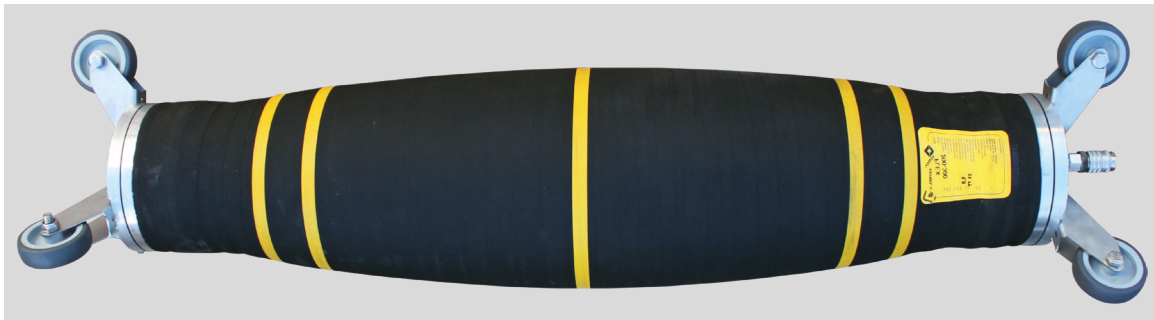


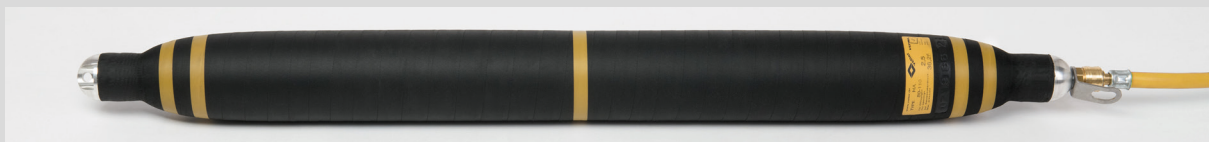
Operating Instructions

VETTER Flexible packer

✓ Flexible packer



✓ Lateral packer



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1. Introduction

The pre-condition for the safe and reliable use and defect-free operation of the Vetter Flexible packer is to have a sound knowledge and to observe these operating instructions as well as the information concerning safety.

DIN 7716 is to be observed with long-term storage.

In addition to this, the pertinent regulations concerning work protection and work safety as well as accident prevention regulations are to be observed together with the recognized technological regulations.

These operating instructions are to be regarded as part of the product and are to be kept together with the product during its life cycle. If the product is passed on to another party then these operating instructions must accompany it.

1.1 Symbols used

The following symbols are used in the text for dangers and warnings:



This symbol means that there is imminent danger. If it is not avoided then death or serious injury will result.



This symbol means that there is a possible dangerous situation. If it is not avoided then death or serious injury could result.

1.2 Correct application according to regulations

These operating instructions apply to the following Vetter Flexible packer:

- ✓ Flexible packer with frame
- ✓ Lateral packer

Vetter Flexible packers were developed for application in the field of sewer repair. They are used for repair work on local damage to sewers and pipelines. They are also suitable for damage repair using liners and stainless steel shells or for lamination repair. Flexible packers can, according to size, be used in pipelines having diameters from 70 mm to 600 mm. Any other applications or uses going beyond this do not comply with regulations.

Applications which do not comply to regulations for the Vetter Flexible packer are:

- ✓ Incorrect use, operation and maintenance of the Flexible packer
- ✓ Operation of the Flexible packer using defective safety devices or inflation fittings which are incorrectly connected or not fully functional.
- ✓ Non-observance of the instructions contained in the operating instructions with respect to storage, operation and maintenance of the Flexible packer.
- ✓ Insufficient monitoring of accessory parts or parts subject to wear.
- ✓ Maintenance and repair work incorrectly carried out.

