

Operation Manual Unloading Equipment Swivel Arm Type

FAS Unloading Equipment Swivel Arm Type

	Table of Contents	Page
1.	Introduction	
1.1	Notice to Users	3
1.2	General	3
2.	Technical Description	
2.1	Operating Range	4/5
2.2	Safety Breakaway Coupling System	6
2.3	Adjusting of Breakaway Actuating Cable	7
2.4	Hydraulic System	7/8
2.4.1	FAS High Pressure Accumulator Vessel	9
2.4.2	Adjusting and Checking of the FAS High Pressure Accumulator Vessel	9/10
2.5	Main Shutoff Valve	11
2.6	Bearing Unit	12
2.7	Swivel Joint	13
2.8	Depressurize Installation	14
3.	Technical Data	
3.1	Specification FAS Unloading Equipment, Type FAS-G5	15/16

Because of a policy of continuous product improvement, FAS reserves the right to change design, materials or specifications without notice.

1. Introduction

1.1 Notice to Users

The FAS Unloading Equipment, type FAS-G5, is designed for the safe handling of Liquefied Petroleum Gases (LPG) under regulations for environmental control and easy operation by the user.

Like other technical equipment with mobile parts, the loading arms may be hazardous for the user when basic principles and procedures during operation are ignored.

In every situation, work on LPG Unloading Equipment should only be undertaken by persons introduced to this work.

This Operation Manual should be studied carefully before commissioning. If there are further questions concerning the Unloading Equipment, do not hesitate to contact the following persons:

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1.2 General

The Unloading Equipment was designed by FAS as a standard system for filling and discharge of LPG.

The main components of the equipment are: a loading arm with swivel joints, size DN 80, for the liquid phase and a loading arm with swivel joints, size DN 50, for the vapor phase.

The equipment for road tanker and rail tanker service are different in the type of connection armatures. Optional designs are equipped with ball valves, one side with welding neck or with flanges.

The swivel joints are not of welding neck type as used in common equipment, but of flanged type. This offers the advantage that all movable parts of the loading arm can be removed for service and repair work in order to be reassembled again. No welding or cutting is needed for disassembly and reassembly of the loading arms.

During the development of the loading arm system, design requirements focussed on operational reliability of the equipment and a smooth operation in every-day performance. Therefore each swivel unloading arm is equipped with a reliable breakaway coupling, type FAS ERC. Both swivel unloading arms were developed to suit smooth movability. Both arms are arranged on top of each other so that a wide range of connections are possible. A special hydraulic system makes it possible to move the arm in the vertical direction without physical efforts.

