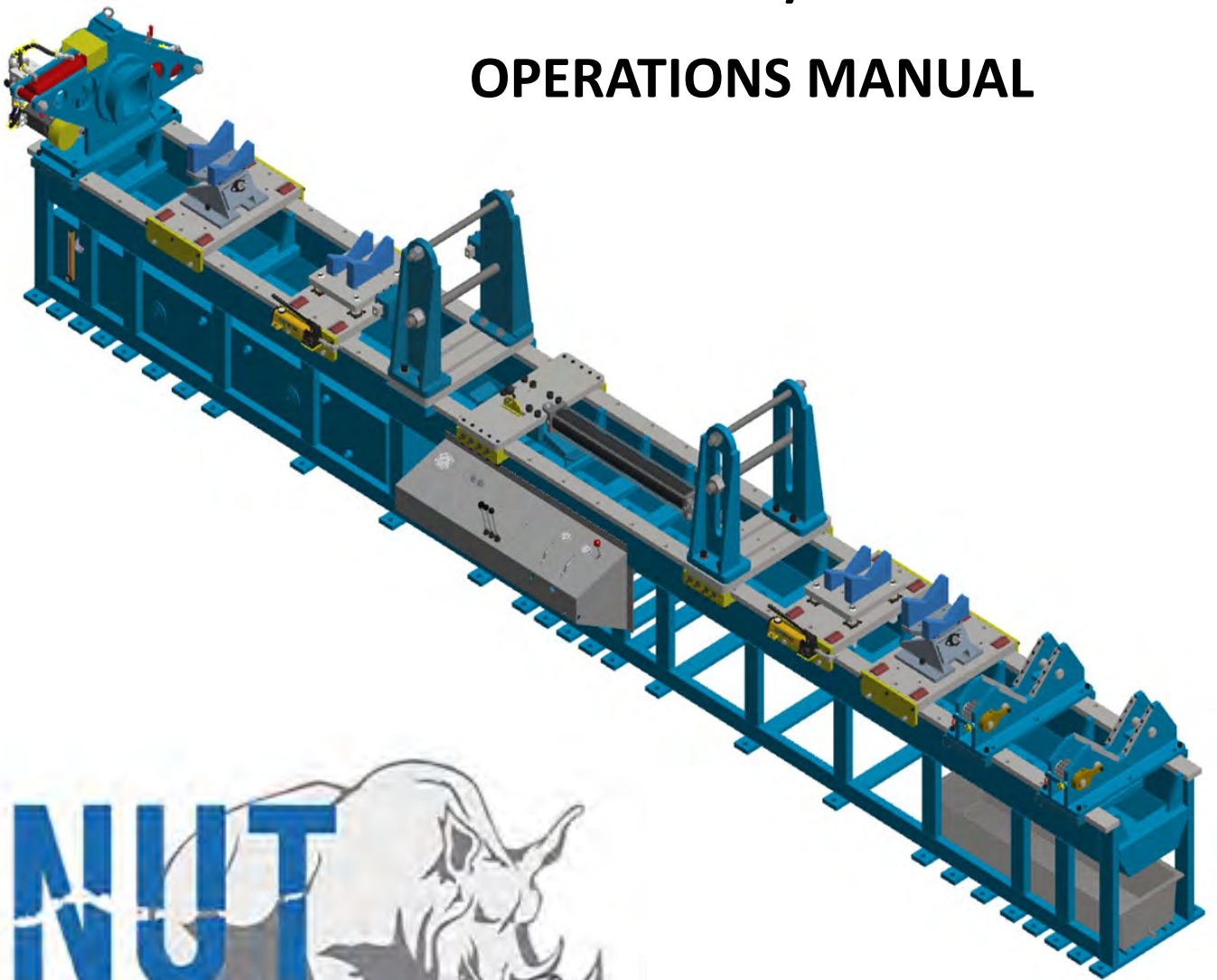




MACHINERY SERVICE & DESIGN

HYDRAULIC REPAIR EQUIPMENT

STANDARD & HEAVY-DUTY DISASSEMBLY / TEST BENCH OPERATIONS MANUAL



Machinery Service & Design, LLC.

Operations Manual

Thank you for your purchase of our equipment. We hope you will appreciate the design and features of this equipment and get many years of valuable service from this machinery. This **Operations Manual** is designed to help you get the maximum benefit from the equipment, and to use the machinery safely and efficiently.

The manual is laid out in a modular sequence. The individual pages for each component are separate and can be replaced when components are changed or upgraded. It is very important to replace any old sheets with any new information sheets, as they are sent out. We will attempt to keep you informed of the most recent changes in material and methods; your cooperation is needed to keep this manual current.

The manual is inclusive, and you may find pages describing equipment that you currently do not have. Please disregard any information on tools or options not currently installed on your machines. Do not assume that the operation of one tool is the same as another. If you have any questions, please feel free to call, write, or e-mail us at the numbers listed. We want to be sure that you are satisfied with our equipment and offer this information to help you understand the proper methods to use it.

Parts lists, bill of materials, and circuit schematics are included in this manual. We are not responsible for changes made after this equipment has left Machinery Service & Design. You are responsible to verify that the circuits and equipment matches with the information supplied. We promise that every effort is made to keep your manual current and correct but cannot always know of, or approve, changes made by the customer. The information included cannot be expected to match any modifications or changes made after the equipment has left Machinery Service & Design.

Please contact Machinery Service & Design for any further information or any clarification of the information in this manual. It is our purpose to provide you with the equipment and training to work efficiently and safely. We will offer any help that we can to be sure that you are able to take full advantage of this equipment, including training and technical support.

Sincerely,

Machinery Service & Design, LLC.



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Machine Spec Sheet

(All spec's are approximate depending on tooling options)

Model Number	D-15	D-20	D-25	D-30	HD-26.5	HD-38.5	HD-45
Machine Length	15 ft (4.6 m)	20 ft (6.1 m)	25 ft (7.6 m)	30 ft (9.1 m)	26.5 ft (8.1 m)	38.5 ft (11.7 m)	45 ft (13.7 m)
Machine Floor Space	30" x 180" (0.8 m x 4.6 m)	30" x 240" (0.8 m x 6.1 m)	30" x 300" (0.8 m x 7.6 m)	30" x 360" (0.8 m x 9.1 m)	30" x 318" (0.8 m x 8.1 m)	30" x 462" (0.8 m x 11.7 m)	30" x 540" (0.8 m x 13.7 m)
Max Cylinder Length	96" (2.4 m)	150" (3.8 m)	210" (5.3 m)	270" (6.9 m)	228" (5.8 m)	372" (9.5 m)	450" (11.4 m)
Max Cylinder Diameter	12" (304.8 mm)	12" (304.8 mm)	12" (304.8 mm)	12" (304.8 mm)	24" (609.6 mm)	24" (609.6 mm)	24" (609.6 mm)
Hydraulic Power Units	15 HP 18 GPM (68.1 LPM)	15 HP 18 GPM (68.1 LPM)	15 HP 18 GPM (68.1 LPM)	15 HP 18 GPM (68.1 LPM)	30 HP 30 GPM (113.6 LPM)	30 HP 30 GPM (113.6 LPM)	30 HP 30 GPM (113.6 LPM)
Pressure Boosters	YES	YES	YES	YES	YES	YES	YES
Hydraulic Reservoirs	A	A, B	A & B	A, B, C	A, B, C	A, B, C, D	A, B, C, D
Maximum Nut Buster Size	50K	50K	50K	50K	100K	100K	100K
Cylinder Pull Apart	YES	YES	YES	YES	N/A	N/A	N/A
Automatic Pull Apart	N/A	N/A	N/A	N/A	YES	YES	YES
Chain Vice Capacity	8" (203.2 mm)	8" (203.2 mm)	8" (203.2 mm)	8" (203.2 mm)	24" & 30" (609.6 mm x 762 mm)	24" & 30" (609.6 mm x 762 mm)	24" & 30" (609.6 mm x 762 mm)

Hydraulic Reservoirs

- A= 40 Gallons (151.4L)
- B= 114 Gallons (431.5L)
- C= 214 Gallons (810.1L)
- D= 250 Gallons (946.4L)

Nut Busters:

Nut Runner Force= 2,100 pounds (952.5 kg)

Nut Runners- 20K, 30K, 50K, 70K, and 100K Nut Busters

Hydraulic Power Units.

15 hp with 16 gpm (60.6 LPM) Gear pumps. Rated for 3,000 psi (206.8 bar), Remote pressure control.

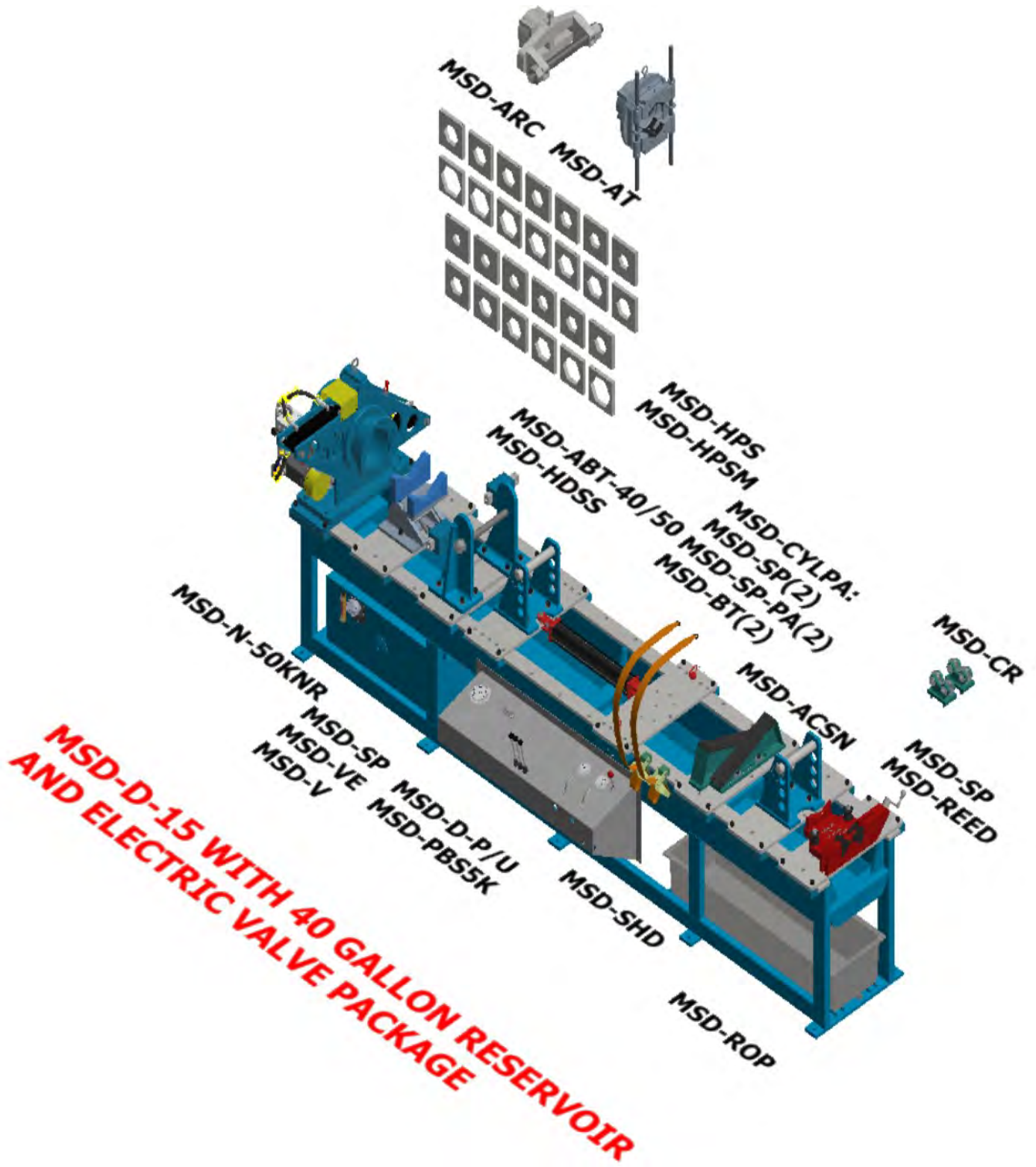
30 hp motor with 30 gpm (113.6 LPM) piston pump. Rated for 3,000 psi (206.8 bar), Remote pressure control.

Air operated pressure booster options: 5,000 psi (344.7 bar), 7,000 psi (482.6 bar), and 10,000 psi (689.5 bar).

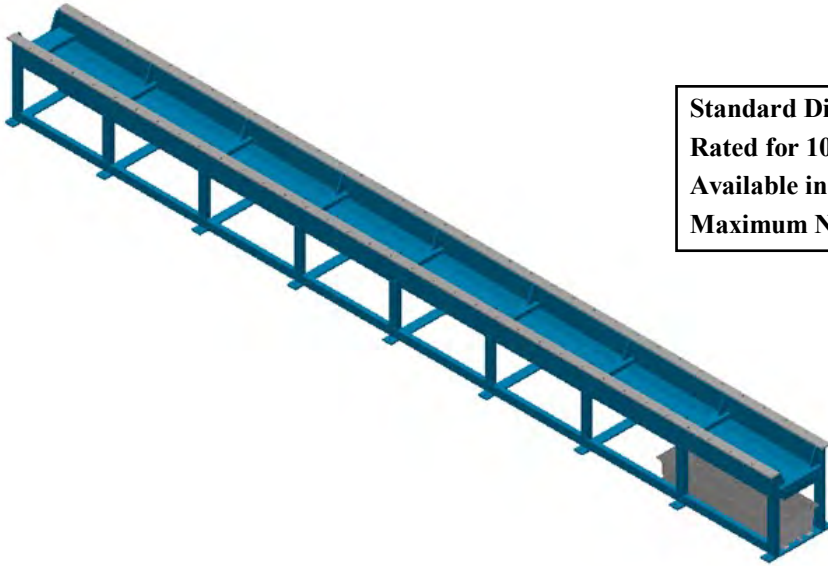
Hydraulic Control Valves.

Three spool valves for Nut Buster control, pull apart and cylinder test.

Electric control valves with pendant control.

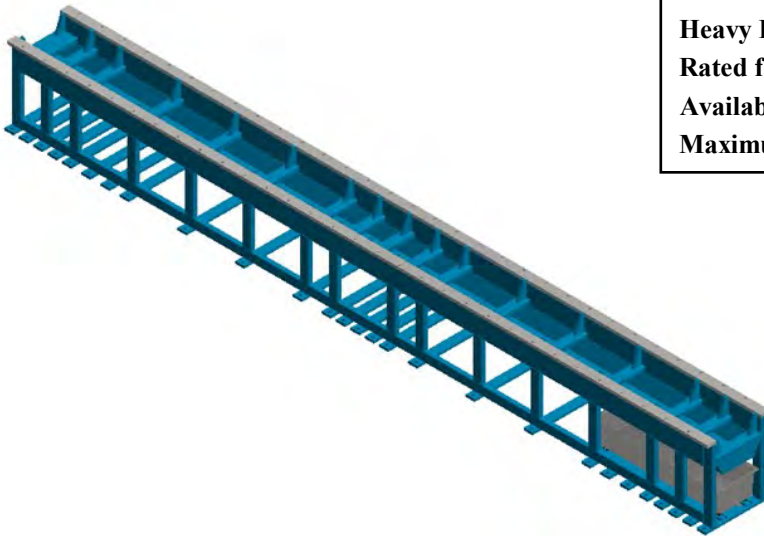


Standard Disassembly Table



Standard Disassembly Machine:
 Rated for 1000 Pounds per foot.
 Available in 15,20,25,30 ft & customizable lengths.
 Maximum Nut Buster size is 50K

Heavy Duty Disassembly Table



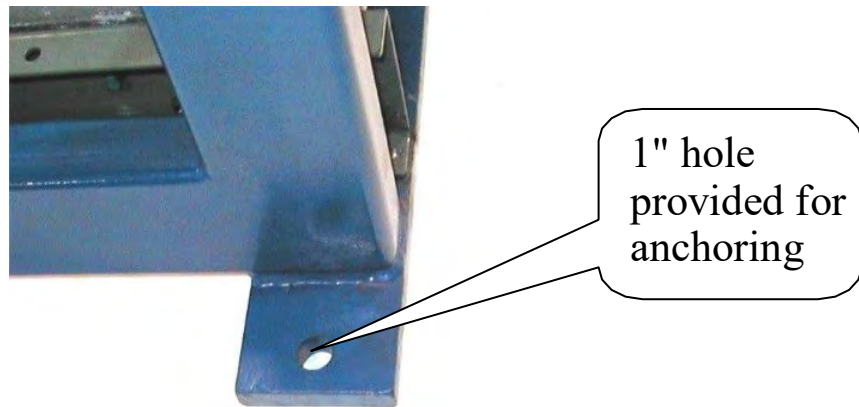
Heavy Duty Disassembly Machine:
 Rated for 3000 Pounds Per foot.
 Available in 26.5, 38.5, 45 ft & customizable lengths.
 Maximum Nut Buster size 100K

OPTIONS

Power Unit options : 15 HP (16 GPM) and 30 HP (30 GPM)
 Pressure Testing up to 3000 PSI (Standard)
 Pressure Booster options : 5000, 7000 and 10,000 PSI
 Options : 40,114, 214 and 250 gal.

Disassembly Fixture Installation

The table is designed to be bolted to the floor. The table legs are drilled for a 1" (25.4 mm) diameter to allow the installer to drill a 3/4" (19.1 mm) diameter hole right thru the leg mounting hole. We have designed the frame to provide maximum rigidity but cannot be responsible for damages to the frame if the machine is operated without attaching it to the floor. We suggest using US Anchor Co or any equivalent anchor system. Drill and install 3/4"-10 x 7.0-inch-long anchor bolts.



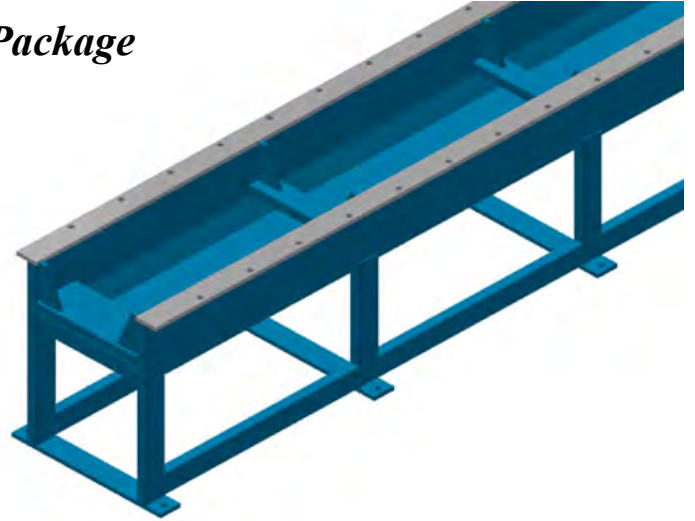
Pull Anchor 3/4"- 10 x 7" long.



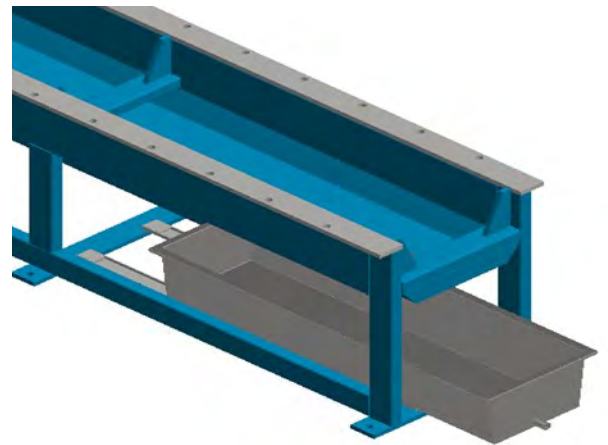
Anchor Bolts in position.

The Disassembly / Test Bench Package

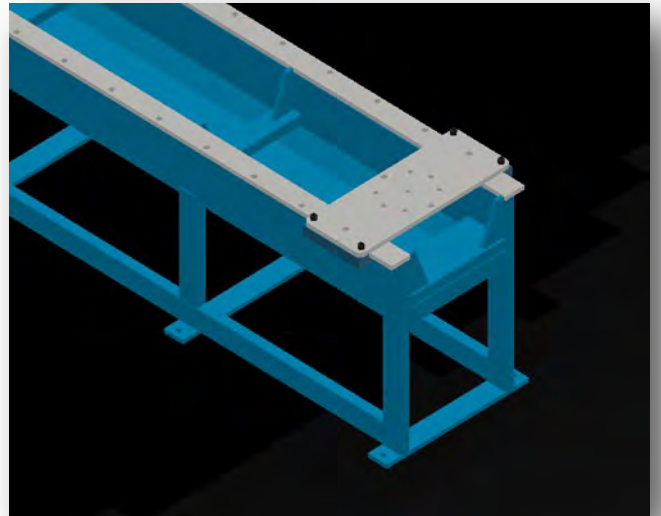
1. The full-length 10ga. (37.9L) Collector pan in the frame helps keep your shop clean and promotes safety by eliminating spillage while disassembling components. Keeping the pan clean and free of tools will increase efficiency and safety.



2. A 10ga. (37.9L) Rollout pan, supported on a section of roller conveyor, rolls out for easy disposal of waste oil. This tank is also used to capture oil from an overhung cylinder head during disassembly. The **drain pan should be rolled back after use** thus eliminating a safety hazard and maintaining a clean and dry working area. This pan must be manually drained when it fills. We suggest an inexpensive centrifugal pump to pump the fluid to a waste container. The pan can also be rolled out of the frame and manually emptied.



3. The package is supplied with two (2) 32" x 12" x 3/4" (812.8 mm x 304.8 mm x 19.1 mm) sliding support plates (Slide Plates). These plates are predrilled for the following: Ridgid and Reed chain vises, brace tooling, vise elevator, hold down tooling and a disassembly (pull-apart) cylinder. Plates can be slid along the full length of the fixture. They can be secured at any place by tightening the four attached Allen head cap screws, or locked in place with a bolt placed through the predrilled holes in the frame and slide plate for maximum strength.



It is strongly recommended that the slide plates are always secured with the Allen bolts except when the cylinders are being pulled apart or nuts run off. See the section on Slide Plates for operating instructions.

Integrated Power Unit

MSD-D-PU



The standard MS&D disassembly table has the option of a built-in power unit. The power unit consists of a 40 gal. reservoir, 15 hp. 3 phase motor and starter, a 2-stage gear pump that will develop 16 gpm and 3000 psi.

This power unit is used to power the “Nut Buster”, pull apart and pressure test cylinders being repaired. Phase converters are available for single phase operation.

AIR PURGE

An air purge system is incorporated into the unit to purge oil from cylinders after testing.

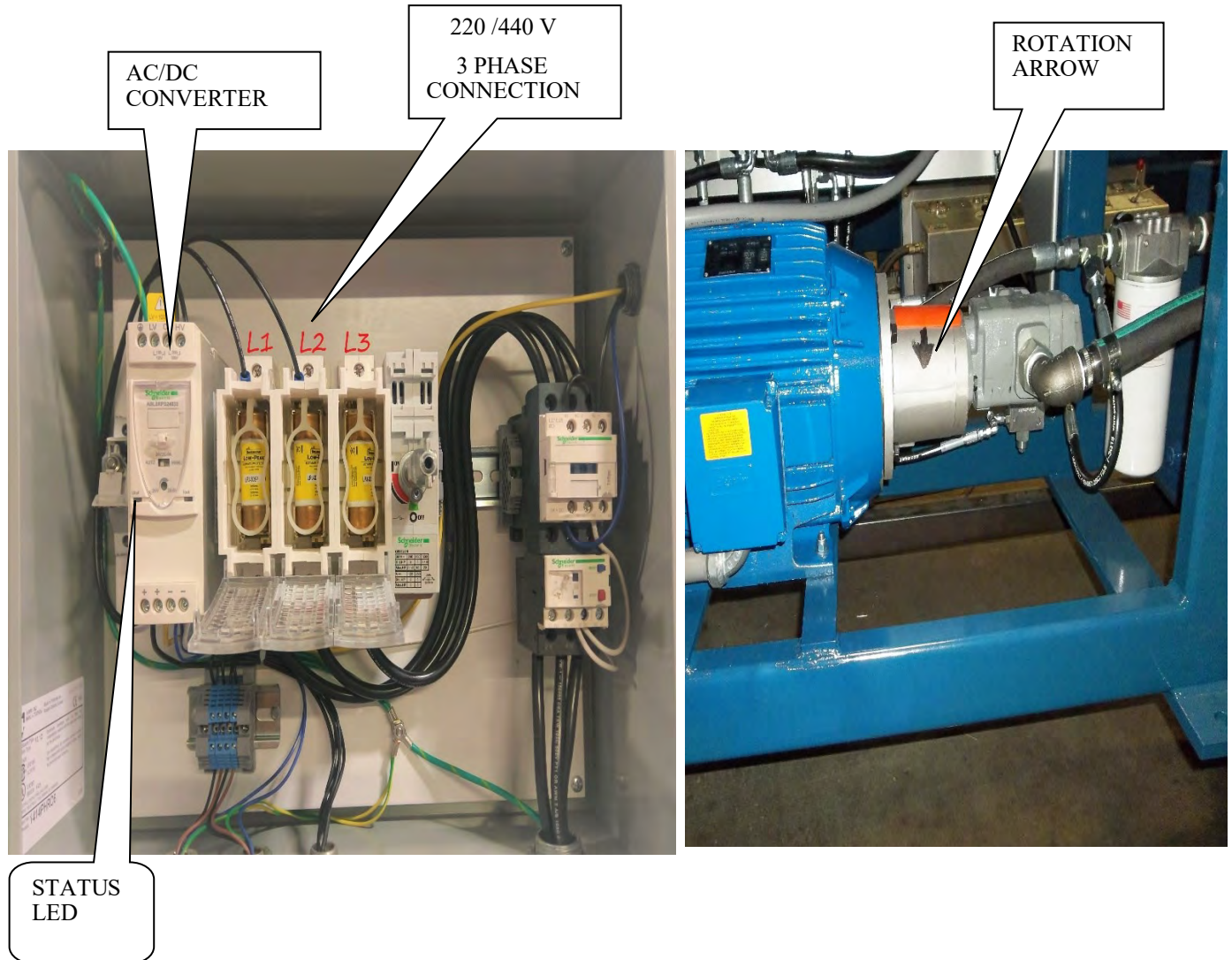


CONTROL PANEL

The control panel contains a main pressure gauge, a three-spool control valve, adjustable relief valve, two pressure gauges and isolation valves to check leakage across pistons.