2. Safety instructions

Use of the Vetter Flexible packer is to be made under the precondition that there is a sound knowledge of the contents of the operating instructions and that the operating instructions are fully observed.

2.1 General information

- ✓ Before operation of the packer and its accessories, an inspection must be made to ensure it is complete and that all safety measures are in place.
- ✓ Select the correct packer size according to the pipe diameter.
- ✓ Only use original Vetter accessories such as controllers, hoses and fittings.
- ✓ It is imperative that the required personal protective devices be worn such as: protective clothing, gloves, helmet, face and eye protection devices.
- ✓ Bring the wheels of the mechanism to the correct position.
- ✓ The packer must be protected against chemicals.
- ✓ For the packer, the area in the pipe must be free of debris, dirt and foreign bodies, e.g. broken fragments, sharp edged or pointed objects etc.
- ✓ Check to see if the packer is in the correct position in the pipe.
- ✓ Never exceed the packer operating pressure stipulated by the manufacturer (max. 2.5 bar).

2.2 Information about the dangers

Any changes and reconstruction of packers, inflation fittings and inflation hoses are not permitted. The operation of the Vetter Flexible packer is only permitted with original Vetter inflation fittings and inflation hoses. Other parts obtained from another source can compromise safety.

Flexible packers are made of a strong expandable material. If the packers are expanded above the maximum permitted range then this can cause bursting. No persons are allowed in the working area during reconstruction and repair work.

After positioning the packer it is to be ensured that nobody remains in the shaft or in front of the pipe during inflation, reconstruction and deflation work.



DANGER



DANGER



DANGER

2.3 Warnings

The flexible packers as well as the accessories must be checked for perfect condition before and after each operation. Outside of the pipelines, Vetter Flexible packers are only to be inflated to a maximum of 0.5 bar for the safety inspection.

All controllers are fitted with safety valves that correspond to the maximum permitted operating pressure of the packer. If the maximum operating pressure of 1.5 respectively 2.5 bar is exceeded then the safety valve will blow. The tolerance for opening and closing of the safety valve must be maximum $\pm 10\%$. The set pressure is not allowed to be changed in any way.

Should the seal on the upper part of the valve be removed then operation can no longer be guaranteed and the safety valve must be exchanged. The permitted input pressure on the controller (marked on the input coupling) must not be exceeded.



3. Preparations for operation

3.1 Inspection for completeness and safety

- ✓ Inspection is made of the packer and the accessories.
- ✓ The surface of the packer must not have any mechanical or chemical damage: tears, forms of bubbles, show fabric lining.
- ✓ The inflation coupling as well as the wheel sets must function perfectly.
- ✓ The controller and the connection hoses must not have any signs of damage.
- ✓ The packer is to be cleaned after each period of use. In doing this no aggressively acting cleaning agents are to be used.

3.2 Selection of packer size

- ✓ Each packer is designed for a certain diameter. This size is stipulated on the packer label.
- ✓ Before operation, measure and check the pipe diameter clearance to see if it is in the packer range.
- ✓ The Flexible packer must not be used outside the specified range.

3.3 Only use Vetter accessories

- ✓ Carefully check the controller as well as the inflation hoses to see if they are clean because this is especially important for perfect operation of the packer.
- ✓ If there is any form of defect on the Flexible packer or its accessories then please contact the manufacturer.

3.4 Use work protection clothing and other protective devices

- ✓ When working with packers, work protection clothing, helmet, safety glasses and gloves are to be worn.
- ✓ Important! It is absolutely imperative that all regulations and instructions with respect to entry into the channel shaft be strictly adhered to.

3.5 Bringing the mechanism wheels into the correct position

- ✓ Incorrect positioning of the wheel set can cause problems and unwanted delay when positioning the packer in the pipe. With respect to hardening of the soaked fibre glass mat it is very important that this procedure is quickly carried out otherwise this will decrease the quality of the repair and this can even lead to damage of the Flexible packer.

