CPE SYSTEMS INC

CB+SERIES PORTABLE PUMP

OPERATIONS MANUAL

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CONTENTS

1. INTRODUCTION

Thank you for purchasing a CPE Centrifugal Pump. Your pump comes completely set up, wired, and pre-programmed. Please read this manual front to back, it includes care instructions for your pump.

2. QUICK START GUIDE

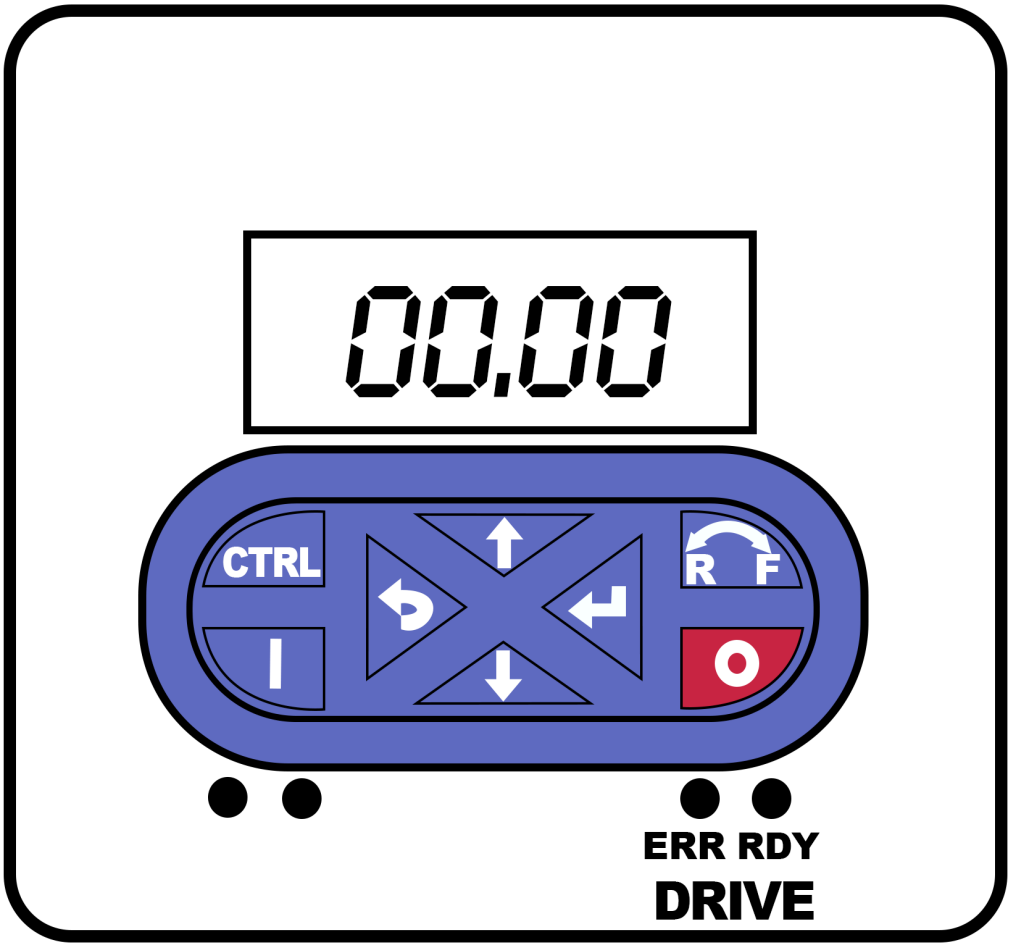
This pump was assembled, wired, programmed, and tested before shipping. It should be ready for use without any modifications or changes required on your part.

1. Connect inlet (suction) line to the Tri-Clamp fitting on the front of the pump using a new Tri-Clamp gasket and a heavy duty clamp. The inlet line should be at least the same diameter as the fitting on the pump. We recommend against clamping a valve or tee onto the inlet port.
2. Connect the discharge line to the Tri-Clamp fitting on the top of the pump using a new Tri-Clamp gasket and a heavy duty clamp.
3. Plug the power cord into an appropriate wall receptacle using the supplied plug. Do not change the plug or use an adapter; this will void the warranty.
4. Open the valve on the inlet line to the pump to allow liquid to flow to the pump.
5. Open the valve on the discharge line if you have one installed.
6. If so equipped, adjust the potentiometer (speed control knob) on the front of the digital pump controller to the midpoint so the indicator dot on the knob is at the top.
7. Press the run button  briefly to start the pump.
8. Adjust the speed of the pump by using the up and down arrows  or the potentiometer (if equipped) to obtain your desired flow.
9. When you are finished pumping. Stop the pump by pressing the stop button  . Do not stop the pump by simply turning down the speed to zero. This will still allow voltage to the motor and can cause damage and electrical shock.
10. Close both the inlet and discharge valves if equipped.