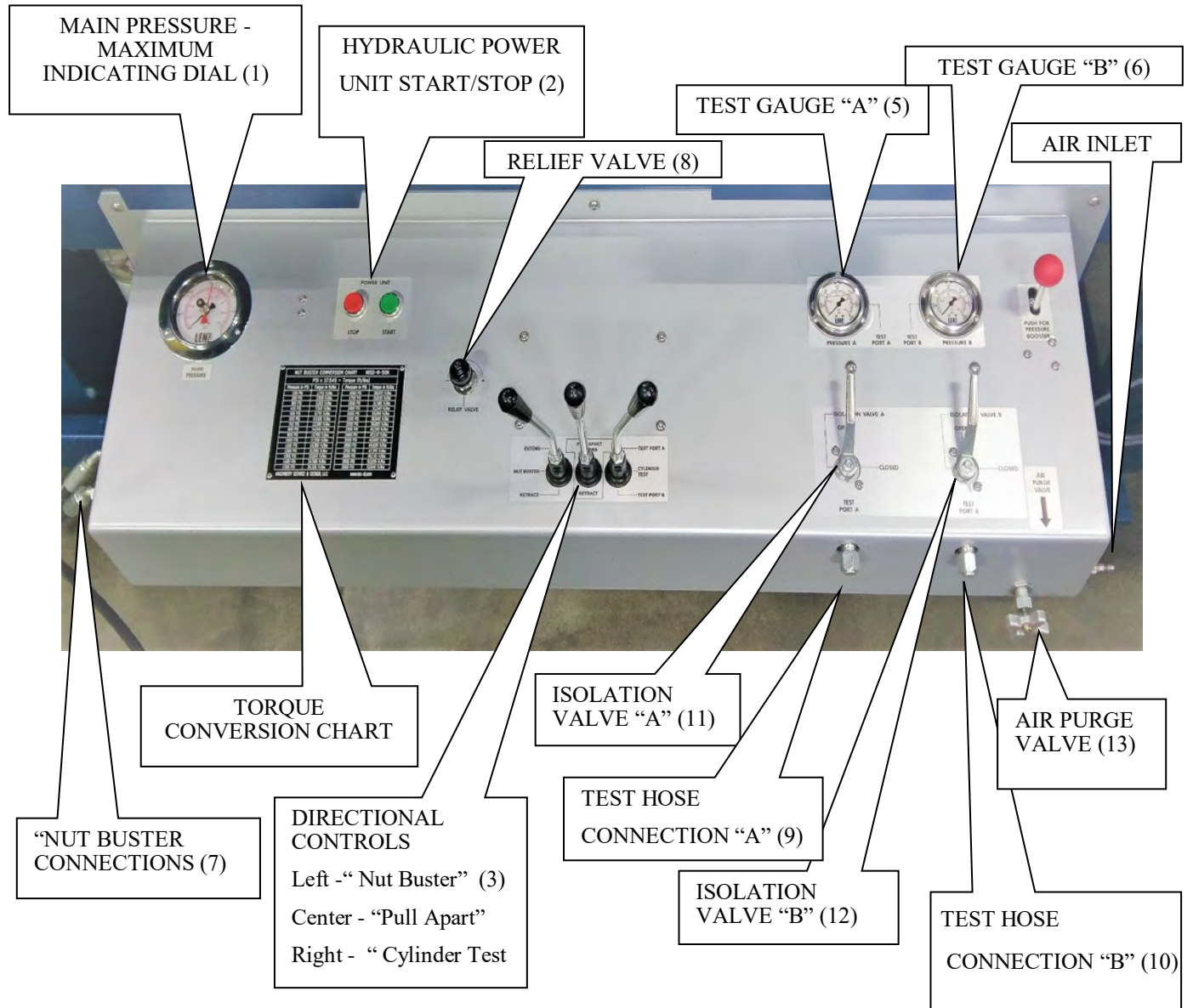


Electrical Connections



1. Each MS&D power unit has been pre-tested and will be wired 220V or 440V, 3 hp according to your instructions. Special units will have different wiring instructions.
2. The three phase main power leads are connected to terminals labeled L1, L2, and L3, at the top of the electrical starter.
3. Motor rotation is shown on the pump-motor coupler; you should remove the orange cover to check rotation. Rotation is changed by reversing two of the input leads connected to L1, L2, or L3.

Test Console Description



Procedures and Guidelines for Integrated Power Unit

1. The following procedures and safety guidelines cover the general operation of the built-in power unit. The specific operations of the Nut Buster, Pull Apart cylinder, and cylinder test procedures are covered in more detail in separate sections.

Be sure to read and understand the instructions in each section before using the disassembly table.

You are encouraged to contact Machinery Service & Design if you have any questions. The number in parenthesis (3) will refer to the number shown in the following picture. The numbers are for reference only. Use your Bill of Materials for component part numbers.



Procedures and Guidelines for Integrated Power Unit

2. The standard power unit is designed with 15 GPM (56.9 LPM) flow and a maximum pressure of 3,000 psi (206.8 bar). It has an adjustable relief valve (8) mounted on the control panel to allow the operator to set the pressure to the components at the correct value. Pressure should always be set at the lowest value to get the job done. The relief valve should always be turned down before starting the unit. A pressure gauge is mounted on the control panel to show the pressure in the system.

3. The pump is a two-stage gear pump with unloading valve circuit. The pump will deliver 15 GPM (56.9 LPM) at low pressures and will deliver 4 GPM (15.1 LPM) at pressures above 1,000 psi (68.9 bar). This is an automatic function within the pump and should not be changed or adjusted. The higher flow is desired to quickly fill up larger cylinders for testing, while the lower flow at high pressures will minimize the power draw and component sizes.

4. The control panel has three handles for the integral directional control valve (3 and 4). The control valve is used to operate the Nut Buster, Pull Apart cylinder and cylinder testing. The hoses can be used from either side of the control valve to operate any of the components. The specific operating instructions are detailed in the individual sections, i.e. testing, Nut Buster etc.

5. The control panel also has two rotating levers to operate the isolation valves (11 and 12).
The isolation valves are used to test cylinders, and their operation is described in the section on Cylinder Testing.
Mounted next to the isolation valves are the cylinder pressure gauges (5 and 6), which show the pressure in the line connected to each isolation valve. **Note, due to the location of the isolation valve, under certain circumstances you might build up higher pressures in the cylinder lines than the main relief valve is set for.** Adjust the relief valve to maintain safe pressures in all parts of the system. **Check the two-cylinder port gauges to be sure that the pressure in the cylinder is not higher than the main system pressure.**

6. A Start stop button (2) on the control panel will be used to turn the unit on and off.

7. **Before starting the unit be sure that the relief valve is backed off.** It is safest to start the power unit under little or no load. By reducing the setting on the relief valve each time, you will minimize the wear and tear on the system and reduce the possibility of excessive system pressure building up. Unexpectedly high-pressure surges from startup could lead to component failure and PSO (pressure squirting out). While the components are selected to handle the pressure in the system, wear, fatigue and improper maintenance can reduce the strength and safety factor of the components. For this reason, **we strongly recommend that the relief valve always be turned down when starting the power unit.**

8. A return line filter for the integral power unit is mounted within the disassemble table. Proper maintenance for the filter will assure a long service life for all components. See the bill of materials for your machine to determine the type of filter, elements and recommended replacement intervals.

Procedures and Guidelines for Integrated Power Unit

9. Since each customer will have different facility needs, we do not supply the hoses and fittings for the external connections to the Nut Buster, Pull Apart cylinder, or cylinder testing. The appropriate length hoses should be selected for your application. **All hoses and fittings must be rated for at least 4,000 psi (275.8 bar)**. We recommend that you use valve quick disconnects for the connections on the hoses to minimize leakage and contamination. We can supply any type, lengths and sizes of hoses and fittings you specify.

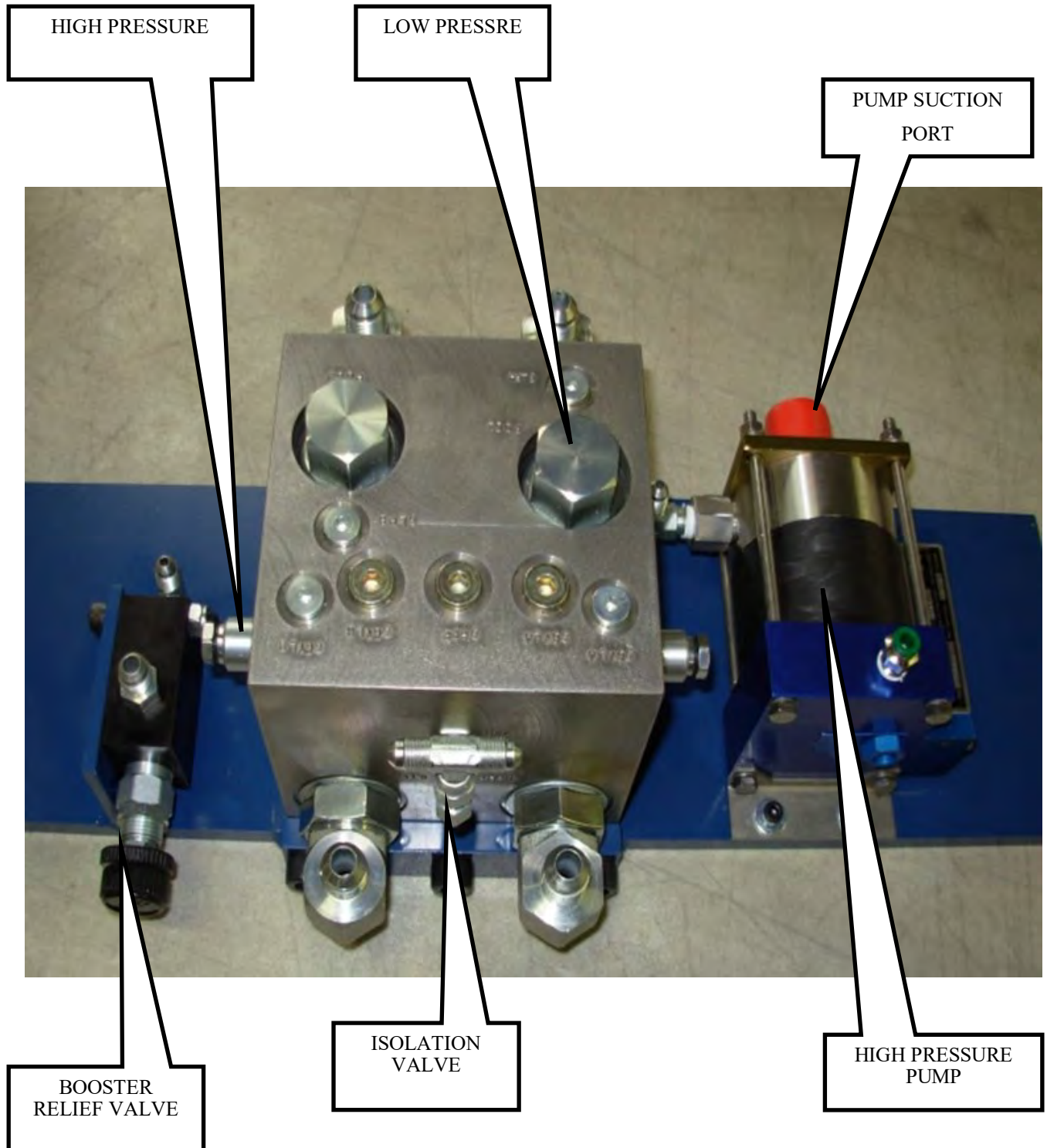
10. A purging system is installed on standard power units to help force out oil from the cylinder after testing is completed. An air valve is used to introduce compressed air into the cylinder, which will extend and retract the cylinder and force out the oil from testing. Compressed air can force oil to spray a long distance, so you must shut off the compressed air valve and cycle the directional control valve several times before removing any fittings or hoses. Purging details are included in the test procedures.

11. The torque values for the “Nut Buster” are different for each size “Nut Buster”. An appropriate conversion table for pressure to torque is included for each “Nut Buster”. A conversion table and formula are also located on the front panel. For information on how to use the specific tools and options please check in the sections listed for each unit. Remember; check to be sure that the reference material you select is for the correct unit and options.



5,000 PSI Pressure Booster Description.

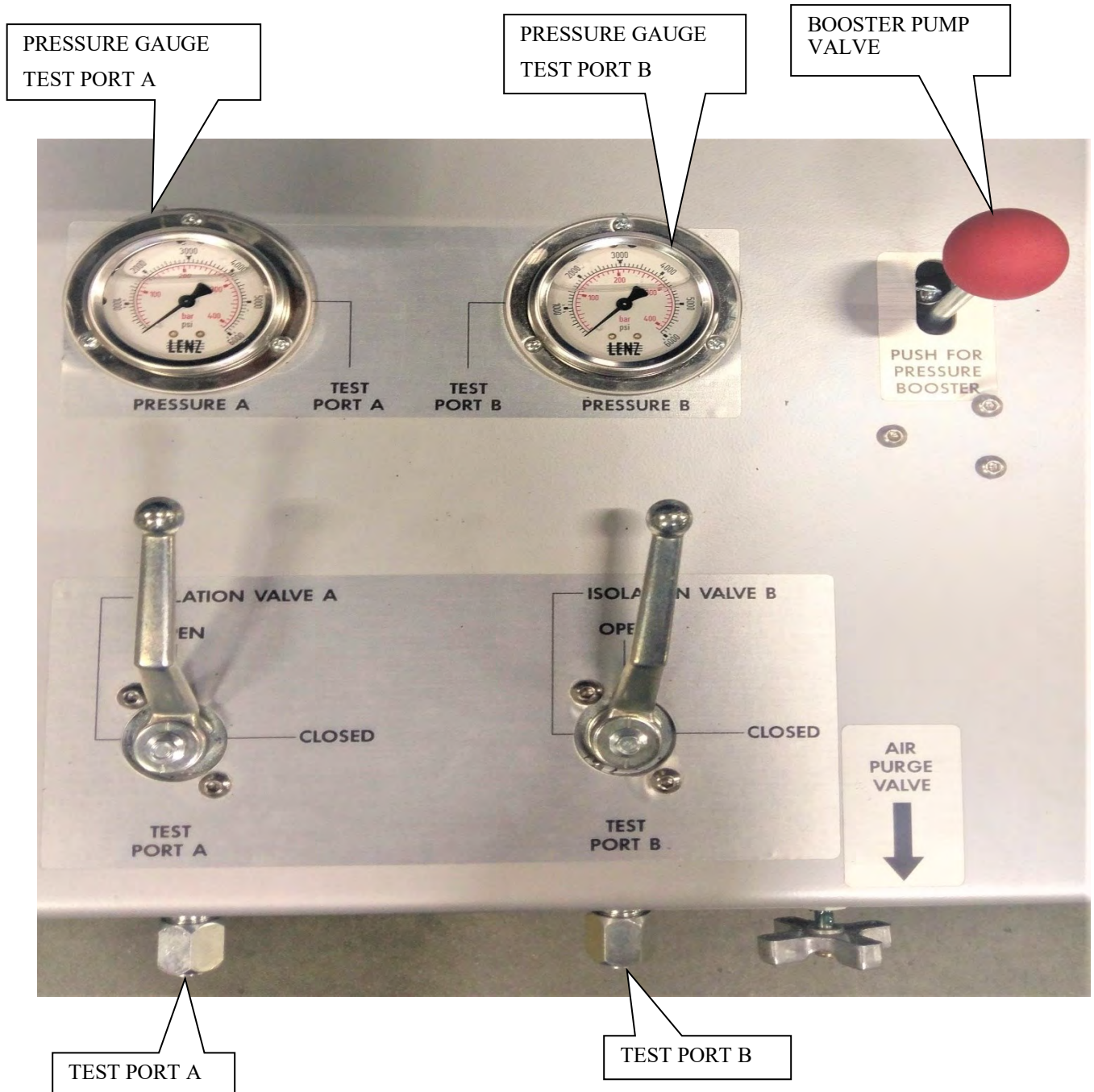
Machinery Service & Design offers an Air Operated Pressure booster system to boost static test pressure to 5,000 psi (344.7 bar). The pressure booster system consists of a High-Pressure Air Operated hydraulic pump, isolation manifold and boost pressure relief valve. The booster system is built on a mounting plate and is housed inside the machine frame. The system is installed so that the operator has access to the booster relief valve.



5,000 PSI Pressure Booster Controls

Pressure booster system is controlled from the operator station. A red ball handle is provided to apply air pressure to the high-pressure pump. To set the operating pressure of the pressure booster, the operator will use the directional valve and pump pressure to build pressure in the test cylinder. The operator will then release the control valve handle.

Pressure should hold at the set pump pressure; the operator will push the red ball forward to build static pressure. The operator can change the booster pressure setting by holding the red ball valve forward watching the test port gauge and adjust the booster relief valve.



Priming the 5,000 - 7,000 - 10,000 PSI Pressure Booster System

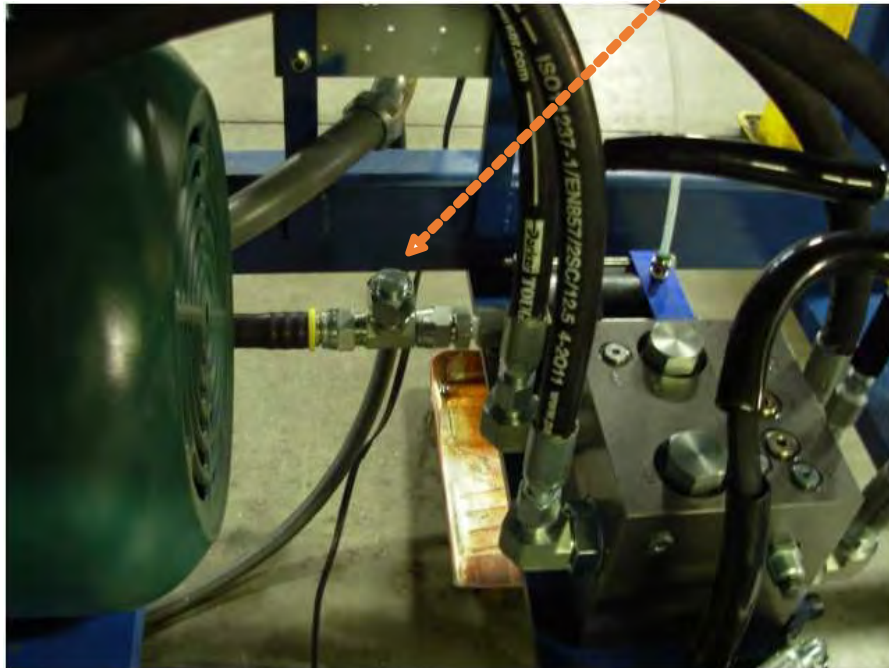
If the booster system loses its prime.

The suction port of the high-pressure booster pump has a JIC run tee connected to the suction port of the high-pressure pump. To prime the pump, remove the JIC cap from the fitting and pour hydraulic oil into the fitting, re-install the JIC cap and tighten.

Make sure that the test ports A & B are closed off with a JIC cap. Start the hydraulics on the disassemble machine. Operate the cylinder test spool and slowly bring the pump pressure relief valve up to 3,000 psi (206.8 bar). Release the control valve spool, pressure should hold at relief valve setting. Connect a shop airline to the Air Purge connector.

Note! You do not and should not open the Air Purge needle valve to operate the booster system.

PRIMING PORT FOR
PRESSURE BOOST
SYSTEM

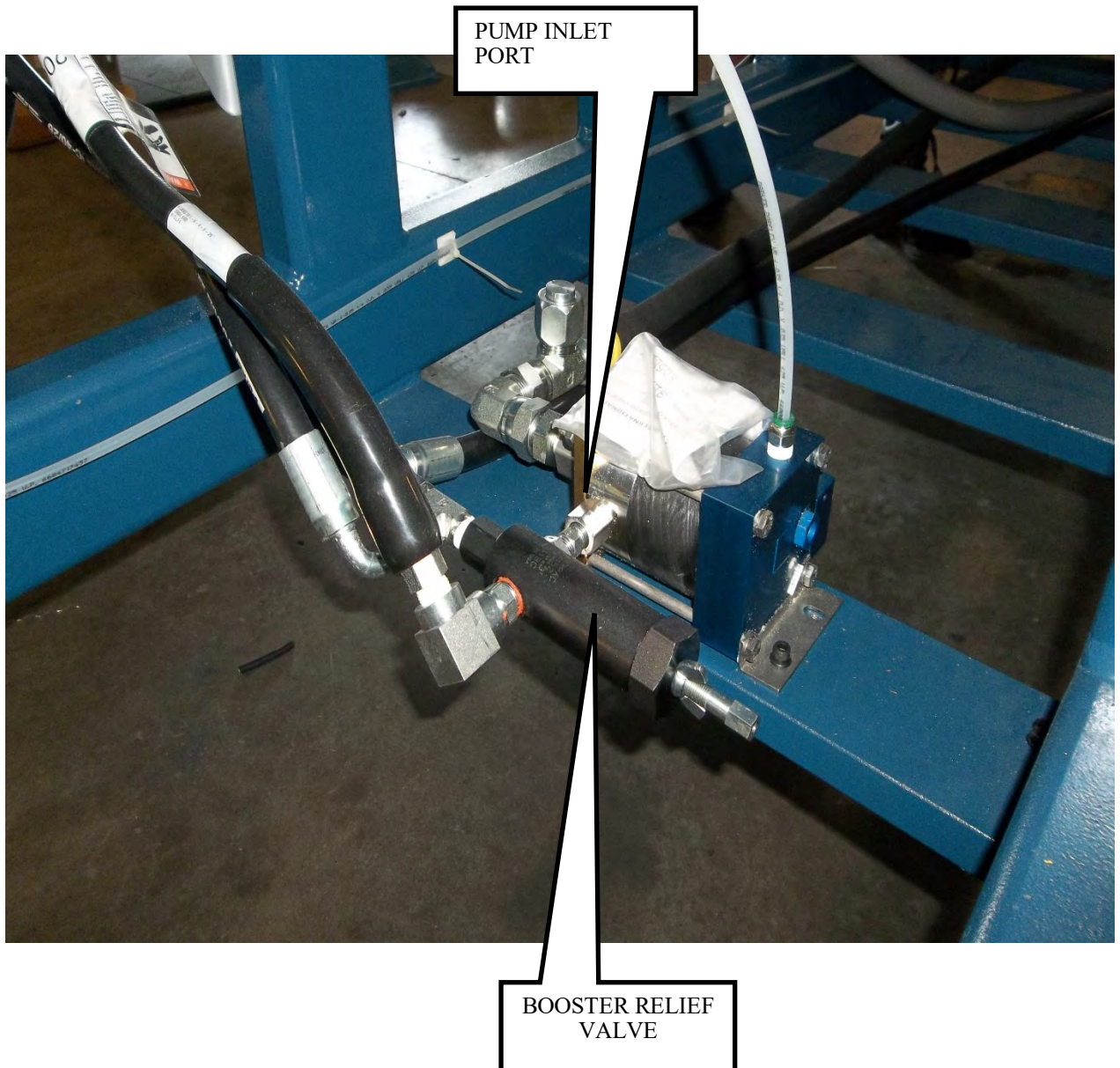


Note! It may take several attempts to prime the booster pump.

After the priming is complete you should not have to prime the pump unless you drain the reservoir tank.

7,000 PSI and 10,000 PSI Pressure Booster Description

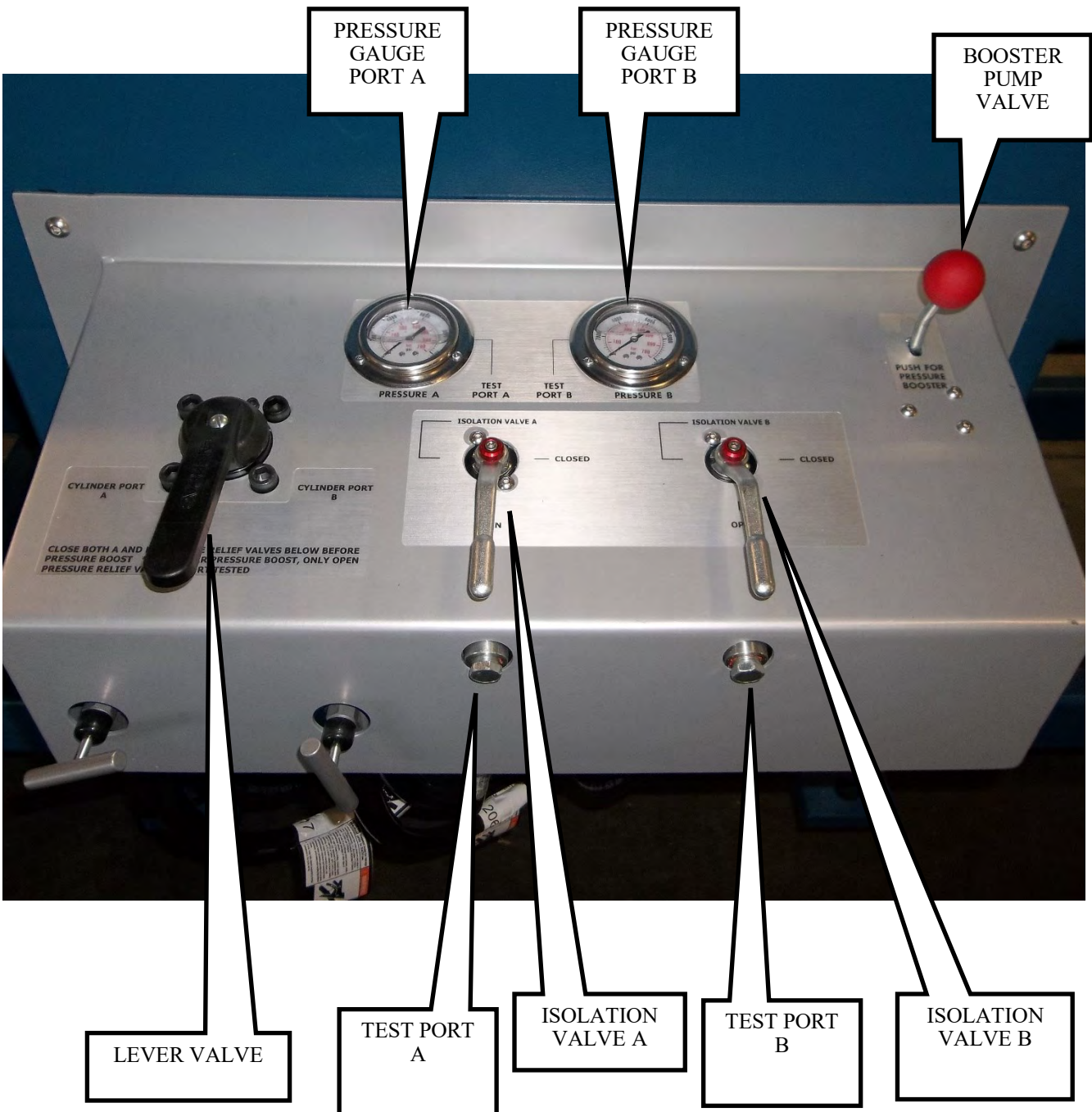
Machinery Service & Design offers an Air Operated Pressure booster system to boost static test pressure to 7,000 psi (482.6 bar) and 10,000 psi (689.5 bar). The pressure booster system consists of a High-Pressure Air Operated hydraulic pump, lever valve and booster relief valve. The booster system is built on a mounting plate and is housed inside the machine frame. The system is installed so that the operator has access to the booster relief valve.



