



Volume 3
3

HIGH SPEED INTERNAL TUBE CUTTER

MODEL AA-4

HIGH SPEED INTERNAL TUBE CUTTER MODEL AA-4



FORWARD

Congratulations and Thank You for purchasing the finest internal tube cutter made today with patents starting from 1931.

The ease of use and rugged design will provide many years of dependable operation. The type AA cutter has many accessories available to meet your needs.

Sold in various Electric and Pneumatic models for cutting materials from admiralty brass to stainless steel and titanium.

The type AA cutter can also be used to serrate multi grooves in tube sheet holes using a serrating adapter. The serrating blades are manufactured to your specifications.

The type AA cutter can also be used to trim the tubes to a specified projection length from the tube sheet face by using the trim stop. This will produce a uniform tube length for later coating

HIGH SPEED INTERNAL TUBE CUTTER MODEL AA-4

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INTERNAL TUBE CUTTER

AIR SOURCE REQUIREMENTS

Recommended Air Pressure: 90 P.S.I. Minimum 125 P.S.I. Maximum with a 3/8 inlet.

The Cleco Drives (160 RPM) run on air pressure alone. Varying the pressure will vary RPMs

The Sioux Drives (1465 – 1000 RPM, 1466 – 550 RPM, and 1467 – 375 RPM) have a governor that maintains speed as long as the minimum air supply is supplied.

ELECTRIC SOURCE REQUIREMENTS

Milwaukee Drives (1000 or 500 RPM) Standard 110vac single phase grounded receptacle.

LUBRICATION OF PNEUMATIC DRIVES

It is recommended that the supplied whip hose with the ASL #5 Lubricator be used for best results. A good grade of S.A.E. #10 lubricating oil is recommended. Set lubricator to 5 to 10 drops of oil per minute.

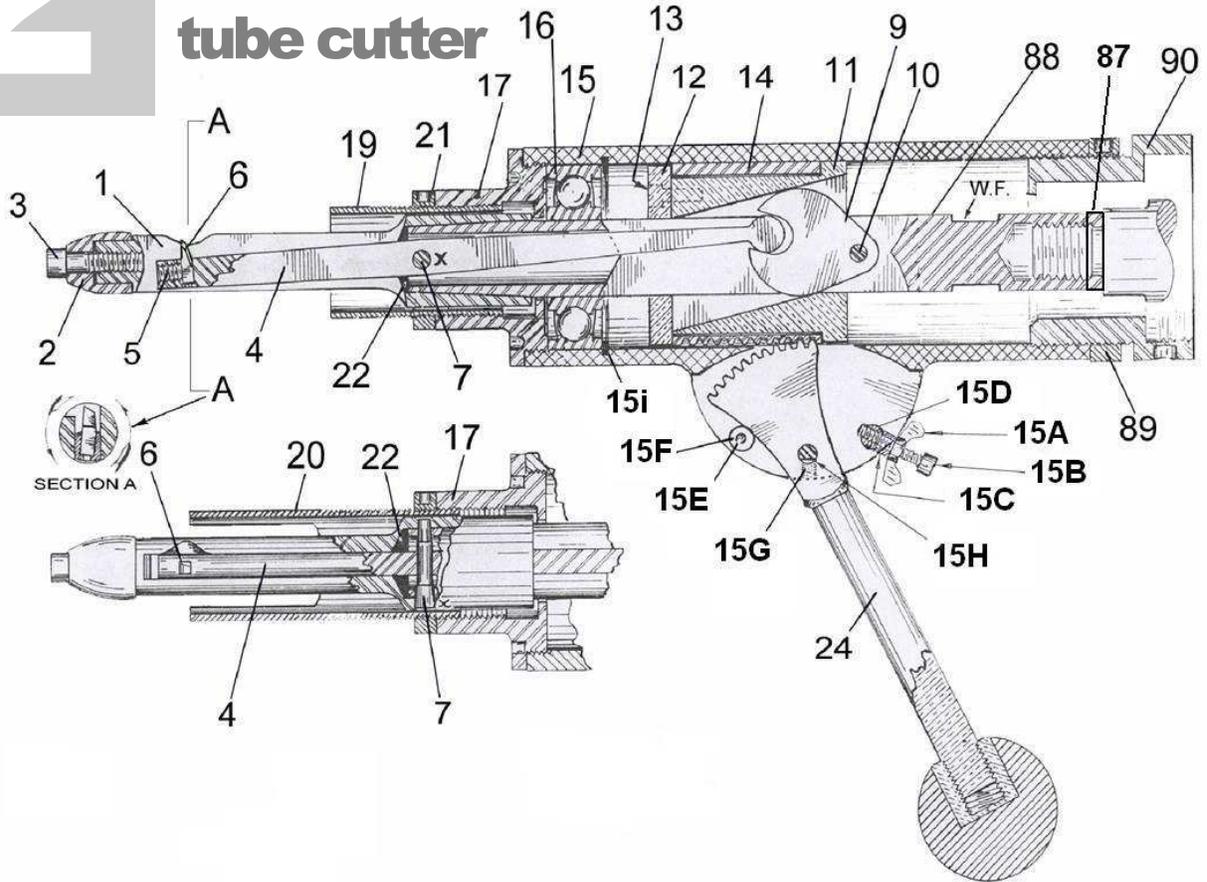
Plain bearing grease is use in:

