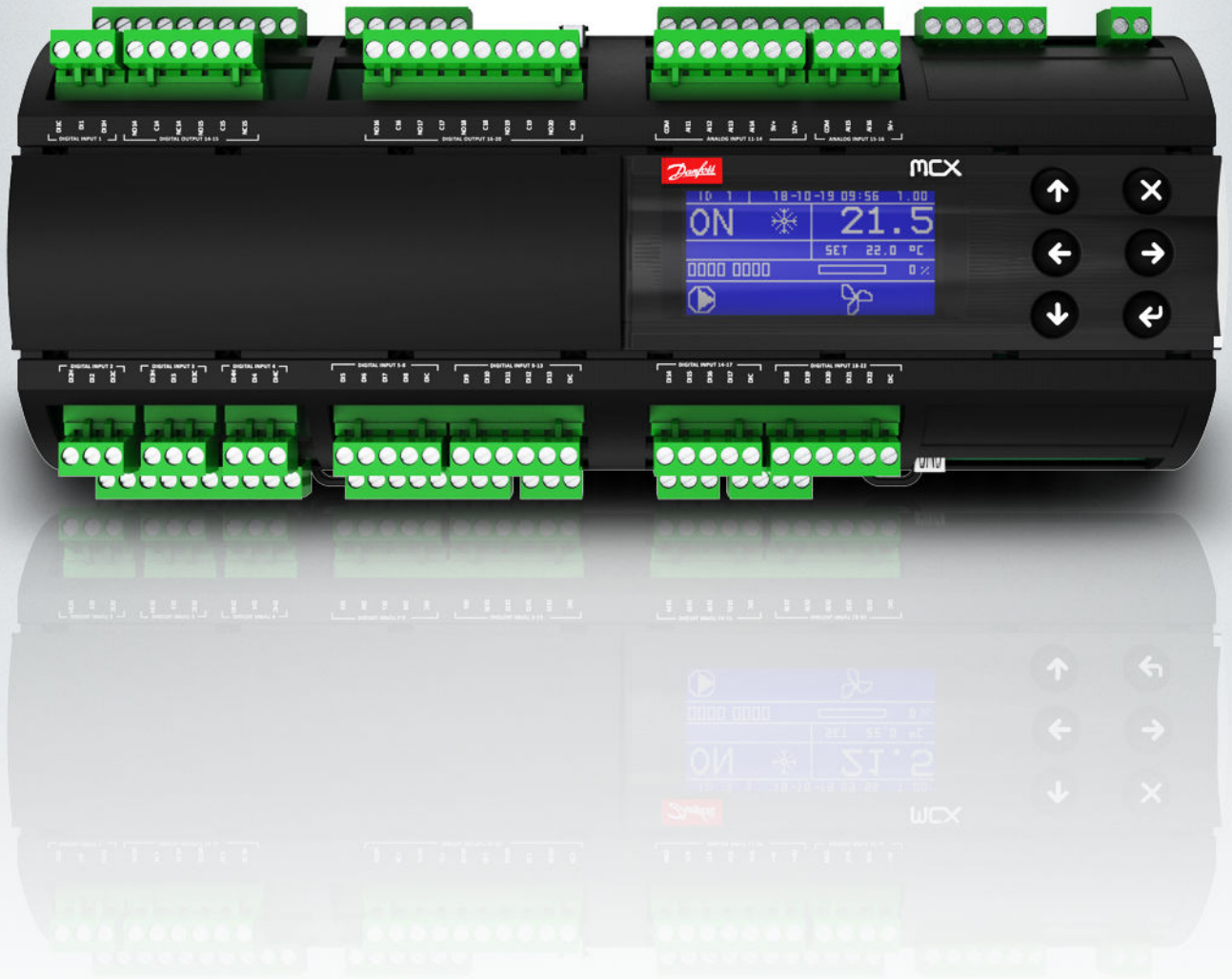
ENGINEERING
TOMORROW

User Guide

Pump and Level controller Type EKE 3470P

Designed for controlling the liquid level in a horizonal or vertical vessel recirculatory refrigeration system



Contents

Introduction

The EKE 3470P Pump and Level controller is a complete solution for controlling the liquid level in a horizonal or vertical vessel recirculatory refrigeration system. It is easy to setup and use. The LCD display and simple keypad combine to provide an easy to navigate, operator friendly interface for set point and calibration entry.

Some of the Standard features include:

- Selection of either *level probe* (LP) or *float-switch* (FS) mode to measure liquid level
- Motorized valves with proportional/integral (PI) for liquid level control
- Option to use multiple pump pressure sensors
- Option to use Delta pressure sensors for both vessel and pump pressures
- Automatic pump control with Smart Mode option
- Motor protection
- Modbus RTU and Modbus TCP/IP communications
- Real-time clock
- Pump runtime hours with Pump runtime equalization
- Web interface creation capabilities
- Update software and save parameters with a USB stick
- Integrated Superheat controller for possible oil rectification

There are two basic control functions that need to be performed for proper operation, liquid level control and pump control. This Data Sheet will describe in detail the operation of the Liquid Level Controller.

Product specification

Model
EKE 3470P Pump and Level controller

Part Number
080G5012

SupplyVoltage
21–265 V AC 50/60 Hz
40–230 V DC
Maximum power consumption: 15 W
20 VA insulation between power supply and the extra-low voltage: functional

Modbus
It is important that the installation of the data communication cable be installed correctly. Remember to terminate each end of the bus. EIA485 Rated cable must be used. Refer. Data communication between ADAP-KOOL® refrigeration controls.

