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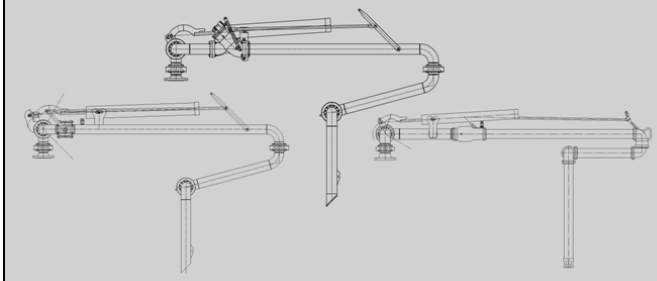
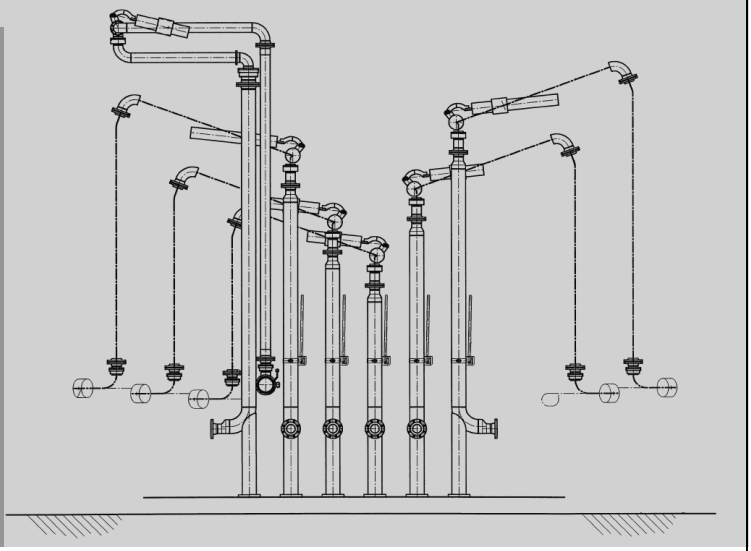
EMCO WHEATON
A Gardner Denver Product

INSTALLATION, OPERATION & MAINTENANCE MANUAL



EMCO WHEATON

Top & Bottom Loading Arms



This manual contains information that may not pertain to your arm.

Rev.: 1

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1 Safety

1.1 Safety Comments

The following instruction manual describes the loading arm delivered by EMCO WHEATON. It does not describe the loading system and does not include fittings and devices which are not part of the loading arm.

This manual explains how to install, operate and maintain the loading arm, helping to ensure safety and functionality.

Follow the instructions of this manual in all details. It does not release you from the responsibility to perform the described steps in a professional and appropriate manner.

Please refer to all drawings and additional documentation accompanying this manual for important data pertaining to the loading arm.

The loading arm is intended to be assembled in a loading system. It must not be used prior to the loading system being confirmed to correspond to the current version of all local laws, regulations and requirements which apply. This manual does not replace these rules in any way.

EMCO WHEATON offers on-site training for installation and maintenance of supplied equipment.

Intended Use

EMCO WHEATON Loading Arms are movable pipes and joints for transferring fluid between a fixed connection and a movable tank. Refer to the loading arm general arrangement drawings for information about the conditions for using the loading arm.

Any other use of the loading arm is not intended and therefore not permitted.

- Do not change the structure of the loading arm in any way. Any changes may endanger persons and/or cause the loading arm to become unsafe. Contact EMCO WHEATON for information.
- Do not use the loading arm when you notice it has been damaged or is malfunctioning. Contact your supervisor immediately.
- Only change the operating conditions of the loading arm with written permission by EMCO WHEATON. The loading arm has been designed for the conditions described in the drawings accompanying this documentation. Contact EMCO WHEATON for authorization if the loading arm is required to exceed the conditions specified, to ensure that the loading arm meets the new requirements.
- Follow the instructions and warnings on the loading arm.
- Do not cover or remove any signs on the loading arm.

The customer shall only allow staff working with the loading arm that:

- are capable of safely handling the loading arm;
- have been trained on proper handling the loading arm;
- Understand the dangers of the loading arm.

1.2 Safety Symbols and Notes

This instruction manual also indicates potential dangers of handling, operating and maintaining loading arm. These dangers are highlighted in the text with an explanation of how to avoid them. Observe the highlighted cautionary notes and be especially careful in these situations. Explain these dangers to all persons working with or near the loading arm.

DANGER	**Danger** This symbol indicates a hazardous situation which will result in serious injury or death, if not avoided.
WARNING	**Attention** This symbol indicates a hazardous situation which could result in serious injury or death, if not avoided.
CAUTION	**Caution** This symbol indicates a hazardous situation which may result in minor or moderate injury, if not avoided.
	**Note** This symbol indicates additional information and imposes no hazardous situation.

2 Loading Arm Types

Refer to the drawings, parts lists and accompanying documentation for additional information specific to your loading arm.

