



Outotec

DOC36460-B

PF1125

English 2014

IOM MANUAL

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Outotec Oyj


Address: Riihitontuntie 7 D, PO Box 86

FI-02200 Espoo, Finland

Telephone: +358 (0) 20 529 211

Fax: +358 20 529 2200

Internet: www.outotec.com

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| B200186FI | | | | [Customer Document ID] | | | | |
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| | | | | PF1125 | | | | |
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| [Equipment No.] | | [Item No.] | | | | | | |

Original instructions Translation of the original instructions

Language code: EN

| | | | | | | |
|-------------|-------------|------------------|----------------|-------------|-----------|----------------------|
| Project ID: | Plant Code: | Plant Unit Code: | Document Type: | Running No: | Revision: | Outotec Document ID: |
| B200186FI | [ENH01] | [DA01] | [PFB02] | [00001] | B | DOC36460-B |

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1 About this manual

1.1 Purpose and scope

This manual describes the installation, use and maintenance of the product. Only personnel with proper training are allowed to carry out maintenance and repair work, operate or install the product. This manual must be read and understood by all personnel involved in the operation, installation, maintenance or repairing of the product.

This manual contains important information for the safe installation, use and maintenance of the product. Following these instructions will help you avoid risks, reduce repair costs as well as downtime, and improve the reliability and lifespan of the product.

This manual and its appendices contain the following important information:

- general information about the purpose and content of the manual, instructions for reading the manual and warranty information
- information about safety
- information for the installation, operation and maintenance of the machine

All information in this document has been written with our present experience and insight, to the best of our knowledge.

The original version of this manual may have been written in another language. Details about the original document version and translation are written on the front cover.

All illustrations and drawings in this document only serve as a general illustration, as their details are not always decisive for construction.

This document and its appendices must be kept throughout the lifespan of the product. Attach any further changes to the document and keep it clean and accessible for whenever it is needed. If the document is damaged, immediately order a new one. If the product is sold, the new owner must be provided with the document.

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1.2 Presentation conventions

Tasks and procedures are presented as numbered step-by-step lists. For tasks where the sequence of actions is not important, bulleted lists may be used.

Arial 10 bold font is used for words that represent graphical user interface (GUI) text.

Notes are used to alert the reader to important information on the proper use of the product, user expectations, error situations, and actions related to these. Notes concern, for example, unauthorized modifications to the product that might affect liability, items that might be expected within a product delivery but are not included, and avoidance of errors during operation.






NOTE: Note text.

| | | | | | | |
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1.3 Safety and warning symbols

In Outotec documentation, dangers, warnings, and cautions are used when it is necessary to take special precautions to avoid a potential hazard.

According to the ISO 3864 standards, warnings are divided into three groups according to the hazard severity and the level of risk or harm.

| | |
|--|---|
|  DANGER | DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury. |
|  WARNING | WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
|  CAUTION | CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |

Caution is also used to indicate a hazard that could cause damage to the product or system.

1.3.1 Symbols

The general shape and color of the safety symbols used with danger, warning, and caution is defined in ISO 3864-1.

| HAZARD | PROHIBITION | MANDATORY ACTION |
|---|---|---|
|  |  |  |

Hazard: The black symbol inside a yellow triangle with a black border describes the hazard.

Prohibition: The black symbol inside a red ring with a diagonal red bar describes the action that should not be taken.

Mandatory action: The white symbol inside a blue circle describes the action that must be taken to avoid a hazardous situation.

| | | | | | | |
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1.3.1.1 Hazard symbols

These symbols are used in warnings to indicate a hazardous situation or action. Hazard symbols are divided into five categories according to nature:


- Mechanical hazards
- Electrical hazards
- Radiation hazards
- Material/substance hazards
- Ergonomic hazards

Mechanical hazard symbols



The hazard symbols related to each hazardous situation are presented in the following table.

| | | |
|---|---|---|
| Falling load hazard | Crushing hazard | Hand crushing risk |
|  |  |  |
| Sharp element | Entanglement hazard | Risk of falling |
|  |  |  |
| Floor-level obstacle | High pressure injection hazard | |
|  |  | |






Electrical hazard symbols

| |
|---|
| Electricity / Dangerous voltage |
|  |



Radiation hazard symbols

| | |
|---|---|
| Radioactive material | Laser beam |
|  |  |

Material / Substance hazard symbols

| | | |
|---|---|---|
| Hot surface | Explosive hazard | Flammable material |
|  |  |  |
| Toxic material | Corrosive substance | |
|  |  | |

Ergonomic hazard symbols

| | | |
|---|---|--|
| Heavy object | Hazardous to the environment | |
|  |  | |

Prohibited action symbols

These symbols are used in warnings and notifications to indicate an action that should not be taken. The prohibited action symbols are presented below.

| | | |
|---|---|---|
| No open flame | Do not touch | Do not enter |
|  |  |  |
| Do not weld | Do not remove safety guard | General prohibition sign |
|  |  |  |

Mandatory action symbols

These symbols are used in warnings and notifications to indicate an action that must be taken. The mandatory action symbols are presented below.

| | | |
|---|---|---|
| Wear protective gloves | Wear eye protection | Wear head protection |
|  |  |  |
| Wear a safety harness | Wear ear protection | Wear safety footwear |
|  |  |  |
| Wear protective clothing | Wear high-visibility clothing | Wear respiratory protection |
|  |  |  |
| Disconnect main plugs | Disconnect before maintenance | Read the instruction manual |
|  |  |  |
| Use cardboard for locating leaks | General mandatory action sign | |
|  |  | |

1.3.2 Danger

A danger is used to alert the user to an imminently hazardous situation that could result in death or serious injury.



 **DANGER**

Warning text.

1.3.3 Warning

Warnings concern, for example, information about dangerous voltages or actions that could result in bodily harm or injury.




 **WARNING**

Warning text.

1.3.4 Caution

A caution is used to alert the user to precautions needed to avoid hazard, which, if not avoided, could result in minor or moderate injury, or damage to the product or system. Cautions concern, for example, damage caused by electrostatic discharge.



 **CAUTION**

Warning text.

1.4 Reading and storing the IOMS manual

Before you use the equipment, carefully read the manual and make sure that you understand all safety precautions.

After reading the manual, keep it in a convenient place for easy reference for all personnel who use the equipment.

If one or more documents are damaged or lost, order a new copy from Outotec. Contact your nearest Outotec Service Center or our head office (www.outotec.com/services).

Please note that the replacement copies may be liable to charge.

| | | | | | | |
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1.5 Warranty information

1.5.1 Warranty terms

Warranty terms of the delivered goods are in accordance with the "contract" or the "contractual purchase order" or if otherwise not specified, then in accordance with general terms NL 85 and NLM 84 with the exception of the below mentioned amendments and additions:

The warranty does not cover:

- Wearing parts such as filter cloths, diaphragms, seals, slide pieces, valve balls and sleeves, V-belts, chains, scrapers, grids, closing device, hydraulic hoses and hydraulic seals.
- Direct or consequential damages which have been caused by structural alterations or use of such parts, which are not of original manufacture.
- Any filter or part of the filter that has been resold by the original contractual purchaser unless agreed in writing with Outotec of the transfer of the remaining warranty period to the new owner.

The claims against the warranty must be made by the purchaser in writing, within a reasonable time after the damage has been discovered.

The following information must be indicated on the claims:

- The serial number of the filter
- Date when the damage was discovered
- Operational data of the filter when the damage was discovered
- Full details of the damage

The damaged part must be sent with the claim to Outotec, freight prepaid. If the mentioned terms are not followed properly, the purchaser may lose his right to the warranty.

Unless otherwise stated, the warranty of the repair work and/or replacement parts shall expire simultaneously with the warranty of the filter.

Outotec (Filters) Oy

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1.5.2 Warranty claim

WARRANTY CLAIM CLAIM RETURNED GOODS DATE:

| | |
|-------------------------|--------------------------|
| CUSTOMER'S NAME/CONTACT | AFFILIATE OR DISTRIBUTOR |
|-------------------------|--------------------------|

Outotec (Filters) Oy

| | |
|---------|-------------|
| Address | P.O. Box 29 |
|---------|-------------|

FIN-53101 Lappeenranta, Finland

| | |
|---------|--|
| Country | |
|---------|--|

| | | | | | |
|-------|--------|-------|--------------------|---------|------------------|
| Phone | E-mail | Phone | +358 20 529 211 | E-mail: | info@outotec.com |
|-------|--------|-------|--------------------|---------|------------------|

| | | | | |
|-----|-----|---------------------|-----------|-----------------|
| Fax | Fax | +358 20 529 2200 | Internet: | www.outotec.com |
|-----|-----|---------------------|-----------|-----------------|

| | | | | |
|-------------|-------|--|------------|-----------------|
| Filter type | Model | | Filter No. | Date of failure |
|-------------|-------|--|------------|-----------------|

| | | |
|-------------------------|----------|--------------------------|
| Principal part involved | Part No. | Operating cycles or time |
|-------------------------|----------|--------------------------|

| | |
|---|-------------------|
| For Outotec's use only Business unit | Type of operation |
|---|-------------------|

Description of the case, place, circumstances, etc.

| |
|--|
| |
|--|

Goods to be returned

| |
|---------------------------------|
| COMPONENT DELIVERED TO CUSTOMER |
|---------------------------------|

with filter other delivery date:

| | | |
|------|------|-------------|
| Qty. | Code | Description |
|------|------|-------------|

| | | |
|--|--|--|
| | | |
|--|--|--|

Signature

| | | | |
|---|--|-----------------------------------|-----------------------------|
| For Outotec's use only | Warranty status | | |
| Actions | Warranty period | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| <input type="checkbox"/> To be repaired | | Date | By |
| | <input type="checkbox"/> Claim returned for completion | | |
| <input type="checkbox"/> To be scrapped | | | |
| | <input type="checkbox"/> Claim accepted | <input type="checkbox"/> Rejected | |
| <input type="checkbox"/> To be delivered to supplier for inspection | Date | By | Date of credit |
| | | | Credit invoice |
| | | | |

1.6 Revision history

Table 1. Revision history

| REVISION | DATE | CHANGE |
|----------|------------|--------|
| B | 2014.06.09 | Final |

2 Description of equipment



⚠ DANGER

To safely install, operate, maintain and decommission this machine you must read and fully understand the installation, operation, maintenance and safety instructions. Only qualified personnel may install, operate, maintain or decommission the machine.

2.1 EC declaration by manufacturer

The machine can be delivered in two alternative executions according to the definition by the EC Machinery Directive 2006/42/EC as follows:

- a. as “complete machinery” (ref. Directive 2006/42/EC, Article 2 (a)) with the following declaration:

EC Declaration of Conformity of the Machinery (Directive 2006/42/EC, Article 5, Annex II, Sub A)



NOTE: CE-mark fixed on the machine by manufacturer.

- b. as “partly completed machinery” (ref. Directive 2006/42/EC, Article 2 (b)) with the following declaration:

Declaration of Incorporation of Partly Completed Machinery (Directive 2006/42/EC, Article 5, Annex II, Sub B)



NOTE: Machine delivered without a CE-mark.

2.2 Product identification

Table 2. Product identification

| | |
|----------------------|---------------------------|
| Product name | Automatic Pressure Filter |
| Type designation | PF 96/96 M48 2 60 |
| Serial number | PF1125 |
| Year of construction | 2014 |

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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The product information is presented in the product plate on the machine.

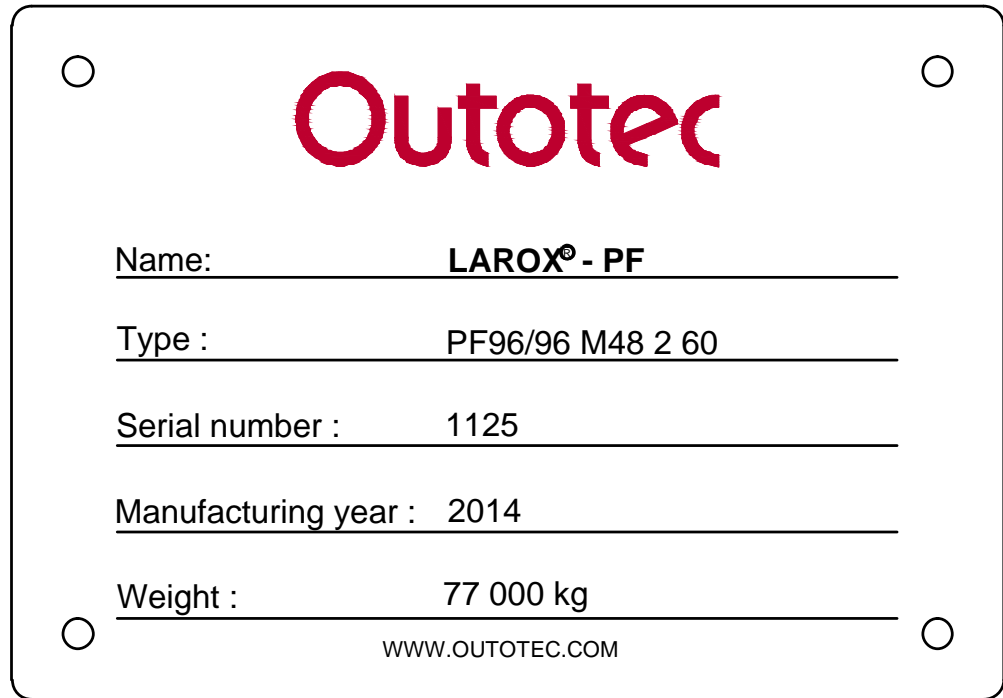


Figure 1. Product plate

2.3 Intended use

The machine is intended for indoor professional automatic use in the mining and chemical process industries. It is an automatic operating pressure filter for efficient solid/liquid-separation. The machine can be operated remotely from a control room or locally from the control panel. The main operating stages of the PF filter include filtering, diaphragm pressing, cake washing and compressed air drying.



⚠ DANGER

It is strictly forbidden to use this machine in any other way or for any other purpose, other than those specified in this instruction manual and its appendices.

| | | | | | | |
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2.4 Main components

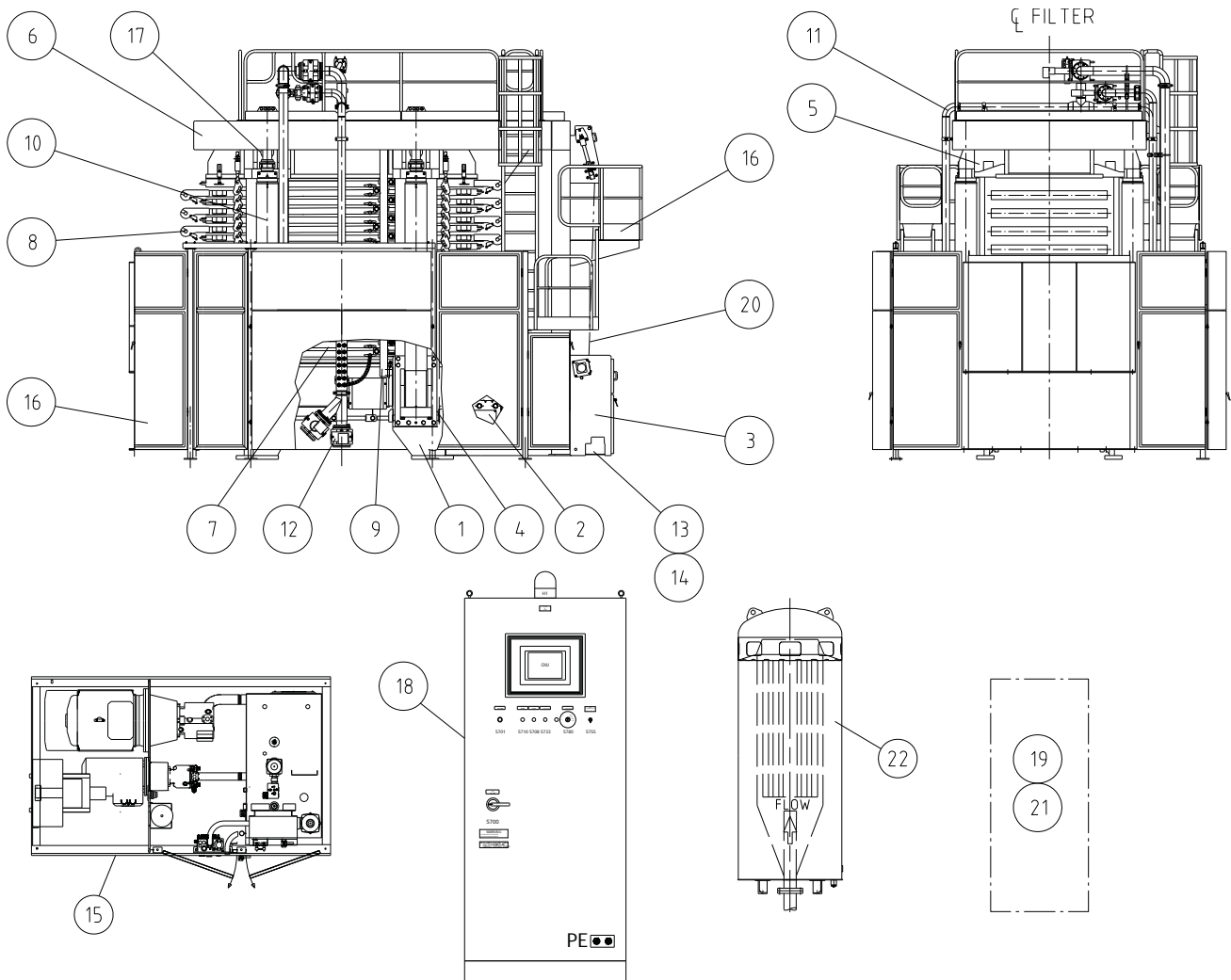


Figure 2. Main assembly drawing 1

| | | |
|----------------------------|---------------------------|---------------------|
| 1. Lower frame | 2. Cloth wash unit | 3. Cloth drive unit |
| 4. Columns | 5. Upper pressing plate | 6. Top frame |
| 7. Plate pack | 8. Rollers | 9. Guide bars |
| 10. Quick action cylinders | 11. Process pipelines | 12. Process valves |
| 13. Hydraulic piping | 14. Hydraulic connections | 15. Hydraulic unit |
| 16. Side shields | 17. Lubrication | 18. Control panel |
| 19. Maintenance tools | 20. Filter cloth | 21. Packing |
| 22. Muffler | | |

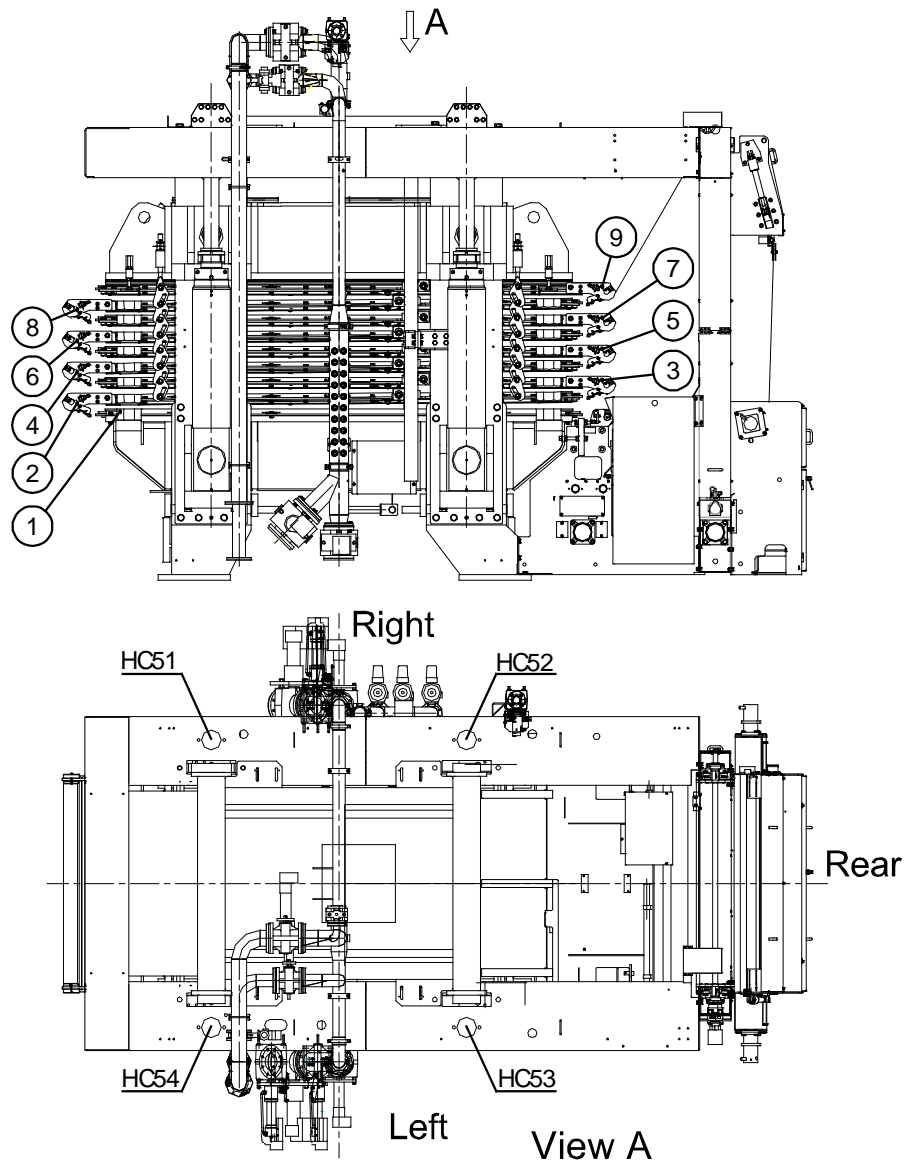


Figure 3. Main assembly drawing 2

| | | |
|------|-------------------------|--|
| HC51 | Hydraulic cylinder no.1 | 1. Filter plate, lowest (plate no. 1)* |
| HC52 | Hydraulic cylinder no.2 | 2. Filter plate, right (plate no. 2) |
| HC53 | Hydraulic cylinder no.3 | 3. Filter plate, left (plate no.3) |
| HC54 | Hydraulic cylinder no.4 | 9. Filter plate, top (plate no.9) |



NOTE: *The filter plates are numbered from bottom to top.

2.4.1 Process operations



⚠ DANGER

Hazardous moving parts. The plate pack consists of several moving parts, which can cause serious injury or death. Never touch the plate pack during operation.



⚠ WARNING

High-pressure liquid injection hazard. Compressed liquid can cause death or serious injury.

As a result of seal damage or foreign objects between the plate pack, liquid squirts are possible. When the pack is closed, always be careful.

2.4.1.1 Plate pack

The filter plate has three main parts: the filtrate chamber, base plate and frame.

Note that the feed channels must be open to ensure that both sides of the plate are under equal pressure during all operation stages. Otherwise the plate bends and causes leakages in the plate pack and damage the filter cloth.

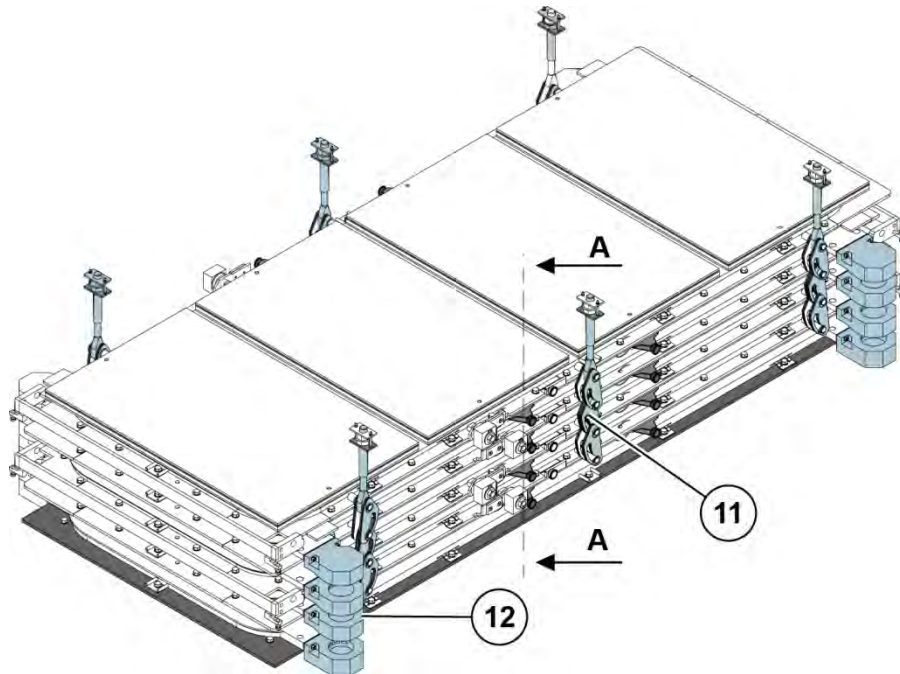


Figure 4. Plate pack

| | | | | | | |
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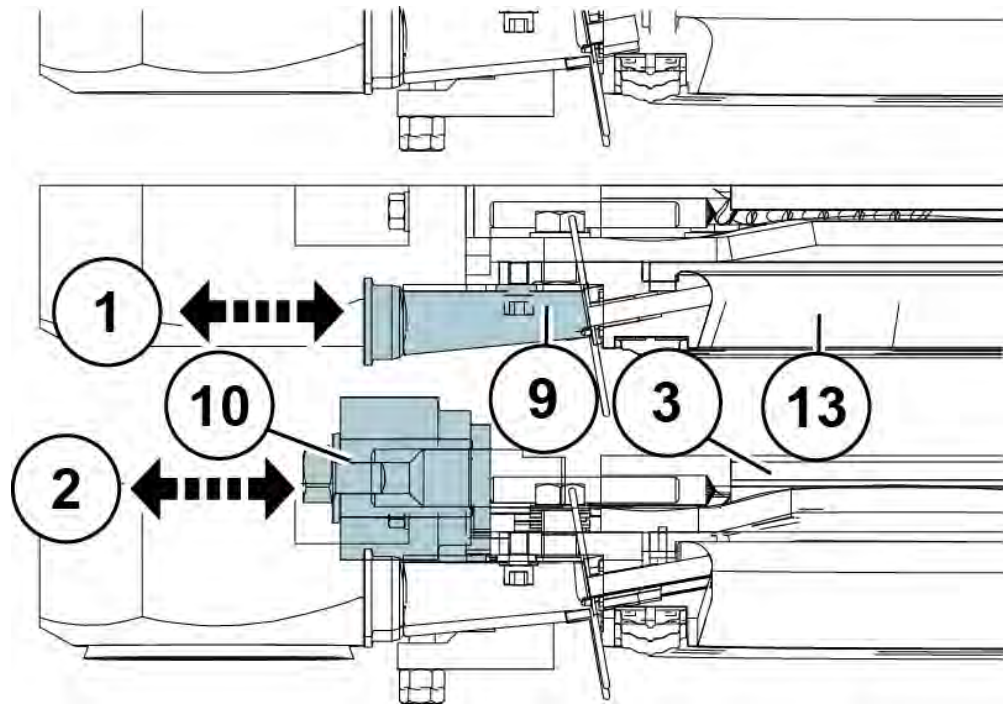


Figure 5. Plate pack, cut view A-A

| | | |
|---|--|----------------------|
| 1. Pressing air / water | 2. Slurry in, wash liquid and drying air | 3. Filtrate vat |
| 9. Pipe connection (pressing water / air) | 10. Feed pipe connection | 11. Suspension plate |
| 12. Collector | | |

Filtrate vat (3)

The filtrate vat collects the filtrate and leads it out through the collectors attached to the corners of the chamber.

Grid (4)

The grid supports the cloth and forms an outlet for the filtrate.

Bottom plate (5)

The bottom plate is a frame part in which all parts of the filter plate are attached. The pressing air channel is led through the bottom plate. The bottom plate and diaphragm form the pressing air chamber.

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Diaphragm (6)

The rubber diaphragm acts as a pressing element. The cake is pressed against the filter cloth and the grid by means of pressurized air. As a result of the pressure, the liquid is removed from the cake through the filter cloth into the filtrate chamber.

Pressure may rise above 16 bar, but as far as the durability of the diaphragm is concerned, it's much more recommendable to start with a pressure of 8 bar. And when the pressure is rising, the effect of the pressure rise on the pressing time and the residual moisture should be observed. In this way the most suitable pressure for each process and slurry can be determined.

In temperatures above +60 °C, a strong aging phenomenon affects to rubber. If the slurry to be filtered is hotter than +60 °C, pay special attention to the temperature and follow the manufacturer's instructions.

Observe the condition of the diaphragms continuously. In case the consumption of pressurized air has increased and it flows into the chamber even at the end of pressing stage, change the damaged diaphragm immediately.

Frame (7)

The frame works as a fixing element for the diaphragm. The plate pack seal is fixed to the lower surface of the frame. The feed channels leading into the filtration chamber have been led through the frame.

Seal (8)

The seal is fixed to the frame on the chamber's side in order to prevent slurry leakages.

There is no seal below the cloth, but the cloth and plastic surface are face to face. If a counter pressure forms a space below the cloth, the filtrate starts to leak from the plate pack.

Filtrate collector (12)

The filtrate collectors form the channels through which the filtrate is discharged from the plate pack in the "pack closed" position.



⚠ CAUTION

Observe the collectors' alignment. Removing the collectors causes leakage in the line. Correct their position.

The wear of slide pieces and/or removing the filtrate chamber is causing these changes. Refer to chapter 8.2.18.1 Adjustment of slide pieces.

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Filter plate

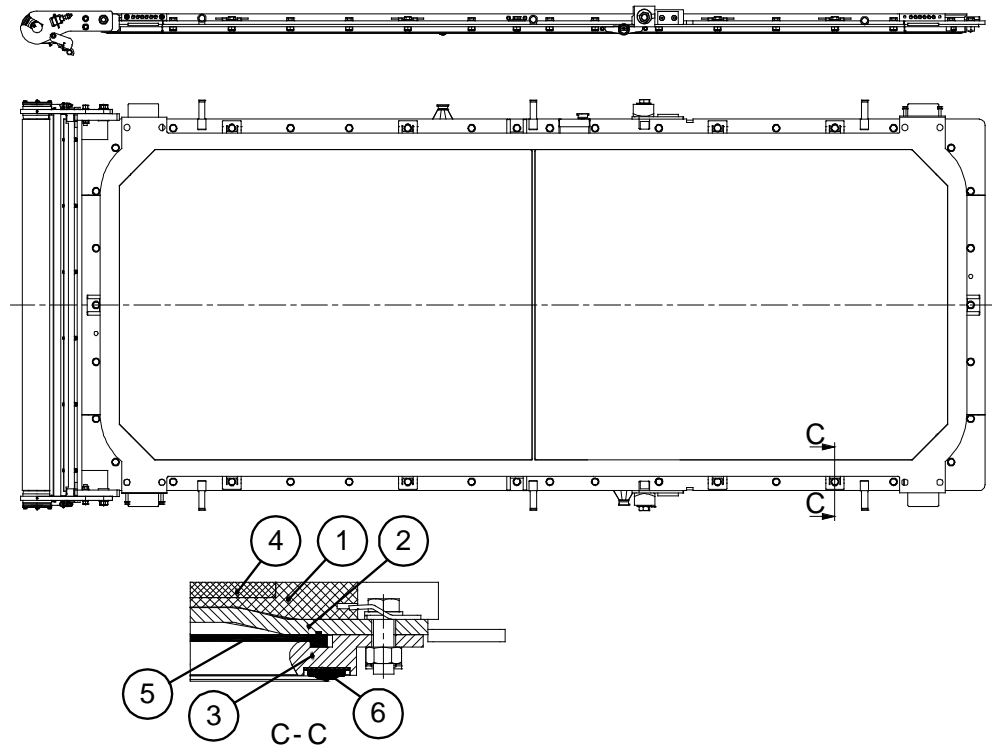


Figure 6. Filter plate

| | | |
|-----------------|----------------------|----------|
| 1. Filtrate vat | 2. Filter base plate | 3. Frame |
| 4. Grid | 5. Diaphragm | 6. Seal |

2.4.1.2 Process piping

The PF filter includes two pipelines, which are directly in contact with the filtration process; the feed pipe and the filtrate pipe.

Filtrate pipe

The purpose of the filtrate pipe is to remove the filtrate or the wash liquid (filters with cake washing) which has penetrated through the cake.

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Feed pipe

The slurry as well as drying air is led through the feed pipe into the filter chambers. Also in filters with a cake washing option the same route is used for the washing liquid. All these different operations can be accomplished with pinch valves. Slurry is pumped through the lower end, drying air and the possible washing liquid through the upper end of the feed pipe.

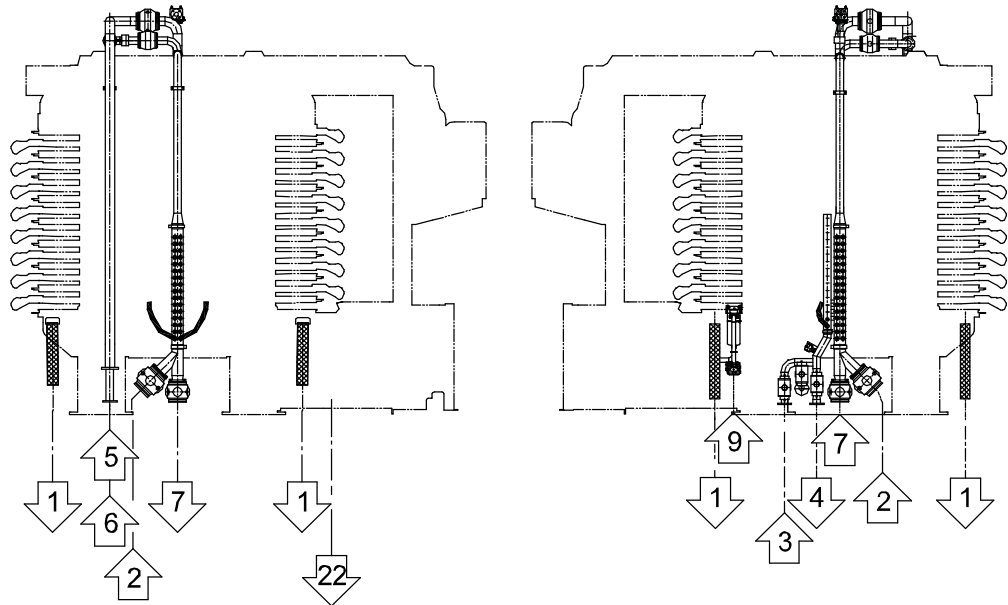


Figure 7. Feed pipe

| | | |
|-------------------------|---------------------|----------------------|
| 1. Filtrate | 2. Slurry feed | 3. Pressure air in |
| 4. Pressure air out | 5. Wash water | 6. Drying air |
| 7. Distributor draining | 9. Cloth wash water | 22. Cloth wash drain |

2.4.1.3 Pressing air piping

The pressing air pipe distributes pressing air in the diaphragms. The operation is carried out with the pressing air and controlled by pressing air inlet valve V03 and return valve V04.

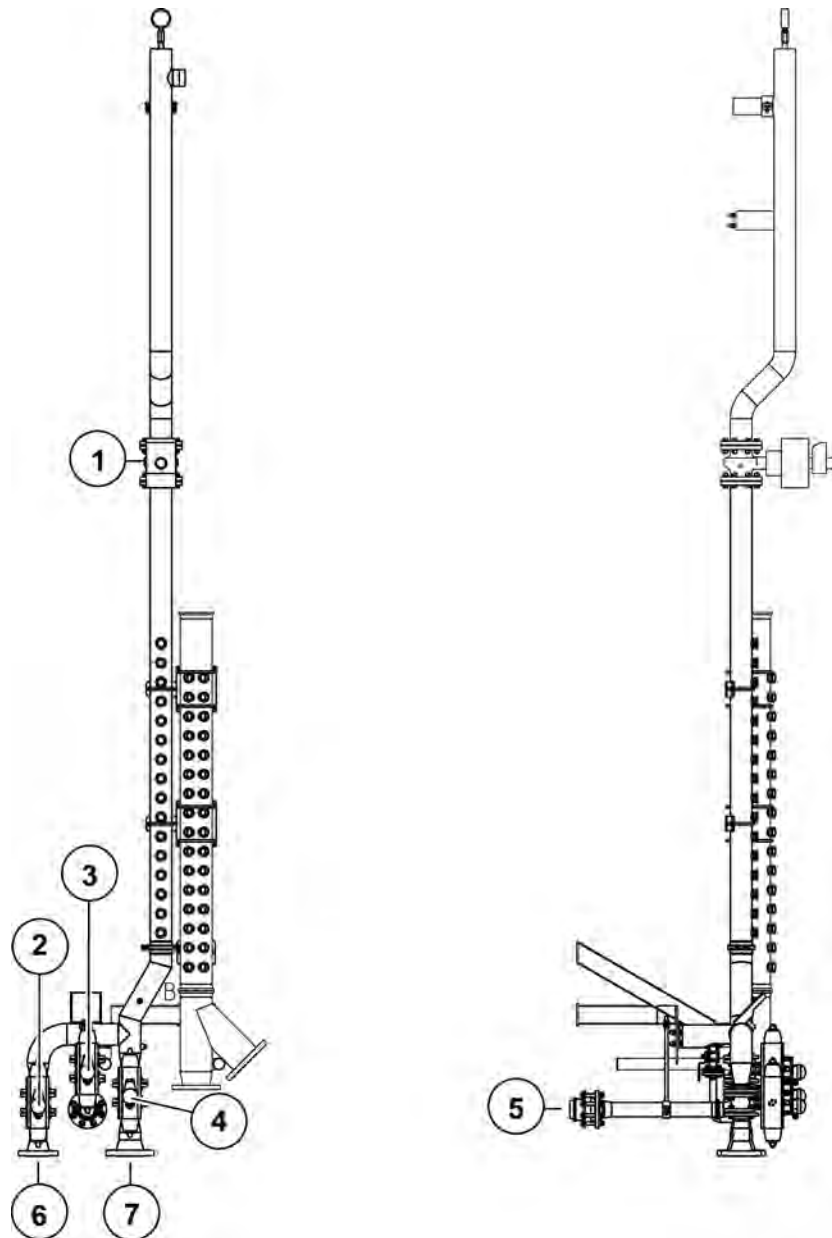


Figure 8. Pressing air pipe

| | | |
|---|--|--|
| 1. V34 | 2. V03 Valve closes on failure of actuating energy | 3. V24 Valve closes on failure of actuating energy |
| 4. V04 Valve opens on failure of actuating energy | 5. Diaphragm lifting up | 6. Pressure air in |
| 7. Pressure air out | | |

2.4.2 Auxiliary operations

2.4.2.1 Clothing mechanism

The closing mechanism comprises quick action cylinders (1) and locking pins (2) as indicated in the enclosed drawing.

The closing of the plate pack takes place in two stages: first the upper pressing plate (3) is driven to its lowermost position by means of quick action cylinders (1) and the plate pack closes. After closing, the plate pack is locked with locking pins (2). The locking pins (2) fix the upper pressing plate (3) into the columns (4), which have been fixed to the lower pressing plate (5).

The filtration chambers have thus been formed, and the plate pack is now surrounded by the pressing plates, base plate and columns.

The opening of the plate pack takes place in three stages: first the upper pressing plate (3) is driven downwards to release the tension of the locking pins (2). After that the locking pins are unlocked by driving them inside the upper pressing plate (3). Finally the upper pressing plate is driven to its uppermost position by means of quick action cylinders (1).

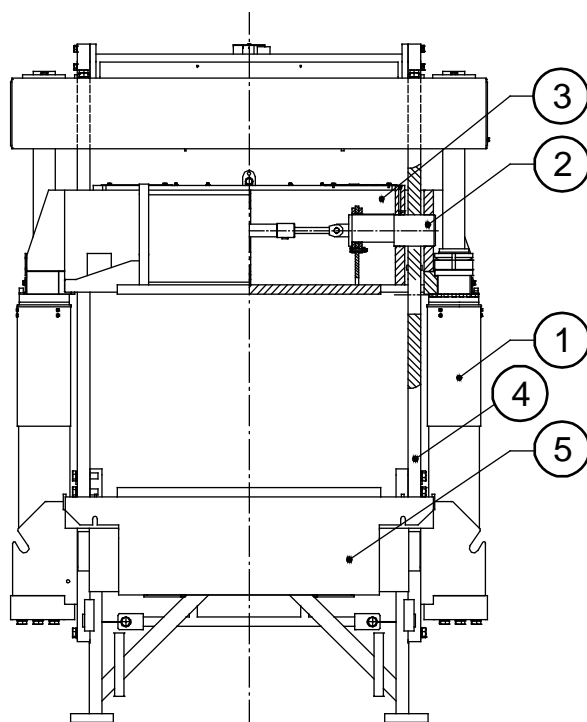


Figure 9. Clothing mechanism

| | | |
|--------------------------|-------------------------|-------------------------|
| 1. Quick action cylinder | 2. Locking pin | 3. Upper pressing plate |
| 4. Column | 5. Lower pressing plate | |

| | | | | | | |
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2.4.2.2 Cloth drive mechanism

To remove the cakes and to wash the cloth, the cloth is moved by means of drive rollers between filtering cycles. A spring-loaded pressing roller presses the cloth against the drive roller in order to maintain the tension.

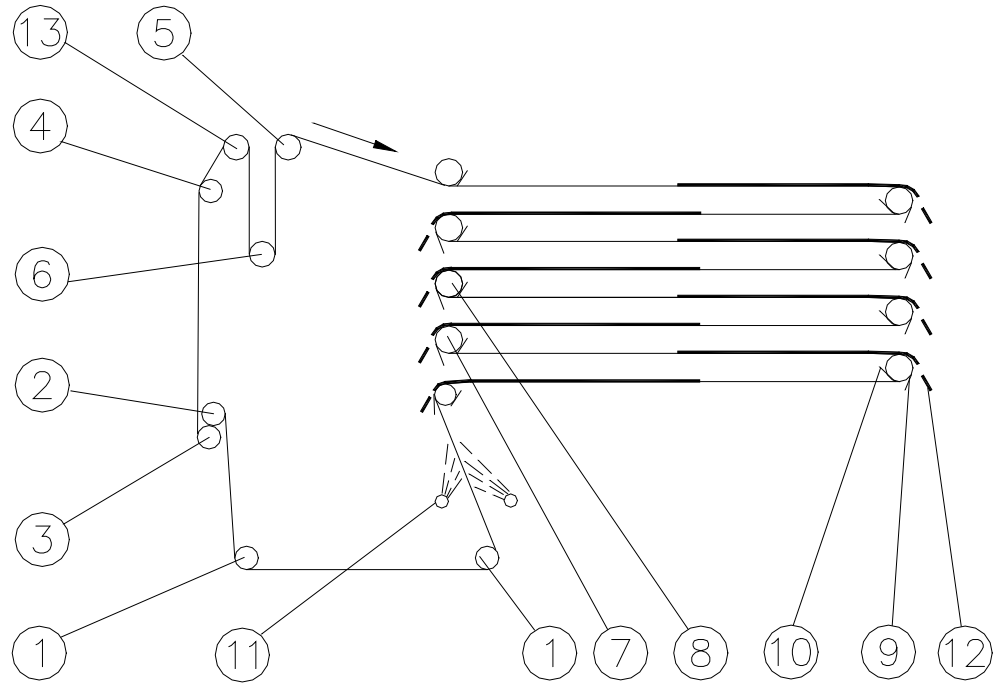


Figure 10. Cloth drive mechanism

| | | |
|---------------------|---------------------------|----------------------|
| 1. Vat roller | 2. Main drive roller | 3. Pressing roller |
| 4. Centering roller | 5. Impulse roller | 6. Tensioning roller |
| 7. Guide roller | 8. Auxiliary drive roller | 9. Cloth scraper |
| 10. Roller scraper | 11. Cloth wash nozzles | 12. Cake |
| 13. Spread roller | | |



WARNING

Hazardous moving parts. Rotating drive and pressing rollers will cause serious injury or death. Keep your hands away from the rollers.

Hydraulic motors are located on the both sides of the cloth drive unit. Auxiliary motors are added to the plate pack, in which case they are serially connected and do not affect the controls. The hydraulic motors are coupled to the cloth drive roller. Depending on the rotating direction of the motors, the filter cloth moves forwards or reverse direction.

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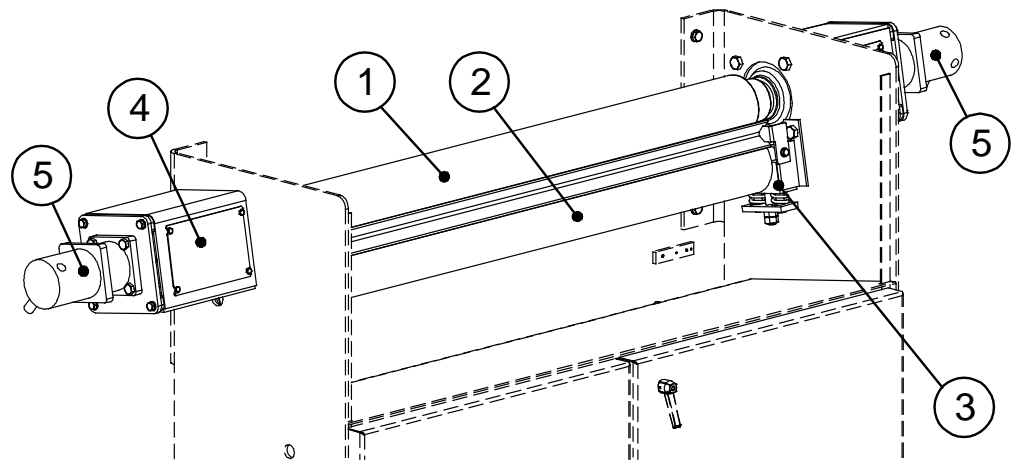


Figure 11. Cloth drive unit

| | | |
|-----------------|--------------------|-----------------|
| 1. Drive roller | 2. Pressing roller | 3. Roller clamp |
| 4. Coupling | 5. Hydraulic motor | |

Cloth

The cloth operates both as a filtering element and as a conveyor belt transporting the cake out of the filter. Besides having a good filtering ability, the cloth must be able to withstand heavy pulling.

Only special type of fabrics can be used. The most commonly used material is a multifilament fabric which is lengthwise (warp) stronger than crosswise (weft).

Pay special attention to possible holes in the cloth. Patch the holes immediately; solid matters entering through the holes wear the filtrate channels heavily especially during drying when the air flow speed is high.



⚠ CAUTION

The cloth drifts sideways periodically. Do not let it get stuck.

Cloth wash

To sustain the cloth's filtering properties, a part of the cloth is spray-washed by pressurized water after every filtration cycle. The washing takes place automatically and simultaneously with the cloth travel.

Make sure that all the nozzles stay open and that the sprays are directed towards the cloth in a correct angle. No unwashed stripes must be left on the cloth. If necessary, rinse the wash liquid filter located in the wash liquid piping.

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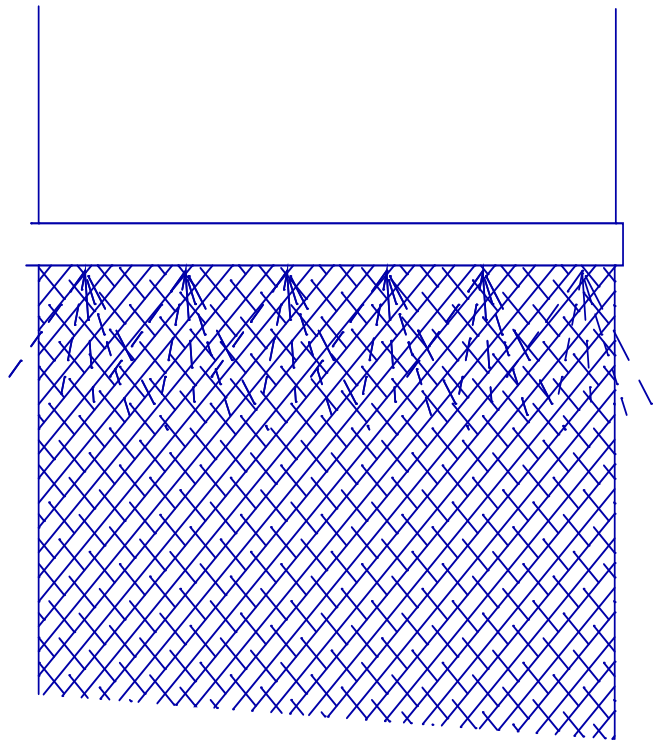


Figure 12. Cloth wash direction

The wash water consumption is comparable to the available pressure according to the curve presented below. The consumption of water is fractional - it is used only when the cloth is moving.

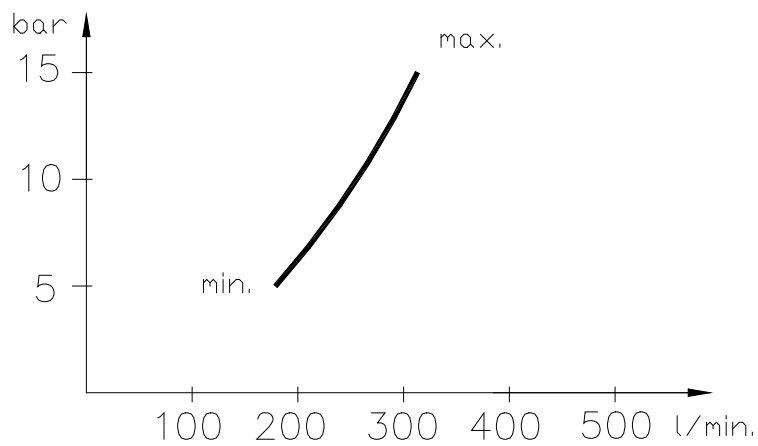


Figure 13. Wash water consumption



NOTE: Due to the efficient operation of the nozzles, the pressure recommendation is 10 - 14 bar.

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Table 3. Temperature at max. pressure

| MAX. PRESSURE | TEMPERATURE |
|---------------|-------------|
| 15 bar | +30 °C |
| 10 bar | +120 °C |



Figure 14. Cloth wash

| | |
|-----------------------|-----------------------|
| 1. Wash liquid filter | 2. Cloth washing pipe |
|-----------------------|-----------------------|



Figure 15. Cloth washing sprays

| | | | | | | |
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Cloth tracking

Normally the filter cloth moves in the plate pack without crossing the guide roller edges. However, in case the cloth tends to be directed towards either of the edges, the automatic cloth tracking brings the cloth back into its center position.

The cloth tracking operates automatically by means of a tracking roller movable at its other end. The left end of the roller in the cloth conveyor unit is moving up or down according to the transmitters' signals. The system is equipped with angle transmitter B503 for the cloth edge position transmitting with effective range of +20°...-20° (+ 30...-30 mm) and with cloth tracking cylinder position transmitter B504 (automatic control operation). Refer to figure on the next page.

The tracking roller is moved up/down with hydraulic cylinder (HC4). This cylinder has a built-in position feedback (potentiometer). The automatic tracking control can be turned on/off from OIU configuration screen ("Automatic cloth tracking"). While the automatic cloth tracking is off, the tracking cylinder can be operated with the hand held unit.

When tracking the cloth manually, let the cloth circulate several times and make sure that it does not drift to either side systematically. If the cloth does not stay centered, the cloth seam is inclined or one of the rollers does not rotate.



⚠ CAUTION

Observe that the cloth stays in the center area.

If the cloth is drifting too much sideways, a cloth alarm limit switch a.k.a. cloth edge sensor will be activated causing an alarm (5 sec delay). The sensors are located on both sides of the cloth tracking device. If the cloth drifts too much to the left, sensor S838A (4) becomes activated. And when the cloth drifts to the right, sensor S839A (5) becomes activated.

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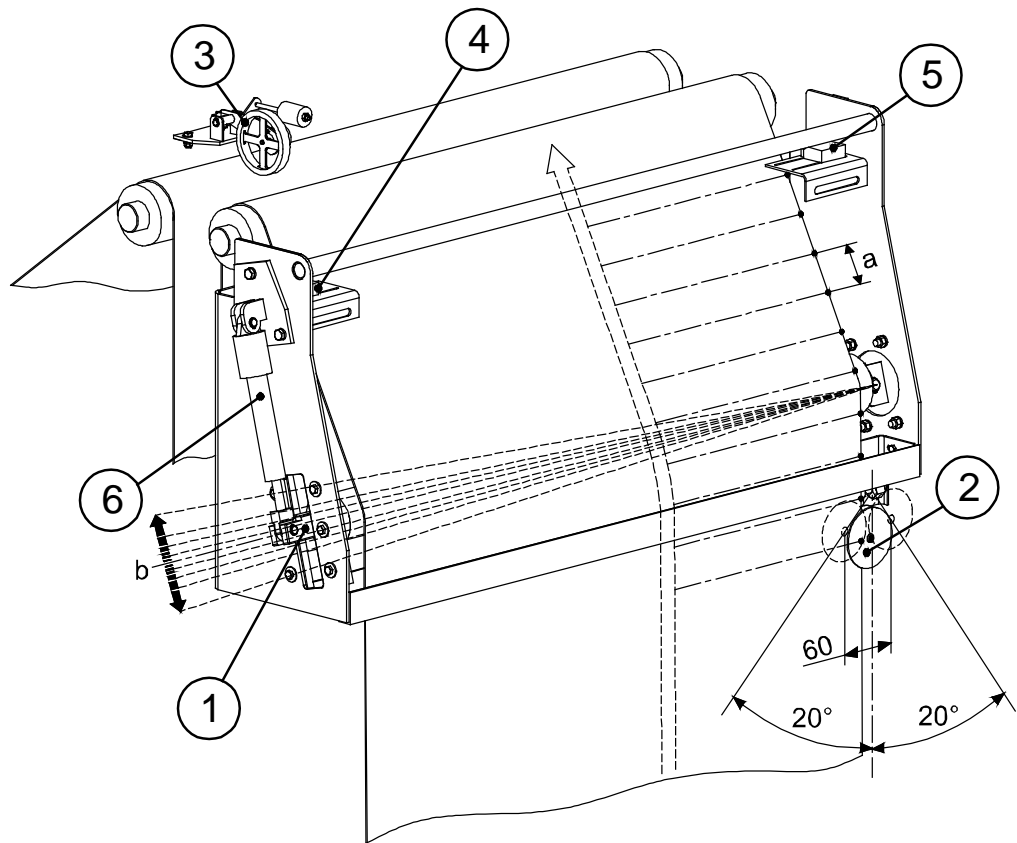


Figure 16. Cloth tracking device

a = 0,1 second (place of the cloth edge is read every 0,1 second by sensor B503).

b = Tracking in steps (every tracking step takes 0,25s)

| | | |
|-----------------------|---|--|
| 1. Tracking roller | 2. Cloth edge position transmitter B503 | 3. Perambulator B331 (see seam positioning) |
| 4. Limit switch S838A | 5. Limit switch S839A | 6. Hydraulic cylinder HC4 with position transmitter B504 |

| | | | | | | |
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Cloth tensioning device

The change in the cloth length, that takes place during the opening of the plate pack and cloth travel is compensated by means of tensioning device. A torque, which is brought about by means of hydraulic motor tightens a pair of chains fixed to the tensioning roller.

Observe the pressure used by the tensioning device motor and compare it to the pressure used during the start-up. You may increase the torque by raising the pressure and decrease it by lowering the pressure.

The cloth tensioning force is generated by means of a hydraulic motor (1). A tensioning roller (3) is fixed on the chain pair (2) in the tensioning device.

The hydraulic motor (1) rotates a shaft (4) located in the lower part of the tensioning device to which the chain wheels (2) have been attached. The sprockets (5) for the chains are located in the other end of the chains; in the upper part of the tensioning device. When the motor rotates counterclockwise, the tensioning roller (3) moves downwards tensioning the cloth. When the torque of the hydraulic motor stays constant, the cloth tensioning force stays constant in spite of the tensioning roller position. When closing the plate pack, the rotation direction of the hydraulic motor is changed by means of the control valves. In that case the tensioning roller (3) moves up giving the cloth the additional length needed. The tensioning and loosening of the cloth is carried out fully automatically when the cloth is moving and the plate pack is closing.

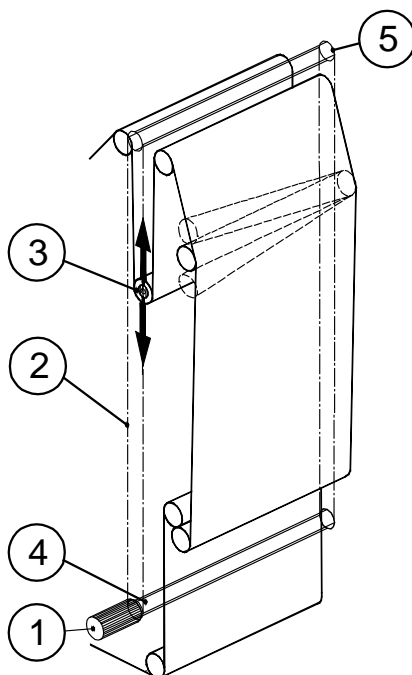


Figure 17. Cloth tensioning device

| | | |
|------------------------|---------------|----------------------|
| 1. Hydraulic motor HM8 | 2. Chain pair | 3. Tensioning roller |
| 4. Shaft | 5. Sprocket | |

| | | | | | | |
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Seam positioning

After discharge, the clipper seam should stay outside the sealing surfaces of the filter plates. The seam can be positioned so, that it remains either on the same or other side of the plate back.

A recommendable way is to choose the discharge plates (odd number) so, that the seam by turns remains on different sides of the pack, whereby also the cake in turns forms on both sides and thus gets washed by a counter flow principle.

In case the desired result is as clear a filtrate as possible, the discharge distance (plates) should be chosen so, that the seam always gets positioned on the same side of the plate pack. The discharge distance (plates) should be such that the cloth moves at least four plate lengths during it. Thus in a normal case even all scraping remnants have had time to drop into the cake chute.

In case the seam remains inside the sealing surfaces, it can be damaged by closing force and thus the change of cloth may become difficult. The slurry has also a direct route to the filtration chamber and affects the clarity of the filtrate, capacity and cake moisture.

Following sensors are for control seam positioning: B331 (perambulator) and S332 (clipper seam sensor). B331 (1) is located on the impulse roller and is fixed to the upper frame. B331 send out impulses, the distances A-B and B-C (shown in the picture below) are measured by these impulses. S332 (2) zeros the seam positioning at point A. S332 is located another side than the B331, between the tensioning device frame and the cloth.

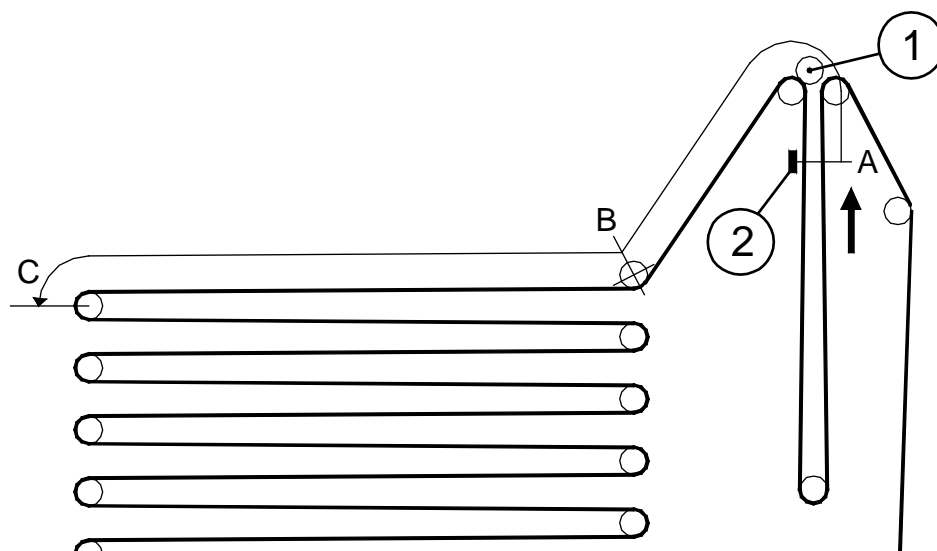


Figure 18. Seam positioning

- 1. Perambulator (B331)
- 2. Clipper seam sensor (S332)

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The automatic positioning of the clipper seam only functions when the filter is in automatic drive. The test drive of cloth does not include the positioning function, thus when returning to automatic drive (cake discharge subroutine), the cloth is driven so long that the seam is acceptable for closing plate pack. Note that if seam is not OK for closing plate pack (in SBR05) there will be S332D (Clipper seam displaced) alarm, due to security reasons it cannot be acknowledged until program is reset.

When the cake discharge starts, the cloth is at first driven forward one plate length at cake discharge speed. When the first plate length is done, the rest of discharge is done by cloth wash speed. When the whole discharge is done the cloth stops to the next roller. Thus the seam always gets positioned at the end of the filter plate.

In case the seam passes by the seam detector S332 (2) after the discharge has done, the seam stops under the upper roller of the plate pack, i.e. at point B.

In case "end mode" has been chosen as the drive mode, the positioning of the cloth takes place only after the full length of the cloth has been washed. The number of revolutions can be changed from parameter screen. Normally one revolution is enough.

The length of the cloth is given in meters through the operator's interface on the basis of which the number of pulses for the whole cloth length is calculated. In case S332 (2) does not receive an impulse from the seam after the said number of pulses, an alarm S332 "clipper seam alarm" is given.

In case the cloth is changed and seam positioning has worked properly with the previous cloth, there is no need to change the parameters.

In case the length of the cloth is changed (filter plate pairs have been added to the filter), the new length in meters should be given through the operator's interface and after that filter program should be reset, cloth is driven forward or reverse without tension (e.g. one second is enough) and started in automatic mode. Then PLC will measure cloth (and compare it to given cloth length) and position clipper seam. This initialization can take maximum 2 full cloth lengths, depending where clipper seam is when initialization starts. During this there is message "Searching clipper seam" at operator's interface screen.

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2.4.3 Control operations

2.4.3.1 Control panel

The control panel contains a programmable logic (PLC) which enables an automatic control of the filter.

The operator interface terminal is formed of a touch screen unit which is connected to the programmable logic via a serial connection port. Information exchange between PLC and the touch screen unit is automatically affected by the touch screen unit.



⚠ DANGER

Explosion hazard. Explosions will cause severe injury or death. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.



Explosion hazard. Explosions will cause severe injury or death. When in hazardous locations, turn off the power before replacing or wiring the modules.

A window provided with a lock protects the operator interface; this window should always be kept locked when the display screen is not used. Similarly, the control panel door must always be closed, unless maintenance measures otherwise require.



Figure 19. Window



NOTE: The changes in the PLC program are only allowed when accepted by the manufacturer.

| | | | | | | |
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WARNING

It is not allowed to add or remove any components from the control panel without the manufacturer's permission. All components replaced during maintenance must fulfill at least all the same technical requirements as original parts.



DANGER

Electrocution hazard. Electrocution will cause severe injury or death. It is not allowed to use the control panel power supply for any other external equipment.

2.4.3.2 Hydraulic power unit

The hydraulic power unit (HPU) includes all elements for hydraulic power generation, pressure control, flow control, storage, filtration and temperature control.

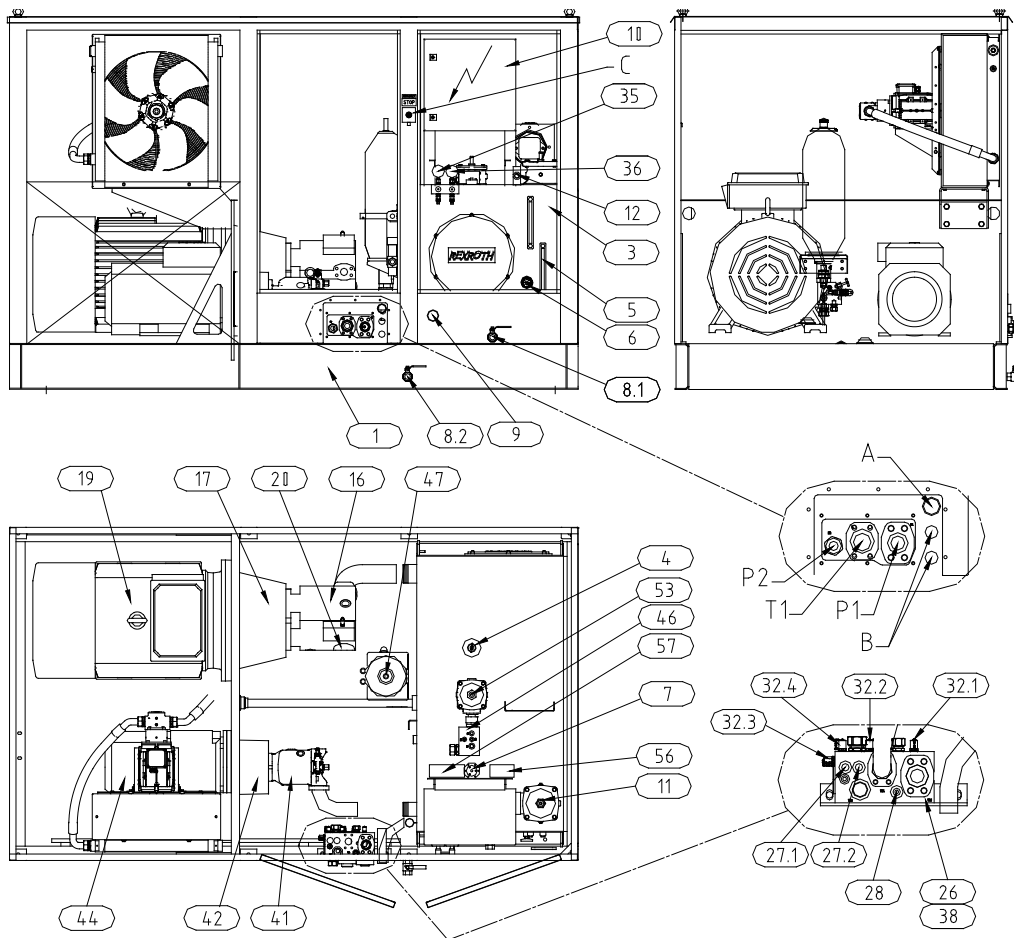


Figure 20. Hydraulic power unit

| | | | | | | |
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| | | |
|-------------------------------------|--------------------------------------|--|
| 1. Drip tray | 3. Oil tank | 4. Air Filter |
| 5. Oil level gauge | 6. Thermometer | 7. Oil level / temperature switch |
| 8.1 Tank drain valve | 8.2 Drip tray drain valve | 9. Oil heater R1HU |
| 10. Junction box | 11. Return filter | 12. Connector, oil filling |
| 16. Pump P1 | 17. Coupling | 19. Electric motor M1HU |
| 20. Pressure transducer | 26. Manifold | 27. Pressure relief valve |
| 28. Pressure reducing valve | 32.X Measuring points G1/4 | 35. Pressure gauge |
| 36. Pressure gauge | 38. Pressure transducer | 41. Pump P2 |
| 42. Coupling | 44. Electric motor M2HU | 46. Manifold block |
| 47. Pressure accumulator | 53. Return filter | 56. Online particle monitor (OPTIONAL) |
| 57. Online water monitor (OPTIONAL) | A. Electric cables to connection box | B. Connections to the water cooler |
| C. Emergency stop button | | |

Hydraulic pumps

The fluid pressure is generated with two axial piston pumps (16 & 41). The pumps have electric motors (19 & 44).

Pump P1 (16) gives 420 l/min output flow and provides power for hydraulic cylinders and cloth tracking and driving.

Pump P2 (41) gives 40 l/min output flow and provides power for valves, cloth tensioning and optional cake chute flaps

Oil cooler (52) has its own pump which is used to circulate the oil through the cooler, optional particle monitor (56) and water sensor (57) and back to reservoir through a return filter. The cooling circuit is controlled by a temperature transmitter TT1HU according to the set value in OUI.

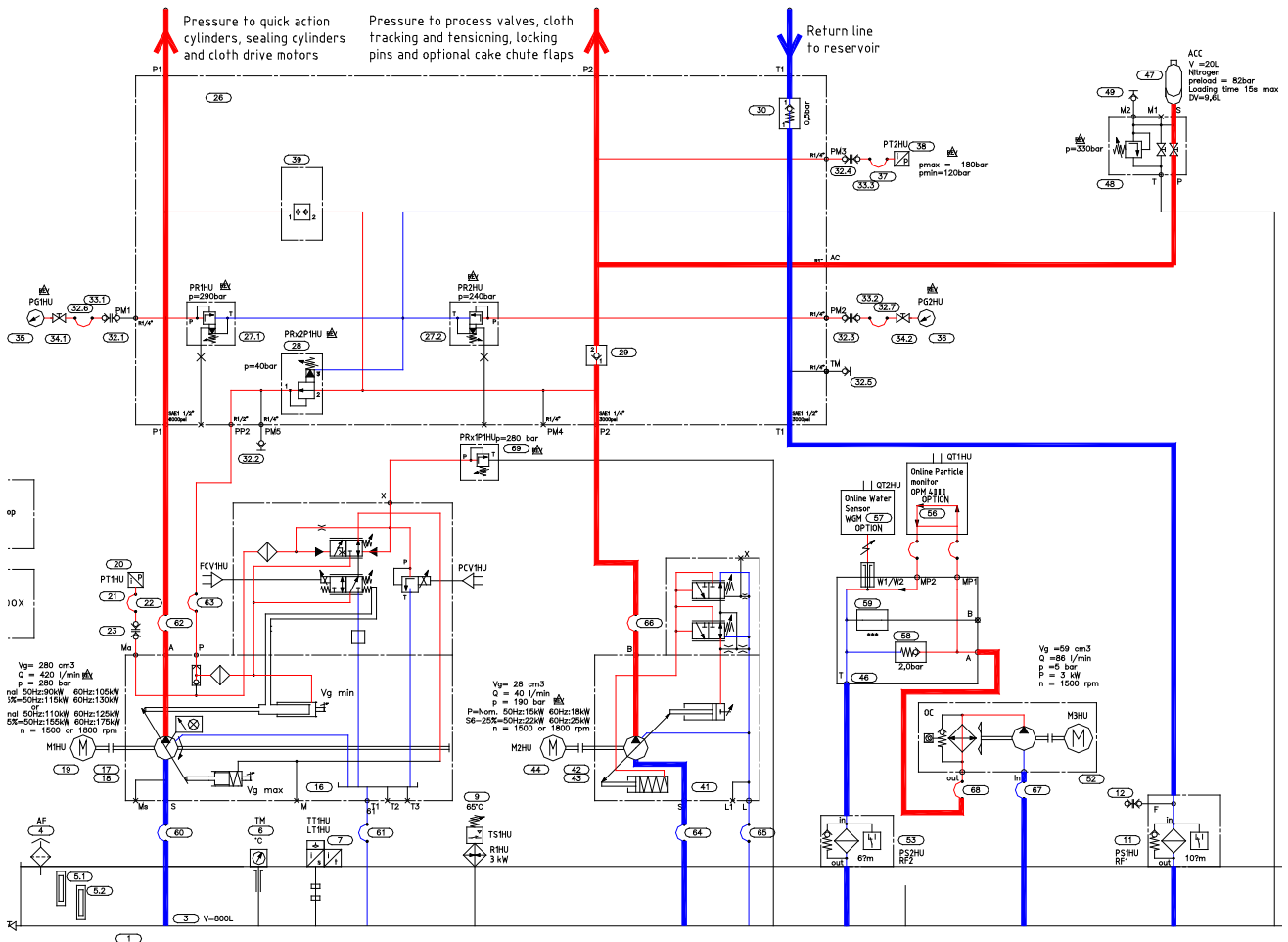


Figure 21. Hydraulic pump

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Manifold block

Hydraulic fluid connections to the filter are attached to the manifold block. Ports P1 and P2 are for pressure connections and T1 is a return line to the reservoir.

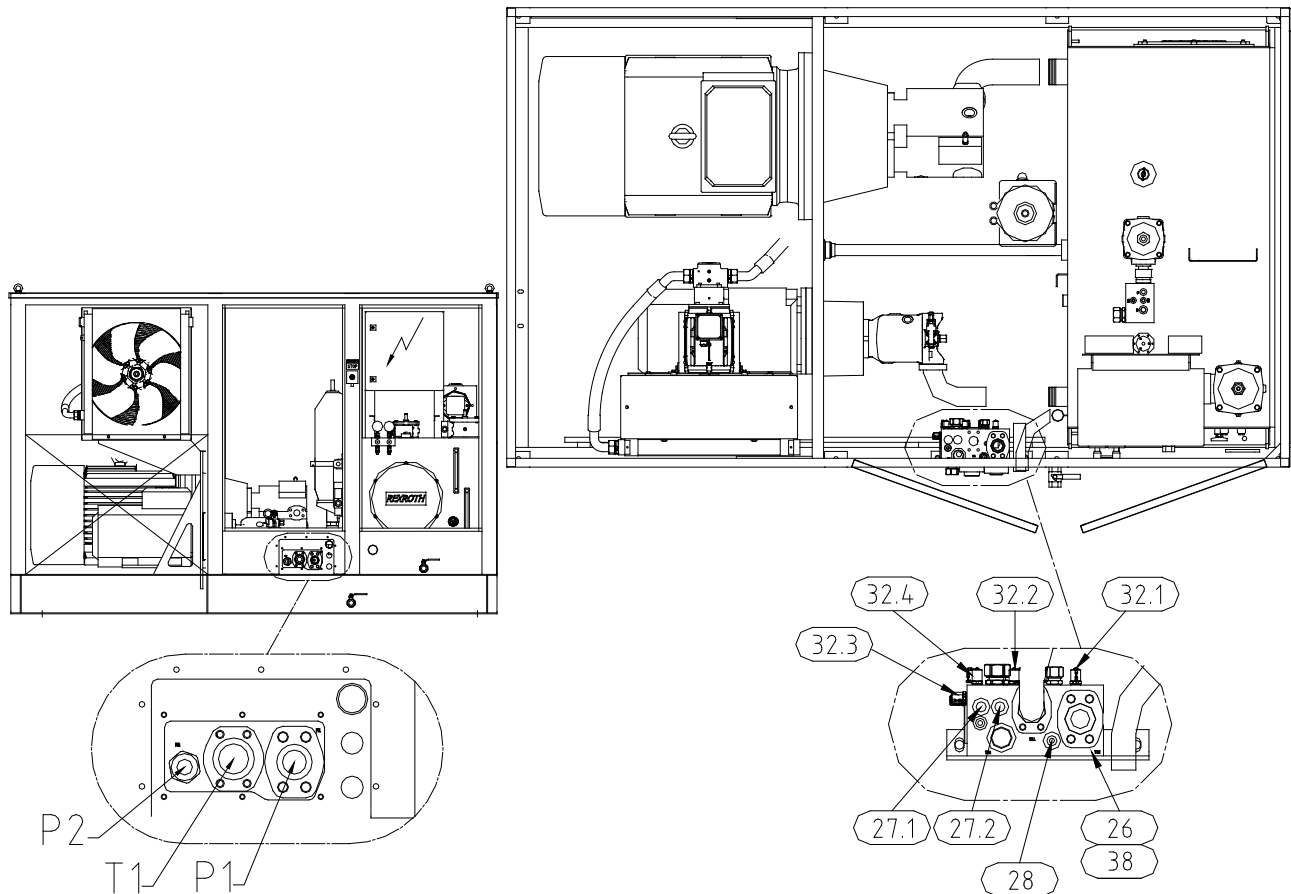


Figure 22. Manifold block

The manifold block includes for example the following components:

- Pressure relief valve PR1 (27.1)
- Pressure relief valve PR2 (27.2)
- Pump P1 control pressure line relief valve PRx2P1HU (28)
- Measurement point PM1 (32.1)
- Measurement point PM2 (32.4)
- Measurement point PM5 (32.2)

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Figure 23. Manifold block components

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Accumulator circuit

The accumulator circuit has a 20 liter accumulator (47) to supply hydraulic pressure during power failures. The accumulator supplies the minor operations with hydraulic pressure while the hydraulic pump P2 is turned off.

Accumulator charging is controlled by a pressure transmitter PT2HU. When the P2 line pressure drops below set value pump P2 is turned on.

Should the accumulator break there is an alarm related to the charging interval. If charging happens more often than the set value an alarm is shown on the OUI screen and the filter stops.

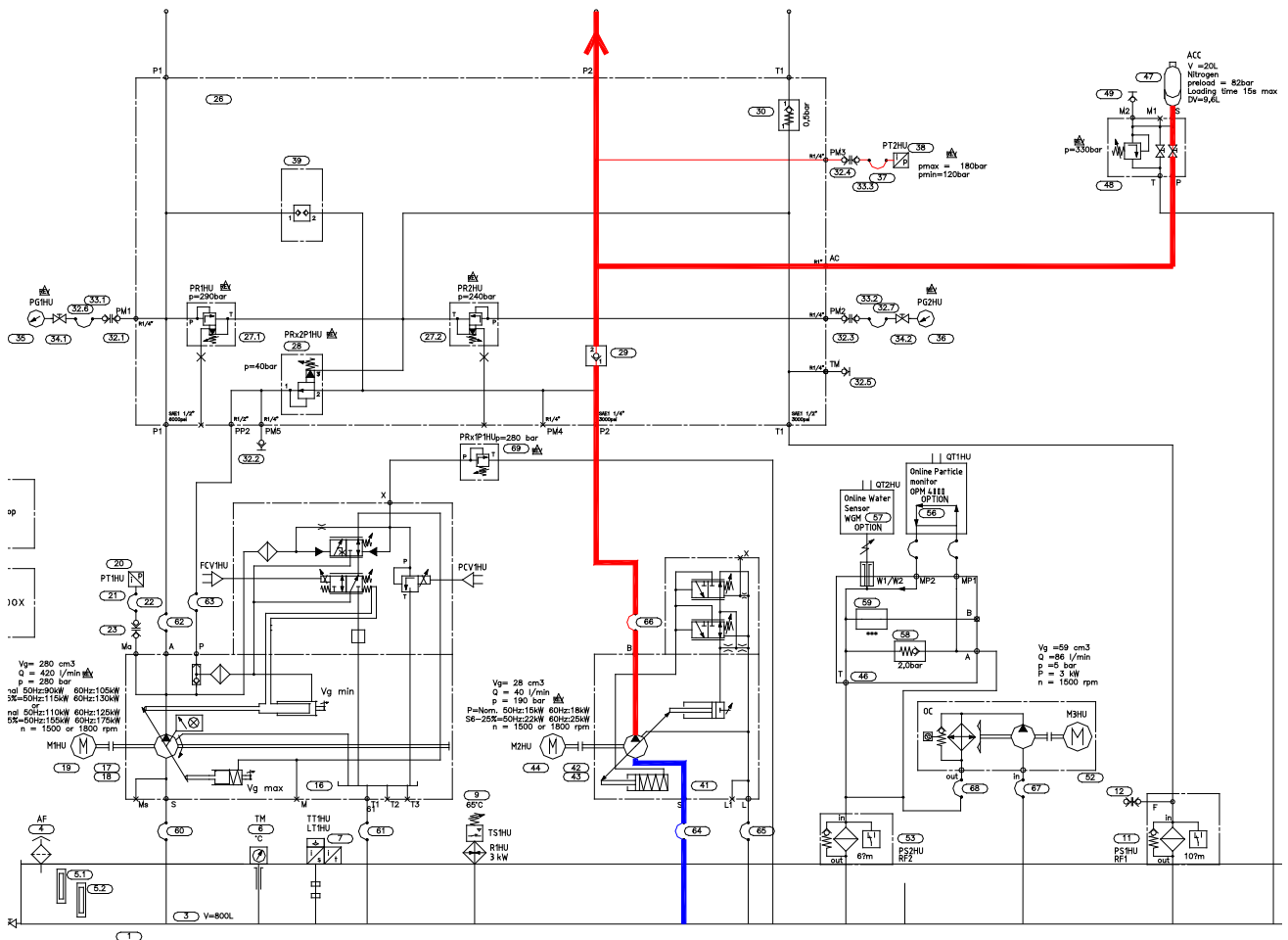


Figure 24. Accumulator circuit

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Accumulator can be discharged with a hand valve.

1. First use END mode to stop the filter.
2. Turn off the hydraulic unit with switch S755 on the control panel.
3. Open the discharge hand valve. See the following figure for reference.



Figure 25. Discharge hand valve

4. Check the P2 line pressure from pressure gauge PG2. It should be zero before hydraulic lines can be opened. Measurement can be made also from point 49.

The safety valve (pressure release valve) on the accumulator unit cannot be adjusted and is sealed.

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Reservoir

The 800 liter reservoir (3) stores the hydraulic fluid. It is equipped with air filter AF (4) for oil level changes during operation.

For dusty conditions OPTIONAL bladder breather is available. It provides air filtration when fluid level changes and keeps the oil completely isolated from surrounding air.

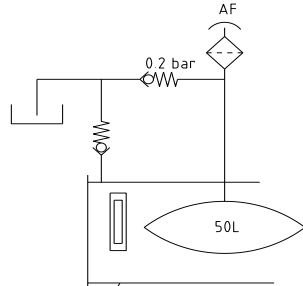


Figure 26. Reservoir

Level (LT1HU) and temperature (TT1HU) transmitters (7) monitor the hydraulic oil. Fluid temperature is controlled by a heater (9) and a cooler (52). For demanding conditions optional water cooling is available.

The return flows into the tank pass through the return filter cartridges (11 & 53) except accumulator discharge line. Both return filters are equipped with a pressure transmitter (PS1HU and PS2HU) which gives an alarm if the filter gets clogged.

The reservoir can be equipped with OPTIONAL particle monitor (56) and water sensor (57).

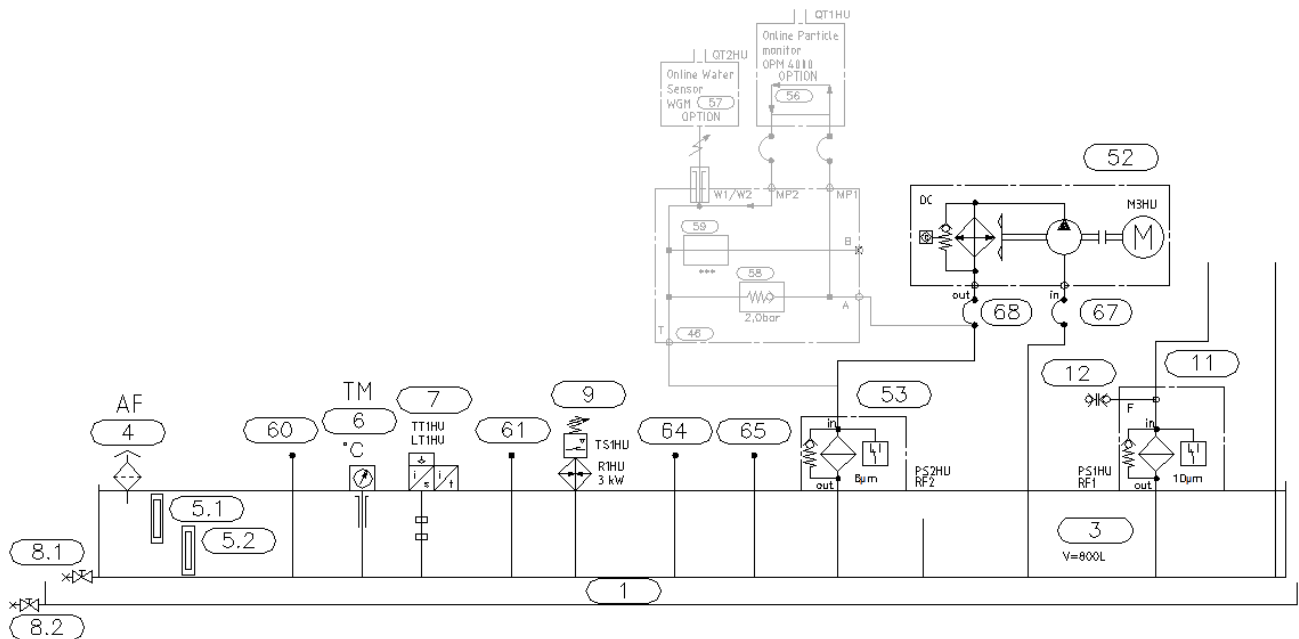


Figure 27. Reservoir components

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Filling the reservoir

Use the pump unit with integrated filter (shown in figure below) provided by Outotec to fill the reservoir to the upper limit of the oil level gauge. The oil must fulfill Outotec recommendations. Fill the reservoir through quick connection (12), which has a 6 µm filter.



⚠ CAUTION

Make sure the reservoir is completely clean inside before you fill it with oil. Do not fill with an open vessel.

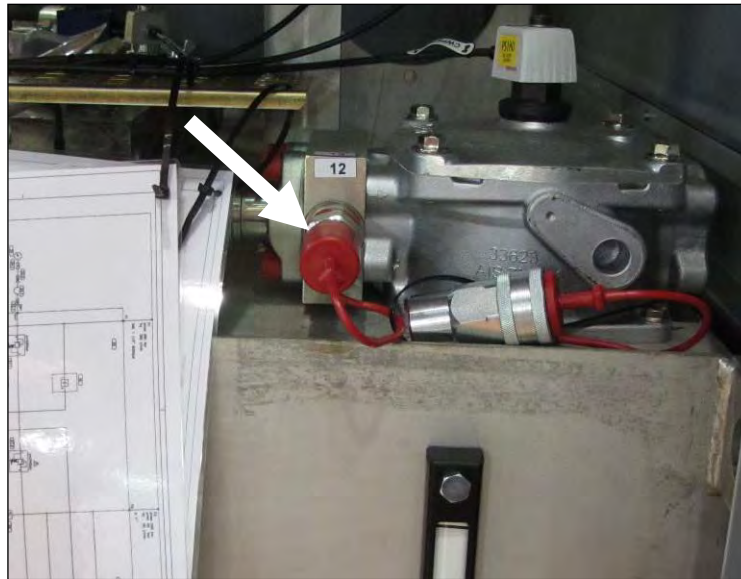


Figure 28. Filling the reservoir

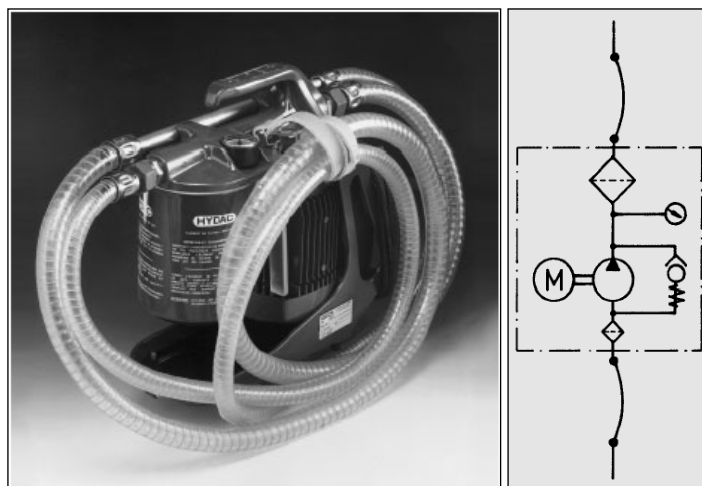


Figure 29. Air filter

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Recommended hydraulic oils

Table 4. Recommended hydraulic oils

| OIL COMPANY | AMBIENT TEMP. / OPERATING TEMP. +10... +40 °C / +40... +65°C +50... +105°F / +105... +150°F |
|--------------|---|
| BP | Energol HLP46 |
| Castrol | Hyspin AWS 46 |
| Exxon / Esso | Nuto H 46 |
| Gulf | Harmony 46 AW |
| Mobil | Mobil DTE 25 |
| Neste | Paine 46 |
| Shell | Shell Tellus Oil S 46 |
| Raisio | Bio Safe 32 |
| Sunoco | Hydroil 821 Hyvis 32 S |
| Texaco | Rando Oil HDZ 46 |

Recommended grease

- Gleitmo WSP5000 or equivalent



CAUTION

The barrel oil delivered by oil companies is not clean enough for the hydraulic system. If barrel oil is used without separate filtration, the oil filter will be blocked within a few days.

For more detailed information about hydraulics, refer to the hydraulic diagrams attached to this manual.

Start-up

Make sure the items below are completed before the start-up of the hydraulic system:

- The hydraulic piping or components are not damaged.
- The supply voltage and frequency are correct.
- The pump rotates in the right direction as shown by the arrow on the pump.

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⚠ CAUTION

Measure the oil temperature before the start-up. When the oil temperature is below 10 °C, an incorrect procedure during start-up damages the pump within a few seconds.



Pay special attention with the oil viscosity class 46 cSt. Heat the oil with the immersion heater of the oil container to temperature of 10 °C before start-up.

Calibration

The hydraulic unit is tested and calibrated at the factory. If the calibration needs to be done again, for example to verify the unit's functions, follow the steps below.

1. Activate the filter test mode with key switch S780 on the control panel.
2. Log in on the tools screen.
3. Select the hydraulics calibration.

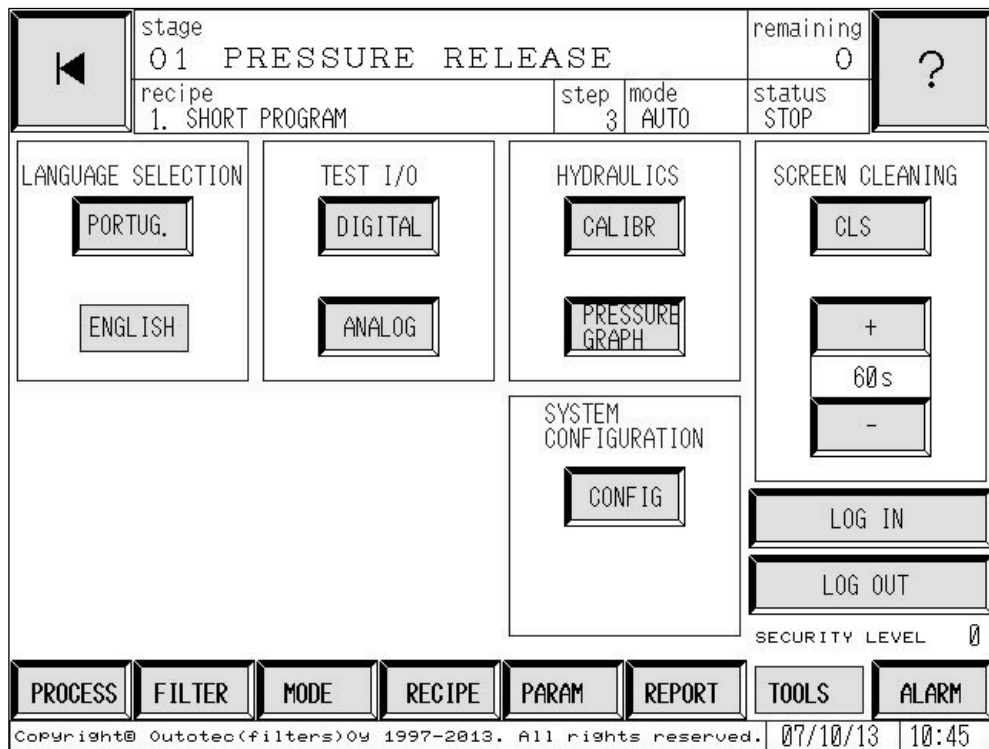


Figure 30. Hydraulic calibration screen

4. Turn the selector switch S714 in Hand Held unit to position HC5.

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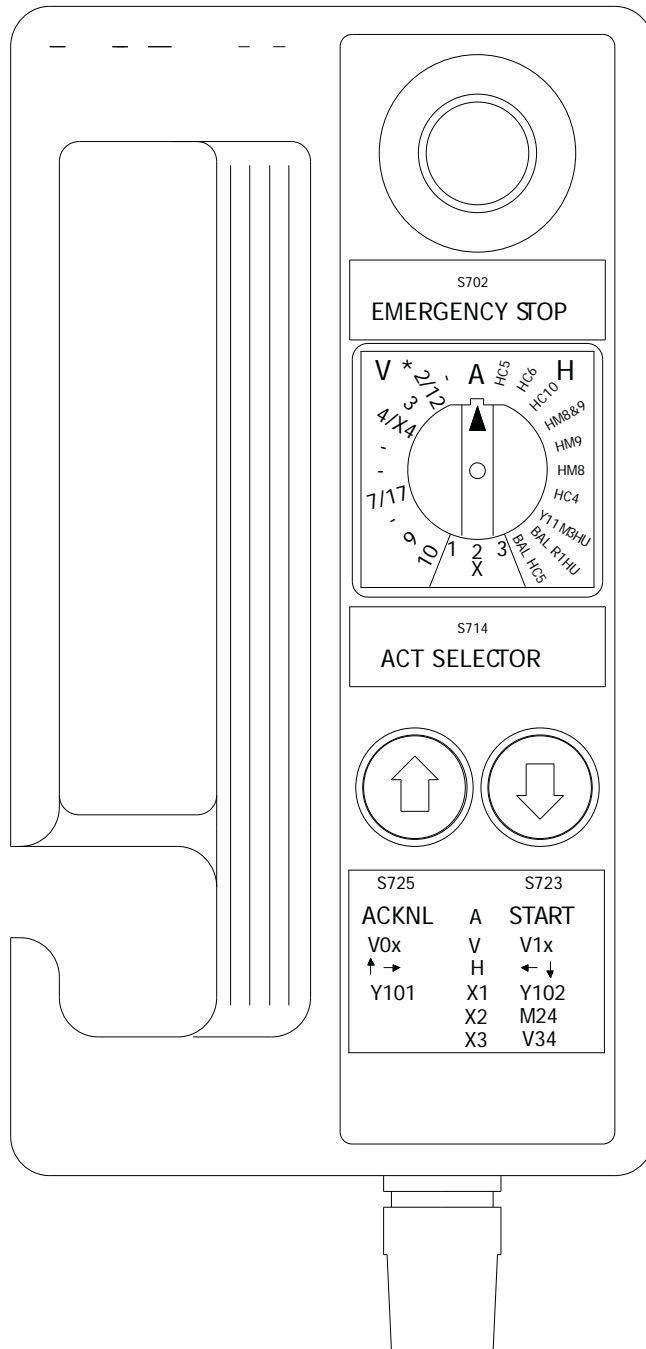


Figure 31. Hand held unit

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Pump P1 idle pressure check

1. Set the flow to 100 l/min from the OUI screen.

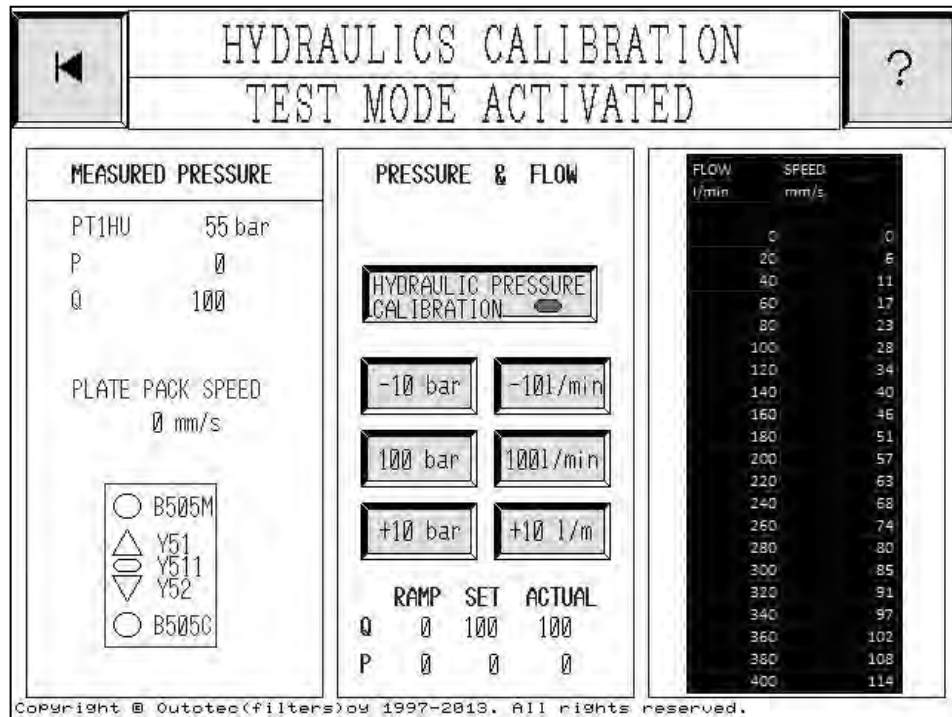


Figure 32. OUI screen

Check the pressure reading from the screen or from PG1. It should be 50 - 55 bar.

2. If not adjust the pressure from the pump. See the following figure.

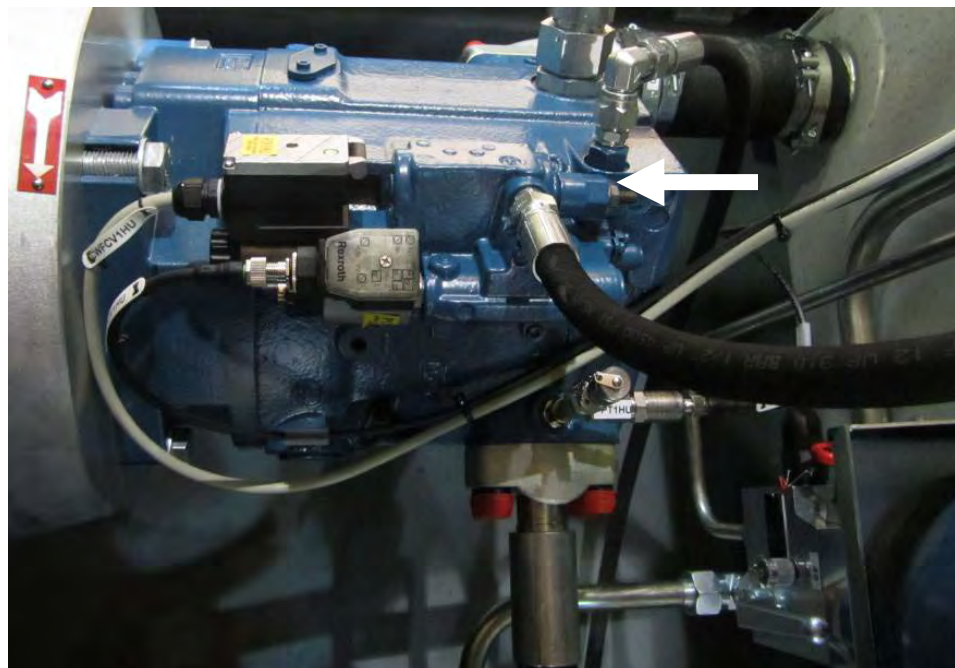


Figure 33. Adjusting the pressure

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Pump P1 flow rate check

1. Set the pressure to 280 bar from the OUI screen and flow rate to 100 l/min.
2. Drive the plate pack up or down and check the actual flow rate. It should be same as set rate.

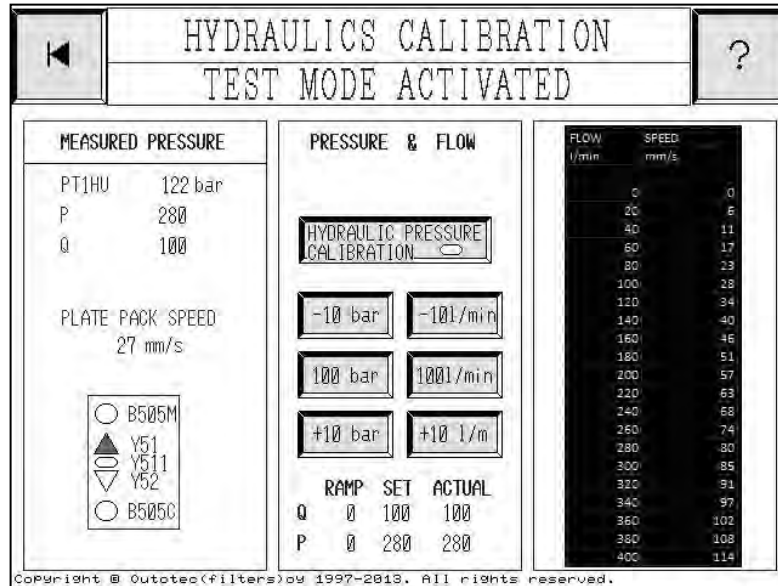


Figure 34. OUI screen

Pressure relief valve PR1

1. Set pressure from Hydraulics Calibration screen on the OUI to 280 bar.
2. Lower the pressure by adjusting the valve PR1 (27.1). Pressure can be checked from pressure gauge PG1 or from the OUI screen.
3. Increase the pressure by adjusting the valve PR1 until pressure is 280 bar.

Once it is reached turn the adjustment screw a quarter revolution more.

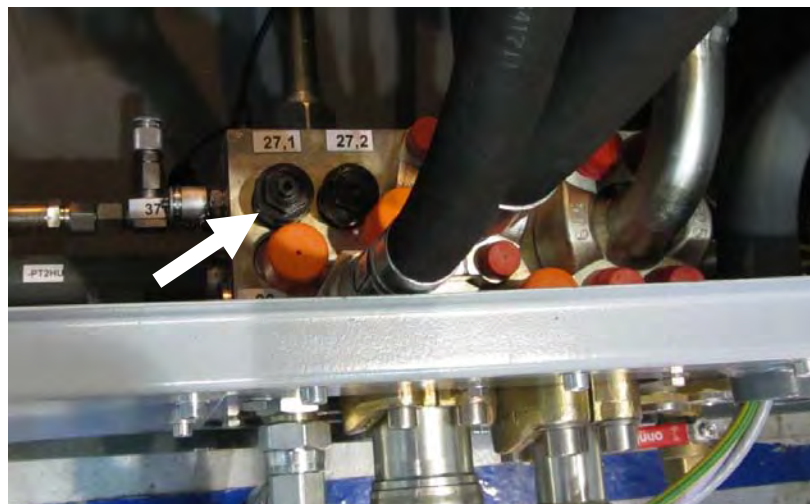


Figure 35. Adjustment screw

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Pump P1 control pressure relief valve PRx1P1HU

1. Lower the pressure by adjusting the valve (24).
2. Check the readings from pressure gauge PG1 or from the OUI screen.
3. Increase the pressure by adjusting the valve (24) until 280 bar is reached.

The actual pressure limit of the valve will be about 20 bar less because of the flow control valve in the line before it.



Figure 36. Pump P1 control pressure relief valve

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Pump P1 control pressure line relief valve PRx2P1HU

1. Install a pressure gauge to measurement point PM5 (32.2) in the manifold block.

Pressure gauge PG2 can be used for this purpose by moving the connector from point PM2 (32.4) to PM5 (32.2).

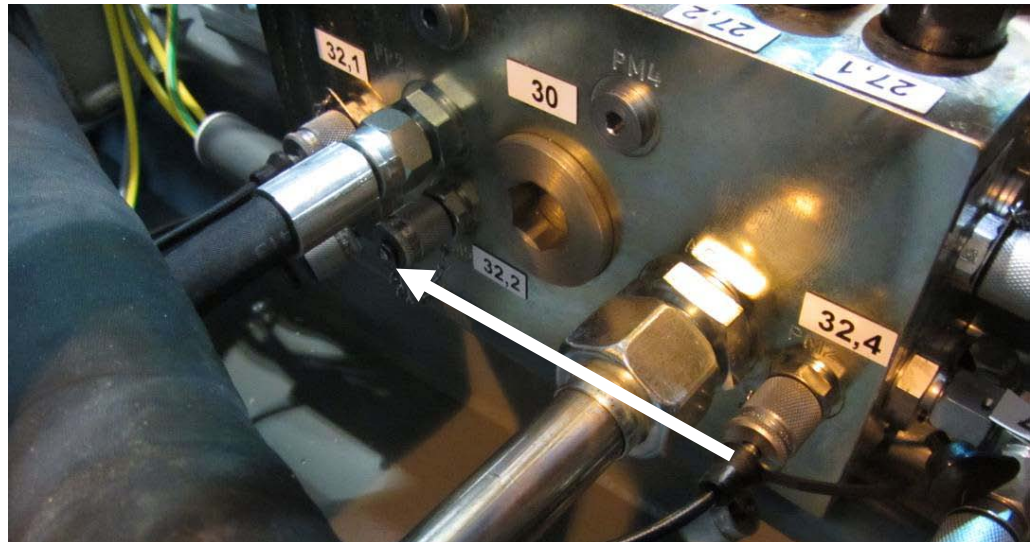


Figure 37. Pressure gauge

2. Lower the pressure by adjusting valve PRx2P1HU (28) in the manifold block.

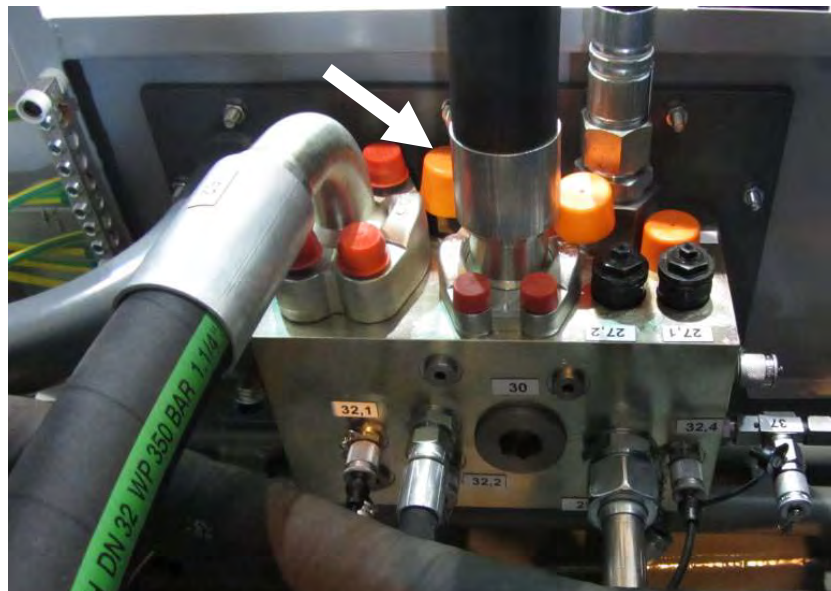


Figure 38. Pump P1 control pressure line relief valve

3. Check the readings from pressure gauge installed to the PM5 (32.2). OUI cannot be used for this!
4. Increase the pressure by adjusting valve PRx2P1HU (28) until 40 bar is reached.
5. Move the pressure gauge PG2 connector back to the PM2 (32.4).

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Pump P2 pressure

1. Adjust the pressure to 190 bar with the valve attached to the pump. See the figure below.

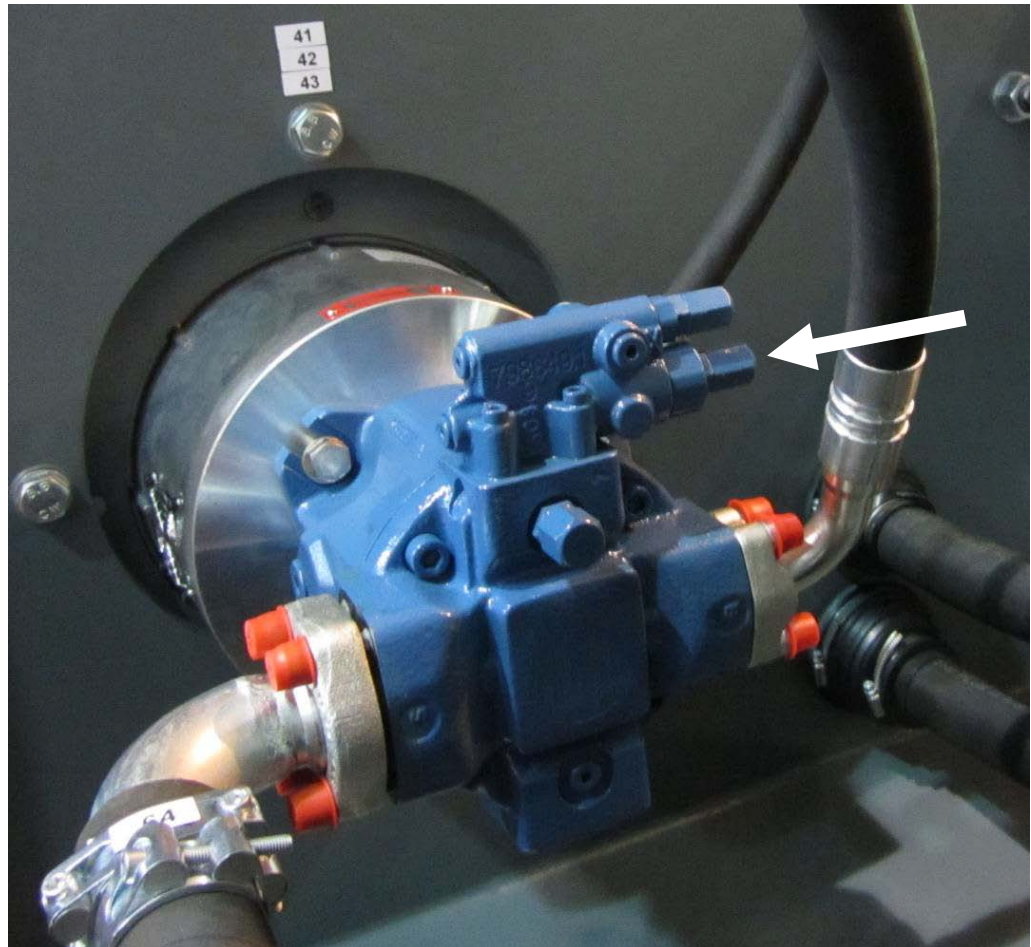


Figure 39. Valve

2. Check the pressure from PG2 or from the OUI screen.

2.4.3.3 Adjustments for hydraulic components in the filter

The hydraulic system includes control components in the filter which need to be adjusted during start-up and in some maintenance tasks. These include the following components:

- Pressure relief valves PR51 and PR52 for quick action cylinders
- Control valves for cloth tensioning
- Control valves for sealing cylinders
- Control valves for cloth tracking

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Quick action cylinders

Following steps need to be done during start-up or after possible oil leak on QAC cylinder. Two people are need for this task.

Adjusting the pressure relief valve PR51

The pressure for pump P1 has be set over 100 bar before adjusting the valves.

1. Lock the plate pack to lower position.
2. Select BALHC5 with the Hand Held device selector S714.



NOTE: BALHC5 selected from the Hand Held device the serial connection of hydraulics aligning the pressing plate is not in action. Only the weight of the plate pack is keeping the pressing plate aligned.

3. Drive the plate pack towards open position and check the pressure from PG1 or OUI screen.
4. Ask the assistant to adjust the PR51 valve until 100 bar is reached.
5. Tighten the locking nut on the valve gently.



Figure 40. Adjusting the pressure relief valve PR51

Adjusting the pressure relief valve PR52

Plate pack locked in lower position and BALHC5 selected from hand held unit.

1. Drive the plate pack towards closed position and check the pressure from PG1 or OUI screen.
2. Ask the assistant to adjust the PR52 valve until 55 - 60 bar is reached.
3. Tighten the locking nut on the valve gently.

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Bleeding the air

Plate pack locked in lower position and BALHC5 selected from hand held unit.

1. Drive the plate pack towards open and closed positions several times.

The sound of oil flowing from the valves to the reservoir can be heard easily at this point.

2. Select HC6 with the selector switch S714 on the Hand Held device.
3. Drive the locking pins to open position.
4. Select HC5 with the selector switch S714 on the Hand Held device.
5. Drive the plate pack to open and closed positions and make sure the upper pressing plate stays horizontal.



⚠ CAUTION

If the upper pressing plate starts to turn out of alignment immediately stop the movement.

6. If the upper pressing plate does not stay horizontal select BALHC5 from the Hand Held device.
7. Drive the plate pack carefully to closed position and lock it in place.
8. Repeat the steps above.

In case the upper pressing plate still does not stay horizontal repeat the bleeding process with plate pack locked in open position.

If the filter is stopped and the plate pack has descended and turned out of alignment drive the plate pack with BALHC5 selected from the hand held device to realign it.

Sealing cylinders

To prevent pressure shocks on the system the reaction speed of the directional control valves can be adjusted with flow control valves (1) below them.

In case the sealing pressure set in the program (70 - 80 bar) cannot be reached adjust the pressure relief valve.

Adjusting sealing cylinder pressure relief valve

Pressure for Pump P1 has to be set over 100 bar before adjusting sealing pressure. Refer to chapter Hydraulic Unit Calibration on how to do this.

1. Drive the plate pack to closed position and lock it in place.
2. Select HC7 from the Hand Held device (selector switch S714).
3. Drive the sealing cylinders up (towards sealing position) and check the pressure gauge PG1.
4. Adjust the pressure relief valve (2) until the wanted pressure has been reached.

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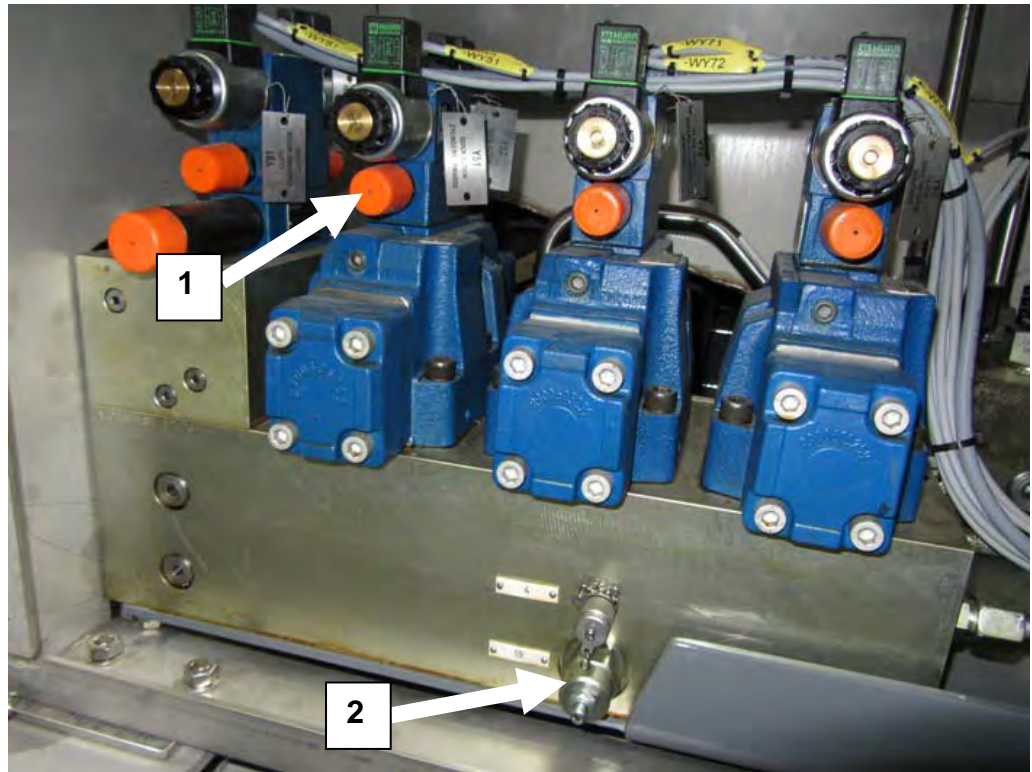


Figure 41. Adjusting sealing cylinder pressure relief valve

- | | |
|-----------------------|--------------------------|
| 1. Flow control valve | 2. Pressure relief valve |
|-----------------------|--------------------------|

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Cloth tensioning device

1. Adjust the valve A to change the tensioning speed. Another control valve is on the other side of the directional valve.
2. Adjust valve B to change the tensioning force.
3. Check the pressure from the gauge C.

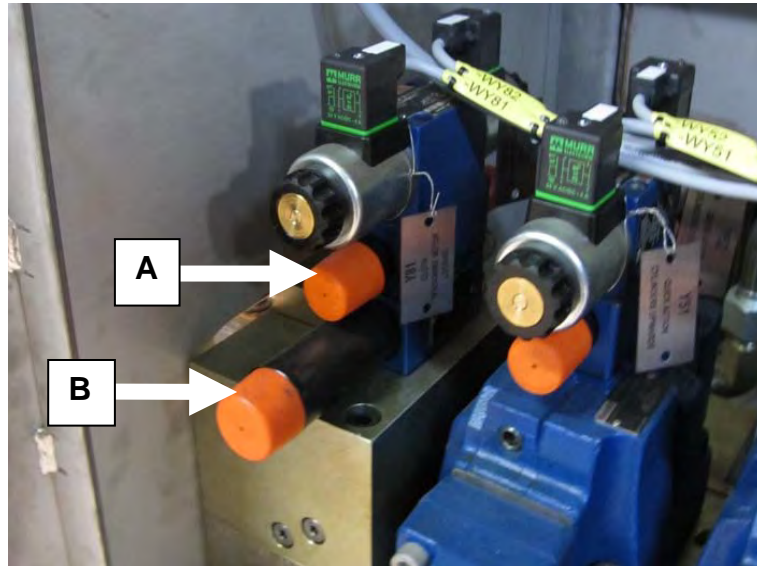


Figure 42. Cloth tensioning device

| | |
|----------------------|----------------------|
| A = Tensioning speed | B = Tensioning force |
|----------------------|----------------------|

Restrictor valve can be used to lock the tensioning roller in place during maintenance.

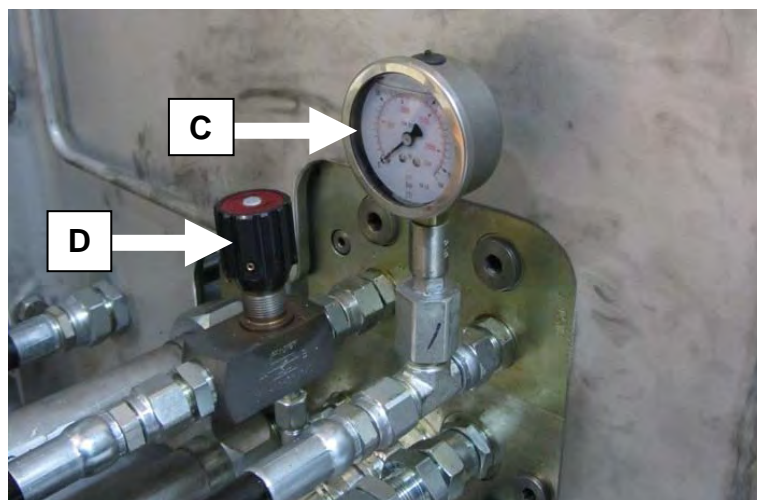


Figure 43. Cloth tensioning device

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|--------------------|--------------------------|
| C = Pressure gauge | D = Throttle check valve |
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Cloth tracking

To adjust cloth guide roller speed and setting pressure relief valve two people are needed.

