

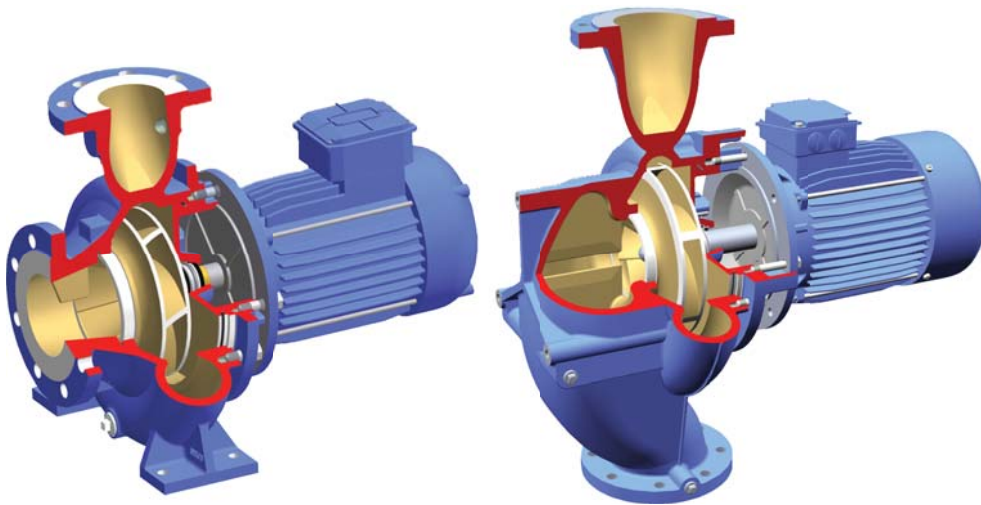
CombiLine - CombiBlocHorti

Circulation pumps

CL-CBH/EN (1212) 7.5

Original instructions

Read and understand this manual prior to operating or servicing this product



EC Declaration of conformity

(Directive 2006/42/EC, appendix II-A)

Manufacturer

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

hereby declares that all pumps member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiLine, CombiLineBloc and CombiNorm whether delivered without drive (last position of serial number = B), or delivered as an assembly with drive (last position of serial number = A), are in conformity with the provisions of Directive 2006/42/EC (as altered most recently) and where applicable the following directives and standards:

- EC directive 2006/95/EC, "Electric equipment for use within certain voltage limits"
- standards EN-ISO 12100 part 1 & 2, EN 809

The pumps to which this declaration refers may only be put into operation after they have been installed in the way prescribed by the manufacturer, and, as the case may be, after the complete system of which these pumps form part, has been made to fulfil the requirements of Directive 2006/42/EC (as altered most recently).

EC Declaration of conformity

(Directive 2009/125/EC, Annex VI and Commission Regulation (EU) No 547/2012)
(Implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water pumps)

Manufacturer

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

Hereby declares that all listed pumps member of product families CombiBloc, CombiBlocHorti, CombiChem, CombiLine, CombiLineBloc and CombiNorm are in conformity with the provisions of Directive 2009/125/EC and Commission Regulation (EU) No 547/2012 and the following standard:

- prEN 16480

Declaration of incorporation

(Directive 2006/42/EC, appendix II-B)

Manufacturer

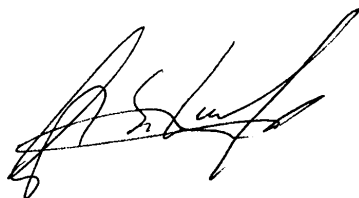
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hereby declares that the partly completed pump (Back-Pull-Out unit), member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiLine, CombiLineBloc and CombiNorm is in conformity with the following standards:

- EN-ISO 12100 parts 1 & 2, EN 809

and that this partly completed pump is meant to be incorporated into the specified pump unit and may only be put into use after the complete machine of which the pump under consideration forms part has been made and declared to comply with that directive.

Assen, January 1st 2013



G.A. Schaafsma,
General Manager

Instruction manual

All technical and technological information in this manual as well as possible drawings made available by us remain our property and shall not be used (otherwise than for the operation of this pump), copied, duplicated, made available to or brought to the notice of third parties without our prior written consent.

SPX is a Fortune 500, global multi-industry manufacturing leader. SPX divides its business into four segments and one of these is the SPX Flow Technology segment. Johnson Pump Horticulture is part of SPX Flow Technology segment.

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1 Introduction

1.1 Preface

This manual is intended for technicians and maintenance staff and for those who are in charge of ordering spare parts

This manual contains important and useful information for the proper functioning and maintenance of this pump. It also contains important instructions to prevent potential accidents and damage, and to ensure safe and fault-free operation of this pump.



Read this manual carefully before commissioning the pump. Familiarize yourself with the operation of the pump and strictly obey the instructions!

The data published here comply with the most recent information at the time of going to press. However they may be subject to later modifications.

SPX reserves the right to change the construction and design of the products at any time without being obliged to change earlier deliveries accordingly.

This manual has been compiled by SPX with the utmost care. Nevertheless SPX cannot guarantee the completeness of this information and therefore assumes no liability for possible deficiencies in this manual. The buyer/user shall at all times be responsible for testing the information and for taking possible additional and/or deviating safety measures. SPX reserves the right to change the safety instructions.

1.2 Safety

This manual contains instructions for working safely with the pump. Operators and maintenance staff must be familiar with these instructions. Installation, operation and maintenance has to be done by qualified and well prepared personnel.

Below is a list of the symbols used for those instructions and their meaning:



Personal danger for the user. Strict and prompt observance of the corresponding instruction is imperative.



Risk of damage or poor operation of the pump. Follow the corresponding instruction to avoid this risk.



Useful direction or tip for the user.

1.3 Guarantee

SPX shall not be bound to any guarantee other than the guarantee accepted by SPX. In particular, SPX will not assume any liability for explicit and/or implicit guarantees such as but not limited to the marketability and/or suitability of the articles supplied.

The guarantee will be cancelled immediately and legally if:

- service and/or maintenance has not been carried out strictly in accordance with the instructions.
- necessary repairs have not been carried out by our personnel or have been carried out without our prior written permission.
- the articles supplied have been changed without our prior written permission.
- the spare parts used are not original SPX parts.
- the products supplied are not used in accordance with their nature and/or purpose.
- the products supplied have been used amateurishly, carelessly, improperly and/or negligently.
- the products supplied become defective due to external circumstances beyond our control.

All parts which are liable to wear are excluded from guarantee.

Furthermore, all deliveries are subject to our "General conditions of delivery and payment", which will be forwarded to you free of charge on request.

1.4 Inspection of delivered items

Check the consignment immediately on arrival for damage and conformity with the advice note. In case of damage and/or missing parts, have a report drawn up by the carrier at once.

1.5 Forwarding and storage instructions

1.5.1 Packaging

The pump is packed in a solid cardboard box. The bigger types are provided with a wooden bottom. The pump is bolted down on this bottom. The forwarding and storage instructions are stated on the box by means of symbols. Adhere to these instructions. Furthermore, the box contains the same information about the pump as the information written on the label on the cover of this manual. Always leave the pump in the packaging as long as possible in order to avoid damages and facilitate possible further transport in case the pump has to be moved elsewhere. All boxes are provided with grips. Use these grips as much as possible in case of manual transport.

For the bigger pump types, the wooden bottom is designed as a platform, allowing the boxes to be moved by forklift.



When using a forklift always set the forks as far apart as possible and lift the package with both forks to prevent it from toppling over! Avoid jolting the pump when moving it!

1.5.2 Opening the packaging

The boxes are kept shut by 2 plastic straps. These straps also serve to keep the bottom and the covering box together.



Always make sure that the box stands on the floor! Wear gloves: the straps are under tension and may be sharp!

- 1 Cut the plastic straps.
- 2 Remove the covering box.
- 3 Unscrew the pump from the bottom.
- 4 Rest the pump on the supporting brackets under the suction bend.

➤ *Do not throw away the packaging! SPX is striving for an environmental minded management. Please contact us about the possibilities of returning your packaging materials.*

1.6 Ordering parts

This manual contains a survey of the spare parts recommended by SPX as well as the instructions for ordering them.

See <http://global.johnson-pump.com/Horticulture> ➤ horticulture ➤ products ➤ spare parts.

When ordering parts or for any correspondence you should always state all data stamped on the name plate.

➤ *This data is also printed on the label on the front of this manual.*

If you have any questions or require further information with regard to specific subjects, then do not hesitate to contact SPX.

2 General

2.1 Description of the pump

2.1.1 CombiLine (CL)

The CombiLine is a built-in in-line circulation pump range. These pumps are easy to install in straight pipelines, inlet and outlet flange connections have the same size and pattern and are positioned in-line.

2.1.2 CombiBlocHorti (CBH)

The CombiBlocHorti is a close-coupled foot-mounted pump range. These pumps are characterised by a compact build and a pump casing with horizontal inlet and vertical outlet.

2.1.3 General

CL and CBH share the same impeller, shaft seal, and drive section (Back-Pull-Out unit). For this design the electric motor is provided with an extended, stainless steel motor shaft. The impeller is directly mounted onto the motor shaft. The pumps are provided with a rubber bellows mechanical seal, according to EN 12756 (DIN 24960).

The pumps are available with single- and double-speed electric motor. Frequency controlled motor drives are available for the single-speed electric motors. These electric motors are standard suitable for 50 Hz and 60Hz. The speed of the electric motor can be controlled in a frequency range from 10 Hz - 60 Hz.

➤ *Running the pump at the lower speed will result in considerable energy savings.*

2.2 Type code

Pumps are available in various designs. The main characteristics of a pump are shown in the type code.

Example: **CL 80-200, CBH 80-200**

CL	CombiLine
CBH	CombiBlocHorti
80	diameter suction and delivery connection in mm (for CL) diameter delivery connection in mm (for CBH)
200	nominal impeller diameter in mm

2.3 Serial number

Serial number of the pump or pump unit are shown on the name plate off the pump and on the label on the cover of this manual.

Example: **11-09 X123500 1/2**

11-09	month-year of manufacture
X123500	unique number
1/2	number of pumps

2.4 Applications

The CombiLine is a built-in circulation pump that can be used in the following areas:

- greenhouses
- hot and cold-water systems
- cooling-water systems
- utility building
- industrial installations

In general, this pump can be used for thin, clean or slightly polluted liquids. These liquids should not affect the pump materials.

The maximum allowable temperature and pressure are mentioned in paragraph 10.1 "Technical data pumps".



Do not use the pump for purposes other than those for which it is delivered without prior consultation with your supplier!

Using a pump in a system or under system conditions (liquid, pressure, temperature, etc.) for which it has not been designed may hazard the user!

2.5 Construction

2.5.1 Pump casing CL

The pump casing is of the volute type. Suction and delivery flange are placed in-line and have the same flange size. The specially shaped suction bend ensures low-noise functioning of the pump.

2.5.2 Pump casing CBH

The pump casing is a volute type end-suction casing with horizontal inlet and vertical outlet. A replaceable wear ring is fitted at the position of the impeller inlet.

2.5.3 Impeller

The impeller is of the closed type and is mounted directly on the end of the extended motor shaft. The impeller is fixed by means of a cap nut, except for pump types CL4/4 and CL5/4, which have a normal nut.

2.5.4 Shaft sleeve

For the smaller pump types the motor shaft is protected by a shaft sleeve to keep it from getting into contact with the pumped liquid.

CL 4/4, CL 5/4 and all pumps fitted with a IEC 132 or IEC 160 size electric motor or with a 6-pole motor are **not** provided with a shaft sleeve.

2.5.5 Lantern piece

The lantern piece connects the electric motor to the pump casing, serving at the same time as pump cover. Inside the lantern piece there is a standard mechanical seal with bellows, according to EN 12756.

2.5.6 Electric motor

The electric motor has an extended shaft, on which the impeller is mounted. The forces on the impeller are absorbed by the motor bearings. The bearings are dust-proof and greased for life, so they are maintenance-free. The protection class for all motors is IP 55. The electric motors are equipped as standard with an aluminium terminal box.

➤ *All electric motors are suited for connection to frequency control.*

2.6 Ecodesign Minimum Efficiency Requirements Water Pumps

- Directive 2005/32/EC of the European Parliament and of the Council;
- Commission regulation (EU) No 547/2012 Implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to eco-design requirements for water pumps.

2.6.1 Introduction

SPX Flow Technology Assen B.V. is an associate member of the HOLLAND PUMP GROUP, an associate member of EUROPUMP, the organization of European pump manufacturers.

Europump promotes the interest of the European pump industry with the European institutions.

Europump welcomes the aim of the European Commission to reduce eco-impact of products in the European Union. Europump is fully aware of the eco-impact of pumps in Europe. For many years the ecopump initiative is one of the strategic columns in the work of Europump. From the first of January 2013 the regulation is coming into force concerning minimum required efficiencies of rotodynamic water pumps. The regulation sets minimum efficiency requirements on water pumps set out under the Ecodesign Directive for energy related products. This regulation mainly addresses manufacturers of water pumps placing these products on the European market. But as a consequence customers may also be affected by this regulation. This document gives necessary information related to the coming into force of the water pump regulation EU 547/2012.

2.6.2 Implementing Directive 2009/125/EC

- Definitions:

“This Regulation establishes eco-design requirements for the placing on the market of rotodynamic water pumps for pumping clean water, including where integrated in other products.”

“Water pump” is the hydraulic part of a device that moves clean water by physical or mechanical action and is of one of the following designs:

- End suction own bearing (ESOB);
- End suction close coupled (ESCC);
- End suction close coupled inline (ESCCi);
- Vertical multistage (MS-V);
- Submersible multistage (MSS);”

‘End suction water pump’ (ESOB) means a glanded single stage end suction rotodynamic water pump designed for pressures up to 1600 kPa (16 bar), with a specific speed n_s between 6 and 80 rpm, a minimum rated flow of 6 m³/h, a maximum shaft power of 150 kW, a maximum head of 90 m with nominal speed of 1450 rpm and a maximum head of 140 m with nominal speed of 2900 rpm;

‘End suction close coupled water pump’ (ESCC) is an end suction water pump of which the motor shaft is extended to become also the pump shaft;

'End suction close coupled inline water pump' (ESCCi) means a water pump of which the water inlet of the pump is on the same axis as the water outlet of the pump;

'Vertical multistage water pump' (MS-V) means a glanded multistage ($i > 1$) rotodynamic water pump in which the impellers are assembled on a vertical rotating shaft, which is designed for pressures up to 2500 kPa (25 bar), with a nominal speed of 2900 rpm and a maximum flow of 100 m³/h;

'Submersible multistage water pump' (MSS) means a multistage ($i > 1$) rotodynamic water pump with a nominal outer diameter of 4" (10,16 cm) or 6" (15,24 cm) designed to be operated in a borehole at nominal speed of 2900 rpm, at operating temperatures within a range of 0°C and 90°C;

This Regulation shall not apply to:

- 1 water pumps designed specifically for pumping clean water at temperatures below -10°C or above +120°C;
- 2 water pumps designed only for fire-fighting applications;
- 3 displacement water pumps;
- 4 self-priming water pumps.

▪ Enforcement:

In order to enforce this there will be a **Minimum Efficiency Index (M.E.I.)** criteria set for the above list of pumps.

The MEI is a dimensionless figure that is derived from a complex calculation based on the efficiencies at BEP (Best Efficiency Point), 75% BEP & 110% BEP, and the specific speed. The range is used so that manufacturers do not take an easy option of providing good efficiency at one point i.e. BEP.

The value ranges from 0 to 1,0 with the lower value being less efficient, this provides the basis of eliminating the less efficient pumps starting with 0,10 in 2013 (the lowest 10%) and 0,40 (the lowest 40%) in 2015.