Note: Do not try to run your centrifugal pump in reverse. It will not operate in reverse; the forward/reverse button  has been disabled.

3. KEYPAD GUIDE

3.1 Layout

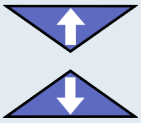


Caution:
Do not assume that your unit is in a power-off state because the LEDs or 4-digit display is off. This does not guarantee a power-off state. Be sure the pump is unplugged or that the main power switch or circuit breaker is in the "OFF" position before servicing the drive.

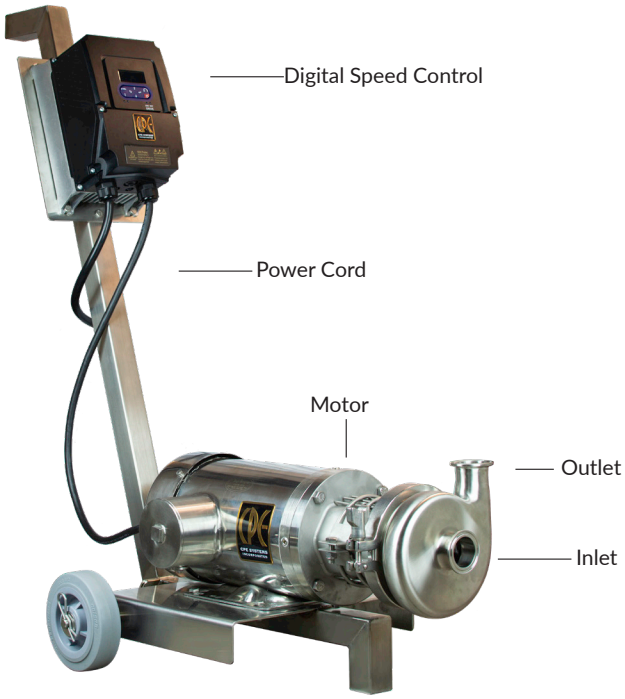
3.2 Drive Operation

Start-up procedure - Your variable frequency drive has been programmed and all the connections have been completed. To start the drive, press the run button  and use the up button  (or potentiometer, if equipped) to achieve the desired speed. Use the up button  and the down button  to adjust the speed. To stop the pump, press the stop button  .

Table 1: Keypad Guide

Key	Actuation	Condition	Action
	Shortly	Local keypad control active Display "LOC"	Run motor
		Remote control active Display "REM" Display "KSTOP"	Deactivate keypad triggered stop The motor remains at standstill Display changes from"KSTOP" to"STOP"
	Shortly	No jog operation	Stop motor Display "KSTOP"
	Shortly	Operating mode	Change to parameterization mode > keypad parameterization mode
	More than 3 s	None (anytime possible)	Save parameter settings in the user memory of the memory module
	Shortly	During operation	Scroll through information in the above status line
	Shortly	Manual setpoint selection via keypad active Display "MAN"	Change frequency setpoint
	Shortly	Operating mode	Activate full keypad control Display "ON?"→ Confirm with Control and setpoint selection can now only be carried out via keypad Renewed clicking: Exit full keypad control Display "OFF?" → Confirm with
	Shortly	Local keypad control active Display "LOC"	Reversal of rotation direction Display "REV?"→ Confirm with

4. LINE INSTALLATION



4.1 Inlet Line

The suction line should be short and follow a direct route with a minimum number of elbows and fittings. Elbows should be located as far as possible from the suction inlet to prevent head loss due to increased friction. Excessive friction losses in the suction line could result in pump cavitation, which causes poor performance, noise, vibration, damage to equipment, and possible damage to the product. Whenever practical the diameter of the line at the suction inlet should be increased in size. An eccentric tapered reducer should be used in lieu of a concentric tapered reducer to prevent air pockets from forming and impairing pump efficiency. The eccentric reducer may be placed at the inlet of the pump and should be positioned so the straight side is up. A horizontal suction line must have a gradual rise to the pump. A high point in the suction line will form an air pocket and prevent proper pump operation. All joints in the suction line should be airtight to prevent air leakage, which can reduce pump capacity and efficiency.

