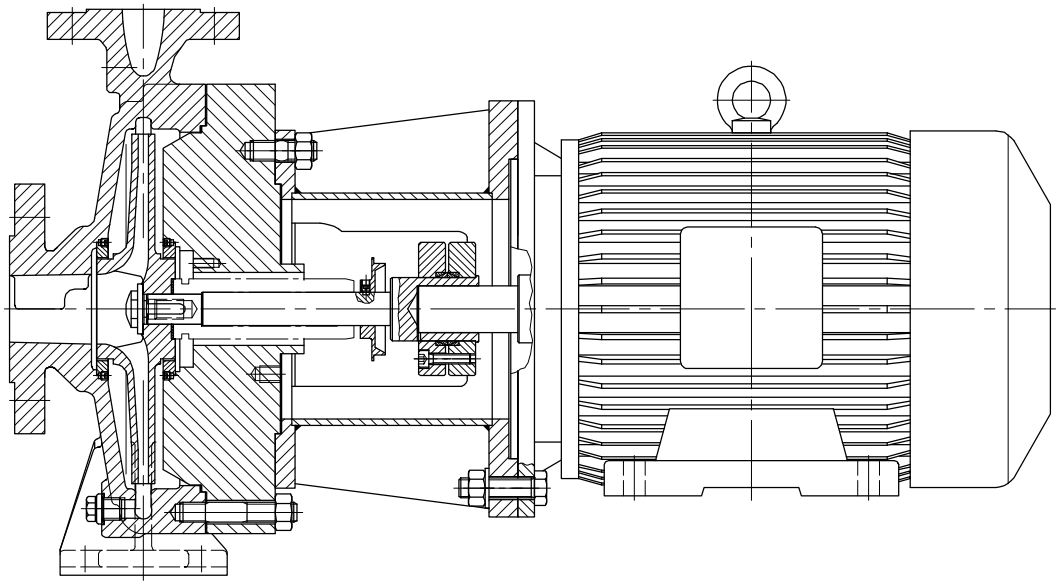
Installation, Operation and Maintenance Instructions

Type NCB
frame size
0, I, II, III

CE

No. 44 NCB.E0.09/03



Pump sizes:	frame 0	frame I	frame II	frame III
	26/170	32/165	32/250	65/320
	26/210	32/210	40/250	80/320
		40/165	40/320	100/250
		40/210	50/250	100/320
		50/165	50/330	100/400
		50/210	65/165	125/250
			65/200	125/320
			65/250	125/400
			80/165	150/250
			80/200	
			80/250	
			100/200	

DICKOW PUMPEN KG

EC Declaration of Conformity

as defined by EC-Machinery Directive 98/37 EG Annex II A
and by the EC-Explosion-Proof Directive 94/9/EG Annex XB

Herewith we declare that the pump unit, described in the data sheet,

Series „NCB“

complies with the following provisions applying to it

EC-Machinery Directive 98/37 EG, Annex I No. 1
EC-Explosion-Proof Directive 94/9/EG Annex II

Applied harmonized European standards in particular

DIN EN 809	EN 1127-1
DIN EN 292 Part 1	EN 13463-1
DIN EN 292 Part 2	EN 13463-5

Applied national technical standards and specifications in particular

DIN 24250	DIN EN 12723	VDMA 24276
DIN 31001	DIN EN 22858	
	DIN EN ISO 9906	
	DIN ISO 5199	

Manufacturer:

DICKOW PUMPEN KG
Siemensstraße 22
D-84478 Waldkraiburg

Importer in country of use

(Signature)

(Signature)

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2. GENERAL INFORMATIONS

2.1 INTRODUCTION

This manual provides instructions for the installation, operation and maintenance of the DICKOW-Chemical Pump, Type NCB.

> IT IS ESSENTIAL THAT THIS MANUAL BE THOROUGHLY REVIEWED AND THAT COMPLETE COMPREHENSION OF THE MATTERS EXPLAINED HEREIN IS ATTAINED BEFORE ATTEMPTING INSTALLATION AND START-UP.

The design, materials and workmanship incorporated into the DICKOW-Pump are based on years of experience. They assure trouble-free service throughout the lifetime of the pump. However, like any rotating equipment, satisfactory performance depends on correct initial sizing, proper installation, periodic inspection, monitoring of operating conditions (temperature, vibration, flow) and prescribed maintenance. This Manual has been prepared to assist the operator in understanding the workings of the DICKOW-Pump and to assure proper installation, operation and maintenance.

2.2 LIMITED WARRANTY

DICKOW warrants that DICKOW-Pumps and Parts are free, upon installation and start-up per this Manual and under rated use and service, from defects in design, material, and workmanship for a period of one (1) year from date of installation, but not to exceed eighteen (18) months from date of shipment by DICKOW. This warranty does not cover

1. any loss or damage resulting from wear, corrosion, abrasion or deterioration due to normal use in rated service;
2. replacement of service items such as outer antifrictional bearings;
3. products or parts manufactured by others but furnished by DICKOW which, if defective, shall be repaired or replaced only to the extent of the original manufacturer´s warranty;
4. any loss or damages to, or defects in any such products or parts resulting from the misuse or improper storage, installation or operation thereof; or
5. any loss or damages to, or defects in, any such products or parts resulting from any alteration or modification of the products or parts not expressly authorized and approved by DICKOW in writing.

DICKOW shall not be liable, directly or indirectly under any circumstances, in an amount greater than the purchase price nor for consequential or incidental damages, including, but not limited, to: any loss of business or profits, and labour, material or other charges, claims for losses or damages incurred or suffered from, in connection with, or in consequence of the working upon, alteration, or repair of any such defective products or parts by persons or firms other than DICKOW. DICKOW´s liability for breach of warranty hereunder is limited solely to the repair or to the replacement, F.O.B. DICKOW facility, as the case may be, of any products or parts which shall have been determined by DICKOW, after written notice to DICKOW, and inspection by DICKOW within the warranty period, to be so defective when shipped by DICKOW.

> THIS WARRANTY AND THE LIABILITY SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER LIABILITIES AND WARRANTIES, EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE.