2. Technical Description

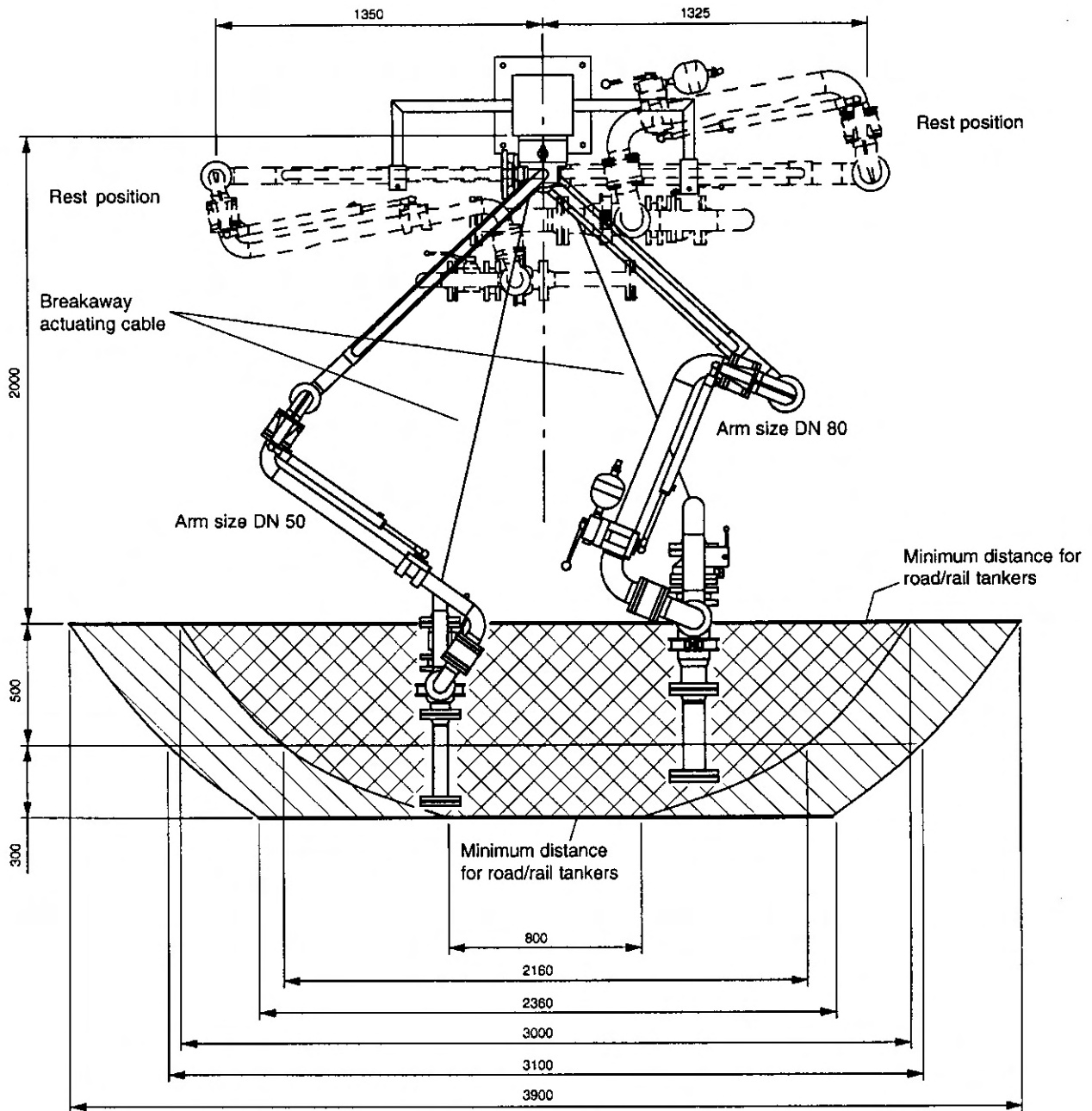
2.1 Operating Range


The Unloading Equipment, type FAS-G5, can operate in a range that nearly every connecting situation can be carried out. It is also necessary for the accurate functioning of the breakaway couplings that the connecting takes place within a predefined operating range.

The operating range and the space required are shown in the following drawing "Top View of the Operating Range for Standard Unloading Equipment, type FAS-G5".

The distance between the connecting flanges or the connecting stud of the road/rail tanker and the equipment post should be of between 2000 mm and 3000 mm.



When planning the location for the installation of a FAS Unloading Equipment provide a free area of 1400 mm in distance to both sides of the centre of the equipment post.




 Arriving/departing direction

Connection height
 min. 150 mm
 max. 1150 mm

An increased connection height corresponds to a smaller operating range!