3.6 Protecting the packer against chemicals

- ✓ Before covering the packer with the soaked glass fibre mat, the Flexible packer is to be covered with a PE foil or some form of protective covering (coating) which will help to avoid a chemical reaction taking place between the rubber and the resin. If a protective covering (coating) is selected then it is recommended that the packer be inflated to 0.2 bar so that the protective material is able to penetrate into all the pores of the packer cladding.
- ✓ Insufficient protection of the packer cladding can cause a chemical reaction and therefore damage to the Flexible packer. This is the reason why no solvent agents, hydrocarbons and any other aggressively acting agents are to be used as a protective covering.

3.7 Clean the pipe before operation

- ✓ Mud, sand, stones and any sharp objects must be removed before entering the packer into the sewer area. In most cases it is necessary to use compressed water jets. It is recommended that the pipeline be inspected with a camera after cleaning has been made.

4. Operation of the Flexible packer

In this chapter you will find out how the Vetter pipe and test sealing bags are applied.

When using the flexible packers, observe the safety instructions given in chapter 2 as well as the pertinent regulations for work protection and safety protection, accident prevention regulations (e.g. the safety regulations of the technical authorities -TGB) and the generally recognized laws of technology.

With operation of the packer, the corresponding pressure stages are to be observed.



4.1 Checking the correct position of the packer

- ✓ The maximum permitted pressure of the packer in the open is 0.3 bar.
- ✓ It is to be observed that when positioning the packer, the packer cladding does not touch the floor of the shaft. Any sharp objects can cause damage to the cladding.
- ✓ The packer is either pushed or pulled to the damaged position.
- ✓ Inflate the Flexible packer only after the pipe has been cleaned.

4.2 Never exceed the pre-specified operating pressure

- ✓ Inflate the packer to the pre-specified operating pressure (refer to the label on each packer). Due to expansion of the rubber cladding it is recommended that the operating pressure be checked.
- ✓ If the maximum permissible operating pressure is exceeded, the packer can be destroyed.

4.3 Things to be observed when inflating the packer

- ✓ During repair work no persons are to remain in the area of danger.
- ✓ The area of danger is defined as being the area of the pipe as well as channel and shaft areas in which the packer is situated.

WARNING: It is not permitted to remain in the danger area. An accident can cause serious injuries and even fatalities.



5. Withdrawing the packer

5.1 Release air out of the packer before withdrawing it out of the pipeline

- ✓ Never withdraw the packer out of the pipeline before the air has been fully released out of the packer.
- ✓ Withdraw the packer out of the pipeline using the tension eyes and the work line cables.

6. Care, maintenance and storage

This chapter gives you information about care of your Vetter flexible packer and the maintenance intervals which must be observed.

6.1 Care

The flexible packer equipment is to be cleaned after each operation. Cleaning is normally carried out with warm water and a detergent.

Cleaning must never be carried out with a chemical cleaning agent and never with high-pressure hot water devices.

Drying is made at normal room temperature.



6.2 Maintenance intervals

A function test of the safety valve must only be carried out **without** the flexible packer. Maximum pressure area!

A function test of the safety valve **with** the flexible packer outside the pipeline or test pipe can cause bursting of the bag.

The function test of the flexible packer at the maximum operating pressure in the permitted maximum pipe diameter must only be carried out in a resistive pipe. A pipe which is too weak will explode when a bag is inflated to the maximum operating pressure!

