



• INSTALLATION AND
MAINTENANCE MANUAL
FOR BOTTOM LOADING ARM



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1. INTRODUCTION

The bottom loading arms are versatile arms commonly used at facilities where vehicles are loaded from below.

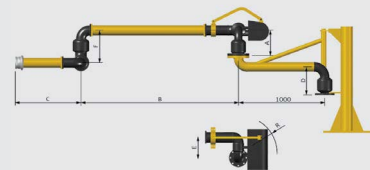
The bottom loading arms consist of articulated joints (360° rotation) to provide better mobility and designed to cover a larger sweeping range of compartments, being an excellent choice for loading rail cars and/or tank trucks with several compartments.

2. SPECIFICATION OF REDLANDS LOADING ARMS

There are three (3) standard bottom loading arm designs supplied by REDLANDS: the G-series, P-series and M-series. Each model type can be specified with a compression spring or a torsion spring, and can be supplied in various diameters, depending on the desired flow rate.

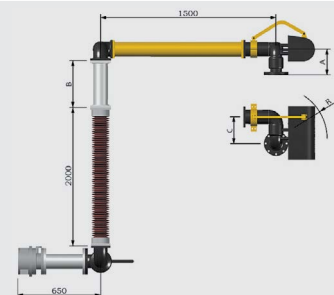
G-Series.

Consists of: Torsion / compression spring set, boom pipe, main pipe and secondary pipe.



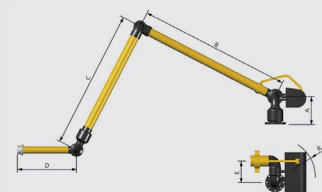
P-Series.

Consists of: Torsion / compression spring set, swivel joint, main pipe, reel, hose and valved coupler.



M-Series.

Consists of: Torsion spring set, main pipe, secondary pipe and secondary pipe.



3. INSTALLING THE BOTTOM LOADING ARM

This manual encompasses the general instructions for installation and maintenance of REDLANDS bottom loading arms and its components.

Prior to installing the REDLANDS bottom loading arm, make sure the pipes are clean and free of any dirt, in order to assure smooth operation and long life of the seals and seats, as any debris or dirt can damage them permanently. Because the arm will always work full of liquid, it's vitally important to install a pressure relief system, due to possible thermal expansion of the product.

3.1. Installation procedures

3.1.1. Remove the loading arm from the protective wood packaging with the aid of a hoist, forklift or similar equipment.

3.1.2. The loading arm may be supplied in parts, so as to minimize manpower in the field yet facilitate transportation. To assemble these parts into one another, the respective flanges must be joined with suitable bolts and nuts, and with the respective ring or gasket between the flanges. To join the flanges of the arm components, the respective rings, gaskets, bolts, nuts and washers are provided by Redlands.

3.1.3. Verify the drawing of the loading arm to determine the correct assembly of the components.

3.1.4. Always thoroughly clean the faces of the square, TTMA or ANSI flanges prior to connection.

3.1.5. Always use the o-ring in its proper channel or gasket between flanges.

3.1.6. Connect the ANSI flange of the swivel joint at the base to the corresponding waiting flange of the supply line with its respective sealing gasket, and secure them using cap screws, nuts and washers.

3.1.7. Move the arm, checking for balance of the assembly with the torsion spring or compression spring.

NOTE: After final assembly, you will notice that the arm will be inclined, keeping the API coupler in a position above the ideal position for loading. This is due to the fact that the assembly was set at the factory to work with the pipes full. Do not make any adjustment to the torsion spring or compression spring until the arm is completely filled with product.

3.2. Arm filling procedure

3.2.1. Connect the API coupler of the arm to the API adapter of the tank truck. This operation will require a greater effort to lower the arm, because it will be empty and the spring assembly will be the forcing it upward.

3.2.2 Open the API coupler of the arm and then the line valve, and start pumping the product until completely eliminating the air contained in the line.

3.2.3 After this step, close the valve and uncouple the arm from the tank truck. The arm should remain in the appropriate position, with the API coupler near the level of the truck's API adapter. If a slight adjustment is required, follow the instructions for adjusting the torsion or compression spring set.

4. MAINTENANCE

CAUTION: BEFORE CARRYING OUT ANY MAINTENANCE ON THE ARM, MAKE SURE IT IS NOT PRESSURIZED AND HAS NO PRODUCT WITHIN IT.

Note: For components not included in this manual, please consult the specific manuals of such components.

5. SWIVEL JOINT MAINTENANCE

5.1. Tools required

- One ¼" Allen wrench.
- One ¾" open-end or box-end wrench.
- One 5/16" open-end or box-end wrench.
- Grease and brush.
- One Vise (if available at the site).



Image 1. Tools for assembly and maintenance.

5.2. Disassembly of the Swivel Joint

1. Attach the swivel joint female body to a bench vise with the nuts of the ball channels facing downward. If a vise is not available, hold it firmly so that it does not move.

2. With a $\frac{3}{4}$ " open-end or box-end wrench, unscrew the top nut with light pressure only enough to loosen the assembly. Unscrew the retaining screws of the ball bearings with a $\frac{1}{4}$ " Allen wrench until the screw and nut come loose from the female body.