2.3 FACTORY INSPECTION

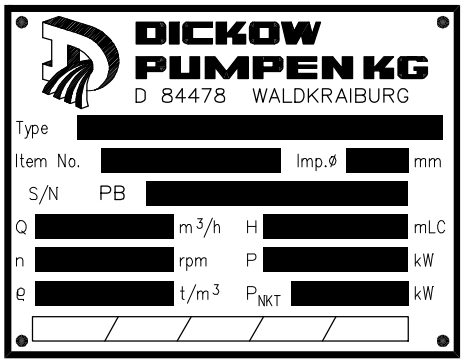
Before delivery, all pumps are performance-tested in our factory test area at the specified speed. Test liquid is water at 20°C (68°F). Test pressure and the specified service conditions (capacity, differential head and absorbed power) are documented and reconfirmed by a shop expert. Inspection certificates B according to EN 10204 (DIN 50049 3.1B), are available on request.

Certificates of further characteristics such as vibration, NPSH-value, noise level etc., are available if specified in the purchase order.
The hydraulic test is performed in accordance with EN ISO 9906, class 2, the pressure test is performed with 1,5-times the maximum operating pressure unless otherwise specified.

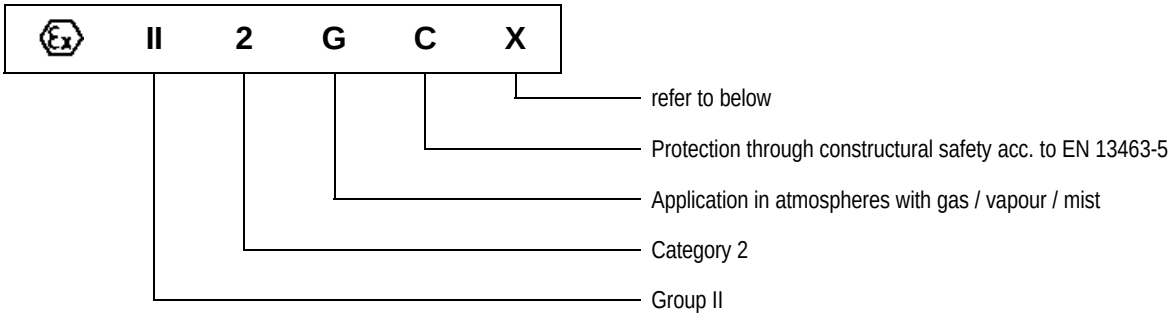
2.4 IDENTIFICATION

2.4.1 Name tag

A name tag is located on the motor lantern of each pump providing the information as shown.
When ordering spare parts or when contacting our application engineers about problems, you need to state the pump model, size, serial number, and the item number of the required parts.



2.4.2 Identification acc. to Explosion-Proof Directive



Since the effective maximum surface temperature does not depend on the according ignition source, but on the temperature of the pumped liquid, no identification ensues with a temperature class or a temperature. The symbol "X" has been integrated in the identification and the chapter 6.2 (item 7) of this manual refers to the arising surface temperatures.

2.5 SAFETY

2.5.1 Symbol- and Notice Explanation

2.5.1.1 Work Safety Symbol

This symbol will be found in this manual at all remarks for operational safety, where risks for health and life of personnel may be posed.
Please observe these points and be cautious in these cases. All cautions should also be passed on to other users. Apart from the cautions in this manual, the generally accepted safety rules must be adhered to.

2.5.1.2 Attention Notice

Attention !

To the items marked with ATTENTION in this manual, special attention must be paid in order to maintain a correct operating procedure and to avoid damage and destruction of the machines and/or other plant equipment.

2.5.2 General Instructions for pump´s operation

The chemical pumps of type NCB are manufactured in accordance with state of the Art-Technology and are safe to operate. However, these units bear danger if they are inexpertly installed or handled.
Each person who is in charge of assembly, installation, operating and maintenance of NCB-pumps in a plant, must have read and understood the complete manual and particularly item 2.5 „Safety“.

Special attention must be paid to the following points when operating the pump:

- When maintaining the pump, power supply to the driver must be interrupted and secured against unauthorized restart.
- Never disassemble pump before completely drained and cleaned from pumped liquid.
- Never use heat for pump disassembly.
- Never touch shaft sealing parts while the pump is in operation and the pump casing is pressurized.

Attention !

- Never start pump without making sure that pump and suction line is completely filled with liquid.
- Never run pump with discharge valve closed or below minimum flow.
- Never run pump dry.
- Never start operation without connection of the required auxiliary devices for supply and monitoring the shaft sealing.
- Never operate pump with suction valve closed or with clogged suction strainer.

- If it cannot be excluded that larger solids (>0,5 mm) will be contained in the pumped liquid, a filter must be provided on suction side. Suction strainers must have a net „free area“ of at least six to seven times the suction pipe area. Screen with a mesh width of 480 micron is recommended. Pressure losses at rated capacity should not exceed 1 to 1,5 m (3 to 5 ft). There should be a minimum of two pipe diameters of straight pipe between strainer outlet and pump suction flange.

3. PUMP DESCRIPTION

3.1 APPLICATION / DEFINED USE

DICKOW-NCB-pumps are used where ever aggressive liquid is handled and where the shaft sealing must meet utmost requirements. NCB-pumps are suitable for a temperature range of –40°C up to 250°C (–40°F up to 482°F) and an operating pressure up to 40 bar. Common shaft sealing systems are available for the different pumped liquids.

For the defined use of the pump it is absolutely necessary that the pump is constantly filled with liquid. The maximum speed is determined with 2900 rpm at 50 cycles and with 3500 rpm at 60 cycles.

3.2 CONSTRUCTION

The model NCB is a single flow, single stage volute casing pump of back-pull-out design with end suction flange and vertical discharge flange. Disassembly of the drive unit with the shaft sealing is possible without removing the volute casing from the piping. The flange to flange dimensions meet the standards of DIN EN 22858.

3.2.1 Volute casing, part 102

The volute casing is sealed on drive side by the intermediate casing. The intermediate casing is screwed to the volute casing by studs. The pumped liquid is sealed from the atmosphere by a confined gasket. A replaceable wear ring in the volute casing is available in the standard configuration.
The volute casing is provided with cast-on feet for mounting on the baseplate.

Complete drainage of the pump is possible through the drain connection at the bottom of the volute casing.

3.2.2 Impeller, part 233

The closed impeller is keyed to the pump shaft and secured by key and cap nut with Heli-Coil insert, respectively by cheese head screws at frame 0. All impellers are dynamically balanced according to DIN ISO 1940 / part 1, grade G 6.3. The impellers are also hydraulically balanced such that no thrust loads will occur within the performance range.