1. Install pressure gauge to the measurement point shown in the figure below.

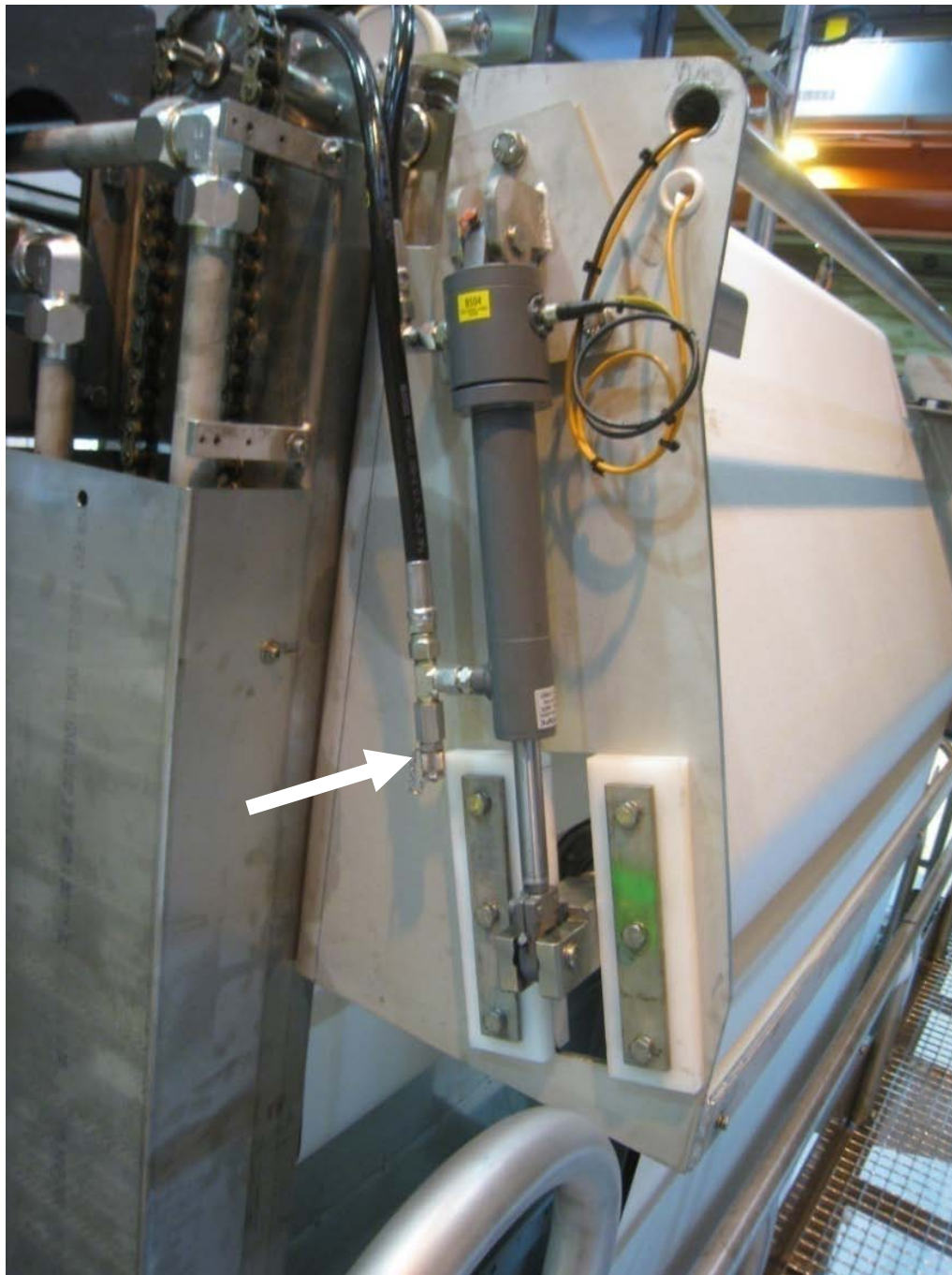


Figure 44. Pressure gauge measurement point

2. Filter in test mode select HC4 with the Hand Held device selector switch S714.
3. Ask the assistant to drive the cloth to left.

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4. Check the pressure gauge and adjust the pressure relief valve (A) until 65 bar is reached.

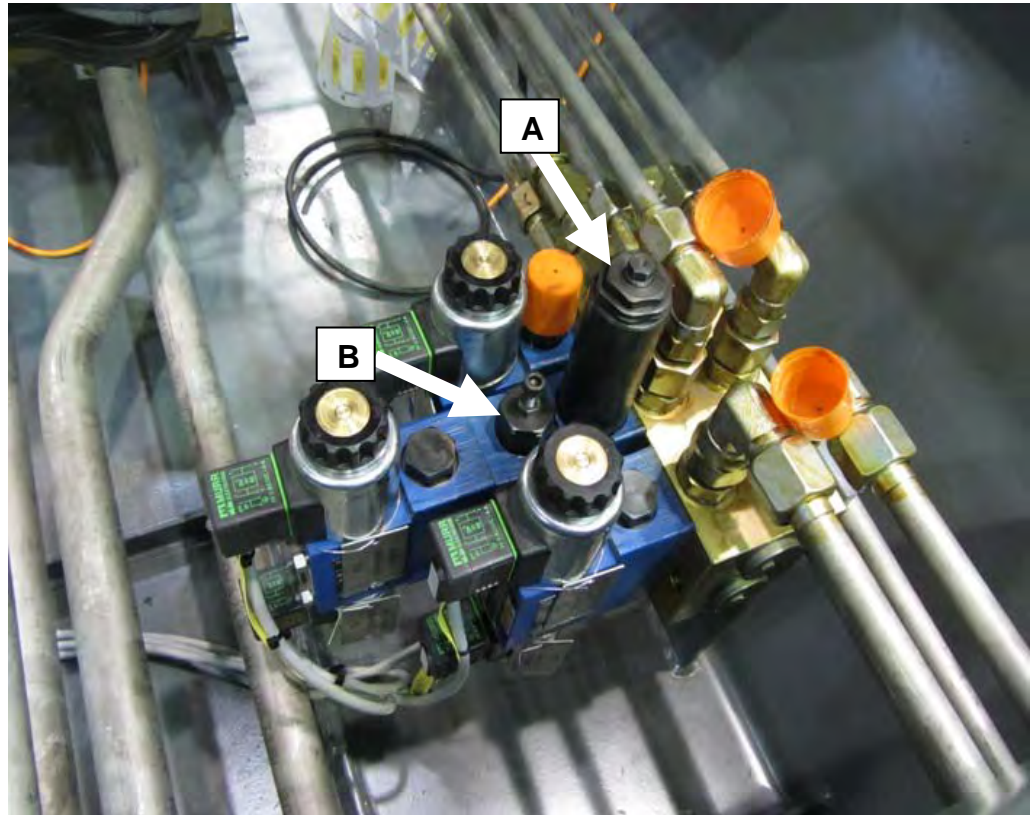


Figure 45. Pressure relief valve and throttle check valve

| | |
|---------------------------|--------------------------|
| A = Pressure relief valve | B = Throttle check valve |
|---------------------------|--------------------------|

5. Ask the assistant to drive the cylinder between end positions and measure the time.
6. Adjust the throttle check valves (B) until the cylinder movement to both directions takes about 5 s. The other throttle check valve is located on the opposite side (not visible on the figure above.).

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2.4.4 Optional devices

2.4.4.1 Cake thickness gauge

The cake thickness gauge is based on a signal from an ultrasonic sensor, from which the average cake thickness is counted during cake discharge.

The measure range of the sensor is 60-500 mm.

The output message of the sensor is 4-20 mA.

The filtration control is activated from the configuration page using the push-button in question. The system can control the filtration time within limits set by parameters 3 and 4. When filtration control has been chosen, the filter runs for three cycles before the filtration time control becomes activated.

A new filtration time is counted when three latest measured cake thicknesses have exceeded or fallen below the desired cake thickness.

The following conditions deactivate the pump control:

- The filter has been stopped for more than 60 minutes
- The surface in the slurry tank has been below the OK limit over 60 minutes
- Voltage break in the control panel

After deactivation, the filtration time control is reactivated after three cycles.

When filtration time control has been chosen but is not yet activated, the time defined in the recipe is used as the filtration time.

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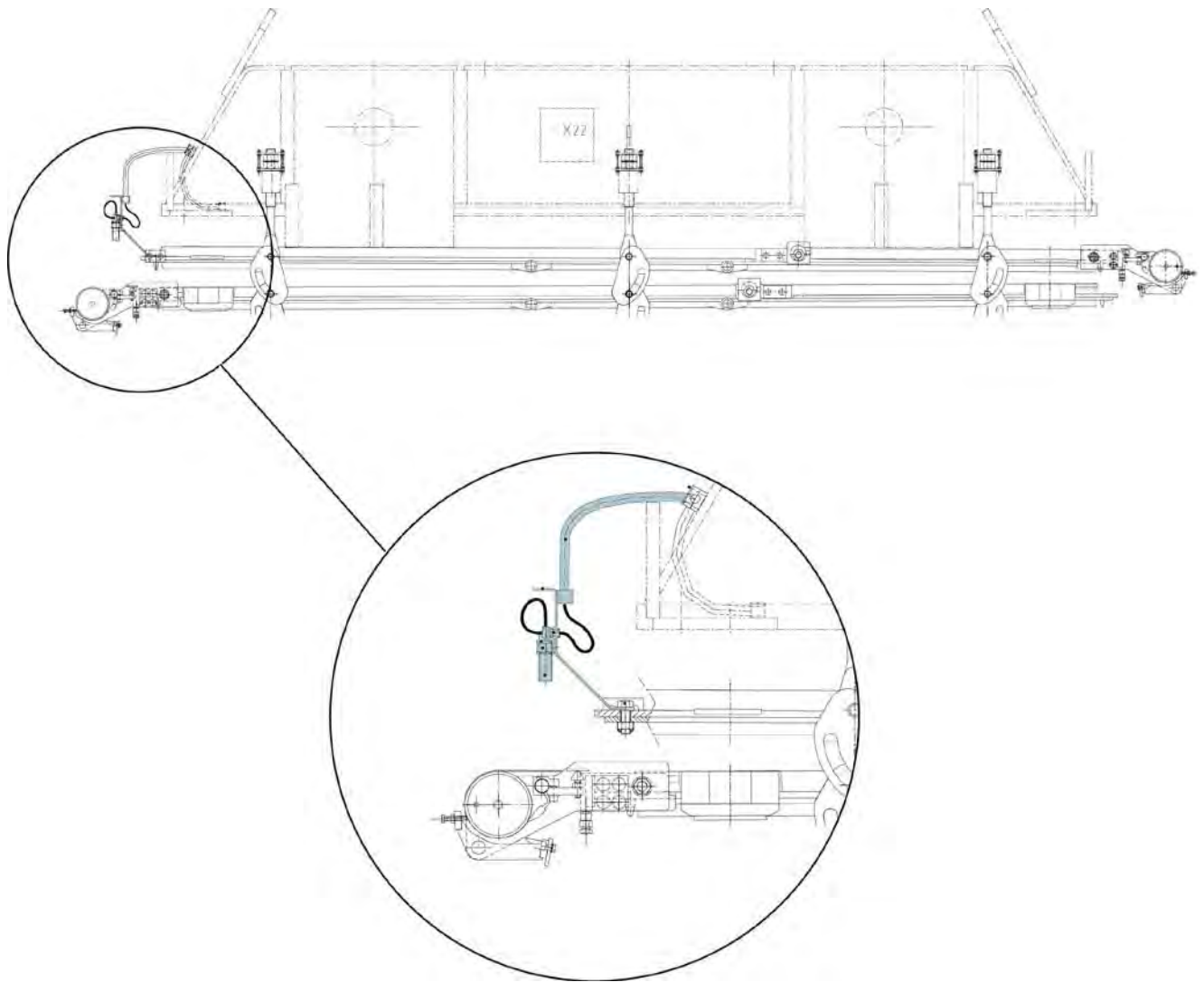


Figure 46. Cake thickness gauge

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2.4.4.2 Cake chute flap



⚠ DANGER

Do not put your hands near the cake chute flaps when the machine is in use.



Make sure the cake chute flaps cannot move during the maintenance work of the machine.

The cake chute flaps prevent the washing water from getting into the cake chute. The machine has two cake chute flaps, one in each cake chute.

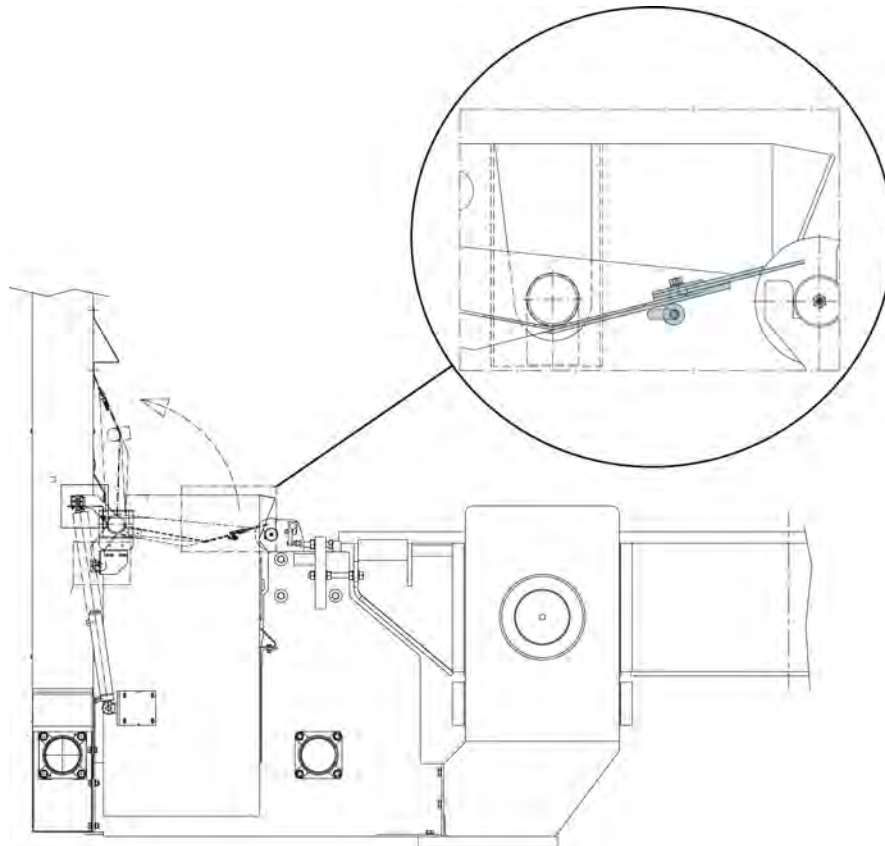


Figure 47. Cake chute flap

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

2.4.4.3 Cake discharge device

Cake discharge device distends the diaphragms while the plate pack is opening. Because of this the cake drops on the cloth and will thus be discharged normally.

In the same time when the plate pack starts to open, valve opens and blower starts to blow air above the diaphragm through a pressing water pipe. The diaphragm distends and forces the cake to drop.

After an adjusted distending time, the flow direction valve changes flow direction and the blower will start to absorb the air off.

After this step, the normal program continues (cake discharge, cloth washing...). Maximum set value for overpressure and vacuum valves is 250 mbar.

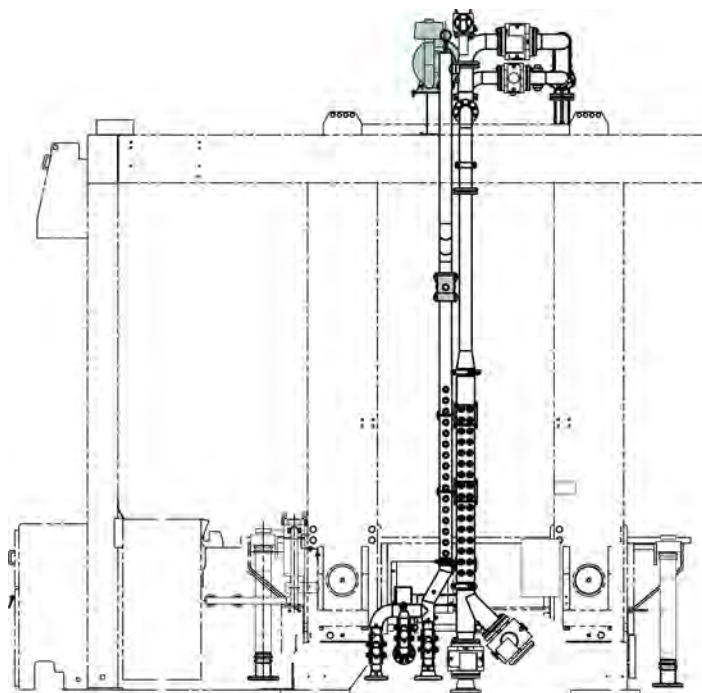


Figure 48. Cake discharge device

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

2.4.4.4 Drying air control module

Drying air flow is measured in normal cubic meters with a pressure modified flow signal (NTP).

Air consumption is the major energy requirement for pressure filtration and management of this utility is the key to low operating cost.

Air consumption is controlled regardless of cake thickness or permeability.

Higher drying air pressures up to 10 bar can be used.

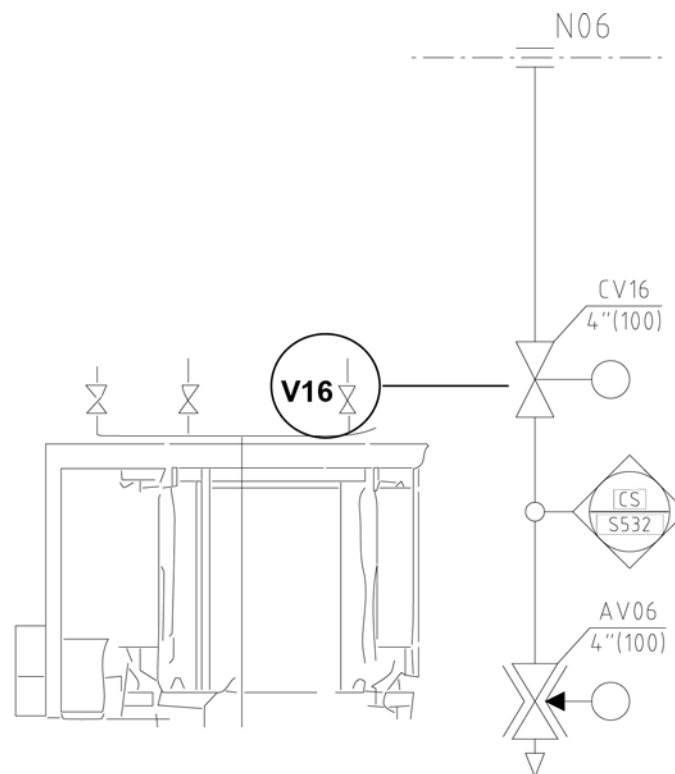


Figure 49. Drying air control module

Hardware

Drying air flow, flow meter, B923 (scale 0...60 m³/min = 4...20 mA)

Drying air pressure transmitter, B416 (scale 0...2000 kPa = 0...20 bar = 4...20 mA)

Drying air flow, control valve, V16 (scale 0...100% = 4...20 mA)

Connection cables for transmitters

Connection to the PLC

Software

Outotec air control software

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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NORMAL AIRFLOW

Calculated from following formula:

- $Nm^3/min = Am^3/min * P / 101.32 * 273 / (273 + T)$

Where

- P = Absolute Operating Pressure in kPa (Kilo pascal) = Operating Pressure (kPa) + 101.32, 1 bar = 100 kPa
- T = Operating Temperature in degree Centigrade.
- Nm³/min: Normal Cubic Meter per minute, at NTP Conditions.
- Am³/min: Actual Cubic Meter per minute, at Operating Conditions.

NTP CONDITIONS ARE

Pressure = 101.325 kPa

Temperature = Zero deg. Celsius

Example:

Pressure P = 7.5 bar

Actual Cubic Meter per minute Am³/min = 30 m³/min

Operating Temperature = 30 °C

$Nm^3/min = 30 m^3/min * (750 kPa + 101.32 kPa / 101.32 kPa) * 273 / (273 + 30) = 227 Nm^3/min$

Operating modes

Drying air flow controller has 3 different operating modes:

1. Ramping V16 open
2. Flow control (FLW_ENABLE configuration bit)
3. Pressure control (PSR_ENABLE configuration bit)

Operating modes can be selected from Tools -> Configuration screen.

Ramping V16 open

Note that valve V16 is butterfly valve, which has about 20% dead area, which means that there will be no flow before valve is opened at least 20%. While V16 is closed, it will be kept 20% open. It will be totally closed only while filter is stopped.

Ramping V16 open is active if both (FLW_ENABLE and PSR_ENABLE) configuration bits are off (from OIU tools -> configuration screen). In this case V16 is ramped to open fully during air drying. Ramping is done with clock pulse (0.1 Hz) according parameter "V16 Opening time".

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Example: if parameter “V16 Opening time” = 15 s, ramping will be $80\% / 15 = 5.33\% / s = 0.533\% / 0.1 S$, ramp is 0.533.

Ramping V16 open mode can be used if pressure or flow transmitter is defected and due to that flow or pressure control mode cannot be used.

Flow control

This is the default-operating mode of the Drying air flow control module. While configuration bit FLW_ENABLE is on, the module is active. Drying air flow is controlled with PID-controller with “Drying air flow” value coming from OIU parameters (OIU Parameter screen).

Flow control is designed so that when air drying starts V16 is ramped first to 40% open (20% open while closed) with 500 ms ramp (1%/500 ms). After that PID-controller is activated (auto mode) and controls the flow according set value and controller parameters.

Note that if Drying air flow or pressure value is too big, controller will never reach it, valve V16 will be opened fully without reaching set values.

PID-controller parameters need to be adjusted at site to correspond with the process in question.

Default parameters are:

- PID Parameters, flow control
- Loop update time = 100 ms
- Proportional Gain $K_p = 1.5$
- Integral time $T_i = 1.5 s$
- Derivate time $T_d = 0.1 s$

Pressure control

Pressure control operating mode can be used for example when flow transmitter is defected. When configuration bit PSR_ENABLE is turned on drying air pressure control is active. Drying air pressure is controlled by PID-controller with “Drying air pressure” value coming from OIU parameters (OIU Parameter screen).

Pressure control is designed so that when air drying starts V16 is ramped first to 40% open (20% open while closed) with 500 ms ramp (1%/500 ms). After that PID-controller is activated (auto mode) and controls the pressure according set value and controller parameters.

Note that if Drying air flow or pressure value is too big, controller will never reach it, valve V16 will be opened fully without reaching set values.

PID-controller parameters need to be adjusted at site to correspond with the process in question.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Default parameters are:

- PID Parameters, pressure control
- Loop update time = 100 ms
- Proportional Gain $K_p = 2.5$
- Integral time $T_i = 1.0$ s
- Derivate time $T_d = 0.02$ s

Parameters and configuration bits

Table 5. Parameters

| PARAMETER | UNIT | DESCRIPTION |
|---------------------|----------------------|--------------------------------------|
| Drying air flow | Nm ³ /min | Used while in flow control mode. |
| Drying air pressure | bar | Used while in pressure control mode. |
| V16 Opening time | s | V16 opening time in ramping mode. |

Table 6. Configuration bits

| CONFIGURATION BIT | DESCRIPTION |
|-------------------|-------------------------------|
| FLW_ENABLE | Enable flow control mode. |
| PSR_ENABLE | Enable pressure control mode. |

2.4.4.5 Slurry feed control module

Slurry flow is measured with magnetic flow meter. Density of slurry is calculated from slurry tank based on pressure and level measurements.

With these measurements slurry feed can be optimized on several ways: pumping speed control for maximum recommended flow (l/s), pumping exact amount of slurry (kg) to filter, ramping slurry pump up/down.

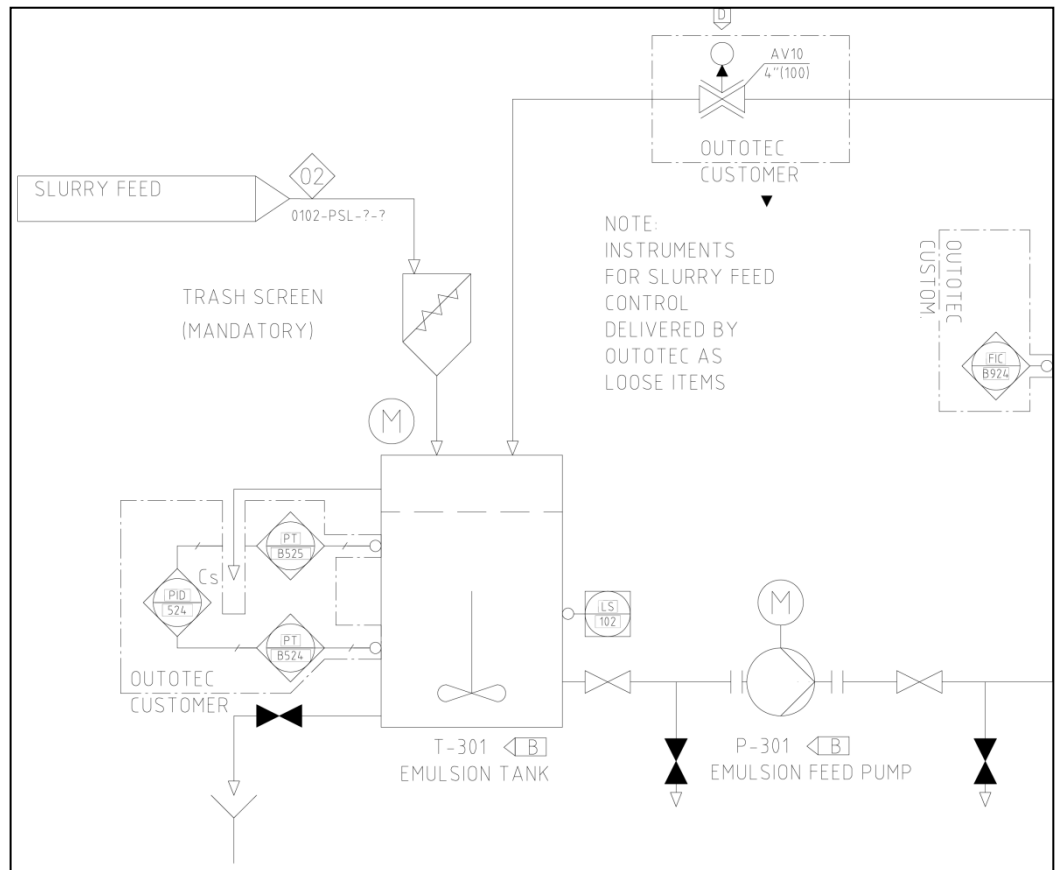


Figure 50. Slurry feed control module

Hardware

- Slurry flow transmitter, B924 (scale 0...150 l/s = 4...20 mA)
- Slurry tank lower level transmitter B524 (scale 0...4060 mm H₂O = 4...20 mA)
- Slurry tank upper level transmitter B525, (scale 0...2010 mm H₂O = 4...20 mA)
- Variable speed drive (VSD) for slurry pump
- Connection cables
- Connection to the PLC

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Software

Density is mass per unit volume:

$$\rho = m/V$$

Pressure and differential pressure transmitters are often used to measure the density of a fluid. Both types of transmitters measure level based on the principle that pressure (P) is proportional to the level (L) of the liquid multiplied by its specific gravity (S):

$$P = LS$$

Since specific gravity is the ratio of a fluid's density to the density of water, any change in density will result in a change in pressure. For example, if the height of the fluid is 1000 mm and the specific gravity changes from 0.9 to 1.3, the pressure reading changes correspondingly from 900 to 1300 mm H₂O.

Since the density of water is 1000 kg/m³ (at 4 °C), the density of a material with a specific gravity of 0.9 is 900 kg/m³, and the density of a material with a specific gravity of 1.3 is 1300 kg/m³. Thus, the density of a material can be determined using a variation of the basic level measurement.

Often the density of a fluid must be determined in a vessel where the level is changing and a reference column is impractical. In these cases density can be measured with two transmitters.

Example:

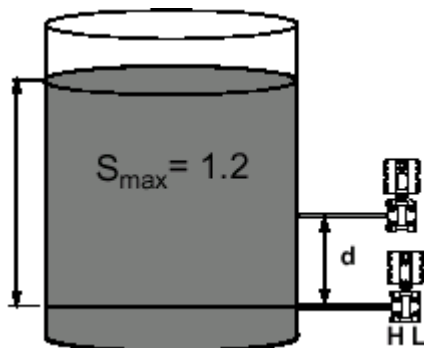


Figure 51. Example of measuring the density

L max = 5000 mm; d = 1000 mm

To measure density with two transmitters:

1. Calibrate the bottom transmitter to measure from its tap to the maximum level with maximum S.
2. Calibrate the top transmitter to measure from its tap to the maximum level with maximum S.
3. Determine the specific gravity by: difference in transmitter readings/vertical distance between transmitters (d).

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Top transmitter = 3000 mm H₂O

Bottom transmitter = 4300 mm H₂O

$S = \text{bottom transmitter reading} - \text{top transmitter reading} / d$

$S = 4300 \text{ mm H}_2\text{O} - 3000 \text{ mm H}_2\text{O} / 1000 \text{ mm} = 1.3$

$\Rightarrow \rho = 1.3 \text{ kg/dm}^3$

Operating modes

Slurry flow module has following operating modes:

- Maximum flow control (M09FLOW_ENABLE)
- Filling control (M09FILLING_ENABLE configuration bit)

Operating modes can be selected from Tools -> Configuration screen.

Maximum flow control

While maximum flow control mode is active (M09FLOW_ENABLE) configuration bit (from OIU tools -> configuration screen), slurry pump speed is controlled with parameter "Maximum slurry flow".

In this mode slurry pump speed is ramped to this flow with parameter "Slurry pump ramp time".

After ramping, flow is kept constant with PID controllers "Maximum slurry flow" parameter. At the end of slurry pumping pump will be ramped down with fixed ramp (5 s).

Filling control

While filling control mode is active, slurry amount is controlled by density and flow measurements. There is a parameter "Filling amount", which means exact amount (kg) of slurry to be pumped into the filter.

In this mode the slurry pump speed is ramped to maximum flow "Slurry pump maximum speed" parameter with "Slurry pump ramp time" parameter.

After ramping is done, slurry amount (kg) is calculated from density and flow measurements. When the needed amount is pumped, slurry pump will be ramped down with fixed ramp (5 s).

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Parameters and configuration bits

Table 7. Parameters

| PARAMETER | UNIT | DESCRIPTION |
|---------------------------|------|---------------------------|
| Maximum slurry flow | l/s | Maximum slurry flow |
| Slurry pump ramp time | s | Slurry pump ramping time |
| Filling amount | kg | Filling amount |
| Slurry pump maximum speed | % | Slurry pump maximum speed |

Table 8. Configuration bits

| CONFIGURATION BIT | DESCRIPTION |
|-------------------|-------------------------------------|
| M09FLOW_ENABLE | Enable flow control mode. |
| M09FILLING_ENABLE | Enable filling amount control mode. |

PID-controller parameters need to be adjusted at site to correspond with the process in question.

Default parameters are:

- PID Parameters, flow control
- Loop update time = 100 ms
- Proportional Gain $K_p = 2.5$
- Integral time $T_i = 1.0$ s
- Derivate time $T_d = 0.02$ s

2.5 Process description

Filtration

When the filter plate pack has been closed, the process slurry is pumped into all filter chambers simultaneously. The solids (cake) begin to form as the filtrate is displaced by more slurry entering the chamber. As the solids build, the pumping pressure increases, and filtrate is forced through the cloth until the required solids thickness is achieved.

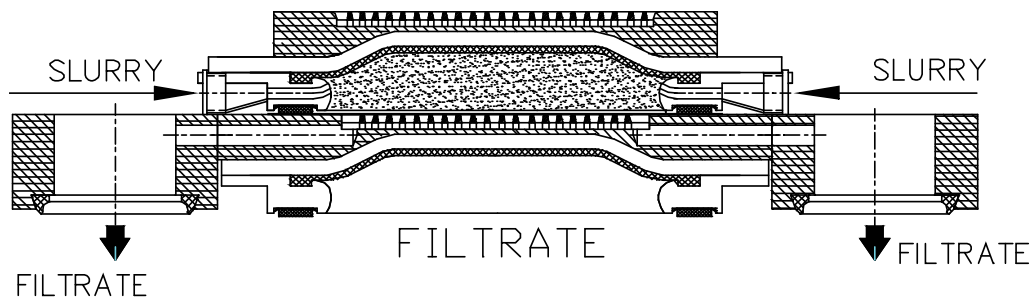


Figure 52. Filtration

Pressing I

Pressing air inflates the rubber diaphragms located at the top of each chamber. The diaphragm presses the solids (cake) against the cloth surface squeezing the solids (cake) to remove more filtrate through the cloth.

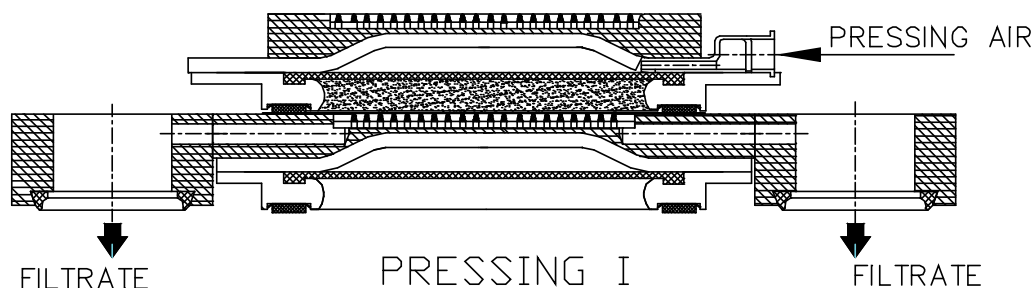


Figure 53. Pressing I

Washing (optional)

The wash liquid is pumped into the filter chambers in the same way as the slurry. As the wash liquid fills the filtration chamber, the diaphragm is lifted up and the air is forced out from the upper side of the diaphragm. The wash liquid flows into the discharge pipes after passing through the solids (cake) and the cloth.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

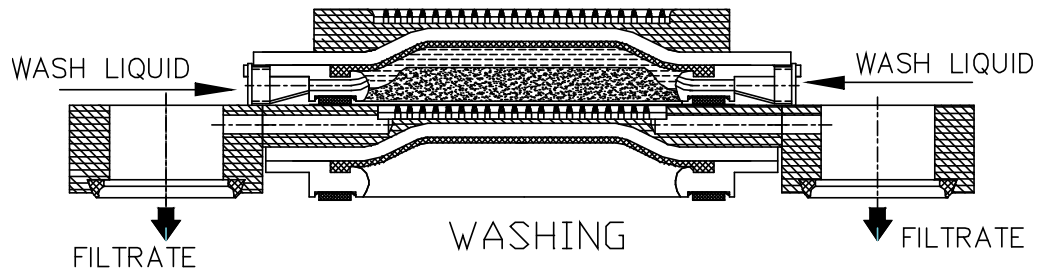


Figure 54. Washing (optional)

Pressing II (optional)

The diaphragms are re-inflated, forcing the wash liquid uniformly through the solids (cake) as in stage 2 above.

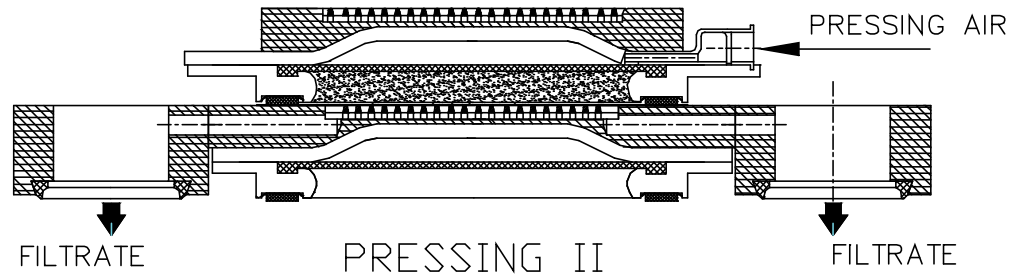


Figure 55. Pressing II (optional)

Air drying

Compressed air is blown through the solids (cake) for final dewatering. In other words, the air is entered through the distribution pipe filling the filter chamber, raising the diaphragm and forcing the pressing air above the diaphragm out of the filter. The air flow through the solids (cake) optimizes the moisture content and, at the same time, empties the filtrate chamber.

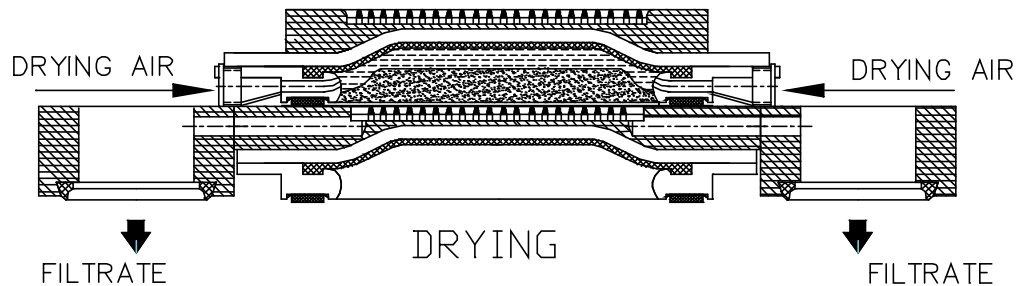


Figure 56. Air drying

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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Solids (cake) discharge

When the air drying process has been completed, the plate pack opens, cloth moving mechanism starts and the dewatered solids are conveyed out of each chamber on the moving filter cloth. The solids on the cloth are discharged from both sides of the filter.

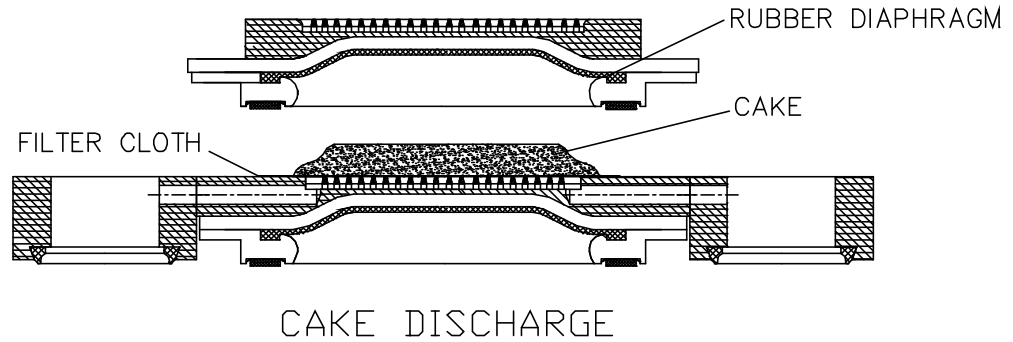


Figure 57. Solids (cake) discharge



NOTE: The four-stage (short) program does not include washing and second pressing stages.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

2.6 Technical data

2.6.1 Filter types

The filtration area can vary depending on the model, as shown in the table below.

Table 9. Filter types

| PF M48 | | | | | | | | | | | | | |
|-------------------------|----------------|-------------|------|------|---------|------|---------|-------|---------|------|----------|------|--|
| Model | | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | 156 | 168 | |
| Frame size no | | 1 | | | 2 | | 3 | | 4 | | 5 | | |
| Filtration area | m ² | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | 156 | 168 | |
| Chamber volume | | | | | | | | | | | | | |
| • 33 mm chamber | m ³ | 1,58 | 1,98 | 2,38 | 2,77 | 3,17 | 3,56 | 3,96 | 4,36 | 4,75 | 5,15 | 5,54 | |
| • 45 mm chamber | m ³ | 2,16 | 2,70 | 3,24 | 3,78 | 4,32 | 4,86 | 5,40 | 5,94 | 6,48 | 7,02 | 7,56 | |
| • 60 mm chamber | m ³ | 2,88 | 3,60 | 4,32 | 5,04 | 5,76 | - | - | - | - | - | - | |
| Filter plates | pcs | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | |
| Filter plate size | mm | 1500 x 4010 | | | | | | | | | | | |
| Main dimensions, length | mm | 7935 | | | | | | | | | | | |
| Main dimensions, width | mm | 5470 | | | | | | 5775 | | | | | |
| Main dimensions, height | mm | 5170 | | | 5860 | | | 6340 | | 6920 | | 7610 | |
| Weight | t | 59...65 | | | 65...74 | | 68...74 | | 80...93 | | 86...102 | | |
| Required floor area | m ² | 110 | | | | | | | | | | | |
| Max. pressure | bar | 16 | | | | | | | | | | | |
| Filter cloths, width | m | 1.70 | | | | | | | | | | | |
| Filter cloths, length | | | | | | | | | | | | | |
| • 33/45 mm chamber | m | 53,5 | 63,5 | 73 | 85 | 94,5 | 106,5 | 115,5 | 127 | 137 | 149 | 159 | |
| • 60 mm chamber | m | 53 | 63 | 74,5 | 85,5 | 95,5 | - | - | - | - | - | - | |
| Installed power (peak) | kW | 105 | | | | | | 125 | | | | | |
| Hydraulic unit volume | l | 800 | | | | | | | | | | | |

2.6.2 General marking principle for the filters

Company, Brand, Filter family, Filtration Area / Frame Size, Series, Material, Extra parameters, options

Table 10. General marking principle for the filters

| | | | | | | |
|-------------------------------------|-----|------|-----|---|----|---|
| OUTOTEC LAROX PF 168/168 M48 1 45 L | 168 | /168 | M48 | 1 | 45 | L |
| Filtration area | | | | | | |
| Frame size (max area) | | | | | | |
| Filter series | | | | | | |
| Construction material | | | | | | |
| Chamber height | | | | | | |
| Plate type for 45 mm chamber | | | | | | |

Construction material (material of parts in direct contact with slurry or filtrate):

- 1 = AISI 304L, used in processes in which pH = 4-14
- 2 = AISI316L, used in processes in which pH = 2-4
- 3 = ASTM NO8904, used in strongly acid processes in which pH = 1-2
- 4 = PP polypropylene plates; steel parts & pipes AISI304
- 5 = EN1.4462 (SAF2205) for processes where high CL- content
- 6 = EN 1.4162 (“Lean Duplex”) limited availability, check before quoting. (Good chlorides resistance, high tensile strength, corrosion resistance slightly below material 2). Only base plate of filter plate made of 1.4162 other wetted parts acc material 1.
- X = Other steel material, specify in the technical description

Chamber height:

- 30 = 30 mm chamber (available only for 1.6 m² and 2.5 m² plate size with certain limitations)
- 33 = 33 mm chamber (available for 6 m² plate size with certain limitations)
- 40 = 40 mm chamber, only option with PP plates, plate size 1.6 m², available for PF6.3 - PF12.6 in 1.6 series and PF9.5 - PF32 in 12 series
- 45 = 45 mm chamber
- 60 = 60 mm chamber
- 75 = 75 mm chamber (available only for PF 60-132 with certain limitations)

| | | | | | | |
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Filter Series:

- M1.6
- M12
- M15
- (M30)
- M48
- M60

Plate type for 45 mm chamber for 48 series

- L = Plate height 90 mm
- H = Plate height 100 mm

2.6.3 Technical description

See specified design values from sizing report.

Table 11. Technical description

| TYPE OUTOTEC LAROX PF1125 | | | 96/96 |
|--|--------|----------------|-------------|
| Filtration area | | m ² | 96 |
| Construction material | | | 2 |
| Number of filter plates | | pieces | 16 |
| Plate size | | mm | 1500 x 4010 |
| Chamber volume | | m ³ | 5.76 |
| Chamber height | | mm | 60 |
| Maximum pressure | | bar | 16 |
| Main dimensions | Length | mm | 7935 |
| | Width | mm | 5470 |
| | Height | mm | 5860 |
| Weight (filter without auxiliary equipment) | | t | 82 |
| Required floor area | | m ² | 110 |
| Filter cloth | Width | mm | 1700 |
| | Length | m | 95.5 |
| Oil tank volume | | m ³ | 0.8 |

| | | | |
|--|--|-----------|-------------------------------------|
| TYPE OUTOTEC LAROX PF1125 | | | 96/96 |
| Locking pin | | pieces | 4 |
| Automatic cloth centering | | pieces | 1 |
| Auxiliary drive rollers | | pieces | 4 |
| Electric motors 575 Vac, 3-phase, 60 Hz | | | |
| Hydraulic unit motor (M1HU) | | kW-r/min | 110 - 1800 |
| Hydraulic unit motor (M2HU) | | kW-r/min | 15 - 1800 |
| Hydraulic oil cooler motor (M3HU) | | kW -r/min | 3 - 1800 |
| Hydraulic oil heater (R1HU) | | kW | 3 |
| Pressures | | | |
| Infeed pressure | | bar | 2.0 - 10.0 |
| Diaphragm pressing pressure | | bar | 5.0 - 16.0 |
| Air drying pressure | | bar | 4.0 - 12.0 |
| Feed pipe / hose washing pressure | | bar | min. 1.5...2 bar over feed pressure |
| Cloth washing pressure | | bar | min. 12 |
| Instrument air pressure | | bar | 6.0 - 10.0 |

Table 12. Utilities requirements (according to ISO 8573-1)

| ITEM | | | VALUE | UNIT |
|--|-----------------|-----------------------|-----------------|-------------------|
| Pressing air (ISO 8573-1 class 2.7.2) | Dirt | Particle size | 1 | µm |
| | | Max. concentration | 1 | mg/m ³ |
| | Oil | Max. concentration | 0.1 | mg/m ³ |
| | Water | Max. press. dew point | No requirements | |
| | Air temperature | | +10...+80 | °C |

| ITEM | | | VALUE | UNIT |
|---|--------------------------------|--------------------------------------|-----------------|------------------------|
| Drying air (ISO 8573-1 class 4.7.4.) | Dirt | Max. particle size | 15 | µm |
| | | Max. concentration | 8 | mg/m ³ |
| | Oil | Max. concentration | 5 | mg/m ³ |
| | Water | Max. press. dew point | No requirements | |
| | Air temperature | | +10...+80 | °C |
| Instrument air (ISO 8573-1 class 4.4.4.) | Dirt | Max. particle size | 15 | µm |
| | | Max. concentration | 8 | mg/m ³ |
| | Oil | Max. concentration | 5 | mg/m ³ |
| | Water | Max. press. dew point | +3 | °C |
| | Air temperature | | +5...+80 | °C |
| | Air pressure | (overpressure) | 6...10 | bar |
| | Air consumption | Average during operation | 140 | l/cycle |
| | | Maximum instantaneous flow | 800 | l/min |
| Cloth wash water | | Max. particle size | 40 | µm |
| | | Max. solids content | 300 | mg/l |
| | Recommended pH | | 6.5...7.5 | |
| | Air temperature | | 15...50 | °C |
| | Water consumption | Pressure 10 bar | 240 | l/min |
| Pressure 14 bar | | 295 | l/min | |
| Cooling liquid of hydraulic unit | Temperature | | <40 | °C |
| Feed pipe and hose flush water consumption | | Filtration area 48-96 m ² | 0,7...1,0 | m ³ /cycle |
| | Recommendation for pump sizing | Volume | 40...80 | l/s |
| | | Head | 15...20 | m (over feed pressure) |

2.6.4 Vibration value

The highest root mean square value of weighted acceleration does not exceed 0,5 m/s².

2.7 Product modifications



⚠ DANGER

It is strictly forbidden to modify this machine or use it in any other way or for any other purpose, other than those specified in this instruction manual and its appendices. Unauthorized changes and modifications may affect operation and/or safety and may result in damage to property, personal injuries and even death.

Any modifications to the product may only be carried out by trained personnel with written consent from Outotec (Filters) Oy.

If an unauthorized modification has been implemented, its effect on warranty liability will be considered and may result in the rejection of warranty applications.

Outotec (Filters) Oy reserves the right to make alterations to the product, including documentation, at any time, in order to:

- Improve the product
- Update the product to comply with changed applicable standards

If the need for modifications is recognized by Outotec (Filters) Oy.

| | | | | | | |
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3 Safety

3.1 Essential safety principles

Only the personnel who have the required skills, experience, and specific training may install, operate, service or decommission the equipment. If you are unsure about the requirements, contact Outotec.



⚠ WARNING

Read the instruction manual.

Failure to observe the limitations, requirements, cautions, and warnings in these instructions could result in death or severe injury.

3.2 Limits of use



⚠ DANGER

It is strictly forbidden to use this machine in any other way or for any other purpose, other than those specified in this instruction manual and its appendices.



⚠ WARNING

Crushing hazard. Falling filter plates can cause death or serious injury. Do not place body parts between the filter plates without first securing the hanging plates.

- Do not use the feed hoses or filter plates for climbing.
- Do not take samples from the solids flow when the machine is discharging.
- Do not change the process operation parameters in the PLC. This can cause product related problems, such as blocking and blinding of the feed lines. This can also lead to mechanical failures of the filter elements.
- The slurry used in the machine may only be in accordance to the original technical specification. Use of other slurry may cause corrosion, mechanical wear, chemical hazards etc.

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3.2.1 Space limits

- The machinery is intended for industrial environment, indoors operation.
- The machinery is to be connected as a part of plant process.
- The machinery is to be connected to external electric and pneumatic power sources.
- The space requirements for installation are defined in layout-drawings typical for each PF-filter. The filter has no such moving parts that would extend out of the defined installation space while in operation.
- Physical human contact with the machinery is necessary only during maintenance tasks. Normal operation is fully automatic.
- The machinery is typically divided in three individual units: Main filter unit, Hydraulic power unit and Pressing water station.

3.2.2 Time limits

- The machinery is intended for an operational life of 30 years with 90% availability.
- The machinery needs regular maintenance from cleaning, lubricating and visual inspection to replacing several wearing parts, such as: filter cloth, pressing diaphragms, scrapers, plate slide pieces, feed hoses, hydraulic oil, hydraulic oil and air filter. Frequency of each task depends on site and process conditions, but visual inspection is a daily task.

3.2.3 Other limits

- The machine is intended for use in ambient temperature between 0 °C...50 °C
- Construction materials for parts in contact with process media are selected case by case and define maximum chemical limitations like pH, feed temperature, Cl-content.
- Maximum pressure for process feed connections is 1,6 MPa.

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3.3 Personnel qualifications and training

- Only reliable personnel may carry out installation, operation, maintenance or decommissioning work on the machine.
- Personnel must be trained or instructed to carry out their duties. Ensure that only authorized personnel are working with the machine.
- Clearly define the responsibilities and accountabilities of each member of personnel.
- Only an experienced person may train and instruct personnel or supervise apprenticeships.
- Electrical work may only be carried out by a qualified electrician or by an instructed person who is under the supervision of a qualified electrician.
- Only qualified personnel with experience may carry out work on the hydraulic/pneumatic system.

3.3.1 Instruction form

The following instruction confirmation form can be used to ensure personnel have been familiarized with important information concerning the filter.

Table 13. Instruction Confirmation

| NAME OF THE INSTRUCTED PERSON | | FUNCTION OF THE INSTRUCTED PERSON | | |
|-------------------------------|---|-----------------------------------|--------------------------------|-------------------------|
| No. | Instruction item | Date | Signature of instructed person | Signature of instructor |
| 1. | To read the Operating Instructions and to clarify all possible questions. | | | |
| 2. | The operation method of the filter | | | |
| 3. | Pictographs and information signs | | | |
| 4. | Safety equipment of the filter | | | |
| 5. | Personal protective equipment | | | |
| 6. | Changing the filter cloth | | | |
| 7. | Work regulations | | | |
| 8. | Additional operating instructions | | | |
| 9. | Cleaning instructions | | | |

3.4 Personal protective equipment

The following protective equipment must be made available to all personnel involved in the installation, operation and maintenance of the machine.

Table 14. Personal protective equipment

| SYMBOL | DESCRIPTION |
|---|---|
|  | Wear protective gloves. |
|  | Wear steel toed safety boots. |
|  | Wear a helmet. |
|  | Wear close fitting protective overalls. |
|  | Wear protective eye wear when handling possibly hazardous substances and applied media. |
|  | Wear ear protection. |

3.5 Hazards and risks



⚠ CAUTION

Make sure there are no unauthorized persons in the danger zones during use.



Always use personal protective equipment, such as a safety helmet, goggles, protective overalls, protective footwear and safety gloves when working with the machine. Other protective equipment, such as ear protection, a respirator etc. must also be used whenever needed.



When carrying out maintenance or repair work, make sure the machine cannot accidentally be turned on. Use the appropriate lockout-tagout procedure.



Observe local laws, rules and regulations whenever applicable.



To avoid potential damage or injury, carefully plan your work beforehand.



Keep all warning labels on the machine clean and visible at all times.



All discovered defects or faults must immediately be brought to the attention of the operator or an authorized person.



⚠ DANGER



It is strictly forbidden to remove or disable any safety feature before starting the machine. When the machine is in use, all safety features must be in place and operational.



Hazardous moving parts. Moving parts of the machine will cause serious injury or death. Stop the machine completely before maintenance, repairs or disassembly. Do not touch the machine unnecessarily when it is use.

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Electrocution hazard. Electrocution will cause serious injury or death.

- Connect the grounding points on the frame of the machine to an earth before connecting the machine to a power supply.
- Cut the power supply to the machine before maintenance, repairs or disassembly and use the appropriate lockout-tagout procedure.



Falling load hazard. Falling loads will cause severe injury or death. Never stand under a lifted load.



High-pressure air injection hazard. High pressure air spray can cause death or serious injury. Ensure the pneumatic system is not pressurized before maintenance, repairs or disassembly.



High-pressure oil injection hazard. Compressed hydraulic oil can cause death or serious injury. Ensure the hydraulic system is not pressurized before maintenance, repairs or disassembly.



Slipping/tripping hazard. An untidy work area can cause severe injury or death. Keep the machine and the area around the machine accessible and clean. Clean up spilled liquids and oils immediately.



Cutting hazard. Sharp edges or corners on the machine can cause severe injury or death. Wear the appropriate protective equipment when working near the machine.



Burning hazard. May cause severe injury or death. Some surfaces of the machine or substances used in the process may be hot. Wear protective overalls and gloves and do not unnecessarily touch the machine.



Fire hazard. Fire can cause death or serious injury. Keep heat sources, ignition sources and all forms of open fire away from the machine.

⚠ WARNING

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3.5.1 Fire safety



⚠ WARNING

In the event of a fire, immediately evacuate the area to reduce the risk of injury from flames, heat, hazardous vapors, explosion, or any other hazard that may arise.



⚠ CAUTION

Follow your local rules and regulations in the event of a fire.

3.5.2 Installation and maintenance of the pneumatics



⚠ DANGER

Only qualified personnel are allowed to carry out installation, maintenance and repair work on the pneumatic system.



⚠ CAUTION

Wear safety goggles when maintaining, repairing or disassembling the pneumatic system.



The customer must provide a device with which the machine can be disconnected from the pneumatic supply. The device must be clearly marked and lockable to prevent accidental switch on.



⚠ WARNING

High-pressure air injection hazard. High pressure air spray can cause death or serious injury. Make sure the pneumatic system is not pressurized before maintenance, repairs or disassembly.

- Visually check of all pipes, hoses and screw fittings for leaks and visible damage daily and regularly check the condition more thoroughly. Repair any damage immediately.
- To locate leaks in the pneumatic system, use a piece of cardboard.
- Lay and install all lines and connections correctly. Fittings, lengths and hose pipe qualities must correspond to requirements.

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3.5.3 Installation and maintenance of the hydraulics



⚠ DANGER

Only qualified personnel are allowed to carry out installation, maintenance and repair work on the hydraulic system.



⚠ CAUTION

Wear safety goggles when maintaining, repairing or disassembling the hydraulic system.



The customer must provide a device with which the machine can be disconnected from the hydraulic supply. The device must be clearly marked and lockable to prevent accidental switch on.



⚠ WARNING

Hydraulic fluid injection hazard. High-pressure hydraulic fluid spray can penetrate the skin and will cause death or serious injury. Make sure the hydraulic system is not pressurized before maintenance, repairs or disassembly.

- Visually check of all pipes, hoses and screw fittings for leaks and visible damage daily and regularly check the condition more thoroughly. Repair any damage immediately.
- Lay and install all lines and connections correctly. Fittings, lengths and hose pipe qualities must correspond to requirements.
- Avoid skin contact with the hydraulic fluid.

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3.5.4 Installation and maintenance of the electrical system



⚠ DANGER

Only qualified personnel are allowed to carry out the installation, maintenance and repair work of the electrical system.



Electrocution hazard. Electrocution will cause severe injury or death. Cut the supply voltage before performing work on the electrical system.



⚠ CAUTION

The customer must provide a device with which the machine can be disconnected from the electrical supply. The device must be clearly marked and lockable to prevent accidental switch on.



Stop the machine immediately if electrical failure occurs.



Only use original Outotec (Filters) Oy fuses with the correct intensity of current.



If it is absolutely necessary to work on live parts, ensure there is a second person present to actuate the main switch or emergency stop. Appropriately close off and clearly mark the working area. Only use appropriate, insulated tools and devices.

- Visually check of the condition of the electrical equipment daily and regularly check the electrical equipment of the machine more thoroughly.
- Repair all defects immediately. Examples of typical defects: loose connections or damaged cables.

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3.5.5 Safety during welding and grinding

Before starting welding, determine the material to be welded, the appropriate method of welding and the consumables.



⚠ DANGER

Carry out welding, firing or grinding on the machine only if it is permitted.



Explosion hazard. Explosions will cause severe injury or death. Clean all dust and flammable substances from the machine and its surroundings and ensure sufficient ventilation.



Poisonous gas hazard. Poisonous gases will cause severe injury or death. Maintain and check the working order of the ventilation installations regularly.



3.5.6 Original spare parts

Only original spare parts or Outotec (Filters) Oy approved parts may be used for replacement.



NOTE: Any damage that occurs by using other than original or Outotec (Filters) Oy approved spare parts or accessories rules out all liability and warranty on the suppliers' behalf.

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3.6 Danger zones



⚠ DANGER

Do not unnecessarily touch the machine when it is in use.

A danger zone is any space within and/or around the machine in which a person can be exposed to hazards.

The danger zones have been recognized during the design phase of the machine (risk assessment process) and the risks have been minimized by design and by the use of safety guards and/or safety devices.

When the safety instructions in the manuals are observed and all safety features are in place and operational, moving inside the “Danger zones” is safe and allowable. The danger zones are presented in the following illustration.

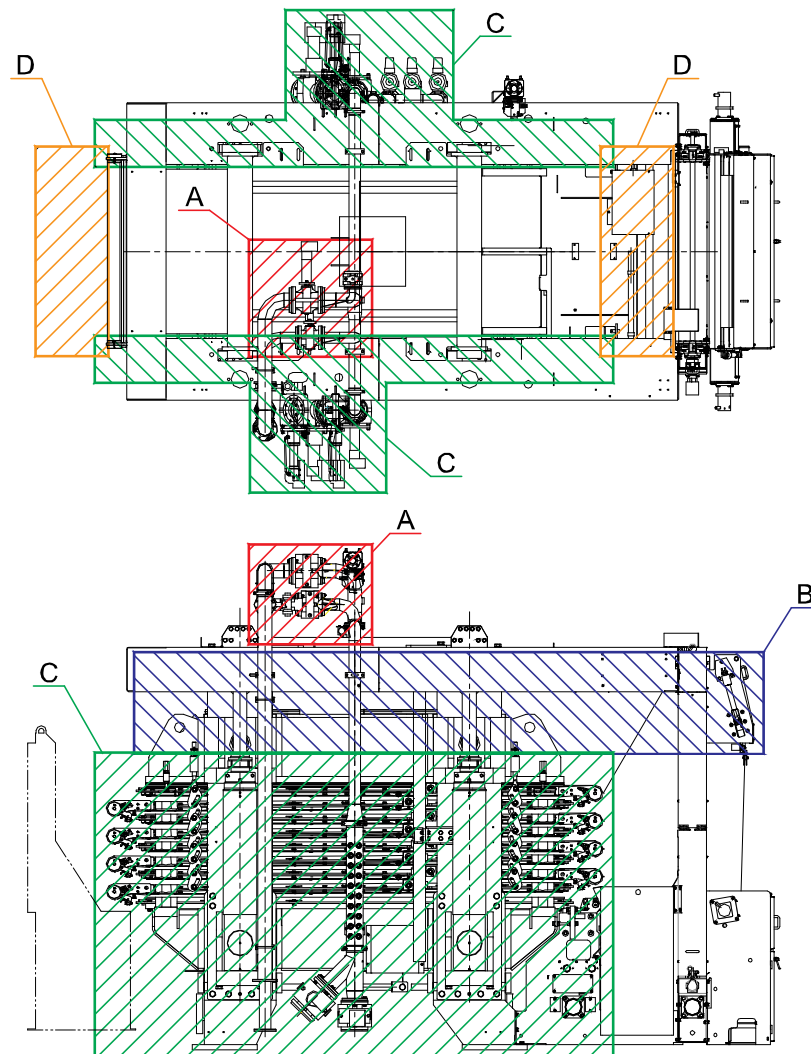


Figure 58. Danger zones

| | | | | | | |
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Danger zone A

- Shearing (crushing) hazard by pinch valve actuators

Danger zone B

- Crushing hazard between top pressure plate and upper frame
- Drawing-in hazard by the cloth and the rollers

Danger zone C (both sides)

- Crushing hazard by plate pack
- Thermal hazard by plate pack and process pipes*
- Shearing hazard by plate pack suspension plates
- Drawing-in hazard by the rollers
- Cutting hazard by cloth edge
- Shearing (crushing) hazard by pinch valve actuators
- Crushing hazard by the collector**

Danger zone D (both ends)

- Falling hazard by cake chute
- Impact hazard by discharging cake

* Thermal hazard only if process temperature is over 60 °C

** Only on one side

| | | | | | | |
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3.7 Emergency stops and location of the main switch

3.7.1 Emergency stops



⚠ WARNING

Make sure the emergency stops are accessible at all times.



Check operation of the emergency stops and protective doors weekly.



Close the hydraulic hand valves always after pressing an emergency stop button. Open the hydraulic hand valves before restarting the filter.

The filter is equipped with several emergency stop buttons. In case of danger, the filter can be stopped immediately by pressing the emergency stop button. When the button is pushed, the filter stops and all of its functions cease. An emergency stop message is displayed on the screens in the control room. After all emergency stop buttons are released, the emergency stop circuit can be reset by pressing the alarm acknowledgement push button.



⚠ CAUTION

When the filter is equipped with protective door system, all filter protective doors must be closed in order to operate the filter automatically. If any door is opened during automatic operation, the filter stops immediately.



Only test mode functions are possible with doors opened.



Reset the emergency stop push button by pressing the alarm reset push-button (5) on the control panel (3). Do not release emergency stop button until it is safe.

The location of the emergency stop push buttons is displayed in the following illustration.

| | | | | | | |
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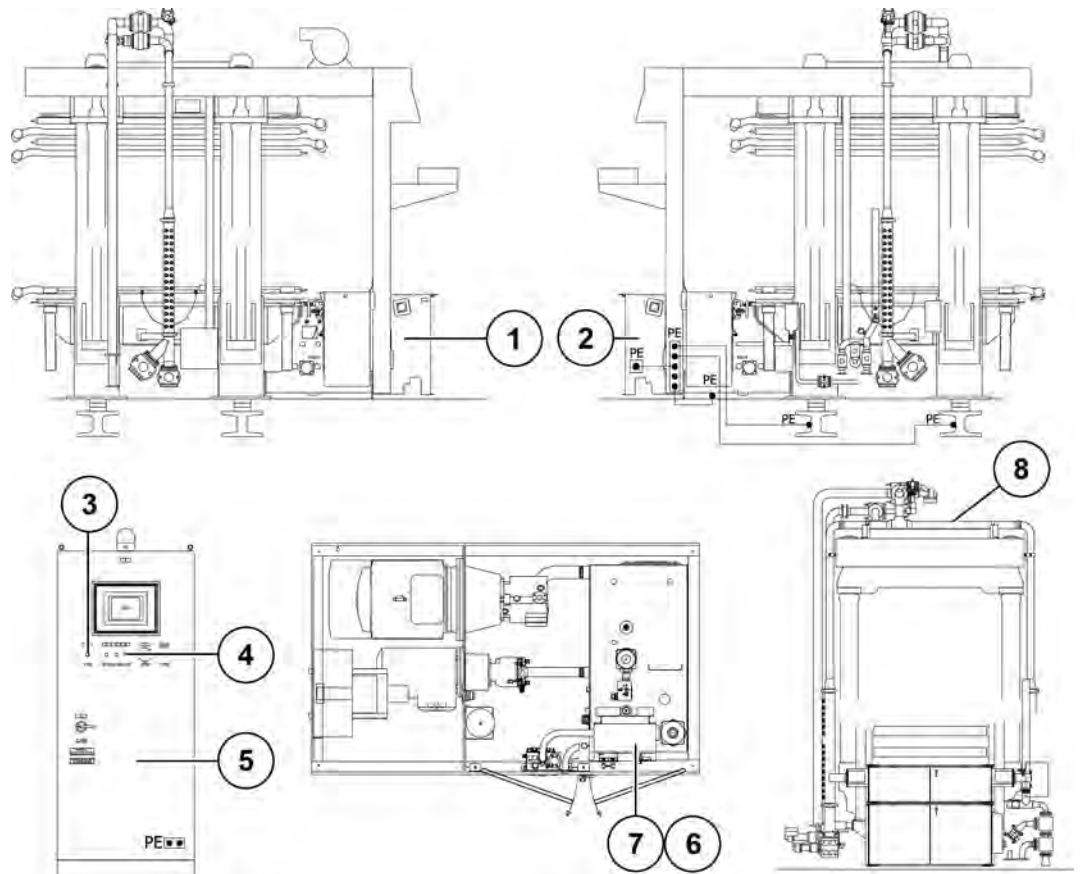


Figure 59. Emergency stops locations

| | |
|------------------------|---|
| 1. Emergency stop S707 | 2. Emergency stop S702 (hand held unit) |
| 3. Emergency stop S701 | 4. Alarm reset push-button |
| 5. Control cabin | 6. Emergency stop S705 |
| 7. Hydraulic unit | 8. Emergency stop S715 (terminal box X12) |

3.7.2 Location of the main switch

The main switch (1) is located on the cover of the control panel (2).

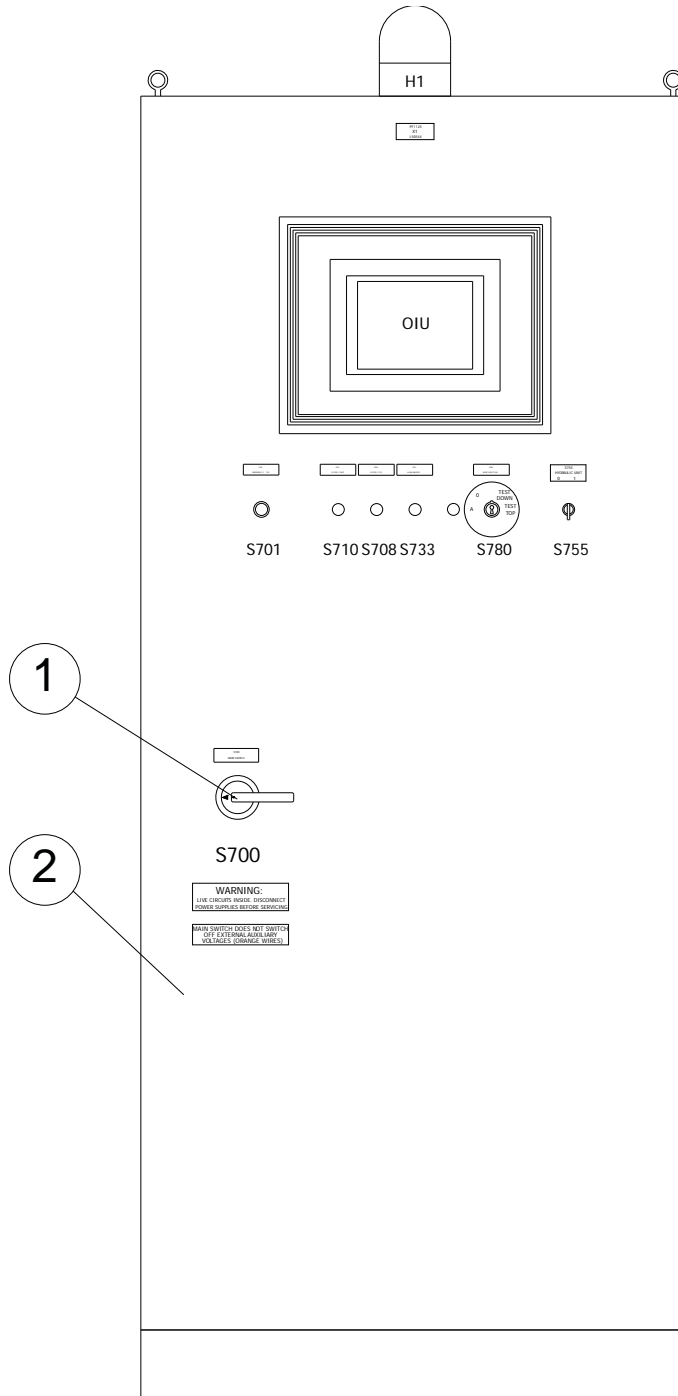


Figure 60. Main switch

| | | | | | | |
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3.8 Safety devices and guards

- Emergency stop push buttons
- Protective door system
- Safety rails
- Safety covers and plates
- Warning labels
- Working platforms

3.8.1 Protective door system



⚠ WARNING

All protective doors must be closed in order to operate the filter automatically.

The filter is equipped with protective doors which are monitored with safety switches. All the safety switches are connected to the safety controller. The machine will be brought to a safe state (stop category 0) following actuation of any of the safety switches (i.e. opening a protective door). As a result, all electrical power is disconnected from actuators.

If any of the doors are opened during automatic operation, the filter will stop immediately. If any of the protective doors are open, only test mode functions are possible.

If a protective door is opened during filtering, it must be acknowledged before filtering can be restarted. The acknowledgement buttons on the filter (2 pieces) are situated on the left and right sides of the filter. The acknowledgement must be done in two parts. Firstly, by pressing the acknowledgement button on that side of the filter at which the protective door was opened. And secondly, after acknowledging the protective door alarm at the filter, the alarm must also be acknowledged from the main filter control cabin within 60 s.

| | | | | | | |
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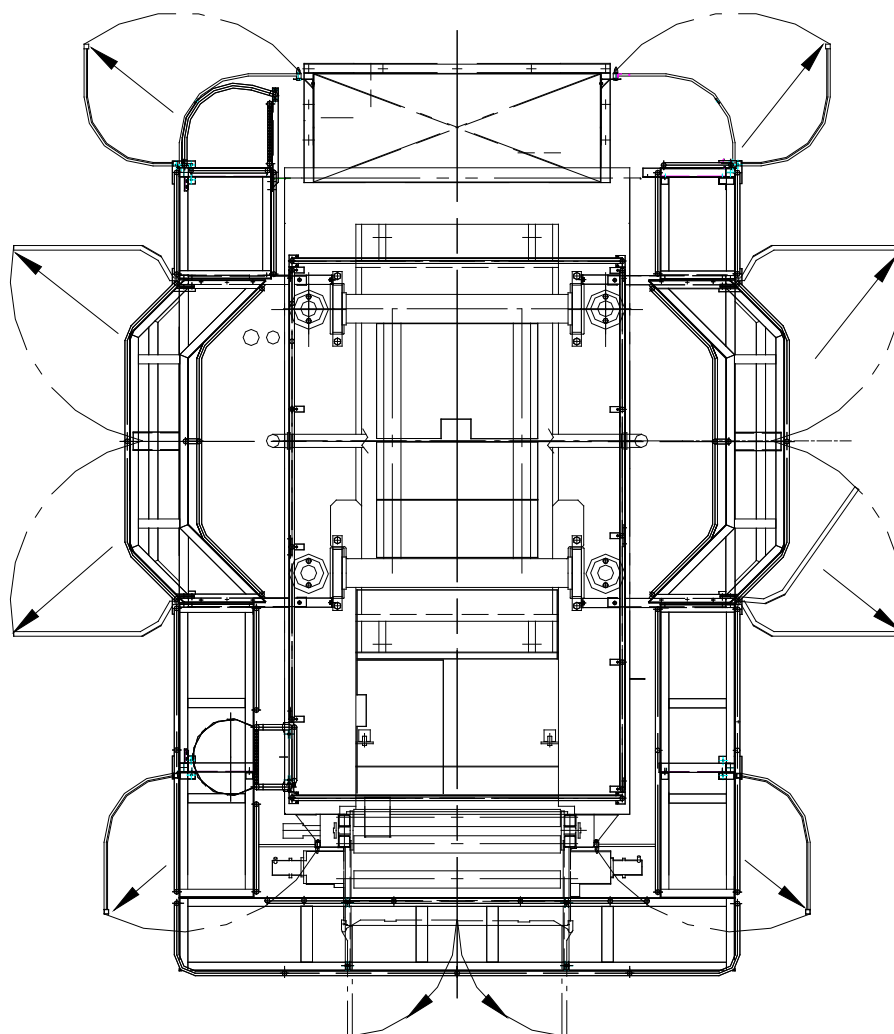


Figure 61. Protective door system

3.8.2 Safety and monitoring devices



⚠ CAUTION

Keep all safety and protective devices in perfect condition.

Safety and monitoring devices may only be deactivated by persons entitled to do so.

Do not remove safety or monitoring devices unless necessary to perform repair or maintenance work.

Safety devices must be installed, activated and checked before starting the machine.

| | | | | | | |
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3.8.3 Devices for disconnecting from the electric supply



⚠ CAUTION

Disconnect any electric supplies prior to maintenance operations. Note that in some cases electric devices may have an electric charge even if disconnected from the power supply.

See chapter 8 Maintenance for detailed instructions.

3.8.4 Devices for relieving pressure from pneumatic systems



⚠ CAUTION

Relieve any residual energy or stored energy in the pneumatic system without danger of personal injuries prior to maintenance operations.

See chapter 8 Maintenance for detailed instructions.

3.8.5 Devices for relieving pressure from hydraulic systems



⚠ CAUTION

Relieve any residual energy or stored energy in the hydraulic system without danger of personal injuries prior to maintenance operations.

See chapter 8 Maintenance for detailed instructions.

3.8.6 Devices for relieving pressure from process lines



⚠ CAUTION

Relieve any residual energy or stored energy in the process system without danger of personal injuries prior to maintenance operations.

See chapter 8 Maintenance for detailed instructions.

3.8.7 Warning devices



NOTE: Find a description of the optical and/or acoustic warning from OEM documents, electrical drawings and spare part book attached to these instructions.

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3.9 Safety labels and signals



⚠ WARNING

The safety symbols found in this manual may also be posted on the machine. All personnel involved in the operation, installation, maintenance or repairing of the machine must observe and be familiar with all safety symbols, labels and instructions.



⚠ CAUTION

Keep safety instructions and safety labels clean and visible at all times.



Replace any illegible or missing safety instructions and safety labels before operating the machine.

3.10 Chemical substances



⚠ CAUTION

Materials and supplies are to be used and disposed in accordance with the manufacturer's instructions.



Use appropriate personal protective equipment when handling chemical substances.



⚠ WARNING

Hot materials hazard. Hot materials and supplies can cause severe injury or death. Observe extreme caution and wear appropriate personal protective equipment when handling hot materials or supplies.

3.11 Radiation

The filter does not contain any radiation sources.

Regarding the used process media please refer to application and site specific documentation provided by the filter operator.

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3.12 Environmental aspects

3.12.1 Disposal of the filter components



 CAUTION

Dispose of the filter parts according to local regulation.



Separate the plastic and metal parts of the filter and recycle them appropriately.

| | | | | | | |
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4 Transportation and storage

4.1 Dimensions and mass

Table 15. Main package dimensions and weights

| ITEM | LENGTH (M) | WIDTH (M) | HEIGHT (M) | NET WEIGHT (KG) | GROSS WEIGHT (KG) |
|--|------------|-----------|------------|-----------------|-------------------|
| Lower frame and cloth wash unit | 5.70 | 3.00 | 1.70 | 14000 | 14500 |
| Upper pressing plate | 4.80 | 3.42 | 1.60 | 11900 | 13000 |
| Top frame | 6.40 | 3.42 | 1.20 | 2000 | 3300 |
| Cloth drive unit | 5.60 | 3.42 | 1.60 | 2650 | 3900 |
| Filter plates (6 pieces) | 5.20 | 2.66 | 1.40 | 9700 | 10650 |
| Filter plates (5 pieces) | 5.20 | 2.66 | 1.20 | 8100 | 9000 |
| Filter plates (5 pieces + lowest plate) | 5.20 | 2.66 | 1.20 | 9300 | 10200 |
| Lower parts of columns | 4.40 | 1.90 | 1.00 | 7600 | 8100 |
| Quick action cylinders and top parts of columns | 5.20 | 1.90 | 1.00 | 5150 | 5700 |
| Process pipelines and guide bars | 6.00 | 2.28 | 1.60 | 2200 | 3050 |
| Control panel | 2.40 | 1.14 | 0.80 | 200 | 330 |
| Hydraulic unit | 3.60 | 2.28 | 2.60 | 2600 | 3200 |
| Muffler | 3.20 | 1.52 | 1.40 | 520 | 620 |
| Service platform frames and free end cake chute | 5.20 | 3.42 | 2.00 | 2700 | 3900 |
| Service platform shields | 3.60 | 2.28 | 1.60 | 800 | 1400 |
| Spares (Start-up + 2 year) | 2.80 | 2.00 | 1.20 | 1000 | 1300 |
| High pressure cloth wash unit | 2.40 | 1.52 | 1.60 | 165 | 511 |

4.2 Transportation



⚠ DANGER

Only qualified personnel are allowed to attach loads and do transporting duties.

4.2.1 Filter protection for sea shipments

Individually identified parts in each Outotec (Filters) Oy filter are specially protected during transportation.

Protected parts

- Piston rods of hydraulic cylinders
- Hydraulic blocks/valves/connectors
- All machined, uncovered (not painted) surfaces

How to remove protection

A tin of thinner is delivered with each filter for removing protection.

The person who starts up the filter removes the protection from the piston rods of hydraulic cylinders, locking pins and column holes.

4.2.2 Handling and storing of the filter plates

The filter plates are delivered lying flat on pallets if they are not installed onto the machine.



⚠ CAUTION

Handle with care and avoid putting them down roughly. Only use means of transport with soft surfaces to lift and transport the filter plates.

Store filter plates flat on a smooth base and never in an upright position.

Protect filter plates from frost, direct sunlight or heat and make sure they do not come into contact with oil or solvents.

| | | | | | | |
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4.3 Storage

These instructions describe preparing your machine for storage. Site specific actions have to be decided by your own experts. This instruction will not overrule local operating instructions of single equipment.

4.3.1 Storage of machine



⚠ CAUTION

Remove all liquid from the machine to prevent freezing, corrosion and other damage when preparing the machine for storage. Protect all bright or uncoated parts by greasing or waxing them.

- Minimum temperature: -15 °C
- Maximum temperature: +65 °C

The storeroom must be dry, shady and kept at a constant temperature. Solvents, oils or paints cannot be stored in the same room.

Protect filter plates from frost, direct sunlight or heat. Make sure they do not come into contact with oil or solvents.

- De-pressurize all pipelines.
- Close the plate pack but do not seal it.
- Position the pinch valves to be in open position to avoid formation of pinch valve hose.
- Turn the main switch in off position and lock it.
- Check the purity of the filter and the surrounding equipment. If needed, wash all equipment well to prevent corrosion. Note the IP rating of equipment when cleaning the filter and use only proper methods for cleaning.
- Cover the filter with tarpaulin.

4.3.2 Storage of filter parts

The filter plates are delivered lying flat on pallets if they are not installed onto the machine.

- Remove the packing and undo the wrapping tape (be careful when using sharp or hard tools).
- Check every filter plate for transport damage.
- Store the plates horizontally on a smooth surface. Handle the filter plates with care.
- Protect synthetic material filter plates from solvents, frost, direct sunlight or heat. Store them in a dry and shady place at a constant temperature.
- Install only undamaged and flawless filter plates on the machine.

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Soft rubber diaphragms

- Soft rubber diaphragms must be packed on pallets or in crates stacked in a flat plane. When packing the diaphragms on pallets, use several layers of corrugated board and wood ledges to protect the edges, and then band the diaphragms with packing hoop steel. Put cardboard layers between the individual diaphragms.
- Transport and store pallets or crates with diaphragms only with the diaphragms lying flat and do not pile up the loaded pallets. Avoid compression, friction and shock stresses.
- Unpack the rubber diaphragms carefully one by one.
- Store them in darkened rooms which are kept at a moderate temperature. The best storage temperature is 12...25 °C. The air moisture has no influence on the physical properties.
- Put the diaphragms flat one upon the other with layers of strong cardboard in between them (if possible, on a flagged floor), but do not stack more than five diaphragms.
- As for the rest, we refer you to the guidelines of the DIN 7716 standard "Caoutchouc and rubber products -requirements for storage, cleaning and maintenance" and, in particular, to par. 3 and 4 of the DIN 7716 standard if the storage will last longer than six months. If these prescriptions and requirements are complied with, the usability of the diaphragms will not undergo any substantial change within a two years' storage time.
- In case of a longer storage time, also protect the diaphragms against damage with strong tarpaulins.

4.3.3 Storage of spare parts

Store the spare parts always in clean and dry conditions. Consider using moisture protective products such as Zerust bags, capsules or spray.

Should there be contradiction between this instruction and that of the part manufacturer, always follow the latter.

4.3.3.1 Hydraulic equipment



WARNING

Hydraulic pressure warning! Storing a hydraulic cylinder filled with oil is very dangerous because a temperature raise can develop extremely high hydraulic pressure inside the cylinder. This may lead to death or serious injury when opening the ports.

For short time storing, the hydraulic equipment should be stored as delivered. If you are storing for longer periods and/or using repairable assemblies, please make sure the following guidelines are followed:

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Store hydraulic pumps and motors:

- Indoors in dry and clean conditions
- Inside a Zerust bag or similar
- Ports plugged
- Rotate the shaft 10 revolutions every 3 months
- Drained of oil

Store hydraulic cylinders:

- Indoors in dry and clean conditions
- Inside a Zerust bag or similar
- Ports plugged
- Fully retracted
- Any piston chrome left visible should be protected from corrosion for example with a Zerust spray or Denso tape
- Extend and retract the piston 10 centimeters every 6 months
- Rotate the cylinder 90° every month if stored horizontally
- Drained of oil

4.3.3.2 Rubber parts

The properties of rubber parts deteriorate during storing. Careful storing helps to minimize damages. Pay attention to the following:

Temperature

The storage temperature should not exceed +25 °C. If the storage temperature is below +15 °C, please pay attention to cautious handling of rubber parts as they may be stiffened causing a risk of distortion.

Humidity

Avoid high moisture contents in the surrounding air. Prevent water from condensing on the products.

Light

Avoid ultraviolet light. Protect the products against direct sunlight.

Oxygen and ozone

Remove all equipment developing ozone from the room where the products are stored. Minimize the store room ventilation.

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Deformation

Store the rubber and polyurethane parts (diaphragms, plate seals, rollers, scrapers, hoses) tension free; straight instead of rolled. If rolling cannot be avoided, make the coils as large as possible.

Solutions and solvent vapors

Protect the rubber parts from chemical solutions and solvent vapors.

Stock circulation

Keep the storing times of the rubber parts as short as possible. Use the first in, first out - principle.

Rodents and insects

Protect from pests and vermin.

Metals

Prevent contact with metals (such as copper, iron, manganese), as these may cause rubber to deteriorate when in contact.

Different rubber qualities

Prevent different rubber qualities from touching each other.

Please refer to Table 16 below for storage period recommendations of different rubber types. For example natural rubber parts can be stored for 5 years after which they should be inspected. If no defects are found, the part qualifies for additional 2 years storage time.

Table 16. Storage periods of unassembled rubber components in ISO 2230:2002

| RUBBER TYPES | STORAGE PERIOD |
|--|---------------------------------|
| Group A Natural rubber, polyisoprene, polyurethane, polybutadiene, SBR | 5 years + 2 years extension |
| Group B Nitrile, butyl, neoprene | 7 years + 3 years extension |
| Group C EPDM, silicone, chlorosulphonated polyethylene, fluorocarbon | 10 years + 5 years extension |

For more information, please refer to standards ISO 2230 and DIN 7716.

4.3.3.3 Hose assemblies

In addition to general rubber storing instructions, pay attention to the following:

Plugs

When storing hydraulic hoses, do not remove protection such as plugs or wrap from the hose heads until installation.

Please refer to hose specifications for more specific instructions.

4.3.3.4 Hydraulic hoses

Please familiarize yourself with standards such as BS 5244, ISO/TR 17165-2 or DIN 20066 to secure safe storage and utilization of spare part hydraulic hoses.

Keep in mind that hydraulic hose as any rubber product has a maximum shelf life. See Table 17 and Table 18 below for more details.

Table 17. Shelf life according to BS 5244

| AGE | RECOMMENDED ACTION |
|-------------|--|
| < 3 years | No testing required |
| 3 – 5 years | Proof pressure test |
| 5 – 8 years | Proof, impulse and burst pressure tests, cold bend test, electrical test |
| > 8 years | Scrap |

Table 18. Service life according to DIN 20066

| AGE | RECOMMENDED ACTION |
|-----------|------------------------|
| < 2 years | Maximum storage period |
| < 6 years | Maximum service life |
| > 6 years | Scrap |

According to DIN 20066 the shelf life of hose assembly should not exceed 2 years. Total service life (including the storing) should not exceed 6 years.

4.3.3.5 Conveyor belts

Please refer to standard ISO 5285 for the storage of conveyor belts.

4.3.3.6 Electronic parts

Electronic parts should be stored stocked indoors and in their original packages to avoid damages e.g. due to static electricity. Also please pay attention to the following conditions:

Temperature

The storage temperature should remain between +5 °C and +40 °C.

Humidity

Avoid high moisture contents in the surrounding air. Prevent water from condensing on the products.

Light

Protect the products against direct sunlight.

4.3.4 Preparation of the hydraulic unit for storage

- Hydraulic power pack must be disconnected from the electric power supply.
- Check that hydraulic power pack is unpressurized.
- Fill up the oil reservoir almost full (two centimeters from the top level). Purpose is to reduce air volume in the reservoir and avoid condensation.
- Remove air breather and plug the connection in the reservoir.

4.3.5 Restart after long term storage

- Inspect all wearing parts and change all worn out components before restarting the filter.
- Clean all waxed surfaces and remove motor hoods (inhibitor plastic).
- Drain additional amount of hydraulic oil to gain the proper oil level. Make sure that oil is in proper condition and if needed change the oil.
- Reinstall air breather into the oil reservoir.
- Follow instructions given in this instruction manual chapter 6 Commissioning and start-up.

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5 Installation

5.1 Safety



⚠ CAUTION

Before starting installation, use the packing list to check that all the items for the filter and all the accessories have been supplied completely and are free of damage. Immediately contact Outotec (Filters) Oy if there are any missing or damaged parts.

5.2 Unpacking

5.2.1 Checking delivery

Please refer to Outotec terms of sale and delivery.

The assembly and connection material for the interfaces of the dismantled components is included in the delivery. All the other accessories are appropriately packed and included with the delivery.



⚠ CAUTION

Dispose of packing and insulating material properly and in an environmentally compatible manner. Observe national regulations.

5.3 Lifting



⚠ CAUTION

Use appropriate and certified lifting equipment, such as cranes, hoisting slings and hoisting chains for lifting the filter. Ensure that the condition and lifting class of the lifting equipment is sufficient.

Carefully plan your work beforehand.

The transport accessories (plywood frame, steel supports and tarpaulin) must be kept on the machine while lifting.

Lift very slowly and leave enough room around the filter. The filter will not rise quite horizontally. When it is lifted off the platform it tends to move towards its longitudinal axis.

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Plan the lifting so that changes of the fixing are at the minimum. Make sure that the condition and lifting class of the cranes are sufficient. Even a “slight” swing or collision may cause severe damages to people or equipment. The main dimensions, weight, lifting points and the centre of gravity of the pressure filter can be seen in manufacturer’s drawing.

The pressure filter must be lowered to the platform very slowly because it tends to move slightly towards its longitudinal axis. Once the filter is in its place, the transport supports can be removed.



⚠ DANGER

Falling load hazard. Will cause severe injury or death. Do not stand under a lifted load.



Squashing hazard. A moving hoisted load will cause severe injury or death. Make sure no unauthorized personnel are in the vicinity of a lifted load.



⚠ WARNING

Falling hazard. Falling can cause severe injury or death. Moving on the pressure filter (when fixing and loosening lift chains) requires special attention and caution. Water or ice can make the painted surfaces extremely slippery.



⚠ CAUTION

Incorrect hoisting may also cause damage to the machinery. Do not damage leads, cables and other components when fixing and loosening the lifting equipment.



NOTE: The shafts of the quick action cylinders (4 pieces) are covered with plastic pipes in the factory. Check that they are in place. Prevent the shafts from being damaged.



NOTE: More specific lifting instructions are available in the following chapter 5.4 Installing.

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5.4 Installing

5.4.1 Installation and connections



⚠ CAUTION

Follow the specific lifting instructions for this machine.

The pressure filter is installed on a concrete or steel foundation with dimensions as indicated in the confirmed drawings supplied as enclosures to the order confirmation.

The filter auxiliary equipment related to the operation of the filter are measured and installed according to the documentation of such equipment.

Install the filter in a horizontal position. Check the correct position of the filter by leveling the columns, which must be in a vertical position (± 1 mm/m). This instruction does not apply to the operator panel.

The piping, which is not included in the delivery, is constructed and connected by the customer according to the Outotec instructions. The inlet and outlet pipes must be connected to the filter piping flanges or valve ends.

The filter is connected to the electrical network according to the cabling instruction drawing (ref drawing in Folder 2 "Electrification").

The cleanliness of the hydraulic system is very important. When installing the hydraulics, make sure that there is no dirt between or inside the components and joints.

In case the filter is in a stock for a longer time (2 months or more), protect it against corrosion. The procedure of the protection depends on the circumstances. Please contact OUTOTEC to get more information about the current procedure.

In case of an extended shut down, (1 day or more) drive the plate pack up and the locking pins out. In this case the corrosion protection has the same rules as above.

Before installation it must be checked that all parts mentioned in the packing list have arrived.

A seizing deterrent must be used in all screw joints unless otherwise instructed. The tensioning torques of screw joints can be found on the next page.

During lifting, general precaution must be observed and all pieces must be protected. Especially the quick action cylinder rods must be covered until the plate pack is moved. The pieces are lifted at the points indicated in the drawings and instructions. Any surface damage must be repaired.

Due to the height of the filter, a passenger hoist or scaffolding is required for the installation.

The weights of different pieces are indicated in the installation instructions and packing lists.

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Special care and cleanliness must be observed during installation of hydraulics. The pipes/hoses and actuators must be kept plugged until connected.

The instructions for the Hand Held operations should be read through carefully before testing any hydraulic functions.

5.4.2 Installation of partially dismantled filter

See assembly drawings and part lists from spare part book.

5.4.2.1 Foundation inspection

Refer to foundation drawing.

Check:

- The positions of foundation - carry out length, width and crosswise measurement.

The foundation is horizontal. If needed, adjust with shimming pieces.

5.4.2.2 Foundation plate position

It is essential that the filter's foundation plate is horizontal both lengthwise and crosswise. Use the column fixing pins as references for level. The allowance is +/- 0.5 mm in both directions. To level the filter foundation plate, use a hydraulic jack at the lifting positions incorporated. Rustproof filling plates/shims are excluded from Outotec delivery.

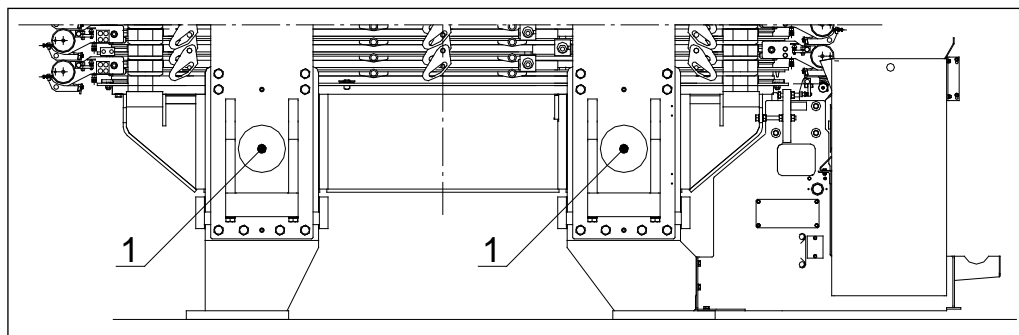


Figure 62. Column fixing pin (1)

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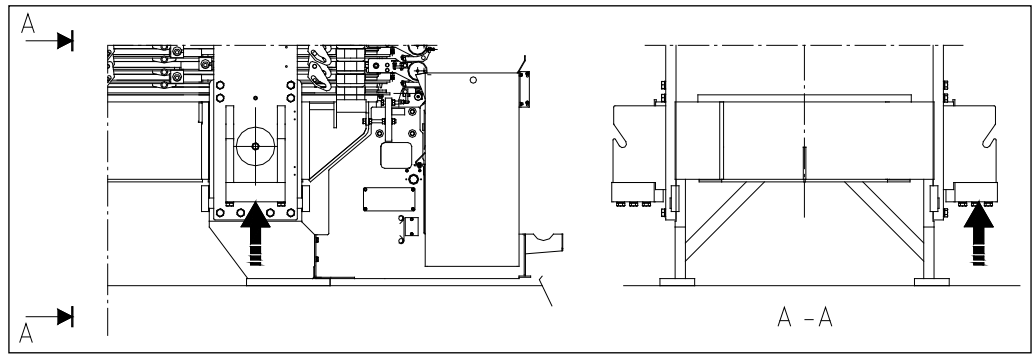


Figure 63. Lifting point

Lifting point: a black arrow in the picture above indicates the lifting point for the hydraulic jack.

5.4.2.3 Upper part of the columns

Lift the upper part of columns in their places as illustrated in picture below.

A 36 mm socket will be required with preferably a rattle gun or ratchet.

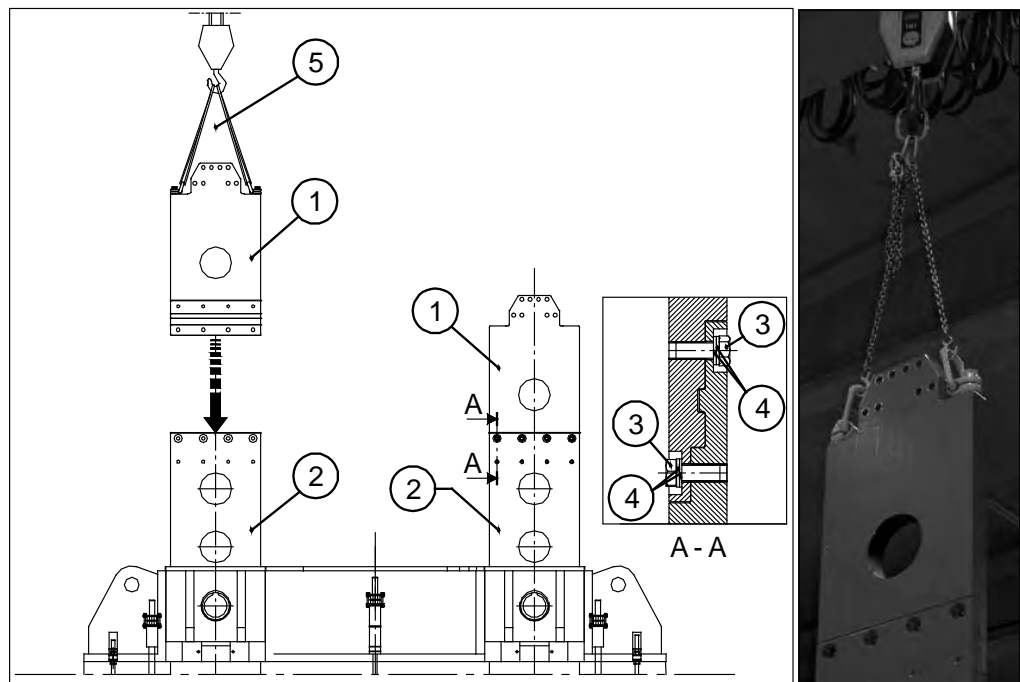


Figure 64. Lifting the upper part of columns

- | | | |
|--|-------------------------|--|
| 1. Top part of column (weight 385 kg) | 2. Lower part of column | 3. Hex screw M24 x 60 (530 Nm, lubricated) |
| 4. Washer M24 | 5. Soft sling | |

5.4.2.4 Quick action cylinders



NOTE: Allen key is required (19 mm).

1. Lighten the upper pressing plate with crane and release the upper pressing plate by driving the locking pins to “open” position. Drive the locking pins by using compressed air. Inflate compressed air to the line A. Line B must be open. Refer to picture below.

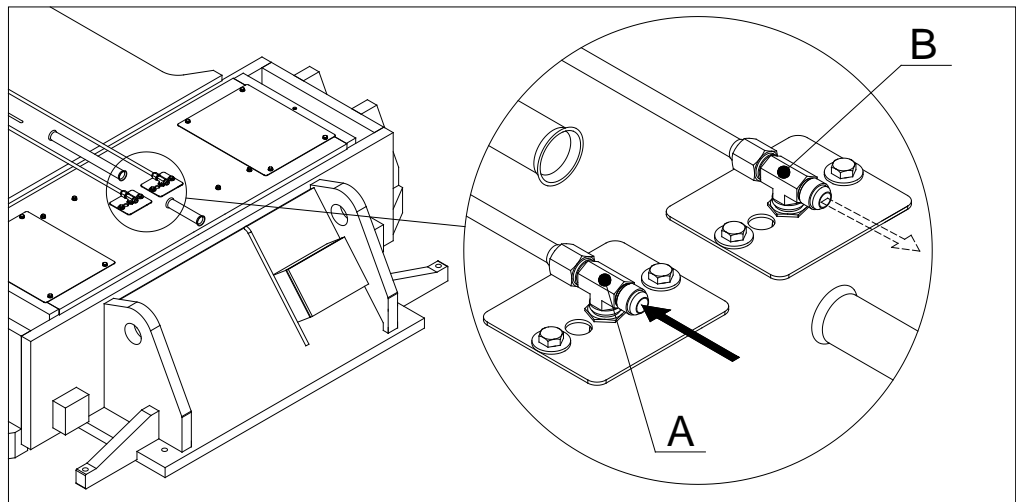


Figure 65. Driving the locking pins

| | |
|------------|------------|
| A = Line A | B = Line B |
|------------|------------|

2. In order to be able to install the cylinders, it must be ensured that the 3 wooden beams (150 x 100, L = 2000 mm) according to figure below are situated between the top pressing plate and the filling plate.

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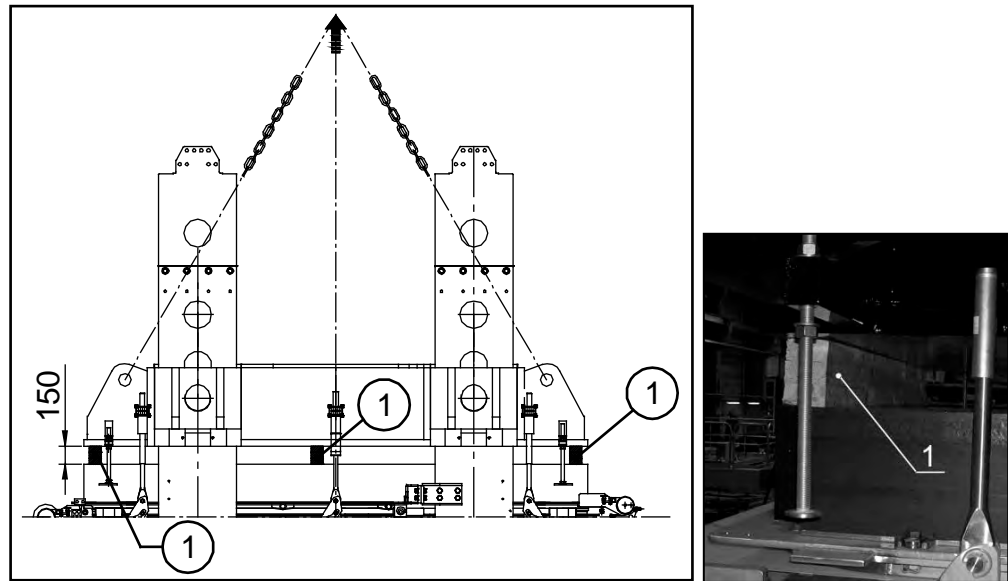


Figure 66. Wooden beam (150 x 100, L = 2000) (1)

3. Prepare the lifting of the quick action cylinders. In this process, the following points must be observed:
 - Weight of the cylinder (check weight of cylinder from spare part book; parts explosion).
 - The cylinders will be delivered filled with oil. Check that the cylinders are filled with oil before lifting.
 - The cylinder rods must be well protected and in general extreme precaution must be observed when handling them.
 - The fixing flange on the lower end of the cylinder is removed.



Figure 67. Lower end of cylinder



Figure 68. Fixing flange of the lower end and fixing screws

- Shaft nut, nut and ring on the top end of cylinder body are removed.

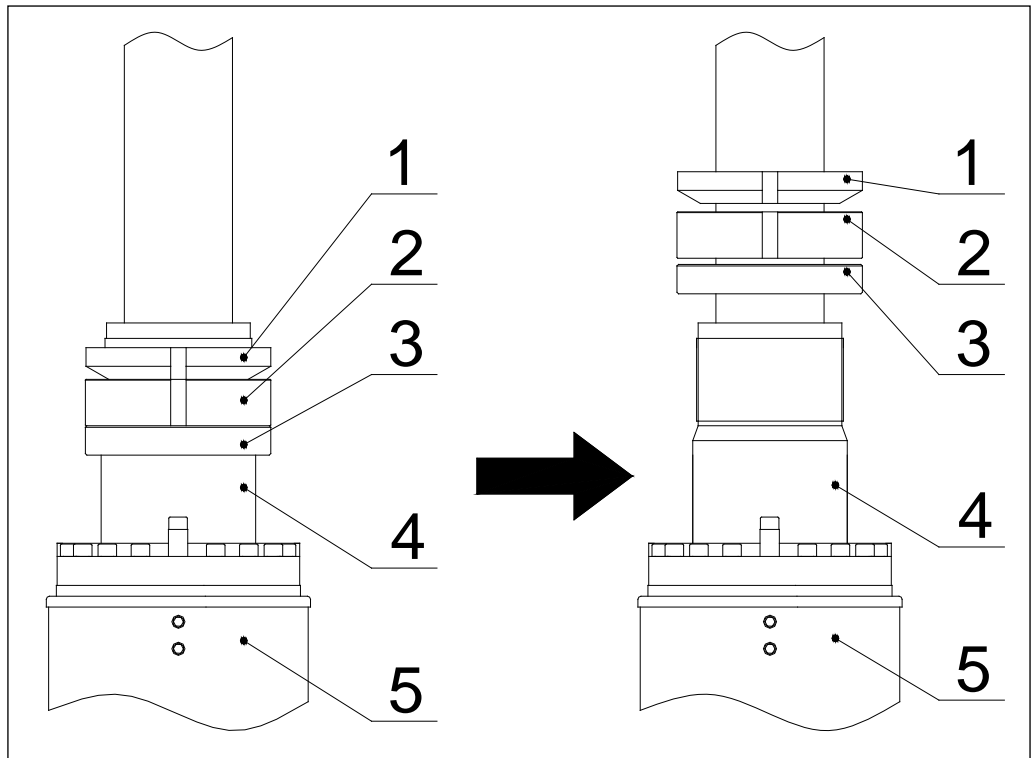


Figure 69. Removing of the shaft nut, the nut and the ring

| | | |
|---------------------------------|------------------|---------|
| 1. Shaft nut | 2. Nut | 3. Ring |
| 4. Top end of the cylinder body | 5. Cylinder body | |

- The lower protecting tube of the cylinder is fixed to the upper end of the cylinder with a rope, so that the protection pipe will stay compressed during lifting.

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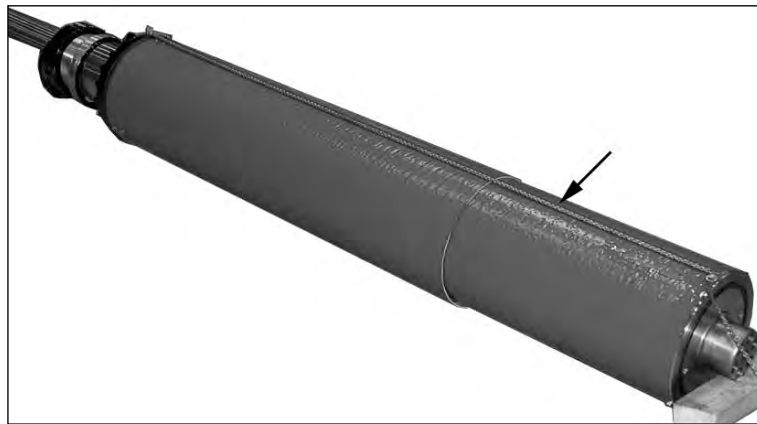


Figure 70. Rope

- The oil circulation pipe (included in maintenance tools) on the upper end of the cylinder is attached.
 - Use the rotating lifting points for lifting at the upper end of the cylinder.
4. Check the positions of the cylinders and hydraulic connections. Refer to picture below. The black arrow indicates the side of the cloth conveyor unit.

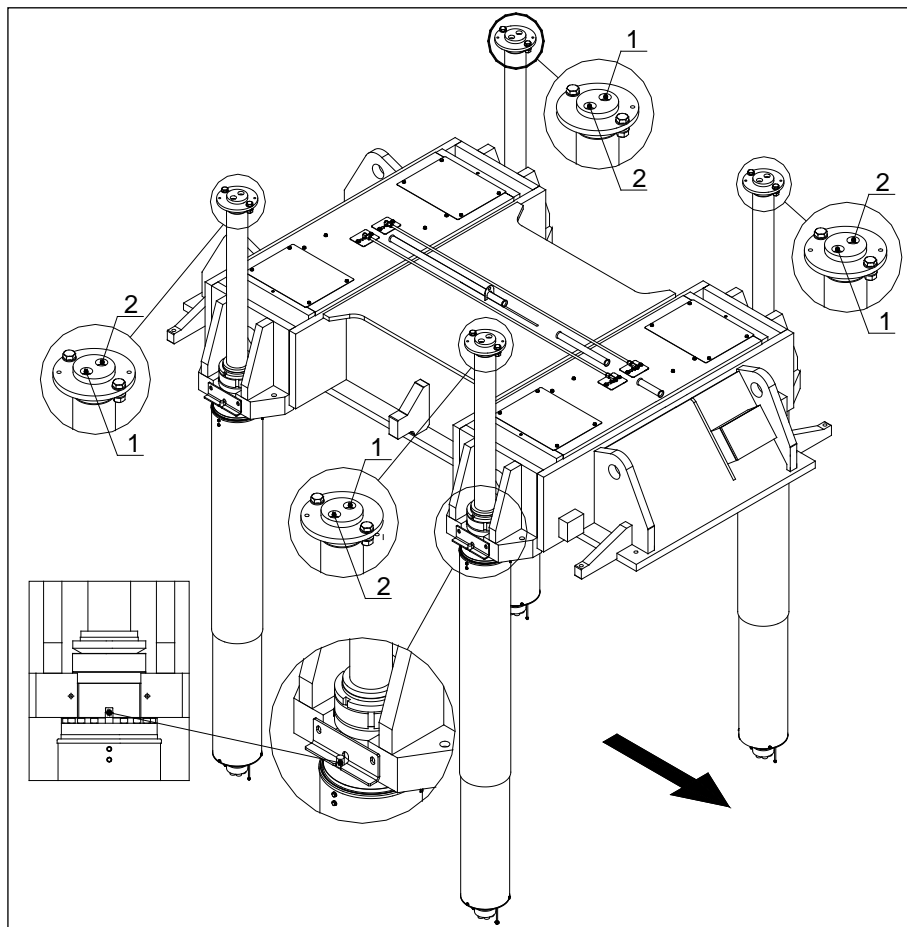


Figure 71. Hydraulic cylinder positions and hydraulic connections

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5. Lift the cylinder to the upright position. For safety reasons, use a lifting hook with a lock.



Figure 72. *Lifting the cylinder to the upright position*

6. Lift the upper end of the cylinder directly against the upper pressing plate (1-2). Install the upper end of the cylinder to the upper pressing plate (3). Install the shaft nut, nut and ring. Lower the piston rod slowly and direct the lower end into the fixing lug hole (4). Grease both the fixing lug hole and the piston rod for easing the fit. The crane hooks must not be slackened before the upper end of the cylinder is fixed to the upper pressing plate. Install the fixing plate (5).

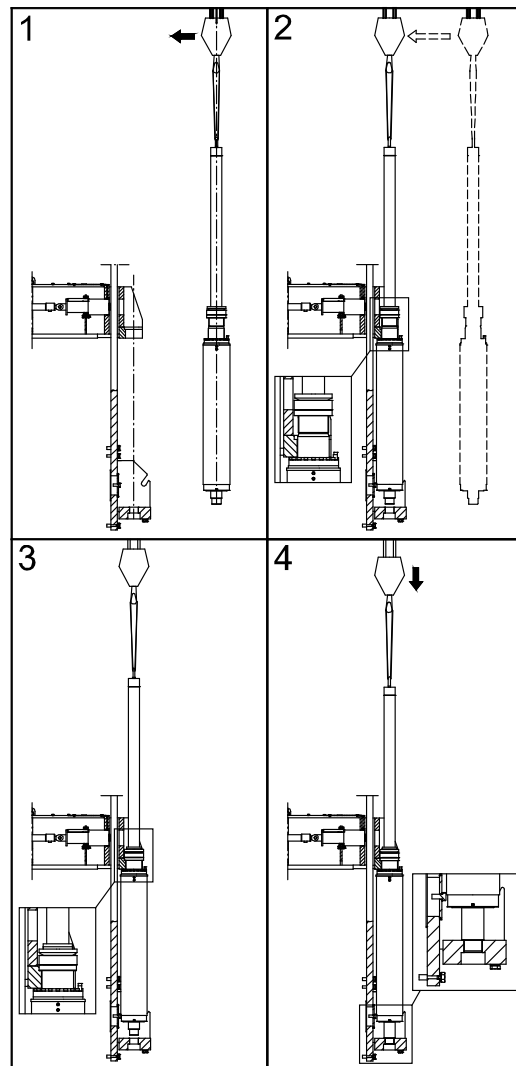


Figure 73. Lifting cylinder installation

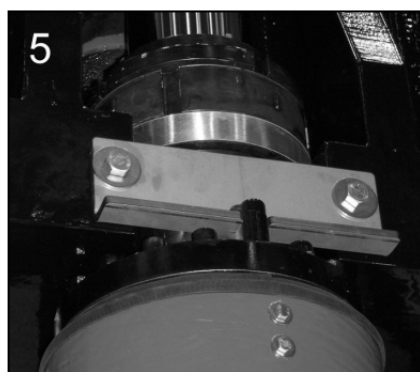


Figure 74. Fixing plate installed

7. The lower end fixing flange can now be attached, but not yet tightened. At this stage, remember to check that the hydraulic connections of the cylinder are in the right position, i.e. that the openings 1 and 2 are correctly directed.

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5.4.2.5 Upper frame

The weight of the upper frame: 1800 kg

The upper frame is placed on the columns. The upper frame is not symmetric, check the correct position in attached picture.

1. Remove the flanges for locating the quick acting cylinders and frame fixing bolts prior to lifting.

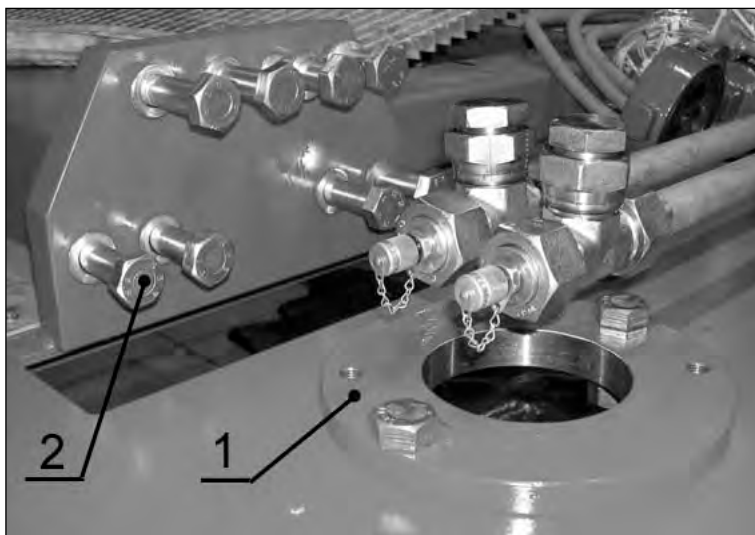


Figure 75. Upper frame

- | | |
|--|---------------------------|
| 1. Flange of the quick action cylinder | 2. Fixing flange of frame |
|--|---------------------------|

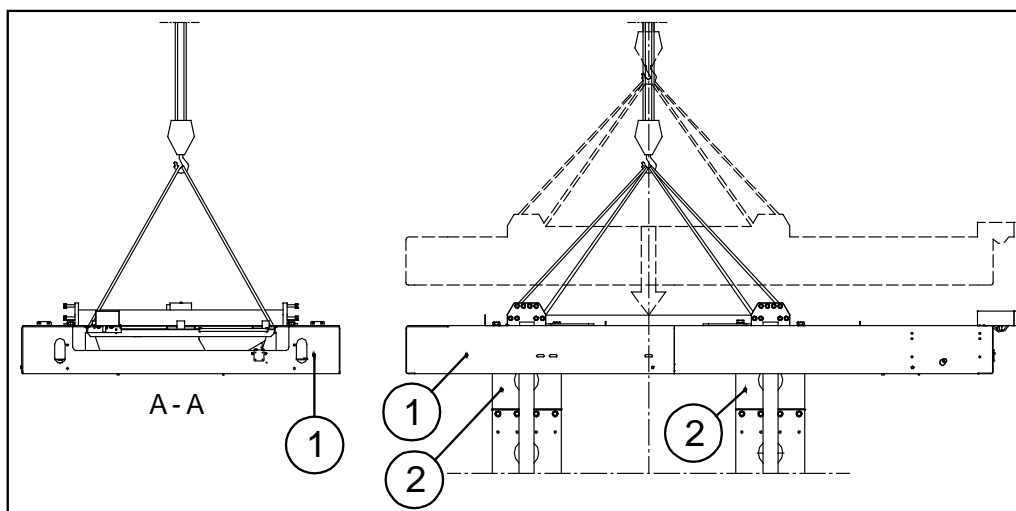


Figure 76. Lifting the upper frame

- | | |
|---------------------------------|-----------|
| 1. Upper frame (weight 1800 kg) | 2. Column |
|---------------------------------|-----------|

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2. Once in position, replace and tighten all bolts and flanges.
 - Make sure that the QA cylinder hydraulic connections are in the right position and secure the fixing flanges at the lower end of the cylinders.
 - The tightening torque of the fixing screws at the lower end of cylinder is 700 Nm (hex socket screw M24 x 180, 7 pieces/cylinder).
3. Attach the central guide bars to the upper frame. Note the guide pins.

5.4.2.6 Cloth tensioning device and conveyor unit

1. Lift the cloth tensioning device in its position.
 - In case a short hoisting tackle/chain is used, a support (timber) must be used between the tensioning device bodies/frames, so that the device's own weight does not cause any damage.
2. To avoid damage, use the second smaller crane to lift the unit at first to the horizontal position, and then raise it vertically. When in position, thread a rope through the rollers from plate 1 to ease the cloth installation.
3. Attach bolts to the bifurcated chute and to the upper frame. Remove any timber supporting the unit once in position.

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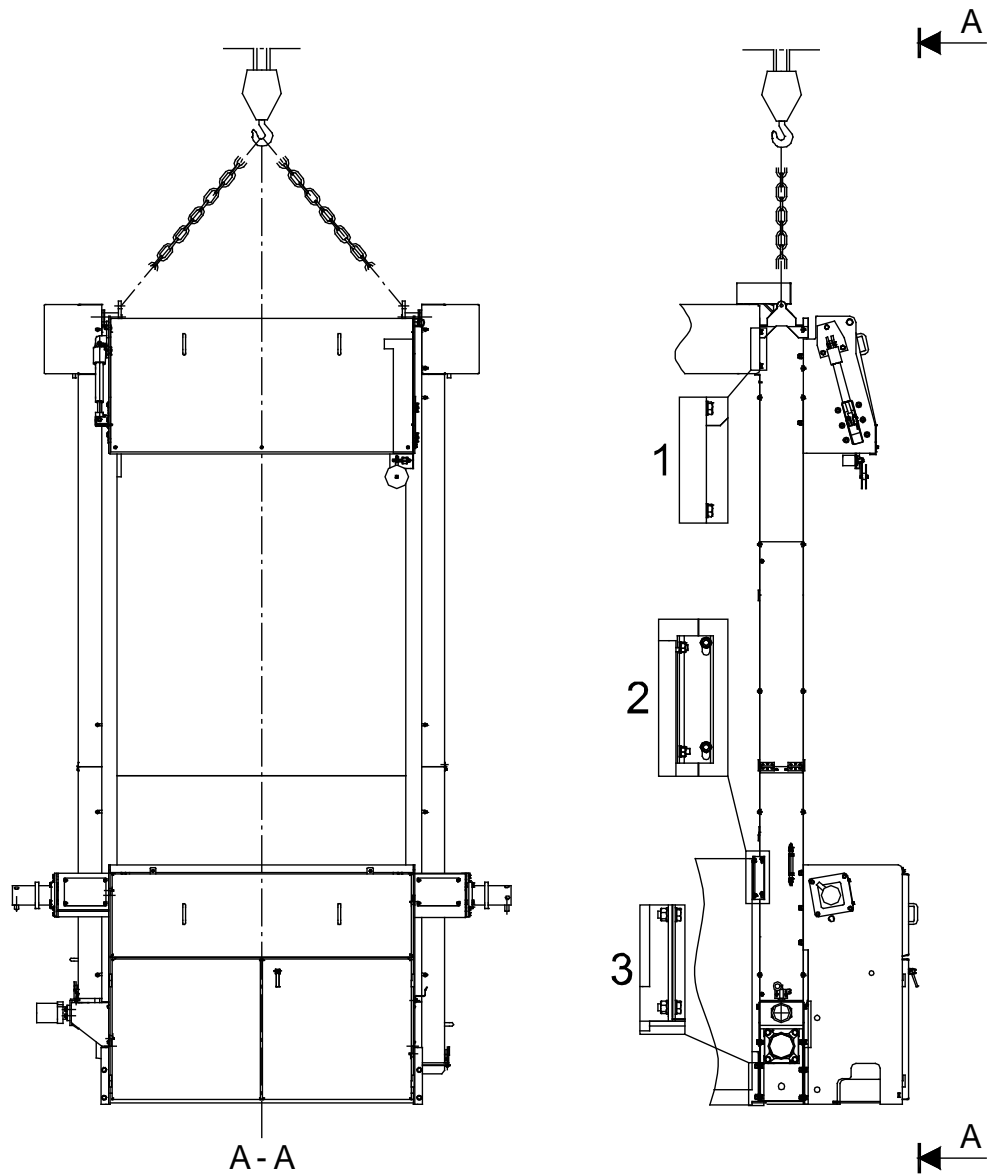


Figure 77. Fastening points of the cloth tensioning device and conveyor unit (both side of the Filter)

- | | | |
|--|--|--|
| 1. Fastening points at the upper frame | 2. Upper fastening points at the bifurcated cake chute | 3. Lower fastening points at the bifurcated cake chute |
|--|--|--|

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5.4.2.7 Process piping

Install the process pipelines according to assembly drawings. Refer to spare part book.

1. Install the slurry piping.
2. Install the pressing air pipe.
3. Install the feed manifold and pressing air manifold hoses. Lay the hoses adjacent to the filter and arrange for connection in order of different lengths. Check the hose length (for each plate) details from the spare part book.

The hoses must be connected first to the manifolds and then to the plates. It is easiest to begin at the bottom and continue upwards. A scaffolding or a scissor lift will be necessary. Arrange the connection couplings in an angle ("\\ /") pattern up of the manifold. The correct angles are 135° and 45°.

