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1. General

Thank you for buying a Svendborg Brakes product.
Before using the product please read this manual carefully.

1.1 Who to contact

In case you have any questions to this manual please contact your local representative or nearest Svendborg Brakes Office:

Svendborg Brakes offices:

Denmark:
Jernbanevej 9, DK-5882 Vejstrup
Phone: +45 63 255 255
E-mail: sb@svendborg-brakes.com

Germany:
Kirchnerstrasse 42, DE-32257 Bünde
Phone: +49 52 23 685 4011
E-mail: sb@svendborg-brakes.de

Spain:
C/San Benito 24, 1B, E-42001 Soria
Tel +34 975 233 655
E-Mail sb@svendborg-brakes.es

USA:
100 Park Avenue West #2106
Denver, CO 80205
USA
Phone: +1 303 285 1271
E-mail: sb@svendborg-brakes.us

or visit us at:
www.svendborg-brakes.com

1.2 Safety

The Svendborg Brakes brake line of products are designed to be mounted on a rotating brake disc for use in conjunction with parking brake applications and or service brake applications only.

Note:

- Always make sure that you consult Svendborg Brakes A/S before using tools or any other equipment not recommended in this manual
- Always use original spare parts from Svendborg Brakes A/S.
- It is the customer's responsibility that the brake and hydraulic aggregate are always clean, and free from dirt, grease or oil.
- It is the customer's responsibility that the air gap between brake pads and brake disc never exceeds the air gap recommended.
- Always use a torque wrench when refitting mounting bolts or valves in order to ensure the torque obtained is the torque described in this manual.
- Always be sure that the brake disc is locked and not able to rotate before adjusting the air gap.
- There should be one manual available for the service / maintenance crew as a minimum.
- Do not perform any work on the products before the manual has been read and understood.

Hydraulic aggregate / hydraulic power unit:

- Do not operate the hydraulic aggregate before correctly filling the reservoir / oil tank with oil.
- Do not adjust valves or pressure switches to higher operating pressure than specified in the manual.
- Do not change the size or type of components.
- Do not use hydraulic fluids not recommended in this manual.

Brakes:

- Do not operate the brake before removing the air from the hydraulic system by bleeding and then re-filling with oil.
- Do not use higher operating pressures than specified on the nameplate of the brake/or in the manual.
- Do not change the size or type of spring pack.
- Do not use the brake pads when they are worn to the minimum thickness as shown in the manual.
- Do not operate the brake if there is dirt or corrosion on brake disc or on brake pads.
- Do not try to adjust the brake or remove it, before securing the brake disc from rotating.
- Do not work on a spring applied brake without locking / securing the piston by using the air gab bolt / nut.

1.3 Conventions used in this manual

To make sure that you perform certain tasks properly, please take note on the following symbols used throughout this manual.

WARNING: Information to prevent injury to yourself when trying to complete a task.

CAUTION: Information to prevent damage to the components when trying to complete a task.

IMPORTANT: Information that you MUST follow to complete a task.

NOTE: Tips and additional information to aid in completing a task.

1.4 Disclaimer

Svendborg Brakes A/S reserves the right to revise this document without prior notification. These documents have been proofread for errors in translation and accuracy. Despite this, technical and typographical deviations can sometimes occur.

This document is updated on a regular basis; changes will be published in future printings. Improvements and/or changes to the described products or manual can be implemented at any time without preceding notice.

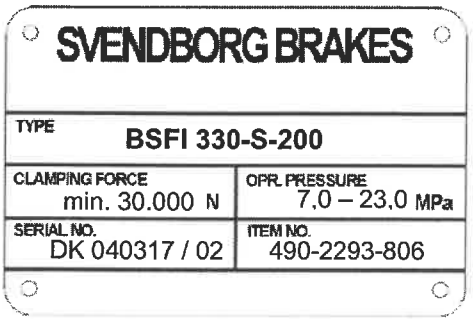
In no event shall Svendborg Brakes A/S be liable for any special, incidental, consequential or punitive damages.
This includes, but is not limited to: damage to other property or person, inconvenience, loss of goodwill, lost profits or revenue, loss of use of this product or any associated equipment, cost of substitutive equipment, downtime costs or claims of any party dealing with purchaser for such damages, resulting from any misspellings or inaccurate information in this users guide.

This document or parts hereof may in no event be copied, reproduced, changed or translated to other languages without express written permission from Svendborg Brakes A/S.

1.5 Nameplate / Serial-numbers

Before contacting Svendborg Brakes A/S or your local reseller please record the serial number of the product.
This will ease the process of identifying the actual product supplied and will help in locating eventual problems.

1.5.1 Brakes - reading the nameplate
The nameplate is located on the brake and should look like this:



Naming of the brake:
"TYPE"
The type is the description (name) of the brake. Our brakes are named after following nomenclature:

BSFI 300-X-XXX

BS	=	Brake system
F	=	Fail-safe – spring applied/hydraulic released
I	=	Brake version
300	=	Clamping force – 330 = 30,000 N
X	=	Finish (S/R) (Standard / Offshore)
-XXX	=	Version / option number of the brake

Example:
BSFI 330-S-200 means a Dual Spring brake in the **BSFI 300** brake series with 30,000N in clamping force in Standard finish (**S**) in the option **200** which is equivalent to a brake with extended spring pack

Serial number:
The serial number is located on the nameplate at the label named "SERIAL NO."
The serial number is a unique number, which identifies the brake by the origin of the brake, the date produced (year month date) and the number in the series.

Example:
DK 040317 / 02 indicates this is brake number 02 produced in Denmark on March 17th in 2004
For tracking purposes the serial number is also written on the delivery note / invoice.

Other information on the nameplate:
"ITEM NO"
This shows the item number of the brake including the version number.

"CLAMPING FORCE" and "OPERATING PRESSURE"

The performance of the brake is shown by the clamping force provided.
The operating pressure has to ensure correct use of the brake.

Brakes with a spring set:
Spring applied fail safe brakes are marked with the minimum clamping force (nominal) provided and the minimum operating pressure (oil pressure) to ensure that the brake is lifted.

1.6 Conversion factors

All units in this manual are in metric units

If you have needs for conversion between metric and imperial units the following figures can be used.

Table 1.1

Conversion factors			
Length:			
1	Inch	= 25.4	mm (millimeter)
1	mm (millimeter)	= 0.0394	inch
Mass:			
1	kg (kilogram)	= 2.2046	lb (pound)
1	lb (pound)	= 0.4536	kg (kilogram)
Force:			
1	N (Newton)	= 0.2248	lbf. (pound force)
1	kN (kilo-Newton)	= 224.8089	lbf. (pound force)
Pressure:			
1	Bar	= 0.1	MPa (Mega Pascal)
1	Bar	= 14.5038	PSI (pound per square inch)
Torque:			
1	Nm (Newton meter)	= 0.7376	lbf.ft. (pound foot)
1	lbf.ft. (pound foot)	= 1.3557	Nm (Newton meter)

Example:
115 bar = 11.5 MPa = 1667.937 PSI

15 kNm = 11,064 lbf.ft.

1.7 Lubrication

Different types of lubrication are used in different situations.
This can be either for lubrication of the seals or disc springs during servicing or when tightening bolts of a diameter above 16 mm.

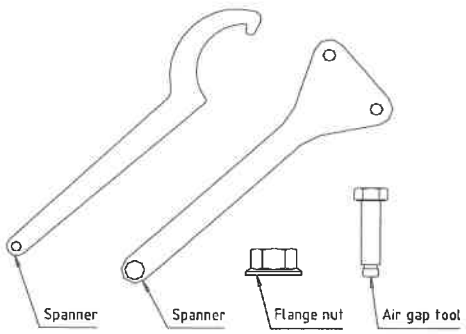
Some symbols are used on the drawing to indicate where lubrication is needed during service:

△ Grease – Molykote P74
□ Grease – Molykote B20
○ Hydraulic oil
MoS_2 Molybdenum Disulfide

Molykote is produced by Dow Corning.
Hydraulic oil can be synthetic or mineral oil as per recommended oil types.
Molybdenum Disulfide (MoS_2) can be in various forms; either spray, fluid or solid state.

1.8 Before starting

1.8.1 Please check that all the parts listed on the order have been delivered.



Example of tool kits

1.8.2 A tool kit is needed to be able to install the brake correctly. If a such has been ordered it should be included in the delivery. The same tool kit can be used for several brakes of the same type.

1.8.3 Any indicators that may have been ordered are not mounted on the brake but packed separately to avoid damage during transportation and mounting of the brake.

1.8.4 The brake pads have also been packed separately and should not be unpacked until immediately before mounting them.

1.8.5 All loose parts should be visually inspected to check they are intact after transport, and they should be removed before the brake is lifted from the transport crate.

1.8.6 The brake is marked with a label, which should be checked against the ordered items. The nameplate contains information on the type of brake, the serial number and the necessary working pressure of the brake.

1.8.7 If anything is missing from the delivery according to the ordered items, or if anything is damaged please contact the supplier immediately.

1.9 Disposal

General
The operator and / or user are responsible for the proper disposal of the brake and the associated components.
If any doubts about the correct disposal please do not hesitate to contact Svendborg Brakes or your local dealer or regional disposal enterprises for further information.

Brake pads
The brake pads are made of a steel back plate and some brake pad material / lining. The brake pad material is either made of an organic compound or of sintered metal
Either type is asbestos free and free of lead

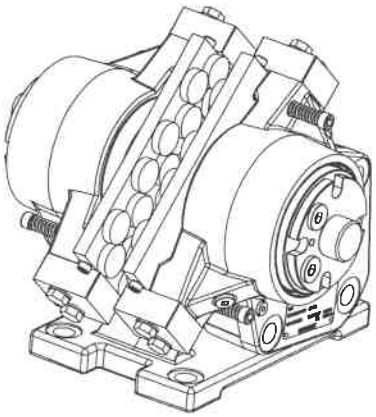
The brake pads can be treated as metallic waste.

Hydraulic oil
Hydraulic oil may not enter the environment and must be professionally treated.
The oil must be removed from the brake and from the hydraulic system / unit and stored in proper containers until delivery to local disposal enterprises.

Brake
The brake is in general made of cast iron or machined steel.
Once the hydraulic oil has been removed from the brake and the seals have been removed - the brake can be treated as steel waste/scrap.

2. Installation

2.1 Lifting and handling the brake



CAUTION

Do not fit any hook or tie any rope, chain or strap around switches, valves, accumulator, gauges etc. – this may damage the parts.

The total weight of the caliper is approx. 72 kilos.

2.2 Cleaning the brake disc

Before installing the brake calipers the brake disc must be cleaned from any dirt or anti corrosive protection.

The anti corrosive protection can normally easily be removed in two steps:

1) By using petroleum or diesel fuel for the initial cleaning.
2) Using solvent cleaners to remove the remaining dirt completely.

Use a cleaning solvent for the final cleaning. Solvent cleaners could be clear methylated spirit or white spirit, isopropyl alcohol or trichloroethylene.

Any residual oil or anti-corrosion preparation will reduce the coefficient of friction greatly.

WARNING

Solvent cleaners can be flammable, poisonous and can cause burns.

To avoid serious personal injury when you use solvent cleaners, you must read the manufacturer's instructions before using a solvent cleaner, and then carefully follow these instructions.

Also follow these procedures:

- Wear safe eye protection
- Wear clothing that protects your skin
- Work in a well-ventilated areas

All ways follow local rules and regulations for / when working with solvents.

2.3 Cleaning of the mounting surfaces

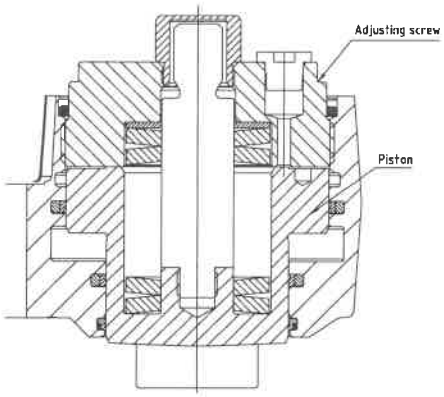
The mounting surfaces for the brake should be cleaned in a similar way as the brake disc - see section 2.2 - *Cleaning the brake disc.*

WARNING

Solvent cleaners can be flammable, poisonous and can cause burns.
Please follow the manufacturer's instructions and - see section 2.2 - *Cleaning the brake disc.*

2.4 Mounting the brake

2.4.1 There must be sufficient distance between the brake pads to allow passage of the disc between them before the brake can be assembled to the brake disc. This can be achieved by lifting the pads using a hand pump or the existing hydraulic system. Push the brake unit into position.



NOTE

If the space between the pads is not enough, unscrew the adjusting screw. This can be done without any hydraulic pressure.

2.4.2 Connect the pressure and drain lines - see section 2.7 - *Connecting the hydraulics.* Make sure that the drainage connection is at the bottom.