DO - Digital outputs, 15
DO1 – D013 SPST relay 5 A
DO 9 - Unused
DO 14, DO 15 Unused

AO - Analog output, 6
AO 1 – AO 4 Outputs are 0–10 V DC
AO 5 – AO 6 Unused

AI - Analog Inputs, 10
AI1 – AI6 Inputs are 4–20 mA
AI 7 – AI 10 Unused

DI - Digital inputs, 22
DI 1 - DI 4 24/230 V AC opto-insulated
DI 5 – DI 15 Voltage free/24 V AC sensing
DI 6 – DI 22 Unused

Operating conditions
CE: -20T60 / UL: 0T55, 90% RH non-condensing

Network Topology

The network cable, for Modbus RTU communications, should be EIA485 rated. The cable is connected from controller to controller, and no branches (stars) are allowed on the cable. If the cable length exceeds 1200 meters (1312 yards) a repeater must be inserted. One repeater must be added for every 32 controllers. If the data communication cable runs through an electrically noisy environment which impairs the data signal, one or more repeaters must be added to stabilize the signal. When configuring Modbus devices on the control bus, the highest device address that can be used is 120 (max 120 Modbus control devices in total). The wires are looped from device to device and must observe polarity. A is connected to A and B is connected to B. The shield must be connected and complete a path from the device, all controllers, and any repeaters. The shield must not be connected to earth ground.

The -Liquid Level Controller default baud rate is 19.2K.

I/O Descriptions

D I/O	DESCRIPTION	TYPE
DO 1	High Level Shutdown Alarm	OUTPUT
DO 2	Liquid Feed Solenoid Valve #1	OUTPUT
DO 3	Liquid Feed Solenoid Valve #2	OUTPUT

D I/O	DESCRIPTION	TYPE
DO 4	Pump #1 Start	OUTPUT
DO 5	Pump #2 Start	OUTPUT
DO 6	Pump #3 Start	OUTPUT
DO 7	Transfer Pump Solenoid Valve	OUTPUT
DO 8	Pump Bypass Solenoid Valve	OUTPUT
DO 9	Superheat Oil Rectifier - Solenoid Valve	OUTPUT
DO 10	General Alarm	OUTPUT
DO 11	Shutdown Alarm	OUTPUT
DO 12	High Level Alarm	OUTPUT
DO 13	Low Level Shutdown Alarm	OUTPUT
DO 14	Pump Mode – Evaporator Injection Signal	OUTPUT
DO 15	General Alarm 1,2, 3 or Low Level Alarm (select)	OUTPUT
DI 1	System Remote Enable/Disable	INPUT
DI 2	Remote Reset	INPUT
DI 3	Float Switch – High Level Shutdown Alarm (HLSD)	INPUT
DI 4	Pump #1 Aux Run Contacts	INPUT
DI 5	Pump #2 Aux Run Contacts	INPUT
DI 6	Pump #3 Aux Run Contacts	INPUT
DI 7	Float Switch – High Level Alarm	INPUT
DI 8	Float Switch – Transfer Solenoid	INPUT
DI 9	Float Switch – Liquid Feed Solenoid Valve #1	INPUT
DI 10	Float Switch – Liquid Feed Solenoid Valve #2	INPUT
DI 11	Float Switch – Low Level Alarm	INPUT
DI 12	Float Switch – Low Level Shutdown Alarm (LLSD)	INPUT
DI 13	Pumps Enable/Disable	INPUT
DI 14	Liquid Motorized Valve #1 Alarm	INPUT
DI 15	Liquid Motorized Valve #2 Alarm	INPUT
DI 16	Superheat Oil Rectifier Activation	INPUT
DI 17	Stepper Valve Driver Alarm	INPUT
DI 18	General Alarm 1	INPUT
DI 19	General Alarm 2	INPUT
DI 20	General Alarm 3	INPUT

OUTPUTS:

High Level Shutdown Alarm – DO 1
Output is de-energized when the liquid level in the vessel rises to the "High level Shutdown Setpoint LP" SP3 set Control parameters or if employing a High level shutdown float switch, when the input is de-energized. Output is energized when liquid level falls below the setpoint or if float switch is energized. A "High Level Shutdown" alarm must be operator reset. Output is re-energized when liquid level falls below HLSD SP (high level shutdown setpoint) and the alarm is cleared using DI 2 Remote Reset or in Main Menu "Alarms → Reset".

Liquid Feed Solenoid Valve #1 – DO 2
Controls the liquid feed makeup to the vessel. If a motorized liquid makeup valve is not installed, then the solenoid output is energized when the vessel liquid level is below set point, and de-energized when the vessel liquid level is at or above set point. If a motorized liquid makeup valve is installed, the solenoid is in-line with the motorized liquid makeup valve. The solenoid is open when vessel level is below, equal to or above set point, to allow the motorized valve to control the level. If the vessel level rises a percent above set point (parameter - Liquid Feed SV1 OFF Diff SP LP), the solenoid will be de-energized. If a float switch "FS Liquid Feed Solenoid #1" is employed and energized, the output is energized.