1. the pockets of the feeder spool
2. Coat the front shield of bearing #16 to aid prevent contamination
3. Gear housing of the drives

INCLUDED ITEMS

1. AA Cutter Body
2. Drive
3. 1.5-3" Pin Spanner Wrench P/N 31
4. A&S Pin Spanner Wrench P/N 27
5. A&S Knock adaptor off bar P/N 29
6. 1/8" Pin Punch P/N 38
7. Assorted Allen Wrenches P/N 42
8. Depths Stop with Lock Ring P/N 19-08 & 21
9. AA Whip Hose with ASL LUBRICATOR and Foster Safety Disconnect

Parts List for the AA internal tube cutter



ITEM	PART NUMBER	PART NAME	REQ'D	ITEM	PART NUMBER	PART NAME	REQ'D	ITEM	PART NUMBER	PART NAME	REQ'D
1	1	Spindle	1	14	15	Jacket Assem.	1	27	20	Trim Stop	1
2	2	Pilot	1	15	15a	Wing Nut	1	28	21	Stop Lock Ring	1
3	3	Pilot Screw	1	16	15b	Cap Screw	2	29	22	Rubber Seal	1
4	4	Tool Holder Leg	1	17	15c	Spacer	1	30	24	Handle	1
5	5	Leg Screw	1	18	15d	Rear Stop	1	31	27	A&S Spanner Wrench	1
6	6	Tool Bit	1	19	15e	Handle Stop Set Screws	4	32	31	Spanner Wrench	1
7	7	Leg Pin	1	20	15F	Front Stop	1	33	87	Shaft Spacer	1
8	9	Cam	1	21	15G	Handle Pin Set Screws	4	34	88*	Shaft	1
9	10	Cam Pin	1	22	15H	Handle Pin	1	35	89	Jacket Lock Ring	1
10	11	Spool	1	23	15i	Bearing Retainer Ring	1	36	90*	Motor Adaptor	1
11	12	Spool Cap	1	24	16	Bearing	1				1
12	13	Cap Screw	2	25	17	Bracket	1				
13	14	Spool Feeder	1	26	19	Depth Stop					

* Specify Drive Type for P/N 88 or 90

OPERATING AND MAINTENANCE INSTRUCTIONS FOR TUBE CUTTER TYPE AA

PREPARING THE TUBE CUTTER FOR OPERATION

Before using the tube cutter, determine the thickness of the tube sheet, size and gauge of the tubes, and the amount to be cut off the tubes. The tube cutter when shipped from the manufacturer is set to the size and gauge ordered. The depth adjustment will vary with the requirements stated in the order of the machine. The placement of the cut in the tube can be varied by adjustment of the depth stop (#19) and the depth stop lock nut (#21).

OPERATION

To cut the tubes, start the air motor making sure it is on fully. Bring cutter handle to the rear position, which retracts tool bit. Insert spindle (#1) into tube until depth stop (#19) is firmly against tube sheet. Move cutter handle (#24) forward slowly until tube is cut through. (It will be up to the operator to get the feel of the cutting tool so he will know how fast to force the handle when cutting various gauge tubes.) Continuous running of the air motor will enable the operator to have better control and more rapid operation of the machine.

REPLACING THE TOOL BIT

When the tool bit (#6) loses its cutting edge it is replaced by loosening the tool holder leg screw (#5). This can be done by removing screw (#3) and putting long end of 3/32" Allen wrench provided, through front end of spindle. Remove the worn tool bit by tapping with pin from underside hole provided in tool holder leg. On standard machines there are two types of tool bits, namely right and left. These tools can be distinguished by holding the cutting edge toward the direction of rotation. The tool bit with the cutting point to the right is termed a right hand tool bit, and is used when the straight face is desired on the inner piece. The tool bit with the cutting point to the left side is termed a left hand tool bit and is used when it is desired that a straight face be left on the piece left in the sheet.

CHANGING ADAPTERS FOR VARIOUS SIZES

When other size tubes are to be cut, the ADAPTER consisting of the pilot, leg and spindle assembly (1-7, 22) can be removed as a unit. The proper size adapter can then be installed in its place.

To accomplish this, the stop lock nut (21) and depth stop (19) or trimming stop (20) should be removed first with the spanner wrench provided. This will expose the tool holder leg pin (7). This pin is a tapered fit and should be removed from the side of the spindle marked with an X by driving opposite side with a 1/8" pin punch provided. Once this pin has been removed, take the spindle knock off tool and drive the spindle off the shaft. This can be accomplished by first pushing the actuating handle (24) forward. This moves the tool holder leg to the side so that the end of the knock off tool can be fitted against the front end of the slot in the spindle. Tap lightly until spindle comes free. Tool holder leg (4) is removed by hand.