4. Install the cloth washing pipe.

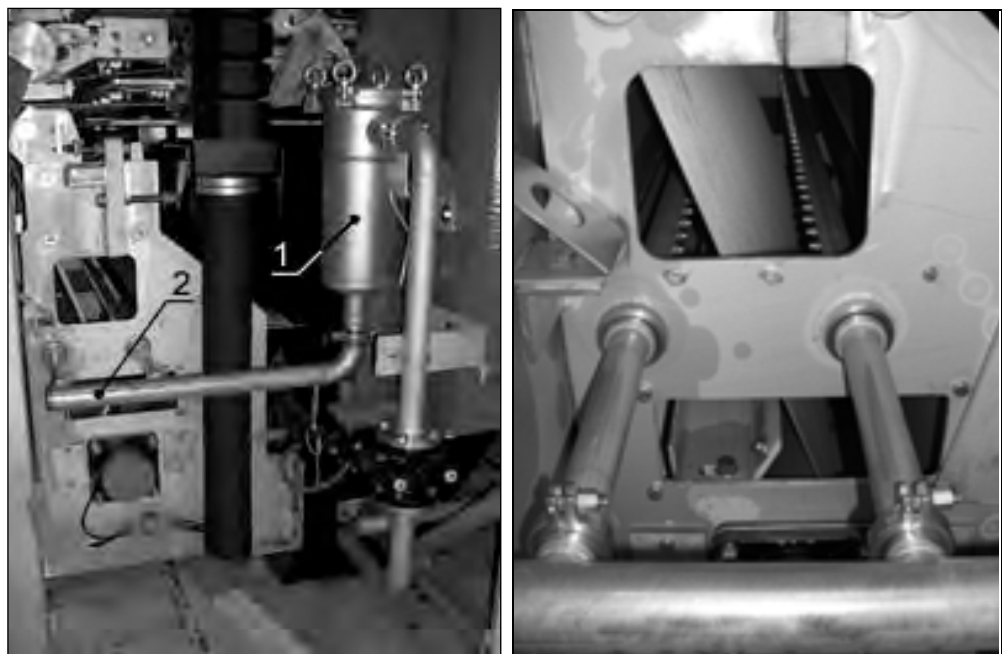


Figure 78. Cloth washing sprays

| | |
|-----------------------|-----------------------|
| 1. Wash liquid filter | 2. Cloth washing pipe |
|-----------------------|-----------------------|

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5.4.2.8 Hydraulic connections

While the hoses are connected, all hydraulic connections can be fitted. Two fitters, one on the top of the filter and the other at ground level, are needed to work on this.

Pay special attention to the following areas: Connections between the hydraulic unit and the filter, under frame elbows, upper frame, quick acting cylinders, connections to the foundation plate, upper pressing plate, cloth drive and auxiliary drive motors, pinch valves, and cake chute covers.

Most of the connections are obvious and well tagged. In case of any doubt, refer to the hydraulic connection drawings for a final check of work carried out.

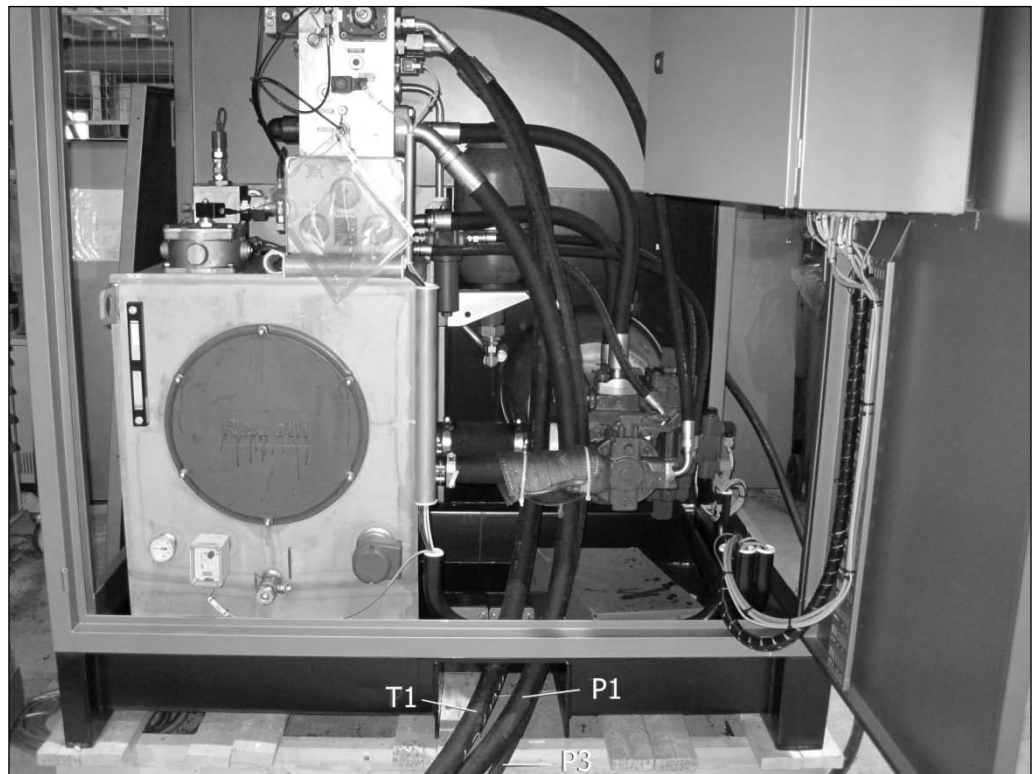


Figure 79. Hydraulic connections at the hydraulic unit

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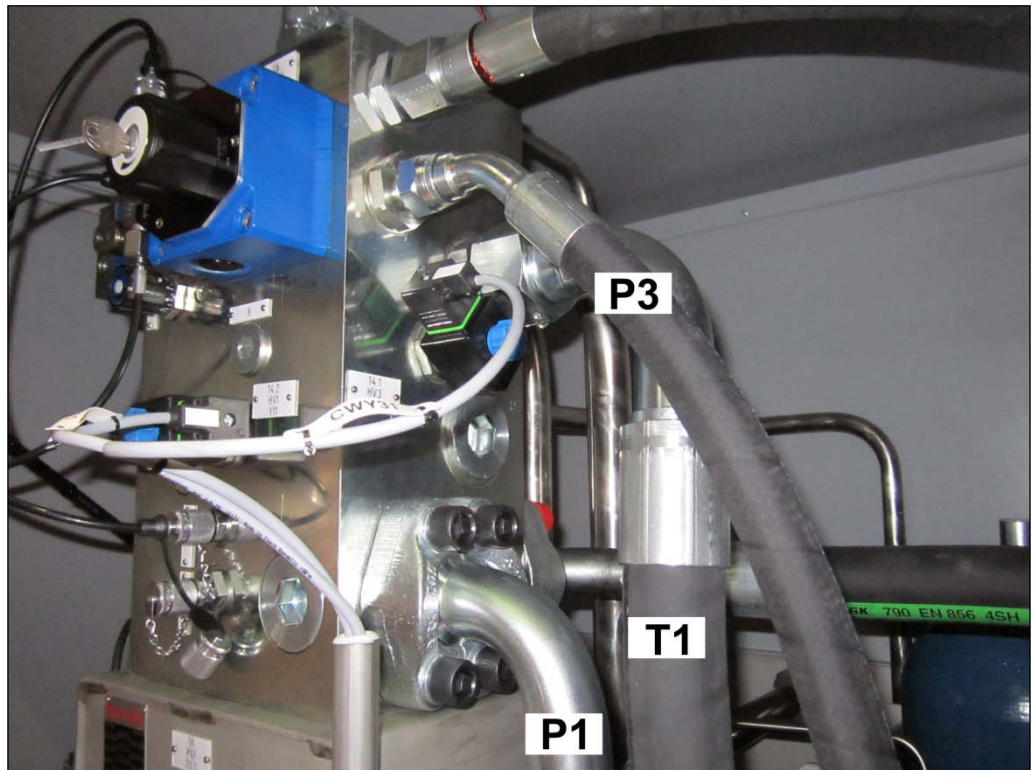


Figure 80. Hydraulic connections at the hydraulic unit

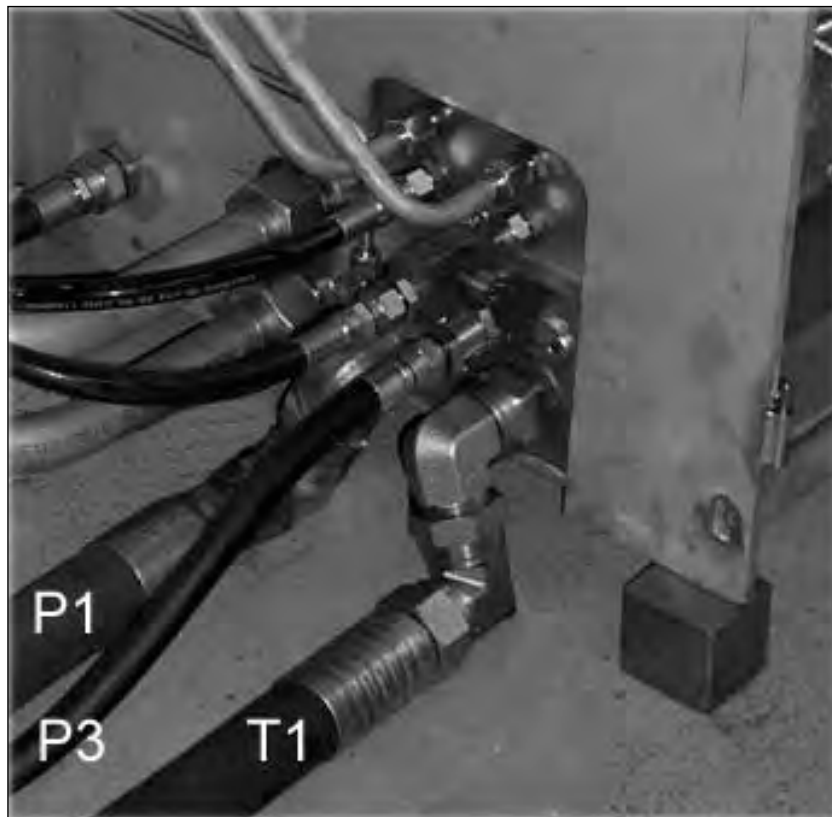


Figure 81. Hydraulic connections at the Filter

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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NOTE: See the instructions of filling the oil container of the hydraulic unit from chapter 2.4.3.2 Hydraulic power unit.

5.4.2.9 Electrical connections

Cables from hydraulic unit and control panel can be connected in dry commission. Limit switches are positioned throughout the filter, and are also tagged well for assembly. The designation of the limit switches is formed according to the following code:

Example 1:

S102 = Valve V02 open, where S=switch

1 = function, 1 = open position; 02 = actuator number

The function codes are as follows:

- 0 = undefined (sensor)
- 1 = open position (sensor)
- 2 = closed position (sensor)
- 3 = impulse function (sensor)
- 4 = pressure switch
- 5 = level switch
- 6 = temperature switch (thermostat)
- 7 = manual control (push button, switch etc.)
- 8 = error/alarm indicator
- 9 = transmitter (e.g. pressure)

Refer to electrical drawings for limit switch locations.



NOTE: These need to be adjusted at dry commissioning.

5.4.2.10 Rotation direction test of motors

The following motors are to be bump tested:

- M09 - Slurry Feed Pump Motor
- M15 - Hose Wash Pump Motor
- M06 - Cloth Wash Pump
- M1HU - Hydraulic Unit Motor
- M3HU - Oil Cooler Fan

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

5.4.3 Torque for screws and nuts

Ref installation/assembly of Outotec Larox PF 48 - 168

Pre-stress approx. 80% of minimum yield limit.

Table 19. Torque for screws and nuts

| THREAD | M6 | M8 | M10 | M12 | M14 | M16 | M18 | M20 | M22 | M24 | M27 | M30 | M36 |
|----------------|---|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| Strength class | Tensioning torque Nm(Nm ≈ 0.1 kp m ≈ 0.1 kgm) | | | | | | | | | | | | |
| A4 - 80 | 7.8 | 19 | 36 | 65 | 103 | 160 | 230 | 320 | 445 | 570 | 840 | 1170 | 1980 |
| 8.8 | 11 | 25 | 48 | 80 | 125 | 190 | 265 | 350 | 480 | 590 | 960 | 1290 | 2270 |

The values in the table require a friction coefficient of $\mu_1 = 0.12$, $\mu_2 = 0.12$, which correspond to a lightly oily surface – seizing deterrent must be used in all screw joints unless otherwise instructed.

- μ_1 = friction coefficient of the thread
- μ_2 = friction coefficient between the base and the screw (nut) head



NOTE: The screws for the filter plate/frame have their own torque value (350 Nm).

Apply Rocol J160 or similar to plate / frame screws to prevent the threads from seizing.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

5.4.4 Installation readiness check list

Table 20. Installation readiness check list

| | | | | |
|-----|--|--|--|--|
| 1. | The filter shipment is at the site. | | | |
| 2. | Examine the shipment and send a possible damage report to Outotec. | | | |
| 3. | The site transportation for the filter components and auxiliary equipment is available. | | | |
| 4. | Prepare a foundation that agrees with Outotec foundation drawings. | | | |
| 5. | Make the lifting equipment (overhead crane) available. | | | |
| 6. | Make the tools on the Outotec tool list available. | | | |
| 7. | Make the scaffolding and ladders available. | | | |
| 8. | Make the electrical power for lifting equipment and tools available. | | | |
| 9. | Make the compressed air for pneumatic tools available. | | | |
| 10. | Make an office available. The office must have a heating/cooling -system, lighting, telephone, furniture and toilet. | | | |

| | | | | | | |
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6 Commissioning and start-up

6.1 Start-up inspection



⚠ CAUTION

Make sure all safety features have been fitted to the filter and to the ancillary equipment before startup.

In order to carry out the start up without unnecessary delays certain things have to be ready and completed.

- Filter installed
- All dismantled (for packing and transportation) components assembled to the filter; also pipelines including limit switches
- All hydraulic hoses loosened for packing connected
- Pipelines built according to Outotec design instructions
- Cake can be discharged from the filter, and the conveyor(s) meets Outotec recommendations
- Voltage connected to control panel
- Voltage connected to filter's motors
- Cables connected (Please see the cabling diagram)
- Cloth wash water available
- Cake wash water (liquid) available
- Compressed air available for cake drying, and capacity meets Outotec recommendations
- Slurry pump installed
- Slurry available
- Hydraulic filter aggregate equipped with a 3 - 5 µm filter available for hydraulic oil filling (Please see the manual, chapter 8 Maintenance)
- Hydraulic oil available (for quality and quantity, please see the manual)
- Test cloth installed in to the filter and production cloth available
- Start up spare parts kit available

| | | | | | | |
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7 Operation

7.1 Intended use

- The machinery is intended for automatic use.
- Purpose of the machinery is to separate solids from the liquids of the process media. Typical applications can be found in mining and chemical process industries.
- The machinery is solely intended for professional use.
- The machinery is operated by trained professionals.
- The machinery can be operated remotely from a control room or locally from the control panel. All machine functions are controlled by integrated PLC.
- Maintenance is to be done by trained professionals. Maintenance tasks require skills to operate the machinery with a manual hand-held unit.

7.2 Recommended operating conditions

Ambient temperature: 0 °C...50 °C

7.3 Starting and stopping

7.3.1 Checks before start up

- Check the condition of the filter cloth seam
- Make sure that the times of different operational stages correspond to the optimum times achieved in test filtration or test runs
- Check the surroundings of the filter and make sure that no ladders or other objects are leaning on it
- The filter's first lubrication is performed by Outotec before the first test run, though it is recommended to lubricate items with an interval of week or less before starting the production run. Otherwise follow the lubrication intervals found in chapter 8.1.2 Lubricant recommendations.

7.3.2 Start up measures

1. Open the manual valves of the pipelines leading to the filter.
2. Make sure that the cake discharge conveyor works properly.
3. Make sure that the slurry feed pump works properly.
4. Make sure that the separate pump for cloth wash works properly (if in use).

If the stage timings and the "ready for operation" lights are blinking, filtering can be started.

| | | | | | | |
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NOTE: If any of the alarm lights is on or the "emergency-stop" button is pushed down, the "ready for operation" light does not illuminate.

5. Start the filter by discharging.



⚠ CAUTION

Pieces of cake left in between the sealing surfaces might damage the filter cloth. Make sure that the spaces between the plates are clean before the plate pack is closed.

6. Turn the selector switch to "AUTO" position. From now on the operation of the filter proceeds automatically onwards to "plate pack closing", "filtering" etc.

7.3.3 Adjustments

Observe the variables listed below and adjust the filter and the process according to different situations in order to reach the best results in all stages of the process.



NOTE: The exact adjustment gives the best result.

The factors effecting to the filtration results

- filterability of the feed
- condition of the cloth
- openness of the filtrate channels

The amount of the cake also depends on

- solid contents of the feed
- feed pressure
- filtration time

The dryness of the cake also depends on

- particle size of the feed
- pressing pressure
- drying air pressure
- air drying time

| | | | | | | |
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The washing result also depends on

- wash liquid pressure
- washing time
- wash liquid properties
- cake permeability

7.3.4 Checks after start up

In order to reach the best possible results with minor possible problems, always pay attention to following:

- When the slurry valve opens, observe the pressure reading. If the pressure does not start rising, there are either closed valves on the feed pipeline, a pipe is blocked or the pump is not working properly.
- If there is too much leakage between the plates during the filtering stage, a seal has been damaged or the filtrate piping has become clogged.
- When washing the cake, watch the wash liquid pressure reading (for the same reason as when pumping slurry).
- When drying with air, an air blow requires a sufficient amount of air. Check that at the beginning of the drying phase the pressure of the distribution pipe reaches at least 3 bar, which ensures that there is a sufficient amount of compressed air for all the chambers.
- When the filter discharges, make sure that there is a cake formed on each filter plate. An empty space is a sign of a blockage either in the feed hose or in the feed joint of the filter plate.



CAUTION

Blockages can cause the empty filter plates to bend under the pressure. Clear all blockages before carrying on with filter operation.



NOTE: Check the condition of the filter cloth. An acid washing is necessary in certain processes occasionally.

- Observe the cloth to be sure it remains undamaged. A damaged cloth must be mended immediately to prevent the particles for escaping through a broken cloth out of the filtrate flow channels.
- Observe the diaphragms. They must remain undamaged.
- Always use the lowest possible pressure to achieve the desired filtering result. An unnecessarily high pressure shortens the life of the diaphragm and other wearing parts.

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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

- Do not feed too much material into the filter (The maximum cake thickness is 40 mm for 45 mm high chambers, and 55 mm for 60 mm chambers): the feed pipe may get clogged, cake discharge become more difficult or, if the material is heavy, the cloth can break.



⚠ DANGER

Do not feed too much material into the filter to avoid damage.

- Do not let the feed hoses to block up. An empty filter chamber under pressure causes the plate to bend. A bent plate causes leakage, makes holes in the cloth and hampers the cake discharge.



⚠ DANGER

Hazardous moving parts. The plate pack consists of several moving parts, which can cause serious injury or death. Never push anything in between the plates while the filter is in operation.

- Avoid high temperatures when a standard filter is in question. In temperatures above +60 °C, a strong aging phenomenon affects to the rubber and the operating life of the rubber parts becomes shorter. When operating in temperatures over +60 °C, the manufacturer's instructions must be strictly followed.



⚠ DANGER

Do not direct the pressure-water spray directly at the electrical devices when washing the filter.

7.3.5 Maintenance

Maintenance of the standard parts

- According to the instructions given by the sub-suppliers attached to this manual.

General

- Flush the filter from outside when necessary, when the filter is not in operation.
- Keep the filter and its surroundings tidy and free from any unnecessary objects.

| | | | | | | |
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7.4 Normal operation

7.4.1 Control panel

The Control Panel is used to facilitate the operation of the OUTOTEC LAROX Pressure Filter. All the main controls, which are required for the operation, such as switches, push buttons and the operator interface terminal are located in the control panel. Each push-button, switch and indicator lamp is provided with a label briefly describing the function of the device.

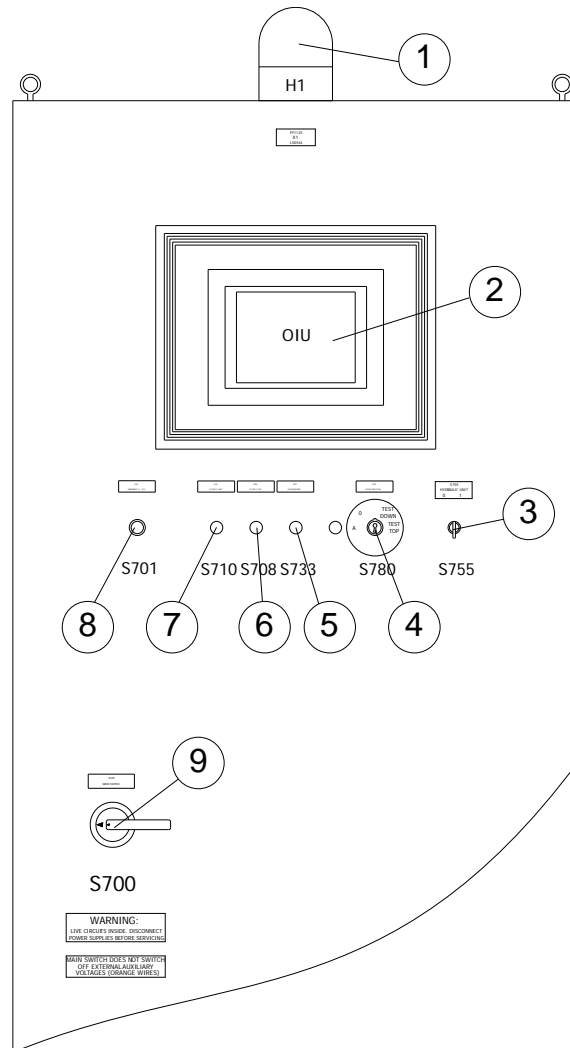


Figure 82. Control panel

| | | |
|-----------------------|-------------------------------|-------------------------------|
| 1. Alarm signal light | 2. Touch screen | 3. Hydraulic unit mode switch |
| 4. Mode selection | 5. Alarm reset push-button | 6. Stop push-button |
| 7. Start push-button | 8. Emergency stop push-button | 9. Main switch |

Alarm signal light (1)

In case of an alarm, the alarm signal on top of the panel as well as the S733/H733 button (5) start flashing and an alarm message appears on the display.

Touch screen (2)

The flow diagram is located in the display of the operator interface terminal. The indicator lamps show the present state of the actuator or motor in question.



NOTE: The picture below is for reference only, and not necessary from your PF48 filter unit.

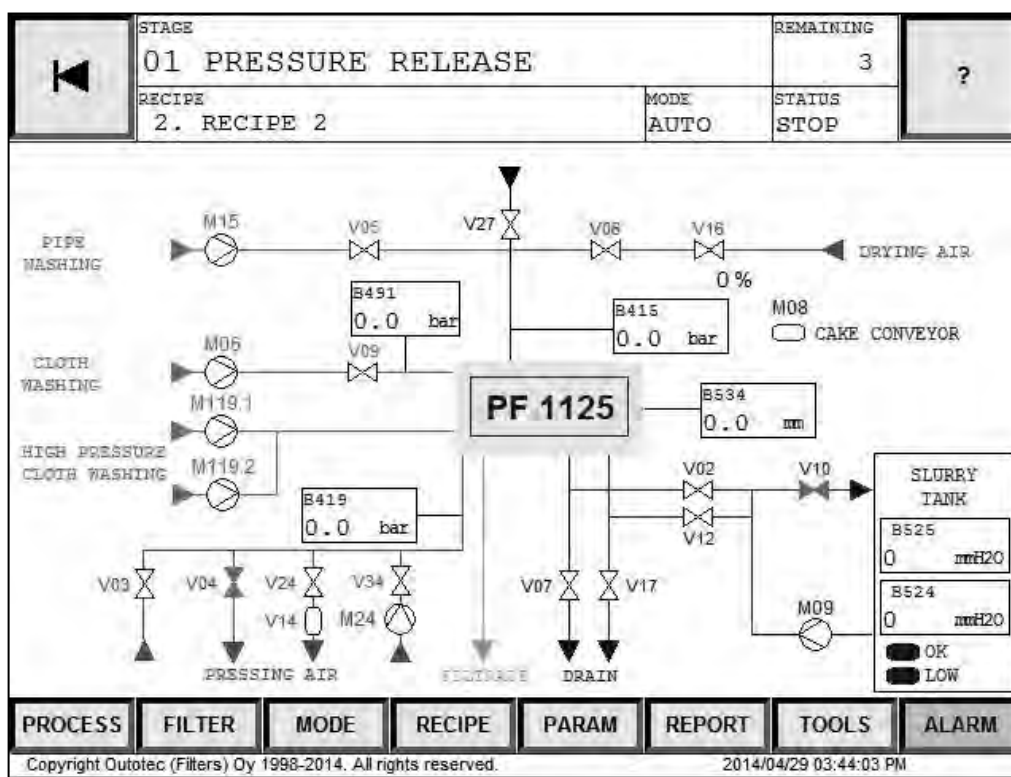


Figure 83. Touch screen

Hydraulic unit mode switch (3)

The hydraulic unit is automatically started and stopped according to control system, when the switch S755 is turned to position 1.

Mode selection (4)

Test mode can be selected only with key switch S780. After activated, the handheld test unit can be used.

| | | | | | | |
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Alarm reset button (5)

When S733/H733 is pushed once, the alarm signal will stop flashing. The second push acknowledges and eliminates the cause of the activated alarm.

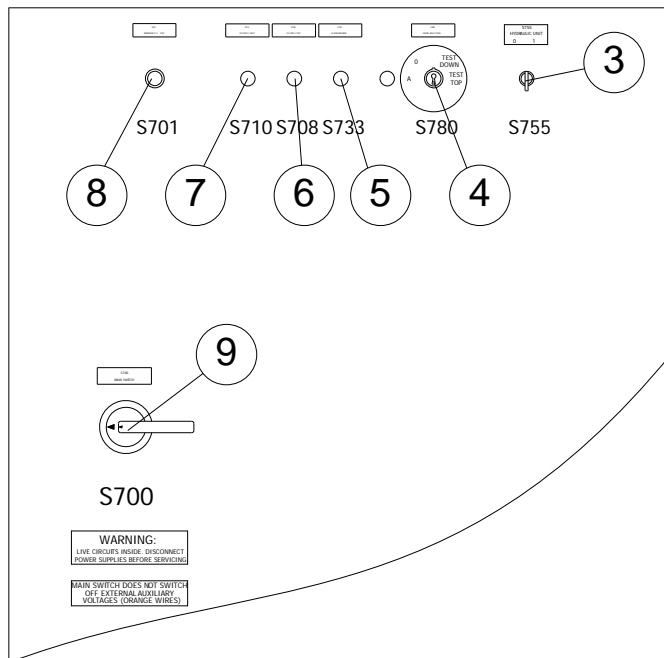


Figure 84. Control panel buttons

Stop button (6)

Pushing the stop button S708/H708 stops the filter. When the button is pushed once, it illuminates indicating that the filter has stopped.

Start button (7)

To start the filter from the present stage, push the start button S710/H710 once. When the filter is running, the button is illuminated. When the S710/H710 is flashing slowly, it indicates that the filter is ready for operation.

Emergency stop button (8)

The filter is equipped with several emergency stop buttons. In case of danger, the filter can be stopped immediately by pressing the emergency stop button. After all emergency stop buttons are released, the emergency stop circuit can be acknowledged by pressing the alarm reset/acknowledgement push button (S733).

EMERGENCY STOP push buttons are not illuminated.

Main switch (9)

The main switch S700 is used for switching on and off the electric supply of the pressure filter.

| | | | | | | |
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7.4.2 Operator interface

Controlling and observing the operation of the filter, choosing the required filtering program, changing parameters and testing actuators are operated through the operator interface. In addition, the operator interface gives clear text information about alarms.

7.4.2.1 Screen selection

Touch buttons are used to select screens.



⚠ CAUTION

Do not use objects like a screwdriver, pencil etc. to activate a touch button.

The screen needs to be touched lightly and shortly only. Some menus may seem to have a slight delay before performing the function requested, so it is a good idea to have a pause before touching again.

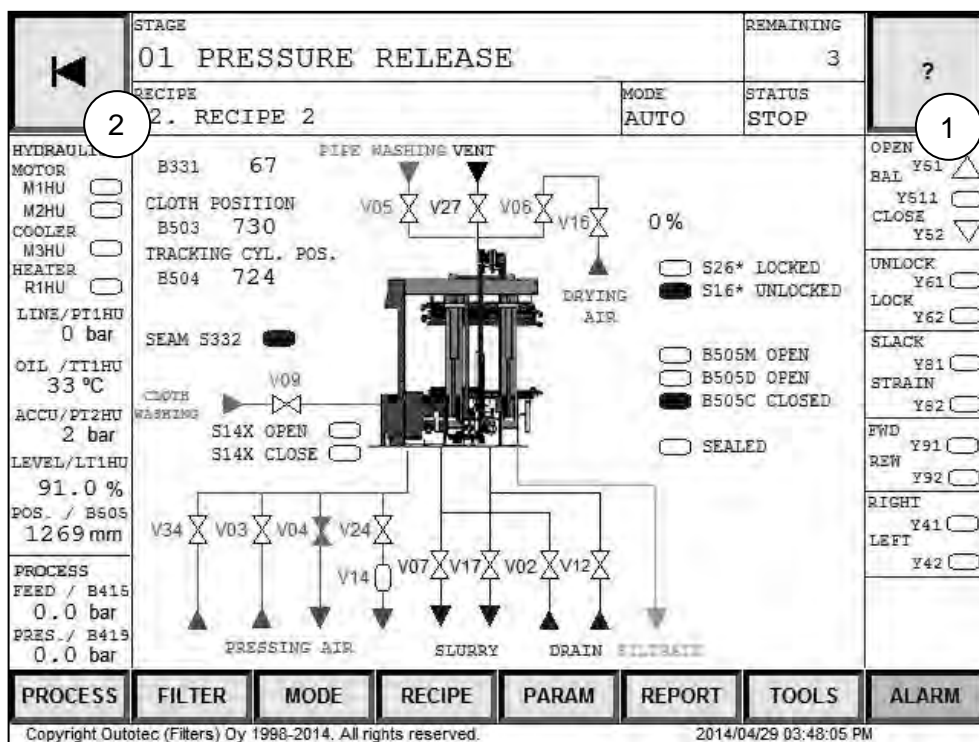


Figure 85. Filter screen

The HELP touch button ? (1) locates stationary* in the top right hand corner of the display. When the button is touched, a screen containing the requested information is displayed.

To quit any HELP screen, use the PREVIOUS SCREEN touch button (2). This touch button locates stationary* in the top left hand corner of the display.

* The button is available on every selected screen.

| | | | | | | |
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7.4.2.2 Operator interface structure

The available menus of the operator interface are illustrated in a form of a diagram in the figure below.

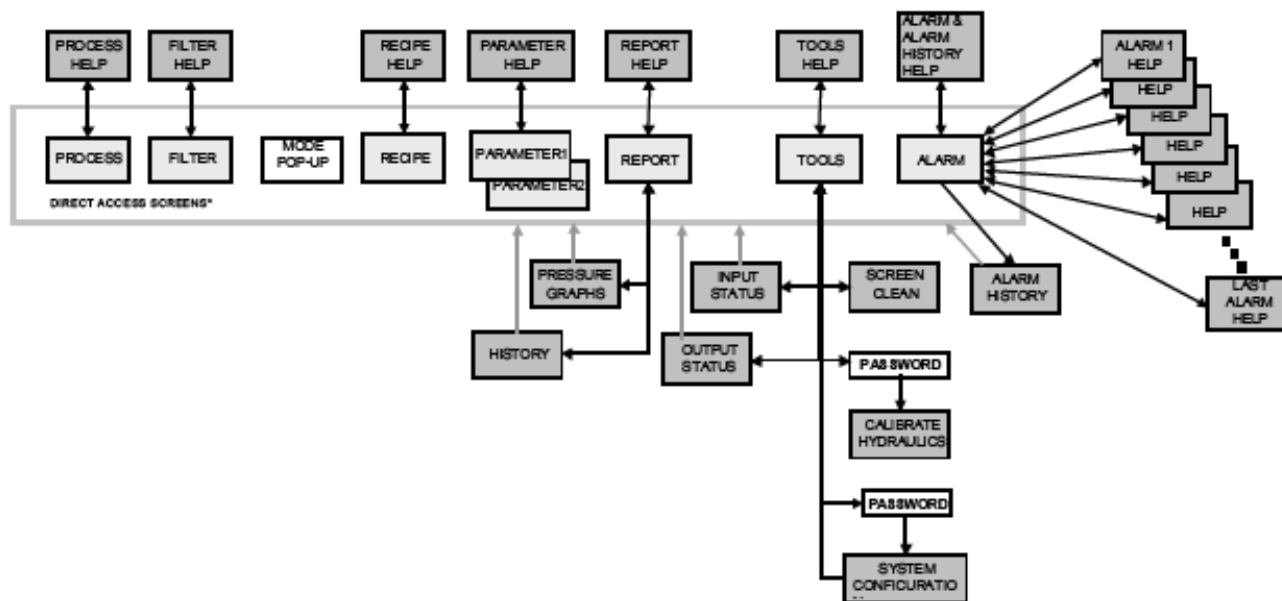


Figure 86. Operator interface structure

*) Direct access screens (inside the grey frame) can be accessed directly from any screen inside the frame or linked to it.

7.4.2.3 Cleaning the display



⚠ CAUTION

To clean the display, use a soft cloth or paper towel and any ordinary window cleaner.

It is an essential part of the unit’s maintenance to keep the display clean. Even if a great care is taken to touch the display with clean hands only (this is not necessary), dirt will still collect on the display surface.

For cleaning the display (since all screens have been active), a Screen cleaning [CLS] function has been programmed into the display unit. The function is accessed from the TOOLS menu. After a selected time the display will automatically return back to the FILTER menu.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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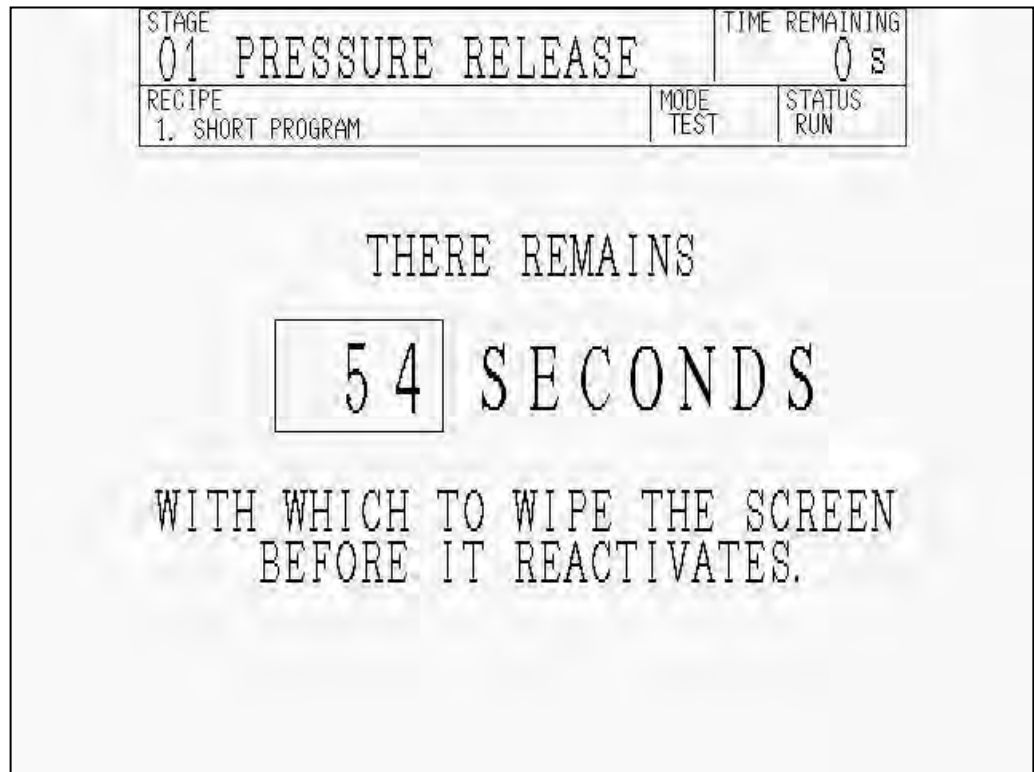


Figure 87. Cleaning the display

To help prevent marring the plastic sheet on the surface of the display, carefully clean off any abrasive particles on the display surface, and then clean as advised above.

7.4.2.4 Drive mode

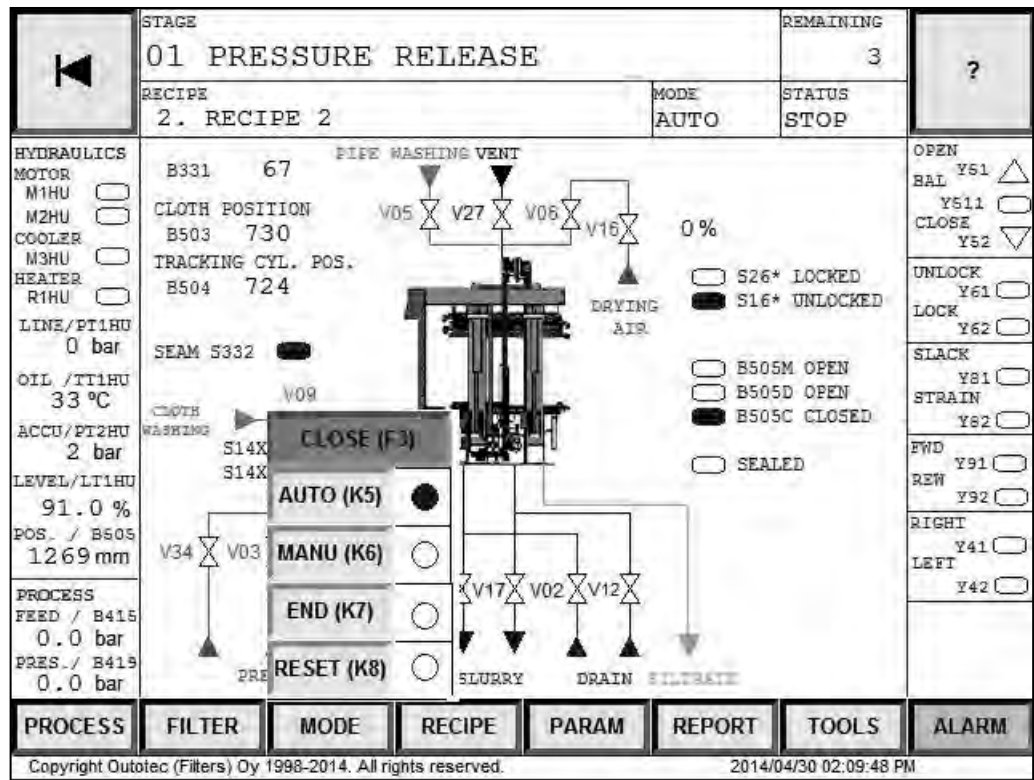


Figure 88. Drive mode screen

The [MODE] touch button is used to select a drive mode. The following drive modes are available:

- AUTO** The filter operates using the preset stage times.
- MANUAL** The filter can be operated one stage at a time. This mode is used e.g. for optimizing the stage times.
- END** When this mode is selected, the filter stops at the end of the cycle. This is used whenever the operator wishes to stop a filter running in auto mode.
- RESET** Is used to e.g. stop a filtering cycle. In this case the filter starts filtering in a controlled manner from the very first stage.

| | | | | | | |
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.2.5 Process

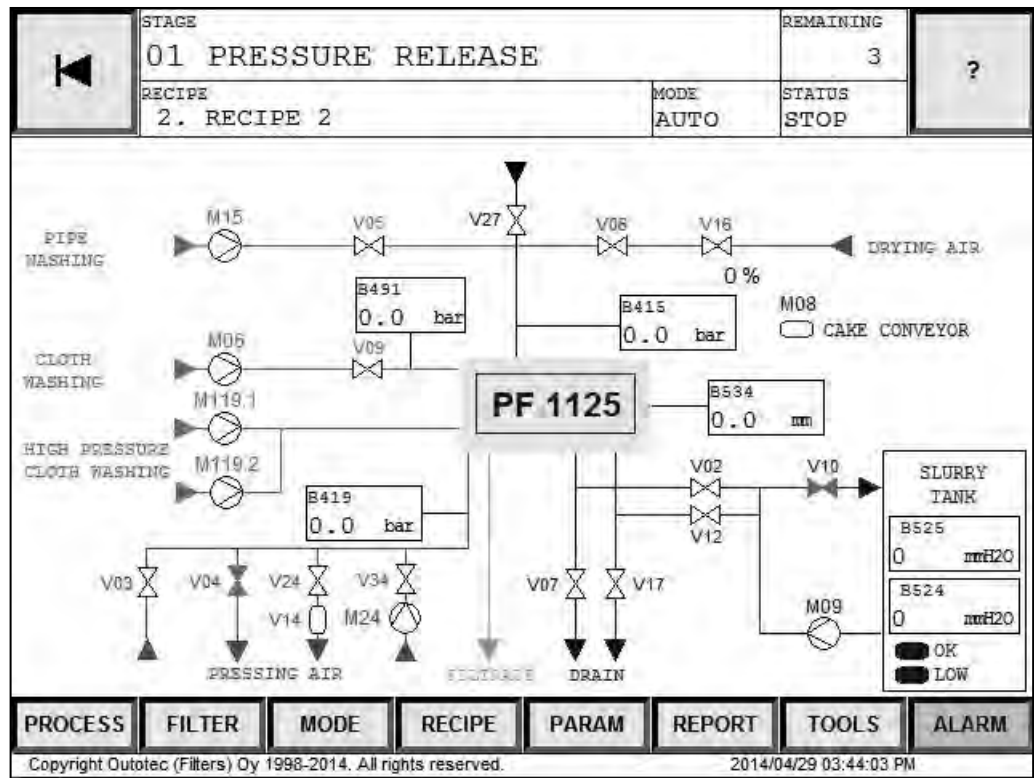


Figure 89. Process screen

The PROCESS screen displays the main devices of the filtering process as well as the process diagram. In addition to the filter, the slurry tank with level information, feed slurry pump, and cake conveyor are displayed.

The rest of the basic screens can be accessed by means of the touch buttons in the lower part of the display. The drive mode can also be selected directly from this screen.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Table 21. List of symbols on the PROCESS screen

| ITEM | DESCRIPTION | ITEM | DESCRIPTION |
|------|--|-------|---------------------------------|
| M06 | Cloth washing pump | V12 | Slurry inlet valve |
| M08 | Cake conveyor motor | V16 | Flow control valve |
| M09 | Slurry feed pump motor | V17 | Manifold drain valve |
| M15 | Process water pump | V24 | Diaphragm lifting up valve V14 |
| V01 | Filtrate outlet valve (optional) | V27 | Feed manifold ventilation valve |
| V02 | Slurry inlet valve | V37 | Cip-drain valve (optional) |
| V03 | Pressing air valve | V39 | Plate pack wash valve(optional) |
| V04 | Pressing air valve | V139 | Rollers wash valve(optional) |
| V05 | Cake wash liquid inlet valve | V239 | Cake chute wash valve(optional) |
| V06 | Drying air inlet valve | B415 | Feed manifold pressure |
| V07 | Manifold drain valve | B419 | Pressing manifold pressure |
| V08 | Pre-/Wash filtrate outlet valve (optional) | B491 | Cloth washing pressure |
| V09 | Cloth wash liquid inlet valve | SLOK | Slurry tank level OK |
| V10 | Slurry recycle valve (optional) | SLLOW | Slurry tank level, min. |

7.4.2.6 Filter

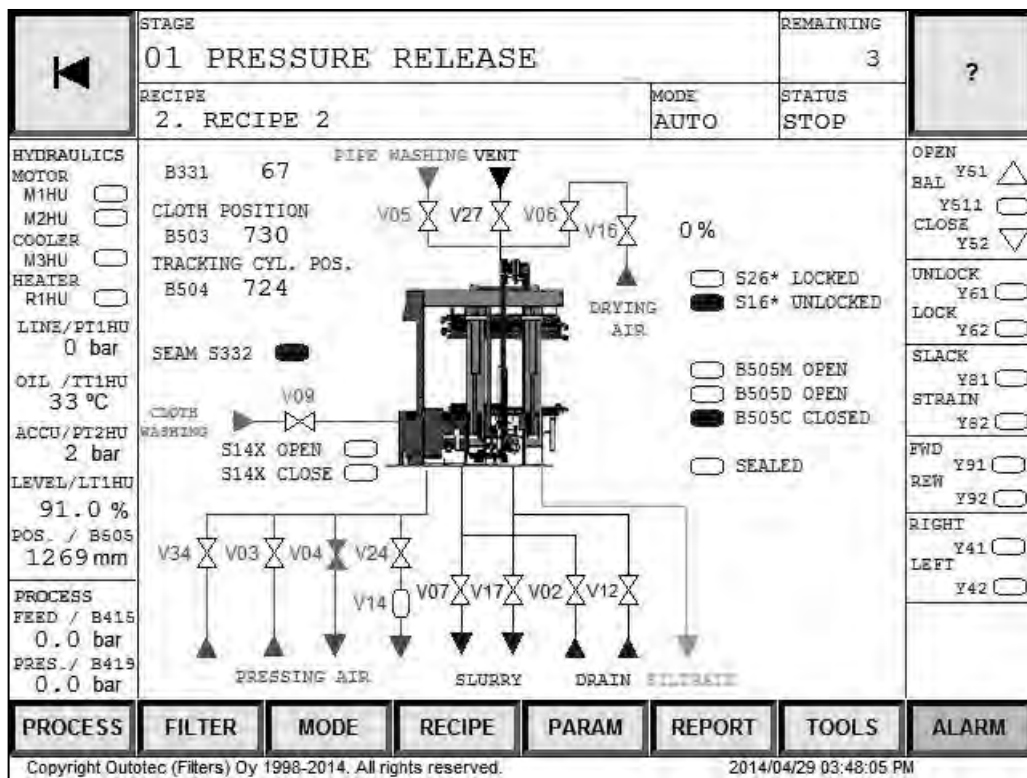


Figure 90. Filter screen

Table 22. List of symbols on the FILTER screen

| ITEM | DESCRIPTION | ITEM | DESCRIPTION |
|-------|---------------------------------------|------|---|
| M1HU | Hydraulic unit motor | Y82 | Cloth tensioning |
| R1HU | Hydraulic oil heater | Y91 | Cloth drive forward |
| Y11 | Hydraulic oil cooler valve | Y92 | Cloth drive reverse |
| M3HU | Hydraulic oil cooler fan (optional) | Y41 | Cloth tracking cylinder out (the cloth to left) |
| PT1HU | Hydraulic pressure transmitter | Y42 | Cloth tracking cylinder in (the cloth to right) |
| PT2HU | Hydraulic accu pressure transmitter | B491 | Cloth washing pressure |
| LT1HU | Hydraulic oil level transmitter | B505 | Plate pack position |
| TT1HU | Hydraulic oil temperature transmitter | V01 | Filtrate outlet valve (optional) |

| ITEM | DESCRIPTION | ITEM | DESCRIPTION |
|-------|--|------|--|
| B415 | Feed manifold pressure transmitter | V02 | Slurry inlet valve |
| B419 | Pressing manifold pressure transmitter | V03 | Pressing air inlet valve |
| B503 | Cloth edge position | V04 | Pressing air outlet valve |
| B504 | Cloth tracking cylinder position | V05 | Cake wash liquid inlet valve |
| S332 | Cloth seam detector | V06 | Drying air inlet valve |
| S838A | Cloth alarm limit switch, left | V07 | Manifold drain valve |
| S839A | Cloth alarm limit switch, right | V08 | Pre-/Wash filtrate outlet valve (optional) |
| S26* | Locking pins locked | V09 | Cloth wash liquid inlet valve |
| S16* | Locking pins unlocked | V12 | Slurry inlet valve |
| S505M | Plate pack open (maintenance) | V16 | Flow control valve |
| S505D | Plate pack open (discharge) | V17 | Manifold drain valve |
| S505C | Plate pack closed | V24 | Diaphragm lifting up valve V14 |
| Y51 | Plate pack opening | V27 | Feed manifold ventilation valve |
| Y511 | Plate pack balancing | V37 | Cip-drain valve (optional) |
| Y52 | Plate pack closing | V39 | Plate pack wash valve(optional) |
| Y61 | Locking pins unlocking | V139 | Rollers wash valve(optional) |
| Y62 | Locking pins locking | V239 | Cake chute wash valve(optional) |
| Y81 | Cloth slackening | | |

7.4.2.7 Recipe

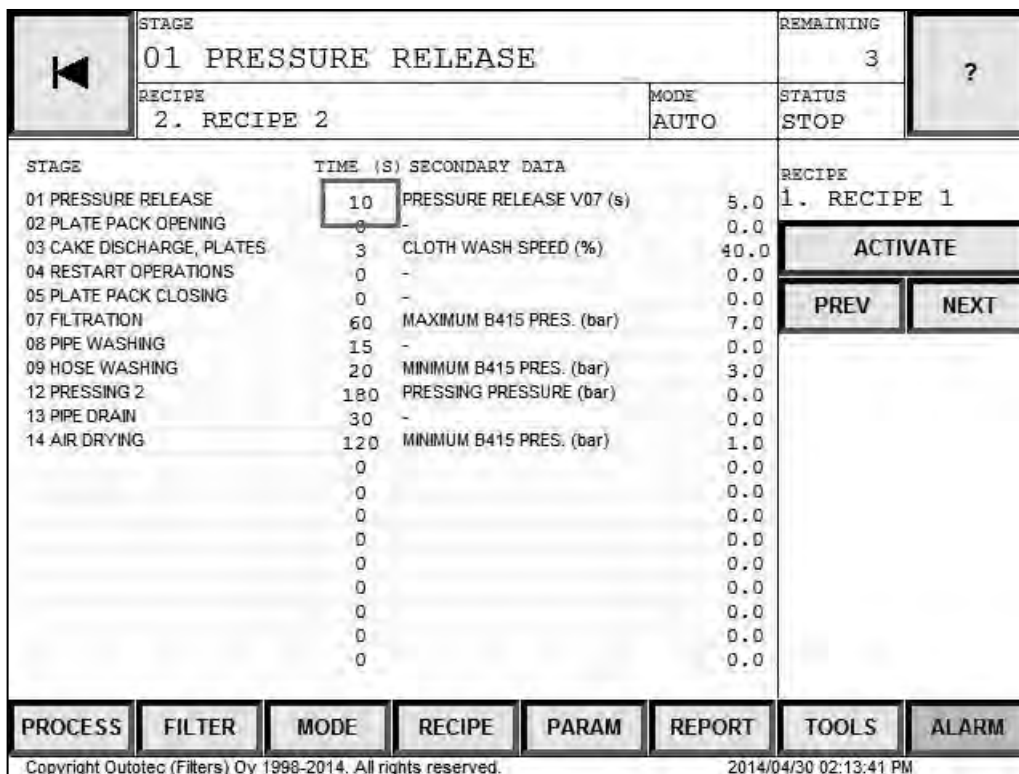


Figure 91. Recipe screen

The RECIPE screen displays the filtering recipes the filter is provided with. The preset recipes (max. 10 pieces) can be scrolled, modified and activated.

The [PREV] and [NEXT] touch buttons are used to scroll the recipes. The title of the recipe is displayed in the RECIPE field above the [ACTIVATE] button (the first 18 digits).

To modify the control data, enter password from the keyboard and push [ENT]. The cursor will now move to the time value of the first stage. A new value is set accordingly. Use the arrow keys in the numerical keyboard in order to move to the previous/next stage. [CLR] is used to delete the field indicated by the cursor. If password is configured not to be in use, there is no need to enter it.

| | | | | | | |
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7.4.2.9 Parameter 1 and parameter 2

The PARAMETER screens display the filter control parameters that are valid for any recipe. The parameters are distributed between two screens, which can be scrolled by means of the [PAGE 1] and [PAGE 2] touch buttons.

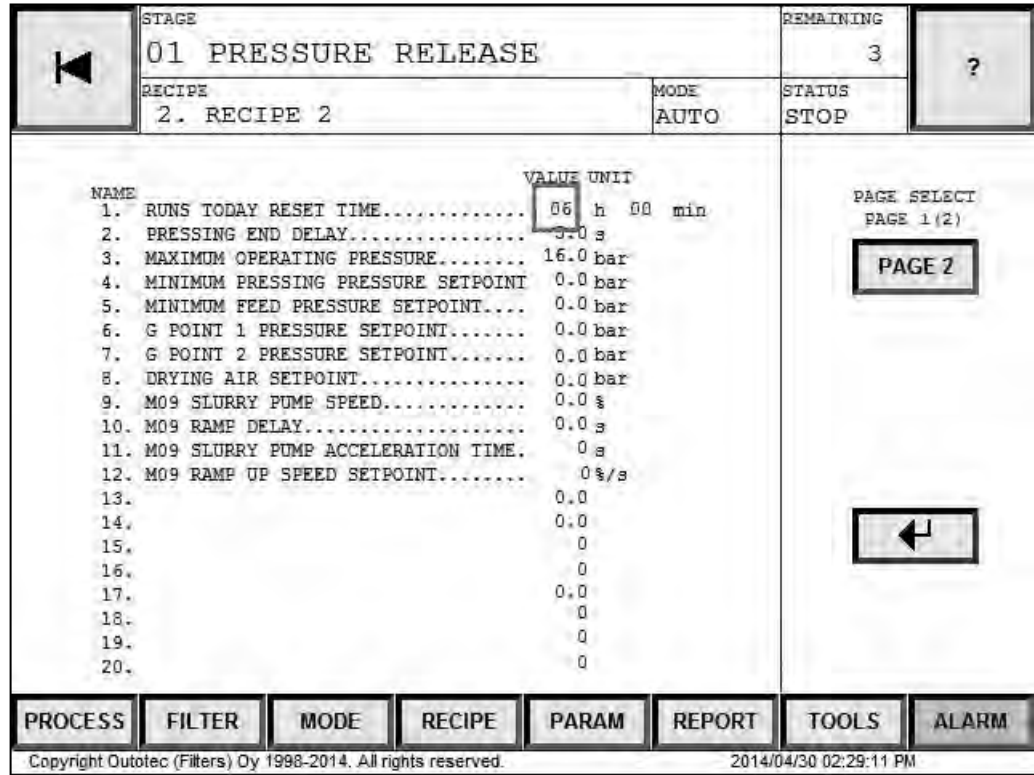


Figure 93. Parameter 1 screen

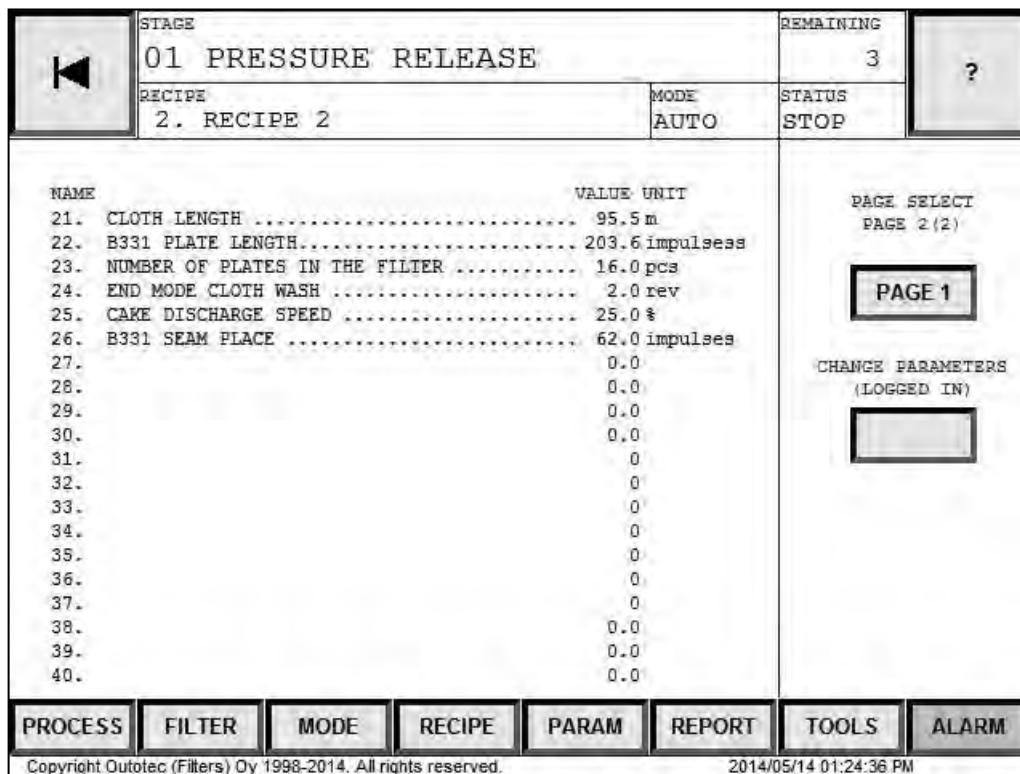


Figure 94. Parameter 2 screen

To modify the values, enter password from the keyboard and push [ENT]. The cursor will now move to the value of the first parameter. A new value is set accordingly. Use the arrow key in the numerical keyboard in order to move to the previous/next parameter. [CLR] is used to delete the field indicated by the cursor.

If the password has been entered in a RECIPE screen and a PARAMETER screen is selected next, there is no need to enter the password again.

The RECIPE field of the PARAMETER screen displays the title of the active recipe.

The rest of the basic screens can be accessed directly by means of the touch buttons in the lower part of the display. Drive mode can also be selected directly from this screen.

7.4.2.10 Messages

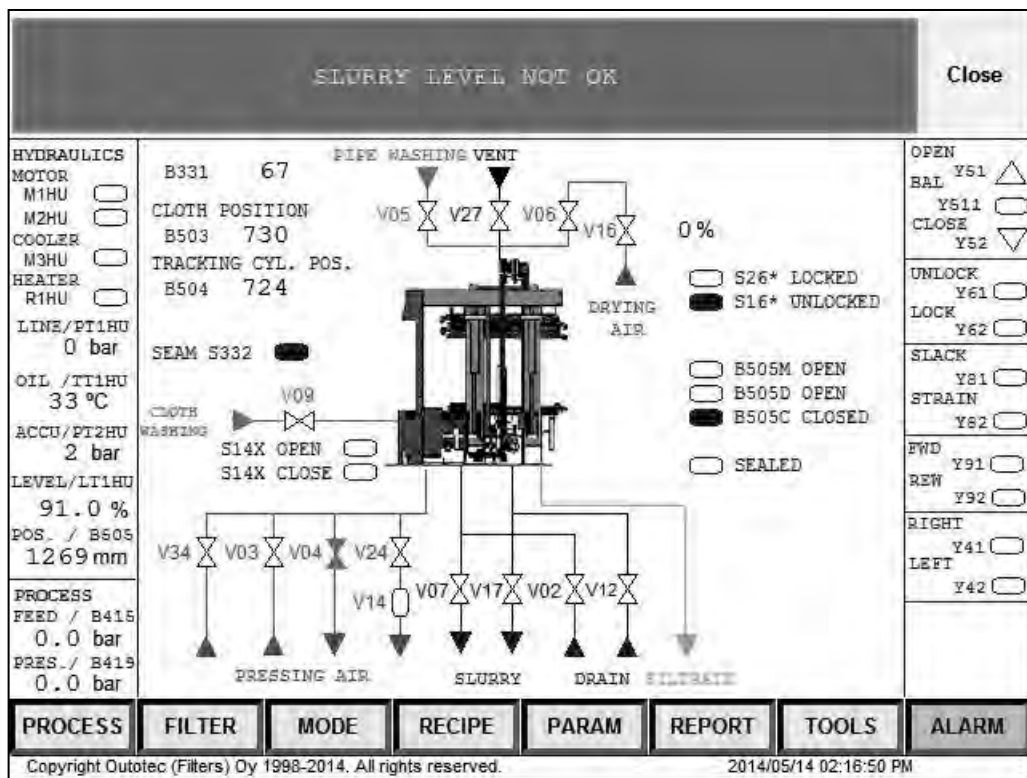


Figure 95. Messages screen

The Outotec filter control system informs the operator of operating situations with a green message runner at the bottom of the screen. For example, when the filter stops without any visible reason, it can be waiting for a discharge permission. The green message runner tells the cause for the filter's stop condition.

The message runner disappears as soon as its cause is removed.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
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7.4.3 Switching on the voltage

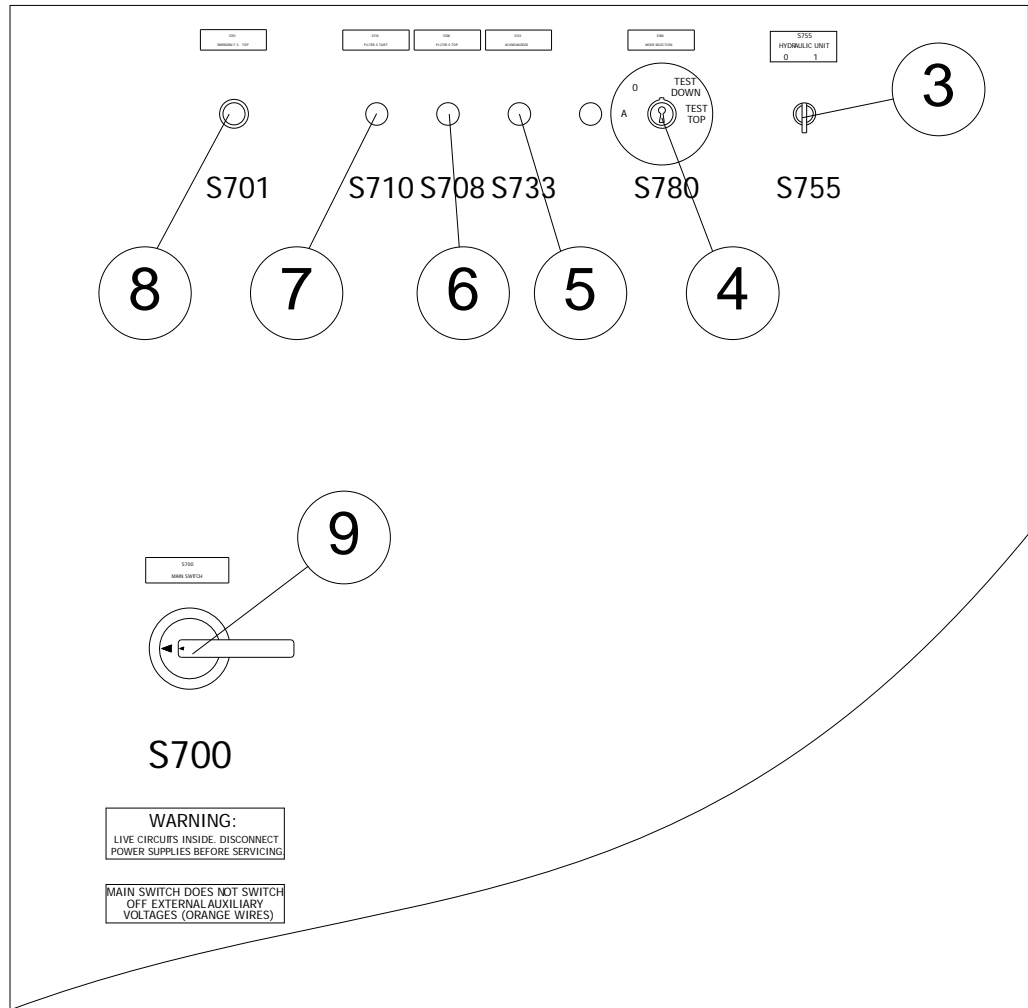


Figure 96. Touch panel buttons

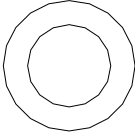
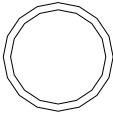
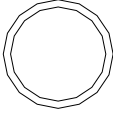
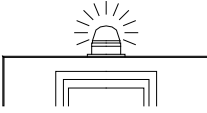
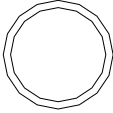
1. Turn the MAIN SWITCH S700 to the ON position.
2. When the main switch is turned ON, the S733/H733 button (5) starts to flash and the S708 / H708 button (6) begins to illuminate. If not, check the main switch and the fuse(s) inside the panel.
3. Make sure that there are no foreign objects between the filter plates.
4. Switch off all "Emergency Stop" buttons.
The status of indicator lamps should be as follows:
 - S710 / H710 = OFF
 - S708 / H708 = ON
 - S733 / H733 = FLASHING
5. Turn the HYDRAULIC UNIT switch S755 (3) to position 1. The hydraulic unit is automatically started and stopped according to the drive mode.

In Test Mode, if no actuator or function is activated within five minutes, the hydraulic unit will stop. The unit restarts as soon as any actuator or function is activated.

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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.3.1 Description of the indicator light functions

Table 23. Description of the indicator light functions

| | |
|--|---|
|  <div style="border: 1px solid black; padding: 2px; text-align: center;"> S701 EMERGENCY STOP </div> | <p>S701 EMERGENCY STOP</p> <p>Emergency stop push buttons are not illuminated.</p> |
|  <div style="border: 1px solid black; padding: 2px; text-align: center;"> S710 / H710 START / RUN </div> | <p>S710 / H710 READY/RUN</p> <p>When flashing slowly, it indicates that the filter is ready for operation.</p> <p>When steadily illuminated, the filter is in operation (RUN).</p> |
|  <div style="border: 1px solid black; padding: 2px; text-align: center;"> S708 / H708 STOP / STOPPED </div> | <p>S708 / H708 STOP/STOPPED</p> <p>When illuminated, it indicates that the filter is stopped.</p> |
|  | <p>In case of alarm, the alarm signal on top of the panel as well as the S733 / H733 button start flashing and an alarm message will appear on the display.</p> |
|  <div style="border: 1px solid black; padding: 2px; text-align: center;"> S733 / H733 ACKNL / ALARM </div> | <p>When S733 / H733 is pushed once the alarm signal will stop flashing, the second push will acknowledge it provided that the cause of the alarm has been eliminated.</p> |

7.4.4 Test mode

The Test mode is used during troubleshooting and routine maintenance of the filter. All valves and motors present on the pressure filter can be individually actuated (with some restrictions) when in the TEST Mode.

The Test Mode can be activated through KEY SWITCH (S780).

7.4.4.1 Using the remote test functions



⚠ DANGER

Before operating the machine, make sure that no one is near the danger zones of the filter.

Outotec Larox pressure filter is provided with two test units. A Handheld test unit and a top test unit are installed in terminal box X12 on the top of the pressure filter. The hand held unit can be connected to left or right side of the filter unit. This allows the handheld unit to be brought to the actuator to be tested facilitating thus maintenance and adjustments of the actuator.

The handheld test unit has an emergency stop push button, test selector switch S714, and two push buttons S723 and S725.

Test mode can be selected only with key switch S780. When the key switch S780 is turned to position test down, the hand held unit is activated. After activated, the handheld test unit can be used. When the key switch S780 is turned to position test top, the top test unit is activated. After activated, the top test unit can be used.

When the test operation is over, turn the selector switch to position “A” in the handheld unit or top test unit. If hand held unit is used put the unit back onto its suspension hook. The filter is ready for normal process use. Select Auto-mode with the key switch S780 on the control panel.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

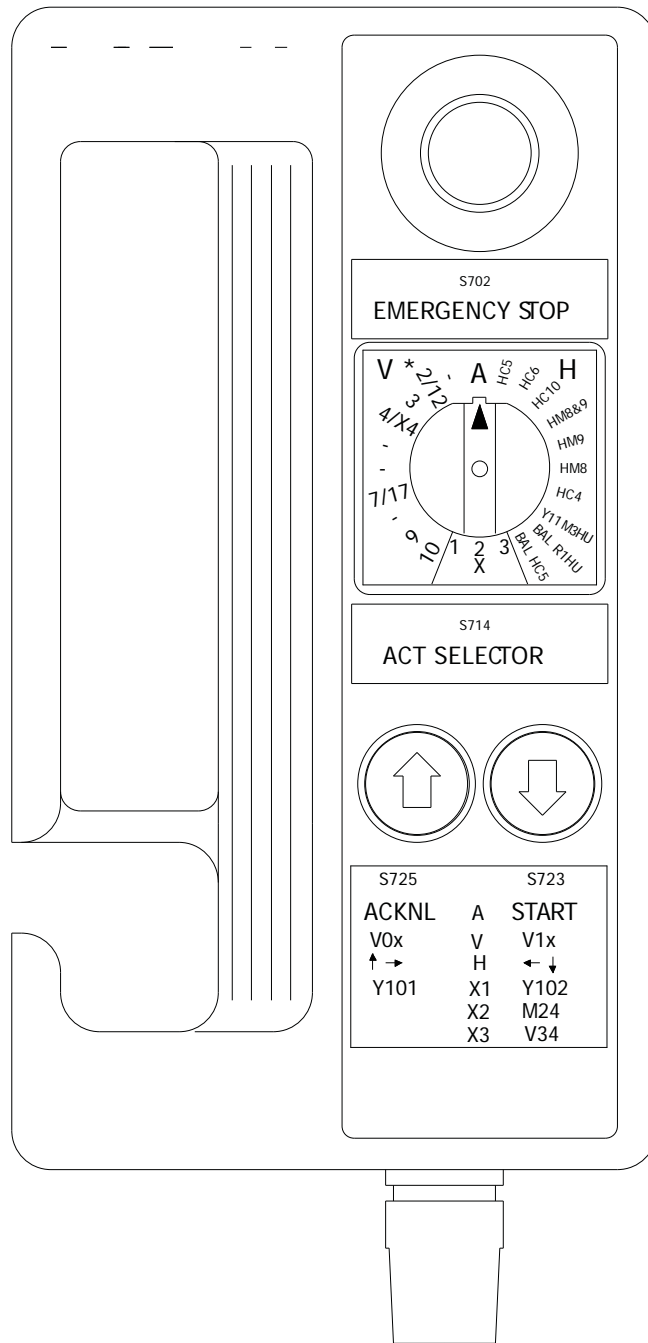


Figure 97. Hand held unit

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

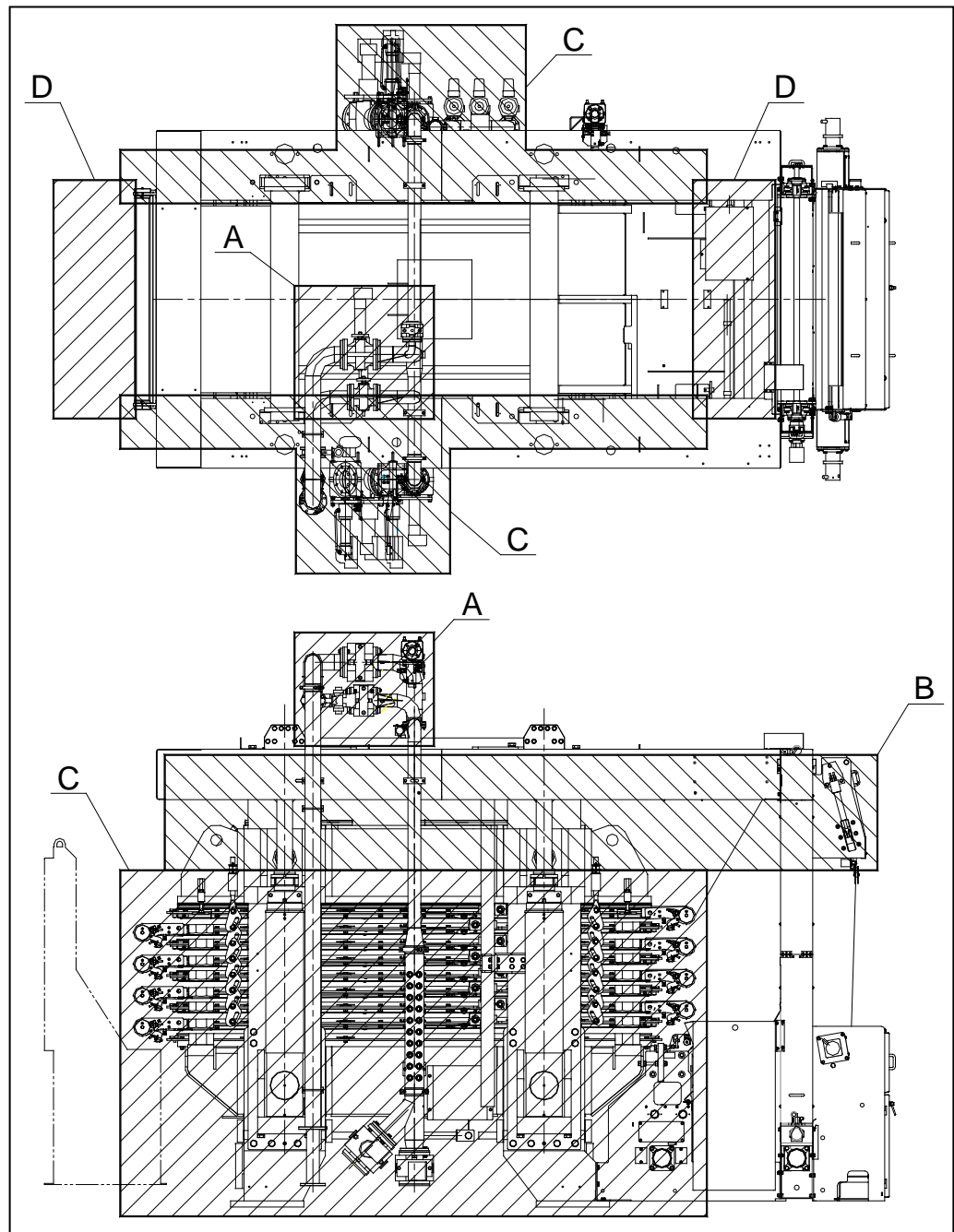


Figure 98. Pressure filter danger zones

Danger zone A

- Shearing (crushing) hazard by pinch valve actuators

Danger zone B

- Crushing hazard between top pressure plate and upper frame
- Drawing-in hazard by the cloth and the rollers

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Danger zone C (both sides)

- Crushing hazard by plate back
- Thermal hazard by plate pack and process pipes*
- Shearing hazard by plate pack suspension plates
- Drawing-in hazard by the rollers
- Cutting hazard by cloth edge
- Shearing (crushing) hazard by pinch valve actuators
- Crushing hazard by the collector**

Danger zone D (both ends)

- Falling hazard by cake chute
- Impact hazard by discharging cake

* Thermal hazard only if process temperature is over 60 °C

** Only on one side

Filter is equipped with several emergency stop buttons. If there is any danger, filter can be stopped immediately by pressing emergency stop button. Never release emergency stop button until it is safe to do so. After all emergency stop buttons are released, emergency stop circuit can be acknowledged by pressing alarm acknowledge push button (S733).

When filter is equipped with protective door system, all filter protective doors must be closed in order to operate filter automatically. If any door is opened during automatic operation filter will stop immediately. Only test mode functions are possible with doors opened.

Emergency stop buttons and protective door limit switches and related safety functions must be tested regularly.

The doors must be closed when testing pressing air inlet valve V03.

7.4.4.2 Emergency stop description

Emergency stop system consists mainly of:

- Programmable safety relay KA100
- Expansion input unit KA101
- Expansion relay unit KA102
- Expansion relay unit KA112
- Expansion relay unit KA110
- Expansion relay unit KA111
- Fieldbus unit to PLC KA130

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Programmable safety relay, base unit, includes 20 digital inputs, 4 digital semiconductor outputs and 2 relay outputs (potential free contacts).

Expansion unit KA101 includes 8 digital inputs.

Expansion unit KA110 includes 8 relay contacts. KA110 is used for hydraulic unit.

Expansion unit KA111 includes 8 relay contacts. KA111 is used for equipments (pumps and motors) outside of filter.

Emergency stop system includes also:

- Emergency Stop Push Buttons S7**
- Door Switches S8**
- Acknowledge Pushbuttons with signal lights for door alarms S741/H741 and S742/H742
- Enable Switch S790

Base unit KA100 includes the safety program. The inputs as well as KA101 inputs are used for controlling the safety signals from safety devices and safety control devices. The outputs are used for controlling the expansion safety relays (KA110, KA111, KA102 and KA112) and other devices.

Fieldbus module KA130 is used for communication with PLC.

7.4.4.3 Emergency stop functions

Auto mode

In Auto mode (Key Switch S780 in Auto mode), the Hand Held unit must be connected in Right Side, near to the terminal box X2. Enable Switch S790 must be connected to opposite corner of the filter and the Enable Switch S790 must be released. The doors must be closed and the door alarms must be acknowledged. When these conditions are true and all the safety relays are ON (KA110, KA111, KA102, KA112), the Auto Ready signal is sent to PLC. In Auto mode the PLC together with Safety System controls the functions of filter and auxiliary equipments.

Test mode

In Test Mode (Key Switch S780 in Test Down or Test Top mode) it is possible to make the maintenance and test functions for the single devices of the filter. In Test mode the Hand Held can be connected on Right side or on Left side.

When Hand Held is connected to Right side, the doors can be open on Right side and similarly when connected to Left side the doors can be open on Left side. If the doors are opened on the other side, there will become a door alarm to that side. In that case close the doors and acknowledge the alarm.

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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

If it is needed to open the doors on both sides, the Enable Switch S790 must be connected on the other side than Hand Held. After that it is possible to open the doors on both sides without alarm.

In Test Down mode it is possible to test the devices on low level of the filter with Hand Held unit.

In Test Top mode it is possible to test the valves on the top of the filter. The selection switch S714 in Hand Held unit must be in Auto mode. The doors on both sides can be open. The valve to be tested is selected by selection switch S712 and test activation will be done by Test Activate push button S765. The switches are located on the top of the filter in X12 or in X15.

Alarms from safety system

If there are any alarms in safety system (“S70* EMERGENCY STOP”, “S8**LT DOORS LEFT SIDE NOT ACKNOWLEDGED” or “S8**RT DOOR RIGHT SIDE NOT ACKNOWLEDGED”), before any device or function can be activated the safety alarms must be acknowledged. All alarms are seen in OIU and can be acknowledged with push button S733. In case of door alarms (H741 or H742 illuminated), acknowledge it with Door Alarm Push Button S741 or S742 before acknowledge it from OIU with S733 (see chapter 7.5.1 Malfunctions and alarms). If H741 or H742 are flashing, door(s) are open.

Expansion safety relay KA110

Emergency Stop Push Buttons are located in different units. S701 in Control cabin X1, S703 in pressing water station, S705 in hydraulic unit, S706 and S702 in Hand Held unit. There can be also some other Emergency stop Push Buttons.

KA110 is controlled only by Emergency Stop Push Buttons.

Expansion safety relay KA111

Expansion Safety Relay KA111 is reserved for motors and equipments outside of filter. All motors and equipments that supply water, slurry or some other material to the filter and equipments that can cause harm or danger to filter or to people, must have contact from KA111 for stopping those devices.

Expansion Safety Relay KA111 is not working in Test mode. In Auto mode it is ON every time when Auto ready conditions are True.

Feedback signal from MCC

Feedback signal from MCC must be ON before Emergency Safety Relay system is possible to acknowledge. With this loop it is controlled that all the motors and equipments must be stopped before the safety system can be activated.

If MCC loop is not ON after emergency stop (by doors or EMS buttons), Emergency Stop relay will have O_FAULT and alarm is seen in OIU “KA100 FAULT IN EMERGENCY STOP RELAY”, when trying to acknowledge the alarm.

| | | | | | | |
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Testing of devices

Testing of valves and hydraulic and pneumatic functions of the filter devices will be done with Hand Held unit. Later there is explanation of the Hand Held unit operation.

Expansion safety relays KA102 and KA112

In terminal box X2 in the filter there is Emergency Stop Expansion Relay KA102. Via this relay the power is activated to solenoid valves and other devices on the low level of the filter.

In Test Down mode KA102 will be activated only when the Test Activate push Button S723 or S725 is pushed in HH unit.

In terminal box X12 on the top of the filter there is Emergency Stop Expansion Relay KA112. Via this relay the power is activated to solenoid valves of process valves on the top of the filter.

In Test Top mode KA112 will be activated only when the Test Activate push Button S765 is pushed in X12 or X15.

If during Test Down mode the doors are open on both sides, in the other side another operator must use Enable switch S790. If the Enable Switch is connected, the doors can be opened without alarm. When the doors are open on both sides, the enable switch must be kept in middle position, before KA102 can be activated and any device or function can be activated.

Safety in testing

Hand Held unit can be connected to both sides of the filter, normally the connectors are in opposite corners. Home place for HH unit is near to terminal box X2 and in Auto mode it must be connected to that side. Enable Switch S790 must be connected in Auto mode to opposite side.

When operator is testing alone, the doors can be open on that side where the HH is connected. For safety reasons the doors on the other side must be closed.

If it is necessary to open the doors on both sides, the other operator must use Enable switch S790.

If Enable switch is connected to other side, it is possible to open the doors without door alarm. For testing it must be pressed first the Enable switch in middle position by one operator and after that the other operator can push the test activate push button in HH unit. The operator can stop the test function by releasing the Enable Switch.

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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.4.4 Indications and alarms in safety relay KA100

The RUN light must be on in relay. This means that the program is running. If there are some FAULTs in the system, the program will be stopped leading to safe condition.

FAULT LED ON:

External error on the base unit, leading to a safe condition, e.g. terminator not connected. The alarm can be seen in OIU.

FAULT LED FLASHING:

Internal error on the base unit. The alarm can be seen in OIU.

I_FAULT LED ON:

External error, leading to a safe condition, e.g. short across the contacts or error on safety mat input. The alarm can be seen in OIU.

I_FAULT LED FLASHING:

Internal error on the base unit. The alarm can be seen in OIU.

O_FAULT LED ON:

External error on the outputs of the base unit, e.g. short across the contacts, leading to a safe condition. The alarm can be seen in OIU.

O_FAULT LED FLASHING:

Internal error on the base unit. The alarm can be seen in OIU.

7.4.4.5 Test selector S714

The Test selector S714 has several functions:

1. When in AUTO position, the eventual alarms during testing can be acknowledged directly from the handheld test unit, the filter can run and top test unit can be used.

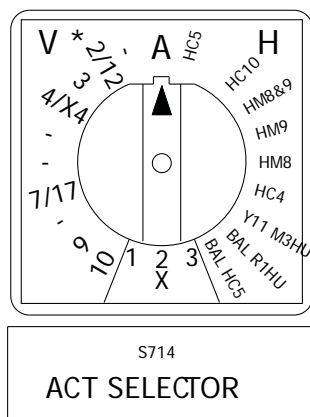


Figure 99. Auto position on test selector S714

| | | | | | | |
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|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

2. VALVE side positions permit the testing of the process valves as shown on switch S714. The left hand side push button S725 activates the valve V0*. The eventual parallel valve V1* can be activated by the right hand side push button S723.

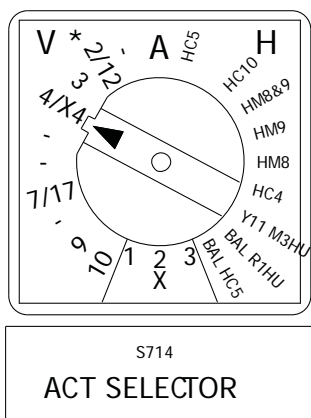


Figure 100. Valve position on test selector S714

3. HYDRAULIC side positions permit testing of the hydraulics and motors as shown on switch S714. Note that there may be two devices or two directions for each position of S714. In case of two devices, the left hand side push button S725 operates the device listed on the left and the right hand side push button S723 operates the device listed on the right. If there are two directions in which the device may operate, the left hand side push button S725 runs the device either upwards or forward and the right hand side push button S723 runs the device either downwards or reverse.

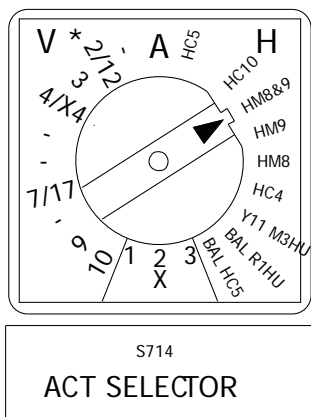


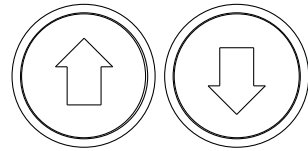
Figure 101. Hydraulic position on test selector S714

Three positions between V and H, are reserved for auxiliary device test functions and are indicated by X1, X2 and X3.

S725/H725 Yellow illuminated push button (leftmost button) This push button activates the hydraulic cylinder or motor selected up or forward when S714 is positioned on the HYDR side, and the valve V0* when S714 is positioned on the VALVE side. This push button also operates as the ALARM ACKNOWLEDGE push button when S714 is in AUTO position.

| | | | | | | |
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| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

S723/H723 Green illuminated push button (rightmost button) This push button activates the hydraulic cylinder or motor selected downwards or reverse operation, when S714 is positioned on the HYDR side, and the valve V1* (parallel to V0*) when S714 is positioned on the VALVE side.



| | | |
|-------|----|-------|
| S725 | | S723 |
| ACKNL | A | START |
| V0x | V | V1x |
| ▲▶ | H | ◀▼ |
| Y101 | X1 | Y102 |
| | X2 | M24 |
| | X3 | V34 |

Figure 102. Push buttons S725/H725 and S723/H723

Testing continues as long as the push button is switched on. Note that cloth drive is provided with positions both with and without cloth tensioning.

7.4.4.6 Restrictions in testing the actuators

- The pressing air inlet valve V03 will operate only when the plate pack is sealed (plate pack is closed and locking pins are locked). Also protective doors have safety locking for opening V03.
- Unlocking the locking pins does not work if there is pressure (pressure transmitter B419) in the pressing manifold.
- The quick action cylinders (up or down) will operate only when the locking pins are fully locked or unlocked.
- The cloth drive will operate only when the plate pack is fully open (B505D must be activated).
- The valves V27 (Manifold ventilation valve) and V37 (CIP-drain valve, OPTIONAL) will operate only by valve test screen.
- Some of the valves can only be tested from the terminal box X12 (or X15, optional) located on top of the filter. See the electrical drawings for reference.

| | | | | | | |
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| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.4.7 List of symbols in handheld test unit

Table 24. List of symbols in handheld test unit

| LABEL | DESCRIPTION | S725 FUNCTION | S723 FUNCTION |
|-------------|--|---|---|
| A | Auto Mode | Alarm Acknowledge | Filter Start |
| HC5 | Quick Action Cylinders | Opening (Up) | Closing (Down) |
| HC6 | Locking Pins | Lock | Unlock |
| HC10 | Cake Chute Cover (optional) | Opening | Closing |
| HM8&9 | Cloth Drive and Tensioning | Forward | Reverse |
| HM9 | Cloth Drive Only | Forward | Reverse |
| HM8 | Cloth Tensioning | Loosing (Down) | Straining (up) |
| HC4 | Cloth Tracking | Cloth Tracking Cylinder Out (the cloth to left) | Cloth Tracking Cylinder In (the cloth to right) |
| Y11 M3HU | Oil Cooler Water Valve - Oil Cooler Motor (Optional) | Oil Cooler Water Valve Open | Oil Cooler Motor M3HU Start |
| BAL | QA Balancing | QA Balancing | |
| BAL R4 | QA Balancing oil heater | QA Balancing | Hydraulic oil heater |
| BAL HC5 | QA Balancing with Quick Action | QA Balancing with QA Upwards | QA Balancing with QA Downwards |
| X3 | Spare | | |
| X2 | Spare | | |
| X1 | Spare | | |
| V*0 | Valve *0 | V00 | V10 Slurry Recycle |
| V*9 | Valve *9 | V09 Cloth Wash | |
| V*8 | Valve *8 | V08 Wash Filtrate | |
| V*7 / 17 | Valve *7 | V07 Manifold Drain | V17 Manifold Drain |
| V*4 / X4 | Valve *4 | V04 Pressing Air Out | V14 Air Mover |
| V*3 / 13 | Valve *3 | V03 Pressing Air In | V13 |
| V*2 / 12 | Valve *2 | V02 Slurry | V12 Slurry |
| V*1 | Valve *1 | V01 Filtrate | V11 |

7.4.4.8 Test selector S712

1. When in AUTO position, the filter can run and handheld test unit can be used.

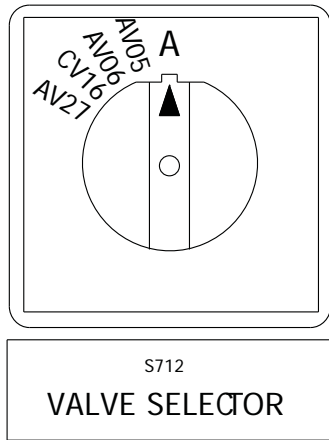


Figure 103. Auto position on valve selector S712

2. VALVE side positions permit the testing of the process valves as shown on switch S712.

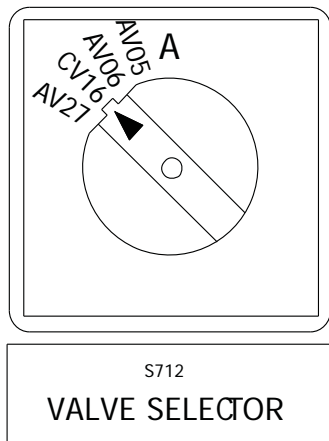


Figure 104. Valve position on valve selector S712

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.4.9 Push button S765

This push button activates the valves V05, V06, V16 & V27, when S712 is positioned on the valve side.

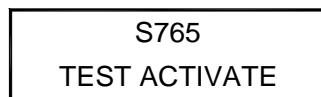
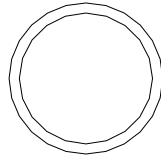


Figure 105. Push button S765



NOTE: The testing continues as long as the push button is switched on.

7.4.4.10 List of symbols in top test unit

Table 25. List of symbols in top test unit

| LABEL | DESCRIPTION |
|-------|---------------------------------|
| A | Auto Mode |
| AV05 | Process water valve |
| AV06 | Drying air valve |
| CV16 | Drying air control valve |
| AV27 | Feed manifold ventilation valve |

7.4.5 Operational modes



NOTE: The picture below is for reference only, and not necessary from your PF48 filter unit.

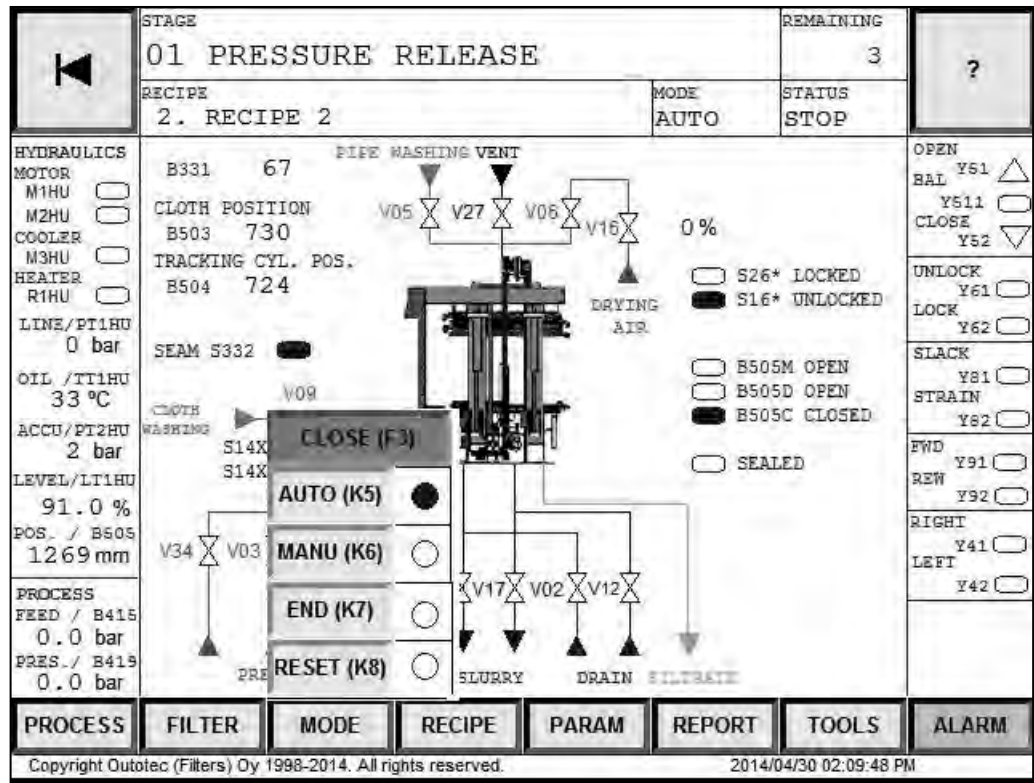


Figure 106. Operational modes screen

The [MODE] touch button is used to select a drive mode. The following drive modes are available:

- AUTO** The filter operates using the preset stage times.
- MANUAL** The filter can be operated one stage at a time. This mode is used e.g. for optimizing the stage times.
- END** When this mode is selected, the filter stops at the end of the cycle in AUTO mode drive.
- RESET** Reset mode is used to e.g. stop a filtering cycle. The filter starts filtering in a controlled manner from the very first stage.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.5.1 Man mode (Manual mode)

The MAN mode can be used when the operator is searching for the optimal values of the process variables as well as when the sequence must be continued from a different point than from where it was stopped, or if the operator wants to run any stage longer than normally.



NOTE: The picture below is for reference only, and not necessary from your PF48 filter unit.

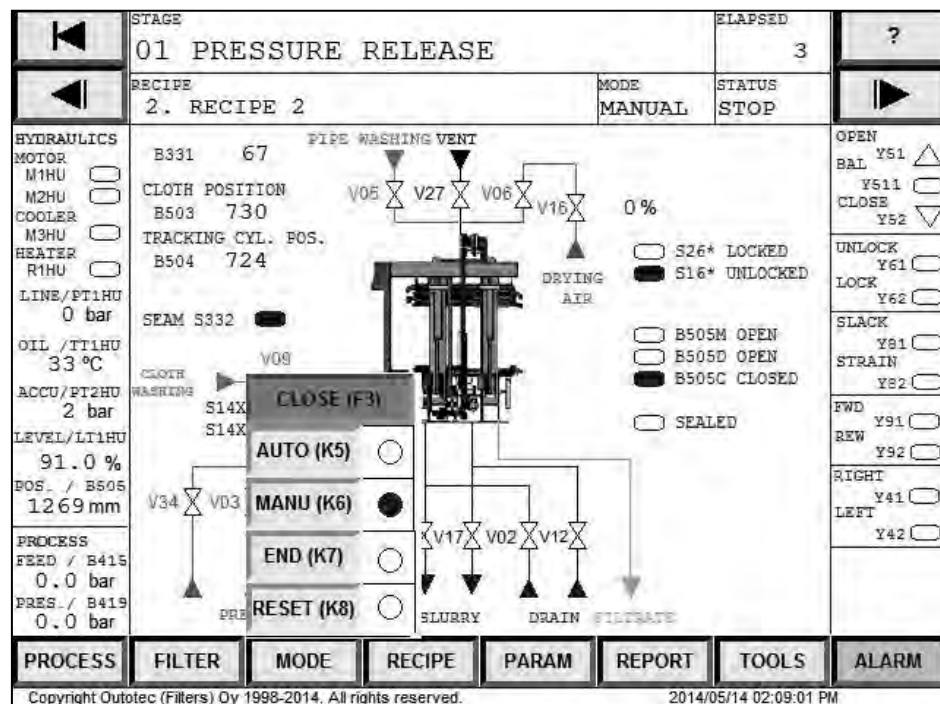


Figure 107. Man mode screen

1. Select MAN MODE from the touch screen and turn the HYDRAULIC UNIT switch S755 to position 1.

The MAN MODE field is now displayed. The field has the following elements:

- [?] Touch button to activate HELP-screen.
- RECIPE Displays the current program.
- STAGE Displays the number of the current stage.
- MODE Displays the current mode. MAN MODE.
- ELAPSED Displays the time elapsed in MAN MODE.
- STATUS Displays the current status, e.g. RUN, READY, ALARM, STOP
- [< |] Touch button to reverse.
- [| >] Touch button to forward.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

2. For PRESSURE RELEASE proceed to step 4. For any other stage, use the [<] or [>] touch buttons for scrolling through the stages. Note that the [<] touch button does not forward the sequence from the beginning to the end, where as the [>] touch button rewinds the sequence from the end to the beginning. Note also that this kind of selection process is possible only when the filter is stopped.
3. To start the filter, push the START button once. Note that prior to starting the filter, the START button should be flashing indicating that the filter is ready to begin operations. In case it fails to do so, make sure that there are no active alarms. Once the filter is running, the START button is illuminated.

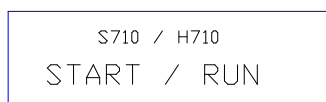
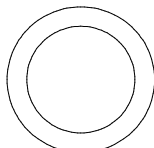


Figure 108. Start / Run button S710 / H710

The time elapsed during filter operations will be displayed in the TIME ELAPSED area.

In MAN MODE time will COUNT UP from zero to show actual time elapsed in the stage currently running.

1. To proceed to the next stage, push the START button once.
2. To stop the filter, push the STOP button. When pushing the STOP button once, it illuminates indicating that the filter has stopped.
3. To restart the filter from the stage, where it was stopped, push the START button.

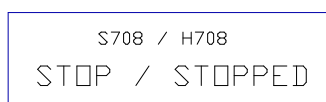
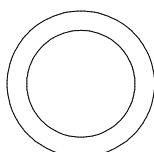


Figure 109. Stop / Stopped button S708 / H708

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Restrictions

1. The filtration stage cannot be selected twice during one operation cycle. If filtration has been going on for 10 seconds or more and is stopped and restarted, the sequence will automatically skip over slurry feeding and continue from pipe and hose washing.
2. The process stages cannot be selected unless the plate pack is fully closed.
3. The discharge stage cannot be selected unless the plate pack is fully open.



⚠ CAUTION

Overfilling can cause serious damage to the filter plates. When in manual mode, supervise the prefiltration and filtration stages.



⚠ WARNING

Hazardous moving parts. The plate pack consists of several moving parts, which can cause serious injury or death. Never leave the filter running by itself in MAN mode.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.5.2 Auto mode (Automatic)

AUTO MODE is the normal operating mode of the filter. All necessary operations to run the filter are automatically executed by the control system.



NOTE: The picture below is for reference only, and not necessary from your PF48 filter unit.

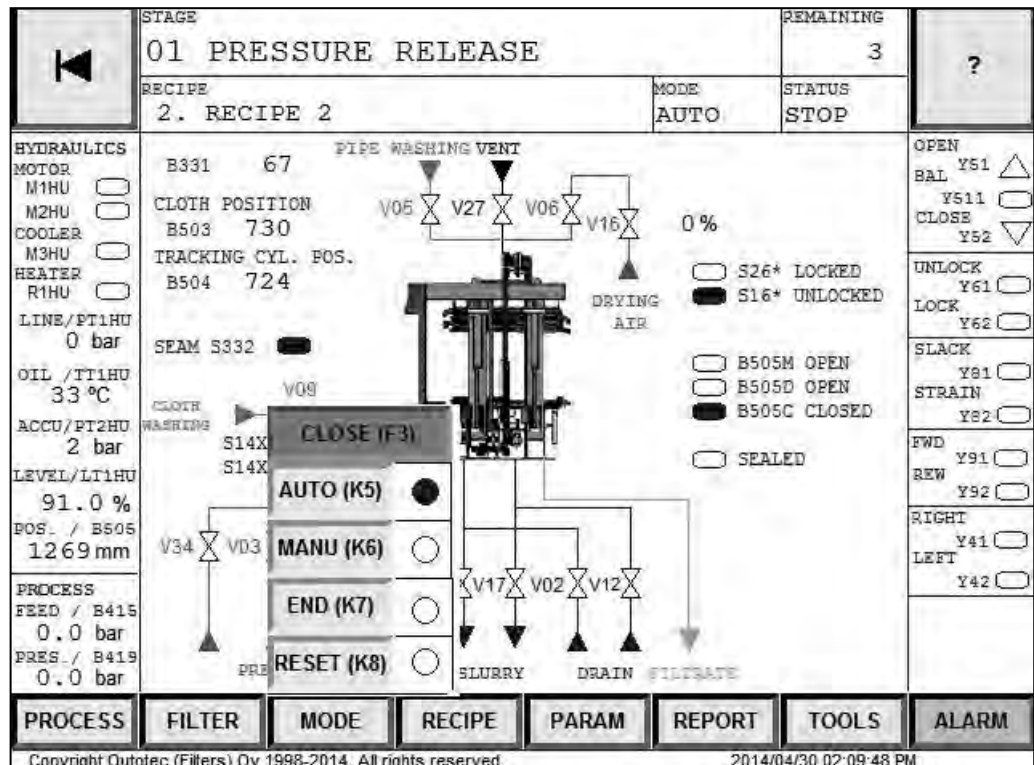


Figure 110. Auto mode screen

1. Select AUTO MODE from the touch screen and turn the HYDRAULIC UNIT switch S755 to position 1.

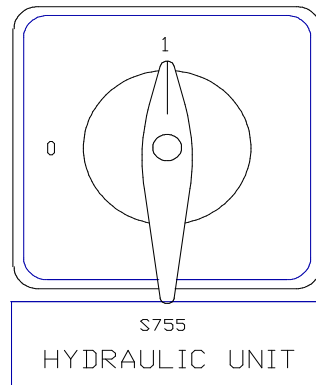


Figure 111. Hydraulic unit button S755

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

The AUTO MODE screen will be displayed. The screen has the following elements:

- [?] Touch button to activate HELP-screen.
 - RECIPE Displays the current program.
 - STAGE Displays the number of the current stage.
 - MODE Displays the current mode. AUTO MODE.
 - REMAINING Displays the time remaining in AUTO MODE.
 - STATUS Displays the current status, e.g. RUN, READY, STOP.
2. To start the filter from the present stage, push the START button once. Note that prior to starting the filter, the START button should be flashing indicating that the filter is ready to begin operations. In case it fails to do so, make sure that there are no active alarms. Once the filter is running, the START button is illuminated.

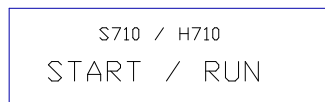
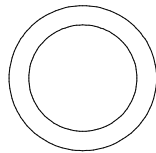


Figure 112. Start / Run button S710 / H710

The time remaining during filter operations will be displayed in the REMAINING area.



NOTE: In AUTO MODE, the time will COUNT DOWN from the preset to show the time remaining in each stage.

3. If you want to start from another stage, see instructions for program RESET in chapter 7.4.7 Reset mode (Sequence reset) and MANUAL START in chapter 7.4.5.1 Man mode (Manual mode).

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

How to stop the filter

To stop the filter, push STOP button. When pushing the STOP button once, it illuminates indicating that the filter has stopped.

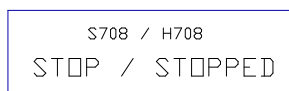
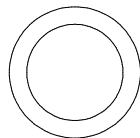


Figure 113. Stop / Stopped button S708 / H708



NOTE: The filter may be stopped due to an alarm or a voltage break.

If the filter has been stopped, and it has been idling for a long period of time, it is recommended that the filter to be driven in the discharge stage in MAN MODE until the full length of the filter cloth has been washed.

Once the full length has been washed, the AUTO MODE can be switched on, to be able to operate the filter normally.

How to restart the filter with automatic drive

If the filter has been stopped due to an alarm or if the STOP button has been pushed, proceed as follows.

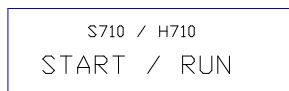
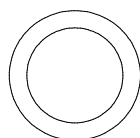


Figure 114. Start / Run button S710 / H710

1. Locate and eliminate the alarm or malfunction prior to restarting the filter (see chapter 7.5.1 Malfunctions and alarms).
2. Push the START button once. The filter restarts from the stage it was stopped in and continues the automatic operation.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.6 End mode (Stop at the end of the cycle)

The END mode is used to stop the filter automatically after complete cycle (after cake discharge), thereby freeing the operator from having to wait for the end of the present cycle.

In this mode the filter will perform an orderly stopping after the end of cake discharge.

All functions in END mode are similar to those in AUTO mode.



NOTE: The picture below is for reference only, and not necessary from your PF48 filter unit.

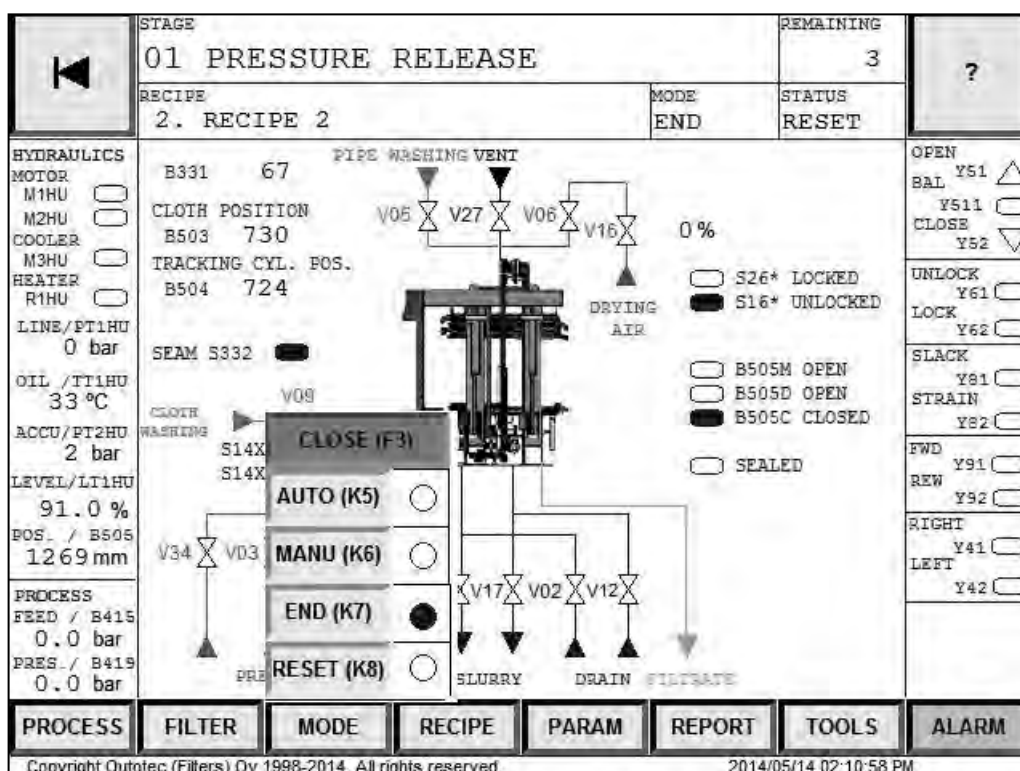


Figure 115. End mode screen

1. Select END mode from the touch screen.
2. The filter will continue its operation through the cycle as if in AUTO mode and stop after the end of cloth washing. At this time the filter will perform an orderly shutdown by closing the plate pack. The filter can be restarted at any time in either MAN mode or AUTO mode by pushing the START button (see chapter 7.4.5.1 Man mode (Manual mode) or 7.4.5.2 Auto mode (Automatic)). The filter will restart from PLATE PACK OPEN after END mode stop.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.7 Reset mode (Sequence reset)

The RESET MODE is used to reset the program sequence back to the PRESSURE RELEASE stage and load into the operational area of the program any new data that has been entered.



NOTE: Before starting the filter from another point than where it was stopped, the program sequence must be reset.

Figure 116. Reset mode screen

1. Select RESET mode from the touch screen. The program then asks for a confirmation and requests you to stop the filter.
2. Push STOP button S708/H708 to RESET the filter program sequence.
3. The default starting stage after resetting the filter program sequence is PRESSURE RELEASE unless the plate pack is fully open. If the plate pack is fully open, the default starting point is CAKE DISCHARGE. To start the filter from another stage, see chapter 7.4.5.1 Man mode (Manual mode).

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.4.8 Operating stages in automation operation

SBR01 Pressure release

For security reasons, pressure release is always the first stage when starting an Outotec Larox pressure filter. During this stage, the remaining pressure in the filter chambers is released for safe plate pack opening. This stage is divided into two periods of time: in the first and main period the inlet valves are closed. During the second period, the manifold drain valves V07 and V17 are opened.

SBR02 Plate pack opening

On completion of the PRESSURE RELEASE the plate pack is opened. The quick action cylinders are then driven to release the pins from the column holes. The locking pins are unlocked (pins move into the upper pressure plate). After the locking pins have been unlocked, the plate pack is opened by driving the quick action cylinders upwards until the plate pack is fully open. The cloth strain starts at the same time as the PLATE PACK OPENING.

SBR03 Cake discharge

When the plate pack is fully open, the cloth drive motor HM09 is started and the cloth wash inlet valve V09 is opened. The cake formed on the cloth is then discharged into the cake chutes at both ends of the filter. After the first plate length of discharge, the speed of the cloth is increased, reducing thus the cloth washing time.

SBR04 Restart operation

Operation delay. The system executes a restart check and proceeds to the next stage.

SBR05 Plate Pack closing

On completion of the restart operations the filter begins to close the plate pack. First the quick action cylinders are moved downwards until the plate pack is completely closed and then the locking pins are locked.

SBR06 Pre-Filtration

When the filter plates are closed and sealed, the slurry is fed to the distribution pipe through V02 and V12 and further to each chamber through the feed collectors. The filtrate passes through the cloth into the filtrate pan and exits the filter chamber via filtrate collectors into the filtrate side pipe and out through the valve V08. Cake begins to form on the cloth. When the filtration time runs out, the filtration stage starts.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

SBR07 Filtration (Slurry feed)

When the filter plates are closed and sealed, the slurry is fed through the distribution pipe to each chamber through the feed collectors. The filtrate passes through the cloth into the filtrate pan and exits the filter chamber via filtrate collectors into the filtrate side pipe and out through the valve V01. Cake begins to form on the cloth.

SBR08 Pipe washing

After the filtration stage, the distribution pipe is cleaned by opening the manifold drain valves V07 and V17 and feeding water through the pipe from cake wash inlet valve V05.

SBR09 Hose washing

After the pipe washing stage, the slurry feed hoses are cleaned by opening the cake wash inlet valve V05 which forces water through the slurry feed hoses and into the filter chambers. The drain valves V07 and V17 are closed.

SBR10 Pressing 1

In the pressing stage, the pressing water is pumped through the pressing water pipe and the hoses into the space above the rubber diaphragms. All the remaining liquid is forced through the cake and it exits the filter.

SBR11 Cake washing (optional)

The washing liquid is fed to the filter chamber through the wash liquid inlet valve V05. The washing liquid washes the cake and passes through the cloth into the filtrate collectors.

SBR12 Pressing 2 (optional)

After the washing stage the washing liquid remaining in the filter chamber is pressed out by introducing the pressing air into the diaphragms, like in the Pressing 1 stage.

SBR13 Drainage of distribution Pipe

After the last pressing stage and before the cake air drying the distribution pipe is drained of water/slurry by opening valves V07, V17 and vent valve V27.

SBR14 Cake air drying

Drying of the cake is accomplished with compressed air. The air enters the distribution pipe through V06 and V16 valves. The air flowing through the cake reduces its moisture content to the optimum value simultaneously emptying the filter chamber from the pressing air.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.5 Alarms and troubleshooting

7.5.1 Malfunctions and alarms

7.5.1.1 General

Extensive diagnostic functions have been programmed into the control system of OUTOTEC Filter.

Alarms that stop the filter immediately

- Emergency stop
- Voltage break

Alarms that stop the filter after a preset delay

- Valve or sensor failure
- Motor failure
- Process pressures
- Cloth drive
- Plate pack movements
- CPU battery low (If the CPU has a battery)
- Failure in hydraulics
- Level of process fluid tanks

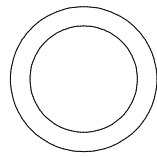
7.5.1.2 Alarm acknowledgement

When in state of alarm, the filter will stop immediately. The ALARM BEACON on top of the control panel and the ALARM RESET button S733 will flash informing alarm or malfunction existing in the filter.

Push the ALARM RESET button once to stop the ALARM BEACON and the ALARM RESET button from flashing.

The ALARM RESET button remains illuminated.

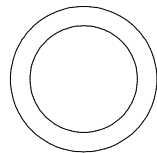
| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|



S733 / H733
ACKNL / ALARM

Figure 117. Acknowledgement / Alarm button S733 / H733

Once the cause of the alarm has been located and eliminated, push the ALARM RESET button again to acknowledge the alarm. Then the filter can be restarted by pushing the START button S710.



S710 / H710
START / RUN

Figure 118. Start / Run button S710 / H710



NOTE: Determine the cause of alarm before restarting the filter.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

7.5.2 Troubleshooting

If the cause of alarm and its corrective measures are not known, the display screen can provide the operator with extensive help in determining the possible reasons for the alarm, and the measures that can be taken to correct it.