3.2.3 Intermediate casing, part 113

The intermediate casing connects the volute casing with the motor lantern. The shaft sealing is located in the intermediate casing. An interchangeable wear ring in the intermediate casing is standard.

3.2.4 Pump shaft, part 211

The pump shaft is placed on the drive shaft and secured by a clamping coupling. The impeller is arranged on the pump shaft in floating position.

4. SHAFT SEALING

4.1 MECHANICAL SEALS, DEFINED USE

For each installed mechanical seal, separate operating- and maintenance instructions are supplied giving information on the designations, materials, application limits and operating methods.

Mechanical seals are to be considered as machine components for common use and are therefore no subject to the explosion proof directive 94/9/EG.

The defined use of the mechanical seal requires the constant availability of liquid in the sealing gap.

4.2 AUXILIARY EQUIPMENT

Double mechanical seals additionally require a thermosiphon vessel. Installation, function, operating method and monitoring devices are described in a separate instruction manual.
Thermosiphon vessels are subject to the Directive 97/23/EG for pressure vessels.

5. INSTALLATION OF THE PUMP

Attention ! Installation, foundation and maintenance of pumps handling inflammable liquids AI, AII, AIII, B and other pollutive products may only be performed by companies or their personnel who possess the permission acc. to the local state regulations regarding the water protection law.

5.1 RECEIVING THE PUMP

Inspect the pump as soon as it is received. Make notes of damaged or missing items on the receipt and freight bill. File any claims with the transportation company immediately. Check for identical speed on pump and motor name tag.

5.2 STORAGE REQUIREMENTS

Short Term - less than six months
DICKOW normal packaging procedure is designed to protect the pump during shipping. Upon receipt store in a covered and dry location.

Long Term - more than six months
Preservative treatment of machined surfaces will be required for pumps of material GGG40.3 or GS-C25. Store the pump in a sheltered dry place. Rotate shaft several times by hand every three months by removing the coupling guard. If required, disassemble and inspect prior to final installation. Refer also to driver manuals for their long term storage.

5.3 ALIGNMENT OF BASEPLATE / BASEFRAME ON THE FOUNDATION

Pre-condition for a proper and troublefree operation of the pump is the accurate assembly of the entire unit. Improper installation inevitably results into increased vibrations (6.4.4). Therefore, the pump should be assembled by specially trained personnel only or by our own fitters.
If the pump unit mounted on baseplate or baseframe shall be grouted to the foundation, the following must be observed before grouting:

- Alignment of baseplate or baseframe by means of a water level.
- Elimination of unevenness in the foundation by suitable supports.

Attention ! The proper alignment of the entire unit prior to start-up is the responsibility of the owner only.

5.4 PIPING

Attention ! The pump must be stressfree connected to the piping. That means, the connecting flanges of the pipes must be in exact alignment with the pump flanges. Never draw piping into place by imposing force. If piping will be cleaned or flushed after installation, suction and discharge opening must be closed by blanks. No solids must get into the pump during standstill.

General

1. All piping must be supported and must line up naturally with the pump flange.
2. Do not make final connection of piping to pump unit until grout has hardened.
3. Piping that handles hot liquids, require proper installation of expansion loops so that linear expansion of piping will not cause misalignment.
4. Piping should be arranged to allow pump flushing and draining prior to the removal of pump for servicing.
5. Gasket installation and materials must be suitable for the service.
6. The allowable forces and moments must be considered.

5.4.1 Suction pipe

Attention ! When using volute casing pumps, care must be taken for the NPSH-conditions. The suction piping requires careful design for these pumps. It is especially important that the available NPSH of the system is exactly determined.

NPSH-available ³ NPSH-required + minimum 0,5 m (1.5 – 2 ft)

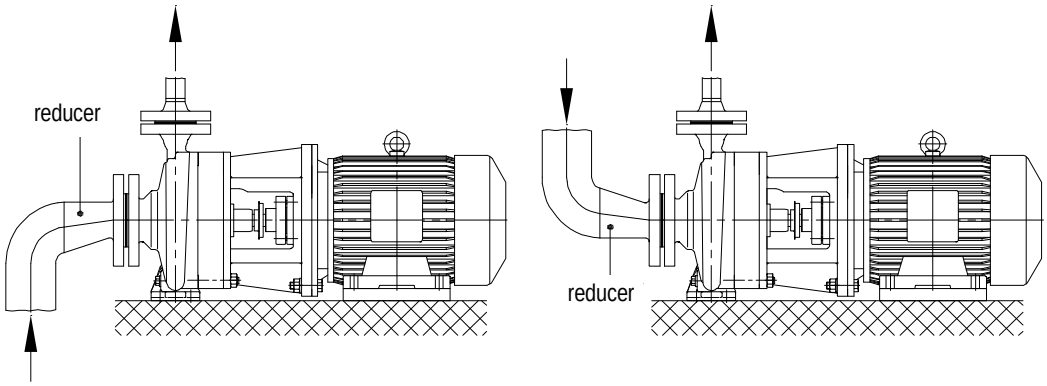
Suction pipe should be flushed before connection to the pump and the following be considered:

1. Use of elbows close to the pump suction flange should be avoided. There should be a minimum of 2 pipe diameters of straight pipe between the elbow and suction inlet.

2. Suction piping must never be of smaller diameter than the pump suction.

3. Reducers, if used, must be eccentric at pump suction flange as shown in the following drawing.

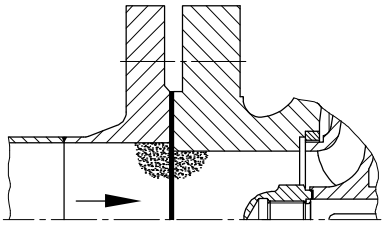
Suction lift conditions ***Flooded suction conditions***



4. Suction strainers if used must have a net „free area“ of at least six to seven times the suction pipe section. Screen with a mesh width of 480 micron is recommended. Pressure losses at rated capacity should not exceed 1 to 1,5 m (39 - 59"). There should be a minimum of two pipe diameters of straight pipe between strainer outlet and pump suction flange.

5. Separate suction lines are recommended when more than one pump is operating from the same suction vessel.

6. Never connect a larger suction pipe direct to the pump suction flange. Flow eddies reduce the free flow area of the pump. Additional losses reduce the calculated available NPSH, cavitation can occur.