When?	What?	What is to be done?	Who?
Before each use	Flexible packers along with controllers and inflation hoses (Safety equipment)	check for completeness Visual check of the flexible packers plus the safety equipment (e.g., changes in form, cracks, fabric damage, porous surfaces, etc.) Function check of the safety equipment	Expert*
		If there are any doubts after the visual check of the flexible packers regarding their safety, the bags should be returned to the manufacturer for an in-depth function test .	Manufacturer
After each use	Flexible packers along with controllers and inflation hoses (Safety equipment)	check for completeness Visual check of the flexible packers plus the safety equipment (e.g., changes in form, cracks, fabric damage, porous surfaces, etc.) Function check of the safety equipment	Expert*
		If there are any doubts after the visual check of the flexible packers regarding their safety, the bags should be returned to the manufacturer for an in-depth function test .	Manufacturer
At least once annually <i>(otherwise, according to BGI 802, it is no longer permitted to use the packers)</i>	Flexible packers along with controllers and inflation hoses (Safety equipment)	check for completeness Visual check of the flexible packers plus the safety equipment (e.g., changes in form, cracks, fabric damage, porous surfaces, etc.) Function check of the safety equipment	Expert*
		If there are any doubts after the visual check of the flexible packers regarding their safety, the bags should be returned to the manufacturer for an in-depth function test .	Manufacturer

If any kind of doubts concerning the safety arise during the visual check or function check, abort the test and send the bag including the equipment to the manufacturer for further testing.

* **An expert is a person** who, based on his technical training and experience, has sufficient knowledge in the sector of packer devices and is so familiar with the relevant governmental occupational safety regulations, accident prevention regulations and generally accepted laws of engineering (e.g., BG rules, DIN and EN standards, technical rules from other EU member states or other contracting states of the Treaty on the European Economic Area) that he can assess the safe working condition of the pipe-sealing devices. Source: BGI 802

Document and retain the test results.

6.3 Storage

When stored and handled properly, the properties of rubber products remain nearly constant for a long period of time. However when handled improperly and under unfavourable storage conditions, their physical properties and/or service life are shortened!



Please comply with the following storage conditions:

Store in a place that is cool, dry, dust-free and moderately ventilated.

The storage temperature should be approx. 15 °C; never let it exceed 25 °C.

The temperature should also not fall below -10 °C.

If there are heating appliances and heating conductors in the storage room, they must be appropriately insulated so that the temperature of 25 °C is not exceeded. Maintain a minimum clearance between the heating appliances and the stored goods of 1 m.

Do not store rubber products in moist storage rooms. The relative humidity should be less than 65 %.

Protect the rubber products from light (direct exposure to sunlight, artificial light with high proportion of UV). The windows in the storage room need to be correspondingly darkened.

Make sure that the storage room does not contain any appliances that cause ozone.

The storage room must be free of solvents, fuels, lubricants, chemicals, acids, etc.

Store rubber products without pressure, tensile stress or similar distortions since that can promote deformations or crack development.

Some metals such as copper and manganese can also have a damaging effect on rubber products.

For more information please refer to DIN 7716.

7. VETTER Flexible packer

7.1 Vetter Flexible packer with frame

The adaptable solution

- ✓ for pipelines with a diameter range of 150 mm to 600 mm
- ✓ guaranteed stability due to mounted wheel sets
- ✓ integrated ducts enable the water to flow out during the repair work