3. Slowly rotate the male insert to the left and right, as the ball bearings come out of the set through the hole to empty each raceway. Attention: remove all of the ball bearings carefully. To avoid the risk of losing them, place them in a separate container for easy location when it's time for re-assembly.

4. Remove the male insert from inside the female body and keep the dust guard attached to the channel, so that it is completely removed from within the chamber.

5. Remove the o-ring located on the inner housing of the female body. Separate all the components necessary for re-assembly of the swivel joint.

5.3. Assembly and maintenance of the Swivel Joint

1. Clean the male insert and all the inner housing of the female body, removing the used grease. Flip the female body over with the ball bearing holes facing upward and re-secure it to a vise or tightly hold the swivel joint so it does not move.



Image 1. Clean the inside of the female body housing.



Image 2. Secure the female body to a vise.

2. With a brush, apply new grease around the inner housing of the female body.



Image 3. Apply the grease with a brush.



Image 4. Line the entire housing with grease.

3. Before inserting the o-ring into the female body, stretch it so that fits perfectly onto its seat.

The O-ring is very important to seal the swivel joint, because if there are any gaps or it is not seated properly, there may be a risk of leakage.



Image 5. Place the ring into the female body.



Image 6. The o-ring should be adjusted in the female body.

4. If the same ball bearings must be re-used, clean them carefully. We suggest replacing them with new ones. Clean the dust guard, and place it around the appropriate channel of the male insert . See photo below.



Image 7. Clean the dust guard and male insert .



Image 8. Place the dust guard firmly around the male insert.

5. Insert the male insert into the female body and keep the dust guard tightened in the male insert channel so that it completely enters the chamber. Use light pressure with your hands to force the male insert into the female body. Turn the male insert twice clockwise to assure that it is properly inserted into the female body.

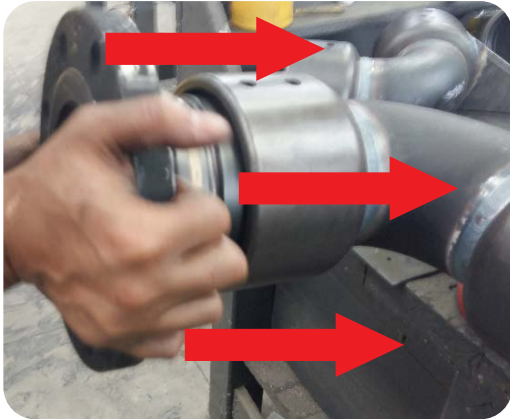


Image 9. Push the male insert forward.



Image 10. Turn the male insert clockwise.

6. Before placing the ball bearings into the channel, count them all before inserting them one by one, because none of them can be missing so as not to cause any risk of the swivel joint straddling or locking up. Each channel must contain the right number of ball bearings (**see number of ball bearings per joint type, in item 3. SPARE PARTS**).

The ball bearing channels of the male insert must be aligned to the female body for easier insertion. Slowly turn the male insert the clockwise and counterclockwise, as the ball bearings are being inserted through the hole.



Image 11. Insert the ball bearings into the channel.



Image 12. Turn clockwise and counterclockwise.

7. Place the two screws and the ball bearing retainer with a ¼" Allen wrench holes into the ball bearing holes and screw in clockwise until the screw reach their fitting. Then relieve the screws by loosening them a half-turn and lightly thread the hex nuts with an open-end or box-end wrench to lock the screw in place.



Image 13. Rotate the ball bearing retaining screws clockwise.



Image 14. Turn the nuts onto the bolts to lock them in place.

Note: Don't forget to turn the screws back a half-turn to relieve them before placing the nuts. Otherwise the ball bearing will get stuck and the swivel joint will lock up.

8. Place the grease fitting with a 5/16" open-end or box-end wrench; this is important for lubricating the swivel joint.



Image 15. Place the grease fitting in the hole.



Foto16. Straight grease fitting.

NOTE: For swivel joint models 3640-FE-40 and 3640-FE-30, the ball bearing retaining screws are secured with 1/4" Allen screws that replace the nuts. (Use 1/8" Allen wrench) Additionally, the grease fitting is installed in one of the retaining screws.

6. Spare parts:

DESCRIPTION	1 2/1"	2"	3"	4"	6"	8"
Viton O-Ring	A0018-0715	A0018-0714	A0018-0713	A0018-0717	A0018-0729	A0018-0737
Buna O-Ring – N	A0018-0615	A0018-0614	A0018-0613	A0018-0617	A0018-0629	A0018-0637
Teflon O-Ring	A0018-0815TE	A0018-0820TE	A0018-0830TE	A0018-2317	-	-
Dust Guard	A0019-1003	A0019-1003	A0319-1003	A0319-1003	A0018-0730	A0018-0729

DESCRIPTION	1 2/1"		2"		3"		4"		6"		8"	
	CODE	Qty ball bearings	CODE	Qty ball bearings	CODE	Qty ball bearings	CODE	Qty ball bearings	CODE	Qty ball bearings	CODE	Qty ball bearings
Stainless steel ball bearing	A6020-4101	56	A0020-4101	48	A0020-4101	66	A0020-4101	84	A0020-4105	76	A5120-4103	116
Chrome steel ball bearing	A6020-4001	56	A0020-4001	48	A0020-4001	66	A0020-4001	84	A0020-4006	76	A0020-4003	116

Note: Number of ball bearings per rotation plane, i.e., two raceways or channels.