Liquid Feed Solenoid Valve #2 – DO 3
Employed when one liquid feed system is not enough to keep up with demand. Controls the liquid feed makeup to the vessel. If a motorized liquid makeup valve is not installed, then the solenoid output is energized when the vessel liquid level is below set point, and de-energized when the vessel liquid level is at or above set point. If a motorized liquid makeup valve is installed, the solenoid is in-line with the motorized liquid makeup valve. The solenoid is open

when vessel level is below, equal to or above set point, to allow the motorized valve to control the level. If the vessel level rises a percent above set point (parameter - Liquid Feed SV2 OFF Diff SP LP), the solenoid will be de-energized. If a float switch (FS) "Liquid Feed Solenoid #2" is employed and energized, the output is energized.

Pump #1 Start – DO 4
(as configured) When pump #1 is requested to start in either Auto or Manual mode, the output is energized. When pump #1 is requested to stop this output is de-energized.

Pump #2 Start – DO 5
(as configured) When pump #2 is requested to start in either Auto or Manual mode, the output is energized. When pump #2 is requested to stop this output is de-energized.

Pump #3 Start – DO 6
(as configured) When pump #3 is requested to start in either Auto or Manual mode, the output is energized. When pump #3 is requested to stop this output is de-energized.

Transfer Pump Or Solenoid – DO 7
This output is energized when liquid level in the vessel reaches the "Transfer Solenoid SP LP" setpoint and in the Level Control parameters group or if employing a Transfer float switch, when the corresponding input (DI 8) is energized. Output is de-energized when liquid level falls below the setpoint or if float switch input is de-energized.

Pump Bypass Solenoid – DO 8
The Pump Bypass Solenoid output is energized when any pump output is energized.

SH Oil Rectifier Solenoid – DO 9
The Oil Rectifier Solenoid output is energized when any pump is running and DI16 (Oil rectifier Activation) is energized. It is de-energized when either all the pumps are stopped or when DI16 is de-energized.

General Alarm – DO 10
Output is energized on any alarm. Output is de-energized when all active alarms are remedied and reset either remotely or locally.

Shutdown Alarm – DO 11
Output is energized on any Shutdown event. Shutdown events include High Level Shutdown, Low Level Shutdown, Pump Aux Fault and Pump High Amps Fault. Output is de-energized only after a manual reset is performed, either remotely or locally.

High Level Alarm – DO 12
Output is energized when the liquid level in the vessel reaches either the "High level Alarm Setpoint LP" set in the Level Control parameters or if employing a High level alarm float switch, when it is de-energized. Output is de-energized automatically when liquid level drops below setpoint or float switch is energized.

Low Level Shutdown Alarm – DO 13
Output is energized when the liquid level in the vessel drops below either the "Low level Shutdown Setpoint LP" set in the Level Control parameters or if employing a Low level shutdown float switch, when the input (DI12) is de-energized. The Output is de-energized when liquid level rises above the setpoint in parameter SP8 or if employing a LLSD float switch, when the delay time set in parameter SP7 expires.

Pump Mode – Evaporator Injection Signal– DO 14
Output is energized when any pump is "running/Auto", "Standby" mode, or both. Select output in parameter label "PDO" in MAIN MENU > Parameters > Pump Control Main > Pump mode Select DO14.

General Alarm 1,2, 3 or Low Level Alarm (select) - DO 15
Output is energized when one of the selected General Alarm digital inputs is energized due to an external alarm condition. See parameter SCA. Main Menu > Service > General > Configuration > General Alarm Select to select condition for DO15 output.

INPUTS:

System Remote Enable/Disable – DI 1

This input must be energized to remote enable the pumps and the liquid feed solenoid valves. If remote enable is not used, a jumper wire will be required from a 24 V DC source.

Remote Reset – DI 2
Alarms may be remotely reset via this input. The remote reset is accomplished energizing this input momentary.

Float Switch – High Level Shutdown Alarm- DI 3
(as configured; Default=YES) The vessel high-level shutdown alarmfloat switch input is energized ON during normal operation. If the liquid level rises in the vessel to the high-level shutdown switch, the input is de-energized and issues a "High Level Shutdown Alarm". The pumps will continue to run to reduce the liquid in the vessel. Alarm causes solenoid liquid feed make-up valves SV1 and SV2 to fully close.

Pump #1 Aux Run Contacts – DI 4
This input must be energized for Pump #1 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #1 Aux Fault" alarm will be issued after "Delay Time Aux Alarm" and the pump will be shutdown.

NOTE: *Digital Inputs DI 5 to DI 15 are voltage free (VF), therefore when DI C is connected to input, input is energized.*

Pump #2 Aux Run Contacts – DI 5 (VF)
This input must be energized for Pump #2 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #2 Aux Fault" alarm will be after "Delay Time Aux Alarm" and the pump will be shutdown.

Pump #3 Aux Run Contacts – DI 6 (VF)
This input must be energized for Pump #3 to run. Normally wired through an auxiliary contact on the motor starter. If at any time it drops out or is de-energized, a "Pump #3 Aux Fault" alarm will be after "Delay Time Aux Alarm" and the pump will be shutdown.

Float Switch – High Level Alarm – DI 7(VF)
(as configured) The vessel high level alarm float switch input is energized during normal operation. If the liquid level rises in the vessel to the high-level switch, the input is de-energized and issues a "High Level Alarm". The pumps will continue to run to reduce the liquid in the vessel. If not currently closed, the liquid solenoid make-up valves SV1 and SV2 will be closed.

Float Switch – Transfer Solenoid – DI 8(VF)
(as configured) The vessel transfer solenoid switch is de-energized during normal operation. If the liquid level rises in the vessel to the transfer solenoid switch, the input is energized, and the transfer solenoid output will be energized.