2.4.3 Check that the base for the caliper bracket is flat and at right angles to the brake disc.

2.4.4 Lift the piston using hydraulic pressure in accordance with Test Certificate or nameplate.

2.4.5 Mount the pads see section 2.10 - *Mounting the brake pads.*

IMPORTANT

The pads have to be turned with the radius against the bracket.

2.4.6 Push the caliper into position.

2.4.7 Ensure that the brake disc rotates freely throughout its diameter and fit the brakes so that the disc is aligned opposite the brake pad. To allow for expansion due to temperature increase, a clearance of 1/1000 of the disc diameter is recommended between bracket and disc.

2.4.8 Release the oil pressure. Allow the pads to come into contact with the brake disc.

2.4.9 Check the distance between the brake pad holders and the brake disc on both sides of the disc. It must be 2-4mm on each side. Check that the bracket is in contact with the base throughout its entire surface. If not, shim up as necessary.

2.4.10 Bolt the mounting bracket to the base using M20 or 3/4"UNC bolts of at least grade 8.8.

2.5 Mounting a caliper on a support

A CALIPER half weighs approx. 26 kilos.

2.5.1 Mount the caliper halves by means of four bolts.

2.5.2 Connect the pressure and drain lines - see section 2.7 - *Connecting the hydraulics.* Make sure that the drainage connection is at the bottom.

2.5.3 Lift the piston using hydraulic pressure.

2.5.4 Mount the pads.

2.5.5 Lift the caliper half into position and fit the mounting bolts into the yoke.

2.6 Inspecting the alignment of the brake

2.6.1 Lift the pistons using oil pressure.

2.6.2 Measure the distance between the surface of the brake disc and the brake pad holder arm on both sides. The difference between the measurements must not exceed 1mm. This check need only be carried out during initial mounting or if the caliper support has been moved.

2.6.3 Check that the disc's angular throw in relation to the support does not exceed the permissible values. See Mounting drawing

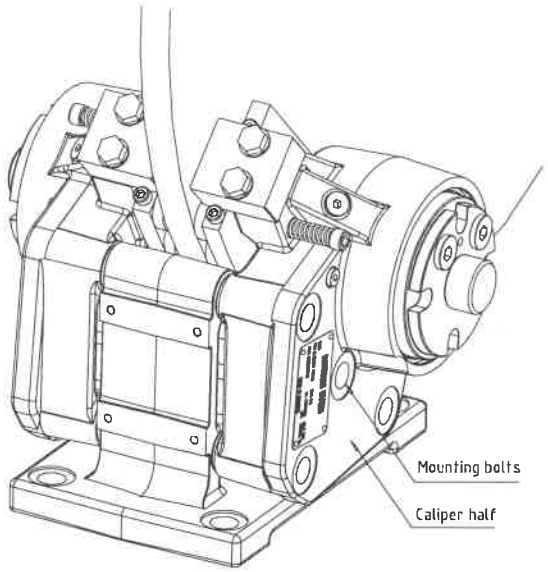
IMPORTANT

The axial movement of the brake disc must not exceed 0.5mm. In cases where this distance is exceeded the air gap must be adjusted accordingly.

2.6.4 Activate the brake by removing the hydraulic pressure. Check that the bracket is in contact against the base along its entire surface. If not, shim up as necessary.

2.6.5 Apply hydraulic pressure to lift the pads again.

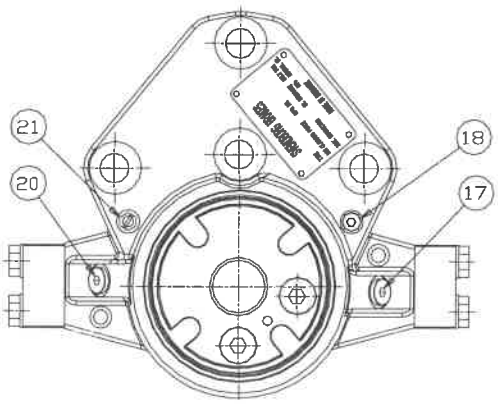
2.6.6 Bolt the caliper to the base. The four mounting bolts must be M20 of strength class 8.8 for BSFH 304 - 340, and class 10.9 for BSFH 350 - 370. The torque setting is 370 Nm for class 8.8 and 520 Nm for class 10.9.



2.6.7 Check that the brake disc rotates freely throughout its diameter and that the brake is aligned parallel to the brake disc. To allow for expansion due to temperature increase, a clearance of 1 per mille of disc diameter is recommended between bracket and disc.

2.7 Connecting the hydraulics

The brake is provided with two pressure connections (17, 20-D) BSP 1/4". The connection at the lowest position shall always be used as pressure connection when connecting the brake to the hydraulic system. The highest pressure connection can be used, depending on the design of the hydraulic system, if through flushing is required.



CAUTION

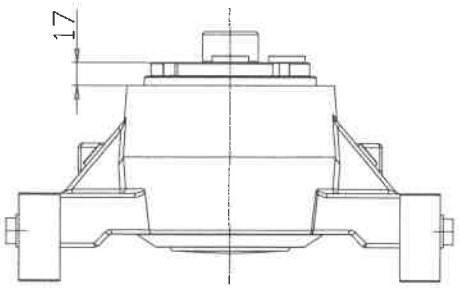
The drain connections (18, 21) BSP 1/8" must not be subjected to pressure UNDER ANY CIRCUMSTANCES.
A pipe with a length of approx. 10-20cm can be connected to the lowest drainage connection. A plastic hose which discharges into a vessel or similar can be connected to the free end of the pipe so as to check, if any leakage occurs from the piston seals.

CAUTION

Check that the pressure connection which is not used is sufficiently tight to eliminate any risk of leakage and that the adjusting screw is screwed sufficiently far into the yoke.

CAUTION

Never apply hydraulic pressure
to the caliper before you have checked that
$X \leq 17mm$.



2.8 Bleeding the brake

2.8.1 The hydraulic system of the caliper must ALWAYS be bled in conjunction with assembly or when making changes in the system.

2.8.2 This bleeding should be repeated a few times a year, since any air in the system will impair the function - see section 2.7 - *Connecting the hydraulics.*

2.9 Bedding in of the brake pads

To obtain the rated coefficient of friction between the brake pad and the brake disc, and to ensure the pad surface is aligned to the disc, it is essential that the pads are bedded to the disc surface.

The coefficient of friction may drop by approx. 20% when not bedded in.

This can be done by making a series of load-tests with increasing load or speed until sufficient coefficient of friction is achieved.
If the brake disc is new the time of bedding in will be longer because the disc also has to be bedded in. Always use new pads with a new disc. Never use used pads with a new disc.

Organic pads:
Organic pads can normally be bedded in by driving the disc through the pads with a minimum of 25% of the rated clamping force applied, or if that is not possible by making a series of activations with increased load or increased speed.

Sinter-metal pads:
The bedding in process for sinter-metal pads is the same as for organic pads, but with a slightly higher clamping force when bedding in – approx. 40% of the rated clamping force applied.

During the process of "bedding in", the disc temperature should be monitored to ensure that the disc does not overheat.

Instruction for the bedding in process is packed together with the pads.

2.10 Mounting the brake pads

NOTE

The brake pads are packet in sealed plastic to protect them from contamination – please keep the pads in the packet for as long as possible.

CAUTION

Be careful to protect the pads from grease and oil which would significantly impair the friction coefficient.

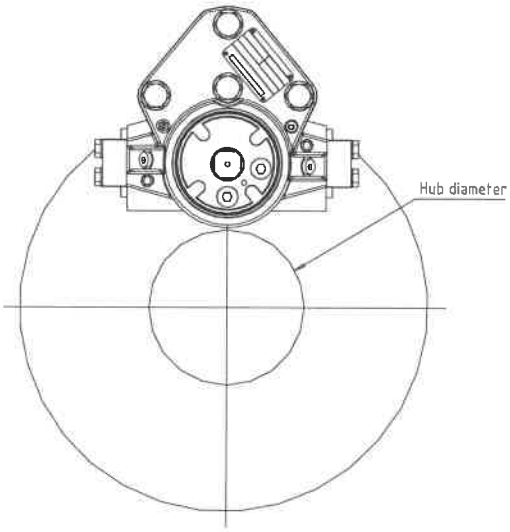
Organic brake pads are very sensitive to grease and oil and cannot be cleaned. They must be discarded and be replaced if exposed to this.
Brake pads of sintered metal are less sensitive to oil and can be cleaned with solvent and re-used.

WARNING

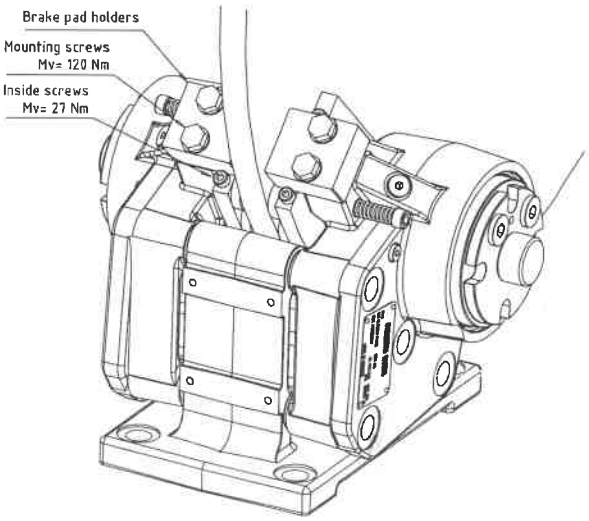
Solvent cleaners can be flammable, poisonous and can cause burns.
Please follow the manufacturer's instructions and see section 2.20 - *Cleaning the brake disc*.

There are to possibilities to mount the pads:

1) **Small hub diameter (i.e. when the hub diameter is smaller than disc diameter - 480mm).** Remove the allen screws from the inside of the brake pad. The brake pad can now be mounted by sliding it from the centre of the brake disc towards the caliper. Tight the allen screws of the pad and mount the pad-retraction springs.



2) **Large hub diameter (i.e. when the hub diameter is larger than disc diameter - 480mm).** Remove the mounting screws and the brake pad holder. The brake pad can be mounted by sliding it sideways in. Bring the pad holder back in position and tight the mounting screws with the right torque. Mount the pad-retractions springs.

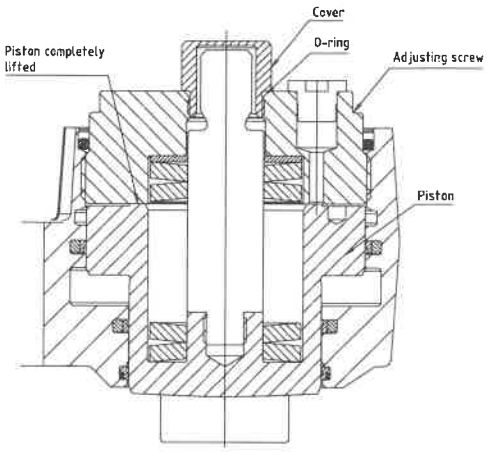


IMPORTANT

The pads should be inserted with the rounded edge orientated so that it follows the curvature of the disc.
Re-fit the two screws and tighten them as specified.

2.11 Adjusting the brake

The air gap is the space between the brake pads and the brake disc, when the piston is completely lifted back against the adjusting screw.

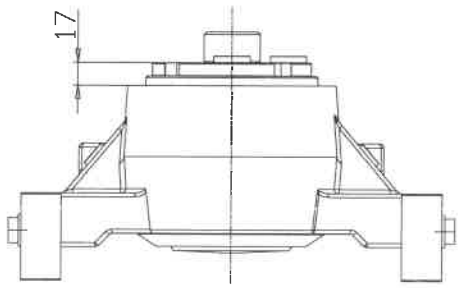


CAUTION

This total air gap must be adjusted to 1mm at installation and must NEVER exceed 3mm, i.e. 1mm wear on each pad. When the air gap is >3mm the caliper must be adjusted.

2.11.1 Remove the indicator set, if fitted.

2.11.2 Check the position of the adjusting screw, Xmax. ≤ 17mm, and apply release pressure to the caliper, see test certificate or nameplate.



2.11.3 Mount the flange nut and release the oil pressure.

2.11.4 Turn the adjusting screw clockwise using the spanner (adjusting tool) until both pads are in contact with the disc. Then turn the adjusting screw a half turn backwards (1800 anti-clockwise).There will now be 1mm air gap (the thread of the adjusting screw has a pitch of 2mm).

2.11.5 Check by measuring with, for example, a 1mm feeler gauge that the air gap between the disc and the pad is exactly 1mm. If the positioning system is mounted, the 1mm air gap must be adjusted to 0.5mm air gap on each side of the brake disc, see data sheet.