Technical Data

Flexible packer		Application range (from - to) mm / inch	Packer length, approx. mm / inch	Application length in largest diam. mm / inch	Application length in smallest diam. mm / inch	Packer diameter mm / inch	Packer length, with carriage, approx. mm / inch	Weight, approx. kg / lbs
Typ 150-250 1491045901	2,5 bar (36.25 psi)	150 - 250 5.9 - 9.8	1,000 39	680 26.5	780 30.4	105 4.1	1,130 44.5	6.4 14.1
Typ 150-250 1491066300	2,5 bar (36.25 psi)	150 - 250 5.9 - 9.8	1,500 59	1,180 46	1,280 50	105 4.1	1,630 64.2	8.2 17.6
Typ 150-250 1491046001	2,5 bar (36.25 psi)	150 - 250 5.9 - 9.8	2,000 78	1,680 65.5	1,780 69.4	105 4.1	2,130 83.9	10 22.1
Typ 150-250 1491066400	2,5 bar (36.25 psi)	150 - 250 5.9 - 9.8	2,500 98	2,180 86	2,280 90	105 4.1	2,630 103.5	12 26.5
Typ 150-250 1491046101	2,5 bar (36.25 psi)	150 - 250 5.9 - 9.8	3,000 118	2,680 104.5	2,780 108.4	105 4.1	3,130 123.2	14 20.9
Typ 200-300 1491044801	1,5 bar (21.75 psi)	200 - 300 7.8 - 11.8	1,000 39	590 23	690 26.9	170 6.6	1,130 44.5	10 22.1
Typ 200-300 1491066500	1,5 bar (21.75 psi)	200 - 300 7.8 - 11.8	1,500 59	1,090 43	1,190 46.9	170 6.6	1,630 64.2	12.5 27.6
Typ 200-300 1491046301	1,5 bar (21.75 psi)	200 - 300 7.8 - 11.8	2,000 78	1,590 62	1,690 65.9	170 6.6	2,130 83.9	15 33.1
Typ 200-300 1491066600	1,5 bar (21.75 psi)	200 - 300 7.8 - 11.8	2,500 98.4	2,090 82.3	2,190 86.2	170 6.6	2,630 103.5	17.5 38.6
Typ 200-300 1491046401	1,5 bar (21.75 psi)	200 - 300 7.8 - 11.8	3,000 118	2,590 101	2,690 104.9	170 6.6	3,130 123.2	20 44.1
Typ 300-400 1491044901	1,5 bar (21.75 psi)	300 - 400 11.8 - 16	1,000 39	560 21.8	660 25.7	230 9	1,170 46.1	13.2 29.1
Typ 300-400 1491066700	1,5 bar (21.75 psi)	300 - 400 11.8 - 16	1,500 59	1,060 41.7	1,160 45.7	230 9	1,670 65.7	16.3 36.4
Typ 300-400 1491046601	1,5 bar (21.75 psi)	300 - 400 11.8 - 16	2,000 78	1,560 60.8	1,660 64.7	230 9	2,170 85.4	19.4 42.8
Typ 300-400 1491066800	1,5 bar (21.75 psi)	300 - 400 11.8 - 16	2,500 98.4	2,060 81.1	2,160 85	230 9	2,670 105.1	23 50.7
Typ 300-400 1491046701	1,5 bar (21.75 psi)	300 - 400 11.8 - 16	3,000 118	2,560 99.8	2,660 103.7	230 9	3,170 124.8	26 57.3
Typ 400-600 1491045701	1,5 bar (21.75 psi)	400 - 600 16 - 23.4	1,500 58.5	900 35.1	950 37.1	350 13.7	1,670 65.7	26.1 57.6
Typ 400-600 1491059500	1,5 bar (21.75 psi)	400 - 600 16 - 23.4	2,000 78	1,400 55.1	1,450 57.1	350 13.7	2,170 85.4	29 63.9
Typ 600-800 1491059001	1 bar (14.5 psi)	600 - 800 23.1 - 31.5	1,500 58.5	700 27.6	900 35.1	400 15.8	1,670 65.7	29 63.9
Typ 800-1000 1491058601	1 bar (14.5 psi)	800 - 1000 31.5 - 39.4	1,500 58.5	520 20.5	760 30	550 21.7	1,670 65.7	50 110.2
Typ 1000-1200 1491059600	1 bar (14.5 psi)	1.000 - 1.200 39,4 - 47,2	2.200 86,6	1.000 39,4	1.200 47,2	550 21,7	2.370 93,3	73 161

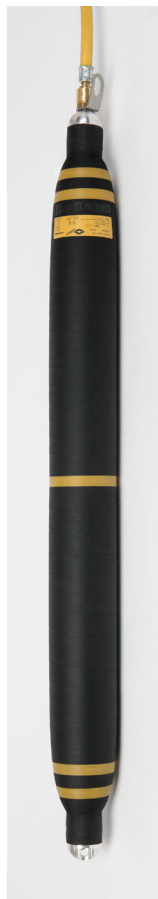
Standard through-flow openings of 2".