Suction lift conditions

1. Suction pipe must continuously slope upwards towards pump suction to eliminate air pockets.
2. All joints must be air tight.
3. A foot valve should be provided to allow proper filling of pump and suction line before start-up.
4. Connection must be provided to fill suction line and pump with liquid before starting the pump.

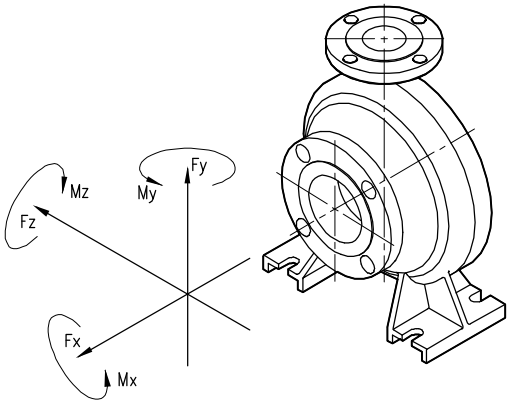
Flooded suction conditions

1. An isolation valve should be installed in suction line to permit closing of the line for pump inspection and maintenance.
2. Suction pipe should slope gradually downwards to the suction flange.
3. The suction pipe shall be submerged sufficiently below the minimum liquid surface to prevent vortex and air entrapment at the source.

5.4.2 Discharge pipe

1. Isolation valve should be installed in discharge line to permit closing of the line for pump inspection and maintenance. If an additional check valve is foreseen, it should be placed between discharge flange and isolation valve.
2. Diffusers, if used, should be placed between discharge flange and isolation valve. Maximum allowable opening angle 8°.
3. Cushioning devices should be used to protect pump from surges and water hammer, if quick-closing valves are installed in system.
4. If a bypass pipe is provided for obtaining a minimum flow, the bypass pipe must lead back to the suction source - not to the pump suction pipe!

5.4.3 Allowable forces and moments



Values below are independent from casing material.

Pump size	Suction flange (max. values)						Discharge flange (max. values					
	Fx(N)	Fy(N)	Fz(N)	Mx(Nm)	My(Nm)	Mz(Nm)	Fx(N)	Fy(N)	Fz(N)	Mx(Nm)	My(Nm)	Mz(Nm)
26/170 210	800	520	640	415	320	207	570	710	462	370	280	185
32/165 200 250	890	580	710	460	355	230	605	755	490	390	300	195
40/165 210 250 320	1100	680	870	670	490	310	640	800	500	415	320	210
50/165 200 250 330	1335	890	1070	950	720	475	710	890	580	460	355	230
65/165 200 250 320	1780	1155	1425	1330	1005	680	880	1070	700	670	490	310
80/165 200 250 320	2350	1500	1850	1700	1280	850	1070	1335	890	950	720	475
100/200 250 320 400	2350	1500	1850	1700	1280	850	1425	1780	1155	1330	1005	680
125/250 320 400	3115	2045	2490	2305	1765	1180	1880	2350	1535	1700	1280	850
150/250	4895	3115	3780	3530	2580	1765	2490	3115	2045	2305	1765	1180

5.5 INSULATION

Insulation, if foreseen for pumps handling hot liquids, should cover the casing parts only. A complete heat emission must be guaranteed in the area of the motor lantern.
Insulation can also be required if the specification regarding maximum surface temperature within the explosion proofness must be fulfilled. This is especially the case if the liquid temperature exceeds the allowable temperature of the given temperature class.

5.6 SAFETY DEVICES

Attention ! All safety devices for temperature, vibration, leakage etc, mentioned in the cover sheet (page 1) must be properly connected to the motor circuit respectively the control panel before start-up. Consider special descriptions and wiring diagrams.

5.7 EARTHING CONNECTION

An earthing connection at the baseplate or frame is provided as standard. Earthing connections must be plugged in any case.

5.8 DRIVE MOTOR

The drive motor is an electric device and must be connected by skilled and trained personnel only. All applicable state and local laws and safety regulations as well as the motor instruction manual must be observed.

Attention ! The proper connection of the electric motor including the provided pump protection devices is the responsibility of the owner only.

6. OPERATION OF THE PUMP

6.1 START-UP PROCEDURE

When the before mentioned instructions have been performed, the protection strainer on suction side has been checked and possible blanks have been removed, the pump can be put in operation as follows:

1. Check for identical speed on pump and motor name tag.
2. If cooling is provided, open valves in the cooling line and check the flow.
3. Fill up pump suction pipe completely with liquid. Open suction valve, close discharge valve.
4. If a thermosiphon vessel is available, fill it with buffer fluid up to middle of sight glass. Under consideration of corrosion resistance and the compatibility with the pumped liquid and the environmental conditions, any liquid can be used. The used buffer fluid however must be free of solids, may not tend to sedimentation, should have a high boiling point, high heat capacity and thermal conductivity.

   Attention ! Instructions given in the manual for thermosiphon vessel must be observed !

5. The sealing chamber must be thoroughly vented in order to avoid dry running and consequent damage of the seal faces.

   Attention ! Instructions given in the manual for mechanical seal must be observed !

6. If all points mentioned before have been checked, start driver briefly for a few seconds, shut off and check for smooth run down and the proper direction of rotation (clockwise when viewing the motor fan). The pump must not come to a jerky stop after shut off.

7. If no problems occur after the test start, the pump can be restarted finally.

Attention ! Immediately observe the pressure gauges. If discharge pressure is not quickly attained, stop driver, reprime and attempt to restart. Adjust discharge valve until rated flow is obtained.

8. **Attention !** Continued operation against closed discharge valve without an additional bypass will cause inadmissible temperatures within the pump. Cavitation and break down of the mechanical seal through vapourisation of the liquid in the sealing gap are possible consequences and must be avoided in any case.

6.2 OPERATION, MAINTENANCE

1. **Attention !** Always adjust capacity with the valve in discharge line. Never throttle flow by suction valve.

2. Pump and motor should always operate steadily and free of vibrations (see 6.4.4)

Attention ! A sudden increase of running noise is always a sign of possible trouble

3. The ampere load specified on the name tag of the drive motor must not be exceeded.

4. When operating with a capacity higher than rated and stamped on the pump name tag, make sure that NPSH-available > NPSH-required.

