



MATERIAL PROCESSOR

INSTRUCTION MANUAL

MODELS:

<i>M20S</i>	<i>M20G</i>	<i>M20C</i>	<i>M20K</i>
<i>M28S</i>	<i>M28G</i>	<i>M28C</i>	<i>M28K</i>
<i>M38S</i>	<i>M38G</i>	<i>M38C</i>	<i>M38K</i>

“Use Genuine NPK Parts”

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

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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 9. 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 (440) 232-7900.
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 (440) 232-7900.
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.
- 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.
- 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 M20, M28, or M38 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.

CARRIER 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.



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.

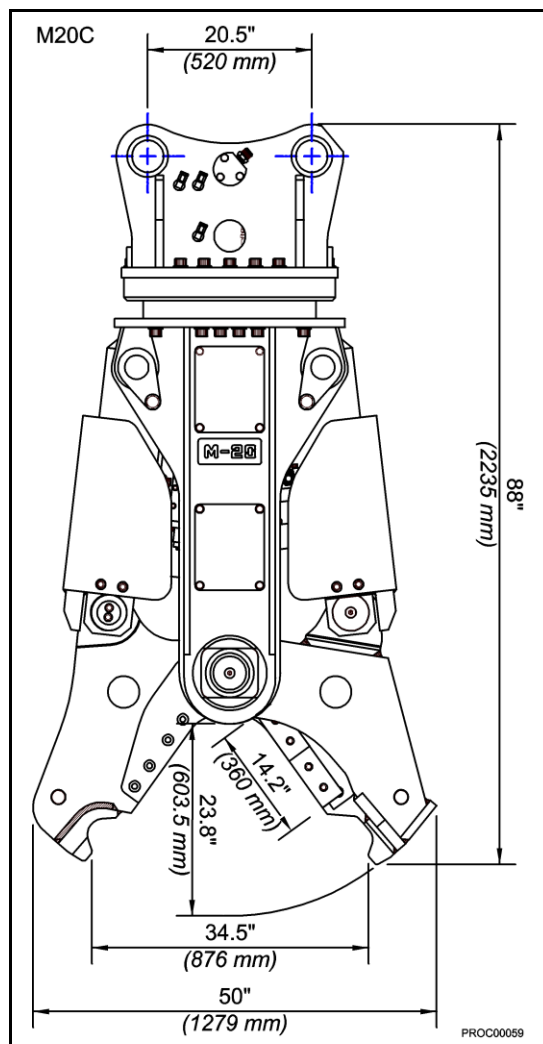
Mounting a MATERIAL PROCESSOR that is too small for the carrier can damage the MATERIAL PROCESSOR and void warranties. Please consult NPK Service or Engineering for specific detailed information.

PROCESSOR MODEL	RECOMMENDED CARRIER WEIGHT RANGE	
	3rd member mounting	
	lbs	(Metric ton)
M20	40,000 – 50,000	(18 - 23)
M28	50,000 – 80,000	(23 - 36)
M38	66,000 – 110,000	(30 - 50)

Specifications subject to change without notice.

M-SERIES SPECIFICATIONS

M20C MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M20C	4,440	(2,015)	34.5	(876)	26-53	(100-200)	1.4	2.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M20C	3,625	(250)	155,120	(690)

Specifications subject to change without notice.

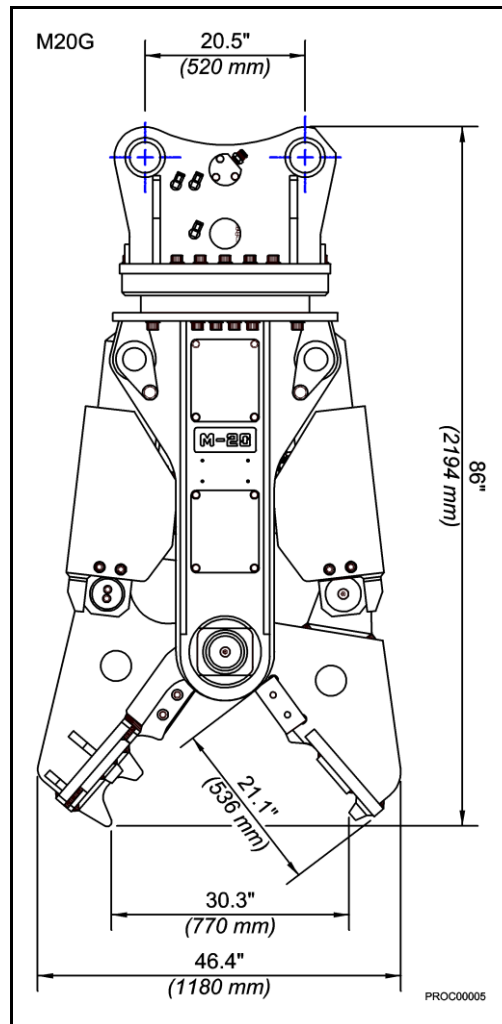
Cycle time is full stroke at maximum flow.

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

M20G MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M20G	4,520	(2,050)	30.3	(770)	26-53	(100-200)	1.4	2.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M20G	3,625	(250)	166,360	(740)

Specifications subject to change without notice.

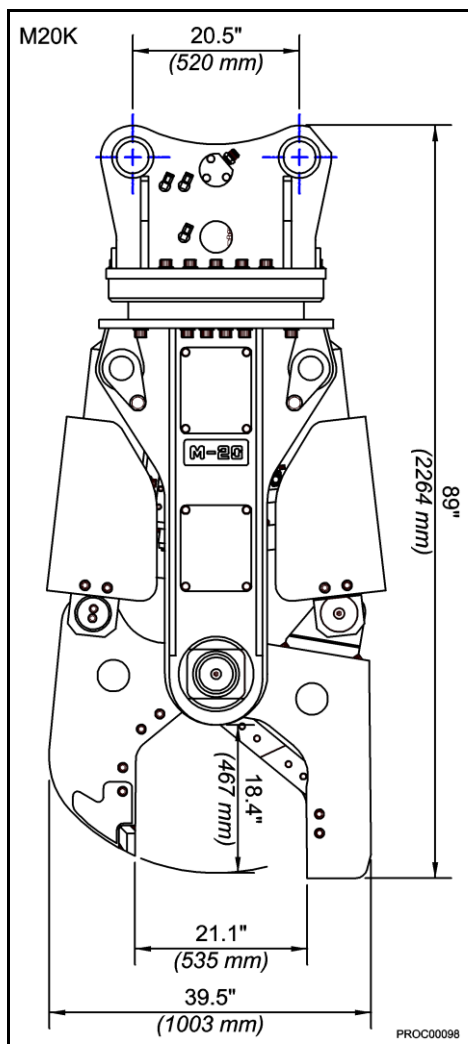
Cycle time is full stroke at maximum flow.

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

M20K MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M20K	4,530	(2,055)	21.1	(535)	26-53	(100-200)	1.4	2.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M20K	3,625	(250)	179,850	800

Specifications subject to change without notice.

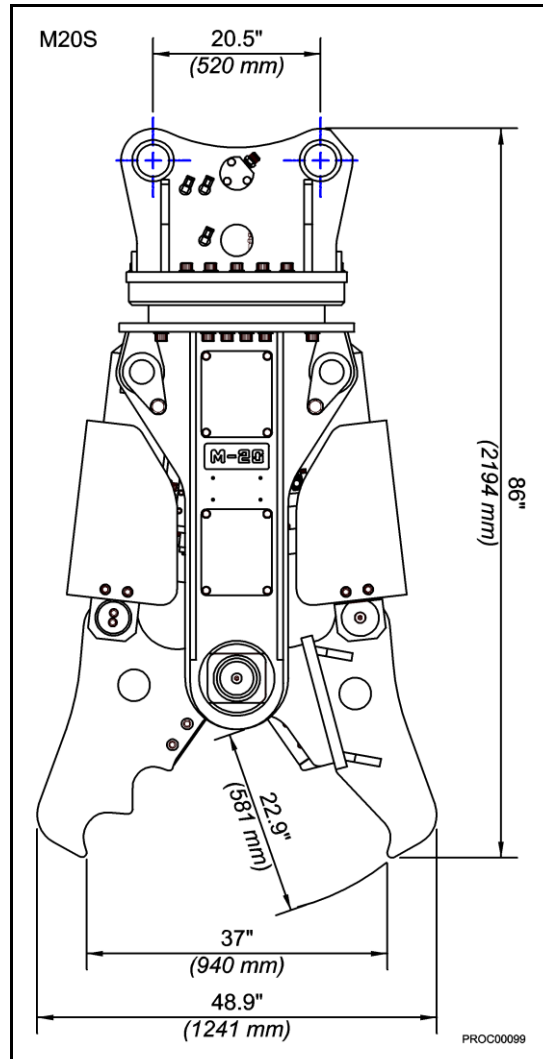
Cycle time is full stroke at maximum flow.

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

M20S MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M20S	4,355	(1,975)	37	(940)	26-53	(100-200)	1.4	2.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M20S	3,625	(250)	155,120	(690)

Specifications subject to change without notice.

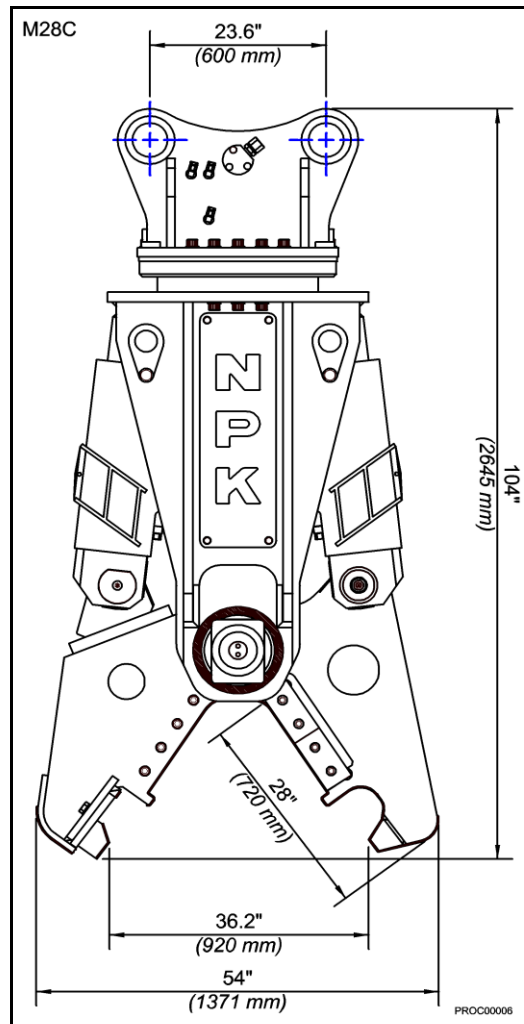
Cycle time is full stroke at maximum flow.

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

M28C MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M28C	6,500	(2,950)	36.2	(920)	50-80	(190-300)	1.7	3.1

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M28C	3,625	(250)	232,000	(1031)

Specifications subject to change without notice.

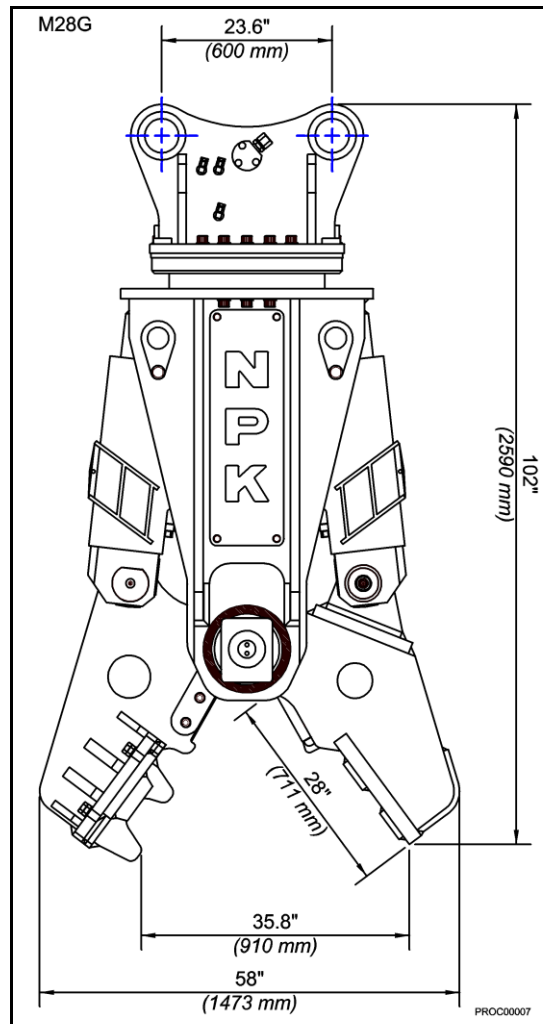
Cycle time is full stroke at maximum flow.

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

M28G MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M28G	6,850	(3,105)	35.8	(910)	50-80	(190-300)	1.7	3.1

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M28G	3,625	(250)	251,790	(1,120)

Specifications subject to change without notice.

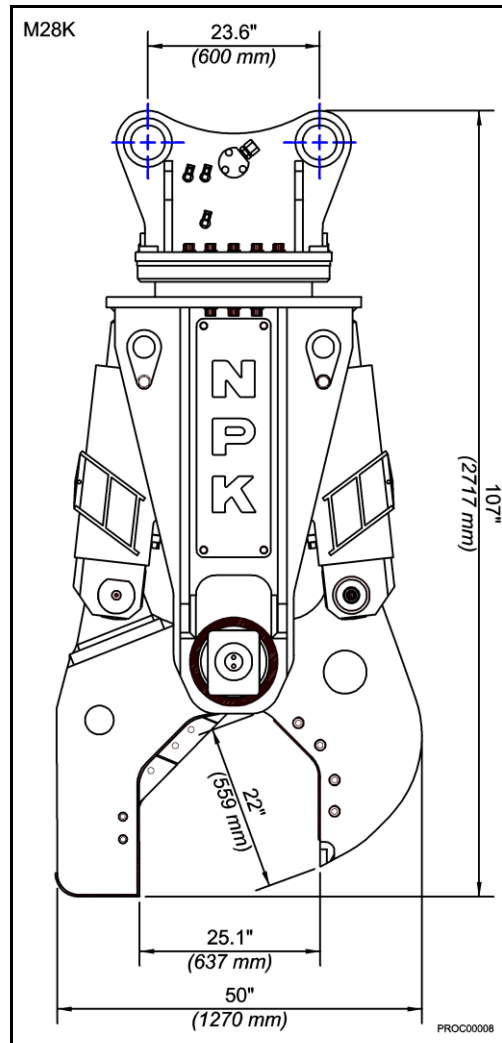
Cycle time is full stroke at maximum flow.

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

M28K MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M28K	6,900	(3,130)	25.1	(637)	50-80	(190-300)	1.7	3.1

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M28K	3,625	(250)	267,520	(1,190)

Specifications subject to change without notice.

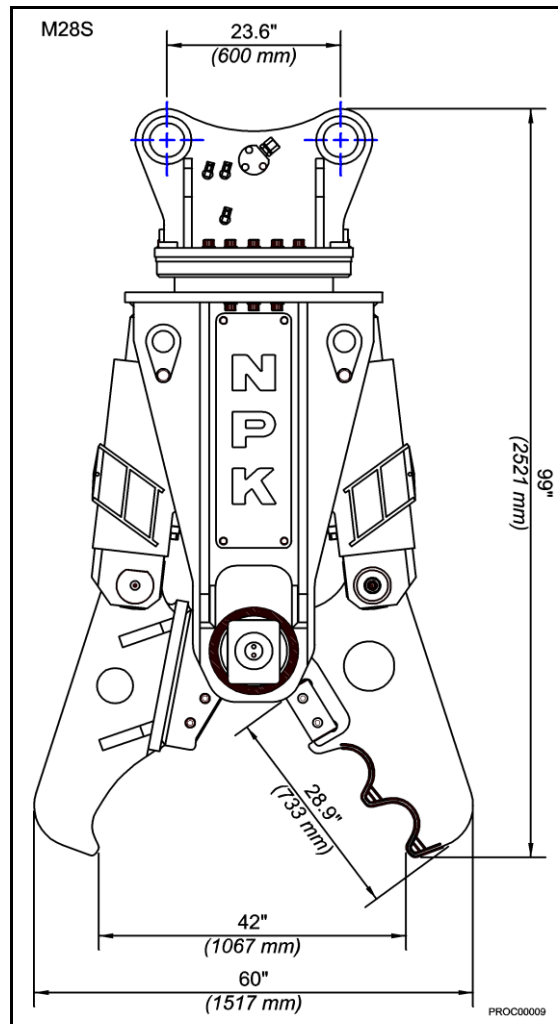
Cycle time is full stroke at maximum flow.

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

M28S MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M28S	6,400	(2,900)	42	(1,067)	50-80	(190-300)	1.7	3.1

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M28S	3,625	(250)	231,555	(1,030)

Specifications subject to change without notice.

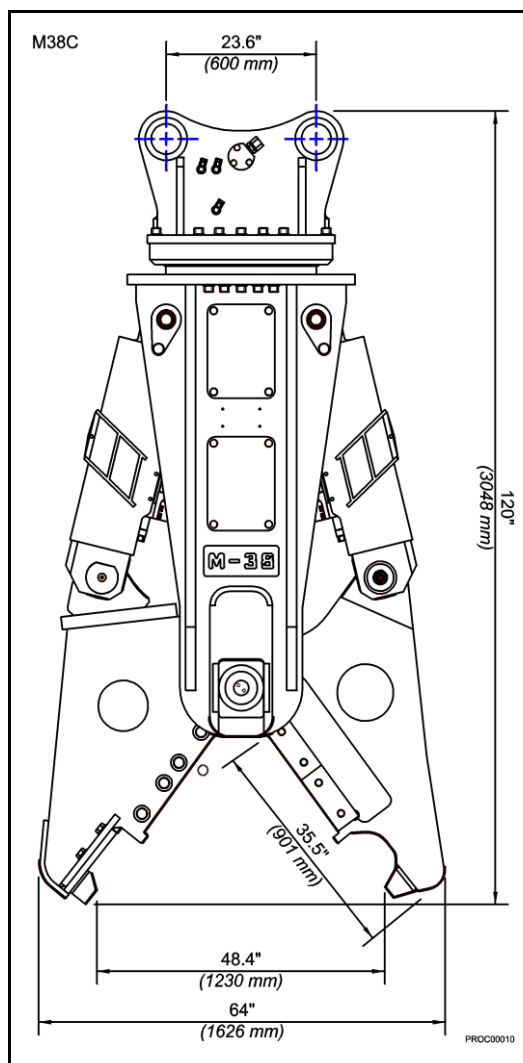
Cycle time is full stroke at maximum flow.

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

M38C MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M38C	8,590	(3,900)	48.4	(1,230)	60-100	(225-380)	2.1	3.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M38C	3,625	(250)	286,000	(1,272)

Specifications subject to change without notice.

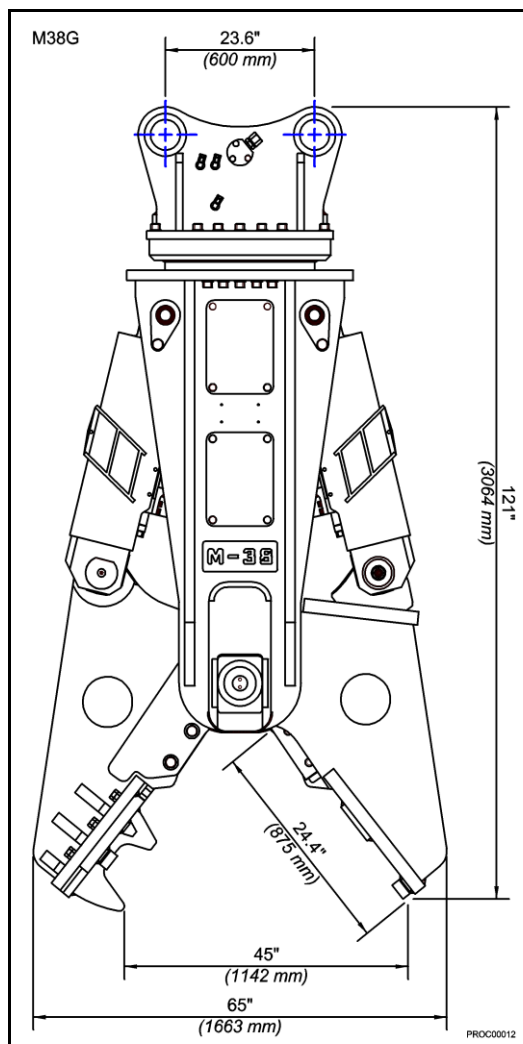
Cycle time is full stroke at maximum flow.

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

M38G MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M38G	9,100	(4,130)	45	(1,142)	60-100	(225-380)	2.1	3.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M38G	3,625	(250)	305,740	(1,360)

Specifications subject to change without notice.

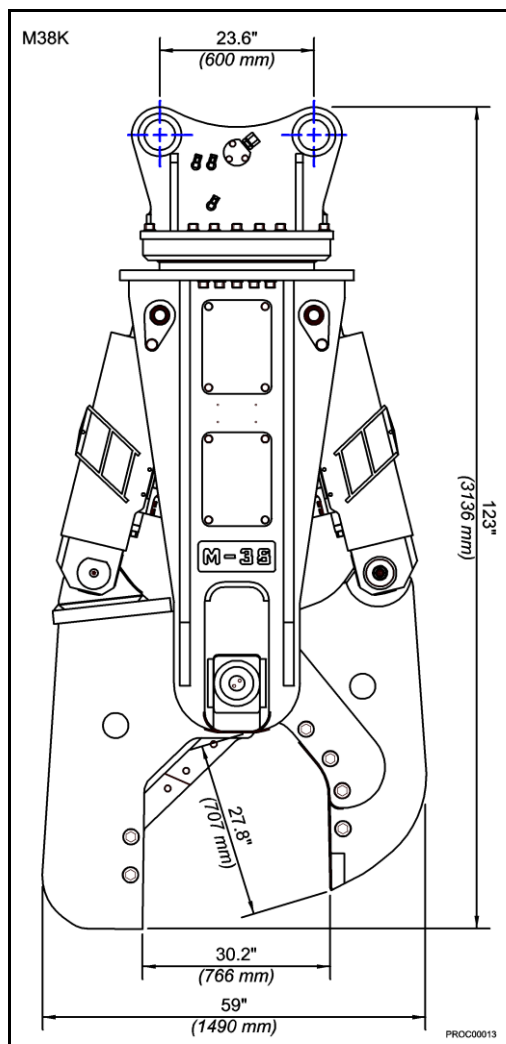
Cycle time is full stroke at maximum flow.

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

M38K MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M38K	9,370	(4,250)	30.2	(766)	60-100	(225-380)	2.1	3.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M38K	3,625	(250)	339,460	(1,510)

Specifications subject to change without notice.

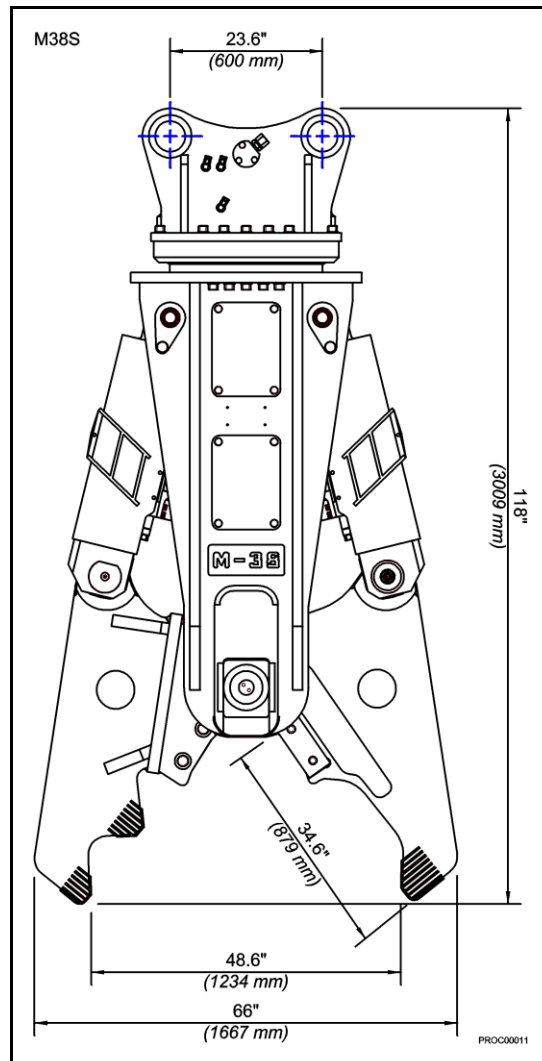
Cycle time is full stroke at maximum flow.

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

M38S MATERIAL PROCESSOR



MODEL	Weight		Maximum Jaw Opening		Oil Flow		Cycle Time seconds	
	lb.	(kg)	in.	(mm)	gpm	(lpm)	open	close
M38S	8,450	(3,835)	48.6	(1,234)	60-100	(225-380)	2.1	3.8

MODEL	Maximum Operating Pressure		Crushing Force at Tip	
	psi	(bar)	lbf	(kN)
M38S	3,625	(250)	292,250	(1,300)

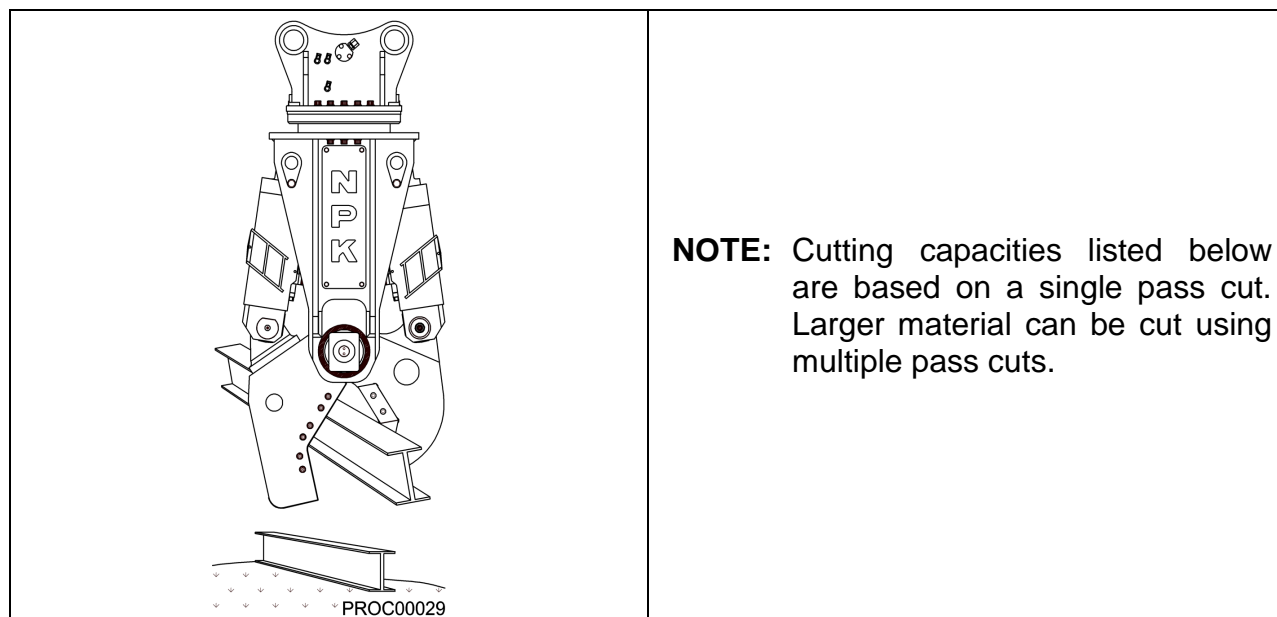
Specifications subject to change without notice.

Cycle time is full stroke at maximum flow.

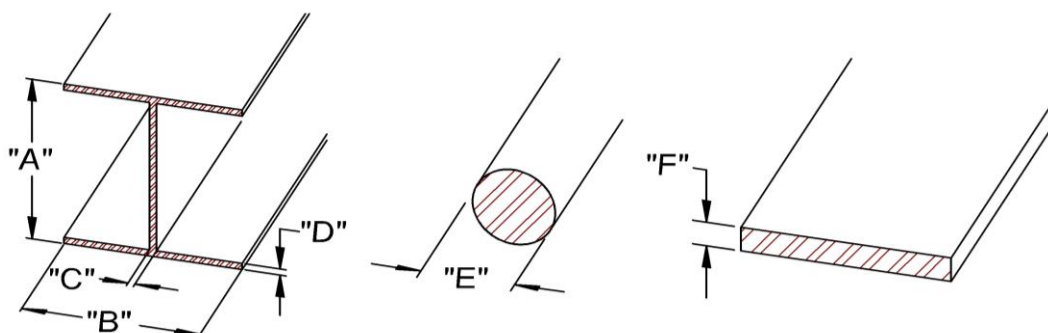
Carrier flow is set at minimal operating pressure of 1000 psi (69 bar).

*Maximum operating pressure is determined by reliefs in the crusher.

K JAW CUTTING CAPACITY



APPETITE GUIDE: MILD STEEL



SHR1095

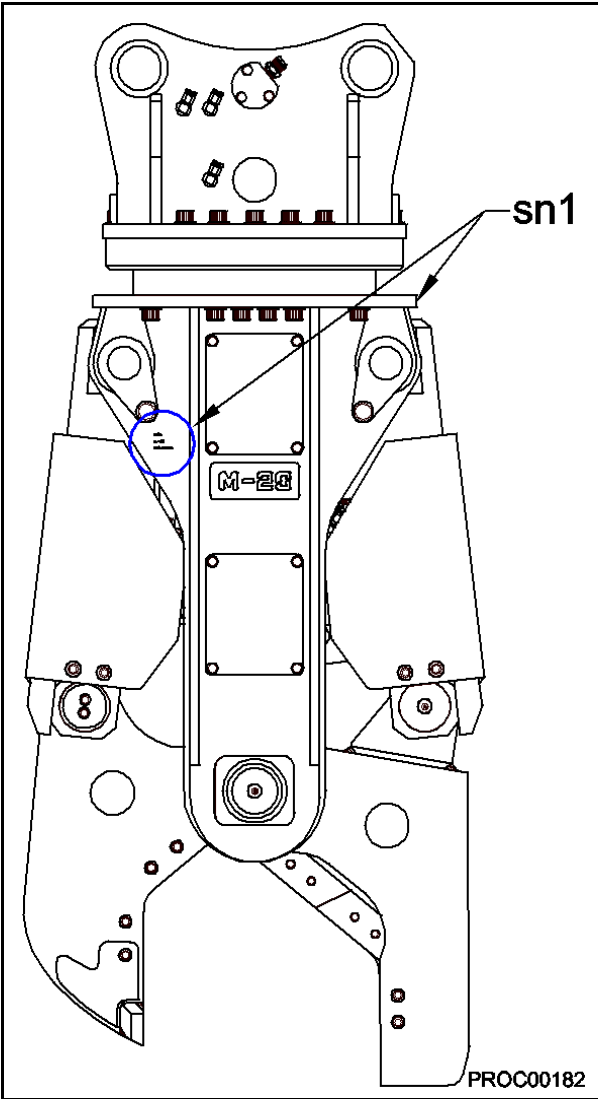
MODEL	A		B		C		D	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)
M20K	12	(305)	12	(305)	1/2	(12.7)	1/2	(12.7)
M28K	16	(406)	16	(406)	5/8	(15.9)	5/8	(15.9)
M38K	19	(483)	19	(483)	3/4	(19.1)	3/4	(19.1)

MODEL	E		F	
	in	(mm)	in	(mm)
M20K	2	(50.8)	1/2	(12.7)
M28K	2-1/2	(63.5)	3/4	(19.1)
M38K	3	(76.2)	1	(25.4)

NOTE: "K" jaws are not designed to cut hardened steel.

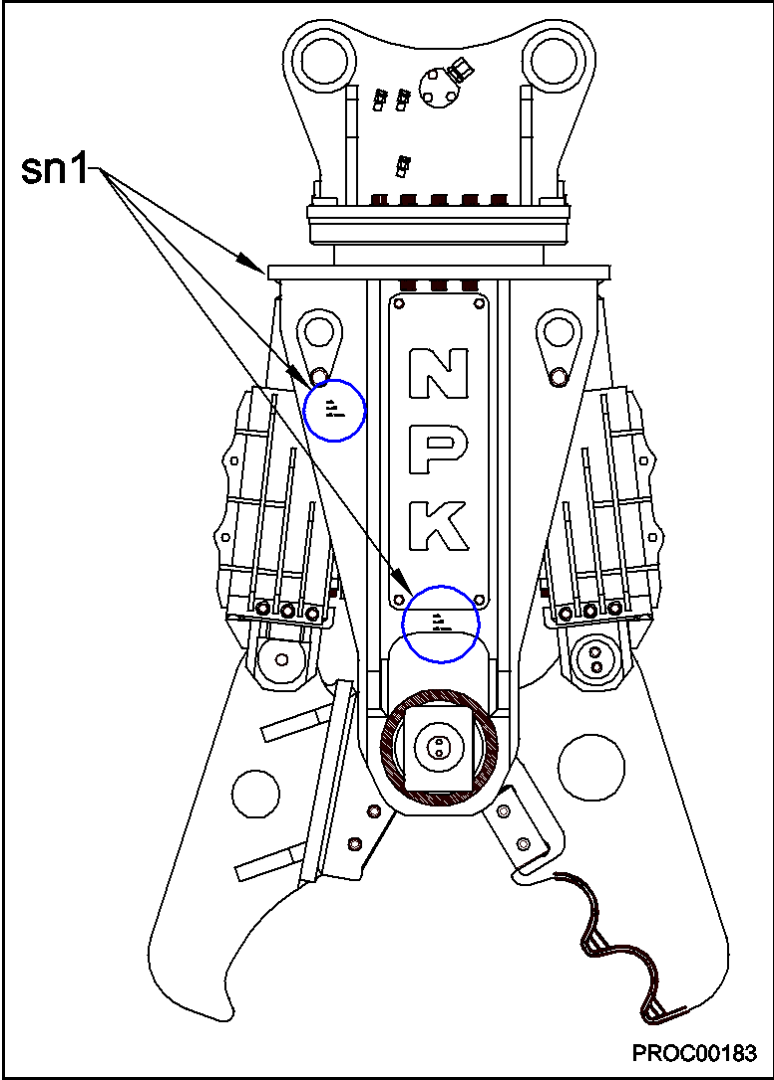
SERIAL NUMBER LOCATION

M20



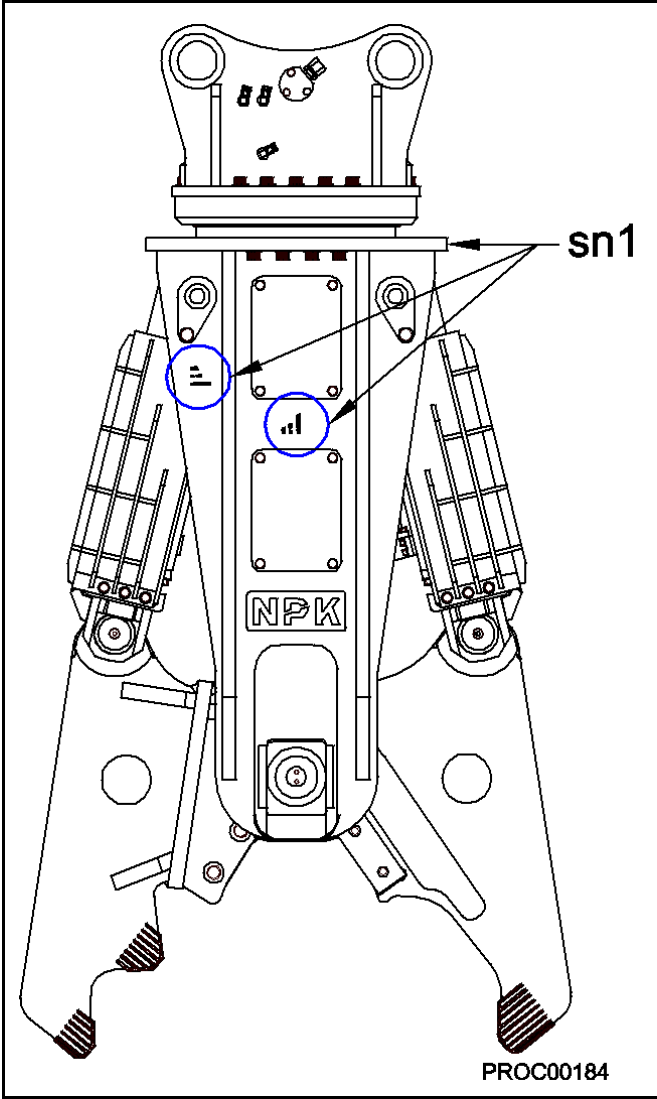
SERIAL NUMBER LOCATION

M28



SERIAL NUMBER LOCATION

M38

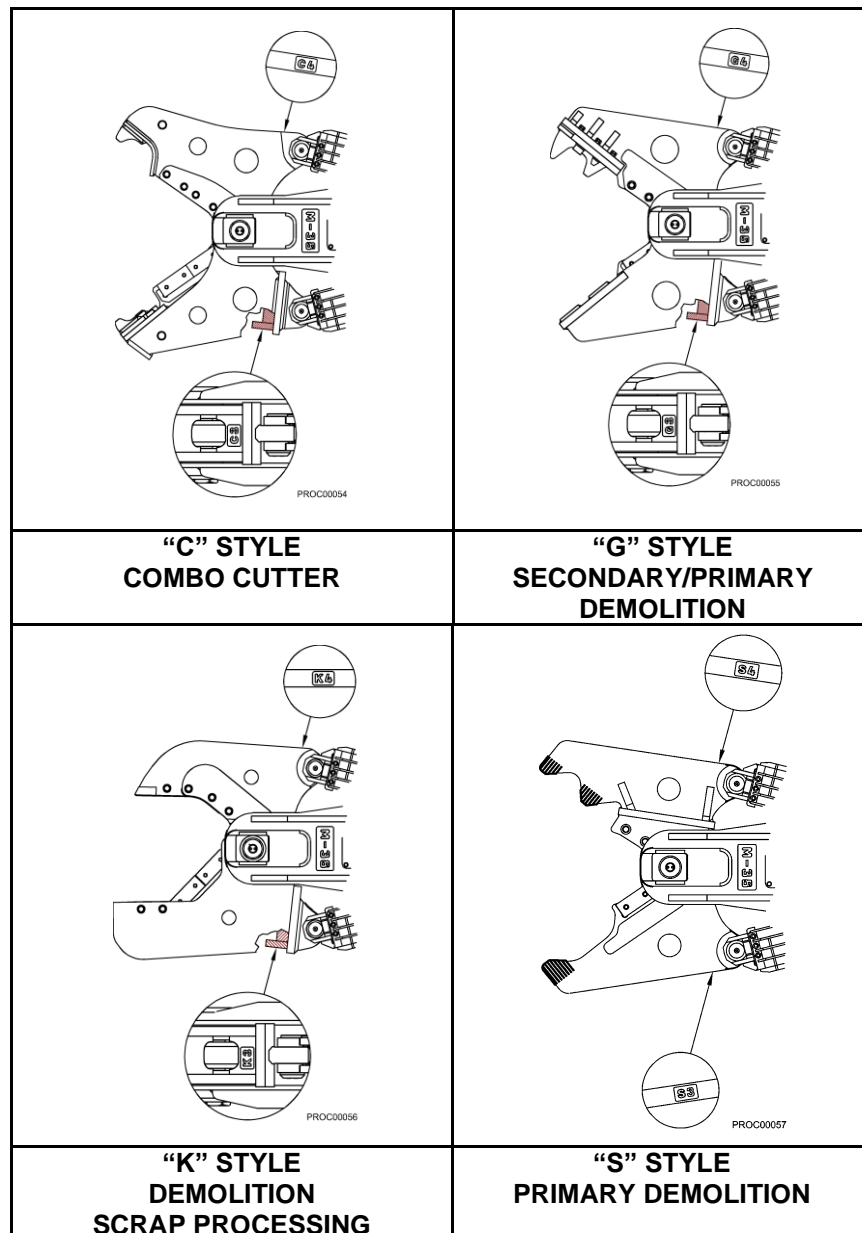


M-SERIES JAW IDENTIFICATION

All M-Series Material Processor jaws are shipped from NPK with the following information welded on them:

1. Letter designating jaw type, i.e., C, G, K, S.
2. Number denoting male or female jaw.

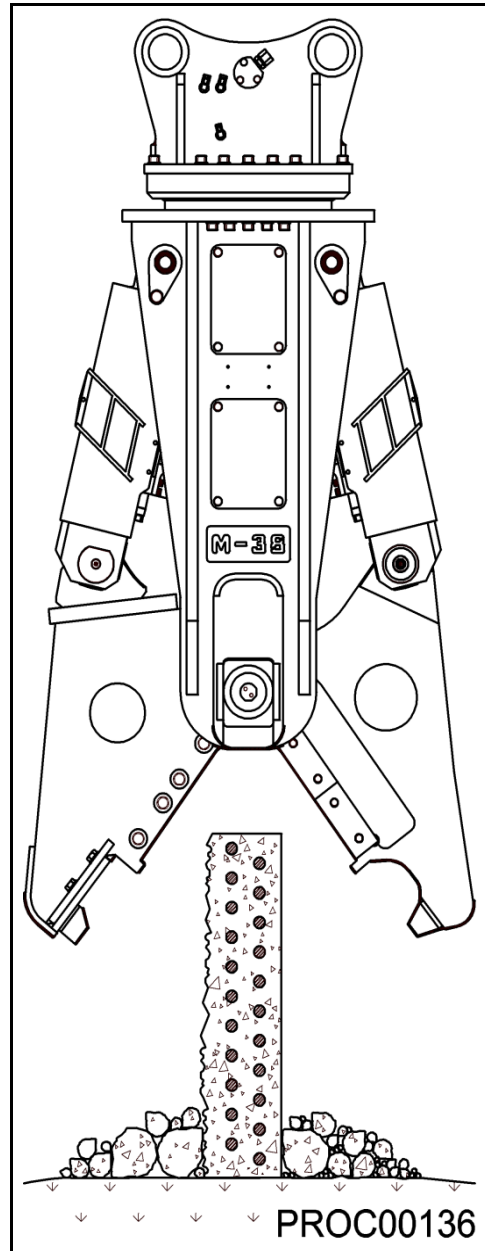
NOTE: Even numbers indicate male jaws, odd numbers indicate female jaws.
This information is welded onto the jaws in the location shown below:



These two items will aid in identifying the exact required parts when ordering.
For questions, please contact the NPK Service Department at (440) 232-7900.