Float Switch – Liquid Feed Solenoid #1 – DI 9 (VF)
The liquid feed solenoid #1 switch input is de-energized when the liquid level is at operational level. If the liquid level in the vessel falls below the liquid feed solenoid #1 float switch, the input is energized, and the Liquid feed solenoid #1 output is energized.

Float Switch – Liquid Feed Solenoid #2 – DI 10 (VF)
The liquid feed solenoid #2 switch input is de-energized when the liquid level is at operational level. If the liquid level in the vessel falls below the liquid feed solenoid #2 float switch, the input is energized, and the Liquid feed solenoid #2 output is energized.

Float Switch – Low Level Alarm – DI 11(VF)
(as configured) The vessel Low-level alarm float switch input is energized during normal operation. If the liquid level in the vessel falls below Low-level alarm float switch, the input is de-energized and issues a "Low Level Alarm" and DO15 is energized if parameter SCA in Main menu > Service>General>Configuration is set to "Low Level Alarm. In addition, the alarm can be set to "No Display" in parameter LLN, but output will still be enabled.

Float Switch – Low Level Shutdown Alarm – DI 12 (VF)
(as configured) The vessel Low-level shutdown alarm float switch input is energized during normal operation. If the liquid level in the vessel falls below Low-level shutdown alarm float switch, the input is de-energized and issues a "Low Level Shutdown Alarm". The pumps will be held "OFF" during the time when the LLSD alarm is active. The LLSD alarm will clear automatically and the pumps will turn back "ON" when both the liquid level rises above LLSD float

switch level and the delay time set in parameter SP7 expires. NOTE: As safety precaution in FS mode only, if time is set to high in parameter SP7, the alarm will clear and the pumps will turn back “ON” when the liquid level rises sufficiently enough to de-energize liquid feed solenoid #1 Input and close SV1.

Pumps Enable/Disable – DI 13 (VF)
Normally used for an evaporator request for liquid,this remote input must be energized for the pumps to run. If this input is de-energized, the pumps will be held in an “OFF” state but still in AUTO mode. The input is voltage free for the energized state. Therefore when DI C (com) is connected to this input it is energized.

Liquid MOV #1 Alarm – DI 14(VF)
Input alarming from an ICAD motorized valve. Input is de-energized during normal operation or when there is no alarm. When input is energized an alarm will be displayed and appear in active alarms as “ICAD MV1 Alarm”. The alarm is auto-resetting and will clear when input is de-energized.

Liquid MOV #2 Alarm – DI 15(VF)
Input alarming from an ICAD motorized valve. Input is de-energized during normal operation or when there is no alarm. When input is energized an alarm will be displayed and appear in active alarms as “ICAD MV2 Alarm”. The alarm is auto-resetting and will clear when input is de-energized.

SH Oil Rectifier Activation – DI 16(VF)
Remote input activates the Oil Rectifier Function. If remote control is not utilized, a jumper must be used to activate.

Stepper Valve Driver Alarm – DI 17(VF)
Input alarming from stepper valve driver alarm. Normally energized. When input is de-energized an alarm will be displayed and appear in active alarms as “Stepper Valve Driver Alarm”. The alarm is auto-resetting and will clear when input is re-energized. Stepper Valve Driver Alarm is associated with a Modbus address for remote monitoring.

General Alarm 1 – DI 18(VF)
Input alarming from remote source. Normally energized (selectable). When input is de-energized (default) an alarm will be displayed and appear in active alarms as “General Alarm 1”. The alarm is auto-resetting and will clear when input is re-energized. General Alarm input 1 is associated with a Modbus address for remote monitoring and can be selected for a activating DO 15. See parameter SCA.

General Alarm 2 – DI 19(VF)
Input alarming from remote source. Normally energized (selectable). When input is de-energized (default) an alarm will be displayed and appear in active alarms as “General Alarm 2”. The alarm is auto-resetting and will clear when input is re-energized. General Alarm input 2 is associated with a Modbus address for remote monitoring and can be selected for a activating DO 15. See parameter SCA.

General Alarm 3 – DI 20(VF)
Input alarming from remote source. Normally energized (selectable). When input is de-energized (default) an alarm will be displayed and appear in active alarms as “General Alarm 3”. The alarm is auto-resetting and will clear when input is re-energized. General Alarm input 3 is associated with a Modbus address for remote monitoring and can be selected for a activating DO 15. See parameter SCA.

ANALOG

A I/O	DESCRIPTION	SIGNAL	TYPE
AO 1	Liquid Feed Motorized Valve #1 or Pump Speed 3	0–10 V	OUTPUT
AO 2	Liquid Feed Motorized Valve #2 or Pump Speed 2	0–10 V	OUTPUT
AO 3	Pump Speed 1 or All Pumps Speed[2]	0–10 V	OUTPUT
AO 4	Liquid Level Output	0–10 V	OUTPUT
AO 5	Oil Rectifier Stepper Valve Driver EKF or ICM	0–10 V	OUTPUT
AI 1	Vessel Liquid Level Probe	4–20 mA	INPUT
AI 2	Pump Motor #1 Amps	4–20 mA	INPUT
AI 3	Pump Motor #2 Amps	4–20 mA	INPUT
AI 4	Pump Motor #3 Amps	4–20 mA	INPUT
AI 5	Vessel Pressure	4–20 mA	INPUT
AI 6	Pump Discharge Pressure	4–20 mA	INPUT
AI 7	Pump Motor #1 Discharge or Delta Pressure	4–20 mA[1]	INPUT