7. Torsion Spring 788 & 789

The torsion spring assembly has two possible adjustments:

1. The torsion spring that will adjust the force required to lower and raise the arm.
2. The resting position of the main arm, i.e., the angle from the horizontal when not in use.

For safety reasons and ease of handling, we recommend that the adjustment of the loading arm be performed by two people.

7.1. Tools required for torsion spring

- Screwdriver.
- 15/16" Box-end (or open-end) wrench.
- Pipe wrench.
- ¼ " Allen wrench.



Image 3. Tools of the adjusting the torque of the torsion spring.

7.2. How to Adjust Torque

1. Remove the cover of the 788/789 assembly. This is done by removing the cover screws with a screwdriver.



Image 1. Unscrew the protective cover.



Image 2. Remove the protective cover.

2. Lower the arm and hold it in place while removing the 4 screws from the damper stop with a 1/4" Allen wrench. NOTE: If the arm resting angle is in the desired position, mark the position of the damper stop before removing it.

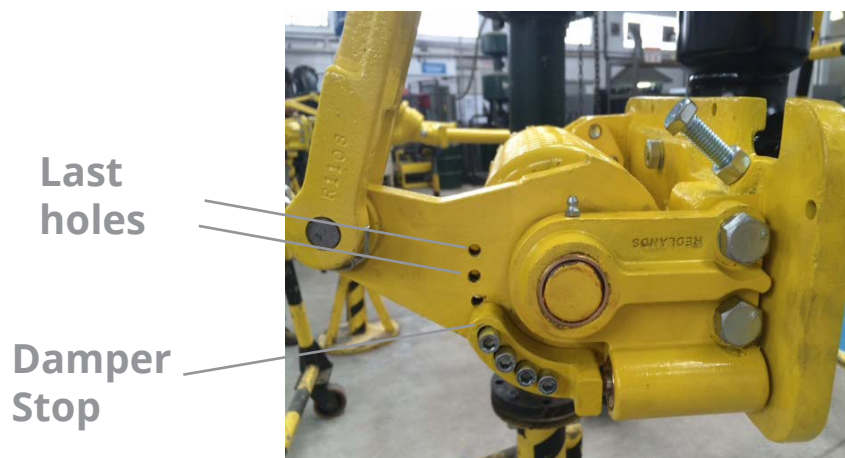


Image 3. Side view of the spring assembly with the damper stop.

3. Return the damper stop on the spring mount to last positions. It's necessary to return of the damper stop to prevent the arm from passing the vertical limit, making it impossible to adjust the spring torque.

4 Raise the arm vertically and keep it in this position. This will take pressure off the torsion spring, allowing it to be adjusted.

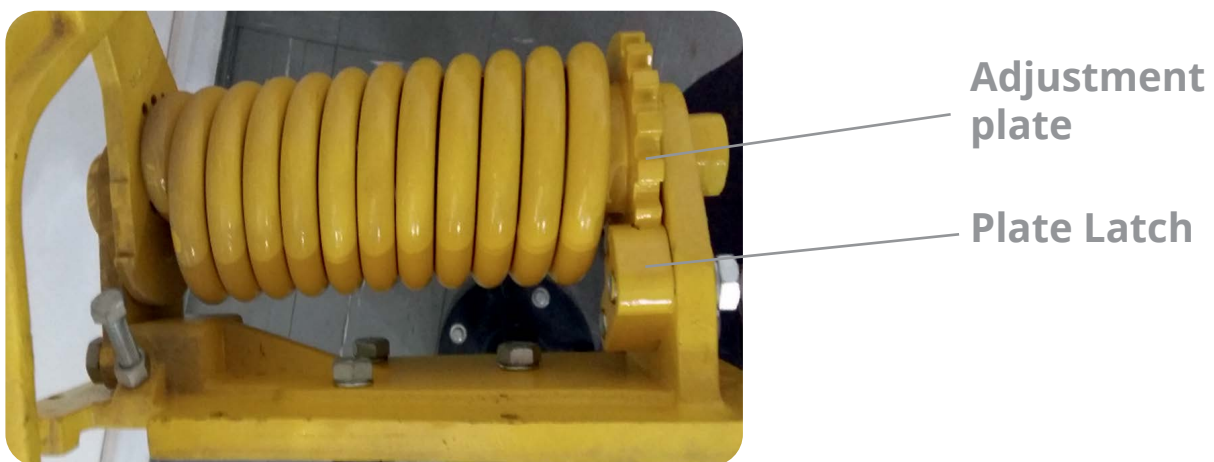


Image 4. Top view of the spring base.