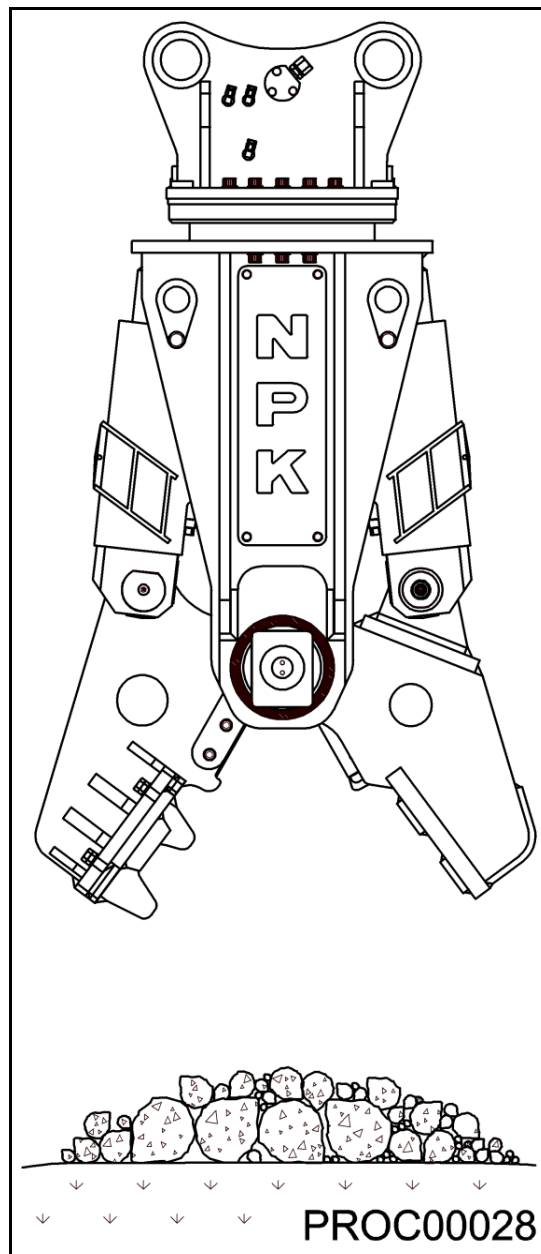
JAW SET IDENTIFICATION

- C Jaw Set (Primary Breaker) for the demolition of concrete pillars, buildings, retaining walls, bridges, and highway barriers that contain a large percentage of steel reinforcement. Approximately two thirds of the jaw opening is for cutting steel. The tip, one third, is for breaking concrete.



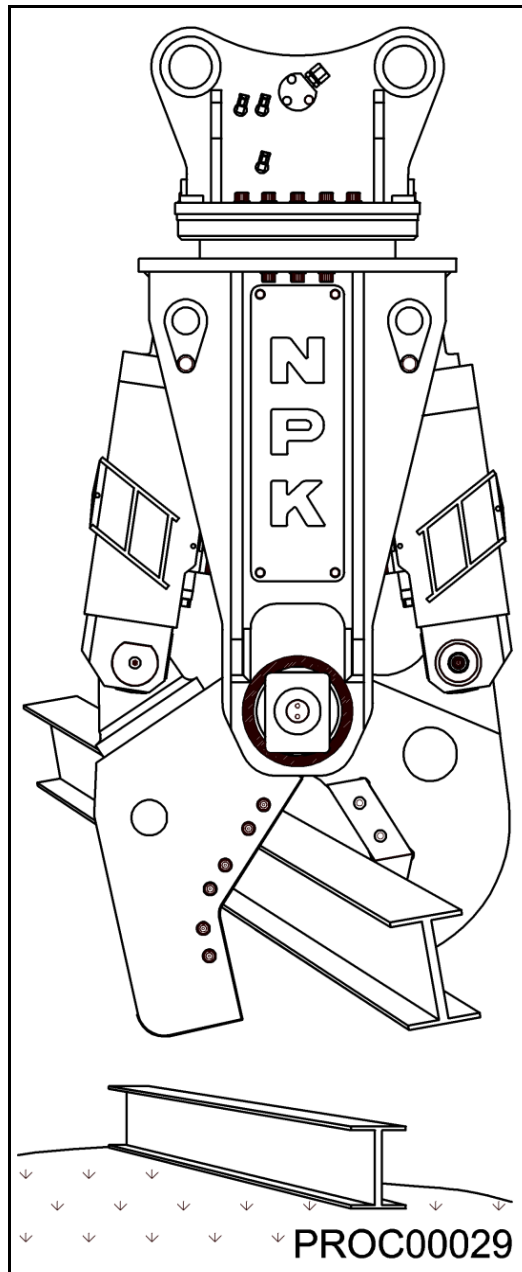
JAW SET IDENTIFICATION

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



JAW SET IDENTIFICATION

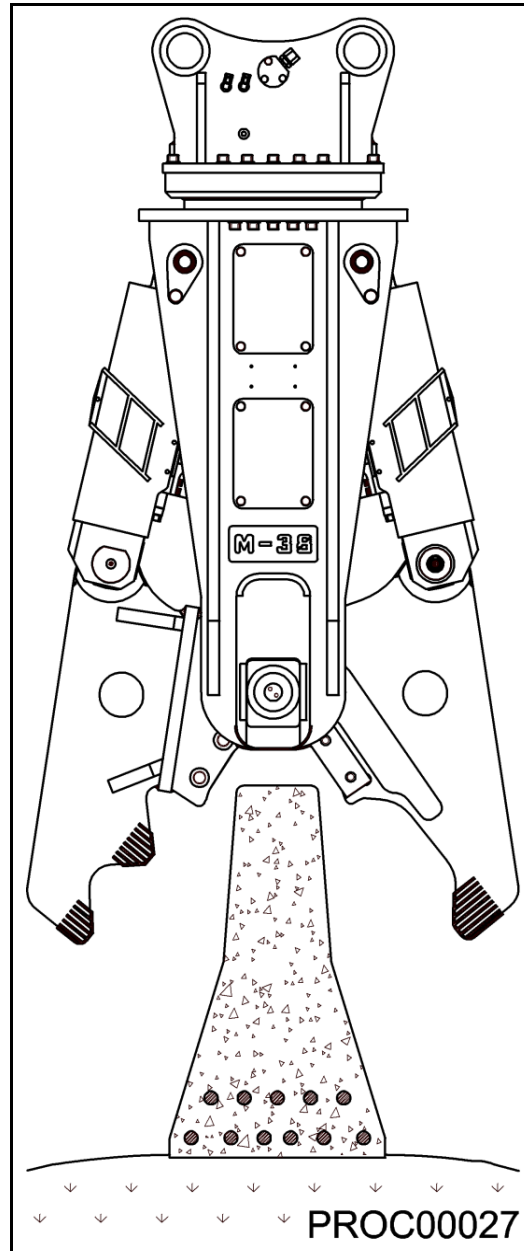
- K Jaw Set (Shear) for the demolition of steel structures, such as buildings and bridges, as well as for processing of scrap, including steel, wood, rubber and plastics.



JAW SET IDENTIFICATION

The following jaw sets are available for the Material Processor:

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



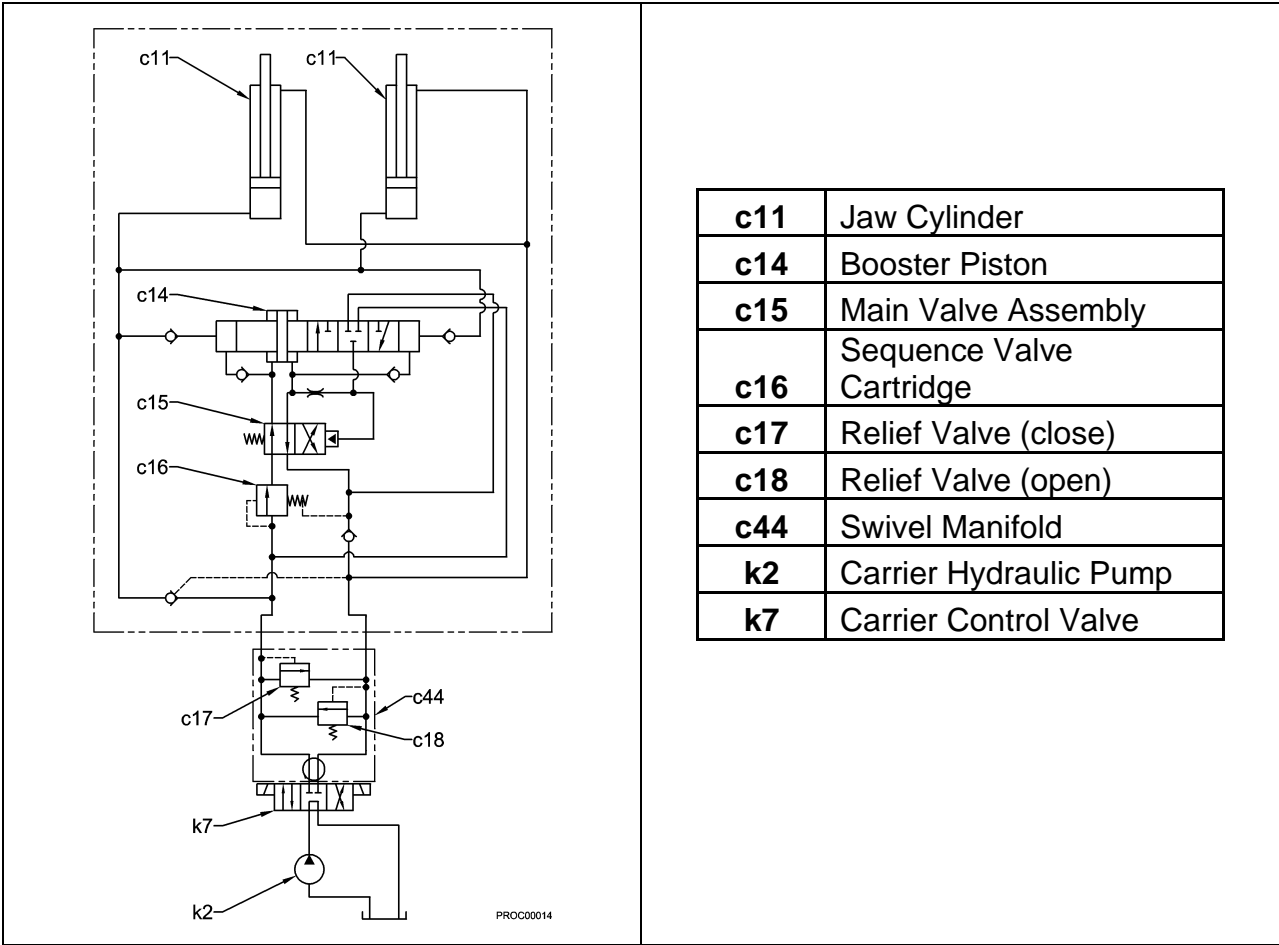
NOTE: Jaw sets can easily be removed from and installed onto the Material Processor at the job site, see the “**JAW SET INTERCHANGE**” section, page 110 of this manual.

PROCESSOR – BOOSTER AND CYLINDER

I INTRODUCTION

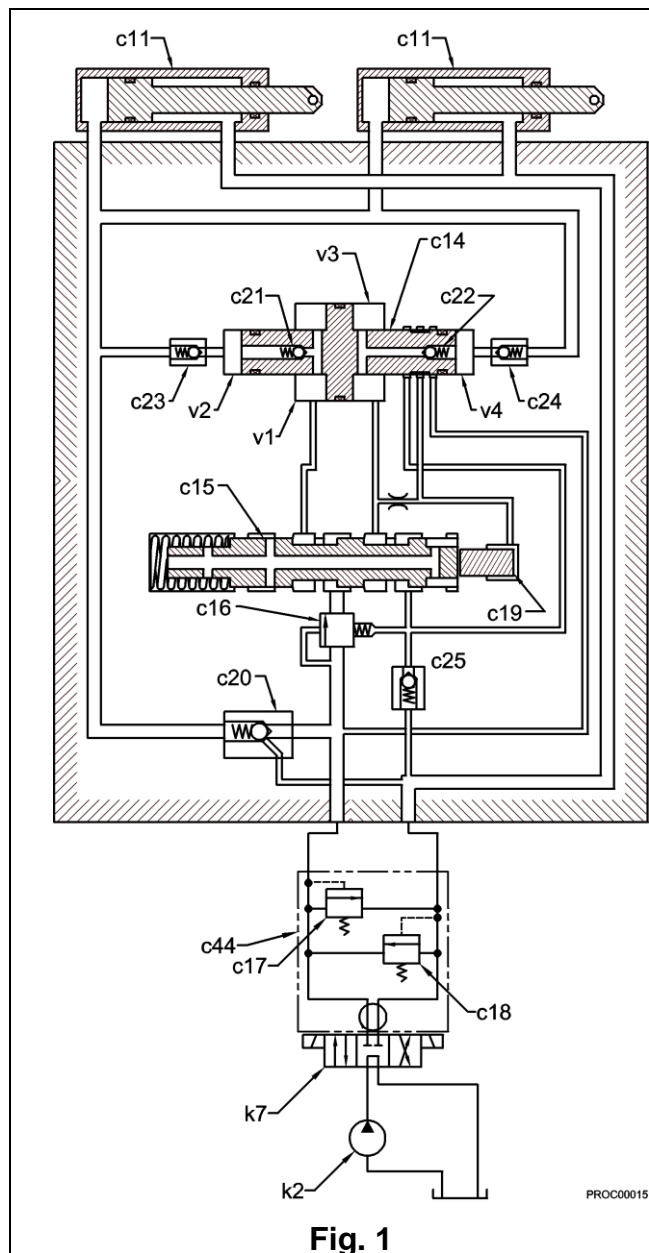
The hydraulic cylinders used on the NPK Material Processor are equipped with a shared hydraulic booster. To close the jaws of the processor, hydraulic oil from the carrier is directed to the base end of the cylinders, which extends the cylinder rods. Under no load, no boost is applied, and this results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

When a load (material to be crushed or sheared) is encountered, pressure builds and shifts the sequence valve of the booster. This directs oil into the booster section, 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 un-boosted cylinder, which are working at excavator system pressure. Because the NPK boosted cylinders are smaller, they require less oil for full stroke as compared to large diameter cylinders. This reduces cycle time for the NPK Material Processor. To open the jaws of the NPK Material Processor, oil is directed to the rod ends of the cylinders. This retracts the rods and pulls the jaws open. No boost is provided in the jaw open mode.



PROCESSOR – BOOSTER AND CYLINDER

II STRUCTURE OF THE BOOSTED CYLINDER



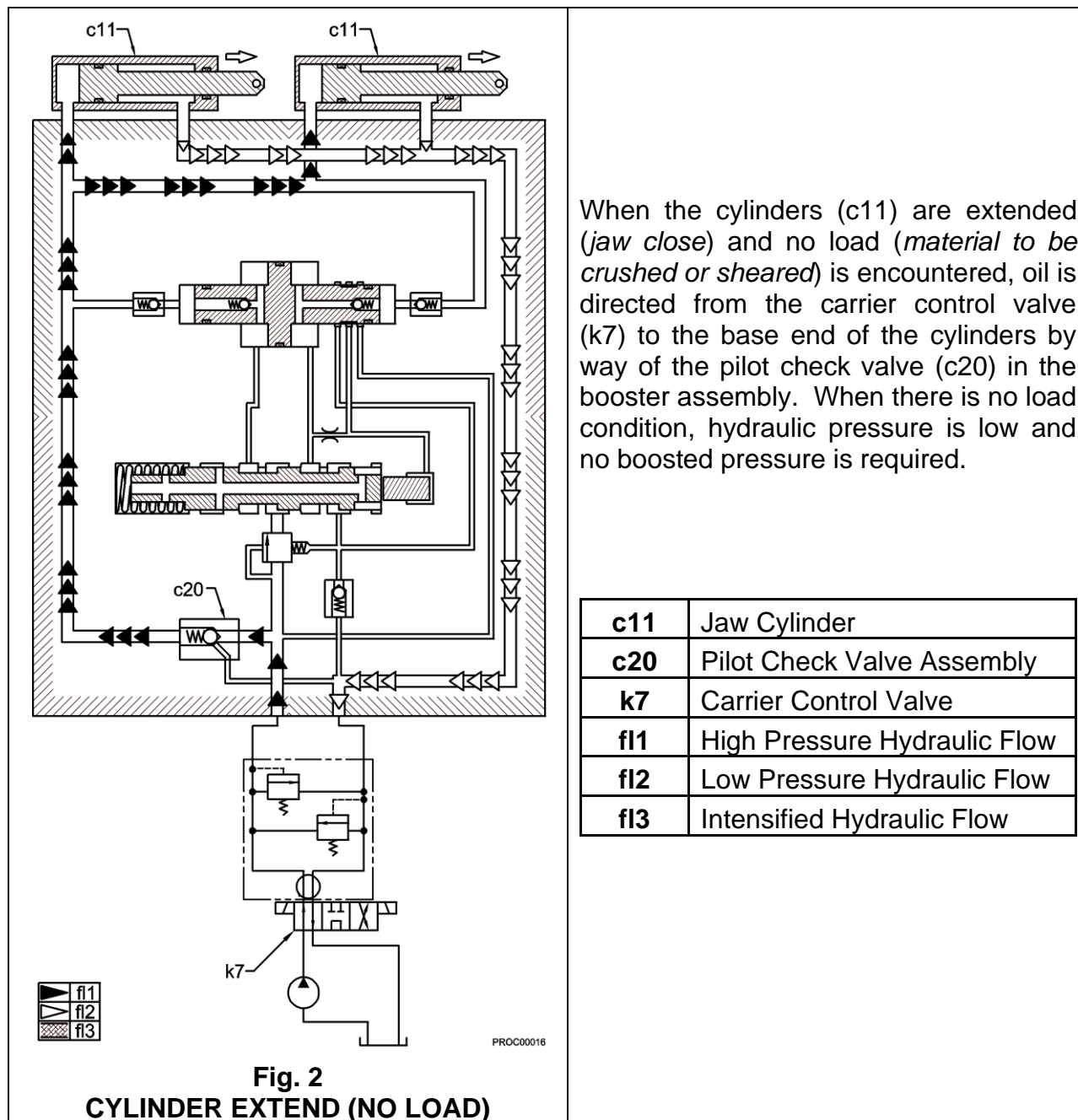
As shown in Fig. 1, the booster cylinder consists of:

c11	Jaw Cylinder
c14	Booster Piston
c15	Main Valve Assembly
c16	Sequence Valve Cartridge
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
c44	Swivel Manifold
k2	Carrier Hydraulic Pump
k7	Carrier Control Valve
v1	Oil Chamber - 1
v2	Oil Chamber - 2
v3	Oil Chamber - 3
v4	Oil Chamber - 4

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

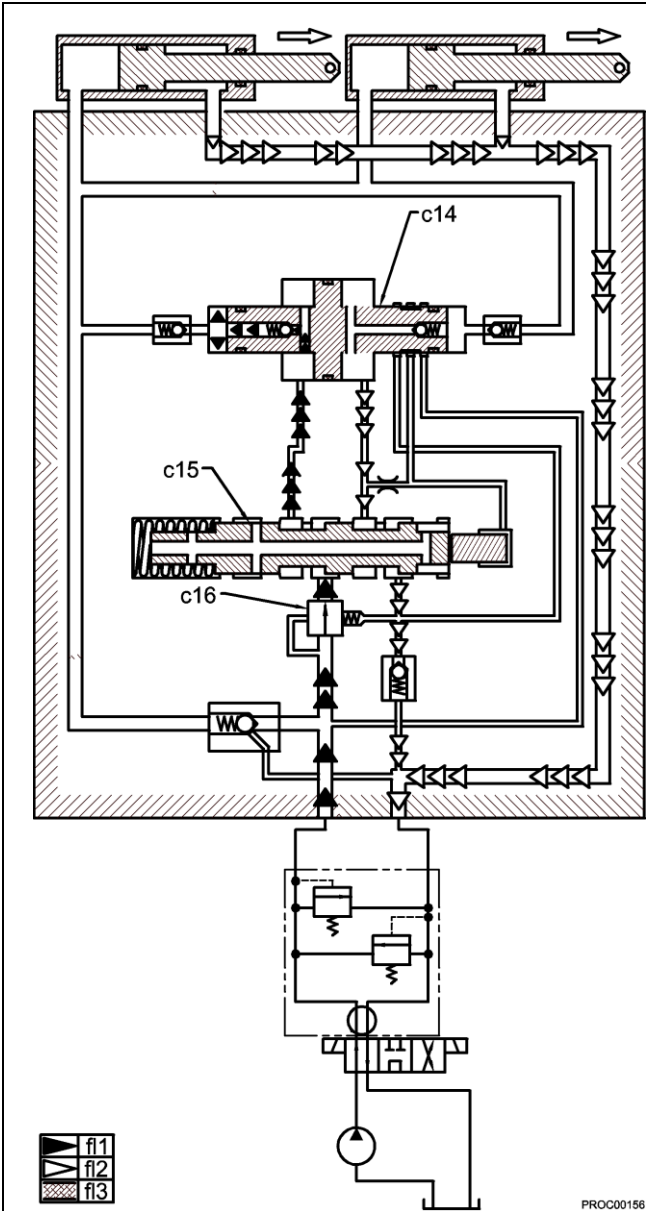
PROCESSOR – BOOSTER AND CYLINDER

III OPERATING PRINCIPLE



PROCESSOR – BOOSTER AND CYLINDER

III OPERATING PRINCIPLE



When a load (material to be crushed or sheared) is encountered on jaw close, the hydraulic pressure in the booster unit starts to rise. When the hydraulic pressure reaches a pre-set value, the sequence valve (c16) shifts and directs 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.

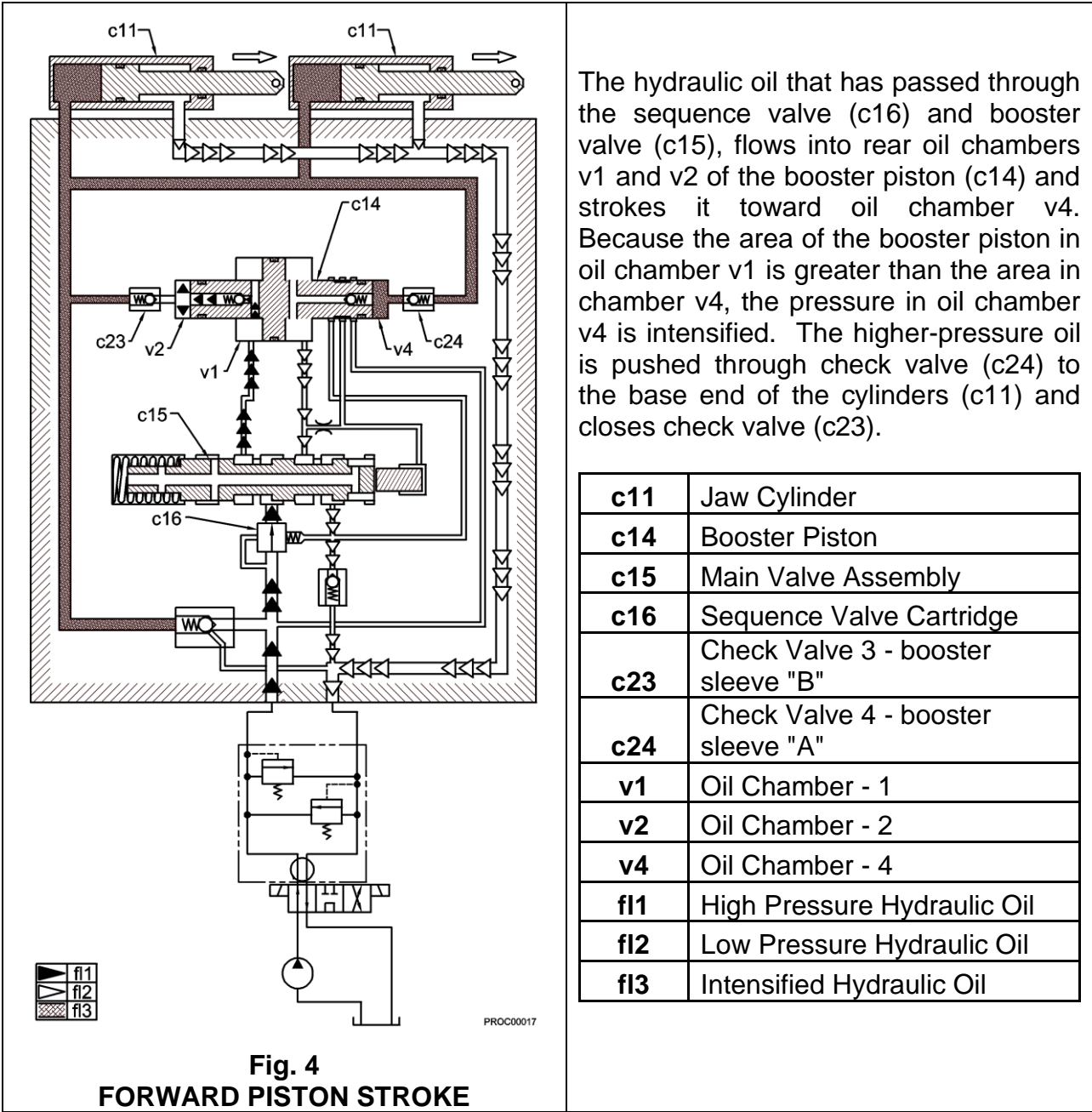
c14	Booster Piston
c15	Main valve Assembly
c16	Sequence Valve Cartridge
f1	High pressure Hydraulic Flow
f2	Low Pressure Hydraulic Flow
f3	Intensified Hydraulic Flow

Fig. 3
BOOSTER ACTUATION

PROC00156

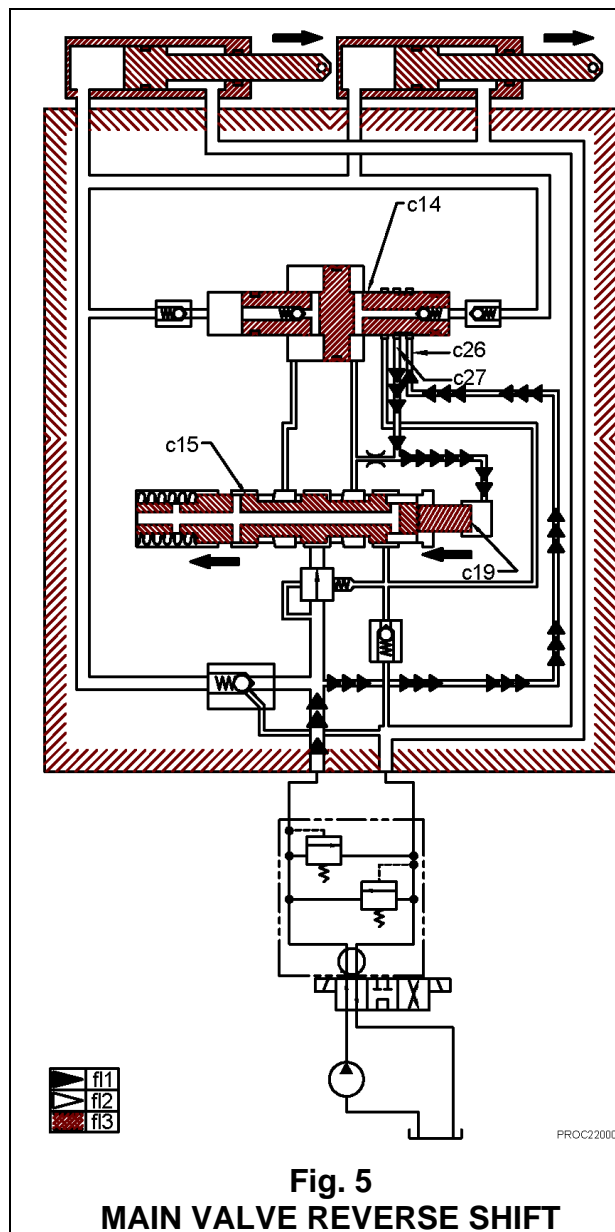
PROCESSOR – BOOSTER AND CYLINDER

III OPERATING PRINCIPLE



PROCESSOR – BOOSTER AND CYLINDER

III OPERATING PRINCIPLE

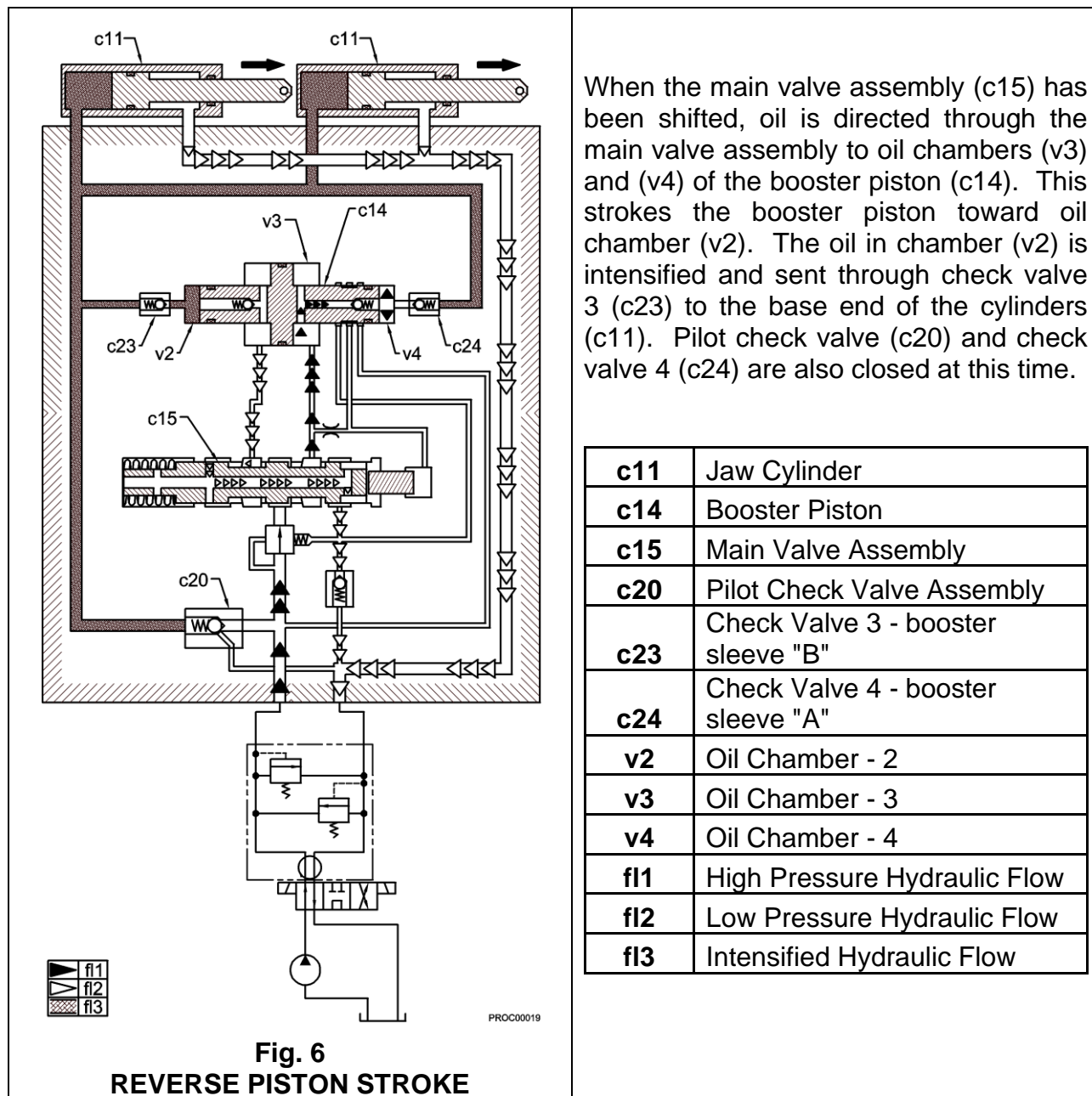


When the booster piston (c14) reaches its full stroke, oil entering port “C1” (c26) transfers to port “C2” (c27) of the piston. Oil is also sent to the plunger (c19) end of the main valve assembly (c15). This shifts the valve as shown in **Fig. 5**.

c14	Booster Piston
c15	Main Valve Assembly
c19	Plunger
c26	Port C1 Piston
c27	Port C2 Piston
f1	High Pressure Hydraulic Flow
f2	Low Pressure Hydraulic Flow
f3	Intensified Hydraulic Flow