 Operating range arm size DN 50
 Operating range arm size DN 80

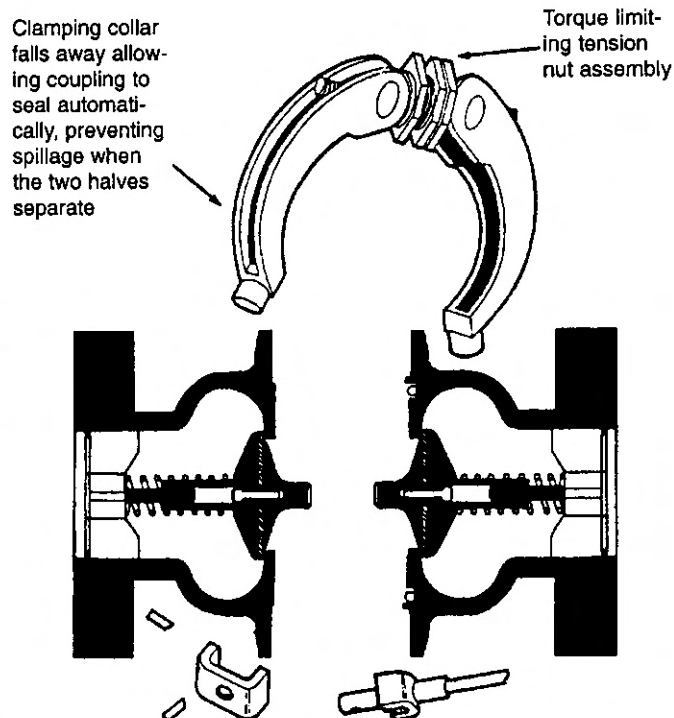
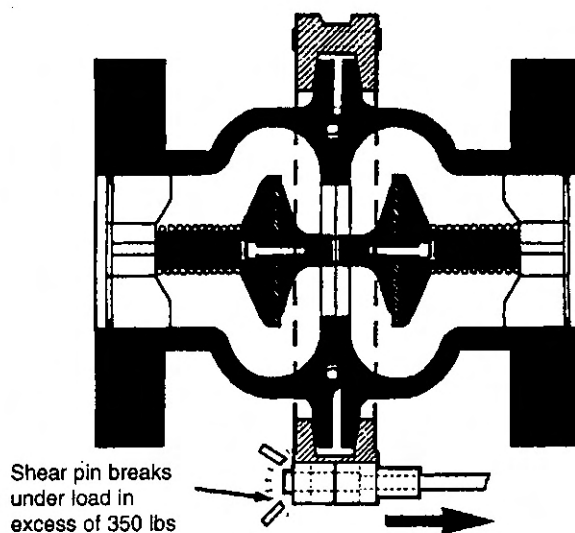
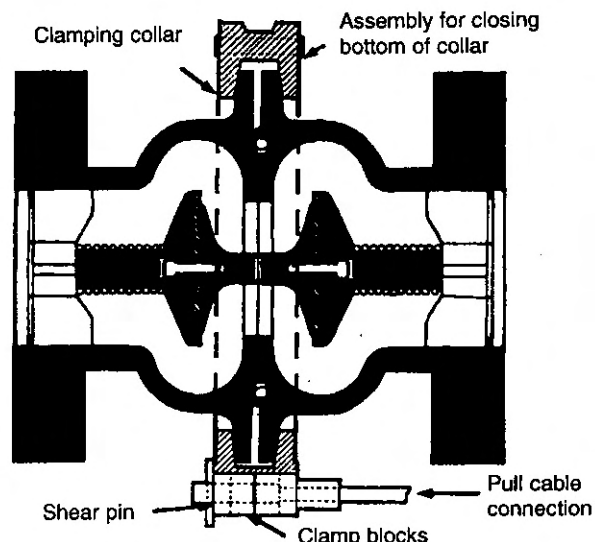
2.2 Safety Breakaway Coupling System (item 130, item 33)

A solution for a safe handling of LPG are the new developed Safety Breakaway Coupling, type ERC, mounted on the unloading arms. The design is similar to that of the APC Breakaway Coupling for hoses. The actuation is started by the pull cable and break of the shear pin. How it works, see the following sectional drawings.

1. Both half-couplings are held together by a clamping collar. This collar, which acts on adjacent angled flanges, is itself held in a closed position by a pair of substantial clamping blocks which makes the coupling a rigid assembly capable of withstanding high shock loads.

2. The clamp blocks are held in place by a shear pin which requires only a very low load to operate and is linked through a pull cable to a pivotal point on the loading arm post. The design allows all normal loading/discharge connections to be made within the safe working envelope of the arm.

3. In the event of a towaway incident where the rail tanker, road tanker or barge moves away still connected, the loading arm pivots to a point where, just before its safe working envelope is exceeded, the pull cable is actuated from its pivot connection and the shear pin is broken as the pull pin is withdrawn. At the same time the clamp blocks are mechanically released allowing the collar to fall down. The two half-couplings separate and shut down the product flow from the loading arm and vehicle and thus preventing major product spillage.



2.3 Adjusting of Breakaway Actuating Cable

For a trouble-free functioning of the Safety Breakaway Coupling it is necessary to adjust the actuating cable to a defined length.