2.11.6 Apply release pressure to the caliper, see Test Certificate or nameplate.

2.11.7 Remove the flange nut.

2.11.8 Re-mount the cover and O-ring.

2.11.9 Re-it the indicator (if fitted).

2.12 Before using the brake

Please check that the disc has been blocked mechanically while the following points are checked:

1) That the disc and the pads are clean, containing no dirt after mounting.
2) That bolts and hydraulic connections have been tightened using the right torque.
3) That the electrical installations have been connected correctly.
4) That the brake set for the correct air gab.
5) That the brake opens and closes correctly, and with the right reaction times.
6) That the indicators function correctly.

Please make sure the brake is closed and that the hydraulic pressure has been removed.

Free the disc from the mechanical blocking.

The brake is now ready for use. Please note that the pads need to be bedded in for a while before the full effect of the brake is obtained.

2.13 Removing the brake

2.13.1 Apply hydraulic pressure, see Test Certificate or nameplate.

2.13.2 Remove the end cover. Screw the flange nut onto the centre bolt.

2.13.3 Relieve the hydraulic pressure.

2.13.4 Remove the brake pads.

2.13.5 Remove the flange nut and re-fit the end cover.

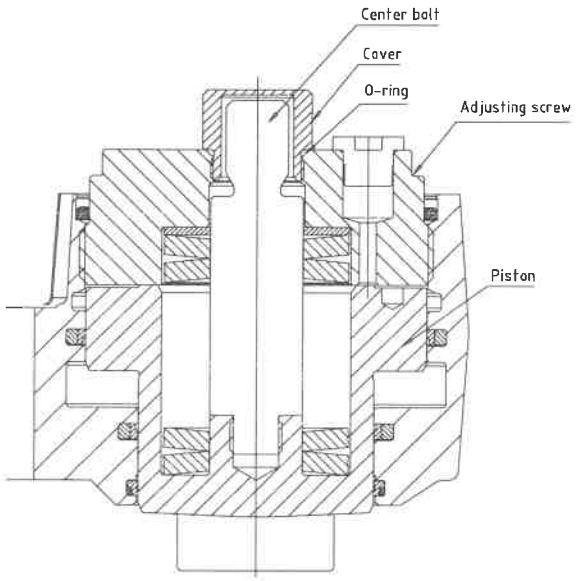
2.13.6 Relieve the pressure and dismantle pipe and hose connections. The brake can now safely be removed from its mounting.

3. Maintenance

3.1 Replacing the brake pads

When the brake pads have been worn to such an extent, that a minimum of 3mm of pad remain, the pads must be replaced.

This can be ascertained when it is no longer possible to adjust the air gap to 1mm. The brake is designed in such a way as not to allow the steel back plate to come into contact with the disc. If in doubt, the brake pads can always be measured manually by means of e.g. a Vernier caliper gauge.



3.1.1 Unscrew the cover.

3.1.2 Check the position of the adjusting screw (Xmax = 17mm). Apply max. release pressure to the caliper (see Test certificate or nameplate).

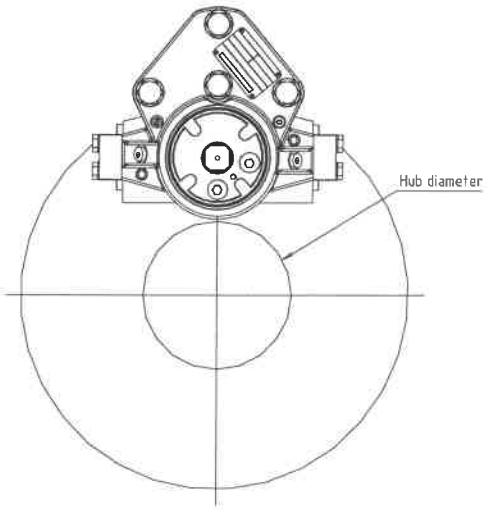
3.1.3 When the piston is fully lifted, mount the flange nut on the center bolt.

3.1.4 Release the oil pressure.

3.1.5 Turn the adjusting screw anti-clockwise using the spanner (adjusting tool), as far out as possible, i.e. until the adjusting screw comes into contact with the O-ring.

3.1.6 Remove the brake pad retraction spring set (if fitted).

3.1.7 If the hub diameter is small (i.e. smaller than disc diameter – 480mm) you have the possibility of replacing the brake pad by removing the allen screws from the inside of the brake pad and then slide the brake pad towards the centre of the brake disc. Mounting is done in reverse order.



If the hub diameter is large (i.e. larger than disc diameter – 480mm) you have to remove the mounting screws, and the brake pad holder. The brake pad can be removed by sliding it sideways out of the brake. Mounting is done in reverse order.

3.1.8 Re-connect the hydraulic power unit to the brake.

CAUTION

All pipes and hoses shall be undamaged and thoroughly free of dirt - see section 2.7 - *Connecting the hydraulics*.

3.1.9 Adjust the air gap between the new brake pads and the brake disc.
Follow the section 2.11 - *Adjusting the brake*.

CAUTION

Remember the bedding in of brake pads.

3.2 Checking the spring package

If you want to check the spring pack visually before it has reached its calculated service life, it can be carried out as follows:

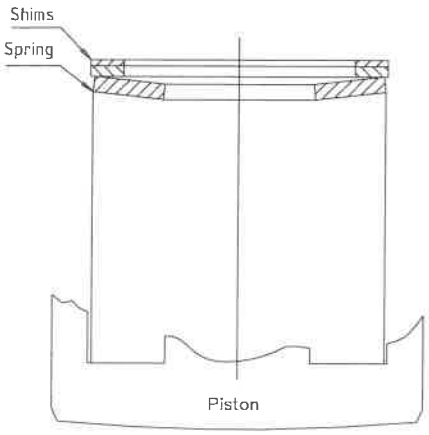
3.2.1 Remove the spring pack - see section 3.4 - *Dismantling the active caliper*.

CAUTION

The positioning of each individual cup spring in relation to each other is very important and must be carefully checked.

CAUTION

Never mount a spring pack if there is any doubt as to the positioning!



3.2.2 Distance shims, if any, must be placed towards the adjusting screw.

IMPORTANT

Check each individual cup spring and distance shim visually. The whole spring package must be replaced by a new pack, if just one cup spring is broken or scratched.

3.3 Replacing the spring package

The spring pack must ALWAYS be replaced after:

Brake type	Operations
BSFI 304 to BSFI 340	2.000.000
BSFI 345	320.000
BSFI 350 and BSFI 355	2.000.000
BSFI 360	530.000
BSFI 365	270.000
BSFI 370	70.000

Replacing the spring pack - see section 3.4 - *Dismantling the active caliper*.

IMPORTANT

The positioning of each individual cup spring in relation to each other is very important and must therefore be carefully checked. Distance shims, if any, must be placed towards the adjusting screw.

Lubricate the springs and the adjusting screw thoroughly when fitting.

CAUTION

A spring package must NEVER be mounted and must be discarded when:

1) There is any doubt as to the positioning of the cup springs.
2) A single cup spring is broken or scratched.

3.4 Dismantling the active caliper

General

The greatest possible cleanliness must be observed when working on a hydraulic system of any type.
Each part must be washed in solvent (paraffin, trichloroethylene) and dried before being lubricated and fitted.

WARNING

Solvent cleaners can be flammable, poisonous and can cause burns.
Please follow the manufacturer's instructions and - see section 2.2 - *Cleaning the brake disc*.
Parts must be stored in, and assembly work must be carried out in a clean and dust free environment. Dirt shortens the service life of the seals considerably and may also damage the hydraulic unit.

The surface of the piston and the yoke which works against the seals is highly polished. Check that they are not damaged and handle them carefully to avoid damaging the surface in any way. A damaged piston will immediately ruin the seals.

3.4.1 Apply release pressure (see Test certificate or nameplate) to the caliper and mount the flange nut.

3.4.2 Release the oil pressure.

3.4.3 Turn the adjusting screw anti-clockwise using the spanner (adjusting tool), until X = 17mm.

3.4.4 Loosen the mounting bolts in the bracket and pull the brake backwards.

3.4.5 Remove the pads.

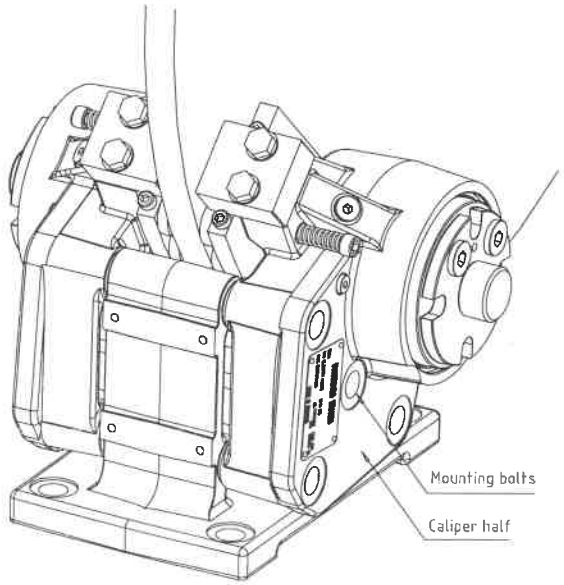
3.4.6 Apply release pressure (see Test certificate or nameplate) to the caliper and remove the flange nut.

3.4.7 Release the oil pressure.

3.4.8 Dismantle and plug the hydraulic connections.

3.4.9 Store the flange nut together with the spanner as part of the tool kit.

3.4.10 Remove the 4 mounting bolts and remove the whole caliper half. The caliper half must be taken to a workshop prepared for hydraulic work.



3.4.11 Remove the adjusting screw from the yoke.

WARNING

Before removing the adjusting screw, be sure there is no pressure on the caliper.

3.4.12 Remove the spring pack.

3.4.13 Push the piston including center bolt backwards.

3.4.14 Remove the wiper and the seals.

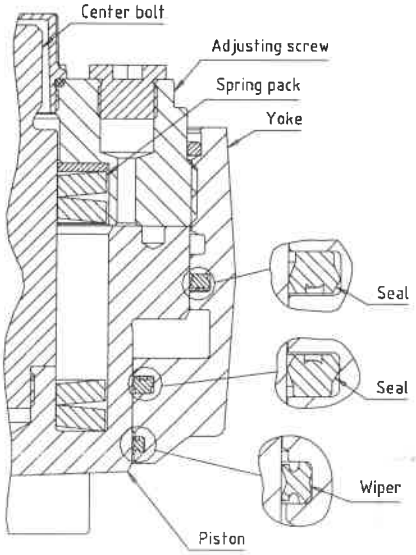
3.4.15 Wash the parts thoroughly, dry and lubricate them.

3.4.16 There are two types of seal kit: U-cup and Stepseal (see drawings). Mount the new seals and the wiper as indicated. The dust lip on the wiper must be placed outwards. The piston seals for the step seal version consist of an O-ring and a sealing ring. The wiper for the Stepseal version also consists of an O-ring together with the wiper. Place the O-ring in the groove first. Then form the sealing ring in a U-form and place them in the groove with the O-ring. Squeeze out any kink.

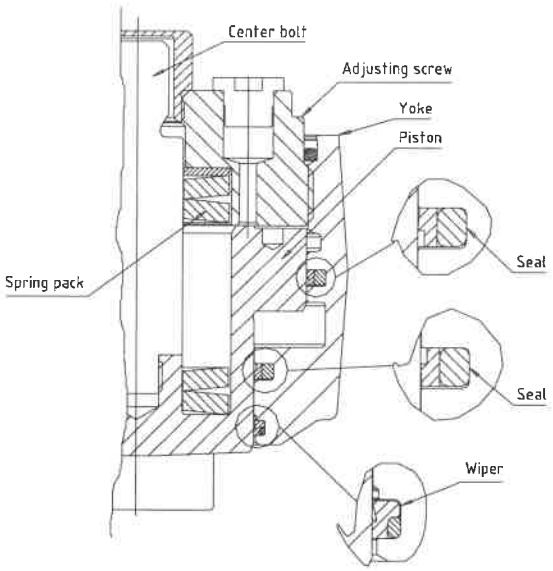
CAUTION

Use your fingers only. Be very careful with the edges on the piston rod seals - even a tiny scratch can ruin the seals.

U-cup



Stepseal



3.4.17 Push the piston as far into the yoke as possible. The adjusting screw can be used as a tool.

3.4.18 Fit the spring pack. - see section 3.3 - *Replacing the spring package*.

3.4.19 Turn the adjusting screw clockwise, using the spanner, until it is max. 17mm out of the yoke.

3.4.20 The caliper is ready for re-installation and adjustment - see section 2.4 - *Mounting the brake*.

3.5 Lubrication

Lubrication is required only when dismantling the active caliper - see section 3.4 - *Dismantling the active caliper* and when replacing the spring pack - see section 3.3 - *Replacing the spring package*.

Seal-surfaces lubricated with hydraulic oil. Springs, threads etc. lubricated with MoS_2

3.6 Storage

The brake is externally treated before delivery with an anti-corrosion film which is sufficient for indoor storage for 12 months.
If the caliper is to be stored for periods longer than 12 months, it must be worked 20 times at full stroke each 12 months.