The MEI value of 0,70 is classed benchmark for the most efficient pumps in the market at the time of developing the directive.

The milestones for the MEI values are as follows;

- 1 1st January 2013 all pumps shall have a minimum MEI value of 0,10;
- 2 1st January 2015 all pumps shall have a minimum MEI value of 0,40.

The most important point of this is that unless the pumps comply then they will not be allowed to have a CE marking.

▪ Part Load Performance

It is common practice that pumps spend much of their time working away from their rated duty, and efficiency can fall off rapidly below the 50% duty point, any scheme should take account of this real life performance. However, manufacturers need a pump efficiency classification scheme that makes it impossible to design pumps with a steep fall off in efficiency either side of the BEP point in order to claim a higher efficiency than would be typical of real life operation.

▪ ‘House of Efficiency’

The decision scheme ‘House of Efficiency’ takes into account design and application purposes as well as the pump minimum efficiency dependence on flow. The minimum acceptable efficiency is therefore different for each pump type. The pass-or-fail scheme is based on two criteria A and B.

Criterion A is the pass-or-fail minimum efficiency requirement at the best efficiency point (BEP) of the pump:

$$\eta_{\text{Pump}}(n_s, Q_{\text{BEP}}) \geq \eta_{\text{BOTTOM}}$$

Where

$$n_s = n_N \times \frac{\sqrt{Q_{\text{BEP}}}}{H_{\text{BEP}}^{0.75}}$$

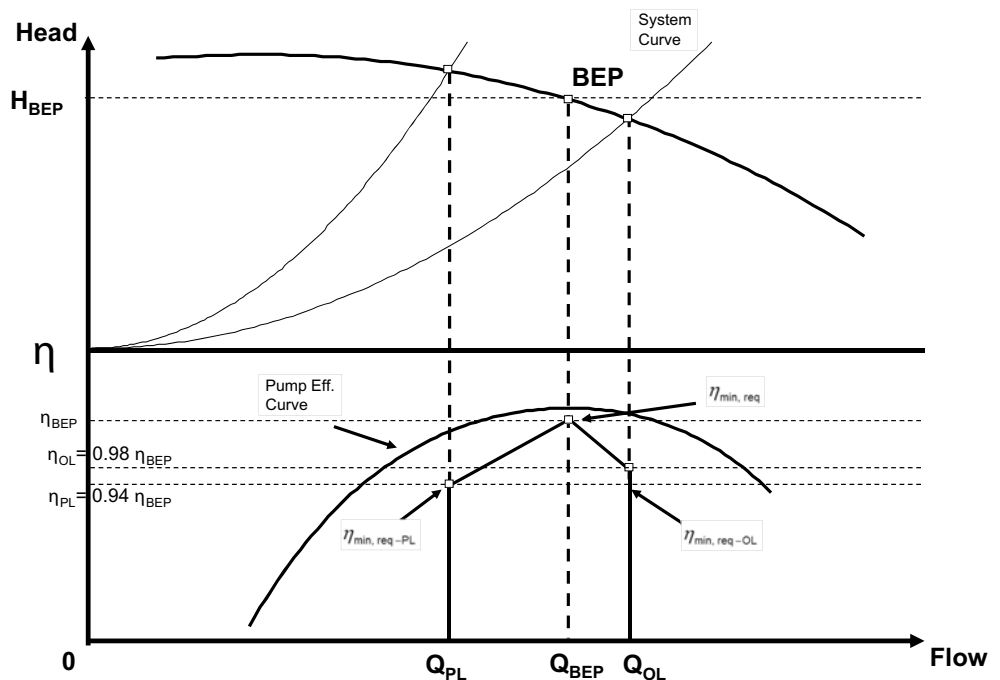
Criterion B is the pass-or-fail minimum efficiency requirement at part load (PL) and at overload (OL) of the pump:

$$\eta_{\text{BOTTOM-PL,OL}} \geq x \cdot \eta_{\text{BOTTOM}}$$

Therefore a method is devised what is called a “house of efficiency” scheme that also requires pumps to pass efficiency thresholds at 75% and 110% of rated flow. The advantage of this is that pumps will be penalised for poor efficiency away from rated efficiency, hence it will take account of real life pump duties.

It should be stated that while the scheme may appear complicated at first sight, in practice it has been easy for the manufacturers to apply the scheme to their pumps.

Figure 1: House of Efficiency



2.6.3 Energy Efficient Pump Selection

In selecting the pump, care should be taken to ensure that the duty point required is as close as possible to the pump's Best Efficiency Point (BEP). Different heads and flows can be achieved by changing the diameter of the impeller and thereby eliminating unnecessary energy loss.

The same pump can be offered at different motor speeds to allow the pump to be used over a much wider range of duties. For instance, changing from 4-pole motor to 2-pole motor will enable the same pump to deliver twice as much peak flow at 4 times the head.

Variable speed drives allow the pump to operate efficiently over a wide range of speeds hence duties in an energy efficient manner. They are particularly useful in systems where is a variation in required flow.

A very useful tool for energy efficient pump selection is the downloadable software program "Hydraulic Investigator 2" from the SPX website.

Hydraulic Investigator is the selection guide for centrifugal pumps and search by pump family and pump type starting from entering required capacity and head. Further refine the pump curves to find the pump that meets your specification.

The default setting of applicable pump types is prioritized on highest efficiency. In the standard automated selection procedure the optimum (trimmed) impeller diameter is calculated already, where applicable. Manually the rotating speed can be adjusted as well when a variable speed drive is preferred.

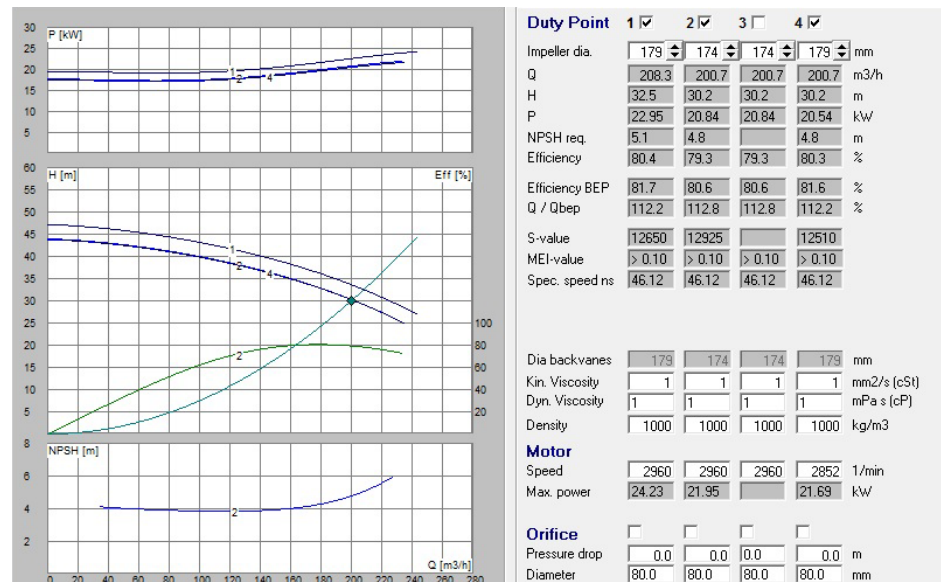
Example:

Curve 1: performance at maximum impeller diameter and 2960 rpm;

Curve 2: performance at required duty point (200 m³/h, 30 m) with trimmed impeller, power consumption 21,95 kW;

Curve 4: performance at required duty point with maximum diameter and reduced rotating speed (2852 rpm), power consumption 21,69 kW.

Figure 2: Hydraulic Investigator 2



2.6.4 Scope of Implementing Directive 2009/125/EC

The following SPX Flow Technology products are in the scope of the directive:

- CombiNorm (ESOB)
- CombiChem (ESOB)
- CombiBloc (ESCC)
- CombiBlocHorti (ESCC)
- CombiLine (ESCCi)
- CombiLineBloc (ESCCi)

The vertical multistage pump range MCV(S) is out of the scope of the directive, these pumps are designed for pressures up to 4000 kPa (40 bar).

Submersible multistage pumps are not available in the SPX product portfolio.

2.6.5 Product information

Name plate, example:

Figure 3: Name plate horticulture

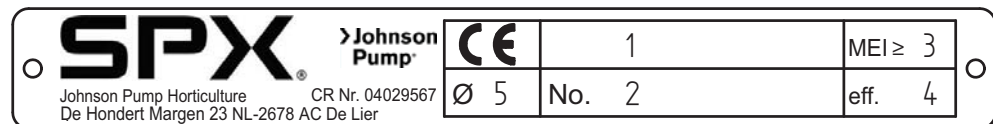


Table 1: Name plate horticulture

1	CL 80-200	Product type and size
2	11-09 X123500 1/2	Month-year, serial number and number of pumps
3	0,10 or 0,40	Minimum Efficiency Index at max. impeller diameter
4	[xx.x]% or [-,-]%	Efficiency for trimmed impeller diameter
5	202 mm	Fitted impeller diameter

1 Minimum efficiency index, MEI:

Table 2: MEI value, CombiLine

	Speed [rpm]	MEI value according prEN16480	Remarks
Material		Cast iron	
4/4	1450	---	Outside scope, Q < 6 m ³ /h
4/4	2900	> 0,10	
5/4	2900	> 0,10	
32-125	1450	> 0,10	
40-125	1450	> 0,10	
40-160	1450	> 0,10	
40-200	1450	> 0,10	
50-125	1450	> 0,10	
50-160	1450	> 0,10	
50-200	1450	> 0,10	
65-125	1450	> 0,10	
65-160	1450	> 0,10	
65-200	1450	> 0,10	

Table 2: MEI value, CombiLine

	Speed [rpm]	MEI value according prEN16480	Remarks
Material		Cast iron	
80-125	1450	> 0,10	
80-160	1450	> 0,10	
80-200	1450	> 0,10	
80A-250	1450	> 0,10	
100-150	1450	> 0,10	
100-160	1450	> 0,10	
100-200	1450	> 0,10	
100A-250	1450	> 0,10	
125-160	1450	> 0,10	
125-200	1450	> 0,10	
125A-250	1450	> 0,10	
150-125	1450	---	Outside scope, ns > 80 rpm
150-160	1450	> 0,10	
150-200	1450	> 0,10	
150-250	1450	> 0,10	
200-200	1450	> 0,10	

Table 3: MEI value, CombiBlocHorti

	Speed [rpm]	MEI value according prEN16480	Remarks
Material		Cast iron	
80-200	1450	> 0,10	
80-250	1450	> 0,10	
100-160	1450	> 0,10	
100-200	1450	> 0,10	
100-250	1450	> 0,10	
125-250	1450	> 0,10	
150-125	1450	---	Outside scope, ns > 80 rpm
150-160	1450	---	Outside scope, ns > 80 rpm
150-200	1450	> 0,10	
150-250	1450	> 0,10	
200-200	1450	> 0,10	
250-200	1450	> 0,10	

- 2 The benchmark for most efficient water pumps is $MEI \geq 0,70$.
- 3 Year of manufacture; the first 2 positions (= the last 2 positions of the year) of the serial number of the pump as marked on the rating plate. An example and explanation is given in paragraph 2.6.5 "Product information" of this document.

4 Manufacturer:

SPX Flow Technology Assen B.V.
 Registration number at Chamber of Commerce 04 029567
 Johnson Pump Horticulture
 De Hondert Margen 23
 2678 AC De Lier
 The Netherlands

- 5 Product type and size identifier are marked on the rating plate. An example and explanation is given in paragraph 2.6.5 "Product information" of this document.
- 6 The hydraulic pump efficiency of the pump with trimmed impeller diameter is marked on the rating plate, either the efficiency value [xx.x]% or [-.]%.
- 7 Pump curves, including efficiency characteristics, are published in the downloadable software program "Hydraulic Investigator 2" from the SPX website. For downloading "Hydraulic Investigator 2" go to <http://www.spx.com/en/johnson-pump/resources/hydraulic-investigator/> The pump curve for the delivered pump is part of the related customer order documentation package separate from this document.
- 8 The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with the full impeller diameter. The trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.
- 9 The operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.
- 10 Information relevant for disassembly, recycling or disposal at end-of-life is described in paragraph 2.7 "Re-use", paragraph 2.8 "Scrapping" and chapter 7 "Disassembly and assembly".
- 11 The benchmark efficiency Fingerprint Graphs are published for:

MEI = 0,40	MEI = 0,70
ESOB 1450 rpm	ESOB 1450 rpm
ESOB 2900 rpm	ESOB 2900 rpm
ESCC 1450 rpm	ESCC 1450 rpm
ESCC 2900 rpm	ESCC 2900 rpm
ESCCi 1450 rpm	ESCCi 1450 rpm
ESCCi 2900 rpm	ESCCi 2900 rpm
Multistage Vertical 2900 rpm	Multistage Vertical 2900 rpm
Multistage Submersible 2900 rpm	Multistage Submersible 2900 rpm

Benchmark efficiency graphs are available under <http://www.europump.org/efficiencycharts>.

2.7 Re-use

The pump may only be used for other applications after prior consultation with SPX or your supplier. Since the previously pumped medium is not always known, the following instructions should be observed:

- 1 Flush the pump properly.
- 2 Make sure the flushing liquid is discharged safely (environment!)



Take adequate precautions and use the appropriate personal protection means like rubber gloves and spectacles!

2.8 Scrapping

If it has been decided to scrap a pump, the same flushing procedure as described in paragraph 2.7 "Re-use" should be followed.

3 Installation

3.1 Safety

- Read this manual carefully before installing the pump and putting it into operation. Non-observance of these instructions may cause serious damage to the pump that is not covered by our guarantee terms. Follow the instructions step by step.
- Depending on the design the pumps are suitable for liquids with a temperature of up to 140°C. When installing the pump unit to work at 65°C and above the user should ensure that appropriate protection measures and warnings are fitted to prevent contact with the hot pump parts.

3.2 General

- The area in which the pump unit is to be placed should be adequately ventilated. A too high ambient temperature and air humidity, as well as a dusty environment may have a negative effect on the functioning of the electric motor.
- The foundation for a CBH pump must be hard, level and flat.
- The cooling air inlet of the motor should be positioned in such a way that unobstructed air supply is ensured.
- Make sure that the system pressure is always below the maximum allowable operational pressure. For exact values see paragraph 10.1 "Technical data pumps".
- If the pumped liquid is harmful to men or the environment, take appropriate measures to drain the pump safely. Possible leakage liquid from the mechanical seal should also be discharged safely.

3.3 Accessories

- In case the pump is provided with an isolation, special attention has to be paid to temperature limits of shaft seal and bearing.

3.4 Piping

As regards the piping and connecting points of the pump attention should be paid to the following:

- The piping to the suction and delivery connections must fit exactly and must not be subject to stress during operation. For the maximum allowable forces and moments on the pump flanges of a CBH pump see paragraph 10.5 "Permitted forces and torques on the flanges, based on EN-ISO 5199".
- Preferably a CL pump should be mounted in the piping in such a way that the direction of flow is vertical, so as to prevent air from remaining in the pump. Air in the pump may cause damage to the mechanical seal!
- Make sure that the system has one or more draining apertures. Also, it should be possible to bleed or de-aerate the system, preferably directly above the pump.

- If necessary mount valves before and after the pump. Do not use quick-acting valves, as they may cause high pressure impulses in the pump and the piping (water hammer pressure).
- Before installing the pump, all piping should be flushed, to eliminate all dirt, grease or possible other particles.

3.5 Installing a CL pump

The pump can be mounted in both horizontal and vertical piping. However, the electric motor should always be in horizontal position.