4.2 Outlet Line

Position the pump outlet line either vertical or top horizontal. The discharge line should be short and direct with a minimum number of elbows and fittings. Elbows should not be used at the discharge outlet as the friction encountered would be increased, resulting in head loss. It is advisable to increase the line diameter at the discharge outlet to prevent head loss. However, the use of a larger discharge line than recommended may reduce the total pump head while increasing the pump volume, which can cause pump vibration due to overload. Use of a discharge pipe smaller than the pump discharge outlet increases the total pump head but decreases the volume. If a reducer is required on the outlet port of the pump and the discharge is vertical, a concentric reducer should be used. If the discharge is horizontal, an eccentric reducer should be used, which should be positioned with the straight side down.

5. PUMP CLEANING

5.1 Clean In Place

Our centrifugal pumps are designed to be cleaned in place (CIP). No disassembly should be required for cleaning if a proper CIP procedure is followed.

5.2 Cleaning Stainless Steel

Cleaning of stainless steel (AISI 300 Series), manually or chemically, is dependent on the process environment the equipment is operated in. Typically, the cleaning regimen should be developed and reviewed by a plant sanitarian or a formulation representative of a reputable chemical supply company.
The following chemicals may be utilized to clean, passivate, and disinfect equipment prior to operation:

Alkaline Detergent: A blended alkaline detergent may be used to clean equipment. The detergent should be a blended sodium hydroxide/water detergent, designed for use with stainless steel equipment and used at initial concentrations of 1-3% w/w solution at a temperature of 160° F (70° C) to 195° F (90° C) (depending on the chemical supplier). The detergent should be formulated with a metal chelating agent, such as sodium gluconate or gluconic acid, to remove metal ions in the water (hardness dependent) and a surfactant to increase the rinse ability of the solution.

Acid: To neutralize any residual alkali and render a passive surface on the stainless steel, a 160°F (70° C) solution of citric acid and water at a concentration of 0.5-3% w/w can be used. Phosphoric acid may be used at concentrations of 0.5-1.5% w/w at 115° F (45° C). If phosphoric acid is used, corrosion inhibitors should be blended in prior to use.

Disinfectant (Food Plants): Caution should be used with the application of chemical disinfectants. Most chemical disinfectants are halogen or quaternary ammonium-based compounds and, in high concentrations, are very corrosive to stainless steel. Typically, the most common disinfectant, iodophor, can be used with a maximum concentration of 25 mg/l at a maximum temperature of < 80°F (25° C). Other common disinfectants, such as sodium hypochlorite and chloramine, are not recommended.

5.3 Preventing Corrosion

The corrosion resistance of stainless steel is greatest when a layer of oxidation is formed on the surface of the metal. If the protective surface is disturbed or destroyed, the metal can easily be corroded by contact fluids.

1. Regularly inspect stainless steel equipment for surface deposition and/or localized pitting corrosion. If deposition or discoloration is detected, disassemble equipment, remove components and soak in a mild alkaline-based detergent. Rinse using warm water. Allow equipment to air dry thoroughly before assembly.
2. Regularly check all electrical devices and verify all equipment is grounded to avoid any electrolytic-concentration corrosion.
3. Regularly inspect joints and gaskets in the system for crevice corrosion.
4. Regularly inspect equipment for trapped air pockets to avoid pitting caused by oxygen concentration corrosion.
5. Regularly inspect any areas of equipment using dissimilar metals connected by a mechanical joint to avoid galvanic corrosion.
6. Regularly inspect system components not manufactured with stabilized low carbon stainless steel (intergranular corrosion).

6. MAINTENANCE

Caution:
Before servicing pump, disconnect electrical power source, carefully relieve all pressure and drain all fluids from pump and connected piping.

For CB+Series pumps, it is not necessary to disassemble regularly if used in a Clean-In-Place installation. However, for some applications it may be necessary to disassemble parts of the pump for cleaning and sanitizing. Disassembly is also required for maintenance and repair. The extent of disassembly will depend on the application and the type of seal used in your pump. It is recommended that periodic inspection of all parts of the pump be made to prevent malfunctions caused by worn or broken parts.

Note: The part numbers in the following instructions reference the part diagrams in Section 8.

6.1 Disassembly

Disassembly of the pump wet end

1. Disconnect the inlet and outlet lines.
2. Remove seal guard assembly (131) by removing the guard screw (131A) with an appropriately sized wrench.
3. Remove the casing by turning the wing nut on the clamp assembly (75) until tension on the clamp saddle is relieved. Open the clamp (75) and remove the casing (1).
4. Insert a 3/8" rod into the hole in the stub shaft to lock it in place and use a wrench to loosen the wing nut (24D) by turning it counterclockwise.
5. Remove the rod. Push back gently on the impeller and continue to remove the impeller nut (24D) by hand. Be careful not to lose the impeller nut gasket (91B).
6. Slide the impeller (2P) forward and remove it.
7. Remove the shaft key (24C) from the stub shaft (6P).
8. Gently remove the cartridge seal (This is one piece that includes parts 96B, 96G, 96D, 96A, 96E)
9. Rotate the backplate (11P) until the backplate pins (11F) clear the pins in the adapter and remove the backplate.
10. Flip the backplate over and use gentle pressure to push the stationary seal (96C) out of the backplate.
11. Remove the casing gasket (90).