7,000 PSI AND 10,000 PSI Pressure Booster Controls

Pressure booster system is controlled from the operator station. A red ball handle is provided to apply air pressure to the high-pressure pump. To set the operating pressure of the pressure booster, the operator will use the directional valve and pump pressure to build pressure in the test cylinder. The operator will then release the control valve handle.

Pressure should hold at the set pump pressure; the operator will push the red ball forward to build static pressure. The operator can change the booster pressure setting by holding the red ball valve forward watching the test port gauge and adjust the booster relief valve.



Basic Test Procedure for External Leakage

- A.** Connect hoses from test hose connections “A” and “B” (9 and 10) to the cylinder
- B.** Place isolation valve handles (11 and 12) in vertical position (open).
- C.** Turn the relief valve adjustment (8) counterclockwise until little spring pressure is felt. This will set the system pressure at a minimum setting.
- D.** Start Power unit using the start/stop button (2) located on the front panel
- E.** Move cylinder test directional handle (4) to extend cylinder. You may have to adjust the relief valve to raise the pressure high enough to move the cylinder. Extend and retract the cylinder several times to fill the test cylinder and work out any air pockets.
- F.** Extend cylinder shaft until it
- G.** Turn relief valve to desired pressure, which will be indicated on main
- H.** With the cylinder extended and the directional handle engaged, shut off the isolation handle on the base side of the circuit. This will trap pressure in the base end of the cylinder. Release the directional handle to let the power unit operate at idle. The pressure showing on gauge A or B (5 or 6) should remain as long as the isolation valve is closed. Hold pressure on the cylinder for at least 30 seconds. Check for leaks from base and ports. When you are satisfied that the base portion of the cylinder is not leaking then release the isolation valve.
- I.** Retract cylinder and repeat the process by closing the isolation valve for the rod portion of the cylinder. Hold the pressure in the rod side for at least 30 seconds. Check for leaks from head, shaft and ports. Since the rod end is more likely to leak, it is recommended that you hold the pressure longer and pay very close attention to the rod and head junctions for any leakage.
- J.** Cycle cylinder (full extend and full retract) at least five (5) times maintaining pressure for 10 sec. at each end. Sometimes a cylinder seal will fail after several pressure cycles have a chance to twist or extrude the seal. Cycling the cylinder completely at least 5 times and building up pressure in each direction will allow you to check the cylinder for this type of failure. If there is any doubt about leakage, clean off the suspect area and continue to pressurize the cylinder until you are sure that the unit is working properly. Check for leakage and excessive oil on shaft. Faulty rod seals and/or poor surface finish on the rod can leave a film on the rod, which will build up and leak after time. If excessive oil builds up on the rod inspect the rod surface for defects.
- K.** Follow the listed procedures for internal leakage.

Basic Test Procedure for Internal Leakage

- A. Fully extend cylinder with cylinder test directional control handle and maintain pressure. Pressure on one test gauge will show system pressure and another test gauge will show tank pressure or “0”. Turn the isolation valve handle located below the gauge reading “0” to the horizontal position (closed). Maintain pressure for 30 sec. if there is leakage across the piston there will be an increase in pressure on the tank gauge “0+”.
- B. Return isolation valve handle to vertical (open) position. Retract cylinder and repeat procedure described in step “A”.
- C. The cylinder can be checked for internal or external leakage at any point along the travel of the cylinder.
- D. To check the cylinder at some point along the middle of the travel, reduce the test pressure to $\frac{1}{2}$ of the pressure used during the initial test. Adjust the relief valve (8) to set the pressure. Locate the cylinder where you wish to test the leakage. Close the isolation valve connected to the rod side of the cylinder. Engage the directional handle to build up pressure in the cylinder. Both test gages (5 and 6) will show pressure. Close the isolation valve connected to the base end of the cylinder. You should have pressure trapped inside the cylinder.
- E. The internal pressure during the leakage test can be set at any safe value. Due to differential area the rod side pressure can be higher than the main relief setting. This is the reason for reducing the pressure as you begin this test. After you close the rod end isolation valve, the pressure can be reset to the desired value.
- F. You will notice that the two pressure gages show a different pressure. This is caused by the difference in area inside the cylinder. The rod side has less area since the pressure cannot push against the portion of the piston covered by the rod. If the cylinder is sealing properly, the pressures will remain different, and the rod will not move. If there is internal or external leakage, the pressures will equalize and cause the rod to slowly extend. Very slow changes are sometimes due to dissolved air in the cylinder and can be disregarded. Experience with the cylinder test procedure will help you decide if any pressure change is a sign of internal leakage.
- G. The rod can be checked for leakage at any point by using the same procedures as explained above.
- H. After all internal and external leakage tests are done, reduce the system pressure using the relief valve (8) and cycle the cylinder several times to reduce the pressure in the cylinder.
- I. Remove excessive oil from cylinder using the air purge procedure listed below.

Air Purge:

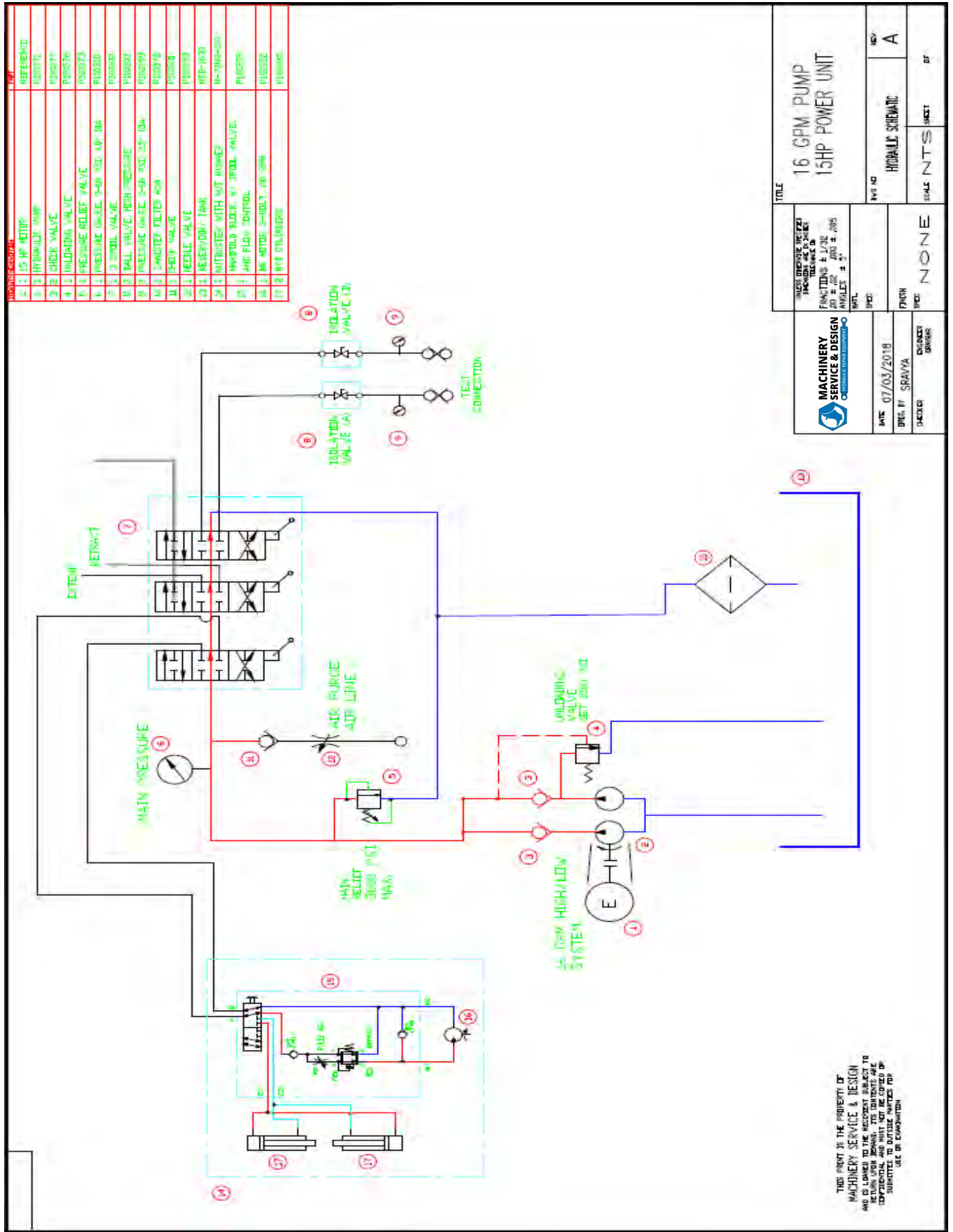
Air purge purpose is to remove test oil from cylinder after pressure testing. The procedure for air purging cylinders is as follows:

- A. Turn hydraulic power unit off with hydraulic power unit start/stop button (2).
- B. Close air purge valve (13).
- C. Connect air supply to the air fitting next to the purge valve.
- D. Slowly open the air purge valve (13) while holding directional control valve handle (test cylinder) to extend cylinder.
- E. Cycle cylinders to full extend and full retract. Note: This will purge all internal oil from the cylinder. Repeat several times to remove as much oil as possible.
- F. Keep directional valve in extended or retracted while the air purge valve is open. Avoid the center position on the directional handle, which will cause air to go directly to tank. This is a waste of air, causes oil vapor to be forced out of the tank breather, and can cause air to be trapped in the oil.
- G. When all possible oil has been removed from the cylinder, retract the cylinder. Close the air purge valve and remove the airline from the fitting. Put the handle in the neutral position to release any air pressure trapped in the supply line. Cycle the valve handle several times to remove any trapped air from the cylinder. Continue to cycle the handle until no more air can be heard escaping from the cylinder. **Important! Do not remove the airlines until most or all of the pressure has been released.** Small amounts of air and oil under pressure can spray out if the cylinder is not properly bled out. This escaping oil can cause eye damage, in addition to making a mess that would have to be cleaned up. Patience is required because the air will take time to come out. The purge is quicker than draining the cylinder through the ports if done properly.
- H. Remove the lines from the cylinder; being careful to avoid any small amounts of air and oil that will probably blow out. If the purge is done correctly there will not be any significant air or oil escaping from the ports.

Safety Notes

- A. Set the pressure at or below the maximum rated pressure for the cylinder. Leak testing does not have to be done at maximum pressure.
- B. **USE SAFETY GLASSES OR PROTECTIVE EYEWEAR** during all test procedures. It is sometimes very hard to see small amounts of oil leaking from the cylinder. Oil in the eye can cause blurred vision and long-term damage if not taken care of properly. Seek prompt medical care for any oil contact with the eye.
- C. Start each test with the pressure set at a minimum pressure. The pressure can be raised during the test to properly load the cylinder.
- D. **DO NOT PLACE YOUR HAND IN FRONT OF ANY LEAKING OIL.** Oil leaking from small orifices can exit at high velocities and easily puncture skin. Seek prompt medical care if any oil is injected or trapped under the skin. In the event of leakage shut down the machine and cycle the directional valve to release the pressure.
- E. Do not stand in front of any cylinder being tested. It is possible for cylinders to break and the most likely path for the parts to travel is forward.
- F. Before you remove any hoses check to be sure that pressure has been released. Most cylinders trap small amounts of air in the barrel and will spray oil from the ports unless the pressure is released. Cycle the directional valve after shutting off the power unit to release the pressure.
- G. Shut off and lock out the electrical power before working on the hydraulic or electrical systems.
- H. Use proper material handling equipment. Cylinders can be heavy, and the design of the table may require reaching over the table while loading and unloading.
- I. Training in the use of the disassembly table is available from Machinery Service and Design. Classes are held at the Pewaukee factory and at the customer site for a nominal fee.

15 HP Power Unit



NO.	DESCRIPTION	REFERENCE
1	15 HP MOTOR	1000000
2	16 GPM PUMP	1000000
3	4-WAY D.C. VALVE	1000000
4	3-CYLINDER ACTUATOR	1000000
5	PRESSURE RELIEF VALVE	1000000
6	PRESSURE GAUGE 0-3000 PSI 1/4" DIA	1000000
7	1/4" GPM VALVE	1000000
8	1/2" GPM UNLOADING VALVE	1000000
9	ISOLATION VALVE	1000000
10	ISOLATION VALVE	1000000
11	3000 PSI RELIEF VALVE	1000000
12	1/4" GPM HIGH/LOW SYSTEM	1000000
13	1/2" GPM UNLOADING VALVE	1000000
14	3-CYLINDER ACTUATOR	1000000
15	3-POSITION DETENT VALVE	1000000
16	15 HP MOTOR	1000000
17	16 GPM PUMP	1000000
18	4-WAY D.C. VALVE	1000000
19	3-CYLINDER ACTUATOR	1000000
20	3-POSITION DETENT VALVE	1000000
21	3-CYLINDER ACTUATOR	1000000
22	3-POSITION DETENT VALVE	1000000
23	3-CYLINDER ACTUATOR	1000000
24	3-POSITION DETENT VALVE	1000000
25	3-CYLINDER ACTUATOR	1000000
26	3-POSITION DETENT VALVE	1000000
27	3-CYLINDER ACTUATOR	1000000
28	3-POSITION DETENT VALVE	1000000
29	3-CYLINDER ACTUATOR	1000000
30	3-POSITION DETENT VALVE	1000000
31	3-CYLINDER ACTUATOR	1000000
32	3-POSITION DETENT VALVE	1000000
33	3-CYLINDER ACTUATOR	1000000
34	3-POSITION DETENT VALVE	1000000
35	3-CYLINDER ACTUATOR	1000000
36	3-POSITION DETENT VALVE	1000000
37	3-CYLINDER ACTUATOR	1000000
38	3-POSITION DETENT VALVE	1000000
39	3-CYLINDER ACTUATOR	1000000
40	3-POSITION DETENT VALVE	1000000
41	3-CYLINDER ACTUATOR	1000000
42	3-POSITION DETENT VALVE	1000000
43	3-CYLINDER ACTUATOR	1000000
44	3-POSITION DETENT VALVE	1000000
45	3-CYLINDER ACTUATOR	1000000
46	3-POSITION DETENT VALVE	1000000
47	3-CYLINDER ACTUATOR	1000000
48	3-POSITION DETENT VALVE	1000000
49	3-CYLINDER ACTUATOR	1000000
50	3-POSITION DETENT VALVE	1000000

 MACHINERY SERVICE & DESIGN <small>COMMERCIAL SERVICE</small>	DATE: 07/03/2018 DESIGNED BY: SRAVVA CHECKED BY: SRAVVA	TITLE: 16 GPM PUMP 15HP POWER UNIT	SCALE: N/A SHEETS: 1 OF 1
	NONE	HYDRAULIC SCHEMATIC	REV: A

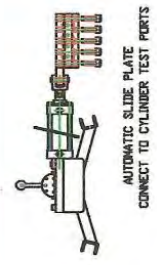
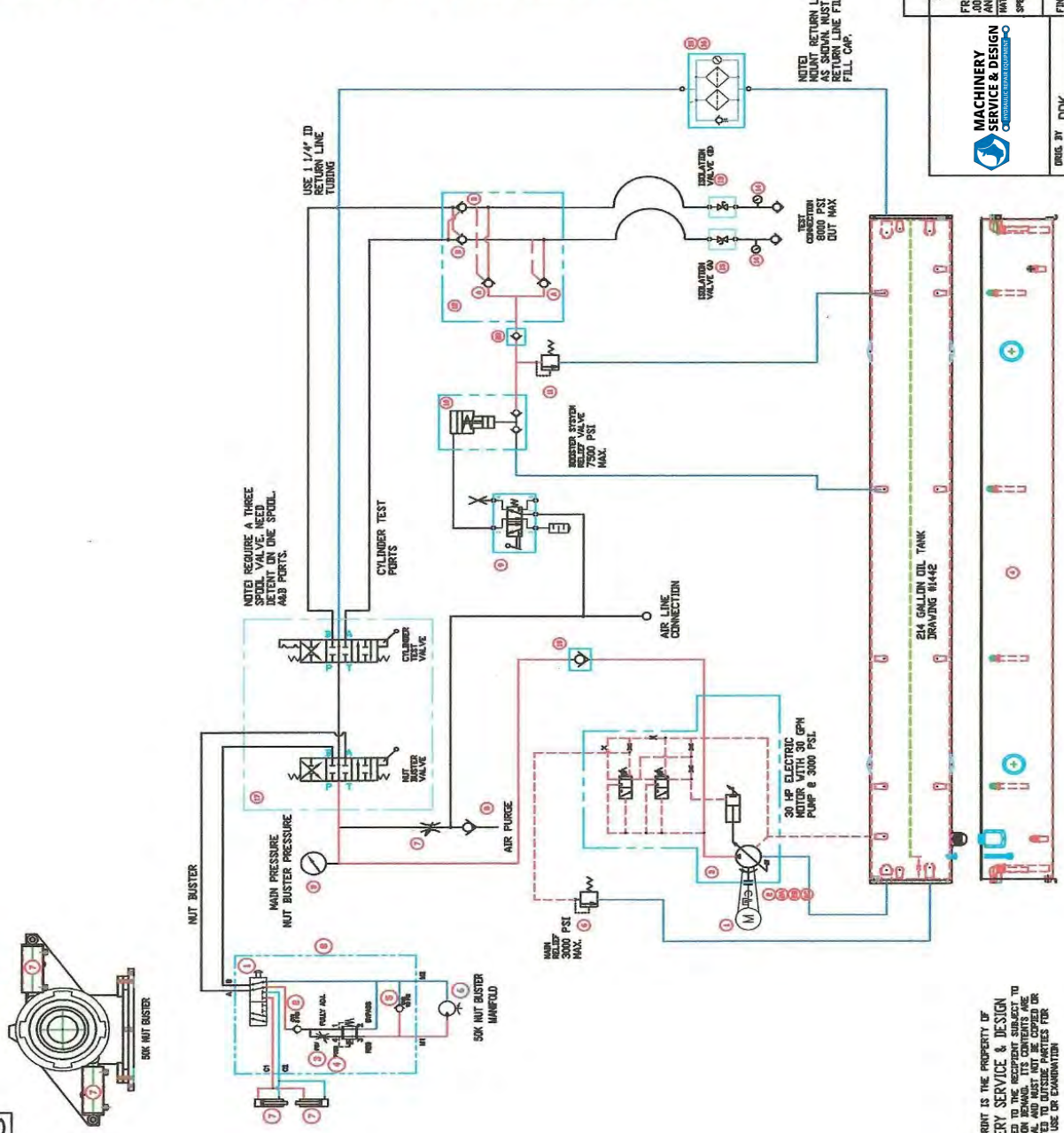
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30 HP Power Unit

1 493

REV	DESCRIPTION	DATE
1	30 HP MOTOR	40NCH-3-30-10-30-1800
2	PUMP MOTOR MOUNT	MAGNALOY 128475EC
2A	PUMP COUPLER	MAGNALOY NS0010910
2B	MOTOR COOLER	MAGNALOY NS0012816
2C	COUPLER INSERT	MAGNALOY NS70N7
3	HYDRAULIC PUMP	HAUVYSD7DRS3SRPC62A00
4	24 GALLON TANK	NSD DRAWING 81442
5	GAUGE	BAC-2R-RC-100-FF
6	RELIEF VALVE	SUN RRC-DAN-CAL
7	CHECK VALVE	CV4RS-1020N
8	NEEDLE VALVE	VE5CR
9	AIR VALVE	V1204
10	AIR PUMP	HASICE 3L-SS-12B
11	RELIEF VALVE	TASK-FORCE VRL3301-V
12	PRESSURE BOOSTER	PEAA1342
12A	PO CHECK	SUN CKCY-VFN
12B	PO CHECK	SUN CKCB-VFN
13	BALL VALVE	ANCHOR AV2N-UNV
14	GAUGE	LENZ AFC-6H-25RC-FF
15	FILTER HOUSING	CPL-1500-10-R
16	ELEMENT	CPL-1222-10-20
17	2 SPOOL VALVE	
18	CHECK VALVE	DMIC CV4RS-1020S
20	1/4" IN-LINE CHECK	DMIC CV4RS-1020N

REV	DESCRIPTION	DATE
1	SELECTOR SPOOL	GREESON DS75
2	3 PSI CHECK	COMMAND CVFF-10-N-3
3	FLOW CONTROL	COMMAND PCEB-10-N
4	PRESSURE COMP.	COMMAND CVFF-10-N-10
5	CHECK VALVE	CHARL VNH 104-1143-006
6	DRIVE MOTOR	PMC-3508
7	HYD CYLINDERS	PRINCE CMB1-1223B
8	MANIFOLD BLOCK	



TITLE	
30 HP & 30 GPM FLOW WITH PRESSURE BOOSTER	
DWG NO	REV
1 493	
SCALE	SHEET
NONE	OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	FINISH
FRACTIONS ± 1/32	ENGINEER
.00 ± .02 .000 ± .005	DDK
ANGLES ± 5°	CHECKER
SPEC AS NEEDED	



DESIGN BY DDK
CHECKER

ENGINEER
DDK

CHECKER

FINISH SPEC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

FRACTIONS ± 1/32

.00 ± .02 .000 ± .005

ANGLES ± 5°

SPEC AS NEEDED

DESIGN BY DDK

CHECKER

ENGINEER

DDK

FINISH SPEC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

FRACTIONS ± 1/32

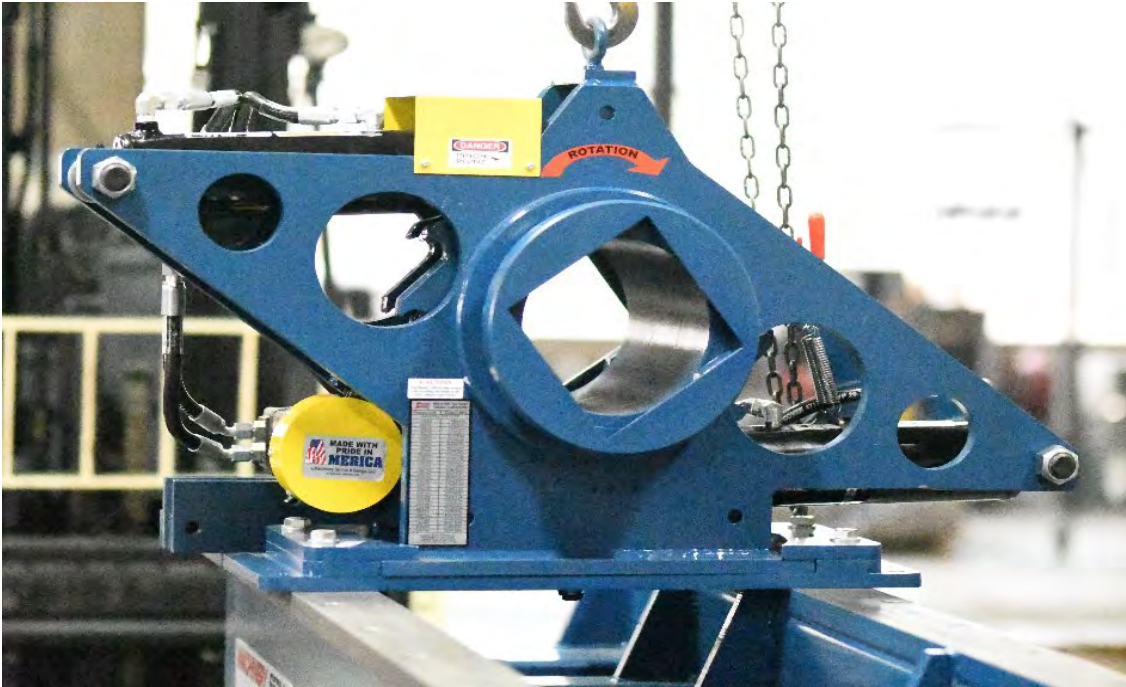
.00 ± .02 .000 ± .005

ANGLES ± 5°

SPEC AS NEEDED

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MSD-N-20/30/40/50/70/100K



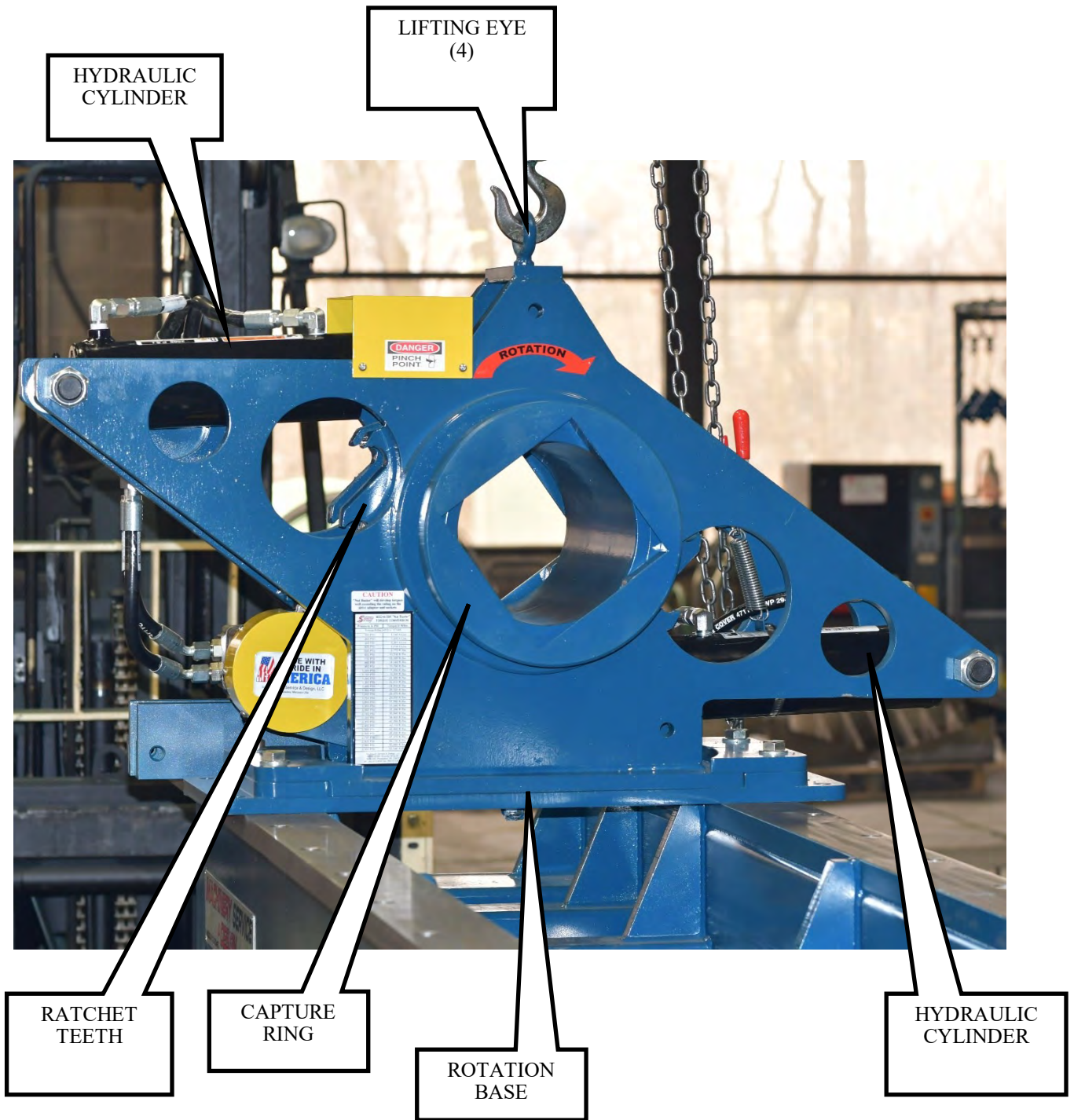
The Nut Buster is a hydraulically operated Ratchet. It is used to remove or install piston nuts and cylinder heads. The Nut Buster uses a minimum of 2 GPM (7.6 LPM) and 2500 to 3000 psi (172.4 to 206.8 bar) to develop 20,000 to 100,000 foot- pounds (27,116.4 to 135,581.8 Newton meters) of torque, depending upon the model. The Nut buster uses a square 8" (203.2 mm) plate as the base for the sockets and attachments. The attachments slide into the adapter on either end of the Nut Buster and rotate 45° to lock in place. Depending upon which side of the Nut Buster is used the tool will rotate clockwise or counter- clockwise. The Nut buster is rated to operate at 2500 to 3000 psi (172.4 to 206.8 bar). The unit has been designed to withstand intermittent pressures much higher than the rated pressure. The rated pressure is specified to insure a long service life. **Machinery Service & Design is not responsible for damage caused by operation above the rated pressure.** For best results, always use the unit at the lowest pressure that will turn the nut. To set the pressure delivered to the Nut Buster you should adjust the relief valve on the power supply.