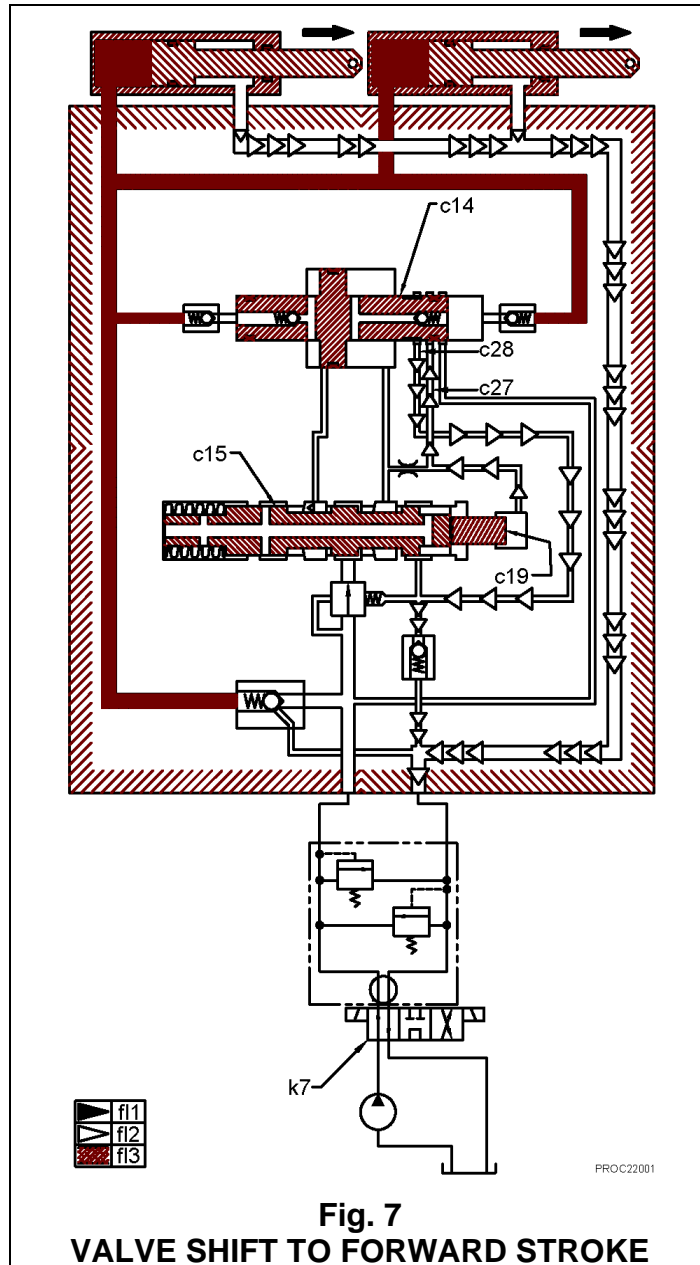
PROCESSOR – BOOSTER AND CYLINDER

III OPERATING PRINCIPLE



PROCESSOR – BOOSTER AND CYLINDER

III OPERATING PRINCIPLE

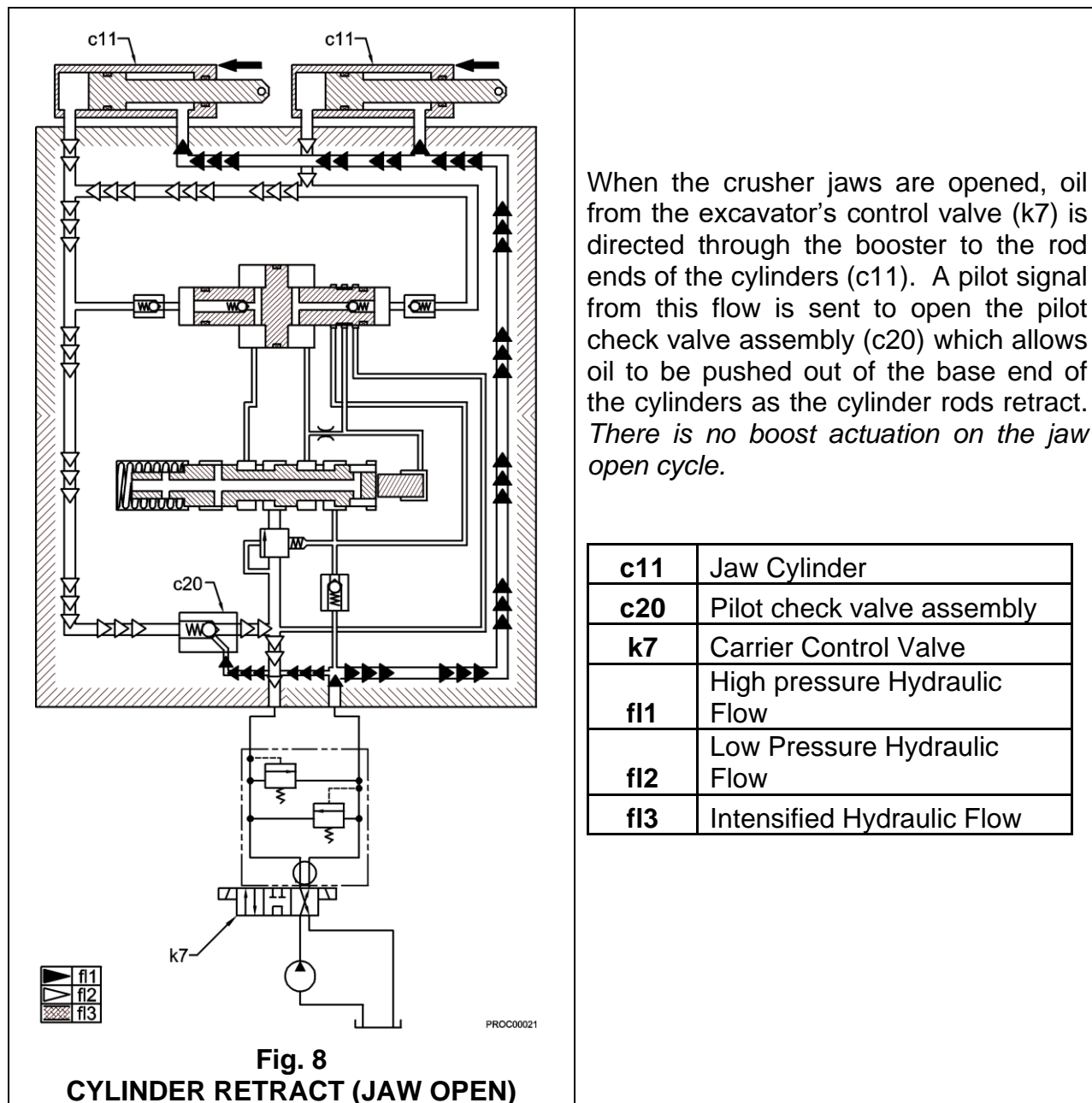


When the booster piston (c14) reaches full reverse stroke, oil drains out of the plunger (c19) end of the main control valve (c15) through ports C2 (c27) and C3 (c28) of the booster piston. The main control valve spring moves the main control valve spool toward the plunger. This places the main control valve in position to direct oil to the booster piston 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 booster and cylinders and that there is sufficient resistance (*load*) to keep the booster active.

c14	Booster Piston
c15	Main Valve Assembly
c19	Plunger
c27	Port C2 Piston
c28	Port C3 Piston
k7	Carrier Control Valve
f1	High Pressure Hydraulic Flow
f2	Low Pressure Hydraulic Flow
f3	Intensified Hydraulic Flow

PROCESSOR – BOOSTER AND CYLINDER

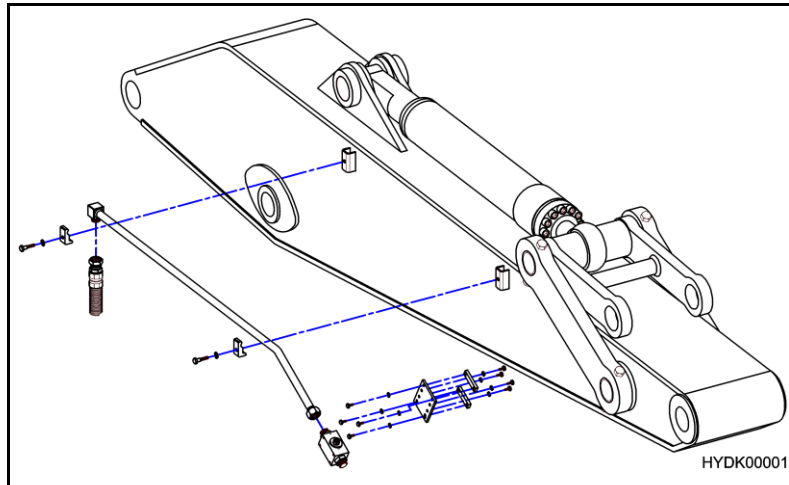
III OPERATING PRINCIPLE



HYDRAULIC INSTALLATION

HYDRAULIC KITS

Most hydraulic 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.

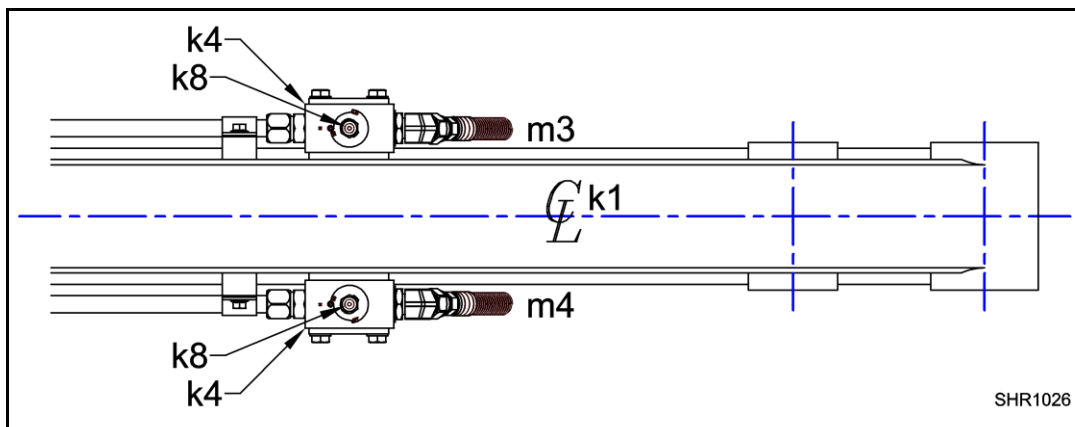


Combination kits that can be used for hydraulic hammer or compactor/driver operation are available.

See your NPK dealer for details or call NPK direct at (440) 232-7900.

FLOW DIRECTION

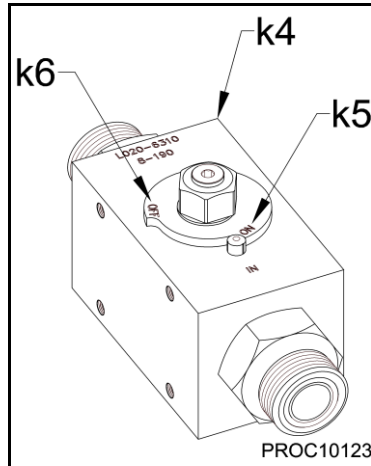
The hydraulic flow to close (m3) the Material Processor jaws is on the left side of the carrier (looking from the operator's seat) and to open (m4) the jaws is on the right.



HYDRAULIC INSTALLATION

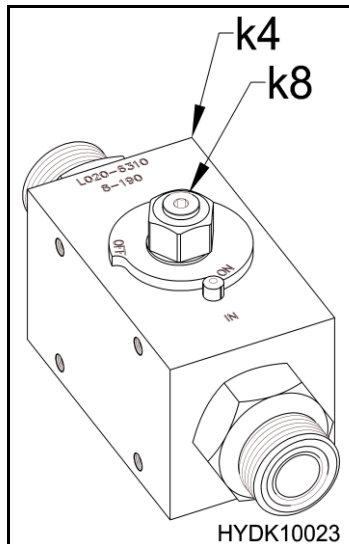
SHUT-OFF VALVES

Most hydraulic 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.



TEST PORT LOCATIONS

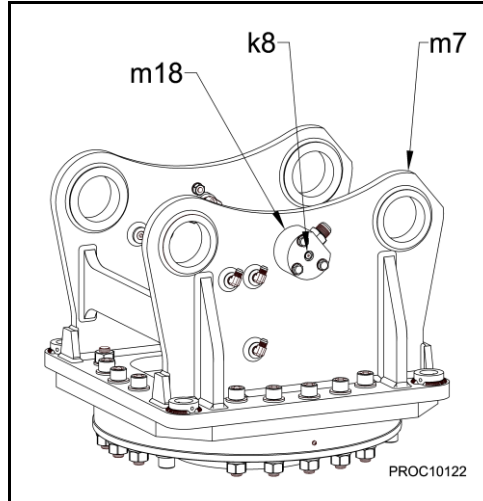
A. Most hydraulic kits have pressure test (gauge) ports (k8) in both shut-off valves (k4).



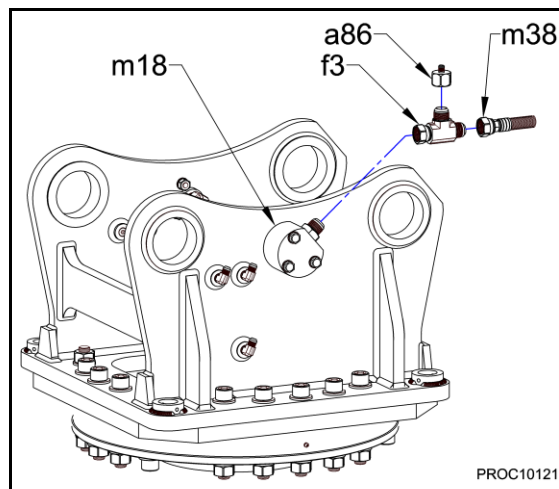
HYDRAULIC INSTALLATION

TEST PORT LOCATIONS

- 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).



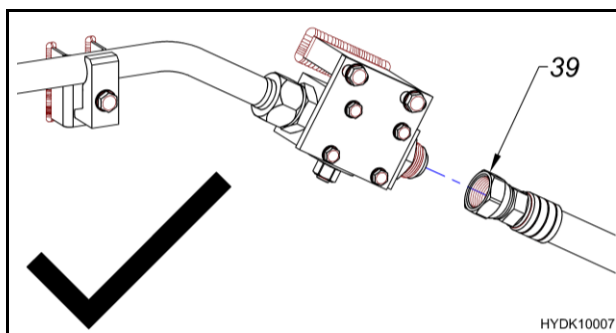
- C. For older units without pressure test ports in the top bracket or for units mounted on a carrier without an NPK Hydraulic Installation Kit, it is suggested that you use a correctly sized JIC swivel run tee (f3) and a reducer fitting (a86) between the whip hose (m38) and the joint fitting (m18).



HYDRAULIC INSTALLATION

HYDRAULIC QUICK DISCONNECTS

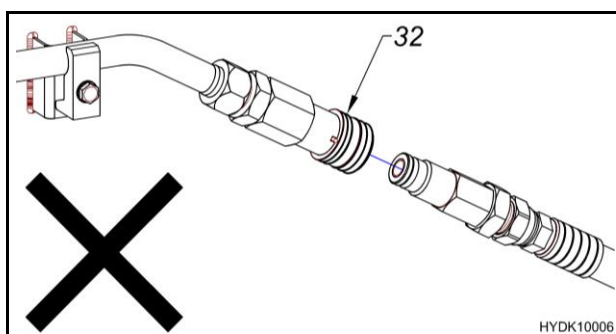
NPK prefers the use of a straight JIC connection (39) when installing its Material Processor onto a carrier.



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.

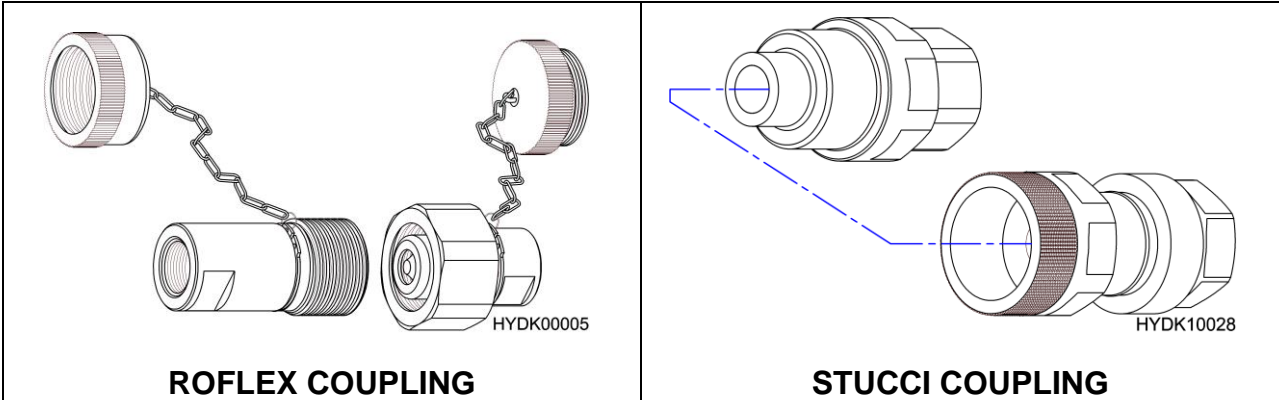


2. Contamination can enter the hydraulic system if the quick disconnect ends are not kept clean. The quick disconnects should be capped to keep them clean. If this is not done, contamination in the quick disconnect will be flushed into the hydraulic system, causing internal damage to the Material Processor.
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 (440) 232-7900 for proper sizing of approved NPK quick disconnects for your unit.



HYDRAULIC INSTALLATION

PREVENTION OF CONTAMINATION

ATTENTION

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 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 NPK Processor 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.

MOUNTING INSTALLATION

NPK Mounting Installation Kits include the parts required to adapt the NPK Material Processor to the arm of your carrier. 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.

M-SERIES TOP BRACKET

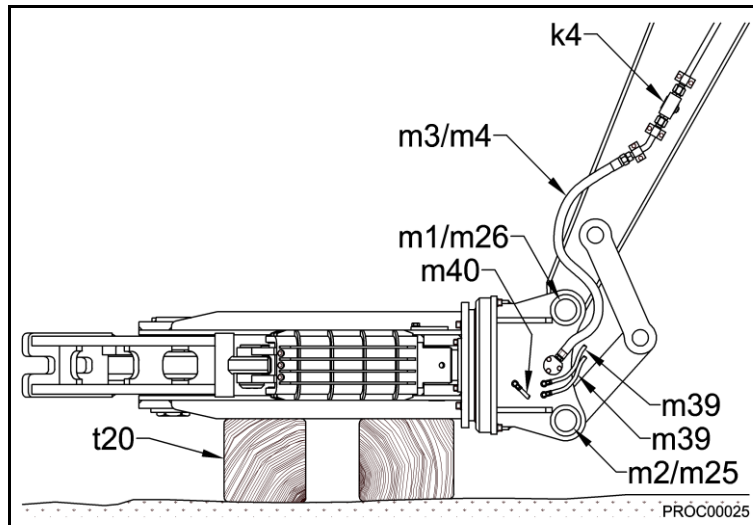
The M-Series top bracket is ported for right or left side hose access for rotation and motor case drain line connections.

ITEM	DESCRIPTION
BO	Holding Valve
BQ2	Rotation Motor
CW	Rotation Hose
CX	Motor Drain Line
m18a	Main Connection (<i>close</i>) - #20 JIC male
m18b	Main Connection (<i>open</i>) - #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 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

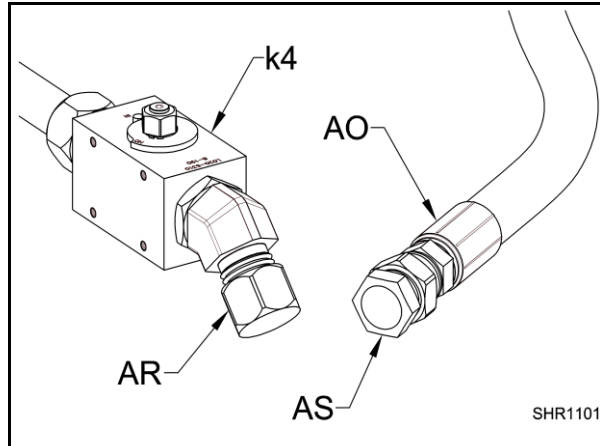
The hydraulic lines must be handled carefully to prevent contamination from entering the Material Processor or the carrier hydraulic system.

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 Material Processor down. Install metal plugs in the hydraulic hoses and metal caps on the stick tubes to keep out contamination.
5. Position the Material Processor horizontal on wood blocks (t20), as shown in "MOUNTING TO THE CARRIER".

STORAGE OF THE MATERIAL PROCESSOR

1. Make sure all whip hoses (m38) that connect the 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.

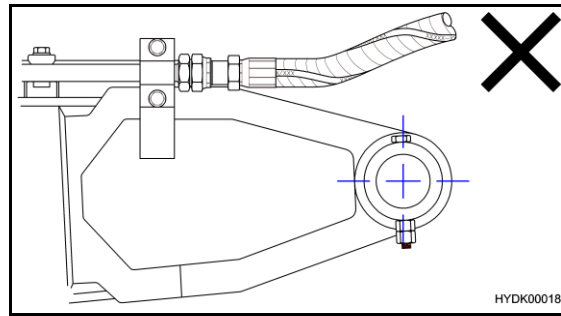


2. Grease all lubrication points; see the “**GENERAL MAINTENANCE**” section under “**LUBRICATION POINTS**”.
3. If the unit is stored outdoors, retract the cylinder and cover with a waterproof tarp.

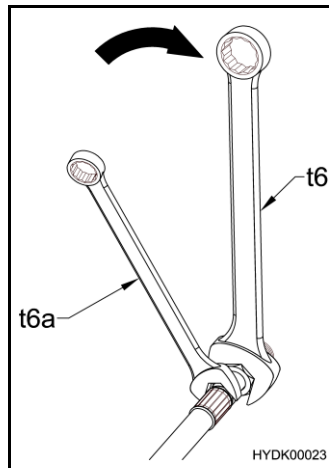
HOSE INSTALLATION

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).



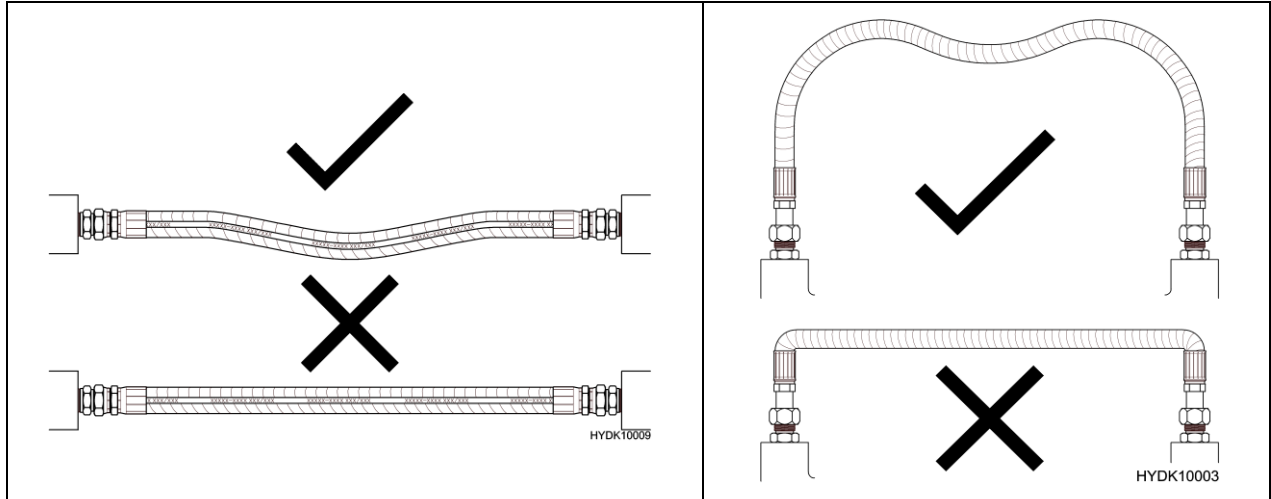
4. Torque hose to specifications.

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

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.

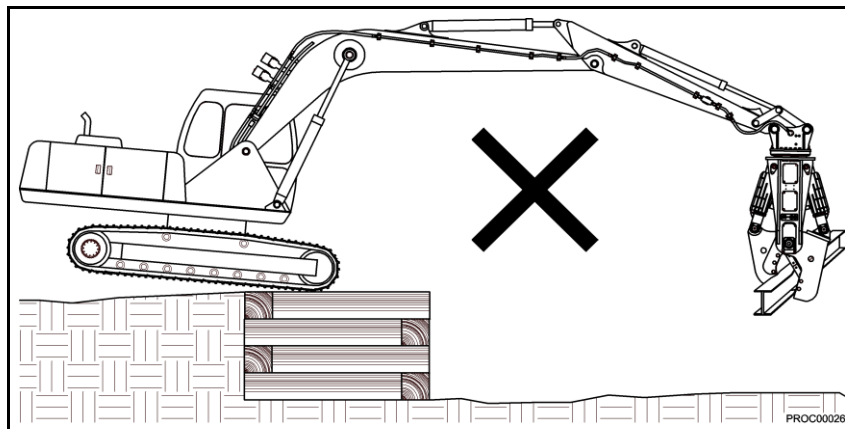
	TEMPERATURE RANGE	
	°F	(°C)
HYDRAULIC FLUID	14 to 176	(-10 to +80)
ATMOSPHERIC	14 to 122	(-10 to +50)

OPERATING INSTRUCTIONS

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



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

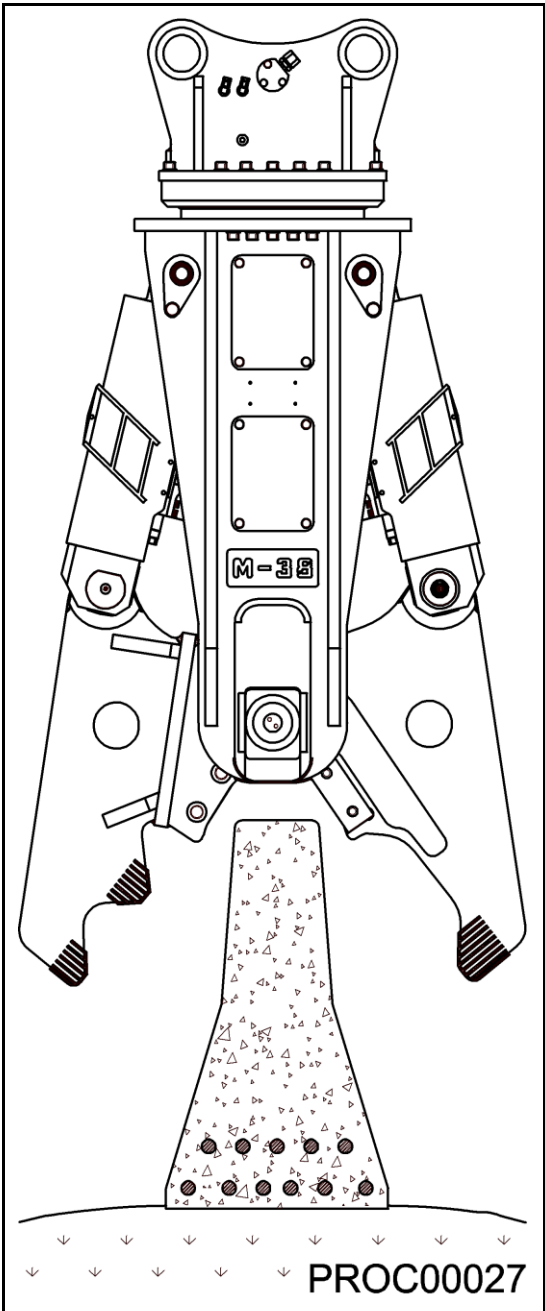


DO NOT LIFT OR LOAD BEYOND THE CAPACITY OF THE MATERIAL PROCESSOR OR THE CARRIER.

OPERATING INSTRUCTIONS

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

- NPK 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.

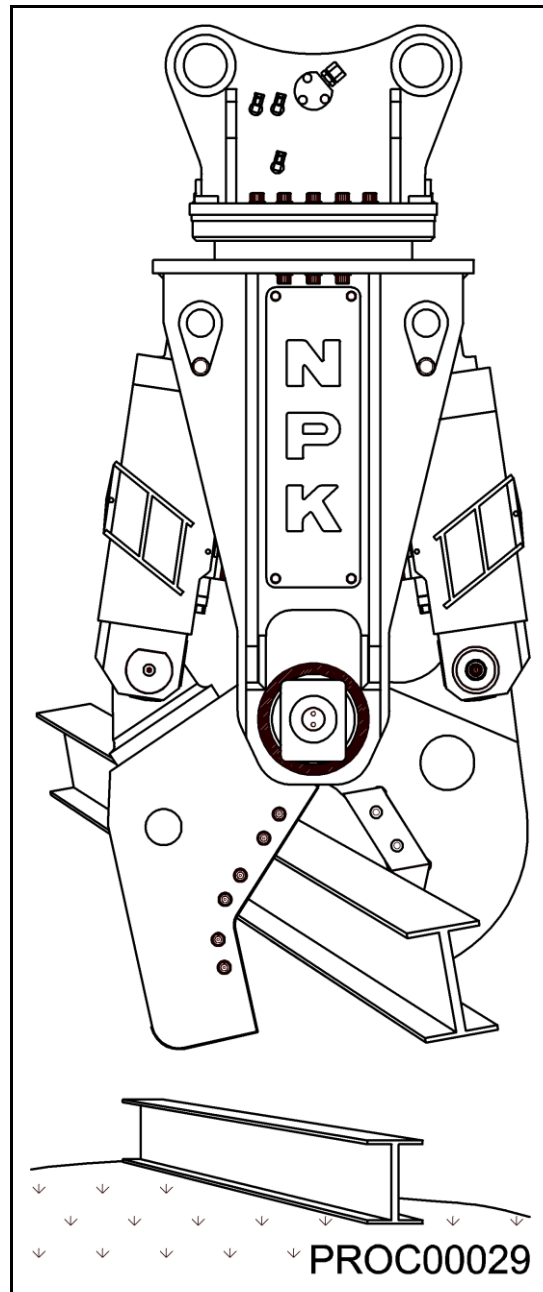


“S” JAW APPLICATION

OPERATING INSTRUCTIONS

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

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

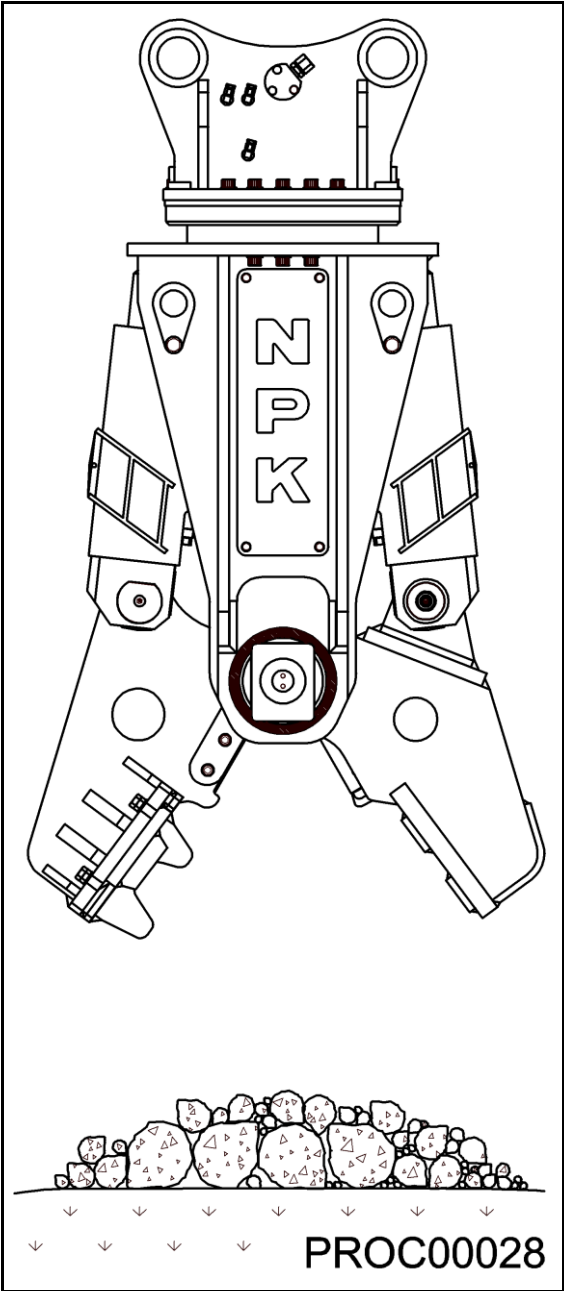


“K” JAW APPLICATION

OPERATING INSTRUCTIONS

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

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

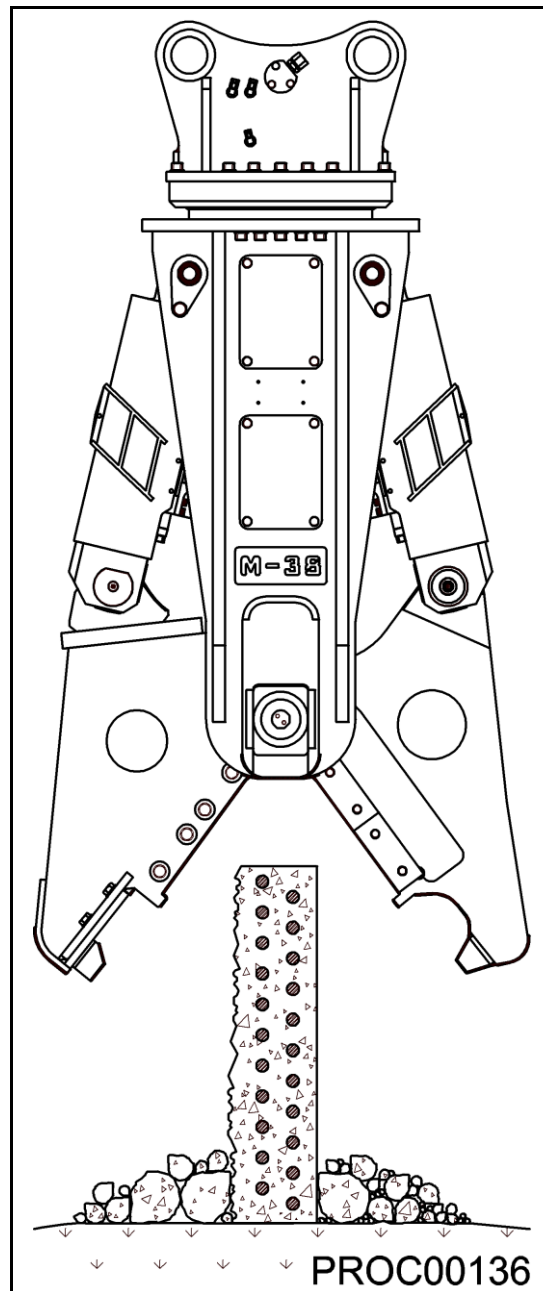


“G” JAW APPLICATION

OPERATING INSTRUCTIONS

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

- ◆ NPK Material Processors equipped with “C” style jaws are designed for the demolition of concrete pillars, buildings, retaining walls, bridges and highway barriers that contain a large percentage of steel reinforcement. Approximately, two thirds of the jaw opening is for cutting steel. The tip, one third, is for breaking concrete.

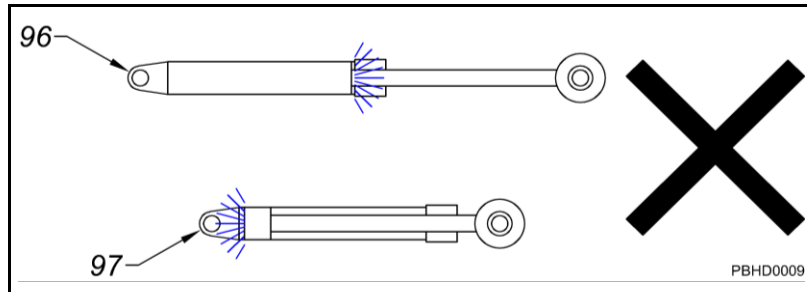


“C” JAW APPLICATION

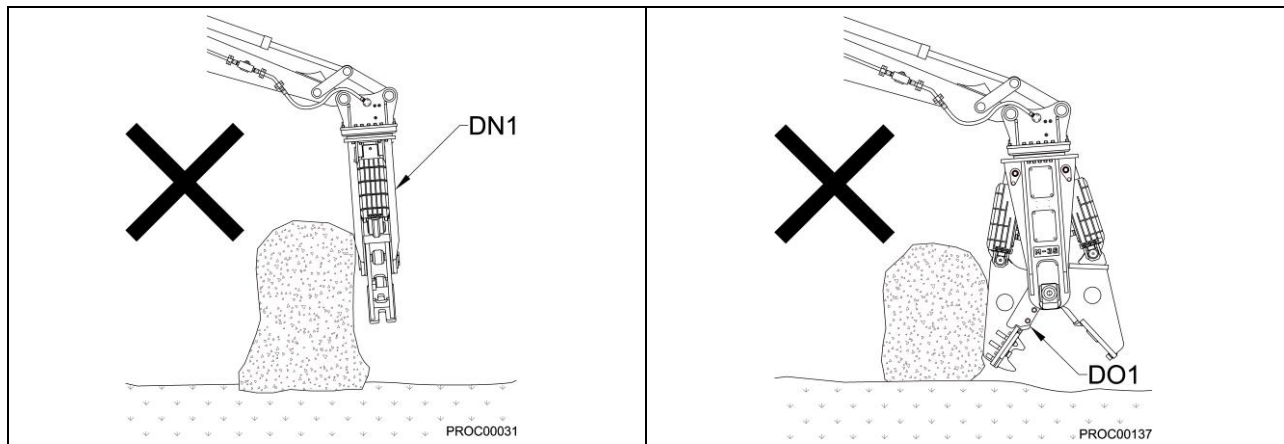
OPERATING TECHNIQUES AND PRECAUTIONS

ATTENTION

1. **Do not** use the Material Processor with the excavator cylinders fully extended (96) or retracted (97).