When this has been done the new adapter may be installed by taking the desired spindle size with pilot and screw (1, 2, 3) and placing tool holder leg with tool bit set screw and rubber seal (4, 5, 6, 22) through the large tapered end of spindle making sure that the X marked side of the leg faces the same side as the X

marked on the spindle (CAUTION: CARE SHOULD BE TAKEN THAT TAPERS ON SPINDLES AND SHAFT (1, 88) ARE CLEAN AND FREE FROM ALL FOREIGN MATTER.) Take the spindle and leg and place on shaft (88) making sure that X marks on spindle, leg and shaft are on the same side. Move handle (24) until cam (9) slot admits ball end of leg (4). Push spindle upon shaft as far as possible by hand. Look through spindle pinhole. If there is a perfect crescent of approximately 1/32" showing on the front edge of the hole on shaft, the spindle can be tapped with a mallet until the holes are in perfect alignment. Now place tool holder leg pin (7) in the X marked side of the spindle making sure the small end of pin enters first. Tap with pin punch until pin is flush or slightly under the surface of spindle on both sides. If pin protrudes, file flush. Now adapter is changed for desired size. Place depth stop or trimming stop (19 or 20) in position desired and lock with nut (21) making cutter ready for use again.

CARE AND MAINTENANCE

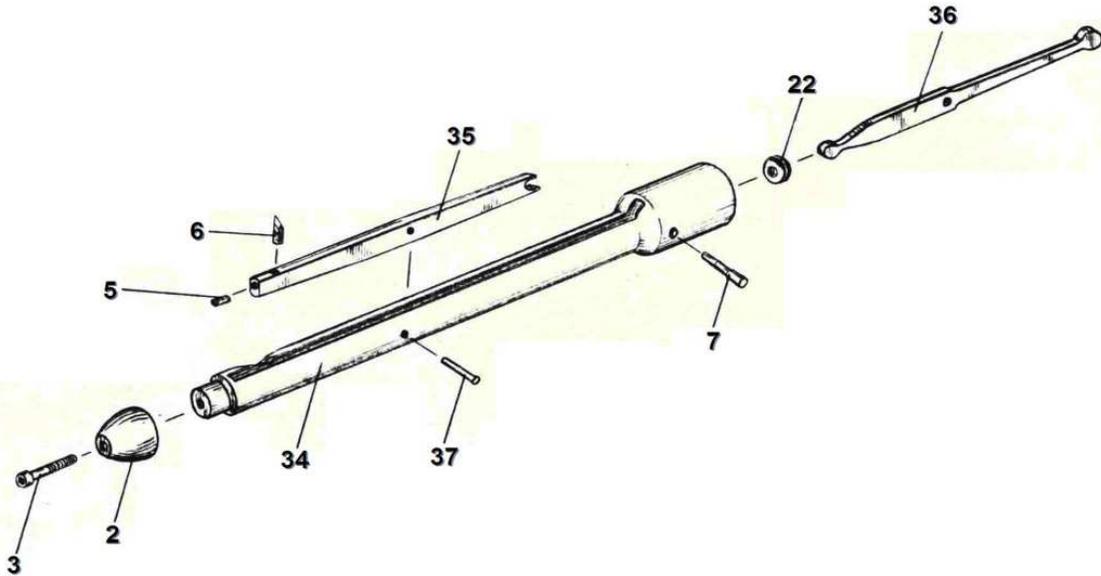
The tube cutter should be dismantled and cleaned as often as necessary. To dismantle the tool, remove the adapter (spindle, leg, pilot, etc.) by the method described in the previous section entitled CHANGING ADAPTERS FOR VARIOUS SIZES. Jacket Lock Ring (89) at rear of jacket (15L) is loosened with special spanner wrench provided. The cutter assembly may then be removed from the drive assembly by unscrewing in a counter-clockwise direction. Next the handle pin screws (28) are loosened at least three full turns with a 5/32" Allen wrench provided. The handle pin (25) is then driven out with a pin punch. This will allow for the removal of the handle (24) from the jacket. The spool and feeder assembly (11-14) may be removed through the rear of the jacket and disassembled by removing the two Allen screws. This assembly should be cleaned and packed with high melt grease. Loosen front bracket (17) from jacket (15L) with special spanner wrench provided with a counter clockwise rotation. Front bearings may be removed from front side of jacket (15L) by driving bearing (16) from inside, keeping clear of bearing retainer ring (91). After all parts have been thoroughly checked for wear, cleaned and greased, cutter may be reassembled in reverse order of disassembly. The spool and feeder assembly (11-14) is inserted in the jacket with the cap and screw end facing the front bearing (16). When doing this, make sure the gear rack on the feeder (14) is line with the handle slot in the jacket. The handle (24) is now placed in the jacket slot making sure that the first gear tooth on the handle fits snugly into the first tooth of the gear rack on the feeder. Line hole in handle up with handle pin holes in jacket. Insert handle pin (25) making sure flats are toward set screws (28). Tighten set screws (28). IT IS IMPERATIVE THAT THE RACK ON THE FEEDER AND THE GEAR ON THE HANDLE AR PROPERLY ENGAGED. The gear on handle and gear on rack should mesh over their entire lengths. Handle should make a full travel from front stop (15F) to rear stop (15R) without binding. The jacket assembly may now be mated with the shaft on the drive motor.

