



LBM800

# Liquip Balance Mechanism

Fitting and Maintenance

Instructions

New Installations & Retro-Fits

Part 59102

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## **Liquip LBM800**

### **Bottom Loading Arm**

Liquip's LBM800 is a breakthrough in balance systems for bottom loading arms.

Firstly, the LBM800 uses either single or dual lift-o-mat struts to counter-balance the weight of the arm. This provides major advantages over the traditional torsion-spring or heavy counter-balance weights as discussed below.

A prime advantage of incorporating gas-springs is that they allow for fluid movement throughout their stroke. In practice, this means that up and down movement of the arm requires minimal effort.

Also, gas struts require minimal maintenance and should replacement be necessary, simply lift and rest the coupler on a platform to allow full extension of the gas struts. Pull out the pins on the upper and lower spindles, pull off the strut and replace with a new one (a quick and easy job).

Secondly, heavily loaded swivels run on multiple rows of needle roller and ball bearings for minimum friction and long life. This reduces the amount of "contact stress" caused by day to day operations.

The LBM800 is fitted with Viton GFLT o-rings and is greased with Molykote BR2 as standard. Liquip can also supply the LBM800 in models to suit chemical and aviation products upon request.

Liquip now offer complete components for bottom loading including the latest API800 bottom loading coupler. Contact your local Liquip representative for all your loading arm needs.

Operating torque of the Liquip swivel is virtually unchanged from nil pipeline pressure to 1,000kPa pipe pressure.

Bottom loading arms come in 100mm (4") standard size. Up to six (6) loading arms can be placed in one bay with full crossover ability to cover the API bottom-loading envelope.

Typical horizontal reach is two (2) metres, but can be ordered to a required length to suit multiple applications. Consult Liquip for available options to best suit your needs.

## Section 1 - Loading Arm Types & Designs

- 1.1. All loading arm designs are recommended to be carried out by or in collaboration with the Liquip head office design section. (Contact your local Liquip Rep for further details and a loading arm survey form).

### 1.2 Technical Data

Balance Mechanism:	Cast steel
Working pressure:	1000kPa (145PSI)
Test Pressure:	1500 kPa (217 PSI)
Weight:	60 kg
Min Moment / Max Moment:	90 kg.m (650 ft.lb) / 250 kg.m (1800 ft.lb)
Up Down Angular movement:	+15° to -15°
Typical Horizontal spacing:	650 mm (25.6")
Typical Vertical spacing:	450mm (17.7")
Typical Radius of arm:	1300mm to 2000mm (51.2" to 78.7")
Typical No. of Arms in a Bay:	6
Viton GFLT Operating Temp:	-40°C to +60°C (-40°F to + 140°F)
Complies with API 1004 RP for API loading arm envelope.	

Maximum pressure drop at 2000 LPM (525 GPM) of petrol SG = 0.72 = 43 kPa (6.25 PSI), through standard arm assembly as shown in figure 8.

### 1.3 Ordering Information

Part Number	<u>LBM800</u> Standard	<u>LBM800C</u> Chemical	<u>LBM800AVI</u> Aviation	<u>2 x 2800N</u> Gas Strut	<u>2 x 5200N</u> Gas Strut	<u>1 x 2800N</u> Gas Strut	<u>1 x 5200N</u> Gas Strut
<u>LBM800</u>	•						
<u>LBM800C</u>		•					
<u>LBM800AVI</u>			•				
<u>LBM800-1Z</u>	•			•			
<u>LBM800-2Z</u>	•				•		
<u>LBM800-3Z</u>	•					•	•

### 1.4 Options And Related Equipment

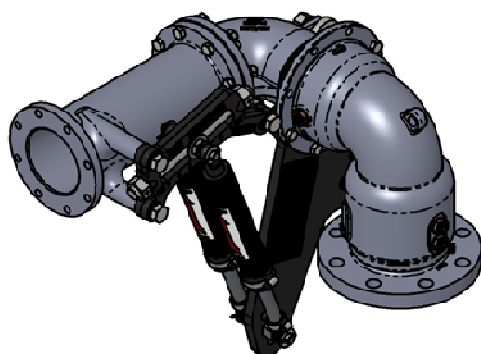
Part number and description	Mass (kg)	Mass (lb)
VNI-A4VG Intermediate swivel	6	13
VNC-A4VG Coupler swivel	5.7	12.5
VSS4 (straight) & VSA4 (angled 15°) Flanged Adaptor (cast spools)	1.8	4
API 800 Series API coupler	8.5	12
API 490 series Truck API valve	4.8	10.6
BF4 – Aluminium Flange 100mm Tube TTMA	0.54	1.2
4248 - Klingersil gasket to suit 100mm TTMA	0.03	0.7
4235 - Klingersil gasket to suit ANSI 150 raised face flange	0.07	1.5
5639P Flexible stainless steel hose, Ø100mm x 2 metres long, 4" TTMA flanges	5.2kg/m	3.51lb/ft
L220A Drop Spool piece, aluminium, Ø100mm x 3mm wall (4" x 1/8"), 4" TTMA flanges	3.5kg/m	2.35lb/ft
L219A Horizontal Spool piece, aluminium, Ø100mm x 6.3mm wall (4" x 1/4"), 4" TTMA flanges	5.2kg/m	3.51lb/ft
L219T Horizontal Spool piece, steel, Ø100 x 3mm wall (4" x 1/8"), 4" TTMA flanges	9.5kg/m	6.4lb/ft
L219P Horizontal Spool piece, steel, Ø100 x 6mm wall (4" Sch40), 4" TTMA flanges	16.0kg/m	10.7lb/ft
In Ø4" pipe, weight of petrol	5.65kg/m	3.8lb/ft
In Ø4" pipe, weight of distillate	6.6kg/m	4.42lb/ft
Riser pipe, spool piece, Ø100 x 6mm wall (4" Sch40), 4" ANSI 150 RF flanges	see L217 on Liquip drawing L1373-1	
Coupler spool pieces	see VSA4 & VSS4 on Liquip drawings V1101 & V1102	
Drop Pipe	see L220 on Liquip drawing L1373-1	
Horizontal spool	see L219 on Liquip drawing L1373-1	