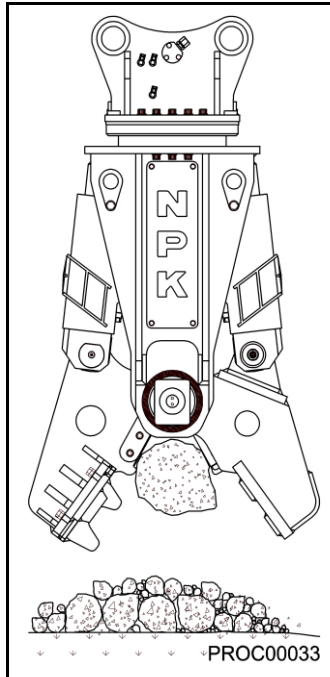
2. **Do not** strike the material with the Material Processor main body (DN1) or outer surface of the jaw set (DO1). **Do not** push, pull or scrape material with the Material Processor.



OPERATING TECHNIQUES AND PRECAUTIONS

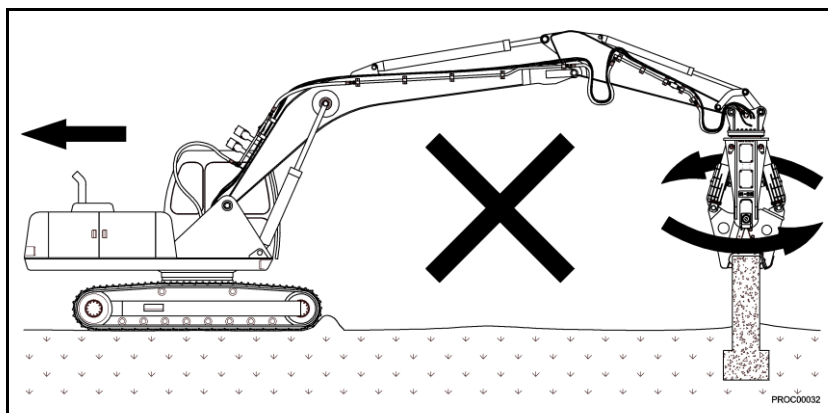
ATTENTION

3. For 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 Material Processor as possible. **Do not** force the material into the jaw.



If you have any questions on operating the Material Processor, please contact your local NPK dealer or call the NPK Service Department at (440) 232-7900.

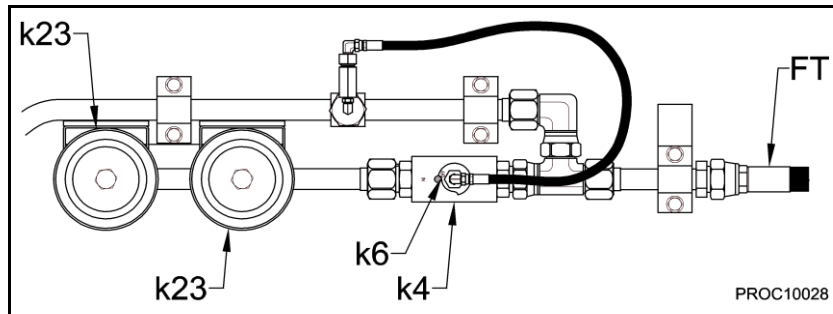
4. **Do not** pry, twist, or pull with the excavator. Allow the hydraulic crushing forces of the Material Processor jaw to do the work. If the material does not crush completely at first, open the jaws and close again in a chewing action. The excavator is used as a way of positioning the processor and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



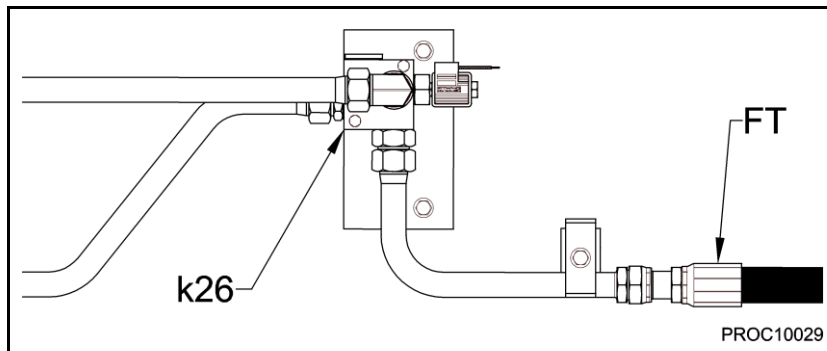
OPERATING TECHNIQUES AND PRECAUTIONS

ATTENTION

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 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 (440) 232-7900 if you are unsure of what your carrier is equipped with.



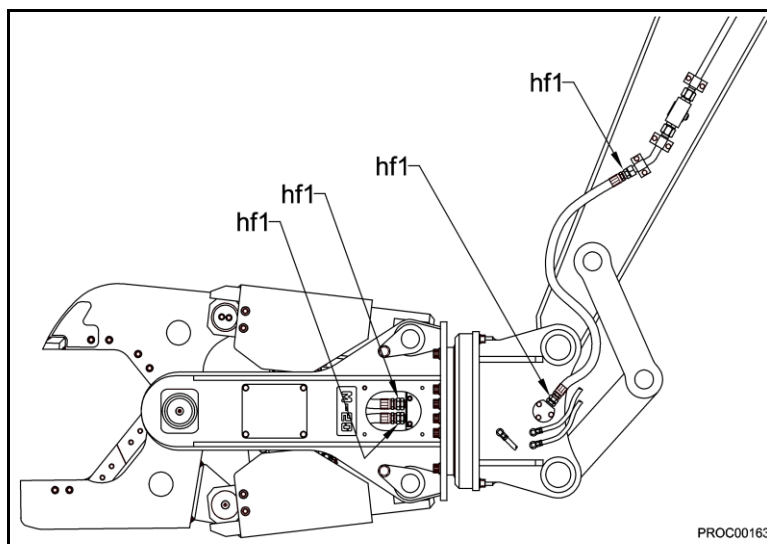
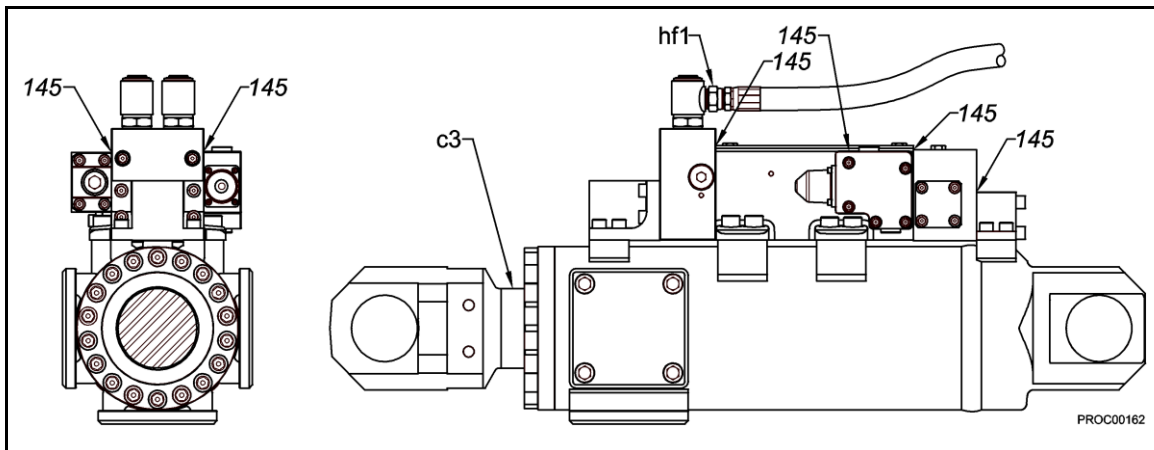
GENERAL MAINTENANCE

REFER TO IMPORTANT SAFETY INFORMATION SECTION

DAILY INSPECTION AND MAINTENANCE

The functions the Material Processor performs are demanding 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 the Material Processor’s hose and fitting connections (hf1).



GENERAL MAINTENANCE

REFER TO IMPORTANT SAFETY INFORMATION SECTION

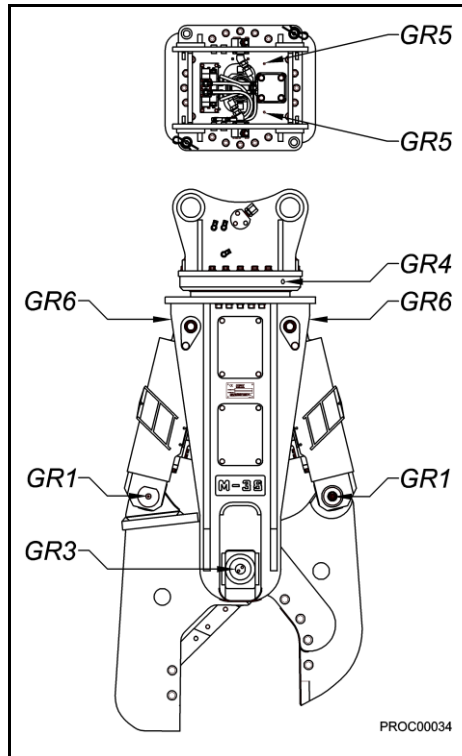
DAILY INSPECTION AND MAINTENANCE

- 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 (440) 232-7900 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 (440) 232-7900 for repair procedure.
- Check the condition of the cutting blades; see “**CUTTER BLADE MAINTENANCE**”.

GENERAL MAINTENANCE

LUBRICATION POINTS

M20, M28, M38



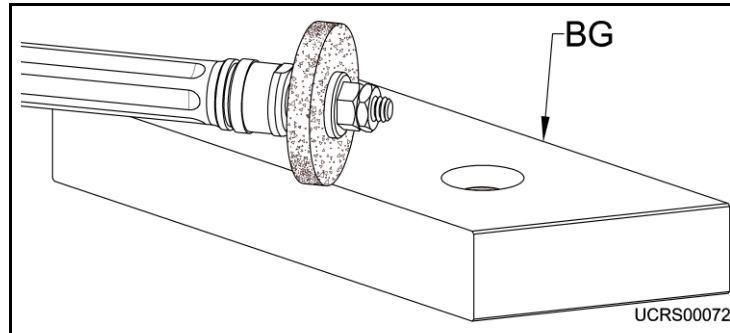
GR1	CYLINDER ROD PINS	One lubrication point per cylinder located at the jaw attachment end.	10 strokes from a grease gun every 4 hours.
GR3	JAW PIVOT PIN	One lubrication point on each end of the main pivot pin (M20), two lubrication points at one end, one lubrication point on the other end (M28, M38).	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

CUTTER BLADE MAINTENANCE

C, 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.



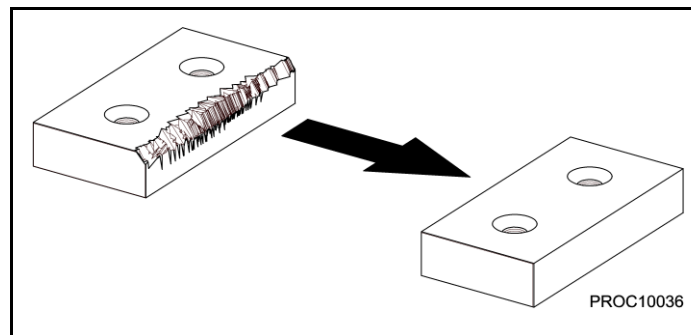
⚠ WARNING

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.



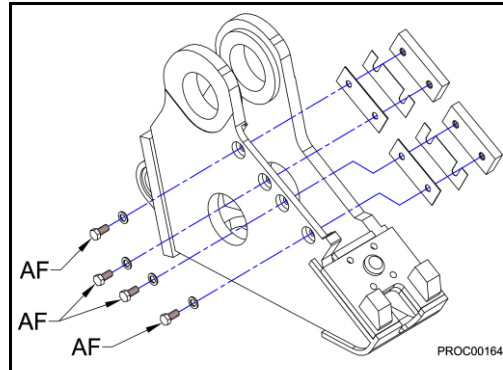
GENERAL MAINTENANCE

CUTTER BLADE MAINTENANCE

C, G, AND S JAWS

DO NOT WELD CUTTER BLADES!

Torque the cutter blade bolts (AF) to specification; see the “FASTENER TORQUE” section of this manual.



BLADE-TO-BLADE CLEARANCE

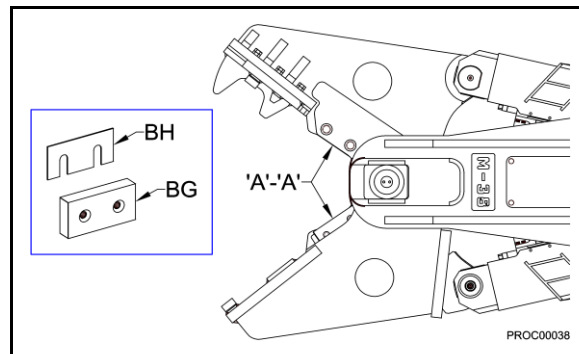


Fig. 1

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
M20 - S, G & C	M2000-7000
M28 - S, G & C	M2800-7000
M38 - S, G & C	M3800-7000

GENERAL MAINTENANCE

M20K, M28K, M38K JAW MAINTENANCE

The following information is to be used as a general guide for maintaining the K Jaw and cutter blades on the NPK M 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

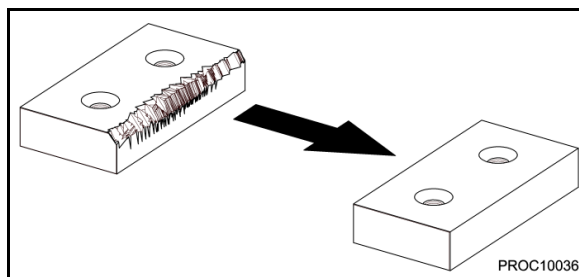
Do not over grind the cutter blades.

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 (440) 232-7900 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

M20K, M28K, and M38K

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

See Fig. 2 and 3 for cutting blade and shim arrangement. Refer to the NPK Parts Manual for part numbers.

PIERCING TIP TO TUNNEL GAP

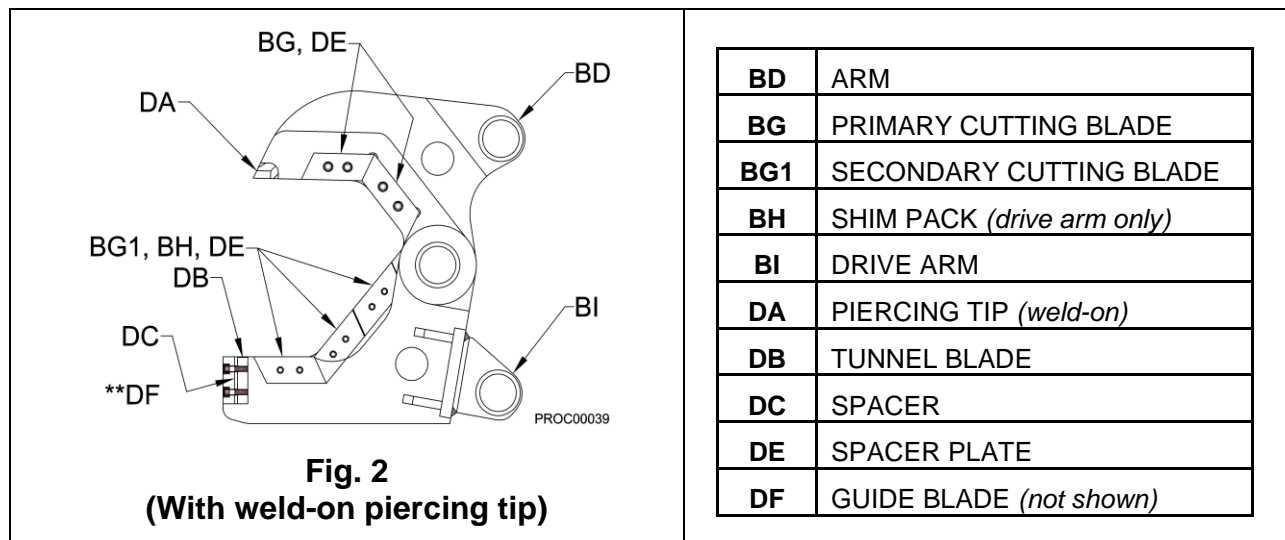
M20K, M28K, and M38K

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 M20K increases the gap by .20 inch (5 mm).

Removal of the spacer on the M28K increases the gap by .47 inch (12 mm).

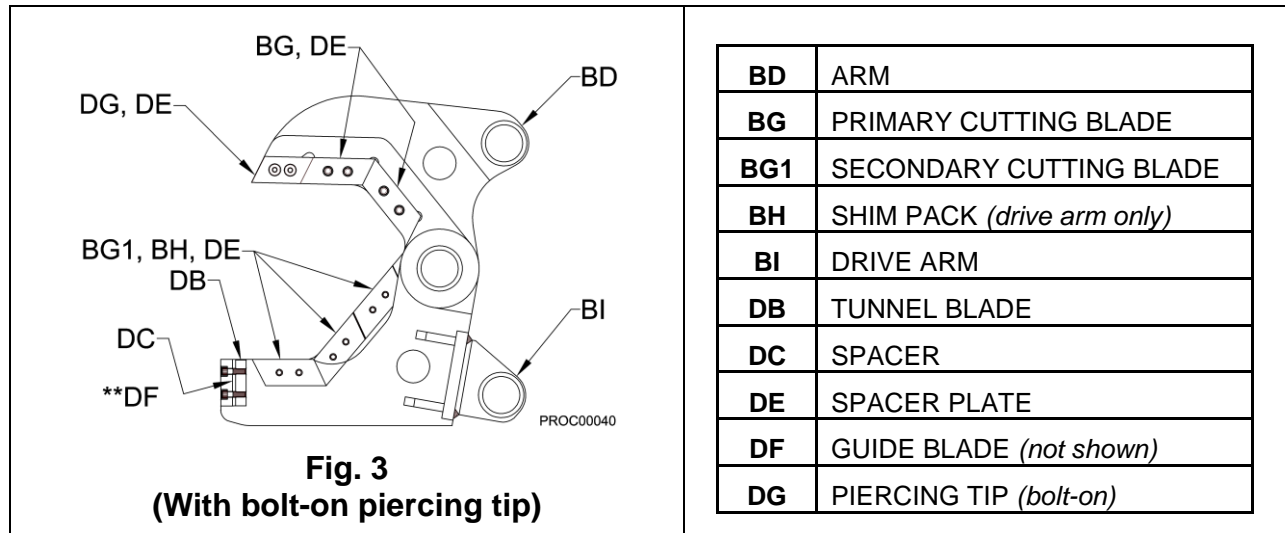
Removal of the spacer on the M38K increases the gap by .75 inch (19 mm).



GENERAL MAINTENANCE

PIERCING TIP TO TUNNEL GAP

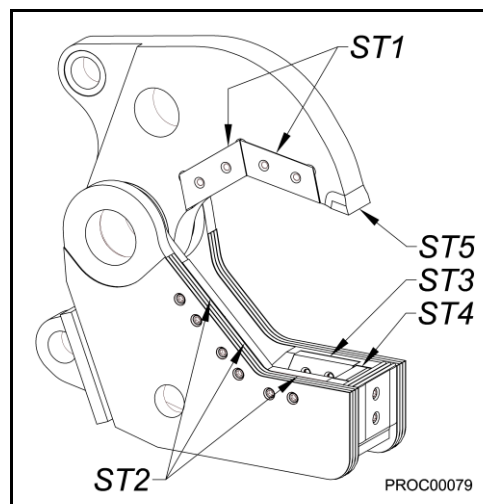
M20K, M28K, and M38K



K JAW BLADE SET UP PROCEDURE

M20K, M28K, and M38K

ST1.	Install the primary blades in the arm second. Check to ensure that the primary blade faces are parallel. See “ COMPONENT DESCRIPTION ” and “ BLADE MAINTENANCE and ADJUSTMENT ”, Steps 1 and 2.
ST2.	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.
ST3.	Install the guide blade and shim to the side of the piercing tip. See “ COMPONENT DESCRIPTION ” and “ BLADE MAINTENANCE and ADJUSTMENT ”, Step 4.
ST4.	Install the tunnel blade in the drive arm. See “ COMPONENT DESCRIPTION ” and “ BLADE MAINTENANCE and ADJUSTMENT ”, Step 5.
ST5.	Install the piercing tip on the arm (<i>if needed</i>) first. See “ COMPONENT DESCRIPTION ” and “ PIECING TIP MAINTENANCE AND REPLACEMENT ”.

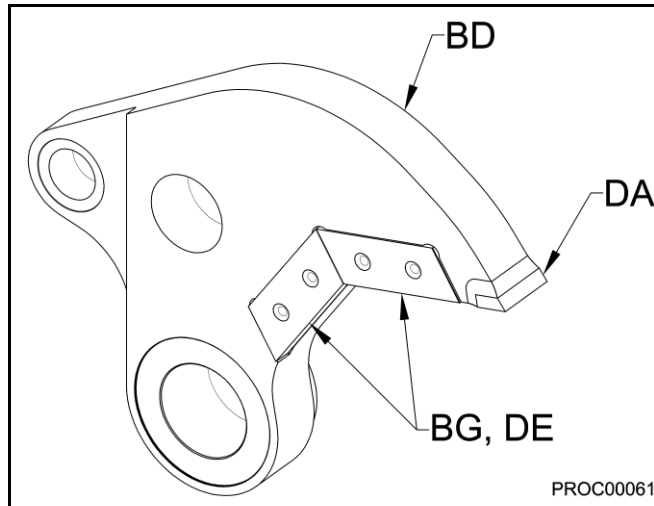


GENERAL MAINTENANCE

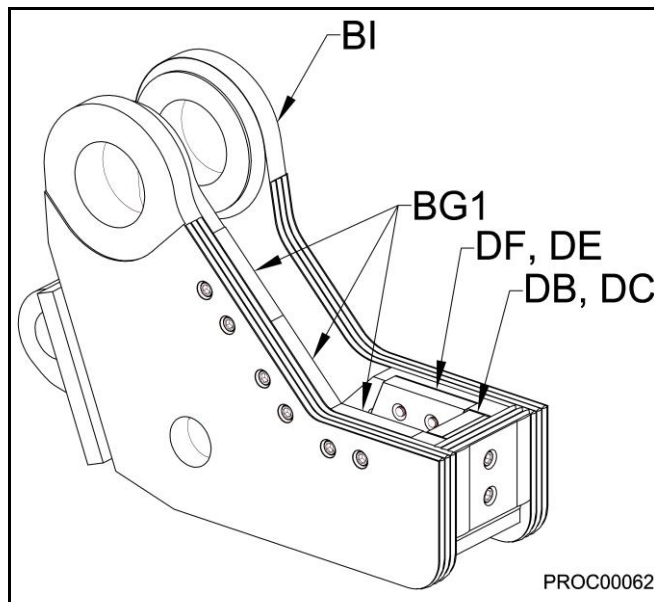
COMPONENT DESCRIPTION

M20K, M28K, and M38K

The arm (BD) contains the primary cutting blades (BG), spacer plates (DE) and piercing tip (DA).



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



GENERAL MAINTENANCE

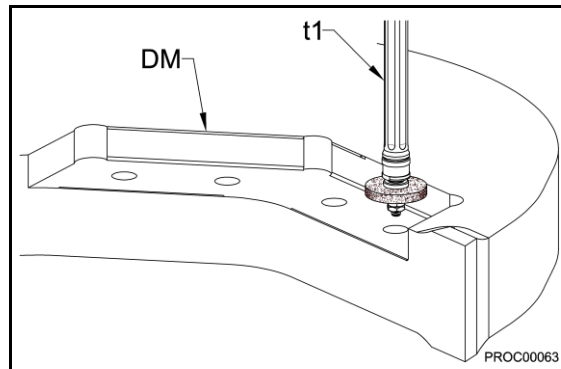
K JAW BLADE MAINTENANCE AND ADJUSTMENT

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 weld-in style and can be built up via a weld procedure (see “**PIERCING TIP MAINTENANCE AND REPLACEMENT**”). The piercing tip can also be replaced (see “**REPLACING PIERCING TIP**”).

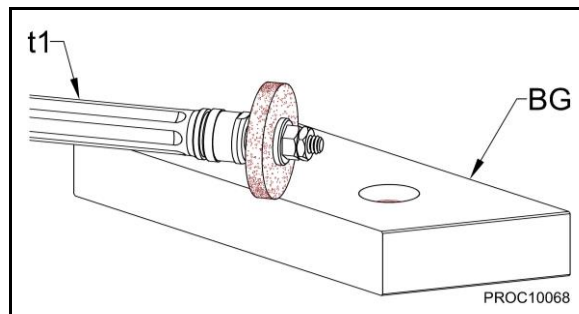
When replacing or turning cutting blades, the following steps must be followed to achieve accurate blade shimming and final blade clearance.

STEP 1:

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



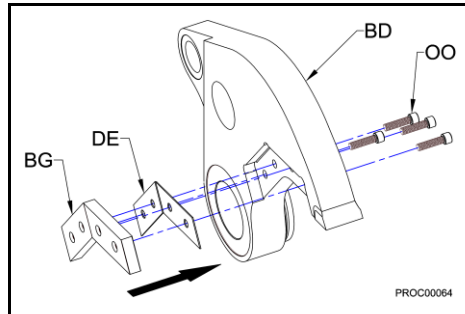
If existing blades (BG) are being turned, the face must also be free of scars. Remove the scars using a grinder (t1).



GENERAL MAINTENANCE

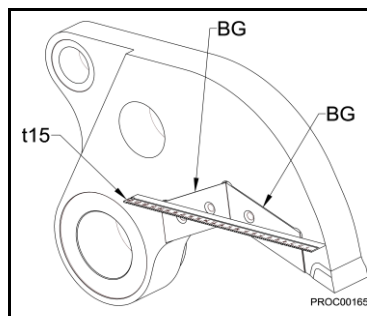
K JAW BLADE MAINTENANCE AND ADJUSTMENT

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.

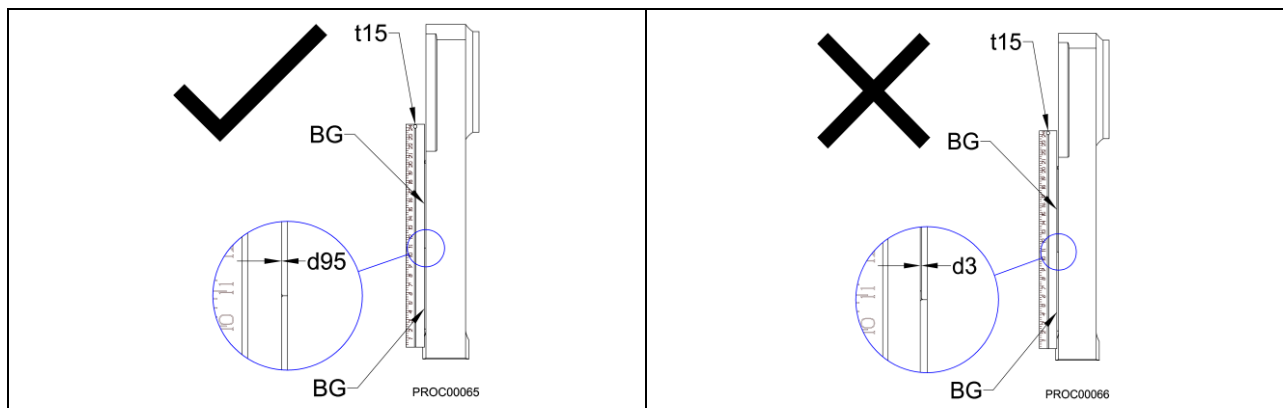


STEP 2:

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



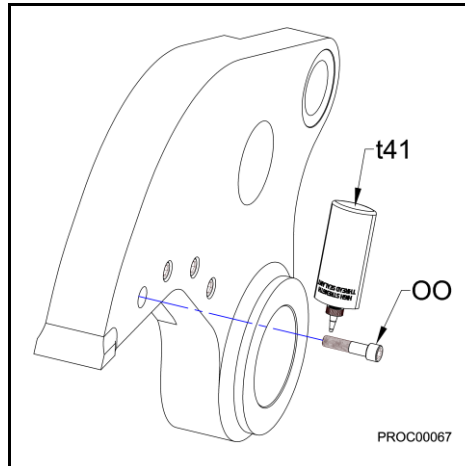
There should be no gap (d95) between either of the primary blades and the straight edge. If the primary blades are being turned and a gap (d3) is found between either of the primary blades and the straight edge, measure the gap using feeler gauges, then, remove the measured amount from the high blade by grinding (*blade may require surface grinding at a machine shop*). If the difference between the primary blades is excessive, install new primary blades. **DO NOT ADD SHIMS BEHIND THE PRIMARY BLADES!**



GENERAL MAINTENANCE

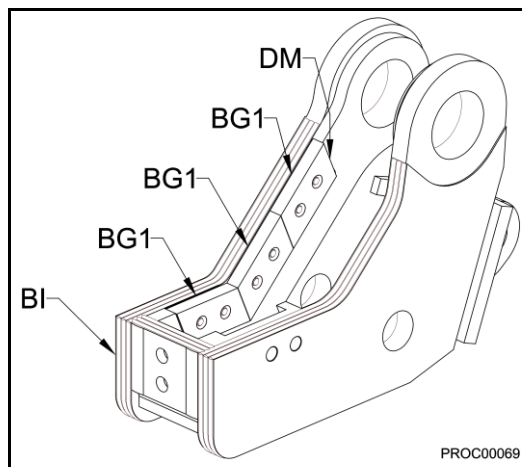
K JAW BLADE MAINTENANCE AND ADJUSTMENT

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**”).



STEP 3:

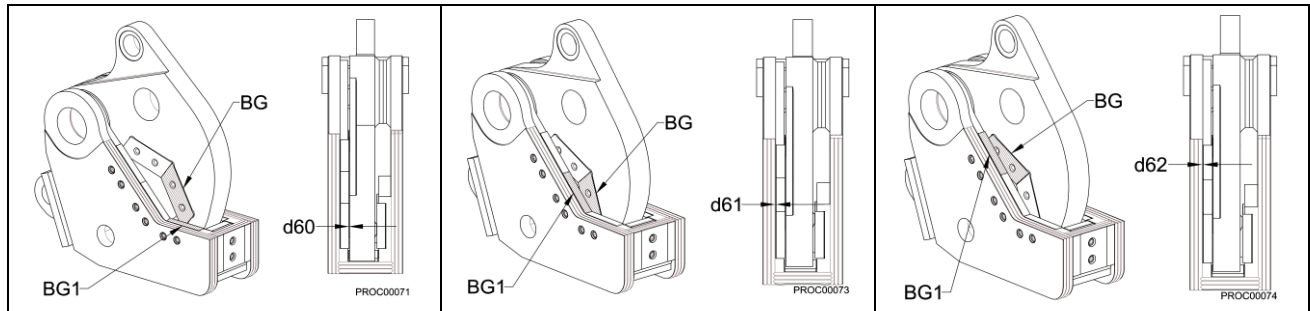
Install either reconditioned (used) or new secondary blades (BG1) into female jaw (BI) blade pockets (DM). Install socket head cap screws and tighten.



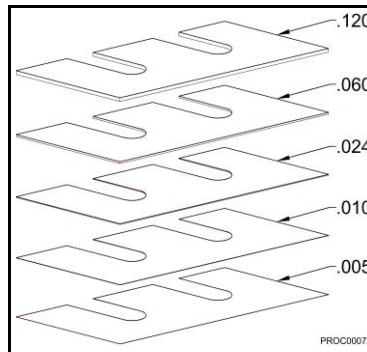
GENERAL MAINTENANCE

K JAW BLADE MAINTENANCE AND ADJUSTMENT

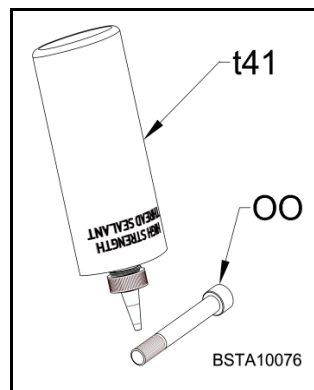
Begin closing the processor jaws until the first primary blade (BG) begins passing the first secondary blade (BG1), stop closing the jaws and measure the clearance (d60) between the two blades. Record the clearance, (example .015" or .381 mm). Continue closing the jaws, stopping to record the clearance (d61) at the second secondary blade and clearance (d62) at the third 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.)



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").

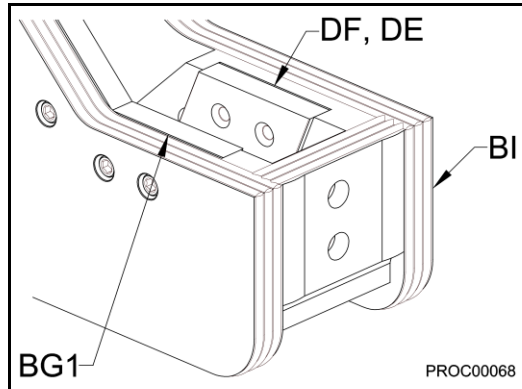


GENERAL MAINTENANCE

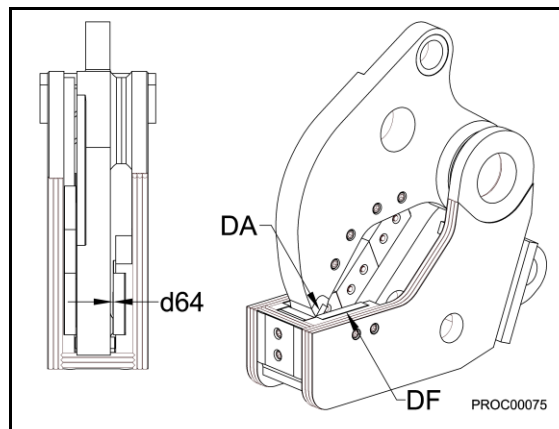
K JAW BLADE MAINTENANCE AND ADJUSTMENT

STEP 4:

The female jaw (BI) also has a guide blade (DF) and a spacer plate (DE). This blade is located directly across from the first secondary blade (BG1).



The guide blade (DF) must also be shimmed as close as possible to the side of the piercing tip (DA). Begin closing the processor jaws until the piercing tip just enters the tunnel. Stop and measure the clearance (d64) between the guide blade and the side of the piercing tip. Install the required amount of shims to reduce the clearance to .005" (.127 mm). Apply thread adhesive to the socket head cap screws for the guide blade. Then torque to NPK specifications (see "**FASTENER TORQUE CHART**").



Special Note:

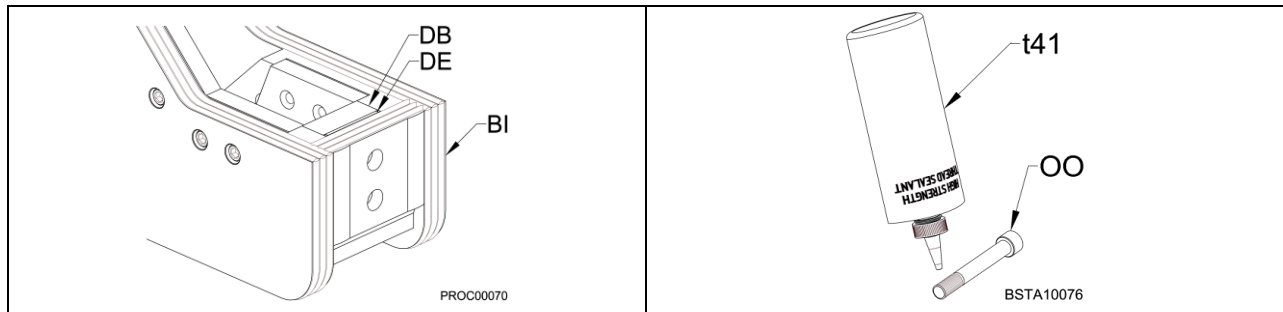
The guide blade clearance will have to be checked after any weld build-up of the piercing tip.

GENERAL MAINTENANCE

K JAW BLADE MAINTENANCE AND ADJUSTMENT

STEP 5:

Inspect the tunnel blade (DB), located in the bottom of the female jaw (BI). If the lead edge is worn or rounded off, remove and turn the blade. This blade can be turned four times. There is a spacer plate (DE) between the blade and pocket wall, be sure to install this spacer. The tunnel blade does not require shimming. Apply thread adhesive to the socket head cap screws (OO) for the tunnel blade. Then torque to NPK specifications (see “**FASTENER TORQUE CHART**”).

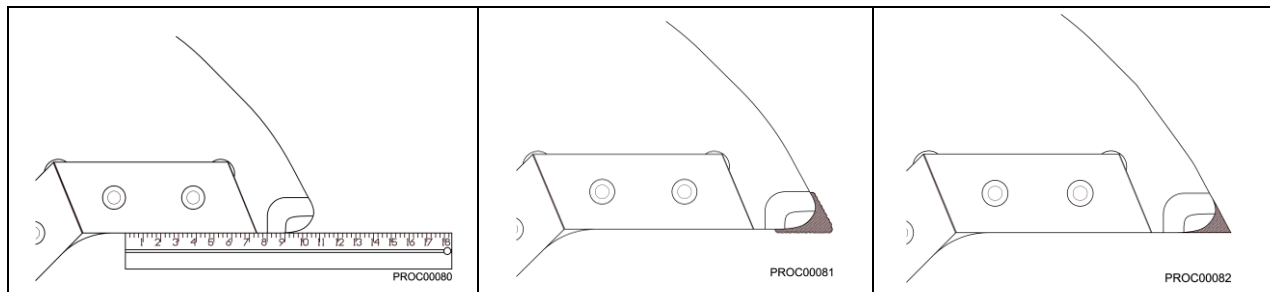


PIERCING TIP MAINTENANCE AND REPLACEMENT

Before maintenance is performed on the piercing tip, it is recommended that the fixed female jaw tunnel be repaired first. (See “**K JAW BLADE MAINTENANCE AND ADJUSTMENT**” STEP 5.)