IMPORTANT: The X on the shaft must be in the up position and the cam must be to the left when looking at the shaft from the front. As cutter jacket assembly is slid on over the shaft, the slot in the spool (11) must be fitted over the cam (9) on the shaft (88) being careful to keep the cam and the slot in the spool to the left when looking from the front. Once this fit has been obtained, the jacket is screwed on to motor adapter (90) as far as it will go to jacket lock ring (89) in back position with moderate pressure. This requires that lock ring (89) be screwed on to its limit, since the jacket will stop short of the lock ring when both are screwed on to their respective limits. The jacket is then backed off approximately one turn, and the handle positioned at the desired operating angle

IMPORTANT WARNING: The lock ring is then brought up to the cutter jacket and tightened firmly! This will lock the handle in desired position, which should be kept tight at all times for safe operating. Front adapters may now be installed as has been previously explained in the section CHANGING ADAPTERS FOR VARIOUS SIZES.

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Parts List for an internal tube cutter Extension Adaptor



ITEM	PART NUMBER	PART NAME
1	1A	Spindle
2	2	Pilot
3	3	Pilot Screw

ITEM	PART NUMBER	PART NAME
14	5	Leg Screw
15	6	Tool Bit
15a	7	Leg Pin

ITEM	PART NUMBER	PART NAME
22	35	Tool Holder Leg
24	36	Shaft Leg
25	37	Pin

Extension Adaptors are a have a reach of 6” (152mm). Longer adaptors can be made to order in 3.5” (89mm) increments, please call us with the size requirements and material being cut. We will advise if it is feasible.

Available in custom configurations.

Pin # 37 is a straight piece of O1 drill rod. Cut to length then peened over and polish to size. Use a pin punch to drive out the pin from a broken spindle and keep unbroken leg parts for future use.

Series "A" Adapter's assembly.

Place .125 inch pin thru spindle and leg. Insert shim in between leg and spindle close to pin. Gently peen pin ends into counter sink edges of hole. Remove shim, Leg should move easily but snugly. File and polish pin smooth with Spindle.



Place shim between leg and spindle on each side of pin.



Peen pin to fill hole champher



Remove Shim and test that the leg moves freely.



Polish excess pin till smooth to spindle.



Insert toolbit and pilot.



Add shaft leg and test that the leg moves freely.

OPERATING INSTRUCTIONS AND SERVICE MANUAL FOR Cleco® 15-B SERIES DRILL



OPERATION

The tools are designed to operate on 90 psig (6.2 bars) air pressure. The 15DP series requires a 3/8" minimum open passage. The Unit WILL NOT run at rated speed without sufficient 213 CFM.

Always wear approved eye protection.

READ, UNDERSTAND, AND PRACTICE THE REQUIREMENTS OF ANSI B186.1 SAFETY CODE FOR PORTABLE AIR TOOLS. THIS STANDARD IS AVAILABLE FROM THE AMERICAN NATIONAL STANDARDS INSTITUTE, INC., 1430 BROADWAY, NEW YORK, NEW YORK 19918.

Before installing or removing a cutting tool, be sure the tool is disconnected from the air supply. If the air supply line has a valve, shut the valve off and drain the air line.

Never wear loose-fitting clothes when using a drill of any type.

CAUTION: HIGH REACTION TORQUE MAY BE EXPERIENCED WITH ANY DRILL AT BREAKTHROUGH. CAUTION MUST BE EXERCISED WHEN USING ANY CUTTING TOOL BECAUSE OF THE POSSIBILITY OF THE CUTTING TOOL BENDING OR BREAKING. CUTTING TOOL MAXIMUM SPEED RATING MUST EQUAL OR EXCEEDS RATED SPEED OF TOOL. EYE PROTECTION MUST BE WORN WHILE OPERATING POWER TOOLS.

LUBRICATION

The (OPTIONAL) automatic in-line lubricator ASL 5 is provided and is highly recommended to provide the tool with clean, lubricated air. The line lubricator should be checked and filled regularly with CLECO Pneu-Lube or a high grade of No.10W machine oil. If a line lubricator is not used, the tool should receive a few drops of lubricant in the air inlet several times daily.

CLECO Pneu-Lube may be purchased under the following code numbers:

1 pint can	Code No.	850159-5
1 gallon can	Code No.	850157-9
5 gallon can	Code No.	850158-7

The gear train should receive 3 or 4 shots of a good grade of No.2 Moly grease every 40 hours of operation, using a low pressure grease gun.

DISASSEMBLY

Remove the A&S tube cutter body.

The tool should then be clamped in the vise with the gear train in a vertical position. Using a suitable wrench, unscrew the gear case and slip the motor out of the motor housing. **NOTE:** On the double reduction tools (-4, -8, & -14), the first reduction spider will remain with the motor and should be removed at this time. This completes the disassembly of the tool into three (3) major sub-assemblies (Gear Case, Motor, and Motor Housing). See the following paragraphs for complete disassembly instructions.

Gear Case

The 15DP 1.6B uses 3 gear reductions, The 3rd can be disassembled from the 1st & 2nd reduction assembly. And the 1st & 2nd reduction assembly can be disassembled from the Motor & Handle Assembly.