Table 26. Troubleshooting

| HOW DISTURBANCE APPEARS | CAUSE FOR DISTURBANCE | WHAT TO DO? |
|--|--|---|
| 1. Leakage between plates during filtering. | Hardened or crystallized cake on seal surfaces under the cloth or foreign material between plates. | Open plate pack, clean plates and wash the cloth. |
| | Defective seal. | Replace the seal. |
| | Bent plate. | Replace or straighten the plate. |
| | Local deflection which does not compensate. | Examine and straighten the sealing surface if necessary. |
| | Counter pressure in the filtrate side. | Check pipelines. |
| | Slurry feed greater than the filter's hydraulic capacity. | Decrease the slurry feed rate. |
| 2. Cake wetter than normal. | Slurry properties have changed. | Install control equipment for slurry. |
| | Damaged diaphragm. | Replace the diaphragm. |
| 3. Cloth slipping sideways off the rollers (displaced). | Cloth seam not perpendicular to the edges. | Repair the cloth. |
| | Rollers not properly positioned. | Adjust the rollers. |
| 4. Folding in the cloth. | Cake sticks to the rollers. | Adjust roller scrapers closer to the rollers. |
| | Bad seam in the cloth. | Repair the clipper seam. |
| 5. Cloth moves jerkily but without slipping on the drive roller. | Cloth seam gets caught on scrapers. | Check the scrapers and adjust if necessary. Check clipper seam and change the cloth if the seam is damaged. |
| | Cloth scrapers retard the cloth. | Adjust the cloth scrapers. |
| 6. The cloth does not move and stops the filter. | The cloth slips on the drive roller due to insufficient cloth tensioning. | Adjust the tensioning pressure. |
| | Cakes are too thick. | Remove the cakes manually. Check the plate feed inlets Check the slurry feed time. |

| HOW DISTURBANCE APPEARS | CAUSE FOR DISTURBANCE | WHAT TO DO? |
|---|--|--|
| 7. Cake gathers on the rollers. | The cloth is insufficiently cleaned. | Adjust the cloth scrapers closer to the cloth. |
| | | Adjust the roller scrapers. |
| | | Check the cloth wash system. |
| 8. Too high solid content in the filtrate. | Hole in the cloth. | Always patch the hole immediately! |
| | Cloth wash does not operate properly. | Check the cloth wash nozzles and their direction. Also check the direction of the nozzle pipes, clean or change clogged nozzles. |
| 9. Blocked grids. | Hole in the cloth. | Always patch the hole immediately! |
| 10. Filtrate outlets and pipes wear out fast. | Cloth wash does not operate properly. | Check the cloth wash nozzles and their direction. Also check the direction of the nozzle pipes, clean or change clogged nozzles. |
| 11. A very thin cake or no cake at all. | Blocked slurry feed inlet. | Clean the slurry feed inlet and check the slurry sieve. |
| 12. Cloth guiding is difficult, cloth edges get frayed, cloth limits give an alarm. | Slide pieces are worn or wrongly adjusted. | Adjust the slide pieces or replace them if necessary. |
| 13. A roller does not rotate or rotates jerkily. | Bearing fail due to damaged seal. | Change the bearing. |
| 14. The chains of the tensioning device do not stay on the sprockets. | The chains have stretched. | Tighten the chains. |
| 15. The pinch valve leaks. | A broken pinch valve sleeve. | Change the sleeve and adjust the actuator. |
| 16. Cloth drive and centering is difficult and cloth life gets shorter. | Ageing of rubber (drive, press and centering rollers). | Change the roller(s). |
| | Too high pressing force (between the drive and press rollers). | Adjust the coil springs of the press roller to the length of 55 mm and change the damaged roller(s). |
| 17. Faults in sub-supplied parts. | | See the manufacturer's instructions. |

7.5.3 Alarm functions

Table 27. Alarms

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|---|--|---|---|
| S70* EMERGENCY STOP (D) | One or more of the emergency stop buttons is engaged. | Emergency stop by the operator. | Find out the reason for the Emergency stop. Make sure that it is SAFE to restart the filter. Release the engaged button(s). Acknowledge the alarm and restart the filter. Emergency-stop buttons are located in the control panel (S701), filter (S707), hand held unit (S702) and the hydraulic unit (S705). If possible do not leave the emergency stop button activated for a longer time because the pinch valves may open, otherwise close the process line manual valves. |
| S801...S810 PROTECTIVE DOOR SENSOR (D) | Protective door sensor indicates that door is open. | Protective door is open. | Close protective door. |
| | | Sensor adjusted wrongly. | Adjust/replace sensor. |
| | | Sensor fault. | Check electrical system. |
| POWER LOSS OR PLC RESTART (H) | PLC stopped and restarted. | Main voltage break. PLC has been in PROGRAM mode. | Check the reason for PLC stop. |
| KA 103 | Emergency stop relay for opening pressing air inlet valve V03 is giving signal when pressing air input valve control solenoid output Y03 is activated. | Locking pin safety sensor indicated that locking pin is not locked. | Check locking pins sensors S261-S264. |
| | | Pressure plate low position sensor indicates that plate pack is not closed. | Check pressure plate low position sensor S865. |
| | | Sealing pressure safety sensor indicates that there is no pressure. | Check electrical system. |
| | | Sensor fault. | Acknowledge the alarm and restart the filter. |
| S865 | Pressure plate low position sensor S865 is not giving signal when pressing air input valve control solenoid output Y03 is activated. | Plate pack not sealed. | Check sensor S865. |
| | | Sensor fault. | Acknowledge the alarm and restart the filter. |

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|---|--|--|--|
| PLC BATTERY LOW (H) | Voltage level of memory backup battery in the Programmable Logic Controller (PLC) has dropped too low. Alarm activated when filter stops. | Battery is low. | Change the backup battery. See PLC manufacturer's instructions from the PLC operation manuals. NOTE! DO NOT REMOVE POWER TO THE FILTER WHILE THIS ALARM IS ACTIVE. |
| B331 CLOTH INCREMENTAL ENCODER (B) | No impulses from incremental encoder when cloth drive activated. | Pressing roller is loose. | Adjust the pressing roller. |
| | | Cloth is cut or too long. | Check the cloth, repair. |
| | | Tensioning mechanism inoperative. | Check the cloth tension. |
| | | Cakes are too thick. Cloth cannot move forward. Water remains in the pressing diaphragms. | Check that the cloth can move freely. |
| | | Encoder has failed. | Replace encoder. |
| S332 CLIPPER SEAM SENSOR (B) | Seam not detected within one cloth revolution or detected in improper place. | Sensor not adjusted properly or has failed. Clipper seam not existing. | Adjust/replace sensor. |
| S332D CLIPPER SEAM DISPLACED (B) | Clipper seam is displaced for closing the plate pack. | Sensor B331 has been faulted or reset. Clipper is inside of plate pack. | Check the function of sensor B331. |
| S838A OR S839A CLOTH DISPLACED TO LEFT OR RIGHT SENSOR (B) | The automatic cloth tracking system has failed to keep the cloth centered. | Cloth not adjusted properly. | Center the cloth using the tracking roller. (If the cloth is badly displaced, loosen the cloth in TEST mode and manually center the cloth). |
| | | Tensioning roller displaced. | Check tensioning roller. |
| | | Cloth seam not straight. Material has piled up on the rollers. Scrapers are not adjusted properly. Jammed roller(s). | Check rollers and scrapers. |
| | | Press roller not evenly adjusted. | Adjust press roller for even pressure against drive roller. |
| | | Sensors not adjusted properly or have failed. | Adjust/replace switch. |

| | | | | | | |
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| NAME (GROUP) | CAUSE | REASON | MEASURES |
|---|---|---|---|
| B503 CLOTH POSITION TRANSM. (F) | Transmitters value out of range (0...1000). | Transmitter B503 not adjusted properly or has failed. | Adjust/replace the sensor. |
| B504 CLOTH TRACKING CYLINDER POSITION TRANSMITTER (F) | The B504 transmitter is located on vicinity of the left end of the tracking roller. Transmitters value out of range. | Transmitter not adjusted properly or failed. | Adjust/replace transmitter. |
| B505M PLATE PACK POSITION SENSOR'S VALUE TOO SMALL (F) | The B505 sensor is located in the center of the upper pressing plate, attached to the top frame. The linear measurement wire is attached to the moving pressing plate and moves up and down with the plate Abnormal signal from sensor B505. The signal value is equal or less than value that indicates B505M minus 6 mm. | Sensor wire disconnected. Sensor has failed. Wiring has failed. | Check the position of upper pressing plate. Adjust/replace sensor and/or wiring. |
| B505C PLATE PACK POSITION SENSOR'S VALUE TOO HIGH (F) | Abnormal signal from sensor B505. The signal value is equal or greater than value that indicates B505C plus 6 mm. | Sensor wire disconnected. Sensor has failed. Wiring has failed. | Check the position of upper pressing plate. Adjust/replace sensor and/or wiring. |
| B505S ABNORMAL MOVE OF PLATE PACK (F) | Abnormal signal from sensor B505. The signal is continuously monitored and compared to respective functions. | Upper Pressing plate not moving properly. | Check movement and position of the upper pressing plate. |
| | | Hydraulic solenoid is jammed. | Check hydraulic solenoids. |
| | | Hydraulic pressure too low. | Check hydraulic pressures. |
| | | Sensor wire disconnected. Sensor has failed. | Adjust/replace sensors. |
| B505D PLATE PACK NOT IN CAKE DISCHARGE POS. (F) | Plate pack is not in cake discharge position when cake discharge stage is active. | The plate pack has flown too down when filter has been stopped. | Check the position of pressing plate. Drive the plate pack up with hand held unit. |
| | | Sensor has failed. Wiring has failed. | Adjust/replace sensor and/or wiring. |

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|--|---|---|---|
| S161...S164 LOCKING PINS UNLOCKED SENSORS (F) S261...S264 LOCKING PINS LOCKED SENSORS (F) | Abnormal state of the displayed sensor when operating the locking pins (locking or unlocking). | Locking pin jammed in the mid position. | Inspect locking pin assembly. Test locking pin movement. |
| | | Hydraulic pressure too low. | Check hydraulic pressures. |
| | | Mechanical failure. Sensor not adjusted properly or has failed. | Adjust/replace sensor. |
| S410 = PS1HU RETURN LINE OIL FILTER PRESSURE SWITCH (G) | Pressure switch PS1HU signals a high differential pressure in the RETURN LINE oil filter. | Return line oil filter is clogged. Oil temp is too low or viscosity improper | Run the hydraulic unit to warm up the oil. If alarm is active when the oil is warm, replace the oil filter. |
| | | Cable is disconnected. | Reconnect the cable. |
| | | Pressure switch PS1HU has failed. | Replace PS1HU. |
| S412 = PS2HU OIL FILTER PRESSURE SWITCH (G) | The differential pressure switch PS2HU signals a high differential pressure. | Oil filter is clogged. Oil temp is too low or viscosity improper | Run the hydraulic unit to warm up the oil. If alarm is active when the oil is warm, replace the oil filter. |
| | | Cable is disconnected. | Reconnect the cable. |
| | | Pressure switch PS2HU has failed. | Replace PS2HU. |
| LT1HUL OIL LEVEL LOW (G) | Oil level transmitter LT1HU in hydraulic oil reservoir is indicating low oil level. | Leak in the hydraulic system. | Check the oil level and add oil if necessary. Check the system for oil leaks. Never run the hydraulic pump if the tank is empty! |
| | | Level transmitter LT1HU has failed. | Replace LT1HU. |
| TT1HUL OIL TEMPERATURE LOW (G) | Oil temperature transmitter TT1HU in hydraulic oil reservoir is indicating low oil temperature (below 10 °C). | Oil heater is off. | Check the oil heater is on. |
| | | Ambient temperature is low. | Check oil temperature from the thermometer TM. Allow heater to warm up the oil for 30 minutes. |
| | | Transmitter TT1HU has failed. | Replace TT1HU. |

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|---|---|--|---|
| TT1HUH OIL TEMPERATURE HIGH (G) TS1HU OIL TEMPERATURE HIGH HIGH THERMOSTAT (G) | Oil temperature transmitter TT1HU in hydraulic oil reservoir is indicating high oil temperature (TT1HU above 65 °C / TS1HU above 70 °C). | Oil cooler is off. | Check the oil cooler OC is on. |
| | | Oil heater has failed on. | Check the oil heater R1HU is off. Check oil temperature from the thermometer TM. Allow cooler to cool down the oil for 30 minutes. |
| | | Transmitter TT1HU has failed. Thermostat TS1HU not adjusted properly or has failed. | Check adjustment of TS1HU. Replace TT1HU / TS1HU. |
| TT1HUHH OIL TEMPERATURE HIGH T>70 °C (G) | Oil temperature transmitter TT1HU in hydraulic oil reservoir is indicating high oil temperature (above 70 °C). | Oil cooler is off. | Check that the oil cooler OC is on. |
| | | Oil heater has failed on. | Check that the oil heater R1HU is off. Check oil temperature from the thermometer TM. Allow cooler to cool down the oil for 30 minutes. |
| | | Transmitter TT1HU has failed. | Replace TT1HU. |
| PT1HUC CLOSING PRESSURE HIGH (G) | Oil pressure transmitter PT1HU in the HPU hydraulic block is indicating high oil pressure (above 60 bar) during plate pack closing before sealing.. | Proportional pressure control has failed. | Check oil pressure. Adjust or replace proportional pressure control. |
| | | Counter balance valve CB51 not properly adjusted. | Adjust counter balance valve CB51. |
| | | Foreign object(s) between plate pack mechanism. Plate pack mechanism or quick action cylinders have failed. | Check plate pack mechanism and quick action cylinders. |
| | | Transmitter PT1HU has failed. | Replace PT1HU. |

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|--|--|--|--|
| PT1HUL SEALING PRESSURE LOW (G) | Oil pressure transmitter PT1HU in the HPU hydraulic block is indicating low oil pressure (below 100 bar) during plate pack sealing. | Proportional pressure control has failed. | Check oil pressure. Adjust or replace proportional pressure control. |
| | | Adjustment of sensor B505 is not correct. | Adjust sensor B505. |
| | | Adjustment of the plate pack is not correct, too few adjustment plates. | Adjust the plate pack correctly; add adjustment plate(s). |
| | | Transmitter PT1HU has failed. | Replace PT1HU. |
| PT1HUH SEALING PRESSURE HIGH (G) | Oil pressure transmitter PT1HU in the HPU hydraulic block is indicating high oil pressure (above 200 bar) during plate pack sealing. | Proportional pressure control has failed. | Check oil pressure. Adjust or replace proportional pressure control. |
| | | Adjustment of sensor B505 is not correct. | Adjust sensor B505. |
| | | Foreign object(s) between plate pack mechanism. Adjustment of the plate pack is not correct, too many adjustment plates. | Adjust the plate pack correctly; remove adjustment plate(s). |
| | | Plate pack mechanism or quick action cylinders has failed. | Check plate pack mechanism and quick action cylinders. |
| | | Transmitter PT1HU has failed. | Replace PT1HU. |
| S531 DIAPHRAGM LEAKAGE SENSOR (F) | S531 sensor is detecting moisture (slurry or water) in pressing manifold. | Diaphragms are leaking. | Check if diaphragms are leaking. Check broken diaphragms. |
| | | Sensor S531 has failed. | Change sensor S531. |
| S532 V06 LEAKAGE SENSOR (F) | S532 sensor is detecting moisture (slurry or water) in drying air manifold. | V06 sleeve are leaking. | Check if V06 sleeve are leaking. Check broken V06 sleeve. |
| | | Sensor S532 has failed. | Change sensor S532. |
| M1HU HYDRAULIC PUMP MOTOR (C) M2HU HYDRAULIC PUMP MOTOR FOR ACCU LOAD (C) M3HU OIL COOLER MOTOR (C) | No feedback signal after K1M** output turns on, or the feedback signal still on after K1M** output turns off. Alarm delay 2 sec. | Safety switches open. Fuse tripped. | Reset switches. Replace fuses. Test the motor in question with TEST mode. NOTE: plate pack must be closed if pressing water pump is tested. |

| | | | | | | |
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| NAME (GROUP) | CAUSE | REASON | MEASURES |
|--|--|---|--|
| M06 CLOTH WASH PUMP MOTOR (C) (OPTIONAL) M08 CKE CONVEYOR (C) M09 SLURRY PUMP MOTOR (C) M15 CAKE WASH PUMP MOTOR (C) (OPTIONAL) | No feedback signal after K1M** output turns on, or the feedback signal still on after K1M** output turns off. Alarm delay 5 sec. | Safety switches open. Fuse tripped. | Reset switches. Replace fuses. Test the motor in question with TEST mode. |
| R1HU OIL HEATER (C) | No feedback signal after K1R1HU output turns on, or the feedback signal still on after K1R1HU output turns off. Alarm delay 2 sec. | Fuse tripped. | Replace fuses. Test the heater by TEST MODE. |
| CCOL1 CONTROL CIRCUIT OVERLOAD IN X1 (H) | Automatic fuse FDC2 has tripped. Alarm delay 1 sec. | Overload. Short circuit. Lose wire connection. | Reset the tripped device. Measure the current of the device and find out the reason for the overload. |
| CCOL2 CONTROL CIRCUIT OVERLOAD IN X2 (H) | Automatic fuse FDC22 has tripped. Alarm delay 1 sec. | Overload. Short circuit. Lose wire connection. | Reset the tripped device. Measure the current of the device and find out the reason for the overload. |
| ***F MOTOR OVERLOAD (C) | Thermal overload relay or motor protector has tripped. | Overload. Short circuit. Lose wire connection. | Reset the tripped device. Measure the current of the device and find out the reason for the overload. Clean the motor. |
| VALVE SENSORS S1** is open sensor. S2** is closed sensor. | Abnormal state of sensor in valve V**. | Instrument air / hydraulic oil pressure low. Break in pneumatics/ hydraulics. Sensor not adjusted properly or has failed. Break in electrical wiring. Blown fuse in terminal box. | Actuate the valve in question in TEST mode. Follow the indicator LED's in the valve circuit for easy troubleshooting. Check instrument air/lines. Adjust/replace sensors. Check electrical system. |
| B415M FEED MANIFOLD PRESSURE HIGH (E) | Feed manifold pressure transmitter B415 is indicating too high pressure (above max. operating pressure set point in auxiliary parameters, typically 16.0 bar). | Slurry feed, wash water or drying air system produces excessive pressure. | Check feed manifold pressure from the pressure gauge. Correct the reason for over pressure. |
| | | Transmitter B415 has failed. | Replace B415. |

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|--|---|--|---|
| B415F SLURRY FEED PRESSURE LOW (E) | Feed manifold pressure transmitter B415 is indicating low slurry feed pressure while slurry pump is running and slurry inlet valve V02 is open. | Slurry feed pump inoperative or cavitating. | Start the slurry feed pump. |
| | | Slurry tank is empty. | Maintain correct slurry level. |
| | | Manual valve closed. | Open the manual valve. |
| | | Pressure set point "MINIMUM FEED PRESSURE" incorrectly set. | Enter correct value into "MINIMUM FEED PRESSURE" set point. |
| | | Transmitter B415 has failed. | Adjust/replace pressure transmitter B415. |
| B415H HOSE WASH PRESSURE (E) LOW B415C CAKE WASH PRESSURE LOW (E) | Feed manifold pressure transmitter B415 is indicating low wash water pressure during HOSE WASH or CAKE WASH stage. | Wash water pump inoperative or cavitating. | Start the wash water pump. |
| | | Wash water tank is empty. | Maintain correct wash liquid level. |
| | | Manual valve closed. | Open the manual valve. |
| | | Pressure set point in Data 2 for HOSE WASH or CAKE WASH stage incorrectly set. | Enter correct value into Data 2 set point. |
| | | Transmitter B415 has failed. | Adjust/replace pressure transmitter B415. |
| B415A DRYING AIR PRESSURE LOW (E) | Feed manifold pressure transmitter B415 is indicating low drying air pressure immediately after opening the valve V06 during DRYING stage. | Compressor not running. | Start up the compressor. |
| | | Manual valve closed. | Open the manual valve. |
| | | Low air pressure/volume. | Check operation of compressor. |
| | | Pressure set point in Data 2 for DRYING stage incorrectly set. | Enter correct value into Data 2 set point. |
| | | Transmitter B415 has failed. | Adjust/replace pressure transmitter B415. |
| B415N FEED MANIFOLD PRESSURE NOT RELEASED (E) | Feed manifold pressure transmitter B415 is indicating too high pressure after opening the drain valve V07. | Drain pipe is clogged. Slurry strainer is clogged. | Ensure that pressure in feed manifold is released. Clean the pipeline. |
| | | V07 valve is failed. | Check operation of valve V07. |
| | | Transmitter B415 has failed. | Adjust/replace pressure transmitter B415. |

| NAME (GROUP) | CAUSE | REASON | MEASURES |
|--|--|---|---|
| B419M PRESSING MANIFOLD PRESSURE HIGH (E) | Pressing manifold pressure transmitter B419 is indicating too high pressure (above max. operating pressure set point in auxiliary parameters, typically 16.0 BAR). | Pressing system produces excessive pressure. | Check pressing manifold pressure from the pressure gauge. Correct the reason for overpressure. |
| | | Transmitter B419 has failed. | Replace B419. |
| B419P PRESSING MANIFOLD PRESSURE NOT REACHED (E) | Pressing manifold pressure transmitter B419 is indicating low pressing manifold pressure after closing the valve V04 and opening the valve V03. | Valve V03 not opening. Valve V04 is not closed. | Ensure valves V03 and V04 are operating normally. |
| | | Manual valve is closed. | Open the manual valve. |
| | | Pressing air system pressure too low. Pressure set point in "MINPRPRE" is incorrectly set. | Enter correct value in "MINPRPRE" set point. |
| | | Transmitter B419 has failed. | Replace B419. |
| B419N PRESSING MANIFOLD PRESSURE NOT RELEASED (E) | Pressing manifold pressure transmitter B419 is indicating too high pressure after opening the pressing air outlet valve V04. | Too short air drying time. Outlet pipe is clogged. V04 valve failed. V03 valve failed. | Ensure that pressure in manifold is released. Adjust DRYING time to allow the pressing air to escape. Clean the pipeline. |
| | | Transmitter B419 has failed. | Replace B419. |
| B415D FEED MANIFOLD PRESSURE TRANSMITTER DRIFT (E) B419D PRESSING MANIFOLD PRESSURE TRANSMITTER DRIFT (E) | Signal from transmitter that pressure does not fall below 0.5 bar when it should. | Feed manifold drain valve V07 inoperative. Drain pipeline blocked. Pressing water return valve V04 inoperative. | Measure mA signal (4 - 20mA) when pipeline pressure is zero. Check feed manifold drain pipeline. |
| | | Transmitter not adjusted properly or has failed. | Adjust/replace pressure transmitter. |
| B491 CLOTH WASH WATER PRESSURE ALARM (E) | B491 transmitter is not detecting pressure while cloth is washed. | Hand valve is closed. | Check if hand valves are closed and open them. |
| | | Filter is blocked. | Check and clean wash water filter. |
| | | Transmitter B491 has failed. | Change transmitter B491. |
| SLLO SLURRY LEVEL LOW (E) | The signal from SLURRY TANK LOW LEVEL switch is missing and causes the filter to stop at the end of cycle. | Slurry tank is empty. Level switch is faulty adjusted or failed. | Check the slurry level and level switch. Check the signal coming to the control panel. |

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| NAME (GROUP) | CAUSE | REASON | MEASURES |
|--|---|--|--|
| S418 INSTRUMENT AIR PRESSURE LOW (E) (OPTIONAL) | The signal from pressure switch S418 is missing for more than 30 seconds. | Instrument air pressure low. Pressure switch faulty adjusted or failed. | Check instrument air pressure. Check pressure switch. Open manual valve. Start up compressor. |
| X* COMMUNICATION ERROR NODE * (H) | Node X* is not available. | Bus cable is loose. | Check the bus cable. |
| | | I/O card is loose or faulted. | Check I/O cards. |
| BUS FIELD BUS FAILURE (H) (It depends on the control system type) | Field bus disconnected or failed. | Bus cable is loose. | Check the bus cable. |

8 Maintenance



⚠ CAUTION

Appropriate protective equipment, such as a safety helmet, goggles, protective overalls, protective footwear, safety gloves, ear protection, a respirator etc. must be used whenever needed.



When carrying out maintenance or repair work, make sure the machine cannot accidentally be turned on by performing the appropriate lockout-tagout procedures.



⚠ DANGER

Hazardous moving parts. Moving parts of the machine will cause serious injury or death. Stop the machine completely before maintenance, repairs or disassembly.



Electrocution hazard. Electrocution will cause serious injury or death. Cut the power supply to the machine before maintenance, repairs or disassembly.



Hydraulic fluid injection hazard. High-pressure hydraulic fluid spray can penetrate the skin and will cause death or serious injury.



⚠ WARNING

High-pressure air injection hazard. High pressure air spray can cause death or serious injury. Make sure that the pneumatic system is not pressurized before maintenance, repairs or disassembly.

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8.1 Planned maintenance

8.1.1 Scheduled maintenance

Table 28. Scheduled maintenance

| MAINTENANCE PERIOD X FILTERING CYCLE OR LIFETIME | | | | | | |
|--|---|---|---|---|---|---|
| OBJECT | A = DAILY B = WEEKLY C = MONTHLY D = SEMI-ANNUALLY 15 000 X E = YEARLY 30 000 X | | | | | 1 = CHECK/FILLING 2 = CHANGE |
| | A | B | C | D | E | OPERATION |
| Operator panel | | | | 1 | | Clean if necessary. |
| Diaphragm | | | | 1 | 2 | Visual check for wear and tear. Refer to chapters 8.2.11 - 8.2.14. |
| Emergency stop switches | | 1 | | | | Verify operation by testing. |
| Filter cloth | 1 | | | | | Cloth condition / centering. Refer to chapter 8.2.6. |
| Seam of filter cloth | 1 | | | | | Check condition of seam wire. Refer to chapter 8.2.6. |
| Filter plates | | | 1 | | | Check grids + plates straightness. Refer to chapter 8.2.7. |
| Suspension plates | | | | | 1 | Check / change. Refer to chapter 8.2.25. |
| Grease nipples | | 1 | | | | Lubrication. Refer to chapter 8.1.2. |
| Hoses | | | 1 | | 2 | Hose fixing and condition. Refer to chapter 8.2.20. |
| Hydraulic unit | | 1 | | | | Check for leaks and reservoir oil level. |
| Hydraulic piping and hoses | | | 1 | | | Check connections and change hoses in every 3 years. |
| Hydraulic cylinders | | | 1 | | | Check for corrosion, scratches, leaks and mounting hardware for torque. Refer to chapter 8.2.24. |
| Hydraulic motors | | | | 1 | | Check for overheating, leaks and abnormal sounds. |
| Hydraulic motor couplings | | | | 1 | | Check flexible element and change if necessary. |

| MAINTENANCE PERIOD X FILTERING CYCLE OR LIFETIME | | | | | | |
|---|---|---|---|---|---|--|
| OBJECT | A = DAILY B = WEEKLY C = MONTHLY D = SEMI-ANNUALLY 15 000 X E = YEARLY 30 000 X | | | | | 1 = CHECK/FILLING 2 = CHANGE |
| | A | B | C | D | E | OPERATION |
| Hydraulic oil | | | | 2 | | Change or fine filtration. |
| Hydraulic pressures | | 1 | | | | During operation. |
| Limit switches | | 1 | | | | Fixing, operation. |
| Action of rollers | | | 1 | | | For replacement refer to chapter 8.2.22. |
| Plate seal | | 1 | | | 2 | Check for wear and tear. Refer to chapter 8.2.9. |
| Pressure adjustment devices for the pressing media (optional devices) | | | 1 | | | Adjust. |
| Pressure switches | | | | 1 | | Check mounting, cleanliness and mechanical condition. Refer to filter layout in electrical drawings for a list of targets. |
| Roller bearings and seals | | | | | 1 | Check warming up, sound and lubrication. For replacement refer to chapter 8.2.9. |
| Scrapers | | | 1 | | | Adjust. Refer to chapter 8.2.19. |
| Sealing pressure | | | 1 | | | Adjust. |
| Slide pieces | | 1 | | | 2 | Adjust and replace if necessary. Refer to chapter 8.2.16. |
| Tensioning device | | | 1 | | | Check + adjust tightness of chains. Refer to chapter 8.2.21. |
| Valve actuators | | | | 1 | | Visual check for leaks. |
| Valves | | | 1 | | | Visual check for corrosion and leaks. |
| Wash nozzles + filter | | 1 | | | | Clean and replace if necessary. Refer to chapter 8.2.23. |
| Lubricators | | | 1 | | 2 | |



NOTE: As far as standard components are concerned, follow the manufacturer's instructions.

| | | | | | | |
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8.1.1.1 Daily maintenance

The daily inspection and maintenance measures, when the filter is started and stopped:

- Remove cake and foreign particles from between the filter plates and on the filter cloth.
- When the filter is operated in cold conditions and the temperature of the hydraulic oil has sunk below the recommended temperature for the oil in question, operate the filter first without slurry. Check the operation of the oil heater.
- The filter cloth must be free of holes and folds. Check cloth tracking.
- During the first filtration cycle, check that all filter plates have a cake of even thickness (i.e. the feed pipe connections are open).
- When the filter is stopped, complete the filtration by filling the filter with water. This enables you to clean the feed holes and grid space. Dry slurry stuck in the feed holes causes pressure differences, which may bend the filter plates. If corrosive slurries have been filtered, wash the filter outside, too.

8.1.1.2 Regular maintenance

As far as standard components are concerned, follow the manufacturer's instructions.

8.1.1.3 Weekly maintenance

- Visual inspection of the scrapers
- Checking the emergency stop function
- Condition and fixing of the limit switches
- Checking the pressure of the hydraulics. Check hydraulic pressures during ON cycle, when the filter is in operation (see the pressure values in the hydraulic diagram).
- Observing the condition of slide pieces
- Filling the grease nipples

8.1.1.4 Monthly maintenance

- Inspect filter plates, seals and diaphragms.
- Check the filter plates are straight and that the plates in the plate pack are in line.
- Check the hydraulic pipeline hoses.
- Check the hydraulic cylinders and fixings.
- Check the operation of locking pins.
- Check the chains and sprockets.

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8.1.1.5 Semiannual maintenance

- Analyze the hydraulic oil. Change the hydraulic oil or carry out fine filtration of the hydraulic oil with a separate filtration unit if necessary. The first oil analysis is 1 month after start up. Oil recommendations have been presented in the hydraulic unit instructions of this manual.
- Thoroughly check the filter. Fix paint system where required.

8.1.1.6 Replacement of wearing parts



NOTE: If the conditions are corrosive and the operating temperature is above 60 °C, special instructions must be required from the manufacturer.

Pinch valve sleeves, filter cloth, pressing diaphragms, plate pack seals, slide pieces and scrapers must be changed immediately when noticed in order to prevent greater break up.

8.1.2 Lubricant recommendations

These lubrication instructions are for general use, and should not be used as a reference in special conditions. Lubricate the following items with a grease gun or brush regularly:

- Chain of the cloth tensioning device
- Centralized lubrication points
- Roller grease nipples

| | | | | | | |
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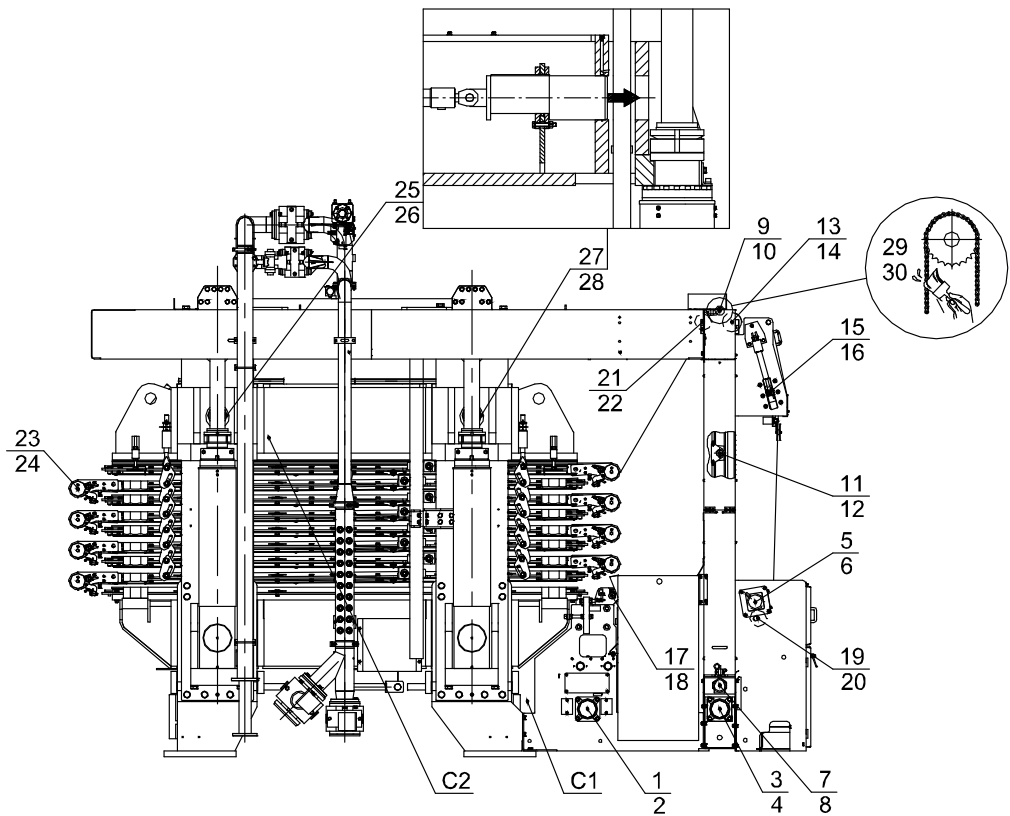


Figure 119. Lubrication points

Table 29. Lubrication points

| POINT | DESCRIPTION | LUBE | AMOUNT | INTERVAL |
|----------------|--|---------------|-----------------|----------|
| C1 | Centralized lubrication for points 1 - 8 | SKF LGEV 2/50 | 80g | 1 week |
| 1 - 4 | Nipples in roller bearings | | | |
| 5 - 6 | Nipples in drive shaft | | | |
| 7 - 8 | Nipples in tensioning shaft | | | |
| 9 - 12 | Automatic lubricators | LAG 125 VA | 125g cartridge | 1 year |
| 13 - 22 | Nipples in roller bearings | SKF LGEV 2/50 | 10 g / nipple | 1 month |
| 23 - 24 | Nipples in plate rollers | SKF LGEV 2/50 | 10 g / nipple | 1 week |
| C2 | Centralized lubrication for points 25 - 28 | Shell Alvania | 100 g | 1 month |
| 25 - 28 | Locking pins | | | |
| 29 - 30 | Chains of tensioning device | Shell Alvania | Lube with brush | 1 month |

8.2 Maintenance procedures

8.2.1 Safety

Before starting any maintenance work:

- Make sure you know the structure of the filter.
- Get familiar with all different operation stages of the filter.
- Learn how to use the control panel push buttons.
- Study all safety regulations.

The filter operates automatically; never start any maintenance or repair work when the filter is energized.



CAUTION

Do not fix maintenance tools in the filter.

Inspect the condition of the distribution pipelines and hoses for wear and tear, as well as their joints.

For possible emergency situations during maintenance, there are several emergency stop switches on the machine. They are situated on the control panel, on the side of the filter cloth conveyor unit casing, on the pressure water station and on the HH unit. The emergency stop switches stop the filter immediately. Ensure the emergency switches are released before a restart.

The filter uses hydraulic pressures so in case of possible failure the pressure is released immediately. The filter is always open on its filtrate side.

Check the hose guards are in place, because they receive the force of the pressure blow in case of possible hose damage.

When changing the filter cloth, beware of the pinch points formed by the rollers.

If the filter is located in a place with a danger of explosion, make sure the filter cloth does not move before it is wetted all around with conductive liquid, for example, water.



CAUTION

If the filter cloth is moved while dry, ensure there are no hazardous gases, dust or any other explosively sensitive materials in the same space with the filter.

If there are explosively sensitive materials in the space where the filter cloth has to be moved, follow the mill practice when carrying out maintenance work (for example welding at the same area).

| | | | | | | |
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The reason for these safety precautions is a possibility of electrical charging of the filter cloth. The filter cloth charges with static electricity under some conditions. If the particles attaching to the filter cloth are electrically non-conductive, they can create a spark associated with rapid electrostatic discharge (ESD).

8.2.2 Using safety devices prior to maintenance

There are four different energy sources related to PF Filter:

1. Hydraulic pressures from hydraulic power unit and accumulator circuit.
2. Electric power from power supplies.
3. Process pressures from process pipe lines.
4. Compressed air pressures from compressors and reservoirs.

Isolate these energy sources prior to carrying out the maintenance activities to prevent accidents. However, some of the energy sources are needed when maintaining the filter (for example hydraulic and electric power is needed to operate the plate pack).

The person performing the maintenance decides which energy sources to isolate and which are needed in order to perform the maintenance work safely. He also takes responsibility for isolating these energy sources.



⚠ CAUTION

Keep the emergency stop button pushed down if the activation of the filter functions is not necessary.



Do not use the emergency stop function as the only isolation method.

8.2.2.1 Preparing the machine for maintenance

1. Stop the filter by selecting END mode from the touch screen.
2. The filter continues its operation through the cycle and stops after the end of cloth washing. The filter performs an orderly shutdown by closing or opening the plate pack depending on the mode selected from the configuration page.
3. Switch the filter to TEST mode by turning the mode selector switch S780 to TEST position.

8.2.2.2 Isolation from process lines

1. Ensure all feed pumps to the filter process are switched off. Lock the pump switches with a safety lock and tag and close the isolation valves.
2. Isolate the filter from the process by closing the isolation valves from all process lines connected to filter.

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NOTE: Pinch valves will start to open after a small delay after the hydraulic / pneumatic pressure to their actuators is disconnected.

8.2.2.3 Isolation from hydraulic power supply

1. Stop the hydraulic unit by using the control panel switch (S755 Hydraulic unit).
2. Drain all the hydraulic pressure from the accumulator circuit with help of manual valve SV01. For the location of the switch (1), see the drawing below and respective hydraulic diagram for the location of SV01 manual valve.

8.2.2.4 Isolation from electrical power supply

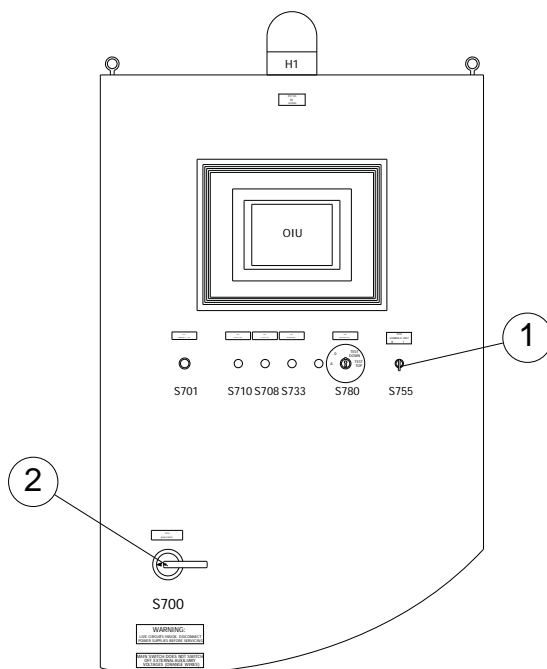


Figure 120. Control panel

| | |
|------------------------|----------------|
| 1. S755 Hydraulic unit | 2. Main switch |
|------------------------|----------------|

1. Turn the filter main switch (S700) to 0-position on the control panel.
2. Lock the main switch with safety lock and tag. For the location of the switch (2), see drawing above.

8.2.2.5 Isolation from pneumatic system

1. Ensure the instrument and process air supplies (for example air reservoirs) are isolated properly with a safety lock and tag.
2. Drain all the pneumatic pressures from the circuits with respective valves. Operate Y34 (ejector) solenoid in pneumatic cabinet.

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8.2.3 Slackening filter cloth

1. Drive the plate pack in its open position by test drive and lock the plate pack.
2. Drive the tension roller (1) of the filter cloth (2) in to the uppermost position. Lock the roller by closing the oil circulation in the cloth tensioning device motor by the restrictor valve. The valve locates in the lower part of the cloth drive device. See pictures below.

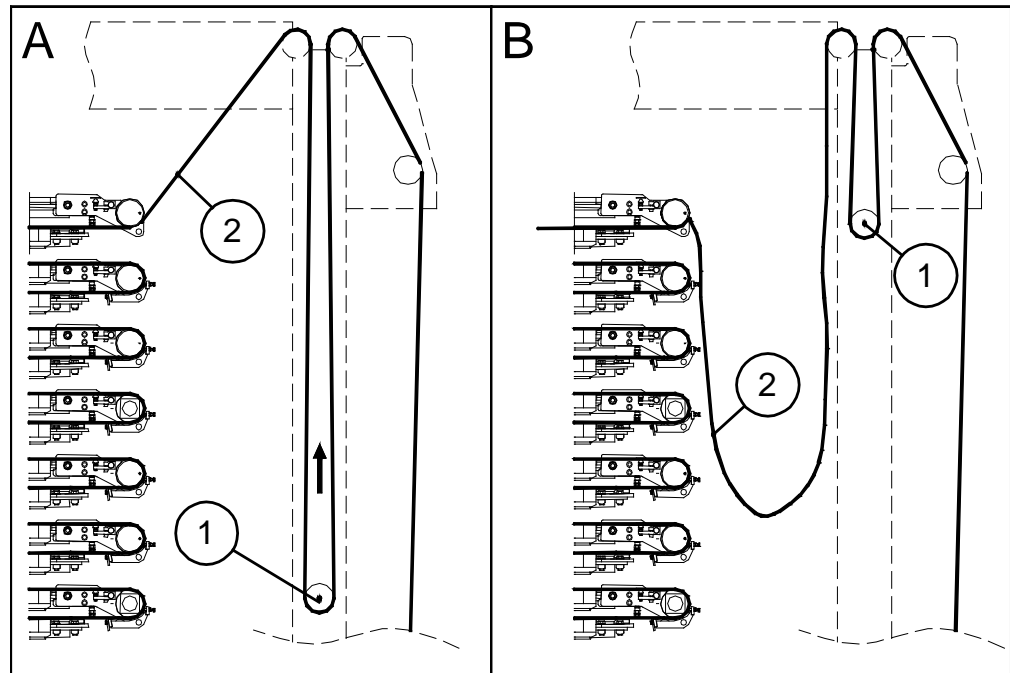


Figure 121. Slackening filter cloth

| | |
|--|--|
| A = Tension roller in its lower position | B = Tension roller in its upper position |
| 1. Roller | 2. Filter cloth |

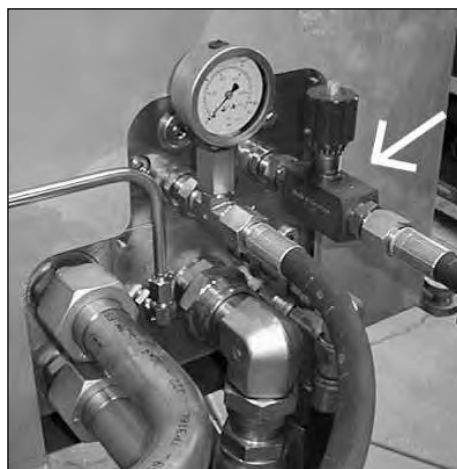


Figure 122. Restrictor valve in the lower part of the cloth drive device

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3. Pull the loose filter cloth near the tension roller where it is needed.
4. After maintenance work release the cloth tension device motor oil circulation by opening the restrictor valve on the lower part of the cloth drive device.

8.2.4 Space arrangement between filter plates



⚠ DANGER

Crushing hazard. Falling filter plates can cause death or serious injury. Do not work between filter plates unless the plate pack is suspended and locked according to instructions in this manual.



Wear overalls, gloves, helmet, eye protection, ear protection, safety harness and safety boots when doing maintenance in between the filter plates.



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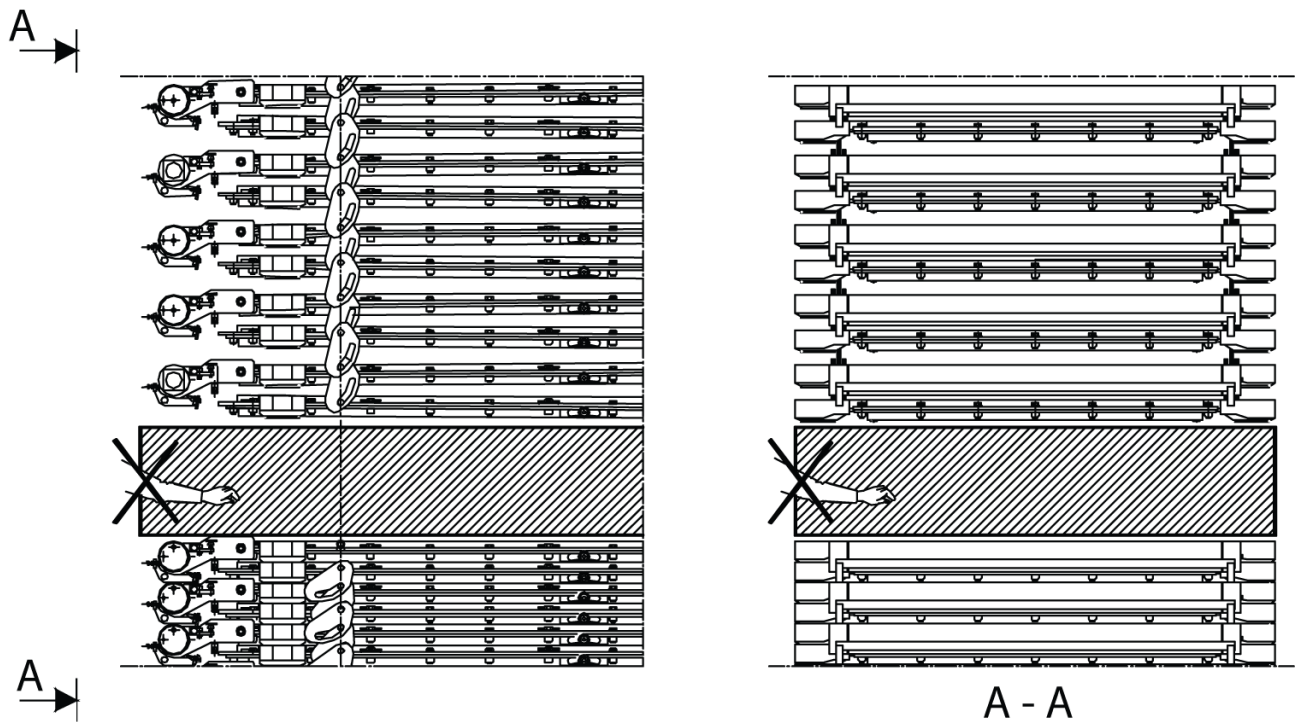
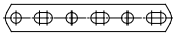


Figure 123. Crushing hazard zone between the filter plates. Do not work in this area unless the plate pack is suspended and locked!

Space arrangement between the filter plates is needed for following maintenance tasks. See the separate chapters below for these tasks. The task is slightly different whether you are cutting lower or upper plate packs, and if you have to use suspension bars. The following subchapters give instructions regarding each case.

- Chapter 8.2.8 Replacement of the filter plate.
- Chapter 8.2.10 Replacing grids.
- Chapter 8.2.14 Replacing diaphragm.
- Chapter 8.2.15 Replacing filtrate vat.
- Chapter 8.2.9 Replacing filter plate seal.

Table 30. Required tools

| ITEM | DESCRIPTION |
|---|---|
|  | Suspension bars (8 pieces) (Suspension bars included in Outotec maintenance tools) |

8.2.4.1 Suspending and locking plate pack



⚠ CAUTION

Follow the instructions in this chapter every time before starting any maintenance work between the filter plates. Fill in a copy of the chapter 8.2.4.6 Checklist for safe plate pack maintenance when suspending and locking the plate pack.



Always use 12 pieces of suspension plates (2 pieces in every support pin) when the filter plate is lifted and suspended by the suspension plates.



Lock the suspension plates with the retaining rings and ensure the correct assembly of suspension plates. (See figures below).

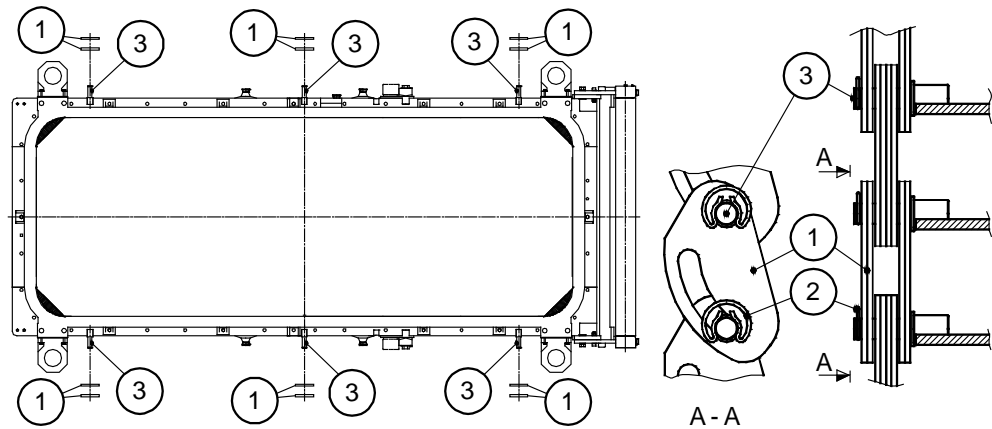


Figure 124. Suspension plates

- | | | |
|--|-------------------|---|
| 1. Suspension plate (12 pieces/filter plate) | 2. Retaining ring | 3. Support pin in the filter plate (6 pieces) |
|--|-------------------|---|

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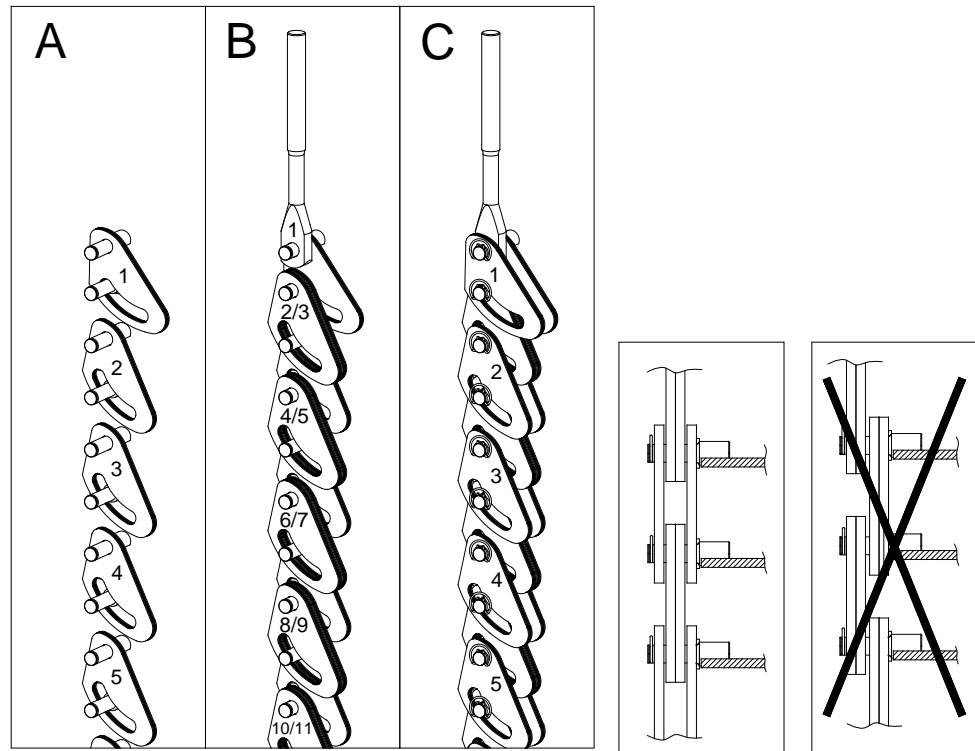


Figure 125. Assembly order of the suspension plates

- | | | |
|---|--|---|
| <p>A. Assemble the lowest suspension plates (1, 2, 3..)</p> | <p>B. Assemble the top suspension plate (1) and the midmost suspension plates (2, 3, 4...)</p> | <p>C. Assemble the topmost suspension plates and retaining rings.</p> |
|---|--|---|

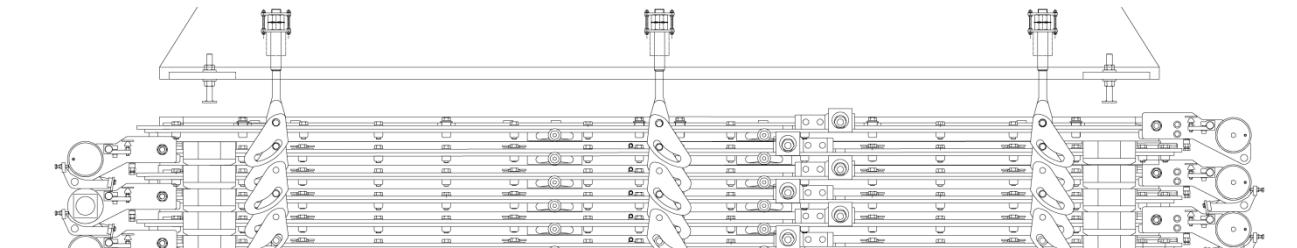


Figure 126. The correct order of suspension plates



⚠ WARNING

Lock the plate pack to its uppermost position before starting to work between the plate pack.

Do not put your hands between the plates before the plate pack is suspended and locked.

| | | | | | | |
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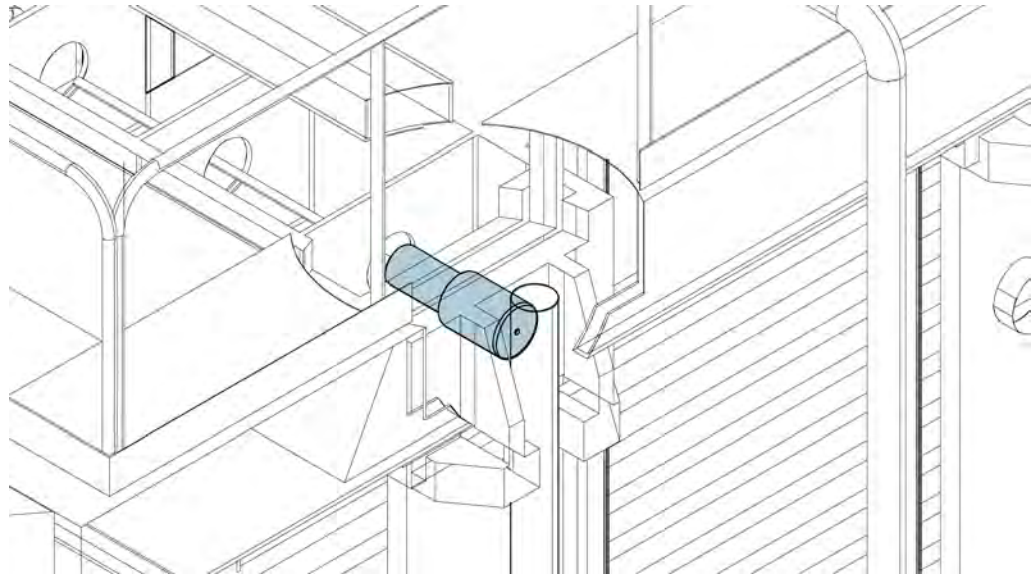


Figure 127. Plate pack locking with locking pins

8.2.4.2 Suspension bars in filter plate pack space arrangement

Suspension bars 8 + 8 pieces (delivered with the filter) which connect 4 or 6 filter plates together are occasionally needed to get enough working space between the filter plates. Check the need of the suspension bars from the table below.

Table 31. The filter plate number below with different PF models indicates the needed working space (the lowest plate is number 1)

| PF | NO SUSPENSION BARS ARE NEEDED | USE 4-TOGETHER BAR | USE 6-TOGETHER BAR |
|----------|-------------------------------|--------------------|--------------------|
| 60 | 7 -> | 5 - 6 | 2 - 4 |
| 72 | 8 -> | 7 | 2 - 6 |
| 84 - 168 | 8 -> | - | 2 - 7 |

8.2.4.3 Space arrangement in the upper part of the plate pack

This chapter describes space arrangement without suspension bars; suspension bar use is covered later. Note the bottom plate is the plate number one (1).

1. Drive the plate pack to its close position. Close the plate pack by using the handheld unit: Select HC5 and push the button S723 (QA-cylinder closing). When the QA-cylinders are down, lock the locking pins: Select HC6 and push the button S725 (Locking pins lock).
2. Stop the hydraulic unit by using the control panel switch (S755 Hydraulic unit). For the location of the switch (1), see Figure 120.
3. Activate the emergency stop circuit by pushing the emergency stop push button S702 (3) from the handheld unit, see the drawing below.

| | | | | | | |
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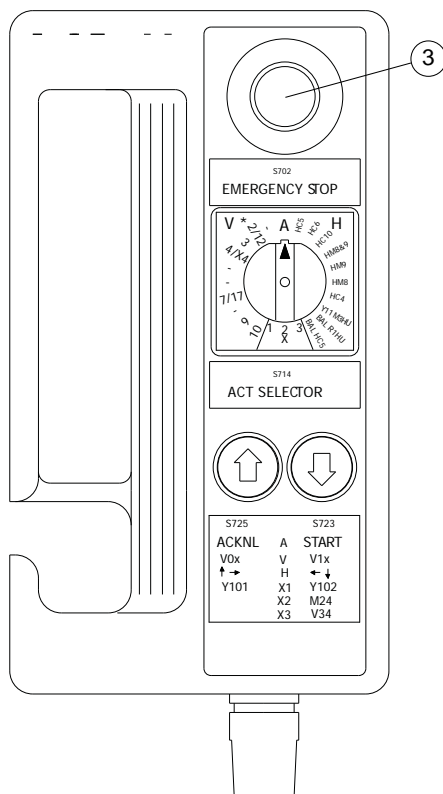


Figure 128. Hand held unit

4. Turn the filter main switch (S700) to 0-position on the control panel. Lock the main switch with safety lock and tag. For the location of the switch (2), see the drawing above.
5. Open the safety guards.
6. Cut the plate pack by removing 12 pieces of the suspension plates from the filter plate, below the place where space is needed.
7. Install other suspension plates back and fix all the retaining rings.
8. Close the safety guards.
9. Release the emergency stop push button from the handheld unit.
10. Open the main switch safety lock and tag. Turn the filter main switch (S700) to 1-position on the control panel.
11. Start the hydraulic unit by using the control panel switch (S755 Hydraulic unit)
12. Acknowledge alarms on the control panel button S733 / H733. The alarm signal will stop flashing when button S733 / H733 is pushed once; the second push will acknowledge it provided the cause of the alarm has been eliminated.
13. Drive the plate pack into its open position. Open the plate pack by using the handheld unit: Select HC6 and push the button S723 (Locking pins open). When the locking pins are open: Select HC5 and push the button S725 (QA-cylinders opening) until the plate pack is open. When the QA-cylinders are up, lock the locking pins: Select HC6 and push the button S725 (Locking pins lock).
14. Stop the hydraulic unit by using the control panel switch (S755 Hydraulic unit).

| | | | | | | |
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15. Activate the emergency stop circuit by pushing the emergency stop push button S702 from the handheld unit.
16. Turn the filter main switch (S700) to 0-position on the control panel. Lock the main switch with safety lock and tag.
17. Open the safety guards.
18. Copy and sign the checklist for safe plate pack maintenance found at the end of this book before proceeding any further with the maintenance work.
19. Prior commencing any maintenance or repair work within the plate pack, check visually that;
 - Isolation of the energy sources is done properly (with lock and tag)
 - Plate pack position is secured by locking all 4 locking pins (from the OIU panel)
 - Plate pack position is secured by locking all 4 locking pins (from the locking pins itself)
 - All the suspension plates and retaining rings are installed correctly
 - Emergency stop push button is pressed down from the handheld unit.
20. After maintenance/repair work, assemble the plate pack in a reversed order.

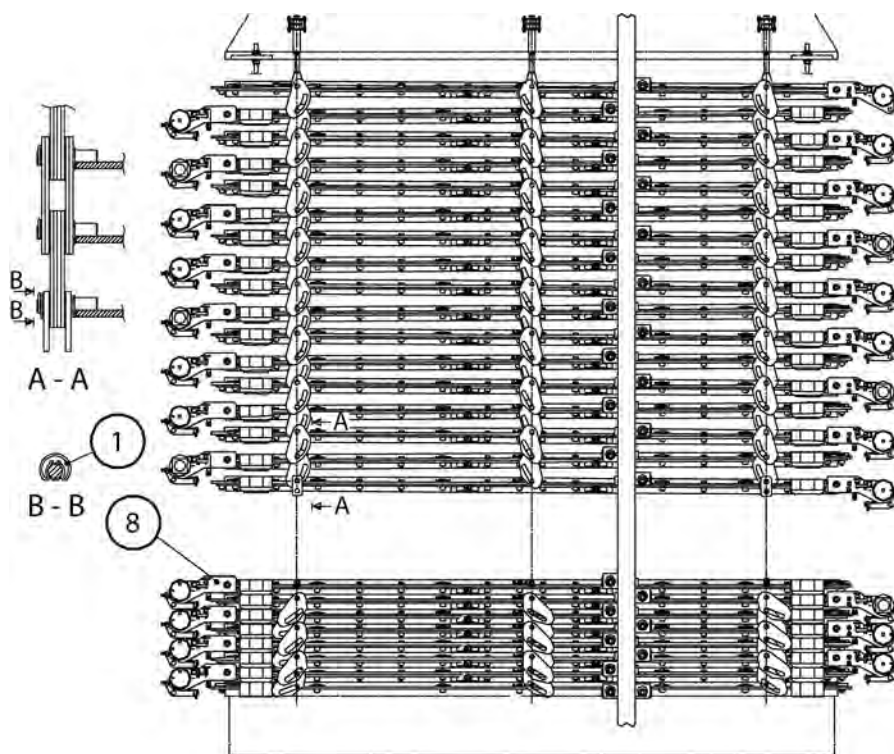


Figure 129. The plate pack is cut and driven into its open position. The filter plate no.8 is below formed space.

1. Retaining ring of the suspension plate

8. Plate number 8

| | | | | | | |
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A – A = Order of the suspension plates. Always use 12 pieces of suspension plates in one filter plate.

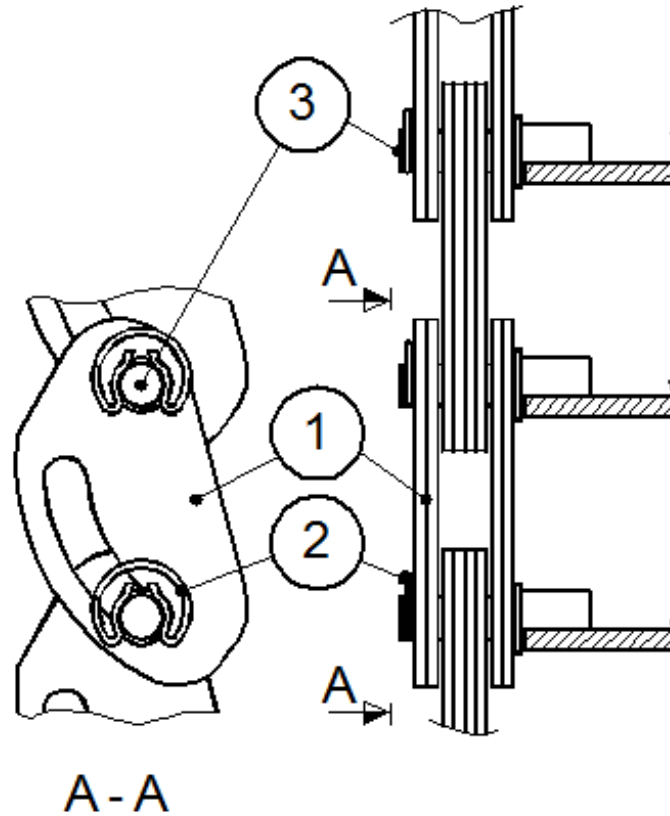


Figure 130. Suspension plate

| | | |
|--|-------------------|---|
| 1. Suspension plate (12 pieces/filter plate) | 2. Retaining ring | 3. Locking pin in the filter plate (6 pieces) |
|--|-------------------|---|

A – A = Order of the suspension plates. Always use 12 pieces of suspension plates in one filter plate.

8.2.4.4 Space arrangement in the lower part of the plate pack with suspension bars

A sufficient maintenance space in the lower part of the plate pack (filter plates 2...7) is obtained by cutting the plate pack and using the suspension bars (8 pieces) delivered with the filter.

1. Drive the plate pack to its close position. Close the plate pack by using the handheld unit: Select HC5 and push the button S723 (QA-cylinder closing).
2. Stop the hydraulic unit by using the control panel switch (S755 Hydraulic unit). For the location of the switch (1), see Figure 120.

| | | | | | | |
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3. Activate the emergency stop circuit by pushing the emergency stop push button S702 (3) from the handheld unit, see Figure 128.
4. Turn the filter main switch (S700) to 0-position on the control panel. Lock the main switch with safety lock and tag. For the location of the switch (2), see the drawing above.
5. Open the safety guards.
6. Cut the plate pack by removing the suspension plates from the filter plate, where the space is needed.
7. Connect the filter plates (6 pieces) located right above the filter plate, from where the suspension plates were removed, by installing a pair of suspension bars in place of the suspension plates on every corner of the filter plates. Install also suspension links to the lower end of the suspension bars to maintain the appropriate distance between suspension bars.

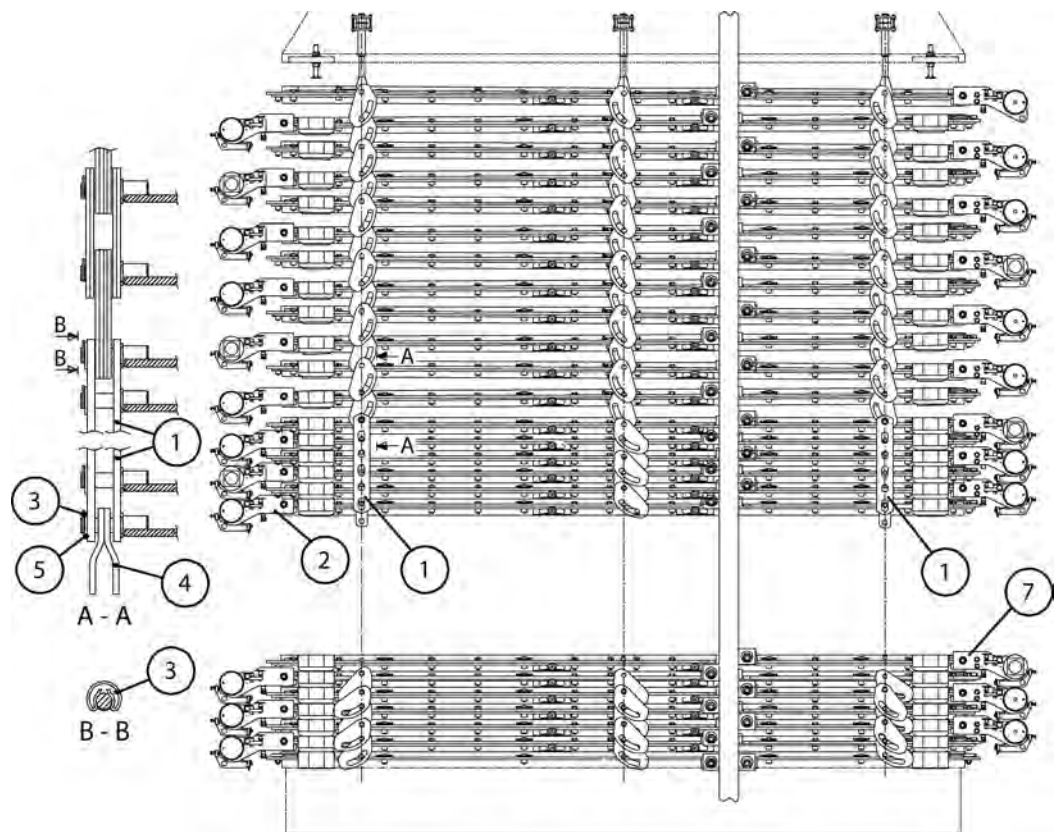


Figure 131. The plate pack is cut; suspension bars and links installed and plate pack driven to its open position. The filter plate no.7 is below formed space.

| | | |
|--|--|-------------------|
| 1. Suspension bar | 2. The lowest filter plate fixed to the suspension bar | 3. Retaining ring |
| 4. Suspension link | 5. Washers M30 | 7. Plate number 7 |
| A – A = the order of suspension plates and bars. | | |

| | | | | | | |
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- Install the suspension bars as a pair. Use washers and retaining rings to secure the bars.

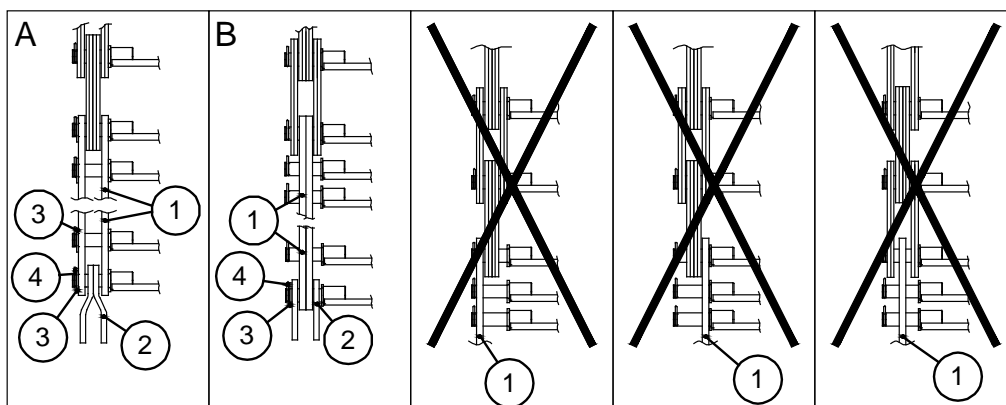


Figure 132. Position of the suspension bars and links

| | |
|-------------------|--------------------|
| 1. Suspension bar | 2. Suspension link |
| 3. Washer M30 | 4. Retaining ring |

- Install suspension bars on the filter plates right above the filter plate under maintenance. No load must be fixed to the filter plates (4 or 6 pieces), which have been connected with the suspension bars.

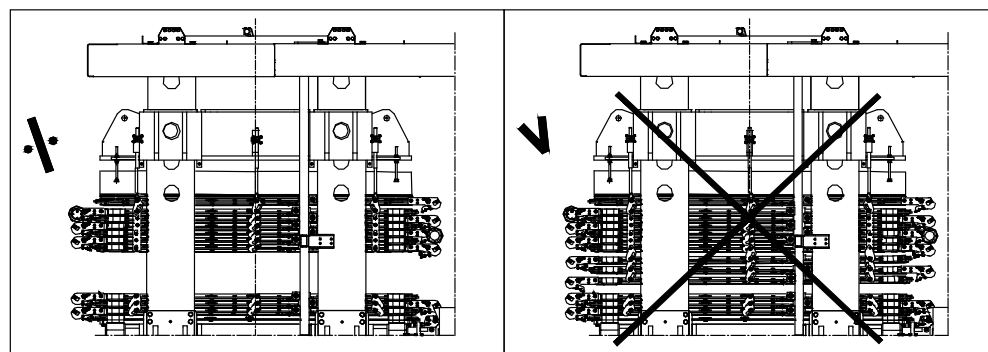


Figure 133. The correct place of suspension bars

- Check the correct location of the suspension bars (1) and links (4). Refer to figure above.
- Fix the filter plates joined by suspension bars on the filter plate above using suspension plates (use 12 pieces of suspension plates per filter plate).
- Fix the retaining rings (3) and washers (5) in their places.
- Close the safety guards.
- Release the emergency stop push button from the handheld unit.
- Open the main switch safety lock and tag. Turn the filter main switch (S700) to 1-position on the control panel.

| | | | | | | |
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16. Start the hydraulic unit by using the control panel switch (S755 Hydraulic unit).
17. Acknowledge alarms on the control panel button S733/H733. The alarm signal will stop flashing when S733/H733 is pushed once; the second push will acknowledge it provided the cause of the alarm has been eliminated.
18. Drive the plate pack into its open position. Open the plate pack by using the handheld unit: Select HC6 and push the button S723 (Locking pins open).
19. When the locking pins open: Select HC5 and push the button S725 (QA-cylinders opening) until the plate pack is open.
 - Observe the pressing air and feed hoses when the plate pack is being driven up because the hoses must not be too tight.
 - Remove, if necessary, the hose ends nearest to the filter plate.
 - When the QA-cylinders are up, lock the locking pins: Select HC6 and push the button S725 (Locking pins lock).
20. Stop the hydraulic unit by using the control panel switch (S755 Hydraulic unit).
21. Activate the emergency stop circuit by pushing the emergency stop push button S702 from the handheld unit.
22. Turn the filter main switch (S700) to 0-position on the control panel. Lock the main switch with safety lock and tag.
23. Open the safety guards.
24. Copy and sign the checklist for safe plate pack maintenance found at the end of this book before proceeding any further with the maintenance work.
25. Prior commencing any maintenance or repair work within the plate pack, check visually that:
 - Isolation of the energy sources is done properly (with lock and tag)
 - Plate pack position is secured by locking all 4 locking pins (from the OIU panel)
 - Plate pack position is secured by locking all 4 locking pins (from the locking pins itself)
 - All the suspension plates and retaining rings are installed correctly
 - Emergency stop push button is pressed down from the handheld unit.

| | | | | | | |
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8.2.4.5 Reversing the filter plate pack space arrangement

1. Release the emergency stop push button from the handheld unit.
2. Open the main switch safety lock and tag. Turn the filter main switch (S700) to 1-position on the control panel.
3. Start the hydraulic unit by using the control panel switch (S755 Hydraulic unit).
4. Acknowledge alarms on the control panel button S733 / H733. The alarm signal will stop flashing when S733 / H733 is pushed once; the second push will acknowledge it provided that the cause of the alarm has been eliminated.
5. Drive the plate pack to its close position.
6. Stop the hydraulic unit by using the control panel switch (S755 Hydraulic unit).
7. Activate the emergency stop circuit by pushing the emergency stop push button S702 (3) from the handheld unit.
8. Turn the filter main switch (S700) to 0-position on the control panel. Lock the main switch with safety lock and tag.
9. Install all suspension links in their places and fix ALL the suspension link retaining locking rings. Remove the suspension bars if installed.
10. After maintenance work release the roller by opening the oil circulation in the cloth tensioning device motor by the restrictor valve. The valve locates in the lower part of the cloth drive device.
11. Release the emergency stop push button from the handheld unit.
12. Open the main switch safety lock and tag. Turn the filter main switch (S700) to 1-position on the control panel.
13. Start the hydraulic unit by using the control panel switch (S755 Hydraulic unit).
14. Acknowledge alarms on the control panel button S733 / H733. The alarm signal will stop flashing when S733 / H733 is pushed once; the second push will acknowledge it provided that the cause of the alarm has been eliminated.
15. Drive the cloth forward by using the hand-held unit: Select HM8&9 and push the button S725 (Forward) until the cloth seam is at the clipper seam detector sensor S332.



⚠ CAUTION

Ensure the loose filter cloth does not get stuck when driving it. Keep the filter cloth tight when driving it.

Always check the filter cloth centering after maintenance work.

16. Check the suspension link function by driving the plate pack to its open and close position several times.

| | | | | | | |
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8.2.4.6 Checklist for safe plate pack maintenance



⚠ CAUTION

Filling this form is obligatory prior to any maintenance work between the filter plates.

Prior to commencing any maintenance or repair work within the plate pack, check the following items visually.

Table 32. Checklist for safe plate pack maintenance

| | YES |
|---|-----|
| 1. Isolation of the energy sources is done properly (with lock and tag). | |
| 2. Plate pack position is secured by locking all 4 locking pins (from the OIU panel). | |
| 3. Plate pack position is secured by locking all 4 locking pins (from the locking pins itself). | |
| 4. All the suspension plates and retaining rings are installed correctly. | |
| 5. Emergency stop push button in pressed down from the handheld unit. | |

Inspector: _____

Date: ____ . ____ . _____

Time: ____ . ____

Filter serial number: _____

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
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8.2.5 Removing the upper part of the cake chute

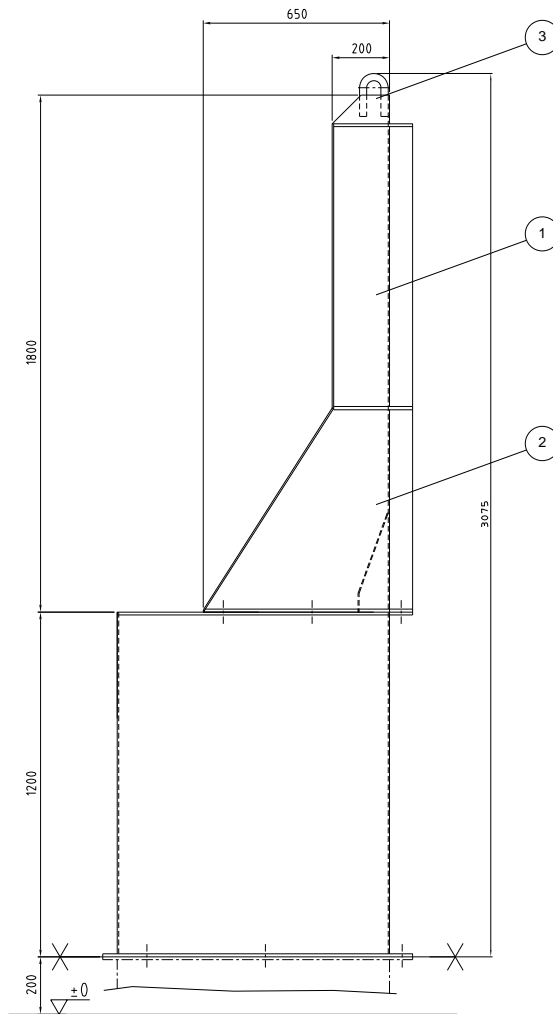


Figure 134. Cake chute

| | | |
|---|---------------------------------|----------------|
| 1. Upper part of the cake chute; mass app. 314 kg | 2. Lower part of the cake chute | 3. Lifting lug |
|---|---------------------------------|----------------|

1. Verify the load of the crane, lifting loops and hooks (mass of the upper part app. 314 kg).
2. Install the lifting devices into the lifting lugs of the upper part of the cake chute.
3. Open the screws on the side and on the end of the upper part of the cake chute.
4. Lift the cake chute by means of a crane.
5. Install the upper part in reverse order.



⚠ CAUTION

Remember to verify that the screws are tightened properly to avoid accidental falling of the upper part of the cake chute.

| | | | | | | |
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8.2.6 Filter cloth maintenance

8.2.6.1 Cloth drive system

To remove the cakes and to wash the cloth, the cloth is moved by means of drive rollers (2 & 8) between filtering cycles. A spring-loaded pressing roller (3) presses the cloth against the drive roller in order to improve the maintenance of tension.

The cloth functions both as a filtering element and as a conveyor belt transporting the cake out of the filter. Besides having a good filtering ability, the cloth must withstand tension.

Only special type of fabrics can be used. The most commonly used material is a multifilament fabric which is lengthwise (warp) stronger than crosswise (weft).

Pay special attention to possible holes in the cloth. Patch the holes immediately; solid matters entering through the holes wear the filtrate channels heavily especially during drying when the air flow speed is high.

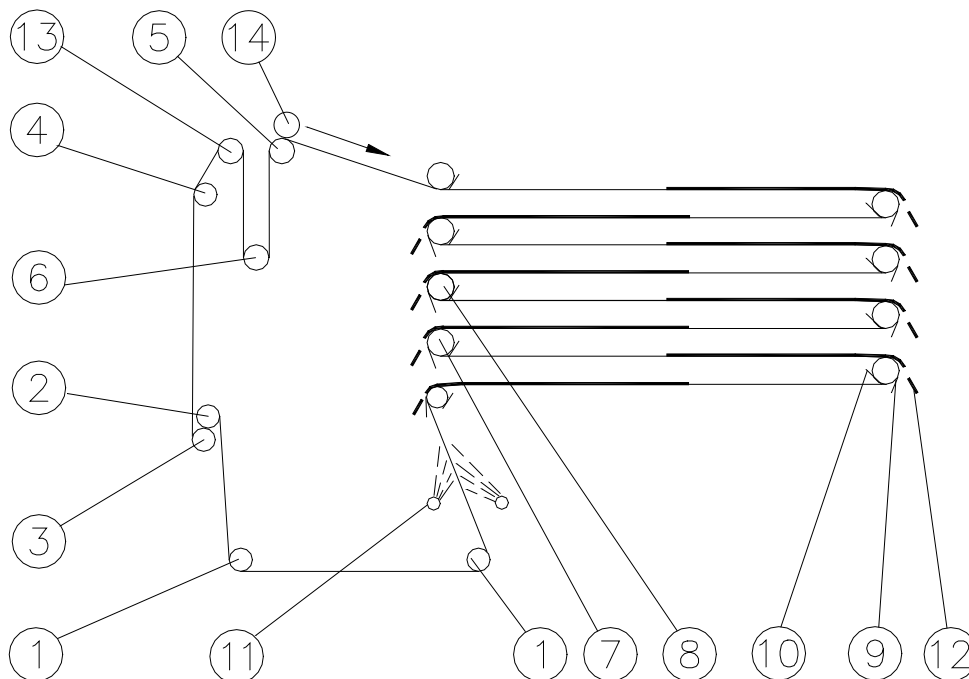


Figure 135. Filter cloth

| | | |
|---------------------|---------------------------|----------------------|
| 1. Vat roller | 2. Main drive roller | 3. Pressing roller |
| 4. Centering roller | 5. Impulse roller | 6. Tensioning roller |
| 7. Guide roller | 8. Auxiliary drive roller | 9. Cloth scraper |
| 10. Roller scraper | 11. Cloth wash nozzles | 12. Cake |
| 13. Spread roller | 14. Encoder | |

8.2.6.2 Installation of the cloth

Proceed as follows.

1. Drive and lock the tensioning roller (6) to its uppermost position by means of test drive.
2. Check from Operator Interface Unit's (OIU) system configuration page 3, that the cloth drive lock release valves 91.1 and 91.2 are not active.
3. Place the cloth pack on a rack (14) outside the conveyor unit, from where it can be easily rotated.
4. Open the hatches of the cloth conveyor unit, cloth tracking unit and cloth tensioning unit.
5. Bring the cloth end over the centering roller (4) on the spread roller (13), from where it is passed through the tensioning roller (6) up on the impulse roller (5).

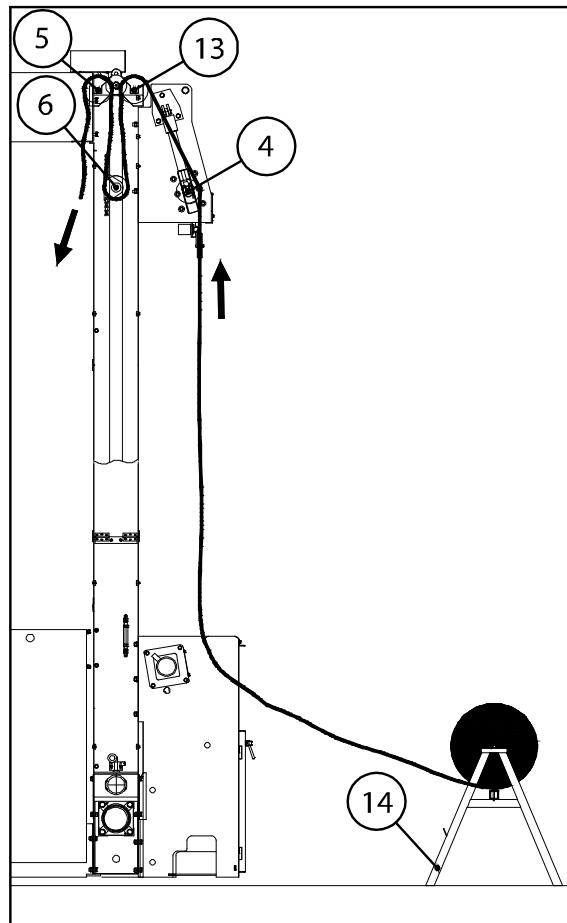


Figure 136. Installing the cloth

| | | |
|---------------------|--|--|
| 4. Centering roller | 5. Impulse roller | 6. Tensioning roller in its upper position |
| 13. Spread roller | 14. Rack of cloth (excluded from Outotec delivery) | |

| | | | | | | |
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6. Bring the cloth end to the guide rollers (7) (of the filter plates), where the cloth is passed between the scraper and the roller.
7. Pass the cloth through the guide roller (7) and vat rollers (1) and further between the wash nozzle pipes (11) onto the main drive roller (2).
8. Loosen the pressing roller springs and pass the cloth between the pressing roller (3) and main drive roller (2).
9. Pull sufficiently enough, loosen and join the cloth ends.

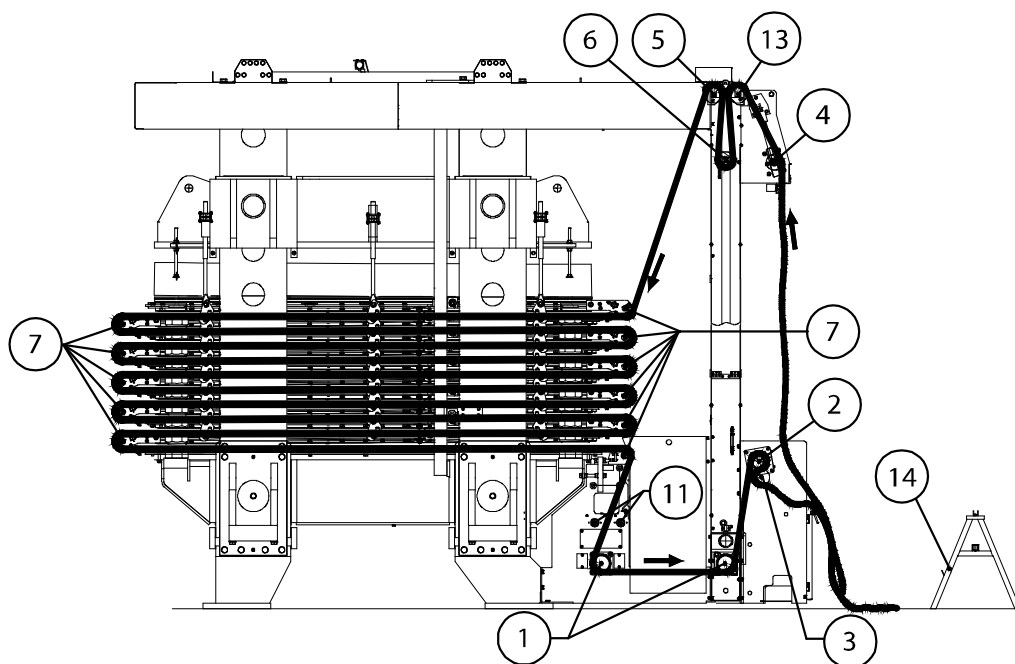


Figure 137. Installing the cloth

| | | |
|---------------------|-----------------------|----------------------|
| 1. Vat roller | 2. Drive roller | 3. Pressing roller |
| 4. Centering roller | 5. Impulse roller | 6. Tensioning roller |
| 7. Guide roller | 11. Wash nozzles pipe | 13. Spread roller |

14. Rack of cloth (excluded from Outotec delivery)

10. Bend one end of the joining thread double for about 10 mm.
11. Pass the thread through the seam so that the bent end of the thread gets inside the seam.
12. Clip off the excess length so that the other end of the thread remains about 5 - 10 mm over the width of the seam.
13. Bend also the other end into the seam.
14. Open the restrictor valve. Refer to attached picture.

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Figure 138. Restrictor valve

15. Tighten the cloth and check the tracking by means of test drive.

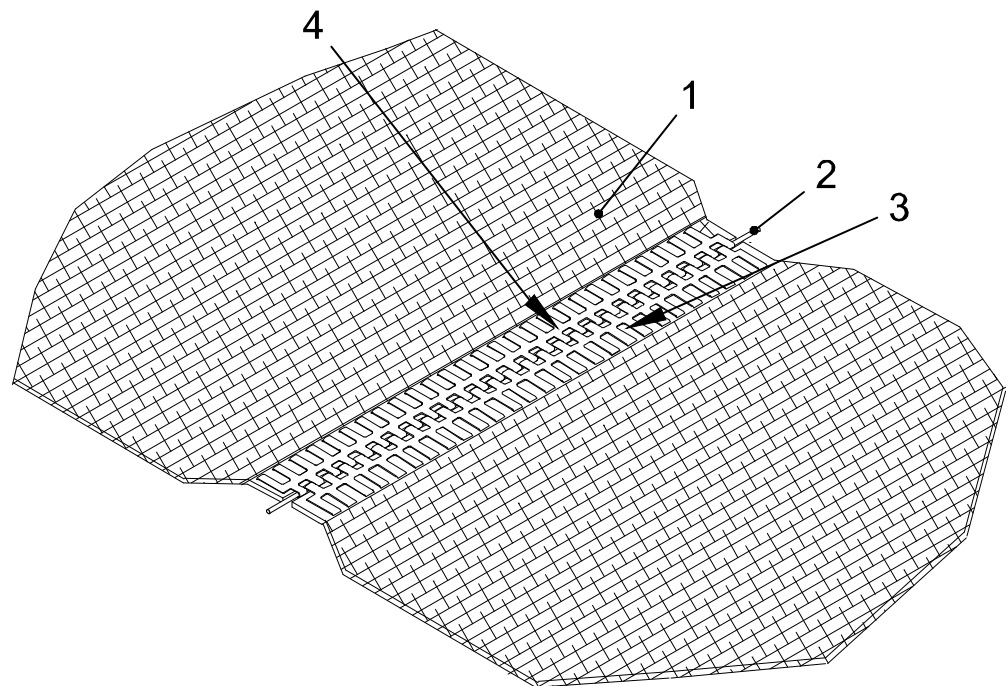


Figure 139. Cloth seam

| | |
|-------------------------|---------------|
| 1. Cloth | 2. Seam |
| 3. Reinforced with glue | 4. Metal hook |

Also refer to chapter 8.2.6.5 Joining the cloth.

| | | | | | | |
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⚠ CAUTION

Only one clipper seam joint in the cloth is allowed.

Always check the cloth centering after maintenance work.

- 16. The cloth length is correct when there is a motion allowance of at least 1000 mm for closing the plate pack above the tensioning roller in the plate pack "open" position.
- 17. The recommended position of the tensioning roller is in the mid range of the motion allowance. Excess motion allowance decreases the tensioning allowance required for the cloth stretching.

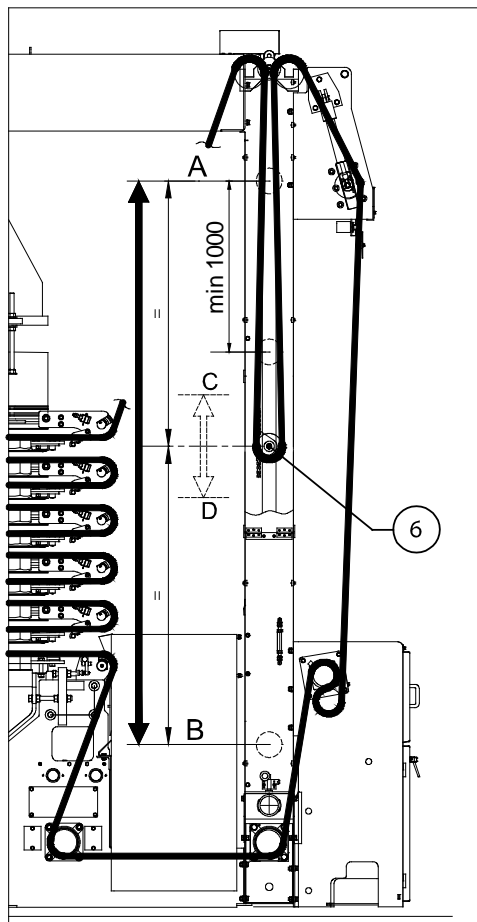


Figure 140. Installing the cloth

| | |
|---|--|
| 6 = Tensioning roller | |
| A = Uppermost position of the cloth tension roller | B = Lowest position of the cloth tension roller |
| Distance between A – B = motion allowance of the cloth tension roller | Distance between C – D = mid range of the motion allowance |

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8.2.6.3 Replacement of the cloth



⚠ WARNING

Crushing hazard. Falling filter plates can cause death or serious injury. Lock the plate pack to its upper position and close all manually actuated process valves. Do not leave your fingers between the plates, when replacing the cloth.

Depending on the customers process the filter cloth to be replaced can pose the following hazards.



⚠ DANGER

Flammable hazard. Will cause injuries ranging from mild irritation to death.



Chemical burn hazard. Will cause injuries ranging from mild irritation to death.



Hazardous / Poisonous material hazard. Will cause injuries ranging from mild irritation to death.



Silica / dust hazard. Will cause injuries ranging from mild irritation to death.



NOTE: The cloth is delivered in the ordered length and provided with a clipper seam joint that can be opened. The weight of the cloth depends on the filter size and can vary from approximately 100 kg to 300 kg. Used filter cloth can weigh up to 600kg!

1. Lay a new cloth (2) on a rack (4) outside the conveyor unit. The new cloth is on the top and the cloth to be changed will be rolled up around a tube (5) underneath.
2. Open the conveyor unit hatches. Follow the cloth seam (1) and drive the seam by means of test drive next to the pressing roller (3).

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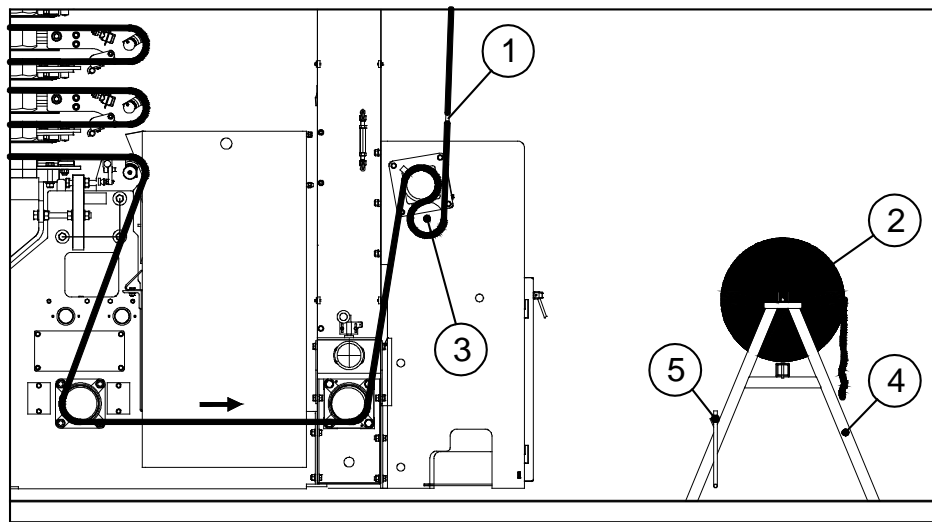


Figure 141. Replacing the cloth

3. Drive the plate pack to its open position by means of test drive and lock the plate pack. Loosen the cloth by driving the tensioning roller in the uppermost position and close the restrictor valve beside the tensioning motor. Refer to chapter 8.2.3 Slackening filter cloth.
4. Open the cloth joint (1) and fix a new cloth (2) to the cloth (3) to be replaced. Join the clothes (1 & 2) as instructed in chapter 8.2.6.2 Installation of the cloth. Fix the other end of the cloth to be replaced to the reeling pipe.

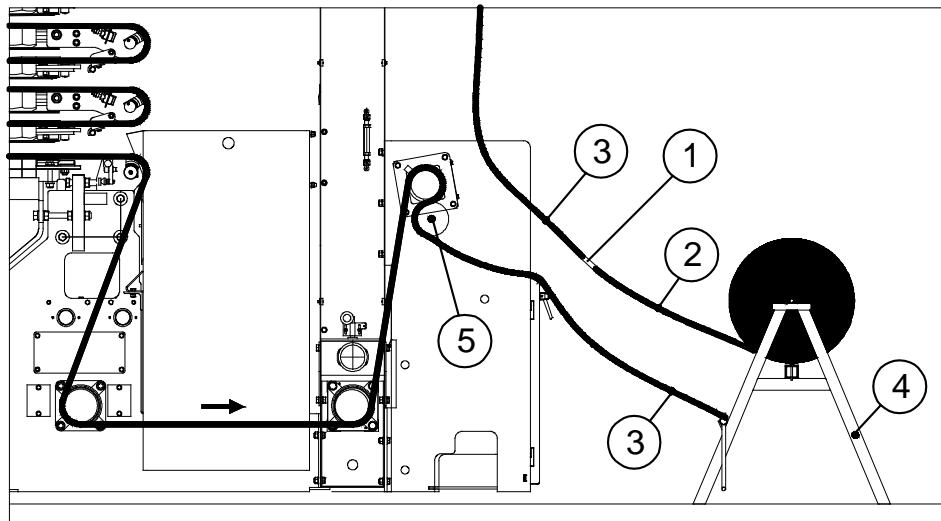


Figure 142. Replacing the cloth

| | | |
|--|---------------------|---------------------|
| 1. Cloth seam | 2. New Filter cloth | 3. Old Filter cloth |
| 4. Cloth rack (excluded from Outotec delivery) | 5. Pressing roller | |

5. Drive the cloth carefully into the filter. Simultaneously reel the old cloth from the pressing roller.

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⚠ DANGER

During the cloth reeling the filter cloth must be kept tight or it can get caught between the rollers. Hand held operator has to be in position to stop the cloth drive immediately if this happens. Otherwise the cloth replacement rack and / or the filter might be damaged.

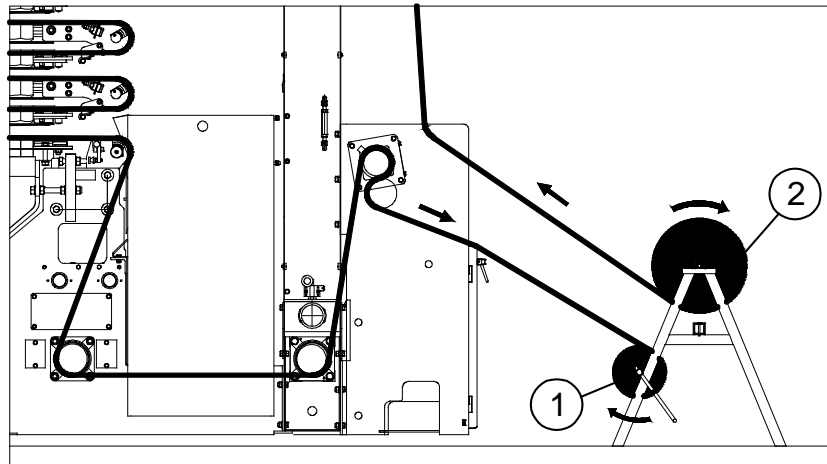


Figure 143. Replacing the cloth

1. Old Filter cloth

2. New Filter cloth

6. Join the ends of the new filter cloth.

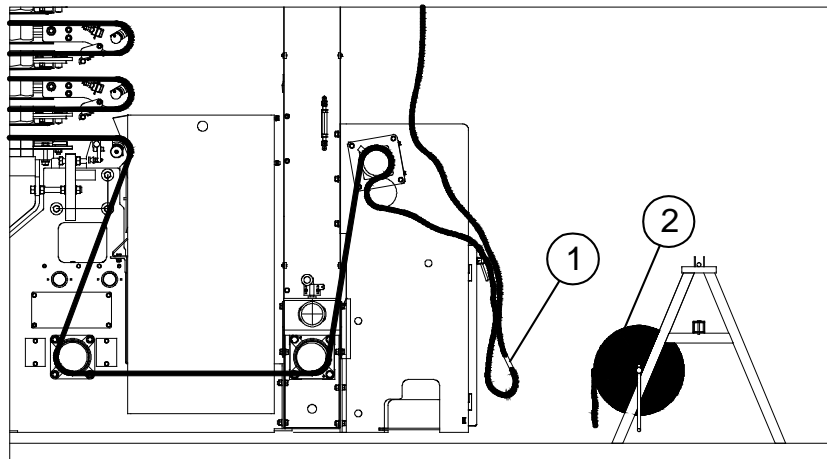


Figure 144. Joining the ends of the new filter cloth

1. Seam of the new Filter cloth

2. Old Filter cloth

7. Open the restrictor valve.

8. Tighten the cloth and check the tracking by means of test drive.

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8.2.6.4 Patching the cloth



CAUTION

Inappropriate cloth may cause damage to the machinery. Patch all holes immediately.

The cloth can be patched by sewing. A zig-zag sewing machine for industrial purposes is suitable for use, e.g. Singer 200 is provided with a 9 mm zig-zag.



NOTE: It is easiest to patch the cloth, when the holes are still small.

Patch the cloth as follows:

1. Follow the area to be patched and drive the cloth by means of test drive above the cloth drive unit.
2. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
3. Pull the cloth out of the tensioning roller so that the area to be patched would be easy to handle.
4. Wash the cloth approx. 10 cm x 10 cm around the hole with a high-pressure washer.
5. Dry the washed area with pressurized air.
6. Sew a patch over the hole according to figure below. Pay special attention to the front edge of the patch, because this seam is strained most by the scrapers.

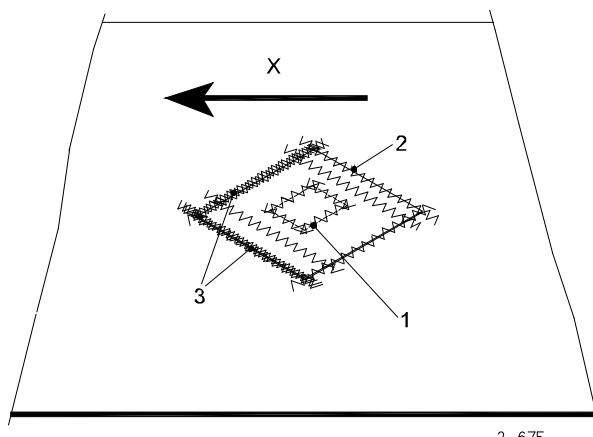


Figure 145. Patching the cloth

1. Zig-zag stitching over the edges

2. Stitch length 1 mm width 6-8 mm

3. At least 3 pieces 6-8 mm zig-zag stitching

X. Direction of Cloth drive

7. First sew the hole edges tightly on the patch, and then make a couple of sews crosswise over the patch, then sew outer edges.

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8.2.6.5 Joining the cloth

The cloth is delivered in the ordered length and provided with a clipper seam joint that can be opened.

If necessary, a part of the cloth can be renewed by making a sewn joint or if the joint has been damaged, separate clipper seams are available. Pay attention to the cloth length. The correct length has been defined in the chapter 8.2.6.2 Installation of the cloth 8.2.6.2. The sewn joints are made according to instruction drawing below. A zig-zag sewing machine for industrial purposes is suitable for use, e.g. Singer 200 is provided with a 9 mm zig-zag.



⚠ CAUTION

Only one clipper seam joint in the cloth is allowed.

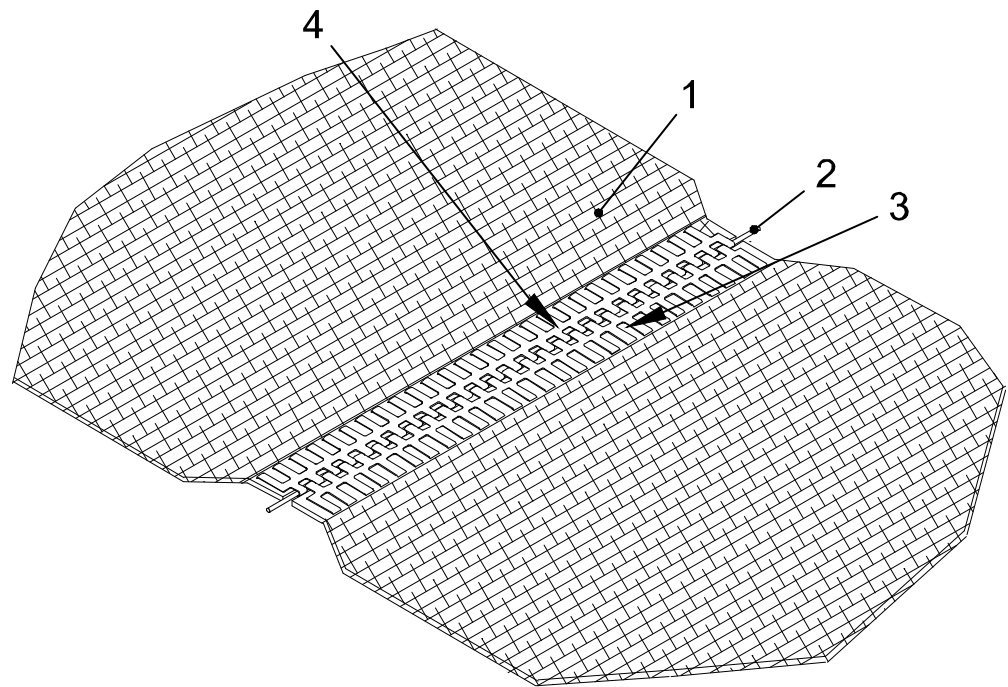


Figure 146. Cloth seam

| | |
|-------------------------|---------------|
| 1. Cloth | 2. Seam |
| 3. Reinforced with glue | 4. Metal hook |

| | | | | | | |
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8.2.6.6 Cloth movement



⚠ CAUTION

Make sure that the cloth stays in the center area after maintenance work.

1. Check the cloth control and its operation principle from chapter 7 Operation.
2. Drive the cloth manually and observe how the cloth moves. If the cloth starts to move away from the middle line, the automatic cloth control will guide the cloth back to the middle.
3. If the cloth does not stay in the middle, localize the spot at which the cloth drifts sideways. Then try to clarify and eliminate the reason for the disturbance.
4. In addition the cloth movement must be observed as a whole as the cloth may drift sideways for many reasons. At the same time make sure that all other factors effecting the cloth movement that are named below, are in order.
5. If problems still occur, we advise you to contact Outotec Service. Possible service measures in order to fix the cloth movement are taken when the plate pack is in its open position.

Filter cloth

A poor condition of the cloth may be one reason for the tracking problems. There may be defective areas in the cloth, which can cause the cloth to drift sideways.

Observe the cloth at the end of the plate pack where the rollers are located. Pay special attention to the cloth seam. There may be a bend on the cloth due to a distorted seam.

If there is a s-bend in the cloth, the cloth may run in the middle at the cloth tracking unit, but in the plate pack it may be on the opposite edges at different places.

If the cloth is badly bent, the tracking unit cannot keep it in the middle.

If the cloth edges are getting frayed due to the fact that the cloth drifts sideways, the cloth must be replaced.

Tracking is not possible with a slackened cloth. The cloth is tightened by means of hydraulic motor. Tensioning force is adjusted by adjusting the pressure.

Operation of the rollers

Make sure that there are no damages on the roller surfaces or any substance stuck on them. The rollers must rotate well, e.g. a bearing damage in a roller can stop the roller's rotation. Sliding rollers or rollers which are stuck, make the cloth tracking impossible.

Check the operation of the auxiliary rollers as well. The scrapers must be operational and correctly adjusted. A misadjusted/damaged scraper can slow down the cloth's movement on one edge and drive the cloth sideways.

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Function of the cloth conveying and tracking mechanism

Keep the cloth tracking mechanism and tracking device mechanically in good working order. If the cloth runs on one side all the time or the operation of the cloth tracking unit is inconsistent, check the functionality and fixing of the detectors.

If the cloth tracking unit operates slowly or reacts too easily, the set values in the program are incorrect. The cloth cannot be driven with maximum speed in all applications.

With a slower moving cloth, it is easier for the tracking device to follow changes in the cloth's movement direction; corrections take place on a shorter distance.

Filter plates

Check that there is nothing in the filter plates, which could slow down the cloth during cloth drive (e.g. hanging filter diaphragms or damaged grids).

If the cloth is driven sideways at a certain filter plate, check the posture of this filter plate in the plate pack. A turned filter plate may direct the cloth sideways.

A sideways turned filter plate can easiest be detected by checking from the end of the plate pack if all rollers are in the same line. The plumb line at the end of the upper roller can be used as an accessory.

The turning of a filter plate may be caused by a damaged or unusually worn slide piece. If necessary, change the damaged slide piece to a new one or readjust the plate slide pieces according to chapter 8.2.16 Replacement and adjustment of slide pieces.

The longitudinal positions of the filter plate in relation to each other do not have any significant effect to the cloth's movement.

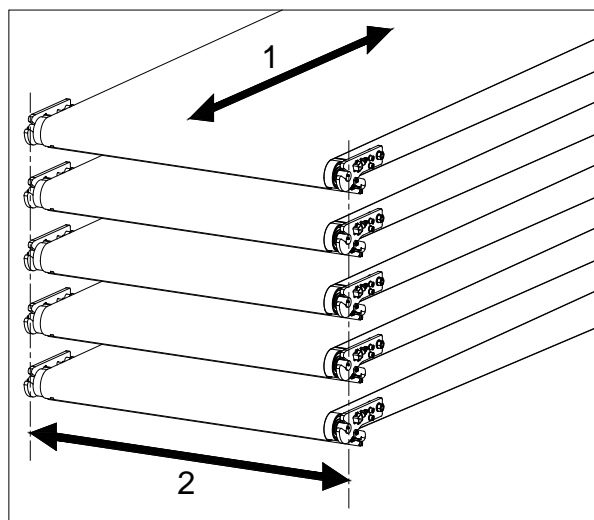


Figure 147. Filter plate positions

- 1. Longitudinal direction
- 2. Lateral direction

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8.2.7 Filter plate maintenance



⚠ DANGER

Hazardous moving parts. Moving parts of the machine will cause serious injury or death. Always when maintaining the plate pack, make sure that the filter is stopped, the manual valves of the pipes are closed, the emergency stop switch of the Hand Held unit is pressed down and the electricity is switched off from the main switch.



Crushing hazard. Falling filter plates can cause death or serious injury. Secure the open position of the plate pack by locking it to the columns with locking pins of the upper pressing plate.

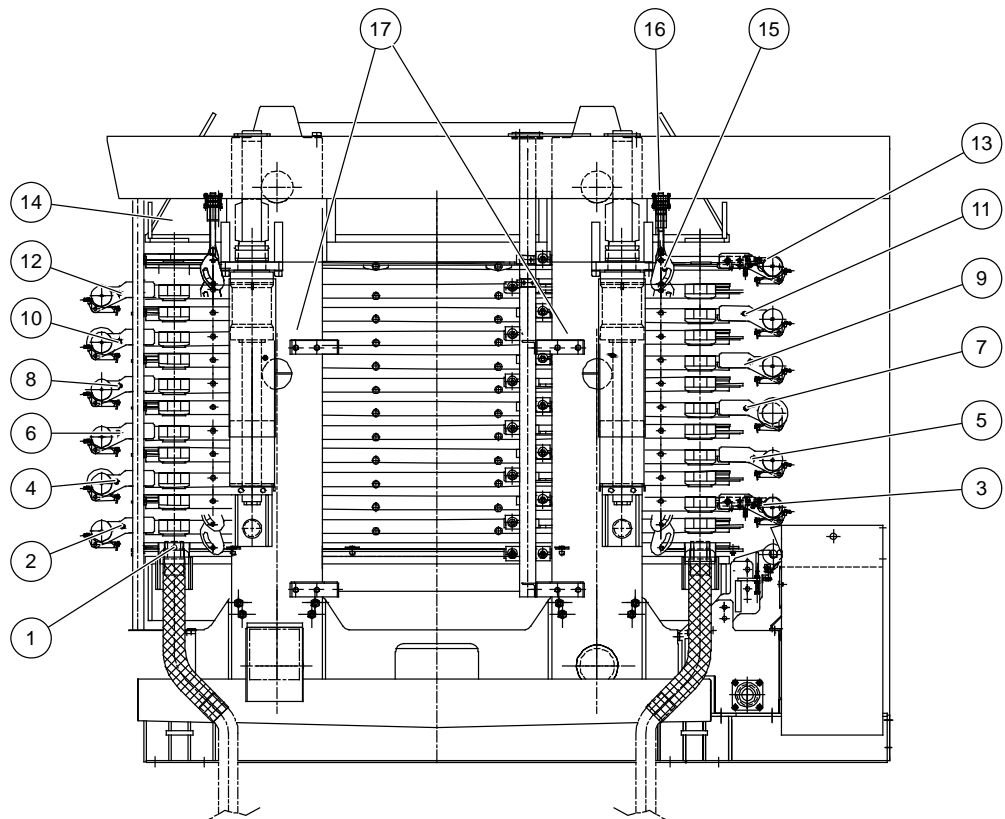


Figure 148. Plate pack 72/72 in open position

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| | | |
|-------------------------------------|-------------------------------|--------------------------------|
| 1. Filter plate no. 1 (lowest)* | 2. Filter plate no.2 (right) | 3. Filter plate no.3 (left) |
| 4. Filter plate no.4 (right) | 5. Filter plate no.5 (left) | 6. Filter plate no.6 (right) |
| 7. Filter plate no.7 (left) | 8. Filter plate no.8 (right) | 9. Filter plate no.9 (left) |
| 10. Filter plate no.10 (right) | 11. Filter plate no.11 (left) | 12. Filter plate no.12 (right) |
| 13. Top Filter plate | 14. Upper pressing plate | 15. Suspension plate |
| 16. Top suspension plate (6 pieces) | 17. Column | |

Numbering of the filter plates is referred to the instructions of chapter 8.2.4 Space arrangement between filter plates.
 *Filter plates are numbered from bottom to top.

Cleaning of the plate pack

The plate pack must be washed with water daily. It is important to wash the rollers and scrapers as well. This ensures that cloth tracking functions properly and that the plate pack stays tight.

8.2.8 Replacement of the filter plate

1. Verify the load of crane (mass of the filter plate app. 1700 kg).
2. Necessary maintenance tools (included in Outotec maintenance tools) are presented below.

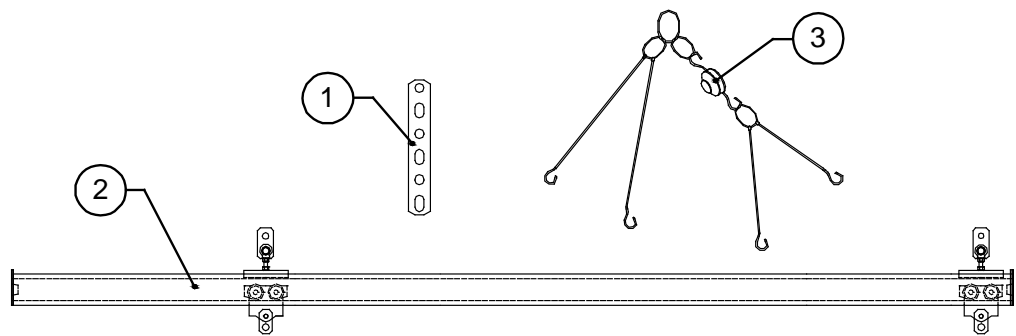


Figure 149. Maintenance tools

| | | |
|------------------------------|---------------------------|--|
| 1. Suspension bar (8 pieces) | 2. Lifting bar (2 pieces) | 3. Lifting chains with lifting rings, hooks and chain tackle |
|------------------------------|---------------------------|--|

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NOTE: The top plate cannot be replaced with the tools mentioned above. However, damaging the uppermost plate is very unlikely, because the frame part of the top plate leans on the top pressing plate.

3. Remove the upper part of the cake chute according to chapter 8.2.5 Removing the upper part of the cake chute.
4. Drive the plate pack to its open position by means of test drive and lock it.
5. Drive the cloth clipper seam (3) to the guide roller (2) of the filter plate (1) to be removed.

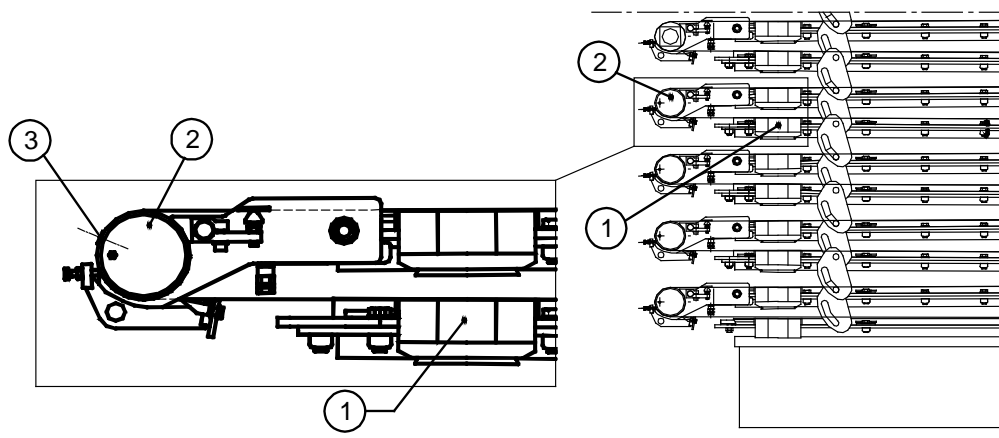


Figure 150. Replacing the filter plate

| | | |
|---------------------------------|--|-----------------|
| 1. Filter plate (to be removed) | 2. Guide roller (Above the filter plate to be removed) | 3. Clipper seam |
|---------------------------------|--|-----------------|

6. Slacken the cloth according to chapter 8.2.3 Slackening filter cloth. Pull the slackened filter cloth to the clipper seam.
7. Detach the clipper seam of the filter cloth by removing the seam thread.
8. Loosen the scraper of the filter plate to be removed.
9. Pull off the filter cloth from the top of the filter plate to be removed.
10. Arrange working space between filter plates by cutting the plate pack above the plate to be replaced according to chapter 8.2.4 Space arrangement between filter plates.
11. Remove collectors, hoses and possible auxiliary cloth drive motor from the filter plate to be removed.
12. Disconnect guide bars from the lower end and from the middle fixing points. Loosen the fixing of the upper end of the guide bars and remove guide bars further off the plate pack.

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⚠ DANGER

Crushing hazard. Falling filter plates can cause death or serious injury. Check the limit stops of the lifting bar's end positions before lifting the filter plate.

13. Fasten the plate lifting bars (2) (delivered with the filter) into the suspension links of the filter plate (3) above the filter plate (1) to be removed.

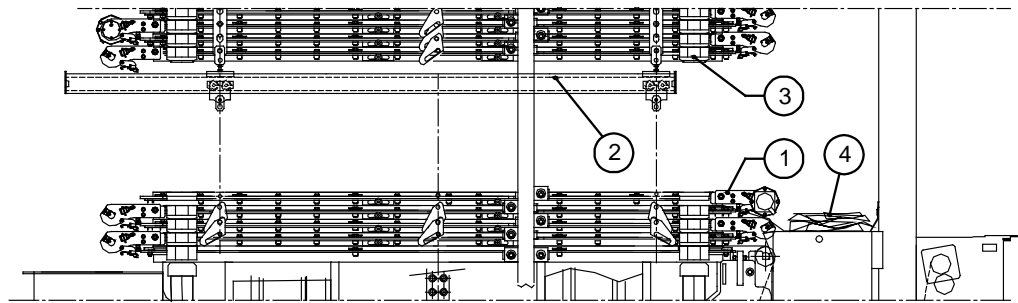


Figure 151. Fastening the plate lifting bars

| | |
|---------------------------------|-------------------------------|
| 1. Filter plate (to be removed) | 2. Lifting bar (weight 85 kg) |
| 3. Filter plate (next above) | 4. Filter cloth |

14. Lower the plate pack and fasten the plate to be replaced from its suspension pins to the lifting bars.

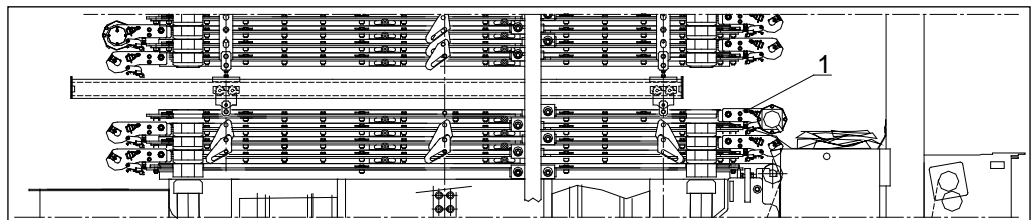


Figure 152. The filter plate to be replaced (1)

15. Lift the plate pack upwards and push carefully the plate up to the limit stops of the lifting bar.



⚠ DANGER

Crushing hazard. Falling filter plates can cause death or serious injury. Make sure that there is nothing in front of the filter plate and between the plate pack before driving the plate pack upwards. The filter plate can glide up to the limit stop by itself.

| | | | | | | |
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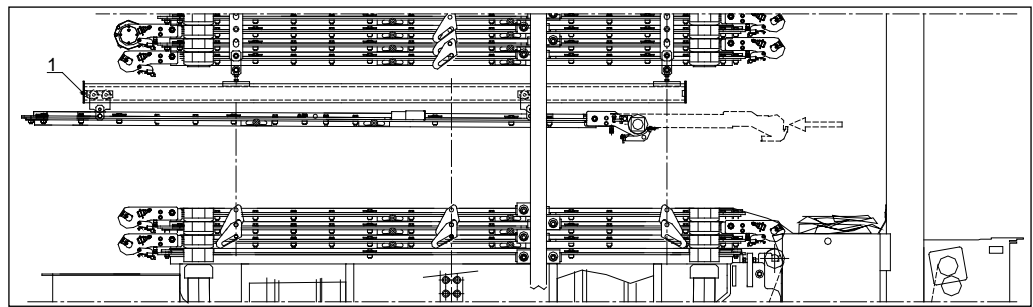


Figure 153. The limit stop of the lifting bar (1)

16. Attach the lifting chains into the suspension pins at the end of the plate. Lift the plate so that you can release the suspension parts from the plate.

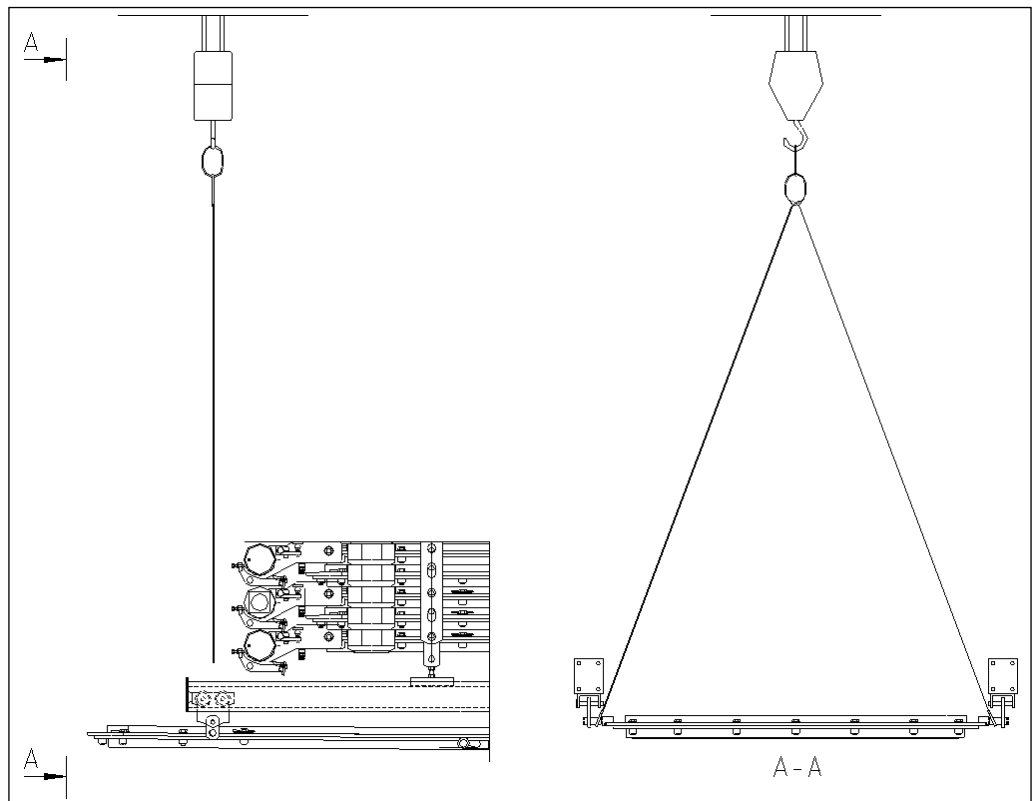


Figure 154. Lifting the filter plate



⚠ CAUTION

Incorrect hoisting may cause damage to the machinery. When lifting, keep in mind the weight of the filter plate.

17. Pull the plate out of the plate pack up to the limit stops with a crane (Figure A).
18. Attach the lifting chains with a lifting tackle to the suspension pins at the other end of the plate. Refer to figure B.

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19. Tighten the lifting chains with the chain tackle (1) so the plate is balanced. Refer to figure C.



NOTE: Make sure the chain tackle is always on the plate pack side. Refer to figure B.

20. Release the suspension parts from the plate. Refer to figure D.

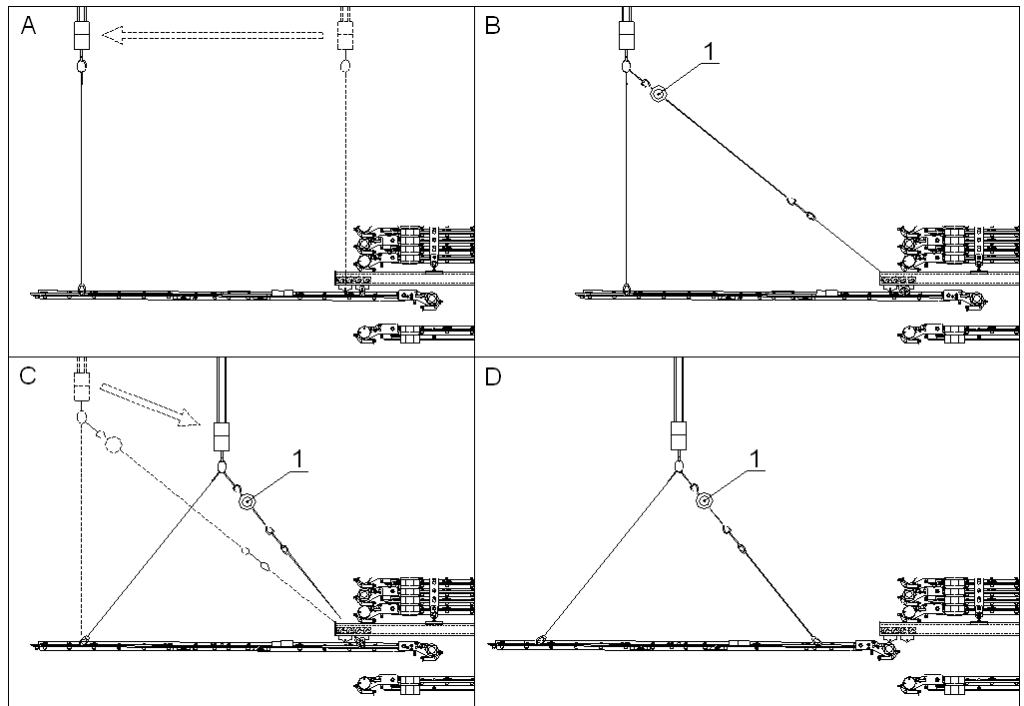


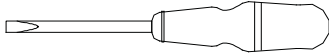
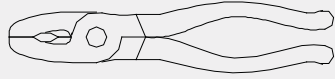

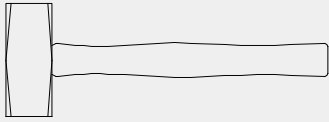
Figure 155. Chain tackle (1)

21. Mount a new plate in reverse order.

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8.2.9 Replacing filter plate seal

Table 33. Necessary equipment for seal replacement

| TOOL | DESCRIPTION |
|---|-------------|
|  | Screwdriver |
|  | Tongs |
|  | Chisel |
|  | Hammer |

8.2.9.1 Removing the old seal

1. After detecting the damaged seal, mark the corresponding filter plate.
2. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
3. Cut the filter plate pack below the marked filter plate. See chapter 8.2.4 Space arrangement between filter plates.
4. Remove the old seal from filter plate: Push a screwdriver between the frame and the seal. Squeeze the seal with the screwdriver and at the same time bend the other end upwards.