MAINTENANCE

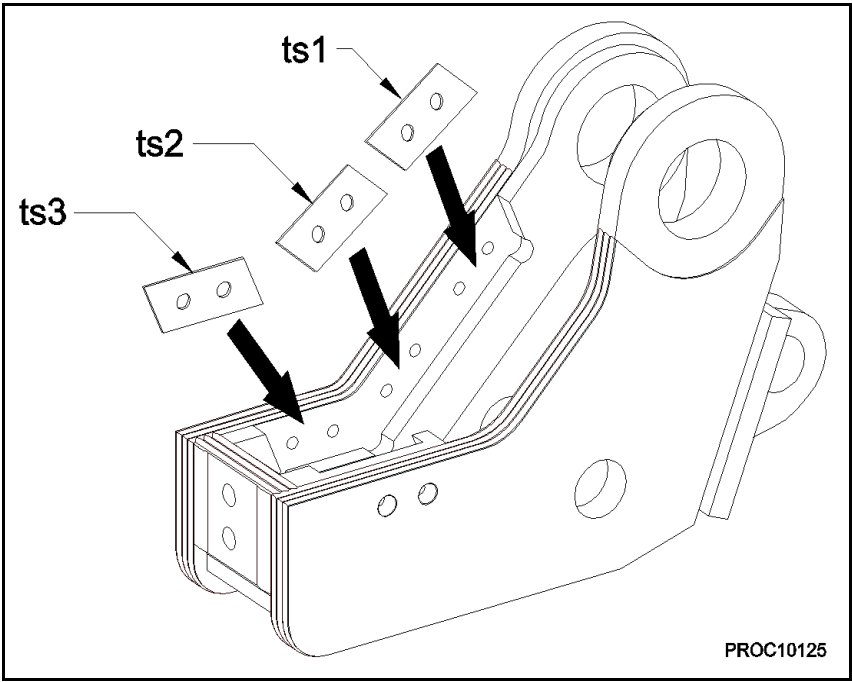
To maintain maximum piercing efficiency, the piercing tip should be checked daily for wear. The rate of wear that will occur is going to be influenced greatly due to the types of material being processed and the amount of piercing being done. To check the jaw and tip for wear, close the processor jaws until the piercing tip is beginning to enter the female jaw (tunnel). The piercing tip should fit squarely in the female jaw tunnel. The piercing tip will require attention if a large gap is noted, and the tip is rounded. Also, if it is noted that the material is being drug through the tunnel and not efficiently pierced by the tip, is also an indication that the tip is in need of attention. The length of time between piercing tip maintenance will greatly influence if a tip can be repaired or if the tip must be replaced.



GENERAL MAINTENANCE

TAPER LINER FOR M SERIES PROCESSOR “K” JAW

NPK provides a taper liner for the M Series Processor “K” Jaw sets. The reason is for repairing a jaw set that becomes slightly bent from the pivot area out to the tip. Installing the taper liner should make the surfaces parallel.



PROC10125

MODEL	ts1	ts2	ts3
	2-3 mm	3-4 mm	4-5 mm
M-20K	19011055	19011056	19011057
M-28K	19011058	19011059	19011060
M-38K	19011061	19011062	19011063

GENERAL MAINTENANCE

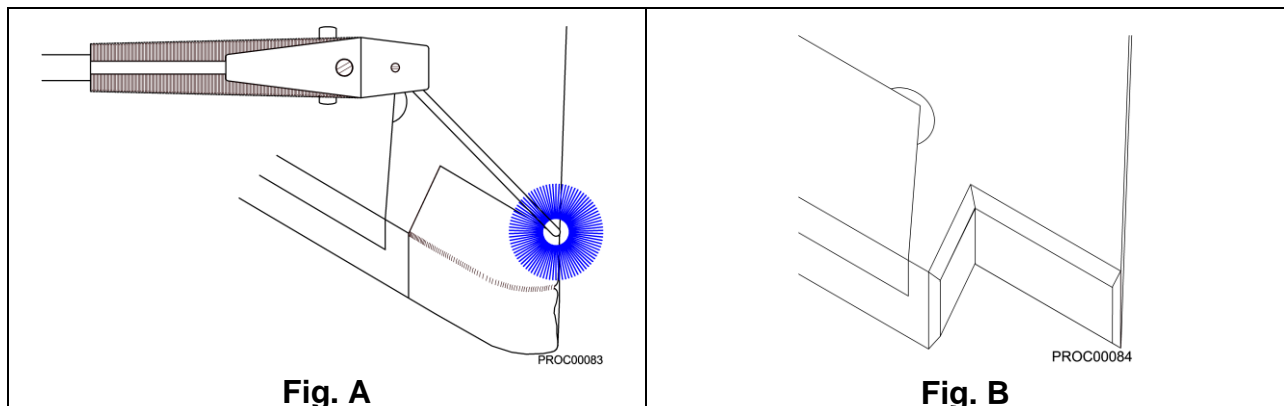
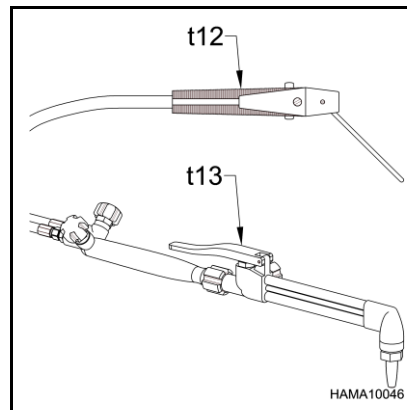
BUILD-UP OF THE PIERCING TIP

Before beginning the build-up of the existing piercing tip, it is necessary to first grind off all remaining hardface material. After determining the amount of build-up required, preheat the tip and surrounding area to 300° - 400°F (150° - 200°C). Using a suitable underlay rod, build up the areas in question by using stringer welds. Peen after each pass. Continue to build the areas by overlaying weld stringers. Stop periodically and cycle the piercing tip through the female jaw tunnel to check the amount of build-up that is still required. Maintain preheat of the jaw area.

After build-up is complete, it may be required to hardface the piercing tip. Hardfacing will help prolong the life of the tip and increase the amount of time a tip can be used before maintenance is once again required. See “**JAW AND TOOTH REBUILD PROCEDURE**” and follow the same directions.

REPLACING THE PIERCING TIP

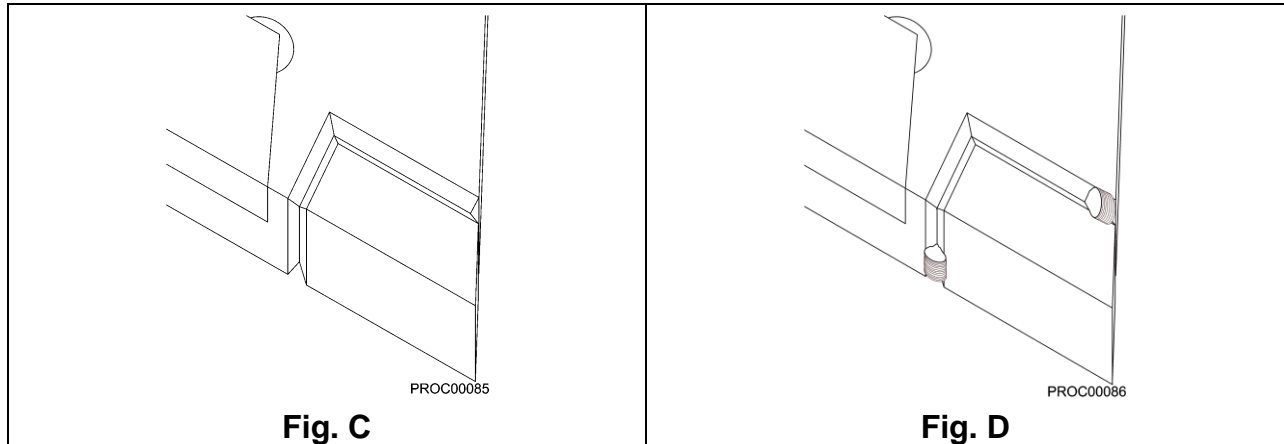
To install a new tip, carbon arc (t12) or torch cut (t13) off the old tip approximately the dimension of your model piercing tip, please note that a seat for the top is present in the male jaw, see Fig. A. The surface must be prepared by chamfering the male jaw, see Fig. B. **NOTE:** *Be sure the area is free from all carbon residue, leaving it flat and smooth.*



GENERAL MAINTENANCE

REPLACING THE PIERCING TIP

Place the new tip into the seat area. Use a straight edge to position the tip before tacking it into place. Place the straight edge against the face of the cutting blade and maintain the alignment to the side edge of the replaceable tip.



Move tip squarely against the edge, making sure it is level, see Fig. C. Tack firmly in place, see Fig. D, cycle the processor jaws to check the clearance of the new tip. The leading edge of the tip should pass within .045" (1.14 mm) of the upper lip of the female jaw. NOTE: Some grinding may be required to fit the tip properly to the tunnel, see Fig. E.

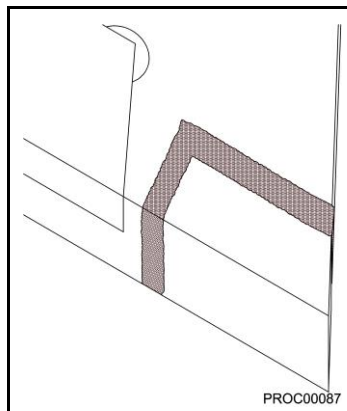


Fig. E

1. Remove the worn tip by carbon arcing or torch cutting.
2. Prepare the surface for the new tip by grinding away any remaining slag.
3. Place the new tip into its proper location.
4. Dry welding rod to 300°F + (150°C +).
5. Preheat the weld area to 300°F - 400°F (150° - 200°C).

JOINING AND BUILD-UP

For joining, stringer beads are the best. For build-up, weaving is acceptable. Use one of the following rods (or wire equivalent) or equal: Airco Austex 361, Cronatron 7770, Eutectic 3205, Hobart Smooth Arc MC, McKay Chrome-mang, and Stoody 2110.

GENERAL MAINTENANCE

DETERMINING REPLACEMENT OR BUILD UP

The piercing tip profile must be maintained for piercing efficiency. Piercing tip build up and/or replacement should be completed after all cutting blade, guide blade, and tunnel blade maintenance has been completed (see “**K JAW BLADE MAINTENANCE AND ADJUSTMENT**”, **STEPS 1 through 5.**) Perform the following steps to determine whether the piercing tip can be built up or should be replaced.

STEP 1a

Place a steel straight edge (t15) on the face of the primary blades (BG). The side of the piercing tip (DA) should be even/parallel with the primary blade face. Record the amount of clearance/gap (d65) between the straight edge and the side of the tip, see Fig. A.

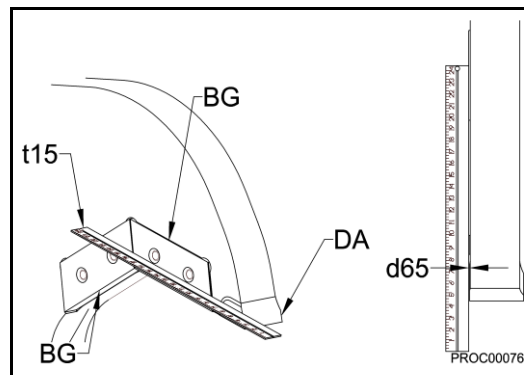


Fig. A

STEP 2a

Close the jaws until the piercing tip (DA) just enters the female jaw (BI) tunnel. Note the wear on the corners of the piercing tip and also the gap (d66) between the lead edge of the piercing tip and the tunnel blade (DB), see Fig. B.

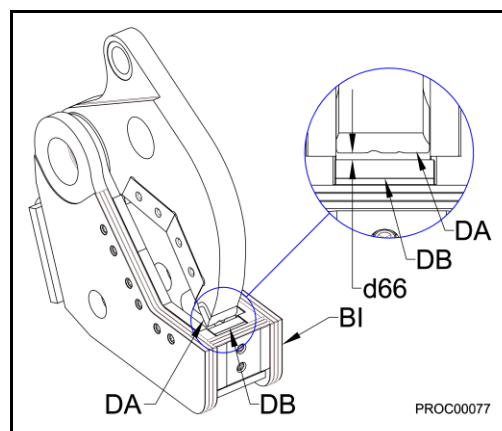


Fig. B

GENERAL MAINTENANCE

DETERMINING REPLACEMENT OR BUILD UP

STEP 3a

If the gap between the straight edge and the piercing tip is minor and the wear on the lead edge and corners of the tip is not excessive, weld build-up of the tip is recommended, (see “**BUILD-UP OF THE PIERCING TIP**”). If tip wear is excessive, replace the piercing tip, (see “**REPLACING THE PIERCING TIP**”).

STEP 4a

After completing the welding and grinding of the tip, place the steel straight edge, once again, on the face of the primary blades to confirm that the side of the piercing tip and primary cutting blades are parallel.

STEP 5a

Slowly close the processor jaws until the piercing tip (DA) enters the tunnel, verify the clearance (d66) between the lead edge of the piercing tip (DA) and the tunnel blade (DB). This clearance should be approximately .020” - .040” (0.51 – 1.02 mm). Additional welding or grinding may be required to achieve the desired clearance, see Fig. C.

When installing a new piercing tip, the clearance between the piercing tip and tunnel blade can be set when placing the new tip in the male jaw.

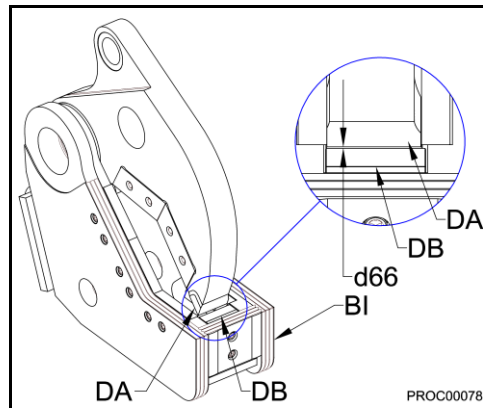


Fig. C

GENERAL MAINTENANCE

DETERMINING REPLACEMENT OR BUILD UP

STEP 6a

Close the processor jaws until the side of the piercing tip (DA) is next to the guide blade (DF). Measure the clearance and add shims to achieve a clearance (d64) of .005" (.127 mm), see Fig. D.

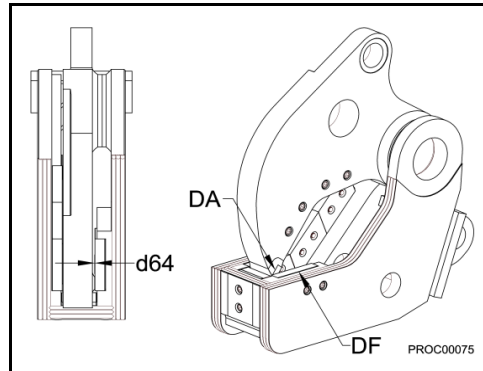
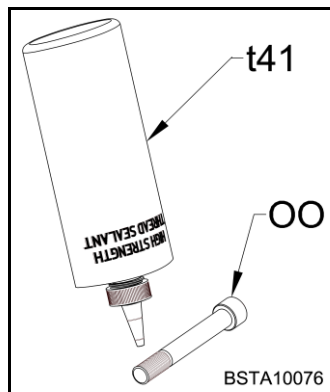


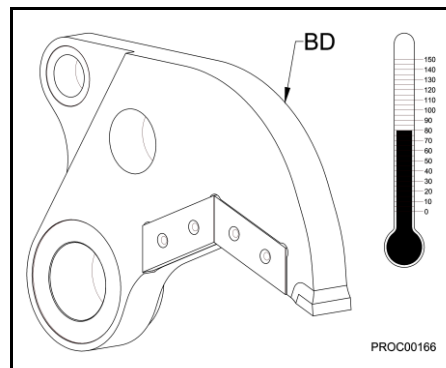
Fig. D

Apply thread adhesive to the socket head cap screws for the guide blade. Then torque to NPK specifications (see “**FASTENER TORQUE CHART**”).



STEP 7a

After completing all welding maintenance, allow the jaw (BD) to cool slowly.



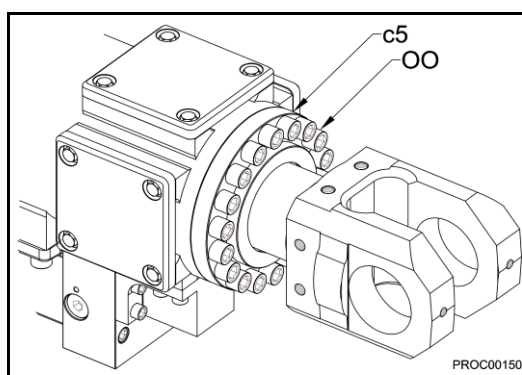
JAW INSPECTION AND MAINTENANCE

JAW INSPECTION: S, C, and G JAWS

WEEKLY INSPECTION

ATTENTION

With new S, C, or G 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: S, C, AND G JAWS

S, C, and G JAWS: Profiles can be checked against NPK original profile templates. Call the NPK Service Department for assistance at (440) 232-7900.

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 into 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 (M38S, M28S, and M20S)

For build-up and hard facing of jaw, use the NPK template to check jaws so that they are to the original profile. Contact NPK for the correct templates, then refer to **JAW and TOOTH REBUILD PROCEDURE**.

JAW INSPECTION AND MAINTENANCE

C 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 into 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.

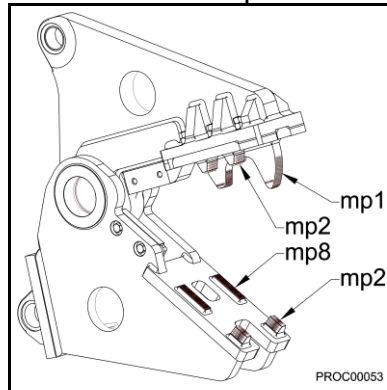
JAW BUILD-UP AND HARDFACING (M38C, M28C, and M20C)

For build-up and hard facing of jaw, use the NPK template to check jaws so that they are to the original profile. Contact NPK for the correct templates. Then, refer to **JAW and TOOTH REBUILD PROCEDURE**.

JAW INSPECTION AND MAINTENANCE

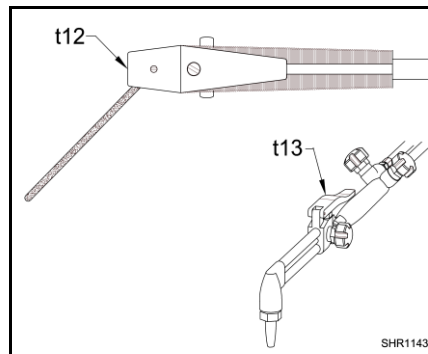
TEETH REPLACEMENT

The M20G/M28G/M38G Material Processors have three types of jaw teeth (mp1, mp2, and mp8). All three types can be cut off and replaced when worn beyond rebuild ability.



Following is the procedure for teeth replacement:

1. Remove worn teeth by carbon arc (t12) or acetylene cutting torch (t13).



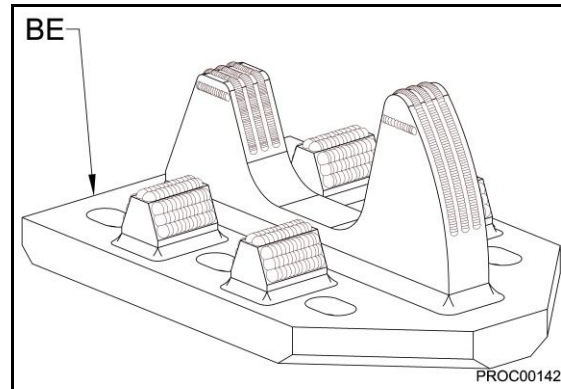
2. Prepare surface for new teeth.
3. Place new teeth into proper location.
4. Heat dry welding rod to 300°F+ (150°C+).
5. Pre-heat weld area to 300°F - 400°F (150°C - 200°C).
6. For joining, stringer beads are best. For build-up, weaving is acceptable. Use one of the following rods (or wire equivalent) or equal: Airco Austex 361, Cronatron 7770, Eutectic 3205, Hobart Smooth Arc MC, McKay Chrome-mang, Stody 2110.
7. Hard face rod for tooth and structure wear surfaces. Pre-heat as in Step number 5. Use two passes maximum for hard facing. Use one of the following rods (or wire equivalent) or equal: Airco Hardcraft CR-70, Cronatron 7350, Eutectic Eutectrode N70, Hobart Smooth Arc 16, McKay Hardalloy 40 Tic, Stody 19, 21, or 77.
8. Adjust weld current to rod manufacturer's specification.
9. Peen each layer.
10. Cool slowly. Cover weld in cold environments.

JAW INSPECTION AND MAINTENANCE

REPLACEABLE TOOTH PLATES – G JAWS

Another alternative is to replace the entire bolt-on plates.

The male jaw tooth plate (BE) is part number M3802-9500 (M38G), M2802-9500 (M28G) and M2002-9500 (M20G)



JAW AND TOOTH REBUILD PROCEDURE: S, C, and G JAWS

Due to the abrasive nature of the material being crushed, jaw wear will occur on the M20, M28, and M38 Processors with S, C, and G jaws. 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 Processors, this rebuild procedure, comprised of three steps, should be followed:

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

1. SURFACE PREPARATION

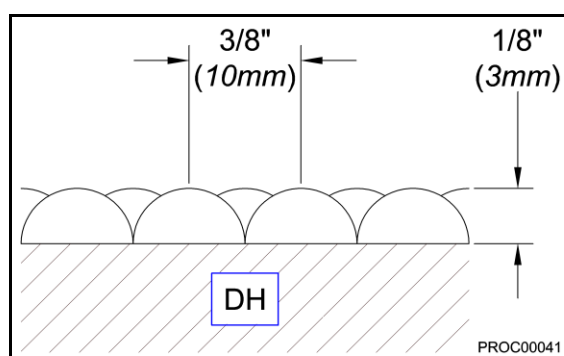
Grind the entire worn area until it is smooth and clean. Remove all paint, grease, oil, dirt, and old hard facing material before welding.

JAW INSPECTION AND MAINTENANCE

JAW AND TOOTH REBUILD PROCEDURE: S, C, and G JAWS

2. UNDERLAYMENT

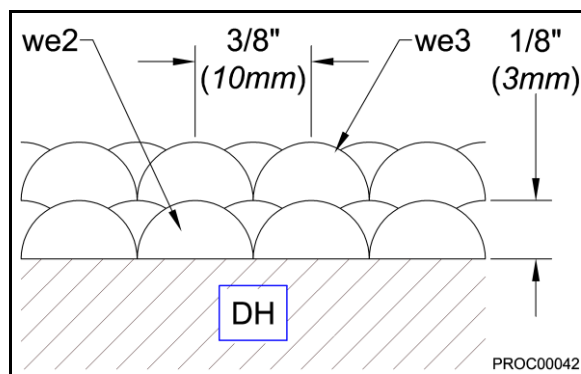
Underlayment weld is necessary to build-up the base material (DH) to match the original jaw or tooth profile before hard facing. You cannot hard face over old hard facing.



- Welding rod: Airco Austex 361, Cronatron 7770, Eutectic 3205, Postalloy 205, Stody 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. HARDFACE

Hardface (we3) can only be applied over base material (DH) or underlayment weld (we2). **NEVER HARDFACE OVER EXISTING HARDFACE!**



JAW INSPECTION AND MAINTENANCE

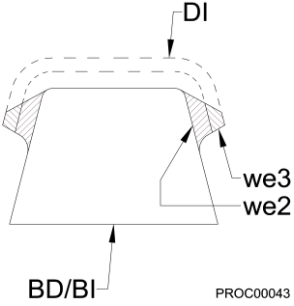
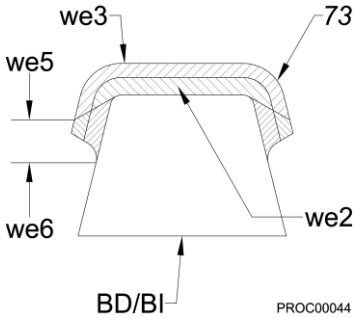
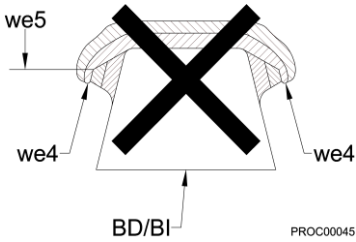
JAW AND TOOTH REBUILD PROCEDURE: S, C, and G JAWS

Welding Rod: Airco Tubecraft 1A, Cronatron 7355, Eutectic N6006, Postalloy 214, Stoodly 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 weld 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 hard facing before applying new underlay weld.

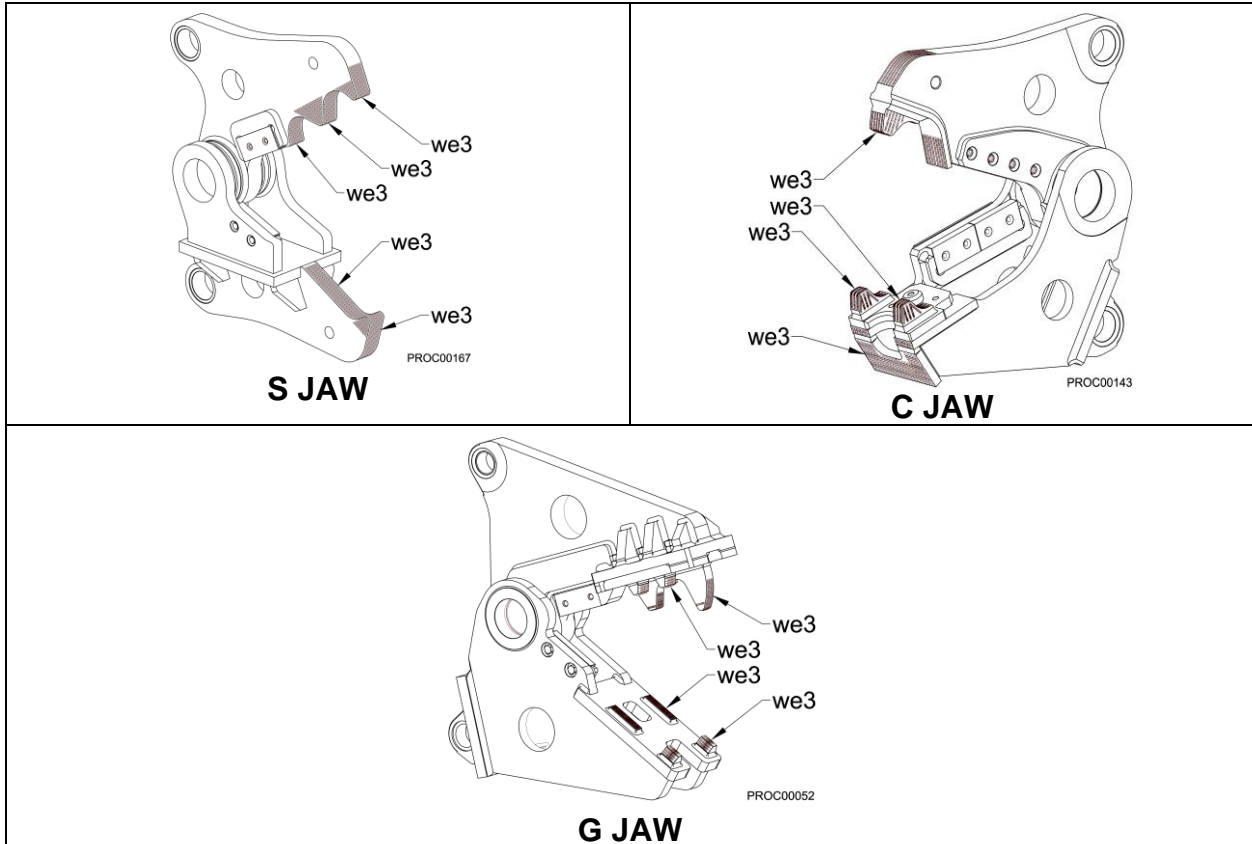
1. BEFORE WELD	2. AFTER WELD	
		
<p>CORRECT</p> <p>BD/BI MALE OR FEMALE CRUSHER JAW</p> <p>DI WORN AREA</p> <p>we2 UNDERLAYMENT</p> <p>we3 HARDFACE</p>	<p>CORRECT</p> <p>BD/BI MALE OR FEMALE CRUSHER JAW</p> <p>we2 UNDERLAYMENT</p> <p>we3 HARDFACE</p> <p>we5 END OF NEW WELD</p> <p>we6 OLD WELD FINISH GRIND TO BLEND</p> <p>73 BLEND</p>	<p>INCORRECT</p> <p>BD/BI MALE OR FEMALE CRUSHER JAW</p> <p>we4 OVERFLOW</p> <p>we5 END OF NEW WELD</p>

JAW INSPECTION AND MAINTENANCE

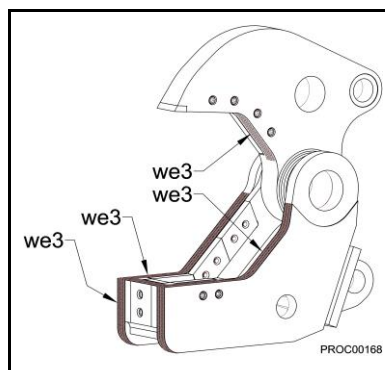
JAW CONTACT AREAS

S, C, and G JAW CONTACT AREAS

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



K JAWS: Several surfaces of the K jaws have been hard-faced in contact areas. Hard facing (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**”.



JAW INSPECTION AND MAINTENANCE

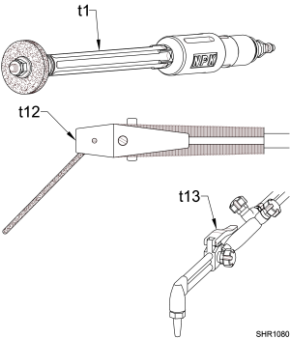
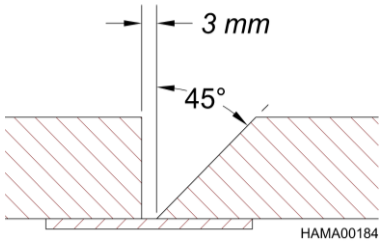
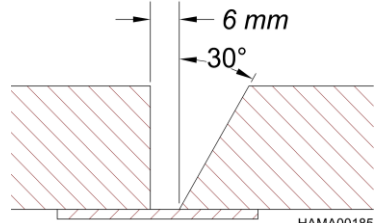
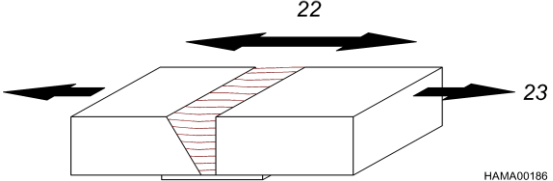
HARDFACING: K JAWS

If hard facing is to be performed, the jaw must be preheated to 300° - 400°F (150° - 200°C) before hard facing is applied. Failure to preheat the tip area will cause the hard facing 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 HARDFACE MATERIAL!** After hard facing is completed, grind the piercing tip to the desired profile. Do not pierce with the tip until the tip area temperature has normalized. This process takes approximately twelve hours. It is recommended that the tip area is covered with a heat blanket, covered with dry sand, floor dry, or other suitable material. Refer to the “**HARDFACE**” section and use the same procedure.

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

<p>1. Gouge any cracks 100% using an air or electric handheld grinder (t1), carbon arc (t12) or torch (t13).</p>					
<p>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.</p>					
<p>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.</p>					
<p>3. If the crack is completely through the plate, grind the bevel in halfway from both sides. Remove all slag and grinding residue.</p> <p>4. Consult the “JAW and TOOTH REBUILD PROCEDURE, HARDFACE” section for pre-heat and welding instructions.</p> <p>5. Peen or stress relieve after each pass. Maintain pre-heat.</p>					
<p>6. After welding, grind area flush.</p> <table border="1" data-bbox="212 1797 776 1885"> <tr> <td style="text-align: center;">22</td> <td>DIRECTION OF GRINDING</td> </tr> <tr> <td style="text-align: center;">23</td> <td>DIRECTION OF PRINCIPLE STRESS</td> </tr> </table>	22	DIRECTION OF GRINDING	23	DIRECTION OF PRINCIPLE STRESS	
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, Inc. 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.*

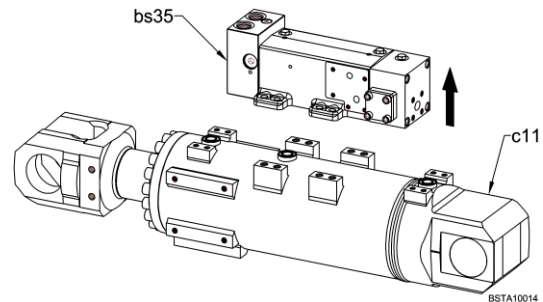
CYLINDER INSPECTION AND MAINTENANCE

BOOSTER CYLINDER

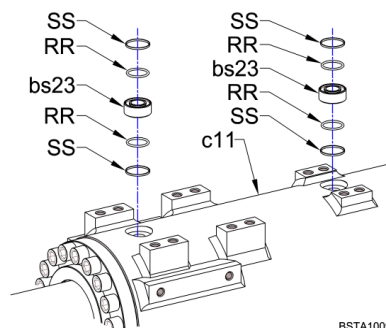
DISASSEMBLY

1. Remove the Booster Assembly (bs35) from the cylinder assembly (c11).

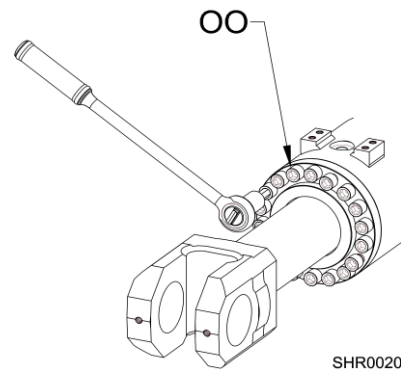
NOTE: See the *Booster Manual (B000-9600)* for booster maintenance.



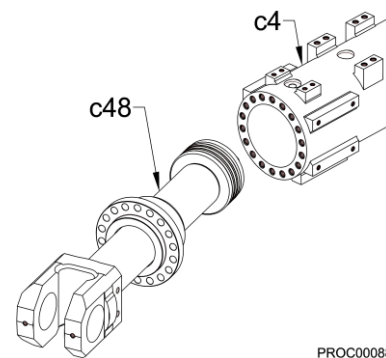
2. Remove the spacers (bs23), o-rings (RR), and backup rings (SS) from the cylinder assembly (c11).



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



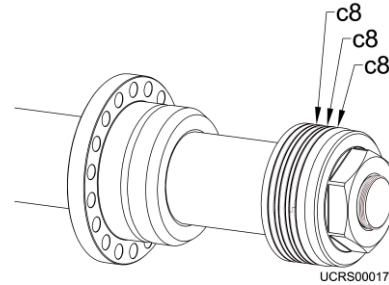
4. Remove the cylinder rod assembly (c48) from the cylinder housing (c4).



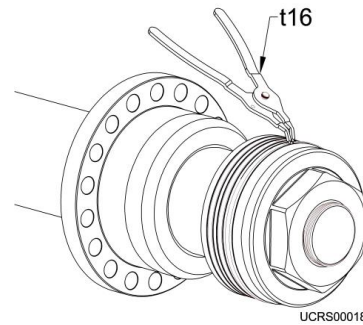
CYLINDER INSPECTION AND MAINTENANCE

BOOSTER CYLINDER DISASSEMBLY

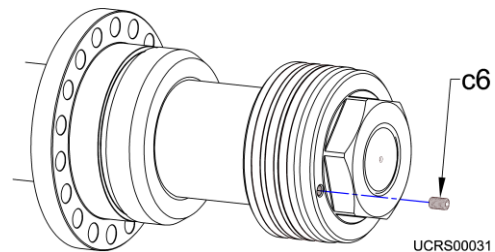
5. Check the piston rings (c8). The rings should be free in their grooves. If the rings are found to be stuck in their grooves, use a die grinder with a soft polishing stone (preferably NPK polishing wheel p/n 25026030) and polish the rings until they spring out of their grooves. If a ring is broken,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



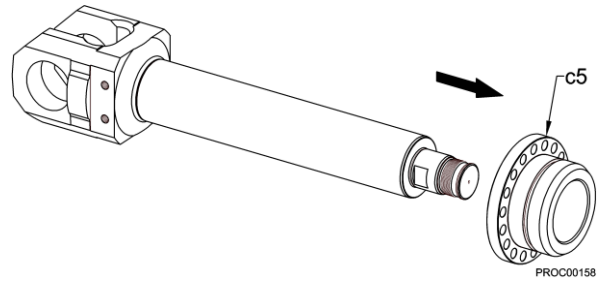
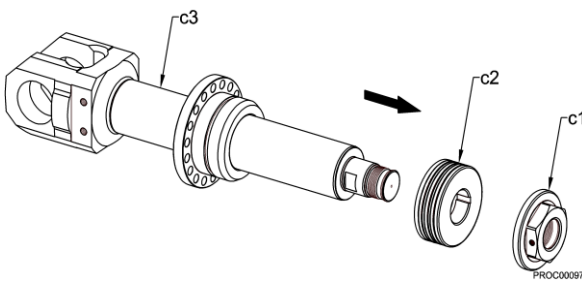
6. Using a ring expander (t16), remove all of the piston rings.