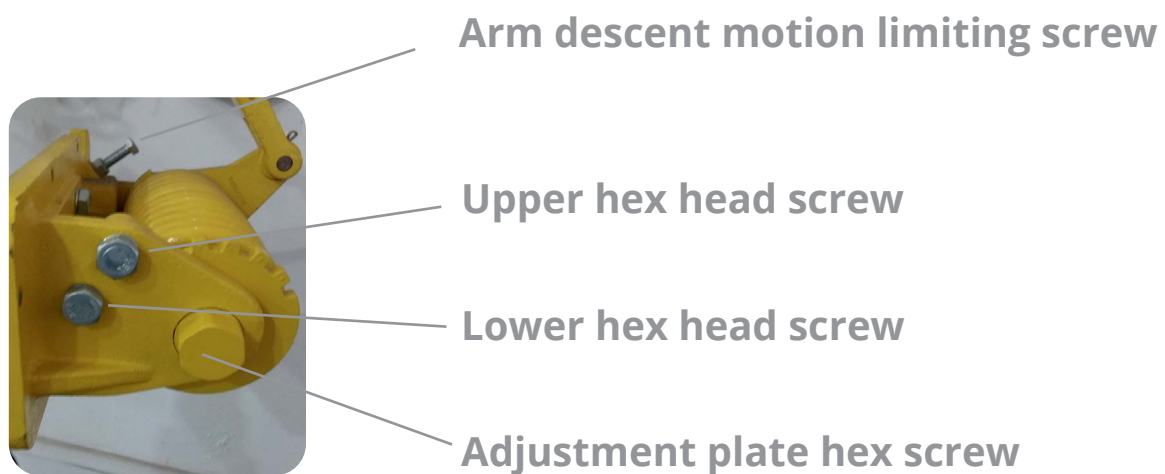


Image 5. Side view of the spring base.

5. Then, use a 15/16" open-end or box-end wrench, and loosen the lower and upper screws that secure the latch plate.

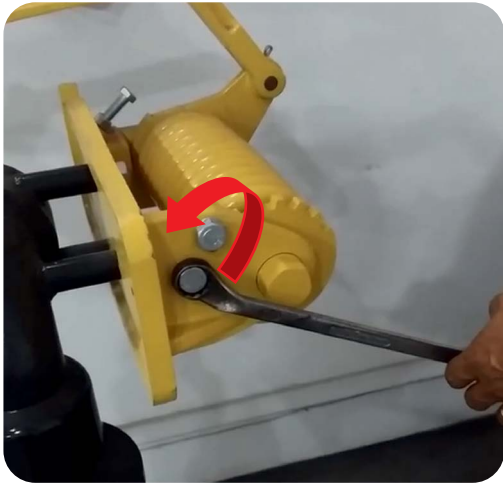


Image 6. Loosen the lower screw.



Image 7. Loosen the upper screw.

6. Use a pipe wrench to secure the adjustment plate hex screw. Only a slight effort will be necessary. Remove only the top screw of the plate latch, do not remove the lower screw. It is possible to move the plate latch without removing the lower screw.



Image 8. Fasten the hex screw of the plate with a pipe wrench.



Image 9. Lift the plate latch.

7. For greater torque on spring, turn the hex screw of the adjustment plate clockwise to the desired position. For less torque, turn the hex screw of the adjustment plate counter-clockwise to the desired position. (If the spring assembly is "left", the above procedure is reversed)

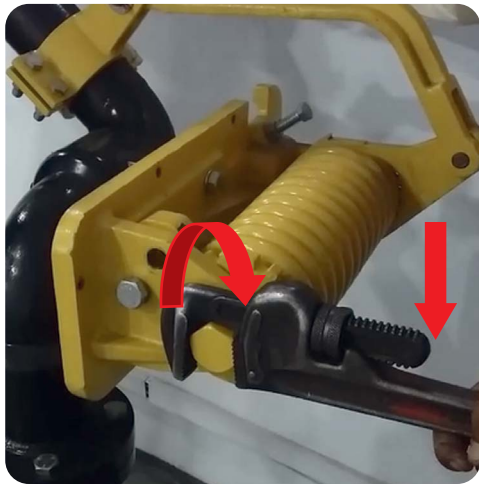


Image 10. For more torque, turn clockwise.

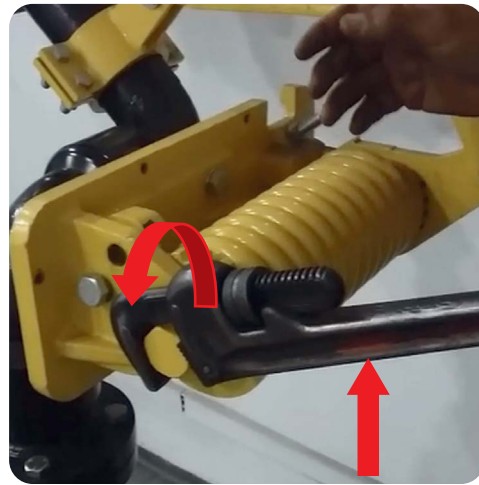


Image 11. For less torque, turn counterclockwise.

8. Holding the hexagonal crew of the adjustment plate, tighten the screws that fasten the plate latch, making sure that the washers are in place.



Image 12. Position the latch on the adjustment plate.