A I/O	DESCRIPTION	SIGNAL	TYPE
AI 8	Pump Motor #2 Discharge or Delta Pressure	4–20 mA[1]	INPUT
AI 9	Pump Motor #3 Discharge or Delta Pressure	4–20 mA[1]	INPUT
AI 10	Oil Rectifier SH S2 Temp C	PT1000	INPUT

[1] is set for 0–10 V input but conditioned externally to accept a 4–20 mA input. Pressure sensor output must be 4–20 mA
[2] Based on parameter selection

OUTPUTS

Liquid Feed Motorized Valve #1 – AO 1
This 0–10 V output is connected to motorized liquid feed valve MV1. The liquid feed valve is open and closed proportionally to the vessel liquid level. The 0–10 V output can also be used to control VFD#3 speed (percent or differential pressure) associated with pump#3. Requires setting Main Valve configuration parameter to either VCF = 1SV , VCF = 2SV or VCF = None.

Liquid Feed Motorized Valve #2 – AO 2
The second motorized feed valve is used when one motorized feed valve is not large enough to supply liquid to large vessels. This 0–10 V output is connected to motorized liquid feed valve MV2. The liquid feed valve is open and closed proportionally to the vessel liquid level.The 0–10 V output can also be used to control the VFD#2 speed (percent or differential pressure) associated with pump#2. Requires setting Main Valve configuration parameter to either VCF = 1SV , VCF = 2SV or VCF = None.

Pump(s) Speed 1 or All Pumps Speed – AO 3
This is a dedicated 0–10 V output used to control Pump#1 speed (percent or differential pressure). It may also control all the pumps speed if using one VFD for all the pumps.

Liquid Level – AO 4
Outputs a 0–10 V or 2–10 V signal proportional to the liquid level in the vessel.

Oil Rectifier Stepper Driver EKF – AO 5
Outputs a 0–10 V signal to the EKF Stepper Motor Driver Module to control an ETS Valve.

INPUTS

Vessel Liquid Level Probe – AI 1
The probe measures the liquid ammonia refrigerant level in the vessel. This liquid level input controls the “Liquid Feed Solenoid valves SV1 & SV2” and “Liquid Feed Motorized valves MV1 & MV2”. The liquid level probe outputs 4–20 mA over the liquid level range of 0-100%.

Pump Motor #1 Amps – AI 2
Current transformer (CT) input senses pump #1 motor current and outputs a linear 4–20 mA signal across its range.

Pump Motor #2 Amps – AI 3
Current transformer (CT) input senses pump #2 motor current and outputs a linear 4–20 mA signal across its range.

Pump Motor #3 Amps – AI 4
Current transformer (CT) input senses pump #3 motor current and outputs a linear 4–20 mA signal across its range.

Vessel Pressure – AI 5
Sensor measures the vessel pressure and outputs a 4–20 mA linear signal across its range to this input. If employing, configure vessel pressure sensor ranges in Parameters > Vessel/Pump Prs Main
NOTE: *Sensor is not required if employing a delta pressure sensor that outputs a 4–20 mA differential.*

Pump Discharge Pressure or Delta Pressure – AI 6
This is the default system pressure configuration when employing only one pump discharge pressure sensor. The sensor measures the discharge pressure and outputs a 4–20mA linear signal across its range to this input. Configure sensor ranges in Parameters > Vessel/Pump Prs Main. A single delta pressure sensor that measures both the vessel pressure and pumps discharge pressure and outputs a 4–2 0mA differential pressure signal may also be used on this input. Configure in Parameters > Vessel System Config > System Pressure Configuration > 1- DP Transmitter. Set sensor ranges in Parameters > Vessel/Pump Prs Main.

Pump Motor #1 Discharge or Delta Pressure – AI 7
Use this input if employing more than one pump discharge pressure sensor. For this input, the sensor measures pump #1 discharge pressure and outputs a 4–20 mA linear signal across its range to this input. A delta pressure sensor that measures both the vessel pressure and pump #1 discharge pressure and outputs a 4–20 mA differential pressure may also be used on this input. If using as delta input, AI 8 (vessel and pump #2 discharge pressure) must be configured to use a delta sensor also. Configure in Parameters > Vessel System Config > System Pressure Configuration > 2- DP Transmitter. If employing, configure sensor range in Parameters > Vessel/Pump 1 Prs Cfg.

Pump Motor #2 Discharge or Delta Pressure – AI 8
Use this input if employing two pump discharge pressure sensors. For this input, the sensor measures pump #2 discharge pressure and outputs a 4–20 mA linear signal across its range to this input. A delta pressure sensor that measures both the vessel pressure and pump #2 discharge pressure that outputs a 4–20 mA differential pressure may also be used on this input. If using as delta input, AI 7 (vessel and pump #1 discharge pressure) must be configured to be used as a delta sensor also. Configure in Parameters > Vessel System Config > System Pressure Configuration > 2- DP Transmitter. If employing, configure sensor range in Parameters > Vessel/Pump 2 Prs Cfg.

Pump Motor #3 Discharge or Delta Pressure – AI 9
Use this input if employing a discharge pressure sensor on each pump. For this input, the sensor measures pump #3 discharge pressure and outputs a 4–20 mA linear signal across its range to this input. A delta pressure sensor that measures both the vessel pressure and pump #3 discharge pressure and outputs a 4–20 mA differential pressure may also be used on this input. If using as delta input, AI 7 and AI 8 must also be configured to use a delta sensor. Configure in Parameters > Vessel System Config > System Pressure Configuration > 3- DP Transmitter. If employing, configure sensor range in Parameters > Vessel/Pump 3 Prs Cfg.