5. Isolation valves in the auxiliary pipes must always be opened during operation.

6. After a longer operation time, the surface temperature at the wetted casing parts – especially the volute casing – will adjust itself according to the liquid temperature. This requires consideration within the bounds of the explosion proofness and the T-classification. Concerning the surface temperature at the mechanical seal, adhere to the instruction manual for the selected seal.

6.3 SHUT DOWN

1. Close valve on discharge side slowly.

2. **Attention !** Immediately after closing the valve, the driver must be shut off and checked for steady run-down.

3. Close valve on suction side.

4. Close auxiliary seal flushing.

5. Close cooling water when the pump has cooled down.

6. Empty the pump during shut-down in winter.

6.4 PREVENTIVE MAINTENANCE

DICKOW-NCB-Pumps are designed to be maintenance-free and do not require any adjustments. But without doubt, a routine maintenance program can extend the lifetime of your pump and can prevent serious damage. Well maintained equipment will last longer and requires less repair. You should keep maintenance records to help pinpoint potential causes of problems.

6.4.1 Routine Maintenance

1. Gauges

In the suction or discharge line - right in front or behind the pump – manometer or mano-vacuummeter should be provided for controlling operating conditions. The maximum pressure of these gauges should be 50% above the operating pressure. Install isolation valves and condensers in the measuring lines in front of the gauges.

2. Vibration monitoring

All rotating pump parts are properly dynamically balanced, according to DIN ISO 1940/part1, grade G 6.3. During performance tests, we check pump vibration and ensure that a rate of velocity = 2,8 mm/s (0.11"/s) will not be exceeded. During operation a vibration rate of 4,5 mm/s (0.18"/s) is allowable.

If a vibration rate of more than 4,5 mm/s (0.18"/s) is noted at start-up of a new pump, the reason may be excessive stress from the piping connections or unstable foundation. Please improve before continuing operation.

It is recommended to perform vibration measurements in regular intervals and to keep records of the measured values. Possible appearing damages to antifriction bearings can be recognized in time and serious failures such as break down of mechanical seal and liquid leakage to the atmosphere can be avoided.

3. Antifriction bearing / Drive motor

The drive motors of NCB-pumps have permanent grease-lubricated antifriction bearings. Experience shows that the grease-filling of the bearings will last for several years. For more information about bearing life or re-greasing periods, refer to drive motor manual. If the pump's vibrations are not monitored regularly, the antifriction bearings must be replaced when the specified lifetime is reached.

6.5 TROUBLE SHOOTING

Attention ! If the pump does not develop the required performance or if other unexpected things happen during start-up, please consider, that you bought a quality product carefully tested prior to delivery. Before calling DICKOW service personnel or disassembling the unit, please check carefully the pump´s environment. Check simple things, such as forgotten blanks in the piping, motor and pump speed in accordance with the labels, wire connections in the terminal box. Make sure that control devices are properly connected and measuring instruments are calibrated.

6.5.1 No liquid delivered at start-up

Problem: Suction line is not completely primed or insufficiently filled.
Remedy: Fill again pump and suction line. Check foot valve in suction line.

Problem: Block valve in suction line is closed, blanks have not been removed.
Remedy: Open valve, remove blanks.

Problem: Feed- or suction line contain air pockets which cannot be eliminated by filling up because piping is incorrectly laid out.
Remedy: Check layout of the pipes. Suction line at suction lift conditions must continually slope upwards, at flooded suction conditions gradually slope downwards to the pump.

6.5.2 Pump does not obtain rated flow or head after start-up

Problem: Block valve in suction line is not opened completely.
Remedy: Open valve.

Problem: Motor speed is not identical with the pump speed according to the name tag.
Remedy: Change motor, check up with application engineer.

Problem: Strainer basket filter on suction side is clogged
Remedy: Clean the filter.

Problem: Suction pipe is leaking.
Remedy: Retighten flange connection on suction side.

Problem: Pump rotates in wrong direction.
Remedy: Change motor wiring.

Problem: Differential head of the system is higher than specified in the order and stamped on the name tag.
Remedy: Check with the application engineer whether the pump can at this stage be equipped with a larger impeller (check power rating of the motor).

Problem: Viscosity of pumping liquid is higher than stated in the order.
Remedy: Check with application engineer.

Problem: Capacity reduces at increasing operating temperature. NPSH-available < NPSH-required.
Remedy: Increase feed head by rising the liquid level on suction side, improve NPSH-available. Installation of inducer improves NPSH-required. Check with application engineer.

Problem: Pump cavitates.
Remedy: As described before.

Attention ! Cavitation causes damage to the mechanical seal respectively the bearing. Never operate pump under such upset conditions.

6.5.3 Motor requires excessive power

Problem: Differential head lower than rated.
Remedy: Throttle discharge valve to obtain the capacity according to the name tag. Correct impeller diameter (item 6.5)

Problem: Density or viscosity is higher than specified in the order.
Remedy: Check with the application engineer.

Problem: Motor speed is not identical with the pump speed according to the name tag.
Remedy: Change motor.

6.5.4 Pump is noisy and vibrates after start-up

Problem: Base not rigid enough.
Remedy: Stabilize and support the area of pump- and motor feet.

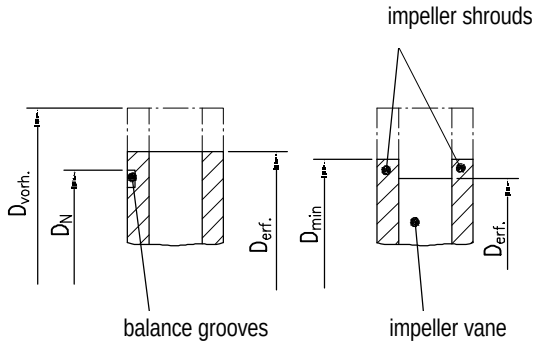
Problem: Foundation bolts are loose.
Remedy: Tighten foundation bolts.

Problem: Pump cavitates.
Remedy: Refer to section 6.4.2 - NPSH-improvement.

6.5.5 Pump gets noisy and vibrates after a longer operating time

Problem: Motor ball bearings are worn out.
Remedy: Replace bearings according to the instructions in the motor manual.

6.6 IMPELLER TRIMMING



D_{rtd} = Rated impeller diameter
D_{req} = Required impeller diameter
D_{min} = Minimum allowable shroud diameter ~ D_N + 5 mm
D_N = Outer diameter balance groove

Any existing unbalance of the impellers is eliminated by balance grooves provided in the impeller shrouds. It is recommended to trim the impeller shrouds only that far, that diameter D_{min} is maintained. Otherwise, the impeller must be rebalanced after trimming.