WARNING	**Attention** Operating the loading arm outside of the specified conditions may damage the loading arm which could result in serious injury or death. The loading arm has been designed for the operating conditions shown on the general arrangement drawings. Please refer to the drawings and ensure the arm is operated within the specified limits.

3 Loading Arm Description

3.1 Loading Arm

The EMCO WHEATON Loading Arms are a movable pipe system for loading or unloading railroad cars, tank trucks and other vessels. The transfer of fluid is achieved by either introducing the loading arm into the manhole or making a connection to the flange of the vessel. Please refer to the general arrangement drawing for connection details.
EMCO WHEATON Swivel Joints and counterbalance mechanisms provide smooth and balanced movement of the loading arm in all directions. EMCO WHEATON loading arms are also designed to be self-supporting.

3.2 Main Components - Top Loading

Refer to Figure 1 and 2 in Section 3.3

1. The **F-Length** provides reach in the horizontal plane. (boom style arms only)
2. The **A-Length** provides reach in the horizontal and vertical planes.
3. The **B-Length** is introduced into or connected to the tank or vessel.
4. **Swivel joints** connect piping and elbows allowing the loading arm to articulate while maintaining a pressure tight seal.
5. The **spring cylinder** balances the A-length and provides assisted movement of the loading arm.
6. The **vacuum breaker** introduces air into the arm and facilitates draining of the loading arm.
7. **Handles** are supplied to aid in manipulation of the loading arm.
8. The **loading valve** is used to start and stop the product flow. EMCO WHEATON loading valves feature an adjustable slow closing mechanism to control the rate of closure to prevent line shock.
9. Other **valve** types are used to start and stop the product flow of loading arms for chemical, hot & food products.
10. A **remote control** is used to assist in operating the loading valve while the operator is visually monitoring the fluid level.
11. The **flange** or **coupler** is used to connect the loading arm to the corresponding connector on the vessel.
12. A **proximity switch** (**limit switch**) can be installed to monitor the position of the loading arm or the state of the product valve (open/closed).