*Note: All spool pieces, horizontal pipes and drop hoses are made to order.*

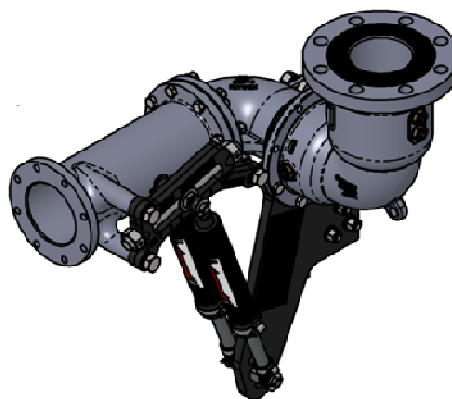
## Section 2 - LBM800 Assembly Instructions

### 2.1 Determine Required LBM800 Orientation

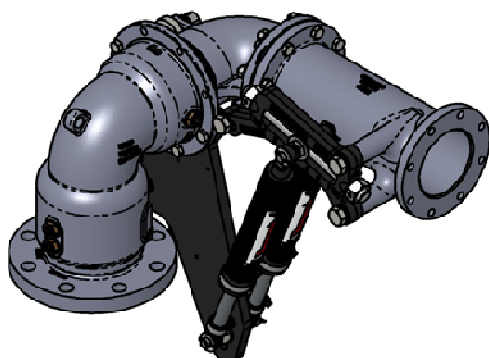
Examples of possible orientation are as below:



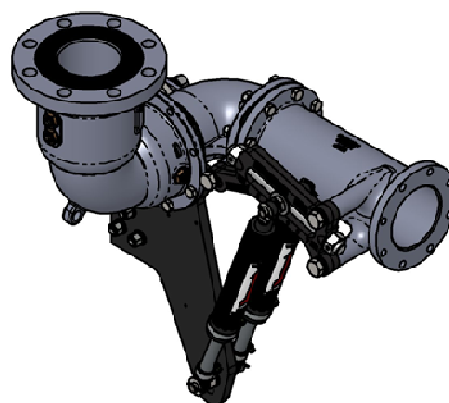
**RIGHT HAND  
UPWARD INLET**



**RIGHT HAND  
DOWNWARD INLET**



**LEFT HAND  
UPWARD INLET**



**LEFT HAND  
DOWNWARD INLET**

Figure 1: LBM800 Orientations

- 2.1.1 If the LBM800 is being installed in a new installation, please refer to the drawing provided to you by Liquip for requirements referring to the orientation of the LBM800 balance mechanism.
- 2.1.2 If the LBM800 is being installed in a retrofit application, copy the existing orientation when assembling the LBM800. The existing arm's profile determines the orientation requirements e.g. if it is offset to the left you will require a left hand orientated unit and if it is offset to the right you will require a right hand orientated unit.

**NOTE:** CHECK TO ENSURE ADEQUATE CLEARANCES BEFORE INSTALLING IN RETRO FIT APPLICATIONS

- 2.1.3 If the existing loading bay is fitted with riser pipes then you will need to assemble your LBM800 in the upward inlet orientation. Ensure you identify if you require left or right hand orientation.
- 2.1.4 If the existing loading bay is fitted with overhead piping you will need to assemble your LBM800 in the downward inlet orientation. Ensure that you identify if you require left hand or right hand orientation.

## 2.2 Assembly of LBM800 Balance Mechanism on Site

**NOTE:** to assemble the LBM800 in place of an existing loading arm complete sections 3.2.1 – 3.2.3 and then complete all steps in section 2.2.

2.2.1 Bolt the Outlet Spool (LBM800-9) to the Base Assembly (LBM800-100) using:

- Viton Gasket (0657DMV x1)
- Bolts (6745 x 8)
- Nuts (6744 x8)
- Washers (5288 x8)
- Spring Washers (5261 x8)

Tighten bolts to a recommended torque of 44Nm

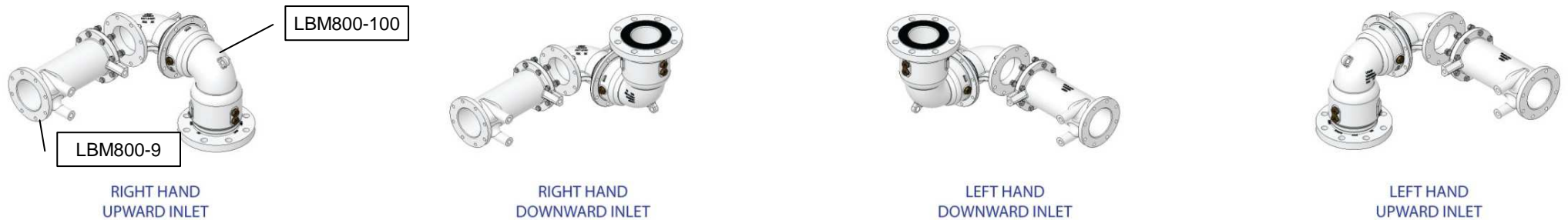


Figure 2 : LBM800 assembly - Step 1

2.2.2 Bolt the adjuster bracket (LBM800-10) subassembly to the Outlet Spool (LBM800-9) using:

- Bolts (4054 x3)
- Spring Washers (5359 x3)

Tighten bolts to a recommended torque of 190Nm



Figure 3: LBM800 assembly - Step 2

2.2.3 Bolt the Drop Bracket (LBM800-7) to the Base Assembly (LBM800-100) ensuring that it is in the correct position to suit the appropriate orientation requirement.