The Nut Buster is designed to be used with a Machinery Service & Design disassembly bench. It can also be used on other disassembly fixtures, with the proper mounting adapters. Whenever the Nut Buster is used on a disassembly fixture not manufactured by Machinery Service & Design the user is responsible to determine if the disassembly fixture will safely handle the torque developed by the Nut Buster. We will offer advice on mounting and operation but cannot guarantee the strength of equipment that we have not designed and built.

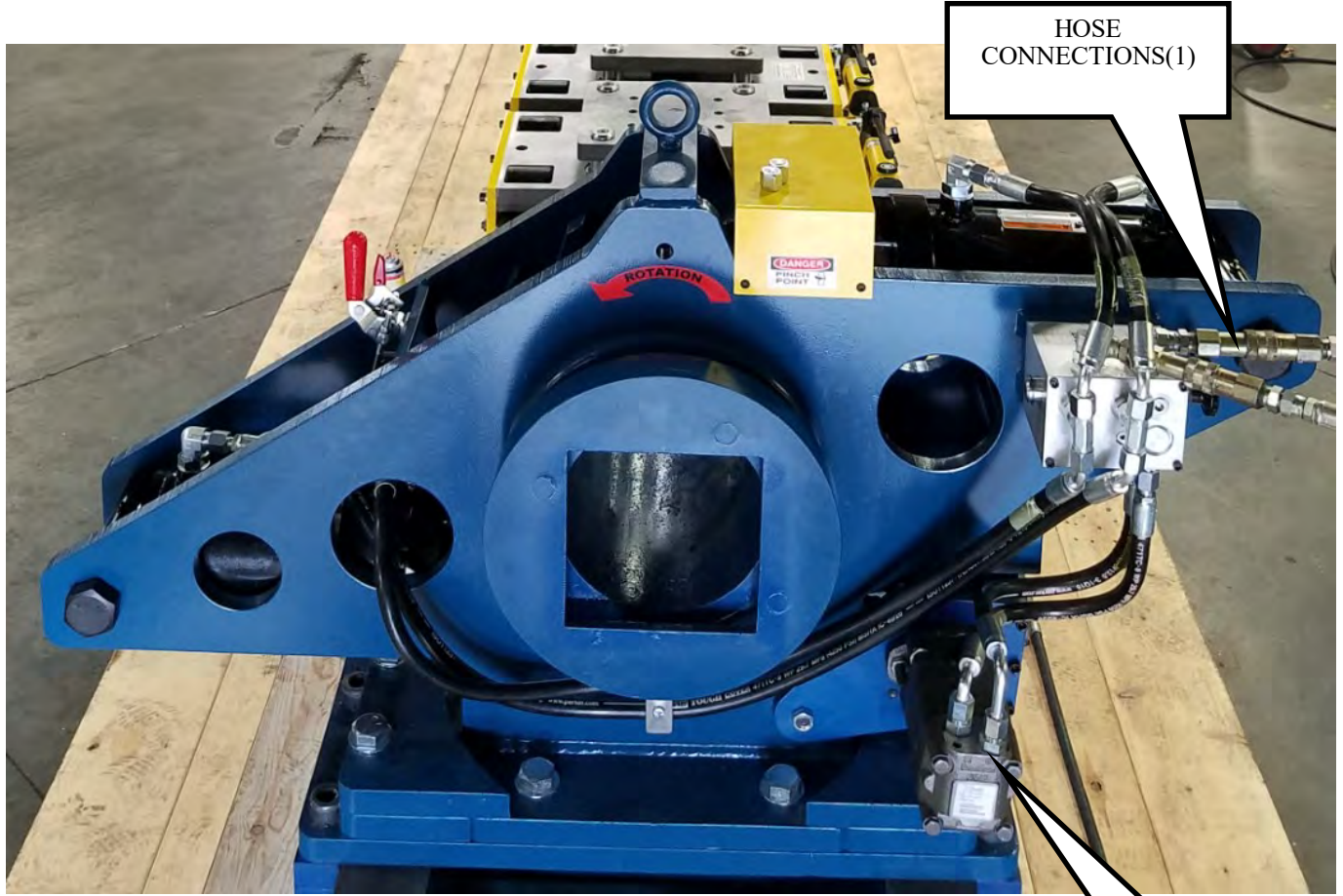
Please be sure to read and understand the operating instructions for the Nut Buster before operating the tool. Operating instructions are included in this manual and can also be ordered separately. All numbers in parenthesis refer to the picture below (figure 1).

Separate Instruction sheets are included for the operation of each tool and attachment. Please refer to the correct instruction sheet for the tool that you are using. **Read and understand the instructions for each tool or attachment before using it.**

“Nut Buster”



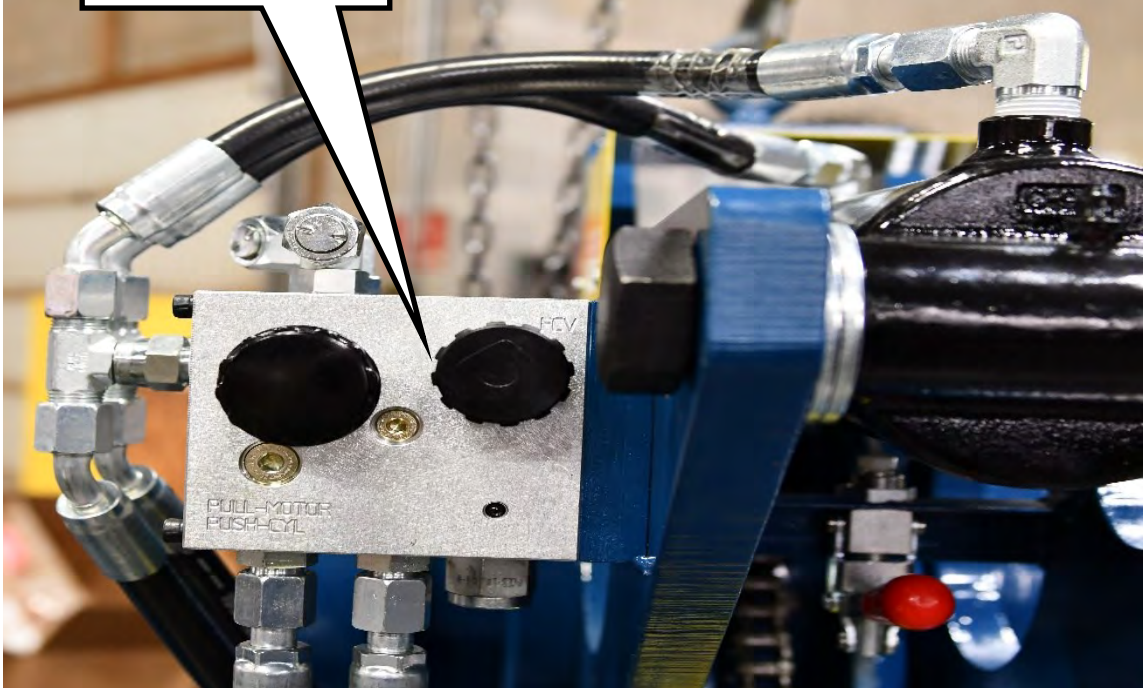
“Nut Runner”



HOSE CONNECTIONS(1)

NUT RUNNER DRIVE MOTOR

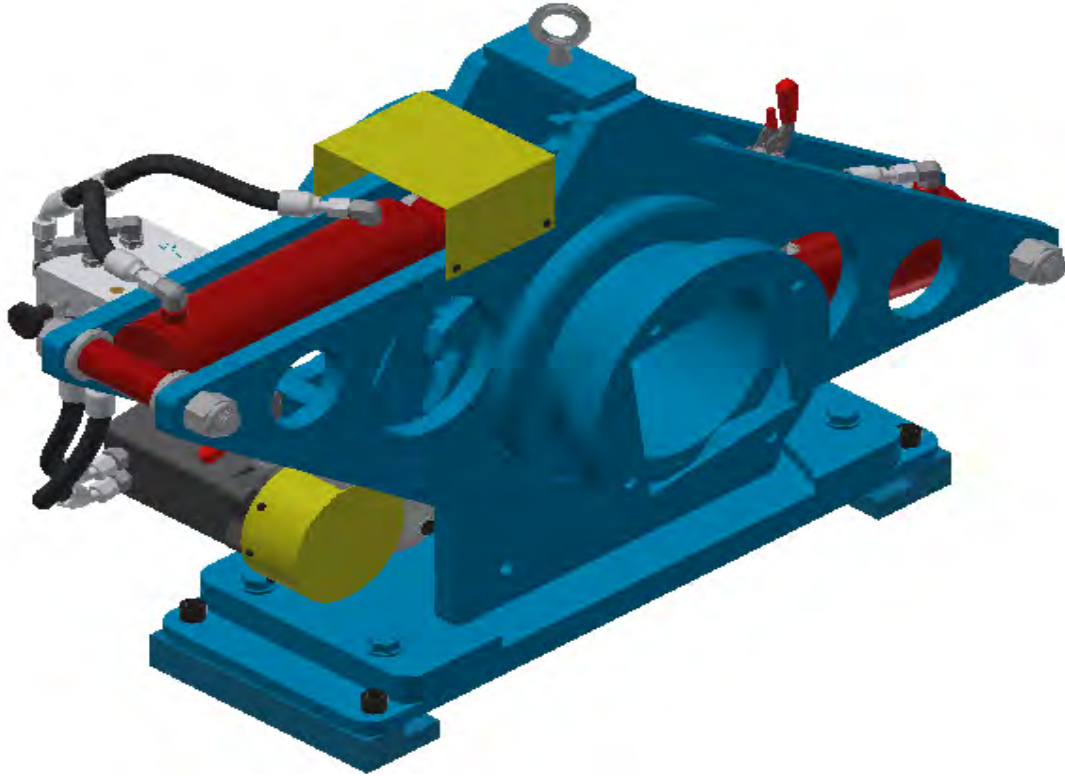
SELECTOR MANIFOLD SPEED CONTROL



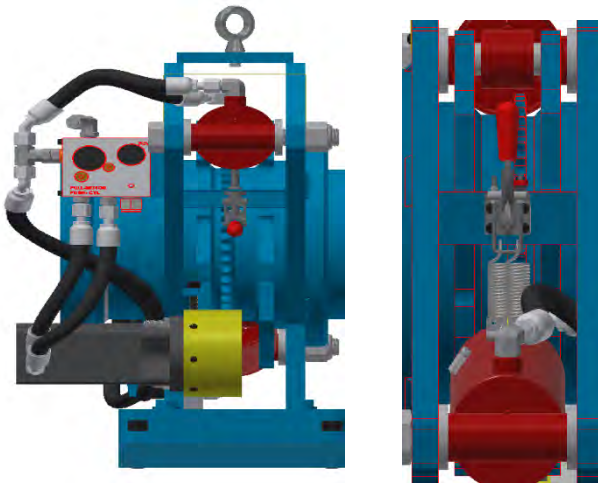
Nut Buster Operating Procedures

1. The Ratchet is rotated to align the tool with the nut or cylinder head. The nut is slid into the tool to fully engage the tool with the nut or cylinder head. The Nut Buster can be moved towards the nut, or the Brace Tool/rod assembly can be slid towards the Nut Buster. The Nut Buster can usually be rotated by hand to align the tool with the nut, or the power unit can be used to rotate the larger attachments.
2. Locate the Nut Buster on the disassembly table. Tighten the 4 Allen head bolts to secure the Nut Buster in place.
3. Hook up hydraulic hoses to the fittings (1) on the upper cylinder. The upper cylinder is plumbed in parallel with the lower cylinder. It is suggested that valve quick disconnects are installed to facilitate easy changing of the hoses. Machinery Service & Design does not supply fittings for the Nut buster due to the wide variety of styles and types used by our customers. Fittings and hoses can be ordered by part number and manufacturer, with the purchase of the Nut Buster.
4. Install the appropriate tool in the capture ring (2). The 8" square mounting plate is inserted in the capture ring and rotated 45° to lock in place. Follow the specific instructions for each tool chosen.
5. After the tool in the Nut Buster is aligned with the nut or cylinder and fully engaged, tighten the mounting bolts on the Brace Tool and Nut Buster. Be sure to check for full engagement of the tool before using the Nut Buster. Check both the Nut Buster and Brace tool to ensure that both units are firmly mounted.
6. The rod or cylinder must be supported while the Nut Buster is being used. The tool in the Nut Buster will not always support the weight of the components after it has been loosened. The only safe method of removing the nut is to use a support block or additional vise assembly to hold the weight of the components. Please check the Nylon Support "V" in the operations for recommended use. A homemade support can be used, if it has been determined by the user that it will adequately support the load being worked on.
7. Operate the power unit to ratchet the nut buster and loosen the nut or cylinder head. Once the nut has begun to move freely the mounting bolts for the Nut Buster should be loosened. Either the Nut Buster or the Brace tool must be allowed to slide as the nut is removed. Remember that the screw thread will cause the nut to travel along the length of the table. The Nut Buster or the Brace tool must be allowed to move along with the nut to keep the tool in full engagement.
8. When the nut is loose, the Nut Buster can be operated with only the top cylinder, since it will stroke before the lower cylinder moves. Watch the upper cylinder and reverse the hydraulic flow when the cylinder has retracted past the ratchet tooth. Continue reversing the hydraulic flow to move the in and out along the ratchet until the nut is moving easily. The ratchet can be moved by hand when the forces on the nut are low enough. Carefully grab the upper ratchet and rotate the tool. The tool can then be rotated until the nut has been removed. It is not necessary to remove the hoses from the Nut Buster while moving the tool.
9. The tools can be installed on either side of the Nut Buster, depending upon which direction you wish to torque. The arrow on the upper part of the Nut Buster will indicate the direction that the Nut Buster will power.
10. If you wish to reverse directions you would either rotate the Nut Buster around and remount it facing the other direction, or you can remount the cylinder or rod on the other end of the table and leave the Nut Buster mounted as it was. Sometimes you can set up your work area so that disassembly takes place on one end of the table, where you would use the Nut Buster to loosen nuts. The assembly area would be on the other end of the same table, where the Nut Buster would tighten the nuts. This would reduce the removal of the Nut Buster except for long cylinders.
11. Removing the Nut Buster from the table is easy if you first remove the hoses, remove the Allen head hold down bolts, and use a forklift or crane to lift the Nut Buster off the table. The eyebolt (4) in the top of the Nut Buster is to be used to lift the Nut Buster off the table. The Nut Buster is heavy, and we do not recommend that you attempt to remove this manually.
12. Store the Nut Buster in a safe place if you have to remove it for any length of time.

MSD-N-50KNR



Shafts with extended threads or lighter torque requirements can be processed faster with this “Nut Buster with Nut Runner option. This “Nut Buster” will develop 50,000 ft/lbs. (67,790.9 Nm) of torque. In the nut runner mode this unit will spin off nuts with a torque rating of 2,500 ft/lbs. (3,389.5 Nm) .



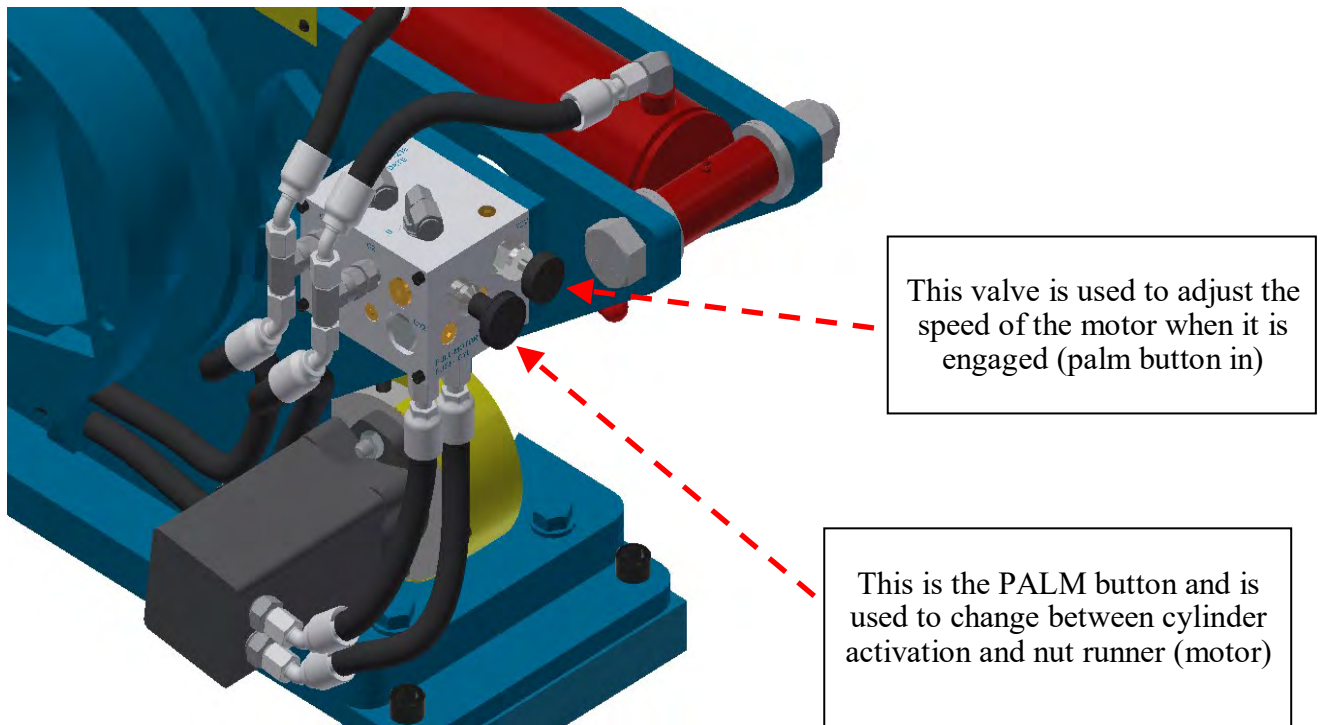
“DE-STA-CO” clamps can be set to lower or lift the appropriate cylinder out the ratchet teeth when the nut runner motor is engaged.

“Caution” should be taken when changing the palm button directional valve from high torque (push – cylinder activation) to high speed (pull – motor activation).

The palm button directional valve is designed not to pull out until all pressures are released.



This “safety feature” protects against a situation where high torque is maintained on a component and the palm button is “forced” out to engage the motor. The tension built up by the cylinders on a component is instantly transferred to the motor and chain system. This accumulated torsion will easily overcome the motor and/or chain drive and will break the chain, spur gear or motor shaft. To release the palm button, turn off the power unit, then actuate the power unit directional valve in both directions.

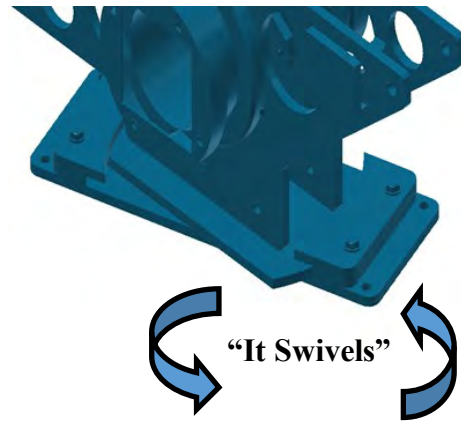


The nut runner is designed to turn off nuts after they have been broken loose and require a lower torque for removal. When changing from nut runner (palm valve out) to the cylinder (palm button in) there is no problem.

Caution “do not force palm button out”.

MSD-N-RB

Rotating Base for the “Nut Buster”



All the Machinery Service & Design “Nut Busters” can be manufactured with this option of a rotating base. This option eliminates having to reposition the “Nut Buster” when changing from removing to installing nuts or glands.



Counterclockwise rotation shown
(70K Nut Buster with Nut Runner)



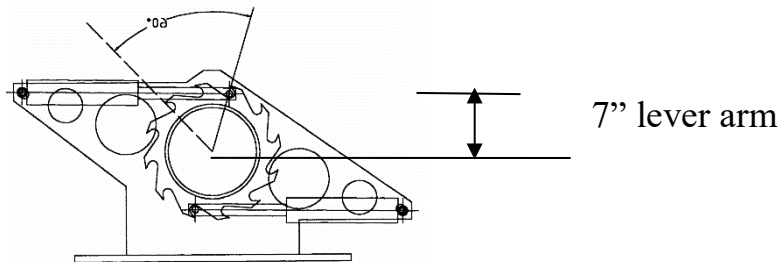
Clockwise rotation shown
(70K Nut Buster with Nut Runner)

Secure in the reverse direction by tightening the three (3) socket head cap screws (70KNR & 100KNR) / two (2) socket head cap screws (other types of Nut Busters) located on either side of the base.

Torque Conversion for "Nut Buster"

The Force generated by our "Nut Buster" can be calculated using the standard formula: Foot pounds of torque = ((force applied in PSI) X (area of the cylinder x distance from center this force is applied X number of cylinders doing the work)) / (divided by 12 inches to convert to foot-lbs)

$$\text{Torque (ft/lbs.)} = \text{PSI} * \text{Area} * 1.1667$$



MSD-N-20 "Nut Buster" TORQUE	
Pressure in	Torque in ft/lbs.
Torque (ft/lbs.) = PSI x 8.246	
500 PSI	4,120 ft./lbs.
600 PSI	4,950 ft./lbs.
700 PSI	5,770 ft./lbs.
800 PSI	6,600 ft./lbs.
900 PSI	7,420 ft./lbs.
1,000 PSI	8,250 ft./lbs.
1,100 PSI	9,070 ft./lbs.
1,200 PSI	9,900 ft./lbs.
1,300 PSI	10,720 ft./lbs.
1,400 PSI	11,550 ft./lbs.
1,500 PSI	12,370 ft./lbs.
1,600 PSI	13,200 ft./lbs.
1,700 PSI	14,020 ft./lbs.
1,800 PSI	14,840 ft./lbs.
1,900 PSI	15,670 ft./lbs.
2,000 PSI	16,490 ft./lbs.
2,100 PSI	17,320 ft./lbs.
2,200 PSI	18,140 ft./lbs.
2,300 PSI	18,970 ft./lbs.
2,400 PSI	19,790 ft./lbs.
2,500 PSI	20,620 ft./lbs.
2,600 PSI	21,440 ft./lbs.
2,700 PSI	22,270 ft./lbs.
2,800 PSI	23,090 ft./lbs.
2,900 PSI	23,920 ft./lbs.

MSD-N-30 "Nut Buster" TORQUE	
Pressure in	Torque in ft/lbs.
Torque (ft/lbs.) = PSI x 11.24	
500 PSI	5,610 ft./lbs.
600 PSI	6,730 ft./lbs.
700 PSI	7,860 ft./lbs.
800 PSI	8,980 ft./lbs.
900 PSI	10,100 ft./lbs.
1,000 PSI	11,220 ft./lbs.
1,100 PSI	12,350 ft./lbs.
1,200 PSI	13,470 ft./lbs.
1,300 PSI	14,590 ft./lbs.
1,400 PSI	15,710 ft./lbs.
1,500 PSI	16,840 ft./lbs.
1,600 PSI	17,960 ft./lbs.
1,700 PSI	19,080 ft./lbs.
1,800 PSI	20,200 ft./lbs.
1,900 PSI	21,330 ft./lbs.
2,000 PSI	22,450 ft./lbs.
2,100 PSI	23,570 ft./lbs.
2,200 PSI	24,690 ft./lbs.
2,300 PSI	25,820 ft./lbs.
2,400 PSI	26,940 ft./lbs.
2,500 PSI	28,060 ft./lbs.
2,600 PSI	29,180 ft./lbs.
2,700 PSI	30,310 ft./lbs.
2,800 PSI	31,430 ft./lbs.
2,900 PSI	32,550 ft./lbs.