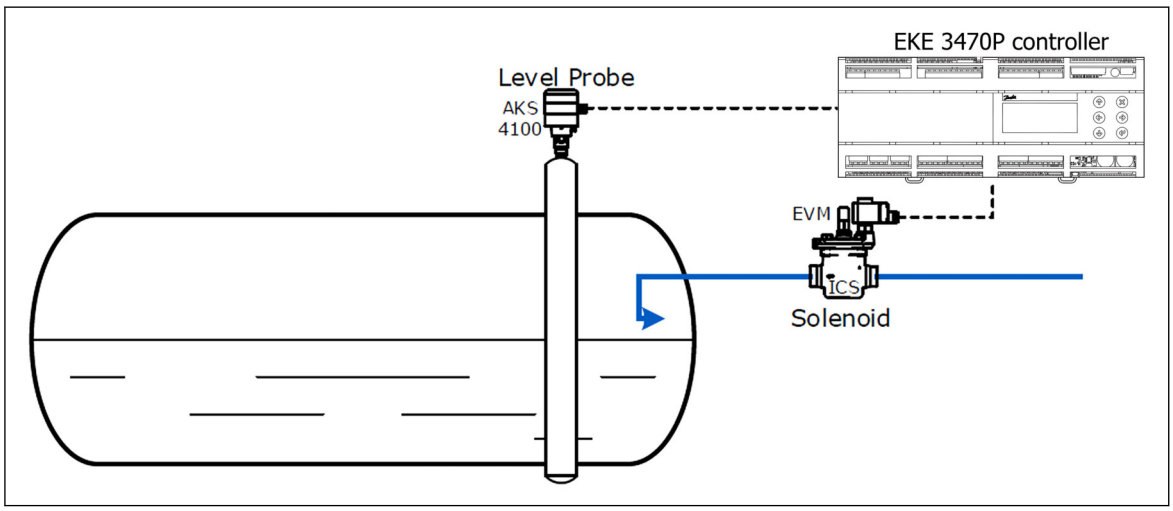
Oil Rectifier SH S2 Temp – AI 10
PT1000 RTD Input. Measures the temperature at the outlet of the heat exchanger. Used to calculate the Superheat temperature.

Operation

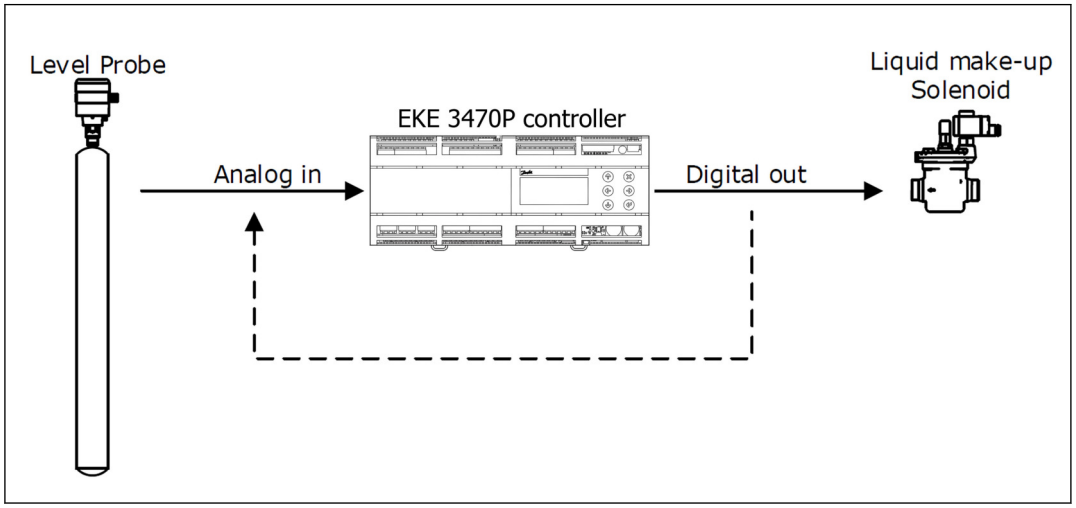
LEVEL CONTROL - Solenoid Valves

The diagram below shows a vessel with liquid in it. A level probe reads the level and transmits the signal to the controller. The controller determines the level in comparison to the desired Liquid Level setpoint, and if lower than setpoint - dead band %, output energizes the liquid fee solenoid until the liquid level reaches the setpoint + Off Diff SP at which point the liquid solenoid is turned off.