- Bolts (6745 x5)
- Nuts (6744 x5)
- Washers (5288 x5)
- Spring Washers (5261 x5)

Tighten bolts to a recommended torque of 44Nm



Figure 4: LBM800 assembly - Step 3

2.2.4 Assemble the bottom pivot pin to the LBM800-7 as show at right.

2.2.5 Bolt the LBM800-17 to the LBM800-7 as shown below

- Bolts (2936 x3)
- Nuts (4971 x3)
- Washers (5266 x3)
- Spring Washers (5280 x3)

Tighten bolts to a recommended torque of 30Nm

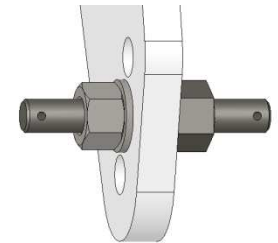
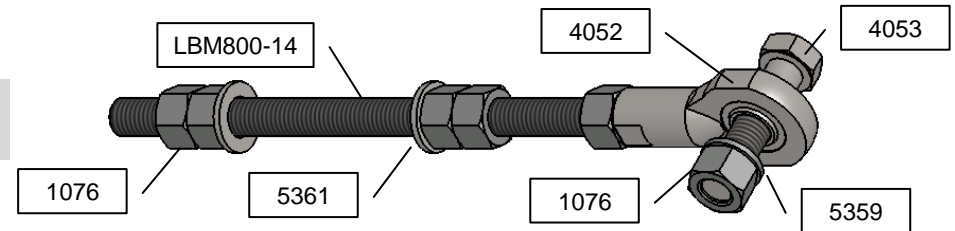


Figure 5: LBM800 assembly - Step 4

2.2.6 Assemble the up/down stop as shown. Ensure the rod of the up/down stop is fully screwed into the swivel assembly and the top nut is torqued.

- Rod End (4052 x 1)
- Up/Down stop rod (LBM800-14 x 1)
- Nut (1076 x 6)
- Bolt (4053 x 1)
- Spring washer (5359 x1)
- Flat Washer (5361 x 2)

Tighten bolts to a recommended torque of 40Nm



2.2.7 Install the up/down stop as shown below. Ensure you secure stop to the drop leg with the bolts/nuts and that the up/down stop nuts are installed above and below the LBM800-7.

**NOTE: Do Not Install Gas Struts yet.**

Struts will be installed during Section 3 – INSTALLATIONS FOR NEW AND RETROFITS



Figure 6: LBM800 assembly - Step 5

Once you have assembled the LBM800 in the appropriate orientation you are ready to complete the installation of the loading arm or to retrofit the LBM800 to the existing loading arm structure. Follow the instructions in Section 3 - Installations For New & Retro-Fits.



## **Section 3 - Installations For New & Retro-Fits**

### **3.1 New Installations**

- 3.1.1 If installing the Loading Arm in a new installation, follow the loading arm design diagram that has been provided to you by Liquip or refer to figure 8.

NOTE: If you have not received any loading arm designs please contact your Local Liquip Representative.

### **3.2 Retro-Fits**

#### **Removal of existing balance assembly**

- 3.2.1 Drain the loading arm of product and isolate the bay before safely removing the horizontal spool from the existing balance assembly.
- 3.2.2 Remove the existing balance assembly from the riser pipe.



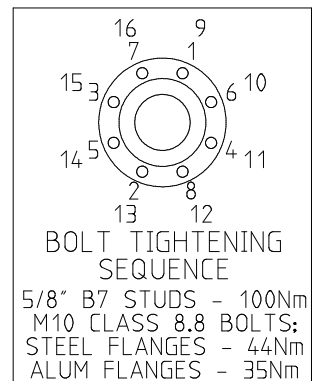
**Caution:** Existing balance assembly is too heavy to support by hand!

#### **Fitting the LBM800 On To Riser Pipe**



**Caution:** LBM800 is too heavy to support by hand!

- 3.2.3 Fit the 100mm (4") ANSI 150 flange of the LBM800 to the riser pipe. Use appropriate gasket and use 5/8" UNC x 3 1/2" long B7 petrochemical studs and 2H nuts tightened to a torque of 100Nm (160ftlbs) (Stud/Nuts – [Liquip P/N: 4892] [8 required] & Klinger gasket – [Liquip P/N: 4235]).



- 3.2.4 Identify which gas struts are currently being used and order new gas struts as required.

Depending on arm dimensions, components & product, using a combination of the two available struts (4416 – 2800N force & 3008 – 5200N force) allows a wide range of solutions for many applications.

- 3.2.5 Position the top pivot pin approximately in the centre of the adjuster bracket. The bottom pivot pin should be in centre hole except for in exceptional circumstances (refer Figure 7: Pivot Pin Identification). Lift spool upwards and place struts onto pivot pins with the leather boot down and fit washers (P/N - 4359) and split pins (P/N - 4871) to both top and bottom pivot pins.

*Important: Lift-o-mat struts must be installed with the leather boots downwards for proper internal lubrication.*