MSD-N-40 "Nut Buster" TORQUE	
Pressure in	Torque in ft/lbs.
Torque (ft/lbs.) = PSI x 14.66	
500 PSI	7,330 ft./lbs.
600 PSI	8,800 ft./lbs.
700 PSI	10,270 ft./lbs.
800 PSI	11,730 ft./lbs.
900 PSI	13,200 ft./lbs.
1,000 PSI	14,660 ft./lbs.
1,100 PSI	16,130 ft./lbs.
1,200 PSI	17,600 ft./lbs.
1,300 PSI	19,060 ft./lbs.
1,400 PSI	20,530 ft./lbs.
1,500 PSI	22,000 ft./lbs.
1,600 PSI	23,460 ft./lbs.
1,700 PSI	24,930 ft./lbs.
1,800 PSI	26,400 ft./lbs.
1,900 PSI	27,860 ft./lbs.
2,000 PSI	29,330 ft./lbs.
2,100 PSI	30,800 ft./lbs.
2,200 PSI	32,260 ft./lbs.
2,300 PSI	33,730 ft./lbs.
2,400 PSI	35,200 ft./lbs.
2,500 PSI	36,660 ft./lbs.
2,600 PSI	38,130 ft./lbs.
2,700 PSI	39,600 ft./lbs.
2,800 PSI	41,060 ft./lbs.
2,900 PSI	42,530 ft./lbs.

Torque Conversion for “Nut Buster”

The Force generated by our “Nut Buster” can be calculated using the standard formula:

Foot pounds of torque = ((force applied in PSI) X (area of the cylinder x distance from center this force is applied X number of cylinders doing the work)) / (divided by 12 inches to convert to foot-lbs)

$$\text{Torque (ft/lbs)} = \text{PSI} * \text{Area} *$$

MSD-N-50KNR "Nut Buster" 15,790ft./lbs.	
Pressure in PSI	Torque in ft/lbs.
Torque(ft/lbs.) = PSI x 17.545	
500PSI	8,770ft./lbs.
600PSI	10,530ft./lbs.
700PSI	12,280ft./lbs.
800PSI	14,040ft./lbs.
900PSI	15,790ft./lbs.
1,000PSI	17,550ft./lbs.
1,100PSI	19,300ft./lbs.
1,200PSI	21,050ft./lbs.
1,300PSI	22,810ft./lbs.
1,400PSI	24,560ft./lbs.
1,500PSI	26,320ft./lbs.
1,600PSI	28,070ft./lbs.
1,700PSI	29,830ft./lbs.
1,800PSI	31,580ft./lbs.
1,900PSI	33,340ft./lbs.
2,000PSI	35,090ft./lbs.
2,100PSI	36,840ft./lbs.
2,200PSI	38,600ft./lbs.
2,300PSI	40,350ft./lbs.
2,400PSI	42,110ft./lbs.
2,500PSI	43,860ft./lbs.
2,600PSI	45,620ft./lbs.
2,700PSI	47,370ft./lbs.
2,800PSI	49,130ft./lbs.
2,900PSI	50,880ft./lbs.
3,000PSI	52,640ft./lbs.

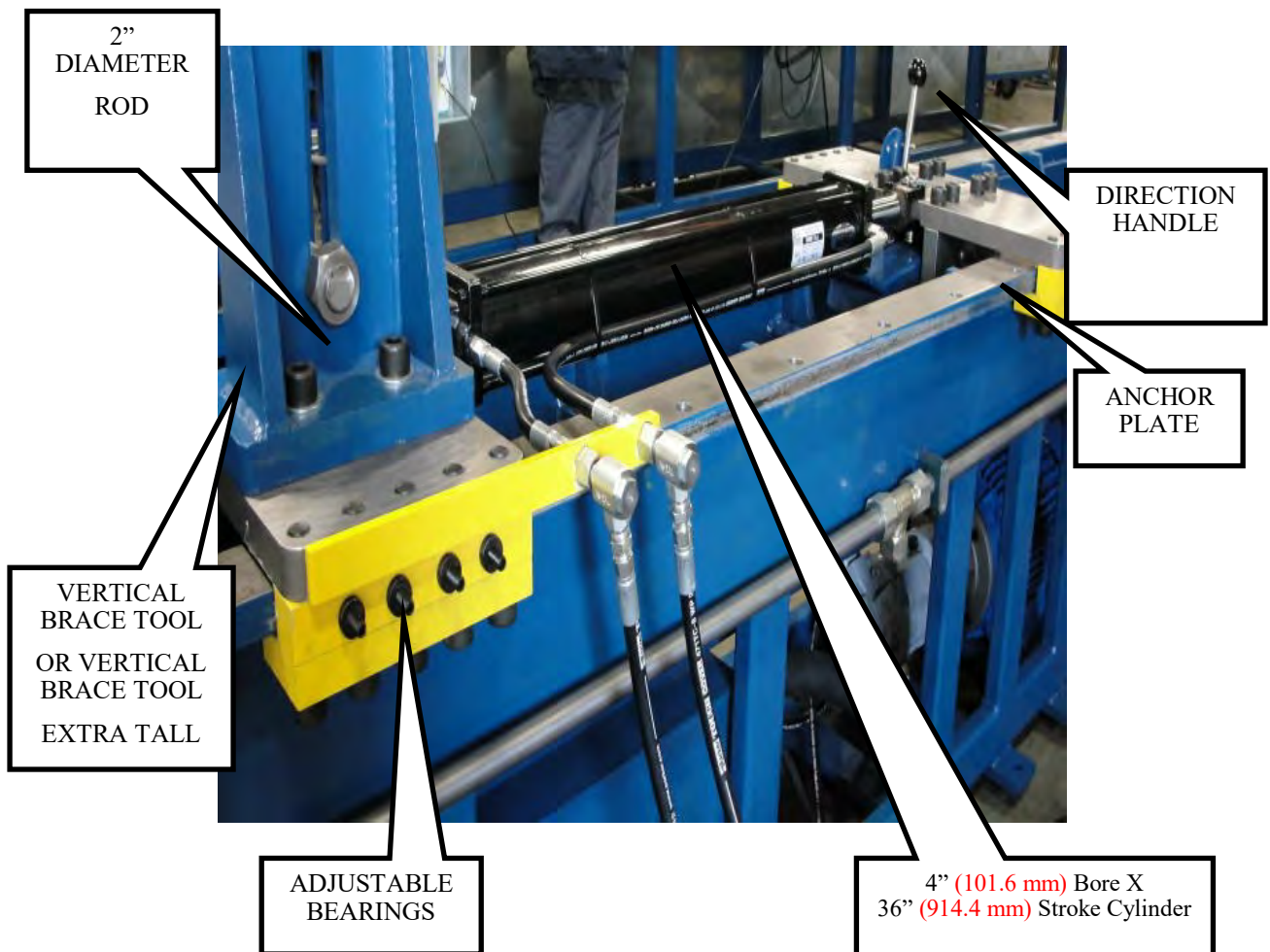
MSD-N-70KNR "Nut Buster" TORQUE CONVERSION	
Pressure in PSI	Torque in ft/lbs.
Torque(ft/lbs.) = PSI x 22.2	
400PSI	8,880ft./lbs.
600PSI	13,320ft./lbs.
800PSI	17,770ft./lbs.
1,000PSI	22,210ft./lbs.
1,200PSI	26,650ft./lbs.
1,400PSI	31,090ft./lbs.
1,600PSI	35,530ft./lbs.
1,700PSI	37,750ft./lbs.
1,800PSI	39,970ft./lbs.
1,900PSI	42,190ft./lbs.
2,000PSI	44,410ft./lbs.
2,100PSI	46,640ft./lbs.
2,200PSI	48,860ft./lbs.
2,300PSI	51,080ft./lbs.
2,400PSI	53,300ft./lbs.
2,500PSI	55,520ft./lbs.
2,600PSI	57,740ft./lbs.
2,700PSI	59,960ft./lbs.
2,800PSI	62,180ft./lbs.
2,900PSI	64,400ft./lbs.
3,000PSI	66,620ft./lbs.
3,100PSI	68,840ft./lbs.
3,200PSI	71,060ft./lbs.
3,300PSI	73,280ft./lbs.
3,400PSI	75,500ft./lbs.
3,500PSI	77,730ft./lbs.

Tooling

Automatic Slide Plate Assembly (MSD-ASP)

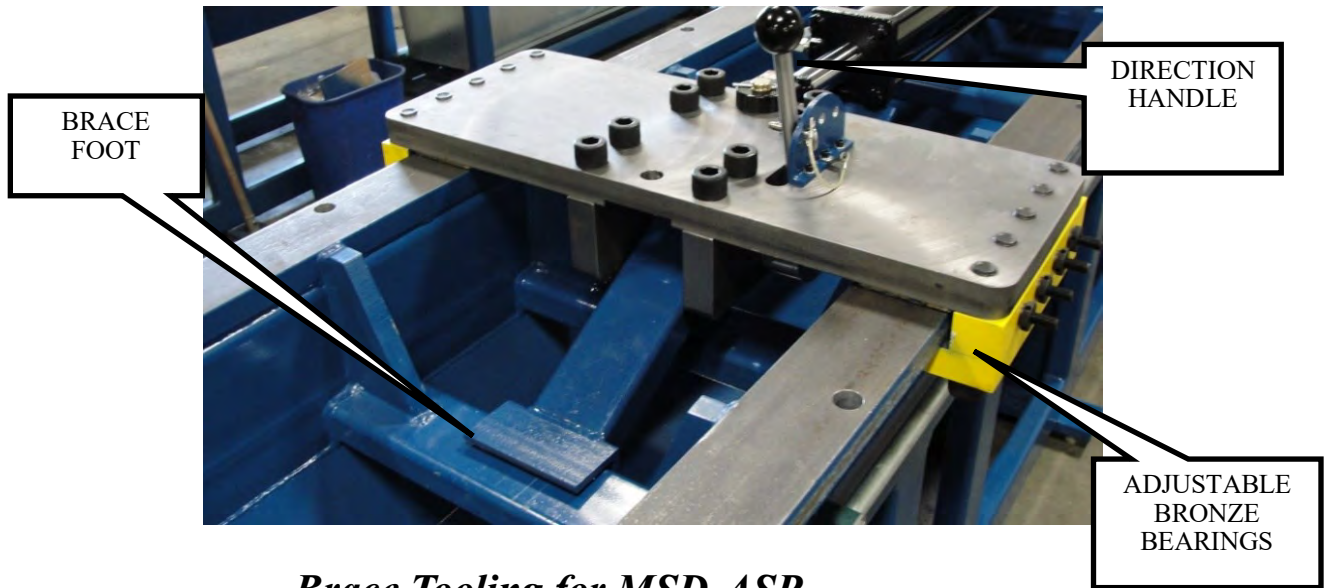
Machinery Service & Design now offers an Automatic Slide plate used for cylinder disassembly and assembly. The Auto slide plate consists of two heavy duty slide plates with adjustable bronze bearing and a 36" (914.4 mm) stroke hydraulic cylinder. One slide plate is used as an anchor plate and the second plate is used to hold a heavy-duty vertical brace tool. The anchor slide plate is equipped with a foot brace to interlock with a horizontal cross member built into the machine frame. The anchor slide plate has a handle assembly used to select the direction of travel. By selecting the direction, the operator can use this automatic slide plate to pull a cylinder shaft out of a cylinder or insert a shaft back into a cylinder tube.

The foot assembly is spring loaded so that as the slide plate moves down the length of the table, the brace arm will lift over the horizontal cross member and engage on the next cross member. This lifting action will work in both directions. The second slide plate is the point where the cylinder shaft clevis is attached. The slide plate is also available with an extra tall vertical brace tool. The vertical brace tool is supplied with a 2" (50.8 mm) diameter heavy duty thread rod. The thread rod is used to clamp the clevis tight in the vertical brace tool. With a 4" diameter bore cylinder the automatic slide plate can generate 37,698 pounds (167,689 n) of push force and 30,483 pounds (135,595 n) of pull force.



Automatic Anchor Plate

As illustrated, the anchor slide plate is equipped with a spring-loaded brace foot used to engage on a horizontal cross member built into the machine frame. The travel direction is determined by the position of the handle. The center position is the neutral position.



Brace Tooling for MSD-ASP

The Automatic Slide Plate is available with two options: Vertical brace tool (MSD-VBT) and Vertical brace tool extra tall (MSD-VBTET). The MSD-VBT has a maximum clevis diameter of 16 1/2" (419.1 mm) by 17" (431.8 mm) wide. The MSD-VBTET has a maximum clevis diameter of 24" (609.6 mm) by 13" (330.2 mm) wide.



MSD-VBTET



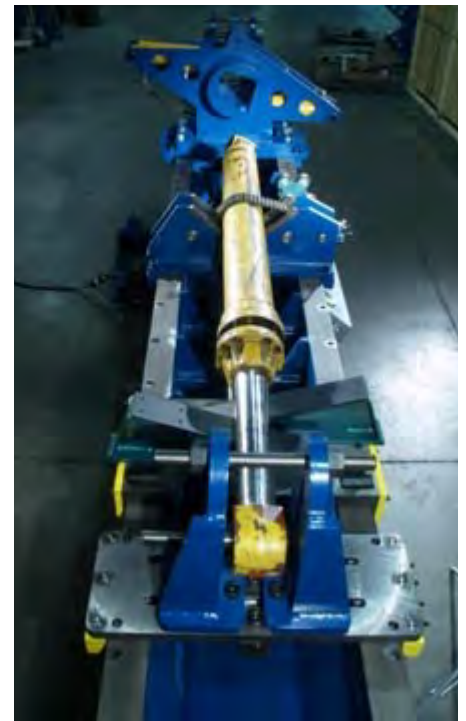
MSD-VBT

MSD-PAC-HD

The Pull Apart Cylinder Heavy Duty is a 4" bore tie bolt cylinder with 11.5 feet of stroke that generates 37,698 pounds of push and 22,974 pounds of pull at 3,000 PSI. This cylinder is mounted inside the frame of the disassembly bench.

MSD-CYAS

Cylinder Assist assembly includes a push/pull plate with bearing bronze slides. The L-Brackets come installed with adjustment screws to allow for adjustment of the bearing bronze slides. It is designed to work in conjunction with a brace tool (MSD-ABT-70, MSD-VBT or MSD-VBTET) and with the MSD-PAC-HD heavy duty pull-apart cylinder.



Typical Setup

Vee Block Roller Plate (MSD-VRP)

The vee block roller plate is a heavy-duty support device designed to support cylinder shaft during cylinder pull a part or cylinder assembly. The picture below shows the vee block roller plate with our vise elevator and nylon vees.

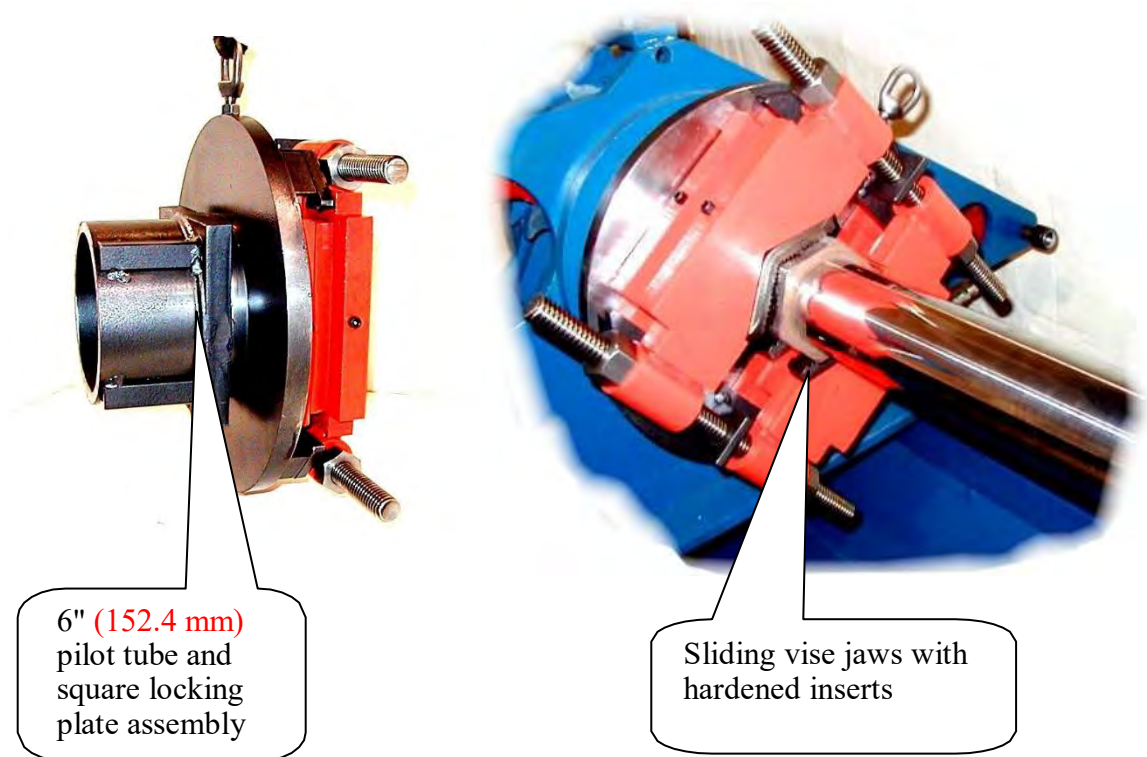


Vee Block Roller Plate with Hydraulic Lift (MSD-VRP-HL)

A hydraulic version of the vee block roller plate is available with a 10-ton (9.1 metric ton) hydraulic lift. The lift has a stroke of 4" (101.6 mm) inches. The operator can select one of our nylon vee's to adjust for the height.



MSD-AT (Adjustable Tool)



The MSD-AT is used to secure onto the cylinder heads, barrels, and nuts from 3" (76.2 mm) to 9" (228.6 mm). It will clamp on to the outside of a part and allow the Nut Buster to grip the component and turn it off. The tool has hardened vise jaws that will bite into the surface of the part and transfer the torque from the Nut Buster.

The adjustable tool mounts in the Nut Buster using the same hole and square plate mechanism. It is a heavy tool and should be mounted using the eye bolt on the top of the fixture to lift it into place. It is one of the most flexible tools and will allow you to remove many parts that can be removed in no other manner.

Adjustable Tool Operating Instructions

1. Mount the Adjustable Tool in the Nut Buster, taking care to put it in the correct side of the Nut Buster. Remember, the arrow on the nut buster will indicate the direction of rotation. The tool is slid into the center hole, guided by a 6" (152.4 mm) pilot, and rotated 45° to lock it in place.
2. The jaws of the adjustable tool can slide along the threaded rods to allow the tool to locate itself on the nut. The jaws will slide freely if the tool is held in the vertical position, so always mount the tool in a horizontal position. **Do not hold the tool or put your hands in the middle of the jaws. The jaws could slide while positioning the tool and pinch your hand.**
3. Mount the tube or rod in the Brace tool. Use the nylon vee block, adjustable vise elevator, or some other method to support the component. **The adjustable tool will not hold the rod or tube in place while rotating, so some other support must be provided.** The rod or tube should be level with the surface of the table and centered on the middle of the Nut Buster.
4. Position the jaws using the nuts on the end of the threaded rods. Open the jaws wide enough to allow them to slide over the nut.
5. Move either the nut buster or the brace tool and rod assembly to position the jaws around the nut. Slide the lightest component; in most cases this would be the brace tool.
6. Clamp the adjustable jaws down onto the nut, using the nuts on the two threaded rods to tighten the jaws securely to the part. Keep the jaws, shaft, and brace tool concentric with each other.
7. **Lock the Nut Buster and the brace tool firmly to the Disassembly table before attempting to use the tool.**
8. Gradually increase pressure until the nut breaks loose. Once the nut is moving, stop and loosen either the Brace tool or the Nut Buster so that the movement of the nut along the threads of the rod will allow the unit to slide. **When using our MSD-AT (adjustable tool) caution should be exercised.** The key to using this tool is that the nut is captured tightly and is not free to move after it has broken loose. Either the nut Buster or the Brace tool must be allowed to move along the length of the table. **Failure to loosen the Nut Buster or brace tool can damage the adjustable tool or the nut being removed.**
9. The adjustable tool will not support the nut or cylinder head as it is being removed. A support must be provided to hold the tube or rod in place while the nut is being removed.

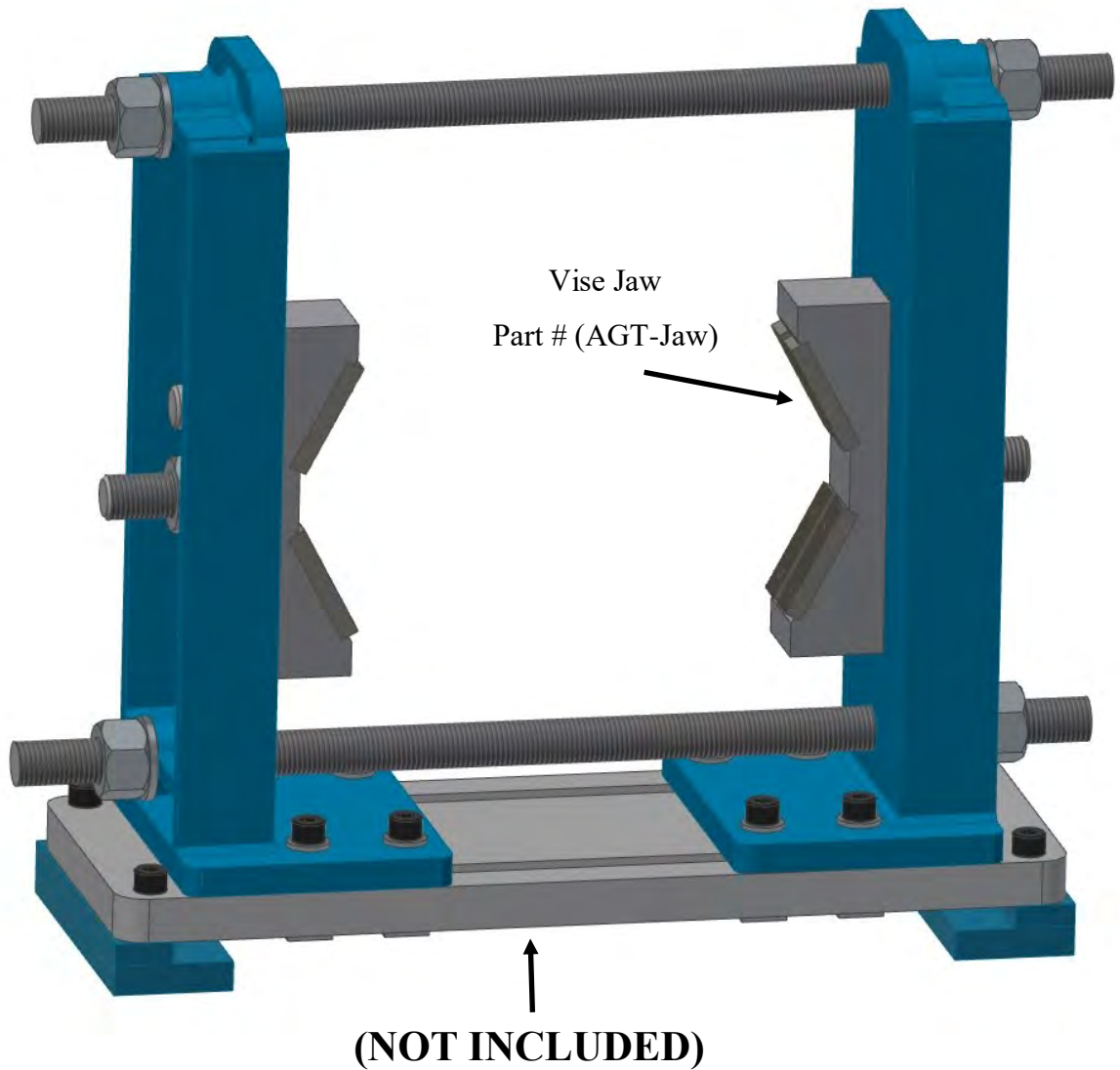


Shown above is a typical set-up to remove a nut from a shaft. Nut is captured with the MSD-AT tooling locked into the MSD-N-20 "Nut Buster". The shaft is supported and raised to the center height of the "Nut Buster" using a MSD-VE (vise elevator) and a MSD-V (nylon "V" block). This is one of the many applications for these pieces of equipment.

10. After the nut is removed, loosen the adjustable jaws, and remove the nut from the tool.
11. Remove the adjustable tool from the Nut Buster after the nut has been removed. The tool should never be left in the Nut Buster. Rotation of the Nut Buster while the tool is installed will allow the vise jaws to slide along the threaded rods and possibly cause personal injury. **For this reason, you should keep hands and other body parts clear of the jaws while rotating the Nut Buster.**

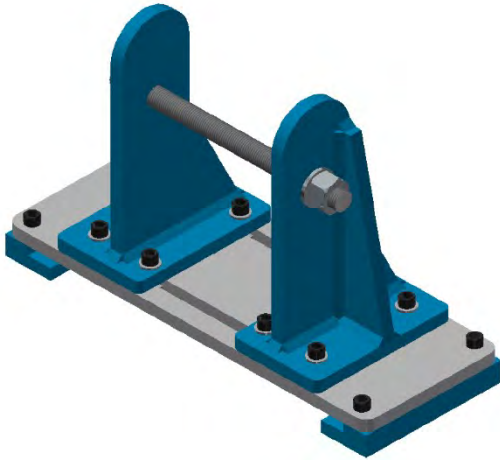
NEW MSD-AGT (Adjustable Gland Tool)

The MSD-AGT is used to secure cylinder head glands, tubes, and nuts from 5" (127mm) to 16-3/4" (425mm) in diameter. This tool comes with hardened vise jaws. It was designed to fit onto your existing MSD-ABT base plate.



Shown on a MSD-ABT-40 base plate with L-brackets

ADJUSTABLE BRACE TOOL
MSD-ABT, MSD-ABT-40K/50K
MSD-ABT-70K/100K



MSD-ABT-40K and MSD-ABT-70K
 IS USED FOR HIGH TORQUE
 APPLICATIONS

The Adjustable Brace tools are used to hold the cylinder tube or rod in place while the nut is removed. The brace tool uses a threaded rod through the clevis of the cylinder tube or rod to pull the uprights tight against the cylinder. This provides maximum support to the tube or rod. The uprights can be adjusted to a wide variety of clevis dimensions to help the Brace tool provide maximum rigidity. The heavy-duty adjustable brace tool with its 1 1/2" (38.1 mm) thick uprights will handle the high twisting loads developed by the Nut Buster.

Adjustable Brace Tool Operating Instructions

1. The adjustable brace tool is mounted on the disassembly frame and locked down using the four Allen head bolts.
2. Place the clevis end of the shaft or tube between the uprights and center the clevis on the hole. Put the threaded rod through the clevis and two uprights together on your clevis.
3. With the tool secure on the clevis align shaft in center of base and tighten down the 8 "T" nuts located on the slide bases.
4. The clevis should be approximately centered in the brace tool. It is not important to have the clevis in the exact center of the tool.