3.3 Survey Drawing (Model E2025 shown)

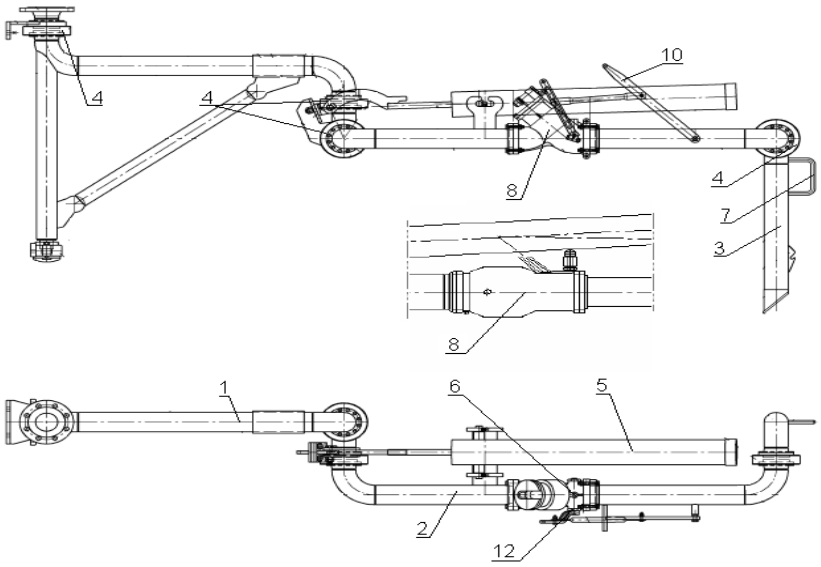


Figure 1

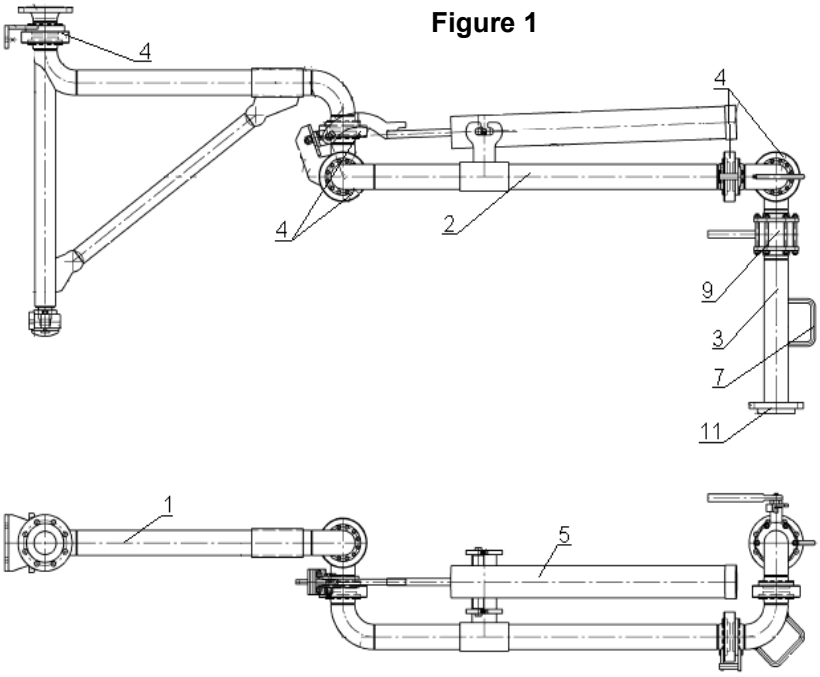


Figure 2

3.4 Main Components – Bottom Loading

Refer to Figures 3 and 4 in Section 3.5

1. The **stand post** carries the loading arm. If several loading arms are standing in a row, the stand post of each loading arm has a different height to enable you to cross the hoses without collision.
2. The **intermediate tube** carries the parking device.
3. The **F-Length** provides reach in the horizontal range.
4. The **A-Length** provides reach in the horizontal and vertical range.
5. The **B-Length** is connected to the tank or vessel.
6. **Swivel joints** connect piping and elbows allowing the loading arm to articulate while maintaining a pressure tight seal.
7. The **spring cylinder** balances the A-length and provides assisted movement of the loading arm.
8. The **vent connection** is used to vent the loader while filling it with product or to accelerate draining for maintenance.
9. Use the **handle** to move the loading arm.
10. The **coupler** of the loading arm connects to the adapter at the tank or vessel.

3.5 Survey Drawing (Model E2304 shown)

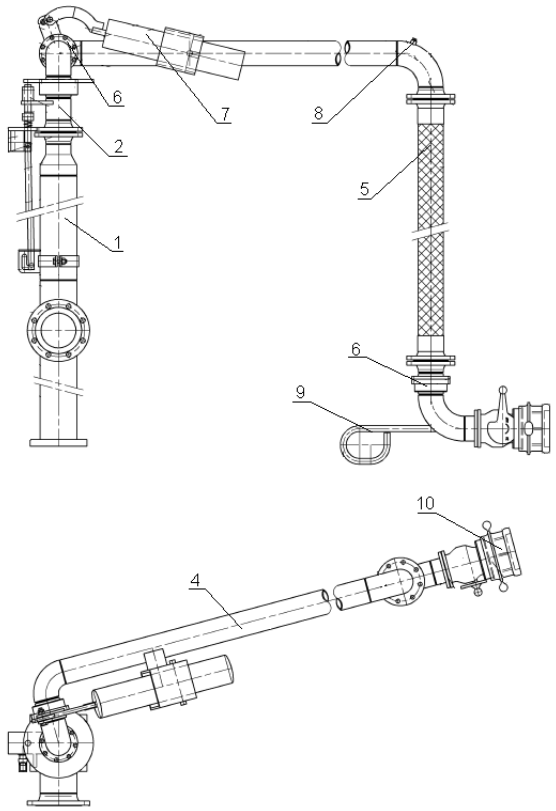


Figure 3

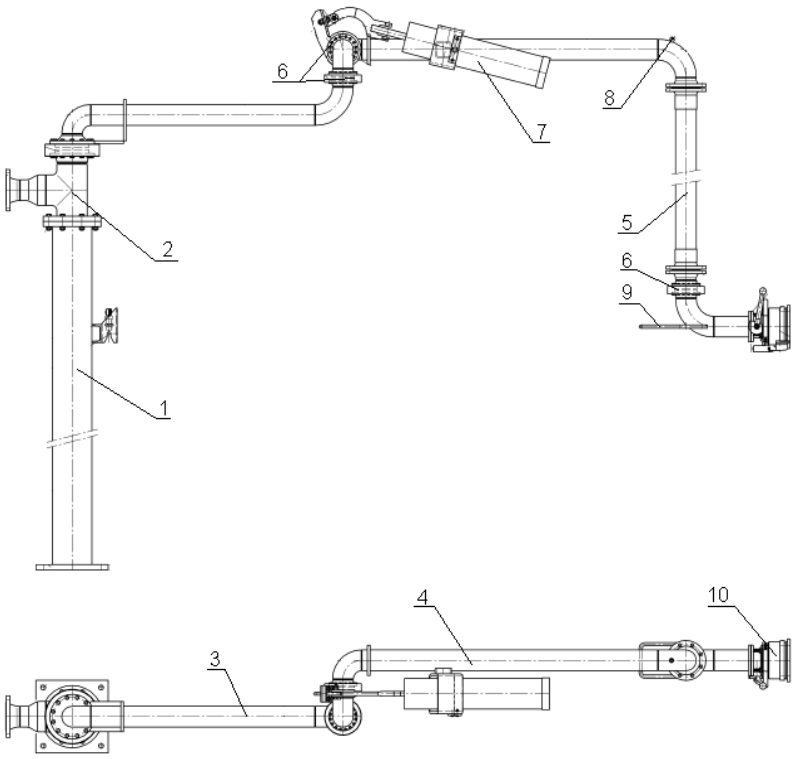


Figure 4

4 Warranty

EMCO WHEATON grants a warranty for the loading arm. Refer to your order confirmation or the EMCO WHEATON Terms and Conditions.