Note: Protect the sealing surface of the backplate against nicks and scratches while removing, cleaning, and reassembling.

Stationary Seal

Cartridge Seal

Disassembly of the pump from the motor

These steps allow you to inspect the stub shaft and remove the pump head from the motor entirely. These steps are not required for a standard seal change.

1. Use a wrench to remove the mounting screws (71B) securing the adapter (71) to the motor frame and remove the adapter (71).
2. Loosen the drive collar bolt (92A) on the drive collar (92) securing the stub shaft (6P) to the motor armature.
3. Remove the stub shaft (6P) by prying from the back with a flat bar. The stub shaft is a tight fit but can be removed by evenly applying pressure around the periphery of the shaft with a pry bar.
4. Inspect the sealing end of the stub shaft (6P) for abrasions, scratches, or other damage.

Seal Service

1. Inspect the stationary seal (96C) for wear and abrasions that could shorten seal life.
2. Carefully inspect the cartridge seal for signs of abrasions, cuts, or other wear that would cause leakage.
3. Inspect all gaskets for cracks and tears.
4. Inspect the casing clamp for damage or wear and replace as required.
5. Inspect the adapter and casing; replace if necessary.

Note: The electric motor contains no field serviceable components; therefore, this manual does not cover the maintenance, repair, and wiring of the electric motor. For specific information contact CPE Systems.

6.2 Reassembly

Reassembly of the pump to the motor

1. If it was removed, install the adapter (71) to the motor with the drain holes at the bottom. Insert the four mounting screws (71B) securing the adapter to the motor; tighten the screws securely.
2. Assemble the stub shaft (6P) and the collar (92) and install both pieces onto the motor armature shaft. Do not tighten the set screw. Ensure that the slot in the motor armature, stub shaft, and shaft collar align.
3. Install the backplate (11P) by rotating it until the pins (11F) in the backplate engage the pins in the adapter (71A).
4. Slide the impeller (2P) onto the shaft (6P). Hold the impeller tight against the shoulder of the shaft and screw on the impeller nut (24D) by rotating it clockwise.
5. Arrange the stub shaft (6P) on the motor shaft with a clearance of 0.070" between the impeller and the inside face of the backplate (11P).
6. Ensure that the slots on the motor shaft, stub shaft (6P), and drive collar (92) line up (see image to left). Tighten the set screw on the stub shaft collar.
7. Remove the impeller (2P), impeller nut (24D), and backplate (11).

Reassembly of wet end

8. Lubricate the O-ring on the stationary seal and use firm but gentle pressure to secure the stationary seal (96C) into place in the backplate (11P) ensuring that the flat side is facing up.

9. Install gasket (90) on backplate (11).
10. Install the backplate (11P) onto the stub shaft (6P) by rotating it until the pins in the backplate (11F) engage the pins in the adapter (71A).
11. Slide the cartridge seal assembly onto the stub shaft with the flat side facing the stationary seal (96C).
12. Place the shaft key (24C) into the slot on the stub shaft (6P).
13. Slide the impeller (2P) in place on the stub shaft (6P); ensure that the notch in the impeller (2P) lines up with the shaft key (24C).
14. Place the impeller nut gasket (91B) into the groove on the impeller (2P) and reinstall the impeller nut (24D) onto the shaft (6P) by rotating it clockwise until it is snug.
15. Insert a 3/8" rod into the hole in the stub shaft (6P) to hold the shaft in place, and use a wrench to tighten the impeller nut to the desired torque. (See table below)
16. Place the casing (1) in position and close and tighten the clamp (75) while lightly tapping the clamp with a hammer to ensure even tightening.
17. Assemble seal guard (131) and tighten the screw (131A).
18. Assemble the inlet and outlet lines to the pump. Check for strain on the casing. Adjust as necessary.

Note: Apply a small amount of food-grade lubricant to the O-ring prior to installation. Do NOT lubricate the seal faces with any type of oil or grease.