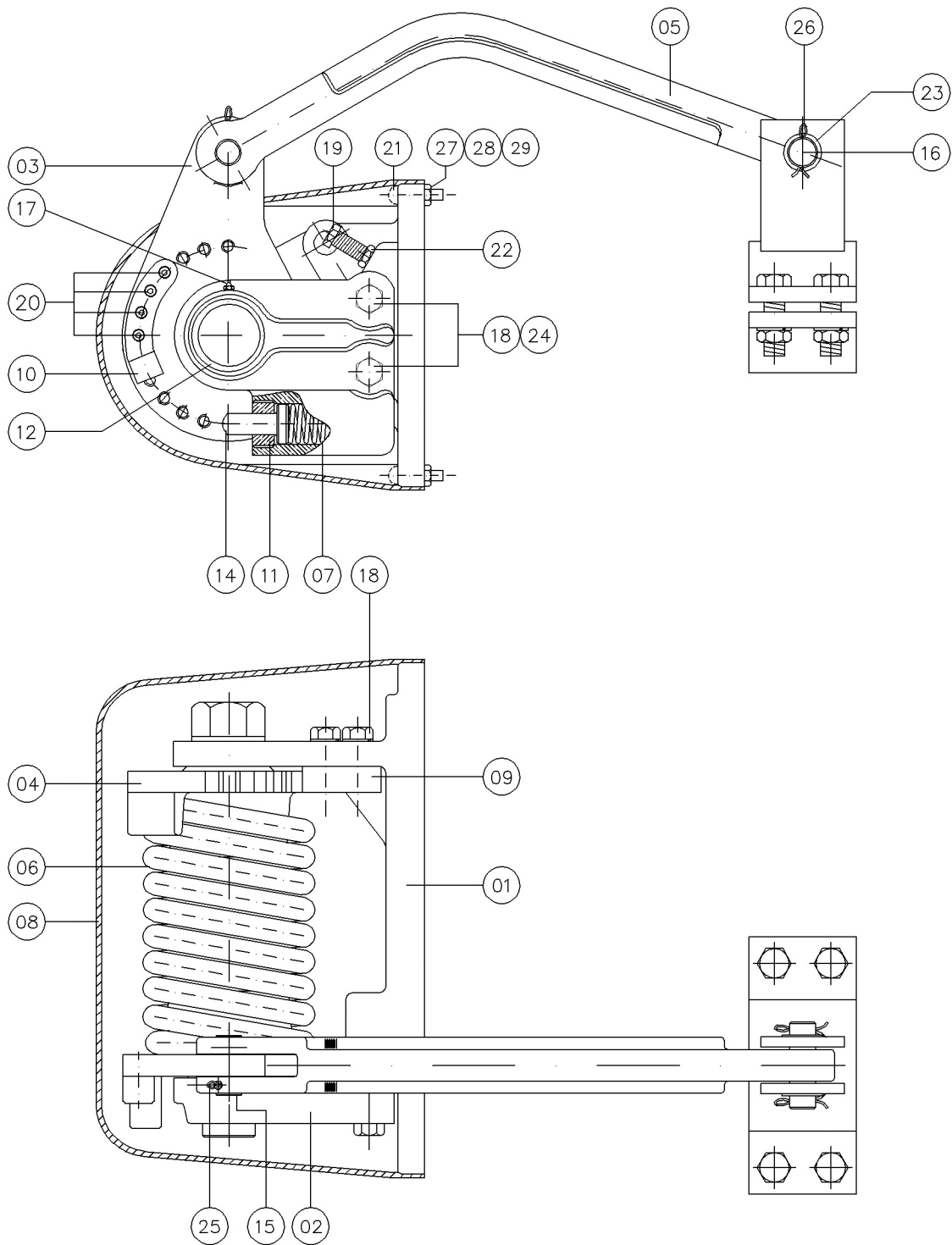
Image 13. Place the screws .

9. Remove the four (4) screws form the damper stop with a ¼" Allen wrench and return the damper stop to the marked or desired position.