Items NOT covered under warranty are:

- Damage caused by inappropriate handling and storage
- Damage caused by faulty installation
- Damage caused by incorrect adjustment
- Components with removed or illegible labelling
- Damage caused by incorrect operation
- Worn parts

5 Delivery and Storage

All EMCO WHEATON products are secured and packed carefully at the factory. Although the utmost care has been taken in preparing the loading arm for shipment, please inspect for transport damages and completeness on receipt of goods. Notify EMCO WHEATON about any findings or concerns immediately. Claims submitted on a later date cannot be accepted.

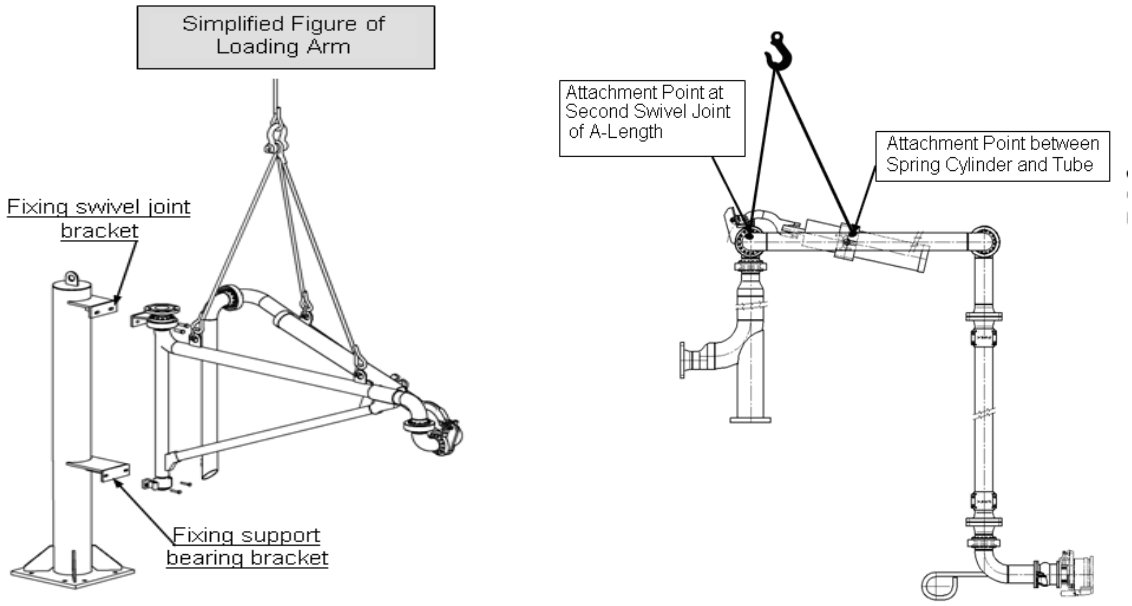
Store the goods in a sheltered area as soon as the delivery is received and cover them properly to protect them from dirt and moisture. Provide ventilation to avoid corrosion caused by condensation.

For loading arms not supplied with a finish coating, the customer is responsible for painting the arm to provide corrosion protection.

Protect all hoses and cables against rodents. If the arm is to be stored for an extended period, protect with a suitable preservative. Please contact EMCO WHEATON for more information.

6 Installation

6.1 Installation of the Loading Arm (E2025 & E2304 shown)



Attach suitable hoisting gear to the loading arm for lifting the loading arm and to avoid damaging the loading arm.

DANGER	**Danger** During installation of the loading arm it could turn or fall down Keep a safe distance from the loading arm while hoisting

Loosen the transportation locks and remove all packing material. Lift the loading arm and remove the supporting frames. Mount the stand post or the wall bracket, if supplied.

Pay close attention to a proper vertical alignment. Lift the loading arm until mounting brackets align properly. The installation position of the loading arm is horizontal (see drawing for correct inlet position). Bolt the swivel joint bracket to

the support bearing bracket. Ensure that the slew axis of the boom is in a vertical position. (previous note only applies when bracket or stand post is supplied)

The inlet flange attachment bolts and nuts are not included in the scope of delivery. Select adequate bolts and nuts which are suitable for the weight and the bending moment. Use all attachment provisions.

Connect the flanges and install gaskets at the flanges.

Remove the transport locks from the loading arm and spring cylinder (See Figure 5 below).

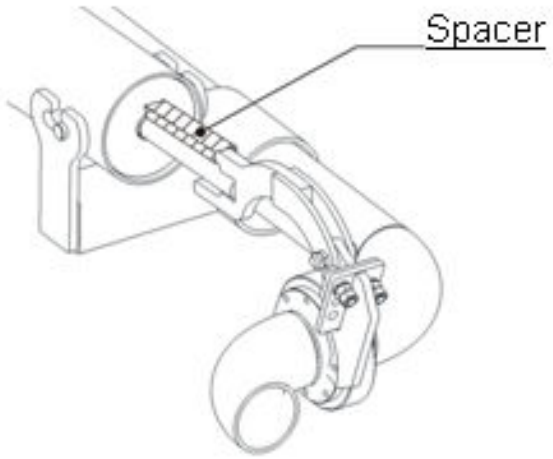


Figure 5

Install components supplied separately (such as overfill device, parallel guide, hoses, couplers etc., if applicable). Refer to the loading arm drawing for more information.