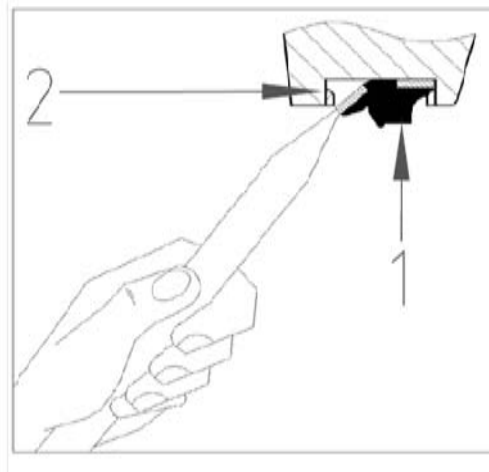


Figure 156. Removing the old seal

| | |
|---------|----------|
| 1. Seal | 2. Frame |
|---------|----------|

8.2.9.2 Installing filter plate seal

1. Install the other edge of a new seal into the groove. Bend the seal downwards and press the other edge into the groove by using a blunt chisel. Use a hammer if necessary.

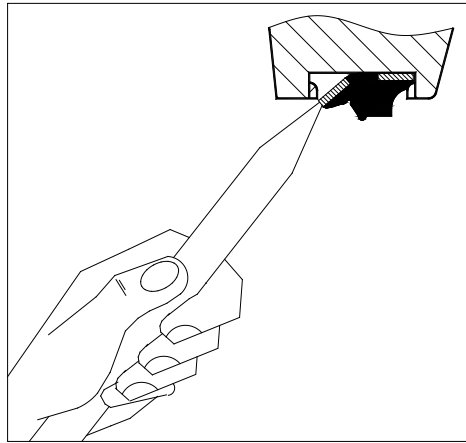


Figure 157. Installing the seal into the groove

2. Install a new seal according to numbered order, as indicated in the picture below.

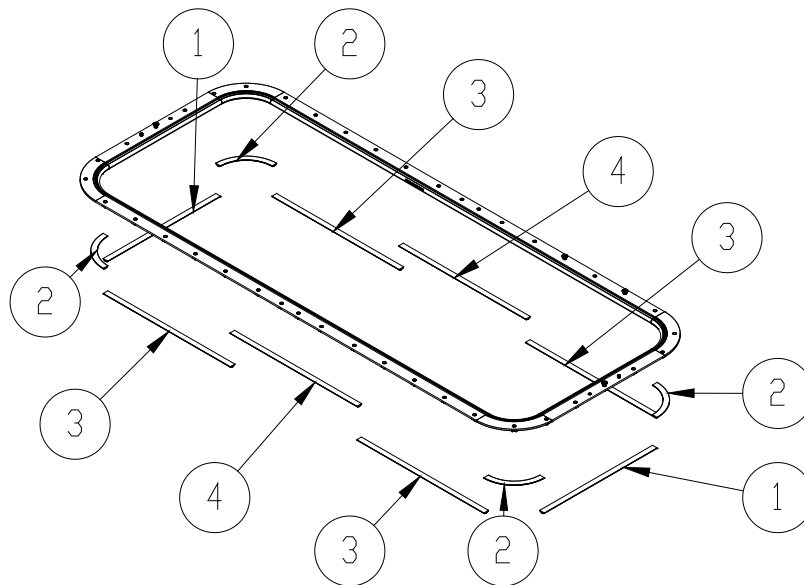


Figure 158. Installing a new seal

| | |
|---------------------------|-------------------------|
| 1. End part of seal | 2. Corner part of seal |
| 3. Outermost part of seal | 4. Midmost part of seal |

| | | | | | | |
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3. Press the end part of the seal (1) into its groove.
4. Install the corner parts of the seal (2). Install the both ends in the same way.

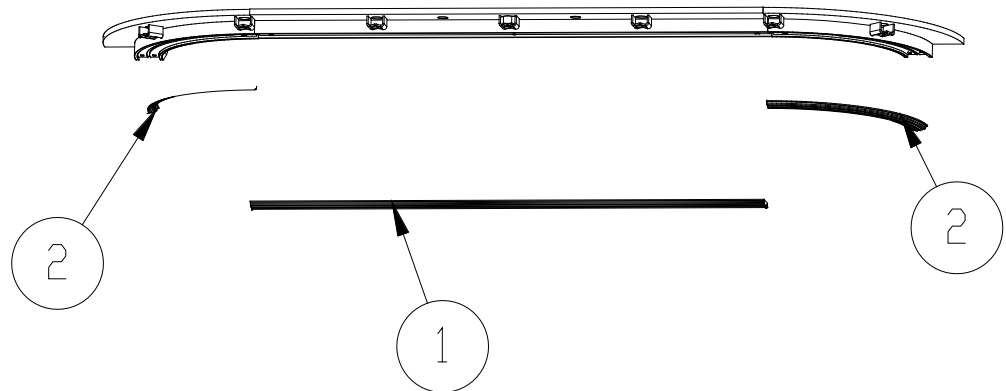


Figure 159. Installing the corner parts of the seal

5. Press the corner parts (2) against the end part (1) with a chisel in order to make approximately 2 mm compression between the seals. Refer to picture below. Use a hammer if necessary.

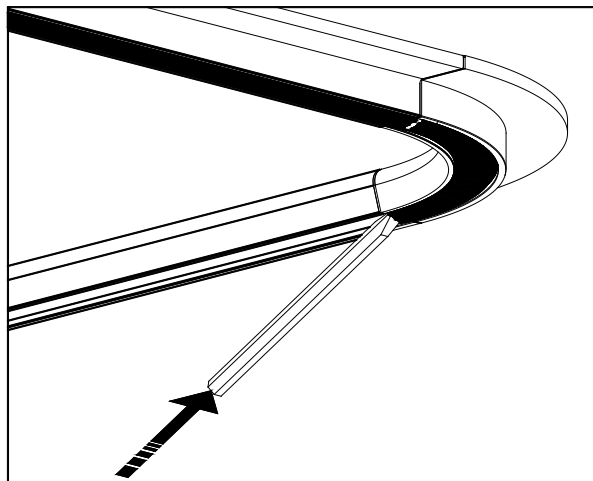


Figure 160. Pressing the corner parts of the seal

6. Install the outermost parts of the seals (3). Press the outermost seals against the corner parts (2) in order to make approximately 2 mm compression between the seals.
7. Install the midmost parts (4) to both sides. Fix the ends of the seal into the groove first. Then use a chisel and a hammer in order to get the central part of the seal into its groove. Refer to figures below.

| | | | | | | |
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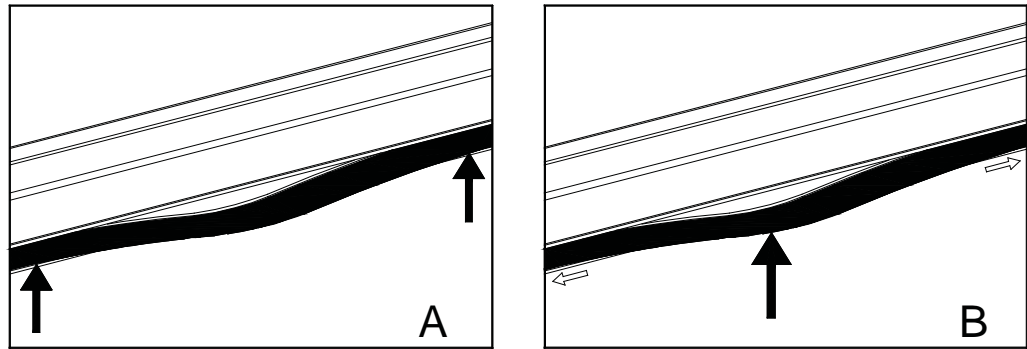


Figure 161. Install the midmost parts of the seal



NOTE: Do not shorten the seals.

8. Reverse the plate pack space arrangement, see chapter 8.2.4.5 Reversing the filter plate pack space arrangement.

8.2.10 Replacing grids

The grid set (two sets in each filtrate vat) in the filter chamber consists of four different items; ten middle pieces, three end pieces and two different corner pieces attached to each other with clamping pins in the grid. The middle and end pieces are interchangeable (The corner pieces are interchangeable with the opposite side of the filter chamber corners).

1. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
2. Cut the filter plate pack above the filter plate with the damaged grid. See chapter 8.2.4 Space arrangement between filter plates.



⚠ CAUTION

There are clamping pins between certain grid plates. Keep this in mind when replacing the broken ones.

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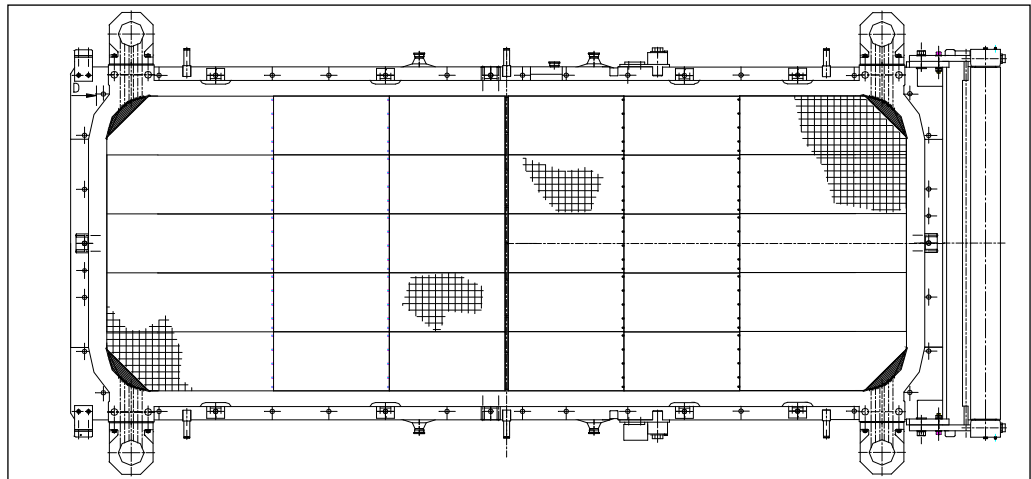


Figure 162. Filter plate

3. Remove the midmost grid plate. Use the screwdriver if needed. Now you can remove the broken grid plate from its clamping pins.
4. Clean the filter plate bottom plate / filtrate vat before installing new grids.
5. Install a new grid plate and fasten it by pressing it into the next grid plates. Push the removed grid plate at the end of the plate into its place and check the grid fixings.
6. Reverse the plate pack space arrangement, see chapter 8.2.4.5 Reversing the filter plate pack space arrangement.

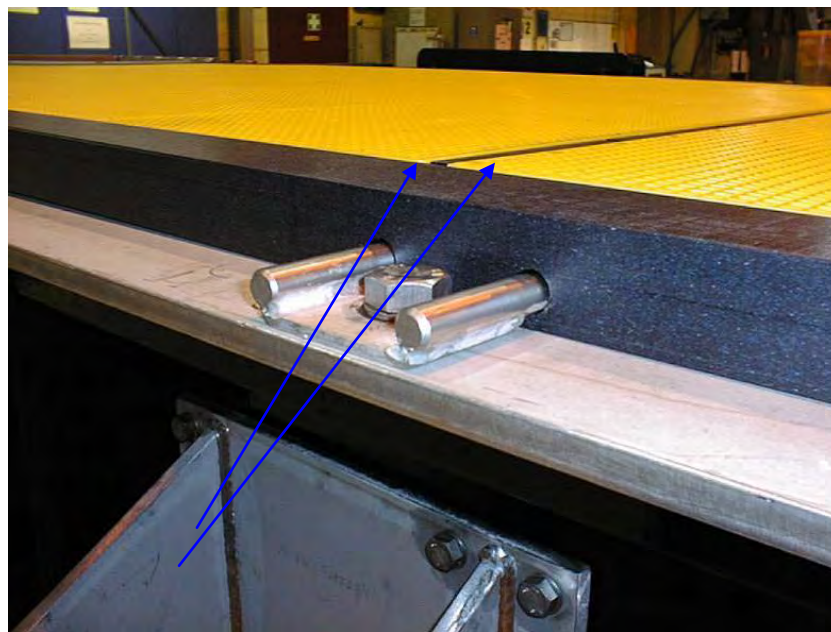


Figure 163. Midmost grid pieces in their places

| | | | | | | |
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Figure 164. Removing the middle grid piece

8.2.11 Symptoms of leaking diaphragm

Observe the condition of the diaphragms continuously. In case the consumption of pressing air has increased and it flows into the chamber even at the end of pressing stage, change the damaged diaphragm immediately.

There is a sensor (S531) in the pressing manifold for detecting moisture (slurry or water).

8.2.12 Risks of the leaking diaphragm

Observe the diaphragms. They must remain undamaged. A damaged diaphragm results in a wet cake, and the solids are escaping into the pressing water wearing down the press water piping and pump.

8.2.13 Locationing of the leaking diaphragm



⚠ CAUTION

Wear safety goggles when searching for a leaking diaphragm. Do not open the feed pipe when the plate pack is closed.

A defective diaphragm is localized as follows: when the plate pack is open, one filtrate hose at a time is removed from the filter plate. Then the plate pack is closed and sealed. After this, diaphragm pressing is started. It is possible to locate the defective diaphragm by checking, if water comes out from the filtrate outlet of the filter plate. The defective diaphragm is located above this filter plate.

| | | | | | | |
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8.2.14 Replacing diaphragm

1. After locating the leaking diaphragm mark the corresponding filter plate.
2. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
3. Cut the filter plate pack above the marked filter plate. See chapter 8.2.4 Space arrangement between filter plates.
4. Unscrew the frame fixing screws using the drive impact wrench (30 mm socket) delivered with the filter.

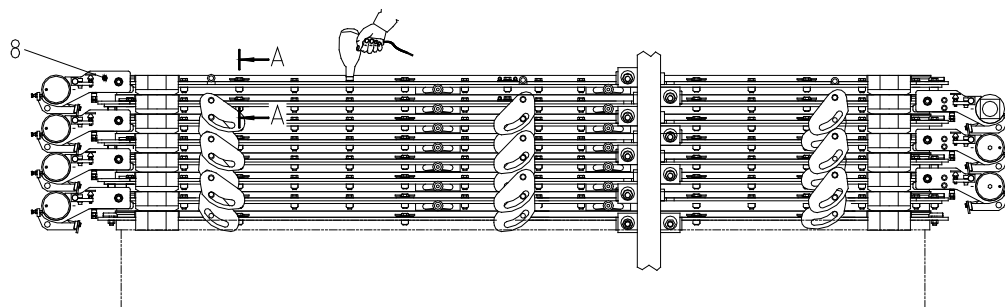


Figure 165. Unscrew the frame fixing screws

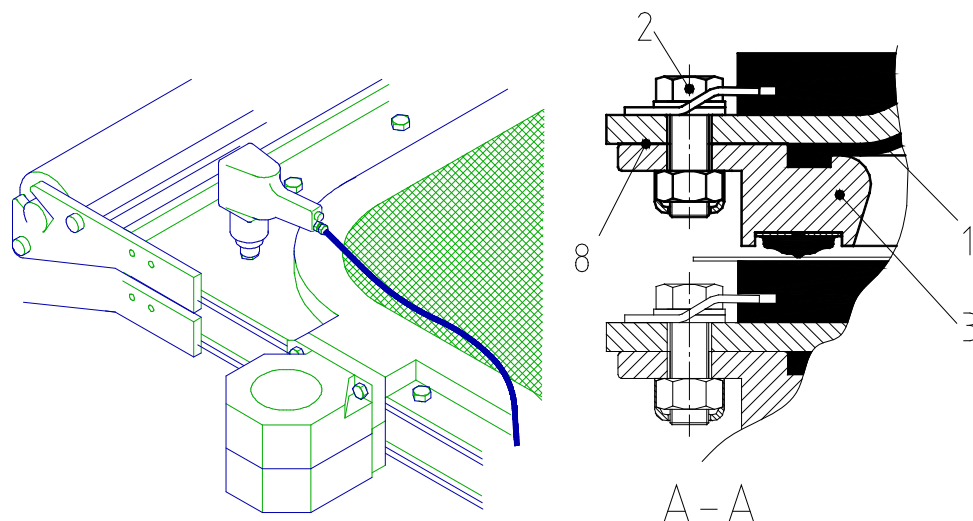


Figure 166. Unscrewing the frame fixing screws

1. Broken filter diaphragm

2. Hexagonal screw M20

3. Frame

8. Filter plate number 8

5. Reverse the plate pack space arrangement by following the instructions in chapter 8.2.4.5 Reversing the filter plate pack space arrangement; and follow the instructions below:
 - If the space arrangement is done without suspension bars, remove the suspension plates from the marked filter plate.

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- If the space arrangement is done with suspension bars, move the suspension bars upwards so the filter plates (6 pieces) are linked together immediately above the marked filter plate.
 - Skip all work steps involving the cloth.
6. Cut the filter plate pack below the marked filter plate. See chapter 8.2.4 Space arrangement between filter plates and the relevant subchapters. This procedure lifts the upper part of the plate but leaves the lower part in place.
 7. Remove the broken filter diaphragm.

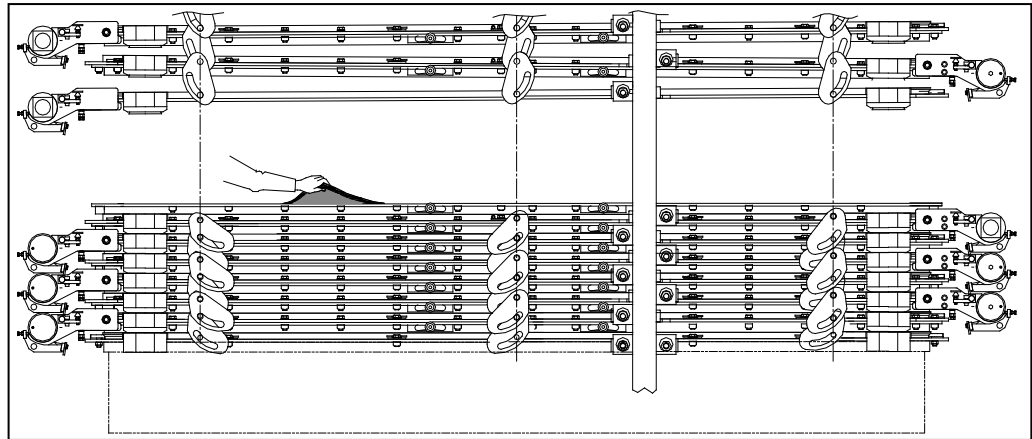


Figure 167. Example of removing the broken filter diaphragm, without suspension bars

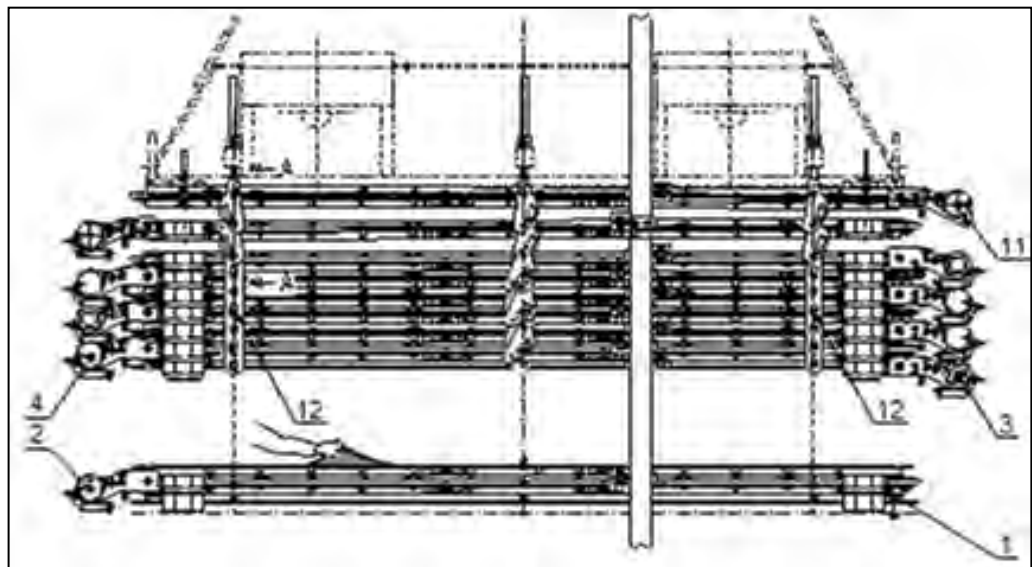


Figure 168. Example of removing the broken filter diaphragm, with suspension bars

- | | | |
|--|----------------------------|---|
| 1. Filter plate number 1 (lowest filter plate) | 2. Filter plate number 2 | 3. The bottom plate of the filter plate to be maintained. |
| 4. Filter plate number 4 | 11. Filter plate number 11 | 12. Suspension bars |

| | | | | | | |
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8. Place 4 pieces of support plates inside the frame to help the installation of a new filter diaphragm (for example polyurethane or polystyrene plate 40 x 1000 x 1500).

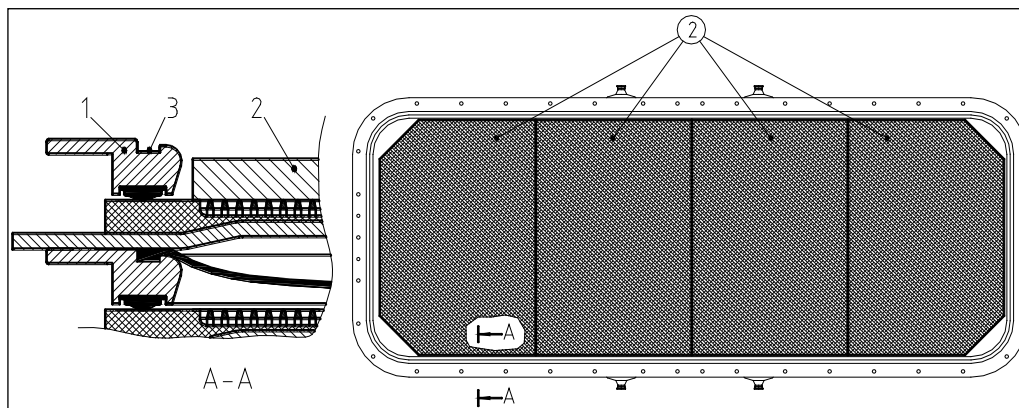


Figure 169. Placing support plates inside the frame

| | | |
|----------|------------------|---------------------|
| 1. Frame | 2. Support plate | 3. Diaphragm groove |
|----------|------------------|---------------------|

9. Install the new filter diaphragm in its place by pressing the filter diaphragm edge in the clean frame groove. Check the filter diaphragm edge is in the groove.

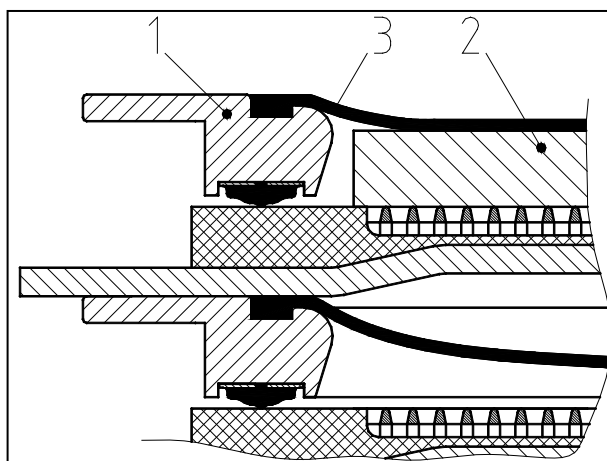


Figure 170. Installation of a new filter diaphragm

| | | |
|----------|------------------|-------------------------|
| 1. Frame | 2. Support plate | 3. New filter diaphragm |
|----------|------------------|-------------------------|

10. Reverse the plate pack space arrangement by following the instructions in chapter 8.2.4.5 Reversing the filter plate pack space arrangement; and follow the instructions below:

- If the space arrangement is done without suspension bars, remove the suspension plates from the marked filter plate.
- If the space arrangement is done with suspension bars, move the suspension bars upwards so the filter plates (6 pieces) are linked together immediately above the marked filter plate.
- Skip all work steps involving the cloth.

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11. Cut the plate pack by following the instructions in chapter 8.2.4 Space arrangement between filter plates and the relevant subchapters.
12. Fix the frame screws back in their places (tightening torque 300 Nm). Apply Rocol J160 or similar to the frame screws to prevent the threads from seizing.
13. Reverse the plate pack space arrangement by following the instructions in chapter 8.2.4.5 Reversing the filter plate pack space arrangement; and follow the instructions below:
 - If the space arrangement is done without suspension bars, remove the suspension plates from the marked filter plate.
 - If the space arrangement is done with suspension bars, move the suspension bars upwards so the filter plates (6 pieces) are linked together immediately above the marked filter plate.
 - Leave the cloth as it is; skip all work steps involving the cloth.
14. Cut the plate pack by following the instructions in chapter 8.2.4 Space arrangement between filter plates and the relevant subchapters.
15. Remove the support plates used previously in the diaphragm installation.
16. Reverse the plate pack space arrangement by following the instructions in chapter 8.2.4.5 Reversing the filter plate pack space arrangement.

8.2.15 Replacing filtrate vat

8.2.15.1 Replacing filtrate vat by removing filter plate

1. Remove the upper part of the cake chute according to chapter 8.2.5 Removing the upper part of the cake chute.
2. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
3. Remove the filter plate requiring maintenance from the plate pack according to chapter 8.2.8 Replacement of the filter plate.
4. Lift the filter plate on wooden beams for maintenance.
5. Loosen the filtrate collectors.
6. Loosen the fixing elements of the filtrate vat: 5 pieces on both sides and 1 piece at each end.

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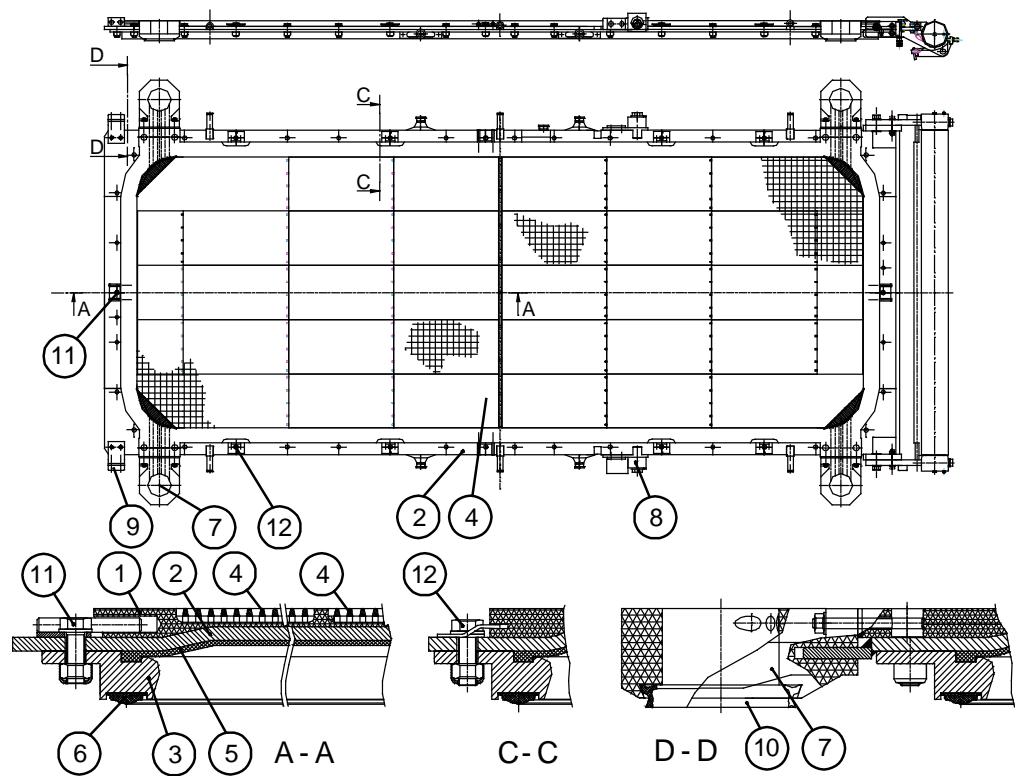


Figure 171. Loosening the fixing elements

| | | |
|-----------------------|--|---|
| 1. Filtrate vat | 2. Bottom plate | 3. Frame |
| 4. Grid | 5. Diaphragm | 6. Seal |
| 7. Filtrate collector | 8. Slide piece longitudinal guidance | 9. Slide piece lateral guidance |
| 10. Collector seal | 11. Fixing element (1 piece at each end) | 12. Fixing element (5 pieces on both sides) |

7. Remove the filtrate vat from the filter plate.
8. Install a new filtrate vat in reverse order. Check alignment of the collectors before tightening the fixing elements.

8.2.15.2 Replacing filtrate vat with filter plate in place

1. Cut the plate pack according to chapter 8.2.4 Space arrangement between filter plates.

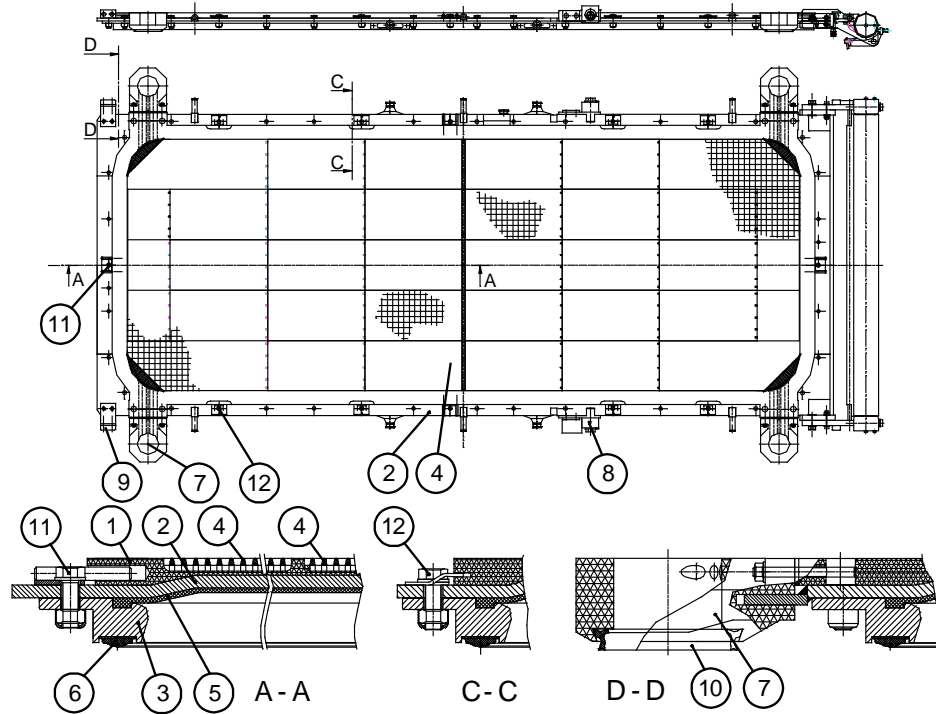


Figure 172. Loosening the fixing elements

| | | |
|-----------------------|--|---|
| 1. Filtrate vat | 2. Bottom plate | 3. Frame |
| 4. Grid | 5. Diaphragm | 6. Seal |
| 7. Filtrate collector | 8. Slide piece longitudinal guidance | 9. Slide piece lateral guidance |
| 10. Collector seal | 11. Fixing element (1 piece at each end) | 12. Fixing element (5 pieces on both sides) |

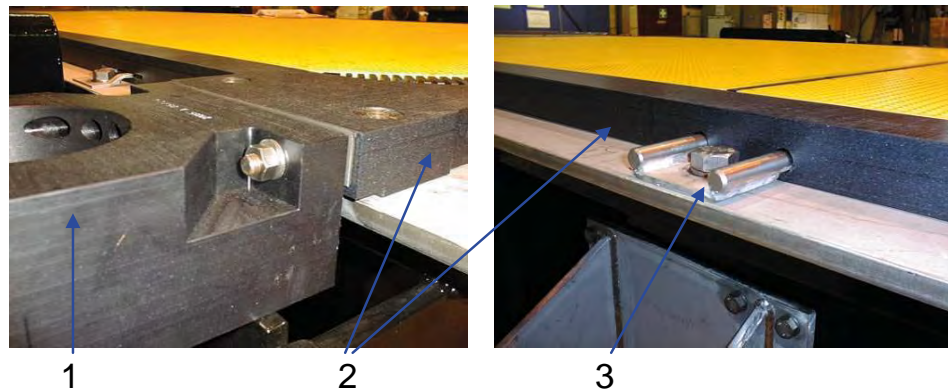


Figure 173. Replacing filtrate vat with filter plate in place

| | | |
|---------------------------|-----------------|--------------------------|
| 1. The filtrate collector | 2. Filtrate vat | 3. Fixing element of vat |
|---------------------------|-----------------|--------------------------|

2. Loosen the fixing elements of the filtrate vat: five pieces on both sides and one pc at each end.
3. Remove the filtrate collectors. Remove the stud bolts and the sleeves.
4. Remove the grids from the filtrate vat.
5. Remove the filtrate vat from the base plate.
6. Install a new filtrate vat in a reversed order. Check the alignment of the collectors before tightening the fixing elements.
7. Re-assemble the plate pack according to chapter 8.2.4.5 Reversing the filter plate pack space arrangement.

8.2.16 Replacement and adjustment of slide pieces

Wearing of the slide pieces causes the plate to move in its longitudinal axis direction, and the alignment of the filtrate collector's changes. As a consequence of this the collector lines begin to leak damaging the collector seals.

Observe the slide pieces for possible wear, and adjust when necessary. When there is no adjustment tolerance left, replace the slide pieces as follows:

- At first unscrew the fixing nut. Then remove the eccentric sleeve and slide piece support. Finally remove the slide piece.
- Check the filter plate alignment and insert a new slide piece. Install the slide piece support and eccentric sleeve so that the maximum adjustment tolerance remains for the slide piece wearing. Hold the adjusting lever of the eccentric sleeve with a key (wrench) and tighten the nut.

| | | | | | | |
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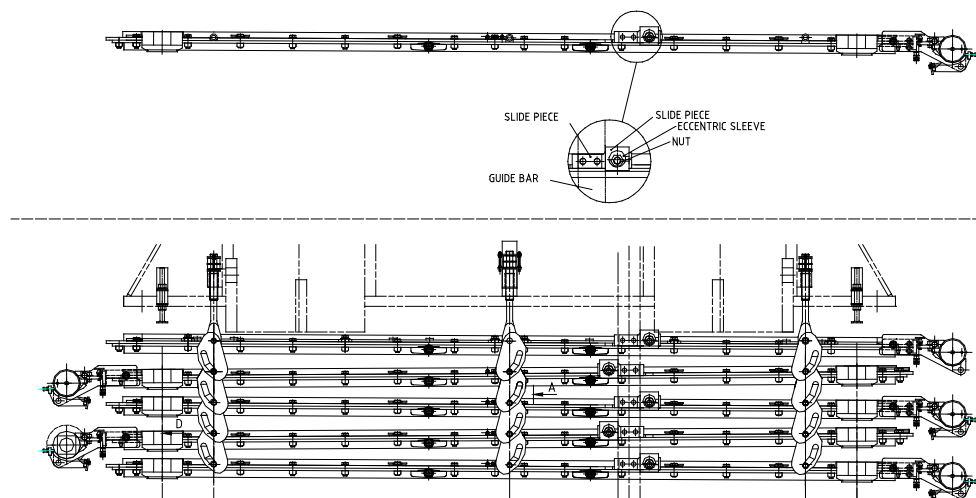


Figure 174. Replacement and adjustment of slide pieces



NOTE: Also see chapter 8.2.17 Plate pack adjustment.

8.2.17 Plate pack adjustment

1. Close the plate pack.
2. Loosen the adjusting nuts (2) of the top suspension plates (1) to get space for removing and installation of the filling plates (do not release top suspension plates from the upper pressing plate).

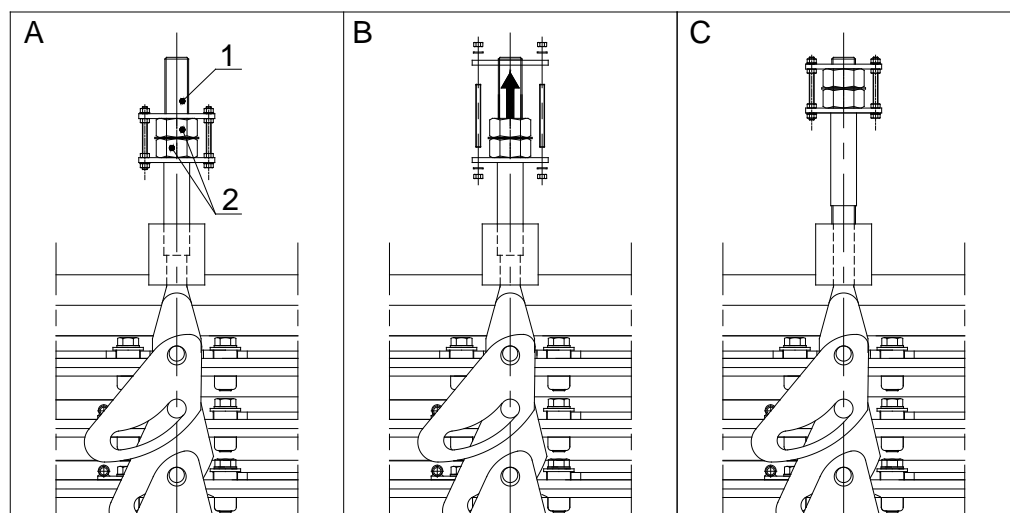


Figure 175. Adjusting plate pack

- | | |
|-------------------------|------------------|
| 1. Top suspension plate | 2. Adjusting nut |
|-------------------------|------------------|

| | | | | | | |
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3. Open the plate pack. Remove the filling plates from the plate pack so that the strokes of the cylinders can be driven right to the bottom.
4. Drive the upper pressing plate into its lower position by driving the strokes of the cylinders right to the bottom. Measure the dimension X, see picture below.

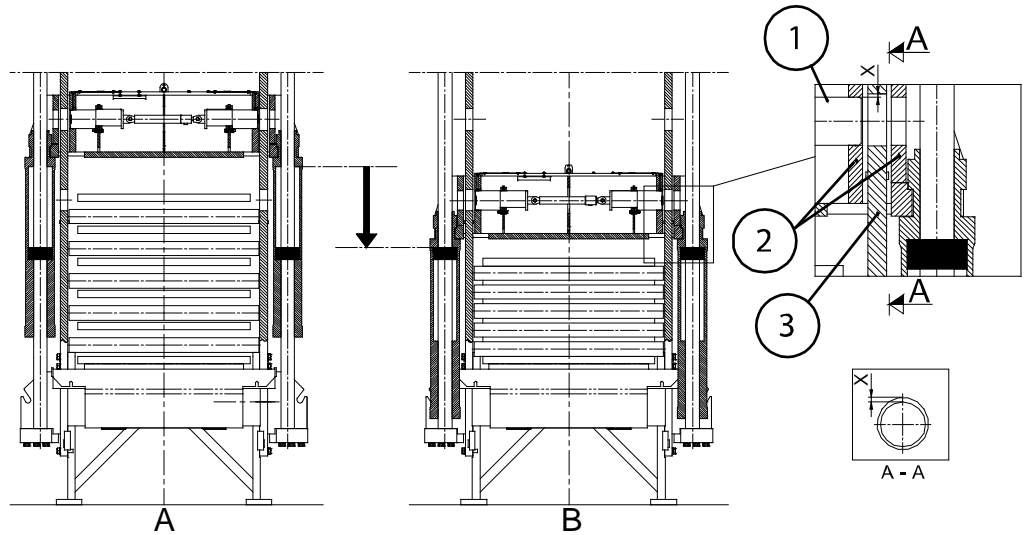


Figure 176. Driving the upper pressing plate

| | |
|---|---|
| A. Upper pressing plate in upper position | B. Upper pressing plate driven into lower position |
| 1. Locking pin | 2. Upper pressing plate |
| 3. Column | dim. X= gap between top surface of locking hole and locking pin |

5. Measure the distance (dimension A in the picture below) between the upper pressing plate and the top filter plate.

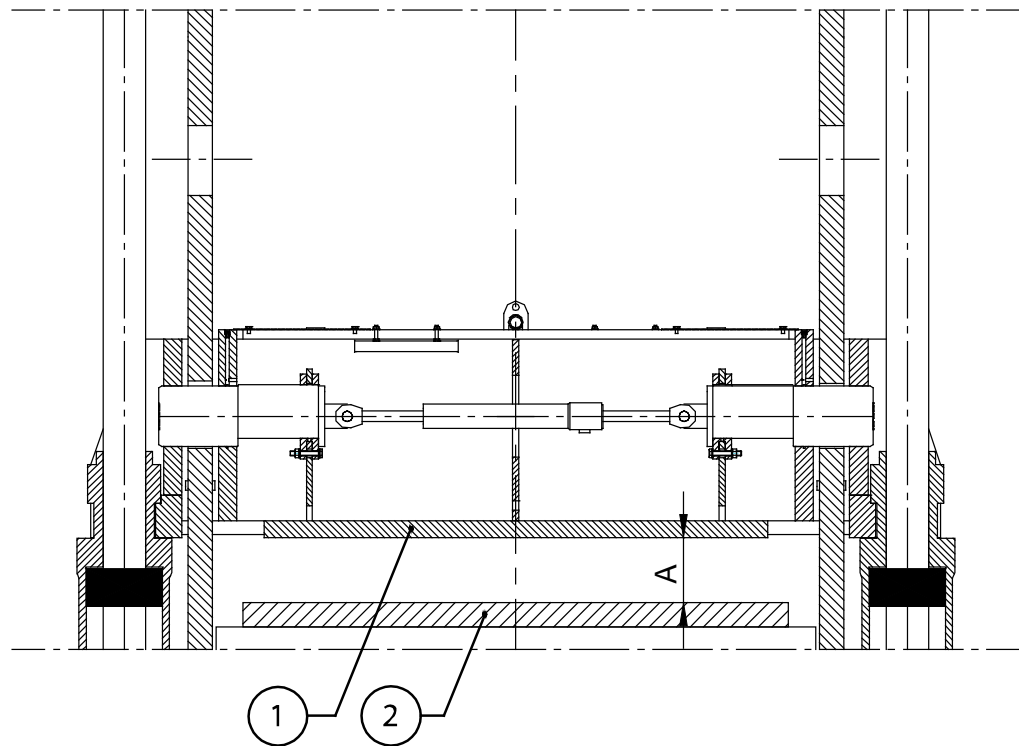


Figure 177. Measuring distance

| | |
|-------------------------|---------------------|
| 1. Upper pressing plate | 2. Top filter plate |
|-------------------------|---------------------|

Dim. A = distance between upper pressing plate and top filter plate

6. Calculate the needed compression for the plate pack. The compression of each seal of the filter plate has to be 2 mm (e.g. compression of 10 filter plates is 20 mm).
7. Open and lock the plate pack.
8. Calculate the necessary filling thickness:
Necessary filling thickness = compression of the plate pack + dim. A + dim. X
9. Install filling plates according to necessary filling thickness.
10. Close the plate pack. Check compression of the plate pack (dim. B), see picture below.

| | | | | | | |
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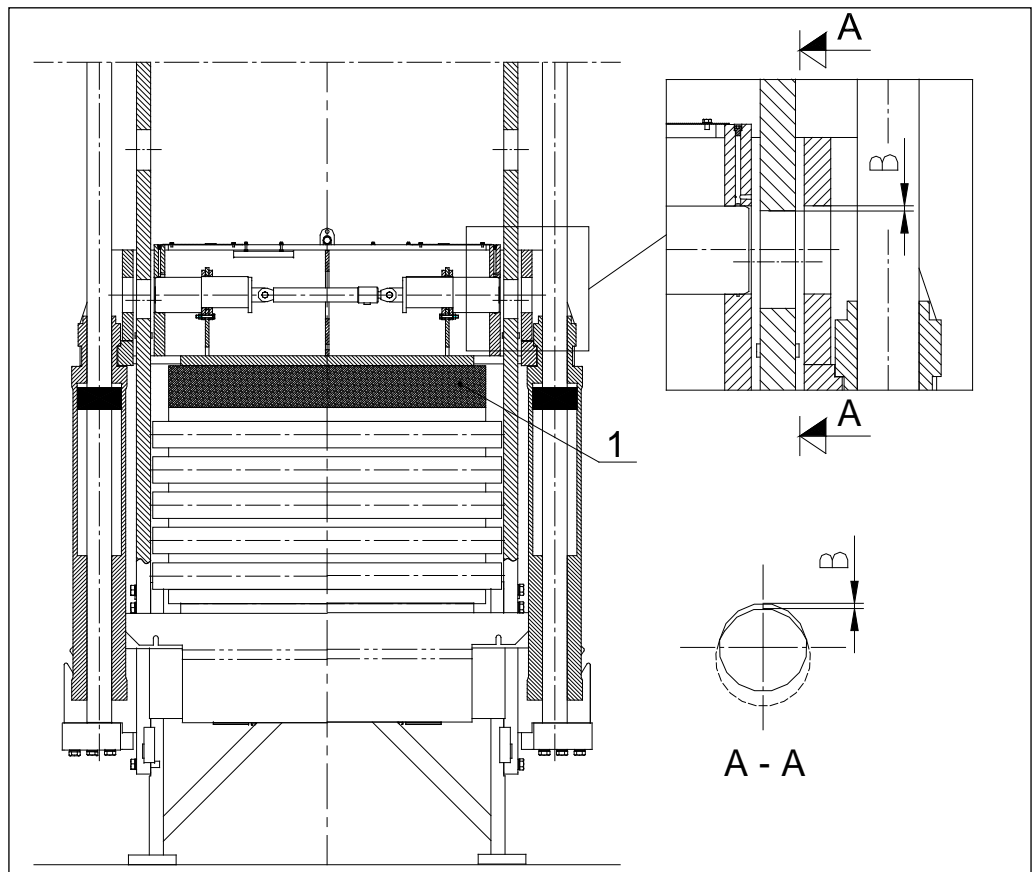


Figure 178. Closing the plate pack

1. Filling plates

Dim. B= Compression of the plate pack

11. Compress the plate pack. Compression pressure should be 160...180 bar (max. 200 bar). At first check that the locking pins are in the column holes. Then lock the plate pack by driving the locking pins into the locking holes of the columns.



NOTE: The compression pressure can rise up to 200 bar without filling plates, because of a piston hit to the cylinder's bottom.

12. Drive the locking pins out from the locking holes and release compression of the plate pack.
13. Adjust the suspension of the plate pack with adjusting nuts of the top suspension plates.

8.2.17.1 Installation and replacement of grids

Proceed as follows

1. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
2. Remove the filter plate requiring maintenance from the plate pack according to chapter 8.2.8 Replacement of the filter plate. Place the filter plate on a flat plane for maintenance.
3. Replace the necessary grid plates and fasten them by pressing the plates against the next ones. Check the grid fixings.
4. Install the maintained filter plate back to the plate pack according to chapter 8.2.8 Replacement of the filter plate.
5. Tighten the filter cloth before the start up and check the cloth tracking.

Integrated grids

The grid set in the filter chamber consists of 6 pieces; 2 middle pieces and 4 corner pieces attached to each other with clamping pins in the grid.

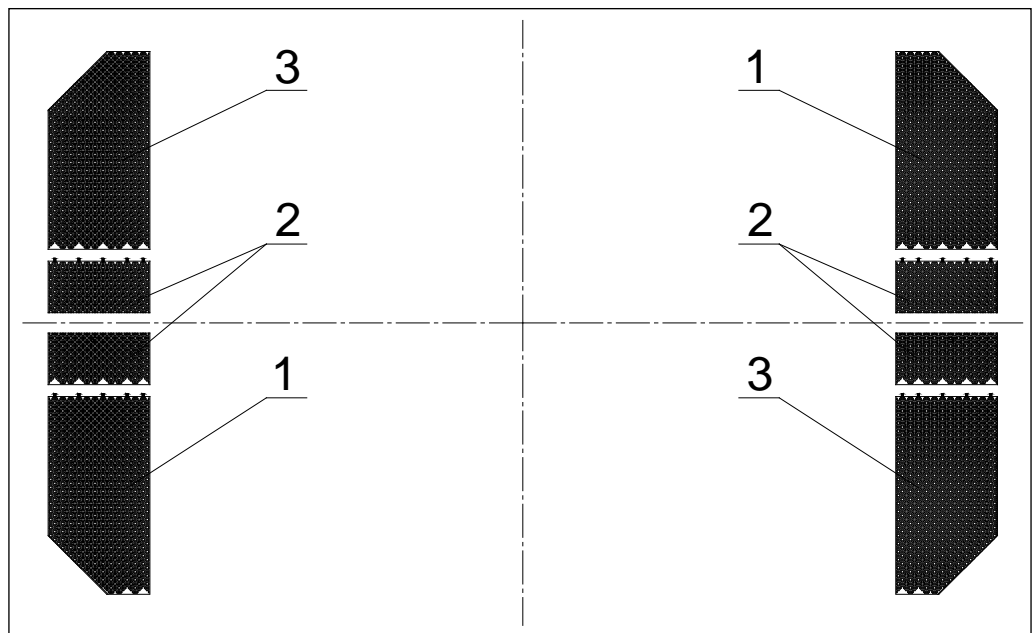


Figure 179. Integrated grids

| | | |
|-------------------------------|---------------------------------|--------------------------------|
| 1. Left grid piece (2 pieces) | 2. Middle grid piece (2 pieces) | 3. Right grid piece (2 pieces) |
|-------------------------------|---------------------------------|--------------------------------|

Detachable grids

The grid set in the Filter chamber consists of 40 pieces: 26 grid plates, 10 middle pieces and 4 corner pieces. Pieces are attached to each other by clamping pins in the grid.

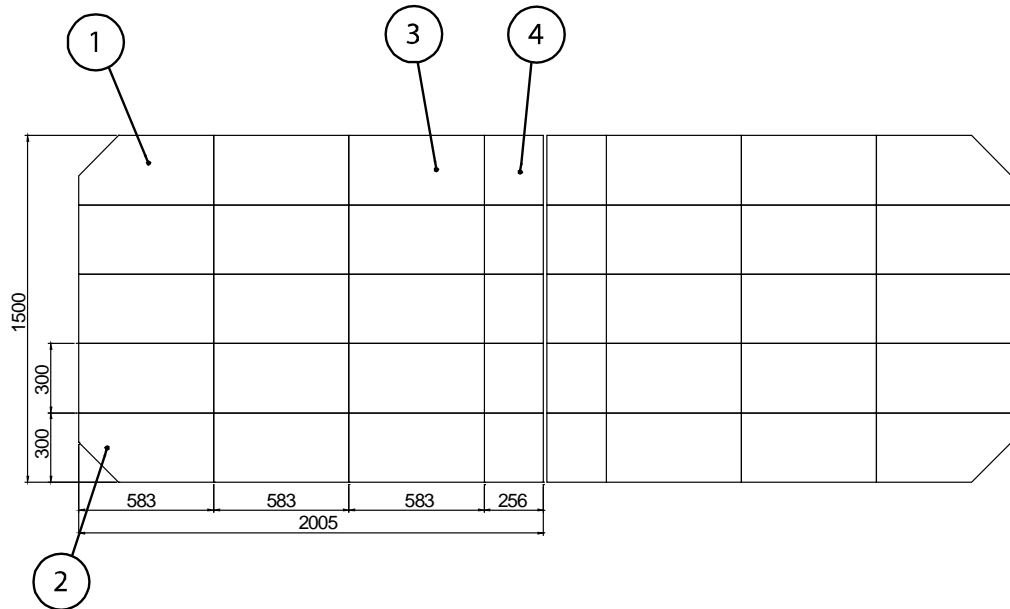


Figure 180. Grid set (detachable)

- | | |
|--------------------------------------|---------------------------------------|
| 1. Left corner grid piece (2 pieces) | 2. Right corner grid piece (2 pieces) |
| 3. Grid plate (26 pieces) | 4. Middle grid piece (10 pieces) |

8.2.17.2 Diaphragm

Symptoms of leaking diaphragm

Refer to chapter 8.2.11 Symptoms of leaking diaphragm.

Risks of the leaking diaphragm

Refer to chapter 8.2.12 Risks of the leaking diaphragm.

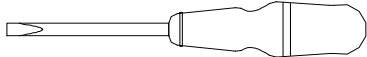
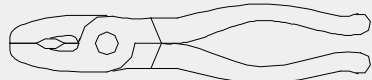
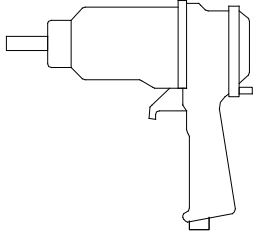
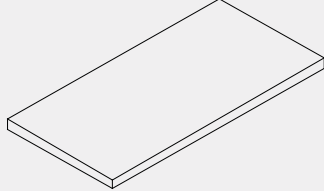
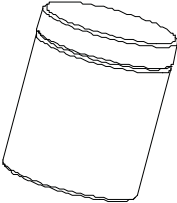
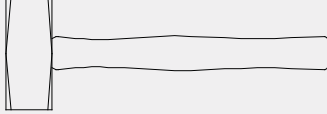
Localization of the leaking diaphragm

Refer to the chapter 8.2.13 Locating of the leaking diaphragm.

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Replacing the diaphragm

Table 34. Necessary equipments for diaphragm replacement

| ITEM | DESCRIPTION |
|---|--|
|  | Screwdriver |
|  | Tongs |
|  | Pneumatic wrench (included in Outotec delivery maintenance tools), opening 24 mm. |
|  | e.g. 4 pieces polyurethane or polystyrene plate 40 x 1000 x 1500 (excluded from Outotec delivery). |
|  | Rocol J160 or similar anti seize compound. |
|  | Hammer |

The filter plate has to be removed from the plate pack in order to change the diaphragm.

1. After locating the leaking diaphragm, mark the filter plate.
2. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
3. Set 4 pieces of support plates on the plywood sheet(s) to facilitate the installation of a new filter diaphragm (e.g. polyurethane or polystyrene plate 40 x 1000 x 1500, (4 pieces).
4. Remove the filter plate requiring maintenance from the plate pack according to chapter 8.2.8 Replacement of the filter plate. Place the plate on plywood sheet(s) (4) standing on supports (5).

- Unscrew the frame fixing screws (2) using the drive impact wrench (30 mm socket) delivered with the filter.

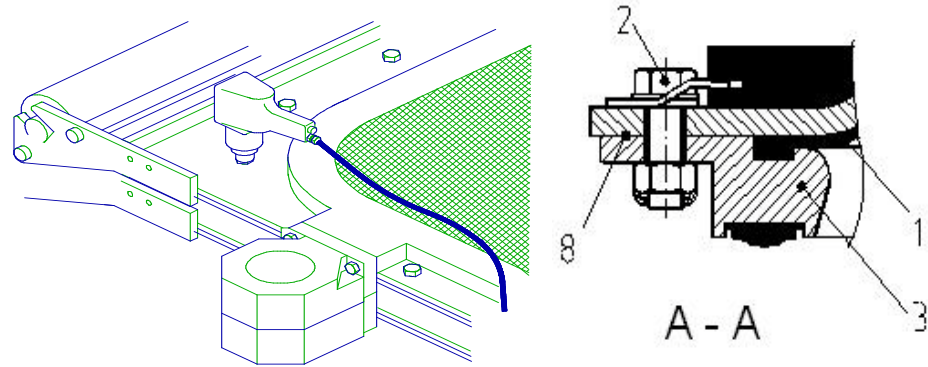


Figure 181. Unscrewing the frame fixing screws

| | |
|----------------------------|--------------------------|
| 1. Broken filter diaphragm | 2. Hexagonal screw M20 |
| 3. Frame | 8. Filter plate number 8 |

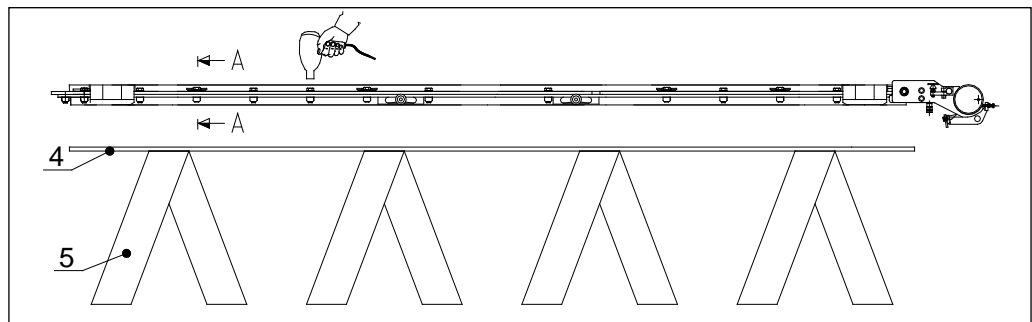


Figure 182. Unscrewing the frame fixing screws

| | |
|---------------------|---|
| 4. Plywood sheet(s) | 5. Support (made of wooden beams for example) |
|---------------------|---|

- Lift the upper part of the filter plate upwards so, that the bottom part can be maintained.

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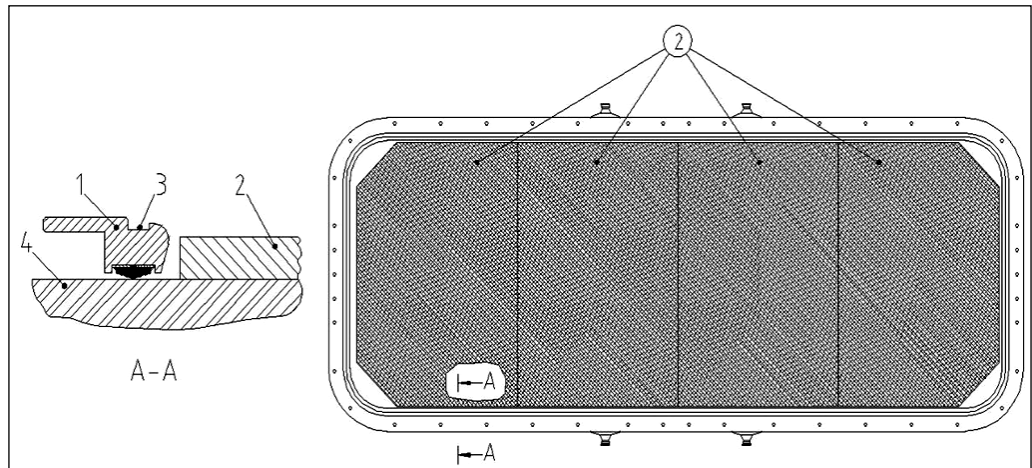


Figure 183. Lifting the upper part of the filter plate

| | |
|---------------------|------------------|
| 1. Frame | 2. Support plate |
| 3. Diaphragm groove | 4. Plywood sheet |

7. Install a new filter diaphragm (3) by pressing the filter diaphragm's edge into the frame's groove.



NOTE: Make sure that the filter diaphragm's edge is in the groove.

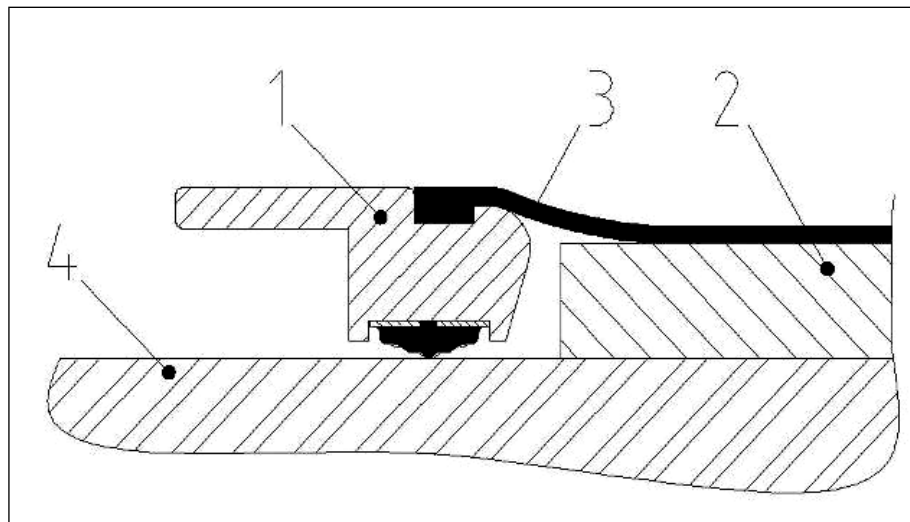


Figure 184. Installing a new filter diaphragm

| | |
|-------------------------|------------------|
| 1. Frame | 2. Support plate |
| 3. New filter diaphragm | 4. Plywood sheet |

8. Lift the upper part of the filter plate back on top of the bottom part and reinstall the frame screws (Tightening torque 350 Nm). Apply Rocol J160 or similar to screws in order to prevent the threads from seizing.
9. Reinstall the maintained filter plate into the plate pack according to chapter 8.2.8 Replacement of the filter plate.

8.2.17.3 Replacing the filtrate vat

1. Remove the upper part of the cake chute according to chapter 8.2.5 Removing the upper part of the cake chute.
2. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth.
3. Remove the filter plate requiring maintenance from the plate pack according to chapter 8.2.8 Replacement of the filter plate. Lay the filter plate down on wooden beams for maintenance.
4. Loosen the filtrate collectors.
5. Loosen the fixing elements of the filtrate vat: 5 pieces on both sides and 1 piece at each end.

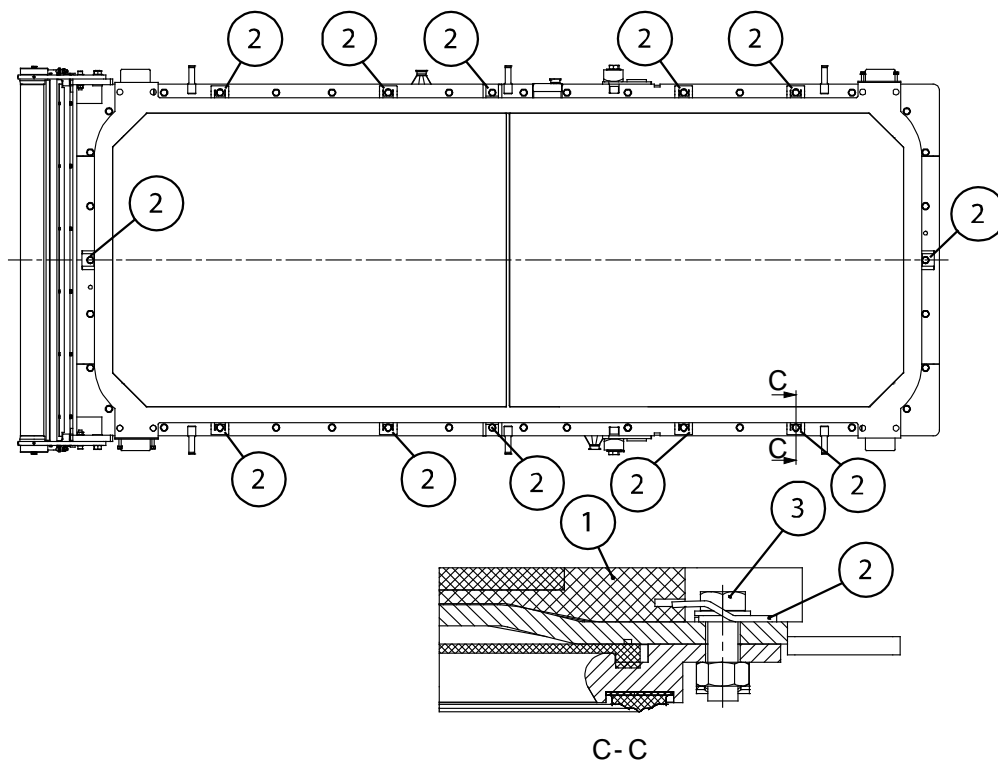


Figure 185. Replacing the filtrate vat

| | | |
|-----------------|-------------------|----------------|
| 1. Filtrate vat | 2. Fixing element | 3. Screw (M20) |
|-----------------|-------------------|----------------|

6. Remove the filtrate vat from the filter plate.
7. Install a new filtrate vat in reverse order. Check the alignment of the collectors before tightening the fixing elements.

| | | | | | | |
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8.2.18 Maintenance of slide pieces

Observe the slide pieces for possible wear, and adjust if necessary. When there is no adjustment allowance left, replace the slide piece.

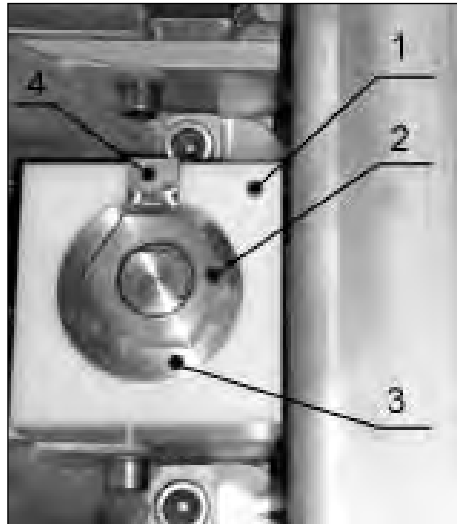


Figure 186. Slide pieces

| | |
|---------------------|--|
| 1. Slide piece | 2. Nut (spanner size 24) |
| 3. Eccentric sleeve | 4. Adjusting lever of eccentric sleeve |

8.2.18.1 Adjustment of slide pieces

A small longitudinal difference between the plates does not disturb the operation of the filter. In lateral direction the plates should be parallel with the filter's center line (max tolerance ± 1 mm). Use a plumb line as an accessory at the end of the upper roller to check possible lateral differences between the filter plates.

Lateral differences can be adjusted within the limits of the allowed tolerance. The slide pieces cannot be adjusted so, that they could turn the filter plate by force. This would cause quick wear of the slide pieces, and the plate is directed to its original position, while the slide pieces wear out.

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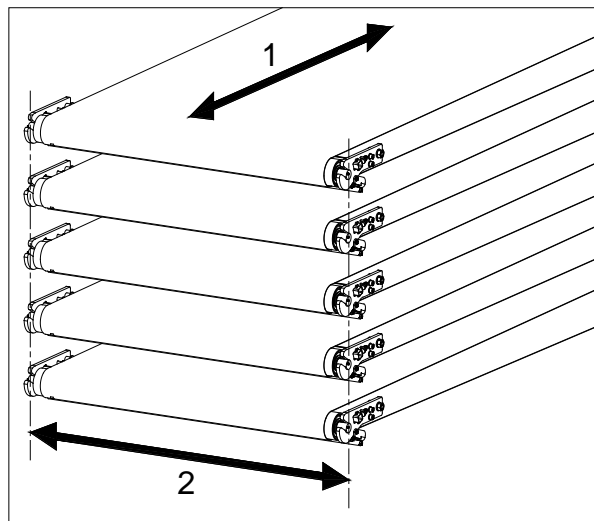


Figure 187. Positions

| | |
|---------------------------|----------------------|
| 1. Longitudinal direction | 2. Lateral direction |
|---------------------------|----------------------|

- Drive the plate pack upwards so, that the filter plate to be adjusted hangs as the lowest one, whereby the weight of the plates below is not directed to this plate, which is to be adjusted. If all slide pieces of the filter plates has to be adjusted, start the adjustment work from the uppermost plate proceeding plate by plate downwards.
- Loosen the slide pieces on both sides of the filter plate. At first let the filter plate hang freely from its suspension links. Then tighten the slide pieces so, that the filter plate stays lengthwise parallel with its center line.

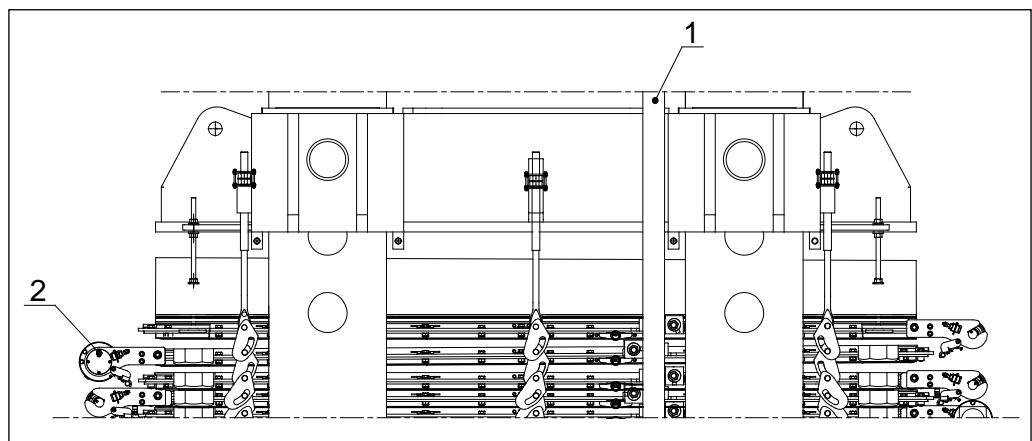


Figure 188. Adjustment of slide pieces

| | |
|--------------|-----------------------------|
| 1. Slide bar | 2. The plate to be adjusted |
|--------------|-----------------------------|

The plate pack has been opened so, that the plate to be adjusted hangs as the lowest one.

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8.2.18.2 Turning/replacing the slide pieces

Wearing of the slide pieces causes the plate to move in its longitudinal axis direction, and the alignment of the filtrate collector's changes. As a consequence of this the collector lines begin to leak damaging the collector seals.

Observe the slide pieces for possible wear, and adjust when necessary. When there is no adjustment tolerance left, replace the slide pieces as follows:

- At first unscrew the fixing nut. Then remove the eccentric sleeve and slide piece support. Finally remove the slide piece.
- Check the filter plate alignment and insert a new slide piece. Install the slide piece support and eccentric sleeve so that the maximum adjustment tolerance remains for the slide piece wearing. Hold the adjusting lever of the eccentric sleeve with a key (wrench) and tighten the nut.

8.2.19 Scrapers

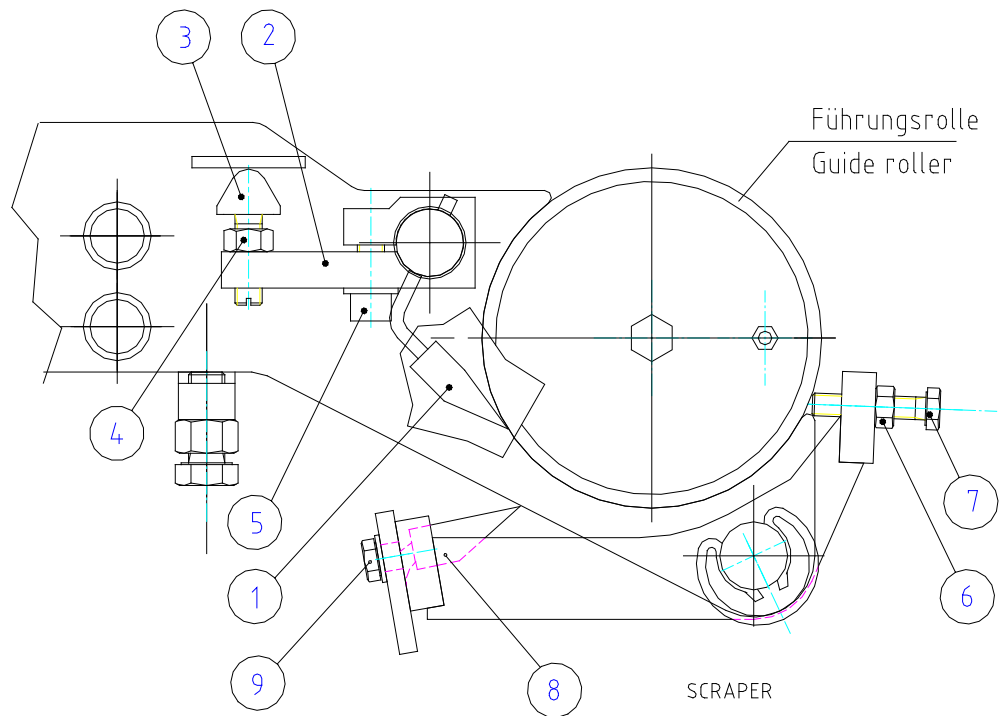


Figure 189. Scrapers

| | | | | | | |
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8.2.19.1 Adjusting the scrapers

Roller scraper

1. Adjust the roller scraper (1) with rubber cushions (3) so the scraper gently touches the roller.
2. Tighten the locking nut (4). If the adjustment tolerance is not sufficient, loosen the locking screws (5) of the adjusting lever (2) and the locking nut of rubber cushions' (4).
3. Close the rubber cushions to their extreme position. Press the scraper (1) lightly against the roller, and tighten the lever locking screws (5).

Cloth scraper

1. Open the plate pack before adjusting the cloth scrapers.
2. The cloth scraper is pre-stressed; it slightly bends upwards in the middle.
3. Adjust the cloth scraper with the screws (7) so the scraper edge touches the cloth on its whole length with even pressure.
4. Tighten the locking nuts (6).

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8.2.20 Maintenance of hoses

8.2.20.1 Replacement of hoses



⚠ CAUTION

Wear safety goggles when changing a hose. Also make sure that the emergency stop switch is pressed down and the plate pack is in open position.

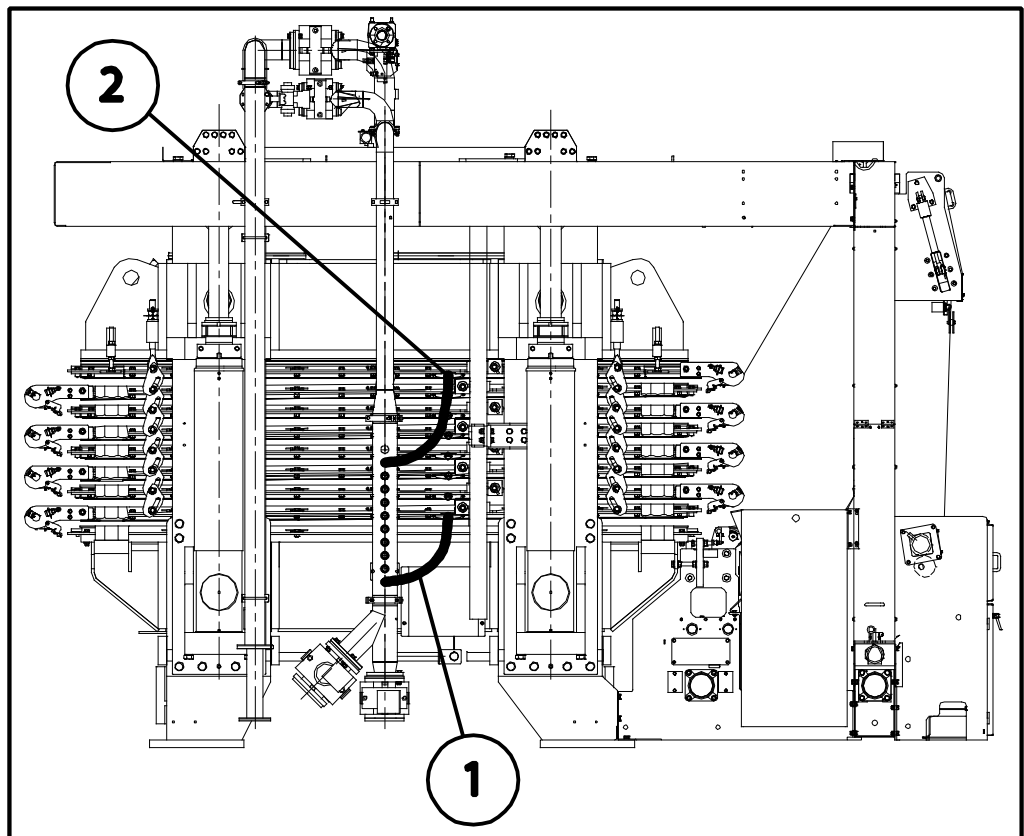


Figure 190. Hoses

- | | |
|------------------|-----------------|
| 1. Shortest hose | 2. Longest hose |
|------------------|-----------------|

Pay attention to the following when changing the feed and pressing air hoses:

- The correct type and length (see the figure).
- Mount the hoses when the pack is open. Bend the hoses upwards and tighten the hose L-coupling bands.
- No sharp bends in the hoses.
- Use high pressure hoses (pressure rating at least 25 bar).
- Use the original spare parts (hoses).

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8.2.20.2 L-coupling band circle installation



⚠ CAUTION

Do not over tighten the L-coupling bands.

Max torque for M8 nut is 10 Nm.

Leave about 2 mm gap between the bands.

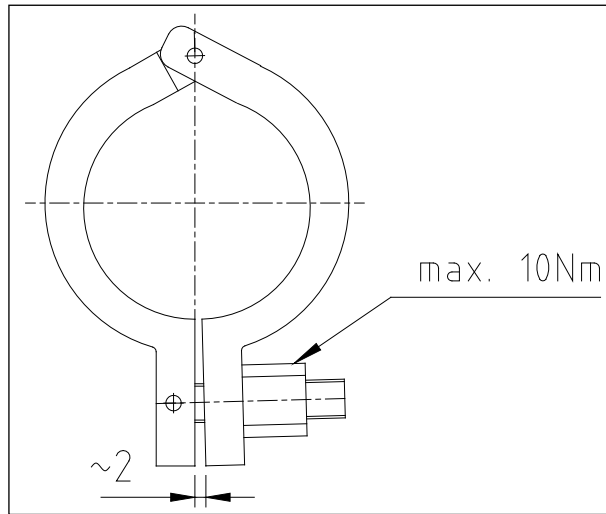


Figure 191. Gap between bands

8.2.21 Maintenance of cloth conveyor and tensioning device

The equipment should be inspected twice a year.

8.2.21.1 Drive rollers

The moving of the cloth is hydraulically controlled. The auxiliary drive rollers are placed in the plate pack. The rotation speed of the drive rollers has been synchronized hydraulically.

Inspection and maintenance measures to be taken:

- Hydraulic motor pressures
- Hydraulic motor couplings
- Roller bearings
- Lubrication of main drive roller bearings

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8.2.21.2 Tracking roller

Inspection and maintenance measures to be taken:

- Fixing and function of limit switches and perambulator B331
- Function of the hydraulic cylinder of the centering roller

8.2.21.3 Cloth tensioning device

The cloth is tightened by means of a hydraulic motor. Tensioning force is adjusted by adjusting pressure.

Inspection and maintenance measures to be taken:

- Condition and tightening of chains
- Sprockets
- Position of the tensioning roller (must be horizontal)
- Hydraulic motor coupling
- Clam wheels

8.2.21.4 Clipper seam sensor replacement

Seam sensor S332 is located on the rear side of the upper frame. Refer to figure below.

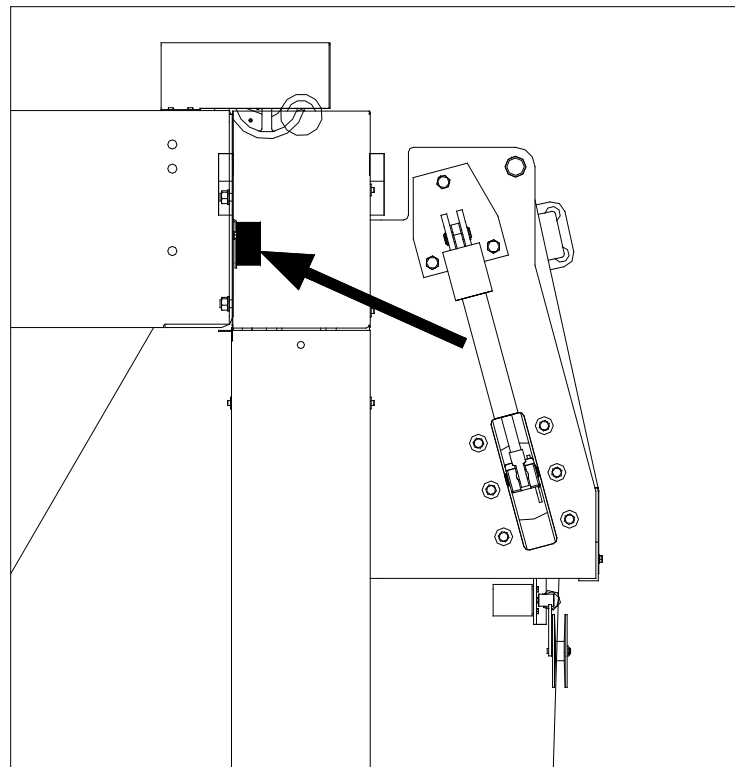


Figure 192. Seam sensor

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1. Loosen the cloth according to chapter 8.2.3 Slackening filter cloth.
2. Pull the cloth sideways from the guide roller. Refer to figure below.

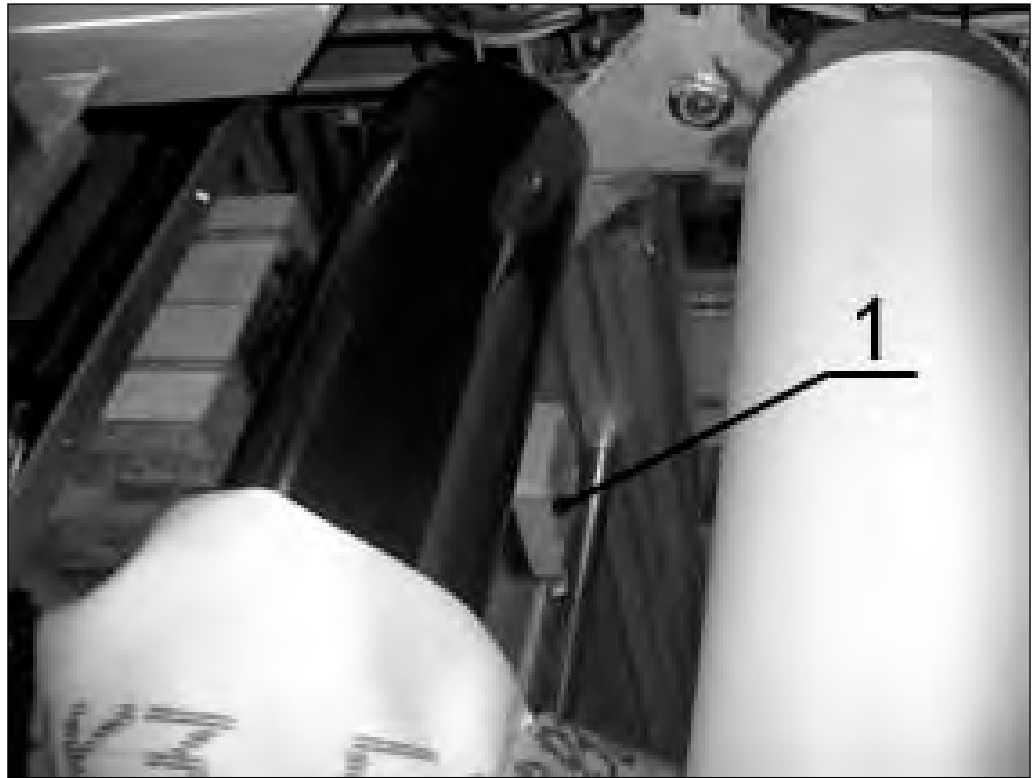


Figure 193. Cloth seam sensor (1)

3. Remove the seam sensor.
4. Install a new sensor in reverse order. Distance between sensor and cloth ~5 mm.

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8.2.22 Maintenance of rollers

8.2.22.1 Plate roller replacement



⚠ DANGER

Hazardous moving parts. Moving parts of the machine will cause serious injury or death. Make sure that there are no persons or foreign objects in between the moving parts.



Hazardous moving parts. Moving parts of the machine will cause serious injury or death. Always keep the EMERGENCY-STOP button pushed down (for preventing the manual and remote starts), when the activation functions of the filter are not necessary.



⚠ CAUTION

Make sure that the working conditions are safe. Inform the operating personnel when maintaining the unit, and close the manual valves in the process piping.



Wear proper protective clothing.



NOTE: The filter plate roller weighs about 150 kg, so a crane is required for the work.



NOTE: Because the uppermost rollers of the plate pack are located quite high, extreme caution is needed when replacing them. Use a lifting platform to guarantee safe working conditions.

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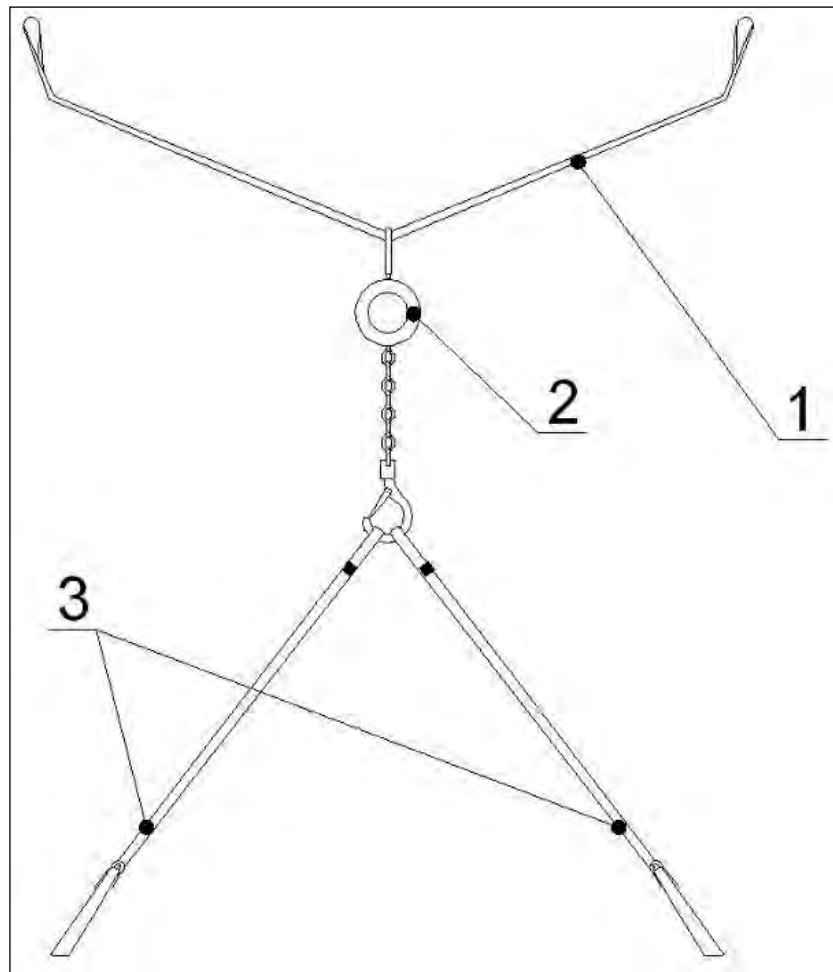


Figure 194. Necessary maintenance tools for replacement of plate the roller

| | | |
|---|---------------------------|----------------------------|
| 1. Lifting bar (1 piece, included in Outotec maintenance tools) | 2. Chain tackle (1 piece) | 3. Lifting belt (2 pieces) |
|---|---------------------------|----------------------------|

The roller is located at the end of the filter plate in a "loop" formed by the filter cloth. There are two possible ways to get the roller out.

The first one is to drive the cloth so that the clipper seam stops at the roller to be changed. The seam is opened and the roller can be changed.

Another and more recommendable possibility is to gather so much loose cloth at the roller, which is to be changed by using the "extra" cloth in the tensioning device. The cloth can be drawn over the end of the roller to either side of the filter plate. Proceed as follows:

1. Stop the filter, and drive the plate pack completely open by means of handheld unit. Drive the locking pins into their holes. Refer to chapter 7 Operation if needed.
2. If the roller is at the free end of the filter, remove the upper part of the cake chute according to chapter 8.2.5 Removing the upper part of the cake chute.

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3. Remove scrapers.

- Roller scraper: Loosen the locking screws (5) of the lever (2) at the end of the scraper (1). Unfasten the adjusting lever (2). Turn the scraper (1) so that the knife of the scraper is outside of the roller fixing lug. Move the scraper laterally and release it from the fixing lugs.
- Cloth scraper: Loosen the locking nuts (6) and screws (7). Remove the cotters (10) and remove the scraper.

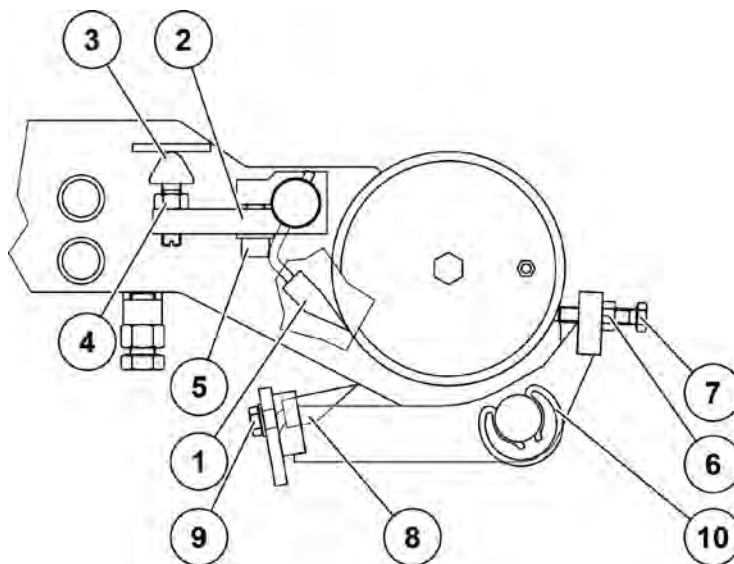


Figure 195. Removing the scraper

| | | |
|-------------------|--------------------|---------------------|
| 1. Roller scraper | 2. Adjusting lever | 3. Rubber stopper |
| 4. Hex nut | 5. Washer | 6. Locking nut (M8) |
| 7. Hex screw | 8. Cloth scraper | 9. Hex screw |
| 10. Cotter | | |

4. **Auxiliary drive roller:** Remove the hydraulic motor from the auxiliary drive roller. The hydraulic hoses may stay fixed to the motor, but the whole assembly must be supported in such away, that the motor does not hang on those hoses.
5. Slacken the filter cloth according to chapter 8.2.3 Slackening filter cloth. Draw the loosened cloth over the roller's end sideways from the filter plate.
6. **Auxiliary drive roller:** Hang the roller, unfasten the roller brackets by removing bolts and pins and lift the roller off (with brackets).
7. Use lifting belts for lifting. The roller must be lifted up as straight as possible to avoid bending of the lug. If the roller tends to get stuck during the lift, hit the roller lightly with a rubber hammer.

Side of the cloth drive unit:

Attach lifting belt or steel wire rope between the pins in the filter frame. Install a lifting tackle with 2 lifting belts to belt/rope. Use the lifting tackle to lift the roller up. Lower the roller down on the support plate on the cake chute.

8. Install a new roller in reverse order.

See pictures of lifting below and on the next page.

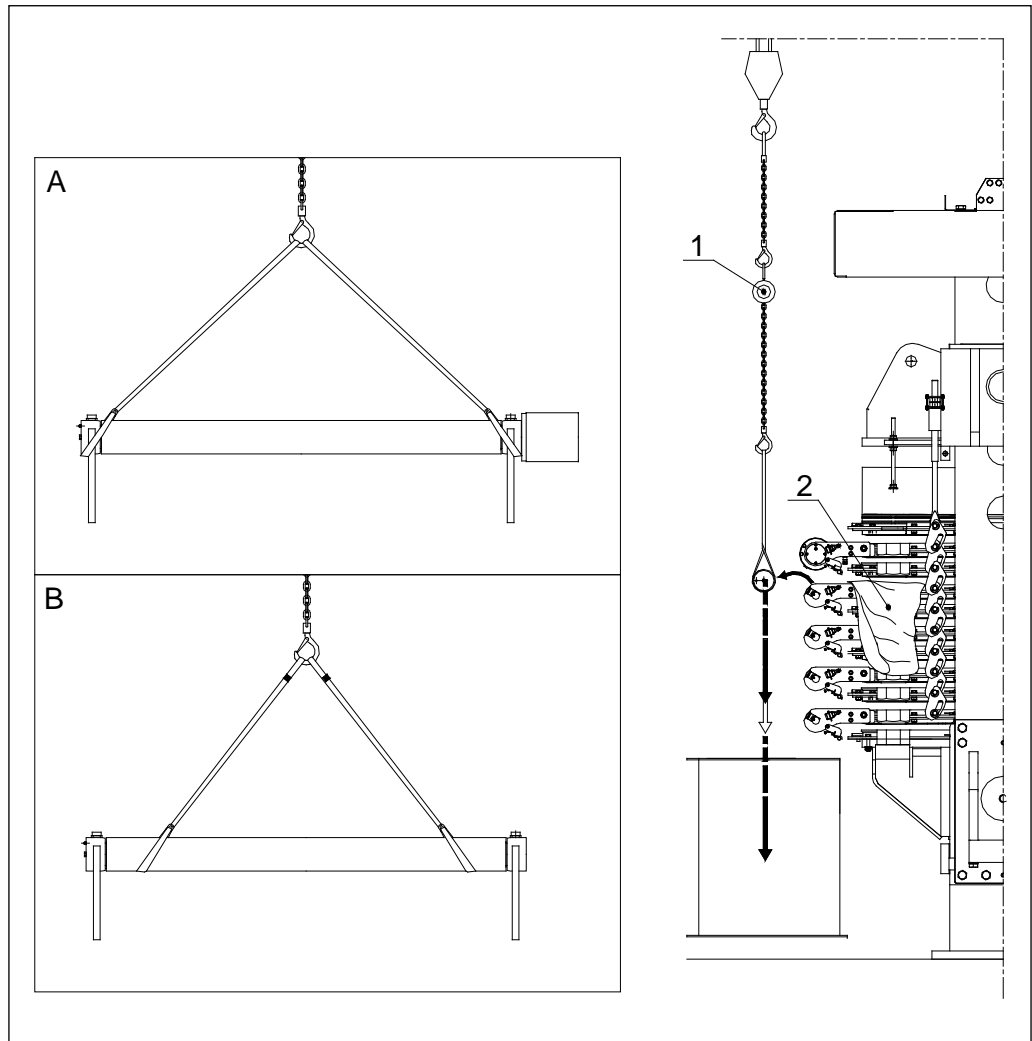


Figure 196. Lifting of the plate roller at the free end of the filter

- | | |
|---------------------------------------|--|
| 1. Lifting tackle | 2. Cloth loop drawn sideways from the filter plate |
| A. Lifting the auxiliary drive roller | B. Lifting the guide roller |

| | | | | | | |
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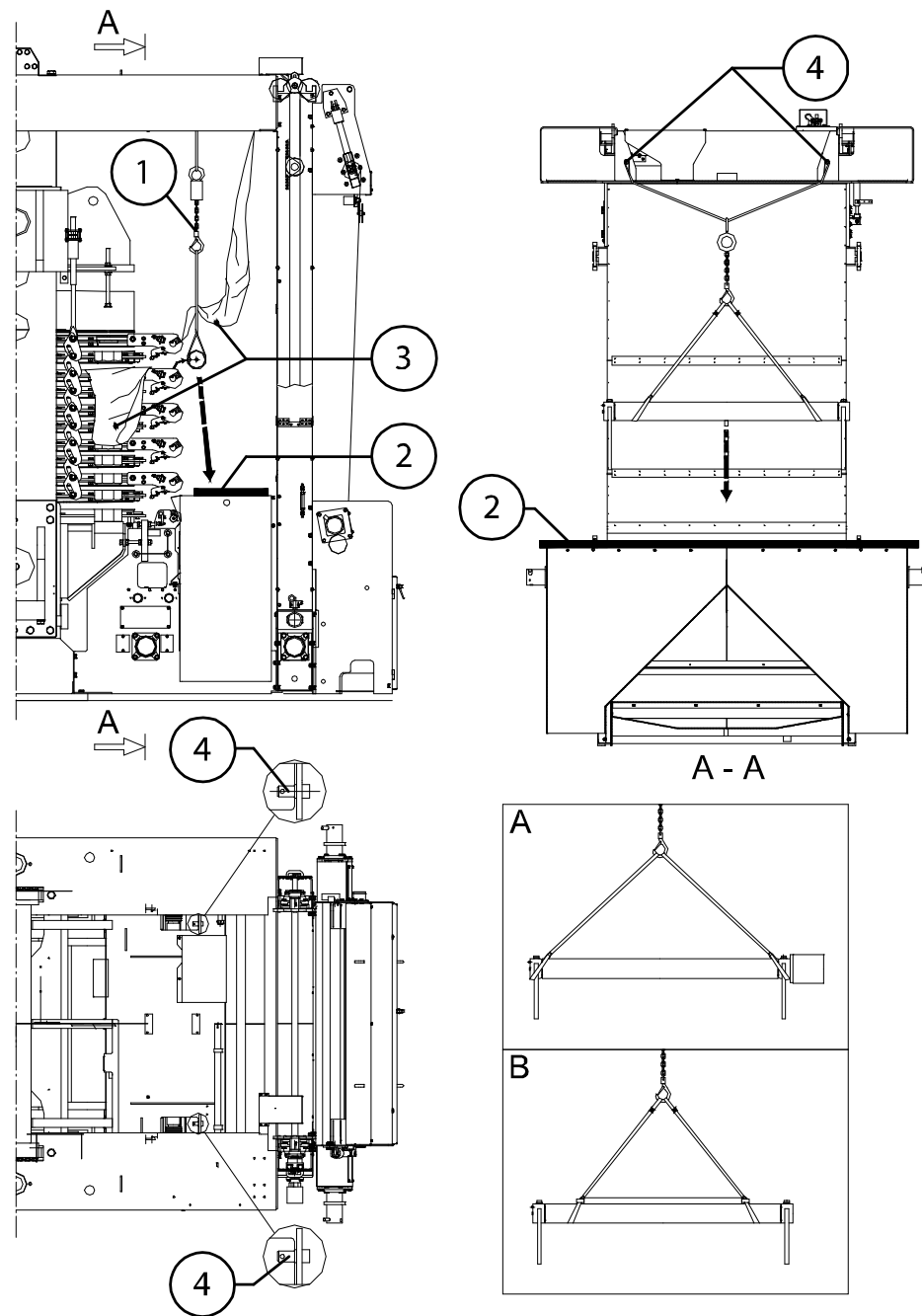


Figure 197. Lifting the plate roller at the side of the cloth drive unit

- | | |
|---|------------------------------------|
| 1. Lifting tackle | 2. Support plate on the cake chute |
| 3. Cloth drawn sideways from the filter plate and lifting belts | 4. Pin for lifting |
| A. Lifting the auxiliary drive roller (when lifting the roller from brackets of the filter plate) | |
| B. Lifting the guide roller (when lifting the roller from brackets of the filter plate) | |

| | | | | | | |
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8.2.22.2 Roller bearing assembly replacement

The plate's roller bearing will be replaced with its housing.

Proceed as follows:

1. Slacken the cloth on the roller, where the damaged bearing is located.
2. Remove the locking screws (1), 4 pieces and a plug (2). Remove the roller end plate locking screw (3) (only on the other end of the roller).
3. Fix a bolt (size M16 x 100) with a bushing into the plug drilling.
4. Pull the housing out by tightening the screw.
5. Install a new housing by using a soft hammer or use installation tool bolt (4).
6. Fix bolt into the roller end and then install bearing housing by rotating the nut clockwise on the bolt.

Both removing and installation tools are included to Outotec maintenance tools.

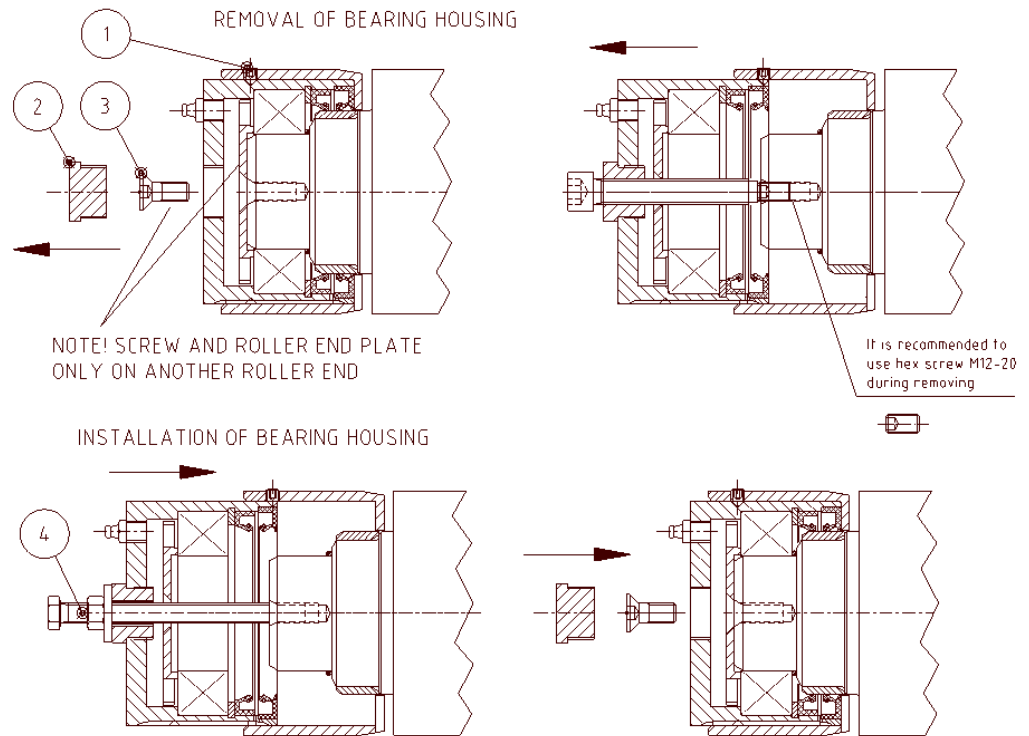


Figure 198. Removal and installation of bearing housing

| | | | | | | |
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Auxiliary drive roller, motor side (fig. 1):

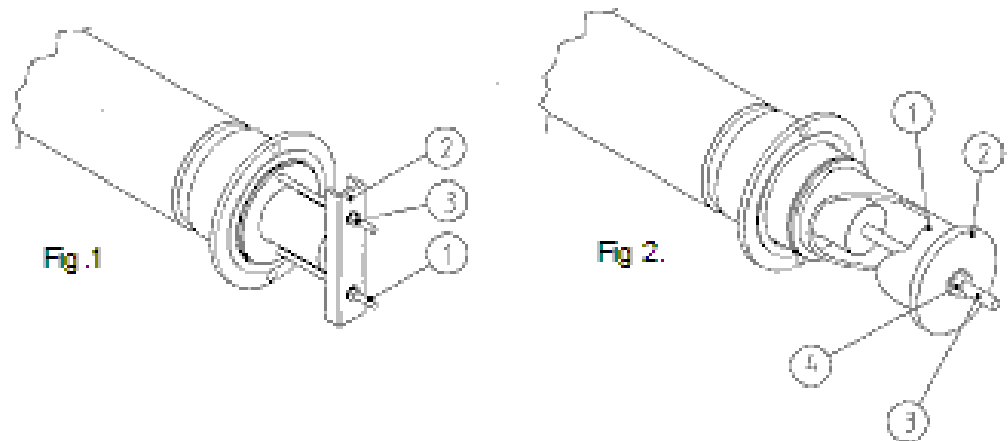


Figure 199. Auxiliary drive roller

7. Remove the motor and make sure that the weight of the motor does not burden the hydraulic hoses.
8. Loosen the locking screw of the roller shaft coupling half and remove the coupling half.
9. Remove the coupling's locking screws (4 pieces).
10. Fix the M12 threaded rods (1) (2 pieces) into the holes of the housing.
11. Use e.g. U-beam (2) and pull the housing out by tightening the nuts (3).

Install a new housing (Fig. 2) by means of pipe (1) and a soft hammer or, as in the drawing, by means of a pipe (diameter min 75 / max 130) (1), M12 threaded rod (3) and M12 nut (4).

8.2.22.3 Plate roller bearing replacement

1. Remove the plate roller requiring maintenance according to former paragraph.
2. Remove retaining ring (10) (figure A).
3. Hit with a rubber hammer to the other end of the roller, in order to release the seal housing (6) and bearing (4) (figure B).
4. Remove the seal housing (6), seals (3, 7 & 8), sleeve (5) and bearing (4) (figure C).

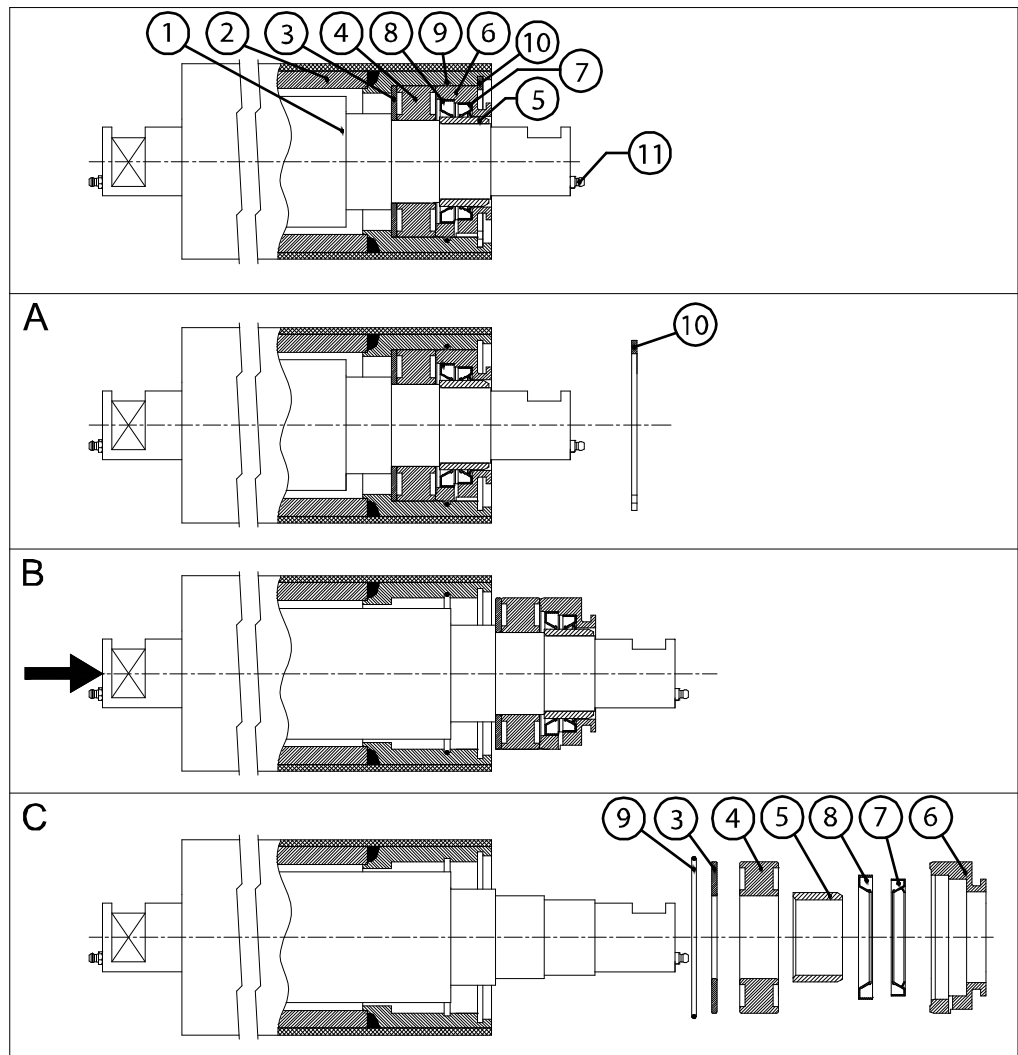


Figure 200. Replacing plate roller bearing

| | | |
|--------------------|-----------------------------|-----------------|
| 1. Shaft | 2. Roller housing | 3. Seal |
| 4. Bearing | 5. Sealing sleeve (bushing) | 6. Seal housing |
| 7. Seal, shaft | 8. Seal, shaft | 9. O-ring |
| 10. Retaining ring | 11. Grease nipple | |

5. Clean all parts and install a new bearing in reverse order. Replace the seals and O-ring. Lock the bushing (5) by means of LOCTITE 641, WEICON AN 306-41 or equivalent. If bushing is damaged replace it. Lubricate bearing with SKF LGEV 2/50. It is recommended to replace both roller bearings at the same time.

Auxiliary drive roller

Bearing of the auxiliary drive roller can be replaced without removing the roller from the filter plate.

Refer to picture on the next page.

1. Ensure the suspension of the roller end requiring maintenance with lifting belt. Refer to figure below.

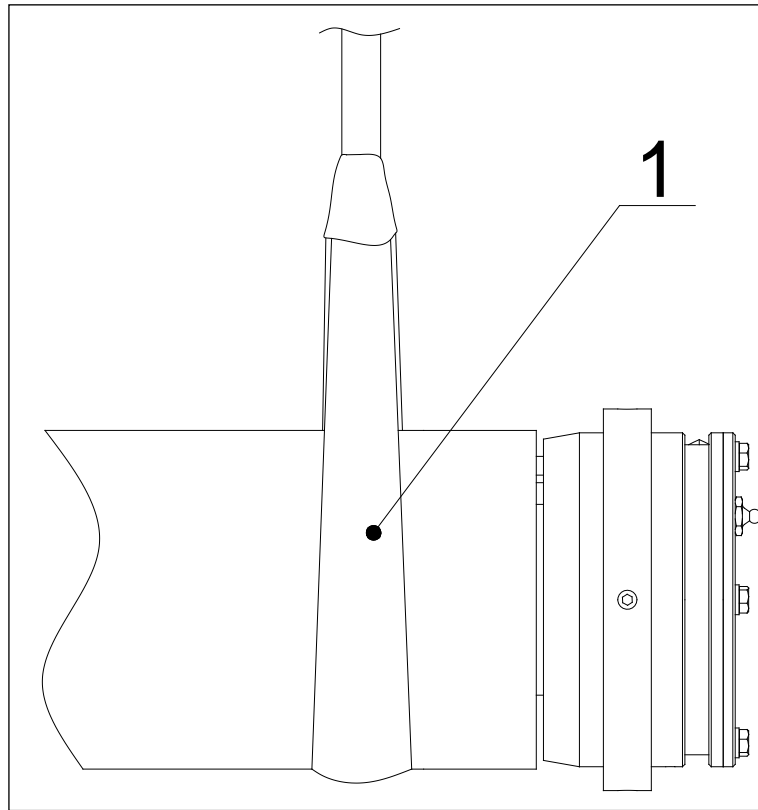


Figure 201. Lifting belt (1)

2. Remove the bearing housing cover (5), locking screws (12) and retaining ring (4) (figure B).
3. Remove the bearing housing (1) by means of extractor (figure C).
4. Remove the seals (6 & 7) (figure D).
5. Remove the retaining ring (3) and the bearing (2).
6. Clean all parts and install a new bearing in reverse order. Replace seals (6 & 7) and O-ring (8). Check condition of the sleeve (9). Replace the damaged sleeve and lock it by means of LOCTITE 641, WEICON AN 306-41 or equivalent. Outside surface of the bearing housing (1) is coated with anti-seize paste. Lubricate bearing with SKF LGEV 2/50.

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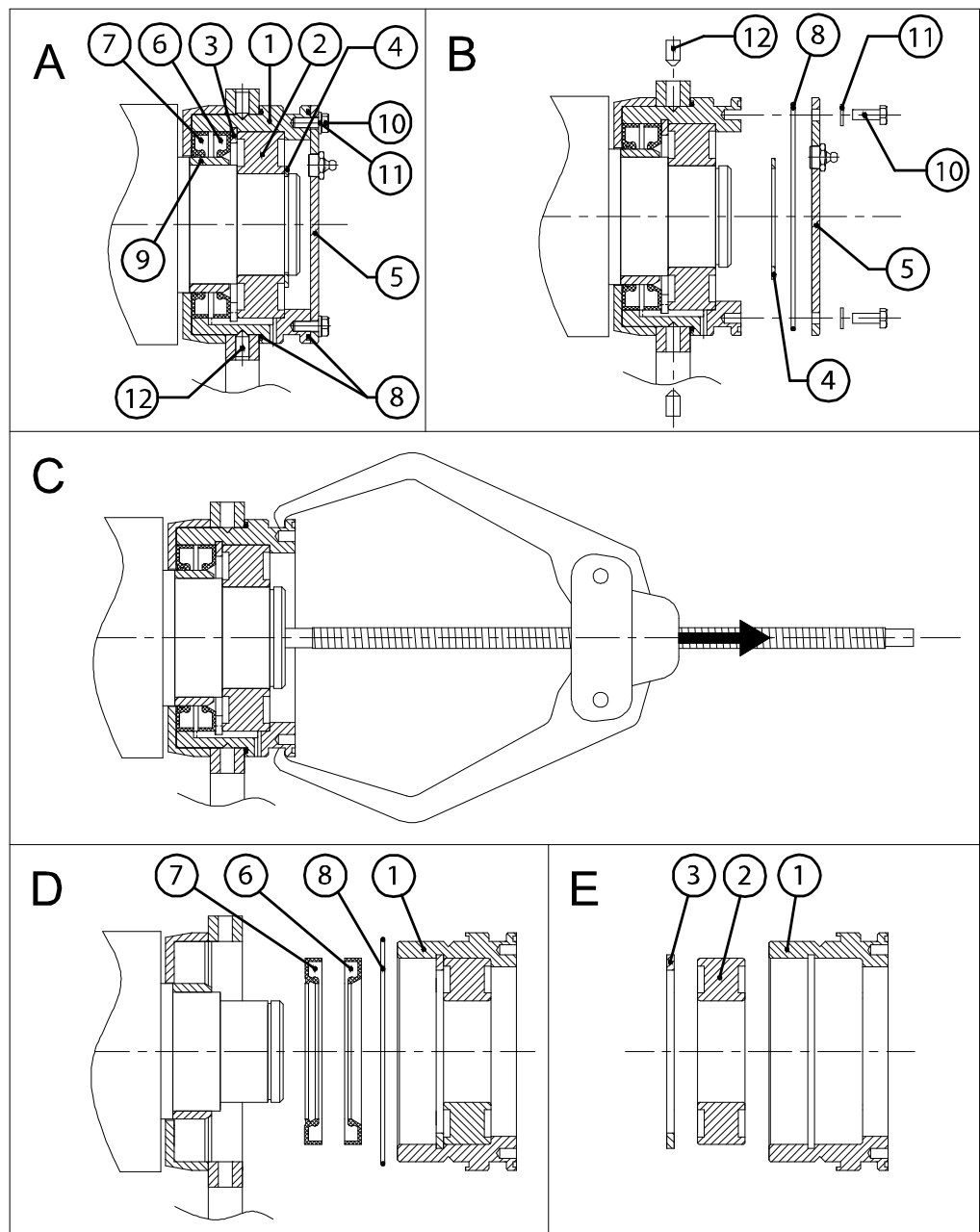


Figure 202. Removing plate roller bearing (auxiliary drive roller)

| | | |
|---------------------------|--------------------------------|--|
| 1. Bearing housing | 2. Bearing | 3. Retaining ring |
| 4. Retaining ring | 5. Cover of bearing housing | 6. Seal, shaft |
| 7. Seal, shaft | 8. O-ring | 9. Sealing sleeve |
| 10. Washer (M6, 4 pieces) | 11. Hex screw (M6x6, 4 pieces) | 12. Locking screw (coach screw M8, 6 pieces) |

Auxiliary drive roller, motor side

Bearing of the auxiliary drive roller can be replaced without removing the roller from the Filter plate. Refer to picture on the next page.

Make sure that the retaining ring (10) is attached. The other end of the roller has to be assembled in order to prevent the roller to move over and unfasten from the bracket.

1. Ensure the suspension of the roller end requiring maintenance with lifting belt. Refer to figure below.

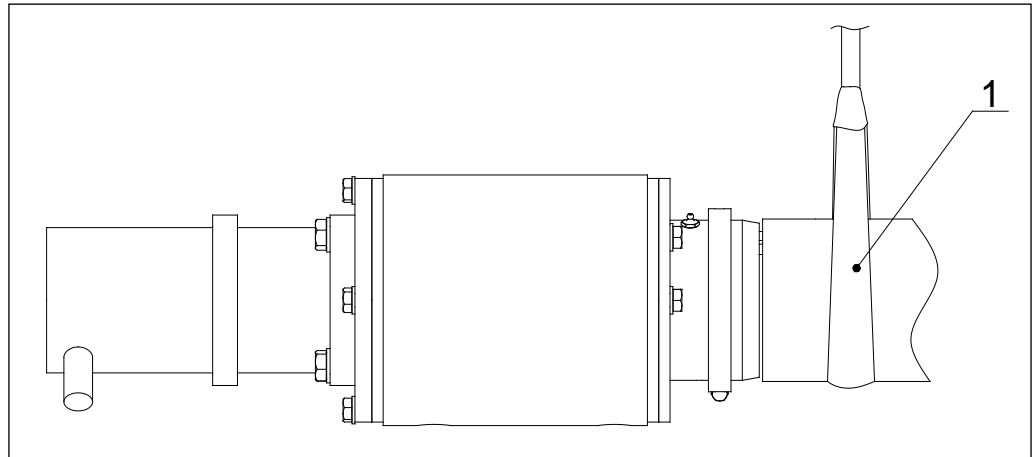


Figure 203. Lifting belt (1)

2. Remove the hydraulic motor and make sure that the weight of the motor does not burden the hydraulic hoses.
3. Remove coupling.
4. Remove bracket (11) with bearing assembly (figures A & B).
5. Remove bearing assembly (figure C).
6. Remove seals (3, 5 and 6), retaining ring (4) and bearing (2) (figure C).
7. Clean all parts and install a new bearing in reverse order. Replace seals (3, 5 & 6) and O-ring (7). Check condition of sleeve (8). Replace damaged sleeve and lock it by means of LOCTITE 641, WEICON AN 306-41 or equivalent. Outside surface of bearing housing (1) is coated with anti-seize paste. Lubricate bearing with SKF LGEV 2/50. Install coupling and hydraulic motor according to figure below.