The 3rd reduction gear, remove #43, #39 may need to be pushed out .

The 1st & 2nd reduction gear, the rack is part of #26. #30 comes out the front. #23 out the back

Motor

Using a soft-faced mallet, drive the rotor out of the front rotor bearing, #20. This will allow the removal of the front bearing plate, #19, cylinder, #17, and rotor blades, #16. After removing the rotor lock nut, #12, from the rear rotor shaft, the rotor may be driven out of the rear rotor bearing, #13.

Motor Handle

The throttle valve, #7, used in the pistol grip handle may be removed for inspection and for inspection and cleaning of the air screen #10 by unscrewing the inlet bushing, #11.

REASSEMBLY

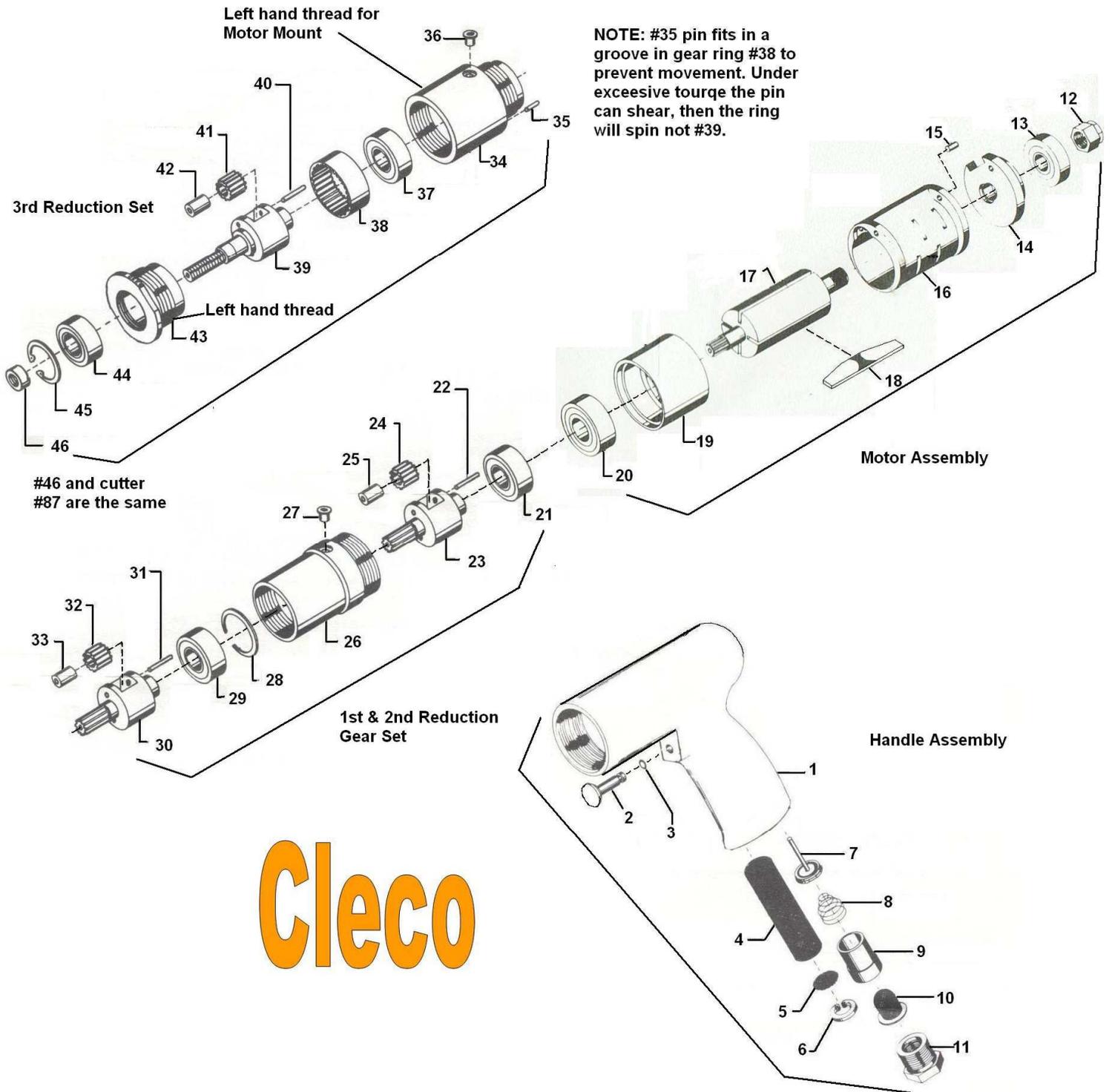
The tool is reassembled in the reverse of disassembly. All parts should be thoroughly cleaned and inspected for wear before reassembly. Replace all bearings which feel rough or have excessive end play. All gears and open bearings should receive a generous amount of No.2 Moly grease during assembly.