Once installed, move the loading arm and verify that it will hold its position. If the loading arm slews about its axis, ensure that the mounting flange is level. If the arm is not properly balanced, adjust the balance of the spring cylinder (refer to the spring cylinder adjustment manual for procedure). Although all components have been adjusted to proper values by the factory, minor adjustments may be required.

⚠ CAUTION	**Caution** If the loading arm is inadequately balanced or moves on its own it may hit persons nearby causing injury. Adjust arm and mounting flange to suit.

Ensure not to enclose any objects in the system (e. g. tools or bolts). Clean all tubes before final installation.

The operator of the system is responsible for grounding the system and protecting it from lightning.

Only persons with the required training and qualification should connect and maintain the electrical, pneumatic or hydraulic systems. Connect these systems according to the accompanying diagrams and data sheets.

Note

All control components have been adjusted to correct values during fabrication. Do not change these values without written consent from EMCO WHEATON.

6.2 Installation of Feed Lines

Only persons with the required training and qualification (i.e. electricians for the electrical systems or mechanics for the pneumatic and hydraulic system) are allowed to work on the electrical, pneumatic and hydraulic system.

Install and connect all pneumatic and hydraulic lines according to appropriate industry standards. Fittings, dimensions and quality of the components must be selected to meet the requirements of the installation.

Clean all pipes and containers from dirt (scales, sand, swarf etc.) before installation.

Connect the electrical system, the pneumatic system and the hydraulic system (if applicable) according to the diagrams and data sheets in the appendix.

All components have been adjusted to their values during fabrication. Do not change these values without our written consent.

Only use dry and clean air or nitrogen for the pneumatic system.

7 Commissioning

Do not operate the loading arm when you notice any damage. Please contact EMCO WHEATON.

Purge the system (loading arm and pipes) before using for the first time to avoid damaging the swivel joints and fittings.

Perform the following tests:

- Leakage Test
  Leak test by means of air or nitrogen of 7 to 15 psi and a foam-forming substance.
- Operating Range/Balancing
  Check the operating range once again by moving the A/B/F-lengths of the loading arm into the extreme positions. Verify with the help of the general arrangement drawing.
- Functional Test:
  Operate the loading arm as described in Section 8. Test the function of all instruments, accessories and signals.

Do not exceed the allowable operating pressure and operating temperature.

8 Operation of the Loading Arm

Refer to the loading arm general arrangement drawing and/or envelope drawing for information about the operating data of the loading arm.

Warning

Explosion hazard – sparks due to static electricity.

You may be severely injured or killed, if sparks ignite product vapours in the air.

Ground the tanker before beginning the loading process.

Check the loading arm operating conditions before beginning the loading process and whether the required conditions are met. Stop the loading immediately when you notice malfunction and/or damage and inform a supervisor immediately.
The loading process is defined by the customer.

Note

EMCO WHEATON recommends purging the loading system (loading arm and pipes) before loading to avoid damaging the swivel joints and fittings.

Warning

Explosion hazard – metal parts can hit and cause sparks.

You may be severely injured or killed, if sparks ignite product vapours in the air.

Move the loading arm slowly and do not release while still in motion.

8.1 Operation of Loading Arms with Open B-Length

Remove the loading arm from its parking position and move to the tanker. Introduce the B-Length into the manhole. The loading arm is now ready for loading. The loading process is defined by the customer. When all requirements for the loading process are fulfilled, open the loading valve or the ball valve to start loading (if applicable).

Caution

Only use your hands to operate the loading valve or remote control. Do not block or fix the remote control in any way (e.g. tie it with a rope).

When the loading process has finished, release the remote control to close the loading valve or turn handle on ball valve. Let the arm drain and raise the B-

Length from the manhole. Return the loading arm to its parking position and secure.

	**Note** Product remaining in the pipe might damage the swivel joints. Drain the arms completely before returning to parking position.

8.2 Operation of the Loading Arms with Flange/Coupler

This section describes how to operate the loading arms with Dry-Break couplers or flange connections on drop tube.
Remove the loading arm from its parking position and move to the tanker. Connect the B-Length to the connection point at the tank. Make the appropriate connection for end fitting.

The loading arm is now ready for loading. The loading process is defined by the customer.

When the loading process has finished, close appropriate valve. Let arm drain if required and disconnect the B-Length from the tank. Return the loading arm to its parking position and secure.

9 Service and Maintenance

9.1 Safety Comments

A. EMCO WHEATON recommends using EMCO WHEATON Service to maintain the equipment.

B. Only persons who are able to perform all tasks professionally due to their training and qualification are allowed to repair the loading arm (e. g. electricians for the electrical system). Contact EMCO WHEATON if the loading arm is severely damaged.