The standard design for the cable length, as it is adjusted by the manufacturer, is that it will break the shear pin at the DN 80 arm before the safe working envelope of the arm is exceeded.

A possible correction of the actuating cable length must be done by an individual experienced and responsible in the type of system involved.

On routine checking it is important to ensure that the cable will be tightened before the corresponding swivel arm is in a stretched position. In the ideal case the cable will be nearly tightened when the unloading arm is connected to the rail/road tanker.

An incorrect adjusted cable will not actuate the mechanical release of the coupling in case of emergency. This means threads of hazard for individuals, environment and for the components of the equipment.

2.4 Hydraulic System

For your easier handling FAS has developed a special hydraulic system.

The hydraulic system enables the fixing of the swivel arm in any vertical position within its safe working envelope and shifting with little effort to other vertical positions.

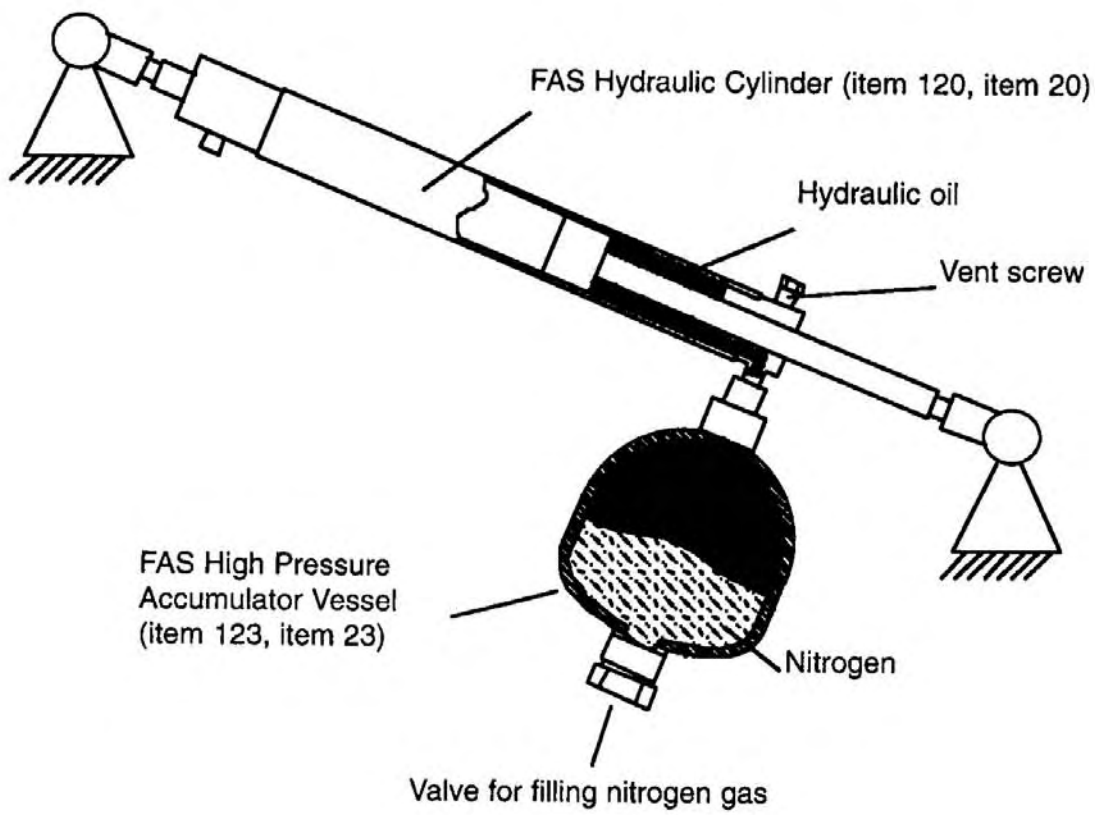
The high pressure in the hydraulic fluid is generated by **nitrogen gas**.

The reliable functioning will be guaranteed by the genuine FAS components in the system.

For design and the functioning see the following sectional drawing "Hydraulic System for Unloading Arms, Type FAS-G5".