Attention ! Non-observance of these instructions may cause excessive vibrations, worn out ball bearings and leaking seals.

7. DISASSEMBLY

7.1 GENERAL

Independent from the installed shaft sealing system, proceed as follows:

1.  Prior to disassembling the pump, the power supply to the motor must be interrupted and the driver secured against unauthorized restart. Before disconnecting the rotating part or the complete pump from the piping, the pump must be depressurized and cooled down.
2. Drain the pump through the drain plugs.
3. Dismantle available monitoring devices.
4. Drain and dismantle thermosiphon vessels and external cooling loops if available.
5. Screw the ring screws into the motor housing and hang the motor on the crane hook.
6. Loosen flange connections between piping and pump. Remove the pump by crane and place it in vertical position on a suitable working table.
7. Remove hexagon nuts 920.2 from intermediate casing.
8. Press the intermediate casing 113 out off its centring by using jack screws. Lift the complete unit by crane and place it in horizontal position on the working table
9. Loosen and remove the impeller nut 922, respectively the inner hexagon cap screw 914.12 at frame size 0.
10. Remove impeller 233 by puller. Place the puller under the vanes to avoid damage to the shrouds.
11. Remove key 940.1.

7.2 DISASSEMBLY OF MECHANICAL SEAL

For disassembling the mechanical seal, follow the instructions given of the seal manual.

7.3 DISASSEMBLY OF PUMP SHAFT

Loosen the hexagon head bolt from the shrink disk 552, pull off and remove the pump shaft 211.

8. INSPECTION

8.1 IMPELLER / WEAR RING

The impeller must be free of corrosion and may not show any scouring or mechanical damage. The sliding surfaces in the wear ring area may not have any visible grooves. Impeller diameters have to be measured. The total clearance in new condition is 0,6 mm (0.0236 inch). If the clearance exceeds 0,9 mm (0.0354 inch), the wear ring must be replaced.

8.2 VOLUTE CASING / INTERMEDIATE CASING

Possible pittings must not exceed a depth of 1 mm (0.0394 inch). Centrings and seats of gaskets or O-rings must not show any mechanical damage, corrosion or erosion. Circulation holes in the intermediate casing must be free of solids or sediments.

8.3 PUMP SHAFT

The pump shaft must be free of corrosion and pittings at the area of mechanical seal, shaft sleeve and motor shaft.

8.4 SHAFT SLEEVES

Shaft sleeves must be free of corrosion. Visible grooves or damage on O-rings, throttle bushings and packing rings are not acceptable. Replace if required.

8.5 SEAL END PLATE

Seal end plates must be free of corrosion. Centrings, gasket seats, O-ring seats must not show any mechanical damage or wear. Replace if necessary.

9. REASSEMBLY

After inspection and replacement of unusable parts, reassembly is to be done as described in section 7, but in reverse order.

9.1 TORQUE SETTINGS

Part No.	Designation	Frame 0 [Nm]	Frame I [Nm]	Frame II [Nm]	Frame III [Nm]
552	Connection – Shrink disk	acc. to the indictions on the shrik disk			
914.12	Inner hexagon cap screw - Impeller	8.8 = 40 A4-70 = 26			
920.1	Hexagon nut – Motor lantern	80	80	80	
920.2	Hexagon nut – Intermediate casing	8.8 = 80 A4 = 50	8.8 = 80 A4 = 50		8.8 = 190 A4 = 130
	up to impeller diameter 250			8.8 = 80 A4-70 = 50	
	up to impeller diameter 320			8.8 = 190 A4-70=130	
920.4	Connection – Motor flange motor size 80a/b, 90S/L motor size 100L, 112M, 132S/M motor size 160M/L	 40 80 190	 40 80 190	 40 80 190	 80 190
922	Impeller nut		120	136	158

10. RETURNING THE PUMP TO THE FACTORY

Pumps returned to the factory for overhauling or repair, may be disassembled or maintained by our service personnel only if the pumped liquid is clearly defined by the pump user. According to the „Decree for dangerous Goods“ a „Safety Data Sheet DIN 52900“ completely filled in must accompany the shipping documents.

For non-toxic and non-explosive liquids, a transport control sheet with Attention Notice for danger and handling must be undetachable fixed on the pump (a copy attached to the delivery note).

Above work safety instructions apply also for complaints on new pumps which have already been in contact with liquid.