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7.2 Vetter Lateral packer

The intelligent solution

- ✓ for pipelines with a diameter range of 70 mm to 200 mm
- ✓ exchangeable ball tips
- ✓ construction designed for very good bend flexibility



Technical Data

Lateral packer 2.5 bar / 36.25 psi	Design	Application range (from - to) mm / inch	Packer length, approx. mm / inch	Application length in largest diam. mm / inch	Application length in smallest diam. mm / inch	Packer diameter mm / inch	Weight, approx kg / lbs
Type 70-110 1491019600	wound	70 - 110 2,8 - 4,3	1.000 39	800 31,2	890 35	51 2	1,4 3,1
Type 70-110 1491067000	wound	70 - 110 2,8 - 4,3	1.500 59	1300 51,8	1390 54,7	51 2	1,6 3,5
Type 70-110 1491019800	wound	70 - 110 2,8 - 4,3	2.000 78	1.800 70,2	1.890 74	51 2	2,0 4,4
Type 70-110 1491067100	wound	70 - 110 2,8 - 4,3	2.500 98	2300 90,6	2390 94,1	51 2	2,4 5,3
Type 70-110 1491020000	wound	70 - 110 2,8 - 4,3	3.000 118	2.800 110,2	2.890 114	51 2	2,8 6,2
Type 100-150 1491031500	wound	100 - 150 3,9 - 5,9	1.000 39	750 30	840 33	66 2,6	1,1 2,4
Type 100-150 1491067200	wound	100 - 150 3,9 - 5,9	1.500 59	1250 49,2	1340 52,8	66 2,6	1,7 3,7
Type 100-150 1491018200	wound	100 - 150 3,9 - 5,9	2.000 78	1.750 69	1.840 72	66 2,6	2,6 5,7
Type 100-150 1491067300	wound	100 - 150 3,9 - 5,9	2.500 98	2250 88,6	2340 92,1	66 2,6	2,7 6,0
Type 100-150 1491018300	wound	100 - 150 3,9 - 5,9	3.000 118	2.750 108	2.840 112	66 2,6	3,4 7,5
Type 150-200 1491019100	wound	150 - 200 5,9 - 7,8	1.000 39	720 28	800 32	92 3,6	1,6 3,5
Type 150-200 1491067400	wound	150 - 200 5,9 - 7,8	1.500 59	1220 48	1300 51,2	92 3,6	2,3 5,1
Type 150-200 1491018700	wound	150 - 200 5,9 - 7,8	2.000 78	1.720 68	1.800 71	92 3,6	3,0 6,6
Type 150-200 1491067500	wound	150 - 200 5,9 - 7,8	2.500 98	2220 87,4	2300 90,6	92 3,6	3,8 8,4
Type 150-200 1441013600	wound	150 - 200 5,9 - 7,8	3.000 118	2.720 107	2.800 110	92 3,6	7,5 16,5

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8. Lists for material and resistance

8.1 Material list

Product	Material	Support material	Manufacture
Flexible packer Lateral packer	NR	nylon cord	hot vulcanized
Inflation hoses and air supply hoses	EPDM	polyester	-

8.2 Temperature resistance

Products	Cold resistance	Cold flexibility	Long-term heat resistance	Short-term heat resistance
Hot vulcanized	-40 °C	-20 °C	+90 °C	+115 °C
Rubber hoses	-40 °C	-30 °C	+90 °C	
Controller, fitting type	-20 °C		+55 °C	