C. Secure the loading arm while performing maintenance tasks to avoid it from moving unexpectedly.

D. Take special care and use adequate hoisting devices (cranes, belts) when lifting heavy components when performing maintenance tasks.

	**Warning** Severe injury or death could result if the product leaves the loading arm under high pressure or if you open hydraulic lines. Purge the loading arm and depressurize lines when servicing any components of the loading arm.

9.2 Spare Parts

Only use original EMCO WHEATON spare parts. Please refer to the spare parts listing for your recommended loading arm spares. Our spares & service department will be happy to provide you with a quotation.

9.3 Regular Tests

Perform regular tests according to recommendations in the following sections as well as any applicable local safety regulations/laws.

9.4 General Maintenance

	**Caution** Do not use a high-pressure cleaner to clean the loading arm. Prevent any static electricity when you are cleaning plastic parts.

EMCO WHEATON recommends EMCO WHEATON Service to service and maintain the loading arm. If you prefer having the loading arm maintained by your staff, EMCO WHEATON offers training which explains the equipment of your loading arm and can be performed on-site.

Refer to section 9.5 for information about maintenance intervals.

	**Note** If EMCO WHEATON Service carries out maintenance, the customer must provide a material safety data sheet of the product loaded and additionally a risk assessment.

9.5 Service Intervals

Component		Service Interval			
		Each Loading	Every 6 Months	Annually	As Required
9.6	Open Lubrication Points		•		
9.7	Maintenance of Swivel Joints	O		•	
9.8	Spring Cylinder Maintenance		•		
9.9	Spring Cylinder Adjustment				•
9.10	Replacement and Disposal of Spring Cylinder				•
9.11	Bolt Connections				X
9.12	Painting			•	
9.13	Electrical Equipment	O		•	
9.14	Loading Valve	O		•	
9.15	Other Valve Types	O			
9.16	Hose	O			•
9.17	Coupler	O			•

O = Check for proper operation. Service the component only, if necessary.

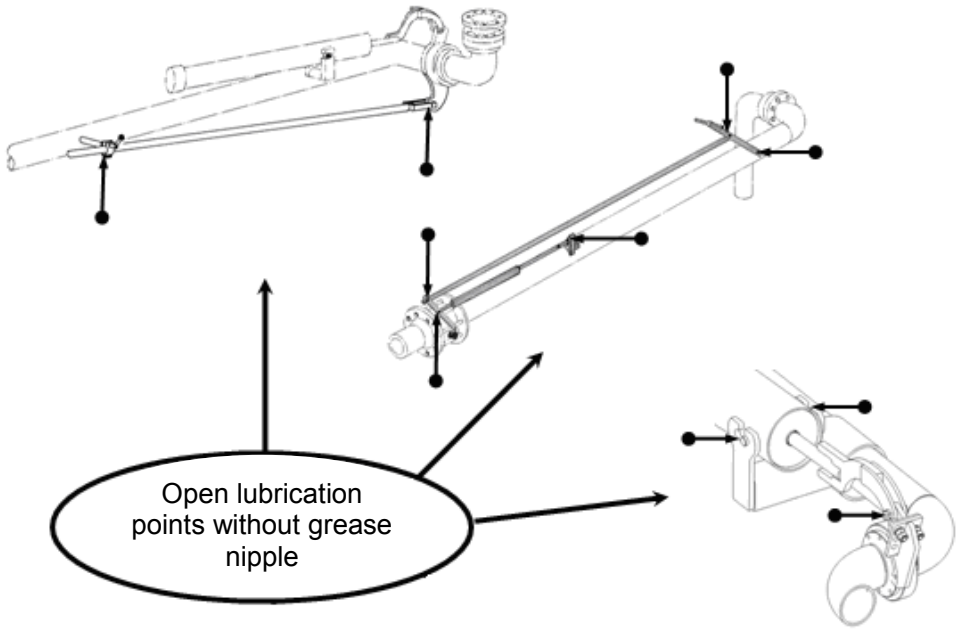
• = Service as described in the according section of this manual.

X = 6 months after commissioning or after 6 loadings, whichever comes earlier. After 1st service check every other year only.

9.6 Open Lubrication Points

Please refer to the figure below for location of open lubrication points. Apply a thin layer of lubricant every 6 months or as necessary depending on loading environment.

Use the same lubricant which is listed in the loading arm drawing for open lubrication points.



Only applies, if your loading arm is equipped with these accessories.