To assemble the motor, install the rear rotor bearing into the rear bearing plate. Make sure the outer bearing race is firmly seated in the bearing plate. Clamp the rotor body lightly in the vise with the threaded end up and slip the rear bearing plate assembly onto the rotor shaft far enough for the rotor lock nut to start. Tighten the lock nut until there is approximately .001 " / .0015" clearance between the rotor and bearing plate. The outer bearing race should be firmly seated and the rotor bumped forward when checking this clearance. The rotor blades should be replaced if they measure less than 7/32" at either end. Pack both rotor bearings with a good grade of No.2 Moly grease after assembly of the motor unit.

During assembly of the gear case to the motor and motor housing, be sure that the teeth of the rotor mesh with the teeth of the idler gears. Rotate the gear train by hand to be sure the teeth are properly meshed before air is applied.

After the tool is reassembled, pour a few drops of CLECO Pneu-Lube into the air inlet to ensure immediate lubrication of all motor parts as soon as air is applied.

Item	PART#	DESCRIPTION	Item	PART#	DESCRIPTION
HANDLE ASSEMBLY			27	843589	OIL HOLE COVER
1	869775	HANDLE	28	864240	BRG. RET.
2	869763	TRIGGER, SUB ASSY	29	844773	BEARING, BALL (9103K)
3	869712	RING; O	30	613587	SPIDER; CAGE
4	869764	MUFFLER	31	844799	PIN; IDLER GEAR
5	203043	SCREEN	32	864241	GEAR, IDLER
6	847033	RING; RETAINING	33	847146	BUSHING, 2ND REDUCTION GEAR
7	869350	THROTTLE VALVE SUB ASSY	3RD REDUCTION GEAR		
8	863072	SPRING; THROTTLE VALVE	34	613361	GEAR CASE
9	869349	SLEEVE	35	613363	PIN; DOWEL
10	869548	STRAINER	36	864964	FITTING; GREASE
11	833471	BUSHING; REDUCER	37	844773	BEARING, BALL (9103K)
MOTOR ASSEMBLY			38	864329	GEAR; RING
12	865352	ROTOR LOCK NUT	39	864658	GEAR SPIDER
13	843444	BEARING; BALL	40	844799	PIN; IDLER GEAR
14	869055	REAR BEARING PLATE	41	881658	GEAR; IDLER(SUB ASSY)
15	812164	PIN; ROLL	42	847146	BUSHING, 2ND REDUCTION GEAR
16	864236	CYLINDER	43	867048	BEARING RETAINER
17	869777	ROTOR	44	207543PT	BEARING, BALL
18	864234	BLADE, ROTOR	45	844364	RING; RETAINING
19	864235	PLATE; FRONT BEARING	46	864654	SPACER; CHUCK
20	844772	BEARING, BALL (9101K)			
DOUBLE REDUCTION GEAR			COMPLETE SUB-ASSEMBLIES		
21	847147	BEARING, BALL	861873		Pistol Grip Handle
22	844799	PIN; IDLER GEAR	611478		2nd Reduction Spider
23	864341	SPIDER; CAGE	881532		1st Reduction Spider
24	864340	GEAR, IDLER (SUB ASSY)	881660		Output Spider
25	844774	BEARING, NEEDLE (B-36)			
26	613733	CASE, GEAR			



Cleco

DIAGRAM





FOSTER SV SERIES SAFETY VALVE COUPLERS

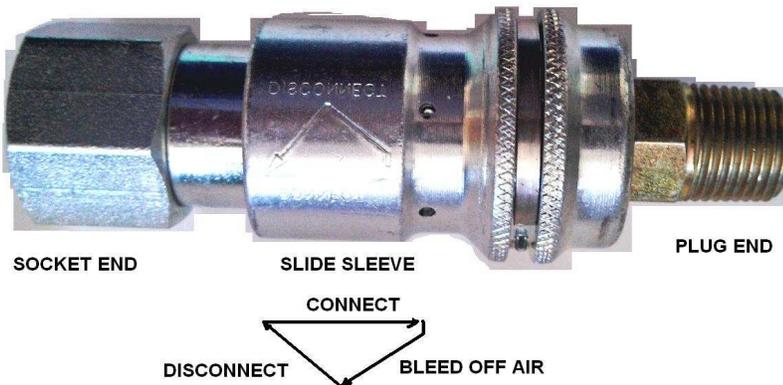
OPERATING AND MAINTENANCE INSTRUCTIONS (OPTIONAL)

BENEFITS:

1. Plug and socket connect and disconnect at 0 psig.
2. Plug is securely locked in place before air is turned on.
3. Socket sleeve will not slide forward without a plug installed.
4. Downstream line is exhausted before plug is released.

OPERATION:

1. To Connect - Simply insert the plug and slide the coupler's sleeve forward to lock and pressurize.
2. To Disconnect - First, rotate sleeve counter clockwise to exhaust pressure. Allow enough time for air to exhaust. Second, rotate sleeve clockwise while sliding toward socket end to unlock and release the plug.



* Operate by hand only. If sleeve becomes difficult to slide, call maintenance.

* To avoid damage, when disconnected, set the coupler down. Do not drop it.

MAINTENANCE:

* SV couplers are precision mechanical devices that are subject to normal wear and tear.

* In order to extend the coupler's useful life, they should be used

with compressed air that is free of dirt and water contamination. They require lubrication. If an in-line lubricator is not in use, they should be lubricated periodically with 10W air tool oil.