Hydraulic System for Unloading Arms, Type FAS-G5

Solution since July 1997



2.4.1 Hydraulic System

FAS High Pressure Accumulator Vessel (item 123, item 23)

Hydraulic high pressure accumulator vessels are standard elements and are used for several years in many industrial branches. For a long performance it is necessary that the correct nitrogen gas pressure is applied.

When from start up the applied gas pressure is too low and furthermore will decline by diffusion, the accumulator vessel cannot store the fluid quantity as otherwise under same conditions.

For this, it is necessary to check the gas pressure at least every month and to correct it, when required. Refilling can be easily done with the FAS High Pressure Filling Tool.

The operational pressure is about 130 bar for the liquid unloading arm, size DN 80, and 90 bar for the vapor arm, size DN 50.

WARNING

Only nitrogen gas should be used for filling of the accumulator vessel.

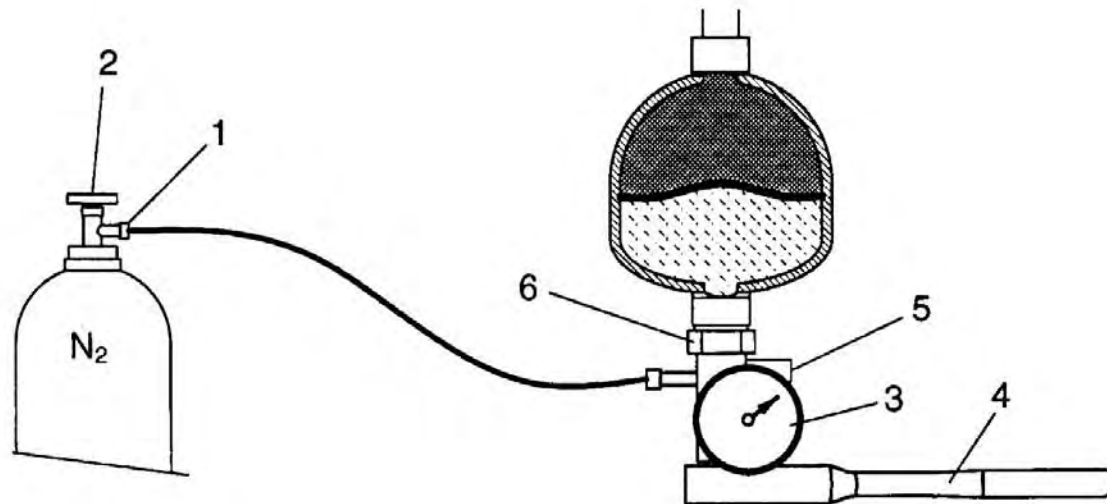
Otherwise threads of hazard by explosion.

Only individuals experienced in the type of system involved should be allowed to refill the FAS High Pressure Accumulator Vessel.

During the refilling procedure, no individual should stay within the working envelope of the swivel arms.

2.4.2 Adjusting and Checking of the FAS High Pressure Accumulator Vessel

1. Remove the protection cap from the high pressure accumulator vessel. Loose the accumulator vessel shutoff screw manually with a hexagon socket screw wrench until the noise of escaping gas can be heard, then tighten screw "handtight".
2. Apply FAS High Pressure Filling Tool with hose connecting nut (1) to a commercial nitrogen cylinder with max. 200 bar pressure.



3. Connect the filling tool with nut (6) to the bottom valve of the FAS High Pressure Accumulator Vessel. Before on-screwing the filling tool to the high pressure accumulator vessel, make sure that the sealing O-ring is correctly located in its groove. Close vent valve (5). Place the torque wrench on the 1/2" female square of the filling tool and loose the accumulator vessel shutoff screw. Gently open the head valve (2) on the nitrogen cylinder so that nitrogen gas flows into the accumulator vessel. When a pressure of about 80 bars is achieved, the stretched swivel arm size DN 50 will slowly move upwards. At about 120 bar the swivel arm size DN 80 will also slowly move upwards. Close in short intervals the shutoff valve and check the gas pressure at the manometer (3). When the corresponding swivel arm is in a horizontal position, close the shutoff valve (2) on the nitrogen cylinder. The manometer on the arm size DN 50 will indicate about 90 bars and the manometer on the arm size DN 80 about 100-130 bar.
4. When the expected gas pressure is achieved, wait some minutes so that the temperature exchange in the accumulator vessel can take place.
The gas pressure may vary a little during this time.
A higher gas pressure can be reduced by opening the vent valve (5) on the filling tool.
5. Tighten the accumulator vessel shutoff screw (hexagon socket head cap screw M8) with a torque wrench to 25 - 35 Nm.