Proper Torque

Item	Torque (ft-lbs)	Pump Frame Size
Motor Bolts	20	140
	55	180-250
	70	280
	110	320
Shaft Collar Bolts	6	180
	15	210-250
	40	280-320

Item	Torque (ft-lbs)	Pump Model
Impeller Nut	15	CB+114
	80	CB+218 CB+216 CB+328 CB+4410

7. VFD DIGITAL SPEED CONTROL

7.1 Standard Features

- Protection level of IP66 (NEMA 4X) with indoor and outdoor approval; hose-proof, dust-tight, and approved for use in rough environments.
- First decentral drive in the market with IO-Link Device Interface.
- Sensorless vector control for synchronous motors.
- Intuitive user interface for fast setup and easy navigation by parameter structure.
- Onboard display with built-in diagnostics.
- Micro USB interface for programming and diagnostics.
- Multiple digital and analog inputs for remote control and safety interlocks.
- Compatible with our wireless remote controls, pressure switches and run-dry protection.
- Full onboard PID programming for interfacing with flow meters, level controls, pressure sensors, and can/bottle fillers.
- Optional front-mounted potentiometer (speed control knob).
- IO-Link compatible.

Note: Your drive has been programmed with the correct settings for optimal performance. Do not change the parameter settings without contacting the manufacturer. This will void the warranty.

7.2 Protection Features

Degree of protection:

- IP66 (EN 60529)
- NEMA type 4X outdoor (NEMA 250)
- UL type 4X outdoor (UL 50E)

Insulation resistance:

- Overvoltage category III (EN61800-5-1) - 0 ... 2000 m amsl
- Overvoltage category II (EN61800-5-1) - Over 2000 m amsl

Isolation of control circuits:

- Safe mains isolation via double/reinforced insulation (EN 61800-5-1)

Protective measures against:

- Short circuit
- Earth fault - earth-fault protected depending on operating status
- Overtemperature of motor - PTC or thermal contact
- Overvoltage
- Motor stalling

Leakage Current: >3.5 mA AC, >10 mA DC (EN 1800-5-1)
Starting Current: ≤ 3 x rated mains current

7.3 Programming

Note: The VFD is factory set for optimal operational efficiency. If you need to make changes please contact our service department for assistance.

All parameters of the inverter can be accessed by means of the keypad for commissioning and diagnostics and are listed in Table 2.

- The keypad parameter list is sorted in ascending order in compliance with the "display code" (Pxxx).
- In order to provide quick access, all parameters of the inverter are divided into different groups according to their function.
- Group 0 contains the configurable "Favourites". In the default setting these are the most common parameters for the solution of typical applications.
- Based on the hundreds digit of the display code (Pxxx) you can quickly see in which group the parameter is to be found on the keypad.

Table 2: Keypad Parameter List

Parameter	Group - Name	Description
P1xx	Group 1 - Diagnostics	Diagnostic/display parameters for displaying device-internal process factors, current actual values, and status messages.
P2xx	Group 2 - Basic setting	Setting of the mains voltage, selection of the control and setpoint source, starting and stopping performance, frequency limits, and ramp times.
P3xx	Group 3 - Motor control	Configuration of the motor and motor control.
P4xx	Group 4 - I/O setting	Function assignment and configuration of the inputs and outputs.
P5xx	Group 5 - Network setting	Configuration of the network (if available).
P6xx	Group 6 - Process controller	Configuration of the process controller.
P7xx	Group 7 - Additional functions	Parameterizable additional functions.
P8xx	Group 8 - Sequencer	The "sequencer" function serves to define a programmed sequence of speed setpoints, PID setpoints or torque setpoints for the motor control. Switching to the next setpoint can be executed in a time-based or event-based manner.