When installing this type of pump, proceed as follows:

- 1 Make sure the piping is supported before and after the pump (brackets).
- 2 The arrow on the pump casing shows the exact position of the suction and delivery flange.
- 3 Check the position of the terminal box on the electric motor in relation to the position of the pump in the piping. If this position is not correct, the stator should be rotated. See paragraph 7.6.1 "Electric motor stator".
- 4 Mount the flange gaskets and place the pump between the flanges of the piping.
- 5 Insert the fastening bolts and nuts for each flange and tighten them crosswise.

3.6 Installing a CBH pump

When installing this type of pump, proceed as follows:

- 1 Mount the flange gaskets and place the pump between the flanges of the piping.
- 2 In case of permanent arrangement of the pump, level the pump on the foundation by means of shims.
- 3 Then carefully tighten the nuts of the foundation bolts.
- 4 Insert the fastening bolts and nuts for each flange and tighten them crosswise.

3.7 Connecting the electric motor



The electric motor must be connected to the mains by an approved electrician, according to the locally prevailing regulations of the electricity company.

- Refer to the instruction manual belonging to the electric motor.
- If possible, mount a working switch as close as possible to the pump.

4 Commissioning

4.1 Inspection

Prior to commissioning the pump:

- Check if the fuses have been installed.
- Check if the impeller can rotate freely. Do this by rotating the shaft end with a screwdriver through the hole in the protective cover of the electric motor.
- Check if the suction and delivery connections have been mounted correctly.
- Check the sense of rotation.

4.2 Commissioning

Proceed as follows, both for commissioning and after the pump is put back into operation after repairs:

- 1 Open the valves. If there still is hot water in the pipes, open the valves gradually to prevent pressure impulses or sudden changes of temperature, which would cause serious damage to the pump.
- 2 Fill the system with liquid until the correct pressure is reached.
- 3 Bleed the system.
- 4 Switch on the pump.

4.3 Pump in operation

When the pump is in operation, pay attention to the following:

!

The pump should never run dry!

- Never use a stop valve in the suction line to control pump output. The stop valve should always be fully opened during operation.
- Check whether the pressure difference between suction and delivery side corresponds with the specifications of the pump's duty point.
- Check whether the absolute inlet pressure is sufficient, to prevent vaporization in the pump. Vaporization may cause cavitation.

!

Cavitation should always be prevented since it causes serious damage to the pump!

5 Maintenance

! **Flawed maintenance will result in shorter lifespan, possible break down and in any event loss of warranty.**

5.1 Bearings

Both motor bearings have been greased for their lifetime and require no maintenance.

5.2 Mechanical seal

A mechanical seal generally requires no maintenance, however, **it should never be allowed to run dry**. If there are no problems, do not dismantle the mechanical seal. As the seal faces have run in on one another dismantling usually implicates replacement of the mechanical seal. If a mechanical seal shows any leakage it has to be replaced.

5.3 Environmental influences

- When a unit is out of operation and there is a risk of freezing, it is recommended to drain the unit.
- Check motor for accumulation of dust or dirt, which might influence motor temperature.
- The standard protection class of the electric motor is IP 55, this means that it is 'spray-water proof'.

! **Never spray water on hot pump elements! They may burst and hot water may flow out.**

5.4 Noise

The noise produced by a pump depends to a great extent on the operation conditions. The values are stated in paragraph 10.6 "Noise data".

If a pump starts making excessive noise, this may point to certain problems with the pump unit. A crackling noise can indicate cavitation or excessive motor noise can indicate deterioration of the bearings.

5.5 Motor

Check motor specifications for start-stop frequency.

5.6 Failures

- 1 If the pump shows problems, the cause may be elsewhere in the system. First check whether this is the case.
- 2 If you are sure the problem is within the pump, try to determine the cause. See chapter 6 "Faults". Then take the necessary measures.
- 3 See chapter 7 "Disassembly and assembly" in case repair is necessary.



Always switch off the pump and close the valves before trying to determine a failure!



First of all try to find what caused the failure. In case of electric failure, the cause may be in the cabling. In that case consult a approved electrician!

6 Faults

Faults in a pump system can have various causes. The fault may not be in the pump, it may also be caused by the pipe system or the operating conditions. Firstly, always check that installation has been executed in accordance with the instructions in this manual and that the operating conditions still correspond with the specifications for which the pump was purchased.

6.1 Faults and possible causes

- 1 Pump delivers no liquid: see **C, D, G, I, K**
- 2 Pump does not reach the working point: see **A, B, D, E, G, H, I, L**
- 3 Irregular liquid flow: see **D, G, I**
- 4 Pump leaks liquid: see **M, N**
- 5 Pump makes noise: see **A, D, G, J, O, P**
- 6 Pump vibrates: see **J, O, P**
- 7 Motor gets hot: see **A, J, O**
- 8 Thermal breakdown of pump: see **E, J, K, O, P, Q, R**
- 9 Pump got stuck: see **F, I, J, K, O, P, R**

6.2 Causes and possible solutions

A Electrical connection is faulty:

- Consult your electrician
-

B Wrong sense of rotation:

- Consult your electrician
-

C Pump not filled with liquid:

- Open valves
 - Fill pump with fluid
 - De-aerate the system
-

D NPSH available too low:

- Increase the pre-pressure
 - Mount the pump as low as possible in the piping
-

E Pump does not run at the required speed:

- Consult your electrician
-

F Foreign particles inside the pump:

- Dismantle and clean the pump
 - If necessary mount a filter
-

G Air in the pipes:

- De-aerate the system
 - Increase the immersion depth of the suction pipe
 - Increase the liquid level at the suction side
-

H Required head higher than calculated:

- Change the speed
 - Select another pump
-

I Suction pipe or possibly mounted filter blocked:

- Clean filter and suction pipe
-

J Damaged bearings:

- Replace bearings
 - Inspect the shaft
 - Check whether the impeller is not damaged
-

K Impeller stuck:

- Try to rotate the shaft at the rear by means of a screw driver through the hole in the fan protecting cover
 - Dismantle and clear the pump, check the shaft on straightness
-

L Suction valve is not entirely open:

- Open the valve

M Defective mechanical seal:

- Dismantle the pump and replace the mechanical seal

N O-ring faulty:

- Dismantle the pump and replace the O-ring

O Bent shaft:

- Dismantle the pump. Replace shaft, mechanical seal and impeller

P Damaged impeller:

- Dismantle the pump and replace the impeller

Q Temperature of the liquid too high:

- Check liquid temperature

R Overloaded motor:

- Check whether the cooling of the electric motor is not obstructed
- Consult your electrician

7 Disassembly and assembly

7.1 General

7.1.1 Special tools

Special tools can make certain operations easier. The instructions will indicate when these tools should be used.

7.1.2 Back Pull Out-unit

The pump is designed with a Back Pull Out-system. This means that in case of repairs, the pump casing does not have to be removed from the piping (unless the fault is in the pump casing itself).

7.2 Precautions

Before the pump can be repaired it first has to be removed from the system. Take the following steps:

7.2.1 Switch off the electricity supply

- 1 Disconnect the electricity supply to the pump by setting the pump switch on the switchboard or, if available, the operation switch, to "O".
- 2 Remove the fuses.
- 3 Place a warning plate at the switchboard cabinet.

7.2.2 Support of the piping

If the entire pump has to be removed, you have to make sure that the piping is properly supported. If this is not so, you should first support and bracket the piping.

7.2.3 Liquid draining

- 1 Close all valves wherever necessary.
- 2 Drain the system to the extent that there is no liquid left in the pump.



Be careful not to touch the liquid, it may still be hot!

- 3 A pump that is used for heating should be left to cool down first.

7.3 Disassembly

7.3.1 Disconnecting the motor



Make sure that the electricity supply to the pump has been disconnected and that the pump cannot be switched on by others!

- 1 Open the cover of the terminal box on the motor.
- 2 Loosen the supply wires. Mark the wires and the corresponding terminals for later reconnection.

7.3.2 Removing the pump

In case the complete pump must be removed:

- 1 Disconnect the electric motor, see paragraph 7.3.1 "Disconnecting the motor".
- 2 Loosen the bolts of the connection flanges.
- 3 For CBH: Loosen the fixation bolts of the pump feet.
- 4 Remove the pump from the piping.

7.4 Replacing the wear ring CBH

7.4.1 Disassembly

After removing the Back-Pull-Out unit the wear ring can be removed. In most cases the ring has been fixed so tightly that it cannot be removed undamaged.

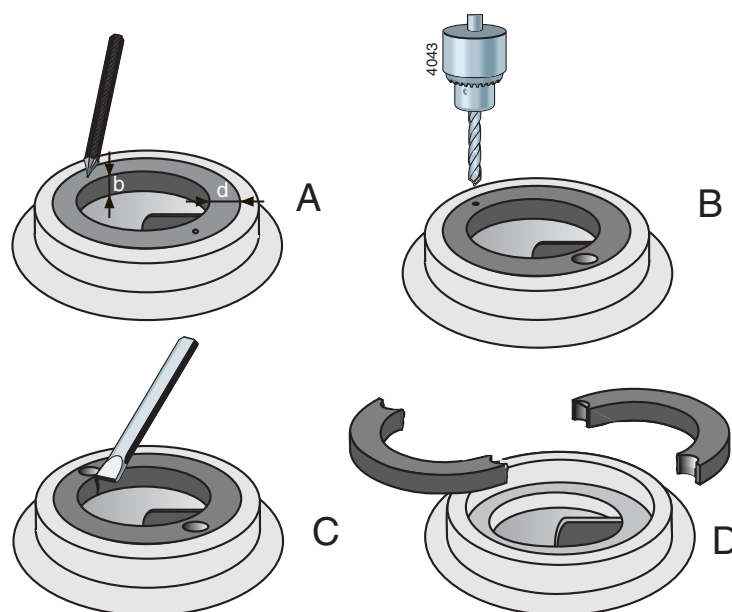


Figure 4: Removal of wear ring.

- 1 Measure the thickness (d) and the width (b) of the ring, see figure 4 A.
- 2 Make a centre hole in the middle of the edge of the ring at two opposite points, see figure 4 B.
- 3 Use a drill with a diameter just a little bit smaller than the thickness (d) of the ring and drill two holes in the ring, see figure 4 C. Don't drill deeper than the width (b) of the ring. Take care not to damage the fitting edge of the pump casing.
- 4 Use a chisel to cut the remaining part of the ring thickness. Now you can remove the ring in two parts from the pump casing, see figure 4 D.
- 5 Clean the pump casing and carefully remove all bore dust and metal splinters.

7.4.2 Assembly

- 1 Clean and degrease the fitting edge of the pump casing where the wear ring is to be mounted.
- 2 Degrease the outer edge of the wear ring and put a few drops of Loctite 641 on it.
- 3 Fit the wear ring in the pump casing. **Take care it is not pushed out of alignment!**

7.5 Disassembling the pump

Start at paragraph 7.5.1 "Back Pull Out-unit" and follow all instructions up to and including the part you want to remove.

The item numbers used refer to the parts lists and drawings of chapter 9 "Parts".

7.5.1 Back Pull Out-unit

For maintenance and repairs usually it is not necessary to remove the whole pump from the piping. You only have to remove the integrated pump cover/motor-part, the so called "Back Pull Out-unit".

! **NEVER start dismantling by loosening the motor fastening nuts (0900). This may result in irreparable damage to the motor shaft and the mechanical seal!**

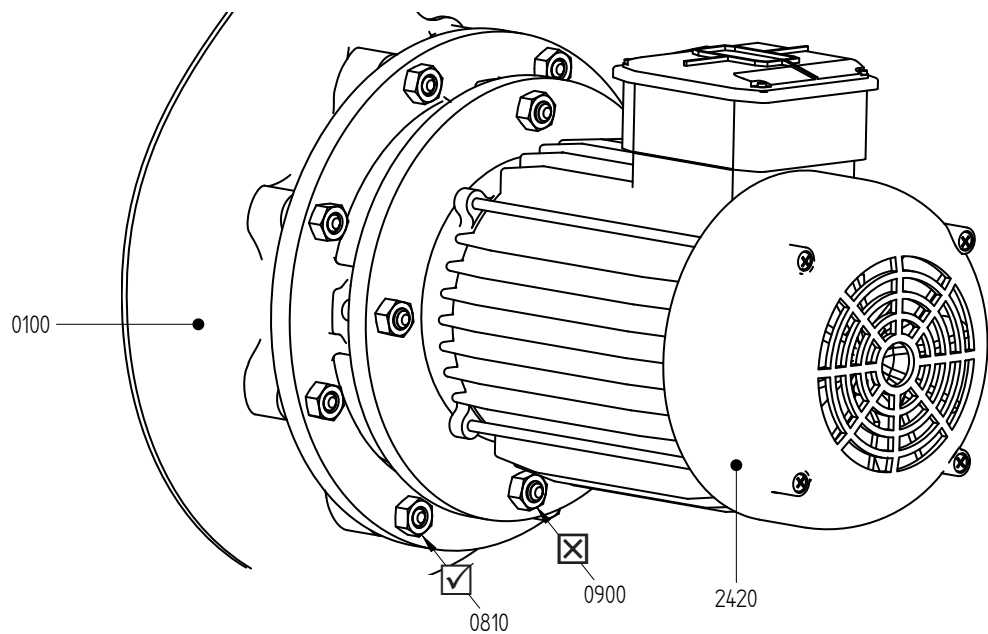


Figure 5: Location of fastening nuts.

- 1 Loosen the fastening nuts (0810) of the lantern piece, see figure 5.
If the pump is still in the piping, start from the bottom side and proceed along the two sides upward, see figure 6.
- 2 Pull the Pull-out unit straight out of the pump casing (0100).

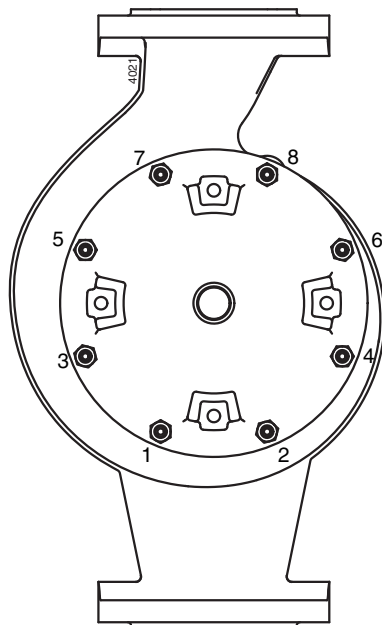


Figure 6: Sequence of loosening the lantern piece fastening nuts.

7.5.2 Impeller

➤ If you wish to replace the impeller it is advisable to also replace the mechanical seal and the bearings.

- 1 Place the Pull-out unit vertically and let it rest on the electric motor (2420).
- 2 Block the impeller (0120) against rotating, see figure 7.
- 3 Loosen the cap nut (1820).
- 4 Remove the impeller with a pulley puller. The position of the puller's jaws should as much as possible coincide with the blades.
- 5 If provided with shaft sleeve, remove the O-ring (1320) from the impeller hub for inspection. **Do not use a sharp tool!**

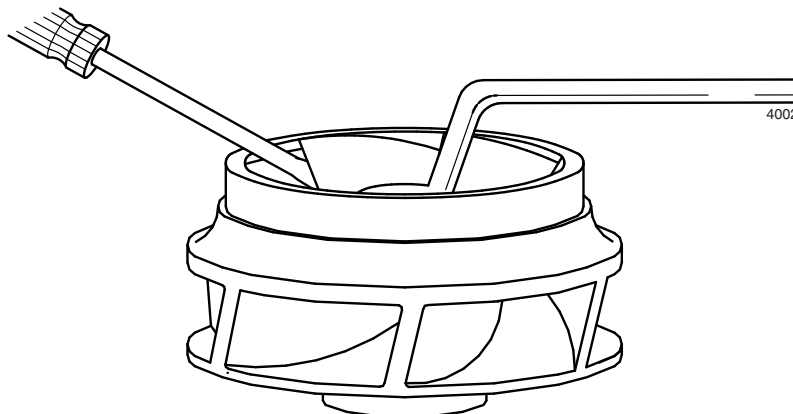


Figure 7: Loosening the cap nut.