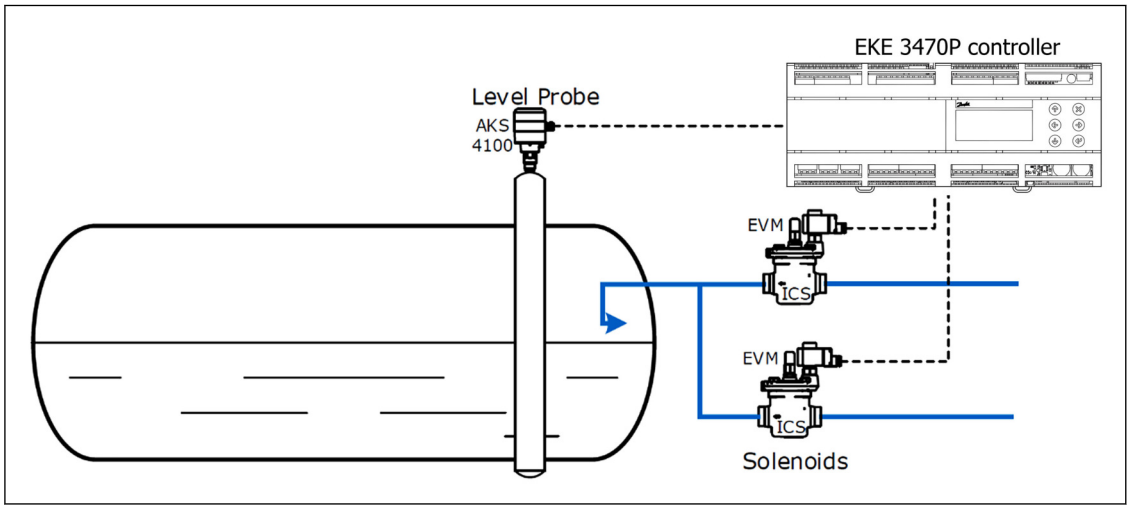
The signal from the level probe may require calibration so that the indicated level is the same as the actual liquid level. In the Main menu – Input/Output - I/O Config menu, the operator can calibrate the input with a (+/-) offset variable to correct the level input signal. The level value is then displayed on the operator interface and is also made available at AO4 (4–20mA) and additionally transmitted through the serial communication port.



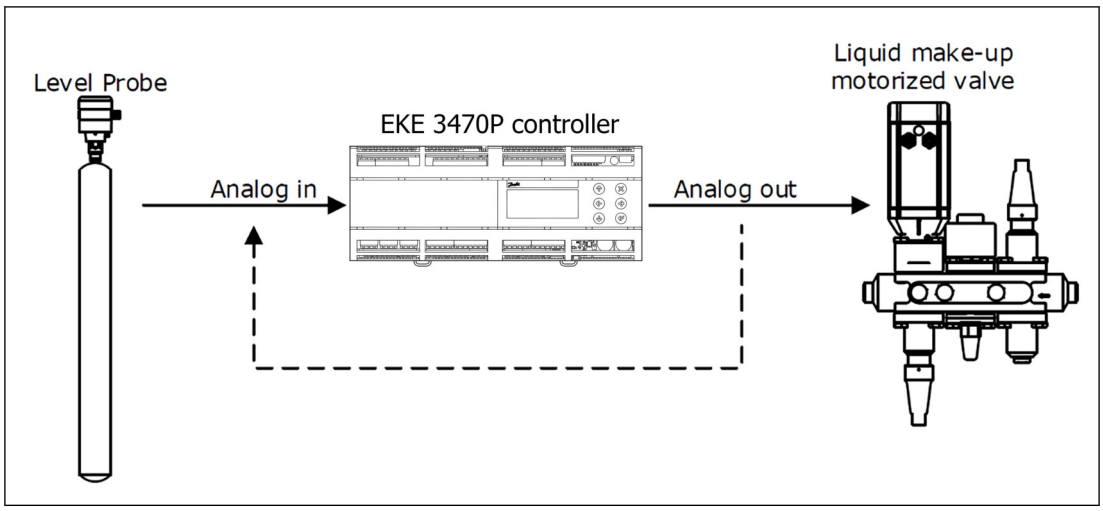
The analog value is read from the level probe and compared to the setpoint entered by the operator. If the level is at setpoint or higher, the output remains off and the solenoid is closed. If the level drops below “Level Control Setpoint 1 LP” - “Liquid Feed SV1 ON DIFF SP LP” set in parameters, the output is turned on and the solenoid is opens. The output remains open until the level reached is at “Level Control Setpoint 1 LP” + “Liquid Feed SV1 Off Diff SP LP”.



Dual liquid make-up solenoids can be employed to optimize for full load and part load conditions. The two solenoids can be the same size or one larger than the other. The software would be configured so that the solenoids would be energized in a two-stage configuration. As an example, if level setpoint 1 is at 50%, solenoid valve1 would open when the level drops to 45% with “Liquid Feed SV1 ON DIFF SP LP” set to 5%, and solenoid 2, with a setpoint at 40% and “Liquid Feed SV2 ON DIFF SP LP” setpoint at 2%, would open when the level dropped to 38%. At this point, both solenoids are open and feeding liquid to the vessel.