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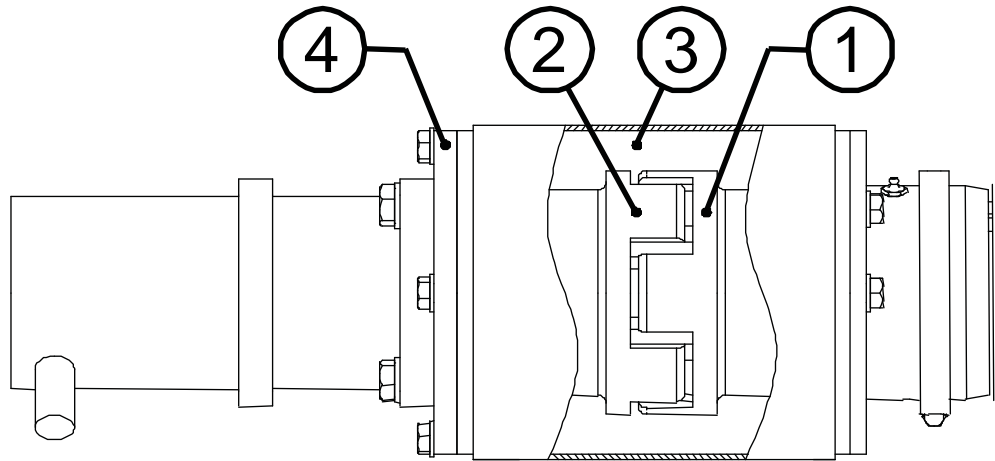


Figure 204. Install part 1 with motor and parts 2, 3 and 4 (tolerance 1 - 2 mm in axial direction)

| | |
|------------------|--------------------------|
| 1. Coupling half | 2. Coupling half |
| 3. Bracket | 4. Fixing plate of motor |

| | | | | | | |
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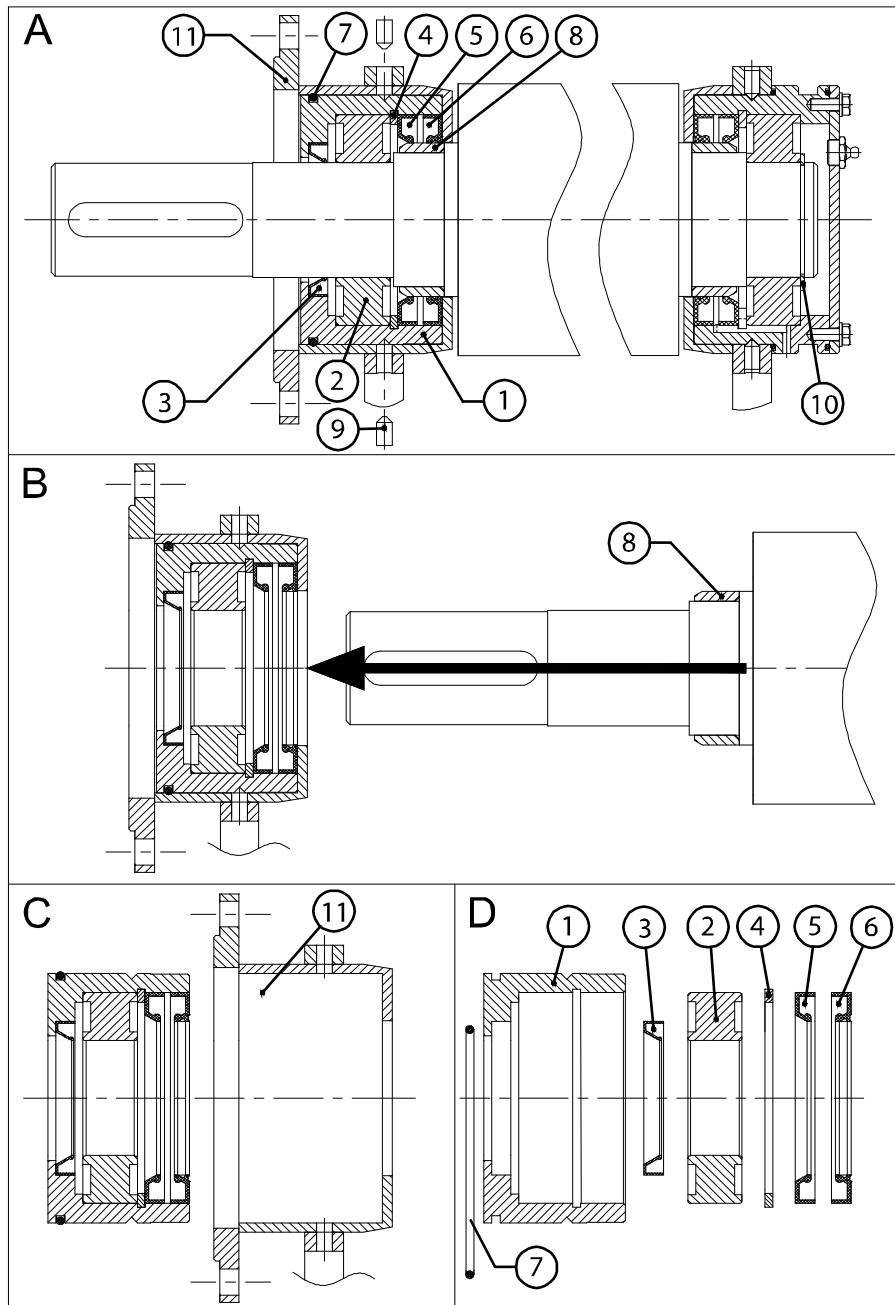


Figure 205. Plate roller bearing replacement

| | | |
|--------------------|--------------------|---|
| 1. Bearing housing | 2. Bearing | 3. Seal, shaft |
| 4. Retaining ring | 5. Seal, shaft | 6. Seal, shaft |
| 7. O-ring | 8. Sealing sleeve | 9. Locking screw (coach screw M8, 6 pieces) |
| 10. Retaining ring | 11. Roller bracket | |

8.2.22.4 Pressing roller replacement

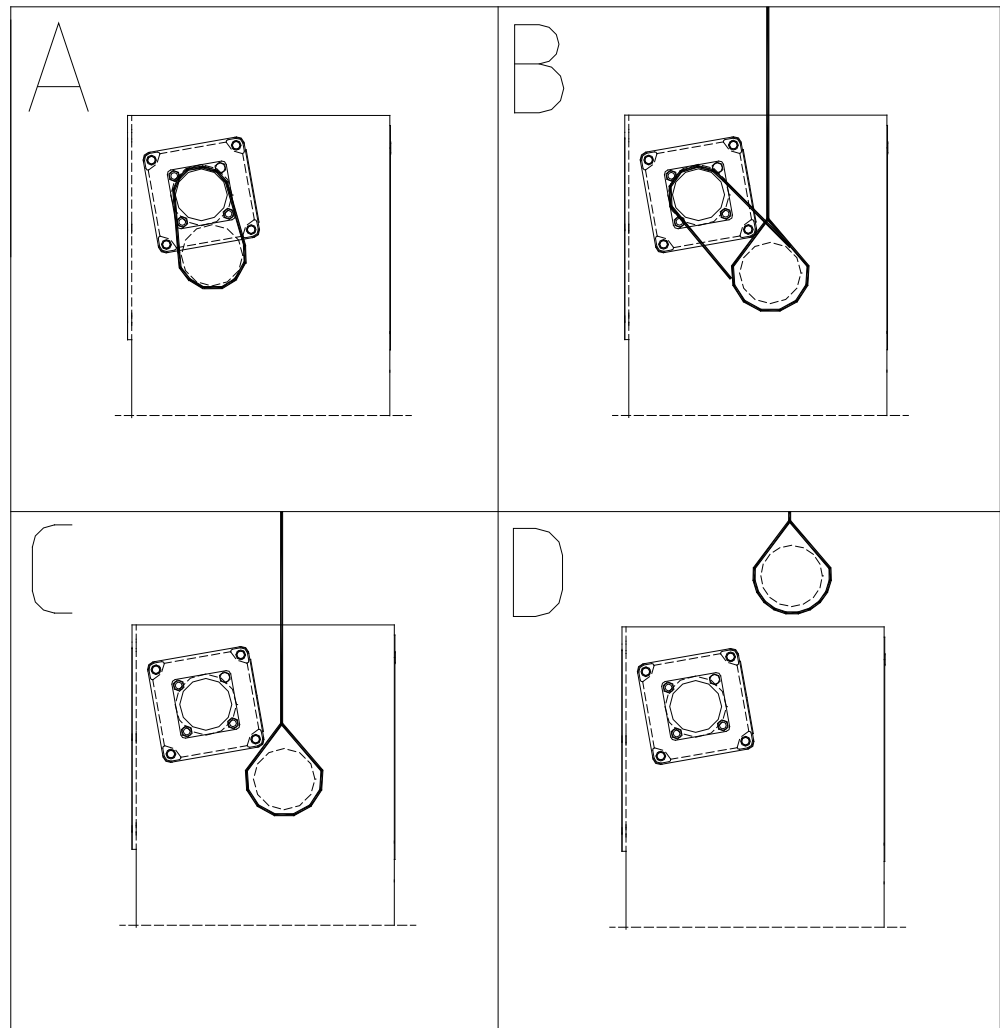


Figure 206. Pressing roller replacement

1. Slacken the filter cloth. Refer to chapter 8.2.3 Slackening filter cloth.
2. Attach the pressing roller to the drive roller with an adjustable lifting sling. See figure A at the start of this chapter.
3. Detach the pressing roller fastening system. See figure below.

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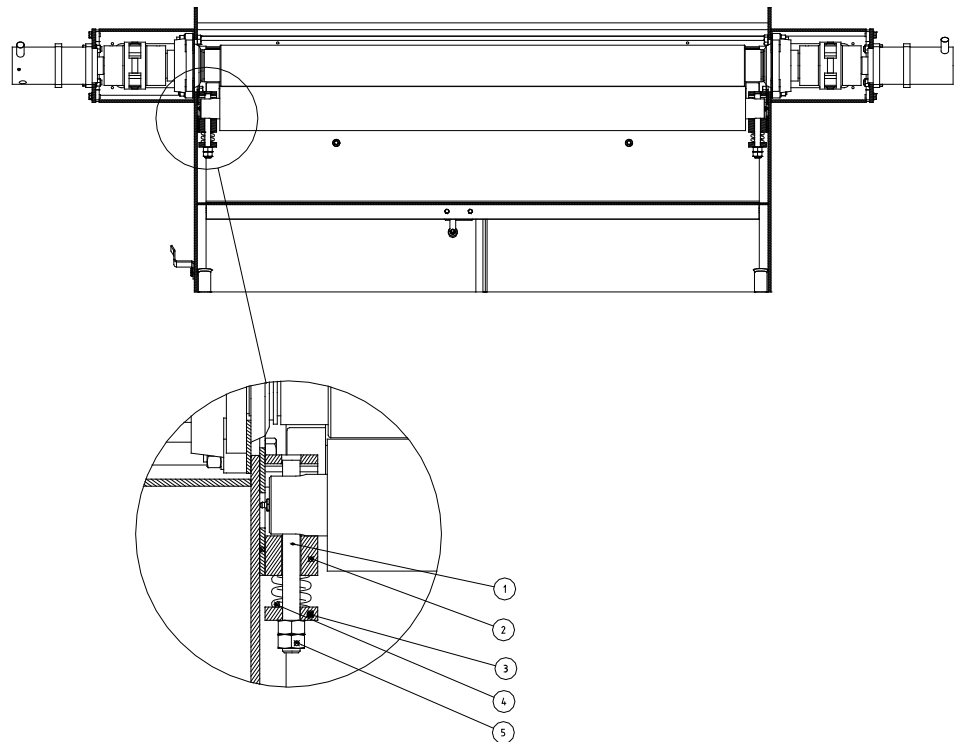


Figure 207. Detaching the pressing roller fastening system

| | | |
|-----------|----------------|---------------------|
| 1. Clamp | 2. Slide piece | 3. Tensioning piece |
| 4. Spring | 5. Hex nut | |

4. Bring another adjustable lifting sling from above and attach it to the pressing roller. Slowly adjust the position of the lifting slings to get the pressing roller to the position in figure B at the start of chapter. Pressing roller should only take support from the lifting sling above after this step is completed.
5. Remove the lifting sling attached to the drive roller. See figure C at the start of chapter.
6. Lift the pressing roller off. See figure D at the start of chapter.
7. Install in a reversed order.

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8.2.23 Maintenance of cloth wash spray nozzles

Flat spray nozzles (Delavan AZM 5.5) are used as the cloth wash nozzles. The direction of the spray can be adjusted by turning the nozzle with a screwdriver. Adjust the sprays so, that they cover the whole width of the cloth, but do not cross each other.

The intersecting angle is adjusted by turning the spray pipe. At first loosen the L-couplings and tensioning flanges on the side of the filter. Then turn the pipe. The new position is locked by tightening the L-couplings and tensioning flanges.

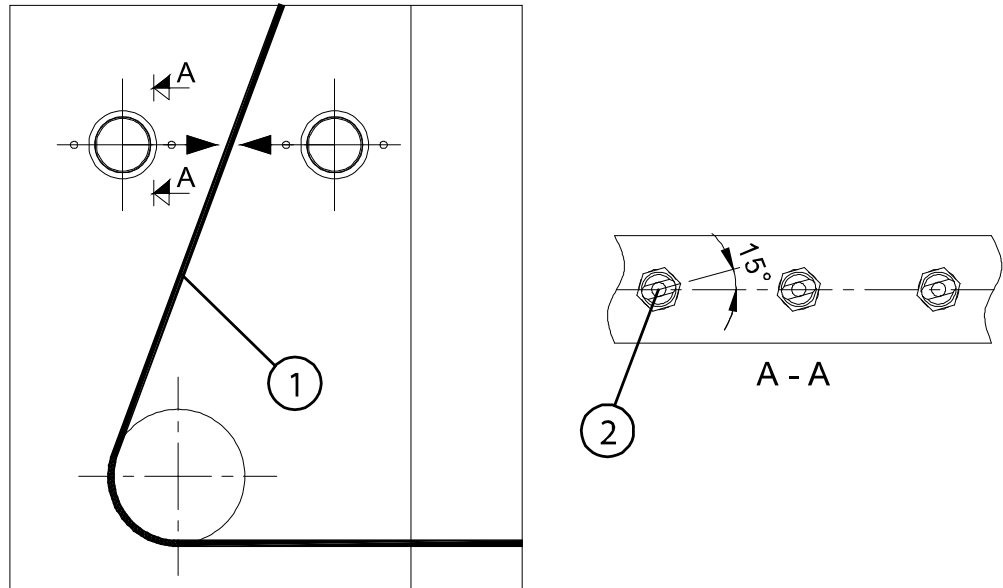


Figure 208. Direction of spray nozzles and angle of nozzles (A–A)

| | |
|-----------------|-----------------|
| 1. Filter cloth | 2. Spray nozzle |
|-----------------|-----------------|

Make sure that all the nozzles stay open and that the sprays are directed towards the cloth. No unwashed stripes must be left on the cloth. If necessary, rinse the wash liquid Filter located in the wash liquid piping.

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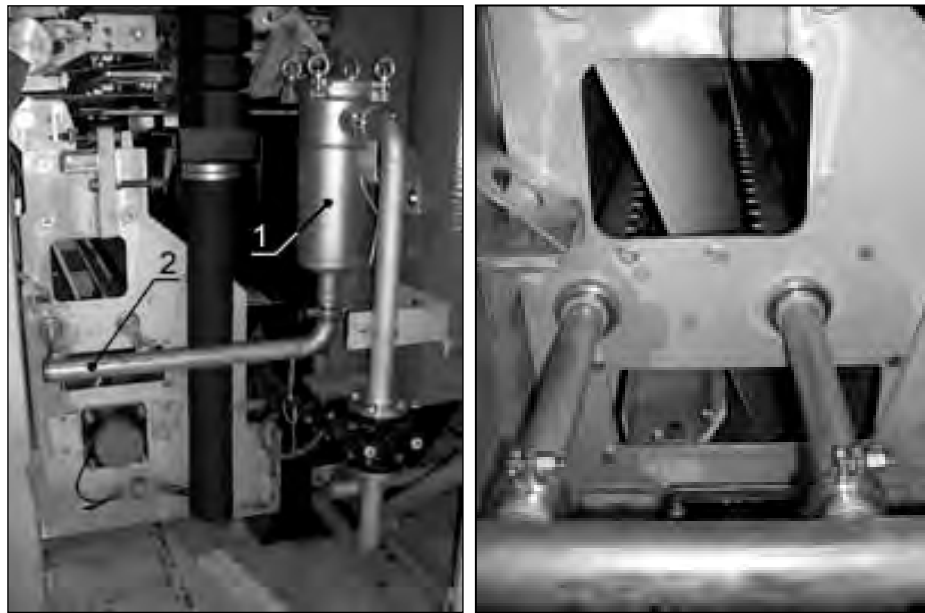

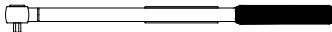


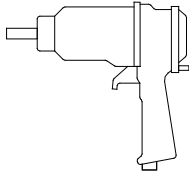


Figure 209. Cloth wash sprays

| | |
|-----------------------|-----------------------|
| 1. Wash liquid Filter | 2. Cloth washing pipe |
|-----------------------|-----------------------|

8.2.24 Quick action cylinder replacement

Table 35. Necessary equipment for cylinder replacement

| ITEM | DESCRIPTION |
|---|---|
|  | 3 pieces, wooden beams (150 x 100, L=2000) |
|  | Torque wrench with presettable torque (700 Nm) |
|  | Cylinder lifting tool 2 pieces (included in Outotec delivery maintenance tools) |
|  | Hex head driver: size 19 mm |
|  | Pneumatic wrench (included in Outotec delivery maintenance tools) |
| | Support 1 piece (included in Outotec maintenance tools) |
| | 2 pieces lifting belts: preferable different length |

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Proceed as follows

1. Drive the plate pack to its close position.
2. Drive the upper pressing plate carefully upwards until the wooden beams will be fitted under it.
3. Install 3 pieces of wooden beams under the upper pressing plate and drive the plate down on the wooden beams.

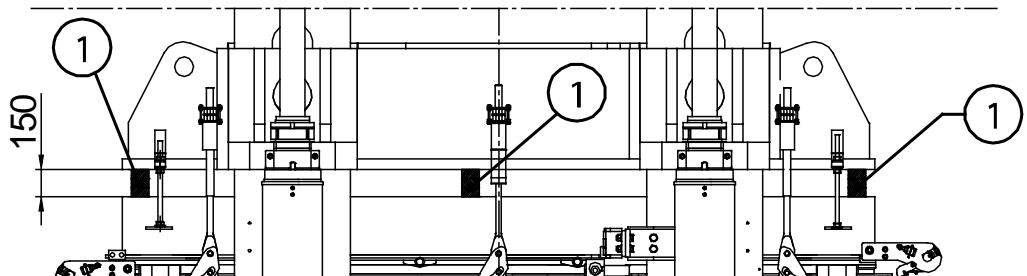
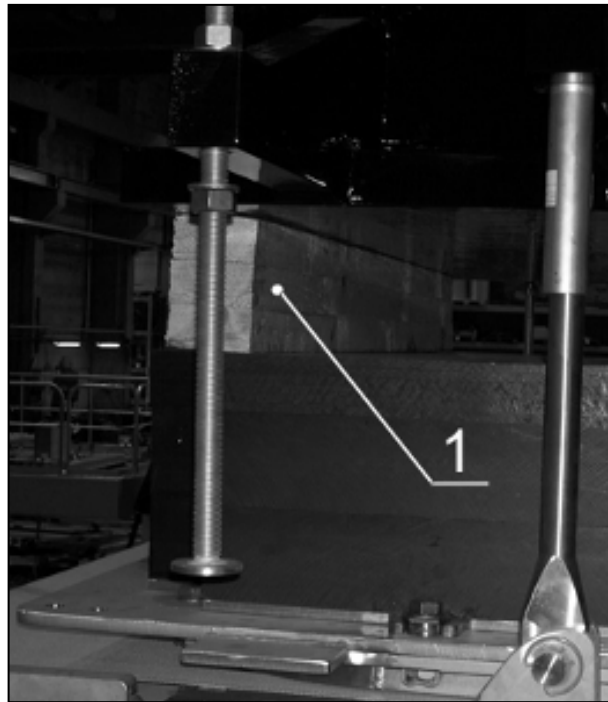


Figure 210. Wooden beams installed between the top pressing plate and the filling plate

1. Wooden beam (150 x 100, L = 2000)

4. Remove fixing plate (7), shaft nut (4), nut (5) and ring (6) on the top end of the cylinder body. Refer to figure B on the next page.
5. Drive the cylinder manually to lower end position.
6. Remove the hydraulic pipe's T-connectors from the end of the piston rod.

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⚠ CAUTION

Wear safety goggles when disconnecting fittings in the hydraulic system.



NOTE: Make sure that the pressure in the hydraulic pipeline is below 5 bar before opening the connections. The hydraulic oil pressure can be checked from the measuring connections at the upper end of the piston rod by using a measuring tube with pressure meter. Refer to attached figure.

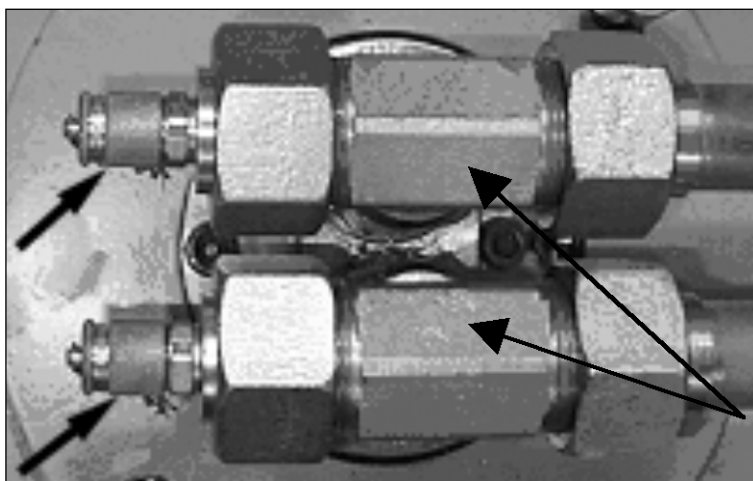


Figure 211. Measuring connections

7. Remove the fixing flange (2) from the lower end of the cylinder and the fixing screw of cover (3). Refer to figure A on the next page.
8. Remove the fixing flange (8) at the top end of the cylinder. Refer to figure C on the next page.

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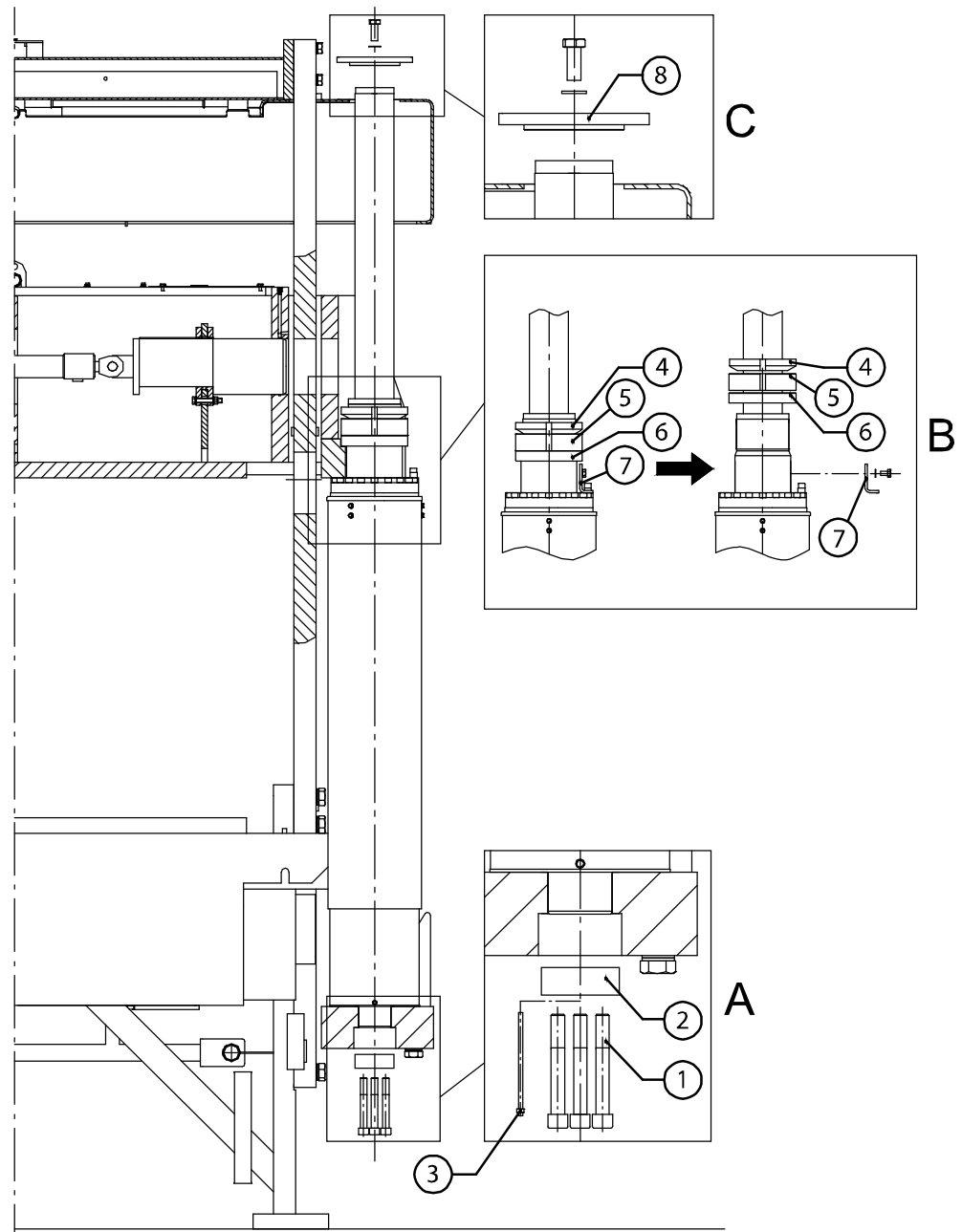


Figure 212. Removing the fixing flange

| | | |
|-------------------------------------|------------------|---|
| 1. Hex socket screw (M24, 7 pieces) | 2. Fixing flange | 3. Hex socket screw of cover (M8 x 185, 2 pieces) |
| 4. Shaft nut | 5. Nut | 6. Ring |
| 7. Fixing plate | 8. Fixing flange | |

9. Attach the cylinder lifting tools (included in Outotec maintenance tools) into the end of the piston rod (M16 threads). Refer to attached figure.
10. Attach two (2) lifting belts (shorter and longer) to the lifting tools.

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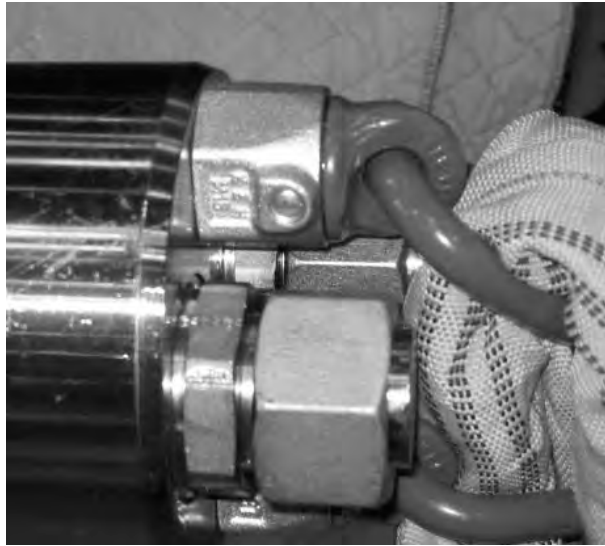


Figure 213. Lifting tools



NOTE: Lifting tools must be tightened with a torque of 10 Nm.



⚠ CAUTION

Incorrect hoisting may also cause damage to the machinery. Verify the load of the crane. The weight of the hydraulic cylinder is approx. 1300 kg. Use rotating lifting points for hoisting. Make sure that the platform, on which the cylinder is lowered, can support the weight.

11. Lift the cylinder rod upwards carefully until the piston rod end is above the fixing hole of the lower frame. Lift the cylinder cover with screwdriver in order to see the piston rod.



Figure 214. Cylinder piston rod

| | | | | | | |
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12. Pull the end of the cylinder piston rod from between the brackets with lifting belt.



Figure 215. Pulling the end of the cylinder piston rod

13. Lower the cylinder carefully down until the upper end of the piston rod is below the upper frame. Refer to figures B and C on the next page.
14. Install the support (included in Outotec maintenance tools) and attach the shorter lifting belt to it.

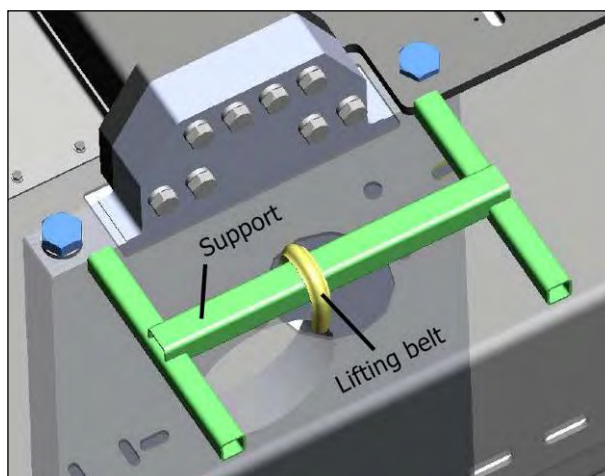


Figure 216. Installing support

15. Lower the cylinder down, so that it hangs from the shorter lifting belt. Refer to figure C on the next page.
16. Move the longer lifting belt outside of the top frame. Lift the cylinder until you can remove the shorter lifting belt from the cylinder. Refer to figure D on the next page.
17. Lift the cylinder away. Refer to figure E on the next page.

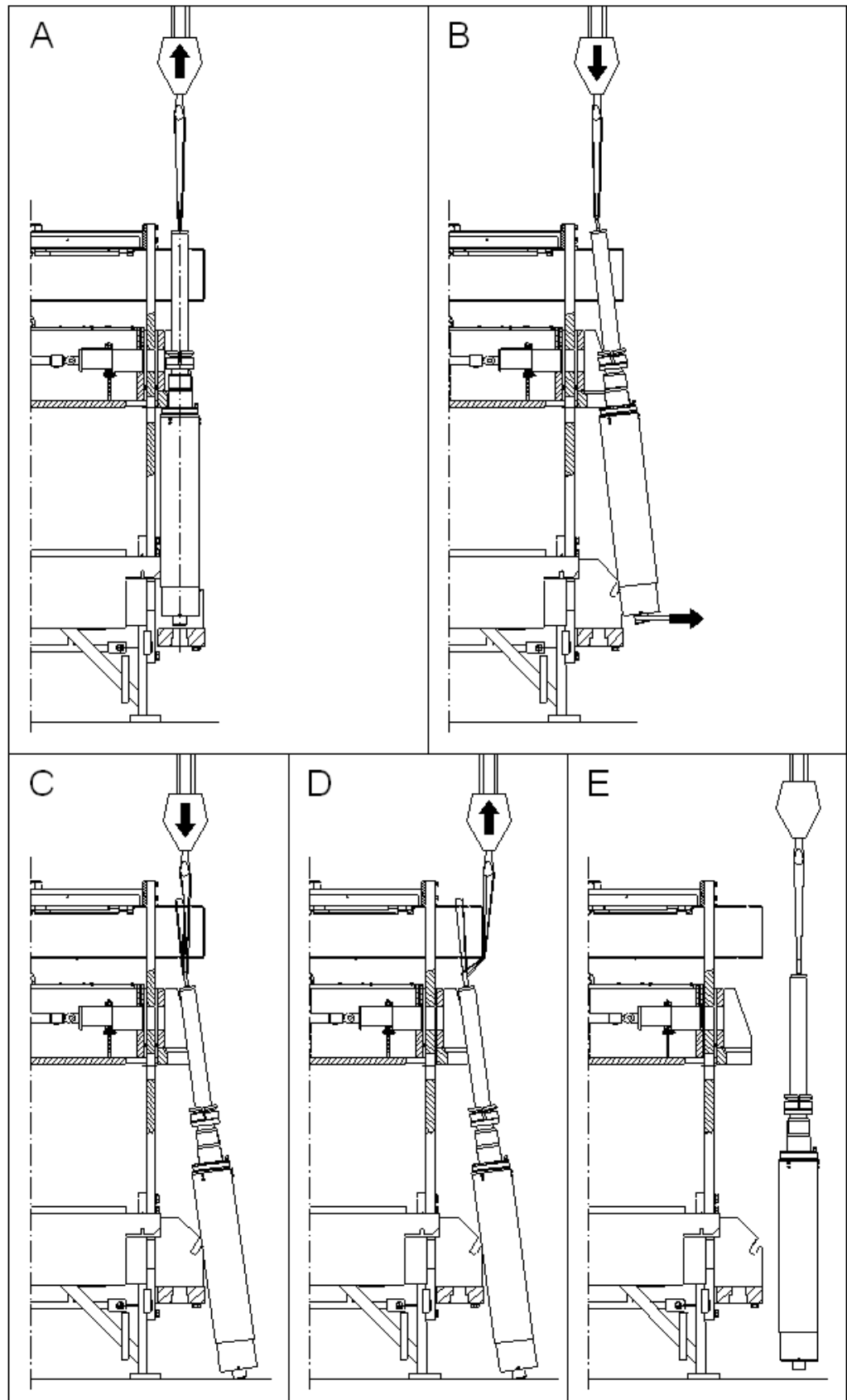


Figure 217. Removing the cylinder

| | | | | | | |
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18. Install the cylinder in reverse order. See the positions of the hydraulic couplings from picture below. Black arrow shows the side of the cloth conveyor unit.

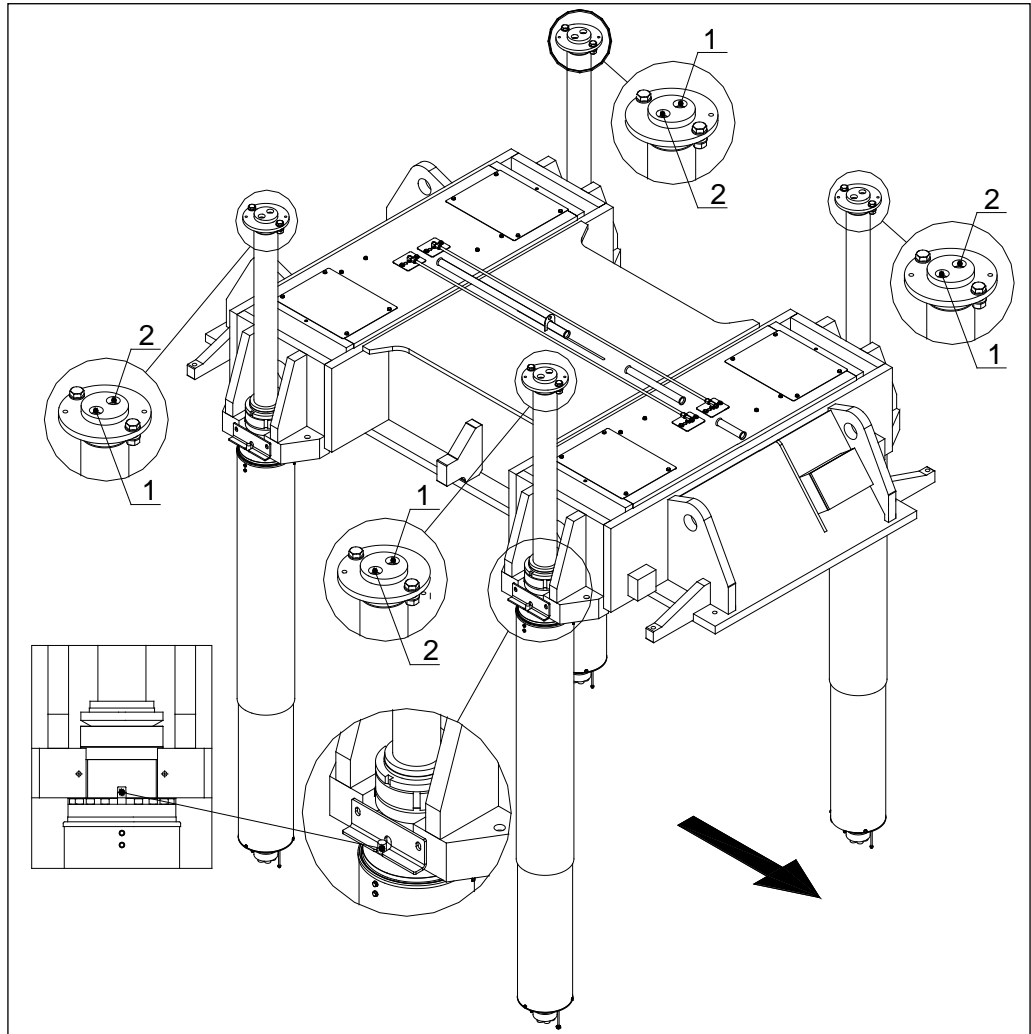


Figure 218. Hydraulic coupling position

| | | | | | | |
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8.2.24.1 Quick action cylinder seal replacement

A Removing the old seals

1. Remove the quick action cylinder (QAC) according to procedure described in chapter Removal of closing (QAC) cylinders PF48.
2. Place the cylinder to suitable working area on the floor or on a worktop so that the work can be done in clean and safe conditions.
3. Clean the cylinder externally.
4. Before removing the upper housing, remove the flange of the upper end of the cylinder tube.
5. Open 18 pieces hex socket screws of upper end housing flange and pull the upper seal housing out.
6. Draw the piston/piston rod package out from the cylinder tube.
7. Unfasten the piston from the piston rod.
8. Open 18 pieces of hex socket screws of lower end housing flange and pull the lower seal housing out.
9. Remove the seals e.g. by using screw driver.

B Installing new seals

1. Clean the parts very carefully. Oil the dismantled parts and the new seals with hydraulic oil.
2. Install the seals into their slots according to the detailed figures and take into account the directions and order of the seals.
3. To re-assemble the cylinder, first lubricate the sealing surface of the cylinder's lower end with oil.
4. Position the lower end seal housing flange in place and tighten the flange bolts.
5. Re-assemble the piston.
6. Lubricate the piston rod and push the piston/piston rod package into the cylinder tube.
7. Fix the flange of upper end seal housing in place and tighten the flange bolts.

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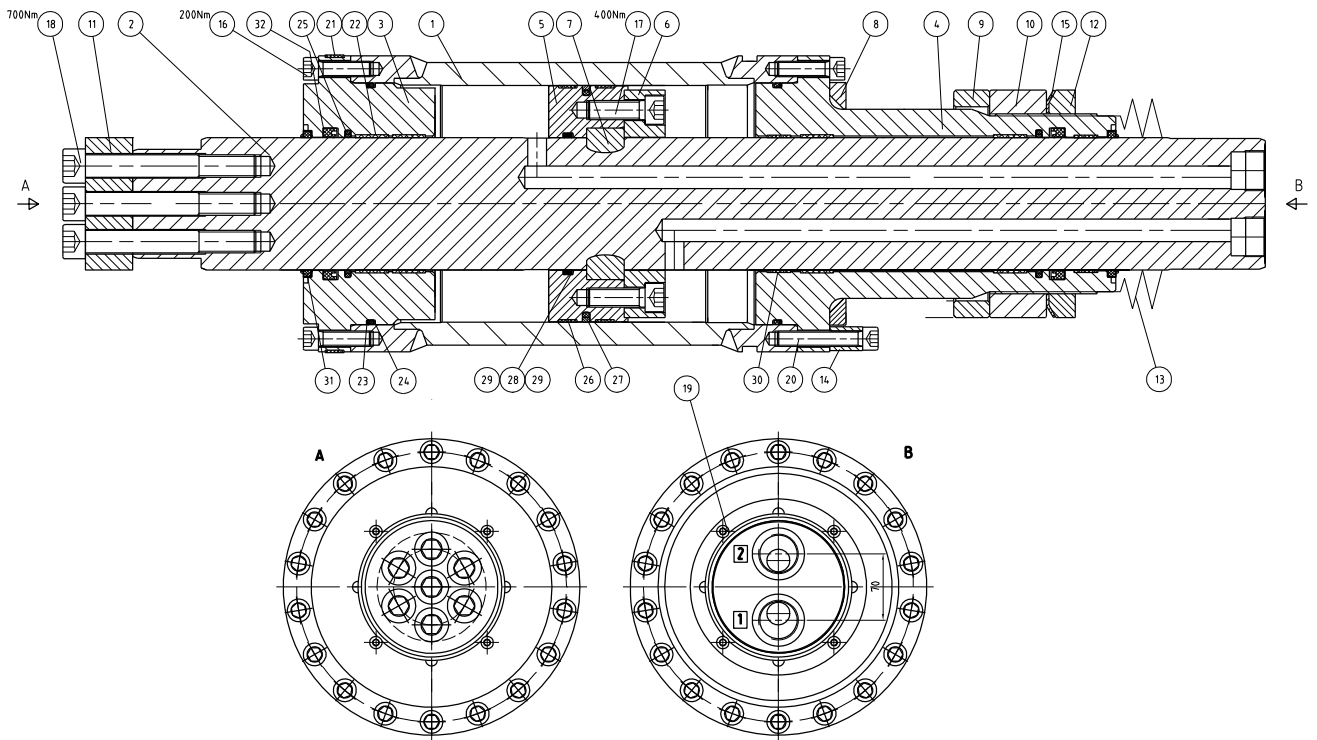


Figure 219. Quick action cylinder

| | | |
|---------------------------------|---------------------------------|----------------------------------|
| 1. Body | 2. Piston rod | 3. End |
| 4. End | 5. Piston | 6. Locking plate |
| 7. Lock ring | 8. Fit plate | 9. Ring |
| 10. Nut | 11. Flange | 12. Shaft nut |
| 13. Bellow | 14. Sleeve | 15. Safety plate |
| 16. Hex socket screw, M16*55 | 17. Hex socket screw, M20*60 | 18. Hex socket screw, M24*180 |
| 19. Hex socket screw, M8*10 | 20. Hex socket screw. M16*90 | 21. Guide |
| 22. Guide(4 pieces) | 23. Support ring (2 pieces) | 24. O-ring (2 pieces) |
| 25. Seal | 26. Guide (2 pieces) | 27. Seal |
| 28. O-ring | 29. Support ring (2 pieces) | 30. Guide (2 pieces) |
| 31. Wiper (2 pieces) | 32. Seal (2 pieces) | |

8.2.24.2 Quick action cylinder bellow replacement

1. Drive the plate pack to its closed position.
2. Remove the hydraulic pipe's T-connectors from the end of the piston rod and plug the open pipes with plugs.



⚠ CAUTION

Wear safety goggles when disconnecting fittings in the hydraulic system.



NOTE: Make sure that the pressure in the hydraulic pipeline is below 5 bar before opening the connections. The hydraulic oil pressure can be checked from the measuring connections at the upper end of the piston rod by using a measuring tube with pressure meter. Refer to figure below.

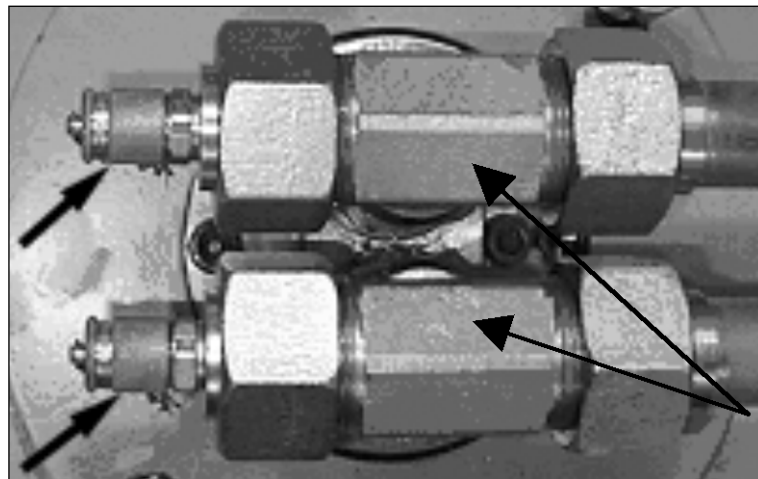


Figure 220. Measuring connections

3. Remove the fixing flange at the top end of the cylinder.
4. Remove the old bellow by cutting it with the knife.
5. Install the new bellow by pushing it through the cap between the hole of upper body and cylinder piston rod.
6. Re-assemble the QA-cylinder.

| | | | | | | |
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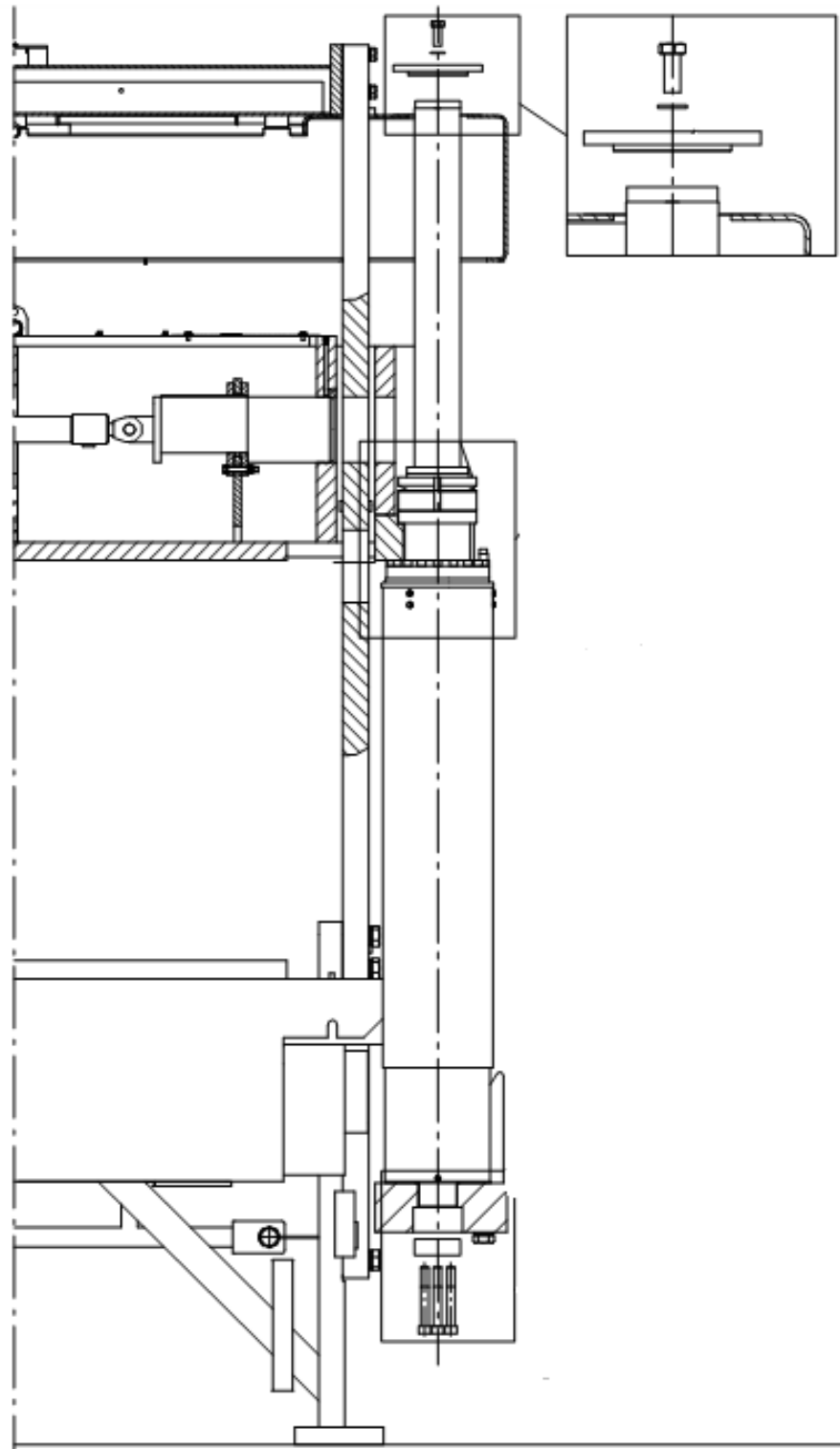


Figure 221. Fixing parts of quick action cylinder

| | | | | | | |
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8.2.25 Maintenance of suspension plates

8.2.25.1 Inspection and replacement of suspension plates



⚠ WARNING

Crushing hazard. Falling filter plates can cause death or serious injury. Omitting inspection and replacement of the suspension plates may lead to personal injury or damaged property, which Outotec cannot be held responsible for. Follow manufacturer's instructions.

Check all suspension plates annually for possible cracks and replace the damaged ones. The designed maximum service life for a suspension plate is 5 years. (Variations to both directions are possible depending on several factors; number of working cycles, cake weight, number of filter plates, environmental factors etc...)

Checking/replacing the suspension plates:

1. Close the plate pack (fig. A).
2. Remove the locking nuts (2) and sleeves (3) of the topmost suspension plates (fig. B).

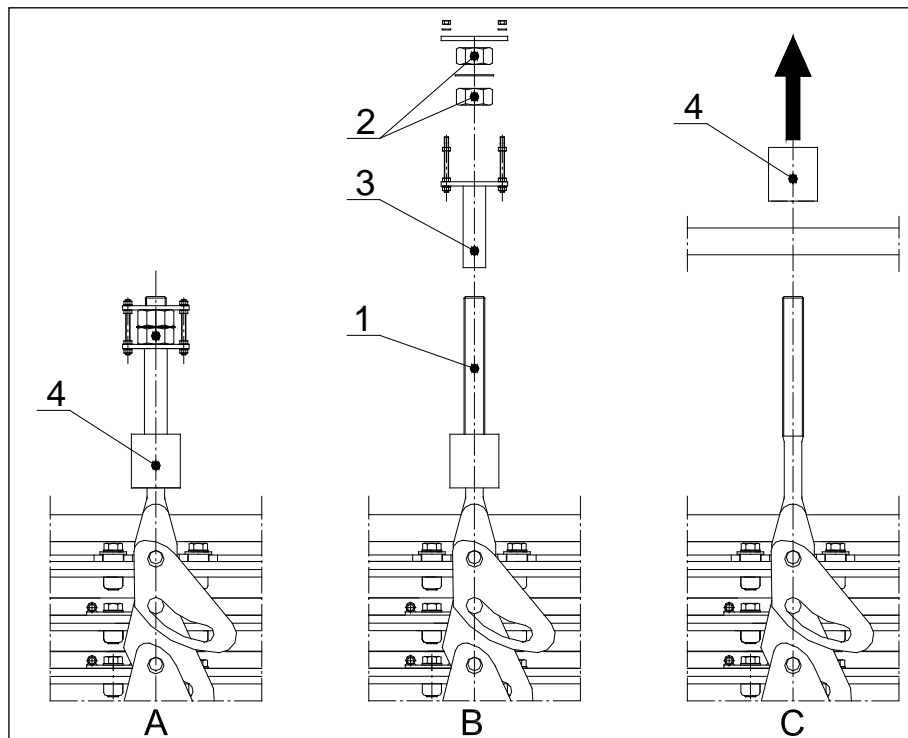


Figure 222. Removing the locking nuts

| | |
|-------------------------|------------------------------------|
| 1. Top suspension plate | 2. Adjusting nut |
| 3. Sleeve | 4. Lug of the upper pressing plate |

| | | | | | | |
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3. Drive the upper pressing plate into its open position. Lock the plate with locking pins. Refer to figure C.
4. Remove all suspension plates from the plate pack.
5. Clean all suspension plates in a meticulous manner.
6. Check suspension plates visually and replace the damaged ones.



NOTE: Pay attention to possible cracks in the suspension plates on inspection. Slight battering and polishing of the pinholes are acceptable. Areas A and B (see picture below), where the biggest stresses affect, are most likely to break first.

7. After inspection, mark the inspected suspension plate by nail punch. When there are five (5) marks made by nail punch, replace the suspension plate.



NOTE: Check also the condition of each suspension pin and its joint to the filter plate. Cracks in the welding area and excessive bending of the pin needs to be fixed before reassembly. Slight battering and polishing of the pins are acceptable.

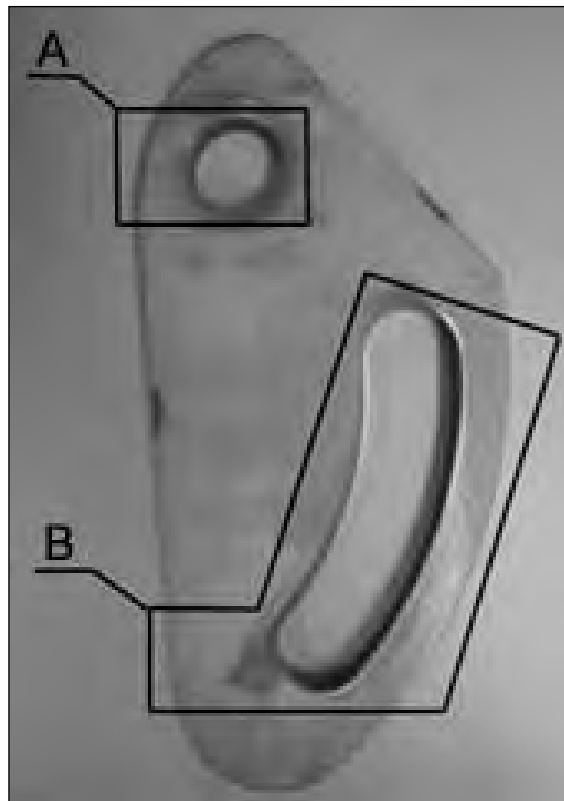


Figure 223. Possible failure area

A = possible failure area at the circular hole

B = possible failure area at the end of the elongate hole

| | | | | | | |
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8. Assemble the suspension plates in their positions from top to bottom. Remember to install all retaining rings. Refer to figure below.

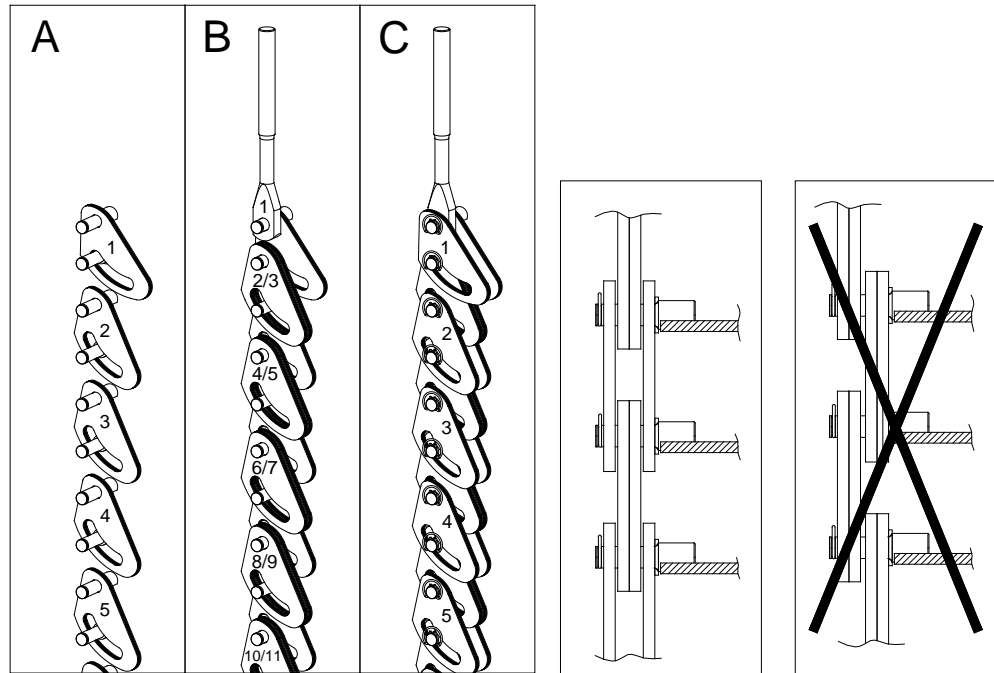


Figure 224. Assembly order of the suspension plates

A. Assemble the lowest suspension plates (1, 2, 3..)

B. Assemble the top suspension plate (1) and the midmost suspension plates (2, 3, 4...)

C. Assemble the topmost suspension plates and retaining rings

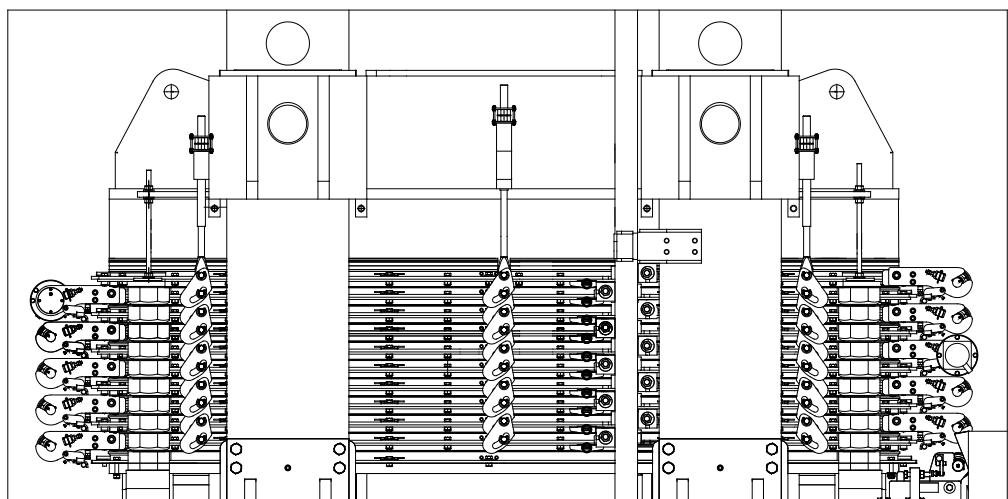


Figure 225. The correct order of suspension plates

9. Drive the upper pressing plate down until there is a gap about 30mm long between the upper end of the topmost suspension plate (1) and bottom surface of the lug (2). Refer to figure A.
10. Install the sleeves (3) one at a time to their positions, so that the stud bolts in the topmost suspension plates are in the sleeves. Refer to figure B.

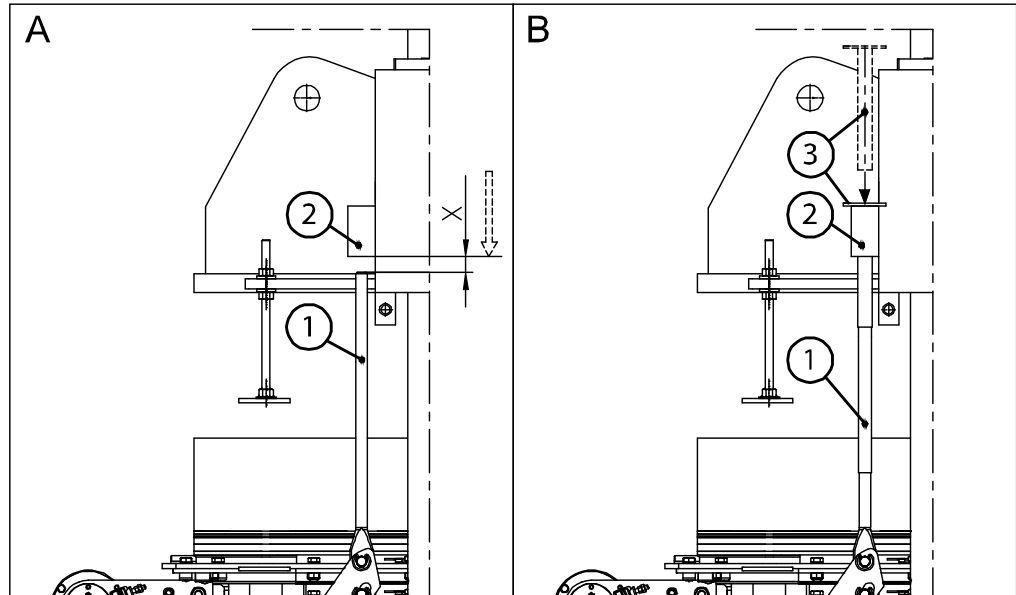


Figure 226. Installing sleeves

| | |
|--|------------------------------------|
| 1. Topmost suspension plate | 2. Lug of the upper pressing plate |
| 3. Sleeve of the topmost suspension plate | |
| X. \approx 30mm = gap between the upper end of the topmost suspension plate and bottom surface of the lug. | |

11. Drive the upper pressing plate on the plate pack and install adjusting nuts (2) of the topmost suspension plates. Refer to figure A. See pre-set dimension for the adjusting nuts from the figure B below.
12. Set the same pre-set dimension for all top suspension plates.
13. Drive the plate pack into its open position. Refer to figure C.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

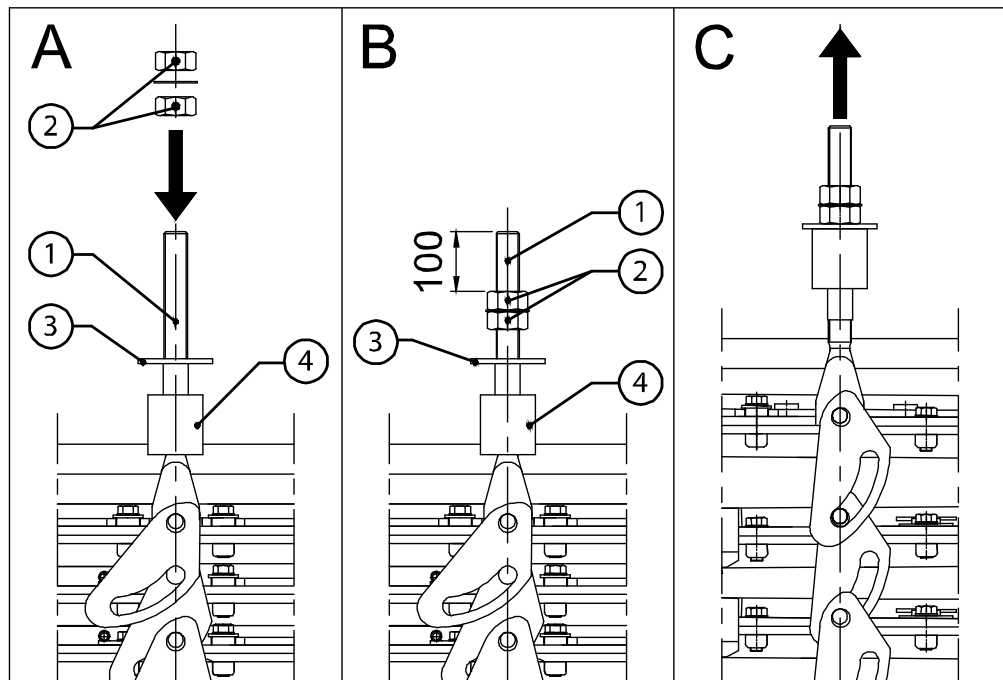


Figure 227. Driving the plate pack

| | | |
|-------------------------|------------------------------------|--------------------------|
| 1. Top suspension plate | 2. Adjusting nut | 3. Sleeve of the topmost |
| 4. suspension plate | 5. Lug of the upper pressing plate | |

When the plate pack is in its open position, there must be a gap (dimension X in the picture on the next page) between the lowest filter plate and the filter plate above. If an adjustment of the filter plates is needed, drive the plate pack into its closed position and adjust the adjusting nuts.

14. Check the gap by driving the plate pack into its open position.

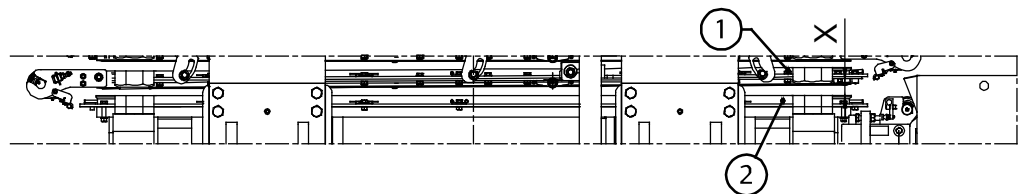


Figure 228. Gap

| | | |
|--|---|---|
| 1. Filter plate above | 2. Lowest filter plate | |
| X = gap between lowest Filter plate and the Filter plate above | X = 55 mm (min. 50 mm) for chamber height 33 mm and 45 mm | X = 70 mm (min. 65 mm) for chamber height 60 mm |

15. When the suspension of the plate pack is adjusted, close the plate pack and lock the adjusting nuts. Refer to figure below.

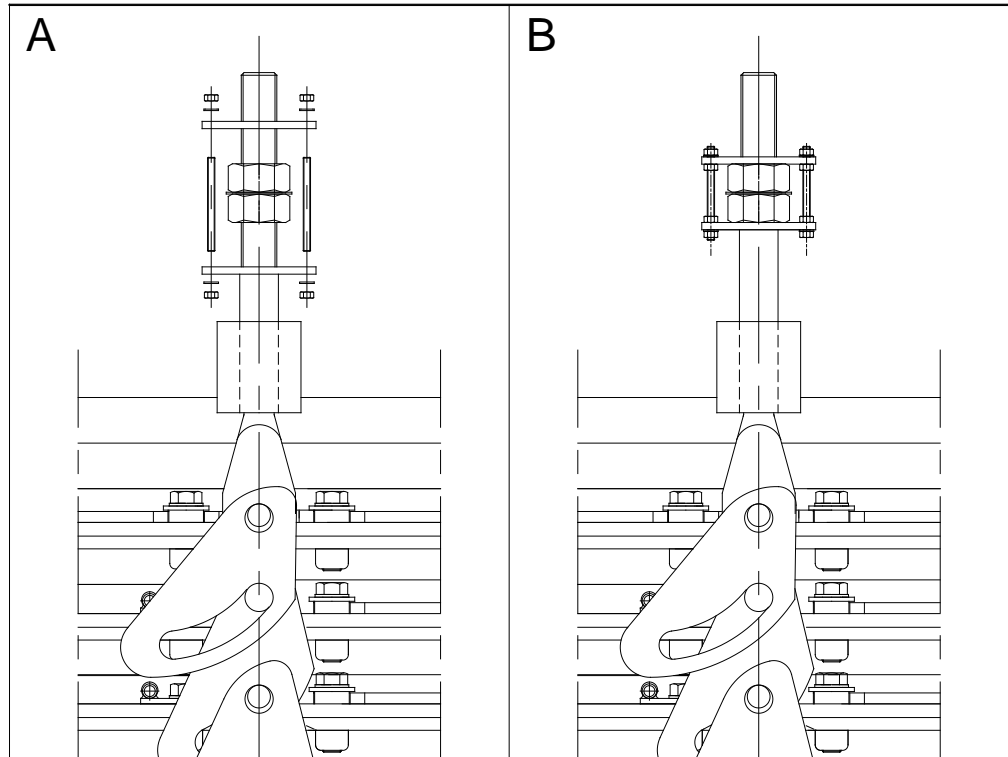


Figure 229. Closing the plate pack

8.2.26 Maintenance of filtrate collectors

Filtrate flows out from the Filter plates through collectors. If the collectors are leaking check whether the contact surfaces are clean and the seals are not damaged.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

9 Services and spare parts

Outotec services are designed to optimize the customers' plants and processes. Depending on the technology concerned, these services cover everything from spare parts support and delivery, site and equipment maintenance and plant audits to optimization and upgrades, project management, and training.

Should you have any questions regarding our products or services, please contact your nearest Outotec Service Center or our head office (www.outotec.com/services).

Table 36. Contact information

| | |
|--------------|--|
| Manufacturer | Outotec (Filters) Oy |
| Address | P.O, Box 29 53101 Lappeenranta |
| Telephone | +358 20 529 4236 |
| Fax | +358 20 529 4439 |
| Internet | www.outotec.com |

9.1 Spare parts and consumables

Outotec assumes no liability for defects or damages resulting from the use of non-genuine spare parts and accessories. Your nearest Outotec Service Center is happy to help you with your spare part enquiries.

9.1.1 Service life

Service life of spare parts depends on multiple factors, such as operations and maintenance practices, process pressures and chemical properties of the slurry.

Outotec recommends you to record and follow up your parts service life systematically to guarantee a reliable availability planning.

9.1.2 Repairable assemblies

In order to guarantee an uninterrupted production, it is recommended to replace some of the subassemblies as complete in the plant floor. Reparation of the subassembly may then be done outside the production break for example in a separate maintenance shop.

While requiring some extra capital investment into replacement assemblies, this practice allows for keeping the production down time at minimum.

Examples of repairable assemblies:

- complete filter plate
- complete hydraulic cylinder
- complete cloth roller
- complete pinch valve

9.2 Ordering spare parts

Outotec is happy to assist you through the provision of site-specific spares information and the supply of genuine parts.

Identification of spare parts is easy using the eCatalogue or the printed Spare Part Book delivered to you with your equipment.

When ordering spare parts or making enquiries, please provide the following information to your closest Outotec Service Center:

- Serial number (Filter related)
- Equipment on which the part is used (others)
- Outotec part number
- Description of the part
- Quantity required
- Your contact information.

Specifying this data ensures that you receive the correct information or the required spare parts.

Table 37. Example: Part number of the filter plate membrane in filter serial number 1018 is P211838.

| FILTER SERIAL NO | SPARE PART NO |
|------------------|---------------|
| 1018 | P211838 |

You can always check the serial number of your filter from its product plate.

9.3 Spare parts recommendation

Equipment specific spare part recommendation helps you to budget and store the right amount of spare parts in order to secure an uninterrupted production.

Important! Please request for a Spare parts recommendation from your nearest Outotec Service Center.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

9.4 Technical services

Outotec has a unique technical service portfolio covering all phases from installation and startup services to planned proactive maintenance and decommissioning services.

Outotec technical services:

Maintenance services: Outotec offers maintenance services to ensure that the customer's assets perform at their optimum level and that maintenance activities are carried out at the right time.

Evaluation & Assessment services: Outotec offers evaluation and assessment services for process and asset performance optimization.

Research & Analysis services: Outotec offers a broad spectrum of research and test services during the entire plant lifetime, ranging from sampling to process and plant analyses.

Installation & Start-up services: Outotec offers installation and start-up services to ensure professional, effective and safe commissioning for the delivered equipment.

Training Services: Outotec offers training services to ensure safe and effective operation and maintenance of the customer's assets.

Engineering Services: Outotec offers a vast scope of engineering services to support customers in all phases of a project, from project development and technology evaluation to delivery and start-up.

9.5 Modernizations

During equipment lifecycle the needs might change, the equipment performance might decrease or there might be some further development of the technology in question. Outotec Modernization Solutions offer services to either refurbish production back to the original performance level or to upgrade it to meet new targets.

Outotec Modernization Solutions:

Modernization assessments: Supporting customer decision-making to find the optimal modernization solution.

Refurbishments: Bringing under-performing equipment back to original performance level either by repairing or replacing parts.

Upgrades: Upgrading equipment either by improving an existing function or adding a new one.

Optional, existing functionalities can also be upgraded to the equipment any time during the equipment lifecycle with tailor made upgrade kits.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

9.6 Ordering services

Outotec is happy to assist you through the provision of site-specific services information.

When ordering services or making enquiries, please provide the following information to your closest Outotec Service Center:

- Equipment related information (Serial number or equipment type)
- Description of the needed services
- Your contact information.

Specifying this data ensures that you receive the correct information of the required services.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

10 Appendices

10.1 Filter datasheet

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Outotec



TECHNICAL SPECIFICATION

www.outotec.com

Outotec

CUSTOMER Sulvaris / Pöyry (Appleton) LLC

APPLICATION Micronized Sulphur Dewatering

OUTOTEC LAROX PF 48 SERIES
AUTOMATIC PRESSURE FILTER

Type Outotec Larox PF 96/96 M48 2 60

Filtration area 96 m²

SERIAL NUMBERS 1125

DRAWINGS According to DIR list: DOC36454

MARKING

| OUTOTEC LAROX PF 96/96 M48 2 60 | |
|---------------------------------|-------|
| Filter type | PF |
| Filtration area /expandability | 96/96 |
| Filter series | M48 |
| Construction material | 2 |
| Chamber height | 60 |

PROGRAM

Short program

1. Filtration
2. Pressing
3. Drying
4. Cake discharge

CONSTRUCTION MATERIALS

2 = all metal parts in contact with slurry, material AISI 316L (EN 1.4404) or equal

PRESSURES

| | |
|---------------------------------|--|
| Infeed pressure | 0,2...1,0 MPa |
| Diaphragm pressing pressure | 0,5...1,6 MPa |
| Air drying pressure | 0,4...1,2 MPa |
| Feed pipe/hose washing pressure | min. 0,15...0,2 MPa over infeed pressure |
| Cloth washing pressure | min. 1,2 MPa |
| Instrument air pressure | 0,6...1,0 MPa |

FILTER CONSTRUCTION DESCRIPTION

Item numbers according to dimensional Drawing F673031.

| Item | Description | Material information | Further information |
|------|--|----------------------|---|
| 1 | Lower Frame | Mild steel | |
| 2 | Cloth wash unit | | |
| | - housing | AISI 316 | |
| | - cloth wash piping | AISI 316 | Nozzles: DELAVAN On both sides of the filter cloth |
| | - cake chute | AISI 316 | Closing lids for cake chutes |
| 3 | Cloth drive unit | | |
| | - side plates and doors | AISI 316 | |
| | - power transmission through hydraulic motors and flexible coupling | | |
| | - cloth tensioning device * power transmission through chains, hydraulic motor and flexible coupling * frame for cloth tensioning device | AISI 316 | |
| 4 | Columns | Mild steel | |
| 5 | Upper pressing plate | Mild steel | |
| | - locking pins | | Qty 4 pcs |
| | - hydraulic cylinders | | Qty 2 pcs |
| 6 | Top frame | Mild steel | |

| Item | Description | Material information | Further |
|------|-------------|----------------------|---------|
|------|-------------|----------------------|---------|

| | | | information |
|-----------------------|--|---|---|
| 7 | Filter plate pack | | |
| | Plate size 1 500 x 4 010 mm | | Qty 16 pcs |
| | - body plate | AISI 316L | |
| | - frame | AISI 316L | Grinded Welds on plate frames |
| | - diaphragm | EPDM | |
| | - grid | PP | Glassfiber reinforced |
| | - vat | HDPE | |
| | - filter plate guides - cloth and roller scrapers | POM PU changeable blade, supports AISI 316 same amount as plates | |
| 8 | Rollers | | |
| | - cloth drive rollers | Mild steel / AISI 316 | EPDM lined |
| | - cloth tracking roller | Mild steel / AISI 316 | AISI 316 lined |
| | - automatic controlled with hydraulic cylinder | | |
| | - guide rollers | Mild steel / AISI 316 | AISI 316 lining |
| | - auxiliary drive rollers | Mild steel / AISI 316 | EPDM lined |
| - vat rollers | Mild steel / AISI 316 | AISI 316 lined 2 pcs | |
| 9 | Guide bars | AISI 316 | |
| 10 | Quick action cylinders | EN 1.4462 | Qty 4 pcs |
| 11 | Process pipelines | | Orbital Welding and Grinded welds |
| | - flanges according to ANSI B 16.5 (150 lbs) | | |
| | - slurry feed pipes | AISI 316L | Qty 2 pcs |
| | - slurry hoses | PTFE | 4 pcs / filter plate Spirally reinforced |
| | - pressing air distribution pipe | AISI 316 | With air remover |
| | - pressing air distribution hose | EPDM | 1 pcs / filter plate |
| | - filtrate collection hoses | Natural rubber | Qty 4 pcs |
| - cake popping device | | 6.3kW 575V/60Hz/IP55 | |

| Item | Description | Material information | Further |
|------|-------------|----------------------|---------|
|------|-------------|----------------------|---------|

| | | | information | |
|-----------------|--|-------------------------------------|-----------------------------|-------------------------|
| 12 | Process valves | | | |
| | - Outotec Larox pinch valves | Housing Sleeve | GRS (std) SBRT | Optionally housing 316L |
| | V02, PVE 150 H 16 | | | Slurry feed |
| | V05, PVE 125 H 16 | | | Cake wash liquid inlet |
| | V06, PVE 100 H 16 | | | Drying air inlet |
| | V07, PVE 125 H 16 | | | Manifold drain outlet |
| | V09, PVE 50 H 16 | | | Cloth washing water |
| | V10, PVE 100 H 16 | | | Slurry recirculation |
| | V12, PVE 150 H 16 | | | Slurry feed |
| | V17, PVE 125 H 16 | | | Manifold drain outlet |
| | V27, PVE 50 H 16 | | | Manifold ventilation |
| | - Ball valves | | | |
| | V03, DN65/50 | | | Pressing air inlet |
| | V04, DN65/50 | | | Pressing air outlet |
| | V24, DN65/50 | | | Ejector line control |
| | - Butterfly valve | | | |
| V16, DN100 PN16 | | | Control valve, drying air | |
| V34, DN100 PN16 | | | Control valve, cake popping | |
| 13 | Hydraulic piping | AISI 316 | Fittings AISI 316 | |
| 14 | Hydraulic connections between hydraulic unit and filter | Hydraulic hoses | 3 pcs | |
| | - hydraulic piping | AISI 316 | Fittings AISI 316 | |
| 15 | Hydraulic unit | | Air cooled | |
| 16 | Safety guards | | | |
| | - frame | mild steel | | |
| | - plates | Transparent polycarbonate / AISI304 | | |
| | - stairs and maintenance platforms | | | |
| 17 | Lubrications | | | |
| | Locking pins and rollers bearings outside of the plate pack are centralized. | | | |

| Item | Description | Material information | Further |
|------|-------------|----------------------|---------|
|------|-------------|----------------------|---------|

| | | | information |
|-----------|--|--|---|
| 18 | Electrification | | |
| 19 | Maintenance tools | | |
| 20 | Filter cloth | | The installed cloth is for factory test and start-up purposes only. |
| | The delivery includes one filter cloth. | | |
| | Seam type: Tamfelt LHH02. Cloth width 1,7m, length 95.5m. | | |
| 21 | Packing | | |
| 22 | Muffler | | |

AUTOMATION AND ELECTRIFICATION

For the control of all functions of the filter as well as quoted accessories and process control functions.

The control panel is to be regarded as interface between automatic pressure filter and the operator. The panel can be used for

- Displaying the status of position sensors
- Displaying the status of valves and motors
- Displaying the flow diagram including process valves, showing the status and process pressures
- Supplying of recipes and parameters

Selection of modes

- Test mode
- Manual mode
- Automatic mode
- End mode

Language for screen text

English and desired one

Electrification and instrumentation is designed acc. to European standards.

Instrumentation in compliance to CSA requirements

Material of construction

- | | |
|-----------------------------------|--------------------------------|
| - Control panel | AISI316, IP65 NEMA 4X |
| - Terminal boxes | AISI316, IP66 NEMA 4X |
| - Terminal box, in hydraulic unit | Coated mild steel, IP65 NEMA 4 |

PLC system

Allen Bradley Control Logix

Operator interface unit (OIU)

Allen Bradley Panelview 1000

Voltage supply to the system

120 VAC 60 Hz 1-phase

Control Logix

5000 PLC, version 19.52

Factory Talk

Version 6.10.00 (CPR 9 SR 4)

The control panel requires voltage supply from which following field voltages are internally generated:

- Instrumentation 24 VDC
- Control solenoids 24 VDC

ELECTRIC MOTORS AND CABLING

Motor starters, cabling external to the filter and its associate parts is excluded from the Outotec delivery.

The limits for supply of electrical components and cabling shall be as shown in cabling diagram.

Auxiliary I/O controls for Outotec supplied process motors and auxiliary devices are included in Outotec automation control system, located in control panel or node can moved to separate box within 100m distance.

Field voltage: 24 VDC
 Control voltage: 120 VAC 60 Hz
 Main voltage: 575 Volt, 3 phases, 60 Hz

Motor frame size according to: NEMA design B, IEEE841
 Enclosed according to: IP 56

| Tag no. | Equipment description | Electric power | Voltage | Degree of protection |
|---------|----------------------------|-----------------|-----------------------|----------------------|
| M1HU | Hydraulic Unit motor | 110 kW, 1800rpm | 575Vac, 3-phase, 60Hz | IP56 |
| M2HU | Hydraulic Unit motor | 15 kW, 1800rpm | 575Vac, 3-phase, 60Hz | IP56 |
| M3HU | Hydraulic oil Cooler motor | 3 kW, 1800rpm | 575Vac, 3-phase, 60Hz | IP56 |
| R04 | Hydraulic oil heater | 3kW | 575Vac, 3-phase, 60Hz | - |

NOTE: Motor frames are according to NEMA B, IEEE-841

HYDRAULIC UNIT

| | |
|--------------------|--------------------|
| Type | Outotec LAROX 800 |
| Oil tank volume | 0,8 m ³ |
| Operating pressure | 0 - 280 bar |
| Max. flow Q l/min | 530 l/min |

Optional online analyzer for water contents and purity measurement, not included to the standard price.

Equipped with removable case. It is important to take care of adequate cooling air recirculation around the hydraulic unit.

The delivery includes hydraulic hoses between filter and hydraulic unit. The length of the hoses is approximately 5 m. The changes have to be agreed separately before the delivery.

Hydraulic unit will be delivered without oil. First filling at site by the customer.

Electrically controlled axial piston pump P1
- max. continuous pressure 280 bar
- output flow Q in l/min 390 l/min

Constant pressure axial piston pump P2
- max. continuous pressure 250 bar
- output flow Q l/min 140 l/min

Separated electric motor for P1 and P2

Pressure accumulator volume 20 litres.
- charging with constant pressure pump

Return oil filter rating 10 µm
Filter for continuous filtration rating 7 µm

Level and temperature transmitter

Oil heater
Air cooler

WELDING PROCESS

The following welding procedures are used at Outotec: electrode (111), MAG (135), TIG (141) (ISO857-1). The weldings are carried out according to welding class C at the minimum (SFS-EN ISO 5817). A welding co-ordinator is responsible for welding (IWE 00132 FIN) and he has full authority over any necessary action. Welders competence is based on (SFS-EN 287-1). Welding instructions have been accepted according to SFS-EN ISO 15614-1, SFS-EN ISO 15610, SFS-EN ISO 15611. Weldings are checked visually and the parts in plate pack which are in contact with slurry are tested for tightness (pressure water 16 bar / pressure air 6 bar). In addition, parent material traceability for the above parts is secured. A final inspection is carried out with a complete product according to ISO 9001:2000.

PAINTING

Mild steel parts are epoxy painted, stainless steel and plastic parts are not painted.

Parts with heavy corrosion and abrasion environment conditions:

EN ISO 12944-5 /C5-M/M (EP 300/1-FeSa 2½)

- surface treatment epoxy painting, 1 coat of epoxy, 1 x 300 µ m
- Teknos K34a or equal

Other parts with normal corrosion and abrasion environment conditions:

EN ISO 12944-5/ C3-H (EP 200/1-FeSa 2½)

- surface treatment epoxy painting, 1 coat of epoxy, 1 x 200 µ m
- Teknos K34d or equal

| | | |
|---------|-------------|----------|
| Colors: | Window Grey | RAL 7040 |
| | Basalt Grey | RAL 7012 |

More details in the painting instruction of the filter.

FEED PIPE AND HOSE FLUSH WATER CONSUMPTION

Filtration area 48 – 96 m² 0.7...1,0 m³ /cycle

Recommendation for pump sizing:

Volume

40...80 l/s

Head

15...20 m over feed pressure

When possible, filtrate is recommended to be used as the feed pipe and hose flush liquid.

CLOTH WASH WATER CONSUMPTION

Water pressure (bar)

Flow rate (l/min)

10

240

14

295

Flow is required only during cloth advancement which is from 0,5 to 1,5 minutes per cycle. Cloth wash water must be clean to avoid blocking of the spray nozzles.

Cloth wash water quality specification:

- Max particle size 40 micron
- Max solids 300 mg/l
- Recommended pH 6.5 – 7.5
- Temperature 15 – 50 °C

INSTRUMENT AIR

Air pressure:

6 - 10 bar (overpressure)

Air temperature:

5 °C - 80 °C

Compressed air quality according to ISO 8573-1 class 4.4.4.

- Dirt:

max. particle size 15 µm,

max. concentration 8 mg/m³

- Water:

max. pressure dew point +3 °C

- Oil:

max. concentration 5 mg/m³

Air consumption:

- Average consumption while operation

140 l/cycle

- Maximum instantaneous flow

800 l/min

PRESSING AIR

- Air temperature: 10 °C - 80 °C
Compressed air quality according to ISO 8573-1 class 2.7.2.
- Dirt: max. particle size 1 µm,
max. concentration 1 mg/m³
 - Water: no requirements
 - Oil: max. concentration 0.1 mg/m³
 - Air pressures and consumptions according to filter's sizing report

DRYING AIR

- Air temperature: 10 °C - 80 °C
Compressed air quality according to ISO 8573-1 class 4.7.4.
- Dirt: max. particle size 15 µm,
max. concentration 8 mg/m³
 - Water: no requirements
 - Oil: max. concentration 5 mg/m³
 - Air pressures and consumptions according to filter's sizing report

FILTER CONSTRUCTION

The filtration elements (i.e. plates) of the PF filter are placed horizontally between two pressure plates. During filtration the plate pack is pressed together, and the pack is opened for cake discharge.

The plate pack is opened and closed by means of hydraulic cylinders.

The endless filter cloth zigzags between the filter plates, which results in the filtered cake being formed on either side of the cloth. The filter cloth is thus automatically back flushed and any particles adhering to it or lodged in the filter cloth from the previous filtration cycle are washed out when filtering on the reverse side of the cloth.

The cloth transports the cakes off the filter and, at the same time, the cloth is cleaned on both sides by high pressure water sprays. The cloth moving device is driven by the hydraulic motor which actuates the cloth drive roller. When the filter plates are opening and closing, the tension of the filter cloth is maintained at a constant level by a simple cloth tensioning device. The cloth tensioning device does not operate when the plate pack is closed.

Slurry is fed into sealed filter chambers through the distribution piping. Wash water and drying air are fed in through the same pipe. The feed pipe is emptied through a drain valve on completion of the feed pumping cycle.

The operation of the filter is controlled automatically by the operation unit containing the programmable logics and indicator lamps for all operations.

The automatically controlled actuators for the pinch valves are hydraulic operated and for the ball valves pneumatic.

PF pressure filter statement concerning pressure equipment

Outotec Larox® PF-filter is not classified as pressure equipment and PED 97/23/EC is not applied.

Inspecta Tarkastus Oy as the notified body no 0424 considers that the Outotec Larox® PF-filter is to be excluded from the scope of the Pressure Equipment Directive 97/23/EC.

The Outotec Larox PF Filter is such an equipment defined in Article I paragraph 3.10 where the dimensioning, choice of material and manufacturing are based on requirements for sufficient rigidity to meet the operational characteristics and the filter is primarily designed to fulfil other functions than pressure containment.

Inspecta Tarkastus Oy statement : DOC23408 CERTIFICATE
CLASSIFICATION OF PF- FILTER 14.7.2011 (Inspecta Tarkastus
Oy Notified body no 0424)

OPERATION

1. Filtration

When the filter plate pack has been closed, slurry is pumped into the filter and fed simultaneously into each filter chamber through the distribution pipes. Filtrate flows through the cloth into the filtrate collection area, then out through the discharge pipe. The filtered material is collected on the cloth surface and forms the filter cake.

2. Pressing I

Pressing air flows in behind the rubber diaphragm. The diaphragm presses the cake against the cloth surface, thus pressing the filtrate from the cake through the cloth.

3. Drying

The final drying of the cake is accomplished with compressed air. The air which enters through the distribution pipe fills the filter chamber, raises the diaphragm and forces the pressing air above the diaphragm out of the filter. The air flow through the cake reduces its moisture content to the optimum and, at the same time, empties the filtrate chamber.

4. Cake discharge

When the air drying has been completed, the plate pack is opened and the cloth moving mechanism started. The filter cake on the cloth is discharged from both sides of the filter.

10.2 Packing list

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

Document code: **DOC40147**

Rev: B 30.1.2014 / HNU

Project Name:

Sulvaris / Pöyry (Appleton) LLC

Project ID :

B200178FI

#1125 PACKING SPECIFICATION, PF 96/96 (M48) 2 60 FULLY DISMANTLED

| POS | EQUIPMENT | PACKAGE No. | DIMENSIONS, m | | | VOLUME m ³ | NET WEIGHT KG | GROSS WEIGHT KG | PACKAGE ITEM.NO | PACKAGE TYPE | STACKING LIMITATION KG |
|------------------------------------|--|-------------|---------------|------|------|-----------------------|-----------------|-----------------|-----------------|--------------|------------------------|
| | | | Lx | Wx | H | | | | | | |
| 1 | Lower frame and Cloth wash unit (including load cell module if in Outotec delivery) | 1 /17 | 5.70 | 3.00 | 1.70 | 29.1 | 14,000 | 14,500 | F605594 | | NO STACKING |
| 2 | Upper pressing plate | 2 /17 | 4.80 | 3.42 | 1.60 | 26.3 | 11,900 | 13,000 | L32001 | LA3 | NO STACKING |
| 3 | Top frame | 3 /17 | 6.40 | 3.42 | 1.20 | 26.3 | 2,000 | 3,300 | L30524 | LA2 | 3000 (see note 1) |
| 4 | Cloth drive unit | 4 /17 | 5.60 | 3.42 | 1.60 | 30.6 | 2,650 | 3,900 | L30255 | LA3 | NO STACKING |
| 5 | Filter plates (6 pcs) | 5 /17 | 5.20 | 2.66 | 1.40 | 19.4 | 9,700 | 10,650 | L30730 | LA3 | NO STACKING |
| 6 | Filter plates (5 pcs) | 6 /17 | 5.20 | 2.66 | 1.20 | 16.6 | 8,100 | 9,000 | L30256 | LA3 | NO STACKING |
| 7 | Filter plates (5 pcs + lowest plate) | 7 /17 | 5.20 | 2.66 | 1.20 | 16.6 | 9,300 | 10,200 | L30256 | LA3 | NO STACKING |
| 8 | Lower parts of columns | 8 /17 | 4.40 | 1.90 | 1.00 | 8.4 | 7,600 | 8,100 | L30529 | LA2 | 3000 (see note 1) |
| 9 | QA-cylinders & Top parts of columns | 9 /17 | 5.20 | 1.90 | 1.00 | 9.9 | 5,150 | 5,700 | L29209 | LA3 | NO STACKING |
| 10 | Process pipelines and Guide bars | 10 /17 | 6.00 | 2.28 | 1.60 | 21.9 | 2,200 | 3,050 | L30259 | LA2 | 3000 (see note 1) |
| 11 | Control panel | 11 /17 | 2.40 | 1.14 | 0.8 | 2.2 | 200 | 330 | L29211 | LA1 | NO STACKING |
| 12 | Hydraulic unit | 12 /17 | 3.60 | 2.28 | 2.6 | 21.3 | 2600 | 3200 | L38954 | LA2 | 3000 (see note 1) |
| 13 | Muffler | 13 /17 | 3.20 | 1.52 | 1.40 | 6.8 | 520 | 620 | L30391 | LA2 | 3000 (see note 1) |
| 14 | Service platform frames & Free end cake chute | 14 /17 | 5.20 | 3.42 | 2.00 | 35.6 | 2,700 | 3,900 | L30254 | LA3 | NO STACKING |
| 15 | Service platform shields | 15 /17 | 3.60 | 2.28 | 1.60 | 13.1 | 800 | 1,400 | L29753 | LA2 | 3000 (see note 1) |
| TOTAL (without auxiliaries) | | | | | | 284.0 | 79,420.0 | 90,850.0 | | | |

SPARE PARTS

| POS | EQUIPMENT | PACKAGE No. | DIMENSIONS, m | | | VOLUME m ³ | NET WEIGHT KG | GROSS WEIGHT KG | PACKAGE ITEM.NO | PACKAGE TYPE | STACKING LIMITATION KG |
|--------------|----------------------------|-------------|---------------|------|------|-----------------------|----------------|-----------------|-----------------|--------------|------------------------|
| | | | Lx | Wx | H | | | | | | |
| 16 | Spares (Start-up + 2 year) | 16 /17 | 5.20 | 2.66 | 1.40 | 19.4 | 1,000 | 1,300 | L30730 | LA2 | 3000 (see note 1) |
| TOTAL | | | | | | 19.4 | 1,000.0 | 1,300.0 | | | |

AUXILIARIES

| POS | EQUIPMENT | PACKAGE No. | DIMENSIONS, m | | | VOLUME m ³ | NET WEIGHT KG | GROSS WEIGHT KG | PACKAGE ITEM.NO | PACKAGE TYPE | STACKING LIMITATION KG |
|--------------|-------------------------------|-------------|---------------|------|------|-----------------------|---------------|-----------------|-----------------|--------------|------------------------|
| | | | Lx | Wx | H | | | | | | |
| 17 | High pressure cloth wash unit | 17 /17 | 2.40 | 1.52 | 1.60 | 5.8 | 165 | 511 | L49631 | LA2 | 3000 (see note 1) |
| TOTAL | | | | | | 5.8 | 165.0 | 511.0 | | | |

Internal packing:

- All Internal packing must be biodegradable (i.e. cardboard or pare rather than polystyrene or bubble wrap).

Marking and Tagging of goods:

- All cases shall have the marking stencilled on with black paint using letters no smaller than five (5) cm heigh.

Note 1:
Two LA2:s can be stacked.
Maximum stacking weight is 3000kg.

10.3 Sizing report

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

| | | | |
|------------------------------|-----------------------------|--------------------------------------|---------------------------------|
| CUSTOMER | Sulphur Solutions | FILTER TYPE | Outotec Larox PF 96/96 M48 1 60 |
| CASE NUMBER | 21157 | FILTRATION AREA | 96.0 m ² |
| TEST NUMBER | 21157T3 - Test 21 | EXPANDABLE TO | 96.0 m ² |
| FILTER SIZING BY | JSK/aux JSi 30062011 | NUMBER OF FILTERS | 1 pc |
| AUXILIARIES SIZING BY | JarSin aux updated 20122012 | Plant altitude from sea level | 1173 m |

| | | | |
|------------------------------|-------------------------|----------------------------------|--------------------------------|
| SLURRY TO BE FILTERED | Sulfer | FILTER SIZING DATA | |
| Solids content | 65.0 % w/w | Plant capacity (maximum) | 26203 kg D.S./h |
| Density | 1330 g/l | Plant capacity (nominal) | 23500 kg D.S./h |
| Liquid density | 1000 g/l | Filtration rate | 272.9 kg D.S./m ² h |
| Solids S.G. | 1.62 kg/dm ³ | Solids content in cake | 93.3 % w/w |
| pH | | Cake thickness | 39 mm |
| Temperature | 55 °C | CYCLE TIMES AND PRESSURES | |
| PSD | <% _____ um | Filling and filtration | 1.00 min 3.0 bar |
| | <% _____ um | 1. Pressing | 1.00 min 16.0 bar |
| | <% _____ um | Cake washing | min bar |
| CAKE WASH LIQUID | | 2. Pressing | min bar |
| Wash liquid consumption | m ³ /tn D.S. | Cake air drying | 3.00 min 8.0 bar |
| Wash liquid density | g/l | Technical time | 4.00 min |
| Wash liquid temperature | °C | Total cycle time | 9.00 min |
| Wash liquid pH | | | |

Note: If filter is expandable auxiliaries are sized for expandable filtration area

| | | | |
|-----------------------------|-------------------------|---|------------------------|
| FEED PUMP | Warman 100 WBH (6/4 AH) | FEED TANK (assumption flat bottom) | |
| Number of pumps | 1 pc | Tank capacity | 7 cycles |
| Filling flowrate at 1.5 bar | 80 l/s | Slurry volume/filter/cycle | 4.5 m ³ |
| Sizing flowrate at 3.0 bar | 60 l/s | Slurry volume/filter | 30.3 m ³ /h |
| Head | 35 m | Slurry volume in tank | 31.8 m ³ |
| Pumping pressure | 3.0 bar | Diameter | 3.5 m |
| Motor size | 55.0 kW | Height | 4.5 m |

| | | | |
|---------------------------------|--|-----------------------------------|-------------------------------|
| DRYING AIR COMPRESSOR | GA200-13 | PRESSING AIR COMPRESSOR | GR110-20 |
| Number of compressors | 1 pc | Number of compressors | 1 pc |
| Sizing rate | 0.50 Nm ³ /m ² min | Pressing air consumption / filter | 3.81 Nm ³ /min |
| Drying air consumption / filter | 16.00 Nm ³ /min | Compressor capacity | 12.60 m ³ /min FAD |
| Compressor capacity | 26.00 m ³ /min FAD | Max working pressure | 17.1 bar |
| Max. achieved working pressure | 11.1 bar | Max pressing pressure | 16.0 bar |
| Min. working pressure | 6.0 bar | Motor size | 110.0 kW |
| Motor size | 200.0 kW | Total Volume of receiver(s) | 10.0 m ³ |
| Total volume of receiver(s) | 20.0 m ³ | | |

| | | | |
|----------------------------|-----------------------------------|--------------------------|--------------------|
| MANIFOLD FLUSH PUMP | Warman 100 WBH (6/4 AH) | FLUSH LIQUID TANK | |
| Number of pumps | 1 pc | Tank capacity | 7 cycles |
| Sizing flowrate | 50 l/s | Diameter | 2.5 m |
| Consumption | 1.10 m ³ /cycle/filter | Height | 3.0 m |
| Total consumption | 7.3 m ³ /h | Liquid volume in tank | 7.7 m ³ |
| Head | 65 m | | |
| Flushing pressure | 5.0 bar | | |
| Motor size | 55.0 kW | | |

| | | | |
|------------------------|-----------------------------------|-------------------------|--------------------|
| CLOTH WASH PUMP | CR 20 | CLOTH WASH TANK: | |
| Number of pumps | 1 pc | Tank capacity | 7 cycles |
| Sizing flowrate | 5.00 l/s | Diameter | 1.5 m |
| Consumption | 0.36 m ³ /cycle/filter | Height | 2.5 m |
| Total consumption | 2.4 m ³ /h | Liquid volume in tank | 2.5 m ³ |
| Head | 130 m | | |
| Washing pressure | 10.0 bar | | |
| Motor size | 15.0 kW | | |

| | | | |
|-----------------------------------|----------------------------------|--|-----------------------------------|
| FILTRATE PUMP | Warman 100/80 MU | FILTRATE TANK: | |
| Number of pumps | 1 pc | Tank capacity | 2 cycle |
| Sizing flowrate | 10 l/s | Diameter | 2.0 m |
| Filtrate amount | 1.8 m ³ /cycle/filter | Height | 3.0 m |
| Filtrate + other liquids flowrate | 21.9 m ³ /h | Filtrate + other liquids volume in tank | 6.6 m ³ |
| Head | 35 m | Other liquids that are added and included to filtrate volume: | |
| Pumping pressure | 2.0 bar | Manifold flush liquid | 1.10 m ³ /cycle/filter |
| Motor size | 7.5 kW | Cloth flush liquid | 0.36 m ³ /cycle/filter |

| | |
|---------------------------------------|----------------------|
| CAKE CONVEYOR | Belt conveyor / VSD |
| Number of conveyors(below the filter) | 1 pc |
| Cake discharge time/cycle/filter | 0.33 min |
| Cake weight | 4213 kg/cycle/filter |
| Load to conveyor during discharge | 213 kg/s |
| Length | 12.0 m |
| Width | 1800 mm |
| Motor size | 7.5 kW |

10.4 Error report for the documentation

We have provided this form to help us track any errors that may exist in our manuals. Should you find an error in this manual, please describe it in the space below and fax this form to us, telefax No. +358 20 529 4439. We appreciate your input.

Current Information

PF No. _____ Page number(s): _____ Figure number(s): _____

Information as currently printed:

Proposed Change
Information as it should be printed:

Any additional information:

Address (optional):
Name

Title

Company

Address

Telephone

Telefax

E-mail

| | |
|-----------------|--|
| Date Received | |
| Date Resolved | |
| Manner Resolved | |

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

10.5 Error report for the filter

WARRANTY CLAIM CLAIM RETURNED GOODS DATE:

| | |
|-------------------------|--------------------------|
| CUSTOMER'S NAME/CONTACT | AFFILIATE OR DISTRIBUTOR |
|-------------------------|--------------------------|

Outotec (Filters) Oy

| | |
|---------|-------------|
| Address | P.O. Box 29 |
|---------|-------------|

FIN-53101 Lappeenranta, Finland

| | |
|---------|--|
| Country | |
|---------|--|

| | | | | | |
|-------|--------|-------|-----------------|---------|------------------|
| Phone | E-mail | Phone | +358 20 529 211 | E-mail: | info@outotec.com |
|-------|--------|-------|-----------------|---------|------------------|

| | | | | |
|-----|-----|------------------|-----------|-----------------|
| Fax | Fax | +358 20 529 2200 | Internet: | www.outotec.com |
|-----|-----|------------------|-----------|-----------------|

| | | | |
|-------------|-------|------------|-----------------|
| Filter type | Model | Filter No. | Date of failure |
|-------------|-------|------------|-----------------|

| | | |
|-------------------------|----------|--------------------------|
| Principal part involved | Part No. | Operating cycles or time |
|-------------------------|----------|--------------------------|

| | |
|---|-------------------|
| For Outotec's use only Business unit | Type of operation |
|---|-------------------|

Description of the case, place, circumstances, etc.

Goods to be returned

| |
|---------------------------------|
| COMPONENT DELIVERED TO CUSTOMER |
|---------------------------------|

with filter other delivery date:

| | | |
|------|------|-------------|
| Qty. | Code | Description |
|------|------|-------------|

| | | |
|--|--|--|
| | | |
|--|--|--|

Signature

| | | | |
|---|--|-----------------------------------|-----------------------------|
| For Outotec's use only | Warranty status | | |
| Actions | Warranty period | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| <input type="checkbox"/> To be repaired | | Date | By |
| | <input type="checkbox"/> Claim returned for completion | | |
| <input type="checkbox"/> To be scrapped | | | |
| | <input type="checkbox"/> Claim accepted | <input type="checkbox"/> Rejected | |
| <input type="checkbox"/> To be delivered to supplier for inspection | Date | By | Date of credit |
| | | | Credit invoice |
| | | | |

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

10.6 Start-up report

Can be added only after start-up.

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

10.7 Order form for manuals

Additional copies of these documents can be ordered from the manufacturer. Please note that further copies are not free of charge.

All rights expressly reserved. Reproduction or communication to third parties, no matter in which form, is not permitted without our written consent.

When ordering additional copies, always state serial number of the filter in question and specify the needed documents as shown below:

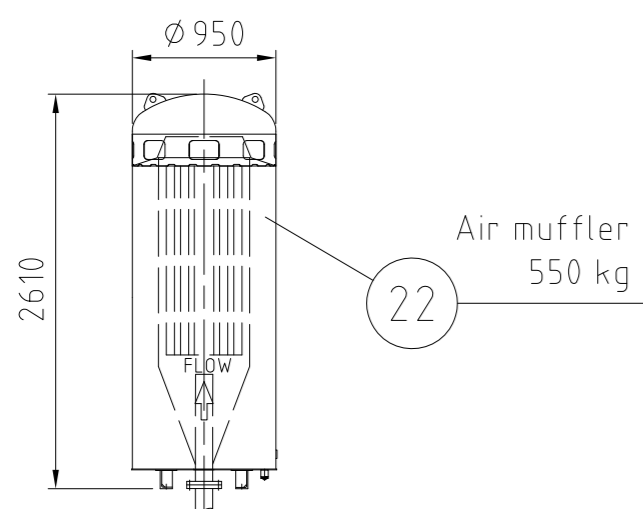
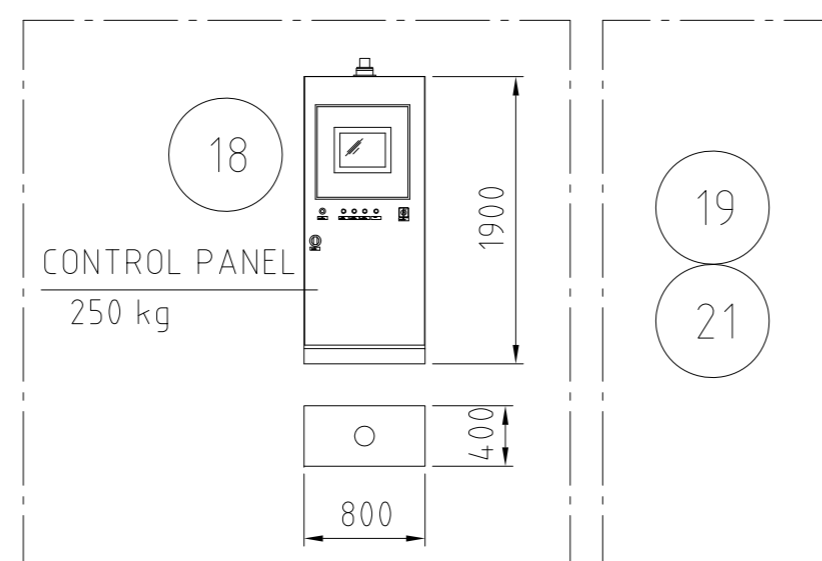
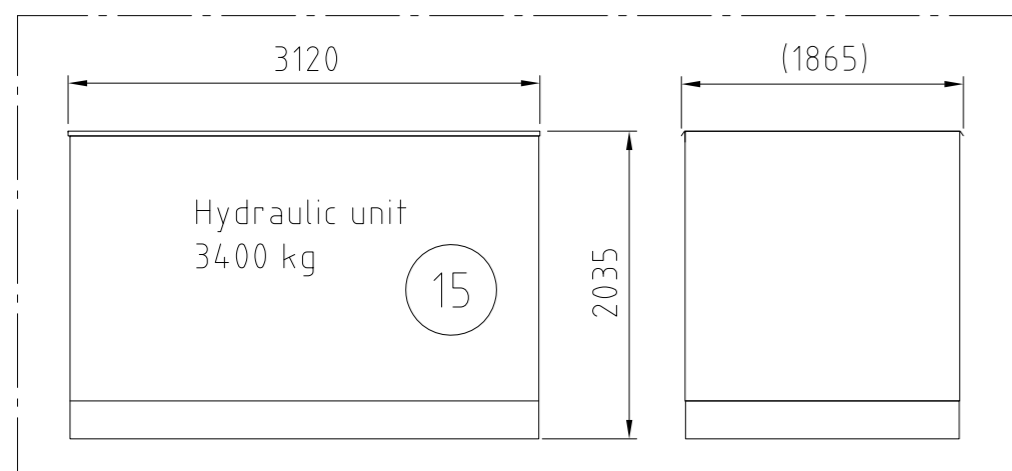
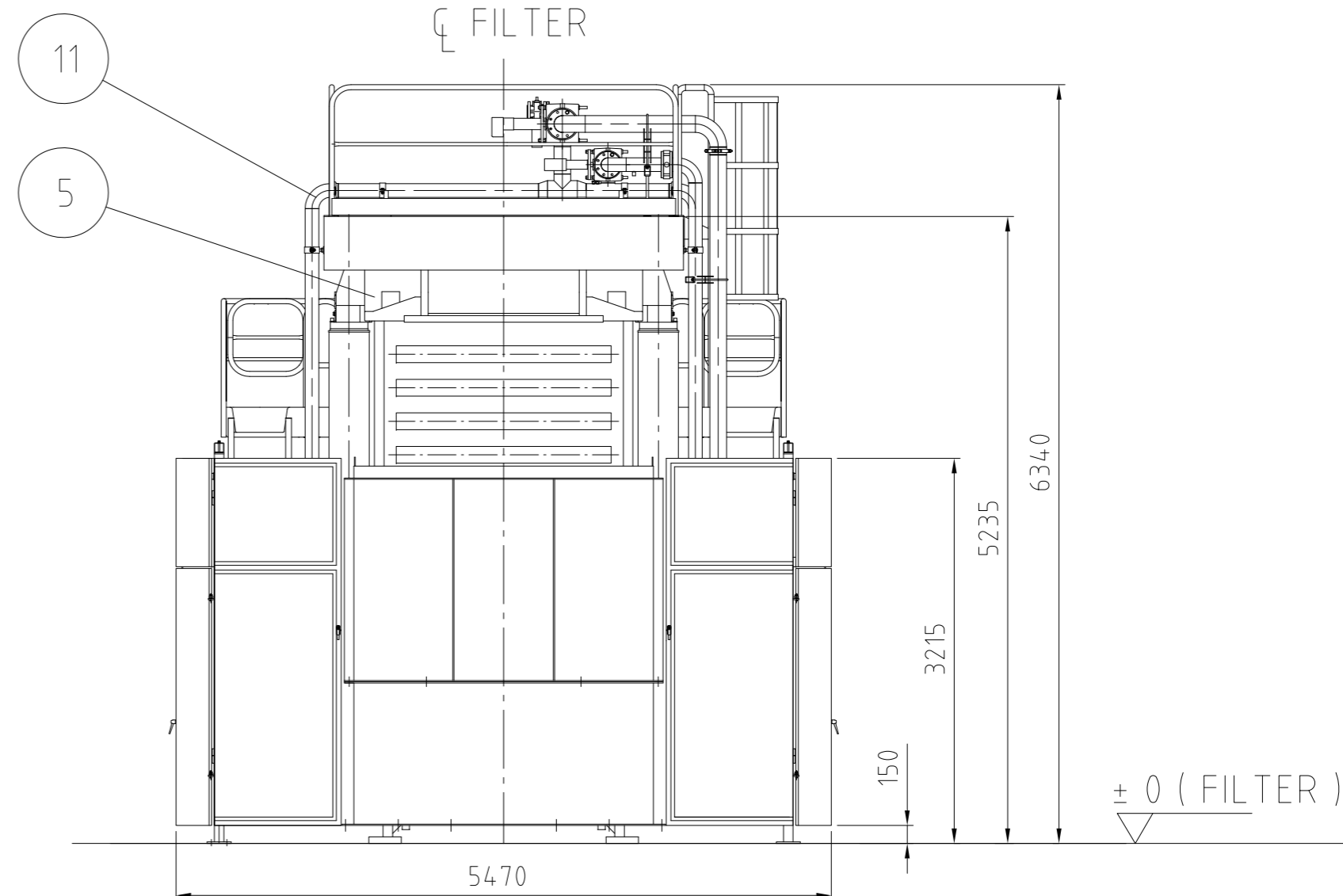
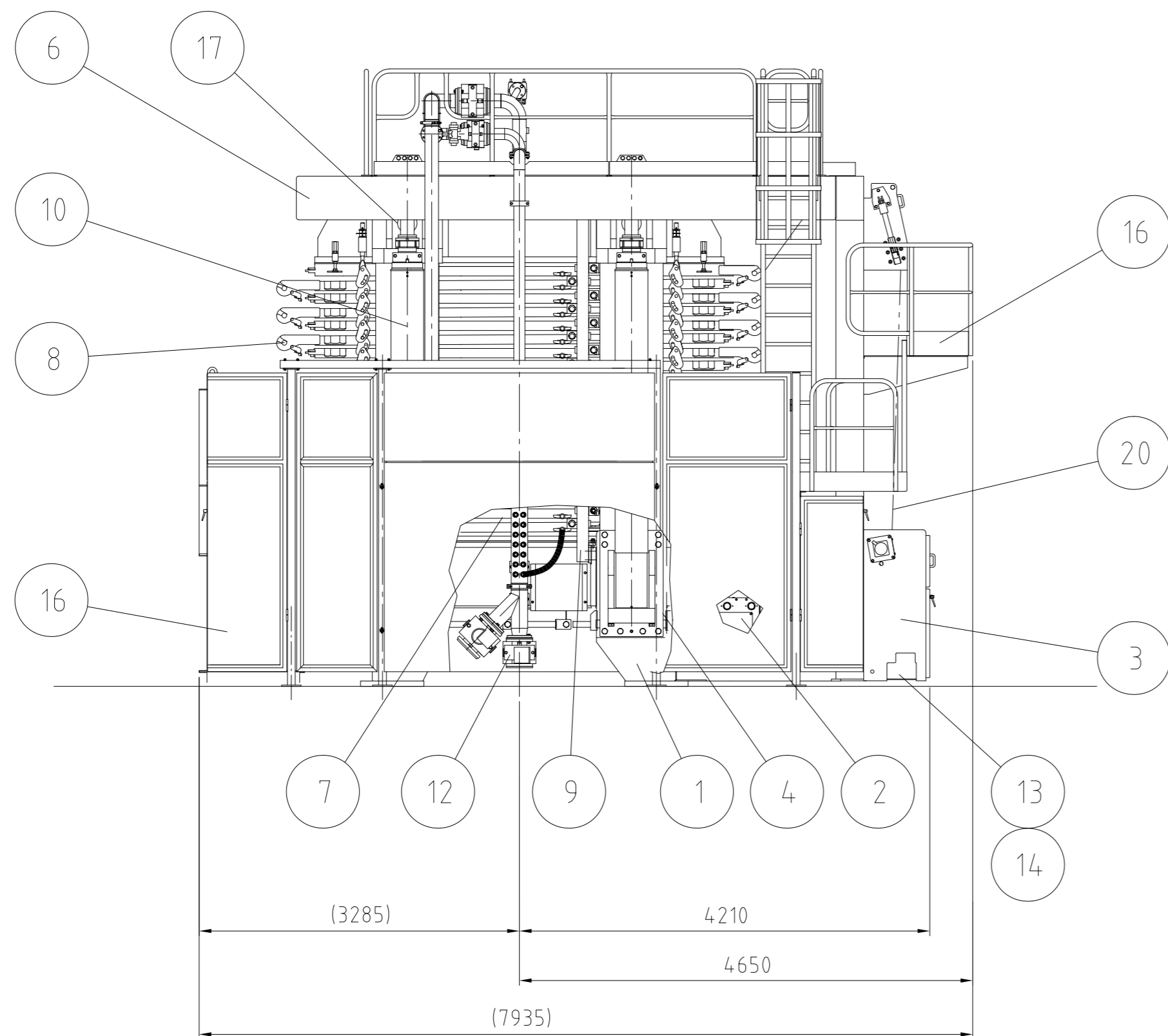
Table 38. Order form for manuals

| SERIAL NO. | DOCUMENT | PIECES | DESCRIPTION (DELIVERY TYPE) |
|------------|---------------|--------|-----------------------------|
| PF1125 | IOM manual | 1 | 1 x paper file; 1 x CD |
| PF1125 | eCatalogue | 1 | 1 x paper file; 1 x CD |
| PF1125 | OEM documents | 2 | 2 x paper file |

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|

10.8 Mechanical drawings

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|



WEIGHT 77 000 kg

| | |
|----|---|
| 22 | Muffler |
| 21 | Packing |
| 20 | Cloth |
| 19 | Maintenance tools |
| 18 | Electricity |
| 17 | Lubrication |
| 16 | Side shields; Maintenance platforms |
| 15 | Hydraulic unit |
| 14 | Hydraulic connections between hydraulic unit and filter |
| 13 | Hydraulic piping |
| 12 | Process valves |
| 11 | Process pipelines |
| 10 | Quick action cylinders |
| 9 | Guide bars |
| 8 | Rollers |
| 7 | Plate pack |
| 6 | Top frame |
| 5 | Upper pressing plate |
| 4 | Columns |
| 3 | Cloth drive unit |
| 2 | Cloth wash unit |
| 1 | Lower frame |

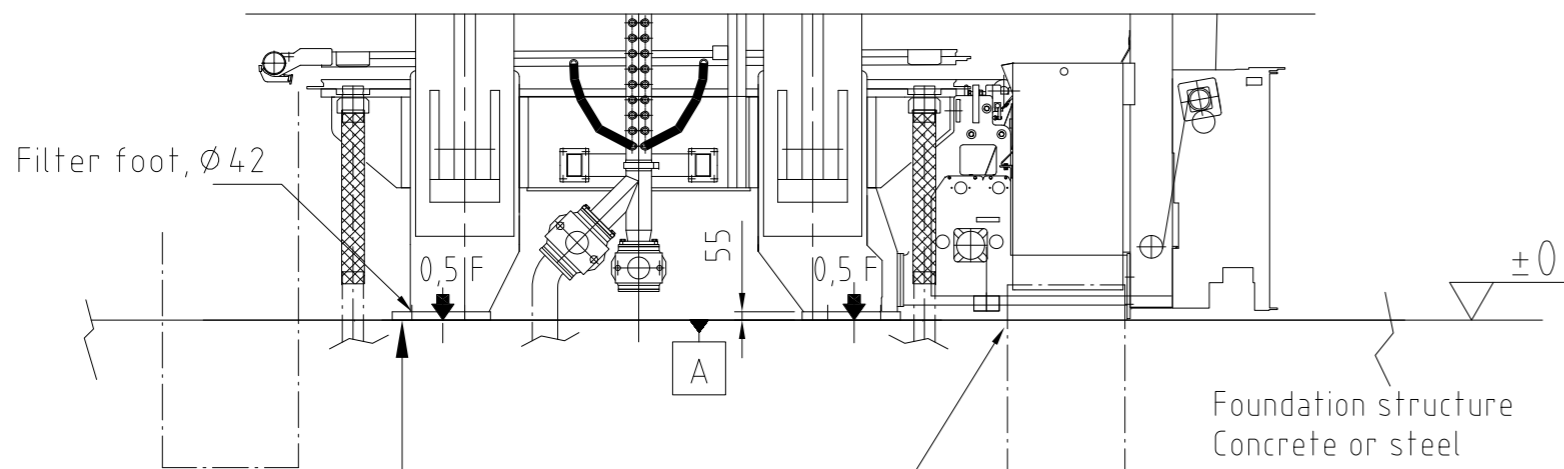
| Pos | Description | | | |
|------------|-------------|-----------|-----|------|
| 27.03.2014 | GAZGUO | As-built. | | C |
| 13.06.2013 | HNU | CERTIFIED | | B |
| 12.03.2013 | MKY | | | A |
| Date | Handler | Change | Pcs | Mark |

PRELIMINARY For APPROVAL CERTIFIED AS-BUILT

Date: 15.4.2013 Signature: HNU

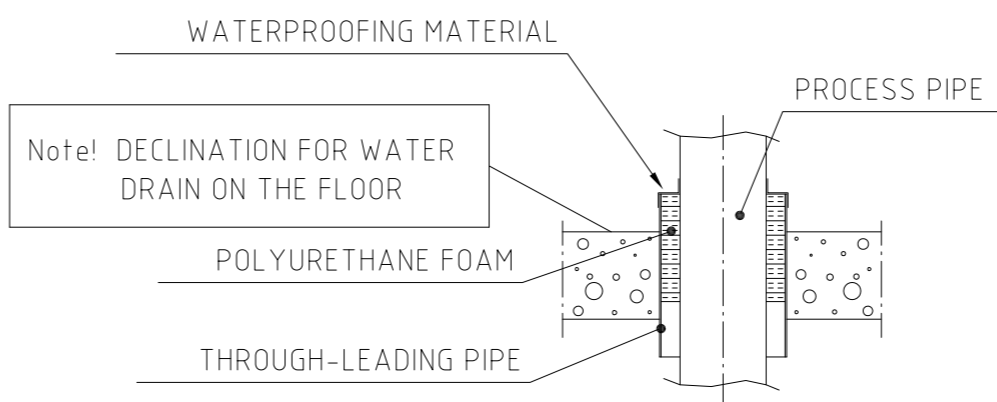
Customer: Sulvaris / Pöyry (Appleton) LLC Ref No. _____
 Supplier ref. No. B200178FI Supplier work No. _____ Serial No. 1125

| | | | |
|----------------|-----------------------------|------------|-----|
| Outotec | GENERAL ARRANGEMENT DRAWING | 12.03.2013 | MKY |
| | PF1125 | 1:50 T-A2 | |
| | PF 96/96 M48 2 60 | F673031 | C |



A 5 \\ (ALL PLATES DIFFERENCE IN LEVELS)

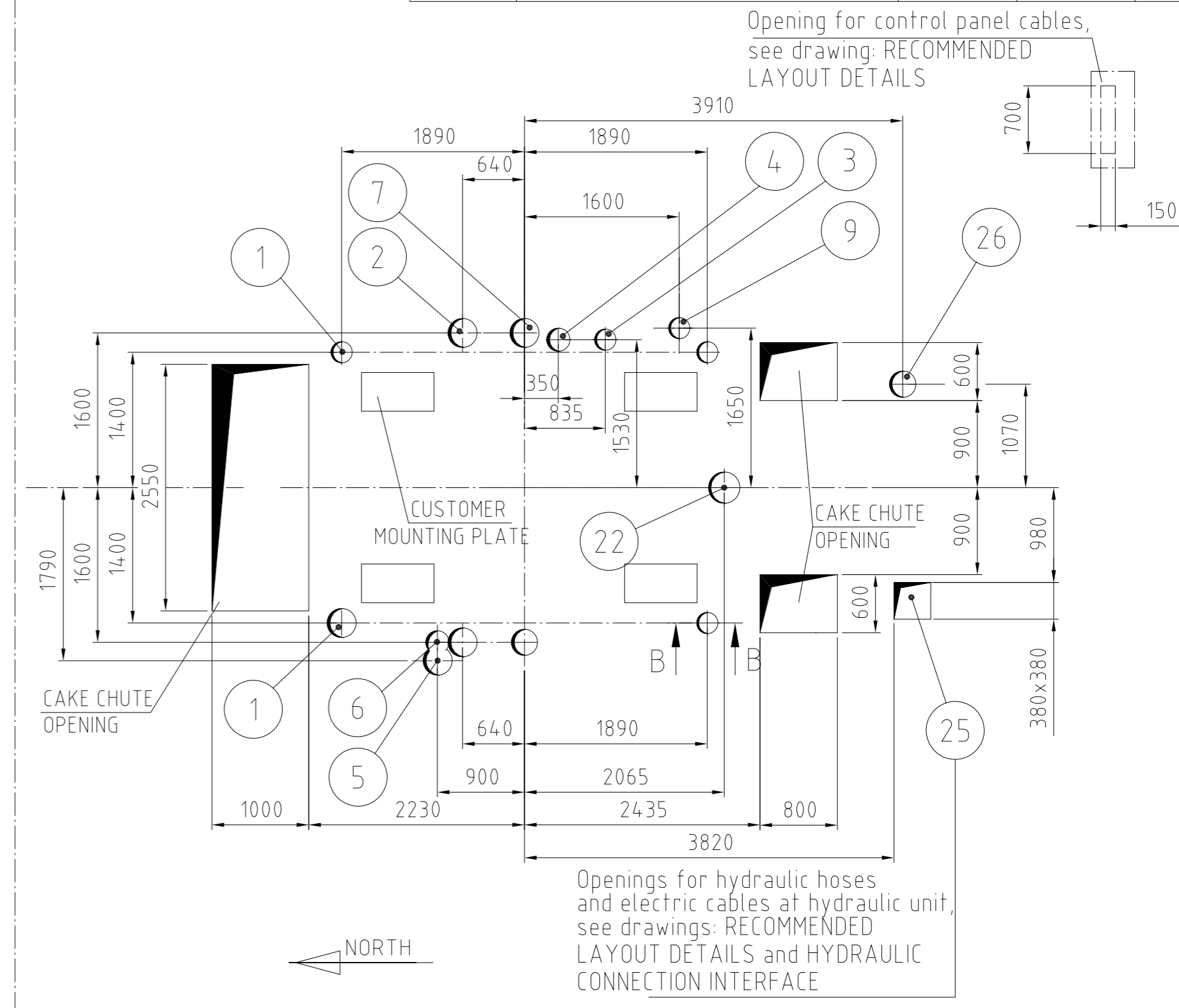
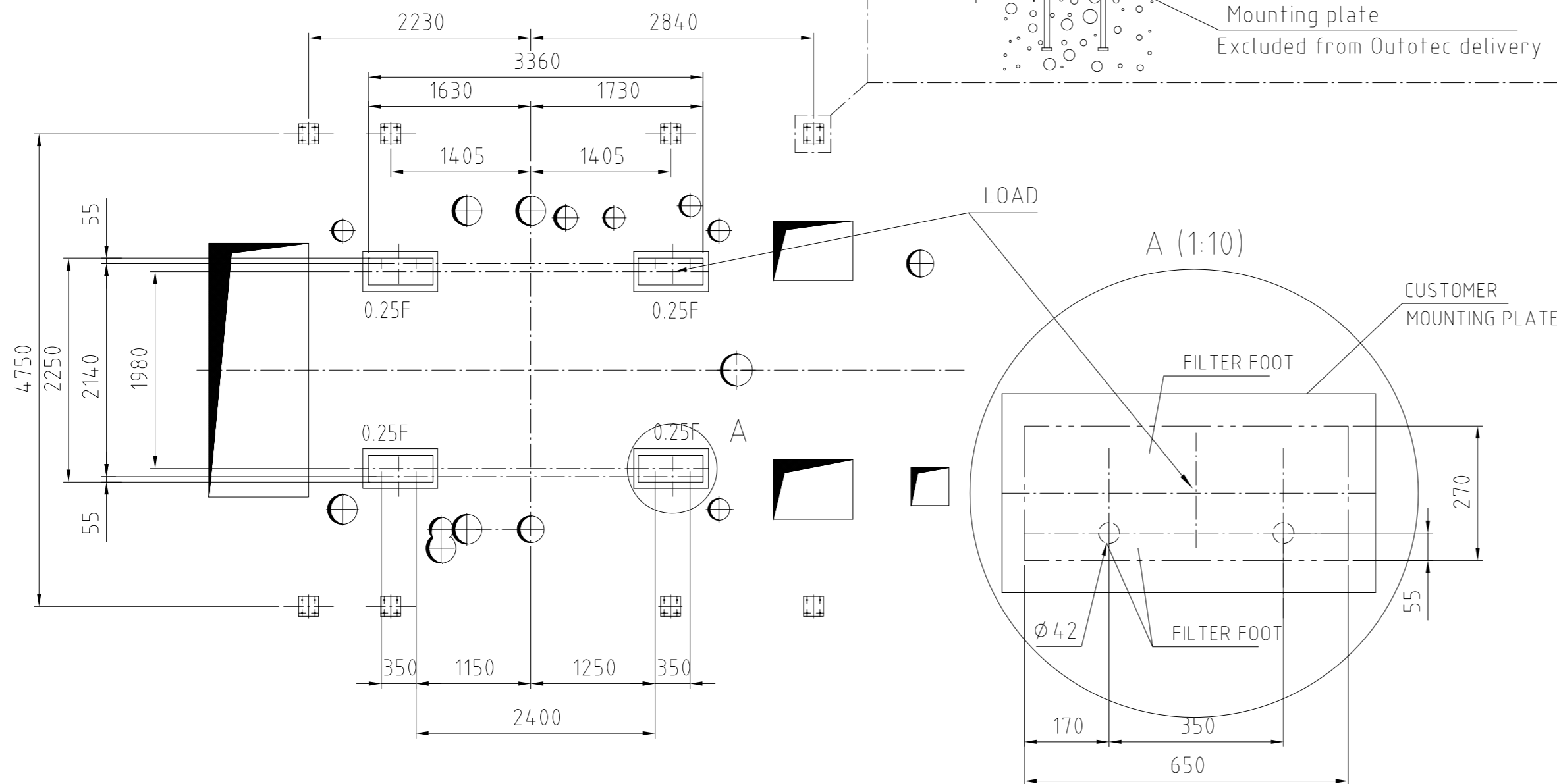
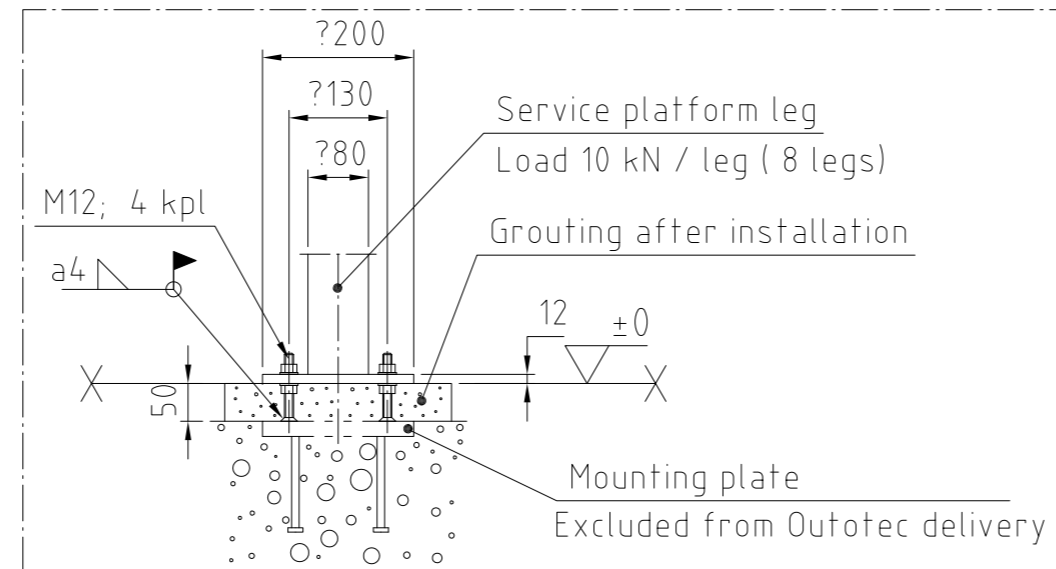
Note! SEALED LEADING THROUGH. DECLINATION FOR WATER DRAIN ON THE FLOOR



Excluded from Outotec delivery
EXAMPLES IN SECTION B - B

x) PIPE OPENINGS ARE DIMENSIONED FOR ANSI B 16.5(150lbs) FLANGES, APART FROM 1 AND 22

| OPENING NO | APPLICATION | PIPE MIN. SIZE | x) OPENING FOR PIPE DIA | pcs |
|------------|----------------------------|----------------|-------------------------|-----|
| 1 | FILTRATE | 6" (DN150) | 290 | 4 |
| 2 | SLURRY FEED | 6" (DN150) | 290 | 2 |
| 3 | PRESSING AIR IN | 3" (DN80) | 220 | 1 |
| 4 | PRESSING AIR OUT | 4" (DN100) | 264 | 1 |
| 5 | WASH WATER | 6" (DN150) | 290 | 1 |
| 6 | DRYING AIR | 4" (DN100) | 239 | 1 |
| 7 | DISTRIBUTOR DRAINING | 6" (DN150) | 290 | 2 |
| 9 | CLOTH WASHING | 2" (DN50) | 162 | 1 |
| 22 | CLOTH WASHING LIQUID DRAIN | 10" (DN250) | 324 | 1 |
| 25 | HYDR. HOSES | - | □ 380x380 | 1 |
| 26 | CABLES | - | 273 | 1 |



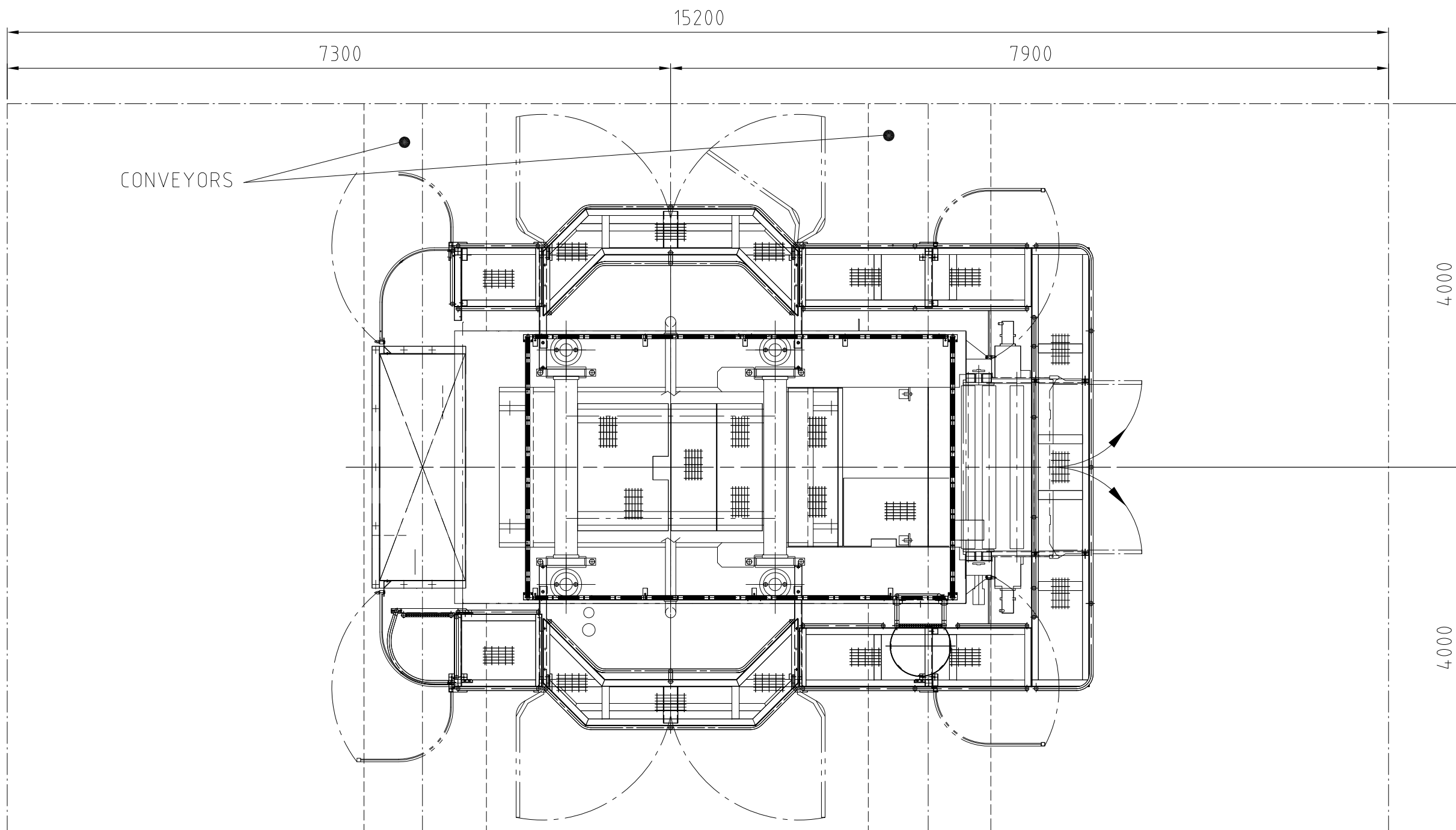
Openings for hydraulic hoses and electric cables at hydraulic unit, see drawings: RECOMMENDED LAYOUT DETAILS and HYDRAULIC CONNECTION INTERFACE

$F_{dyn} = 1,2 \times (F + \text{cake/slurry})$
 F_{dyn} is implying the maximum dynamic vertical force downwards. Caused by the cloth and the plate pack movements. Should be used in strength calculations of supporting constructions.