Vent the filling tool by actuating the vent valve and remove it from the high pressure accumulator vessel.

WARNING

Retighten the accumulator vessel shutoff screw with a torque wrench to 30 - 40 Nm and press on the plastic cap.

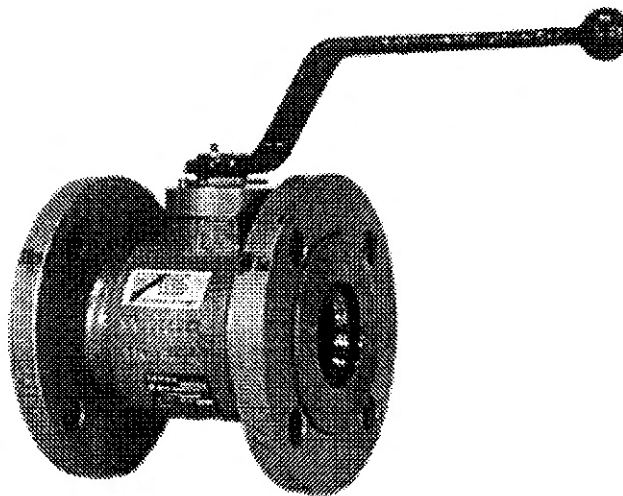
6. Now the hydraulic system is ready for operation.

2.5 Main Shutoff Valve (item 128, item 31)

A manual operated ball valve is flanged before the breakaway coupling on both arms.

The body of the ball is made of forged steel and is certified according to EN 10.204 (DIN 50.049-3.1 B).

The ball valves are for maintenance free operation, conform to DIN 3230, part 3 (Leakage quality 1) and are "Fire Safe" according to BS 6755, part 2.



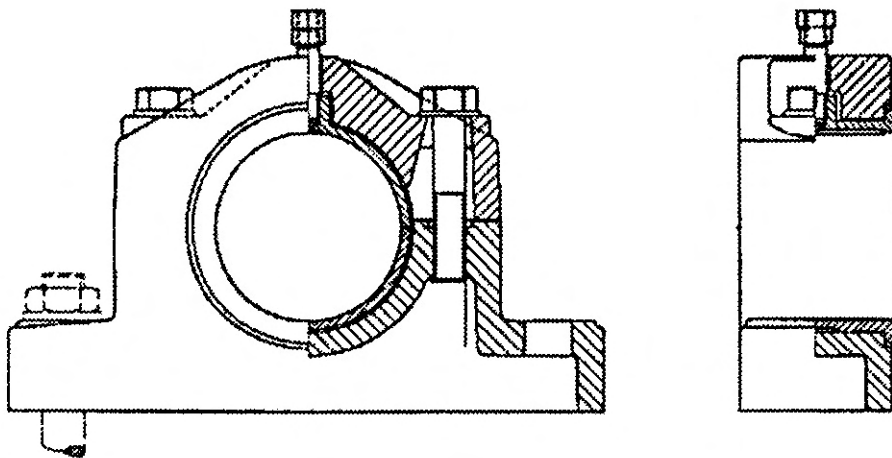
**Main Shutoff Valve, make Argus Ball Valve
FAS Unloading Equipment, Type G5
(FAS order no 25.302 and 25.304)**

2.6 Bearing Unit (item 110, item 10)

The pull forces on the loading arms are guided by the bearing unit to the post.

They are designed for heavy-duty operation conditions, reliability and easy handling of the unloading arms.

They should be greased every month according to the operation frequency. The bearing shaft is made of stainless steel so that no corrosion attack by atmospheric influences may occur.