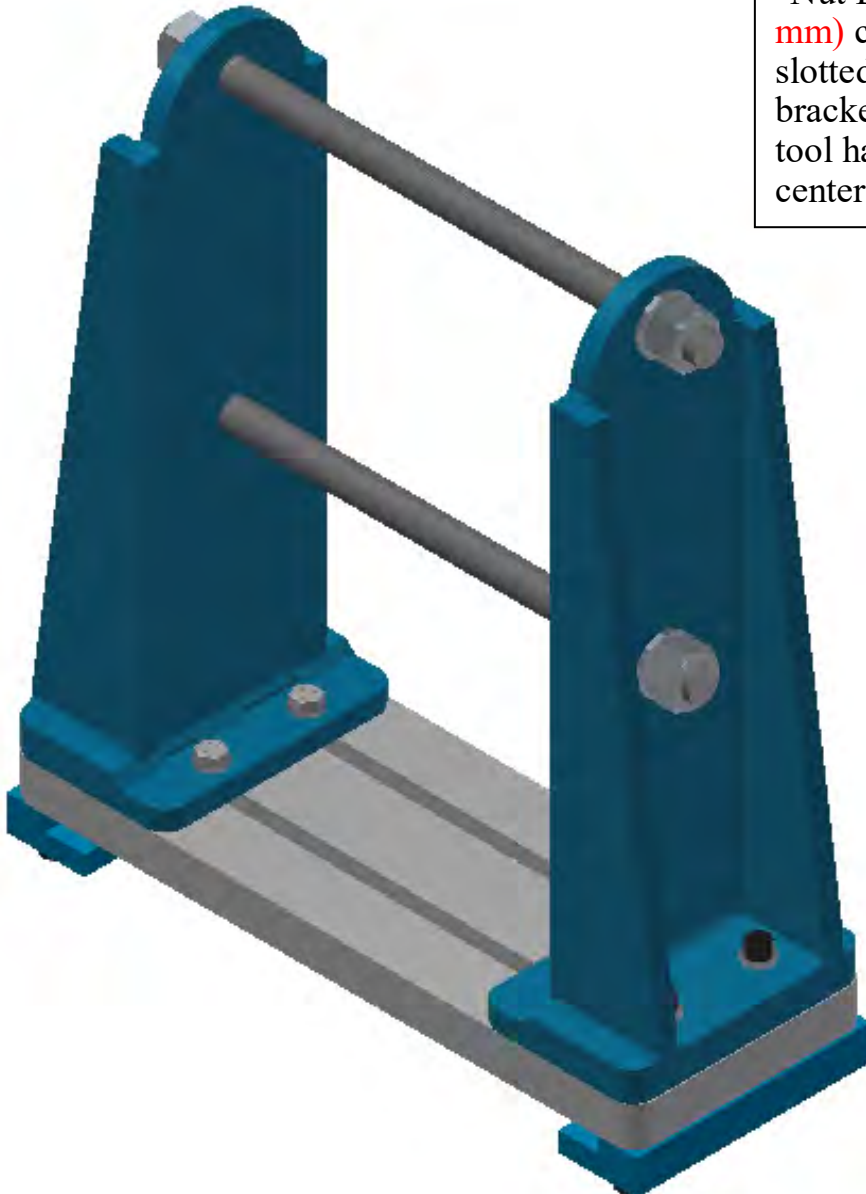
MSD-ABT : Adjustable Brace tool used to capture the clevis end of a shaft when used with our 20K or 30K "Nut Buster". Includes slotted slide plate and "L" brackets.

MSD-ABT-40K/50K : Heavy duty adjustable brace tool is used with our 40K and 50K "Nut Buster" for capturing the clevis end of shafts where high torques are required. Includes slotted slide plate and "L" brackets.

MSD-ABT-70K/100K : Heavy duty fixed brace tool designed for use with our 70K/100K "Nut Buster". Brace tool is supplied with heavy duty slide plate with 1"-8 tee nuts, grade 8 socket head cap screws and heavy duty "L" brackets.

STANDARD ABT 16.5”(MSD-ABT-S165)

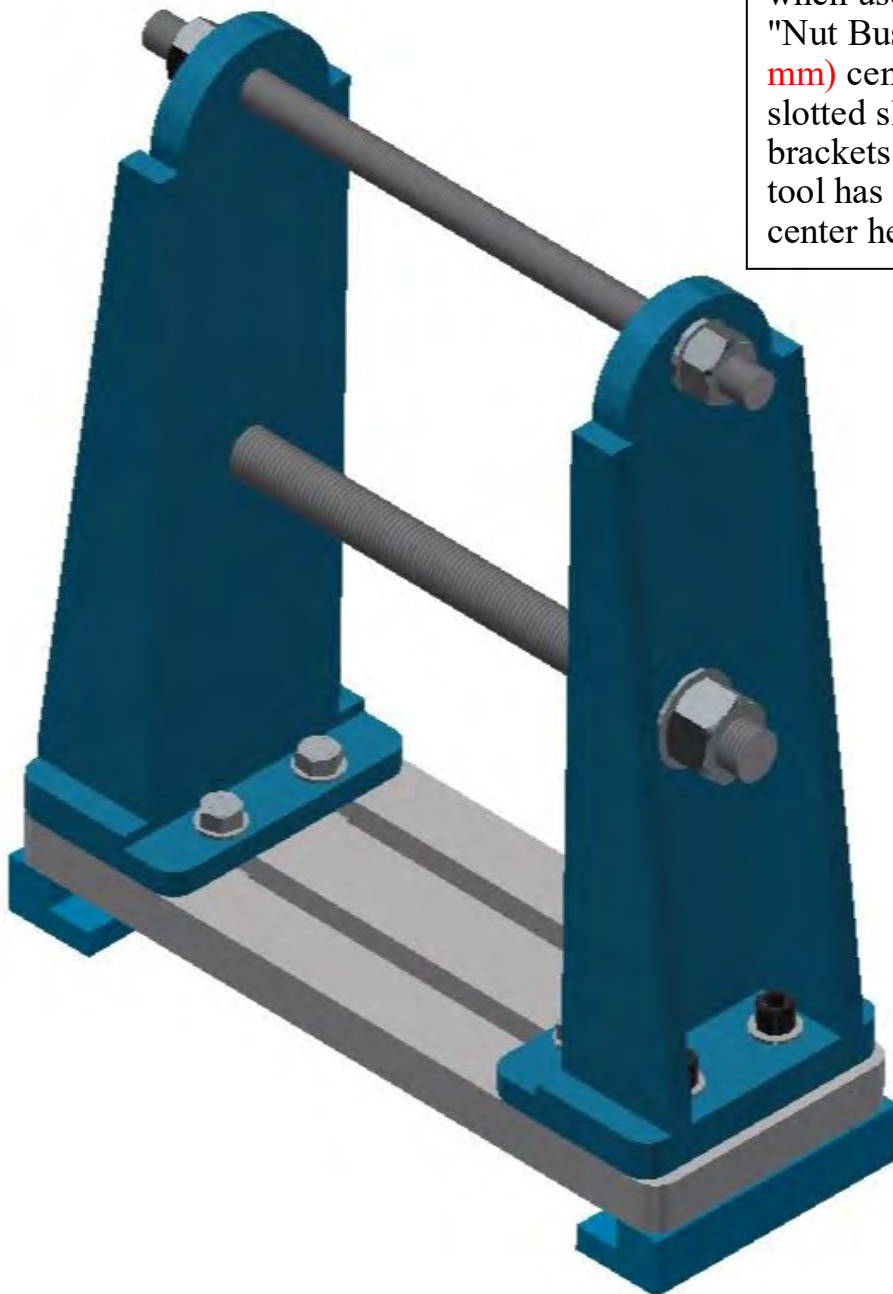
The MSD-ABT-S165 brace tool has a center height of 16 1/2” (419.1 mm). The brace tool is used to hold the cylinder tube or rod in place while the piston nut or head gland is removed. The brace tool uses a 1 1/2” (38.1 mm) threaded rod through the clevis of the cylinder or rod to pull the uprights tight against the clevis. This provides maximum support to the tube or rod. The brace tool can accommodate a clevis of 25” (635 mm) in diameter and 20” (508 mm) in width.



This Adjustable Brace tool is used to capture the clevis end of a shaft when used with our 40K or 50K "Nut Buster" with 16 1/2” (419.1 mm) center height. Includes slotted slide plate and "L" brackets. This adjustable brace tool has a 16 1/2” (419.1 mm) center height.

HEAVY-DUTY ABT 16.5 (MSD-ABT-H165)

The MSD-ABT-H165 brace tool has a center height of 16 1/2" (419.1 mm). The brace tool is used to hold the cylinder tube or rod in place while the piston nut or head gland is removed. The brace tool uses a 2" (50.8 mm) threaded rod through the clevis of the cylinder or rod to pull the uprights tight against the clevis. This provides maximum support to the tube or rod. The brace tool can accommodate a clevis of 25" (635 mm) in diameter and 20" (508 mm) in width.



This Adjustable Brace tool is used to capture the clevis end of a shaft when used with our 70K or 100K "Nut Buster" with 16 1/2" (419.1 mm) center height. Includes slotted slide plate and "L" brackets. This adjustable brace tool has a 16 1/2" (419.1 mm) center height.

BRACE TOOL (MSD-BT)



Our standard brace tool is used to capture clevis ends of shafts by simply inserting the pin through the top hole of the tool (center height of the “Nut Buster”) and securing it with the pins provided. The lower holes are provided for use with the pull a-part configuration. The brace tool mounts on the slide plates, which are predrilled for this tool.

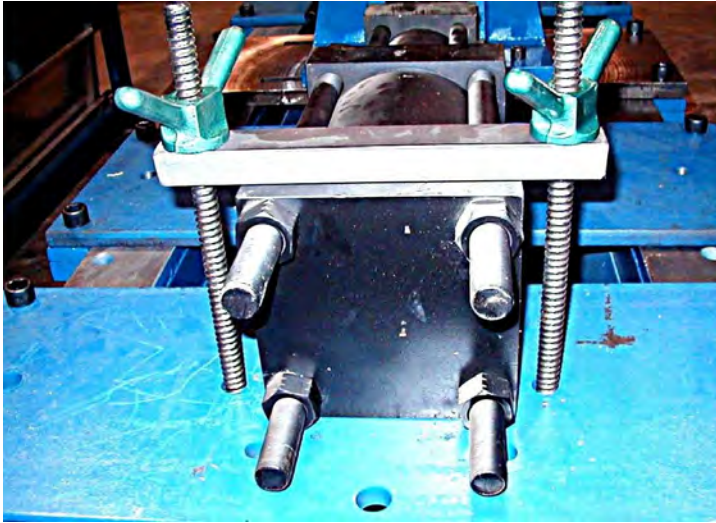
Brace Tool Operating Instructions

1. Mount the Brace tool on the slide plate, bolting it down to the plate using the predrilled holes.

Lock down the slide plate using the 4 Allen head bolts.

2. Place the cylinder in line with the top hole of the brace tool, slide the 2” (50.8 mm) pin through the hole and clevis. Secure the 2” (50.8 mm) pin in place with the clips provided. Spacers can be used to center the rod in the brace tool if it is too loose. **The brace tool is designed to be used with the 20K Nut Buster, or for smaller cylinders with the 30K and 40K Nut Buster.** Use the adjustable brace tool for larger cylinders.

TIE BOLT HOLD DOWN (MSD-HD)



The MSD-HD Tie Bolt Hold Down brackets clamp a tie bolt cylinder to the slide plates to help align end caps during assembly. Using two or three clamps will assure proper alignment of end caps and intermediate trunnion plates.

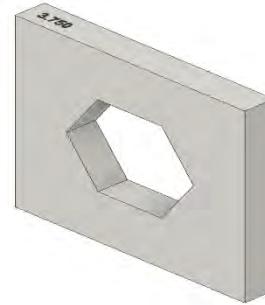
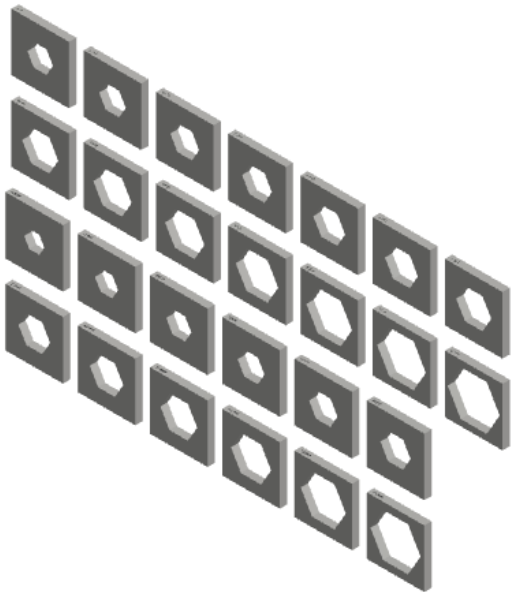
Tie Bolt Hold Down Operating Instructions

1. Locate the tie bolt cylinder end cap on the slide plate. Attach the Tie Bolt hold down on the end cap and lightly clamp the end cap to hold in place
2. Repeat step one for the second end cap.
3. **Assemble cylinder, move slide plates to position the end caps, loosen the tie bolt hold down if necessary, to align the assembly.**
4. When you are ready to torque the cylinder tie rods, tightly clamp the hold down. Torque the tie rods to a minimum value. Loosen the hold down to allow the end caps to realign. Retighten hold down.
5. Repeat step 4, with increasing torque, until the proper tie bolt torque has been reached.



MSD-HPS (Hex Plate Set)

MSD-HPSM (Hex Plate Set Metric)



SAE TOOL PLATE SET (MSD-HPS)-14-piece set
 METRIC TOOL PLATE SET (MSD-HPSM) – 12-piece set
 INDIVIDUAL PLATE – to your specifications

(Plates are 8" X 8" X 1" Blanchard ground with sizes stamped on edge)

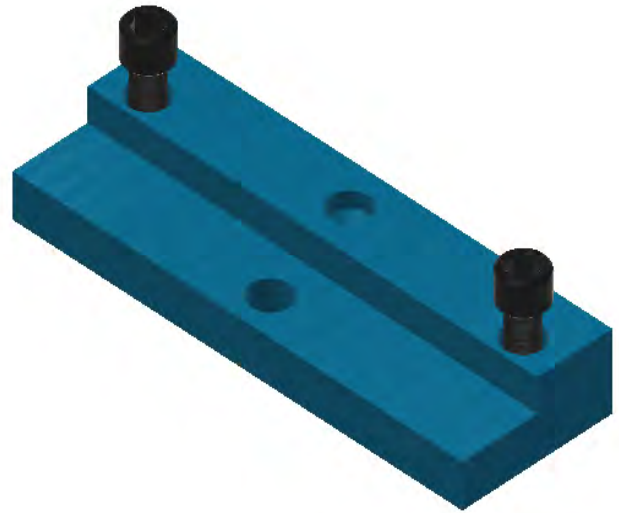
All our tooling for the “Nut Buster” is based on a simple 8" x 8" x 1" (203.2 mm x 203.2 mm x 25.4 mm) plate configuration. They are all positioned into the fixture the same way and locked in place. The hex plates are the basic tools of the Nut Buster unit. The plates are cut out for the standard ANSI nut sizes. Both English and metric sets are available. Our standard hex plate set includes hex sizes of 3", 3-1/8", 3-3/8", 3-1/2", 3-3/4", 3-7/8", 4-1/8", 4-1/4", 4- 1/2", 4-5/8", 5", 5-3/8", 5-3/4", & 6-1/8". Our Metric hex plate set includes hex sizes of 60 mm, 70 mm, 75 mm, 80 mm, 85 mm, 90 mm, 95 mm, 100 mm, 110 mm, 120 mm, 135 mm, & 150 mm.

Hex Plate Operating Instructions.

1. Install the correct size nut plate in the Nut Buster. The plate will mount in the capture ring and rotate 45° to lock in place.
2. Slide the Nut Buster up to the nut and rotate the ratchet assembly by hand until the hex plate lines up
3. Lock the Nut Buster in place and loosen the nut. After the nut has begun to turn, loosen the hold down bolts on the nut buster to allow it to move as the nut travels down the thread. Watch the Hex plate and reposition the Nut Buster if the hex plate moves out of engagement with the nut.
4. **Remember, the nut will travel along the thread as it is removed. The hex plate must remain in full contact with the nut to insure safe operation.** Reposition the Nut Buster whenever necessary to keep the hex plate fully engaged on the nut.

L-BRACKETS (MSD-LB)

Set of “L” clamps used with our slide plates, “Nut Buster” and Adjustable brace tooling. They provide a locking /sliding mechanism for the equipment attached to the Disassembly Fixture.

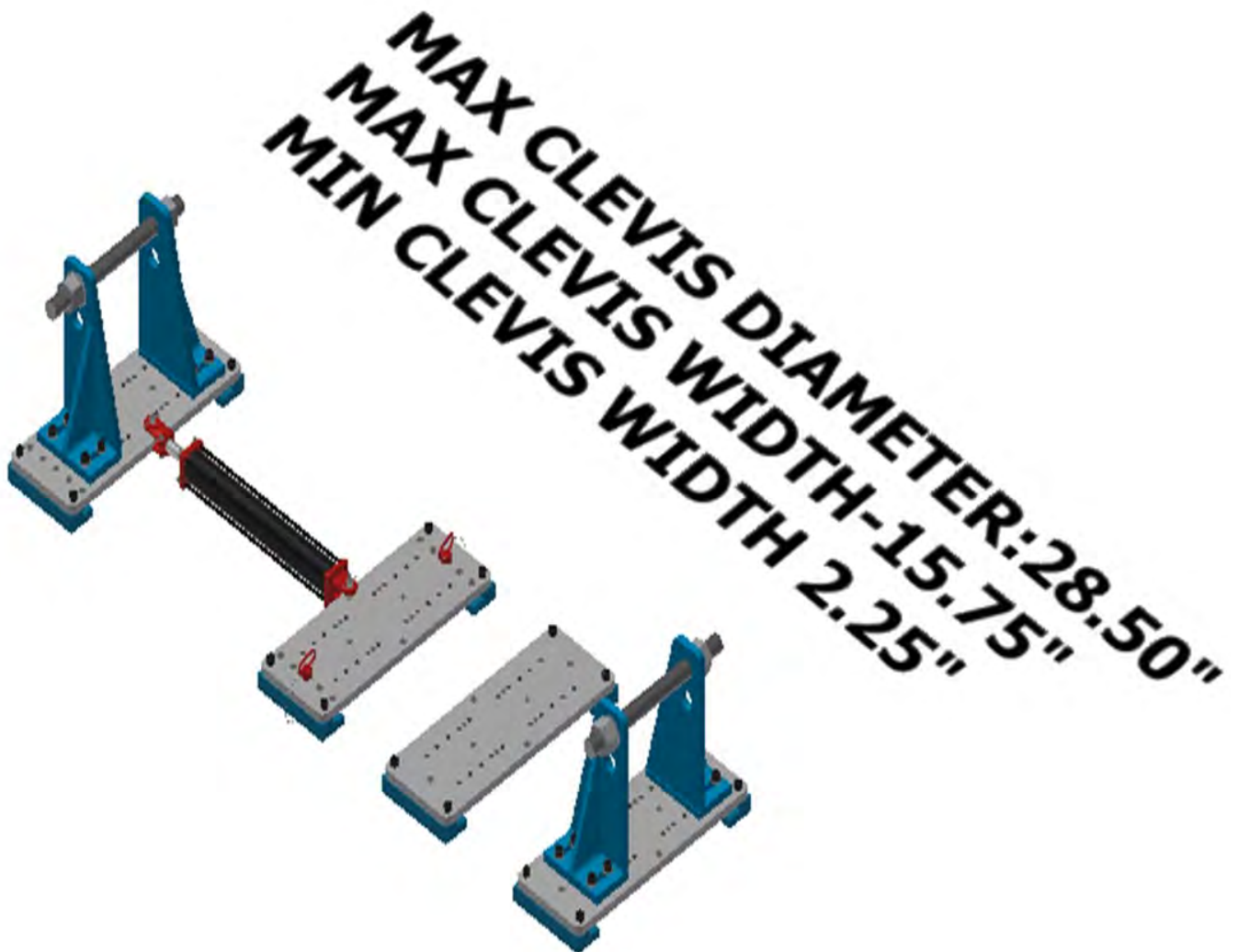


MSD-CYLPA (CYLINDER PULL APART PACKAGE)



Cylinder pull apart package to assist in cylinder disassembly/reassembly on our standard cylinder disassembly bench. Package includes two (2) MSD-BT fixed brace tools, two (2) MSD-SP slide plates, two (2) MSD-SPPA slide plates, two (2) MSD-SPS slide plate spacers (2 per set), two (2) MSD-LP locking pin sets (2 per set) and one (1) MSD-PAC 3" x 24" (76.2 mm x 609.6 mm) stroke pull apart cylinder. The pull apart cylinder will reduce the effort involved in disassembling a large cylinder.

MSD-CYLPA-15.75 (CYLINDER PULL APART PACKAGE)



Cylinder pull apart package to assist in cylinder disassembly/reassembly on our standard cylinder disassembly bench. Package includes two (2) MSD-BT15.75 brace tools (2 per set), two (2) MSD-SP-BT15.75 slide plates, two (2) MSD-SPPA-BT15.75 slide plates, two (2) MSD-SPS slide plate spacers (2 per set), two (2) MSD-LP locking pins (2 per set) and one (1) MSD-PAC 3" x 24" stroke pull apart cylinder. The pull apart cylinder will reduce the effort involved in disassembling a large cylinder.

PULL APART CYLINDER(MSD-PAC)

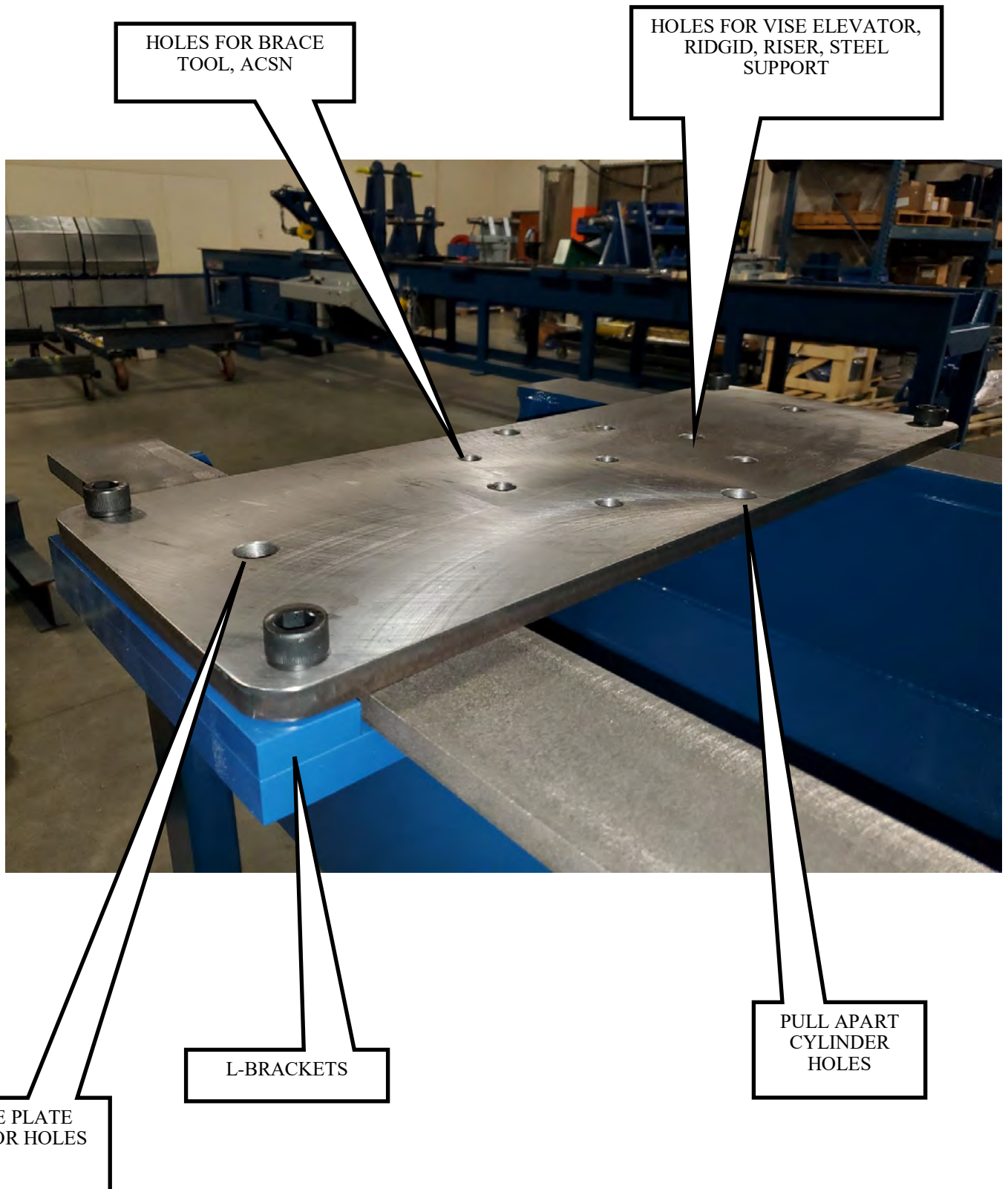
Standard Pull Apart Cylinder Operating Instructions



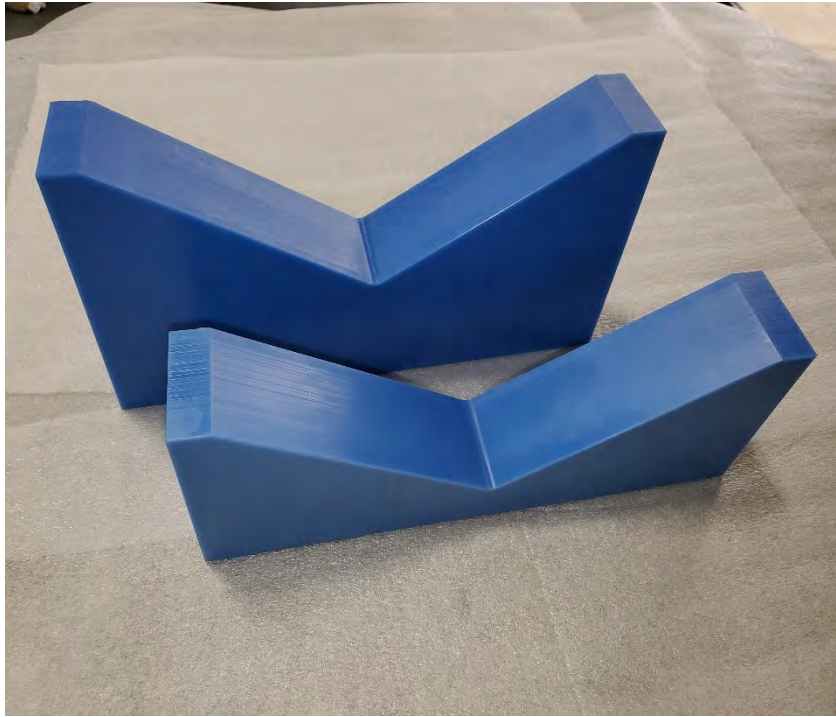
1. The Pull Apart cylinder is used to pull rods out of cylinder tubes. It is attached to a slide plate that has been secured to the frame and pulls on a second slide plate that can move along the frame rails.
2. The nuts on the moving slide plate should be snug enough to minimize lifting or cocking of the slide plate, yet loose enough to let the plate move smoothly. The slide plate should not move easily when pushed or pulled by hand.
3. The Pull Apart cylinder should be used with the Brace tooling for maximum safety. The brace tooling will hold the rod or tube clevis securely and minimize the chance that the components could slip out of the machine during operation.
4. The Pull Apart cylinder is extended or retracted to move the cylinder and can be relocated to pull apart a cylinder longer than itself. A pull is made, the Pull Apart cylinder is relocated, and another pull can be made. This sequence is repeated until the cylinder is disassembled.
5. **Do not stand in line with the tube or rod during the operation of the Pull Apart cylinder.** If the tube or rod pulls free of the mounting plates during disassembly they can fly out and cause bodily harm.
6. Care must be taken to apply pressure to the cylinder slowly. Rapid and prolonged pressure can increase the possibility of the rod or tube breaking free from the disassembly fixture. The Nylon v-blocks or some other method must be used to support the rod in case it would come free of the cylinder being disassembled.