8.3 Resistance list

Chemicals	NR		EPDM		
	NR	EPDM	NR	EPDM	
Aceton	+	-	Calcium nitrate	+	+
Acetylene	+	-	Carbon dioxide	+	+
Alum, watery	+	-	Carbon monooxide	+	+
Aluminium chloride	+	+	Copper sulphate	+	+
Anilene	n.d.	n.d.	Adhesive	+	+
ASTM-oil 1	-	-	Methyl chloride	-	o
Petrol	-	n.d.	Sea water	+	n.d.
Benzene	-	-	Mineral oil	-	-
Boric acid	+	+	Sodium carbonate	+	-
Bromine (moist)	-	-	Ozone	-	+
Butyric acid	-	n.d.	Paraffin	-	-
Chlorine gas (moist)	-	n.d.	Perchloric acid	n.d.	+
Chlorine (wet)	-	o	Phenol (watery)	-	+
Diesel fuel	-	-	Phosphoric acid (concentrated)	-	-
Iron chloride	+	+	Mercury	+	+
Petroleum	-	-	Nitric acid (fuming)	-	-
Acetic acid	+	o	Sulphur dioxide (dry)	o	n.d.
Fatty acid	o	-	Sulphur acid (50 %)	-	-
Formaldehyde	+	+	Nitrogen	+	+
Glucose	+	+	Carbon tetrachloride	-	-
Heating oil	-	-	Animal fat	-	+
Potassium chloride	+	+	Toluene	-	-
Calcium chloride	+	+			

+ resistant o conditionally resistant - not-resistant n. d. no details

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Assembly Instructions

Packer carriage small

These chassis are required by the packers 150-250 and 200-300:

1. Check for completeness

Accessories for the assembly

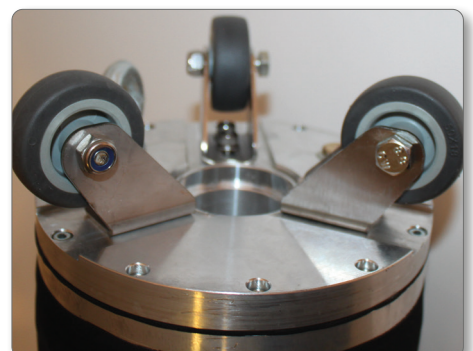
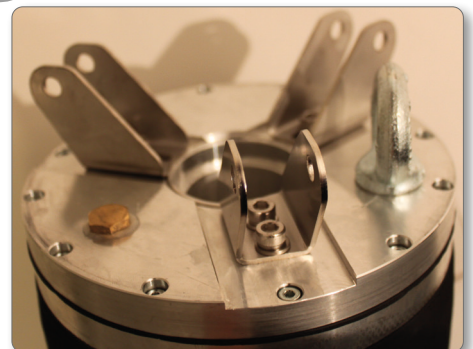
Chassis for packers	6 x
Cylinder screw ISO 4762, M6x10-A2-hexagon socket	12 x
Washer ISO 7090, 6.4-140HV-A2	12 x
Hexagon screw ISO 4014	6 x
Hexagon nut ISO 10511, M8-A2-Grade 8-self-retaining	6 x
Roles	6 x



2. Assembly instructions

For the assembly you need 2 cylinder screws M6x10 and 2 washers per chassis for packers. The parts of the chassis have to be tightened with a 5 mm hexagon socket wrench with 7.5 Nm.

Insert the roles with the hexagon screw as the axis and secure with the self-retaining nut M8 with 18 Nm.



Assembly Instructions

Packer carriage large

These chassis are required by the packers 300-400 to 1000-1200:

1. Check for completeness

Accessories for the assembly

Chassis for packers	6 x
Cylinder screw ISO 4762, M6x12-A2-hexagon socket	12 x
Washer ISO 7090, 6.4-140HV-A2	12 x
Hexagon screw ISO 4014	6 x
Hexagon nut ISO 10511, M10-A2-self-retaining	6 x
Roles	6 x



2. Assembly instructions

For the assembly you need 2 cylinder screws M6x12 and 2 washers per chassis for packers. The parts of the chassis have to be tightened with a 5 mm hexagon socket wrench with 7.5 Nm.

Insert the roles with the hexagon screw as the axis and secure with the self-retaining nut M 8 with 38 Nm.