10. Return the arm to the rest position and test it. Repeat the procedure if the need has not been met.

11. Re-install the spring assembly cover with the respective screws.

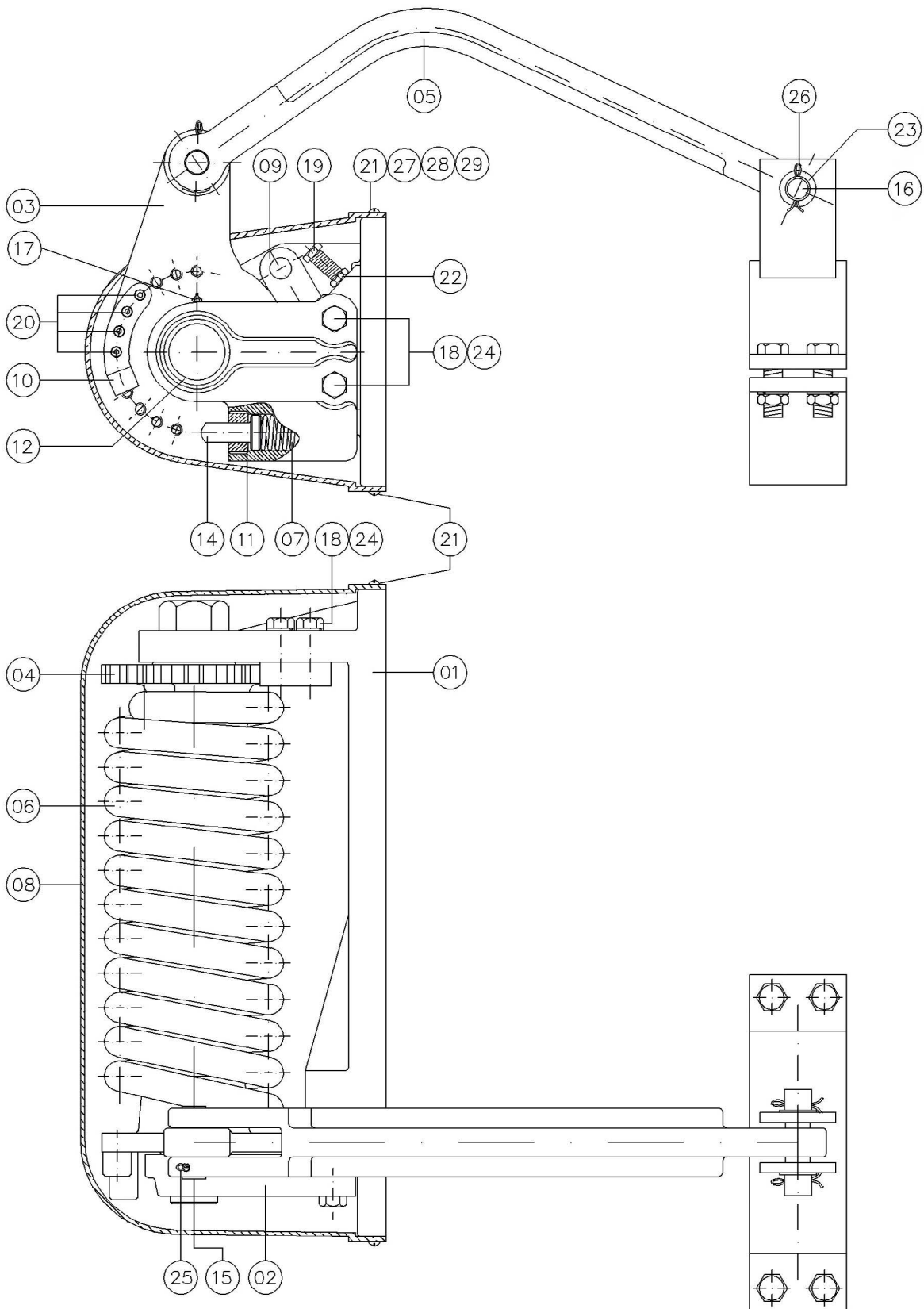
8. Drawing of the 788 Spring



8.1. Components of torsion spring 788 assembly

ÍTEM	QTY.	CODE	DESCRIPTION
01	01	A0525-5301	SPRING ASSEMBLY BASE
02	01	A0510-5302	SIDE SUPPORT
03	01	A0510-5301	SPRING MOUNT
04	01	A0534-5301	SPRING ADJUSTMENT PLATE
05	01	A0507-5301	LEVER
06	01	A0501-0401	MAIN SPRING
07	01	A0501-0402	DAMPER SPRING
08	01	A0536-0101	SPRING ASSEMBLY COVER
09	01	A0535-5301	PLATE LOCK
10	01	A0526-5301	DAMPER STOP
11	01	A0514-0507	DAMPER PLUG
12	01	A0523-0203	SIDE SUPPORT BUSHING
14	01	A0509-4110	DAMPER PIN
15	01	A0509-0409	CONNECTING PIN (LEVER - SUPPORT)
16	01	A0509-0411	COUPLING PIN (LEVER - CLAMP)
17	01	A0031-0401	GREASE FITTING 1/4" UNF
18	04	A0003-0416	HEX-HEAD CAP SCREW 5/8"x 2" W
19	01	A0003-0409	HEX-HEAD CAP SCREW 1/2" x 2.1/2" W
20	04	A0203-0407	ALLEN SCREW W /HEAD 5/16" x 1" W
21	06	A0003-0427	SLOTTED SCREW 1/4" x 1.1/2" W
22	01	A0004-0405	HEX NUT 1/2" W
23	02	A0505-0451	FLAT WASHER 5/8" x 13/8" x 1/16"
24	04	A0005-0401	LOCK WASHER 5/8"
25	01	A0508-0403	COTTER PIN 3/16" x 2.1/4"
26	02	A0508-0402	COTTER PIN 1/8" x 1.1/4"
27	06	A5104-0415	HEX NUT 1/4"
28	06	A0005-0402	LOCK WASHER 1/4"
29	06	A0005-0468	FLAT WASHER 8 X 16 X 2.4