SLIDE PLATE (MSD-SP)

Our standard slide plate is predrilled for all our tooling. Instruction for use of the plate is included with each of the tools.



NYLON “V” (MSD-V)



NON-MARRING “V” set (one set high and one set low) used to support finished shafts in assembly and disassembly. These can be mounted in the Vise elevator or attached directly to the slide plates.

1. They should always be kept clean. Hydraulic cylinder shafts may rub across the nylon, and any debris might cause some scoring. The Nylon is soft enough to allow particles to embed in the nylon instead of rubbing against the rod. It is better to keep the nylon clean rather than dig out embedded particles or risk scoring an expensive rod.
2. Position the “V” so that the cylinder rod is lined up with the center hole of the Nut Buster. It is not necessary to measure the alignment, simply make sure that it looks aligned. This will be close enough to allow the Nut Buster to work properly.
3. Replace the nylon when it becomes frayed or loaded up with metal particles. This is high density nylon and should last a very long time if you take care of it.

WISE ELEVATOR (MSD-VE)

THE VISE ELEVATOR IS DESIGNED FOR HIGH TORQUE AND CAN BE ADJUSTED EASILY WITH A 5/8" WRENCH

WISE BOLTS TO OUR STANDARD SLIDE PLATES WITH HOLES PROVIDED



THE VISE ELEVATORS ARE PRE-DRILLED FOR STANDARD CHAIN VISES AND OUR NYLON "V"

The MSD-VE is used with tooling such as the MSD-V and your standard chain vise to position rods and tubes. Due to the wide variety of sizes and types of components that are disassembled by the Nut Buster, we need to adjust the height of the vise or "V" to align the rod with the center of the Nut Buster. The vise elevator will raise or lower the rod or tube to align the nut. The vise elevator can also be used to hold the cylinder head with a chain vise or anchor a cylinder that does not have a clevis.

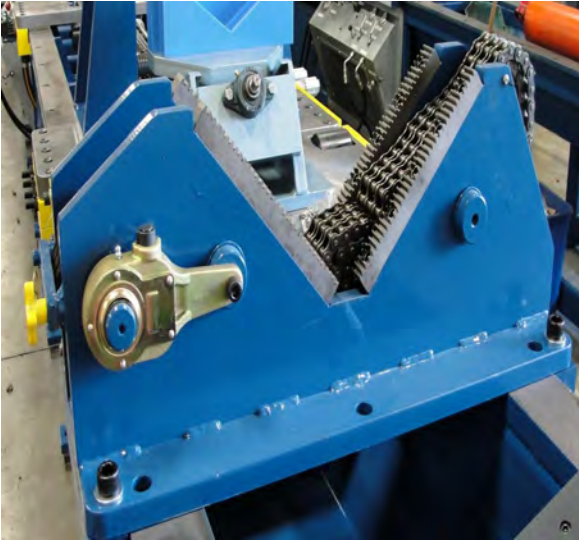
Vise Elevator Operating Instructions

1. Mount the vise elevator on the slide plate.
2. Attach the chain vise or nylon "V" to the predrilled holes in the vise elevator.
3. Mount the rod or tube on the fixture and turn the adjustment screw to set the proper height.
4. Tighten down the slide plate, and chain vise if used.



Heavy Duty Chain Vise
(MSD-HDCV-24, MSD-HDCV-32, MSD-HDCV-48)

Machinery Service & Design now offers a Heavy-duty chain vises up to a capacity of 48" (1219.2 mm). The chain vise is supplied with 10' (3 m) of heavy-duty triple row chain.



4" (101.6 mm) to 24" (609.6 mm)
Heavy-Duty Chain Vise



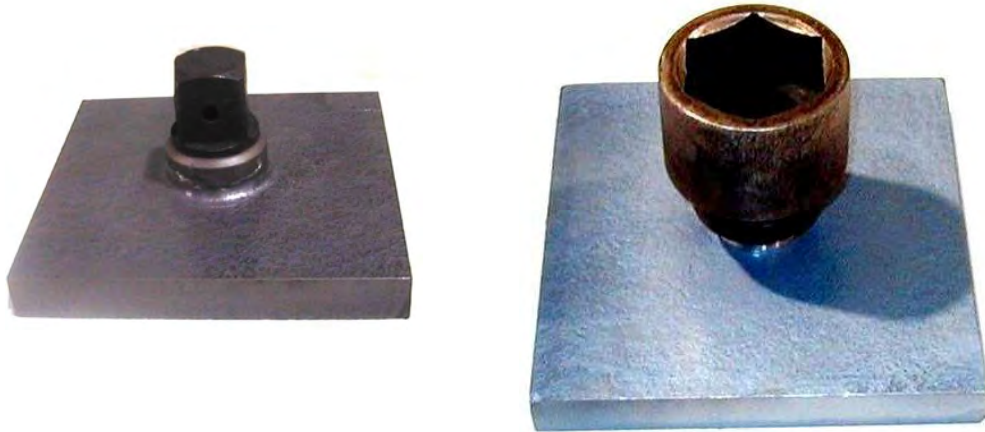
30" (762 mm) to 48" (1219.2 mm)
Heavy-Duty Chain Vise

We currently offer Ridgid chain vises as options for the disassembly table. The chain vises can handle tubes or rods up to 8" (203.2 mm) in diameter. You can purchase and install additional chain to increase the range of the vise to 14" (355.6 mm). Do not use the chain vise as the primary hold down for any torquing operation. The "Nut Buster" generates greater torque than the rating on your chain vise so caution is advised as this high torque could damage your vise.

**8" Ridgid
Chain Vise.**



DRIVE PLATE (MSD-DP-1, MSD-DP-1.5)



Drive plates were developed to use your existing drive sockets with our “Nut Buster”. We can furnish these plates with whatever drive size or configuration you request.

Drive plates were developed to use your existing drive sockets with our “Nut Buster”. We can furnish these plates with whatever drive size or configuration you request.

1. 1” and 1.5” adapters are most popular sizes. This matches with the sockets that many people already own. Metric sizes are available upon request.
2. The plate is installed in the capture ring and rotated 45° to lock it in place. A socket is attached to the adapter.
3. The Nut buster is used in the same manner as the hex plates. See the hex plates for further instructions.

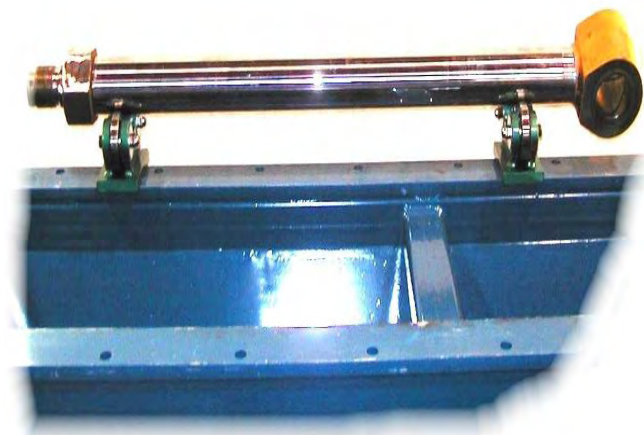
CAUTION: THE “NUT BUSTER” CAN DEVELOP TORQUES MUCH HIGHER THAN THE RATINGS OF MOST DRIVES AND SOCKETS.

The customer is responsible to maintain torques below the maximum torque recommended by the socket manufacturer.

CONCENTRIC ROLLERS (MSD-CR, MSD-CR-LG)



The concentric rollers are used to check concentricity and roundness of hydraulic shafts. They are easily positioned on the slide rails of our Disassembly fixture to whatever spacing is required for the shaft being checked. MSD-CR-LG concentric roller set is used to check the rod concentricity from 6" (152.4 mm) to 14" (355.6 mm).



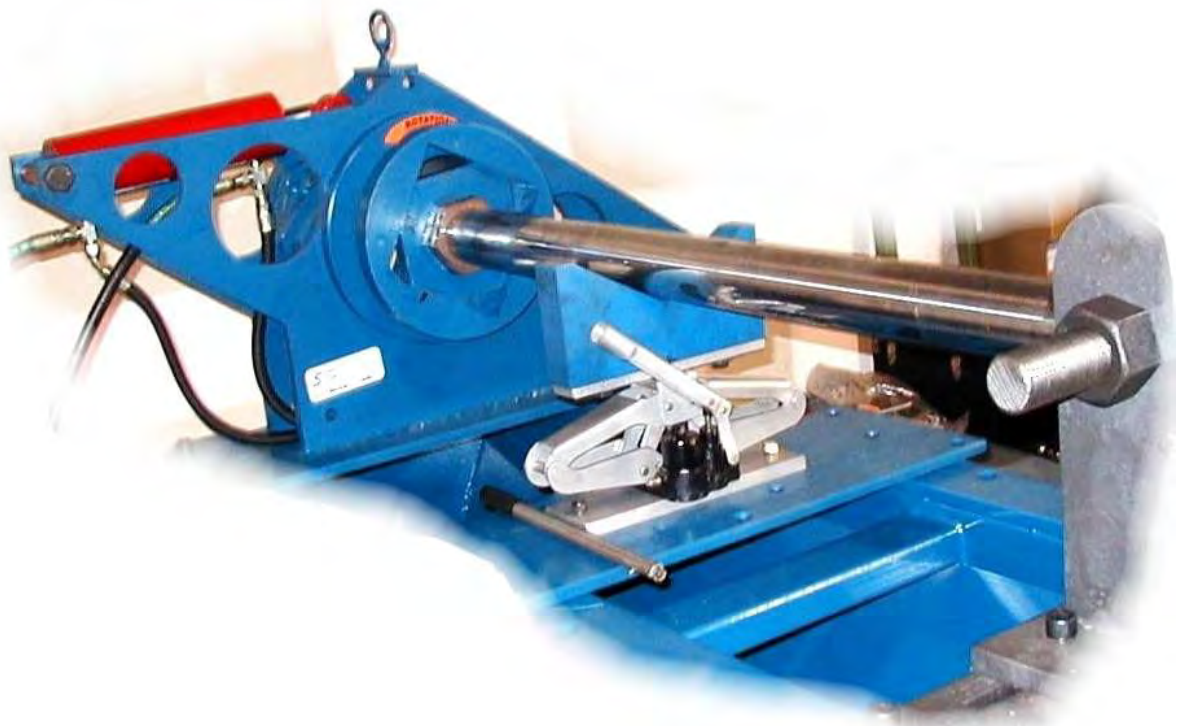
With the shaft cradled in the two roller bearings a magnetic base dial indicator can be used to check the straightness of the shaft as it is being rotated.

HYDRAULIC ELEVATED “V” (MSD-HEV)

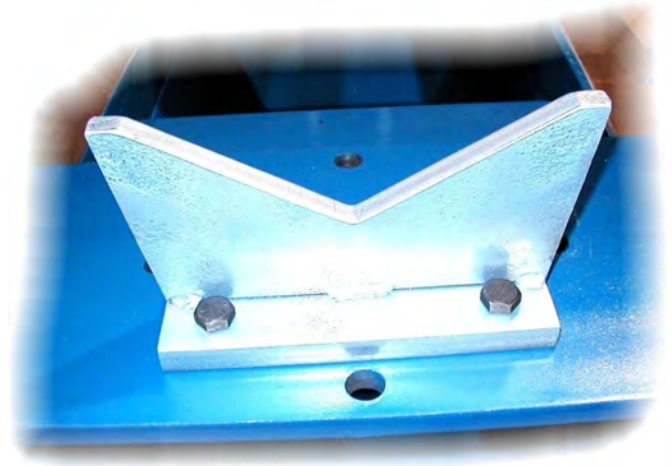
This manually operated hydraulic scissors jack (one ton and two ton) can be used to support chrome-plated shafts or tubes without marring the finish. These tools are light weight and easily positioned.



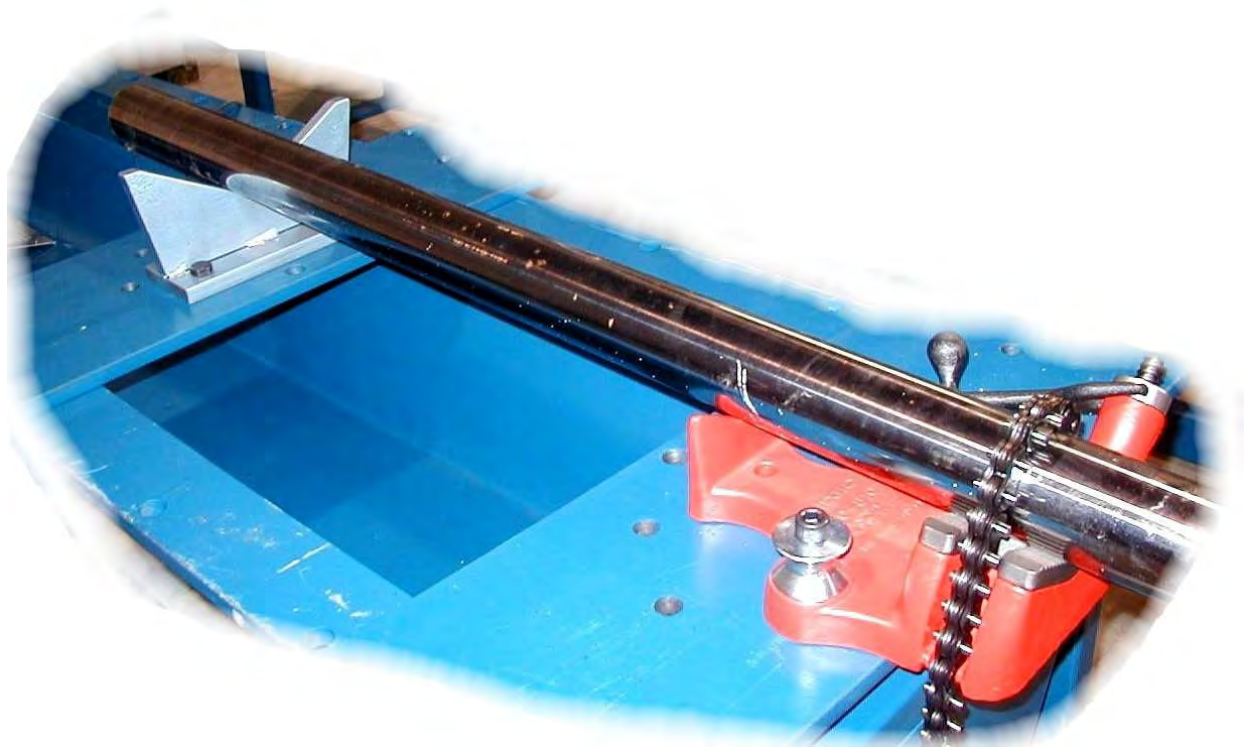
The hydraulically elevated “V” assembly consists of a hydraulic scissors jack with our 2” (50.8 mm) thick nylon “V”. It is manufactured to bolt easily to our standard slide plates. This tool is used to support chrome-plated shafts or tubes without marring the finish. This lightweight tool can be easily moved into position or removed when not in use.



STEEL SUPPORT “V” (MSD-SS)



This simple steel support “V” is used for secondary support of cylinders with a chain vise as the primary retainer. The “V” is concentric and of the same height as a standard “Ridgid” chain vise. This tool is manufactured to bolt to our standard slide plates.



ADJUSTABLE CAPTURE FOR ROTATION OF CYLINDERS (MSD-ARC)



This tool fits in any of our “Nut Busters. It is used to rotate cylinder tubes with clevis ends of widths from 2” (50.8 mm) to 14” (355.6 mm).

The clevis end of the tube is positioned at the center of the “Nut Buster”. Arms are slid in to secure both sides of the clevis and tightened in place by a socket head cap screw, located in the center of each arm. The 2” (50.8 mm) threaded rod is then passed through the two arms and clevis and secured with the nuts provided. The tube is now captured and ready for rotation.

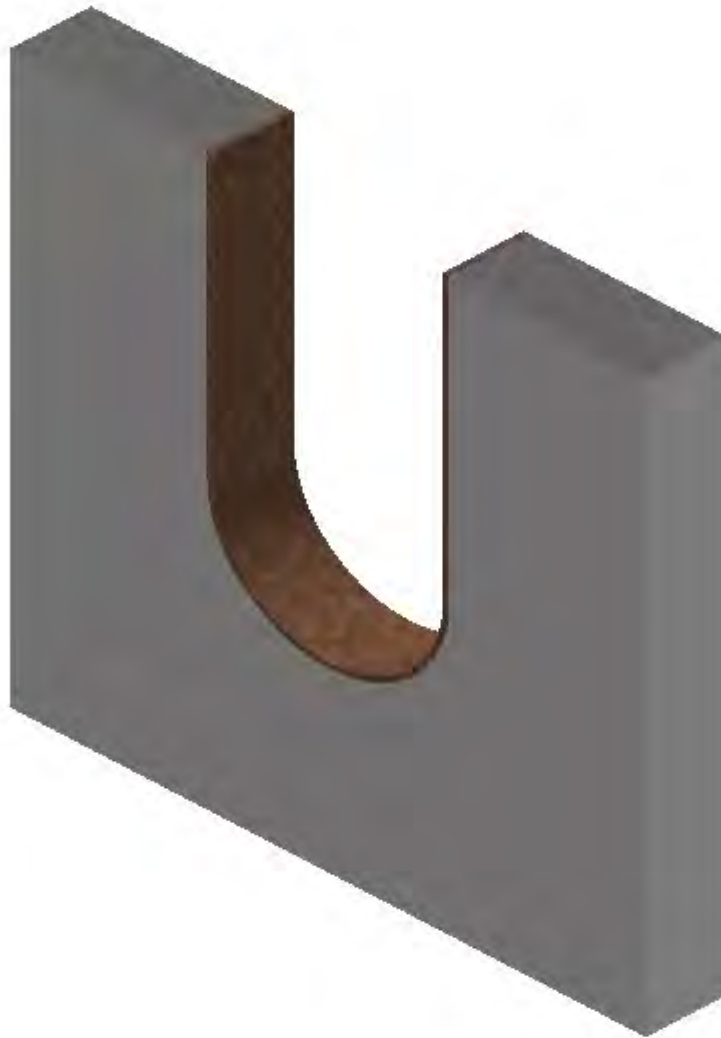


MSD-HEV hydraulic elevated “V” is used to center clevis and provide additional support.



FIXED PLATE SPANNER
(MSD-FPS-2, MSD-FPS-3, MSD-FPS-3.5)

The heavy-duty fixed pin spanner tool comes in three standard sizes 2", 3", & 3 1/2" (50.8 mm, 76.2 mm, 88.9 mm). They have an 8" X 8" (203.2 mm X 203.2 mm) outside dimension to fit our "Nut Buster". A 3/16" (4.8 mm) thick leather liner protects the shaft from damage upon installation and removal. The plates are Blanchard ground and scribed for easy center locating.

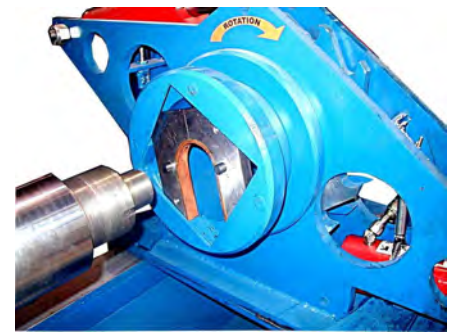
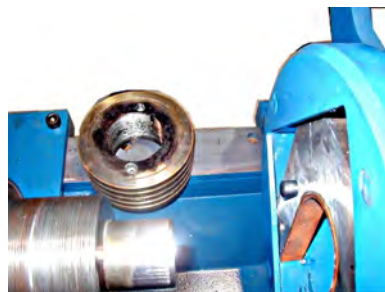


The Heavy-Duty Fixed Pin Spanner plates are designed to remove heads and glands. Plate is supplied with no holes, customer to determine and drill the correct center line distance and pin diameter for application.

FPS Operations

1. The Fixed plate spanner is designed for high torque removal of cylinder heads with pins located on the face of the head. With this tool a shaft and clevis can be placed through the “Nut Buster” prior to installing the tool. Contact Machinery Service & Design to order special plates.
2. Mount the tool in the correct side of the Nut Buster; be sure to check the rotation of the tool before installing the tool. The arrow on the upper portion of the Nut Buster will indicate the rotation.
3. When using our spanner tools remember the head will be pushed tighter against the tool as the head is loosened. Be sure to loosen either the “Nut Buster” base or the Brace Tool after the part is broken loose. **One of the two must be loose as the head is removed, to allow for travel of the cylinder head along its threads.**
4. Keep a small amount of tension on the tool, or carefully hold the hooks against the cylinder head while ratcheting the tool. It is easy for the pin to become disengaged while reversing the tool to get another grip on the ratchet.
5. After the head is loose, separate the Nut Buster away from the cylinder head and finish removing the head by hand.

The heavy-duty fixed pin spanners can be used to remove heads and glands. They can also be used in the application as shown. Spanner holes were drilled in a stubborn piston and removed with the MSD-FPS tool.



LIGHT-DUTY SPANNER SET (MSD-LSS)



This light duty spanner plate can be used on shafts up to 4 1/4" (108 mm) and uses our standard pin spanner and hook spanner sets.

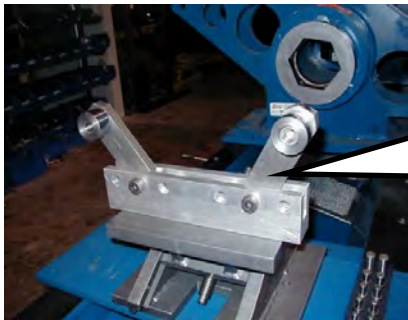
The MSD-Adjustable spanners are designed to hook on to the slots or grooves located on the outside of some cylinder heads. The arms can be made to fit nearly any configuration of slot or groove. A large 4.25" (108 mm) hole through the center allows a shaft and clevis to extend through the tool while working on the cylinder head. Our standard pin spanner comes with three sets of pin arms with 3/8", 7/16", 1/2" and 5/8" hardened pins. Contact Machinery Service & Design to order special arms or to obtain manufacturing information to allow you to make your own arms. Metric pins are available upon request.

Hook Spanner Operations

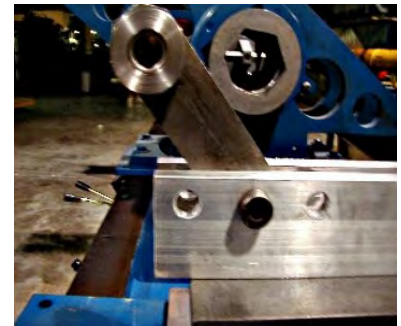
1. The hook spanner is the same basic tool as the Pin spanner. The arms are interchangeable to convert from pin spanner to hook spanner. Some customers will prefer to keep one of each of the tools set up to avoid the extra time in changing the arms for every job.
2. The operation of the hook spanner is nearly the same as the pin spanner. **Remember, always pull with the hook arm, never push the arm.**
3. Mount the tool in the correct side of the Nut Buster; be sure to check the rotation of the tool before installing the tool. The arrow on the upper portion of the Nut Buster will indicate the rotation.
4. When using our adjustable hook spanner tools remember the head will be pushed tighter against the tool as the head is loosened. Be sure to loosen either the "Nut Buster" base or the Brace Tool after the part is broken loose. **One of the two must be loose as the head is removed, to allow for travel of the cylinder head along its threads.**
5. Keep a small amount of tension on the tool, or carefully hold the hooks against the cylinder head while ratcheting the tool. It is easy for the hook to become disengaged while reversing the tool to get another grip on the ratchet.
6. After the nut is loose, pull the Nut Buster away from the head and finish removing the head by hand.

LARGE DIAMETER ADJUSTABLE SPANNER (MSD-LDAS)

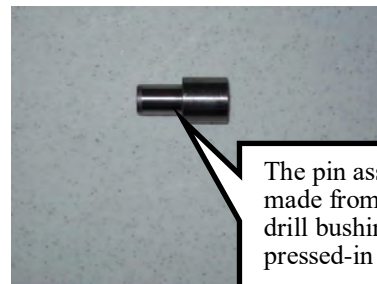
This fixture is used for pin spanner application on large diameter heads of pistons. The fixture mounts on our standard MSD-VE vise elevator for overall height adjustment. (left) The cylinder or shaft is then rotated by the MSD-ARC in any of our “Nut Busters”.(right)



The main support has 3 arm mounting positions to cover 3 diameter ranges. The arm is shown installed in the center position.

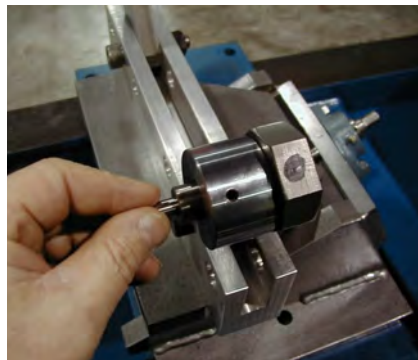


The unit comes with five drive pin sets of 3/8\", 7/16\", 1/2\", 5/8\" and 3/4\". Metric pins are available upon request.