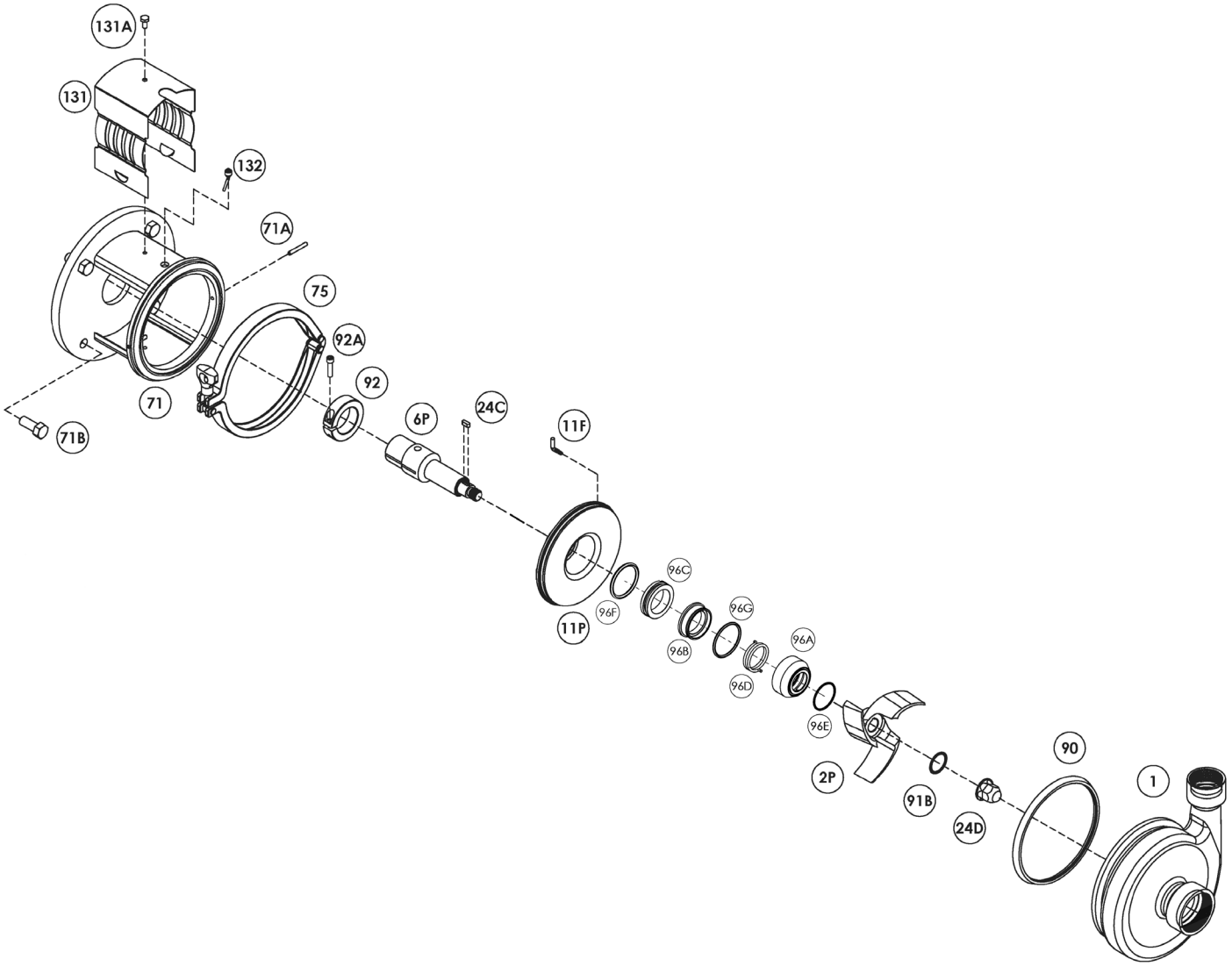
Note: This table is provided for reference only. Please contact customer support before changing any parameters.

7.4 Specifications

Table 3: Technical Data

i550 protec		
Mains	1 AC 120 V	0.37 ... 1.1 kW (0.5 ... 1.5 hp)
	1 AC 230 V	0.37 ... 2.2 kW (0.5 ... 3 hp)
	1/3 AC 230 V	0.37 ... 3 kW (0.5 ... 4 hp)
	3 AC 230 V	3 ... 22 kW (4 ... 30 hp)
	3 AC 400 V/480 V	0.37 ... 22 kW (0.5 ... 30 hp)
	3 AC 600 V	0.75 ... 3 kW (1 ... 4 hp)
Overload Behaviour		Mode S1: 150%, mode S6: 200%
Interfaces		Digital inputs/outputs (5/1), analog inputs/outputs (2/1) Relay
		External 24 V supply PTC/thermal contact HTL incremental encoder (100 kHz) USB onboard
		CANopen, EtherCAT, EtherNet/IP, Modbus RTU, Modbus TCP, PROFINET, IO-Link (optional)
		Integrated brake chopper DC bus connection
Conformity and Approvals		CE, UL, CSA, EAC, RoHS2, IE2 in accordance with EN 50598-2
Functions		V/f characteristic control linear/square-law (VFC plus) Sensorless vector control (SLVC) Energy saving function (VFC eco) Servo control (SC-ASM) with feedback Sensorless vector control for synchronous motors
		Vector control with feedback V/f V/f characteristic control with feedback
		DC-injection braking Brake management for brake control with low rate of wear
		Dynamic braking through brake resistor
		S-ramps for smooth acceleration and delay Flying restart circuit, PID controller
Safety Technology		Safe torque off (STO)