9. Drawing of the 789 Spring



9.1. Components of torsion spring 789 assembly

ITEM	QTY.	CODE	DESCRIPTION
01	01	A0525-5304	SPRING ASSEMBLY BASE
02	01	A0510-5304	SIDE SUPPORT
03	01	A0510-5303	SPRING MOUNT
04	01	A0534-5302	SPRING ADJUSTMENT PLATE
05	01	A0507-5304	LEVER
06	01	VIDE NOTA	MAIN SPRING
07	01	A0501-0402	DAMPER SPRING
08	01	A0536-1910	SPRING ASSEMBLY COVER
09	01	A0535-5301	PLATE LOCK
10	01	A0526-5301	DAMPER STOP
11	01	A0514-0507	DAMPER PLUG
12	01	A0523-0203	SIDE SUPPORT BUSHING
14	01	A0509-4110	DAMPER PIN
15	01	A0509-0414	CONNECTING PIN (LEVER - SUPPORT)
16	01	A0509-0408	COUPLING PIN (LEVER - CLAMP)
17	01	A0031-0401	GREASE FITTING 1/4" UNF
18	04	A0003-0416	HEX-HEAD CAP SCREW 5/8"x 2" W
19	01	A0003-0415	HEX-HEAD CAP SCREW 1/2" x 2.1/2" W
20	04	A0203-0407	ALLEN SCREW W/HEAD 5/16" x 1" W
21	06	A0003-0427	SLOTTED ROUND-HEAD SCREW 1/4" , W X 1.1/2
22	01	A0004-0405	HEX NUT 1/2" W
23	02	A0505-0451	FLAT WASHER 5/8" x 1.3/8" x 1/16"
24	04	A0005-0401	LOCK WASHER 5/8"
25	01	A0508-0403	COTTER PIN 3/16" x 2.1/4"
26	02	A0508-0402	COTTER PIN 1/8" x 1.1/4"
27	06	A5104-0415	HEX NUT 1/4" W
28	06	A0005-0402	LOCK WASHER 1/4"
29	06	A0005-0468	FLAT WASHER 8 X 16 X 2 4

10. Compression spring



Tools required for compression spring adjustment:

- 1.1/4" – 31,75mm x 500mm lug wrench, a ratchet with 1 1/8" socket, or a 1 1/8" spark plug wrench or Redlands special tool item number FERR-COMP (see option below)
- 9/16" socket wrench
- 15/16" star type, combined or fixed wrench
- Rubber hammer



Spark Plug 1.1/4"



9/16" socket wrench

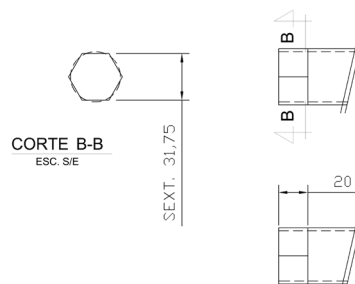


15/16" star type wrench



Rubber Hammer

OPTION - Redlands compression spring adjustment tool, model FERR-COMP

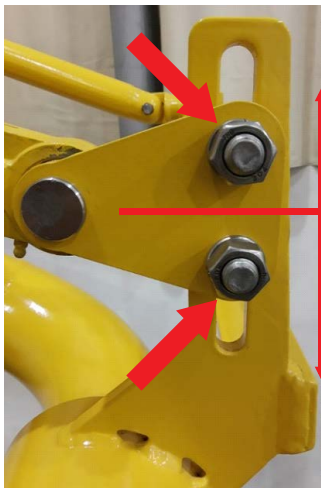


Attention: Before any fine or primary adjustment procedure, bottom loading arms must be installed and filled with product to check the height of the coupler and the equipment's maneuverability. This arm model is pre-adjusted at the factory considering the weight of the product. In this way, if the equipment is empty, any previous adjustment will not promote any gain in the efficiency of the arm.

10.1. Fine tuning adjustment (external)

Fine adjustment of the upward action of the compression spring. This adjustment must be carried out if necessary in the first operation or when the arm starts to work with a product of different density from the original product.

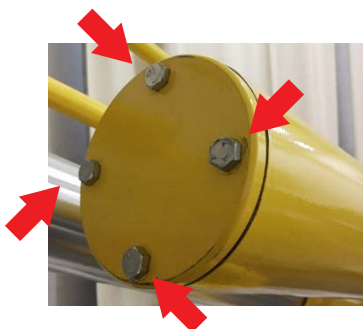
1) Lift the loading arm so as to relieve spring compression, preferably with the help of a hoist, or a second person.



2) Using the 15/16" star / combined or fixed wrench, loosen the 2 nuts (item 14 in the drawing). Attention, do not remove the nuts, just loosen them. The nuts should only be removed if this service is being carried out with the arm resting on the maintenance bench.