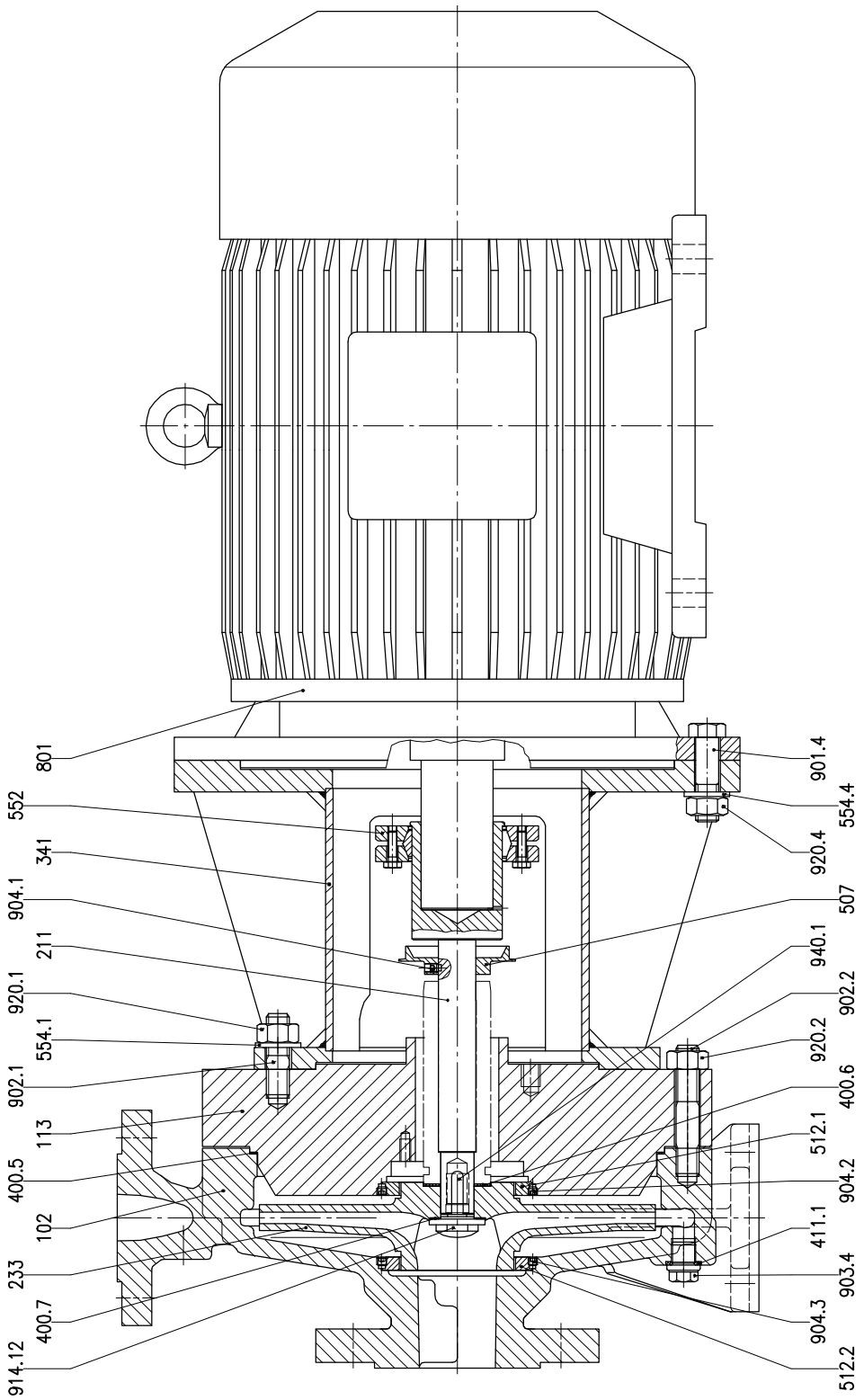
All pumps must be completely drained, flushed and neutralized before returning to the factory in order to avoid endangering of personnel, unnecessary costs for disposal and delay in handling.

11. SPARE PARTS IDENTIFICATION

11.1 SECTIONAL DRAWINGS

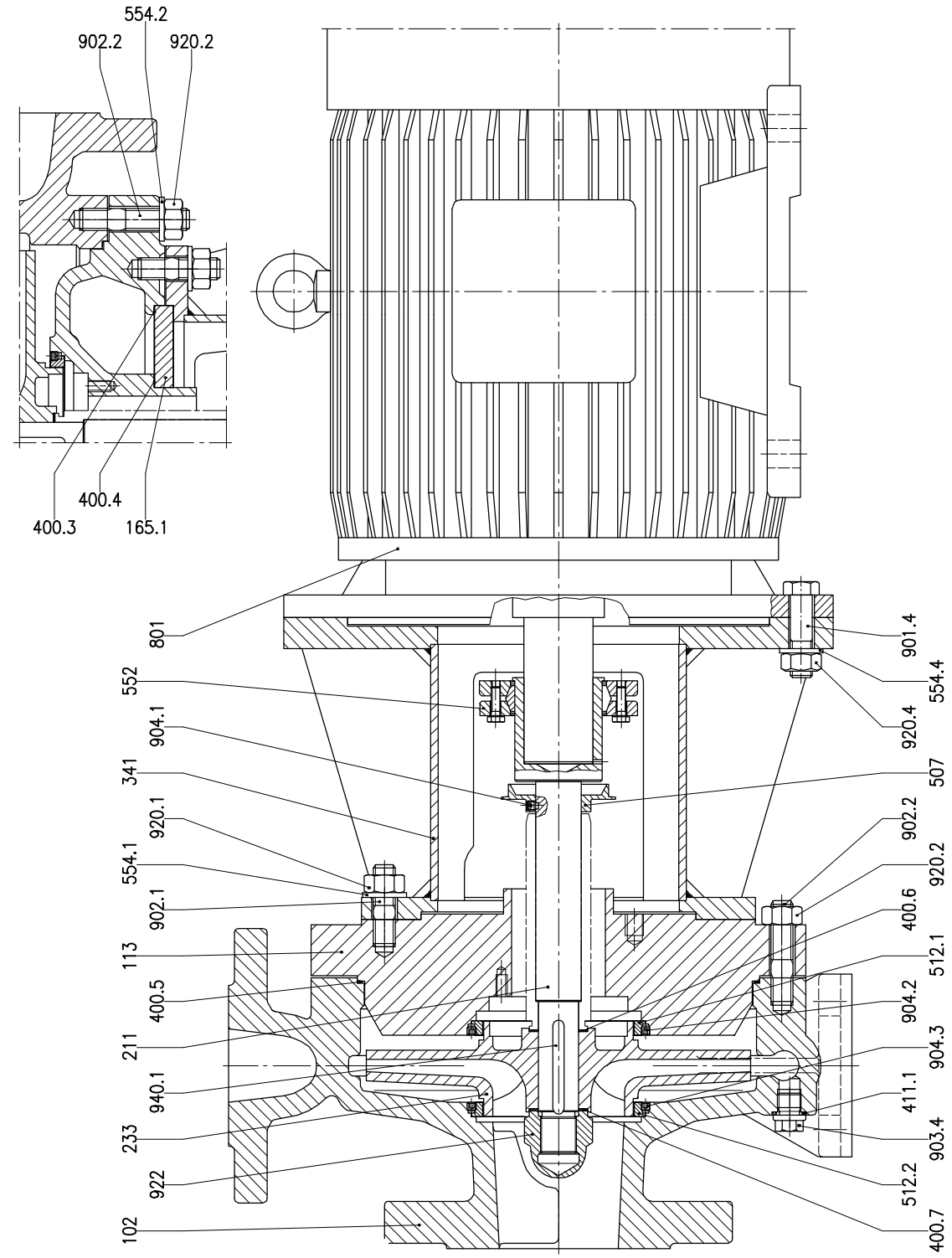
11.1.1 Type NCB, frame size 0 - Standard design