## PIVOT PIN IDENTIFICATION

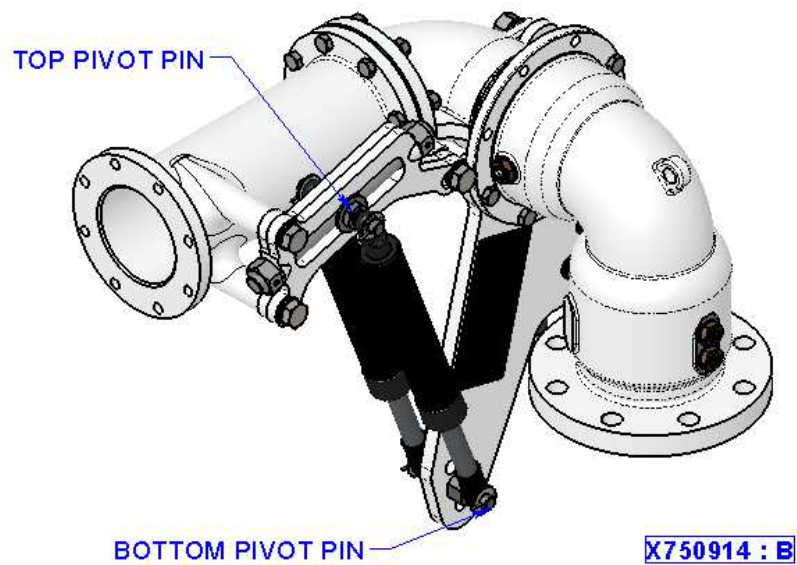


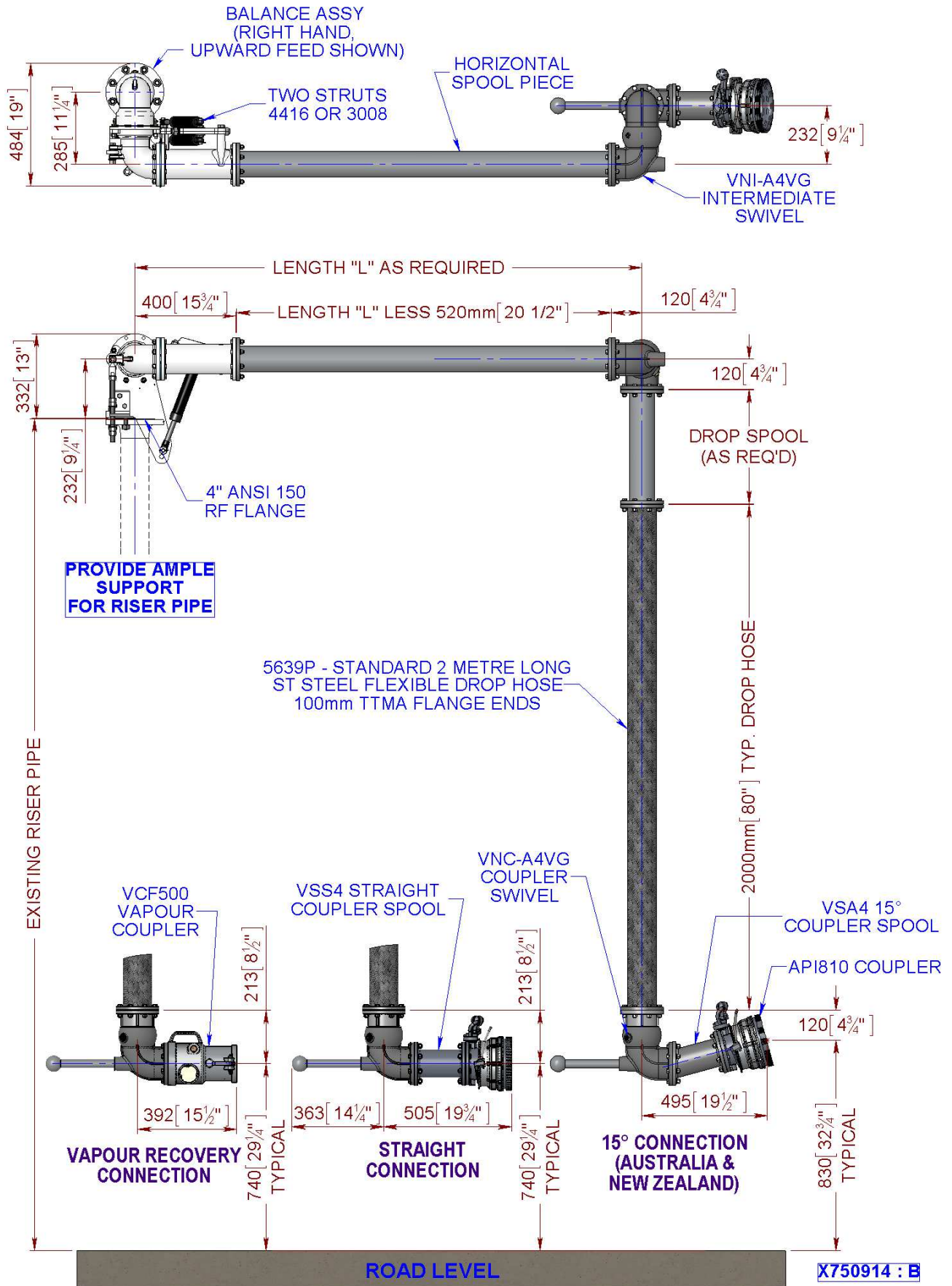
Figure 7: Pivot Pin Identification

- 3.2.6 Bolt the horizontal spool to the TTMA outlet of the LBM800 and re assemble the loading arm.

*Use appropriate gasket & use M10 x 45mm long Class 8.8 bolts and nuts tightened to a torque of 44Nm (32ft.lb) for steel flanges or 35Nm (26ft.lb) for aluminium flanges.*

- 3.2.7 Fill with product, check for leaks, and check operation of all swivels.

## LBM800 SETUP



**LIQUIP**

See website for Liquip branches and distributors -[www.liquip.com](http://www.liquip.com)

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Figure 8: LBM800 Setup

## **Section 4 – Strut And Adjustment Commissioning**

### **4.1. Adjustment of Assembled Loading Arm**



**NOTE:** The Up/Down stop should not be used to support an arm without struts.

Ensure the loading arm is filled with product and has no leaks. Take the weight off the arm before moving the adjustment nut.

### **4.2 Height Adjustment**

#### **Adjustment of Assembled Loading Arm to decrease Upwards force (to lower)**

- 4.2.1** Turn the nut on the adjustor bracket to move the pivot pin towards the riser pipe, decreasing the upward force of the struts (see **Error! Reference source not found.**). The centre of the API coupler should rest 830mm (33”) for 15 deg spools or 740mm (29”) for straight spools from ground level (see **Error! Reference source not found.**), unless otherwise specified.