IMPORTANT

The anti-corrosion protection must be re-applied as necessary after transport and handling if stored for more than 12 months.
Any kind of work carried out on the brake, which are not mentioned in this manual should be regarded as repair. In such cases please contact your local Svendborg Brakes A/S supplier.

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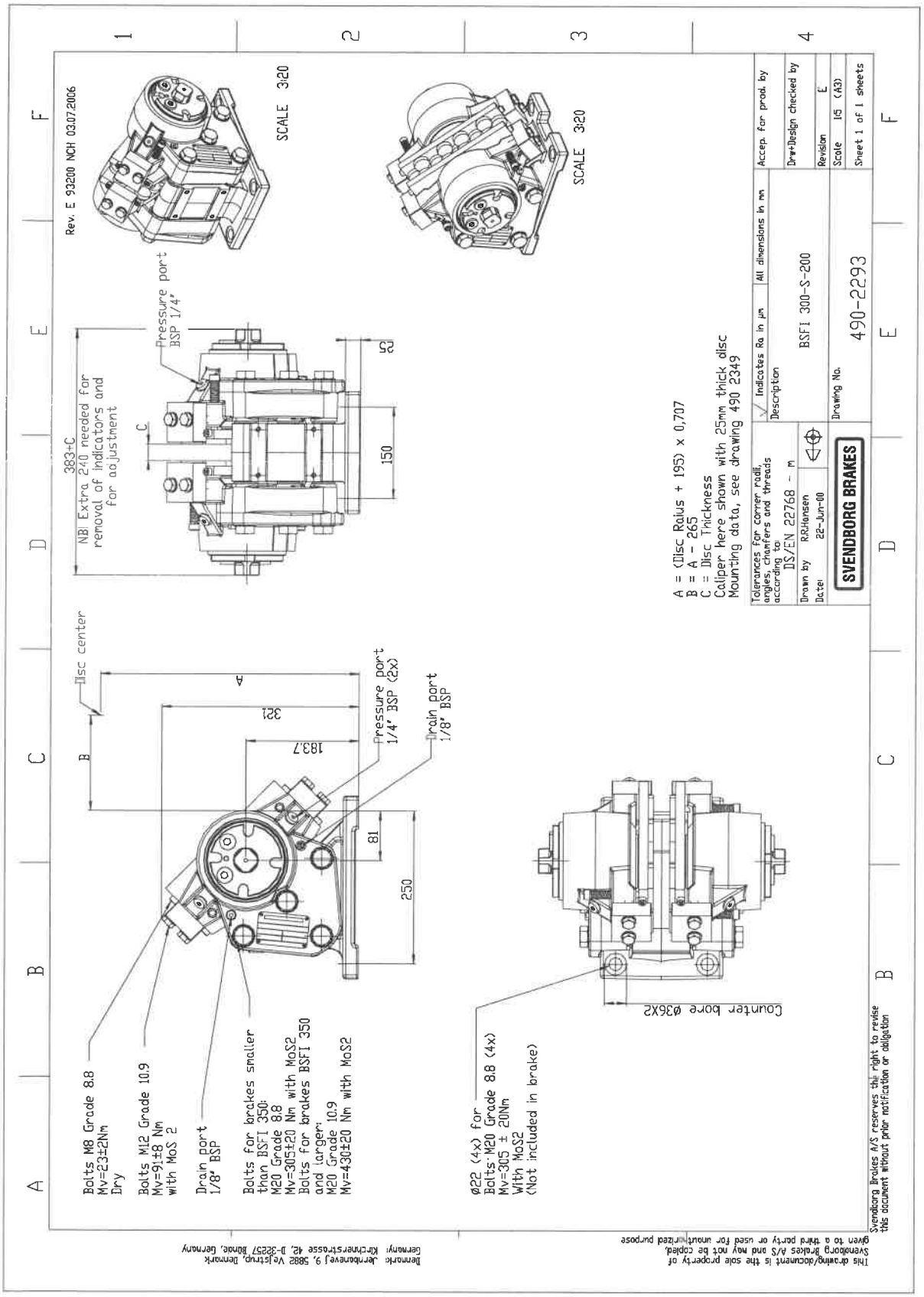
4. Trouble shooting

Fault	Cause	Action
The brake applies slowly	Air in the hydraulic	Bleed system at highest point and at brake
	Air gap between brake pad and disc too large	Adjust air gap
	Abnormal throttling in the hydraulic system / valve in wrong position	Check that all valves are in the correct position
	Abnormal throttling in the hoses and valves	Clean and check pipes hoses and valves
	Oil in lines between brake and tank has too high viscosity (too thick	Check that the oil is the recommended grade and not too cold
Long braking time or insufficient braking force	Load too heavy or speed too high	Check the braking distance, load and speed values
	Air gap too large	Adjust the air gap
	Oil, paint or grease on brake disc or pad	Clean the disc with trichloroethylene. Replace pad. Check that the brake does not leak
	All brakes not connected	Check valves where applicable
	Incorrect or damaged spring	Replace **whole** spring pack not individual cup springs
Leakage	Worn seals or sealing surfaces	Replace seals. Check sealing surfaces
Uneven wear on pad	The brake is incorrectly aligned	Check the alignment o the brake and bracket
	Excessive disc throw or shaft deflection	Replace the brake disc and check the shaft deflection
Abnormally heavy wear on brake pad	Increased brake utilisation	Check that the load, speed and frequency do not exceed permissible values
	Insufficient air gap	Adjust the air gap
	The brake does not lift properly	Check the oil pressure
		Check the movements of pads and pistons and the position of cup springs and guides

Appendix A - Dimension drawing



Appendix A - Assembly parts list, Brake

Please note that several of the items shown on drawing and in bill of material are optional and may not be present on actual brake.

BSFI 300-S-200

Pos.	Qty	Item number	Item name
	2 pcs	490-2051-8xx	BSFI 300-S-200 ½ **Brake size will vary according to clamping force supplied**
	1 pcs	490-0666-803	PAD RETRACTION SPRING SET
	1 pcs	478-2640-8xx	BOLT SET **Actual item number and size will vary according to thickness of brake disc**
	1 pcs	490-xxxx-xxx	BRAKE PAD SET **Actual item number and brake pad type will vary according to brake pad supplied**
	2 pcs	490-xxxx-xxx	INDICATOR "ON/OFF" & PAD WEAR **Indicators are optional but recommended – available in 30DC and 125 VAC and with different cable options**

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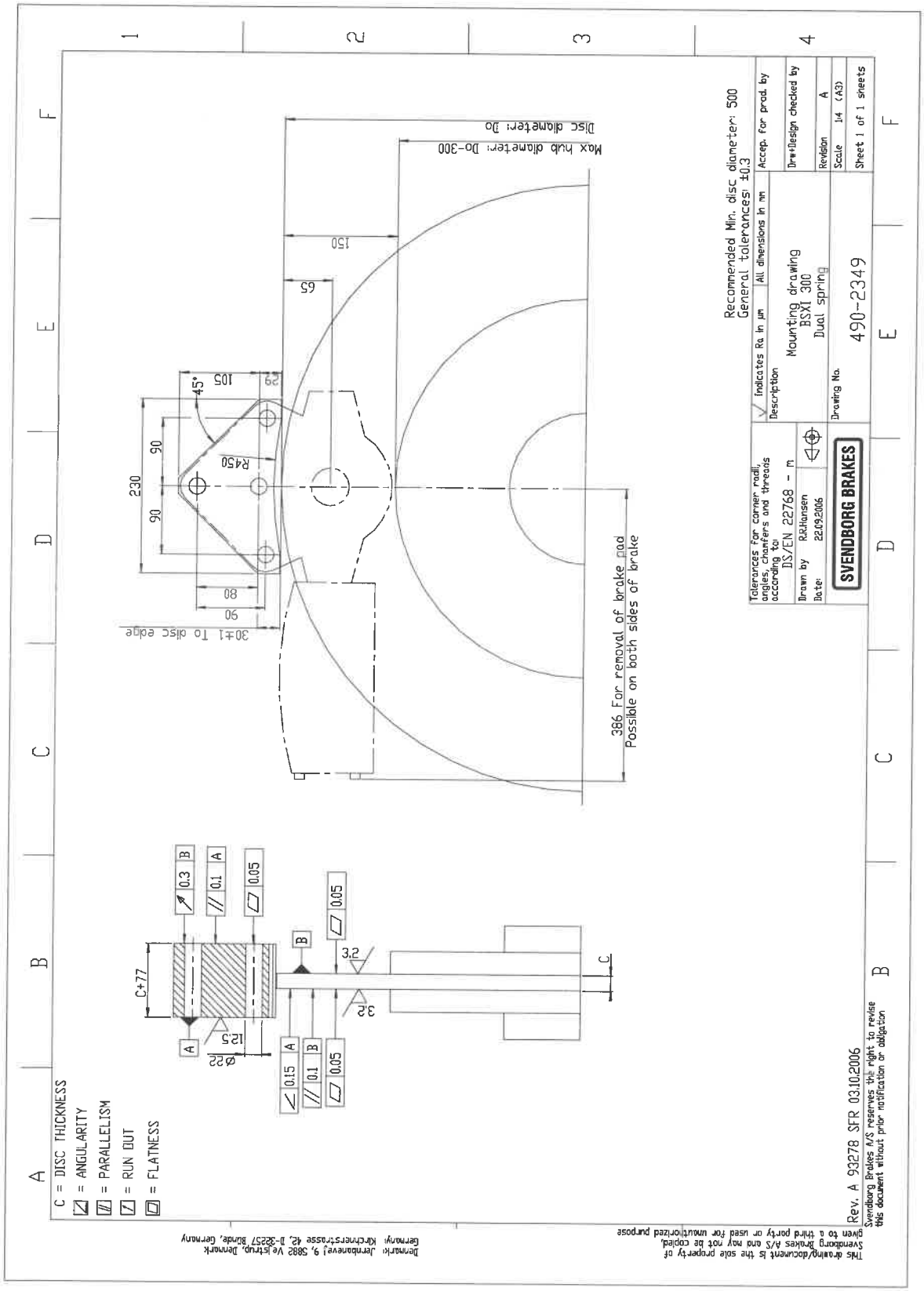
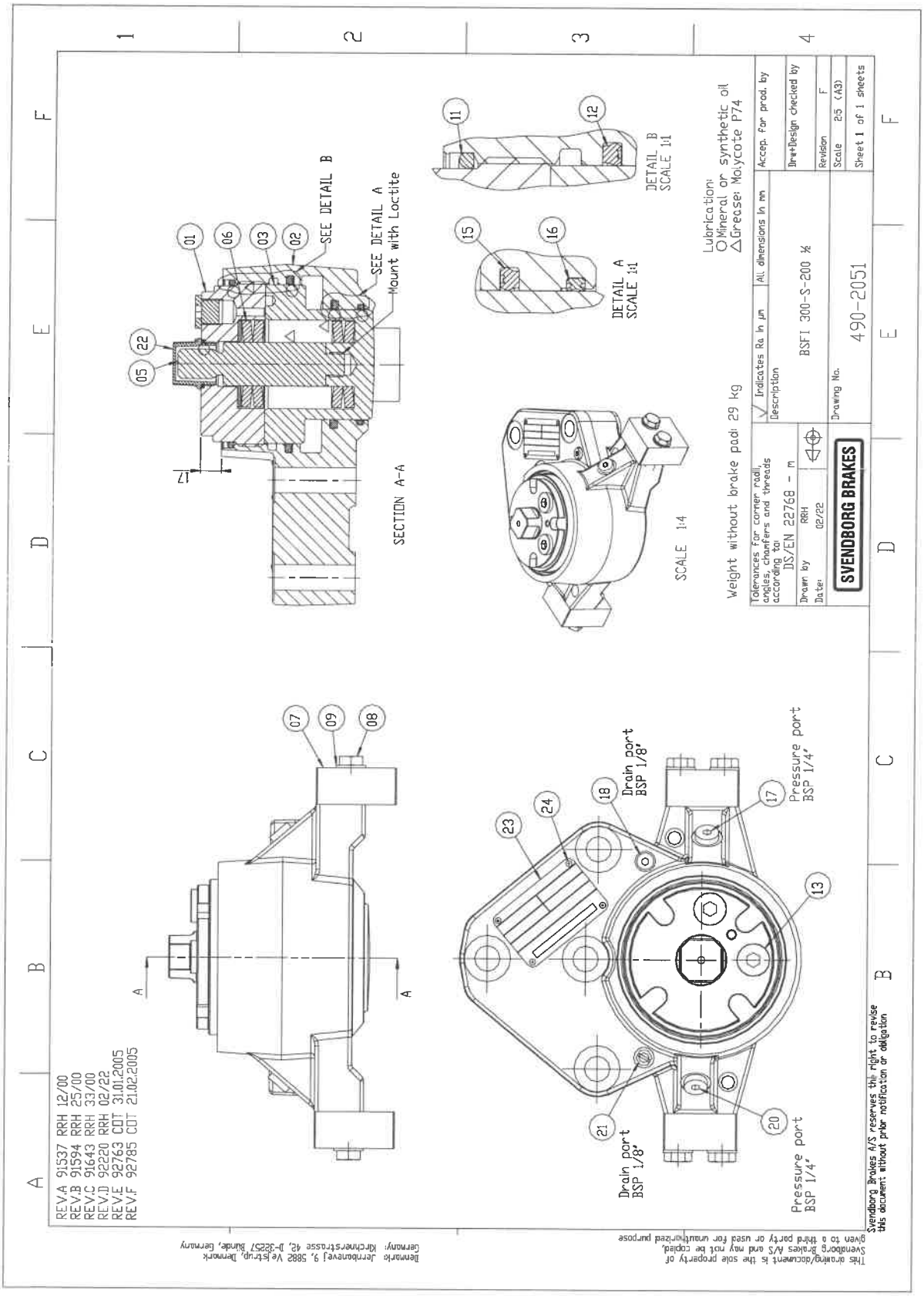
Appendix B - Mounting Drawing