3) To increase the upward action of the spring, move the terminal subassembly up using the rubber mallet or similar tool, to decrease the upward action, move the terminal subassembly down;

10.2 Primary adjustment (on the internal threaded shaft)



1) Remove the four screws from the top cylinder cover with a 9/16" socket wrench, and you can then remove it to access the threaded shaft, nut / locknut

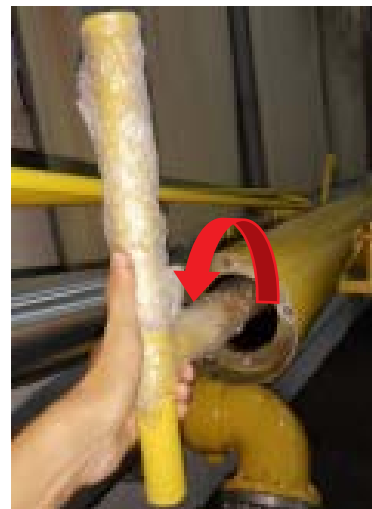
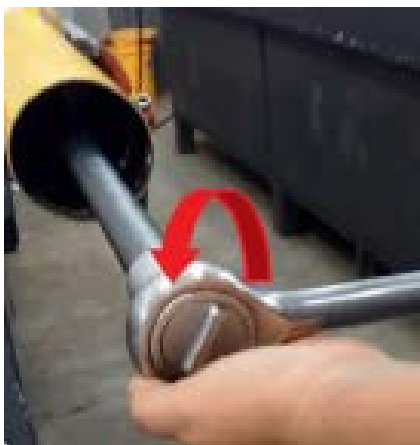


2) Using the special Redlands adjustment tool (FERR-COMP) or 1.1/4" X 500mm spark plug wrench, remove the lock nut completely from the threaded shaft.

3) Using the same FERR-COMP tool, to increase the upward action (make the arm lighter to raise, but more difficult to lower), turn the main adjustment nut clockwise.



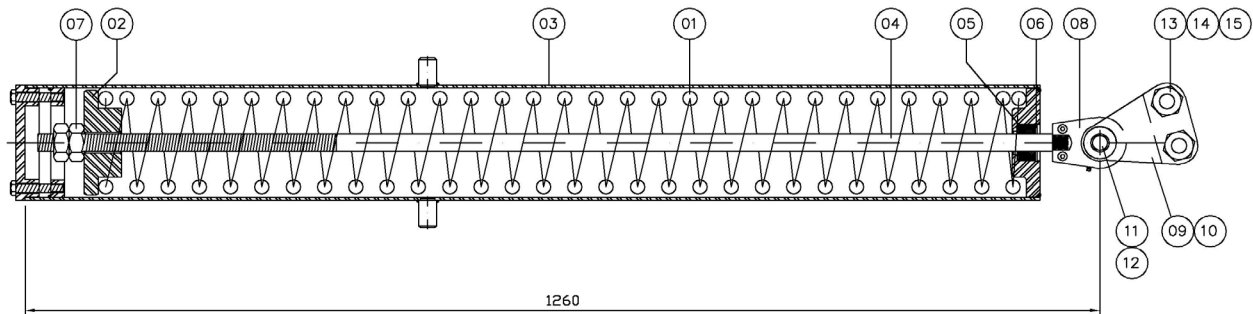
4) To decrease the upward action (make the arm heavier to rise, but easier to lower), turn the main adjustment nut counter-clockwise.



5) When the operation is complete and the arm is balanced, screw the lock nut again, locking the system in the ideal position.

6) Put the cylinder cover back on and tighten the four fixing screws on the cylinder.

11. Compression spring drawing



11.1 Components of the Compression Spring subassembly.

15	02	5/8" PRESSURE WASHER	A0005-0401	A. CARB. BICHROMATED
14	02	5/8" W HEX. NUT	A0004-0409	A. CARB. BICHROMATED
13	02	5/8" W X 3" HEX. SCREW	A0003-0410	A. CARB. BICHROMATED
12	02	RENO ELASTIC RING REF. (501.020)	A0065-0402	CARBON STEEL
11	01	ROTULAR TERMINAL PIN	A0509-0401	A. CARB. BICHROMATED
10	02	FORK SPACER	A0537-0401	CARBON STEEL
09	02	ROTULAR TERMINAL FORK	A0515-0404	CARBON STEEL
08	01	LABEL TERMINAL Ø25MM x M20	GIHNRK25-LO	-- XX --
07	02	HEX. NUT WITH TRAPEZOIDAL THREAD 20 x 4	A0004-0425	CARBON STEEL
06	01	ELASTIC RING	A5865-0412	CARBON STEEL
05	01	FORK BUSHING	A0523-2104	NYLON
04	01	COMPRESSION SPRING CYLINDER AXIS FOR ROTULAR TERMINAL	A0543-4111	STAINLESS STEEL
03	01	SPRING CYLINDER SUB-ASSEMBLY	S0580-0431	CARBON STEEL
02	01	SPRING GUIDE BUSHING	A0523-0401	CARBON STEEL
01	01	COMPRESSION SPRING øext. 115 x øwire 16 x length 1100	A0501-0431	CARBON STEEL
ITEM	QTY.	DESCRIPTION	CODE	MATERIAL

12. CONCLUSION

Redlands has been ISO 9001 certified since September 2002. This certification represents the service commitment we make to all our customers and employees, and establishes our leading position in this market segment.

Thank you for purchasing Redlands equipment.

For any clarifications or further information, please contact our engineering and technical assistance.



REDLANDS
LIQUID HANDLING TECHNOLOGY

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