#### **Adjustment of Assembled Loading Arm to increase Upwards force (to raise)**

- 4.2.2** Turn the nut on the adjustor bracket to move the pivot pin away from the riser pipe, increasing the upward force of the struts (see **Error! Reference source not found.**). The centre of the API coupler should rest 830mm (33”) for 15 deg spools or 740mm (29”) for straight spools from ground level. (see **Error! Reference source not found.**), unless otherwise specified.
- 4.2.3** The arm should be easy to move and when the arm is pushed up or down the API coupler should come to rest within 50mm ( $\pm 2$ ”) from the recommended height outlined in **Error! Reference source not found.**.
- 4.2.4** If the coupler does not come to rest within the height  $\pm 50$ mm as outlined in **Error! Reference source not found.**, re adjust the arm by rotating the adjustor nut one (1) complete turn at a time in the required direction and re check. Continue this procedure until the coupler comes to rest within the tolerance.

If when checked as above the arm comes to rest within the tolerance from ground level, you have successfully adjusted the loading arm.

When adjusting the loading arm jiggle the coupler up and down to get a true indication of what height the coupler comes to rest at.



**Note:** If you change the product the arm is dispensing, you may have to re-adjust the arm.

## HEIGHT ADJUSTMENT

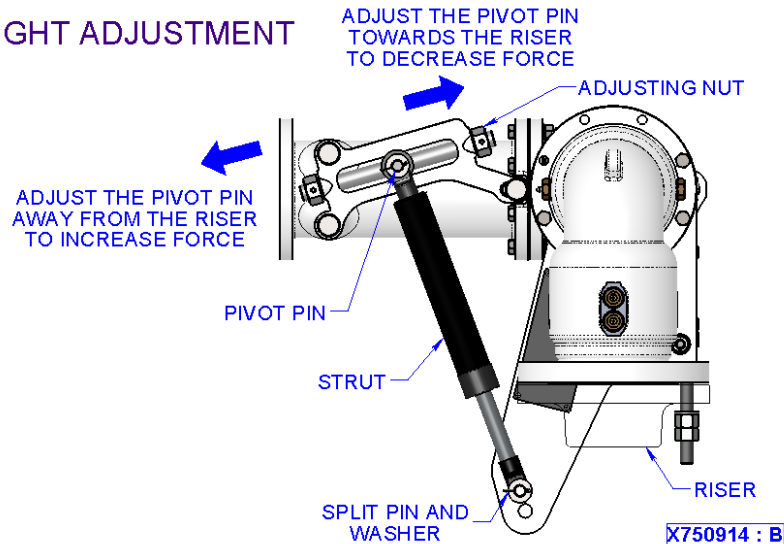


Figure 9: LBM800 Height Adjustment

## 4.3 Up Down Stop Adjustment



**NOTE:** The Up/Down should not be used to support an arm without struts.

- 4.3.1 The Up down stop can be used to prevent damage to the loading arm by preventing contact with overhead objects or preventing the coupler crashing onto the ground.
  - 4.3.1.1 To adjust the up stop, set the top two locking nuts to desired height. (see **Error! Reference source not found.**)
  - 4.3.1.2 To adjust the down stop, set the two bottom locking nuts to the desired height. (see **Error! Reference source not found.**)

## UP-DOWN STOP ADJUSTMENT

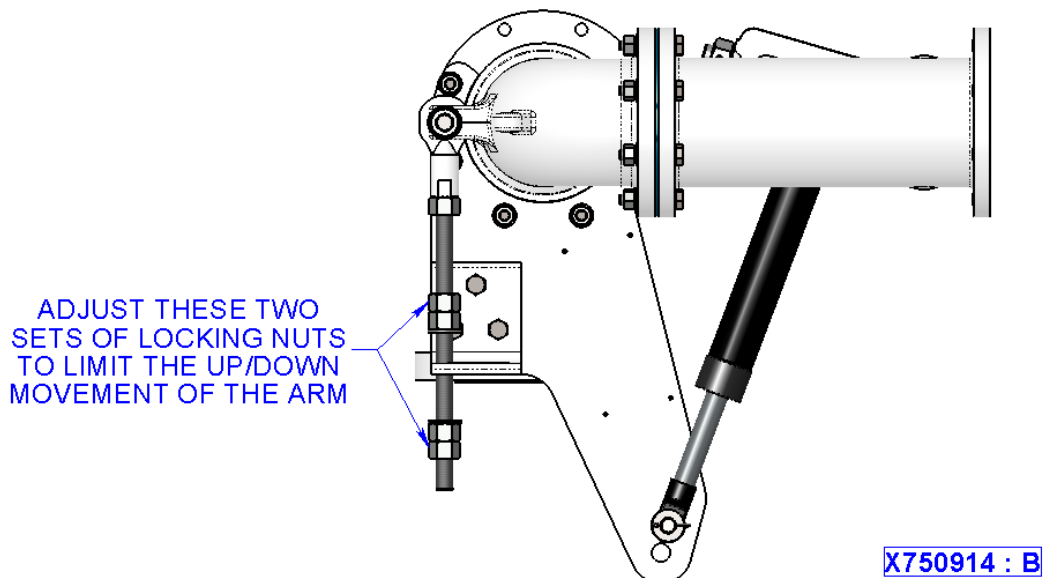


Figure 10: LBM800 Up-Down Stop Adjustment

## Section 5 - Maintenance Information

### 5.1 Regular Maintenance Inspections

The LBM800 balance assembly has been designed so that it does not require regular maintenance under normal operating conditions and in normal environmental conditions. However, Liquip strongly recommend that users periodically inspect the balance assembly for visual wear and functional operation.

If the user notices that the swivel has become harder than usual to rotate or if they note any signs of leakage, it is advised that the unit should be inspected further. Please contact your local Liquip representative for further instructions.