MOUNTING PARTS EXCLUDED FROM OUTOTEC DELIVERY SEE DRAWING: INSTRUCTIONS FOR FILTER INSTALLATION (ON THE CONCRETE FOUNDATION).
Load F kN 770
NOTE ! CAKE/SLURRY WEIGHT MUST BE ADDED

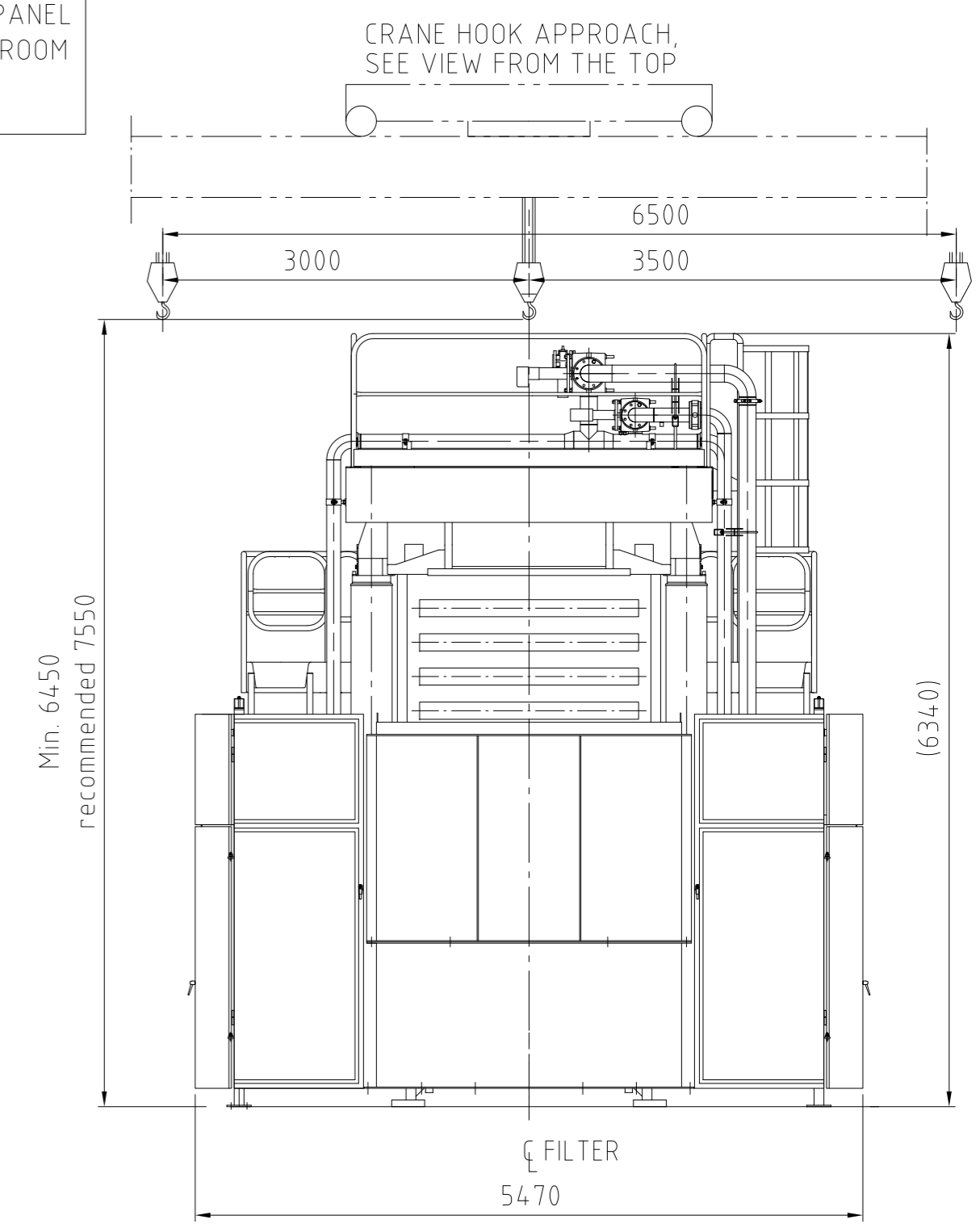
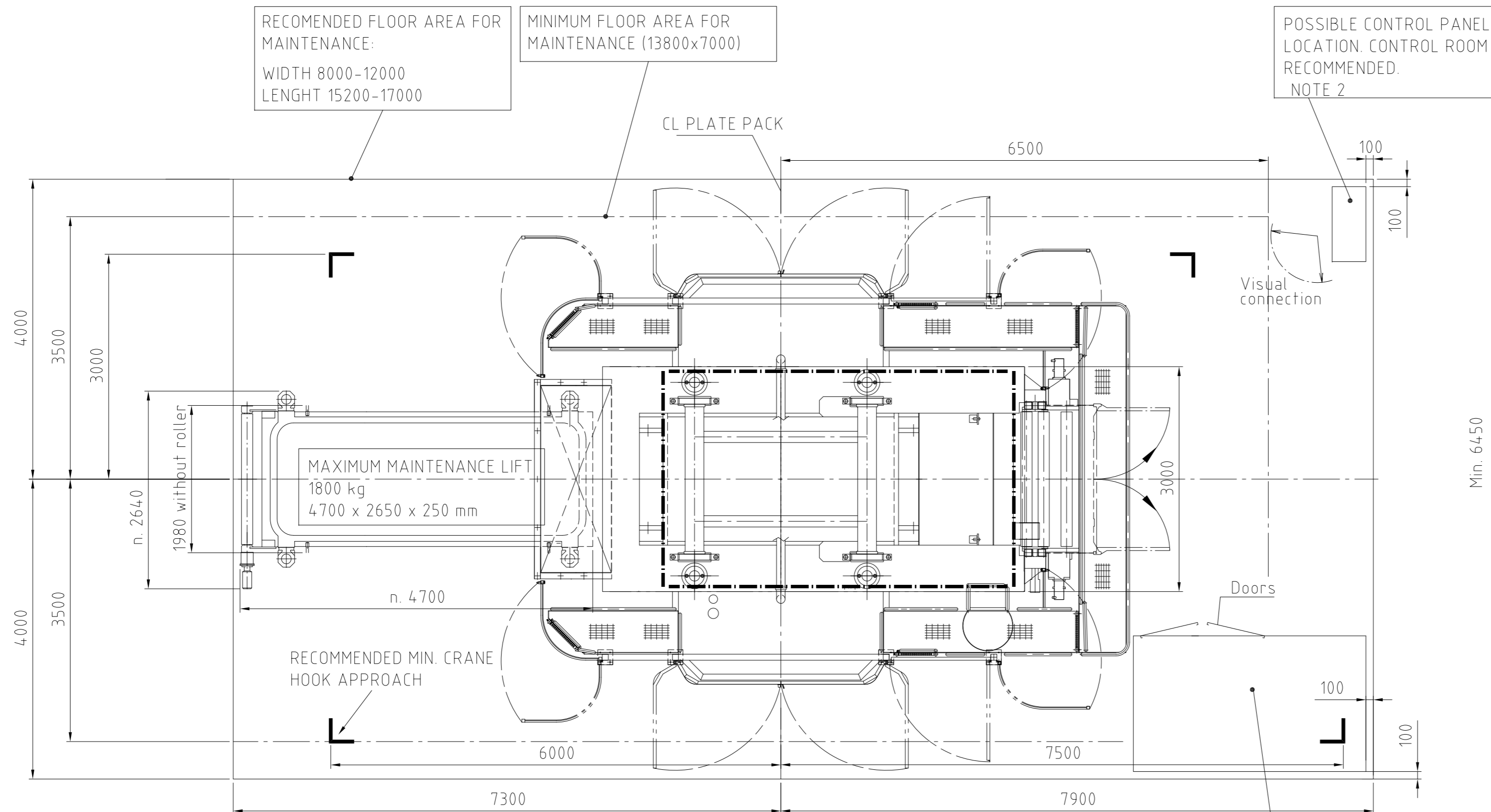
Loads caused by possible earthquake has to take into consideration according to directions of local authorities.

| | | | | | |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | D |
| 28.06.2013 | ALLI | Certified. | | | C |
| 30.05.2013 | ALLI | Pipe 1,5&7 size changed. | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: 15.4.2013 | Signature: HNU | | AS-BUILT | <input checked="" type="checkbox"/> | |
| Customer: Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | | |
| Supplier ref. No. B200178FI | | Supplier work No. | | Serial No. 1125 | |
| | | FOUNDATION | 12.03.2013 | MKY | |
| | | PF1125 | 1:50 T-A2 | | |
| | | PF 96/96 M48 2 60 | F673032 | | D |

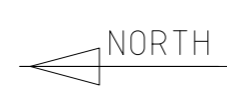


| | | | | | | | |
|--------------------|---------------------------------|--------------------------------------|--------------------------|-----------|--------------------------|----------|-------------------------------------|
| 27.03.2014 | GAZGUO | As-built. | | D | | | |
| 28.06.2013 | ALLI | Certified. | | C | | | |
| 30.05.2013 | ALLI | Delete the needless filters' layout. | | B | | | |
| 12.03.2013 | MKY | | | A | | | |
| Date | Handler | Change | Pcs | Mark | | | |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> | AS-BUILT | <input checked="" type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref N:o. | | | | |
| Supplier ref. N:o. | B200178FI | Supplier work N:o. | Serial N:o. 1125 | | | | |
| Outotec | COMMON LAYOUTS | 12.03.2013 | MKY | | | | |
| | PF1125 | 1:50 T-A3 | | | | | |
| | PF 96/96 M48 2 60 | F673058 | D | | | | |

CRANEAGE REQUIREMENTS
 Crane for erection work min 84 t (total weight)
 Crane for erection work min 14t
 Crane for maintenance min 2t



VIEW FROM THE TOP

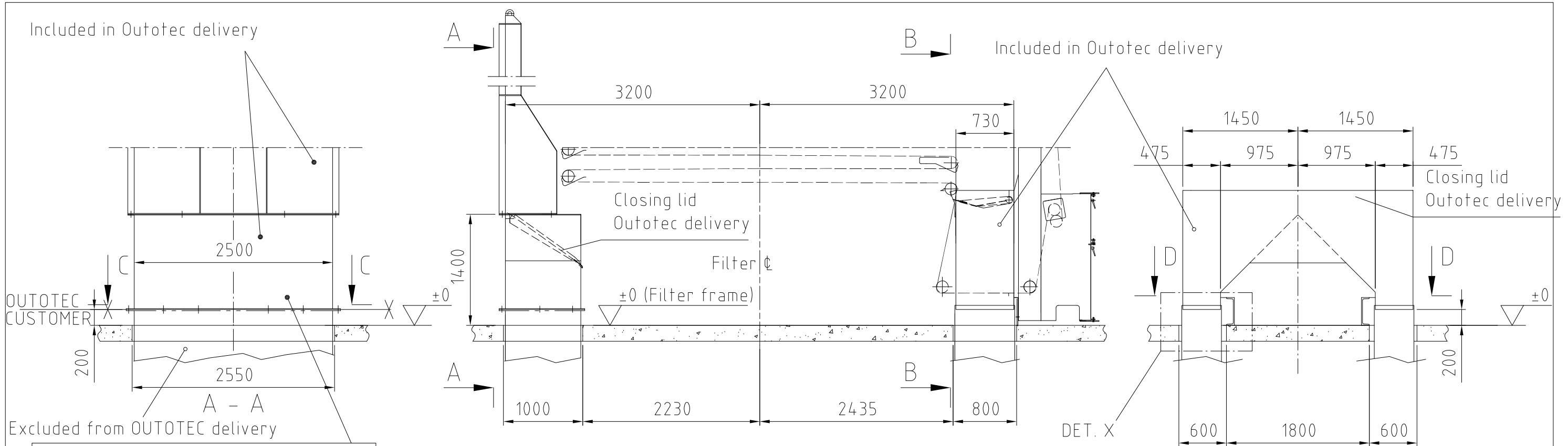


POSSIBLE LOCATION FOR HYDRAULIC UNIT. NOTE 1
 WILL BE LOCATED ON FLOOR BELOW BY CUSTOMER

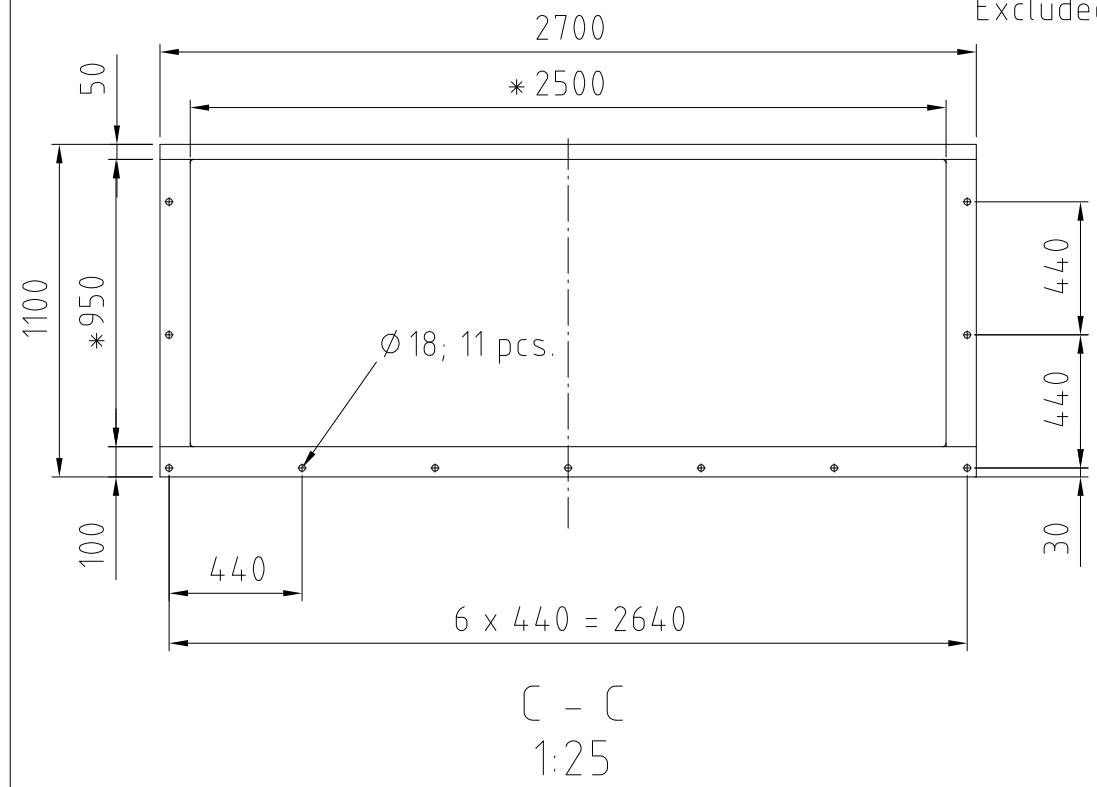
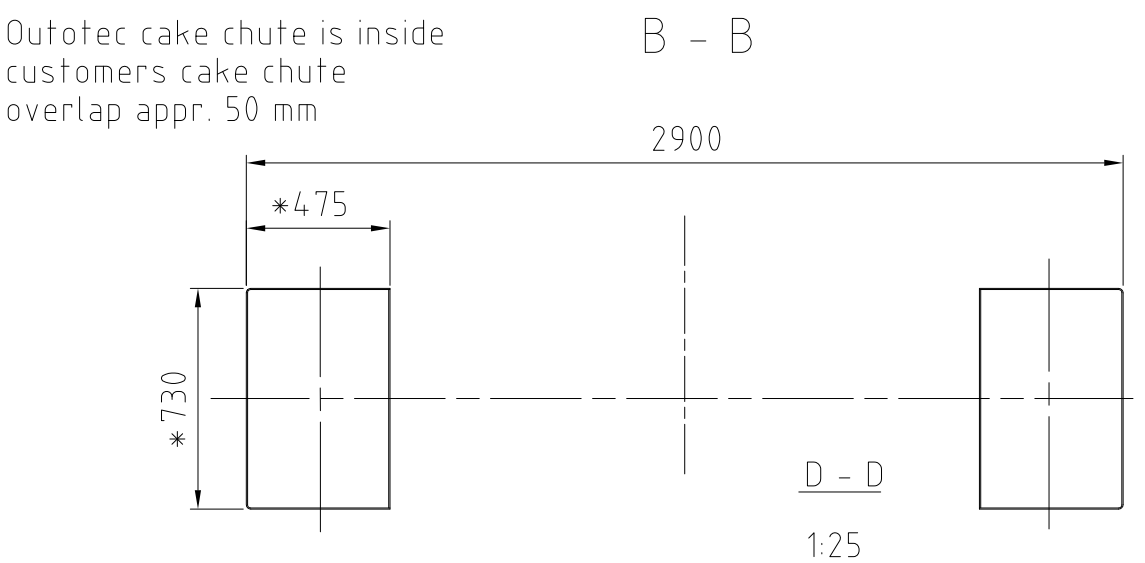
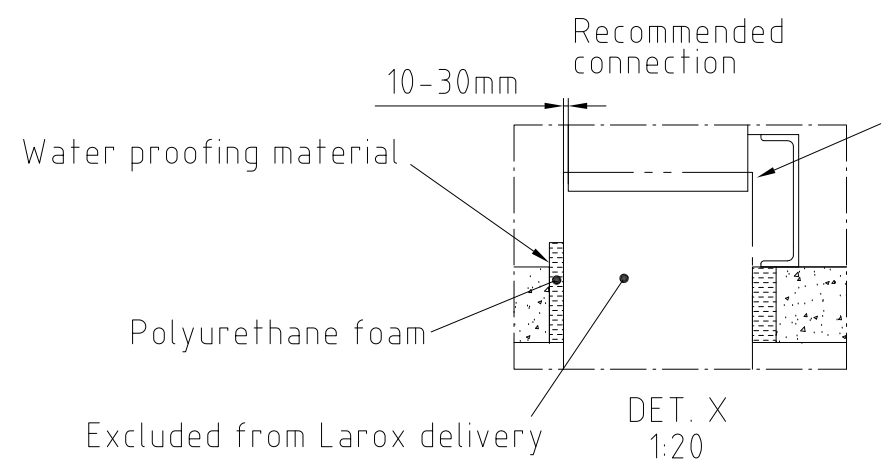
NOTE 1
 1) THE HYDRAULIC UNIT LOCATION AS SHOWN IS NOT FIXED AND ALTERNATIVE POSITIONS CAN BE USED
 VISUAL CONNECTION FROM THE HYDRAULIC UNIT TO THE FILTER IS USEFUL BUT NOT ESSENTIAL
 WHERE PRACTICAL THE HYDRAULIC UNIT SHOULD BE PROTECTED FROM DUST, WEATHER AND SPILLS
 THE LOCATION OF THE HYDRAULIC UNIT SHOULD BE SUCH THAT THE LENGTH OF HYDRAULIC HOSES IS LESS THAN 15m

NOTE 2
 WHERE THERE IS A CONTROL ROOM CLOSE TO THE FILTER THE PANEL CAN BE LOCATED THERE
 VISUAL CONNECTION FROM THE CONTROL PANEL TO THE FILTER IS USEFUL BUT NOT ESSENTIAL

| | | | | | |
|-------------------|---------------------------------|---|--------------------------|-----------|--------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | D |
| 28.06.2013 | ALLI | Certified. | | | C |
| 30.05.2013 | ALLI | Note about hydraulic unit location updated. | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | |
| Supplier ref. No. | B200178FI | Supplier work No. | Serial No. | 1125 | |
| Outotec | RECOMMENDED LAYOUT | 12.03.2013 | MKY | | |
| | PF1125 | 1:50 T-A2 | | | |
| | PF 96/96 M48 2 60 | F673059 | | | D |

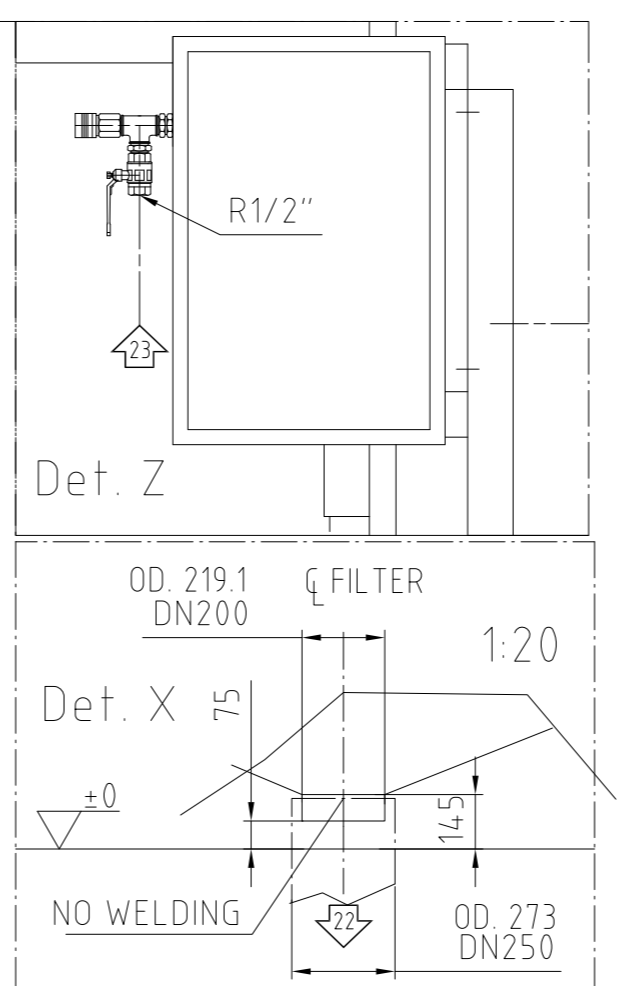
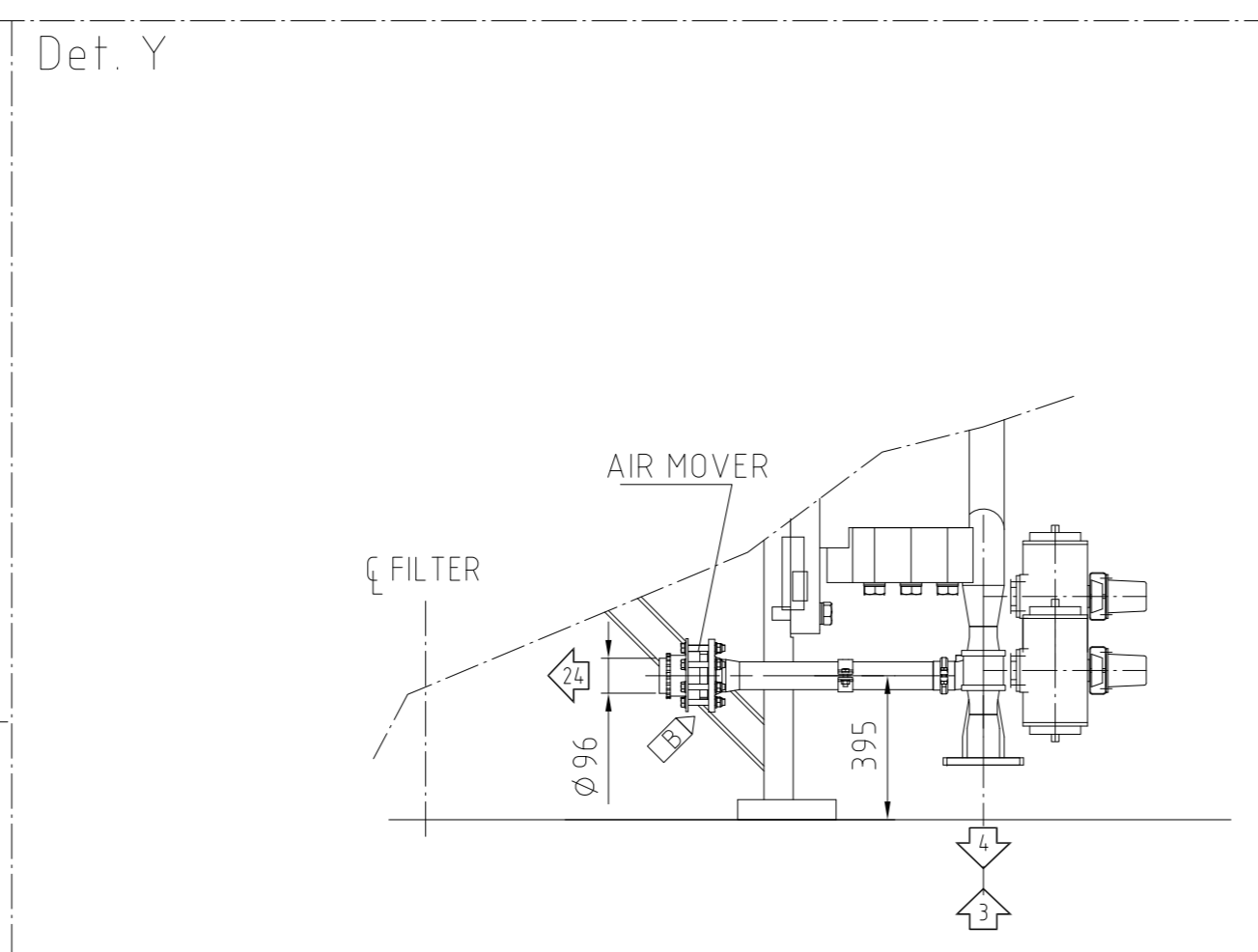
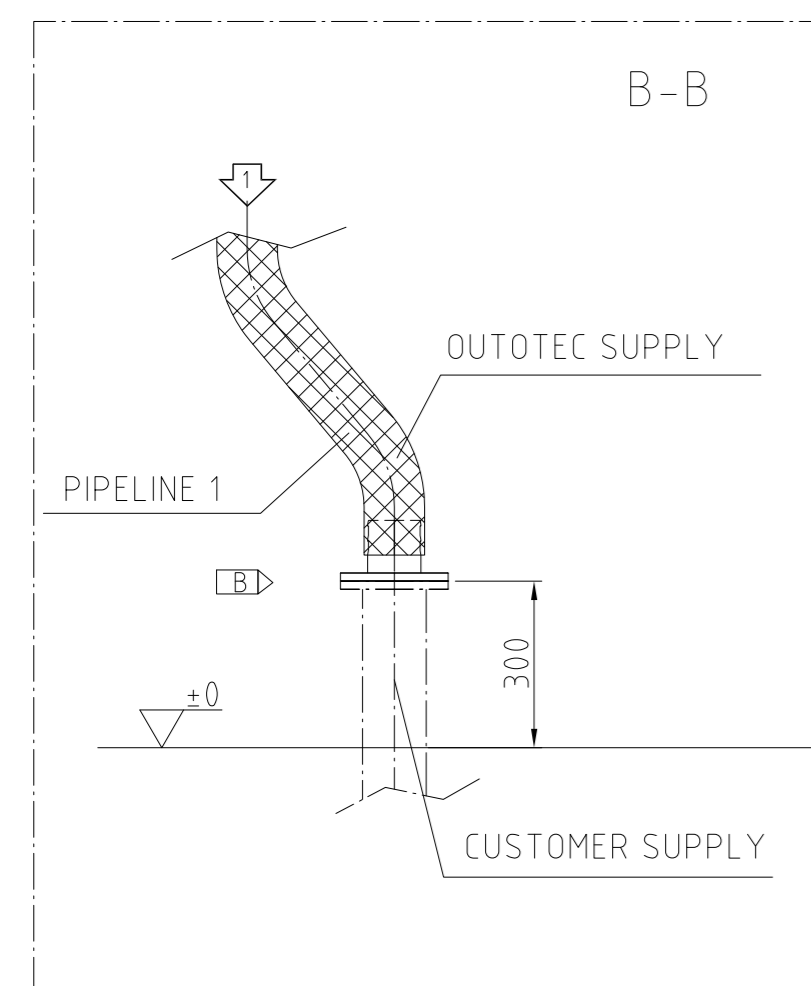
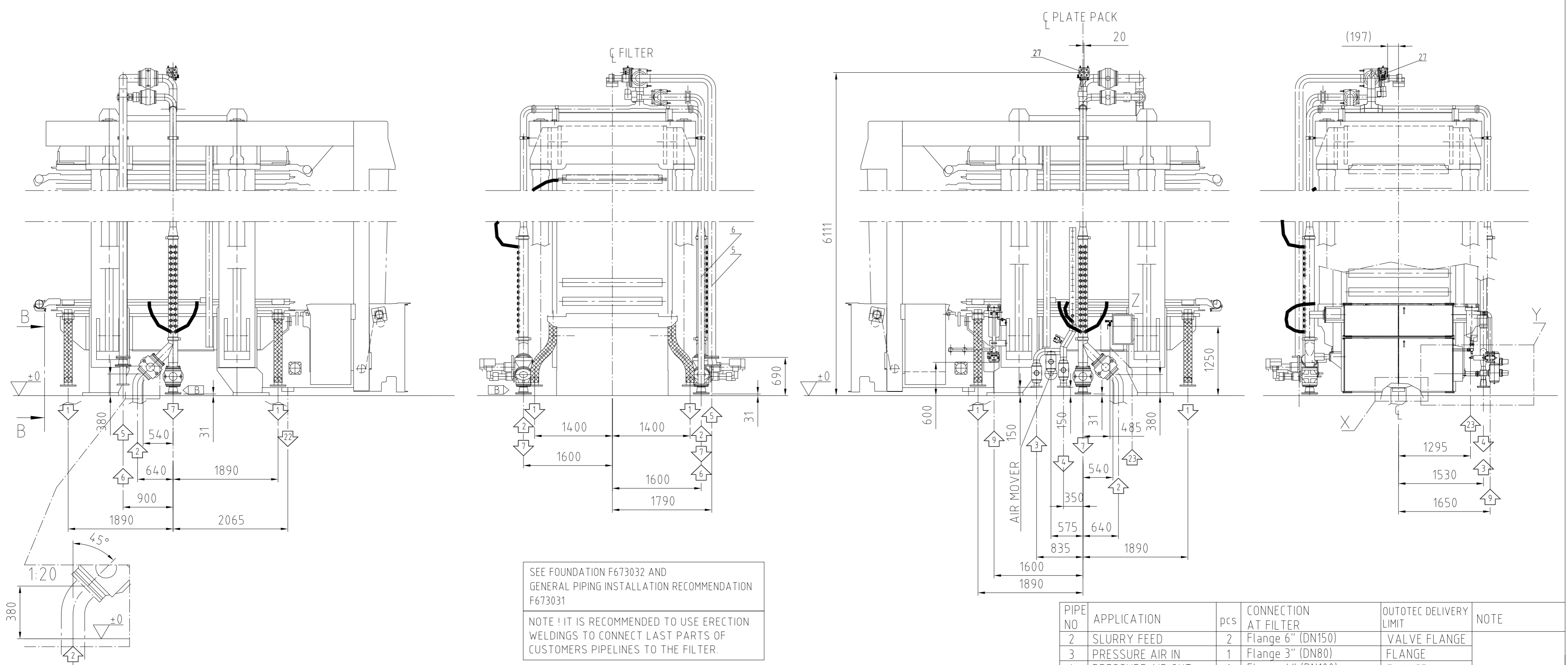


Note:
 Upper part of cake chute (Larox delivery) is assembled on to the lower part by bolts.
 The customer part of cake chute must carry the weight of upper chute including closing lid: 1200 kg (Larox delivery). Bolts are excluded from Larox delivery.



* OUTSIDE DIMENSIONS OF OUTOTEC CAKE CHUTE

| | | | | | |
|--------------------|---------------------------------|--------------------|--------------------------|-----------|-------------------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | C |
| 13.06.2013 | HNU | Certified. | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| AS-BUILT | | | | | <input checked="" type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | | Ref N:o. | |
| Supplier ref. N:o. | B200178FI | Supplier work N:o. | Serial N:o. | 1125 | |
| Outotec | CAKE CHUTE INTERFACE | 12.03.2013 | MKY | | |
| | PF1125 | 1:50 T-A3 | | | |
| | PF 96/96 M48 2 60 | F673060 | C | | |



| PIPE NO | APPLICATION | pcs | CONNECTION AT FILTER | OUTOTEC DELIVERY LIMIT | NOTE |
|---------|----------------------------|-----|-----------------------|------------------------|---------------------|
| 2 | SLURRY FEED | 2 | Flange 6" (DN150) | VALVE FLANGE | ONLY VALVES ARE CRN |
| 3 | PRESSURE AIR IN | 1 | Flange 3" (DN80) | FLANGE | |
| 4 | PRESSURE AIR OUT | 1 | Flange 4" (DN100) | FLANGE | |
| 5 | WASH WATER | 1 | Flange 6" (DN150) | FLANGE | |
| 6 | DRYING AIR | 1 | Flange 4" (DN100) | FLANGE | |
| 7 | DISTRIBUTOR DRAINING | 2 | Flange 6" (DN150) | VALVE FLANGE | |
| 24 | DIAPHRAGM LIFTING UP | 1 | Pipe od.96(3.77") | PIPE END | |
| 27 | MANIFOLD VENTILATION | 1 | Flange 2" (DN50) | FLANGE | |
| 1 | FILTRATE | 4 | Flange 6" (DN150) | FLANGE | |
| 9 | CLOTH WASHING | 1 | Flange 2" (DN50) | VALVE FLANGE | |
| 22 | CLOTH WASHING LIQUID DRAIN | 1 | Pipe od.219.1(8.63") | PIPE END | |
| 23 | INSTRUMENT AIR | 1 | R 1/2" Female | AT CONNECTOR | |

FLANGES ACCORDING TO ANSI B 16.5 (150 lbs)

| | | | | | | | |
|-------------------|---------------------------------|--|--------------------------|------------|--------------------------|----------|-------------------------------------|
| 27.03.2014 | GAZGUO | As-built. | | D | | | |
| 28.06.2013 | ALLI | Certified. | | C | | | |
| 30.05.2013 | ALLI | Filtrate connection changed to flanged, and pipe 5&7 size changed. | | B | | | |
| 12.03.2013 | MKY | | | A | | | |
| Date | Handler | Change | Pcs | Mark | | | |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> | AS-BUILT | <input checked="" type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | | | |
| Supplier ref. No. | B200178FI | Supplier work No. | | Serial No. | 1125 | | |
| Outotec | | | PIPING INTERFACES | 12.03.2013 | MKY | | |
| | | | PF1125 | 1:50 T-A2 | | | |
| | | | PF 96/96 M48 2 60 | F673061 | D | | |

GENERAL PIPING RECOMMENDATIONS FOR PF48 SERIES

(COMPARE WITH PIPING INTERFACE, FLOW SHEET AND P&I -DRAWINGS)

-All valid general standards and instructions concerning piping designing and building have to be taken into consideration in designing.

-Possible pressure shocks caused by filter operation have to be taken into consideration in designing of piping supports.

FILTRATE LINE 1, free drain line without valves (A-program)

-In the filtrate line it is recommended to have always 1/100 declining at the minimum.

-It is not allowed to install extra closing valves in the filtrate line.

-The pipes (DN125) from all four corners of the filter can be connected to one pipe (DN250) under the filter.

-Pipelines should be as short as possible to eliminate back pressure. The maximum length of the filtrate pipe should be approx. 10 m.

-The air release tank is strongly recommended to be installed in the filtrate line (in A-program unit), as close to the filter as possible. The air line upwards from the tank should have enough vertical piping (2 - 3 m at least) to optimize the air/liquid separation.

-The filtrate pipe must not be connected to the discharge lines of vat or distribution pipes. In case several filters are installed do not connect filtrate lines from separate filters together prior to air release tank.

DISTRIBUTOR/SLURRY DRAIN LINE 7

-In the slurry drain line it is recommended to have a 1/100 declining at the minimum. The recommended maximum length is approx. 10 m.

-Distributor drain lines from valves V07 and V17 can be connected to one pipe (DN 200) under the filter.

-The slurry drain line should be directed back to the slurry tank or to the thickener. If the height difference between slurry tank and filter cannot be arranged it is recommended to use a separate tank to which the slurry discharge pipe can be emptied. The connection should be arranged to minimize possible splashing of drainage.

HOSE FLUSHING (CAKE WASHING) AND AIR DRYING LINES 5, 6 (Valves V05 & V06)

-In V05 and V06 lines check valves are recommended prior to air and water valves. By installing these valves possible back flow through the air or water supply lines is prevented in case of failure or accidental opening of either valves. The pressure in the slurry feed pipe line can rise up to 16 bar.

-Lines under continuous pressure must also have manual shutoff valves prior to the filter to enable complete isolation of the filter. Easy access to those valves is vital.

-It is recommended to have a strainer, \varnothing 5 mm, in the lines.

-Slurry feed pipe and slurry hoses are usually flushed with water. Flush water is led into the filter via cake wash water valve V05. Even if there is no cake washing in the program, the water line has always to be connected. Also filtrate can be used as flush water. Flush pressure should be at least 1 bar higher than the slurry infeed pressure.

| | | | | |
|------------|--------|-----------|--|---|
| 27.03.2014 | GAZGUO | As-built. | | C |
| 13.06.2013 | HNU | CERTIFIED | | B |

SLURRY INFEEED LINE 2 (Valve V02 & V12)

-A separate pumping tank with mixer should always be used in the slurry infeed line. The tank must be equipped with a strainer, \varnothing max. 5 mm, which prevents the access of foreign particles via tank to the filter.

-One pipe line (DN200) from pump can be divided under the filter to two lines (DN 150) to the valves V02 and V12.

-Filter's operation in cycles should be taken into consideration in designing. Especially in case of slurries with "settling" properties, vertical rises should be prevented. Recycling between tank and filter is sometimes needed.

-Pump's inlet line must equipped with manual shutoff valve for pump maintenance.

PRESSING AIR LINE 3 (Valve V03)

-Mount the pressure relief valve after pressure reducing valve to protect the filter from overpressure. MAX. PRESSING PRESSURE IS 16 BAR.

PRESSING AIR RELEASE LINE 4

-NO VALVES IS ALLOWED IN THE PRESSING AIR RELEASE LINE. Because of high noise level it is recommended to use muffler at the end pressing air discharge line. Max. length of pipe 15 m with DN 100 diameter.

CLOTH WASHING LINE 9 (Valve V09)

-The pressure in the cloth washing line should be from 10 to 14 bar. to ensure the operation of spray nozzles.

-Cloth wash water has a purity requirement. The maximum particle size is 40 μ m and the maximum solids content 300 mg/l.

DRAIN LINE 22

-In vat drain line there should always be a 1/100 declining at the minimum.

MANIFOLD VENTILATION / (PRESSURE RELEASE) LINE 27


-If pressure release via V27 is used line must be connected to the air release tank or to the slurry tank. and possible after V27 situated check valve must be removed from structure.

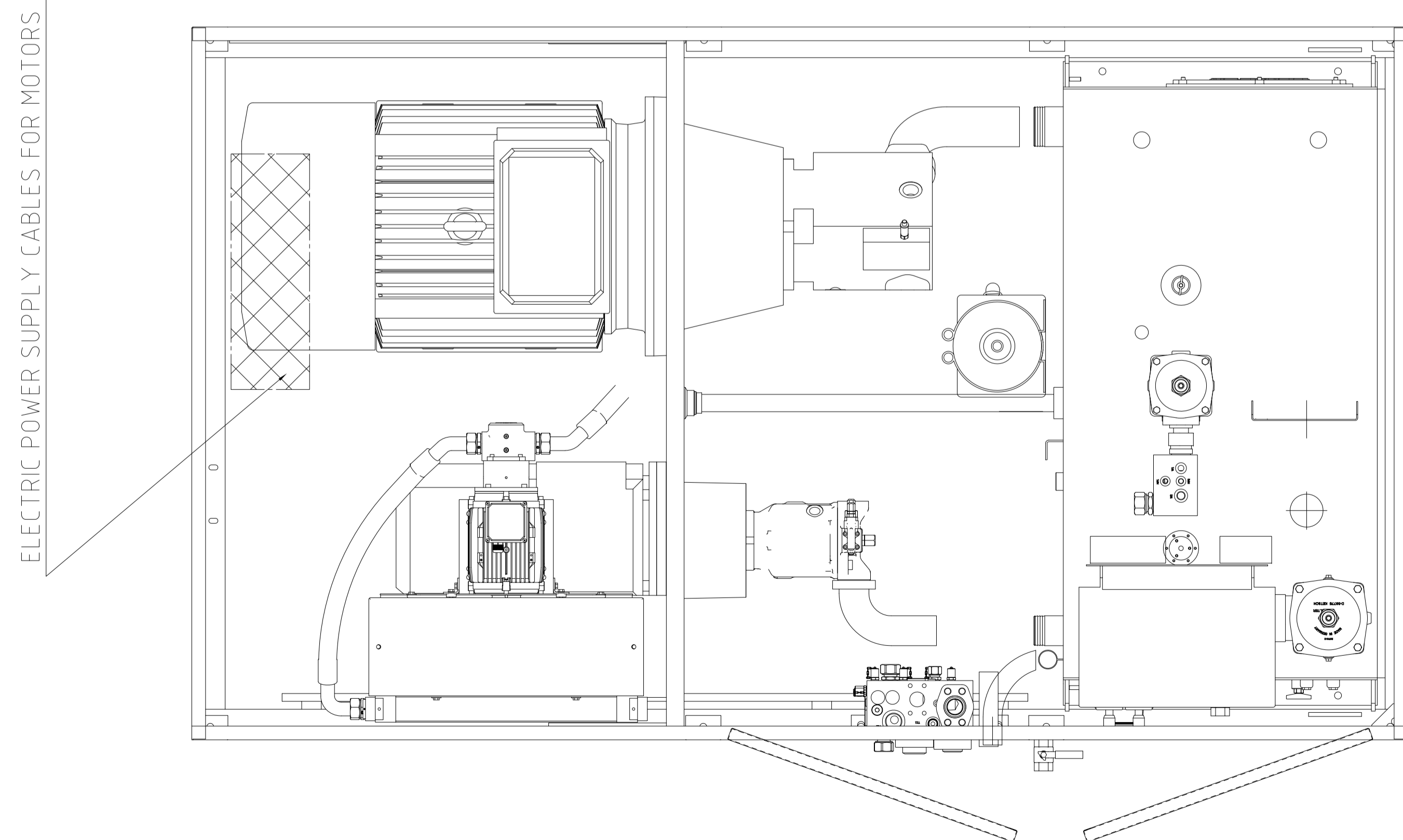
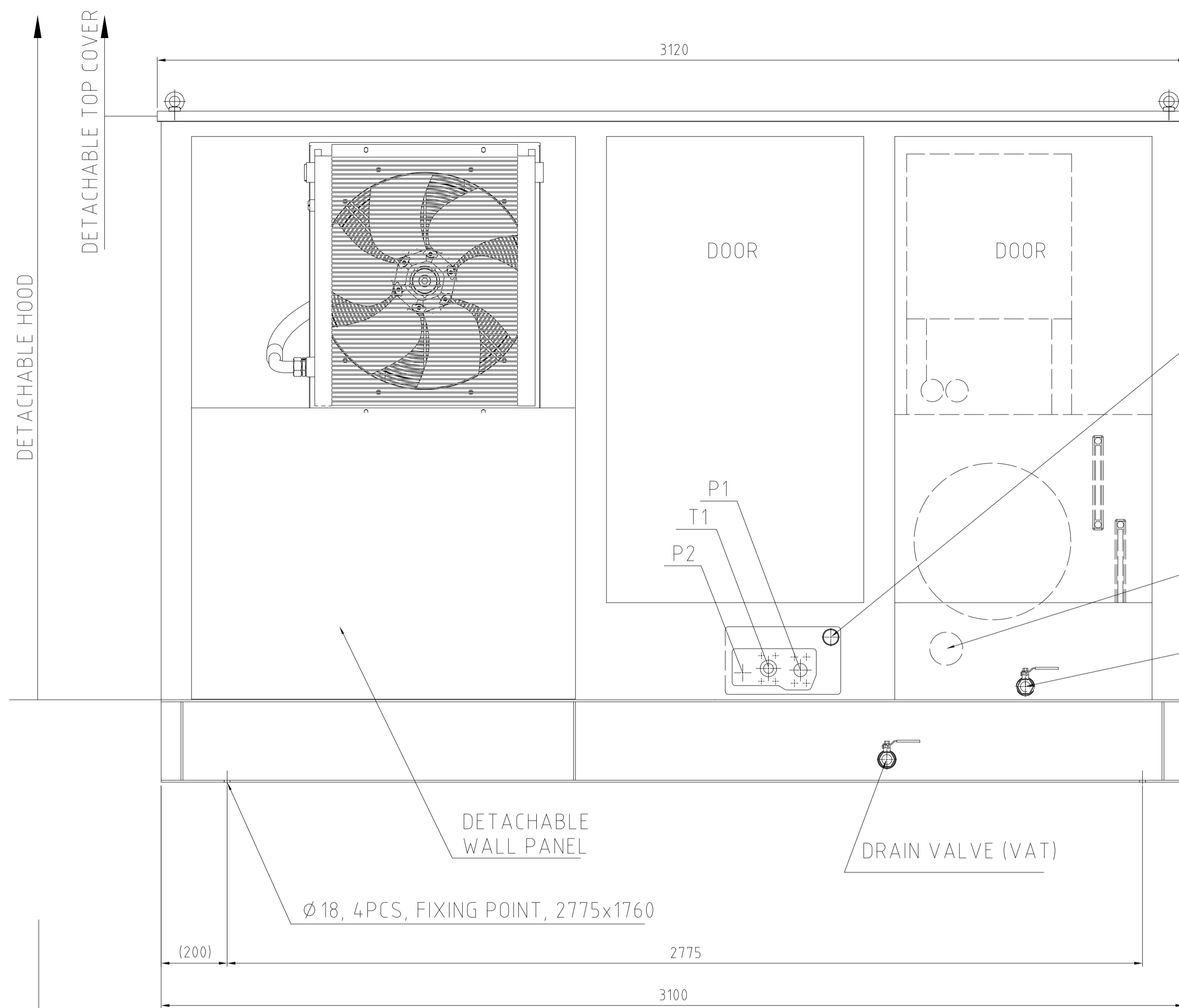
MANUAL WASHING HOSE

-Filter outside washing time to time is strongly recommended. Washing hose close to the filter is needed and wash water drain around the filter to be considered when designing the installation.

NOTE:

THIS DRAWING IS FOR INFORMATION USE ONLY

| | | | | | | | |
|---|---------------------------------|---|--------------------------|------------|--------------------------|----------|-------------------------------------|
| 12.03.2013 | MKY | | | A | | | |
| Date | Handler | Change | | Pcs Mark | | | |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> | AS-BUILT | <input checked="" type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref N:o. | | | | |
| Supplier ref. N:o. | B200178FI | Supplier work N:o. | Serial N:o. | 1125 | | | |
|  | | DESIGN INSTRUCTIONS FOR PIPE INSTALLATION | | 12.03.2013 | MKY | | |
| | | PF1125 | 1:1 T-A3 | | | | |
| PF 96/96 M48 2 60 | | F673062 | | C | | | |



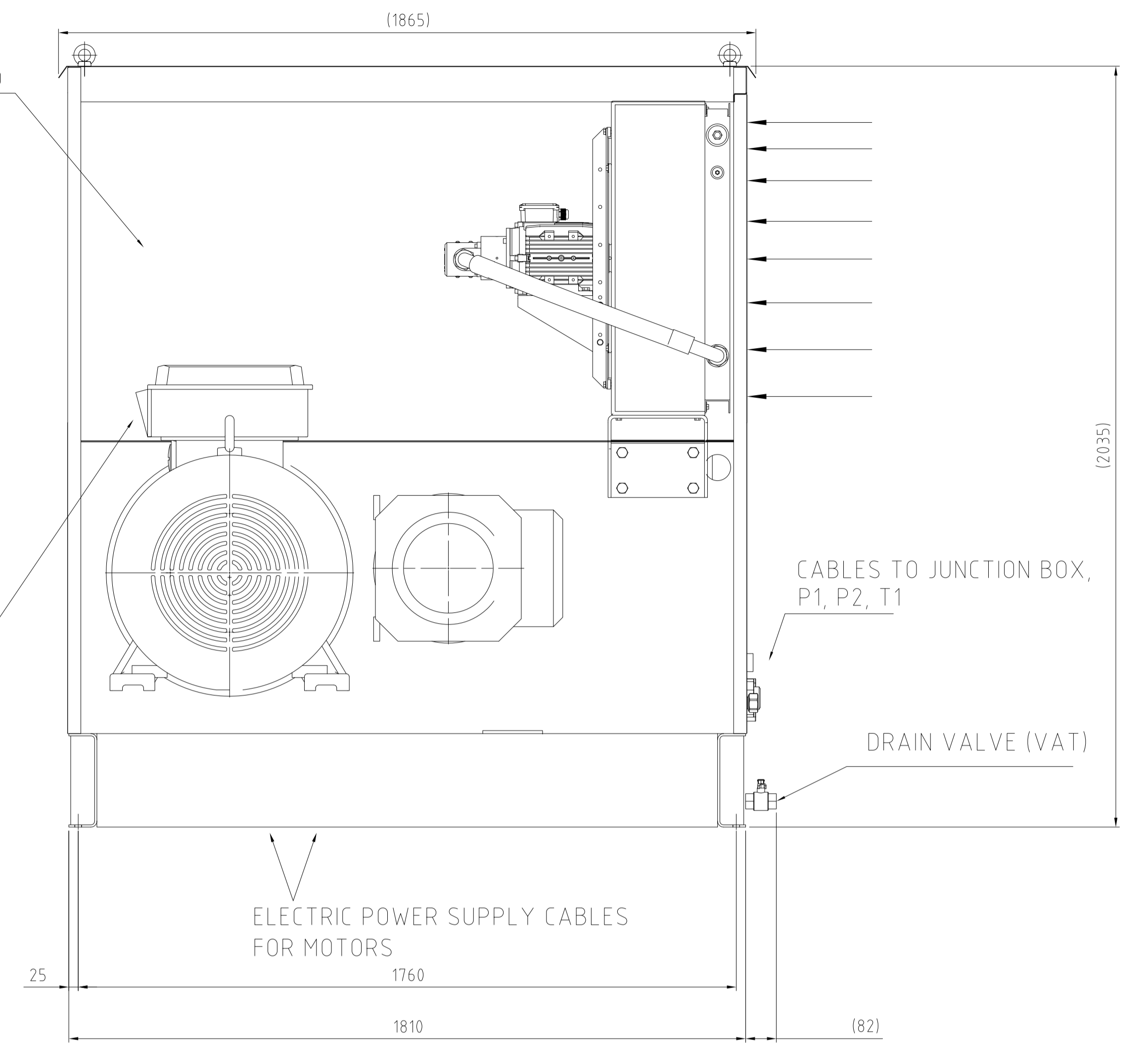
THIS SIDE UNCOVERED

DETACHABLE WALL PANEL

CABLES TO JUNCTION BOX

OIL HEATER BEHIND COVER

DRAIN VALVE (OIL TANK) BEHIND COVER



WEIGHT: APPROX. 2600 KG WITHOUT OIL
MAX. OIL CAPACITY: 800 L

OIL RECOMMENDATIONS:

- HIGH QUALITY OIL EQUIVALENT TO SAE J183 CLASSIFICATION SC, SD OR SE
- CLEANLINESS CLASSIFICATION 16/13 (ISO4406) OR CLASS 7 (NAS1639)
- VISCOSITY 46 cSt AT 30 C

THE FILLING OF THE HYDRAULIC POWER UNIT:

- WITH FILTRATION UNIT (FILTRATION RATE 6 μ ABS) OR
- THROUGH RETURN OIL FILTER

CONNECTIONS

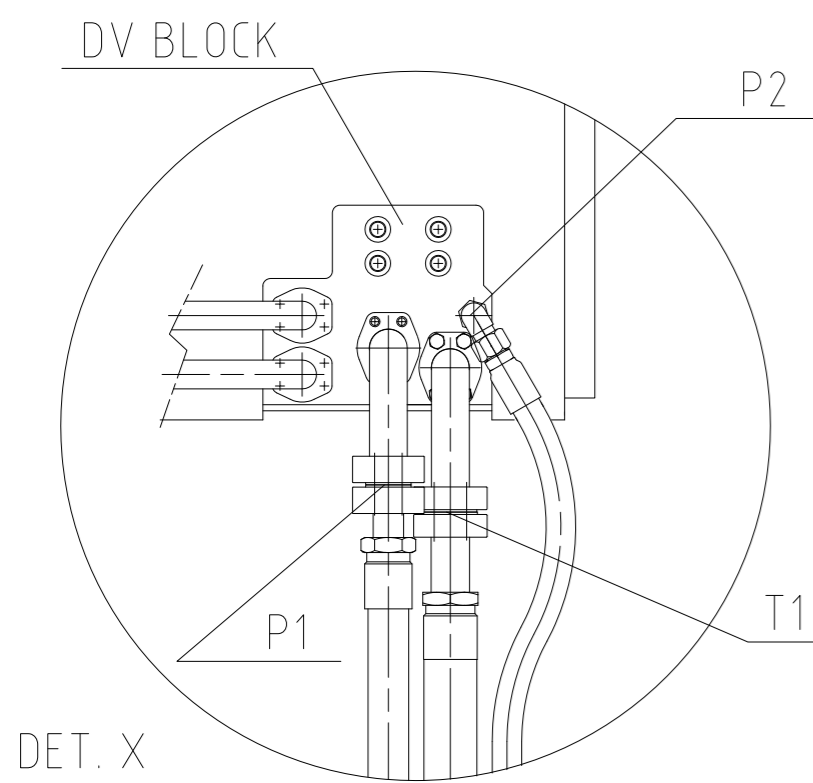
P1= 1 1/2" 6000Psi (ISO 6162-2)

T1= 2" 3000Psi (ISO 6162-1)

P2= R1", (ISO 228 G 1)

SEE DRAWING: HYDRAULIC CONNECTION INTERFACE

| | | | | | |
|---|--------------------------|-------------------|--------------------------|-------------------------------------|--------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | | Pcs Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: 15.4.2013 | Signature: HNU | | AS-BUILT | <input checked="" type="checkbox"/> | |
| Customer: Sulvaris / Pöyry (Appleton) LLC | | | Ref No. | | |
| Supplier ref. No. B200178F1 | | Supplier work No. | Serial No. 1125 | | |
| | | | HYDRAULIC UNIT | | 12.03.2013 |
| | | | PF1125 | | MKY |
| | | | PF 96/96 M48 2 60 | | 1:10 T-A1 |
| | | | F673063 | | B |



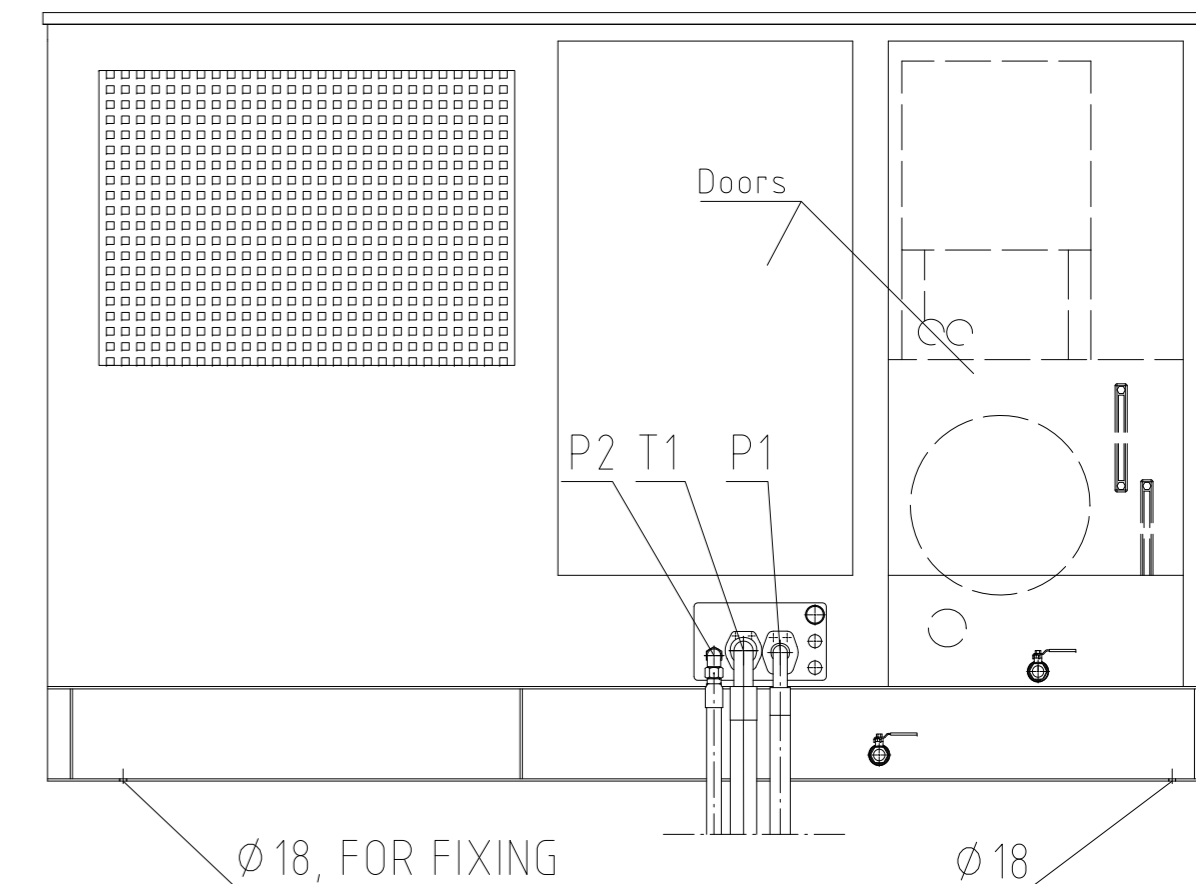
DET. X
1:10

CONNECTIONS FOR THE FILTER

- P2= R 3/4", (ISO 228 G 3/4)
- T1= FLANGE CONNECTOR: 2", SAE J518 code 61, (ISO 6162-1)
O-ring sealing, SAE J515, (ISO 3601-1)
the ends of the hose have a groove for a O-ring
- P1= FLANGE CONNECTOR: 1 1/2", SAE J518 code 62, (ISO 6162-2)
O-ring sealing, SAE J515, (ISO 3601-1)
the ends of the hose have a groove for a O-ring

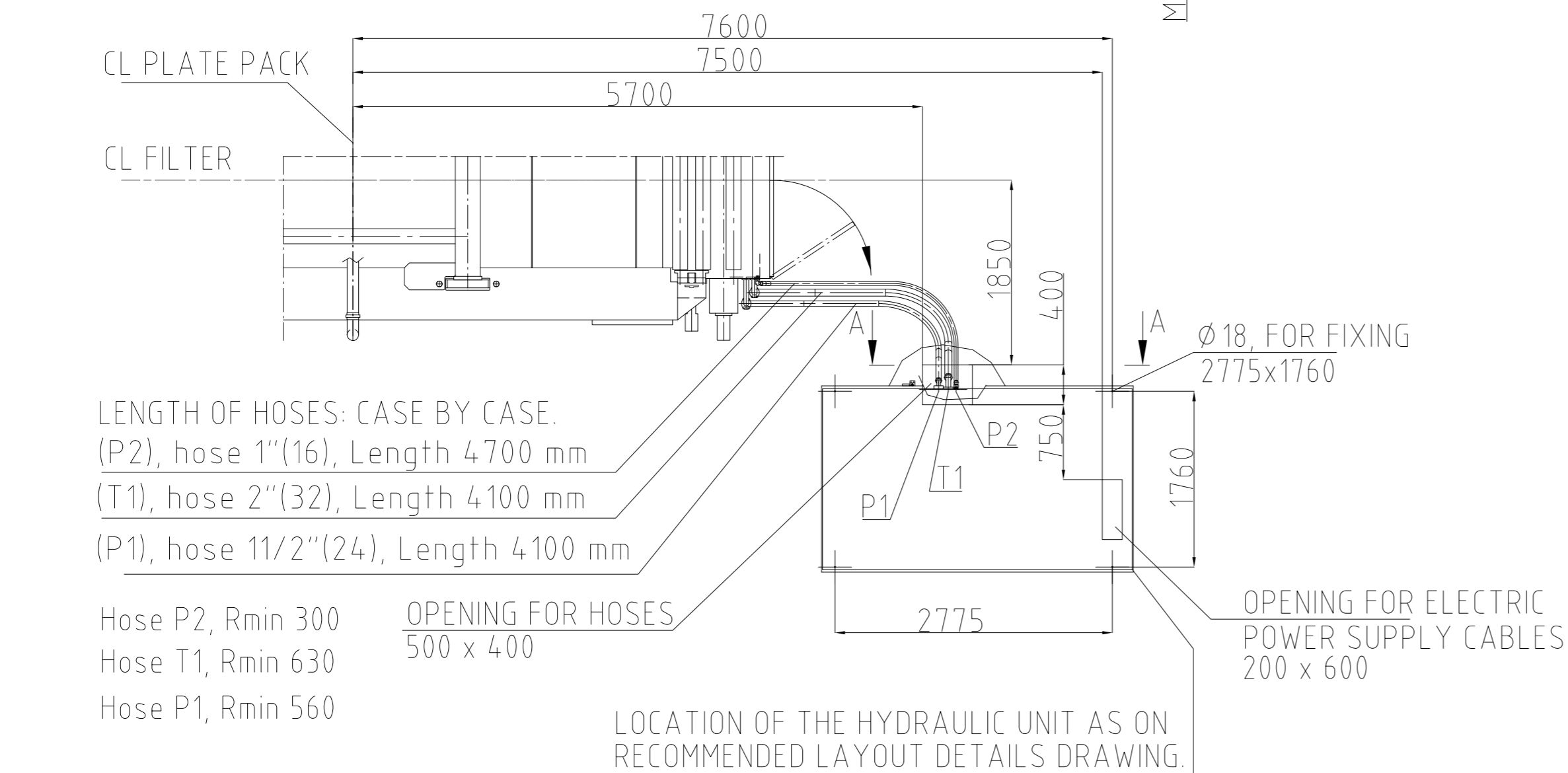
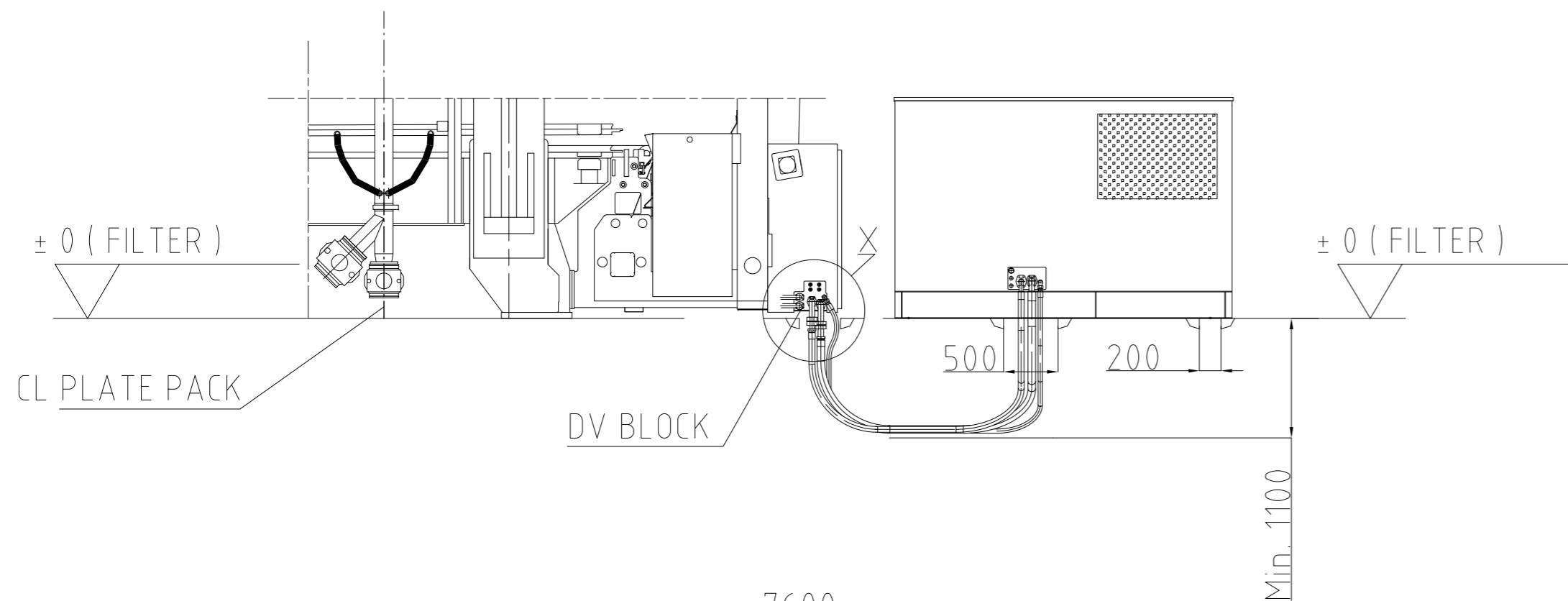
CONNECTIONS FOR THE HYDRAULIC UNIT:

- P2= R1", (ISO 228 G 1)
- T1 = 2", SAE J518 code 61, (ISO 6162-1)
- P1= 1 1/2", SAE J518 code 62, (ISO 6162-2)



A - A
1:20

SEE ALSO: HYDRAULIC UNIT DIMENSIONAL DRAWING



LENGTH OF HOSES: CASE BY CASE.
(P2), hose 1"(16), Length 4700 mm
(T1), hose 2"(32), Length 4100 mm
(P1), hose 1 1/2"(24), Length 4100 mm

Hose P2, Rmin 300
Hose T1, Rmin 630
Hose P1, Rmin 560

OPENING FOR HOSES
500 x 400

OPENING FOR ELECTRIC
POWER SUPPLY CABLES
200 x 600

LOCATION OF THE HYDRAULIC UNIT AS ON
RECOMMENDED LAYOUT DETAILS DRAWING.

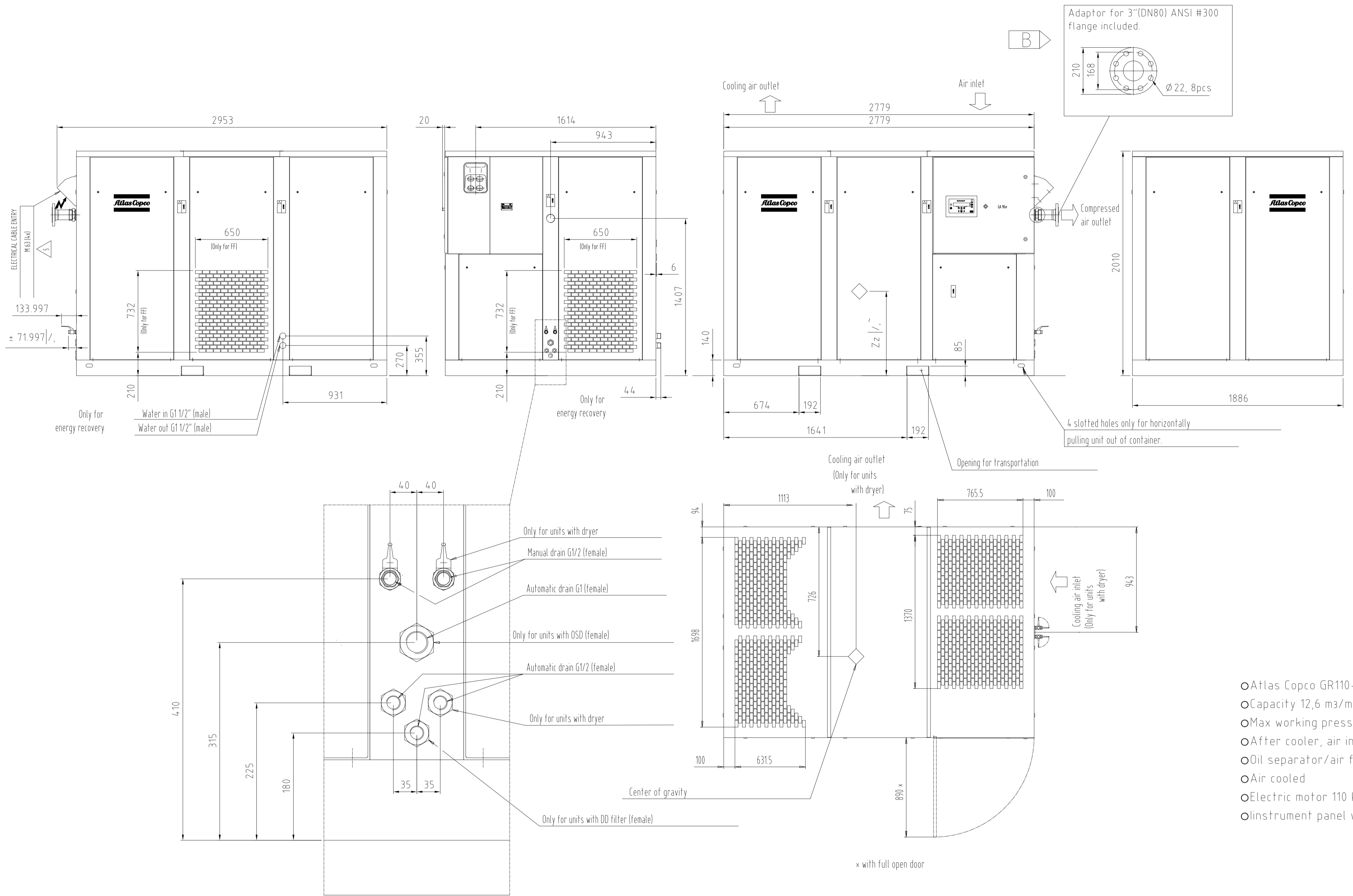
Hoses have to be supported properly to avoid scratching each other or other surfaces during operation.

Connection hoses and fittings are included in delivery.
The support parts and installation work are excluded from delivery.

In case there is a need for longer than 15m hoses, please contact to supplier.

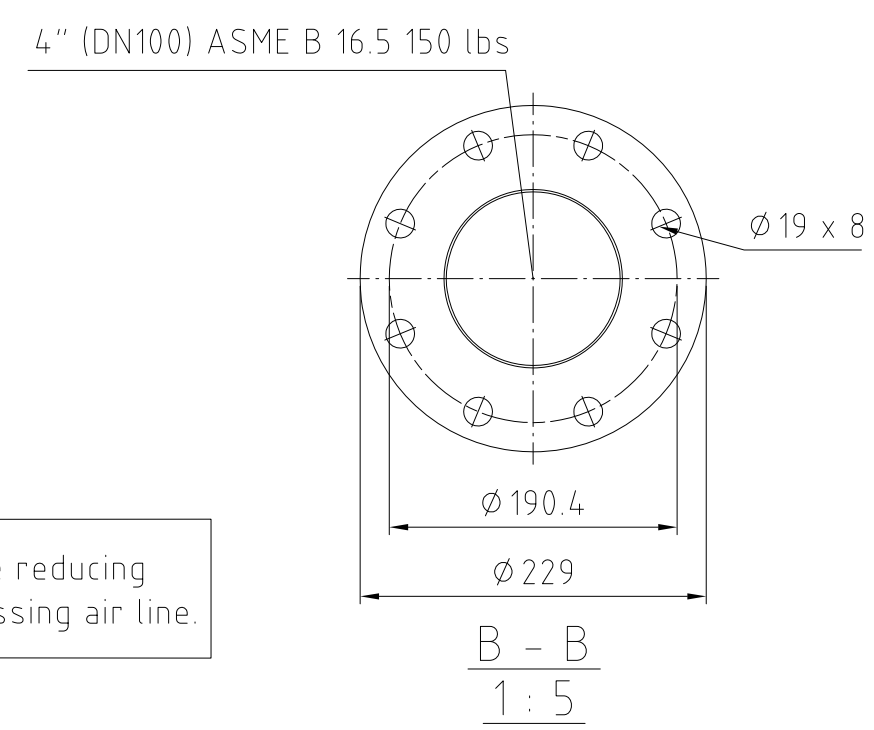
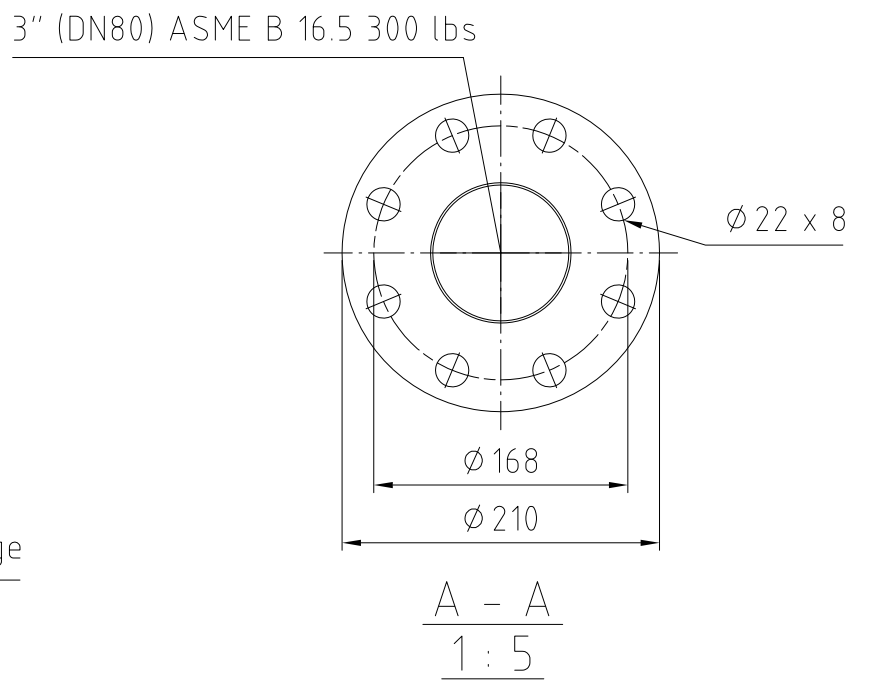
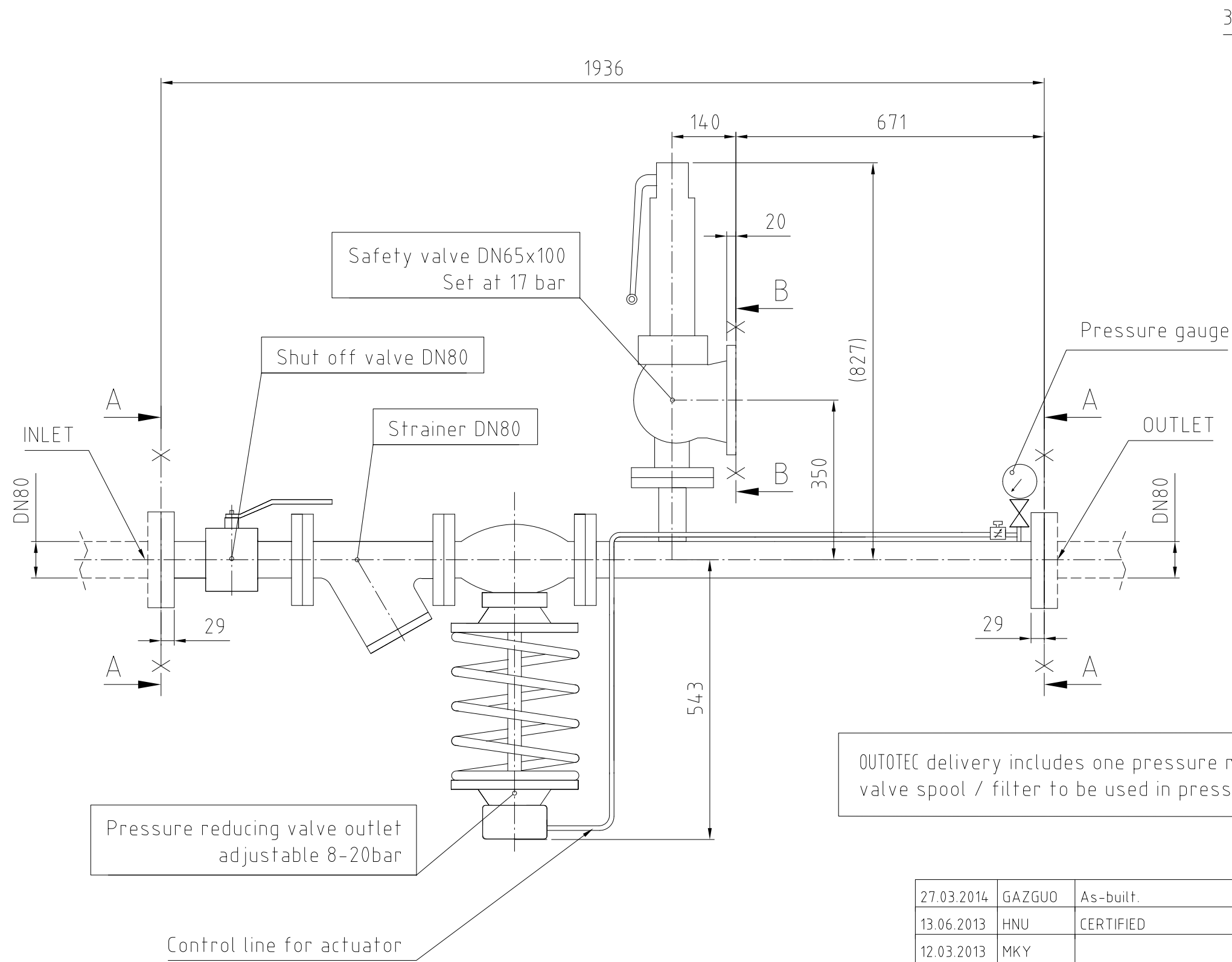
P1= Pressure line, Pmax 280 bar.
P2= Control line pressure, Pmax 200 bar.
T1= Tank line.

| | | | | | |
|-------------------|---------------------------------|-------------------|--------------------------|-----------|-------------------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | C |
| 13.06.2013 | HNU | CERTIFIED | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | AS-BUILT | <input checked="" type="checkbox"/> |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | |
| Supplier ref. No. | B200178FI | Supplier work No. | Serial No. | 1125 | |
| Outotec | HYDRAULIC CONNECTION INTERFACE | 12.03.2013 | MKY | | |
| | PF1125 | 1:50 T-A2 | | | |
| | PF 96/96 M48 2 60 | F673064 | | | C |



- Atlas Copco GR110-20 or equal
- Capacity 12,6 m³/min FAD
- Max working pressure 17,1 bar
- After cooler, air intake filter and silencer
- Oil separator/air filters included
- Air cooled
- Electric motor 110 kW / 575 V / 60 Hz / 3 phases
- Instrument panel with symbols

| | | | | | | | | | | |
|---|---------------------------------|-------------------------|------------------------------|--------------------------------|---|----------------|-------------------------|----------|-------------------------------------|-----|
| GR 110(A) WITH DRYER | 3470 | 726 | 1113 | ... | 27.03.2014 | GAZGUO | As-built | | c | |
| Tolerances: alleen met aanpakken zijn volgens Tolerances: not indicated according to | Row opp /aten Maxsurf /holes | Platwerk Sheet metal | Slijbranden Flare cutting | Lassen Welding | 30.05.2013 | ALLI | An adaptor flange added | | B | |
| ATLAS COPCO STANDARD/Klasse/Class | 1350K / Z | 1350 01K | 1355K / C | 1356K / B | 12.03.2013 | MKY | | | A | |
| Benaming Name | DIMENSION DRWG | | | Geheim/Klasse Secrecy/Class | Date | Handler | Change | Pcs | Mark | |
| Material | NOT APPLICABLE | | | 1102 K/ 3 | PRELIMINARY | For APPROVAL | CERTIFIED | AS-BUILT | <input checked="" type="checkbox"/> | |
| Behandeling Treatment | | | | CAD | Date: 19.4.2013 | Signature: HNU | | | | |
| Schaal Scale | 1:1 | Familie Family | A1 | Vergelijk Compare | Customer: Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | | |
| Getekend Drawn by | AR1175 | Blauw nr. Blank nr. | | Vervangt Replaces | Supplier ref. No. B200178F1 | | Supplier work No. | | Serial No. 1125 | |
| Stid gez./chd | Row gew. Blank wt. | 0 Kg | Afg gew. Fini wt. | 0 Kg | Identificatie/Designation | | Blad/Sheet () | | 01 2 | |
| Des gez./chd | Project/Chd | Goeds/Apply | Datum/Date | 2013-07-22 | 9823 9008 00 | | | | | |
| Bijbehorende tekeningen en documenten Appurtenant drawings and documents | | | | | Outotec | | PRESSING AIR COMPRESSOR | | 12.03.2013 | MKY |
| | | | | | PF1125 | | 1:20 T-A1 | | | |
| | | | | | PF 96/96 M48 2 60 | | F673068 | | C | |



OUTOTEC delivery includes one pressure reducing valve spool / filter to be used in pressing air line.

Pressure reducing valve outlet adjustable 8-20bar

Control line for actuator

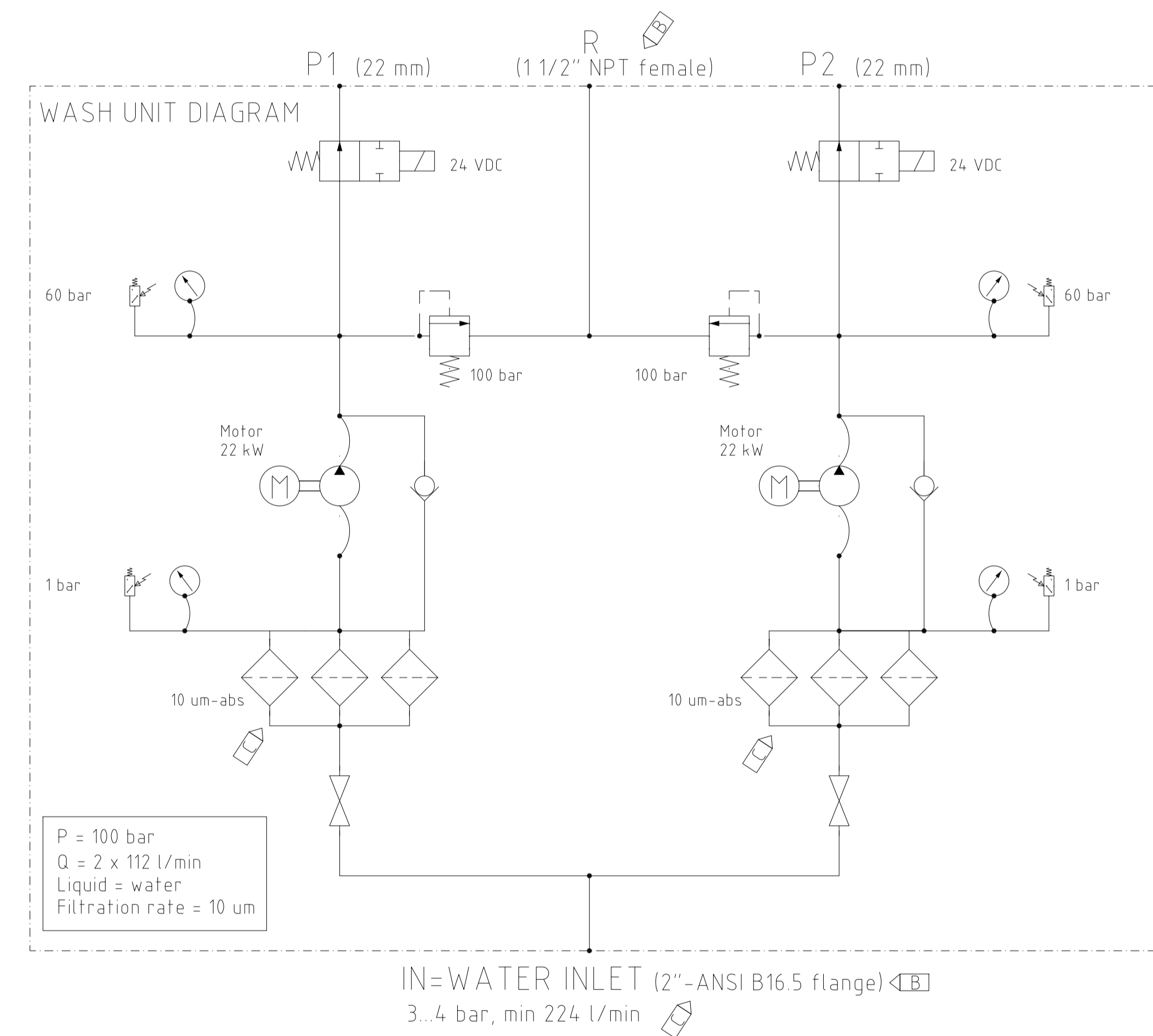
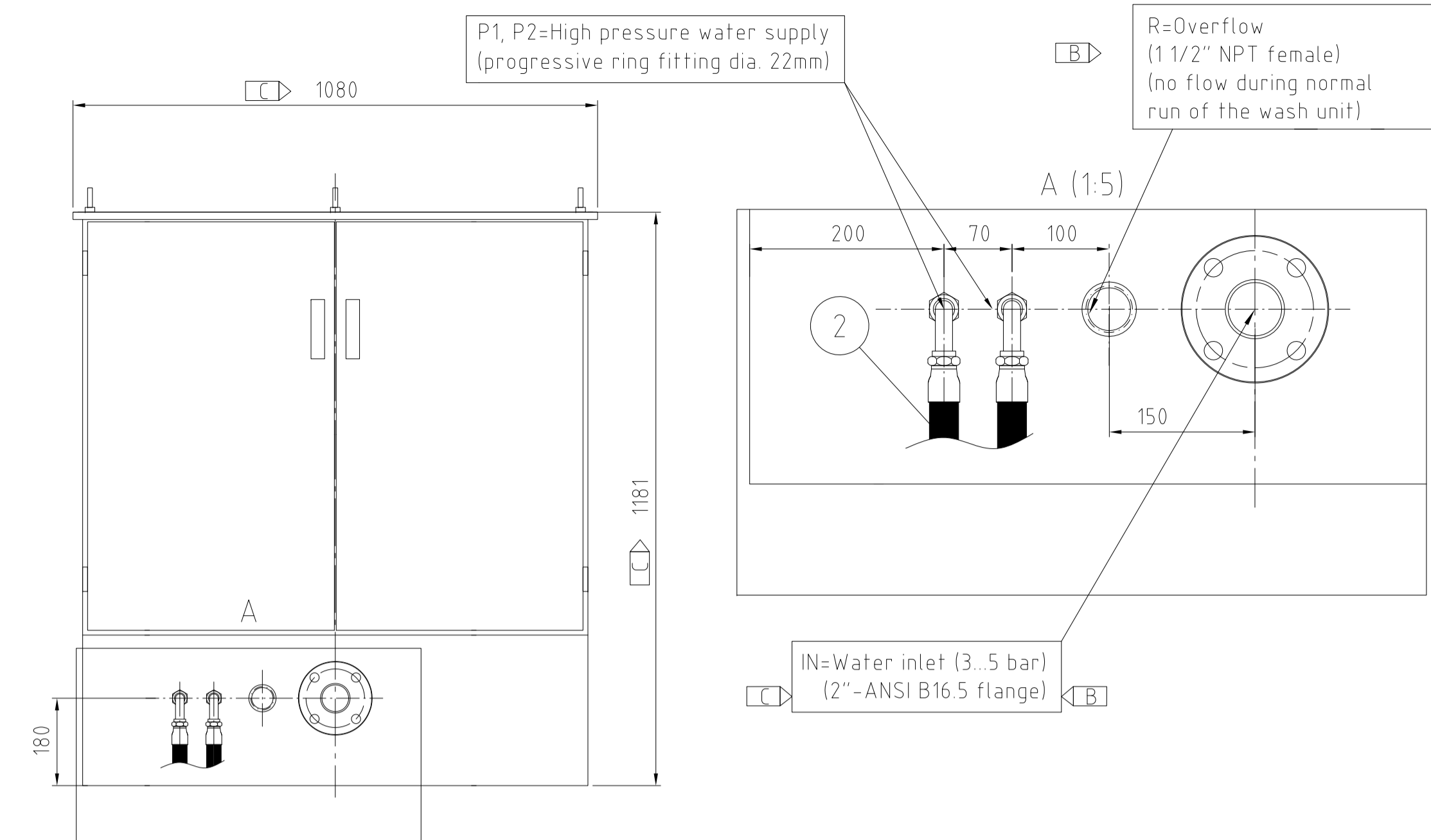
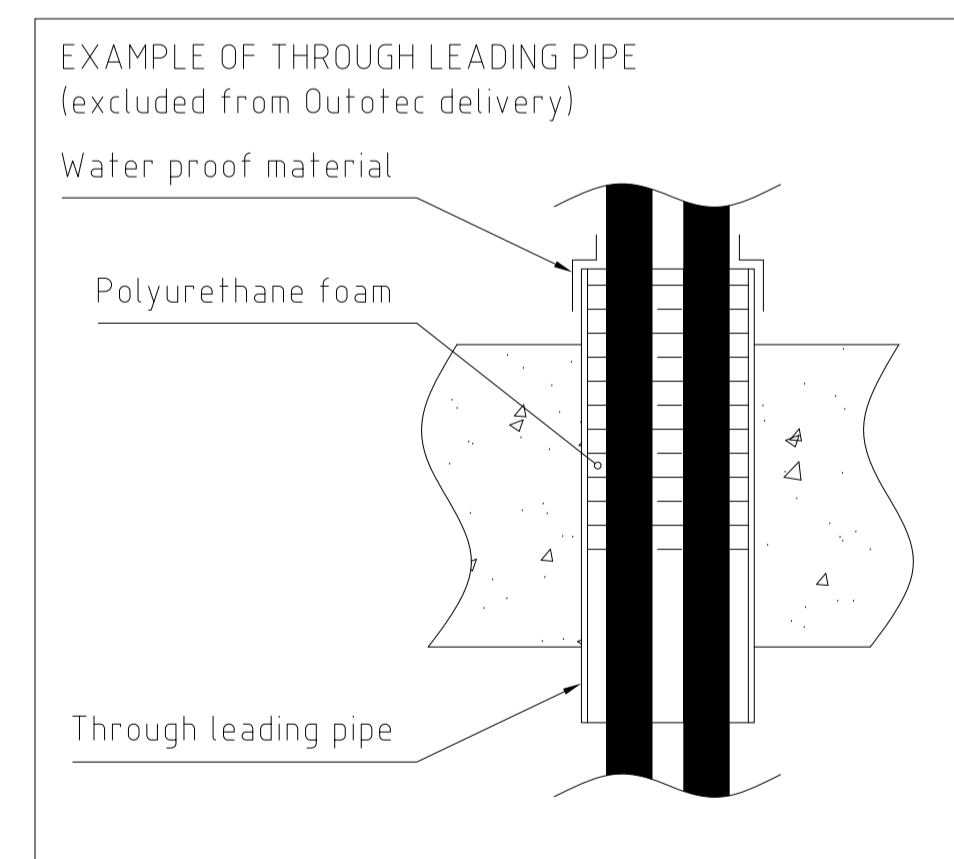
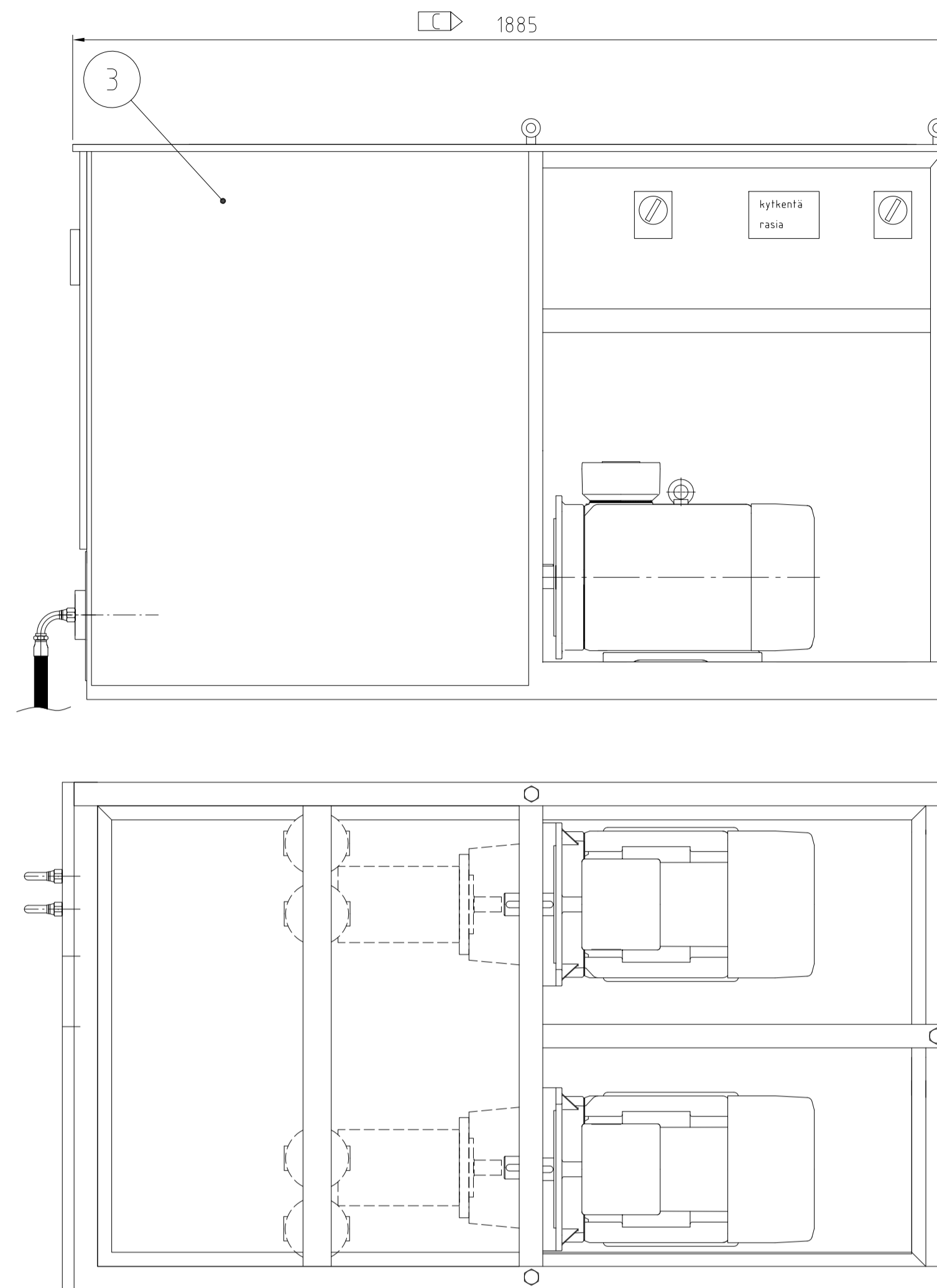
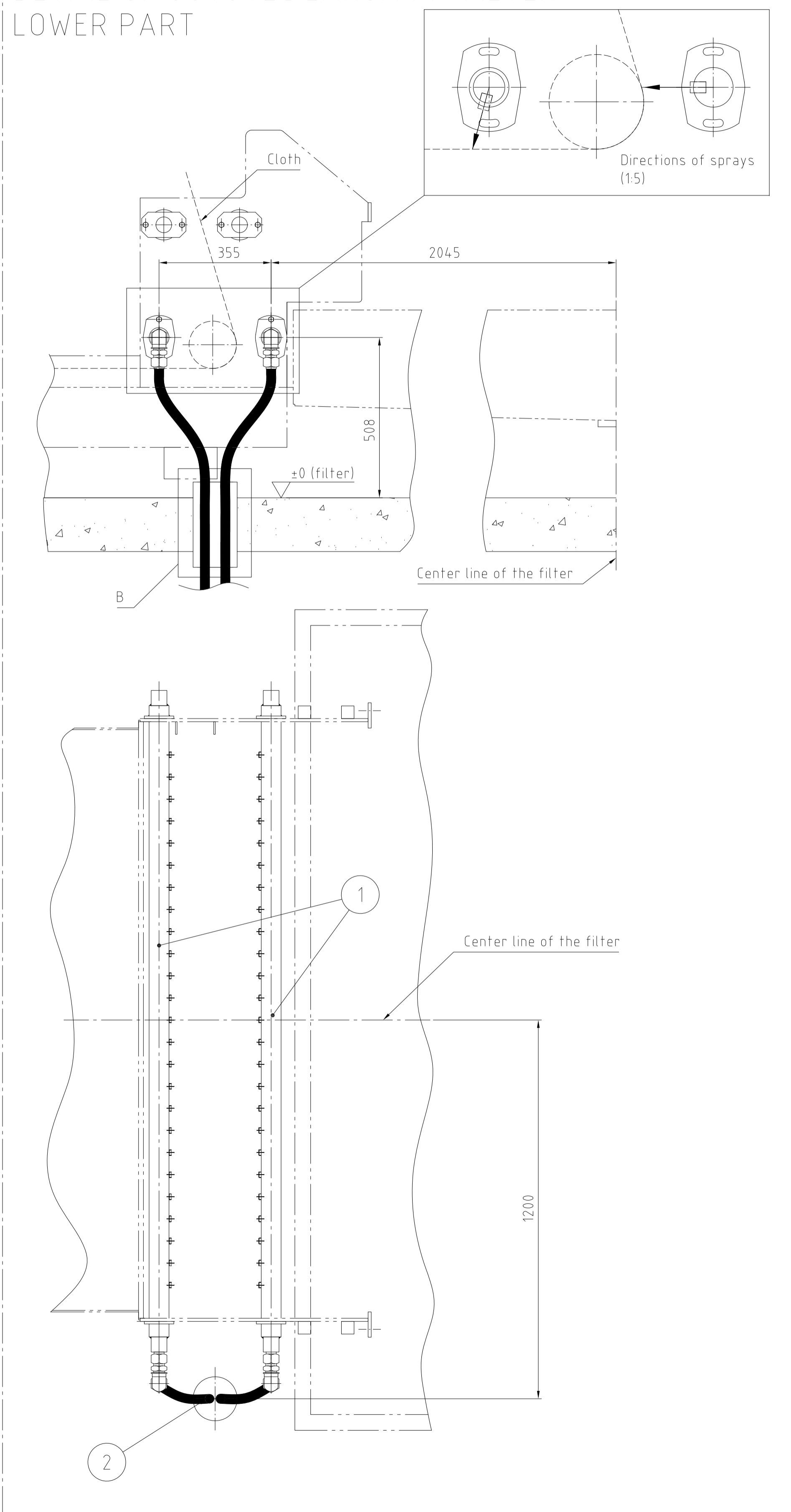
OUTOTEC DELIVERY LIMIT

| | | | | | |
|--------------------|---------------------------------|--------------------|--------------------------|-----------|-------------------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | C |
| 13.06.2013 | HNU | CERTIFIED | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| AS-BUILT | | | | | <input checked="" type="checkbox"/> |
| Date: | 22.10.2012 | Signature: | H.Nuutinen | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | | Ref N:o. | |
| Supplier ref. N:o. | B200178FI | Supplier work N:o. | Serial N:o. | 1125 | |

| | | | |
|----------------|-------------------------------|------------|-----|
| Outotec | PRESSURE REDUCING VALVE SPOOL | 12.03.2013 | MKY |
| | PF1125 | 1:10 T-A3 | |
| | PF 96/96 M48 2 60 | F673069 | C |

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DETAIL OF OUTOTEC LAROX PF-FILTER
LOWER PART

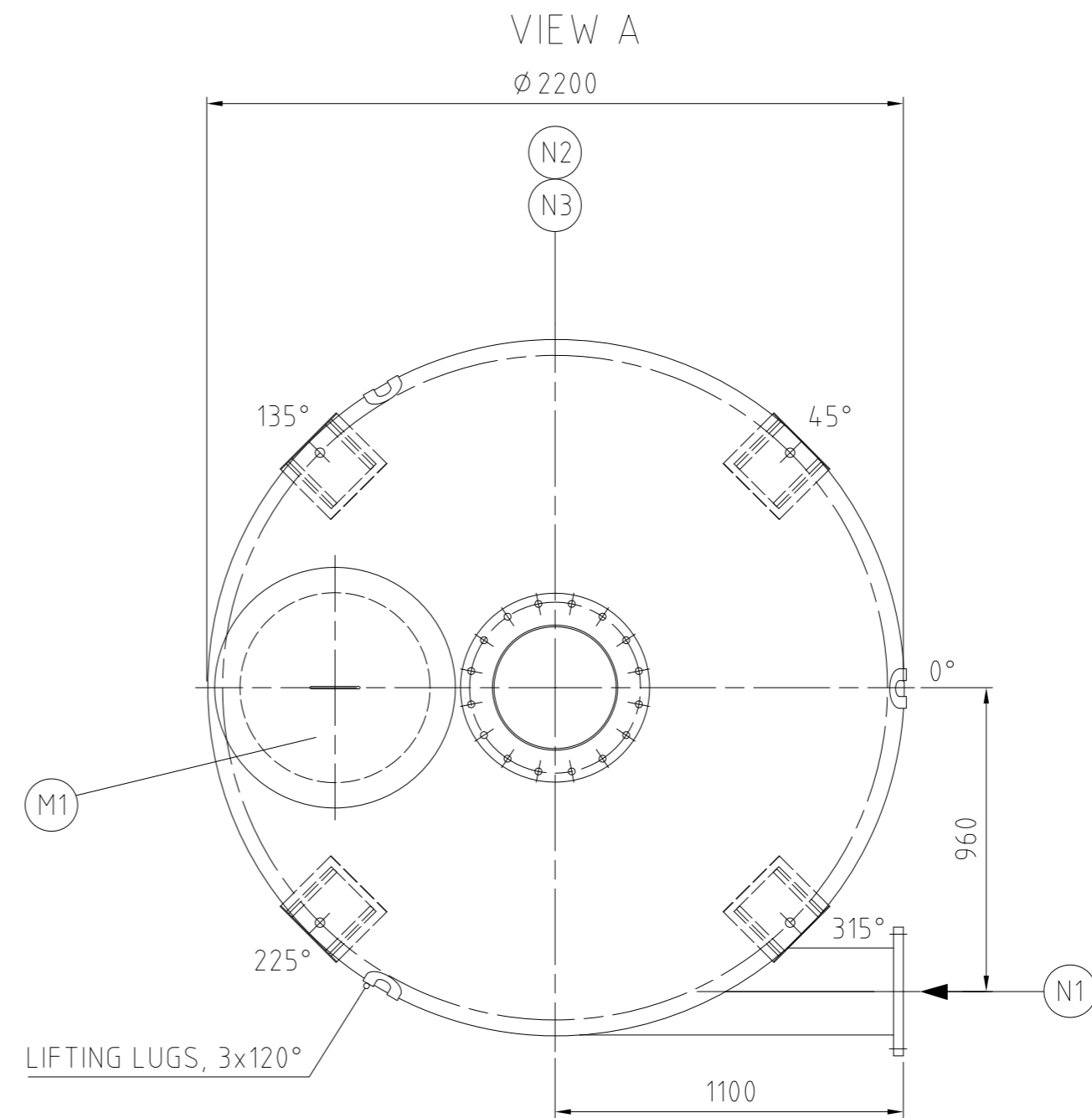
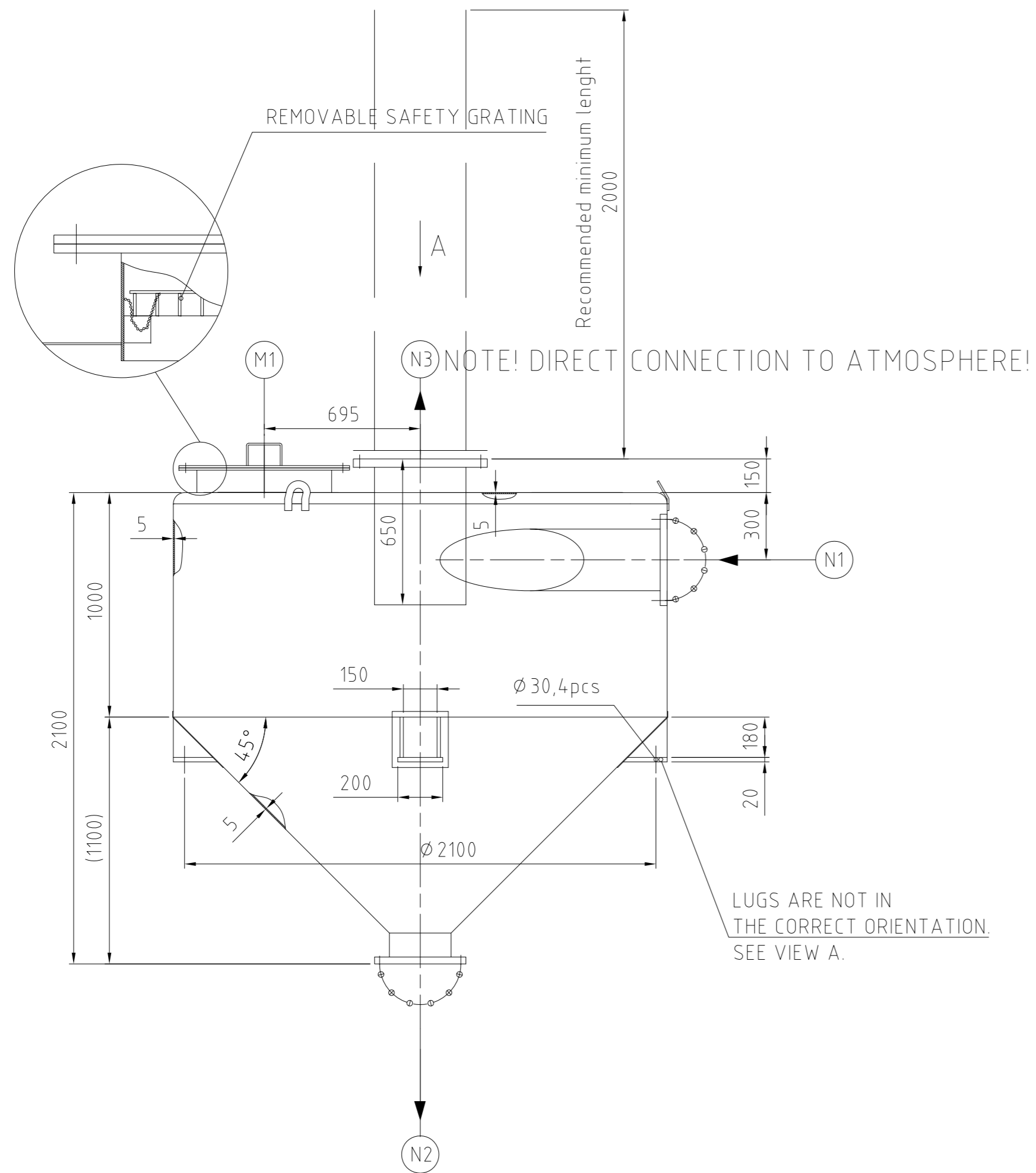