7.5.3 Mechanical seal

- 1 Remove the impeller key (1860) from the shaft end.
- 2 If present, remove the shaft sleeve (1200) with the rotating part of the mechanical seal (1220B) from the shaft.
- 3 Pull the rotating part of the mechanical seal off the shaft or the shaft sleeve.
- 4 To remove the static part of the mechanical seal first remove the lantern piece, see paragraph 7.5.4 "Lantern piece". Then remove the static part of the mechanical seal (1220A) from its seat by pushing at the back through the shaft hole of the lantern piece.

7.5.4 Lantern piece

- 1 Loosen the motor fastening screws (0900) and remove the lantern piece (0110) from the electric motor.
- 2 Remove the O-ring (0300) for inspection. **Do not use a sharp tool!**

7.6 Disassembling the electric motor

The item numbers used refer to figure 17 on page 59.

7.6.1 Electric motor stator

- 1 Put the electric motor vertically with the shaft end pointing downward. Let the motor flange rest on e.g. 2 wooden blocks with an opening in the working surface for the shaft end.
- 2 Remove the fan cover (2420-1) by loosening the 4 screws.
- 3 Remove the cooling fan (2420-2). For electric motors from 2,2 kW you must first loosen 2 clamping screws. After that, remove the fan from the shaft end by means of 2 broad screw drivers, see figure 8.

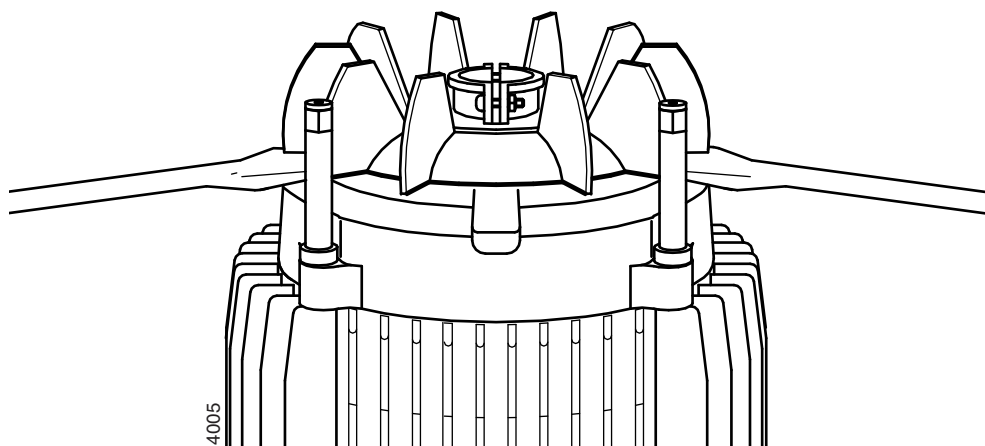


Figure 8: Removing the cooling fan.

- 4 Loosen the 4 tie rods (2420-3).
- 5 Carefully lift up and remove the rear bearing shield (2420-4) by means of two broad screwdrivers.
- 6 Remove the wave spring (2420-5).
- 7 Carefully lift up the stator (2420-6) by means of 2 broad screw drivers and remove it in vertical direction.

7.6.2 Electric motor bearings

- 1 Remove the inner circlip (2420-7).
- 2 Knock on the shaft end, using a plastic hammer, to loosen the shaft (2420-8) with bearing from the bearing seat of the front bearing shield (2420-11).
- 3 Remove both bearings (2420-9) using a proper bearing puller. First remove possible paint from the shaft.
- 4 Remove the oil-baffle (2420-10) from the rear and front bearing shield (2420-4) and (2420-11) respectively.

7.7 Assembly

For correct tightening moments see paragraph 10.3 "Tightening torques".

! **All parts should be clean and undamaged. Bearings and mechanical seal should be left in the packing as long as possible.**

7.8 Assembling the electric motor

The item numbers used refer to figure 17 on page 59.

7.8.1 Electric motor bearings

- 1 Place the shaft (2420-8) end up on the work table, the key way side up.
- 2 Place the inner circlip (2420-7) loosely around the shaft.
- 3 Mount the bearing (2420-9A) onto the shaft.

! **If possible heat the bearings on a heating plate up to 90 °C. Make sure the bearings are mounted straight. Never hit directly on a bearing: use a mounting bush against the inner bearing race.**

- 4 Turn the shaft and mount the other bearing (2420-9B).
- 5 Place the oil-baffle (2420-10) in the seat of the front bearing shield (2420-11).
- 6 Support the motor flange and mount the shaft with the bearing at the key way side in the front bearing shield.

! **Make sure the bearing is placed straight inside the seating. Knock on the shaft end with a plastic hammer. Rotate the shaft slightly after every blow.**

- 7 Mount the inner circlip (2420-7). Make sure it is fitted inside the groove in the bearing seat.

7.8.2 Electric motor stator

- 1 Carefully slide the stator (2420-6) over the shaft and the rotor (2420-8) and press the stator into the collar of the front bearing shield. Make sure that the notches in the cooling fins correspond with the position of the tie rods.

! **The terminal box (2420-12) should then be placed at the fan side!**

- 2 Place the wave spring (2420-5) on the rear bearing.
- 3 Push the rear bearing shield (2420-4) over the bearing (2420-9B). Watch the position of the holes for the tie rods.
- 4 Place the oil-baffle (2420-10) in the rear bearing shield.
- 5 Fix the tie rods (2420-3) and tighten them crosswise and gradually.
- 6 Mount the cooling fan (2420-2). The smaller types only have a light drive fit. Press the fan over the shaft end by means of a mounting bush. For the larger types, also tighten the clamping screws.
- 7 Mount the fan cover (2420-1).
- 8 Check whether the shaft end can be rotated.

7.9 Assembling the pump

The item numbers used refer to the parts lists and drawings of chapter 9 "Parts".

7.9.1 Mechanical seal

! **A mechanical seal is a vulnerable precision part. Leave the mechanical seal inside its original packaging until you mount it. Make sure the work site is free from dust and that the parts and tools are clean. Remove possible paint on parts. Never put the sliding rings down on the sliding surfaces.**

- 1 If applicable screw the studs (0950) into the lantern piece (0110).
- 2 Grease the seat of the static ring of the mechanical seal with Molycote 111.
- 3 Place the lantern piece (0110) flat on the work surface and press the static ring (1220-A) of the mechanical seal inside. If necessary use a plastic pressure piece.

! **DO NOT hammer the ring inside!**

- 4 Fit the lantern piece to the electric motor and proceed with mounting the mechanical seal.

! **Be careful not to damage the centring rim of the motor flange. If the pump is not fixed straight to the lantern piece the bearings and mechanical seal will be damaged.**

- 5 For pumps provided with a shaft sleeve: Grease the shaft with Molycote 111 and mount the shaft sleeve (1200) onto the shaft end.
- 6 Put some soap suds on the bellows and slide the rotating part of the mechanical seal (1220-B) onto the shaft sleeve or the shaft, until the seal faces of the two seal components just touch each other.

! **At that moment, stop pushing the bellows against the spring tension! After the impeller has been mounted, the mechanical seal will be at the right pre-load.**

7.9.2 Impeller

- 1 Place the key (1860) in the key way of the shaft.
- 2 For pumps provided with shaft sleeve and for CL 4/4 and CL 5/4: Grease the impeller hub and the O-ring seat with Molycote 111 and mount the O-ring (1320).
- 3 Mount the impeller (0120) onto the shaft. The impeller will compress the bellows of the mechanical seal, giving it the correct pre-load.
- 4 Put a drop of Loctite 243 on the thread of the cap nut (1820) and fit it onto the shaft. CL 4/4 and CL 5/4: First place the washer (1825).

! **Apply the Loctite only on the thread of the cap nut and not on other parts! It might run in between the shaft and the impeller hub and in that case the impeller will get stuck on the shaft!**

7.9.3 Pull-out unit

- 1 If the studs (0800) were dismantled, screw them into the pump casing (0100).

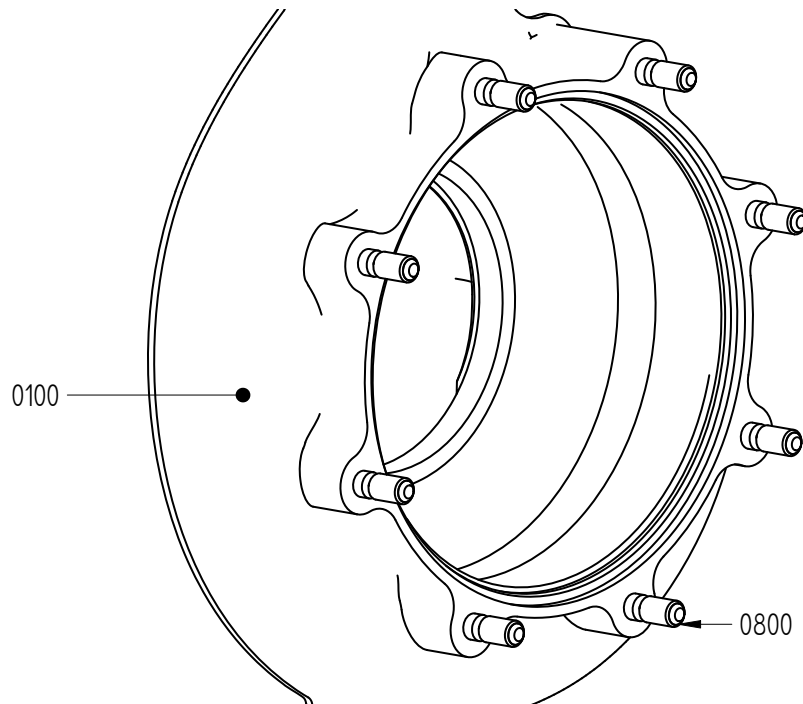


Figure 9: Pump casing with studs.

- 2 Grease the outer rim of the impeller entry with Molycote 107.
- 3 Grease the sealing collar of the lantern piece with Molycote 111 and place the O-ring (0300) in the groove.
- 4 Mount the Back Pull Out-unit into the pump casing and tighten the fastening nuts (0810) crosswise.
- 5 Check whether the shaft end can be rotated, using a screwdriver in the hole of the fan cover.

8 Dimensions and weights

8.1 Weight

The weight of the pump is indicated on the label on the cover of this manual and on a similar label on the packaging.

8.2 Dimensions CL4/4 and CL5/4

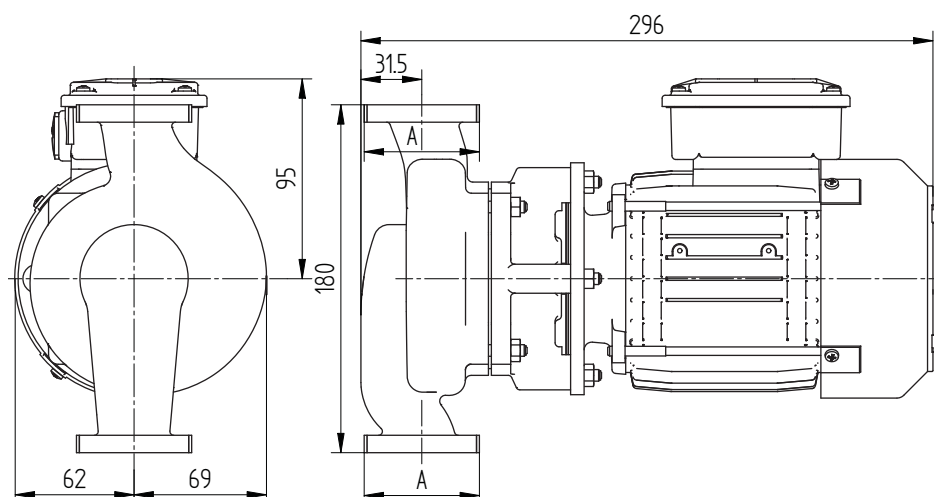


Figure 10: Dimensions drawing CL 4/4 and 5/4.

Pump type	A
CL 4/4	G 1 1/2
CL 5/4	G 2

8.3 Dimensions CombiLine ND6

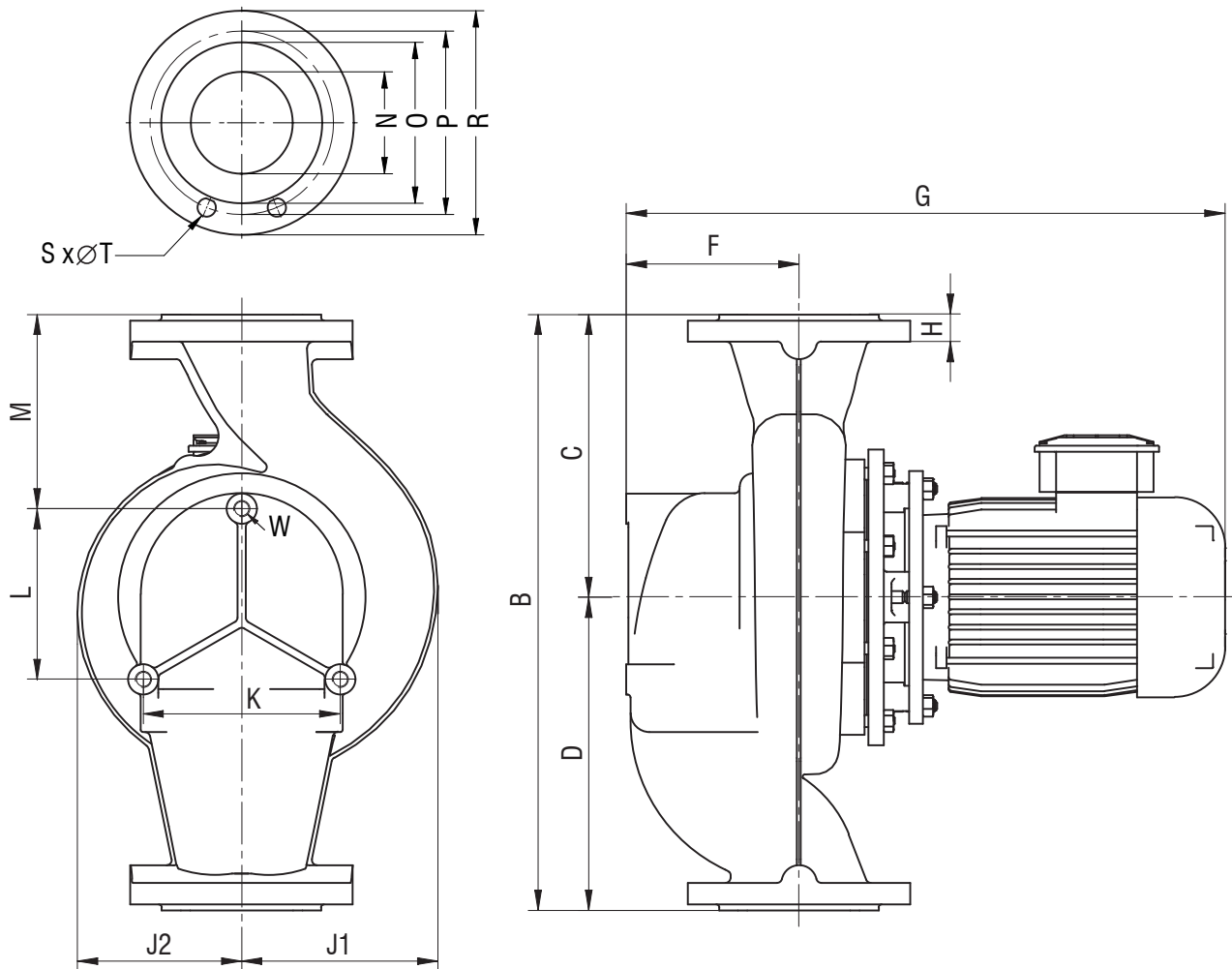


Figure 11: Dimensions drawing CombiLine ND6.