### 5.2 Adjustment Of Assembled Loading Arm

Periodically check to ensure that the loading arm is sitting within the below tolerance

The API coupler should sit within  $\pm 50\text{mm}$  from 830mm (33") for 15 deg spools or 740mm (29") for straight spools from ground level (see **Error! Reference source not found.**).

If the arm is no longer sitting within the tolerance you will need to turn the nut on the adjuster bracket to increase or decrease upward force. Before commencing any adjustments, ensure that you have suitably supported the intermediate swivel. (Refer to 4.2 Height Adjustment, for more detail).

Ensure that you move the position of the nuts on the Up/Down stop to allow the arm to move freely without clashing into any objects i.e. the horizontal arm should be parallel to ground. A tolerance of  $\pm 5^\circ$  is permissible.

5.2.1 A failed strut should always be easily identifiable by

- Oil leakage at bottom.
- It will be loose on spindles. (Before an adjustment is made)  
Remove split pins and slide old strut off - remove from the bottom pivot pin first.

If any of the gas struts have failed, please contact your local Liquip Representative for replacement struts. In the event of strut failure...



**Caution:** Do not attempt to remove a strut unless the horizontal arm is properly supported. The loading arm is too heavy to support by hand!

*When replacing Lift-o-mat struts, ensure replacement strut is of the same force as that being replaced. 5,200N struts have a green leather boot, while the 2,800N strut is black. See section 3.4. Quote identification numbers on side of strut when ordering replacement.*

5.2.2 Slide new strut onto the pivot pins, secure with washers and split pins and wind upper and lower limit adjusting nuts back to previous positions. Refer to section 4 to re-adjust loading arm.

**Important:** Struts must be installed with the leather boots downwards for proper internal lubrication.

The piston rod finish is crucial for the sealing of the strut, (similar to hydraulic or pneumatic cylinder piston). It is very important not to damage the strut. Avoid clamping or gripping, levering against, hammering, buffing or grinding, corrosive substances and painting (or overspray).

5.2.3 To ensure maximum lifetime of struts, it is recommended that the greasing sponge underneath the leather boot has fresh grease applied to it annually. To do so, follow these steps (refer **Error! Reference source not found.**) (regreasing may be carried out without supporting the weight of the arm as struts will not be disconnected):

1. Loosen larger diameter hoseclamp with an appropriate socket or flat screwdriver.
2. Slide leather boot down and remove sponge.
3. Liberally apply grease to inside of sponge tube – Liquip recommends multipurpose lithium based grease.
4. Replace sponge back around piston rod of strut.
5. Pull leather boot over sponge and up over strut cylinder.
6. Replace hoseclamp and tighten in original position.
7. Remember you are doing this to prevent damage to the shaft, so pick a day when the wind is low and there is no dust in the air.

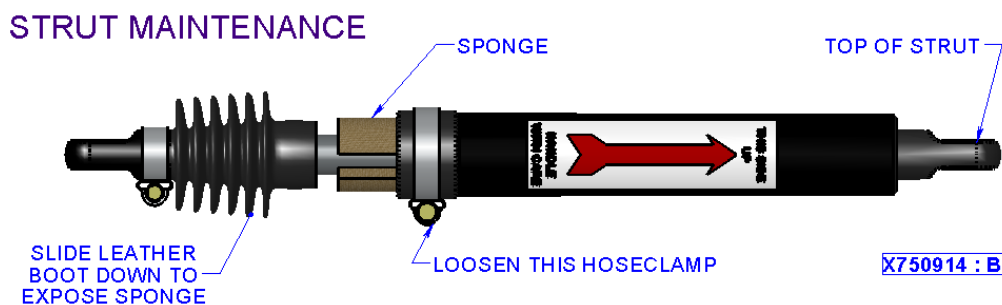


Figure 11: LBM800 - Strut Maintenance

## Section 6 – Checklist Loading Arms

### 6.1 Before Filling With Product, Check:

- All spool pieces and swivels fitted to correct arm.
- Tightness of all flanges bolting (see Section 3 - Installations For New & Retro-Fits for torque values).
- All split pins and washers fitted to top and bottom pivot pins.
- All leather boots secure on struts, with boots facing down.
- Struts lower pivots positioned in central hole in bracket (except for special purposes).
- Up/down stops fitted and adjusted.
- API coupler is closed.

### 6.2 After Filling With Product:

- Adjust force by adjusting struts per Section 4 – Strut And Adjustment Commissioning