Appendix C - Spare parts drawing, Caliper half



Appendix C - Spare parts list, Caliper half

BSFI 300-S-200

Pos.	Qty		Item number	Item name
1	1	pcs	490-1977-001	ADJUSTING SCREW BSFI300-X-200
2	1	pcs	490-1923-001	YOKE BSFI300-S-XXX
3	1	pcs	490-1942-001	PISTON BSFI300-S-200
5	1	pcs	490-0284-001	CENTER BOLT
6	1	pcs	490-xxxx-xxx	SPRING PACK BSFX3XX-X-2XX E **For item numbers on specific spring-pack size – see Recommended Spare Parts**
7	2	pcs	490-1925-001	PAD HOLDER BSFI300-X-XXX
8	4	pcs	4490-0633-009	BOLT M12X50 10.9
9	4	pcs	478-0870-001	WASHER Ø13X24X2
13	1	pcs	2522-2111-113	HYDR PLUG 1/2" BSP W/SEAL
14	1	pcs	4490-0101-001	FLANGE NUT M24 8
17	1	pcs	2522-2111-110	HYDR PLUG 1/4" BSP W/SEAL
18	1	pcs	2522-2111-109	HYDR PLUG 1/8" BSP W/SEAL
20	1	pcs	2522-2111-110	HYDR PLUG 1/4" BSP W/SEAL
21	1	pcs	2522-4502-109	HYDR PLUG 1/8" BSP PLASTIC
22	1	pcs	490-0285-001	COVER JACK DAW GF35
23	1	pcs	478-0815-003	NAMEPLATE W/4 HOLES
24	4	pcs	4490-0676-001	BLIND RIVET Ø2,4X6 RH
	478-2768-814			**SEAL KIT BSFI 300-MS**
11	1	pcs	6490-0044-003	O-RING Ø124,2X5,7
12	1	pcs	6490-0051-005	ROD SEAL Ø130X6,3 U-CUP
15	1	pcs	6490-0051-001	ROD SEAL Ø90X6,3 U-CUP
16	1	pcs	6490-0064-001	WIPER Ø90X6,3

For ordering spare parts:
Please refer to the manual number MEB-0300-048, position number and item number.

For easing the whole procedure please write down the type number and serial-number from the nameplate – pos. 23.

Appendix D - Technical data

DATA SHEET

Name:	DEB-0300-016
Date:	04.04.2007
Revision:	C

TECHNICAL DATA AND CALCULATION FUNDAMENTALS FOR DISC BRAKE BSFI 300 – "E"

Caliper type	Clamping force[1] [N]		Braking force[2]	Loss of force per 1mm	Operating pressure	Balancing pressure[1] MIN	Max.[3] air gap	Pad surface pressure[4]
	MIN	MAX	[N]	[%]	[BAR]	[BAR]	[mm]	[N/mm²]
BSFI 317	17.000	19.000	13.600	4	42	25	3	0,66 - 0,95
BSFI 318	18.000	19.500	14.400	4	42	26	3	0,67 - 0,98
BSFI 320	20.000	22.200	16.000	3	45	29	3	0,77 - 1,11
BSFI 322	22.000	24.500	17.600	3	50	32	3	0,84 - 1,23
BSFI 325	25.000	27.800	20.000	12	55	36	3	0,96 - 1,39
BSFI 330	30.000	33.100	24.000	10	70	44	3	1,14 - 1,66
BSFI 332	32.000	35.200	25.600	9	70	46	3	1,21 - 1,76
BSFI 335	35.000	38.300	28.000	8	75	51	3	1,32 - 1,92
BSFI 340	40.000	43.600	32.000	7	85	58	3	1,50 - 2,18
BSFI 350	50.000	55.000	40.000	11	105	72	3	1,86 - 2,70
BSFI 360	60.000	65.000	48.000	9	130	87	3	2,22 - 3,22
BSFI 370	70.000	75.000	56.000	11	150	101	3	2,58 - 3,74

[1] All figures are based on 1 mm air gap
[2] Braking force is based on min. clamping force, nominal coefficient of friction μ = 0.4 and 2 brake surfaces.
[3] Maximum permissible air gap depending on pad wear.
[4] Organic / sintered pads: (max. clamping force).

BRAKING TORQUE

The braking torque M_B is calculated from following formula where: **a** is the number of calipers acting on the disc, F_B is the braking force according to table above [N] or is calculated from formula for F_B, D_O is the disc outer diameter and **μ** is the coeffiecient of friction

$$M_B = a \cdot F_B \cdot \frac{(D_O - 0{,}13)}{2} \; [Nm]$$

$$F_B = F_C \cdot 2 \cdot \mu \; [N]$$

The actual braking torque may vary depending on adjustment of brake and friction coefficient present

CALCULATION FUNDAMENTALS	Dual Spring	Mono Spring
Weight of caliper with bracket:	76 kg	81 kg
Weight of caliper without bracket:	58 kg	
Overall dimensions (20mm disc)	326 x 316 x 379 mm	279 x 420 x 299 mm
Overall dimensions with indicators:	326 x 316 x 539 mm	279 x 420 x 379 mm
Pad width:	130 mm	130 mm
Pad area: (organic)	29.000 mm² (*)	29.000 mm² (*)
Max. wear of pad: (organic)	10 mm (*)	5 mm (*)
Pad area: (sintered)	20.000 mm² (*)	20.000 mm² (*)
Max. wear of pad: (sintered)	7 mm (*)	5 mm (*)
Nominal coefficient of friction:	μ = 0.4	μ = 0.4
Total piston area - each caliper half:	69,1 cm²	69,1 cm²
Total piston area - each caliper:	138,2 cm²	69,1 cm²
Volume for each caliper at 1 mm stroke:	13,8 cm³	6,9 cm³
Volume for each caliper at 3 mm stroke:	41,4 cm³	20,7 cm³
Actuating time (guide value for calculation):	0.3 sec.	0.3 sec
Pressure connection/port:	1/4" BSP	1/4" BSP
Drain connection port R:	1/8" BSP	1/8" BSP
Recommended pipe size:	10/8 mm	1/8" BSP
Operating temperature range	-20 to +70 °C	-20 to +70 °C

(For temperatures outside this range contact Svendborg Brakes)

(*) On each brake pad

Appendix E - Recommended fluid

DATA SHEET

Name:	DEB-DIVE-005
Date:	12.03.2007
Revision:	A

RECOMMENDED FLUID FOR DISC BRAKES & HYDRAULICS
PRESSURE FLUIDS / OIL TYPES

The following oil types are recommended by Svendborg Brakes – other types corresponding to these can be used.

The minimum and maximum temperatures for standard components are, -20°C - +60°C / -14°F - +140°F.
Extreme temperature applications may require special options. Please contact Svendborg Brakes.

	Special option	Standard		Special option
Mineral Oil	-30°C - +20°C -22°F - +68°F	-20°C - +40°C -14°F - +104°F	+10°C - +60°C +50°F - +140°F	+30°C - +70°C +86°F - +158°F
Shell	**Tellus Artic**	**Tellus TX32**	**Tellus TX46**	**Tellus TX68**
Mobil	-	DTE 13M	DTE 15M	DTE 16M
Hydro Texaco	Rando Ashless 8401	Rando HDZ32	Rando HDZ46	Rando HDZ68
Valvoline	-	Ultramax HVLP32	Ultramax HVLP46	Ultramax HVLP68
Syntethic Oil	-30°C - +20°C -22°F - +68°F	-20°C - +40°C -14°F - +104°F	+10°C - +60°C +50°F - +140°F	+30°C - +70°C +86°F - +158°F
Mobil	-	SHC 524	SHC 525	SHC 526
Bio Oil (1) (Ester or Colza oil)	-30°C - +20°C -22°F - +68°F	-20°C - +30°C -14°F - +86°F	+10°C - +60°C +50°F - +140°F	+30°C - +70°C +86°F - +158°F
Shell	-	Naturelle HF-E15	Naturelle HF-E32	Naturelle HF-E46

General: Mineral Pressure Fluids according to DIN 51524 Part 3
(1) There must be less than <200PPM water in the oil, due to the seals.

Viscosity
Recommended viscosity range: 20-200 cSt at working temperature.

Filtration
The oil in a hydraulic system and the oil added to the hydraulic system must always be filtered. The level of cleanliness in a hydraulic system is an important factor to the lifetime of the system.
When refilling the hydraulic tank, it is recommended that the oil added to the system is filtered through an off-line filter unit.

The hydraulic system, supplied by Svendborg Brakes, has a build-in oil filter with a standard 10-micron purity filter. To maintain a reliable system it is recommend that only hydraulic oil of the following classes of purity is used: NAS 1638, Class 8, or ISO 4406, Class 19/17/14.
It is recommended that the filter be changed at a minimum, once every six months or more often depending on the level of exposure to contamination.

Service life of pressure fluids
Mineral oil: 8.000 Hours or at least once a year.
Other fluids: 2.000 Hours or at least once a year.

Change of pressure fluid
Note: The mixing or blending of different brands or types of pressure fluid can cause unintended chemical reactions, such as sludging, gumming etc. The complete hydraulic system should be thoroughly flushed prior to changing from one oil type to another.
The respective manufactures should be contacted prior to changing from one pressure fluid to another.

Seal material
Brakes from Svendborg Brakes A/S are normally supplied with PUR-seals (PolyURethane)
PTFE (PolyTetraFlourEthylene) seals can be delivered on request for most of the brake types.
Note: the BSFG 400 brake series are supplied with NBR rubber fabric seals (acrylNitrile Butadiene Rubber).

Appendix F - U-CUP information

DATA SHEET

Name:	DEB-DIVE-008
Date:	13.03.2007
Revision:	A

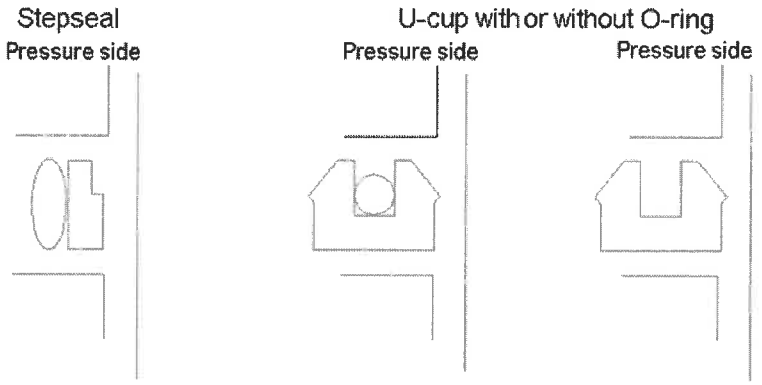
U-CUP INFORMATION

Svendborg Brakes have changed the sealing system (gaskets) in the brakes.
The new seals are in general made of polyurethane (PU) and the type is called U-Cup. The old seal were typically the Stepseal (PTFE) type.

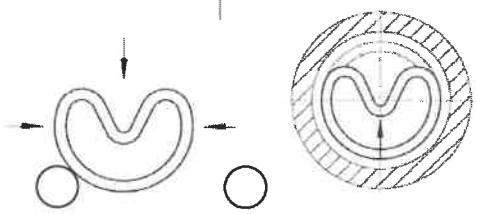
The U-cup type and the Stepseal type of seals are **fully interchangeable** with the exception of the temperature range and the allowed oil types. The U-cup type of seals are softer and will produce less wear on the moving parts i.e. piston.

This information is only to inform how the U-Cup-seals shall be mounted when replacing your seals.

The side with O-ring in the U-cup or the side with the groove in the U-Cup must be placed towards the pressure side (where the hydraulic fluid is), see drawing below.