ND6 acc. to EN1092-2 (DIN2531) PN6 and ISO7005												
CL	B	C	D	F	H	J1	J2	K	L	M	N	W
32-125	250	125	125	74	19	96	85	70	79	80	32	M16
40-125	250	125	125	79	18	96	85	92	85	75,5	40	M16
40-160	320	160	160	77	18	115	115	91	72,5	118,5	40	M16
40-200	360	180	180	76,5	18	141	141	93,5	105	124	40	M16
50-125	280	140	140	86	18	108	89	105	76,5	99	50	M16
50-160	340	170	170	87,5	18,5	120	115	107,5	85	127,5	50	M16
50-200	380	190	190	85,5	18,5	141	141	107	108,5	138,5	50	M16
65-125	340	170	170	115	18	120	100	127,5	101	121	65	M16
65-160	340	170	170	106,5	18	135	115	124	88,5	128,5	65	M16
80-125	360	180	180	130	20	143	109	143	124	118,5	80	M16
80-160	400	200	200	131	20,5	147	123	146,5	127	136,5	80	M16
100-150	560	280	280	148	18	194	145	105,5	116	239	100	M16
100-160	560	260	300	187,5	21	189	150	184,5	170	172,5	100	M16
100-200	590	280	310	171	27	195	163	195	169	192,5	100	M16

Table 4: Flange dimensions CombiLine ND6.

EN1092-2 (DIN2531) PN6 and ISO7005				
N	O	P	R	S x T
32	78	90	140	4 x 14
40	80	100	130	4 x 14
50	90	110	140	4 x 14
65	110	130	160	4 x 14
80	128	150	190	4 x 18
100	148	170	210	4 x 18

8.4 Dimensions CombiLine ND10

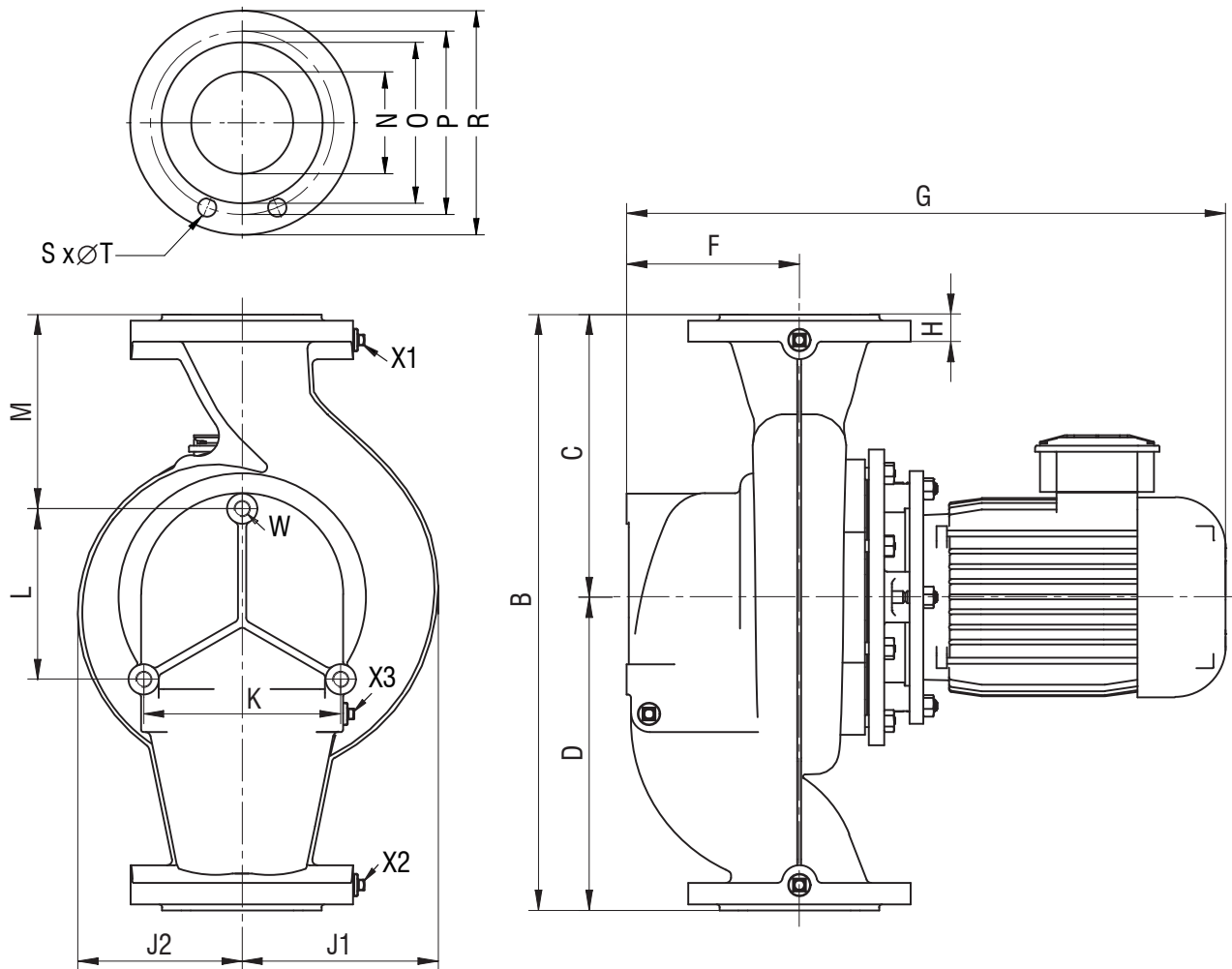


Figure 12: Dimensions drawing CombiLine ND10.

ND10 acc. to EN1092-2 (DIN2532) PN10 and ISO7005															
CL	B	C	D	F	H	J1	J2	K	L	M	N	W	X1	X2	X3
32-125	250	125	125	74	19	96	85	70	79	80	32	M16	G1/4	G1/4	G1/8
40-125	250	125	125	79	20	96	85	92	85	75,5	40	M16	G1/4	G1/4	G1/8
40-160	320	160	160	77	20	115	115	91	72,5	118,5	40	M16	G1/4	G1/4	G1/8
40-200	360	180	180	76,5	20	141	141	93,5	105	124	40	M16	G1/4	G1/4	G1/8
50-125	280	140	140	86	22	108	89	105	76,5	99	50	M16	G1/4	G1/4	G1/8
50-160	340	170	170	87,5	22,5	120	115	107,5	85	127,5	50	M16	G1/4	G1/4	G1/8
50-200	380	190	190	85,5	22,5	141	141	107	108,5	138,5	50	M16	G1/4	G1/4	G1/8
65-125	340	170	170	115	22	120	100	127,5	101	121	65	M16	G3/8	G3/8	G1/8
65-160	340	170	170	106,5	22	135	115	124	88,5	128,5	65	M16	G3/8	G3/8	G1/8
65-200*	440	220	220	132,5	21	151	141	133,5	102,5	169,5	65	M16	G3/8	G3/8	G3/8
80-125	360	180	180	130	24	143	109	143	124	118,5	80	M16	G3/8	G3/8	G3/8
80-160	400	200	200	131	24,5	147	123	146,5	127	136,5	80	M16	G3/8	G3/8	G3/8
80-200*	530	265	265	113	22	170	143	151	139	192	80	M16	G3/8	G3/8	G3/8
80A-250	590	280	310	214,5	27	200	176	195	169	175	100	M16	G3/8	G3/8	G3/8
100-160	560	260	300	187,5	27	189	150	184,5	170	172,5	100	M16	G3/8	G3/8	G3/8
100-200	590	280	310	171	27	195	163	195	169	192,5	100	M16	G3/8	G3/8	G3/8
100A-250	730	355	375	224,5	28,5	237	202	225	195	241	125	M16	G3/8	G3/8	G3/8
125-160*	750	375	375	247	26	223	178	225	195	280	125	M16	G3/8	G3/8	G3/8
125-200	750	375	375	247	26	223	178	225	195	280	125	M16	G3/8	G3/8	G3/8
125A-250	805	355	450	282,5	28,5	261	216	310	254	212	150	M16	G3/8	G3/8	G3/8
150-125	850	400	450	287	28,5	294	218	320	257,5	255	150	M16	G3/8	G3/8	G3/8
150-160	750	315	435	287	28,5	257	200	310	230	175	150	M16	G3/8	G3/8	G3/8
150-200	720	315	405	245	24,5	245	198	258	198,5	214	150	M20	G3/8	G3/8	G3/8
150-250	850	400	450	283	28,5	279	227	320	257,5	255	150	M20	G3/8	G3/8	G3/8
200-200	900	400	500	337	26,5	297	237	298	230,5	280	200	M20	G3/8	G3/8	G3/8

* Cam on flange rotated by 90 degrees.

Table 5: Flange dimensions CombiLine ND10.

EN1092-2 (DIN2532) PN10 and ISO7005				
N	O	P	R	S x T
32	78	100	140	4 x 18
40	88	110	150	4 x 18
50	102	125	165	4 x 18
65	122	145	185	4 x 18
80	138	160	200	8 x 18
100	158	180	220	8 x 18
125	188	210	250	8 x 18
150	212	240	285	8 x 18
200	268	295	340	8 x 22

Motor	63	71	80	90S	90L	100L	100L ¹⁾	112M	132S	132S ²⁾	132M	132M ³⁾	160M	160L	160L ⁴⁾	180L
CL	G															
32-125	369															
40-125	374	405														
40-160		399	415													
40-200			418													
50-125		412														
50-160		416	432													
50-200			430	465												
65-125		443	459													
65-160			448	483												
65-200**				502	502											
80-125			479	514												
80-160				525	525	564										
80-200**					486	525	540									
80A-250**						634		656	729	693	769	789	928	905	875	
100-150*			493	528	528											
100-160					570	612	627									
100-200						592	607	614	679	651	719					
100A-250**						643		665	742	702	782	802	941	919	889	988
125-160**						675	690	697	763		803					
125-200**						670		692	763	729	803		962			
125A-250**								728		765	840	860	999	977	947	1046
150-125**						717	732	739								
150-160**						715		737	808	774	848		1007			
150-200**						677		699	770	736	810	830	969	947		
150-250**										773	848	868	1007	984	954	1054
200-200**										831	906	926	1065	1043	1013	1112

* only ND6

** only ND10

1) 4 pole 3 kW

2) 6 pole 3 kW

3) 6 pole 5,5 kW

4) 4 pole 18,5 kW

8.5 Dimensions CombiBlocHorti

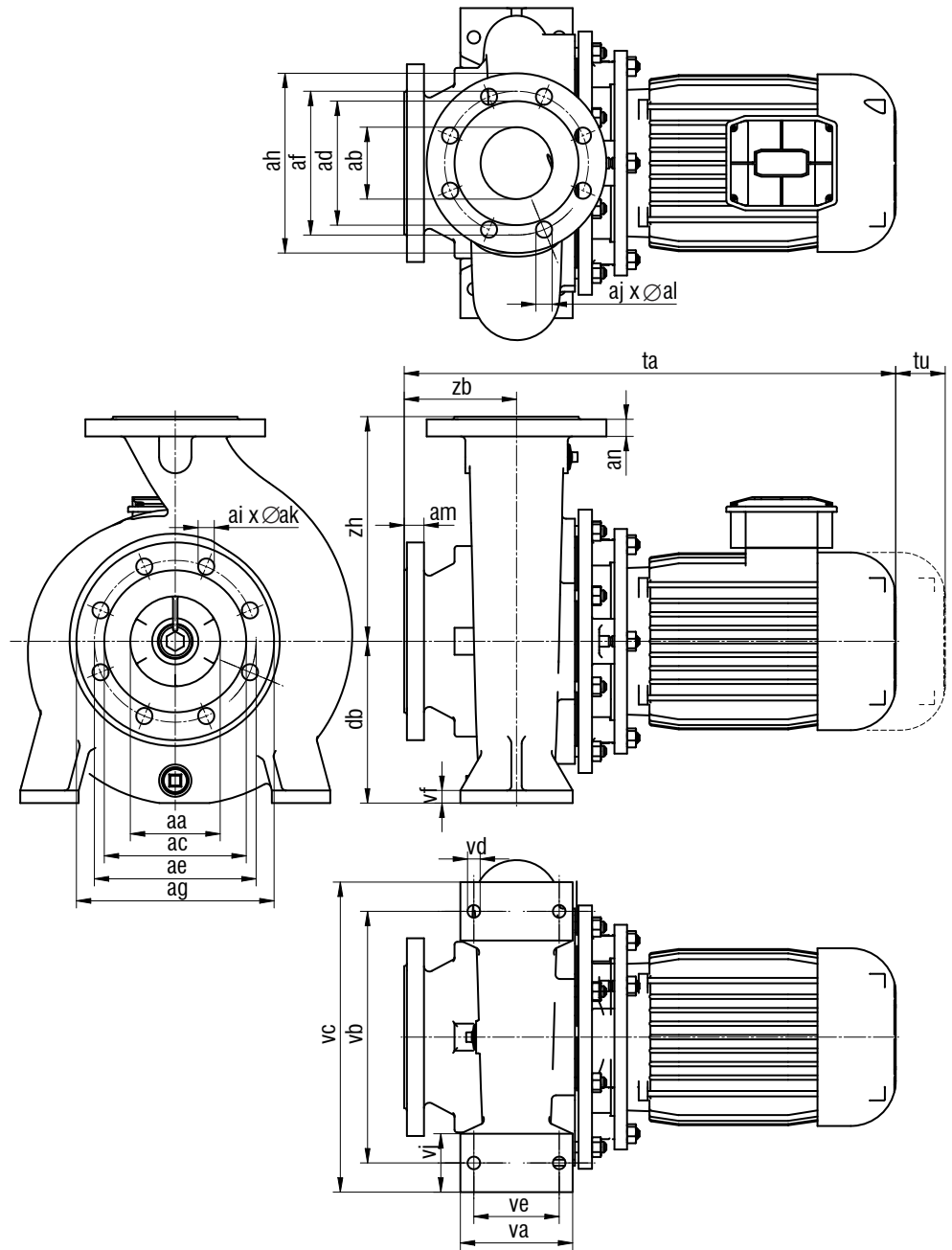


Figure 13: Pump dimensions CombiBlocHorti.