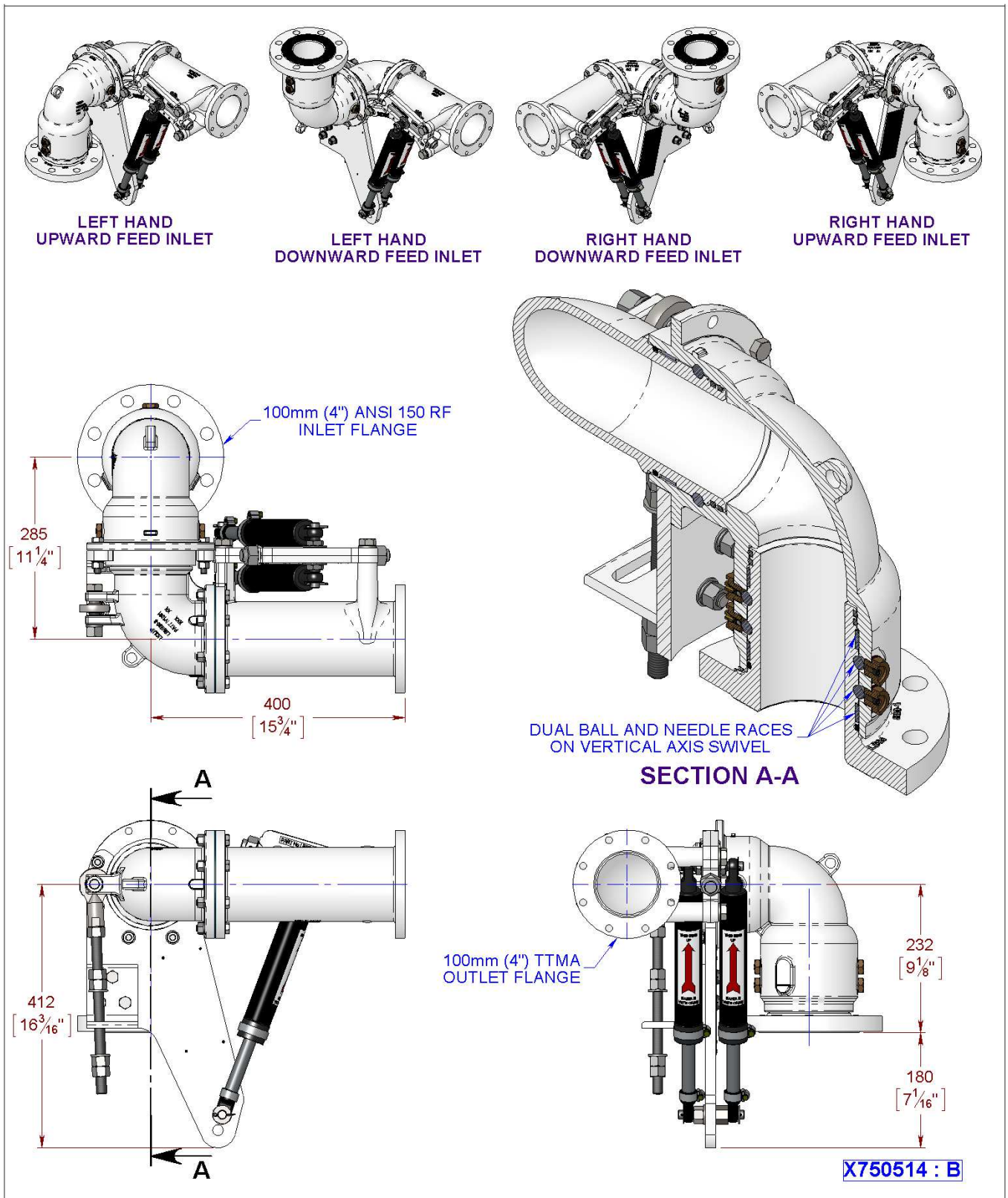
**Note:** *During, adjustment, move the coupler up and down to ensure it shows a true position.*

- Adjust “down” and “up” stops to prevent loading arm from crashing into nearby objects.
- Visually check for product leaks.
- Check ease of rotation and up-down movement.