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



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

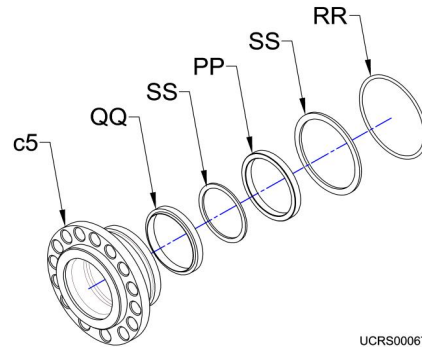


CYLINDER INSPECTION AND MAINTENANCE

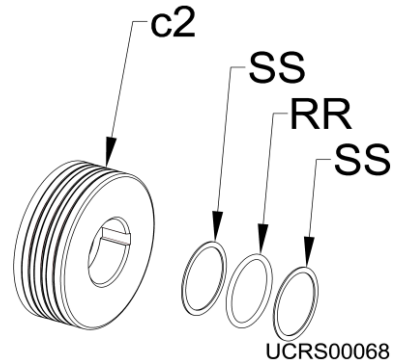
BOOSTER CYLINDER

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 (c2) and discard.



CYLINDER INSPECTION AND MAINTENANCE

INSPECTING AND CLEANING CYLINDER COMPONENTS

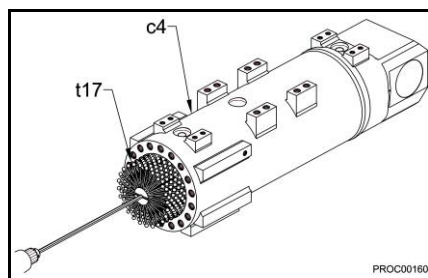


The prevention of foreign contaminant damage is critical when working with hydraulic equipment. Keep the work area clean. Using masking tape, cover all exposed holes and parts which may allow entry of foreign contaminants. Habitually clean the work area by wiping with a lint-free dry cloth.

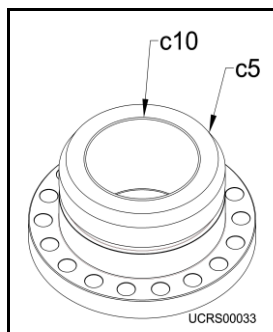
Mating surfaces are machined to a smooth surface. Use care to avoid scratches, nicks, dents, or other damage to machined surfaces. If damaged, the component must be repaired or replaced as required.

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.

NOTE: *Cylinder honing should be kept to a minimum number of passes. Lubricate the ball hone. Excessive honing can result in an oversized cylinder barrel which will need to be replaced.*



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

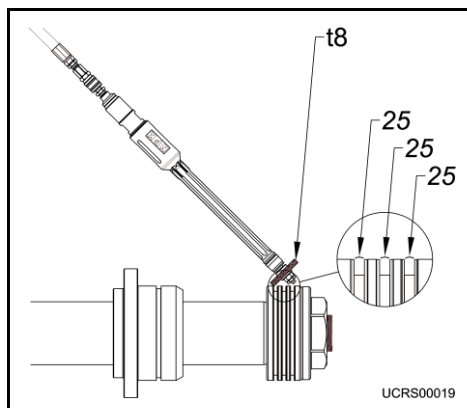


CYLINDER INSPECTION AND MAINTENANCE

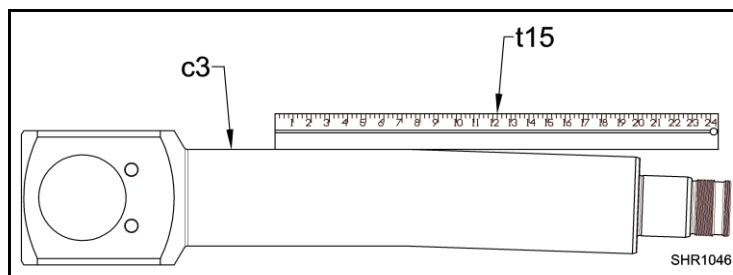
INSPECTING AND CLEANING CYLINDER COMPONENTS

CAUTION

- 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.



- 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.

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

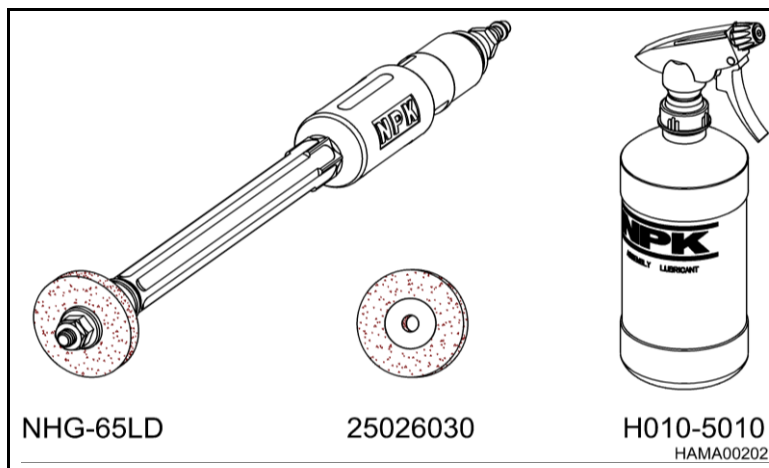
WARNING

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.

- 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.

CYLINDER INSPECTION AND MAINTENANCE

REPAIR TOOLS AND EQUIPMENT



Air or electric handheld grinder (NPK model NHG-65LD recommended)

Polishing wheel for grinder (NPK p/n 25026030)

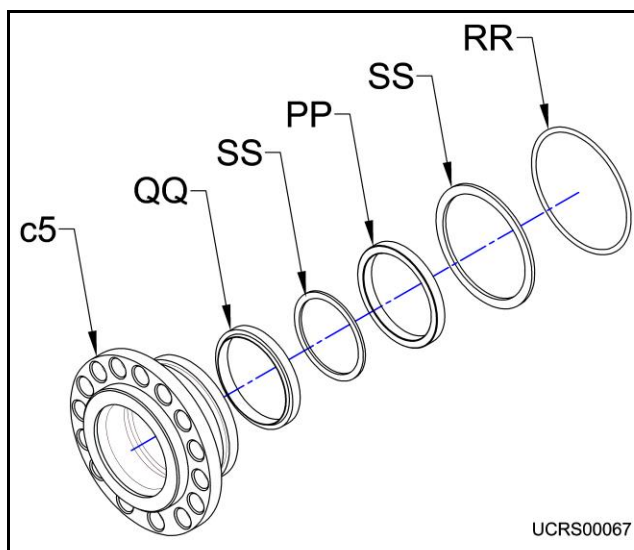
NPK Assembly Lube (p/n H010-5010)

Emery cloth (200 grit)

Cleaning solvent

ASSEMBLY

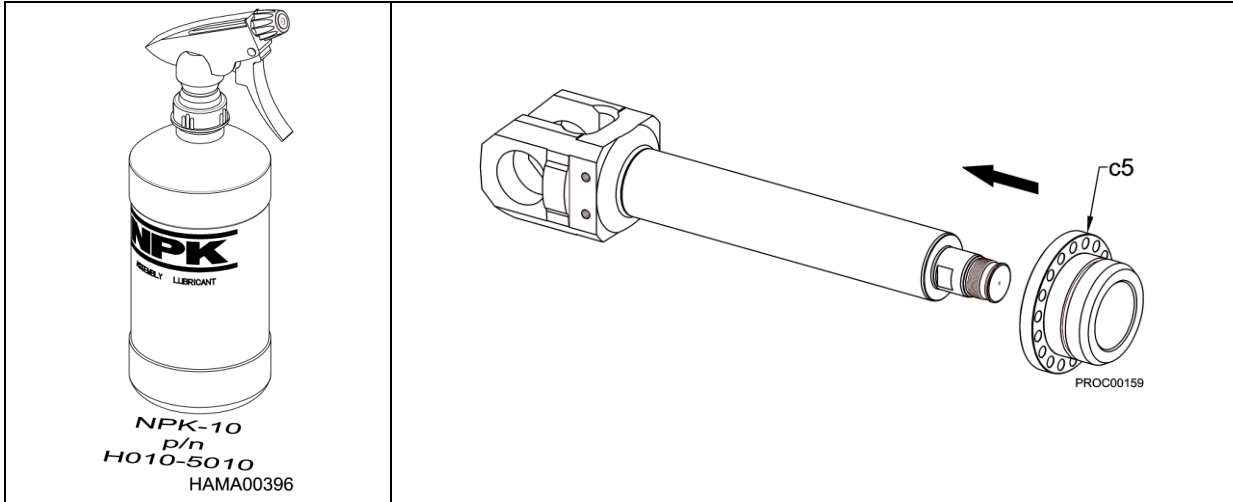
1. Install the dirt seal (QQ), backup ring (SS) and piston seal (PP) into the seal grooves on the inner side of the cylinder end cap (c5). Install the o-ring and backup ring into the outer groove.



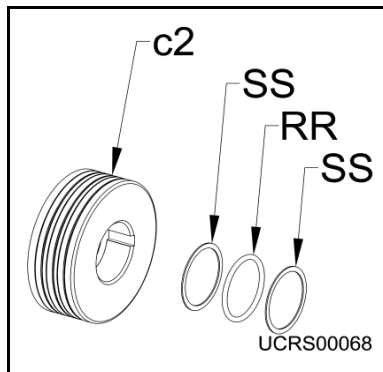
CYLINDER INSPECTION AND MAINTENANCE

ASSEMBLY

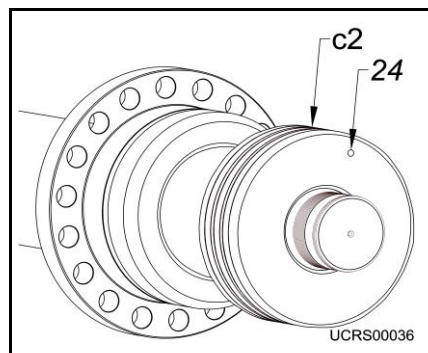
2. Apply hydraulic oil or NPK Assembly Lube to the inner surface coating the previously installed dirt seal, backup ring, and piston seal. Install the cylinder end cap (c5) onto the cylinder rod.



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.



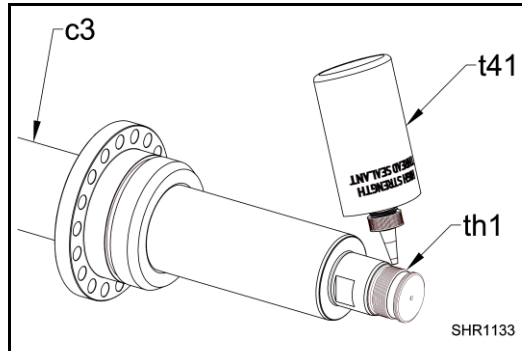
4. Install the piston (c2) with the dimple (24) facing away from the rod eye onto the cylinder rod (c3).



CYLINDER INSPECTION AND MAINTENANCE

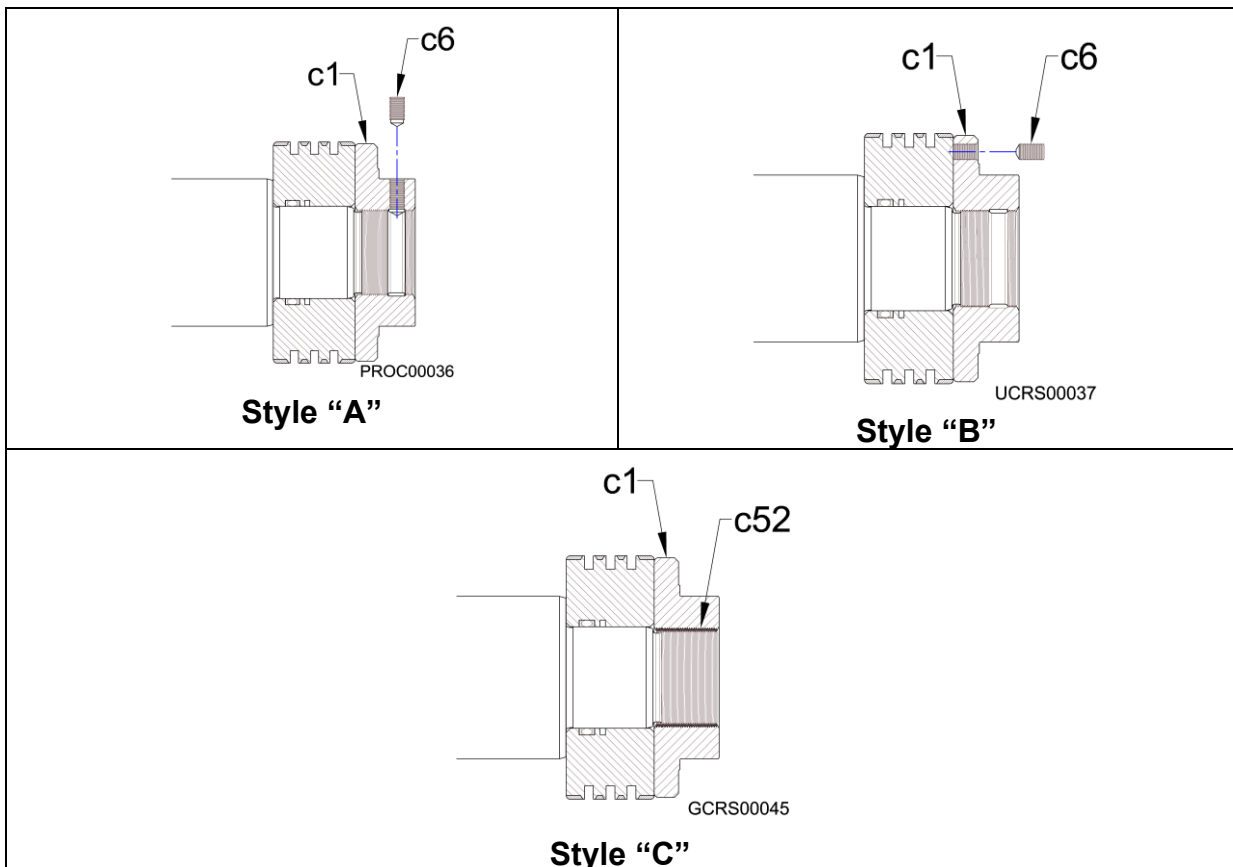
ASSEMBLY

5. Apply high strength thread adhesive (t41) to the clean dry threads (th1) of the cylinder rod.



NOTE: New style cylinder rod nuts (without set screws) have a nylon patch and do not require thread adhesive.

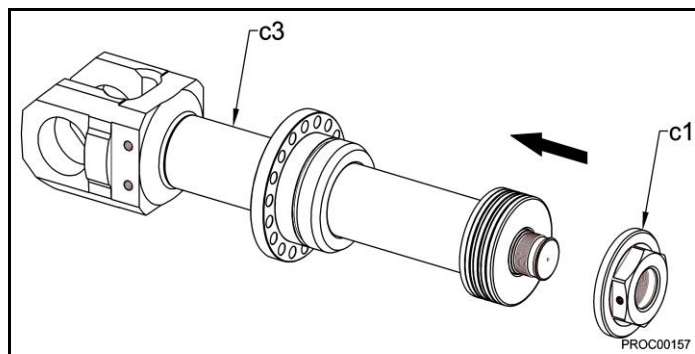
6. There are three styles of piston lock nuts (c1). Lock nut set screw (c6) location changes. Style "A" shows the early factory style. Style "B" shows the current factory style. Style "C" shows the replacement style. Style "C" uses a nylon patch (c52) instead of a set screw.



CYLINDER INSPECTION AND MAINTENANCE

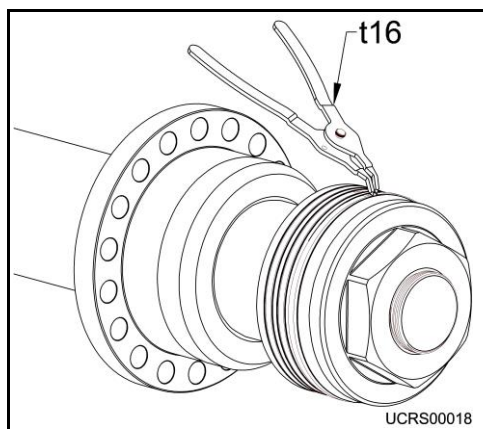
ASSEMBLY

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



MODEL	THREAD SIZE	TORQUE		SOCKET SIZE	ROD NUT PART NUMBER		
		ft. lb.	(Nm)		STYLE "A"	STYLE "B"	STYLE "C"
M20	M65 x 3.0	3,250	(4,400)	90 mm	16032575	16084717	X
M28	M70 x 3.0	4,100	(5,500)	120 mm	16039992	16084683	G180-1000
M38	M70 x 3.0	4,100	(5,500)	120 mm	16039992	16084683	G180-1000

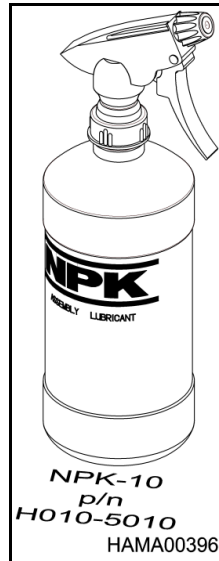
8. Install the set screw. If the original factory lock nuts are to be re-used, a dimple must be drilled into the piston rod (Style "A" type) or the piston (Style "B" type) using the existing threaded hole as a guide. The maximum depth of the hole should not exceed 1/64th inch (0.5 mm). Apply a small amount of medium strength thread adhesive to the set screw before installing. If the lock nut is replaced (Style "C" type), the replacement will have a nylon patch and will not require a set screw.
9. Using a ring expander (t16), install the piston rings with the splits in the piston rings opposing each other.



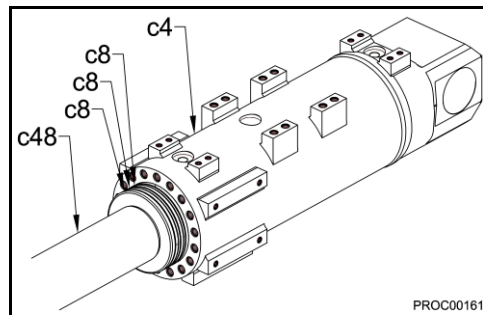
CYLINDER INSPECTION AND MAINTENANCE

ASSEMBLY

10. 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.



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



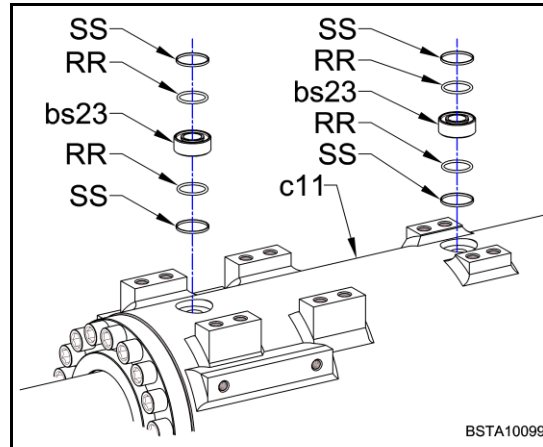
12. Install the cylinder end cap socket head cap screws (OO) and torque to the value listed below.

MODEL	BOLT SIZE	TORQUE	
		ft. lb.	(Nm)
M20	M18-2.5	260	(350)
M28	M18-2.5	260	(350)
M38	M18-2.5	260	(350)

CYLINDER INSPECTION AND MAINTENANCE

ASSEMBLY

13. Apply a light coat of oil or NPK Assembly Lube to four (*quantity of six for M38 units*) new backup rings (SS), four (*quantity of six for M38 units*) new o-rings (RR) and the two (*quantity of three for M38 units*) spacers (bs23), then install in the corresponding counter bores of the main cylinder assembly (c11).



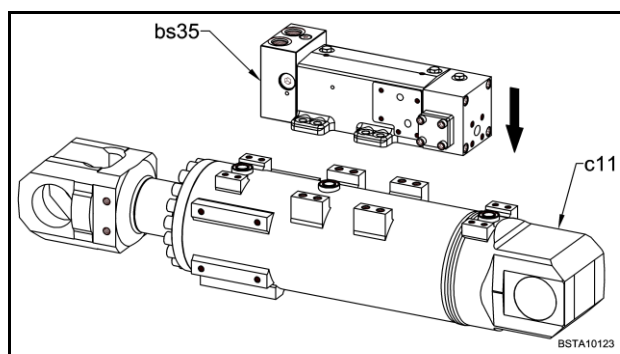
14. Apply a light coat of oil or NPK Assembly Lube to the mating surfaces of the booster main body.



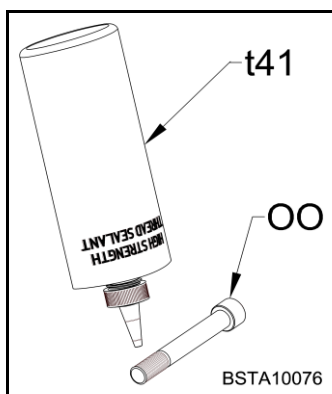
CYLINDER INSPECTION AND MAINTENANCE

ASSEMBLY

15. 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 eyebolts in the threaded bores on top of the booster assembly. Lift and move the booster assembly using a hoist.



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



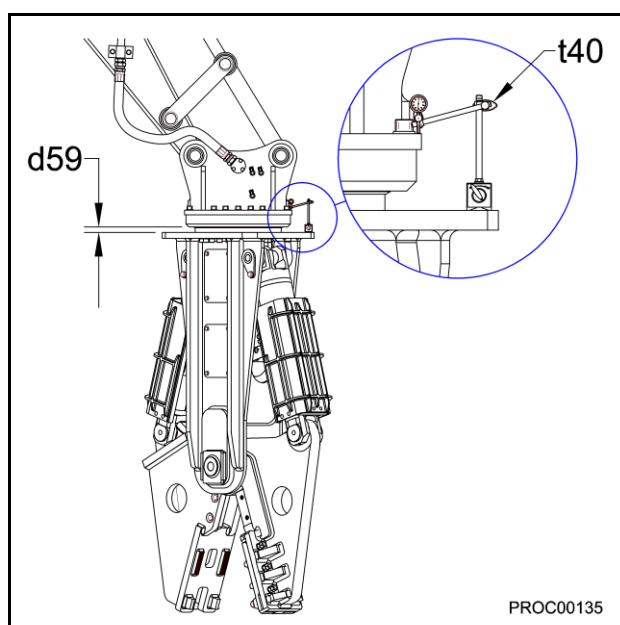
17. Secure the main booster assembly to the cylinder housing using the eight cap screws and washers. Tighten the cap screws in an opposing pattern. Torque to value listed below.

MODEL	BOLT SIZE	TORQUE	
		ft. lb.	(Nm)
M20	M16-2	220	(300)
M28	M16-2	220	(300)
M38	M16-2	220	(300)

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 (440) 232-7900.



MODEL	NEW MAXIMUM	
	in	(mm)
M20	<.010	(<0.25)
M28	<.010	(<0.25)
M38	<.010	(<0.25)

MODEL	MAXIMUM ALLOWABLE WEAR	
	in	(mm)
M20	0.138	(3.50)
M28	0.138	(3.50)
M38	0.138	(3.50)

SLEWING RING INSPECTION AND MAINTENANCE

ROTATION BEARING OUTER DIRT SEAL REPLACEMENT

MODEL	SLEWING RING PART NUMBER	DIRT SEAL PART NUMBER
M20	25309550	25309273
M20	25309660	
M28	25309270	
M28	25309670	
M38	25309680	25309353

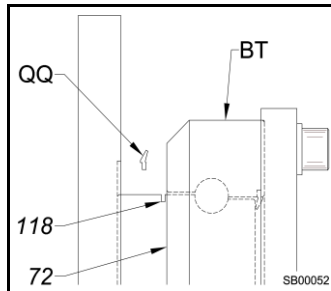
Additional items needed:

High strength adhesive

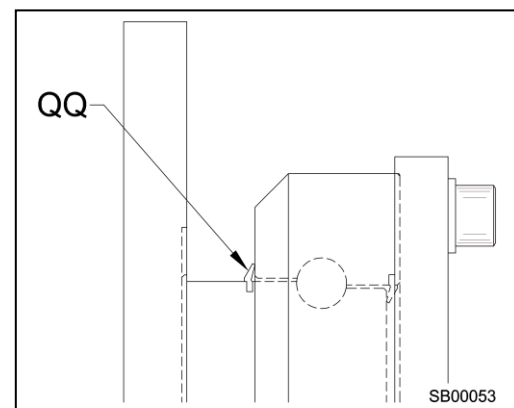
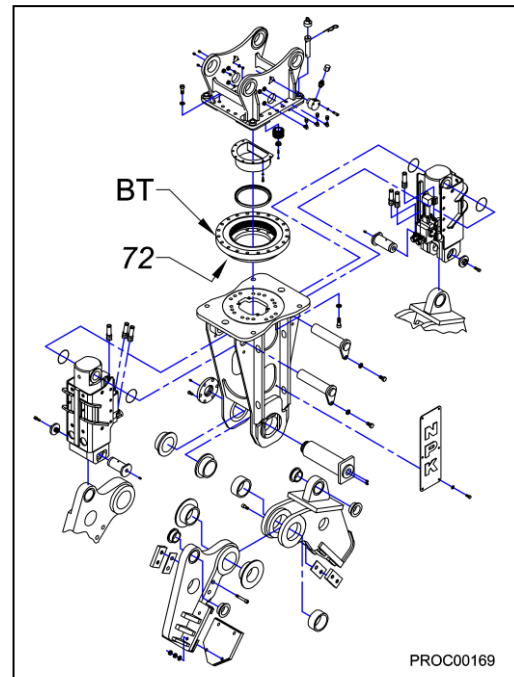
Brake clean/solvent

CAUTION

1. Remove old seal (QQ) from the bottom side (72) of the slewing ring (BT).



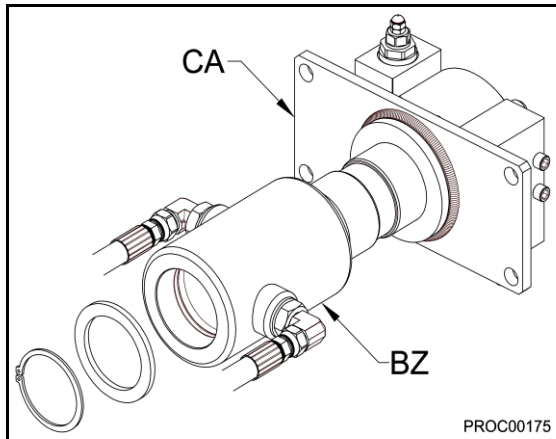
2. Thoroughly clean oil, grease and dirt from the seal groove (118) and surrounding areas.
3. Clean seal groove with brake clean/solvent and allow time to dry completely.
4. Apply a small amount of high strength adhesive into the groove and install one end of the seal. **Take care not to get adhesive on the lower lip of the seal.**
5. Insert seal into the groove and work around the slewing ring applying a small amount of adhesive every 12 in. (300 mm). **Take care not to stretch the seal as it is being installed around the slewing ring.**
6. Cut excess seal material as you get back around to the other end so the seal will butt against itself tightly. Apply adhesive to the groove and end of the seal to make it one continuous ring.



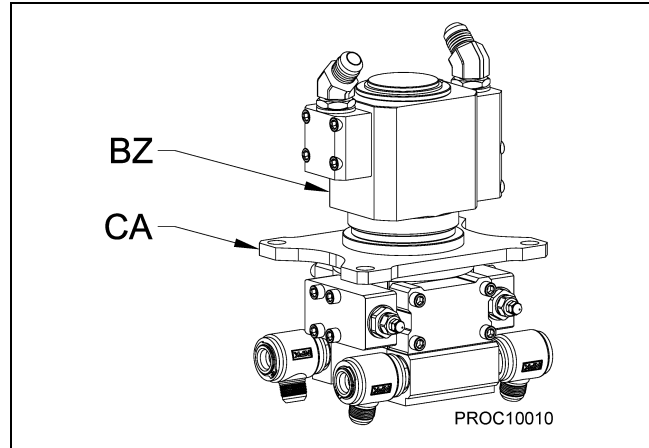
SWIVEL MANIFOLD MAINTENANCE

SWIVEL MANIFOLD ASSEMBLY

The swivel manifold assembly is located between the top bracket, which is pinned to the carrier, and the processor frame that rotates. Hydraulic oil for both the open and close operations of the 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 processor frame.



OLDER MODELS



NEWER MODELS

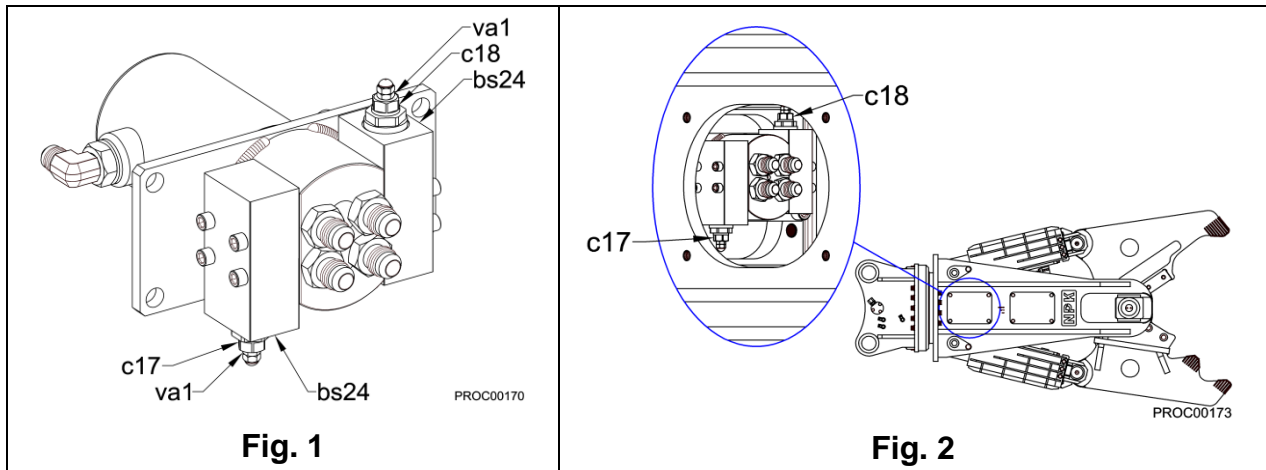
LEAKAGE OF THE SEALS

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. 1**). Access to these is through the upper side access plates of the processor main frame (see **Fig. 2**). 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.*



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 model 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



The jaws of the material processor should be closed, and the frame supported or the shipping pins (t80), as shown in **Fig. 3**, installed to prevent rotation during repair.

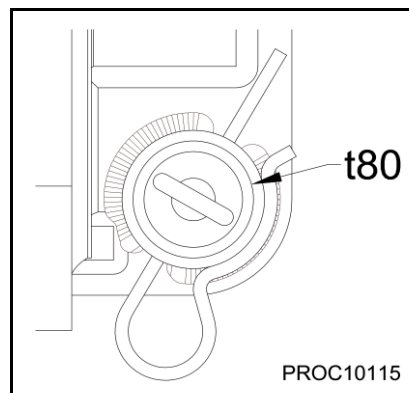


Fig. 3

STEP 1 (Fig. 4)

Disconnect the rotation hoses (m39) at the counterbalance valve (BO). Remove the rotation motor hoses and motor 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** disturb the elbow fittings (f4) in the “**Spindle Case**”.

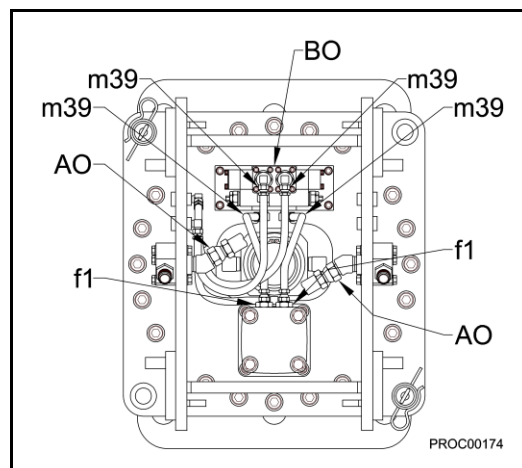


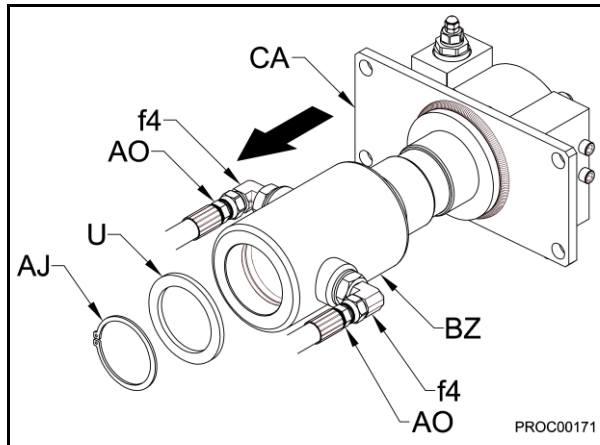
Fig. 4

SWIVEL MANIFOLD MAINTENANCE

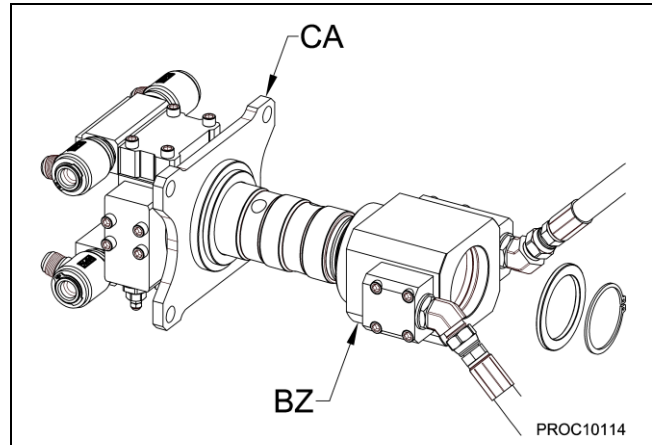
REPLACEMENT OF THE SEALS IN THE SWIVEL

STEP 2

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).



OLDER STYLE



NEWER STYLE

STEP 3 (Fig. 5)

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.

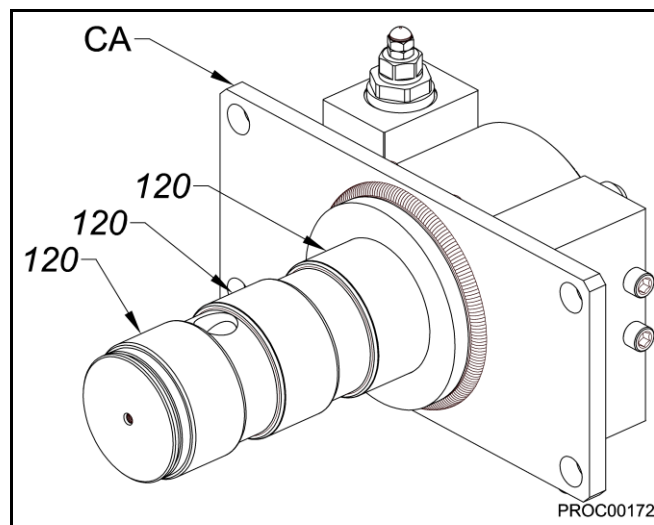


Fig. 5

SWIVEL MANIFOLD MAINTENANCE

REPLACEMENT OF THE SEALS IN THE SWIVEL

STEP 4 (Fig. 6)

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.

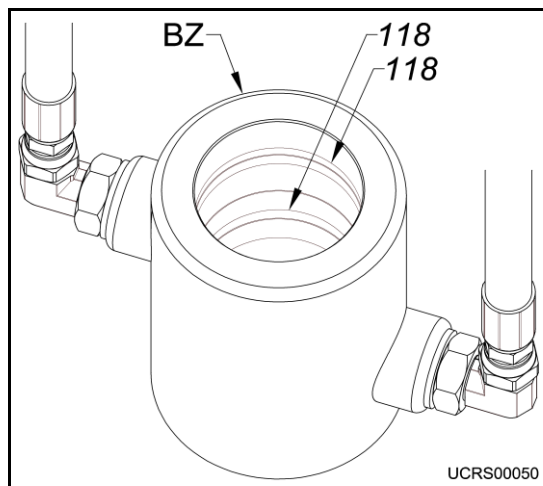
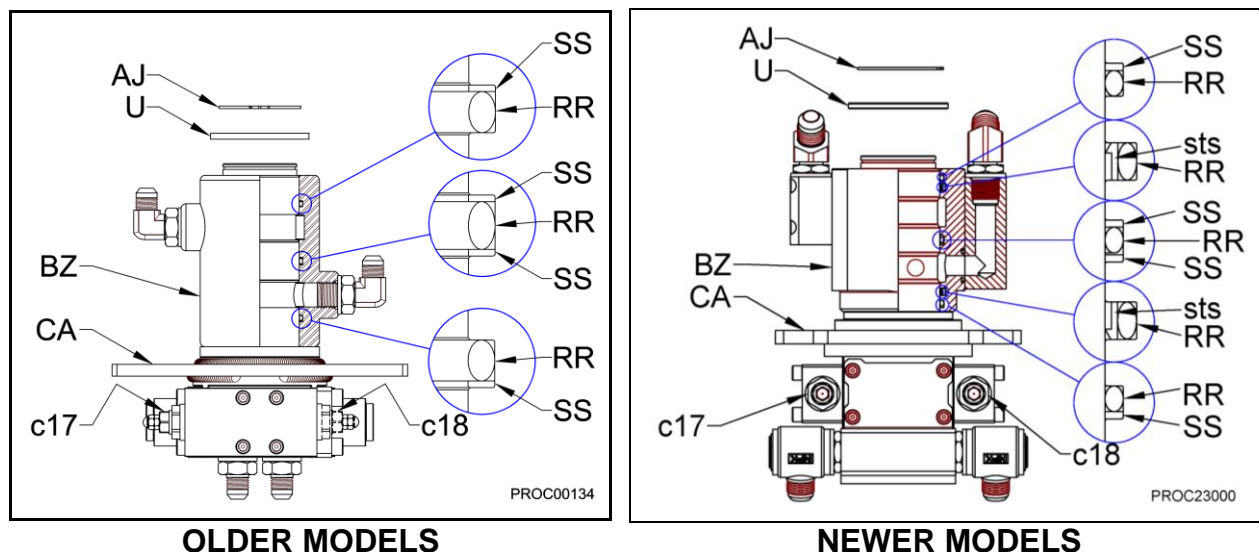


Fig. 6

STEP 5

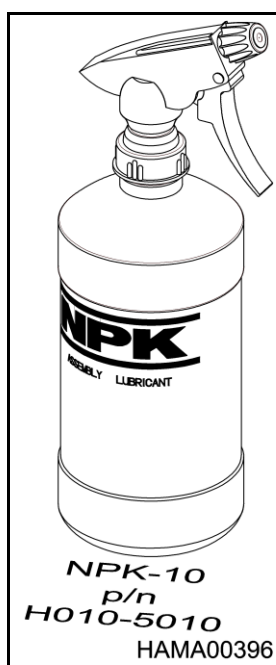
Lubricate the o-rings (RR), back-up rings (SS), and/or step seals (sts) with grease. Install the back-up rings first, taking care not to crimp or fold them. Install the o-rings. Refer to the illustration for o-ring and back-up ring placement.