To mount the seals - gently form it into a U–shape / kidney-shape without any sharp bends and fit it into the groove



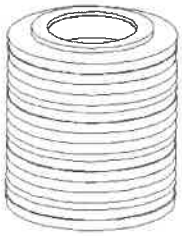
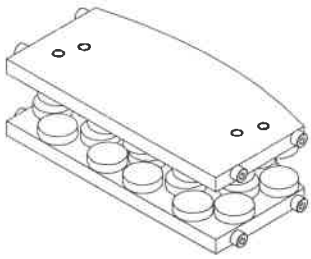
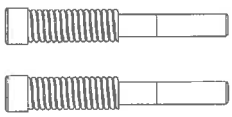
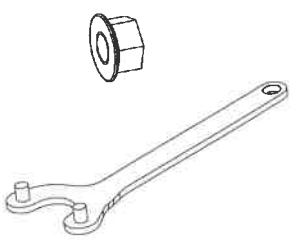
NOTE:
The U-Cup seals are only to be used within an ambient temperature range of -30°C to +80°C. Please correspond to the ambient temperature range of your brake.

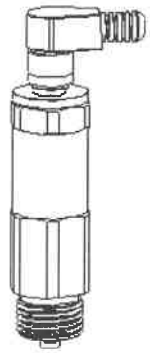
If the temperature is outside the mentioned limits you must specify, that you need step seals.

Products using the step seal solution are still available but only as a special order.
Please refer to the SB sales department for information.

Appendix G - Recommended spare parts

Recommended spare parts for one brake

Spring pack Spring pack BSFH/I 304 Spring pack BSFH/I 306 Spring pack BSFH/I 312 Spring pack BSFH/I 314 Spring pack BSFH/I 317 Spring pack BSFH/I 318 Spring pack BSFH/I 320 Spring pack BSFH/I 322 Spring pack BSFH/I 325 Spring pack BSFH/I 327 Spring pack BSFH/I 330 Spring pack BSFH/I 332 Spring pack BSFH/I 335 Spring pack BSFH/I 340 Spring pack BSFH/I 345 Spring pack BSFH/I 350 Spring pack BSFH/I 360 Spring pack BSFH/I 365 Spring pack BSFH/I 370	490 2879-801 490-2966-801 490-0356-801 490-3266-801 490-0355-801 490-0355-802 490-0324-801 490-0963-801 490-0833-801 490-0833-802 490-0335-801 490-3752-801 490-0336-801 490-0337-801 490 1402-801 490 0298-801 490 1731-801 490 2822-801 490 0714-801	 Check the nameplate for size – section 1.6.1
Brake pad set Sinter metal MD550 Organic BE3521 Organic IP160	490-0402-803 490-2047-801 378-1313-801	
Brake pad retraction springs Pad retraction spring set	490-0666-803	
Seal kit Seal Kit BSFI 300-MS	478-2768-814	
Tools Tool Kit BSFH/I 300-MS	490-0109-804	

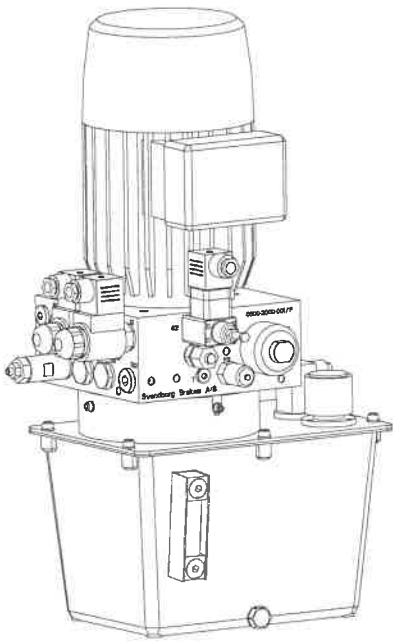
Indicators Mechanical indicators are as standard with a 5 meter cable, other options available on request		
30 VDC		
Brake release & 1mm Pad Wear	490-2004-802	
Brake release & 2mm Pad Wear	490-2005-802	
Brake release & 3mm Pad Wear	490-2006-802	
125 VAC		
Brake release & 1mm Pad Wear	490-2441-802	
Brake release & 2mm Pad Wear	490-2442-802	
Brake release & 3mm Pad Wear	490-2443-802	

For purchasing and further information, please contact your local Svendborg Brakes supplier.

Name:	MEH-1014-0066-802
Date:	22.06.2007
Revision:	-

Installation and Maintenance Manual

HYDRAULIC
BRAKE CONTROL UNIT
1014-0066-802



SVENDBORG BRAKES

Table of content

1.3 Conventions used in this manual

To make sure that you perform certain tasks properly, please take note on the following symbols used throughout this manual.

WARNING: Information to prevent personal injury when trying to complete a task.

CAUTION: Information to prevent damage to the components when trying to complete a task.

WARNING: Electrical shock hazard

IMPORTANT: Information that you MUST follow to complete a task.

NOTE: Tips and additional information to aid in completing a task.

Figures within brackets ( ) relate to position number and appendix number i.e. (15-C) refers to position number 15 in appendix C on both drawing and bill of material (parts list).

1.4 Disclaimer

Svendborg Brakes A/S reserves the right to revise this document without prior notification. These documents have been proofread for errors in translation and accuracy. Despite this, technical and typographical deviations can sometimes occur.

This document is updated on a regular basis; changes will be published in future printings. Improvements and/or changes to the described products or manual can be implemented at any time without preceding notice.

In no event shall Svendborg Brakes A/S be liable for any special, incidental, consequential or punitive damages. This includes, but is not limited to: damage to other property or person, inconvenience, loss of goodwill, lost profits or revenue, loss of use of this product or any associated equipment, cost of substitutive equipment, downtime costs or claims of any party such damages, resulting from any misspellings or inaccurate information in this users guide.

1.5 Transportation

When leaving the factory the hydraulic power unit is always packed / wrapped to ensure maximum security for the product during transport.

CAUTION

If the hydraulic power unit has been sent by air freight - please note that the gas (N2) pressure has been released / removed from the accumulator(s).
A label (see figure 1.1) is then attached to the accumulator.

FIGURE 1.1

If the accumulator is not pre-charged it must be recharged before usage. See section 4.10 – "Recharging the accumulator" for details

Normally there is no hydraulic oil in the unit. A warning label is attached to it.

WARNING
FOR TRANSPORT REASONS
THE PUMP IS SHIPPED
WITHOUT OIL
FILL WITH RECOMMENDED OIL
BEFORE STARTING
REFER TO MANUAL

The hydraulic power unit must be filled with oil according to appendix G of this manual before usage. If running dry the pump will be destroyed.

1.6 Lifting

The hydraulic power unit weighs app. 35 kg (77 lbs). If it is necessary to use a lifting harness, under no circumstance place it around valves, gauges or accumulators.
See below how to lift.

2. Installation and commissioning

2.1 Mounting

In the bottom of the tank there are 4 threaded holes M8 x 12mm for floor mounting.

In the back of the manifold there are 2 threaded holes M10 x 15mm for wall mounting.

2.2 Connections

Hydraulic pressure ports out of the cabinet or on the manifold are size 10L metric male according to DIN 20 078 N

2.3 Before starting the pump unit

Check accumulator before starting – if the accumulator has a warning sign telling that the accumulator has NOT been precharged (in case of air freight – see section 1.5).

Charge the accumulator before usage – see section 4.9 for details.

FIGURE 2.1

2.3.1 Fill up the tank on the pump unit with oil of the recommended quality (see appendix G). The oil volume is approx. 5 litres. Fill up the tank as described in section 4.5.4 & 4.5.5

FIGURE 2.2

2.3.2 Electrical connections

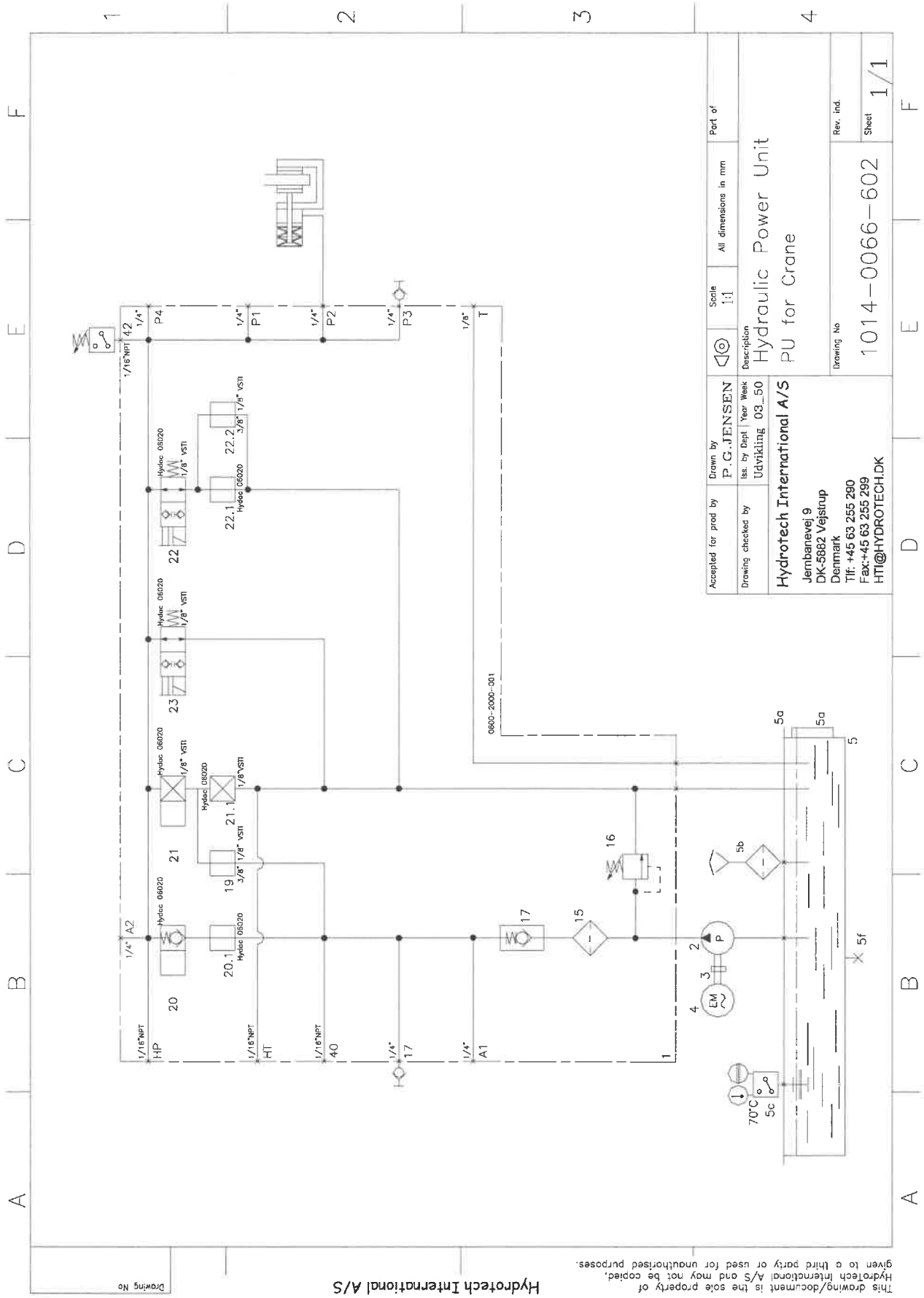
WARNING

Connect the valves (22, 23), the motor (4), the pressure switch (42) and the level/thermo switch (5c) to the voltage described in Appendix E.

CAUTION

2.3.3 Start the electric motor.
Check that the rotation of the electric motor is correct as indicated on the motor – i.e. counter clockwise viewed from the fan end.

3.3 Hydraulic diagram



4.4 Function test

Testing component position (see hydraulic diagram)	Component		Explantion
	Before action	Action	
2, 3, 4, 16, 22, 23, 42 Testpoint: P2	22, 23: on	4: on	Motor should start and stop at the preset pressure signal from 42. For a period of 10 minutes motor should not re-start proving all connections and the valves 22 & 23 are tight. CAUTION: This test will release the brakes.
22	4: on 22, 23: on	22: off or disconnected	Opening the valve 22 should start the motor circulating oil from pump through valve 22 back to tank. CAUTION: This test will apply the brakes.
22, 23	4: on 23: on	22: on and connected 23: off or disconnected	Connecting the valve 22 motor should stop at the preset pressure signal from 42. CAUTION: This test will release the brakes. Opening the valve 23 should start the motor circulating oil from pump through valve 23 back to tank. CAUTION: This test will apply the brakes.
23	4: on 22: on	23: on and connected	Connecting the valve 23 motor should stop at the preset pressure signal from 42. CAUTION: This test will release the brakes.

4.5 Dismantling the power unit

This should only be carried out in an authorised hydraulic workshop. Ask for separate information.