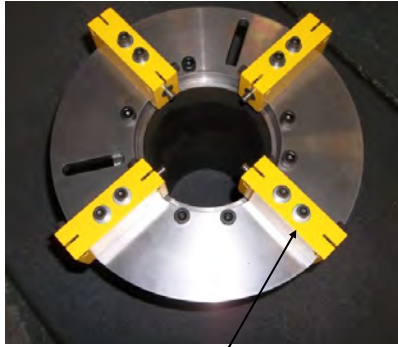
The pin assembly is made from a 3/4\" OD drill bushing with a pressed-in dowel pin.

The drive pins are easily inserted and held in the 3/4\" ID

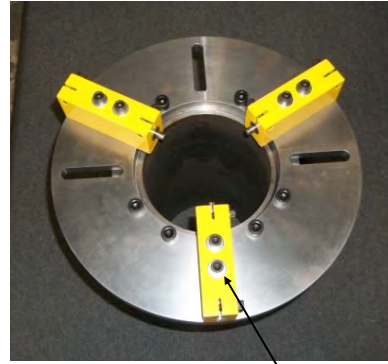


Three- and Four-Point Spanner Tool (MSD-FPST)

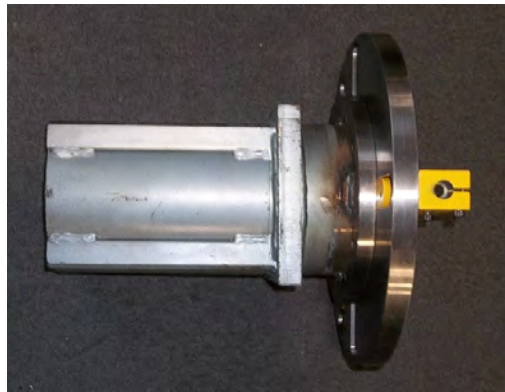
Machinery Service & Design offer a three- and four-point spanner tool. The tool is constructed with a 6 5/8" (168.3 mm) diameter thru hole. This tool is supplied with a set of these spanner pins 3/8", 7/16", 1/2", 5/8", 3/4". Metric pins are available upon request.



Four Point Spanner



Three Point Spanner

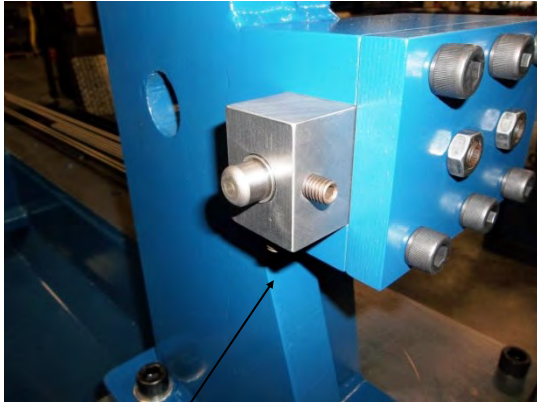


Pins for the MSD-FPST (Part# FPST Pin Set)



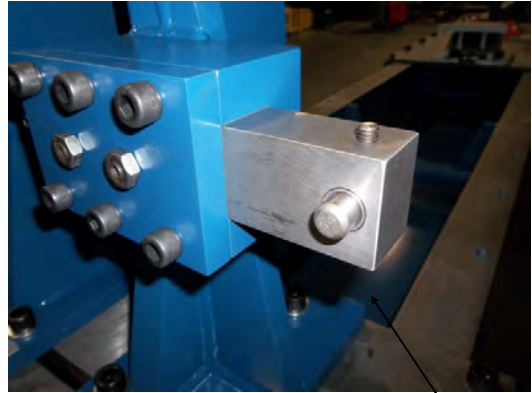
Heavy Duty Spanner Set (MSD-HDSS)

SIDE SPANNER



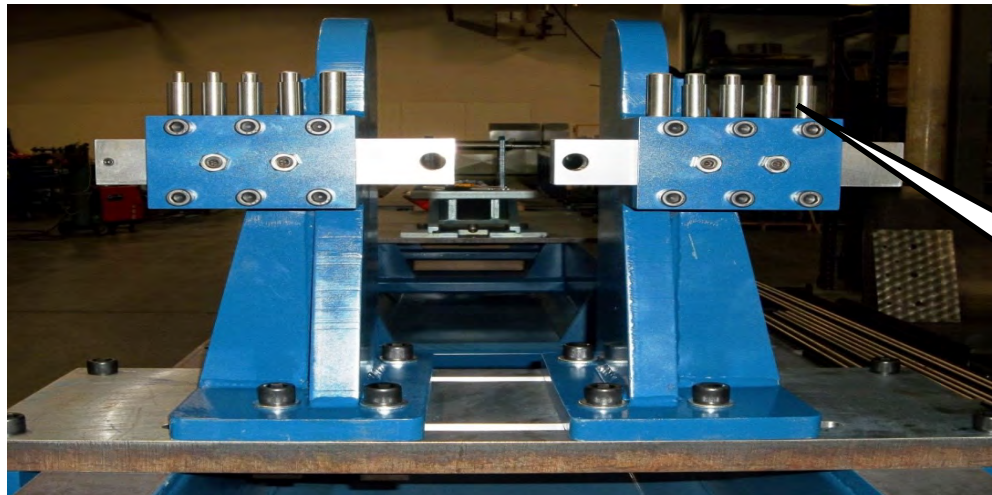
Side Spanners

FACE SPANNER



Face Spanners

**HEAVY DUTY SPANNER TOOL. 16" MAXIMUM DIAMETER
PIN SPANNER SET 5/16", 3/8", 7/16", 1/2", 5/8", 3/4".**



SPANNER PIN SET

MSD-HDSS welded to MSD-ABT (for reference only)

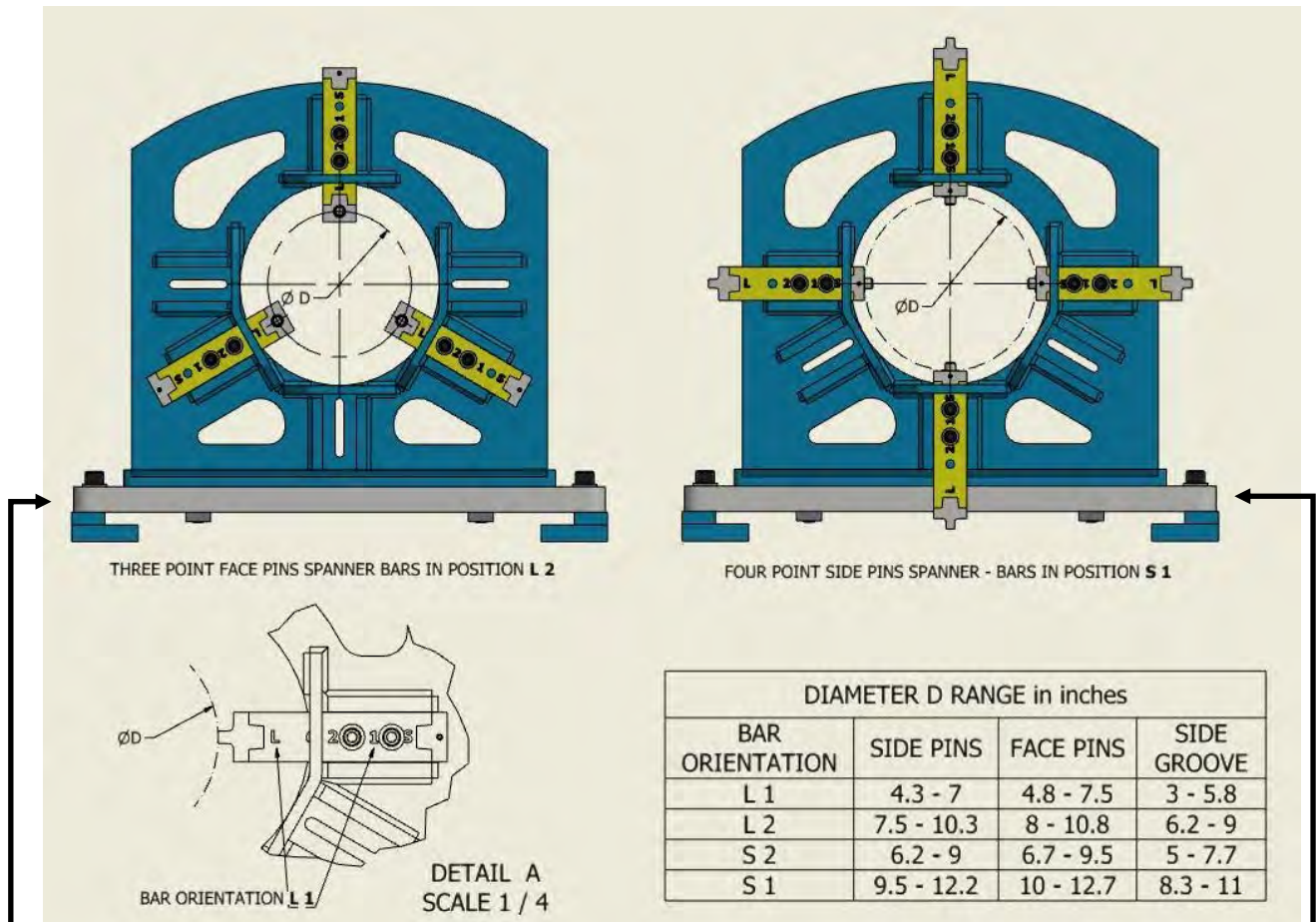
NEW**MSD-LDFS**

Large diameter four point spanner tool (MSD-LDFS). This tool can be used as a two, three or four point spanner. This spanner is designed to bolt on to your existing adjustable brace tool style base plate (MSD-ABT). Base plate is not provided. Optional base plate and L-Brackets are sold separate. Included with this spanner are 4 sets of each pin assembly 5/16", 3/8", 7/16", 1/2", 5/8" and 3/4". Also included, are four 1/2" side groove caps for slotted grooves.

This tool is designed to be at the same center height as the nut buster. Please specify the center height when ordering. (13.5" or 16.5") and what size nut buster you have.

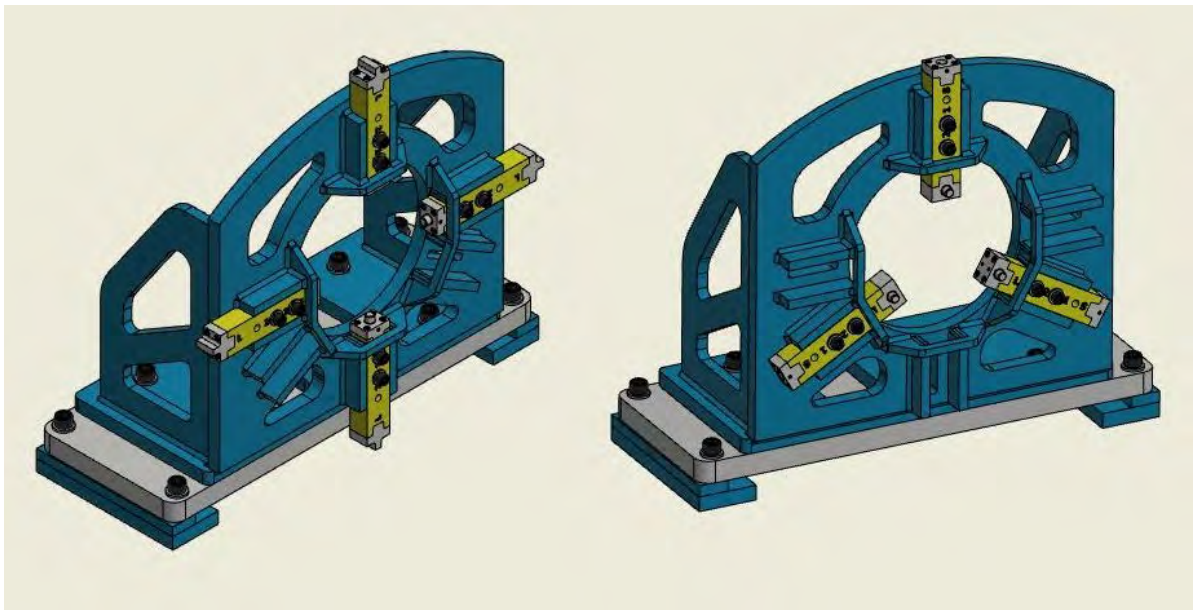
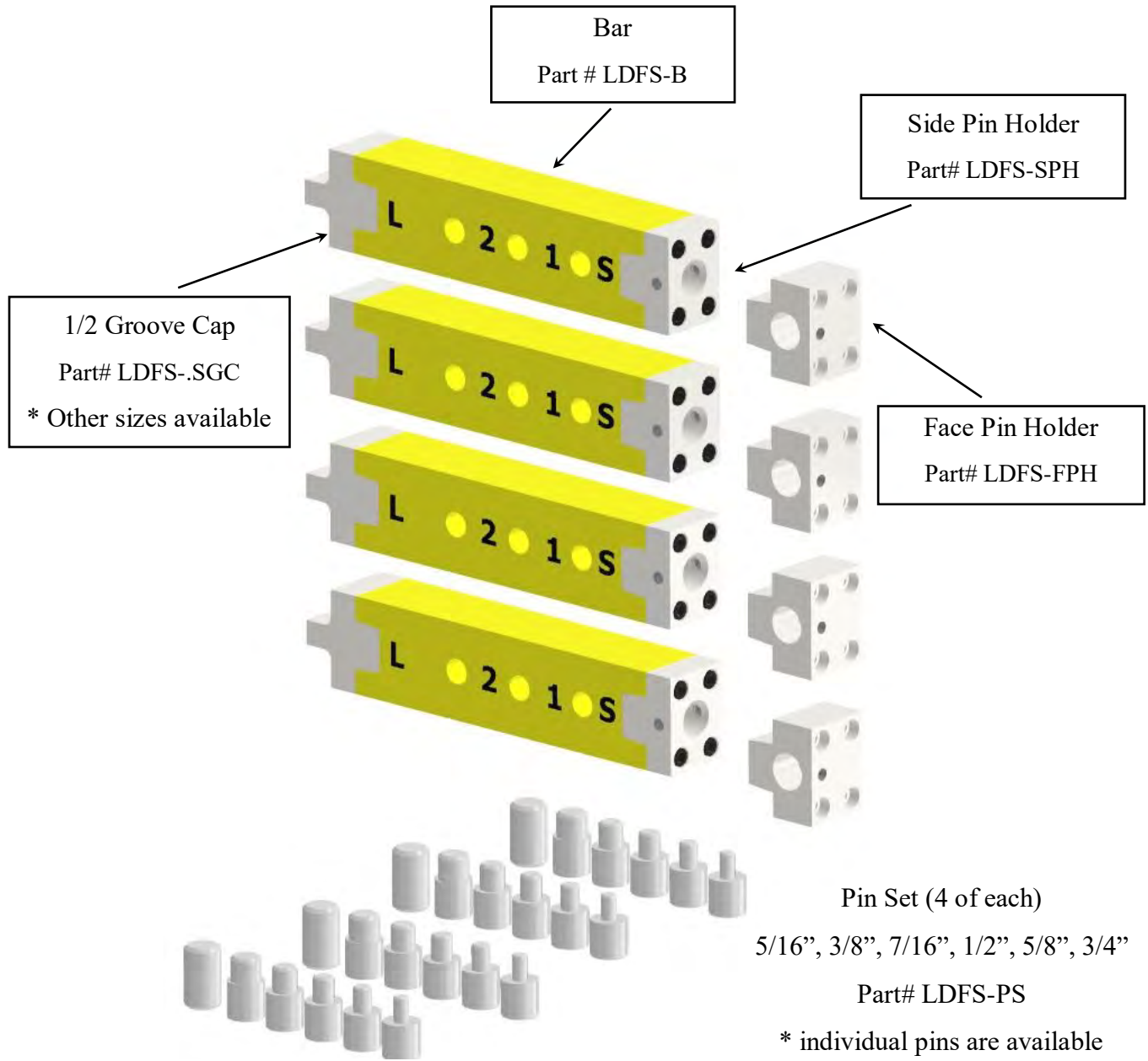
**Shown
3 Point Spanner Bar**

**Shown
4 Point Spanner Bar**



Base plate shown not included.

Shown with customers existing MSD - ABT base plate.



CUSTOM SOCKET (MSD-CS)



This socket tool is used on pistons with recessed nuts. The socket can be made to any size and/or configuration mounted to a standard plate that fits our “Nut Buster”. These sockets are made to take the high torques our “Nut Buster” develops.

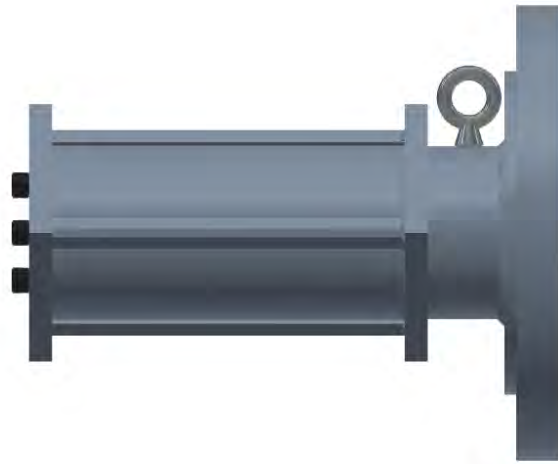


The through hole on our socket tools allows for clearance of the cushion extension found on some cylinders. With the MSD-CS socket tool the need for deep well sockets in the larger sizes is eliminated.

(We can custom build to any size or configuration)



HEX PLATE DRIVE SOCKET (MSD-HPDS)



Drive socket adapter is for large hex nuts ranging in size from 155 mm to 345 mm (this adapter has a built-in 345 mm hex).

Note: Drive sockets are sold separately. Customer will determine the sizes.

VACUUM PUMP SYSTEM (MSD-VPS)

The Machinery Service & Design vacuum system is used to assist the reassembly of hydraulic cylinders. This system takes advantage of atmospheric pressure to simplify the process of entering seals into the bore chamfer and retracting the shaft. Our two-stage pump delivers high volume and produces vacuum up to 30" (762 mm) of mercury.



The pump is connected to the rear port of the tube while the front port is blocked with a cap plug. When the first seal starts into the chamfer a vacuum begins to build up in the tube and atmospheric air pressure forces the piston into the bore.

Examples of pressure build-up:

At a 4" (101.6 mm) bore the force will reach 180 psi (12.4 bar)

At a 5" (127 mm) bore the force will reach 420 psi (29 bar)

At a 6" (152.4 mm) bore the force will reach 750 psi (51.7 bar)



This system eliminates having to pound the piston into the bore with the real possibility of damaging the seals during this process. The technician simply glides the assembly to the point desired.

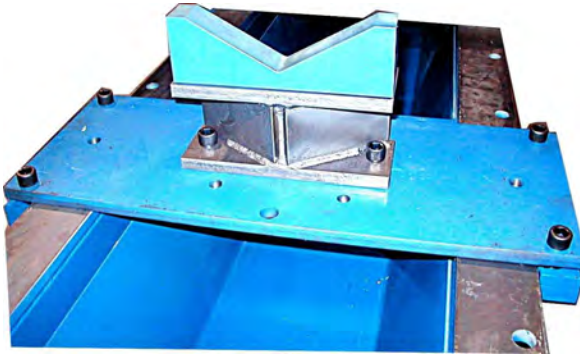
With the subtleties of the vacuum system any tight spots are caught before doing any damage.

Using the vacuum assembly is a fast, safe, and ergonomically effective way to streamline cylinder assembly.



RISER (MSD-R)

Risers - used to elevate vises, nylon "V's" or other tooling. Holes are drilled to fit our slide plates (bottom) and our standard tooling on the top.

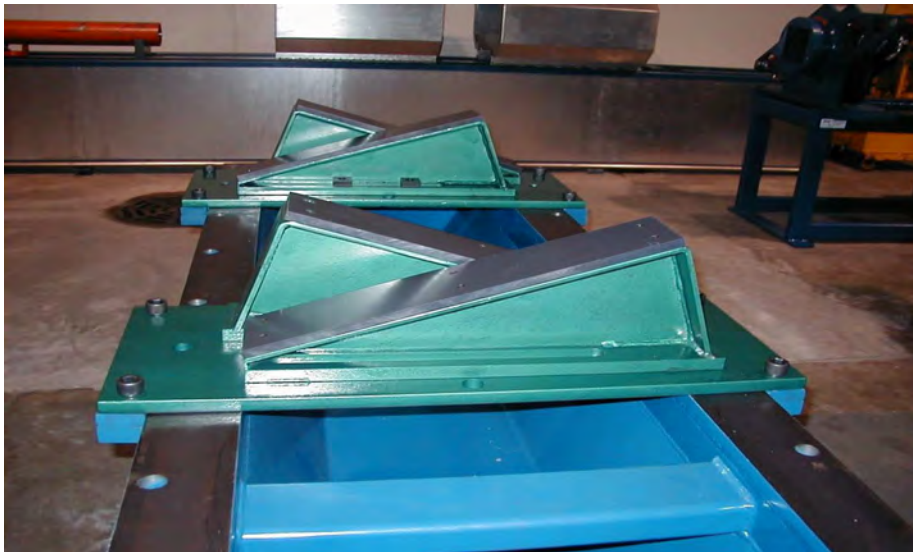


ADJUSTABLE CYLINDER SUPPORT NYLON (MSD-ACSN)

This fixture is used to support large cylinder tubes and shafts that are too large to be secured in a chain vise. It can accommodate large and irregular shapes and mounts to any MS&D slide plate.



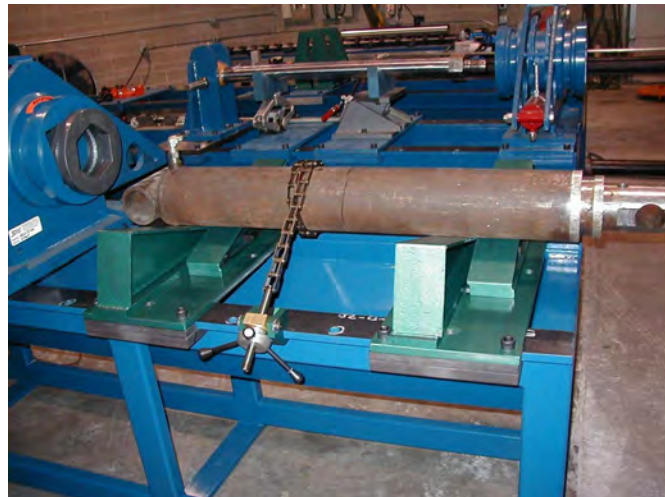
The individual “V” sections are slotted and are secured between two 3/4” T nuts.



As the V's move toward each other, the over-all height of the supporting surfaces increases. One application for this feature is to align a shaft to tube for assembly. Irregular shaped cylinders can be supported horizontally by adjusting each set individually.

The MSD-ACS (Adjustable cylinder support) is manufactured with either a Nylatron cover for polished surfaces or plain steel to support cylinder tubes.

The plain steel support would be used on non-finished surfaces.



When polished shafts require to be secured in place the strap assembly is used with the Nylatron covered surface.



HOLDDOWN (MSD-HD, MSD-CHD-HD, MSD-SHD, MSD-SHD-HD)

The Hold downs are manufactured to secure tubes and cylinders to our Disassembly Table.

MSD-SHD: Strap hold down for a Standard duty bench

MSD-SHD-HD: Strap hold down for a Heavy-duty bench



The MSD-SHD is used on plated or machined surfaces.



The strap hold down adapts standard 2" (50.8 mm) hold down straps to our table.

MSD-CHD: Chain hold down for a Standard duty bench

MSD-CHD-HD: Chain hold down for a Heavy-duty bench



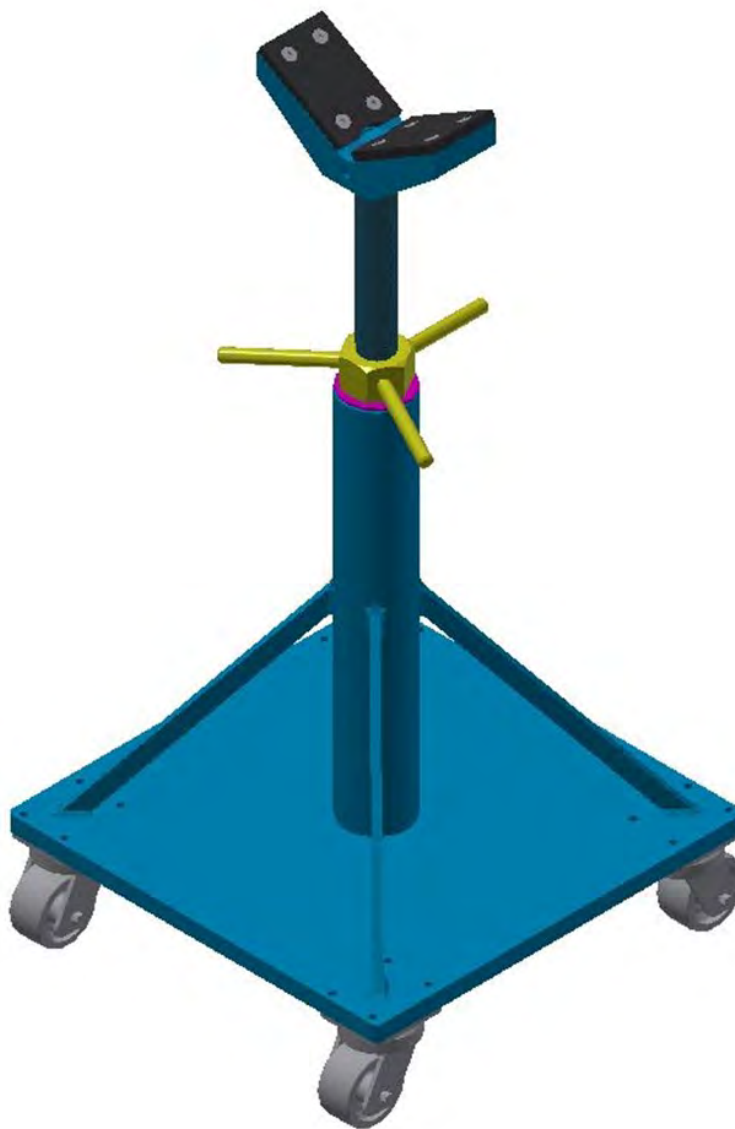
Chain hold down is used on cylinders that must be secured for component repair.



Chain is single wrapped around cylinder – chain link is secured into notch in chain block – and secured tight with the handle on opposite table rail.

PORTABLE V-SUPPORT CART (MSD-PVSC)

MSD-PVSC is a portable "V" support cart. Load rating is 6,000 pounds (2,721.5 kg). The "V" support cart can be adjusted up and down with a range of 18" (457.2 mm). The cart is designed for a maximum diameter of 16" (406.4 mm).



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