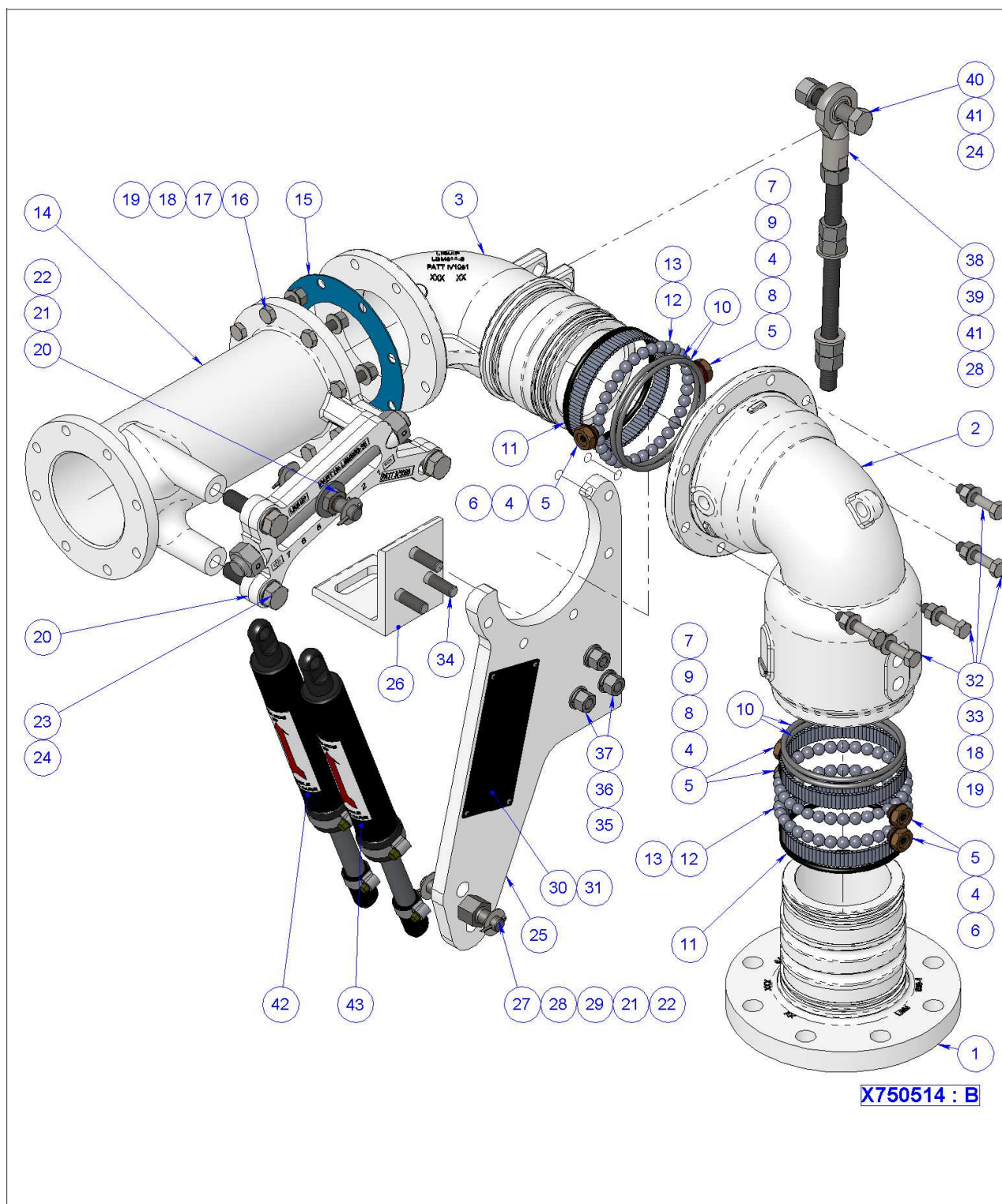


## Appendix

### 1. LBM800 – Dimensions and Orientations



## 2. LBM800 – Exploded View



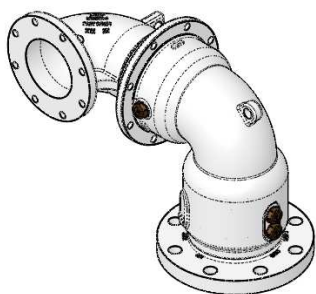
### 3. LBM800 – Parts List

ITEM	PART No	DESCRIPTION	QTY.	MATERIAL
1	LBM800-1	MALE STRAIGHT	1	CAST STEEL
2	LBM800-2	ELBOW FEMALE	1	CAST STEEL
3	LBM800-3	OUTLET ELBOW	1	CAST STEEL
4	0885	WASHER FIBRE	6	FIBRE
5	SJW100-3	BALL RETAINER PLUG	6	BRASS
6	6696	GRUBSCREW CUP POINT	3	ST STEEL
7	4480	SPRING COMPRESSION	3	ST STEEL
8	6688	SCREW RETAINING	3	BRASS
9	4580	BALL BEARING	3	STEEL
10	0126VG	O-RING	4	VITON GFLT
11	7619	O-RING	2	H.A.N.
12	2334	BALL BEARING	96	BEARING STEEL
13	4531	NEEDLE ROLLER	282	BEARING STEEL
14	LBM800-9	OUTLET SPOOL	1	CAST STEEL
15	0657DMV	GASKET TTMA 100mm (4")	1	VITON A
16	6745	BOLT METRIC	8	Z/P STEEL
17	6744	NUT METRIC	8	Z/P STEEL
18	5261	WASHER SPRING	13	Z/P STEEL
19	5288	WASHER FLAT	13	Z/P STEEL
20	LBM800-10	BRACKET ADJUSTER - ASSEMBLY LBM8xx	1	CAST STEEL
21	4359	WASHER FLAT	4	Z/P STEEL
22	4871	SPLIT PIN	4	ST STEEL
23	4054	BOLT METRIC	3	Z/P STEEL
24	5359	WASHER SPRING	4	Z/P STEEL
25	LBM800-7	DROP BRACKET	1	STEEL
26	LBM800-17	BRACKET-UP DOWN STOP	1	STEEL
27	LBM800-11	PIVOT PIN BOTTOM	1	Z/P STEEL
28	5361	WASHER FLAT	3	Z/P STEEL
29	4055	NUT METRIC FINE	1	Z/P STEEL
30	59104	LABEL ID - LOADING ARMS	1	ALUMINIUM
31	0005	POP RIVET	4	ALUMINIUM
32	4020	SETSCREW METRIC	5	Z/P STEEL
33	0055	NUT METRIC	5	Z/P STEEL
34	2936	BOLT METRIC	3	Z/P STEEL
35	5266	WASHER FLAT	3	Z/P STEEL
36	5280	WASHER SPRING	3	Z/P STEEL
37	4971	NUT METRIC	3	Z/P STEEL
38	4052	ROD END - UP/DOWN STOP	1	Z/P STEEL
39	LBM800-14	UP DOWN STOP	1	Z/P STEEL
40	4053	BOLT METRIC	1	Z/P STEEL
41	1076	NUT METRIC	6	Z/P STEEL
42	4416	LIFT-O-MAT STRUT	AS REQD	STEEL
43	3008	LIFT-O-MAT STRUT	AS REQD	STEEL

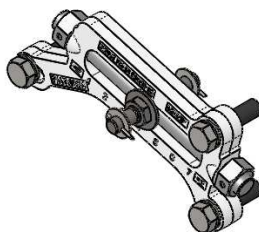
**X750514 : B**

## 4. LBM800 – Spare Parts List

### SPARE PARTS FOR LBM800



**LBM800-100**  
COMPLETE SWIVEL ASSEMBLY  
SIMPLE BOLT-IN REPLACEMENT



**LBM800-ABA**  
ADJUSTER BRACKET ASSEMBLY  
WITH MOUNTING BOLTS



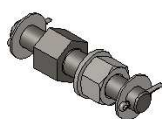
**LBM800-UDL**  
UP/DOWN LIMITER BOLT  
WITH MOUNTING FASTENERS



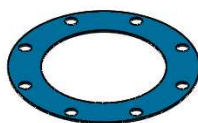
**LBM800-VSK**  
BEARING & SEAL COMPONENTS  
FOR VERTICAL AXIS SWIVEL



**LBM800-HSK**  
BEARING & SEAL COMPONENTS  
FOR HORIZONTAL AXIS SWIVEL



**LBM800-PPA**  
PIVOT PIN ASSEMBLY  
FOR LOWER STRUT MOUNT



**0657DMV**  
100mm VITON TTMA GASKET  
BETWEEN SWIVEL & OUTLET



**4416**  
LIFTOMAT STRUT  
2800N  
(BLACK BOOT)



**3008**  
LIFTOMAT STRUT  
5200N  
(GREEN BOOT)

**X750514 : B**



Liquip complies with the following standard:

AS/NZS ISO9001-2008: Quality Management Requirements