SYMPTOMS OF WEAR:

* When any of these symptoms exist, discontinue use of the coupler and contact maintenance for replacement:

Compressed air is leaking from the coupler.

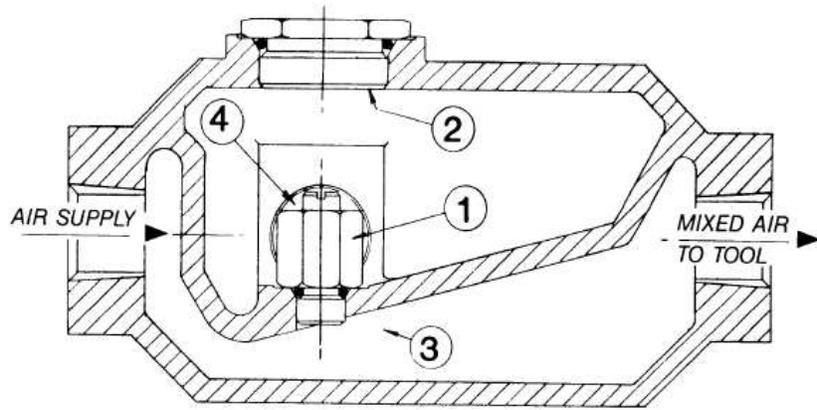
While operating the sleeve, the action should feel smooth. If sloppiness is felt, there is excessive wear.

If the sleeve feels sticky, gritty or binds up during operation, there is excessive wear or contamination.

NEW IMPROVED

ASL

Pressure-Feed Pneumatic Tool Lubricator (OPTIONAL)



INSTALLATION

INSTRUCTIONS The ASL LUBRICATOR should be installed so air flow follows the direction indicated by the arrow. It is advisable to install the LUBRICATOR as near to the tool as possible, but the LUBRICATOR will provide satisfactory lubrication up to a distance as great as 25 feet.

The ASL PRESSURE LUBRICATOR is immediately effective. Once the LUBRICATOR is installed and the pressure is turned on, pressure backs up through the feeder breather line, into the oil reservoir where it is equalized. When the operator starts the air tool, pressure momentarily drops. Pressure in the reservoir forces a fog of oil into the air line the fog provides a perfect lubrication. This operation is repeated automatically as the tool is in use. Since the LUBRICATOR operates under the pressure of actual air tool operation, oil is introduced into the air line only when the air tool is in use. The pressure – proof window reveals the oil supply in the reservoir. Reducers may be used on all models for smaller pipe sizes without harmful effects.

The adjustable feeder makes it adaptable to all climates and conditions. The new improved feeder will not move under vibration. The normal setting is for summer conditions with a No.10 oil.



Increased opening may be necessary for lower temperatures. When adjusting counter clockwise rotation will increase flow clockwise rotation will decrease flow for your individual requirements. Adjust to the point where a

slight film of oil can be felt at the exhaust port of the tool. This adjustment enables the LUBRICATOR to be operated with all types of air tools and climatic conditions.

SPECIFICATIONS -PRESSURE FEED

MODEL	No.5	NO, 10	No.15	NO.15 5	NO.30
LENGTH	4 1/2"	6"	7"	7"	10"
WIDTH	2 3/8"	2 7/8"	3 3/8"	3 3/8"	3 7/8"
HEIGHT	2 13/16"	3 3/8"	3 11/16"	3 11/16"	4 3/16"
WEIGHT	16 oz.	.26 oz.	34 oz.	34 oz.	70 oz.
Oil CAPACIT Y	7 cu. in	12 cu. in	18 cu. In	18 cu. in	34 cu. In
PIPE SIZE	1/2"NP T	3/4"NP T	3/4"NP T	1"NPT	1"NP T
AIR FLOW CAPACIT Y FREE AIR c/o 100 psi 60 (PSI)	100 SCFM	175 SCFM	175 SCFM	350 SCFM	350 SCF M
SAFETY FACTOR 4:1	500	260	300	300	250

Reducers for smaller pipe size may be used with all models, without harmful effect.

Pressure Feed -Service Kit

KIT	DESCRIPTION	NUMBER REQUIRED
No.1	Feeder assembly includes: O-Ring ARP-56B-905	1
No.2	Filler cap assembly includes: O-Ring ARP-56S.-916	1
No.3	Serve Kit Includes: Feeder O-Ring ARP-568-905 Filler O-Ring ARP-566-916 Sight window O-Ring ARP-568-908	1
No.4	Sight window assembly includes: O-Ring ARP-568-908	1

NO SPECIAL TOOLS REQUIRED
Standard 3/4" Socket, screwdriver and wrench only
All standard tools.

Limited Product Warranty

1. Warranty. Armstrong & Sons, Inc. ("A&S") warrants that this A&S Industrial Product (the "Product") shall be free from defects in material and workmanship for a period of ninety (90) days from the date of purchase from A&S or from an authorized A&S Industrial Distributor, as the case may be. Repaired or replacement A&S products provided under this warranty are similarly warranted for a period of 3 months from the date of shipment to the customer or the remainder of the original warranty term, whichever is longer. This Product and any repaired or replacement products will be manufactured from new and/or serviceable used parts which are equal to new in the Product. This warranty is limited to the initial purchaser of the Product from A&S or from an authorized A&S Industrial Distributor and may not be transferred or assigned.