4.6 Changing the oil

WARNING:

4.6.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

With the drain valve:
Remove the end nut
Open the valve.
The location of the drain is on the side of the reservoir.

4.6.2 Make sure that the whole oil drains into a secondary container for proper disposal.

4.6.3 Close the drain valve and re-fit the end nut.

4.6.4 Refill the oil reservoir to the top level mark in the sight glass located on the reservoir sidewall.

CAUTION

Use only filtered oil of the right viscosity for refilling (see appendix F).

4.6.5 Connect the electrical power again and start the pump. Let the unit run 10 cycles (pressurising/de-pressurising).
With system pressurised bleed the brakes.
With system de-pressurised refill oil if necessary.

4.7 Changing the oil and cleaning the reservoir

4.7.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

This procedure is recommended always to be carried out in a hydraulic workshop to ensure clean environment.

FIGURE 4.7

4.7.7 After connecting to power and brakes fill reservoir as described in chapter 4.5.4 & 4.5.5

4.8 Changing the oil filter

4.8.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

The oil filter is placed in the filter housing.

4.8.2 Using an open end spanner, turn the filter housing counter clockwise until it is disconnected from the filter manifold.

4.8.3 Remove the oil filter and clean the inside of the filter housing and cavity. Insert a new oil filter minding the orientation.

4.8.4 Clean the o-ring and Teflon-ring outside the filter housing.
Renew o-ring and Teflon-ring if necessary.

4.8.5 Refit the filter housing.

4.9 Changing the air breather

4.9.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

The air breather consists of two parts:
A strainer inside the reservoir and
A filter in the cap

NOTE
3 litre tanks does only have filter in the cap.

FIGURE 4.13

4.9.2 The air breather is connected to the reservoir with three small screws. Remove these screws with a screwdriver.
Remove the air breather along with the seals.

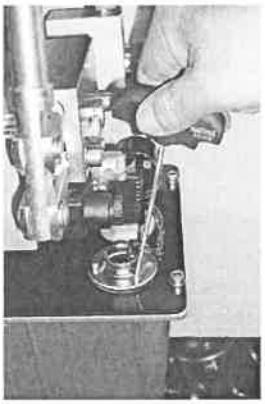


FIGURE 4.14

4.9.3 Mount a new complete air breather and torque tighten the three small screws to 1-2 Nm.

FIGURE 4.15

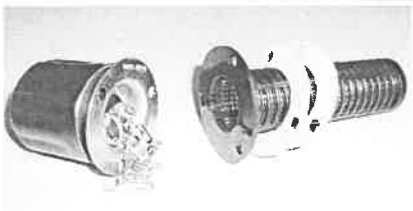


FIGURE 4.20

4.11.1 Establish a filling line between the gas pressure valve and a gas tank.
The accumulator charger kit contains gas pressure gauge and filling line.
Remember that the adaptor from the line and to the gas tank is country specific and may need to be ordered separately.

FIGURE 4.21

4.11.2 Open the gas tank valve and the top valve to fill gas into the accumulator.
Close gas tank valve and wait several minutes for the new gas to decline to accumulator temperature.

Measure the gas pressure.

If the pressure is too low apply more gas.

FIGURE 4.22

4.11.3 If the gas pressure is too high open the side valve to relieve gas.
Close the top valve when the gas pressure is correct.

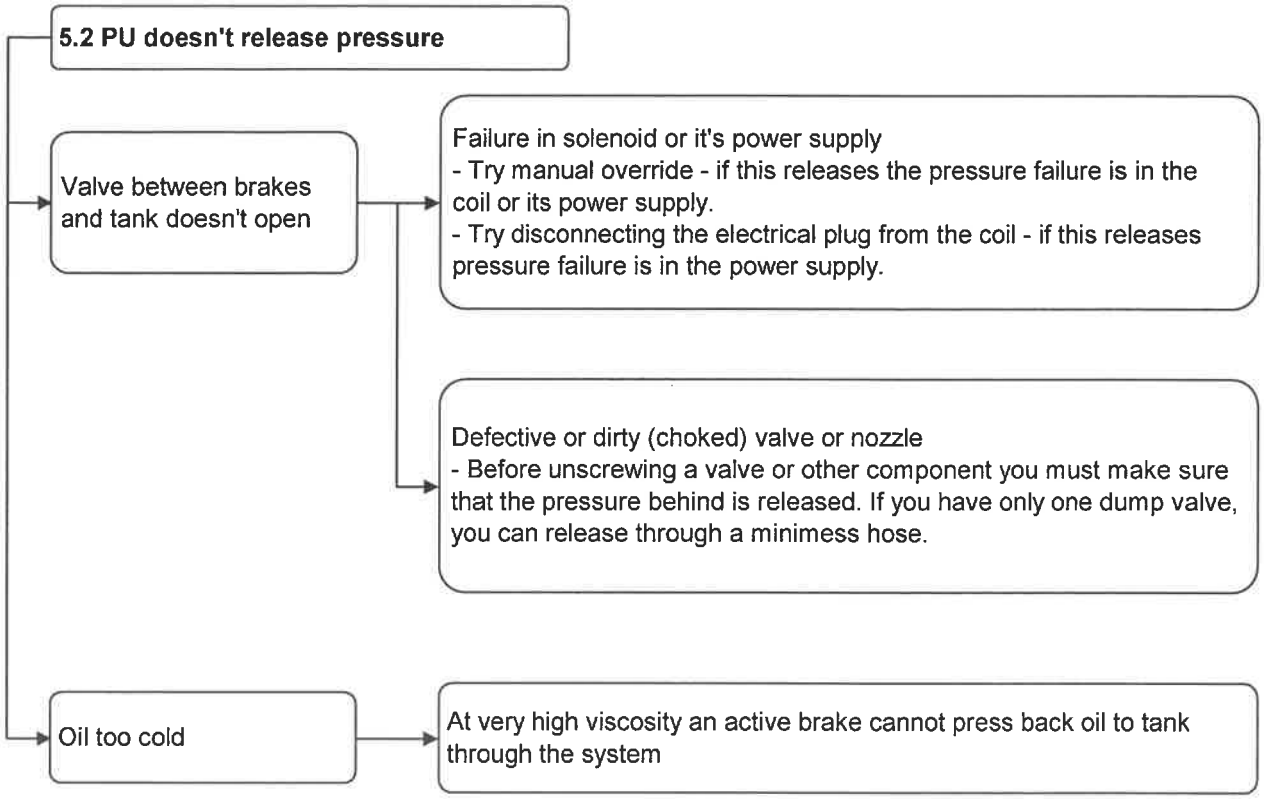
FIGURE 4.23

4.11.4 Open the side valve, relieve the pressure completely and remove the gas pressure gauge.

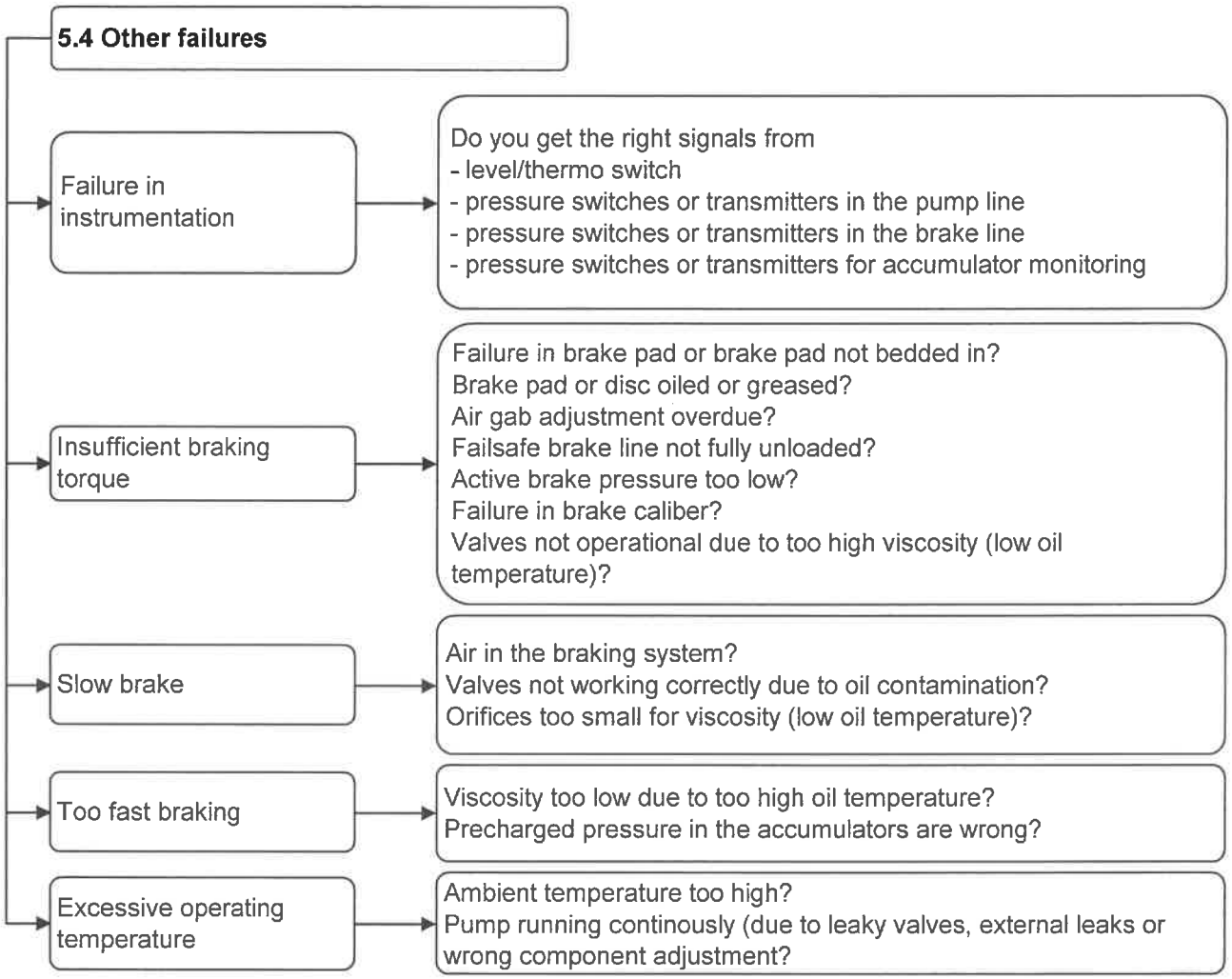
4.11.5 Tighten the plug (18 - 22Nm) using the 6mm Allen key (hexagonal) and mount the threaded end cap by use of hand

FIGURE 4.24

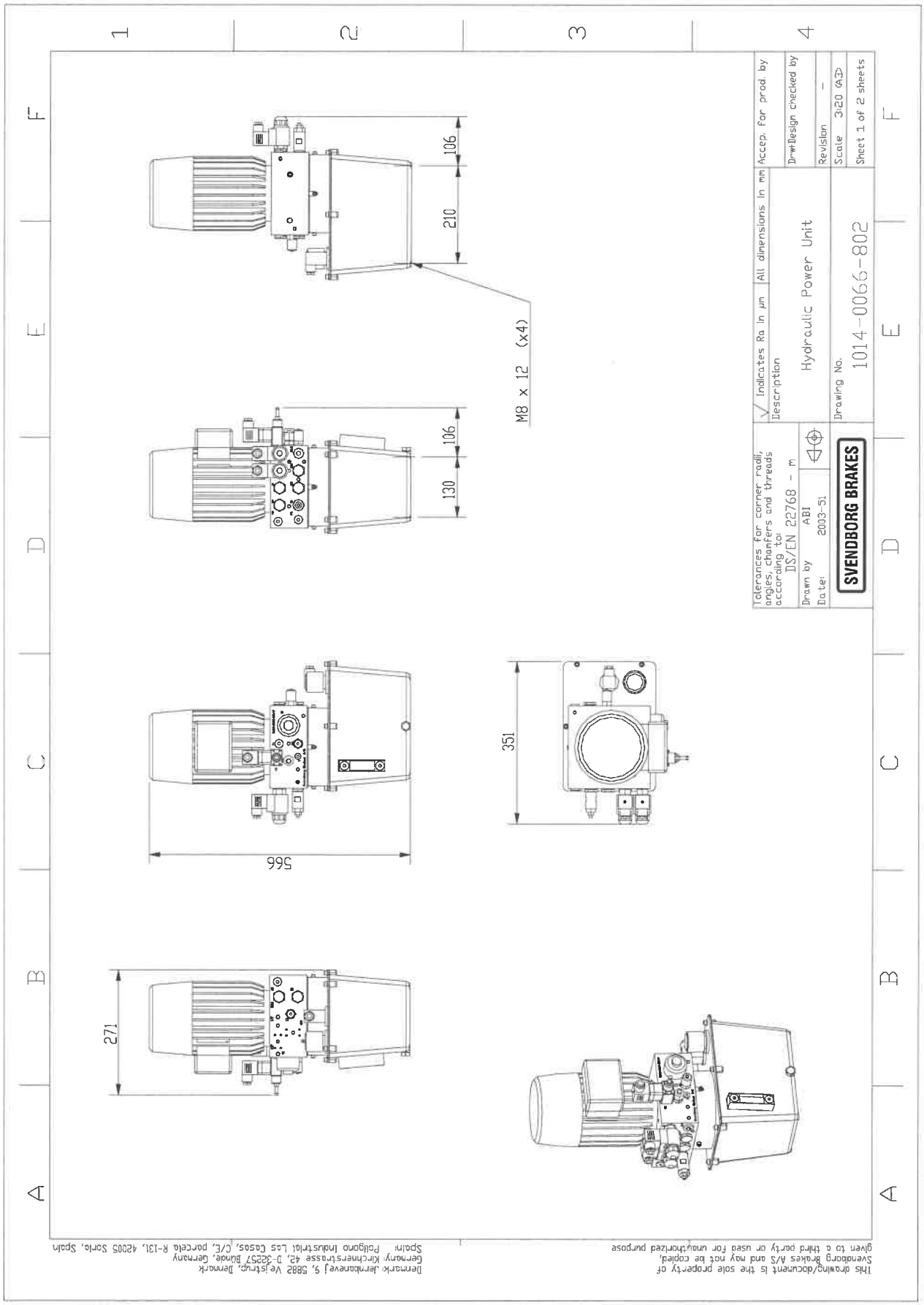
5.2 Power unit does not release pressure