ISO 7005 PN16											
aa	ab	ac	ad	ae	af	ag	ah	ai x ak	aj x al	am	an
100	80	158	138	180	160	220	200	8 x 18	8 x 18	22	22
125	100	188	158	210	180	250	220	8 x 18	8 x 18	24	22
150	125	212	188	240	210	285	250	8 x 23	8 x 18	24	24
150	150	212	212	240	240	285	285	8 x 23	8 x 23	24	24

ISO 7005 ≅ EN 1092-2

ISO 7005 PN10											
aa	ab	ac	ad	ae	af	ag	ah	ai x ak	aj x al	am	an
200	150	268	212	295	240	340	285	8 x 23	8 x 23	26	24
200	200	268	268	295	295	340	340	8 x 23	8 x 23	26	26

ISO 7005 ≅ EN 1092-2

CBH	aa	ab	db	tu	va	vb	vc	vd	ve	vf	vj	zb	zh
80-200	100	80	180	140	125	280	345	14	95	14	65	125	250
80-250	100	80	200	140	160	315	400	18	120	15	80	125	280
100-160	125	100	200	100	160	280	360	18	120	15	80	125	315
100-200	125	100	200	140	160	280	360	18	120	15	80	125	280
100-250	125	100	225	140	160	315	400	18	120	16	80	140	280
125-250	150	125	250	140	160	315	400	18	120	18	80	140	355
150-125	150	150	280	140	160	315	400	18	120	18	80	160	400
150-160	150	150	250	100	160	315	400	18	120	18	80	160	315
150-200	150	150	250	140	160	315	400	18	120	18	80	160	315
150-250	200	150	280	140	200	400	500	23	150	20	100	160	400
200-200	200	200	280	100	200	400	500	23	150	22	100	200	400
250-200	250	250	315	140	200	450	550	23	150	22	100	200	450

Motor	90L	100L	100L ¹⁾	112M	132S ²⁾	132S	132M	132M ³⁾	160M	160L	160L ⁴⁾	180L
CBH	ta											
80-200	501	544	559	562		633	673					
80-250		539	554	561	598	633	673		832	810		
100-160		540	555	562		633	673					
100-200		539		561	598	633	673		832			
100-250		554		576	613	648	688		847	825		
125-250				576	613		688	708	847	825	795	894
150-125		565	580	587								
150-160		575		597	634	668	708					
150-200		576		598		668	708		867			
150-250									867	845	815	914
200-200					708		748	768	907	885	855	954
250-200								768	907	885	855	954

- 1) 4 poles 3 kW
- 2) 6 poles 3 kW
- 3) 6 poles 5,5 kW
- 4) 4 poles 18,5 kW

9 Parts

9.1 Ordering parts

When ordering parts always quote the following data:

- 1 Your **address**.
- 2 The **quantity, item number and the description** of the part.
- 3 The **pump number**. The pump number is stated on the label on the cover of this manual and on the name plate of the pump.
It consists of a 9-digit code, starting with a 5.
Example: 5.1901.01.01
- 4 In the event of different voltage for the electric motor you should state the correct voltage.

9.2 CombiLine with thread connections

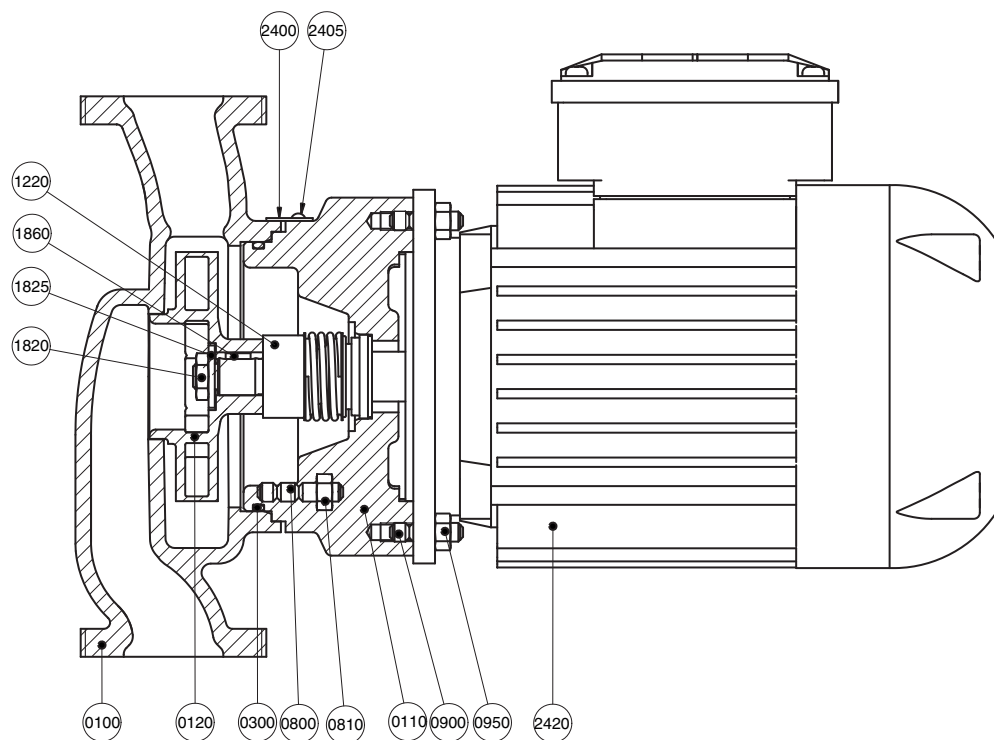


Figure 14: Sectional drawing of CL 4/4-5/4.

See figure 14.

Item	Quantity	Description	Materials
0100	1	pump casing	cast iron
0110	1	lantern piece	cast iron
0120 *	1	impeller	cast iron
0300 *	1	O-ring	EPDM
0800	4	stud	steel
0810	4	nut	steel
0900	4	nut	steel
0950	4	stud	steel
1220 *	1	mechanical seal	--
1820 *	1	nut	brons
1825 *	1	washer	stainless steel
1860 *	1	key	stainless steel
2400	1	name plate	stainless steel
2405	2	rivet	stainless steel
2420 *	1	motor	--

9.3 CombiLine with flange connections

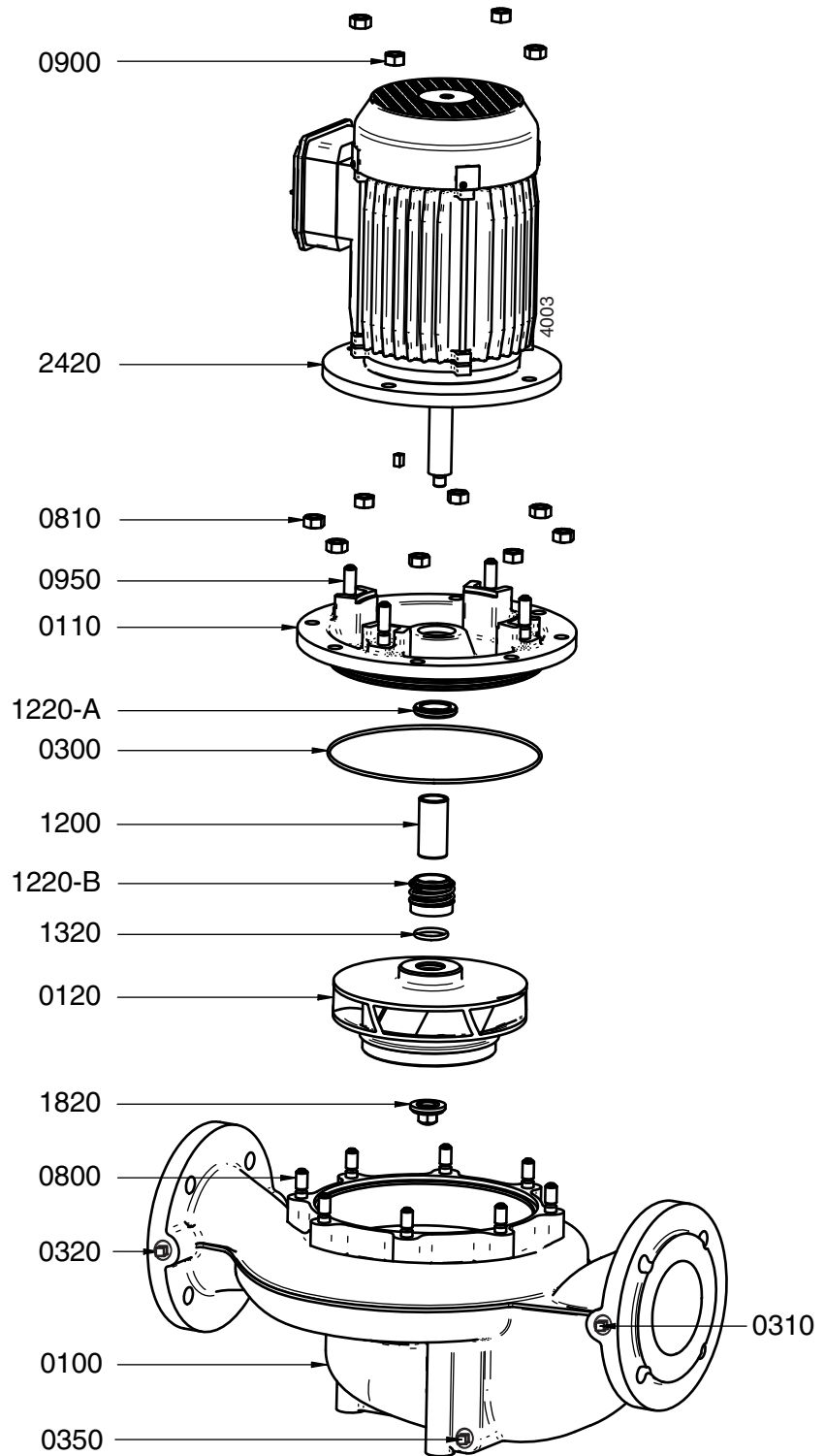


Figure 15: Exploded view of CombiLine.

See figure 15.

Item	Quantity	Description	Materials
0100	1	pump casing	cast iron
0110	1	lantern piece	cast iron
0120	1	impeller	cast iron
0300	1	O-ring	EPDM
0310*	1	plug	steel
0320*	1	plug	steel
0350*	1	plug	steel
0800	8	stud	steel
0810	8	nut	steel
0900	8	nut	steel
0950	8	stud	steel
1200**	1	shaft sleeve	RG7
1220	1	mechanical seal	--
1320**	1	O-ring	EPDM
1820	1	cap nut	stainless steel
1860	1	key	stainless steel
2420	1	motor	--

* only for ND10.

** not applied for IEC132, IEC160 and 6 pole motors.

9.4 CombiBlocHorti

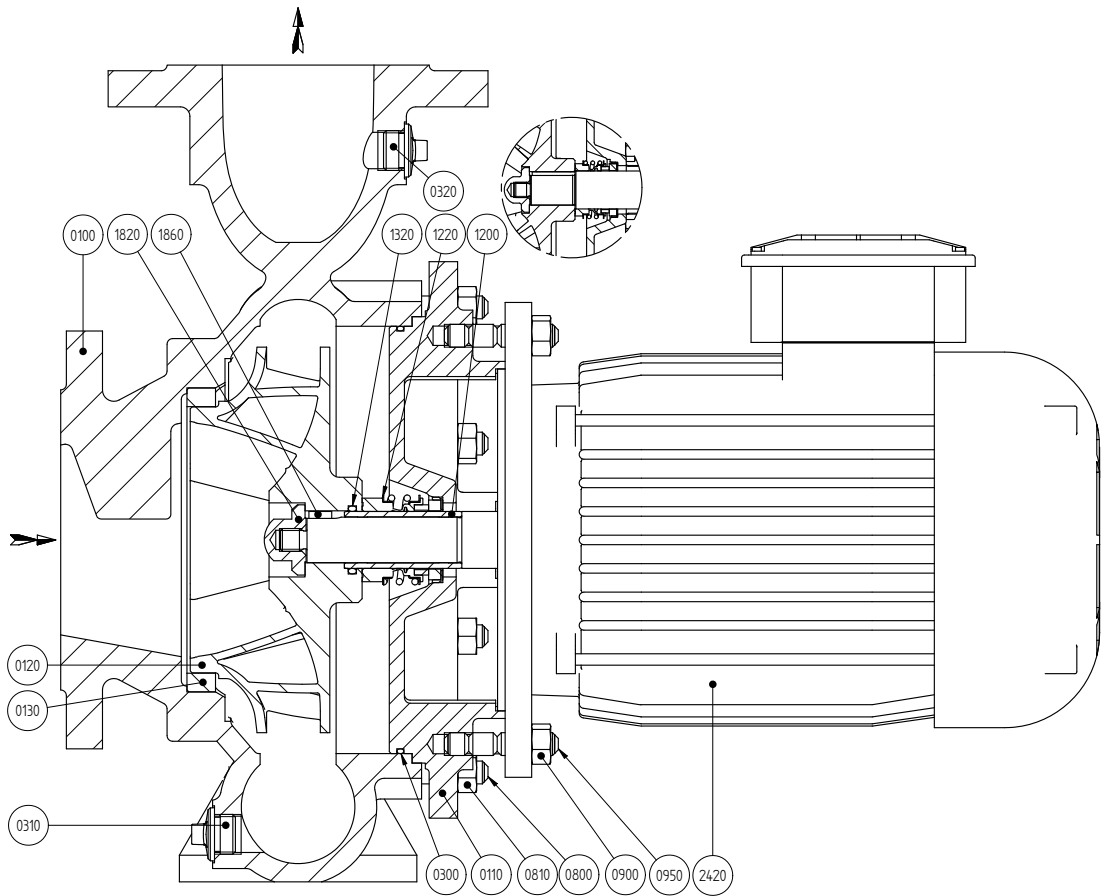


Figure 16: CombiBlocHorti

Item	Quantity	Description	Materials
0100	1	pump casing	cast iron
0110	1	lantern piece	cast iron
0120	1	impeller	cast iron
0130	1	wear ring	cast iron
0300	1	O-ring	EPDM
0310*	1	plug	steel
0320*	1	plug	steel
0800	8	stud	steel
0810	8	nut	steel
0900	8	nut	steel
0950	8	stud	steel
1200**	1	shaft sleeve	RG7
1220	1	mechanical seal	--
1320**	1	O-ring	EPDM
1820	1	cap nut	stainless steel
1860	1	key	stainless steel
2420	1	motor	--

Item 0130 not for pump type 150-125

* only for ND10.

** not applied for IEC132, IEC160 and 6 pole motors.

9.5 Electric motor

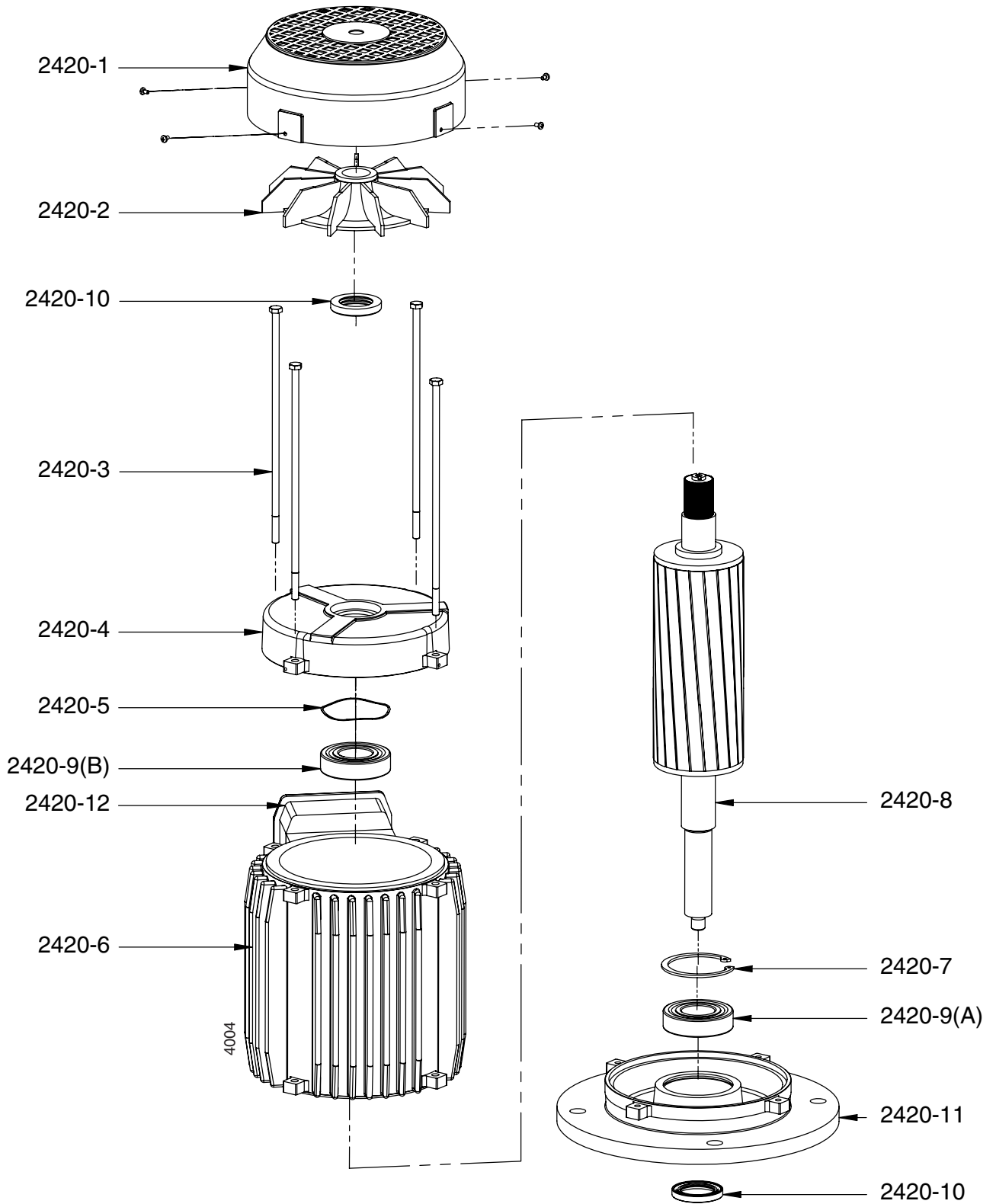


Figure 17: Exploded view of electric motor.