9.7 Maintenance of Swivel Joints

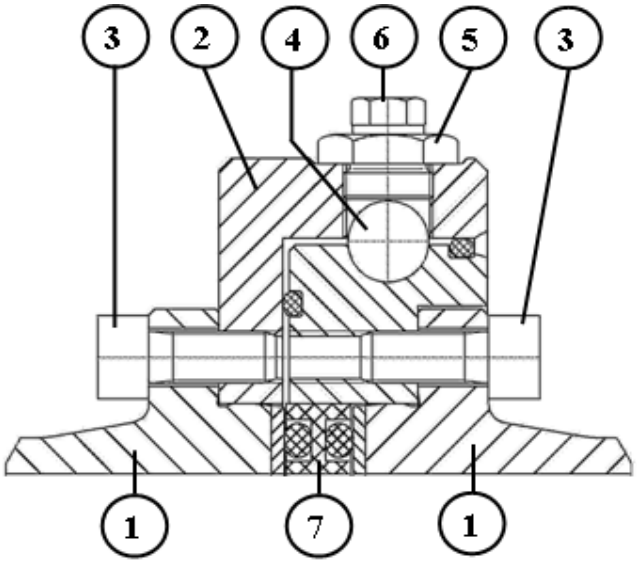
EMCO WHEATON swivel joints are designed for minimum maintenance. Maintenance often consists of a visual inspection. Clean the slot of the dust O-ring annually with a suitable cleaning agent and soft bristled brush.

The lubricant is specifically chosen for the individual application (see general arrangement drawing). EMCO WHEATON recommends opening the swivel joints only when they are leaking or damaged.

Only use original EMCO WHEATON spare parts. Our spares & service department will be happy to provide a quotation.

9.7.1 D2000 Swivel Joints

1. Flange
2. Bearing Module
3. Bolt
4. Ball
5. Ball Race Plug
6. Bolt M6
7. Seal



Each D2000 swivel joint is provided with a bolt (Item #6) in the ball race plug (Item #5). To visually check the lubrication, remove bolt (item #6) only. Do not remove the ball race plug (item #5) as balls may fall out.

The D2000 swivel joints are provided with grease sufficient for 5 years of service provided that the seals are intact and pressure and temperature limits are not exceeded. For heated or chemical applications the swivels are warranted for 1 year of service. In these applications the grease should be checked and re-greased annually.

D2000 grease kits include a grease nipple and standard tube of grease specific to the application. Use the grease nipple at the swivel joint casing to lubricate the swivel joint. Rotate the swivel joint while greasing to distribute the lubricant.

9.8 Spring Cylinder Maintenance

The spring cylinder balances the A-length of the loading arm and enables smooth movement within the operating range of motion. The loading arm is neutrally balanced at the factory to maintain its position when at rest.

Grease the pivot joints and the cylinder rod every six months. Check the spring cylinder for damage.

Make sure that the warning placard is attached to the spring cylinder. Replace it immediately when damaged or missing.

⚠WARNING	**Warning** The spring cylinder contains stored energy. When adjusting use extreme care or severe injury could result Only authorized persons shall maintain the spring cylinder who have been trained by EMCO WHEATON

9.9 Spring Cylinder Adjustment

See detailed instruction manual.

9.10 Replacement and Disposal of Spring Cylinder

Contact EMCO WHEATON in this matter.

9.11 Bolt Connections

Check all bolts for tightness and tighten to correct torque values after the first six months of operation or after the 6th loading process (which ever comes first). Repeat this check every other year.

Bolt Torque [Nm] at μ=0,14 (Standard Friction)						
	Strength Class					
Dimensions	**6.8**	**8.8**	**B7**	**10.9**	**12.9**	**A4-70**
M8	19	25		35	41	17.8
M10	37	49		72	84	36
M12	65	85		125	145	62
M16	150	200	230	290	340	150
M18	200	270	320	400	470	210
M20	290	390	450	570	670	303
M22	400	530	610	780	920	
M24	500	670	770	980	1150	290
M27	740	990	1140	1450	1700	410
M30	1000	1340	1550	1970	2300	556
M33	1370	1820	2100	2680	3130	
M36	1760	2340	2700	3430	4020	
M39	2280	3040	3520	4460	5220	
M42	2820	3760	4350	5530	6470	

9.12 Painting

If the loading arm has not been painted (refer to your order confirmation) the customer must paint the loading arm to provide corrosion protection. Use the same paint to repair any damage in the painting to ensure long-term corrosion protection.

9.13 Hose

Check the hoses regularly for damage and leakage.

9.14 Couplers

Check the couplers for damage and leakage regularly. Maintain coupler according to the instructions of the manufacturer. All Emco Wheaton API couplers include a detailed instruction manual.

9.15 Electrical Equipment

Check the electrical equipment regularly. Replace loose connections and burned or damaged cables immediately.

WARNING	**Electric Shock** Disconnect the power from electrical systems before performing inspections, maintenance or repairs.

9.16 E471Loading Valve

EMCO WHEATON Loading Valves are maintenance-friendly.

The loading valve can be located on all lengths of the loading arm.

Check loading valve for leaks with each loading cycle and replace seals as necessary. Refer to the Figure on page 16 for section views and parts list.

Instructions for Opening the Valve the First time:

1. Move the arm in the loading position. The A-length should be near or below horizontal.
2. Open the product valve slightly to provide roughly 1/16 of the normal flow rate.
3. Once valve is free from air, open fully and allow to close. Repeat as necessary to remove any remaining air trapped in the valve.