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 fittings into the hydraulic motor and install the hydraulic motor hoses.



JAW SET INTERCHANGE

TOOL AND SUPPLIES

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

- At least one lifting device, such as a crane or lift truck with adequate capacity for the particular model being worked on.
- A supporting device, such as a second crane or lift truck.
- Lifting and securing straps or chains with adequate capacity for the model being worked on.
- Three wood blocks, 4" x 4" (100 x 100 mm) or larger.
- 14 mm hex key socket (available as NPK part no. M380-1000).
- 14 mm hex key wrench.
- 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*).
- Ball peen hammer.
- Sledge hammer.
- NPK assembly tube, p/n 35027310 for the M20 and 35027200 for the M28 and M38 models.
- Spanner wrench.
- 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



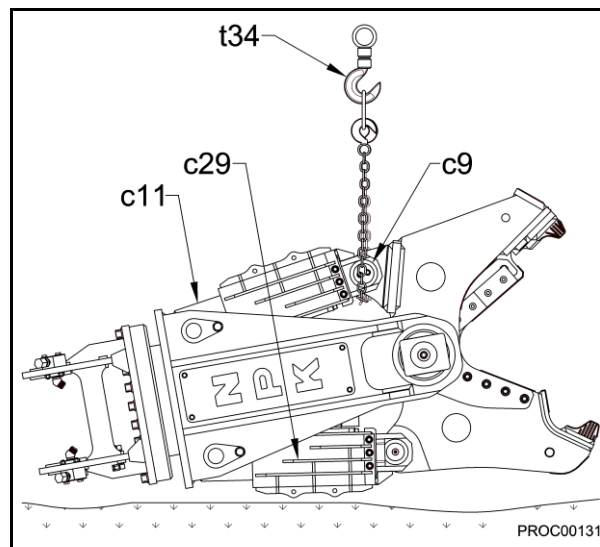
- A. Safe handling procedures must be followed to avoid personal injury.
- B. Lifting and securing mechanisms must be of adequate capacity to safely support the particular Processor model or jaw set.

UNIT POSITIONING

For ease of pin removal or installation, it is recommended that the unit be positioned with the pins parallel to the ground. Changing the jaw sets with the pins perpendicular to the ground is possible, but more difficult.

Removal of a jaw set from the Material Processor may be accomplished with more ease if the jaw set is in the open position. Cap the hydraulic ports at this time.

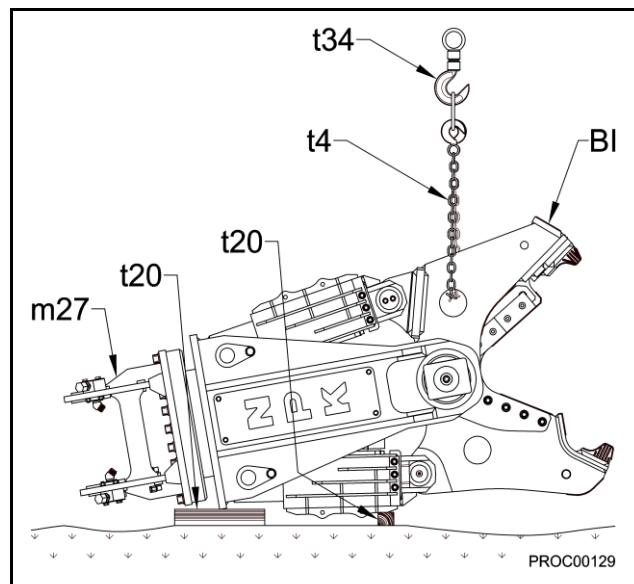
1. To place the unit in the best position, wrap a lifting strap or chain around one of the cylinder sub-assemblies (c11) near the cylinder jaw pin (c9).
2. Using the crane or lifting device (t34), slowly raise the unit until it is resting on a cylinder rod cover (c29).



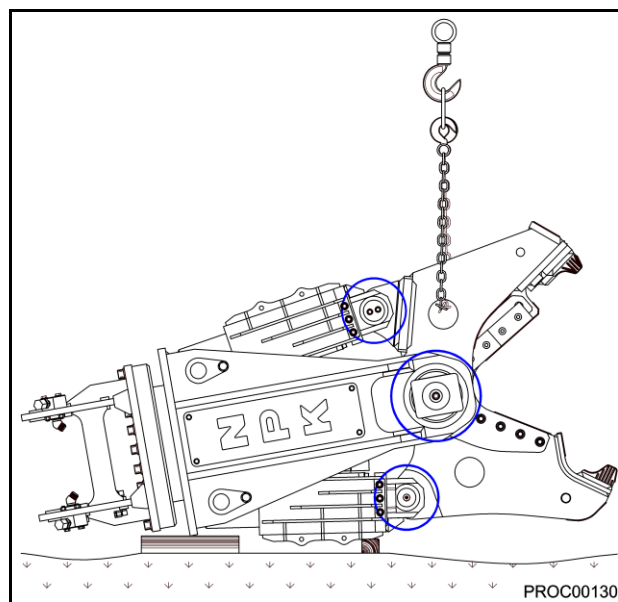
JAW SET INTERCHANGE

UNIT POSITIONING

3. While maintaining crane or lifting device engagement (t34), place two wood blocks (t20) under each side of the main frame toward the top bracket (m27) end. Also place a wood block under the cylinder rod cover near the cylinder rod pin.
4. Reposition the lifting strap or chain (t4) by wrapping it through the bore of the uppermost jaw (BI). For safety, maintain crane or lifting device engagement.



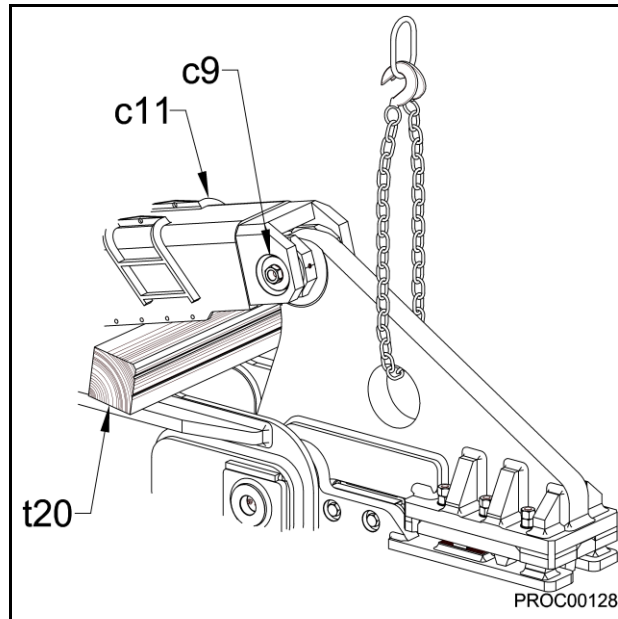
The unit is now positioned for detachment of the jaws from the cylinders and detachment of the jaw set from the main frame by removal of the three pins circled in the illustration below.



JAW SET INTERCHANGE

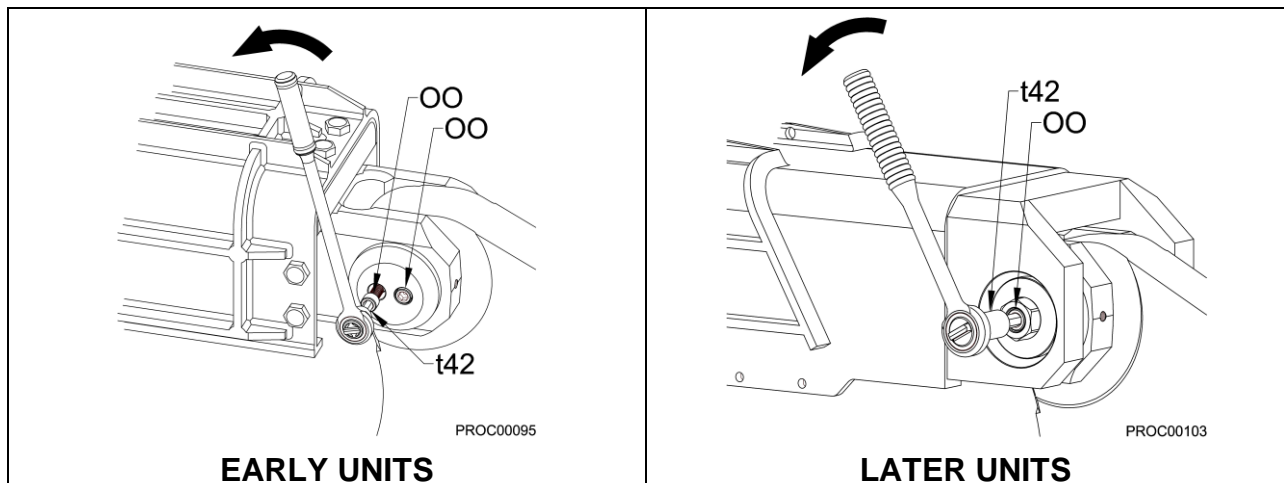
DETACHMENT OF THE JAWS FROM THE CYLINDER SUB-ASSEMBLIES

5. Support the top cylinder sub-assembly (c11) with a wood block (t20) to prevent it from falling and potential damage when the cylinder jaw pin (c9) is removed.



6. **Early units:** Begin with either of the cylinder jaw pins. Using a hex key socket (t42), remove the two socket head cap screws (OO) that secure the cylinder pin lock plate.

Later units: Begin with either of the cylinder jaw pins. Using a hex key socket (t42) remove the socket head bolt (OO) that secures the cylinder pin lock plate.

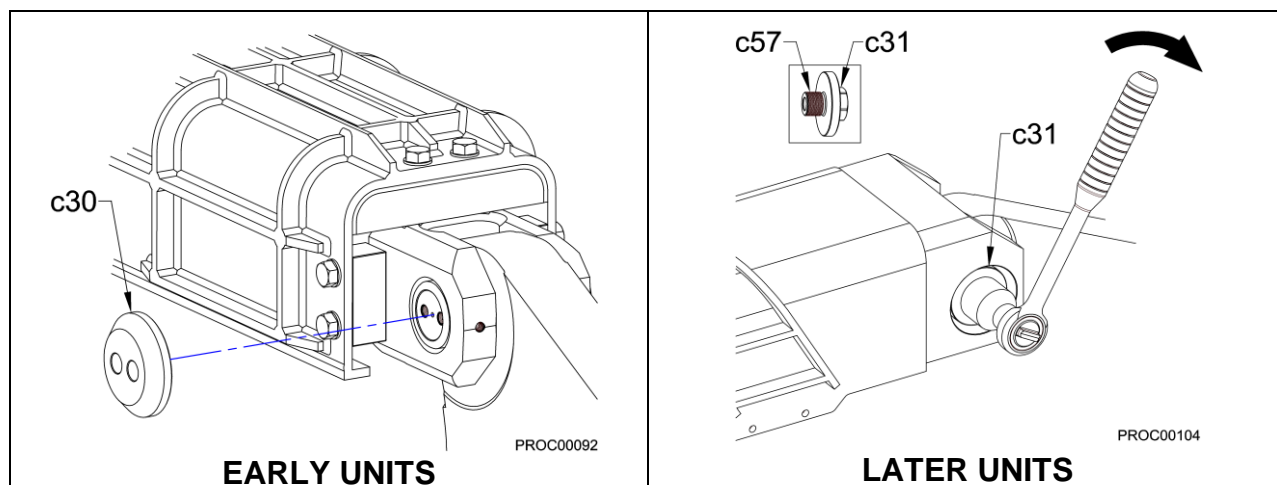


JAW SET INTERCHANGE

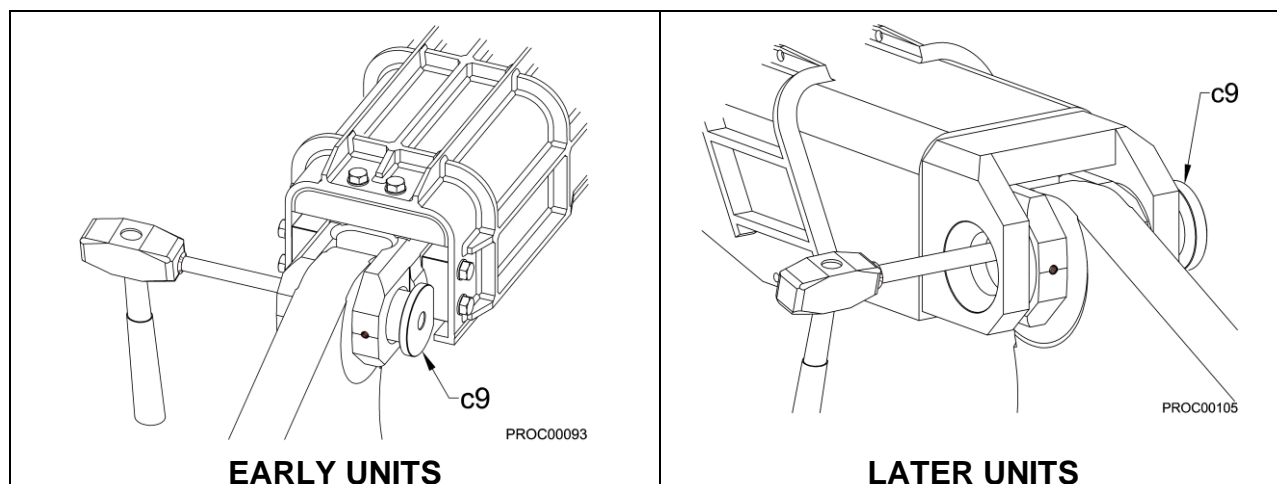
DETACHMENT OF THE JAWS FROM THE CYLINDER SUB-ASSEMBLIES

7. **Early units:** Manually remove the cylinder pin lock plate (c30).

Later units: Using a socket, remove the cylinder pin locking plate (c31). **NOTE:** Left hand thread (c57).



8. Remove the cylinder pin as shown.



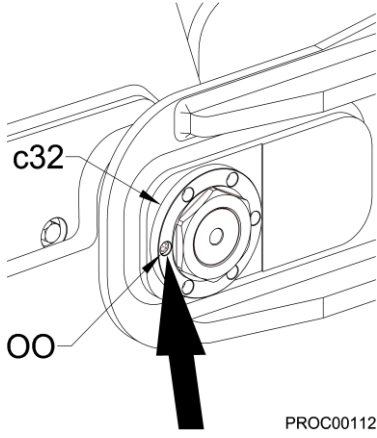
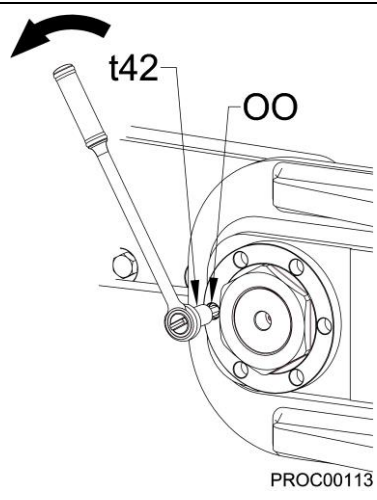
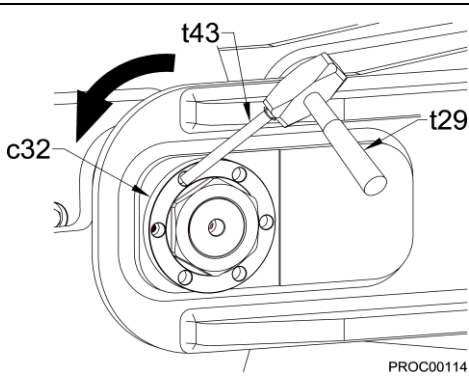
⚠ WARNING

Once the cylinder jaw pin is removed, the jaw may rock forward.

9. Repeat steps six through eight to detach the second jaw from the second cylinder sub-assembly.

JAW SET INTERCHANGE

DETACHMENT OF THE JAW SET FROM THE MAIN FRAME

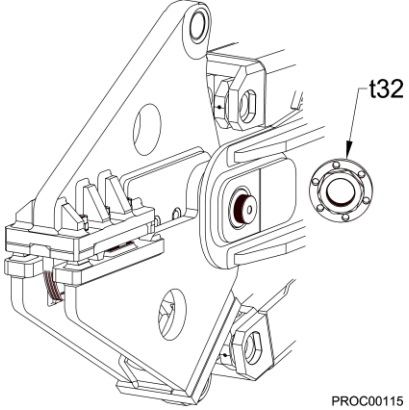
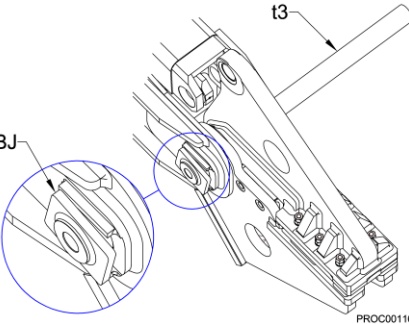
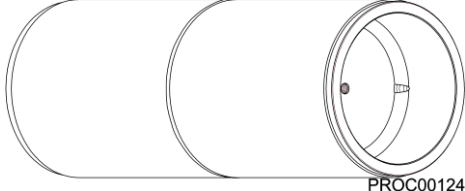
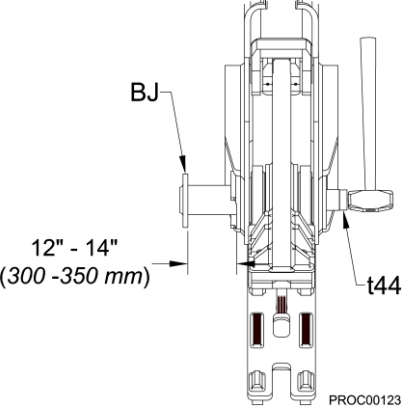
<p>10. Locate the socket head cap screw (OO) on the pivot pin nut (c32).</p>	 <p>Diagram showing the location of the socket head cap screw (OO) on the pivot pin nut (c32). A black arrow points to the screw. Labels c32 and OO are present. PROC00112</p>
<p>11. Using a hex key socket (t42), remove the socket head cap screw (OO).</p>	 <p>Diagram showing the removal of the socket head cap screw (OO) using a hex key socket (t42). A curved arrow indicates the direction of rotation. Labels t42 and OO are present. PROC00113</p>
<p>12. Loosen the pivot pin nut (c32) with a spanner wrench or by angling a brass drift pin (t43) into one of the blind holes and tapping with a hammer (t29).</p>	 <p>Diagram showing the loosening of the pivot pin nut (c32) using a spanner wrench (t43) and a hammer (t29). A curved arrow indicates the direction of rotation. Labels c32, t43, and t29 are present. PROC00114</p>

ATTENTION

Avoid damaging the threads in the frame.

JAW SET INTERCHANGE

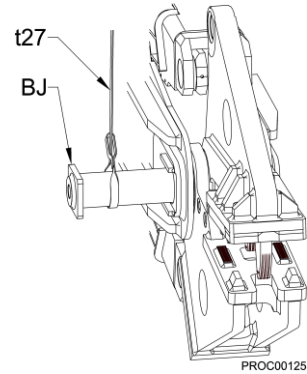
DETACHMENT OF THE JAW SET FROM THE MAIN FRAME

<p>13. Once loosened, remove the pivot pin nut (c32).</p>	 <p>Diagram showing the removal of the pivot pin nut (c32) from the jaw set assembly. The nut is shown being removed from the pivot pin. The diagram is labeled PROC00115.</p>
<p>14. Using a non-metallic (e.g. nylon or wood) rod (t3) or dead blow hammer, drive the jaw pivot pin (BJ) so that it extends out only about 1" (25 mm) on the side shown.</p>	 <p>Diagram showing the jaw pivot pin (BJ) being driven out of the jaw set assembly using a non-metallic rod (t3). The diagram is labeled PROC00116.</p>
<p>It is at this stage that the assembly tube, NPK part no. 35027310 (for M20 units) or part no. 35027200 (for M28/M38 units), is used to keep the jaws united as the jaw pivot pin is removed.</p>	 <p>Diagram showing the assembly tube (t44) used to keep the jaws united. The diagram is labeled PROC00124.</p>
<p>15. Set the assembly tube in the bore snugly against the jaw pivot pin.</p>	
<p>16. Install the assembly tube (t44) by carefully driving it through the bore. This action will simultaneously push the jaw pivot pin (BJ) out the other side and lock the jaws together. Continue careful driving of the assembly tube until the jaw pivot pin extends 12 - 14" (300 - 350 mm) from the main frame, then stop.</p>	 <p>Diagram showing the assembly tube (t44) being driven through the bore, pushing the jaw pivot pin (BJ) out the other side. The diagram is labeled PROC00123.</p>

JAW SET INTERCHANGE

DETACHMENT OF THE JAW SET FROM THE MAIN FRAME

17. Support the jaw pivot pin (BJ) to prevent its free fall upon total removal, such as with a lifting strap (t27) attached to a crane or lift truck.

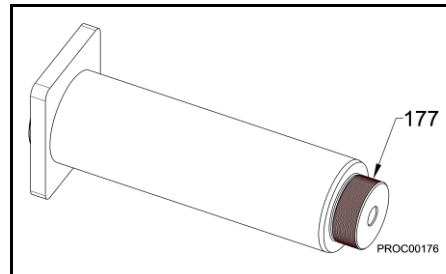


18. Continue driving the assembly tube until it is centered in the jaw set.

19. Complete the removal of the jaw pivot pin by pulling it out or tapping on the underside of the pin's head.

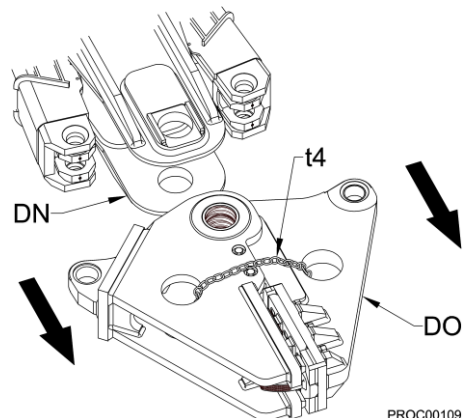
ATTENTION

Avoid damaging the threads (177) when the pin is removed.



JAW SET REMOVAL

20. For easier removal of the jaw set (DO) from the main frame (DN), chain (t4) or strap the jaws together to restrict their movement. Remove the jaw set from the main frame with a crane or other lifting device by moving it horizontally out, not up or down. For better movement control, a second strap or chain can be used to help level the jaw set.



JAW SET INTERCHANGE

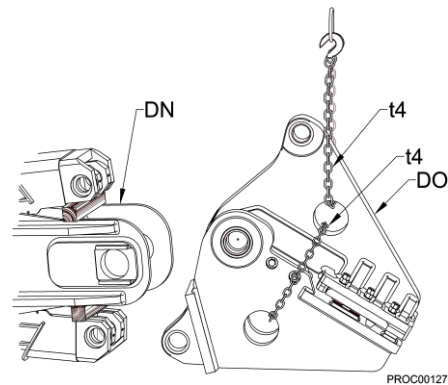
JAW SET STORAGE

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).

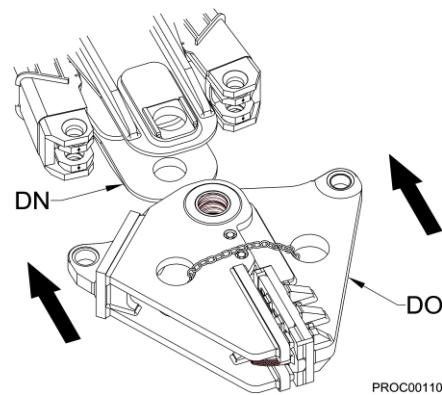
JAW SET INSTALLATION INTO THE MAIN FRAME

NOTE: New jaw sets are shipped pre-assembled with factory installed assembly tubes. Jaw sets that have been used and removed from a Material Processor will be equipped with an assembly tube from a removal operation. If this is not the case, contact the NPK Service Department for assistance.

1. For easier installation of the jaw set (DO) into the main frame (DN), chain (t4) or strap the jaws together to restrict their movement. Wrap a lifting chain or strap through the bore in the upper jaw and attach it to a crane or other lifting device.

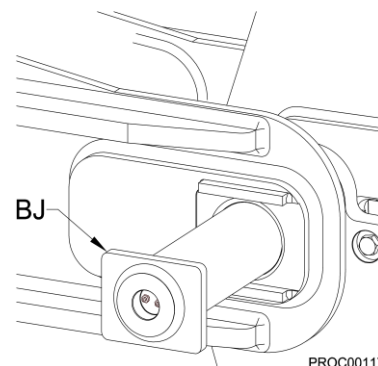


2. Lift the jaw set (DO) and insert it horizontally into the main frame (DN) from the front (do not move up or down). For better movement control, a second strap or chain can be used to help level the jaw set. Adjust as necessary to align the jaw pivot pin bore on the jaw set with the jaw pivot pin bore on the main frame. Maintain this position. This is a tight, no shim design. Alignment for insertion is critical.



ATTACHMENT OF JAW SET TO THE MAIN FRAME

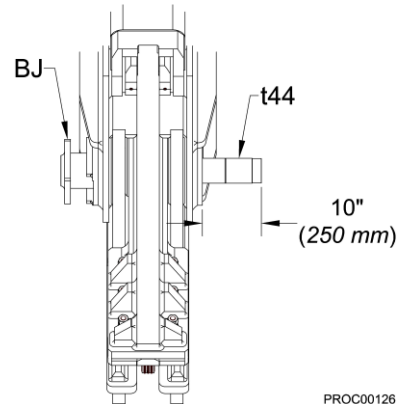
3. Manually insert the jaw pivot pin (BJ) into the jaw pivot pin bore until it rests in the bore without support.



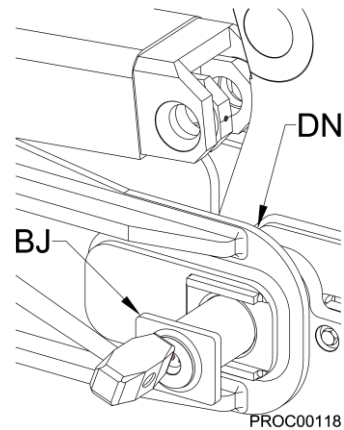
JAW SET INTERCHANGE

ATTACHMENT OF JAW SET TO THE MAIN FRAME

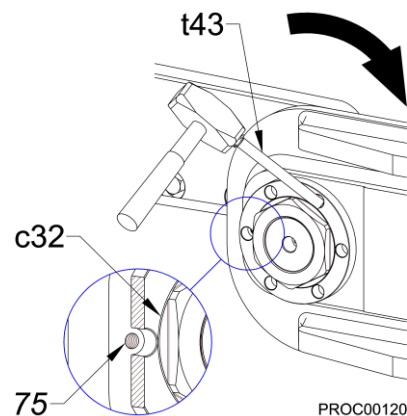
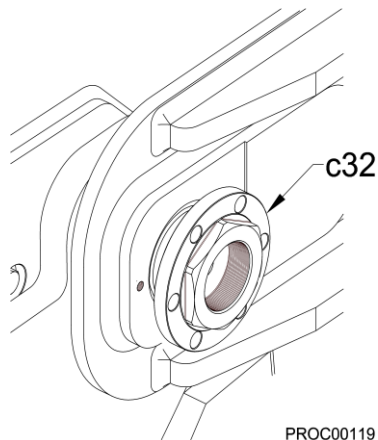
4. Drive the jaw pivot pin (BJ) in until the assembly tube (t44) extends out about 10" (250 mm) on the other side. Remove the assembly tube.



- Continue driving the jaw pivot pin (BJ) in until the head plate is flush with the main frame (DN). (The pin may have to be turned so that it will seat properly.)



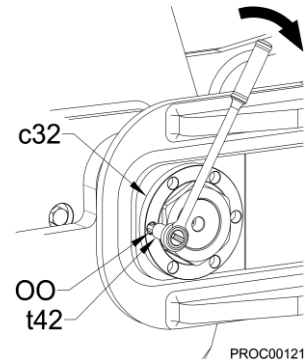
5. Install the pivot pin nut (c32). Tighten with a spanner wrench or by driving with a brass drift pin (t43). The bore on the pivot pin nut (c32) must be aligned with the threaded bolt bore (75) on the main frame.



JAW SET INTERCHANGE

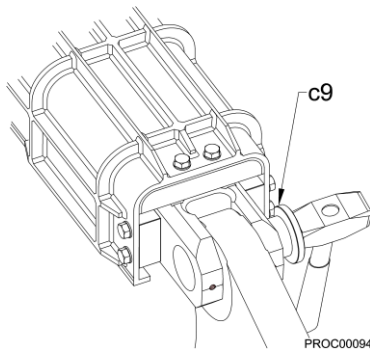
ATTACHMENT OF JAW SET TO THE MAIN FRAME

- Using a hex key socket (t42), install the socket head cap screw (OO) securing the pivot pin nut (c32). See the “FASTENER TORQUE CHART” section of this manual for the correct torque.

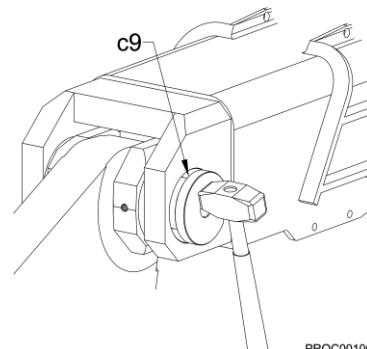


ATTACHMENT OF THE JAWS TO THE CYLINDER SUB-ASSEMBLIES

- Begin with either of the cylinder jaw pins. Align the bore on the jaw with the bore on the cylinder.
- Insert the cylinder jaw pin (c9) into the bore.

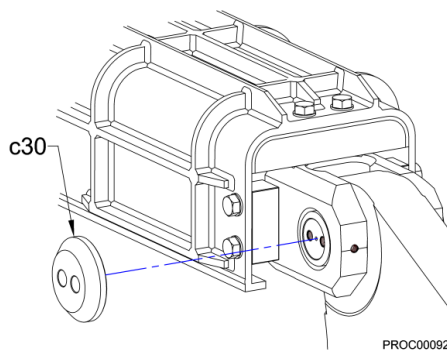


EARLY UNITS

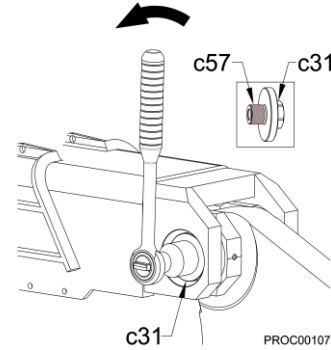


LATER UNITS

- Early units:** Install the cylinder pin lock plate (c30).
Later units: Install the cylinder pin lock plate (c31). **NOTE:** Left hand thread (c57).



EARLY UNITS



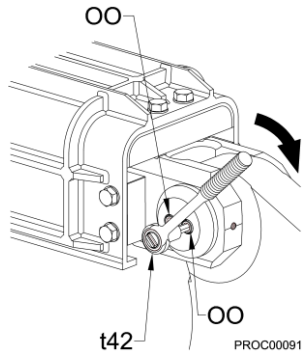
LATER UNITS

JAW SET INTERCHANGE

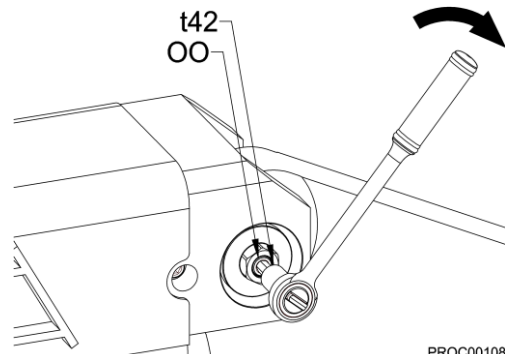
ATTACHMENT OF THE JAWS TO THE CYLINDER SUB-ASSEMBLIES

10. **Early units:** Using a hex key socket (t42), install the two socket head cap screws (OO) securing the cylinder pin lock plate. See the “**FASTENER TORQUE CHART**” section of this manual for the correct torque.

Later units: Using a hex key socket (t42), install the socket head cap screw (OO) securing the cylinder pin lock plate. See the “**FASTENER TORQUE CHART**” section of this manual for the correct torque.

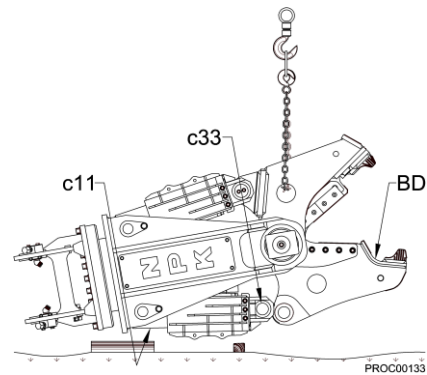


EARLY UNITS



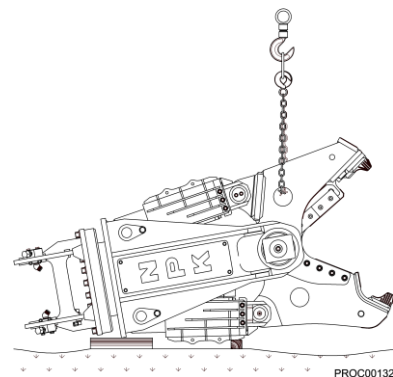
LATER UNITS

11. Remove the chain that is holding the jaws together. Lift the unit to align the bore of the second jaw (BD) with the cylinder jaw pin bore (c33) on the second cylinder (c11).



12. Repeat steps eight through ten to attach the second jaw to the second cylinder sub-assembly.

13. Jaw set change is complete.



FASTENER TORQUE SPECIFICATIONS

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

All fasteners will be used with lube or medium strength thread 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 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 SPECIFICATIONS

FASTENER TORQUE CHART - MAIN FRAME ASSEMBLY

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE LUBED
			ft. lb.	(Nm)	
CYLINDER ROD END PIVOT PIN KEEPER	M20	M16	190	(255)	LUBED
	M28	M16	190	(255)	LUBED
	M38	M20	360	(490)	LUBED
CYL. BARREL END PIVOT PIN KEEPER	M20	M24	530	(720)	LUBED
	M28	M24	530	(720)	LUBED
	M38	M24	530	(720)	LUBED
JAW PIVOT PIN NUT	M20	M16	190	(255)	LUBED
	M28	M16	190	(255)	LUBED
	M38	M16	190	(255)	LUBED
CUTTING BLADE, G & S JAWS	M20	M16	190	(255)	LUBED
	M28	M20	360	(490)	LUBED
	M38	M24	530	(720)	LUBED
CUTTING BLADE, C & K JAWS	M20	M16	190	(255)	LUBED
	M28	M20	360	(490)	LUBED
	M38	M24	530	(720)	LUBED
TUNNEL FRONT BLADE, K JAW	M20	M16	190	(255)	LUBED
	M28	M20	360	(490)	LUBED
	M38	M24	530	(720)	LUBED
TOOTH PLATE, G JAW	M20	M20	365	(495)	ADHESIVE
	M28	M24	640	(870)	ADHESIVE
	M38	M24	640	(870)	ADHESIVE
ACCESS PLATE	M20	M12	90	(125)	LUBED
	M28	M12	90	(125)	LUBED
	M38	M16	90	(125)	LUBED
JOINT FITTING	M20	M12	65	(90)	LUBED
	M28	M12	65	(90)	LUBED
	M38	M12	65	(90)	LUBED

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - CYLINDER ASSEMBLY w/BOOSTER

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE OR LUBED
			ft. lb.	(Nm)	
CYLINDER END CAP	M20	M18	260	(350)	LUBED
	M28	M18	260	(350)	LUBED
	M38	M18	260	(350)	LUBED
CYLINDER ROD NUT	M20	M45	1500	(2000)	ADHESIVE
	M28	M65	3200	(4300)	ADHESIVE
	M38	M70	4100	(5500)	ADHESIVE
CYLINDER GUARD	M20	M16	190	(255)	LUBED
CYLINDER GUARD (EARLY UNITS)	M28	M18	260	(350)	LUBED
	M38	M18	260	(350)	LUBED
CYLINDER GUARD (LATE UNITS)	M28	M20	360	(490)	LUBED
	M38	M20	360	(490)	LUBED
WEAR PLATE	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
BOOSTER ASSEMBLY	M20	M16	220	(300)	ADHESIVE
	M28	M16	220	(300)	ADHESIVE
	M38	M16	220	(300)	ADHESIVE
SWIVEL BLOCK TO CYLINDER (EARLY UNITS)	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
SWIVEL BLOCK TO CYLINDER (LATE UNITS)	M20	M16	225	(300)	ADHESIVE
	M28	M16	225	(300)	ADHESIVE
	M38	M16	225	(300)	ADHESIVE
SWIVEL BLOCK TO BOOSTER	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
MANIFOLD BLOCK TO CYLINDER	M38	M12	93	(125)	ADHESIVE
MANIFOLD BLOCK TO BOOSTER	M38	M12	93	(125)	ADHESIVE

NOTE: For booster assembly bolt torques see **B000-9600C** booster manual.