**Bearing Unit for Unloading Arms
Type FAS-G5**

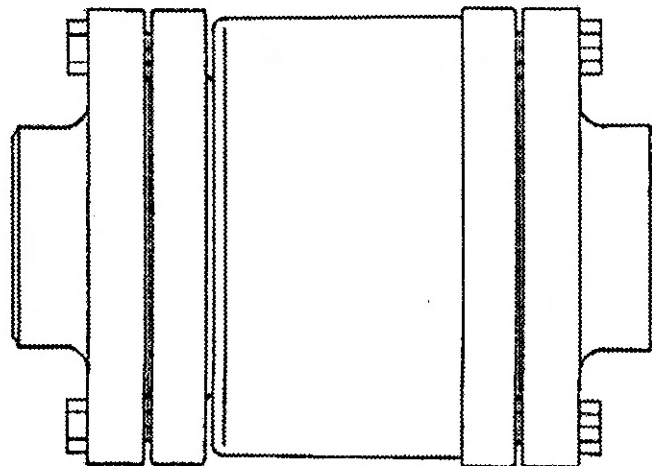
2.7 Swivel Joints (item 5, item 105)

A special type of swivel joint was developed by FAS for the LPG unloading process by loading arm equipment.

Design principles for this type of flanged swivel joints were excellence in functioning and easy handling.

In case of maintenance or replacement work, the FAS swivel joints can be easily removed by disassembling the flanges. The double row rollers in closure design are a rigid construction for maintenance free operation. The roller grooves are for heavy duty performance and hardened by a special fabrication process.

A PTFE sealing ensures the leakproofness during operation.



FAS Swivel Joint installed in FAS Unloading Arms, Type FAS-G5

2.8 Depressurize Installation (item 32, item 129)

At the end of the unloading process, the main shutoff valves on the loading arms and at the road/rail tanker will be closed.

Between the valves remains a rest of LPG in the line which may be a hazard to the operator and the environment when the connection is separated. Therefore, every FAS unloading arm is equipped with a depressurize installation.

This depressurize installation enables to relieve the residual pressure.

The depressurize installation consists of a ball valve and a high pressure hose which is directed along the corresponding swivel arm.

WARNING

The depressure ball valve must be closed at the end of the depressurize process.

The hose will be connected via a weld on neck flange DN 15, PN 25 to a vapor collecting system. If this collecting system will be connected to a system, which is shut off from the atmosphere, a non return valve must be installed.

3. Technical Data (Standard Version)

3.1 Specification Unloading Equipment, Type FAS-G5

1. Connections for road/rail tankers *

Rail tanker fluid phase	Lapped flange DN 80 / PN 40
Rail tanker vapor phase	Lapped flange DN 50 / PN 40
Road tanker fluid phase	Female connection 3 1/4" ACME with filler plug
Road tanker vapor phase	Female connection 2 1/4" ACME with filler plug

2. Connections to distribution pipe system *

Fluid phase	Welded on neck flange DN 80 / PN 40
Vapor phase	Welded on neck flange DN 50 / PN 40
Depressurize system	Welded on neck flange DN 15 / PN 25

3. Dimensions, weight *

Operating range of unloading arms, space requirements	
Maximum allowable distance between post and road/rail tanker	3000 mm
Maximum allowable distance between studs and the road/rail tanker at a distance of 300 mm to the post	1600 mm
Minimum allowable distance between post and road/rail tanker	2000 mm
Connection height above ground level	min. 150 mm max. 1150 mm
Space requirements on both sides to shift unloading arms in rest position	min. 1400 mm
Clearance from ground level when unloading arm is in horizontal position	2155 mm
Total weight	approx. 550 kg

4. Pressure, temperature in LPG pipe sections Torque value for swivel joints

Maximum operating pressure	25 bar
Operation temperature	- 20 °C / + 50 °C
Torque for tightening screws at swivel joint	M = 23 Nm

5. Medium for service and maintenance

Pressure gas for FAS High Pressure Accumulator Vessel	Only commercial nitrogen gas in cylinder at max. 200 bar
Hydraulic oil	RSL-10 / approx. 350 - 400 ml
Bearing unit	Multiple purpose grease
Filling pressure High Pressure Accumulator Vessel 0.7 l / 1.4 l on loading arm size DN 80	approx. 100 - 130 bar
Filling pressure High Pressure Accumulator Vessel 0.7 l on loading arm size DN 50	approx. 90 bar

* Other versions and connections available according to customer specifications.