2. Remedies. Remedies under this warranty shall be limited, at A&S's option, to the replacement or repair of this Product, or the parts thereof, only after shipment by the customer at the customer's expense to a designated A&S service location along with proof of purchase date and an associated serial number. Repair parts and replacement products furnished under this warranty will be on an exchange basis and all exchanged parts or products become the property of A&S. Should any product or part returned to A&S hereunder be found by A&S to be without defect, A&S will return such product or part to the customer. The foregoing will be the exclusive remedies for any breach of warranty or breach of contract arising there from.

3. General. This warranty is only available if (a) the customer provides A&S with written or verbal notice of a warranty claim within the warranty period set forth above in Section 1 and (b) A&S's examination of the Product or the parts thereof discloses that any alleged defect has not been caused by a failure to provide a suitable environment as specified in the A&S Standard Environmental Specification and applicable Product specifications, or damage caused by accident, disaster, acts of God, neglect, abuse, misuse, transportation, alterations, attachments, accessories, supplies, non-A&S parts, non-A&S repairs or activities, or to any damage whose proximate cause was utilities or utility-like services, or faulty installation or maintenance done by someone other than A&S.

4. Product Improvement. A&S reserves the right to make changes to the Product in order to improve reliability, function or design in the pursuit of providing the best possible products.

5. Exclusive Warranty. THE WARRANTIES SET FORTH HEREIN ARE CUSTOMER'S EXCLUSIVE WARRANTIES. A&S HEREBY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. WITHOUT LIMITING THE FOREGOING, A&S SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, COURSE OF DEALING AND USAGE OF TRADE.

6. Disclaimer and Limitation of Liability. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, A&S WILL NOT BE LIABLE FOR ANY BUSINESS INTERRUPTION OR LOSS OF PROFIT, REVENUE, MATERIALS, ANTICIPATED SAVINGS, DATA, CONTRACT, GOODWILL OR THE LIKE (WHETHER DIRECT OR INDIRECT IN NATURE) OR FOR ANY OTHER FORM OF INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES OF ANY KIND. A&S'S MAXIMUM CUMULATIVE LIABILITY RELATIVE TO ALL OTHER CLAIMS AND LIABILITIES, INCLUDING OBLIGATIONS UNDER ANY INDEMNITY, WHETHER OR NOT INSURED, WILL NOT EXCEED THE COST OF THE PRODUCT(S) GIVING RISE TO THE CLAIM OR LIABILITY. A&S DISCLAIMS ALL LIABILITY RELATIVE TO GRATUITOUS INFORMATION OR ASSISTANCE PROVIDED BY, BUT NOT REQUIRED OF A&S HEREUNDER. ANY AA&SON AGAINST A&S MUST BE BROUGHT WITHIN EIGHTEEN (18) MONTHS AFTER THE CAUSE OF AA&SON ACCRUES. THESE DISCLAIMERS AND LIMITATIONS OF LIABILITY WILL APPLY REGARDLESS OF ANY OTHER CONTRARY PROVISION HEREOF AND REGARDLESS OF THE FORM OF AA&SON, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHERWISE, AND FURTHER WILL EXTEND TO THE BENEFIT OF A&S'S VENDORS, APPOINTED DISTRIBUTORS AND OTHER AUTHORIZED RESELLERS AS THIRD-PARTY BENEFICIARIES. EACH PROVISION HEREOF WHICH PROVIDES FOR A LIMITATION OF LIABILITY, DISCLAIMER OF WARRANTY OR CONDITION OR EXCLUSION OF DAMAGES IS SEVERABLE AND INDEPENDENT OF ANY OTHER PROVISION AND IS TO BE ENFORCED AS SUCH.

7. Adequate Remedy. The customer is limited to the remedies specified herein and shall have no others for a nonconformity in the Product. The customer agrees that these remedies provide the customer with a minimum adequate remedy and are its exclusive remedies, whether based on contract, warranty, tort (including negligence), strict liability, indemnity, or any other legal theory, and whether arising out of warranties, representations, instructions, installations, or non-conformities from any cause. The customer further acknowledges that the purchase price of the Product reflects these warranty terms and remedies.

8. Force Majeure. A&S will not be liable for any loss, damage or delay arising out of its failure (or that of its subcontractors) to perform hereunder due to causes beyond its reasonable control, including without limitation, acts of God, acts or omissions of the customer, acts of civil or military authority, fires, strikes, floods, epidemics, quarantine restrictions, war, riots, acts of terrorism, delays in transportation, or transportation embargoes. In the event of such delay, A&S's performance date(s) will be extended for such length of time as may be reasonably necessary to compensate for the delay.

9. Governing Law. The laws of the State of New Jersey shall govern the validity, interpretation and enforcement of this warranty, without regard to its conflicts of law principles. The application of the United Nations Convention on Contracts for the International Sale of Goods shall be excluded.



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