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - CYLINDER ASSEMBLY w/o BOOSTER

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE OR LUBED
			ft. lb.	(Nm)	
CYLINDER END CAP	M20	M18	260	(350)	LUBED
	M28	M18	260	(350)	LUBED
	M38	M18	260	(350)	LUBED
CYLINDER ROD NUT	M20	M45	1500	(2000)	ADHESIVE
	M28	M65	3200	(4300)	ADHESIVE
	M38	M70	4100	(5500)	ADHESIVE
CYLINDER GUARD	M20	M16	190	(255)	LUBED
CYLINDER GUARD (EARLY UNITS)	M28	M18	260	(350)	LUBED
	M38	M18	260	(350)	LUBED
CYLINDER GUARD (LATE UNITS)	M28	M20	360	(490)	LUBED
	M38	M20	360	(490)	LUBED
WEAR PLATE	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
CYLINDER MANIFOLD ASSEMBLY	M20	M16	225	(300)	ADHESIVE
	M28	M16	225	(300)	ADHESIVE
	M38	M16	225	(300)	ADHESIVE
CHECK VALVE CAP	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
BOOSTER END CAP	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
CONNECTOR PIPE	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE

FASTENER TORQUE SPECIFICATIONS

FASTENER TORQUE CHART - ROTATION COMPONENTS

BOLT LOCATION	MODEL	BOLT SIZE	BOLT TORQUE		ADHESIVE OR LUBED
			ft. lb.	(Nm)	
SLEWING RING ASSEMBLY TO FRAME	M20	M24	530	(720)	LUBED
	M28	M24	530	(720)	LUBED
	M38	M24	530	(720)	LUBED
TOP PLATE TO SLEWING RING	M20	M16	260	(350)	ADHESIVE
	M28	M16	260	(350)	ADHESIVE
	M38	M16	260	(350)	ADHESIVE
SLEWING RING COVER	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
ROTATION MOTOR	M20	M16	225	(300)	ADHESIVE
	M28	M16	225	(300)	ADHESIVE
	M38	M16	225	(300)	ADHESIVE
MOTOR PINION GEAR	M20	M12	93	(125)	ADHESIVE
	M28	M12	93	(125)	ADHESIVE
	M38	M12	93	(125)	ADHESIVE
COUNTERBALANCE VALVE	M20	M12	95	(130)	LUBED
	M28	M12	95	(130)	LUBED
	M38	M12	95	(130)	LUBED
COUNTERBALANCE VALVE PLATE	M20	M12	95	(130)	LUBED
	M28	M12	95	(130)	LUBED
	M38	M12	95	(130)	LUBED
SWIVEL MANIFOLD ASSEMBLY	M20	M20	430	(580)	ADHESIVE
	M28	M20	430	(580)	ADHESIVE
	M38	M20	430	(580)	ADHESIVE
RELIEF CARTRIDGE BLOCK	M20	M12	80	(105)	LUBED
	M28	M12	80	(105)	LUBED
	M38	M12	80	(105)	LUBED
FLANGE EXTENSION	M28	M12	80	(105)	LUBED
	M38	M12	80	(105)	LUBED
LOCK PLATE	M38	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 Material Processor jaw crushing/cutting forces are determined by the operating pressure setting and NPK pressure intensifier performance.

2. **LOSS OF CYCLE SPEED**

NPK Material Processor cycle speed is determined by oil flow to the unit. The hydraulic installation circuit for the Material Processor must be set to provide the correct flow.

DETERMINE THE CAUSE OF THE PROBLEM

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

LOSS OF POWER

Loss of power can be caused by a low carrier relief valve setting or by a low Material Processor relief valve setting. Verify the correct relief valve settings of the carrier and the Material Processor. (See “**PROCESSOR SEQUENCE, RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS**” on page 134.)

If the relief valve pressures are to specification, proceed to the “**INTENSIFIER CHECKS**” troubleshooting chart on page 135 and the “**PRESSURE INTENSIFIER OPERATION**” section on page 137.

TROUBLESHOOTING

TROUBLESHOOTING GUIDE FOR LOW POWER RELIEF VALVE CHECKS

PROBLEM	CAUSE	CHECK	REMEDY
Operating Pressure is less than 3,625 psi (250 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 Material Processor operating pressure.
	Material 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 3,625 psi (250 bar).
		Check relief cartridges for tightness.	Tighten the relief valve cartridges.
		Check relief cartridges for mis-adjustment.	Reset to 3,625 psi (250 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.
	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

PROBLEM	CAUSE	CHECK	REMEDY
Operating pressure is at 3,625 psi (250 bar), but the intensifier does not click.	Booster sequence valve cartridge.	Observe sequence valve operation. (See " PRESSURE INTENSIFIER SEQUENCE AND RELIEF VALVE ACTUATION ")	Replace the sequence valve cartridge. (NOTE: <i>The sequence valve cartridge is not adjustable.</i>)
		Check the o-rings and backup rings of the sequence valve cartridge.	Replace the o-rings and backup rings of the sequence valve cartridge.
	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

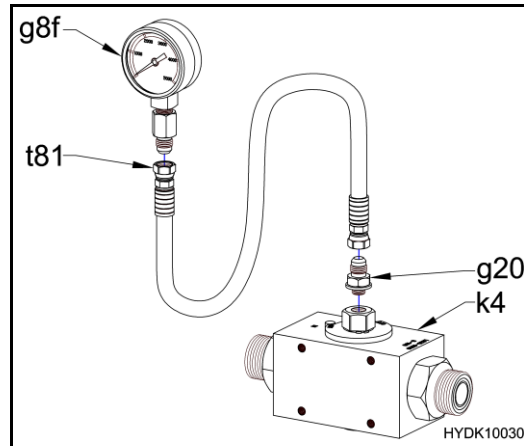
MEASURING OPERATING PRESSURES

Tools and equipment required:

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

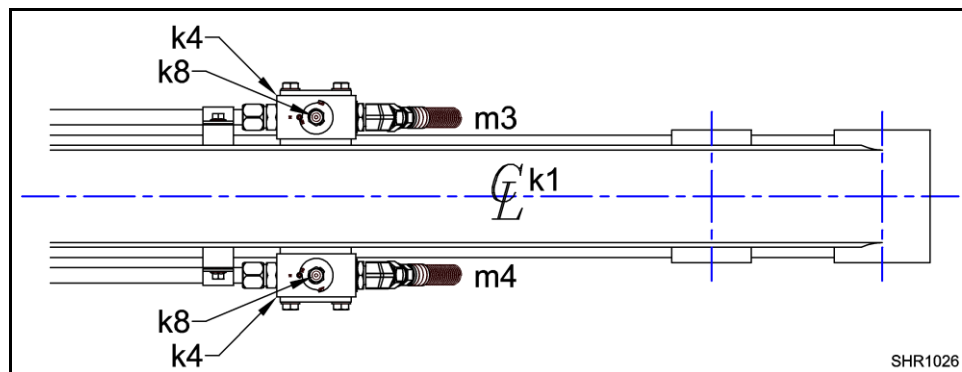
Test port adapter (g20): to fit #4 SAE female port in NPK shut-off valve (k4).

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



RELIEF VALVE CHECKING AND SETTING PROCEDURE

Most 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.

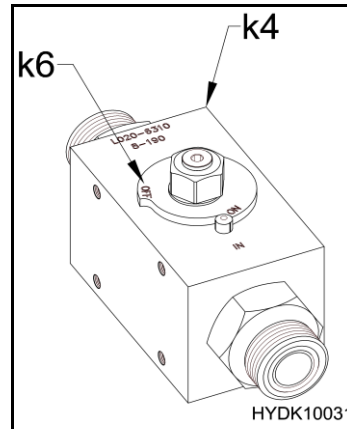


TROUBLESHOOTING

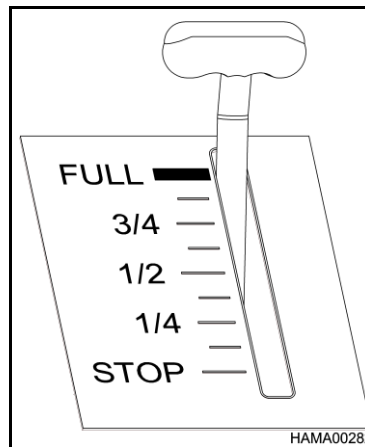
1. CARRIER CIRCUIT RELIEF VALVE CHECK

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

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

TROUBLESHOOTING

2. MATERIAL PROCESSOR RELIEF VALVE

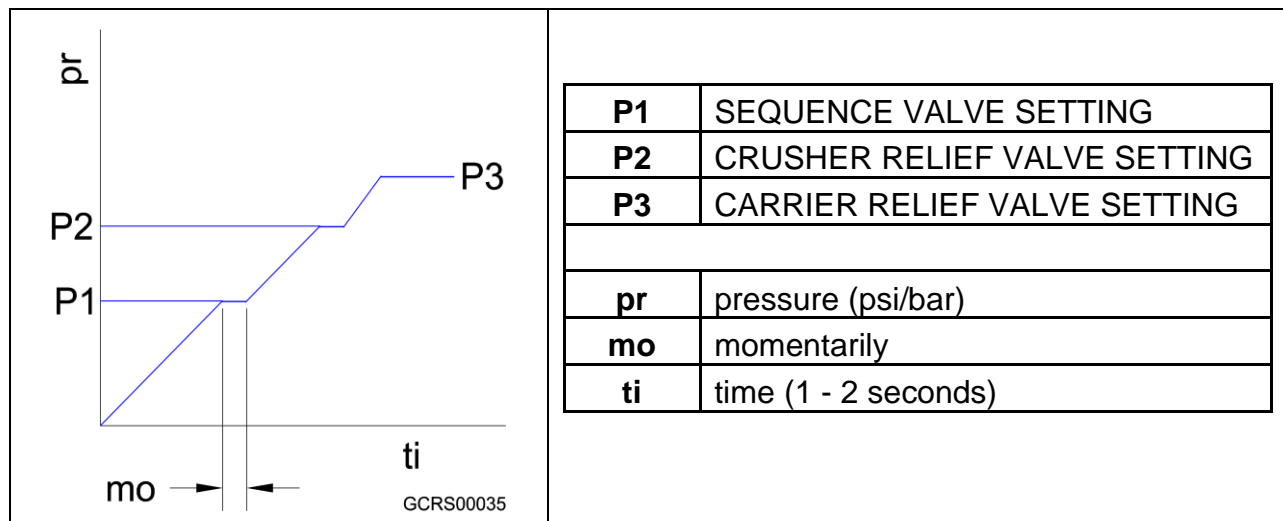
After the Material Processor hydraulic circuit has been verified, check the Material Processor relief valve settings for both open and close.

- 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 Material Processor relief valve setting. If it is not the same, reset the 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 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 Material Processor relief valve setting. If it is not the same, reset the Material Processor relief valve accordingly.

PRESSURE INTENSIFIER SEQUENCE VALVE AND RELIEF VALVE ACTUATION

Close the jaws without material in them. When the jaw cylinders are fully stroked, the load pressure (pr) rises until it reaches the sequence valve setting ($P1$). The oil is then diverted to the pressure intensifier. The load pressure momentarily (mo) levels off for one to two seconds (ti) at the sequence valve pressure setting then rises to the Material Processor relief valve setting ($P2$). The carrier relief valve ($P3$) acts only as a safety relief and must be set 200 psi (14 bar) above the Material Processor relief setting.

NOTE: *Do not adjust sequence valve cartridge (factory preset).*

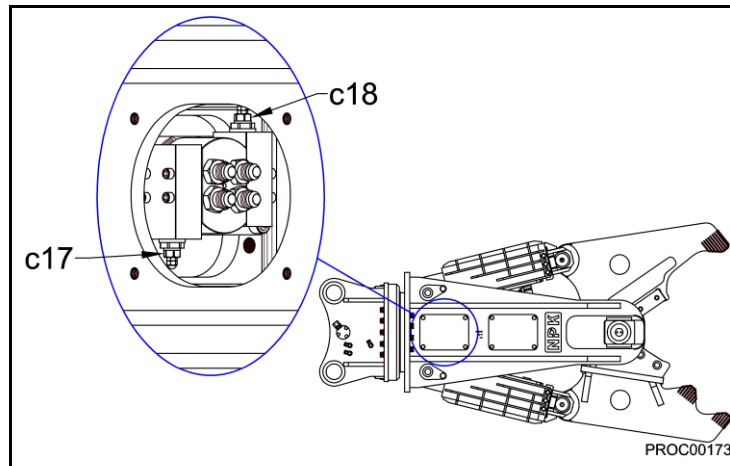


TROUBLESHOOTING

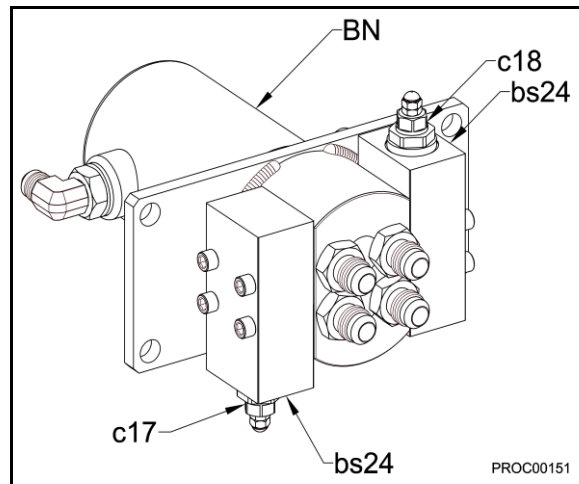
MATERIAL PROCESSOR SEQUENCE, RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS

MODEL	SERIAL NO.	P1 PROCESSOR SEQUENCE VALVE SETTING		P2 PROCESSOR RELIEF VALVE SETTING		P3 MINIMUM CARRIER RELIEF VALVE SETTING	
		psi	(bar)	psi	(bar)	psi	(bar)
M20	ALL	2,950	(205)	3,625	(250)	3,825	(265)
M28	ALL	2,950	(205)	3,625	(250)	3,825	(265)
M38	ALL	2,950	(205)	3,625	(250)	3,825	(265)

RELIEF VALVE LOCATION



The 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	Material Processor relief valves	Check relief cartridges for tightness.	Tighten the relief valve cartridges.
		Check relief cartridges for mis-adjustment.	Reset to 3,625 psi (250 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 sequence valve cartridge.	Observe sequence valve operation. (See " PRESSURE INTENSIFIER SEQUENCE AND RELIEF VALVE ACTUATION ")	Replace the sequence valve cartridge. (NOTE: <i>The sequence valve cartridge is not adjustable.</i>)
			Check the o-rings and backup rings of the sequence valve cartridge.
	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

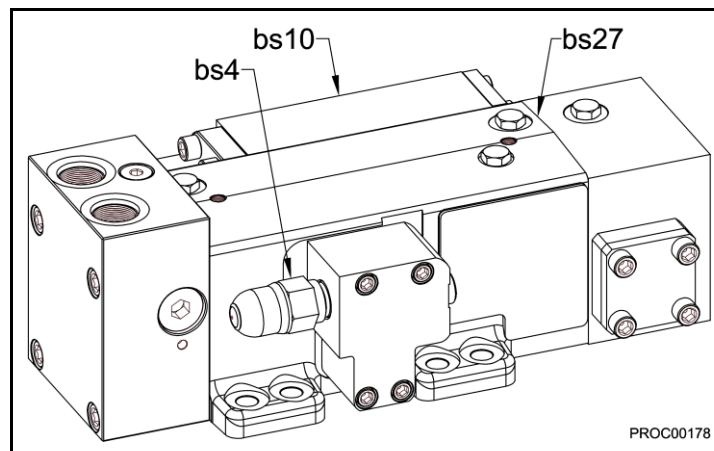
PROBLEM	CAUSE	CHECK	REMEDY
Intensifier clicks but does not slow down	Material Processor relief valves	Check relief cartridges for tightness.	Tighten the relief valve cartridges.
	Main valve orifice. (NOTE: Not found in most "D" style boosters.)	Check the orifice, o-rings and backup rings.	Clean the orifice and replace the o-rings and backup rings. (See Service Bulletin SB04-4)
	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 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 Material Processor meets full resistance. At full resistance, the clicking will slow dramatically or sometimes stop completely.

PRESSURE INTENSIFIER (BOOSTER)



The control valve (bs10), sequence valve (bs4) 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

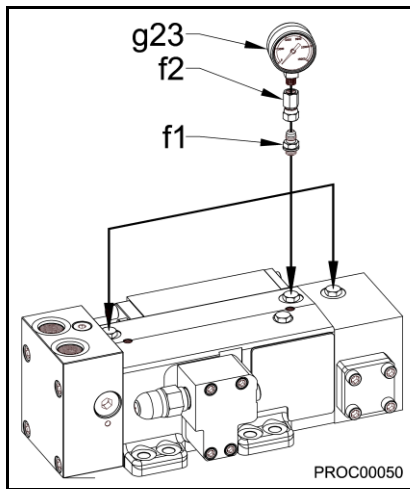
This indicates that the problem is not a relief or sequence valve setting, but it is in the intensifier or the cylinder of the Material Processor. This requires further investigation by a mechanic/technician, see “**INTENSIFIER CHECKS**” (*clicks – does not slow down*) section on page 136.

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 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 point where intensification starts (P1 on page 133). Then it will go up to the full boosted pressure of approximately 12,000 psi (800 bar). 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 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 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 (440) 232-7900.*

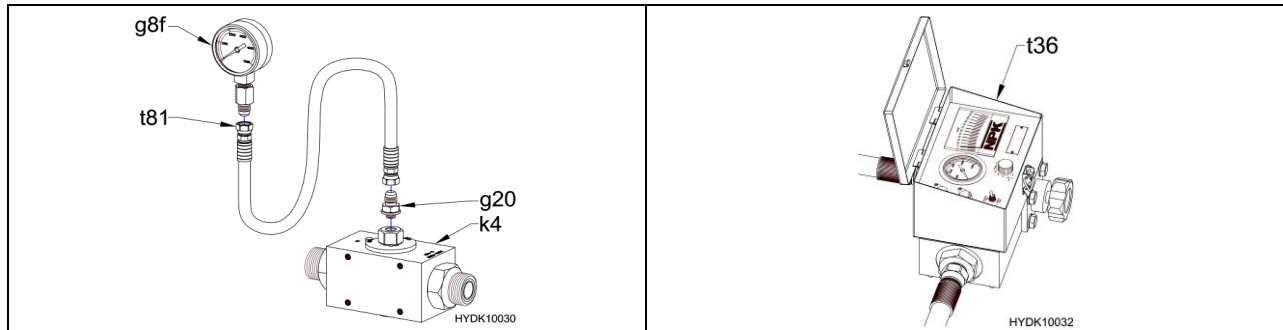
TROUBLESHOOTING

SLOW CYCLE SPEED

The specified cycle times of the Material Processor are controlled by the flow provided by the hydraulic circuit of the carrier. The published cycle times of the 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:



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

SLOW CYLINDER SPEED

PROBLEM	CAUSE	CHECK	REMEDY
Slow cylinder speed. Operating pressure is at 3,625 psi (250 bar), but the intensifier does not click.	Carrier flow setting is set too low.	Check flow output of Material Processor hydraulic circuit at 1000 psi (69 bar).	Adjust carrier flow output to meet NPK specifications.
	Material Processor cylinders	Check piston rings in Material Processor cylinders	Repair or replace the carrier's pump. Replace if damaged or worn.

TROUBLESHOOTING

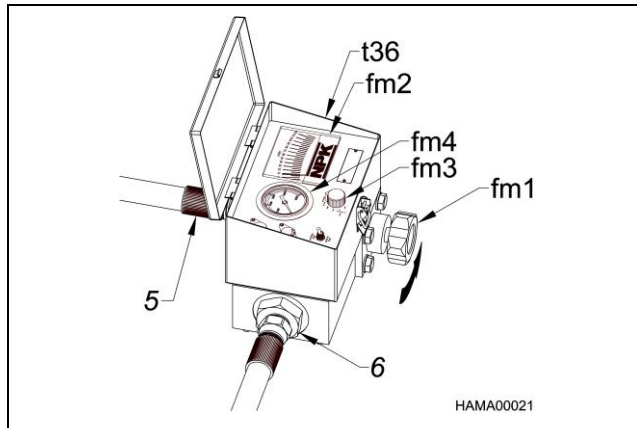
TEST PROCEDURE

SLOW CYLINDER SPEED

PROBLEM	CAUSE	CHECK	REMEDY
Operating Pressure is less than 3,625 psi (250 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 Material Processor operating pressure.
	Material 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 3,625 psi (250 bar).
		Check relief cartridges for tightness.	Tighten the relief valve cartridges.
		Check relief cartridges for mis-adjustment.	Reset to 3,625 psi (250 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 sequence valve cartridge.	Observe sequence valve operation. (See "PRESSURE INTENSIFIER SEQUENCE AND RELIEF VALVE ACTUATION")	Replace the sequence valve cartridge. (NOTE: <i>The sequence valve cartridge is not adjustable.</i>)
		Check the o-rings and backup rings of the sequence valve cartridge.	Replace the o-rings and backup rings of the sequence valve cartridge.

TROUBLESHOOTING

CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE

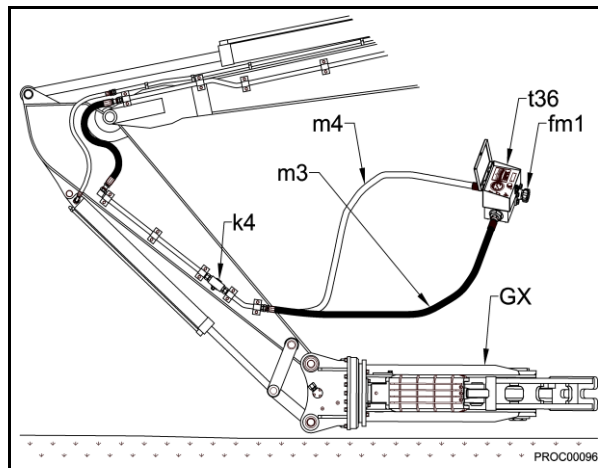


(Typical loading type flow meter)

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 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 Material Processor (*looking from the operator's seat*).



2. Determine the return line pressure (*pressure drop*).

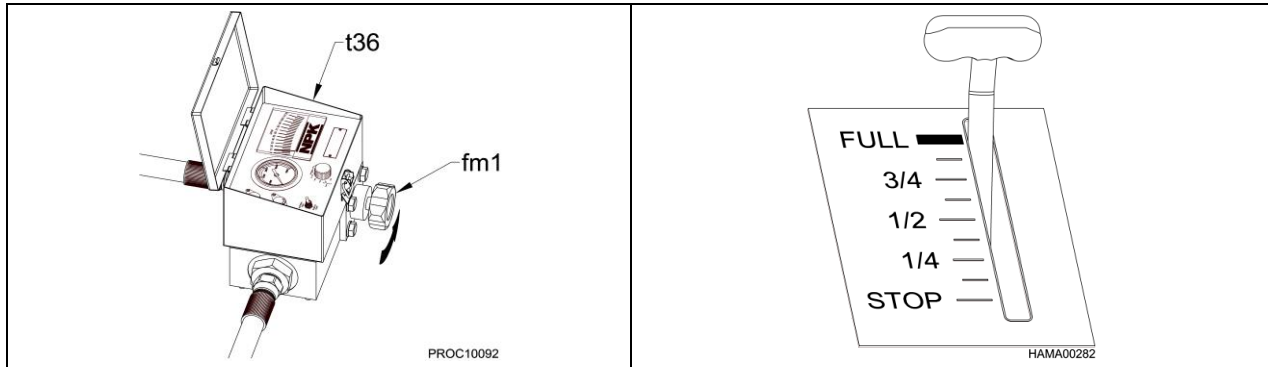
Open both shut-off valves (k4) and energize the Material Processor close switch. Measure the pressure on the flow meter gauge (fm2) with the load valve (fm1) in the full open position.

TROUBLESHOOTING

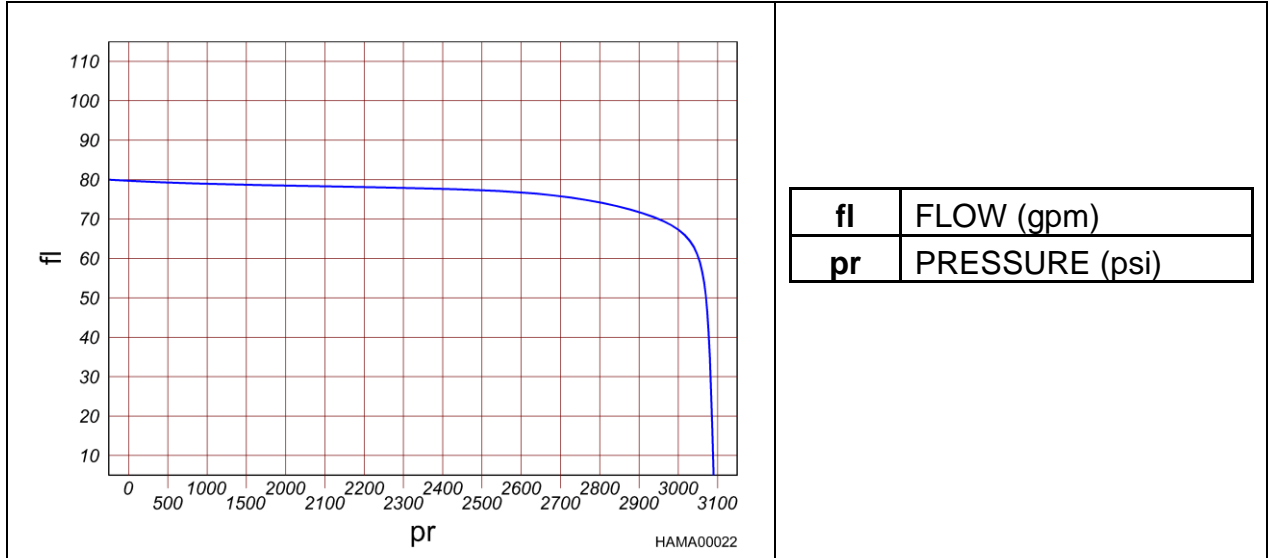
CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE

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 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).



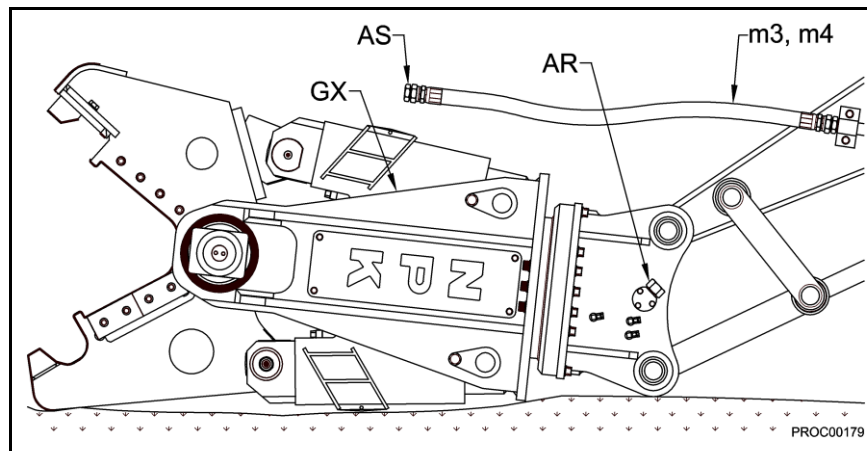
TROUBLESHOOTING

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 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 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 Material Processor.

MODEL	ROTATION SPEED	APPROXIMATE FLOW		CARRIER RELIEF VALVE SETTING	
	rpm	gpm	(lpm)	psi	(bar)
M20	6.5 - 10	2.5 - 4	(10 - 15)	3,000	(205)
M28	6.5 - 10	2.5 - 4	(10 - 15)	3,000	(205)
M38	6 - 9	2.5 - 4	(10 - 15)	3,000	(205)

Adjust the rotation flow so that the rpm is within the guidelines shown for the model number you have.

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 must not exceed 150 psi (10 bar).*

TROUBLESHOOTING

ROTATION



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

ROTATION

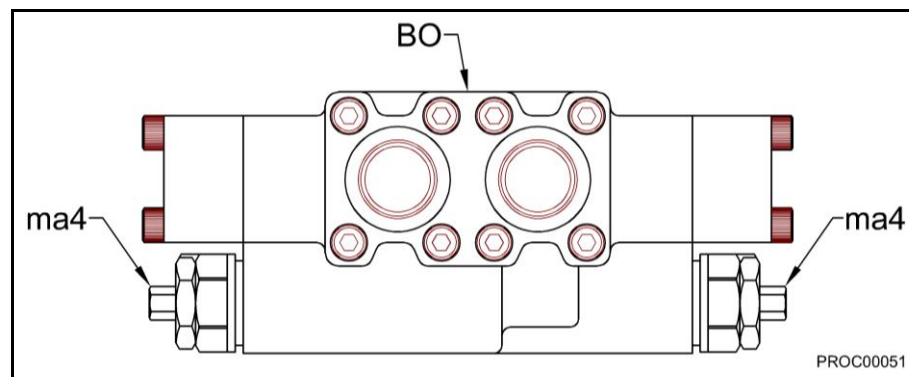
PROBLEM	CAUSE	CHECK	REMEDY
Unit will not rotate.	Low or no flow	Check hydraulic flow. (See <i>Material Processor rotation flow specifications</i> .)	Adjust rotation hydraulic circuit flow setting.
	Pressure setting of Material Processor rotation counterbalance valves.	Check counterbalance valve pressure 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 Material 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

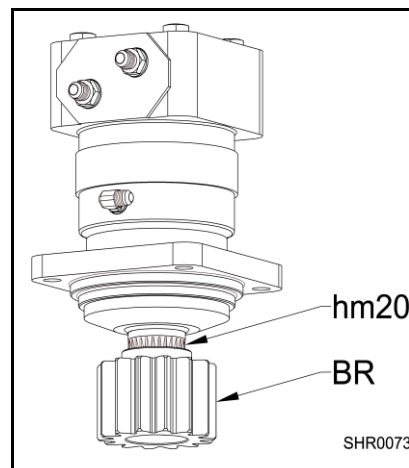
IF THE UNIT WILL NOT ROTATE

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 (440) 232-7900.

2. Check motor shaft and pinion gear.

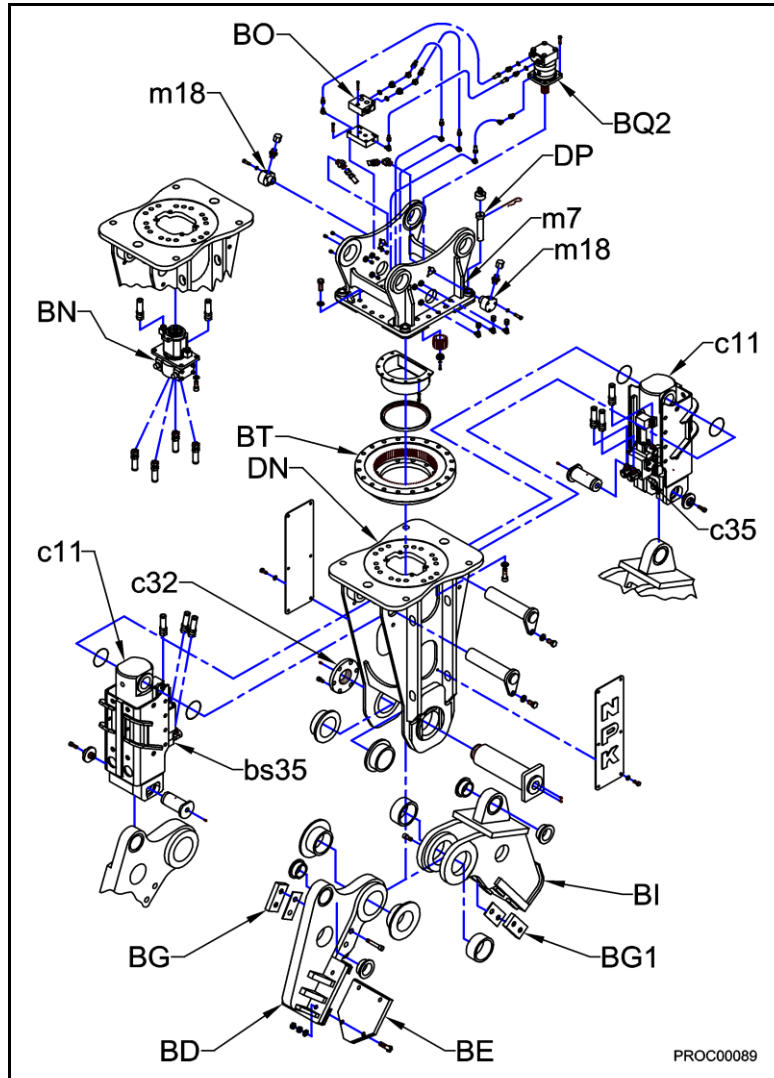


UNIT WILL NOT HOLD POSITION

Follow steps 1a through 1e above.

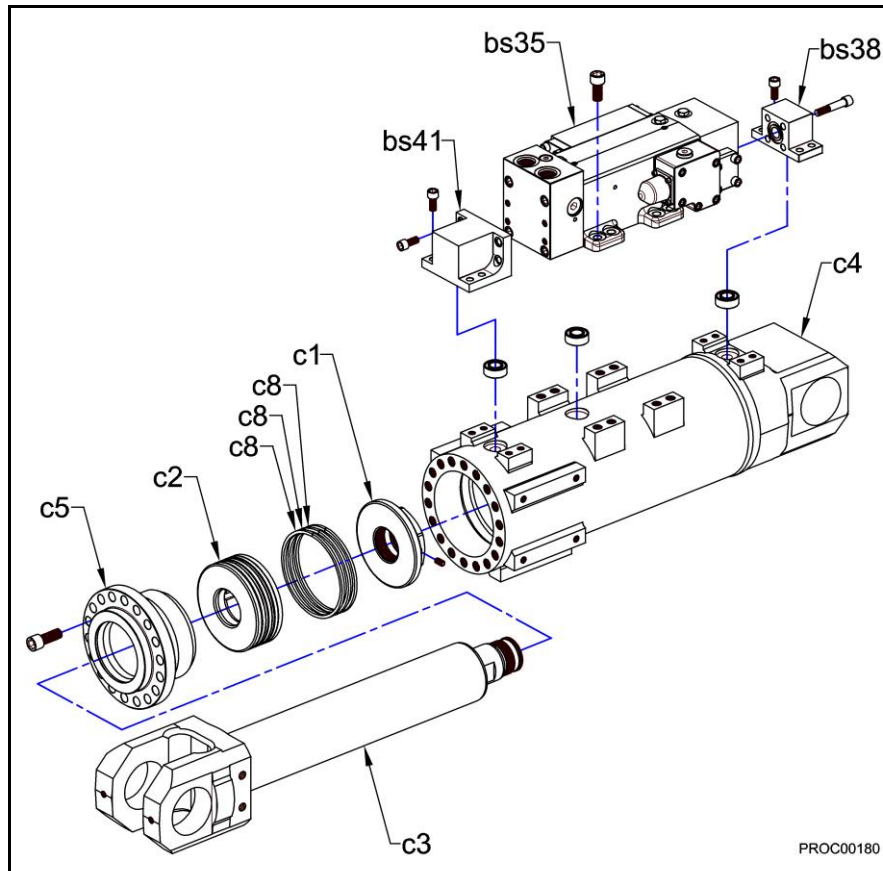
KEYWORDS FOR COMMON PROCESSOR COMPONENTS

M38G SHOWN



BD	MALE JAW
BE	TOOTH PLATE (male jaw)
BG	PRIMARY BLADE
BG1	SECONDARY BLADE
BN	ROTARY JOINT ASSEMBLY
BO	ROTATION VALVE
BQ2	HYDRAULIC MOTOR
bs35	BOOSTER ASSEMBLY
BT	SLEWING RING
c11	CYLINDER ASSEMBLY
c32	PIVOT PIN NUT
c35	MANIFOLD BLOCK
DN	MAIN FRAME
DP	LOCK PIN
m7	TOP BRACKET
m18	JOINT FITTING

KEYWORDS FOR COMMON PROCESSOR CYLINDER COMPONENTS



bs35	BOOSTER ASSEMBLY
bs38	SWIVEL BLOCK
bs41	MANIFOLD BLOCK
c1	CYLINDER ROD NUT
c2	PISTON
c3	CYLINDER ROD
c4	CYLINDER MAIN BARREL
c5	CYLINDER END CAP
c8	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.

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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



7550 INDEPENDENCE DRIVE WALTON HILLS, OHIO 44146

PHONE: 440-232-7900

FAX: 440-232-6294