8. PUMP PARTS



Part #	Part Name	Quantity
1.	Casing	1
90.	Casing Gasket	1
24D.	Impeller Nut	1
91B.	Front Gasket	1
2P.	Impeller	1
96E.	Rotary Holder O-Ring	1
96A.	Rotary Holder	1
96D.	Internal Rotary Spring	1
96G.	Internal Rotary Face O-Ring	1
96B.	Internal Rotary Face	1
96C.	Static Face	1
96F	Stactic Face Back O-Ring	1
11P.	Backplate	1
11F.	Backplate Pin	1

Part #	Part Name	Quantity
24C.	Shaft Key	1
6P.	Stub Shaft	1
92.	Drive Collar	1
92A.	Drive Collar Bolt	1
75.	Clamp	1
71.	Adapter	1
71A.	Adapter Pin	1
71B.	Adapter Mounting Screws	4
132.	Water Cascade Assembly	1 (optional)
131.	Seal Guard Assembly	1
131A.	Set Screw	1

9. TROUBLESHOOTING

CPE pumps are relatively maintenance-free with the exception of sanitizing and seal replacement. However, like any piece of machinery occasional problems can arise. This section provides a means of determining and correcting most of your pump problems. The motor manufacturer should be contacted for specific repair instructions on the motor. Table 4 and Table 5 have been prepared on the basis that the pump is properly suited to its application. Should problems arise where the remedies listed in the following tables do not resolve them, pump cavitation may be the problem. Symptoms of pump cavitation, such as noisy operation, insufficient discharge, and vibration, can result when a pump is not properly applied. If these conditions are present, check the system and re-evaluate the application. If assistance is required, contact CPE Systems.

9.1 Pumping

Table 4: Pump Troubleshooting

Problem	Probable Cause	Remedy
1. No Discharge	a. Pump speed too low	a. Correct wrong or poor electrical connections
	b. Wrong direction of rotation	b. Reverse a three-phase motor by switching any two of the three power leads at the motor controller; reverse a single phase motor per motor manufacturer's instructions
	c. Closed valve; obstruction in discharge piping	c. Open gate valve; clear obstruction
2. Insufficient Discharge	a. Pump speed too low	a. See 1.a
	b. Wrong direction of rotation	b. See 1.b
	c. Valve partially closed; obstruction in discharge piping	c. See 1.c
	d. Impeller damaged	d. Replace Impeller
3. Excessive Power Consumption	a. Motor speed too high	a. Internal motor wiring is incorrect; replace motor
	b. Impeller is binding	b. Relieve strain on casing; replace defective impeller
	c. Motor shaft is bent or worn	c. Replace shaft
4. Pump Is Noisy	a. Magnetic hum in motor	a. Consult motor manufacturer
	b. Motor bearings are worn	b. Replace bearings
	c. Foreign matter is rotating with impeller	c. Remove casing and remove foreign matter
	d. Impeller is binding	d. See 3.b
	e. Cavitation	e. Improper sizing or piping, etc.
5. Excessive Vibration	a. Pump is not leveled properly	a. Level pump
	b. Impeller is damaged	b. Replace impeller
	c. Piping is not supported	c. Support discharge and suction piping
	d. Cavitation	d. Improper sizing or piping, etc.
6. Pump Leaks	a. O-ring seal is worn or defective	a. Replace o-ring seal
	b. Carbon seal is worn	b. Replace carbon seal
	c. Insufficient compression on seal assembly	c. Replace spring
	d. Damaged inlet or outlet	d. Replace casing
	e. Backplate gasket is worn	e. Replace gasket
	f. Clamp is loose	f. Tighten clamp

9.2 VFD Error Codes

Table 5: VFD Error Codes

Error Code	Description	Classification	Remedy	Blocking Times	Reset Possible
2250	CiA: Continuous overcurrent (inside the device)	Fault	• Check motor and wiring for short circuit • Check brake resistor and wiring • Check motor circuit (delta connection, star connection) • Check setting of the motor	5	Yes
2320	Short circuit or earth leakage on the motor side	Fault	• Check motor cable • Check the length of the motor cable • Use shorter or lower-capacitance motor cable	5	Yes
2340	CiA: Short circuit (inside the device)	Fault	• Check motor cable for short circuit	5	Yes
2350	CiA: i²*t overload (thermal state)	Fault	• Check drive sizing • Check machine/driven mechanics for excessive load • Check setting of the motor data • Reduce values for slip compensation (P315.01, P315.02) and oscillation damping (P318.01, P318.02)	5	Yes
2382	Error: Device utilisation (Ixt) too high	Fault	• Check drive sizing • Reduce maximum overload current of the inverter (P324.00) • In case of high mass inertias, reduce maximum overload current of the inverter (P324.00) to 150%	3	Yes
2383	Warning: Device utilisation (Ixt) too high	Warning	• Check drive sizing	0	Yes
3120	Mains phase fault	Fault	• Check wiring of the mains connection • Check fuses	0	Yes
3210	DC bus overvoltage	Fault	• Reduce dynamic performance of the load profile • Check mains voltage • Check settings for braking energy management • Connect brake resistor to the power unit and activate the integrated brake chopper (P706.01 = 0: Brake resistance)	0	Yes
3211	Warning: DC bus overvoltage	Warning	• Reduce dynamic performance of the load profile • Check mains voltage • Check settings for braking energy management • Connect brake resistor to the power unit and activate the integrated brake chopper (P706.01 = 0: Brake resistance)	0	Yes
3220	DC bus undervoltage	Trouble	• Check mains voltage • Check fuses • Check DC bus voltage (P105.00) • Check mains settings	0	Yes