The valve is free of air upstream when the valve closes smoothly with a small delay as soon as you release the lever.

Use the product valve for normal operation.

Adjustment of Closing Speed:

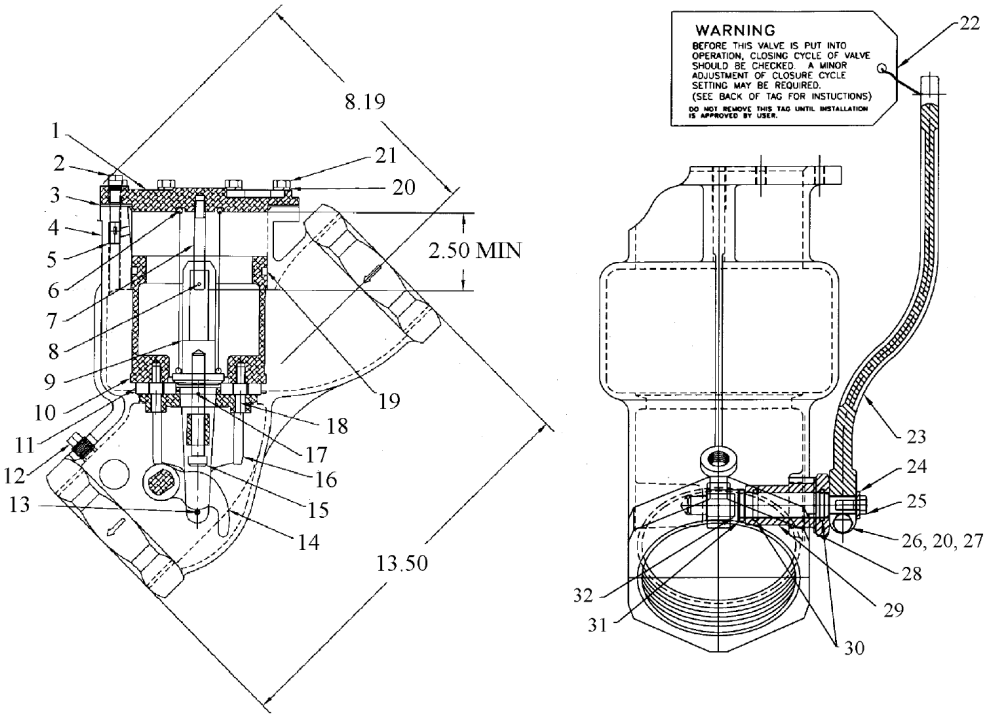
You can adjust the loading valve depending on the flow rate and the viscosity of the product to close within the shortest time without a pressure line shock.

The closing time of the loading valve is set during assembly to a value which lets about 50 to 60 L pass at a product flow of 2000 L/min until the valve is completely closed.

To adjust the closing speed, remove pipe plug (Item #2), and using a blade screwdriver turn the adjusting screw (Item #5). Check the closing time after each medium turn of the adjusting screw until the desired closing-time is found.

Turn the adjusting screw clockwise to increase the closing time.

Turn the adjusting screw counter-clockwise to reduce the closing time.



ITEM	DESCRIPTION	MATERIAL	QTY.	PART No.
1	Bonnet	Alum.	1	454311
2	Pipe plug 1/8" npt	Steel	1	404936
3	Bonnet gasket	Fiber	1	444938
4	Body FNPT ends	Alum.	1	454314
5	Adjusting screw	Steel	1	454312
6	Spring	Steel	1	443956
7	Pilot valve guide	SSt	1	443984
8	Cotter pin	SSt	1	405034
9	Pilot valve	Alum.	1	445069
10	Plunger	Alum.	1	446995
11	Plunger disc	Buna	1	446522
11	Plunger disc	Viton	1	446523
12	Pipe plug 3/8" npt	Steel	1	447574
13	Roll pin	SSt	1	564800
14	Cam	Alum./Brnz	1	440570
15	Plunger guide stem	SSt	1	443986
16	Plunger guide	Alum.	1	452744
17	Cotter pin	SSt	1	405034
18	HH screw 5/16/18	SSt	4	565470
19	Plunger ring	PTFE	1	446001
20	Lock washer 5/16	Steel plt'd	9	470034
21	Bonnet screw 5/16	Steel plt'd	8	452345
22	Warning tag	Paper	1	564804
23	Operating handle	Cast iron	1	443220
24	Flat washer	Brass	1	402912
25	HH screw ¼-20	Steel plt'd	1	403112
26	HH screw 5/16-18	Steel plt'd	1	444519
27	Hex nut 5/16-18	Steel plt'd	1	403150
28	Gasket	Fiber	1	443409
29	Packing nut	Brass	1	443972
30	O-ring	Buna	2	443451
30	O-Ring	Viton	2	566295
31	Bushing	Brass	1	444746
32	Cam operating stem	SSt	1	450898

9.17 Other Valve Types

Check the valves for leakage regularly. Maintain valve according to manufacturers' instructions.