5.4 Other failures



Appendix A - Dimension drawing



Appendix B - Spare parts list

For brake control unit 1014-0066-802
according to Spare Part Drawing and Hydraulic Diagram (section 3.3)

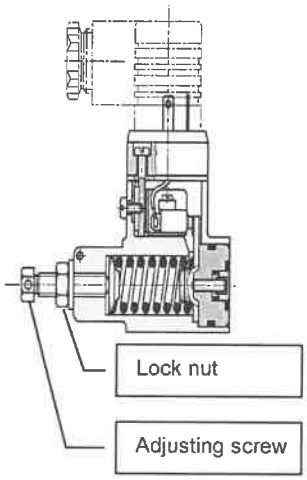
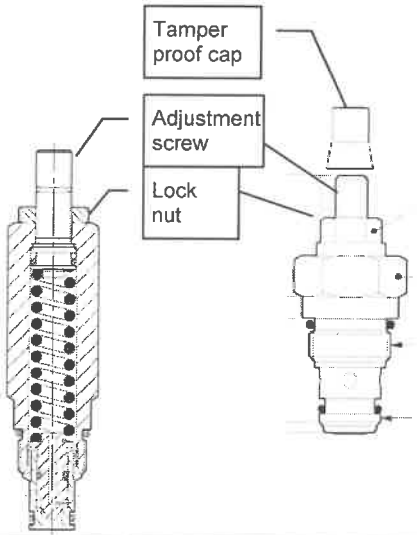
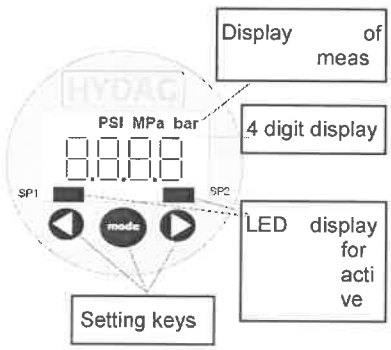
Pos	Qty	Description		SB item no	Rec. spare parts qty. (note 1)	Mounting torque [Nm] (note 2)	Adjustment method (see apx. C & D)
15	1	FILTER ELEMENT	10 MICRON	1701-2024-003	2		
15a	1	FILTER HOUSING		1701-1024-002		Note 3	
16	1	RELIEF VALVE	MAX SETTING 210 BAR	9103-5000-801	1	50	2
17, 20	2	CHECK VALVE		6010-0024-001		50	
17,P3	2	TEST POINT NIPPLE		9009-1010-040	1	30	
2	1	GEAR PUMP	2,1 CCM/REV	0305-1031-003		24	
22, 23	2	DIRECTIONAL POPPET VALVE	2/2 NORMALLY OPEN	2222-1024-801	1	50	
22, 23	2	COIL 230 VAC		2223-0024-002			
22, 23, 42, 5c1	4	ELECTRIC PLUG 230 VAC	230 VAC	5105-0999-001			
3	1	COUPLING MOTOR/PUMP		9803-1032-001			
4	1	MOTOR 50 HZ 3 X 400V	IP55 1,5 KW	5140-0999-003			
42	1	PRESSURE SWITCH	40-210 BAR W PLUG AND BOLTS	4002-1022-801	1	3	1
5	1	OIL TANK	6 LTR	1200-6000-001			
5a	1	LEVEL GLASS		1231-1052-001		10	
5b	1	BREATHER AND FILLING STRAINER	10 MICRON	1712-1024-001	1	Finger	
5c	1	LEVEL/THERMO		1232-2052-001		25	
5d	1	TANK COVER		1220-2000-001			
5f	1	TANK DRAIN PLUG		1290-2999-040		15	

Notes

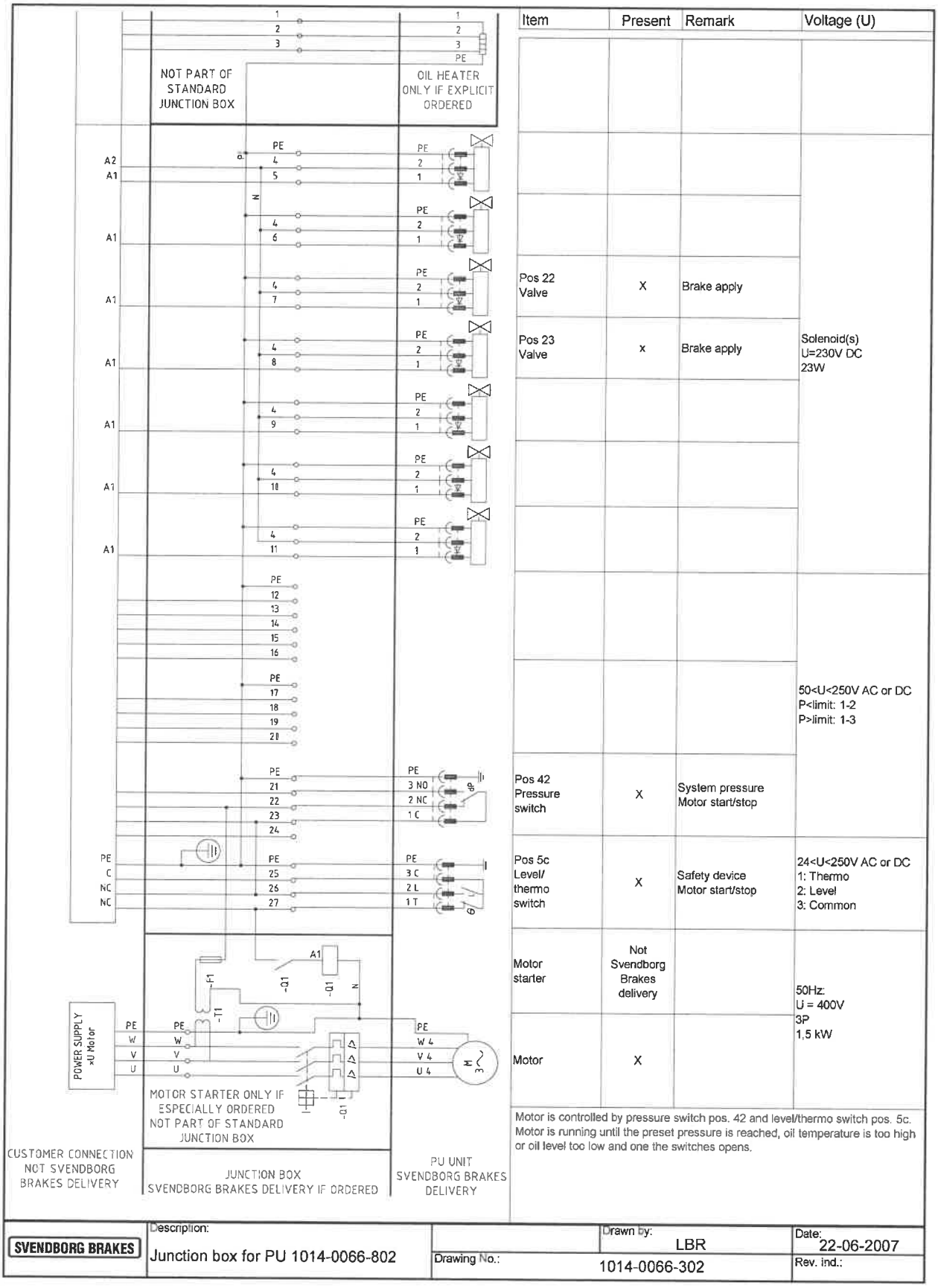
1) It is highly recommended to have the spare parts of the marked type in stock as this may reduce downtime in case of failure. The quantity stated is the minimum quantity recommended.
2) Mounting torque (Nm) (lb/ft = value x 0.74) for each component or bolt fixing the component.
3) Turn in to bottom and out ¼ revolutions.

Appendix D - Adjusting

Choose method according to Appendix B "Spare parts list"

Adjustment method	Item type	Item drawing/Photo	Description
1	Pressure switch		The pressure switches have fixed hysteresis. To adjust the setting pressure the lock nut must be loosened. To increase the setting pressure at which the contact switches the setting screw must be turned clockwise. Remember to tighten the lock nut after adjusting.
2	Relief valve or Counter pressure valve (same item)		The system safety valve (Pos. 16 – relief valve) is preset at the factory to the correct pressure / setting. Do not adjust this valve. If the tamper proof cap is broken or missing the power unit is no longer covered by Svendborg Brakes warranty. For other relief valves if adjustment is needed, remove the tamper proof cap, loosen the lock nut and screw out (counter-clockwise) to decrease max. pressure setting. Screw in (clockwise) to increase max. pressure. Remember to re-tighten the lock nut.
3	Pressure switch	Display and setting keys: 	The settings are locked from factory. To unlock you must hold down both arrow keys for 3 sec. Display shows for 2 sec. "oP6" and then "FrEE". Now you can change the settings for upper switch point and/or hysteresis by selecting mode. Changes are made by using the arrow keys. After the changes you press both arrows again for 3 sec. Display will show "Loc" for a moment and the new settings are saved. Afterwards display will again show the measured pressure.
4	Accumulator		See section 4.8 & 4.9

Appendix E - Electrical diagram



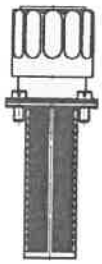
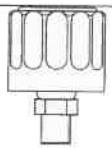
Item	Present	Remark	Voltage (U)
Pos 22 Valve	X	Brake apply	
Pos 23 Valve	x	Brake apply	Solenoid(s) U=230V DC 23W
			50<U<250V AC or DC P<limit: 1-2 P>limit: 1-3
Pos 42 Pressure switch	X	System pressure Motor start/stop	
Pos 5c Level/ thermo switch	X	Safety device Motor start/stop	24<U<250V AC or DC 1: Thermo 2: Level 3: Common
Motor starter	Not Svendborg Brakes delivery		50Hz: U = 400V 3P 1,5 kW
Motor	X		

Motor is controlled by pressure switch pos. 42 and level/thermo switch pos. 5c. Motor is running until the preset pressure is reached, oil temperature is too high or oil level too low and one the switches opens.

SVENDBORG BRAKES	Description: Junction box for PU 1014-0066-802		Drawn by: LBR	Date: 22-06-2007
		Drawing No.: 1014-0066-302		Rev. ind.:

Appendix G - Recommended spare parts

Recommended spare parts for one brake

FILTERS Air filter for 6 and 10 litre tank, 10 µ	1712-1024-001	
Air filter for 3 litre tank, 10 µ	1712-0024-001	
Pressure filter element 10 micron	1701-2024-001	
ACCUMULATOR CHARGER KIT Goes for B, DK, D, SF, NL, N, A, PL, S, CH, CZ	4899-9024-002	
With adaptor for		
South-East Asia, ARG, AUS, BS, GB, GR, IRL, JA, M, NZ, P, E, TR, CY Africa except for Arab countries	4899-9024-006	
Arab countries, BG, COI, F, RG, Israel, MEX, RO, H	4899-9024-007	
Canada, USA, Puerto Rico	4899-9024-003	
Italy	4899-9024-001	
Japan	4899-9024-005	
Taiwan	4899-9024-008	
Korea	4899-9024-009	
South & Middle America except Argentine, Venezuela and Mexico	4899-9024-010	
China	4899-9024-004	
OIL SAMPLE KIT	9640-0024-001	
FILTER FILLING STATION	1702-0024-001	