ALL ITEMS 1-3 ARE INCLUDED IN OUTOTEC DELIVERY

| | | | | | |
|-----------------------------|--|---|--------------------------|-----------|--------------------------|
| 3 | High pressure washing unit | | | | |
| 2 | Hose, length max. 15 m (2 pcs.) | | | | |
| 1 | Cloth washing pipe with nozzles and connectors | | | | |
| Pos | Description | | | | |
| 27.03.2014 | GAZGUO | As-built | | | D |
| 25.06.2013 | ALLI | IN changed to 2"-ANSI B 16.5 flanged, frame size changed to 1885x1080x1181. | | | C |
| 30.05.2013 | ALLI | change connections to NPT and B16.5 flanges. | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | Pcs | Mark | |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: | 28.3.2013 | Signature: | HNU | | |
| AS-BUILT | <input checked="" type="checkbox"/> | | | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | |
| Supplier ref. No. B200178F1 | Supplier work No. | | Serial No. | 1125 | |
| Outotec | | CLOTH WASH UNIT | 12.03.2013 | MKY | |
| | | PF1125 | 1:10 T-A1 | | |
| | | PF 96/96 M48.2.60 | F673075 | | D |

| NOZZLE | DESCRIPTION | SIZE |
|--------|----------------------------|----------------|
| N1 | FILTRATE AND DRYING AIR IN | 10''(DN250) |
| N2 | FILTRATE OUT | 10''(DN250) |
| N3 | AIR OUT | 16''(DN400) |
| M1 | MANHOLE | ID 24''(600MM) |

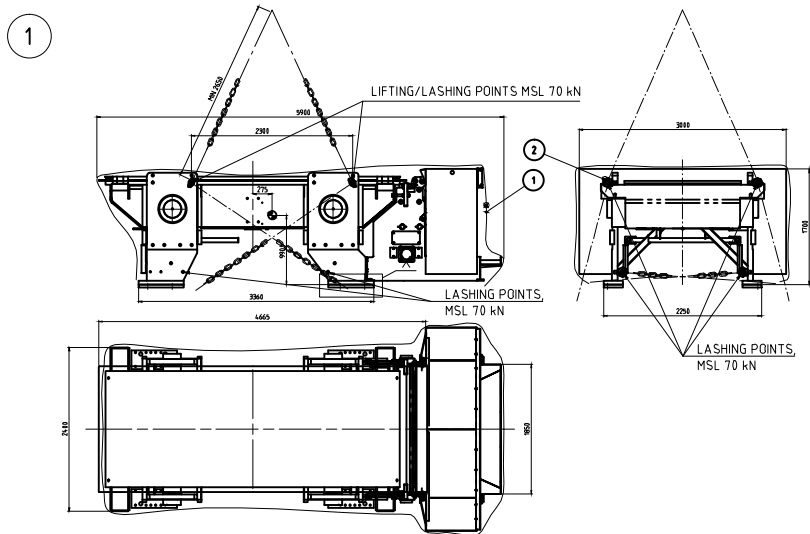
FLANGE DRILLING ACCORDING TO ANSI B16.5 150LB



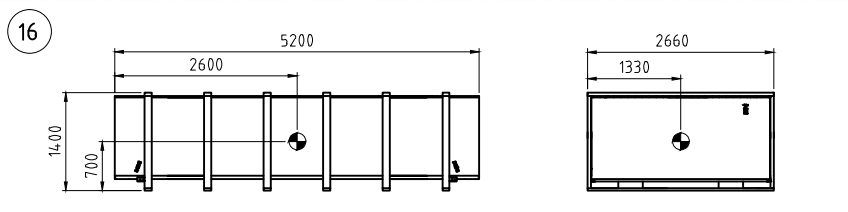
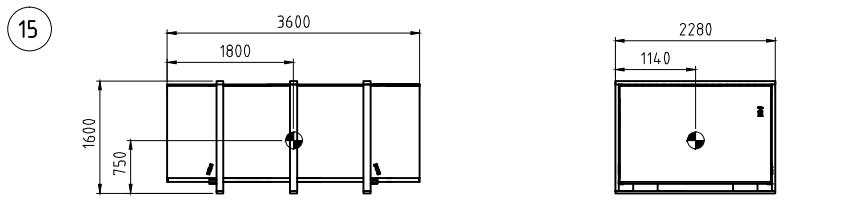
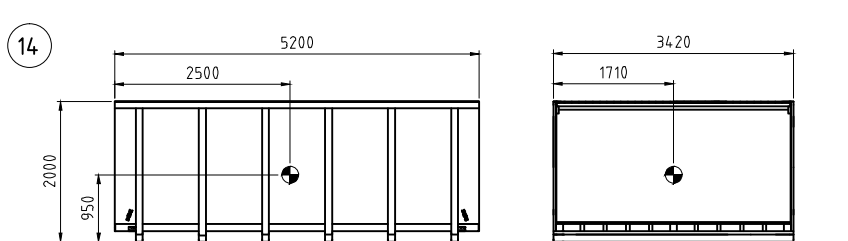
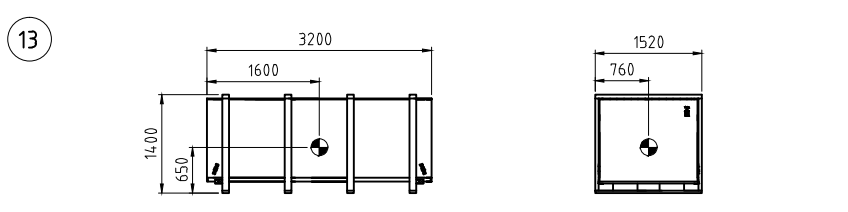
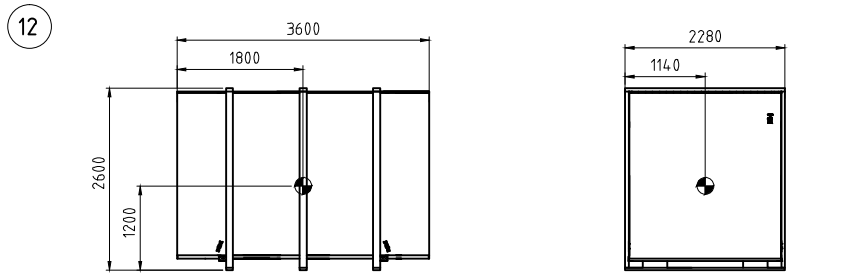
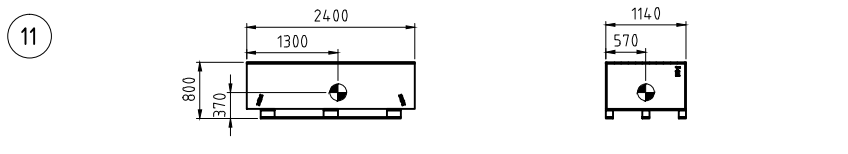
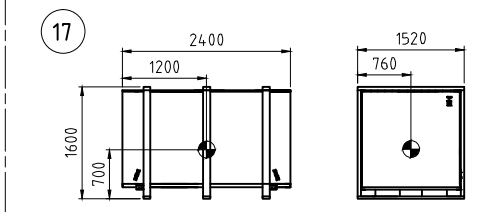
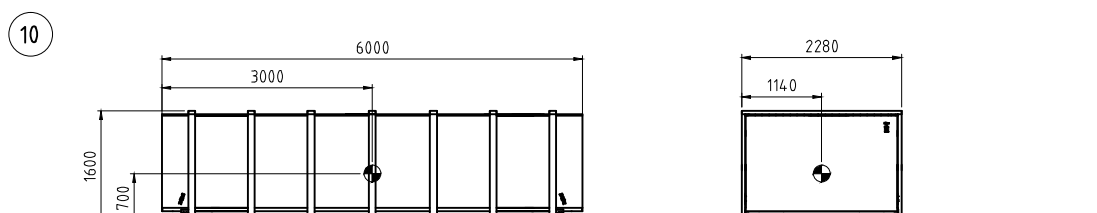
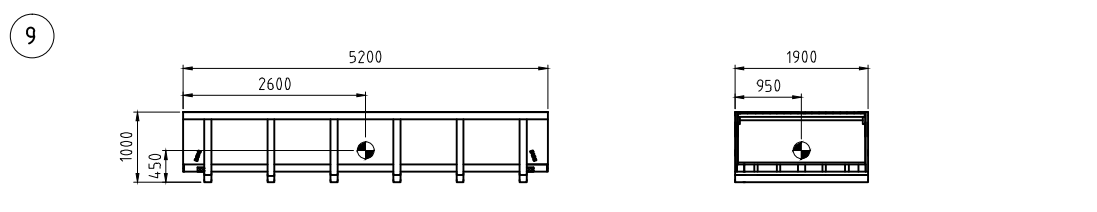
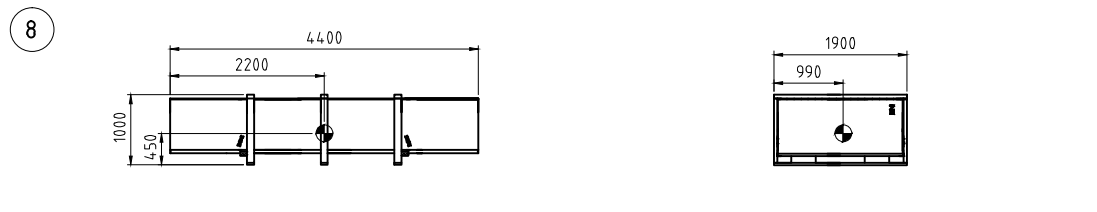
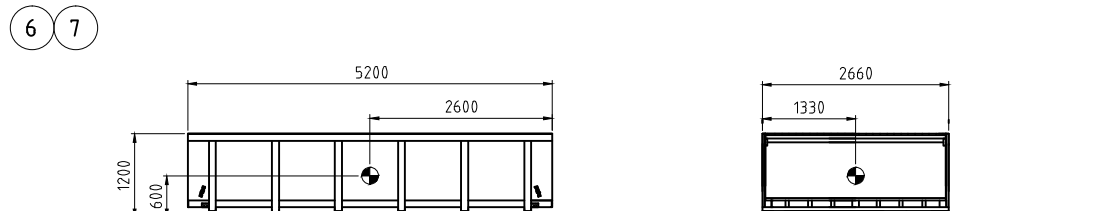
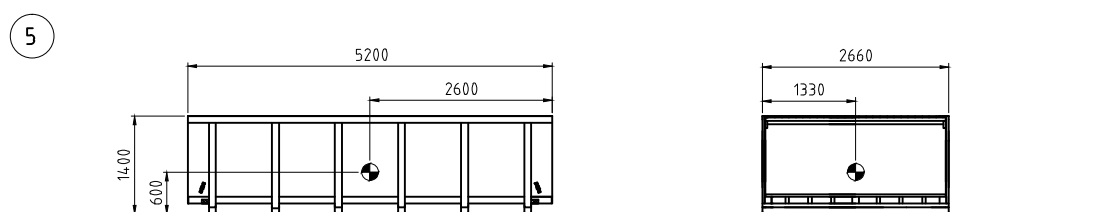
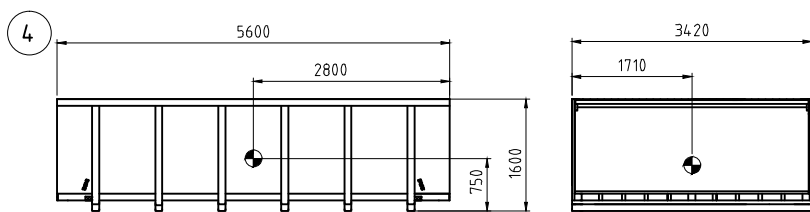
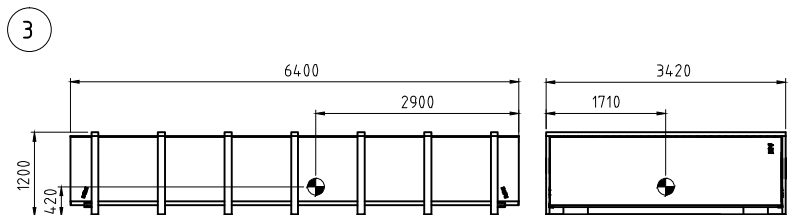
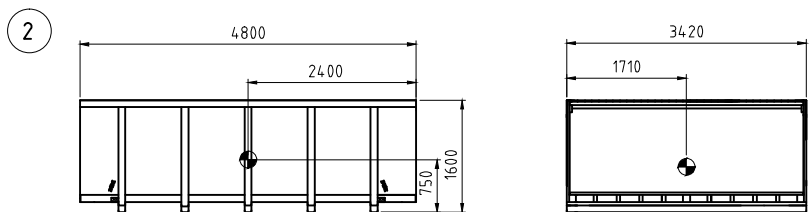
WEIGHT: 900 KG
MATERIAL: AISI 316
V=5.1m³

NOTE 1
SOUND INSULATION MAY BE REQUIRED

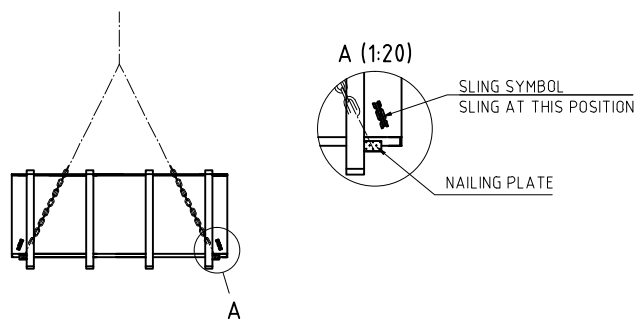
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|-------------------|---------------------------------|-------------------|--------------------------|------------|--------------------------|
| 27.03.2014 | GAZGUO | As-built. | | | C |
| 13.06.2013 | HNU | CERTIFIED | | | B |
| 12.03.2013 | MKY | | | | A |
| Date | Handler | Change | | | Pcs Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: | 28.3.2013 | Signature: | HNU | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | |
| Supplier ref. No. | B200178FI | Supplier work No. | | Serial No. | 1125 |
| Outotec | | AIR RELEASE TANK | 12.03.2013 | MKY | |
| | | PF1125 | 1:20 T-A2 | | |
| | | PF 96/96 M48 2 60 | F673076 | | C |



Packing and lifting of Lower frame and Cloth wash unit (#1)

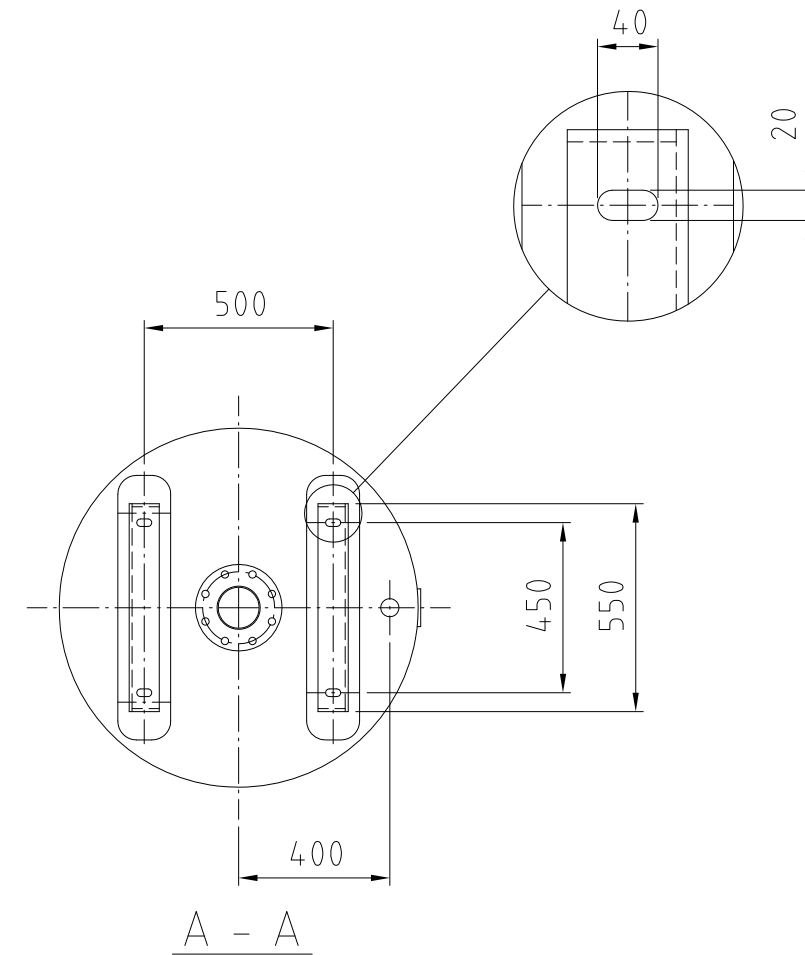
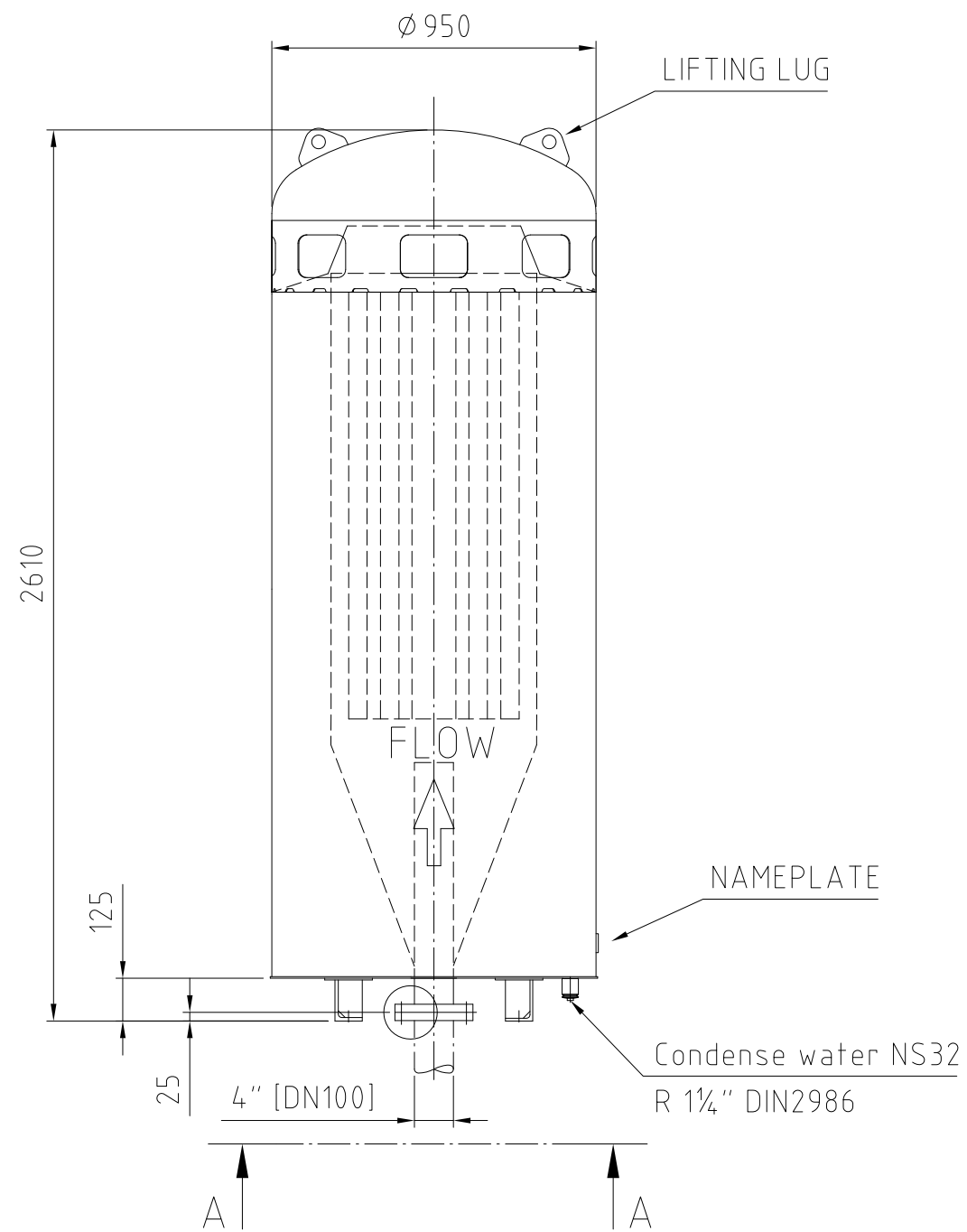


PACKAGE LIFTING EXAMPLE

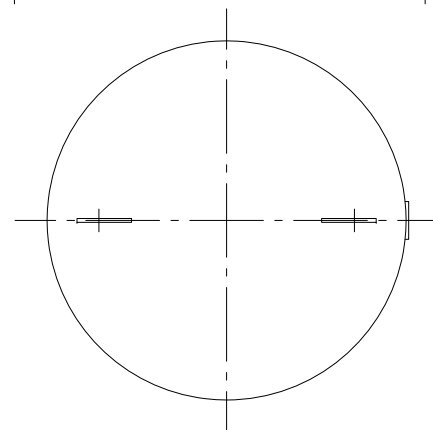


| PF1125 | | | | |
|-------------|---|-------------------|------------------|--------------------|
| POS | EQUIPMENT | PACKAGE TYPE | NET WEIGHT KG | GROSS WEIGHT KG |
| 1 | Lower frame and Cloth wash unit | plastic tarpaulin | 14000 | 14500 |
| 2 | Upper pressing plate | wooden box | 11900 | 13000 |
| 3 | Top frame | wooden box | 2000 | 3300 |
| 4 | Cloth drive unit | wooden box | 2650 | 3900 |
| 5 | Filter plates (6 pcs) | wooden box | 9700 | 10650 |
| 6 | Filter plates (5 pcs) | wooden box | 8100 | 9000 |
| 7 | Filter plates (5 pcs + lowest plate) | wooden box | 9300 | 10200 |
| 8 | Lower parts of columns | wooden box | 7600 | 8100 |
| 9 | QA-cylinders & Top parts of columns | wooden box | 5150 | 5700 |
| 10 | Process pipelines and Guide bars | wooden box | 2200 | 3050 |
| 11 | Control panel | wooden box | 200 | 330 |
| 12 | Hydraulic unit | wooden box | 2600 | 3200 |
| 13 | Muffler | wooden box | 520 | 620 |
| 14 | Service platform frames & Free end cake chute | wooden box | 2700 | 3900 |
| 15 | Service platform shields | wooden box | 800 | 1400 |
| SPARE PARTS | | | | |
| 16 | Spares (Start-up + 2 year) | wooden box | 1000 | 1300 |
| AUX DEVICE | | | | |
| 17 | High pressure cloth wash unit | wooden box | 165 | 511 |

| | | | | | |
|-------------------|---------------------------------|-------------------|-------------------------------------|------------|--------------------------|
| 31.03.2014 | ALLI | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input checked="" type="checkbox"/> | CERTIFIED | <input type="checkbox"/> |
| Date: | 28.03.2011 | Signature: | H.Nuutinen | AS-BUILT | <input type="checkbox"/> |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | |
| Supplier ref. No. | B200178FI | Supplier work No. | | Serial No. | 1125 |
| Outotec | | PACKING | | 31.03.2014 | ALLI |
| | | PF1125 | | 150 T-A1 | |
| | | PF 96/96 M48 2 60 | | F683526 | A |



Painting : According to painting instructions
 Flange : ANSI B 16.5 -150lbs DN100 (4")



| | | | | | |
|---|--------------------------|------------------|--------------------------|-----------|-------------------------------------|
| 25.04.2014 | ALLI | | | | A |
| Date | Handler | Change | | Pcs | Mark |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input checked="" type="checkbox"/> |
| Date: 7.8.2013 | Signature: H.Nuutinen | | | | |
| Customer: Sulvaris / Pöyry (Appleton) LLC | Ref N:o. | | | | |
| Supplier ref. N:o. B200178FI | Supplier work N:o. | Serial N:o. 1125 | | | |
| Outotec | MUFFLER | 25.04.2014 | ALLI | | |
| | PF1125 | 1:20 T-A3 | | | |
| | PF 96/96 M48 2 60 | F684226 | A | | |

10.9 Electrical drawings

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|



OUTOTEC OYJ

Street: Tukkipatu 1
 City: Lappeenranta
 Country: Finland
 Phone: +358 20 529 211
 Fax:
 E-mail:

Customer / Company SULVARIS / PÖYRY (APPLETON) LLC
 Customer: Street STRACHAN
 Customer: City ALBERTA
 Customer: Country CANADA

Manufacturer (company) OUTOTEC OYJ
 Project number B200186FI
 Filter type PF 96/96 M48 2 60
 Serial no PF1125
 Control system Allen Bradley Control Logix

Created on 26.03.2013 by CRF
 Edit date 09.04.2014 by CRF

| | | | | | | | | | | | | | | | | | |
|--------|--|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|--|------------------|--------------------------|-------------------|---------------------|----------------|----------|------|---|
| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | | Page description | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | | |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | | | Title page / cover sheet | Serial no | = PF1125 | Drawing number | F673035 | Page | 1 |
| REV. C | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | | Location | + PF1125+TITLE_PAGE | | | | |
| REV. D | | REV. H | | | | APPR | | | | | | | | | | | |

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| PF1125 | PF1125+F1 | 1 | Electrification layout for filter | | 08.11.2013 | CRF |
| | PF1125+F1 | 2 | Cabling diagram | | 08.11.2013 | CRF |
| | PF1125+F1 | 3 | Bus cabling diagram,devicenet | | 09.04.2014 | CRF |
| | PF1125+F1 | 4 | Grounding diagram for filter | | 09.04.2014 | CRF |
| | PF1125+F1 | 5 | Labels | | 11.09.2013 | CRF |
| | PF1125+F1 | 6 | Labels | | 11.09.2013 | CRF |
| | PF1125+F1 | 7 | CSA Labels | | 08.11.2013 | CRF |
| | PF1125+F1 | 8 | HH Labels | | 05.11.2013 | CRF |
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| | PF1125+F1 | 10 | Motors, single line diagram | | 08.11.2013 | CRF |
| | PF1125+X1 | 1 | Dimensional layout, control panel X1 with proface OIU | | 12.09.2013 | CRF |
| | PF1125+X1 | 2 | Control cabin layout, LOG-AB | | 09.04.2014 | CRF |
| | PF1125+X1 | 3 | Control cabin plate for cable clamps | | 07.11.2013 | CRF |
| | PF1125+X1 | 4 | Voltage distribution, 120VAC | | 09.04.2014 | CRF |
| | PF1125+X1 | 5 | Voltage distribution, 120VAC | | 09.04.2014 | CRF |
| | PF1125+X1 | 6 | Voltage distribution, 24VDC | | 09.04.2014 | CRF |
| | PF1125+X1 | 7 | Voltage distribution, 24VDC with emergency stop | | 09.04.2014 | CRF |
| | PF1125+X1 | 8 | Emergency stop relay KA100 | | 09.04.2014 | CRF |
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| PF1125+X1 | 10 | Emergency stop relays KA130, KA100 and KA101 | | 09.04.2014 | CRF | |
| PF1125+X1 | 11 | Emergency stop relays KA120, KA110, KA121 and KA111 | | 09.04.2014 | CRF | |
| PF1125+X1 | 12 | Allen Bradley logic, Ethernet switch and operator interface | | 09.04.2014 | CRF | |
| PF1125+X1 | 13 | Bus coupler and I/O-modules voltage distribution | | 09.04.2014 | CRF | |
| PF1125+X1 | 14 | Input modules DI1 and DI2 | | 11.09.2013 | CRF | |
| PF1125+X1 | 15 | Input modules DI3 and DI4 | | 11.09.2013 | CRF | |
| PF1125+X1 | 16 | Input modules DI5 and DI6 | | 11.09.2013 | CRF | |
| PF1125+X1 | 17 | Input modules DI7 and DI8 | | 11.09.2013 | CRF | |
| PF1125+X1 | 18 | Input module DI9 and DI10 | | 08.11.2013 | CRF | |

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| | PF1125+X1 | 20 | Output modules DO1 and DO2 | | 08.11.2013 | CRF |
| | PF1125+X1 | 21 | Output modules DO3, DO4, DO5 and DO6 | | 11.09.2013 | CRF |
| | PF1125+X1 | 22 | Output modules DO7, DO8, DO9 and DO10 | | 11.09.2013 | CRF |
| | PF1125+X1 | 23 | Input module AI1 | | 19.11.2013 | CRF |
| | PF1125+X1 | 24 | Output module AO1 | | 16.10.2013 | CRF |
| | PF1125+X1 | 25 | Emergency stop contacts for motors | | 08.11.2013 | CRF |
| | PF1125+X1 | 26 | Emergency stop contacts for motors | | 08.11.2013 | CRF |
| | PF1125+X2 | 1 | layout, terminal box X2 | | 09.04.2014 | CRF |
| | PF1125+X2 | 2 | External cables | | 09.04.2014 | CRF |
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| | PF1125+X2 | 5 | External cables | | 09.04.2014 | CRF |
| | PF1125+X2 | 6 | External cables | | 10.09.2013 | CRF |
| | PF1125+X2 | 7 | External cables | | 09.04.2014 | CRF |
| | PF1125+X2 | 8 | External cables | | 10.09.2013 | CRF |
| | PF1125+X2 | 9 | Power supply | | 09.04.2014 | CRF |
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| | PF1125+X2 | 11 | Voltage distribution, 24VDC | | 09.04.2014 | CRF |
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| PF1125+X2 | 13 | Bus coupler and I/O-modules voltage distribution | | 09.04.2014 | CRF | |
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| PF1125+X2 | 15 | Input modules DI3 and DI4 | | 05.11.2013 | CRF | |
| PF1125+X2 | 16 | Input modules DI5 and DI6 | | 10.09.2013 | CRF | |
| PF1125+X2 | 17 | Output modules DO1 and DO2 | | 10.09.2013 | CRF | |
| PF1125+X2 | 18 | Output modules DO3 and DO4 | | 10.09.2013 | CRF | |
| PF1125+X2 | 19 | Output module DO5 | | 10.09.2013 | CRF | |
| PF1125+X2 | 20 | Analog input modules AI1 and AI2 | | 19.11.2013 | CRF | |

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| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name |  | Page description | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | | Table of contents | Serial no | = PF1125 | Drawing number | F673035 | Page | 2 |
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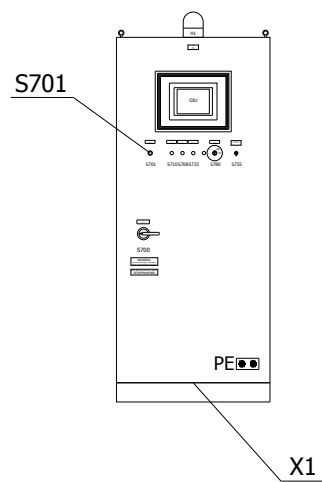
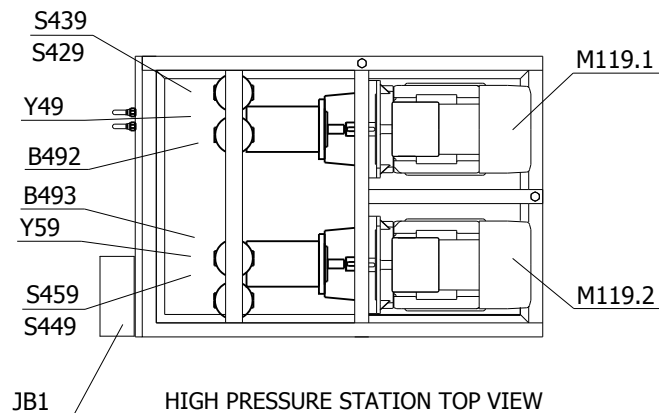
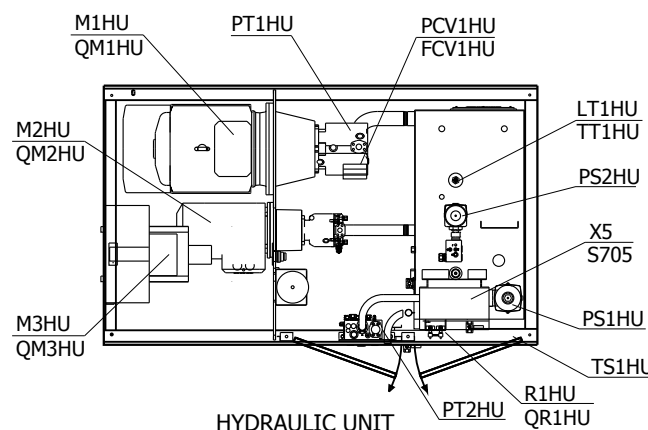
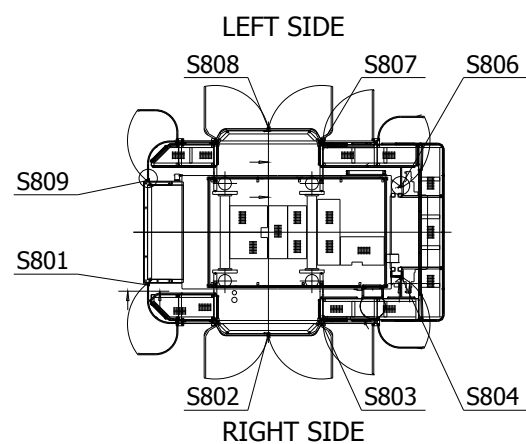
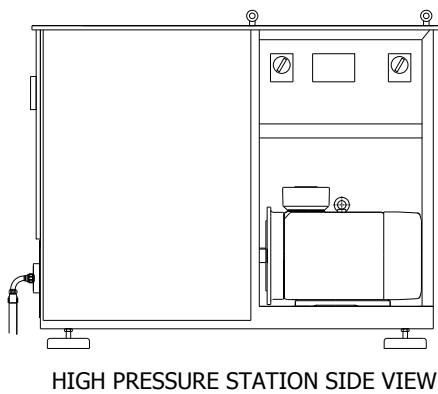
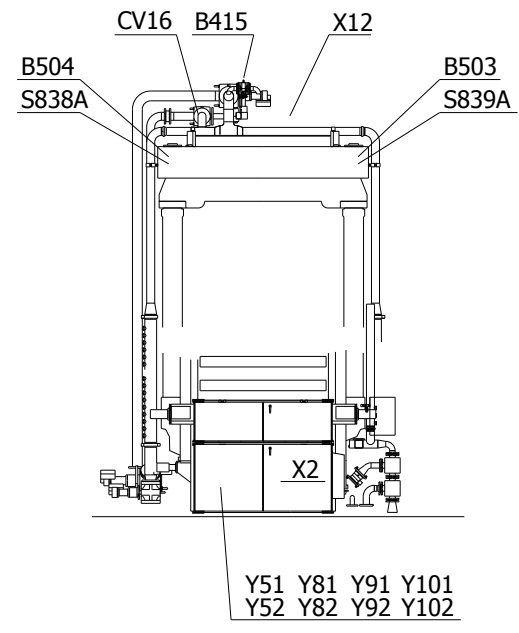
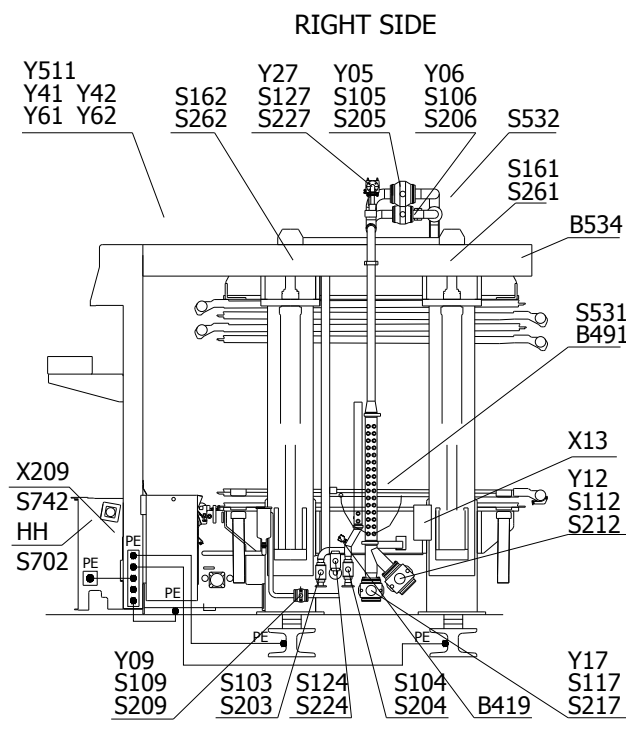
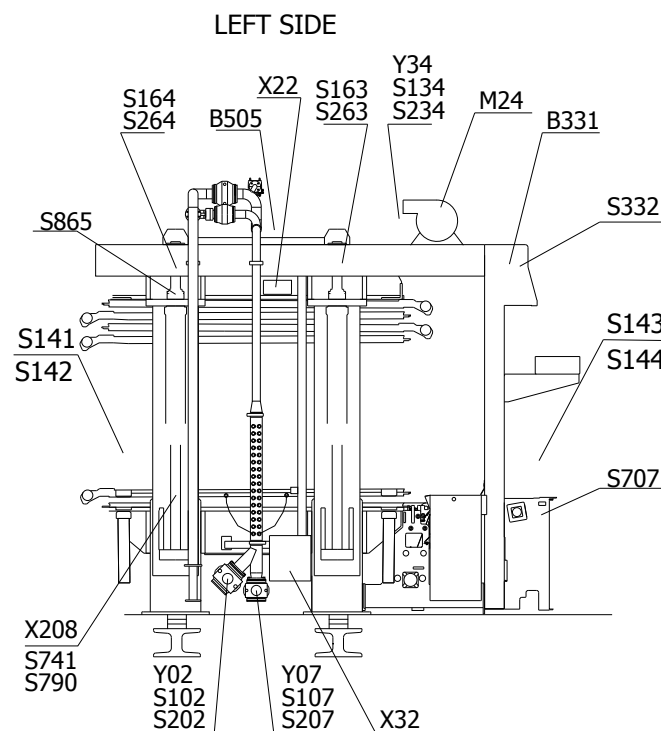
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| PF1125 | PF1125+X2 | 21 | Slurry feed flow transmitter B924, Circuit diagram | | 16.10.2013 | CRF |
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| | PF1125+X12 | 4 | Bus coupler and I/O-modules voltage distribution | | 10.09.2013 | CRF |
| | PF1125+X12 | 5 | Input modules DI1 and DI2 | | 10.09.2013 | CRF |
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| | PF1125+X12 | 10 | Analog input modules INC1 | | 10.09.2013 | CRF |
| | PF1125+X12 | 11 | Analog output module AO1 | | 10.09.2013 | CRF |
| | PF1125+X12 | 12 | Analog input module AI3 | | 10.09.2013 | CRF |
| | PF1125+X22 | 1 | Layout, terminal box X22 | | 11.09.2013 | CRF |
| | PF1125+X22 | 2 | Voltage distribution, terminal box X22 | | 25.09.2013 | CRF |
| | PF1125+X22 | 3 | External cables | | 11.09.2013 | CRF |
| | PF1125+X22 | 4 | External cables | | 11.09.2013 | CRF |
| | PF1125+X22 | 5 | Safety relay KA103 | | 10.09.2013 | CRF |
| | PF1125+X22 | 6 | Bus coupler and I/O-modules voltage distribution | | 10.09.2013 | CRF |
| | PF1125+X22 | 7 | Input modules DI1 and DI2 | | 10.09.2013 | CRF |
| | PF1125+X22 | 8 | Input modules DI3 and DI4 | | 11.09.2013 | CRF |
| | PF1125+X22 | 9 | Analog input module AI1 | | 10.09.2013 | CRF |
| | PF1125+X32 | 1 | Layout, terminal box X32 | | 09.04.2014 | CRF |
| | PF1125+X32 | 2 | Voltage distribution, terminal box X32 | | 09.04.2014 | CRF |
| | PF1125+X32 | 3 | External cables | | 25.09.2013 | CRF |
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| PF1125 | PF1125+X32 | 7 | External cables | | 10.09.2013 | CRF |
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| | PF1125+X32 | 9 | Input modules DI1 and DI2 | | 10.09.2013 | CRF |
| | PF1125+X32 | 10 | Input modules DI3 and DI4 | | 25.09.2013 | CRF |
| | PF1125+X32 | 11 | Input modules DI5 and DI6 | | 10.09.2013 | CRF |
| | PF1125+X32 | 12 | Input modules DI7 and DI8 | | 25.09.2013 | CRF |
| | PF1125+X32 | 14 | Output modules DO1 and DO2 | | 25.09.2013 | CRF |
| | PF1125+X32 | 15 | Output module DO3 | | 25.09.2013 | CRF |
| | PF1125+X32 | 16 | Analog input module AI1 | | 09.04.2014 | CRF |
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| | PF1125+X5 | 1 | Layout, terminal box X5 | | 10.09.2013 | CRF |
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| | PF1125+X5 | 3 | Bus coupler and I/O-modules voltage distribution | | 10.09.2013 | CRF |
| | PF1125+X5 | 4 | Input modules DI1 and DI2 | | 05.11.2013 | CRF |
| | PF1125+X5 | 5 | Output module DO1 | | 10.09.2013 | CRF |
| | PF1125+X5 | 6 | Analog input modules AI1 and AI2 | | 10.09.2013 | CRF |
| | PF1125+X5 | 7 | Analog input module AI3 | | 10.09.2013 | CRF |
| | PF1125+X5 | 8 | Analog output module AO1 | | 05.11.2013 | CRF |



1) DEVICES IN ADWANTEC'S DELIVERY

| | | | | |
|----|--------|---------------------------------------|-------|--|
| 1) | M119.* | HIGH PRE. CLOTH WASH PUMP | TS1HU | TEMPERATURE SWITCH FOR OIL, HIGH ALARM |
| 1) | Y49 | CLOTH WASH PUMP M119.1 PRESSURE VALVE | PT1HU | HYDRAULIC LINE PRESSURE |
| 1) | Y59 | CLOTH WASH PUMP M119.2 PRESSURE VALVE | PT2HU | HYDRAULIC LINE PRESSURE |
| 1) | B49* | PRESSURE TRANSMITTER | LT1HU | HYDRAULIC UNIT OIL LEVEL |
| 1) | S429 | PRESSURE SWITCH PRESSURE SIDE | TT1HU | HYDRAULIC UNIT OIL TEMPERATURE |
| 1) | S439 | PRESSURE SWITCH SUPPLY SIDE | B524 | SLURRY FEED TANK LEVEL LOWER |
| 1) | S449 | PRESSURE SWITCH PRESSURE SIDE | B525 | SLURRY FEED TANK LEVEL UPPER |
| 1) | S459 | PRESSURE SWITCH SUPPLY SIDE | B924 | SLURRY FEED CONTROL, FEED FLOW |

| | |
|--------|---|
| X1 | CONTROL CABIN |
| X2 | TERMINAL BOX, IN FILTER |
| X5 | TERMINAL BOX, IN HYDRAULIC UNIT |
| X12 | TERMINAL BOX, IN FILTER |
| X13 | PNEUMATIC BOX, IN FILTER |
| X22 | TERMINAL BOX, IN FILTER |
| X32 | TERMINAL BOX, IN FILTER |
| JB1 | TERMINAL BOX, IN HIGH PRESSURE STATION |
| HH | HANDHELD UNIT, IN FILTER |
| M1HU | HYDRAULIC UNIT MOTOR |
| M2HU | HYDRAULIC UNIT MOTOR |
| M3HU | HYDRAULIC UNIT COOLER |
| R1HU | HYDRAULIC OIL HEATER |
| M24 | CAKE POPPING DEVICE MOTOR |
| Q**HU | MOTOR SAFETY SWITCHES |
| Y** | VALVE SOLENOID |
| CV16 | DRYING AIR INLET VALVE |
| S1** | PROCESS VALVE, OPEN |
| S16* | LOCKING PINS, UNLOCKED |
| S141 | CAKE CHUTE COVER, CLOTH DRIVE END, OPEN |
| S142 | CAKE CHUTE COVER, CLOTH DRIVE END, CLOSED |
| S143 | CAKE CHUTE COVER, FREE END, OPEN |
| S144 | CAKE CHUTE COVER, FREE END, CLOSED |
| S2** | PROCESS VALVE, CLOSED |
| S332 | CLIPPER SEAM DETECTOR |
| S531 | LEAKAGE SENSOR |
| S532 | LEAKAGE SENSOR |
| S70* | EMERGENCY STOP PUSH-BUTTONS |
| S74* | ACKNOWLEDGE PUSH BUTTON FOR DOOR SWITCHES |
| S790 | ENABLE SWITCH |
| S80* | PROTECTIVE DOOR SAFETY SENSORS |
| S838A | CLOTH EDGE LIMIT SWITCH, LEFT ALARM |
| S839A | CLOTH EDGE LIMIT SWITCH, RIGHT ALARM |
| S26* | LOCKING PINS, LOCKED, SAFETY SENSORS |
| S865 | PRESSURE PLATE, LOW POSITION, SAFETY SENSOR |
| B331 | CLOTH DRIVE IMPULSE ENCODER |
| B415 | FEED MANIFOLD PRESSURE |
| B419 | PRESSING MANIFOLD PRESSURE |
| B491 | WASH WATER PRESSURE |
| B503 | CLOTH EDGE POSITION |
| B504 | CLOTH TRACKING CYLINDER POSITION |
| B505 | PLATE PACK POSITION |
| B534 | CAKE THICKNESS TRANSMITTER |
| X20* | CONNECTOR FOR HH UNIT AND ENABLE SWITCH |
| PCV1HU | HYDRAULIC UNIT, PRESSURE CONTROL |
| FCV1HU | HYDRAULIC UNIT, FLOW CONTROL |
| PS*HU | OIL FILTER CLOGGED |
| TS1HU | TEMPERATURE SWITCH FOR OIL, HIGH ALARM |
| PT1HU | HYDRAULIC LINE PRESSURE |
| PT2HU | HYDRAULIC LINE PRESSURE |
| LT1HU | HYDRAULIC UNIT OIL LEVEL |
| TT1HU | HYDRAULIC UNIT OIL TEMPERATURE |
| B524 | SLURRY FEED TANK LEVEL LOWER |
| B525 | SLURRY FEED TANK LEVEL UPPER |
| B924 | SLURRY FEED CONTROL, FEED FLOW |

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CUSTOMER ← OUTOTEC → FILTER

- DCS CONNECTION : ETHERNET 4) -W550 1)
- SUPPLY FOR FILTER 120VAC, 16A, 60Hz -W010 1)
- FEEDBACK LOOP FROM HYDRAULIC UNIT MOTOR CONTACTORS -W003 1) 2)
- FEEDBACK LOOP FROM PROCESS MOTOR CONTACTORS -W004 1) 2)

- 1) CABLES IN CUSTOMER'S DELIVERY
- 2) EMERGENCY-STOP CONTACT FROM CONTROL CABIN X1 TO CUSTOMER'S MCC: FOR MOTOR CONTROLS
- 3) SAFETY SWITCH IN OUTOTEC'S DELIVERY. INSTALLED BY CUSTOMER N/O AUXILIARY CONTACT TO THE MOTOR CONTROL SYSTEM
- 4) SEE SEPERATE DCS LINK LIST FOR MORE INFORMATION
- 5) HIGH PRESSURE STATION IN ADWANTEC'S DELIVERY

STANDARD CABLE LENGTHS:

- CONTROL PANEL - FILTER 15m
- CONTROL PANEL - HYDRAULIC UNIT 15m
- HYDRAULIC UNIT - FILTER 15m

| | | |
|---|-----------------|-------------|
| MOTOR CONTROL 575VAC, 60Hz (MOTORS IN FILTER) | | -WU119.1 |
| | | -WU119.2 1) |
| HIGH PRE. CLOTH WASH PUMP, M119.1 | 22 kW | -W1119.1 1) |
| FREQUENCY CONVERTER, U119.1 | | |
| HIGH PRE. CLOTH WASH PUMP, M119.2 | 22 kW | -W1119.2 1) |
| FREQUENCY CONVERTER, U119.2 | | |
| HYDRAULIC UNIT, M1HU | 110kW 1800r/min | -WM1HU 1) |
| HYDRAULIC UNIT, M2HU | 15kW 1800r/min | -WM2HU 1) |
| OIL HEATER, R1HU | 3 kW | -WR1HU 1) |
| OIL COOLER FAN, M3HU | 3 kW 1800r/min | -WM3HU 1) |
| CAKE POPPING DEVICE, M24 | 6,3kW | -W124 1) |

CONTROL CABIN X1

S780
S708
S710
S700
S733
S755
S701

LOGIC: Allen Bradley Control Logix
I/O: Beckhoff
OIU: Allen Bradley Panel View 1000 ALL.2711P-T10C4D8

HH-UNIT

S702
S714
S723
S725

HIGH PRESSURE STATION 5)

JUNCTION BOX JBI

U119.1 Q119.1 M119.1 3~ S429 S449
U119.2 Q119.2 M119.2 3~ S439 Y49 S459 B492

HYDRAULIC UNIT

PS1HU PS2HU PT1HU PT2HU TS1HU LT1HU TT1HU PCV1HU FCV1HU

M1HU 3~ M2HU 3~ R1HU 3~ M3HU 3~

Q1HU 3~ Q2HU 3~ Q3HU 3~

TERMINAL BOX X5

B525 1)
B524 1)
B924 1)
S705

TERMINAL BOX X2

-W202
-W802
-W811
-W814
-W815
-W207 X207 X209 -W209
-W505
-W405
-WJB1 1)
-WJB1.1 1)

TERMINAL BOX X12

-W412
-W816
-W208 X208 (X790)
-W790 S790
Y51
Y52
Y81
Y82
Y91
Y92
S707
-W715
Y101
Y102
Y34
S141
S142
S134
S234
S741
S742

TERMINAL BOX X12

-W422
-W522
Y05 S332
Y06 S532
CV16 S838A
Y27 S839A
Y41 B331
Y42 B415
Y61 B503
Y62 B504
Y511 B505
S105
S205
S106
S206
S127
S227

TERMINAL BOX X22

S161
S162
S163
S164
S261
S262
S263
S264
S865
B534

TERMINAL BOX X32

-W432
-W532
-W832
-W813
-W822
Y02 S801
Y07 S802
Y09 S803
Y12 S804
Y17
S102 S806
S202 S807
S107 S808
S207 S809
S109 S143
S209 S144
S112
S212
S117
S217
S531
B419
B491
S103 S124
S203 S224

JUNCTION BOX JB2

-WJB2 1)
Y10
S110
S210

PNEUMATIC BOX X13

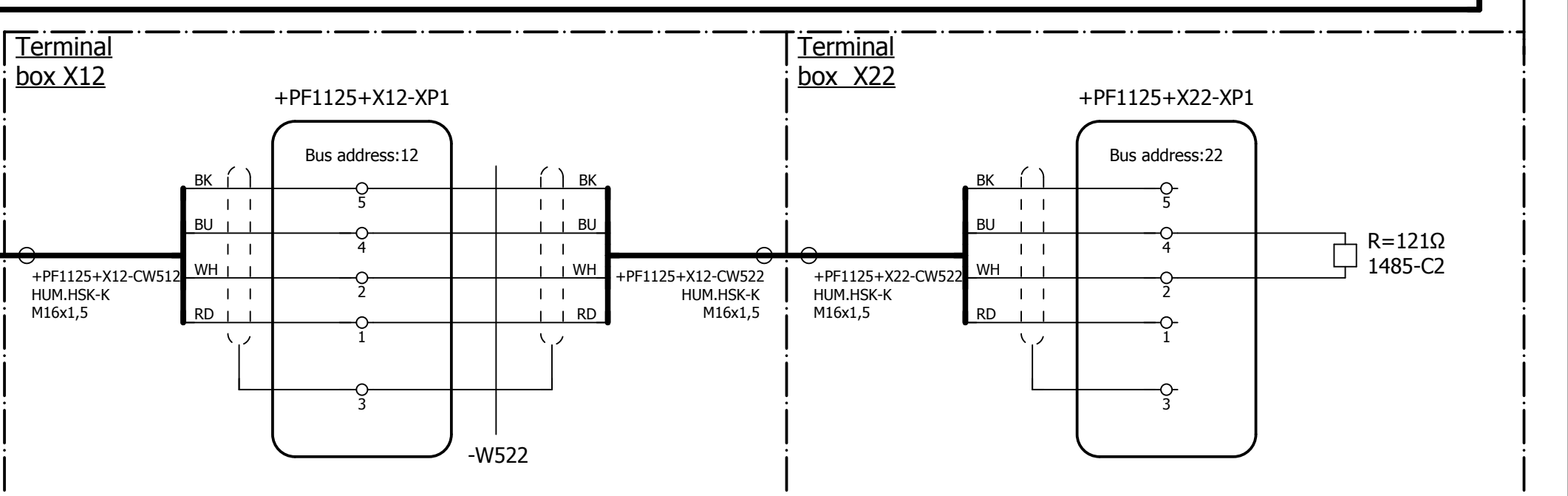
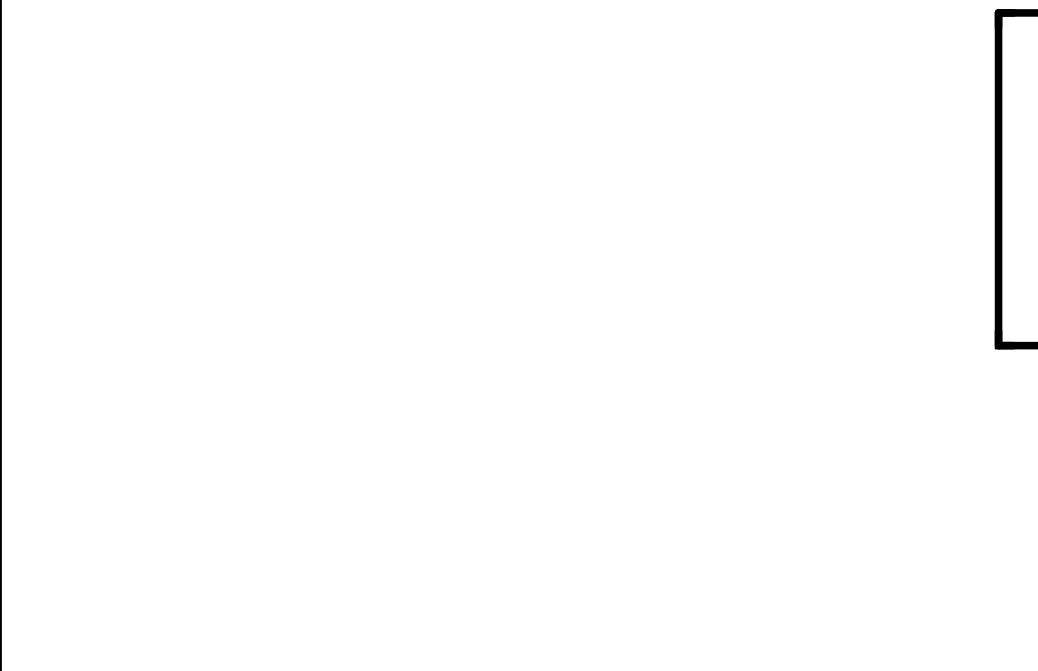
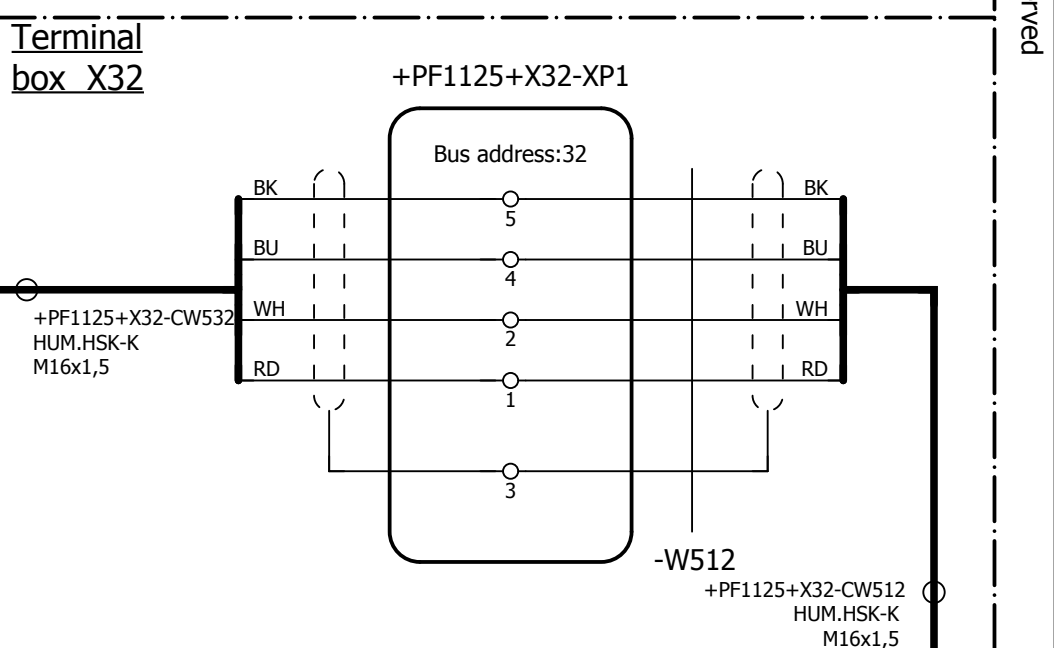
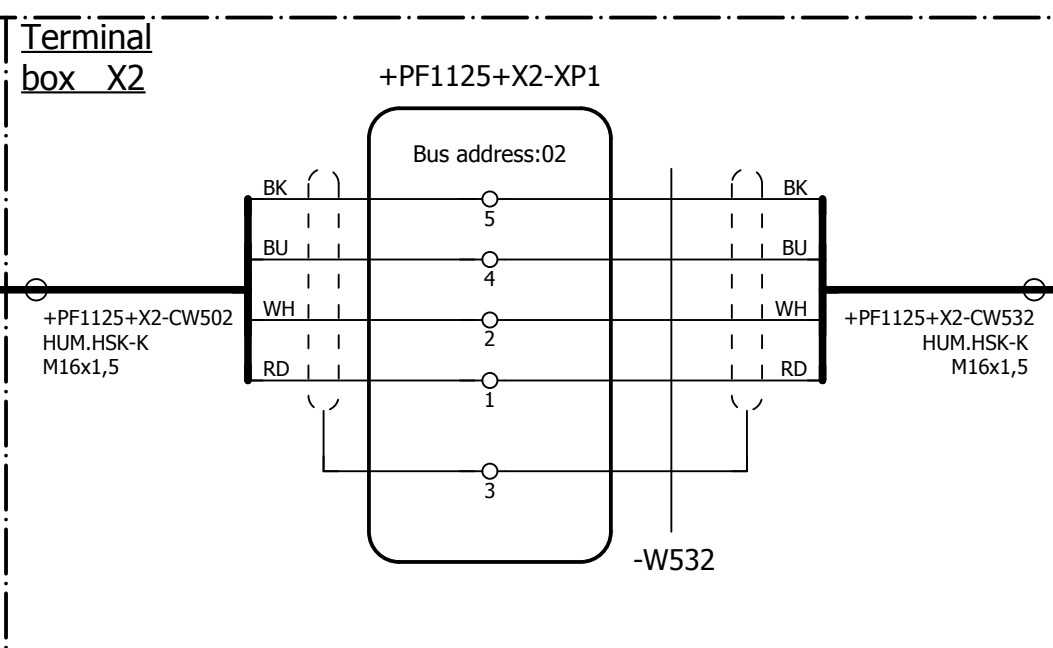
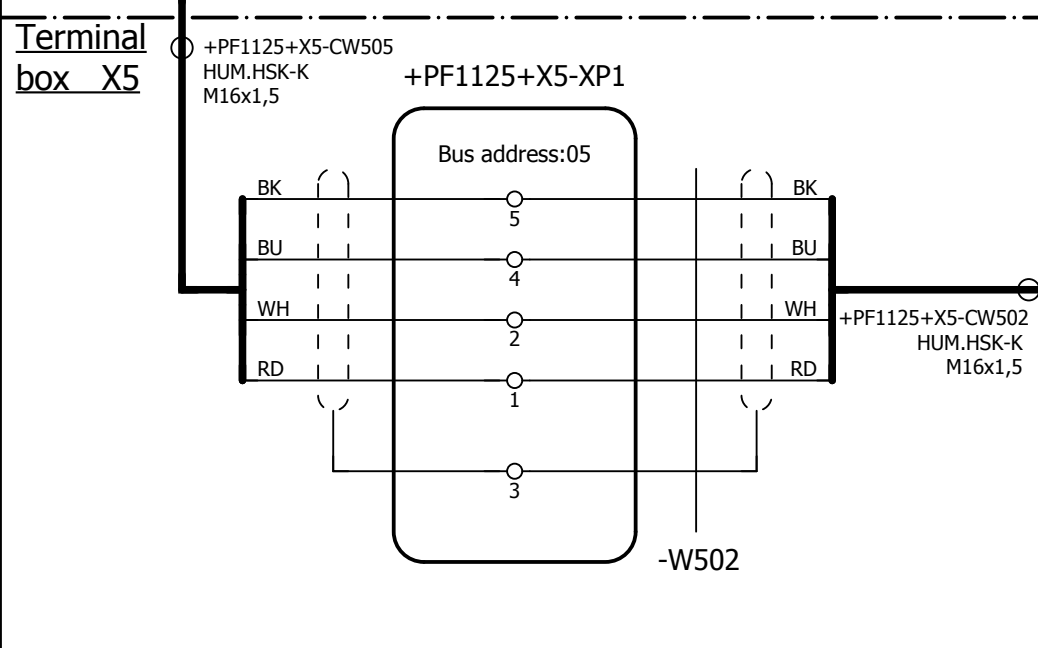
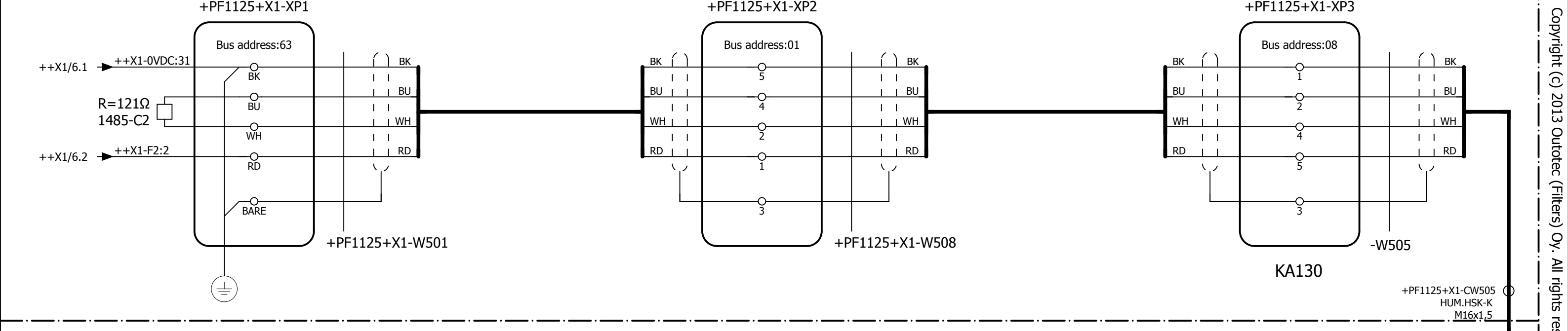
S418
Y03
Y04
Y14
Y24

B**/S**/Y** =24VDC
-W202=120VAC POWER SUPPLY
-W4**=24VDC POWER SUPPLY
-W5**=BUS CABLING
-W7**/W8**=EMERGENCY STOP CABLING

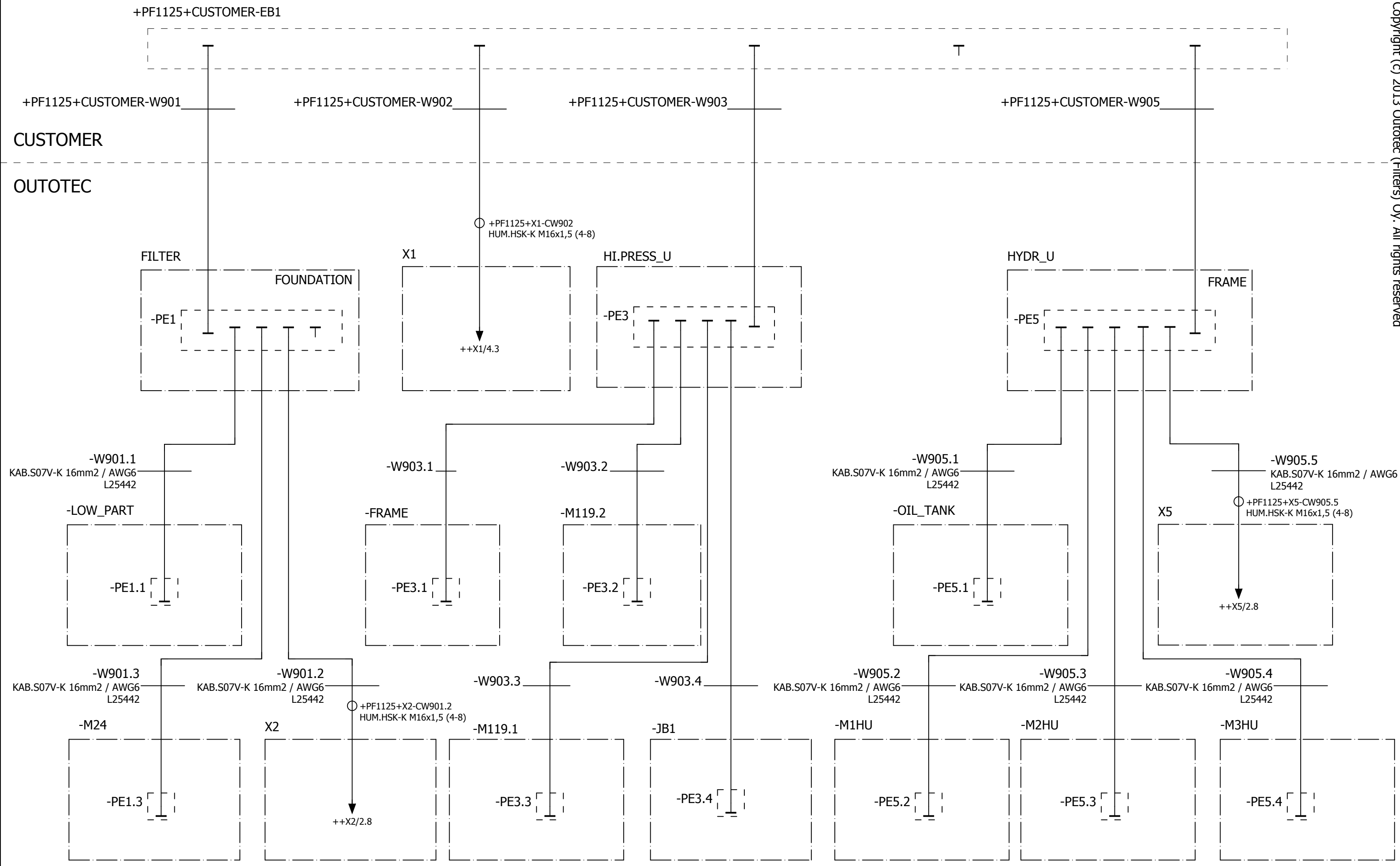
CUSTOMER ← OUTOTEC →



Control cabinet X1

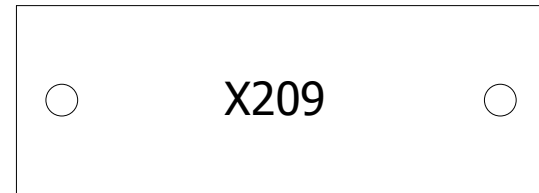
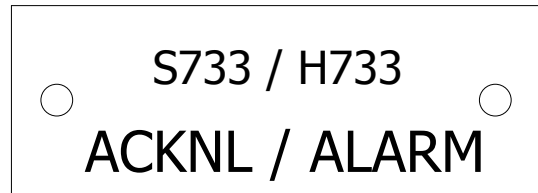
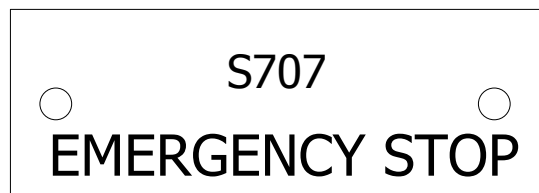
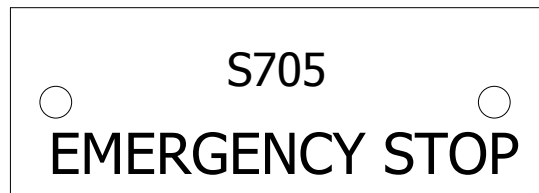
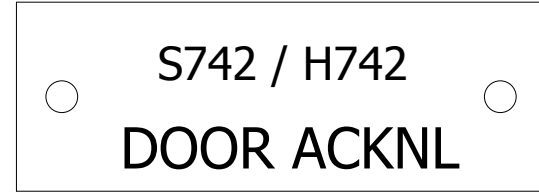
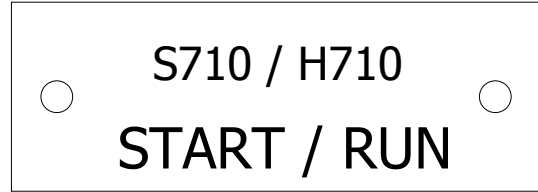
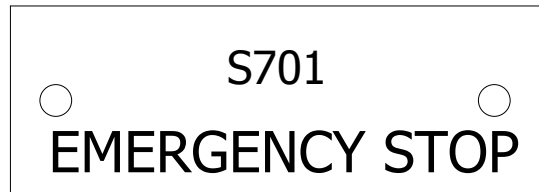
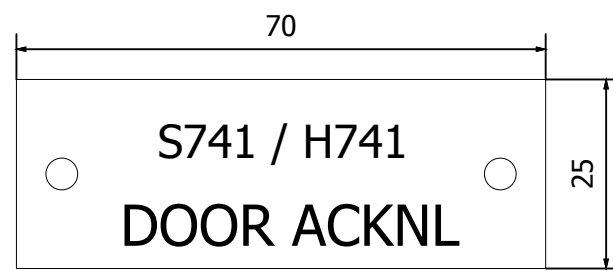
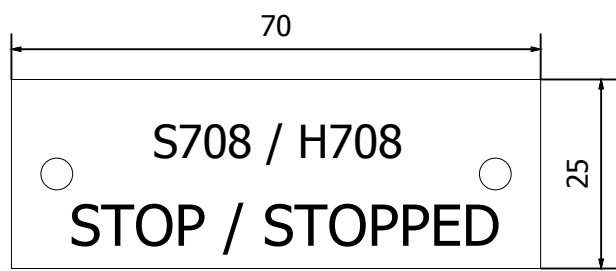
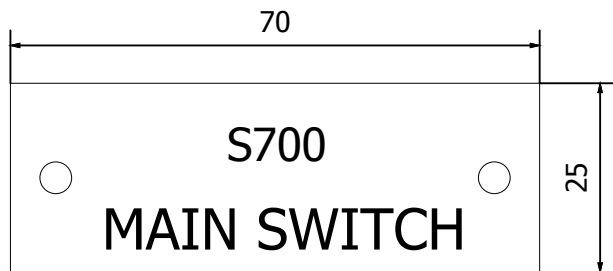


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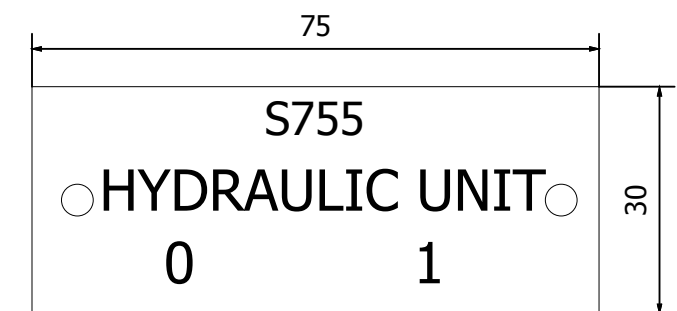
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|--------|--|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|----------------|--|-------------|-------------------|----------------|-----------|----------|----|
| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | Outotec | Page description Grounding diagram for filter | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | F1 |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | | | Serial no | = PF1125 | Drawing number | F673035 | Page | 4 |
| REV. C | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | Location | + PF1125+F1 | | | | |
| REV. D | | REV. H | | | | APPR | | | | | | | | | | |

X1

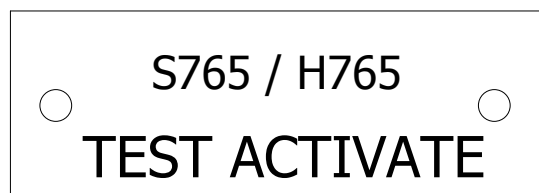
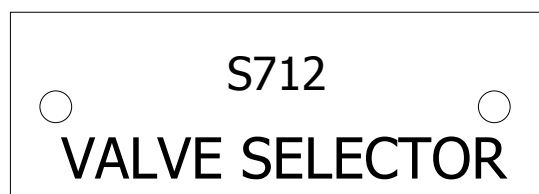
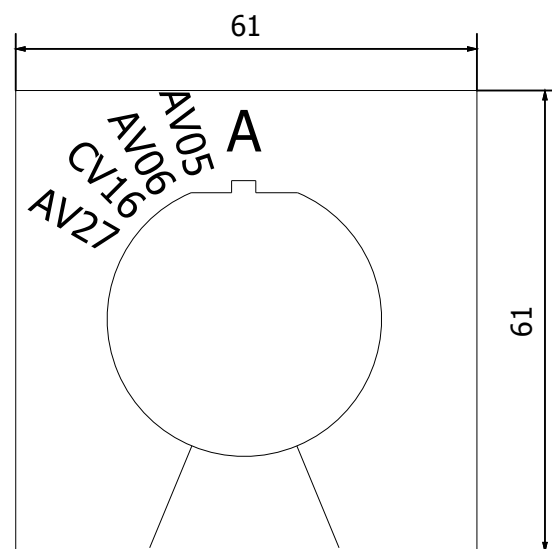
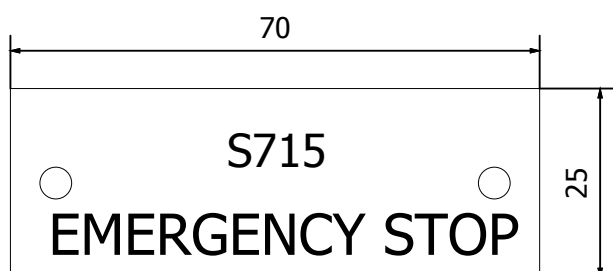


ENGLISH

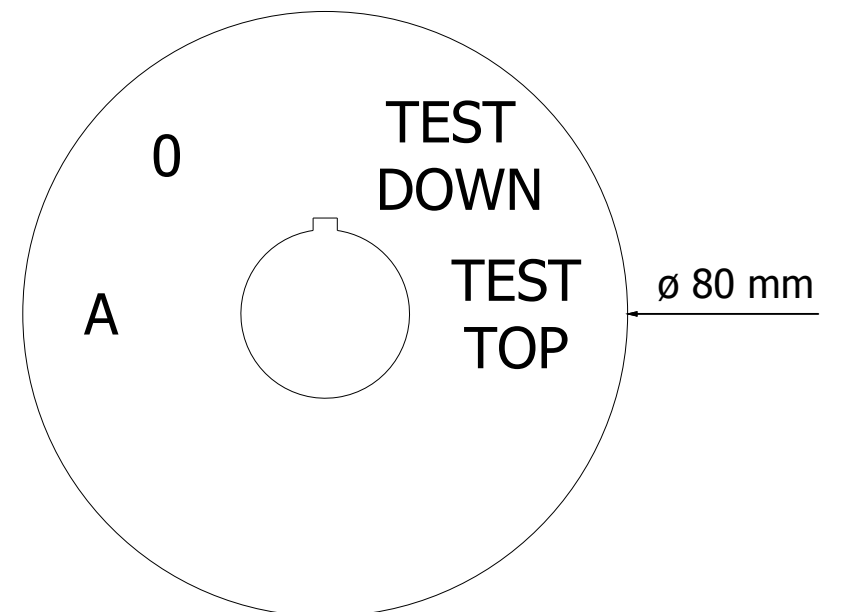
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 TEXT STYLE: WHITE LABEL, BLACK TEXT
 EMERGENCY STOP: RED TEXT

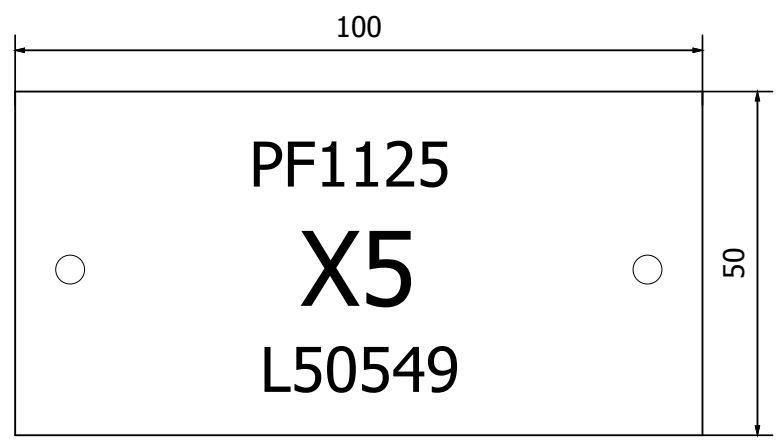
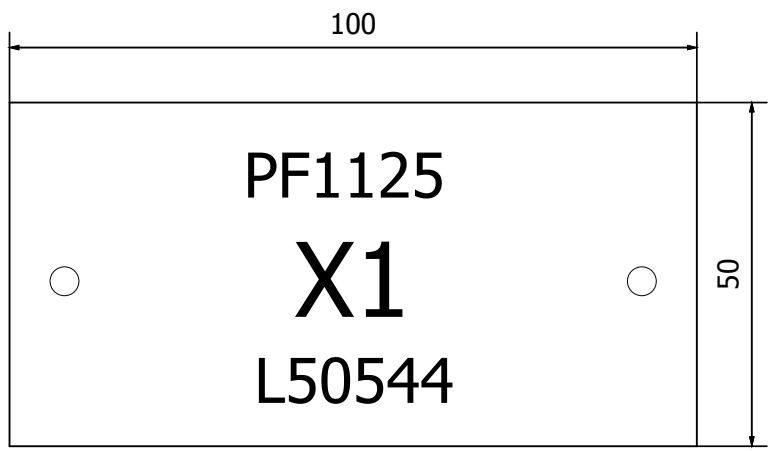


X12



Note :
 Labels material: Stainless Steel
 Fixing hole: \varnothing 4.2mm
 Text color: black
 Text: etched or burned by laser
 Fixing: by rivets or screws

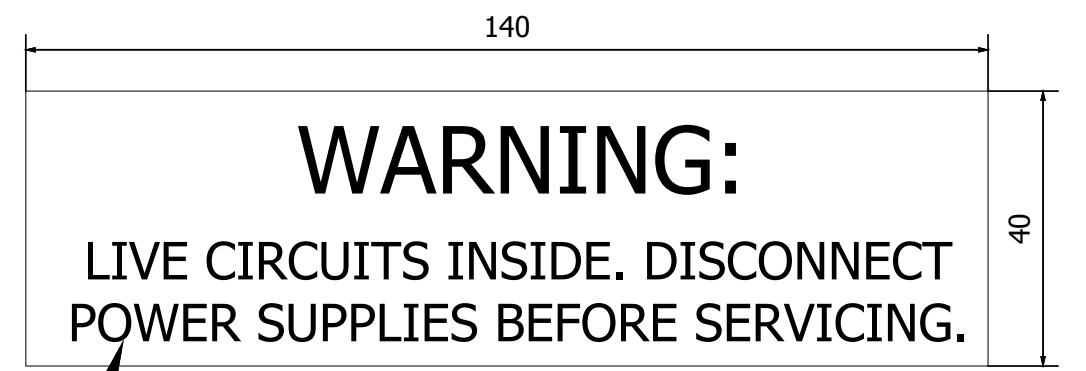
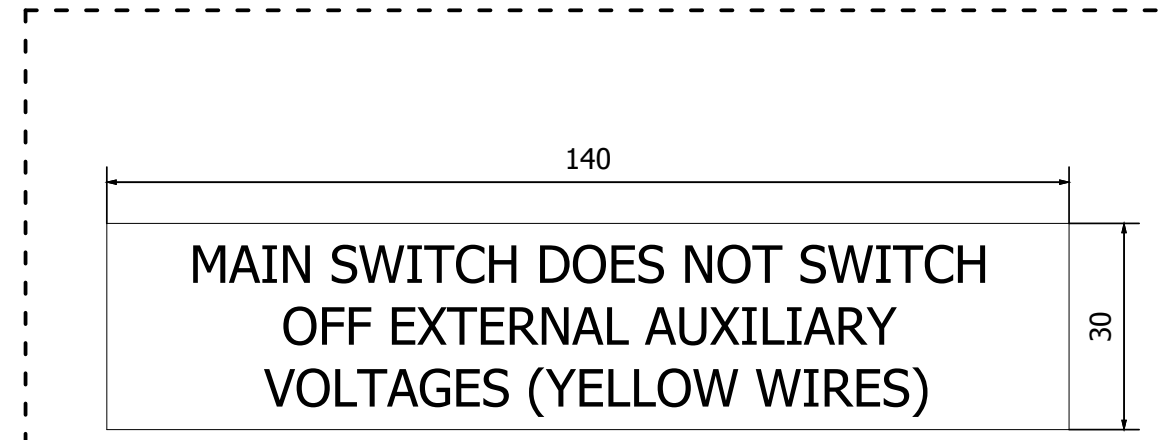
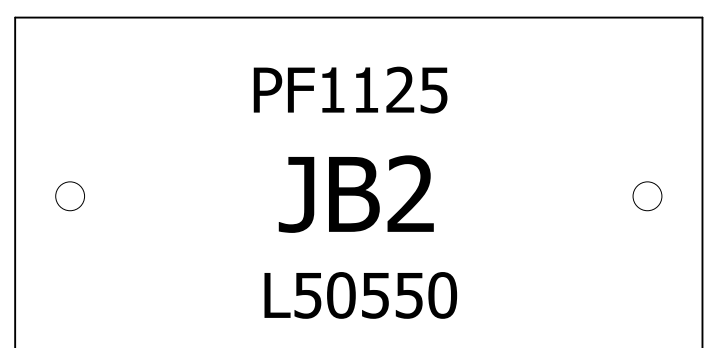
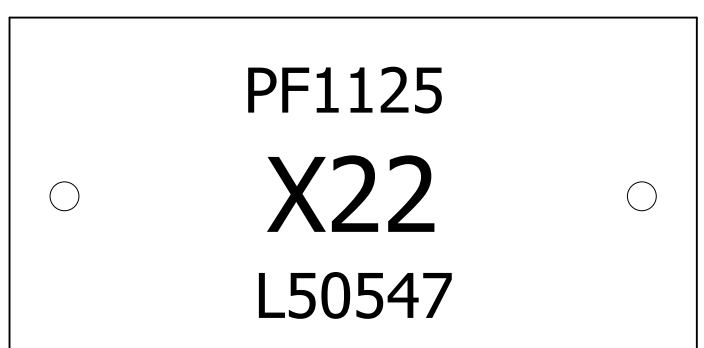
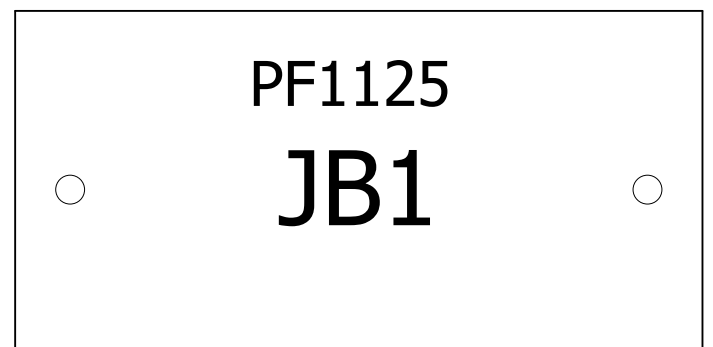
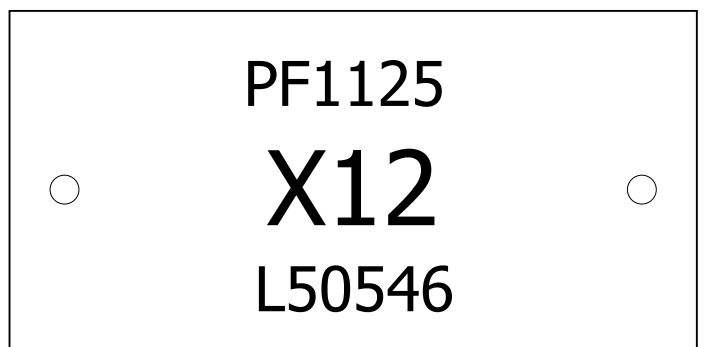
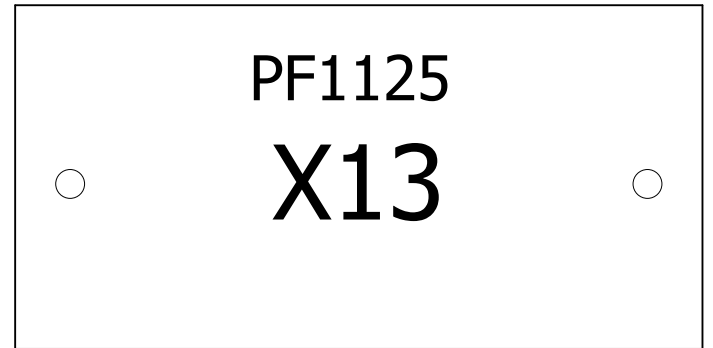
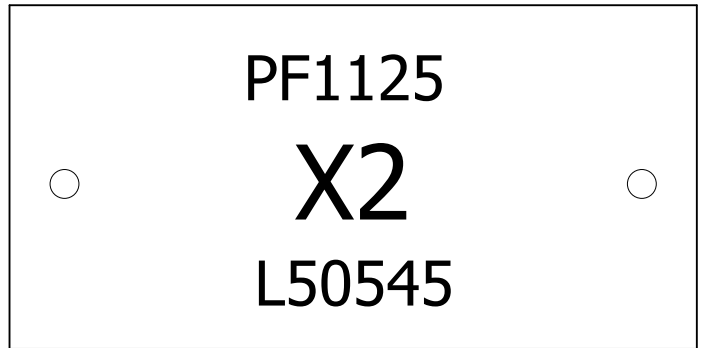




ENGLISH

TEXT FONTS: 4mm 6mm **10mm**
 TEXT STYLE: WHITE LABEL, BLACK TEXT
 EMERGENCY STOP: RED TEXT

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BACKGROUND: YELLOW RAL 1003
TEXT: BLACK

Note :
Labels material: Stainless Steel
Fixing hole: ø4.2mm
Text color: black
Text: etched or burned by laser
Fixing: by rivets or screws

Note :
Labels material: Plastic

| | | | | | | | | | | | | | | | | | |
|--------|--|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|---------------|----------------|------------------|-------------|-------------------|----------------|-----------|----------|----|
| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | | Outotec | Page description | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | F1 |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | Labels | | Serial no | = PF1125 | Drawing number | F673035 | Page | 6 | |
| REV. C | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | Location | + PF1125+F1 | | | | | |
| REV. D | | REV. H | | | | APPR | | | | | | | | | | | |

ENGLISH

STICKERS:

TEXT FONTS: 3mm **4mm**

TEXT STYLE: WHITE LABEL, BLACK TEXT

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X1

64

38

1pce

X1

64

38

1pce

X2

64

38

1pce

X5

64

38

1pce

X12

64

38

1pce

JB1

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1pce

X22

64

38

1pce

JB2

64

38

1pce

X32

64

38

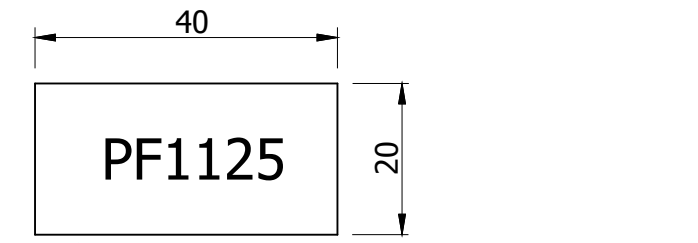
1pce

| | | | | | | | | | | | | | | | | | |
|--------|--|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|------------|--|------------------|-------------|-------------------|----------------|-----------|----------|----|
| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | | | Page description | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | F1 |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | CSA Labels | | Serial no | = PF1125 | Drawing number | F673035 | Page | 7 | |
| REV. C | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | Location | + PF1125+F1 | | | | | |
| REV. D | | REV. H | | | | APPR | | | | | | | | | | | |

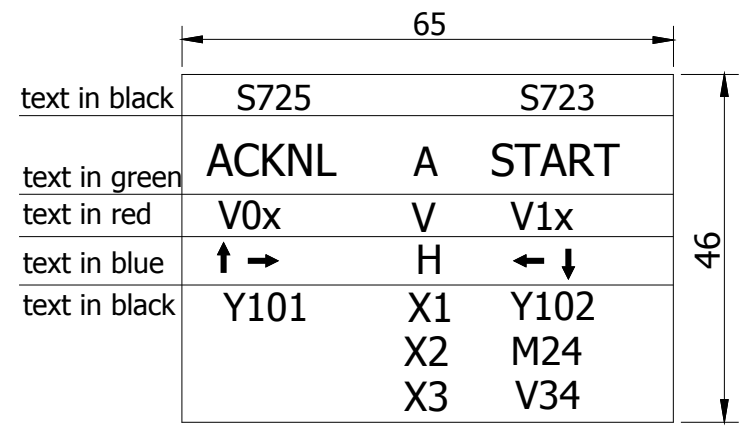
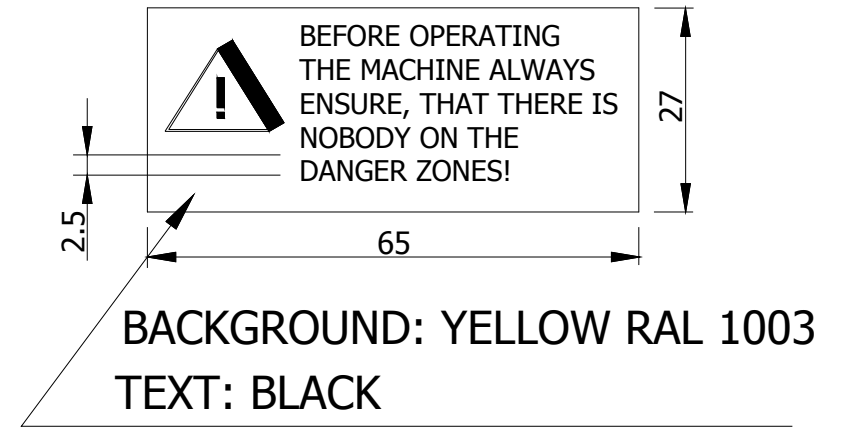
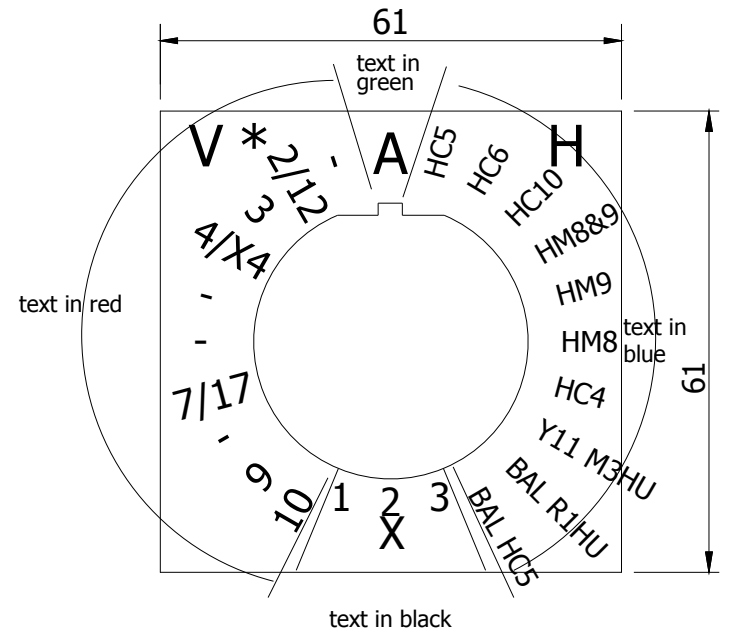
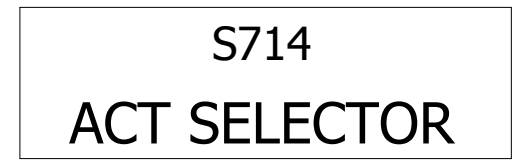
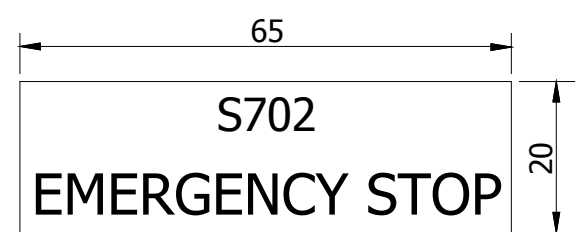
ENGLISH

TEXT FONTS: 4mm 6mm **10mm**

TEXT STYLE: WHITE LABEL, BLACK TEXT
EMERGENCY STOP: RED TEXT



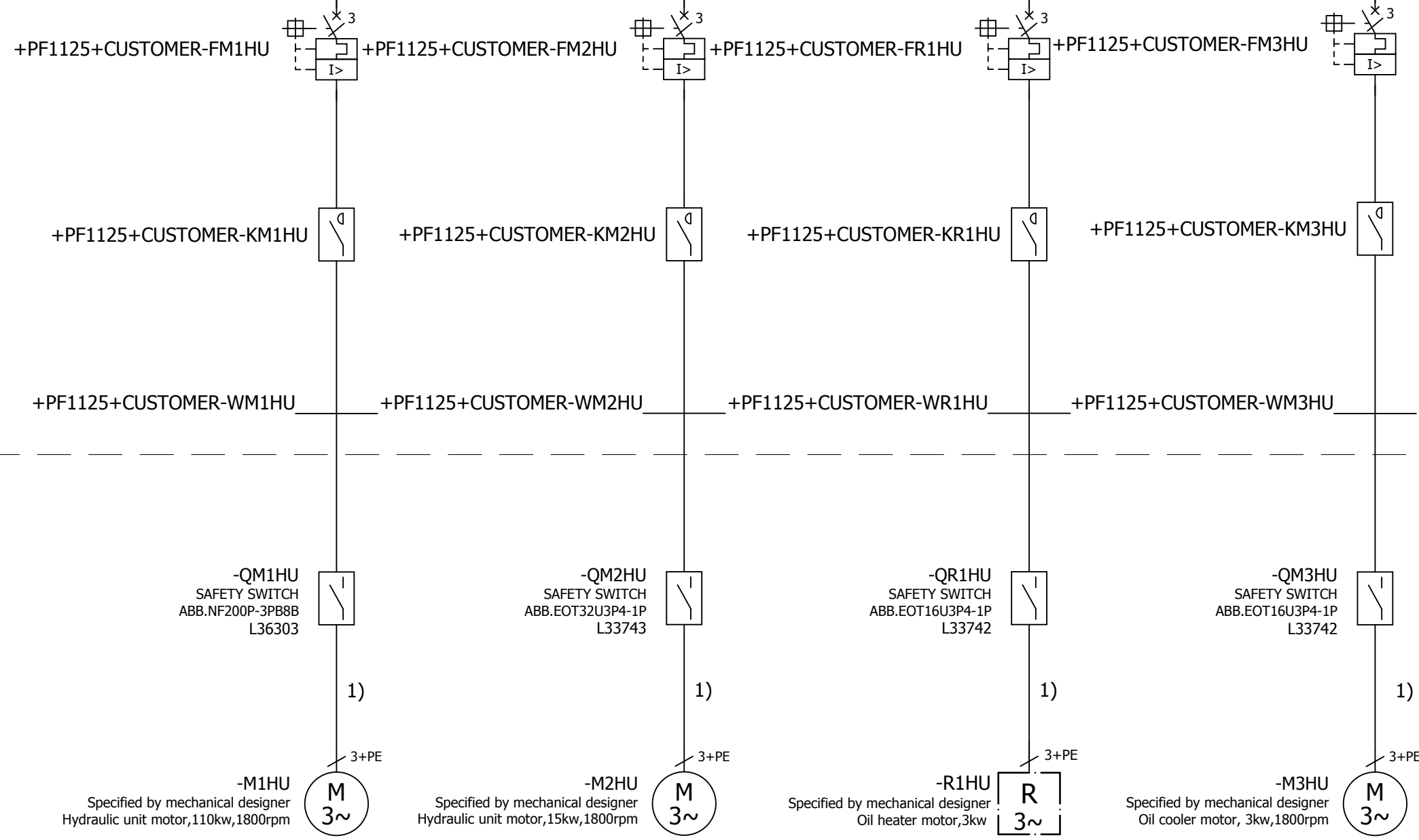
TO HANDHELD UNIT (HANDLE)



Note :
Labels material: Plastic

CUSTOMER'S DISTRIBUTION BOARD (CUSTOMER'S MAIN VOLTAGE, 3-PHASE)

575VAC, 60Hz



CUSTOMER

OUTOTEC

NOTE: CABLING DETAIL SPECIFIED BY CUSTOMER

1) CABLES IN CUSTOMER'S DELIVERY

| | | | | | | | | | | | | | | | | |
|--------|--|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|----------------|---|-------------|-------------------|----------------|-----------|----------|----|
| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | Outotec | Page description Motors, single line diagram | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | F1 |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | | | Serial no | = PF1125 | Drawing number | F673035 | Page | 9 |
| REV. C | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | Location | + PF1125+F1 | | | | |
| REV. D | | REV. H | | | | APPR | | | | | | | | | | |

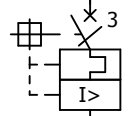
CUSTOMER'S DISTRIBUTION BOARD (CUSTOMER'S MAIN VOLTAGE, 3-PHASE)

575VAC, 60Hz

CUSTOMER

OUTOTEC

+PF1125+CUSTOMER-F024



+PF1125+CUSTOMER-K024



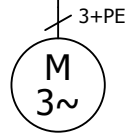
+PF1125+CUSTOMER-W124

-Q24
SAFETY SWITCH
ABB.EOT16U3P4-1P
L33742



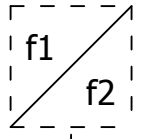
1)

-M24
Specified by mechanical designer
Cake popping device, M24, 6,3kW



+PF1125+CUSTOMER-W1119.1

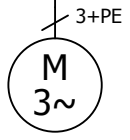
-U119.1
FREQUENCY CONVERTER



-Q119.1
SAFETY SWITCH



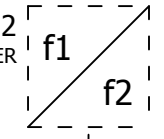
-M119.1
Specified by mechanical designer
High pre. cloth wash pump 1, M119.1, 22kW



HIGH PRESSURE STATION 2)

+PF1125+CUSTOMER-W1119.2

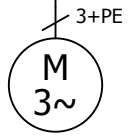
-U119.2
FREQUENCY CONVERTER



-Q119.2
SAFETY SWITCH



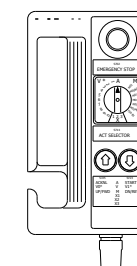
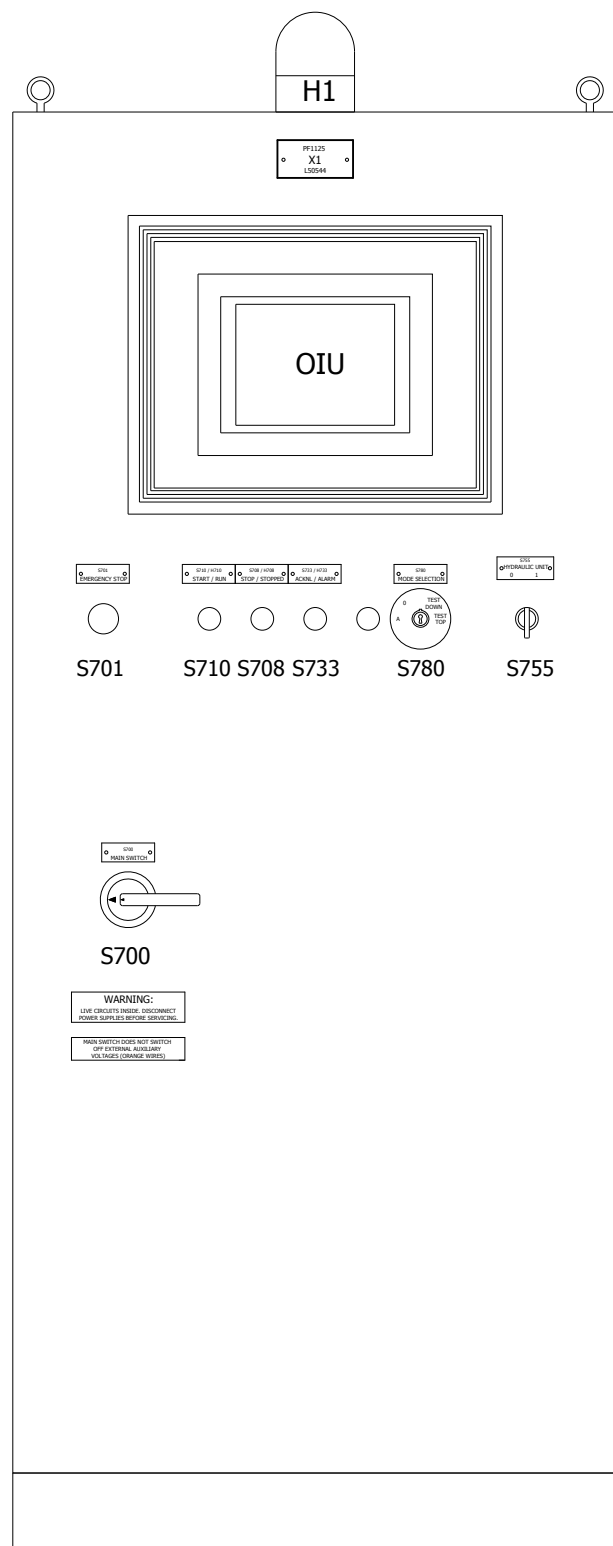
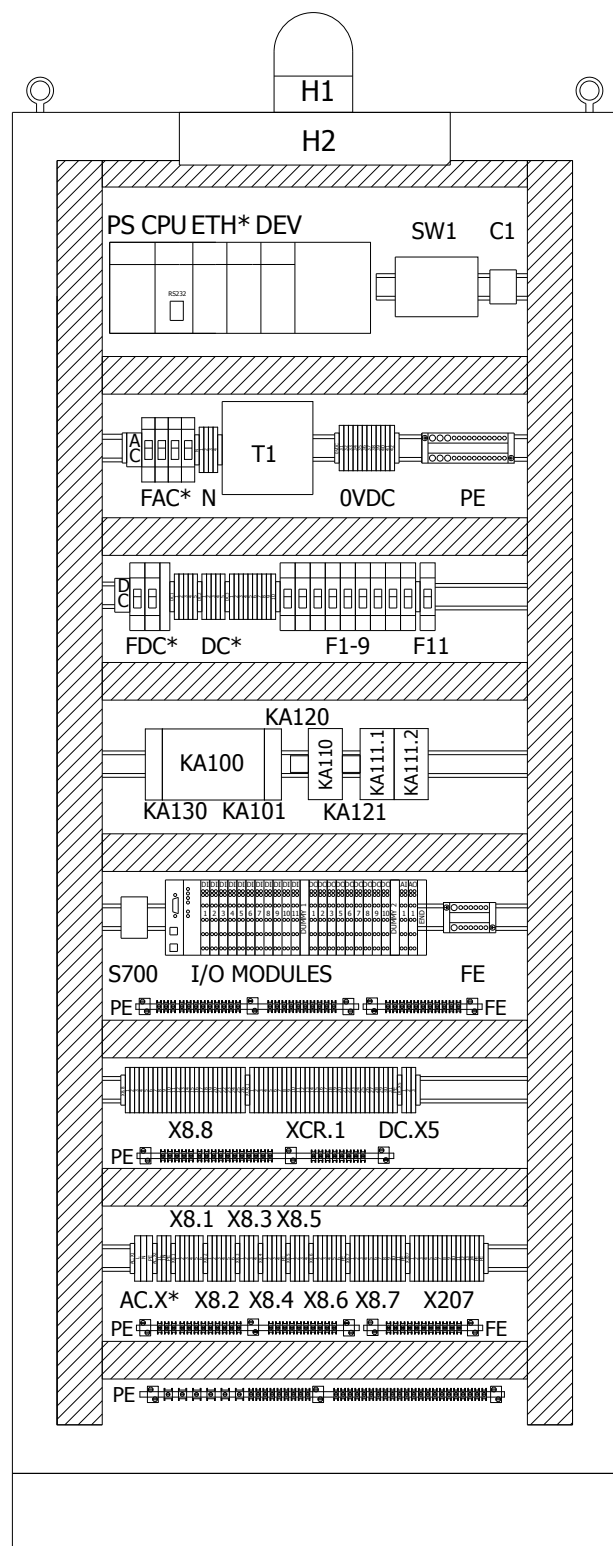
-M119.2
Specified by mechanical designer
High pre. cloth wash pump 2, M119.2, 22kW



NOTE: CABLING DETAIL
SPECIFIED BY CUSTOMER

- 1) CABLES IN CUSTOMER'S DELIVERY
- 2) HIGH PRESSURE STATION IN ADWANTEC'S DELIVERY

| | | | | | | | | | | | | | | | | | |
|--------|--|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|----------------|------------------|-----------------------------|-------------------|----------------|----------------|----------|------|----|
| REV. A | | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | Outotec | Page description | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | F1 | |
| REV. B | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | | | Motors, single line diagram | Serial no | = PF1125 | Drawing number | F673035 | Page | 10 |
| REV. C | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | | Location | + PF1125+F1 | | | | |
| REV. D | | REV. H | | | | APPR | | | | | | | | | | | |



HANDHELD-UNIT

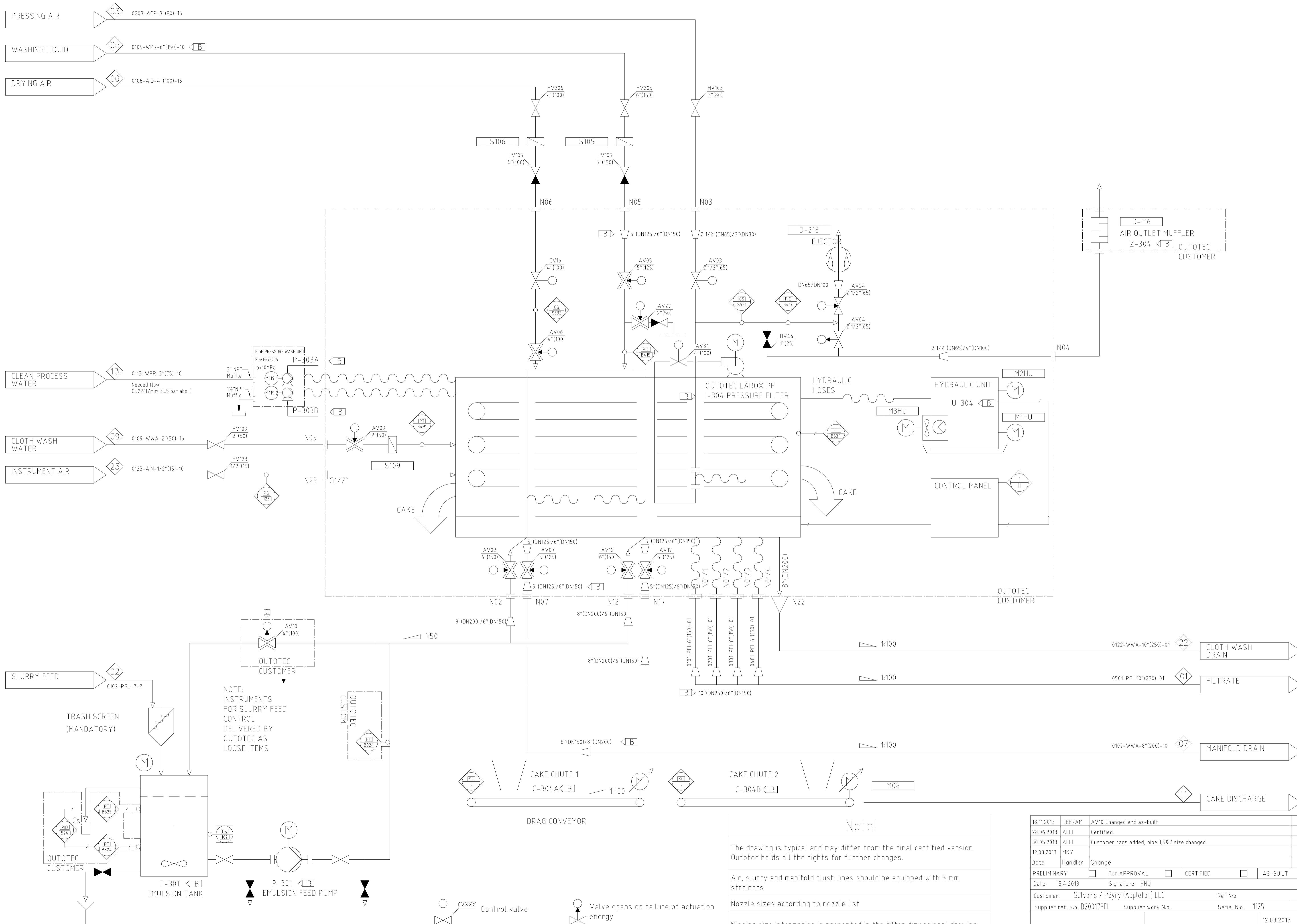
- PS = LOGIC POWER SUPPLY
- CPU = LOGIC CPU
- ETH* = ETHERNET CARD
- DEV = DEVICENET CARD
- H1 = ALARM BEACON
- H2 = CABIN LIGHT / SOCKET
- OIU = OPERATOR INTERFACE UNIT
- SW1 = ETHERNET SWITCH
- FAC* = 120VAC VOLTAGE DISTRIBUTION
- N = NEUTRAL FOR 120VAC
- C1 = COUNTER
- T1 = POWER SUPPLY 24 VDC
- FDC* = 24VDC VOLTAGE DISTRIBUTION
- DC* = VOLTAGE SUPPLY 24VDC TERMINALS
- DC.X5 = TERMINALS FOR X5 POWER SUPPLY
- OVDC = TERMINALS FOR 0VDC
- F1-9, 11 = VOLTAGE DISTRIBUTION 24VDC (AUTOMATIC FUSES)
- KA1** = EMERGENCY STOP / SAFETY CIRCUITS RELAY
- AC.X* = VOLTAGE SUPPLY
- X8.* = TERMINALS FOR EMERGENCY STOP CIRCUITS
- X207 = TERMINALS FOR CONNECTORS
- PE/FE = GROUNDING TERMINAL
- I/O MODULES = I/O MODULES IN CONTROL CABIN
- XCR.1 = TERMINALS FOR CUSTOMER
- S700= MAIN SWITCH
- S701 = EMERGENCY STOP PUSH-BUTTON
- S708 = STOP PUSH-BUTTON
- S710 = START PUSH-BUTTON
- S733 = ALARM RESET PUSH-BUTTON
- S755 = HYDRAULIC UNIT MODE SWITCH
- S780 = MODE SELECTION (AUTOM. - TEST MODE)

PANEL MEASURES: (800x1800x400)mm+ SOCLE (800x100x400)mm
 MATERIAL:AISI316, IP66, NEMA4X
 SINGLE DOOR FLOOR STANDING CABINET
 APPROVALS: CE, TÜV, (cUL, UL, Ex, RINA)

| | | | | | | | | | | | | | | | | | |
|--------|------------|-----|--------|--|--------------|-------------------------------------|------|------------|---------------------------------|----------------|--|-------------|-------------------|----------------|-----------|----------|----|
| REV. A | 09.04.2014 | CRF | REV. E | | PRELIMINARY | <input type="checkbox"/> | DATE | 26.03.2013 | Customer name | Outotec | Page description Control cabin layout, LOG-AB | Filter type | PF 96/96 M48 2 60 | Project number | B200186FI | Location | X1 |
| REV. B | | | REV. F | | FOR APPROVAL | <input type="checkbox"/> | DRN | CRF | SULVARIS / PÖYRY (APPLETON) LLC | | | Serial no | = PF1125 | Drawing number | F673035 | Page | 2 |
| REV. C | | | REV. G | | CERTIFIED | <input checked="" type="checkbox"/> | CHD | CSC | | | | Location | + PF1125+X1 | | | | |
| REV. D | | | REV. H | | | | APPR | | | | | | | | | | |

10.10 Diagrams

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|



NOTE:
INSTRUMENTS
FOR SLURRY FEED
CONTROL
DELIVERED BY
OUTOTEC AS
LOOSE ITEMS

Note!

The drawing is typical and may differ from the final certified version. Outotec holds all the rights for further changes.

Air, slurry and manifold flush lines should be equipped with 5 mm strainers

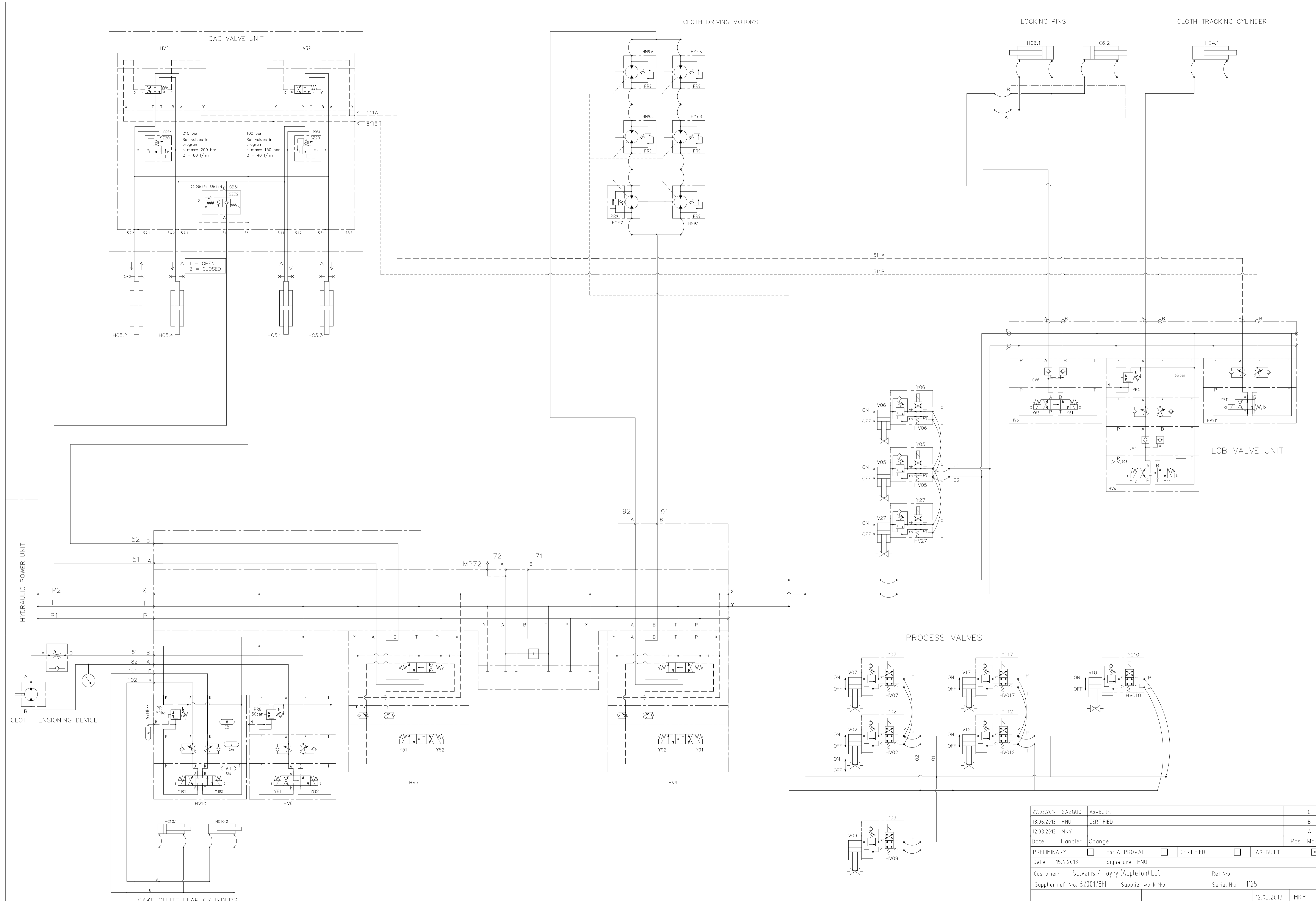
Nozzle sizes according to nozzle list

Missing size information is presented in the filter dimensional drawing

Pressing air line shall be equipped with a safety valve

| | | | | | | | |
|-------------------|---------------------------------|---|--------------------------|------------|--------------------------|----------|-------------------------------------|
| 18.11.2013 | TEERAM | AV10 Changed and as-built. | | D | | | |
| 28.06.2013 | ALLI | Certified. | | C | | | |
| 30.05.2013 | ALLI | Customer tags added, pipe 1,5&7 size changed. | | B | | | |
| 12.03.2013 | MKY | | | A | | | |
| Date | Handler | Change | | Pcs Mark | | | |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> | AS-BUILT | <input checked="" type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | | | |
| Supplier ref. No. | B200178F1 | Supplier work No. | | Serial No. | 1125 | | |
| Outotec | | PI-DIAGRAM | 12.03.2013 | MKY | | | |
| | | PF1125 | 1:1 | T-A1 | | | |
| | | PE 96/96 M48 2 60 | F673033 | | | | D |

- CVXXX Control valve
- AVXXX Automatic On-Off valve
- Valve opens on failure of actuation energy
- Valve closes on failure of actuation energy



| | | | | | | | |
|-------------------|---------------------------------|-------------------|--------------------------|------------|--------------------------|----------|-------------------------------------|
| 27.03.2014 | GAZGUO | As-built | | | C | | |
| 13.06.2013 | HNU | CERTIFIED | | | B | | |
| 12.03.2013 | MKY | | | | A | | |
| Date | Handler | Change | | | Pcs Mark | | |
| PRELIMINARY | <input type="checkbox"/> | For APPROVAL | <input type="checkbox"/> | CERTIFIED | <input type="checkbox"/> | AS-BUILT | <input checked="" type="checkbox"/> |
| Date: | 15.4.2013 | Signature: | HNU | | | | |
| Customer: | Sulvaris / Pöyry (Appleton) LLC | | Ref No. | | | | |
| Supplier ref. No. | B200178F1 | Supplier work No. | | Serial No. | 1125 | | |
| Outotec | | HYDRAULIC DIAGRAM | 12.03.2013 | MKY | | | |
| | | PF1125 | 1:1 | T-A1 | | | |
| | | PF 96/96 M48.2.60 | F673065 | | | | |

Glossary

| | | | | | | |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|
| Project ID: B200186FI | Plant Code: [ENH01] | Plant Unit Code: [DA01] | Document Type: [PFB02] | Running No: [00001] | Revision: B | Outotec Document ID: DOC36460-B |
|--------------------------|------------------------|----------------------------|---------------------------|------------------------|----------------|------------------------------------|



Outotec

Outotec Oyj
P.O. Box 86
FI-02201 Espoo

Tel +358 (0) 20 529 211
www.outotec.com
E-Mail info@outotec.com