See figure 17.

Item	Quantity	Description
2420-1 *	1	fan cover
2420-2 *	1	fan
2420-3 *	4	tie rod
2420-4	1	bearing block
2420-5	1	wave spring
2420-6 *	1	stator
2420-7	1	inner circlip
2420-8	1	shaft with rotor
2420-9 *	2	ball bearing
2420-10 *	2	oil seal
2420-11	1	motor flange
2420-12	1	cable junction box

Parts marked with * are available as spare parts.

10 Technical data

10.1 Technical data pumps

		CombiLine	CombiBlocHorti
Maximum capacity	50Hz	400 m ³ /h	600 m ³ /h
	60Hz	500 m ³ /h	500 m ³ /h
Maximum delivery head	50Hz	1 - 28 m	1 - 26 m
	60Hz	4 - 40 m	3 - 38 m
Maximum temperature		140 °C	140 °C
Maximum working pressure	ND6	6 bar	--
	ND10	10 bar	10 bar
Materials	pump casing	EN-GJL-250 (GG25)	
	impeller	EN-GJL-200 (GG20)	
	motor shaft	X17CrNi 16-2 (1.4057)	
	shaft sleeve	G-CuSn7ZnPb (Rg 7)	
Mechanical seal	type	rubber bellows seal	
	standard	EN 12756 (DIN24960)	
	materials	AQ1EGG (carbon/silicon carbide, EPDM bellows)	

10.2 Technical data electric motor

Type, Frequency, Insulation, Voltage: see name plate on the electric motor.

General		
Nominal speed	50Hz	1450 min ⁻¹ (4 pole)
	50Hz	950 min ⁻¹ (6 pole)
	60Hz	1750 min ⁻¹ (4 pole)
	60Hz	1150 min ⁻¹ (6 pole)
Speed CL4/4 and CL5/4		1450 min ⁻¹ / 2900 min ⁻¹
2 speed motor with Dahlander connection	50Hz	1450/950 min ⁻¹ (4/6 pole)
	60Hz	1750/1150 min ⁻¹ (4/6 pole)
Frequency control, wall mounted		From 1,1 kW, range 10 to 60 Hz
Voltage	50Hz	230/400 V (≤ 1,5 kW)
	50Hz	400/695 V (≥ 2,2 kW)
	60Hz	277/480 V (≤ 1,5 kW)
	60Hz	480/830 V (≥ 2,2 kW)
	Other voltages/speeds on request	
Build	B5	
Protection class	IP 55	
Sense of rotation	clockwise, looking at fan side	
Bearings		
Type	single row deep groove bearings	
Fidelity	according to ISO 281	
Maximum bearing temperature	90 °C	
Bearing at pump side	fixed	
Bearing at fan side	pre-stressed	

10.3 Tightening torques

Item	Description	Thread	Nm
0800	stud	M10	19
		M12	32
0810	nut	M10	19
		M12	32
0900	motor fastening nut	M8	9,4
		M10	19
		M12	32
		M16	78
0950	stud	M8	9,4
		M10	19
		M12	32
		M16	78
1820	cap nut		
	pump with shaft sleeve	all	19
	pump without shaft sleeve	M12	43
M16		105	

10.4 Tightening torques CL4/4 and CL5/4

Item	Description	Nm
0800	stud	12,5
0810	nut	12,5
0900	motor fastening nut	12,5
0950	stud	12,5
1820	cap nut	14

10.5 Recommended liquid locking agents

Table 6: Recommended liquid locking agents.

Description	Locking agent
cap nut (1820)	Loctite 243
wear ring (0130)	Loctite 641

10.6 Noise data

The noise production of a pump depends strongly upon the operating conditions. The values stated below are for each pump type, equipped with its largest possible motor power (electric motor: 4-pole, 50 Hz).

Table 7: Noise data.

Type	dB(A) max.							
	IEC 63	IEC 71	IEC 80	IEC 90	IEC 100	IEC 112	IEC 132	IEC 160
32-125								
40-125		45						
40-160			47					
40-200			53					
50-125		46						
50-160			46					
50-200				53				
65-125			50					
65-160				52				
65-200				63				
80-125				50				
80-160					56			
80-200					58			
80A-250								76
100-150				54				
100-160					60			
100-200							71	
100A-250								76
125-160							70	
125-200							69	
125A-250								76
150-125						60		
150-160							69	
150-200							70	
150-250								76
200-200								76

10.7 Hydraulic performance

10.7.1 Performance overviews CombiLine

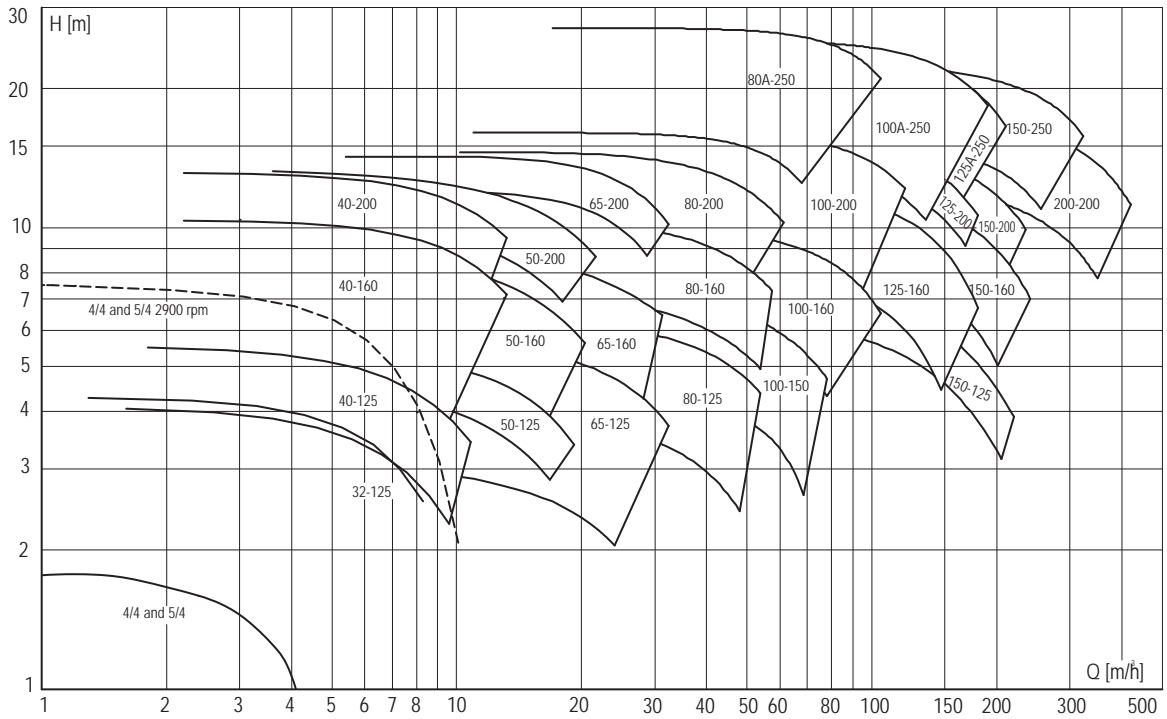


Figure 18: Performance overview CL 1450 min⁻¹.

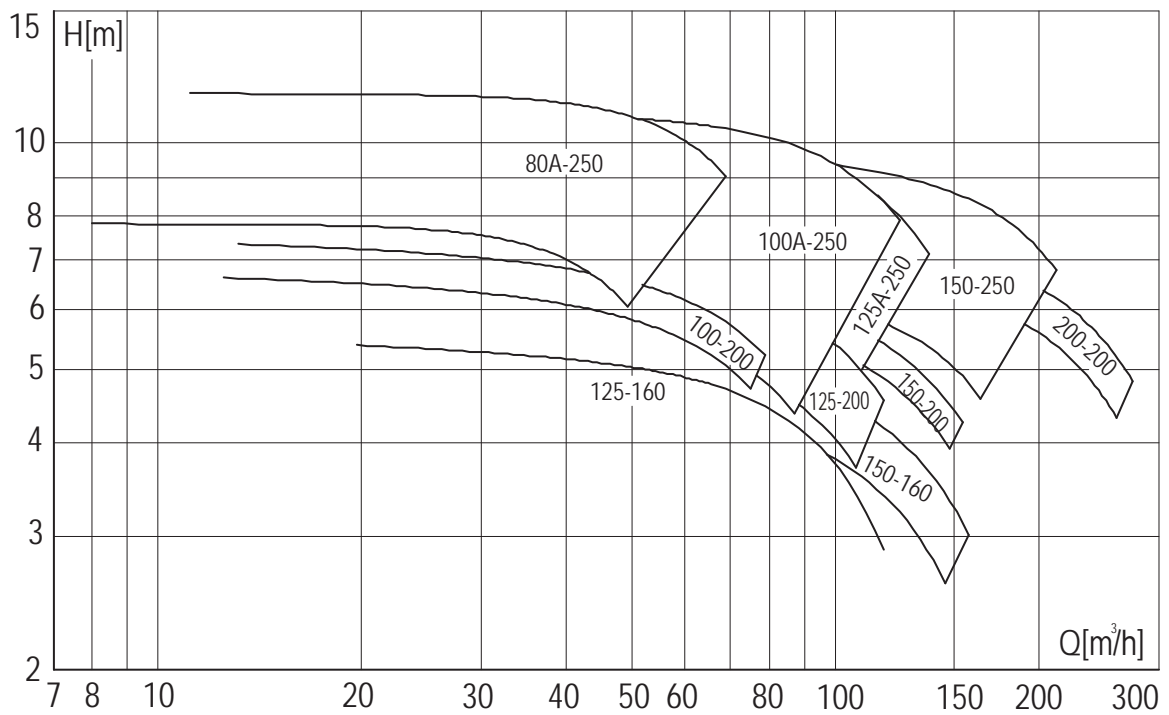


Figure 19: Performance overview CL 950 min⁻¹.

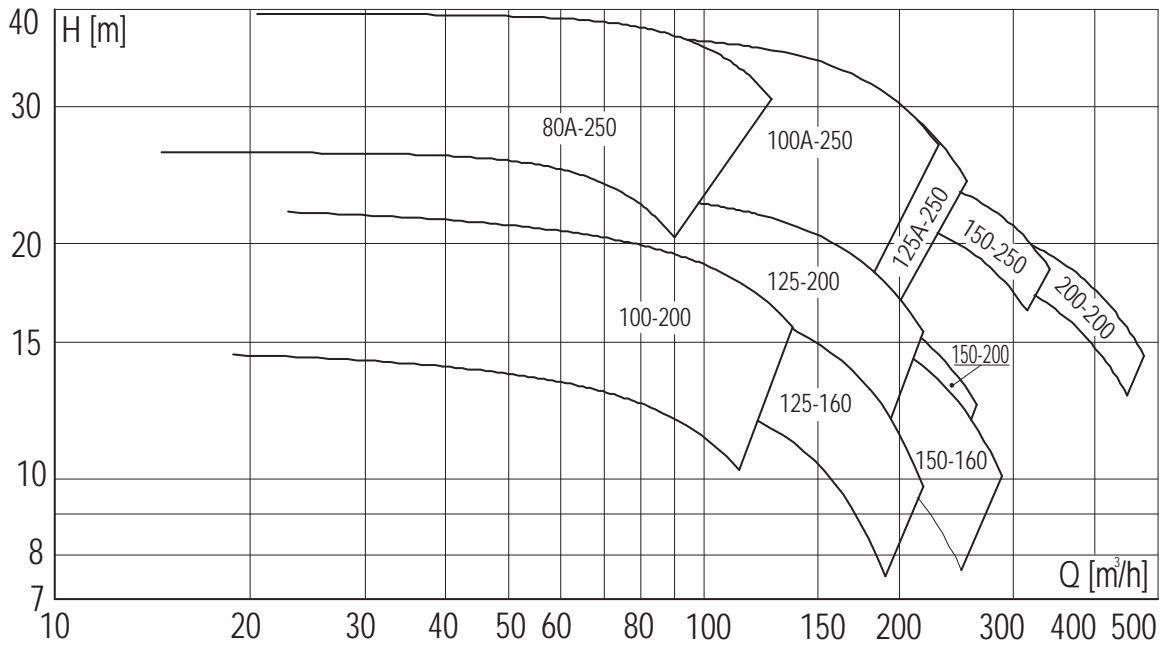


Figure 20: Performance overview CL 1750 min⁻¹.

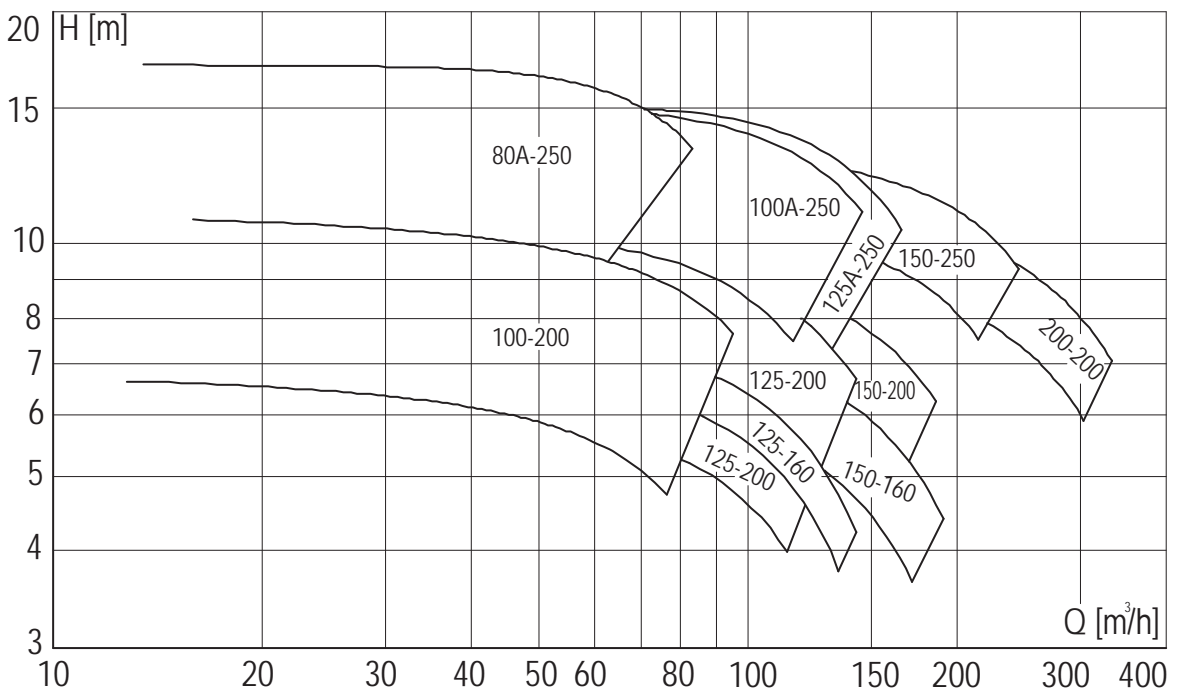


Figure 21: Performance overview CL 1150 min⁻¹.