Drawing No. 54.NCB.7



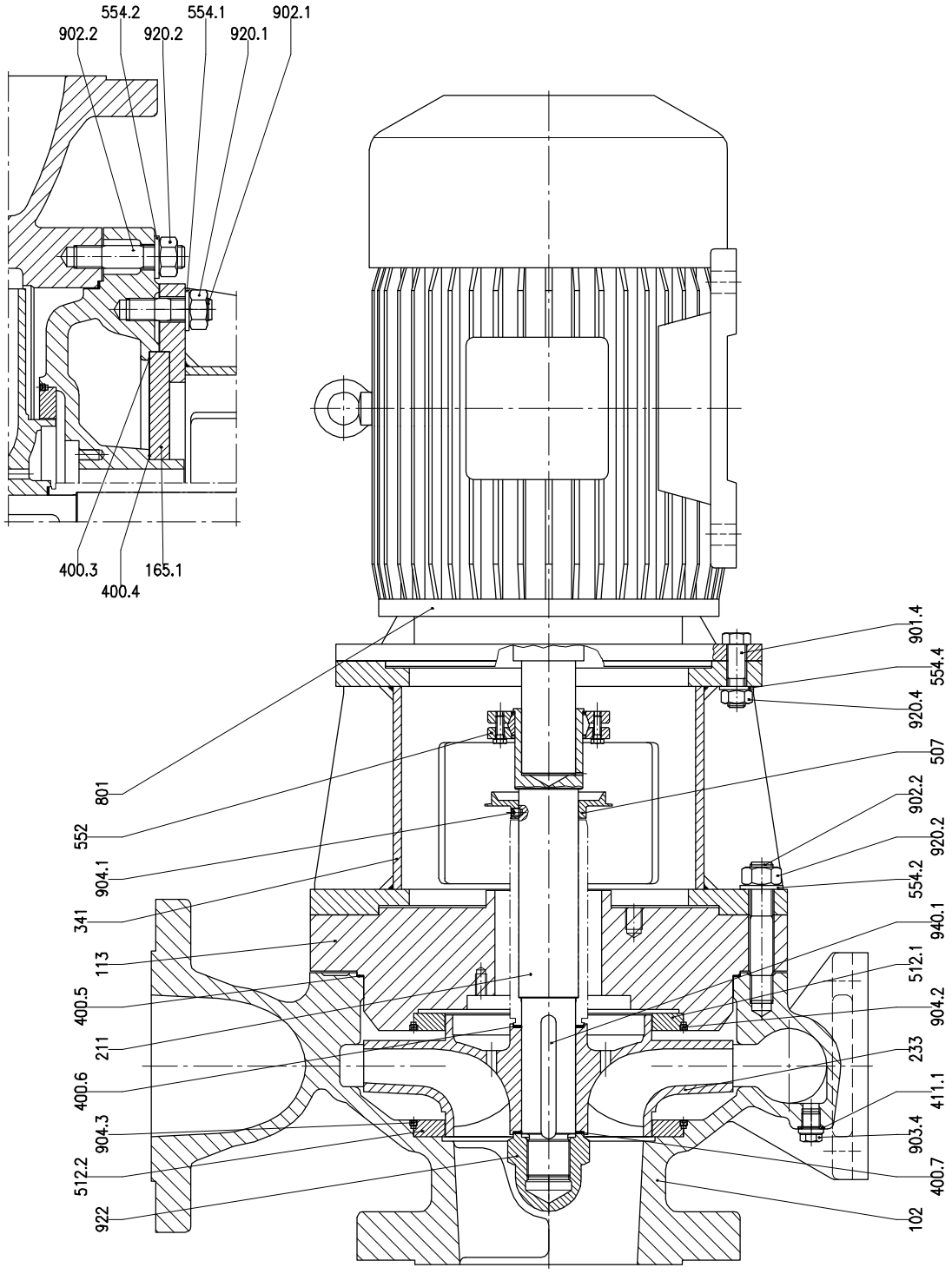
11.1.2 Type NCB, frame size I / II – Standard design ***Drawing No. 54.NCB.8***

design of intermediate casing
at pump size 40/320 and 50/330



11.1.3 Type NCB, frame size III - Standard design *Drawing No. 54.NCB.9*

design of intermediate casing
at pump size 65 – 125/320
and 100 + 125/400



11.2 PARTS LIST and MATERIAL SPECIFICATION for Standard design

Part No.	Designation	Standard – Materials		
		NCBs	NCBhu	NCBh
102	Volute casing	GGG40.3	GS-C25	1.4408
113	Intermediate casing	St52.3 / GGG40.3	ST52.3 / GS-C25	1.4571 / 1.4408
165.1	Cover of cooling chamber	GG25	GG25	GG25
211	Pump shaft	CK45 / 1.4021	CK45 / 1.4021	CK45 / 1.4021
233	Impeller	GG25 / GGG40.3	GG25 / GGG40.3	1.4408
341	Motor lantern	St / GG25	St / GG25	St / GG25
400.3	Gasket	Novatec Premium	Novatec Premium	Novatec Premium
400.4	Gasket	Novatec Premium	Novatec Premium	Novatec Premium
400.5	Gasket	Novatec Premium	Novatec Premium	Novatec Premium
400.6	Gasket	Novatec Premium	Novatec Premium	Novatec Premium
400.7	Gasket	Novatec Premium	Novatec Premium	Novatec Premium
411.1	Joint ring	Top Chem 2000	Top Chem 2000	Top Chem 2000
507	Deflector	1.4408	1.4408	1.4408
512.1	Wear ring	GG25	GG25	1.4571
512.2	Wear ring	GG25	GG25	1.4571
552	Shrink disk	St	St	St
554.1	Washer	St	St	1.4571
554.2	Washer	St	St	1.4571
554.4	Washer	St	St	St
801	Flange motor			
901.4	Hexagon head bolt	4.6	4.6	4.6
902.1	Stud	8.8	8.8	A4-70
902.2	Stud	8.8	8.8	A4-70
903.4	Screwed plug	St	St	1.4571
904.1	Grub screw	8.8	8.8	A4-70
904.2	Grub screw	1.4571	1.4571	1.4571
904.3	Grub screw	1.4571	1.4571	1.4571
914.12	Inner hexagon cap screw	1.4571	1.4571	1.4571
920.1	Hexagon nut	4	4	A4
920.2	Hexagon nut	4	4	A4
920.4	Hexagon nut	4	4	4
922	Impeller nut	C45+PB	C45+PB	1.4571
940.1	Key	1.4571	1.4571	1.4571