Error Code	Description	Classification	Remedy	Blocking Times	Reset Possible
3221	Warning: DC bus undervoltage	Warning	• Check mains voltage • Check fuses • Check DC bus voltage • Check mains settings	0	Yes
3222	DC bus voltage too low for switch-on	Warning	• Check mains voltage • Check fuses • Check mains settings	0	Yes
4210	PU: Overtemperature fault	Fault	• Check mains voltage • Provide for sufficient cooling of the device (display of the heatsink temperature in P117.01) • Clean fan and ventilation slots. If required, replace fan • Reduce switching frequency (P305.00)	0	Yes
4281	Heatsink fan warning	Warning	• Clean fan and ventilation slots. If required, replace fan. The fans can be unlocked via locking hooks and can then be removed	0	Yes
4310	Error: Motor overtemperature	Fault	• Check drive sizing • Check motor thermal sensor and wiring (X109/T1 and X109/T2)	5	Yes
5112	24-V supply fault	Warning	• Check optional external 24-V voltage supply (terminal X3/24E), if connected • Check mains voltage	0	Yes
5180	24-V supply overload	Warning	• Check 24-V output and digital outputs for earth fault or overload	0	Yes
6280	Trigger/functions connected incorrectly	Trouble	• Check and correct the assignment of the triggers to the functions • With keypad or network control, the two functions "Inverter enable" (P400.01) and "Run" (P400.02) can also be set to "Constant TRUE{1}" to start the motor	0	Yes
7180	Motor overcurrent	Fault	• Check motor load • Check drive sizing • Adapt the set error threshold (P353.01)	1	Yes
9080	Keypad removed	Fault	• Plug in the keypad again or activate another control source	0	Yes
FF02	Error: Brake resistor overload	Fault	• Check drive sizing • Check settings for the braking energy management Note: The error will be reset if the thermal load falls below the error threshold (P70180) of - 20%	5	Yes
FF06	Motor overspeed	Fault	• Adapt the maximum motor speed (P322.00) and the error threshold (P350.01)	1	Yes
FF36	Warning: Brake resistor overload	Warning	• Check drive sizing • Check settings for the braking energy management Note: The warning will be reset if the thermal load falls below the warning threshold (P707.08) of - 20%	0	Yes
FF37	Automatic start disabled	Fault	• Deactivate start command and reset error	0	Yes
FF85	Keypad full control active	Warning	• To exit the control mode, press the control CTRL keypad key	0	Yes

Table 6: Diagnostics and Fault Elimination

The "RDY" and "ERR" LED status displays on the front of the inverter provide some quick information about certain operating states.

"RDY" LED (blue)	"ERR" LED (red)	Status/meaning
Off	Off	No supply voltage.
On	On	Initialization (inverter is started).
Blinking (1 Hz)	Off	Safe torque off (STO) active.
	Blinking fast (4 Hz)	Safe torque off (STO) active, warning active.
Blinking (2 Hz)	Off	Inverter inhibited.
	Blinking fast (4 Hz)	Inverter disabled, warning active.
	On	Inverter disabled, error active.
	Lit every 1.5s for a short time	Inverter inhibited, no DC-bus voltage.
	On for a short time every 1s	USB module is connected, 5-V supply voltage for the USB module is available.
On	Off	Inverter enabled. The motor rotates according to the specified setpoint or quick stop active.
	Blinking fast (4 Hz)	Inverter enabled, warning active. The motor rotates according to the specified setpoint or quick stop active.
	Blinking (1 Hz)	Inverter enabled, quick stop as response to fault active.
Both LEDS are blinking in a rapidly alternating mode		Firmware update active.
Both LEDs are blinking in a very rapidly synchronous mode		"Visual tracking" function is active.