10.7.2 Performance overviews CombiBlocHorti

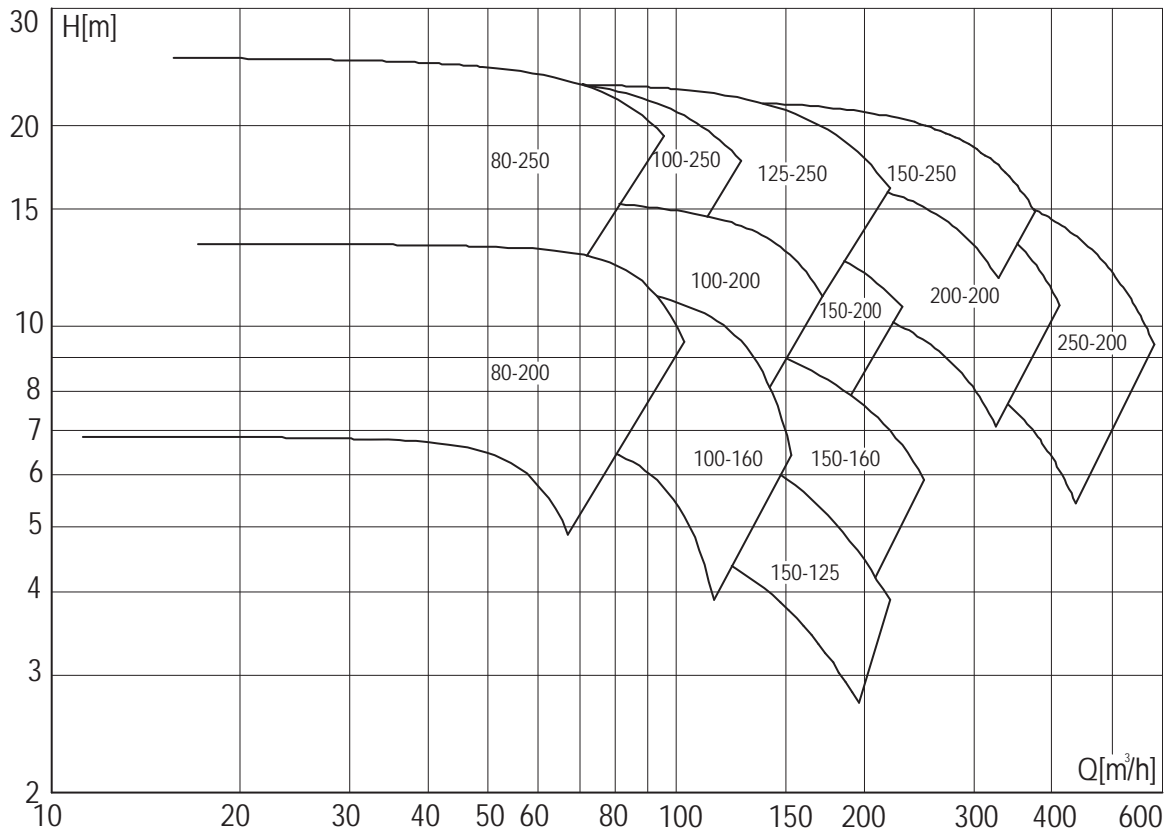


Figure 22: Performance overview CBH 1450 min⁻¹.

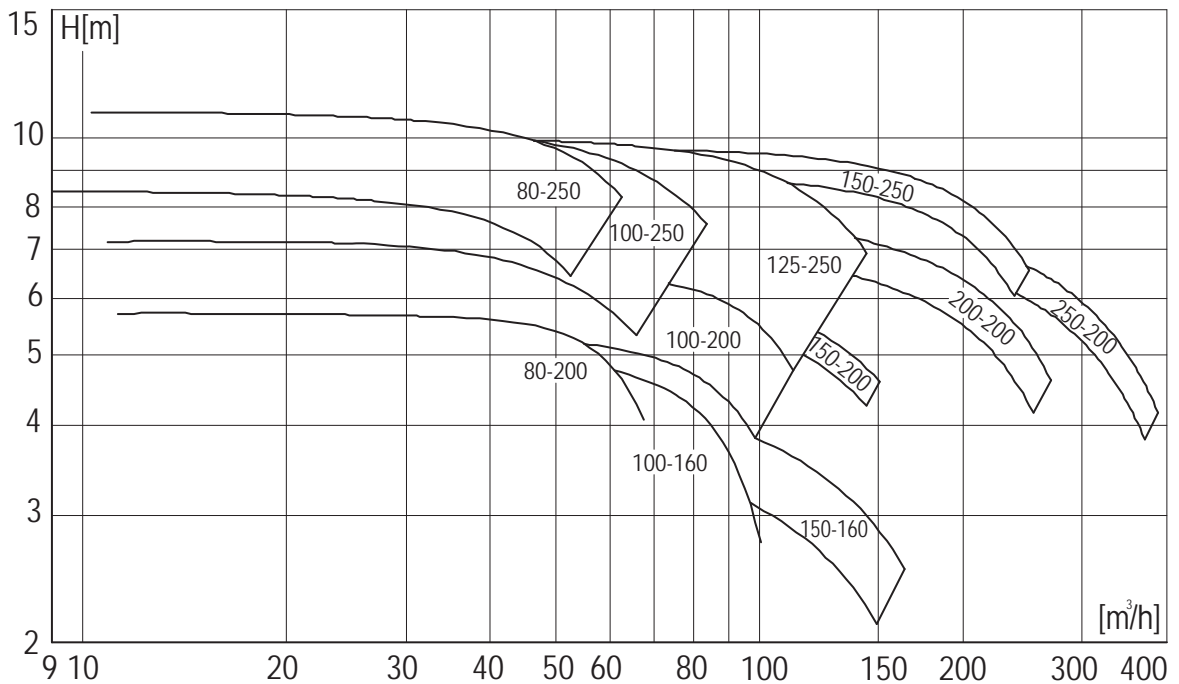


Figure 23: Performance overview CBH 950 min⁻¹.

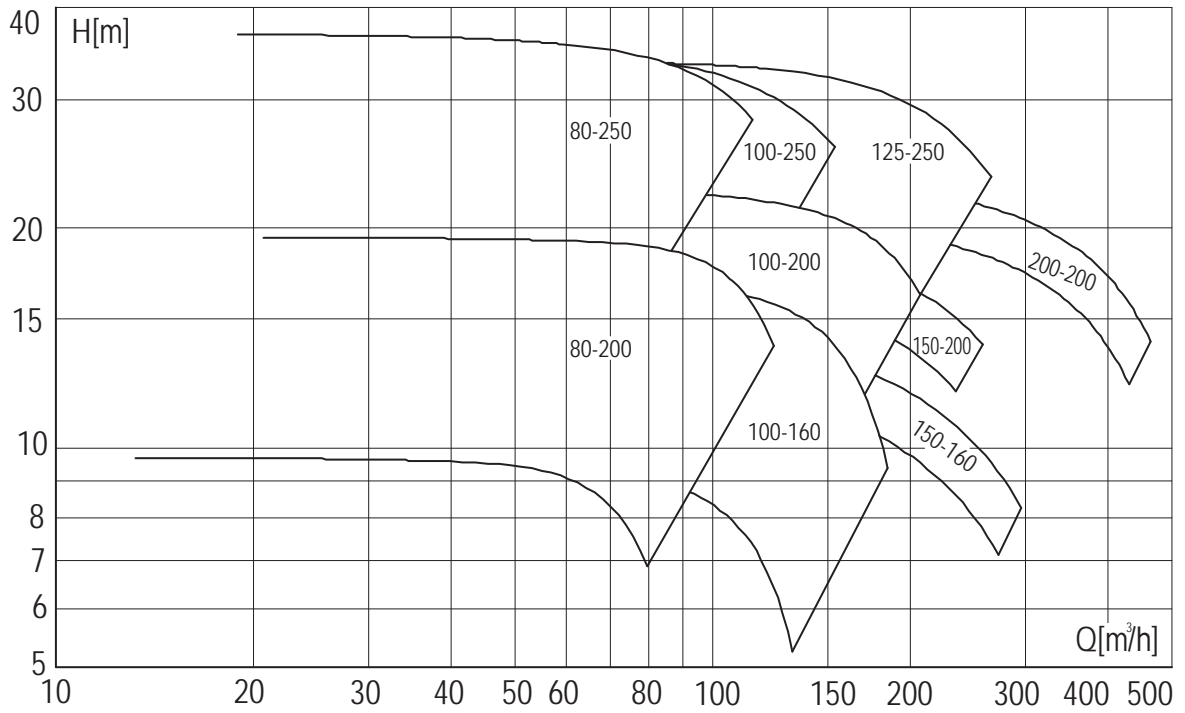


Figure 24: Performance overview CBH 1750 min⁻¹.

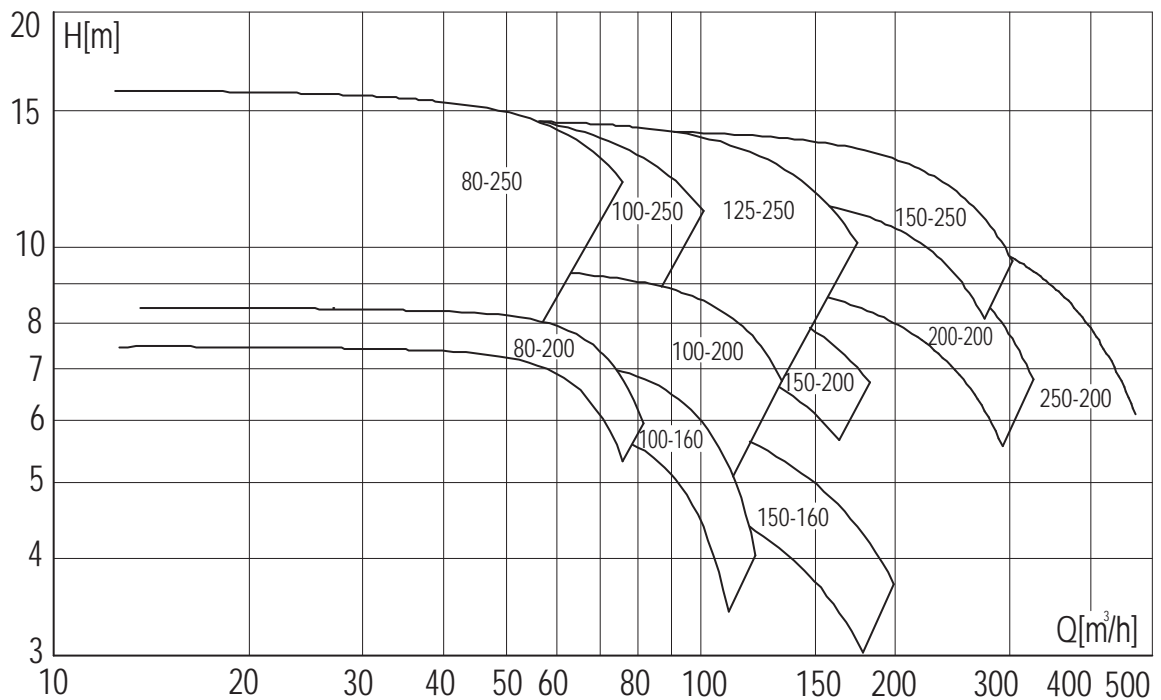


Figure 25: Performance overview CBH 1150 min⁻¹.

10.8 Permitted forces and torques on the flanges for CombiBlocHorti

Forces and moments acting on the pump flanges due to pipe loads can cause misalignment of the pump, deformation and overstressing of the pump casing, or overstressing of the fixing bolts between the pump and the baseplate.

The values can be applied simultaneously in all directions with positive or negative signs, or separately on each flange (suction and discharge).

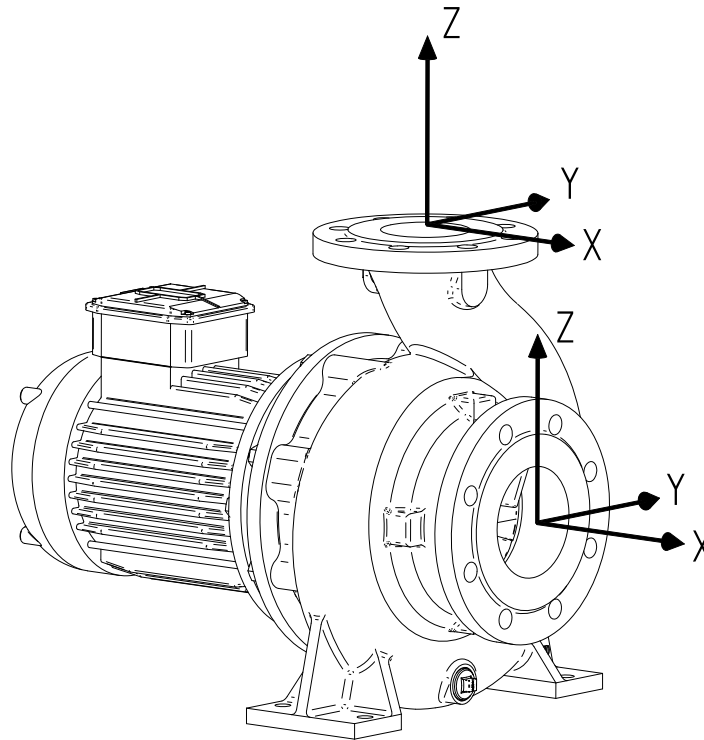


Figure 26: Coordinate system.

Table 8: Permitted forces and torques on the flanges.

CBH	Pump unit rigid mounted															
	Horizontal Pump, End branch, x-Axis								Horizontal Pump, Top branch, z-Axis							
	Force [N]				Moment [N.m]				Force [N]				Moment [N.m]			
	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
80-200	1050	945	1173	1838	438	508	613	910	718	875	788	1383	403	455	560	823
80-250	1050	945	1173	1838	438	508	613	910	718	875	788	1383	403	455	560	823
100-160	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1838	438	508	613	910
100-200	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1838	438	508	613	910
100-250	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1838	438	508	613	910
125-250	1575	1418	1750	2748	613	718	875	1278	1120	1383	1243	2170	525	665	735	1068
150-125	1575	1418	1750	2748	613	718	875	1278	1418	1750	1575	2748	613	718	875	1278
150-160	1575	1418	1750	2748	613	718	875	1278	1418	1750	1575	2748	613	718	875	1278
150-200	1575	1418	1750	2748	613	718	875	1278	1418	1750	1575	2748	613	718	875	1278
150-250	2100	1890	2345	3658	805	928	1138	1680	1418	1750	1575	2748	613	718	875	1278
200-200	2100	1890	2345	3658	805	928	1138	1680	1890	2345	2100	3658	805	928	1138	1680
250-200	2980	2700	3340	5220	1260	1460	1780	2620	2700	3340	2980	5220	1260	1460	1780	2620

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CombiLine - CombiBlocHorti

Circulation pumps



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ISSUED 11/2011 DV-1530
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