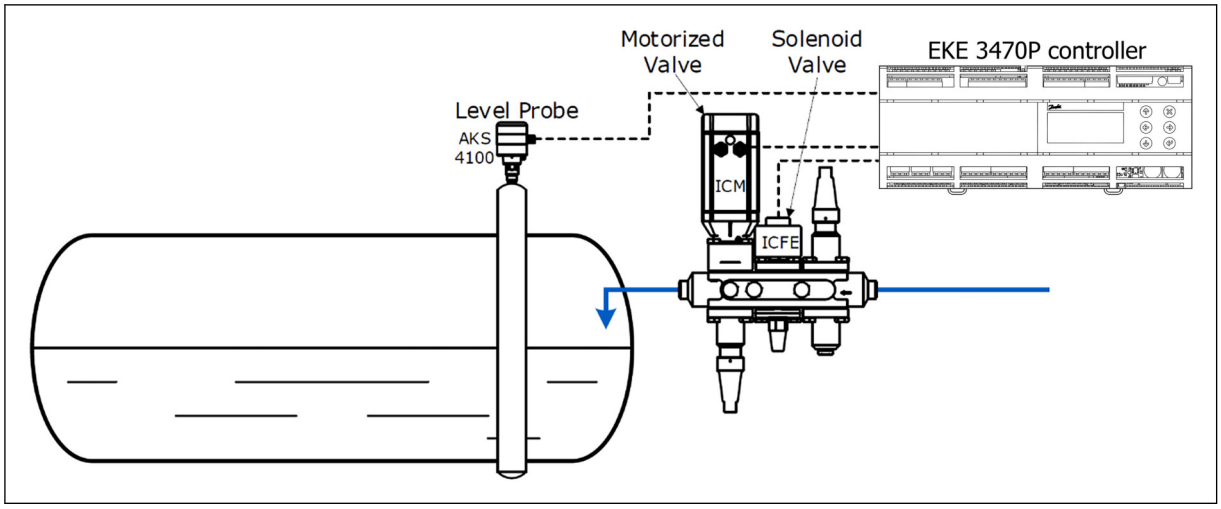
LEVEL CONTROL - Motorized Valves



Variable motorized valves can be substituted for the liquid make-up solenoid valves. The variable motor valve has the advantage of feeding liquid at full flow or part load. Motorized valves eliminate the liquid hammer effect from solenoids. True PI (Proportional; Integral) control can be used with the motorized valve. Motorized valves also make use of a dead band where no PI regulation will occur. In addition, the microprocessor controller outputs a 0–10 V signal to drive the valve.

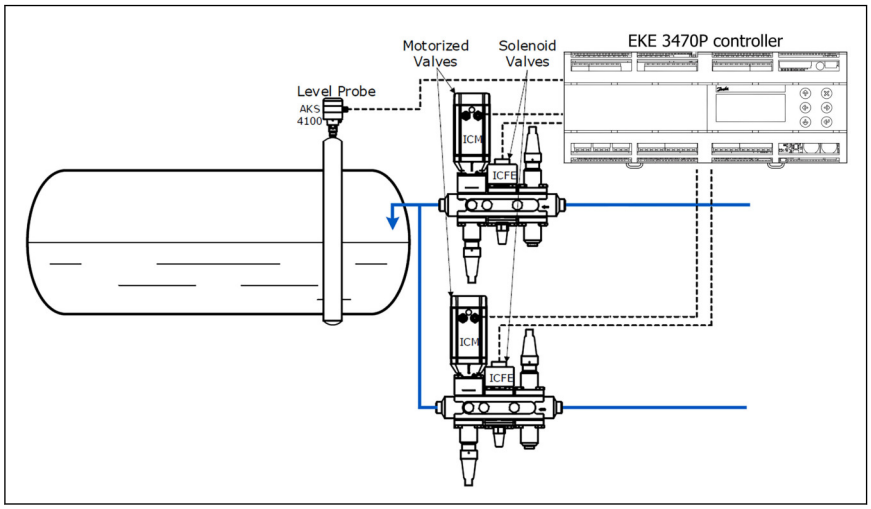
A solenoid should be included with the motorized valve. The reason for the solenoid is that it acts as a back-up safety device in case the motorized valve sticks open or fails operate.

For an example during a power failure which may allow liquid to continue to flow into the vessel and possibly over filling it. The solenoid assures liquid shut-off. The controller will close the solenoid when the liquid level reaches the values set in “Level Control Setpoint 1 LP” + “Liquid Feed SV1 Off Diff SP LP” parameters, regardless of the motorized valve position.



Two motorized valves can be employed and set up as a two-stage system.

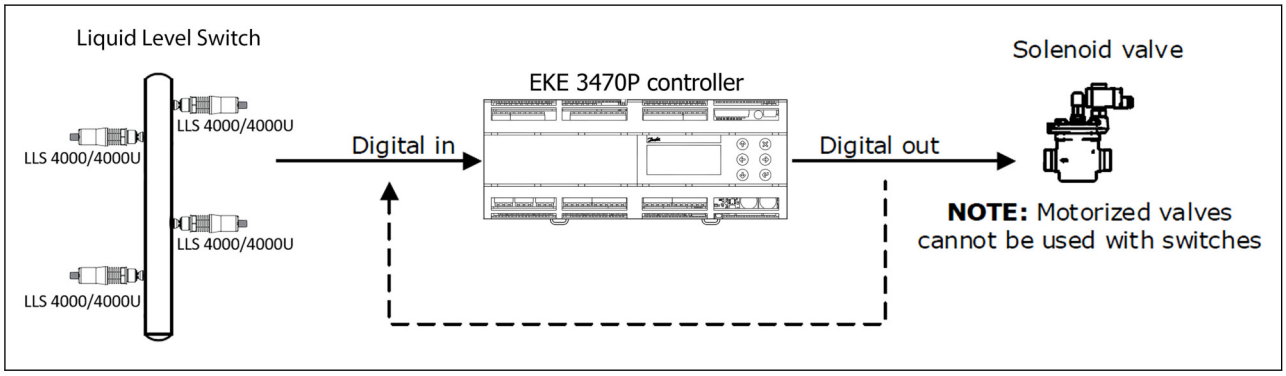
Motorized valve 1 will open proportionally according to level setpoint #1 and motorized valve number two will open proportionally to according level setpoint #2. Operation is similar to the previous example above for the solenoid valve#1, except that solenoid valve #2 will close the when the level reaches the “Level Control Setpoint 2 LP” + “Liquid Feed SV2 OFF DIFF SP LP” setpoint, regardless of the motorized valve position.



NOTE:
Except for Liquid Feed transfer float switches, any mechanical alarm floats can be configured to be used with the Level Probe and motorized valves.

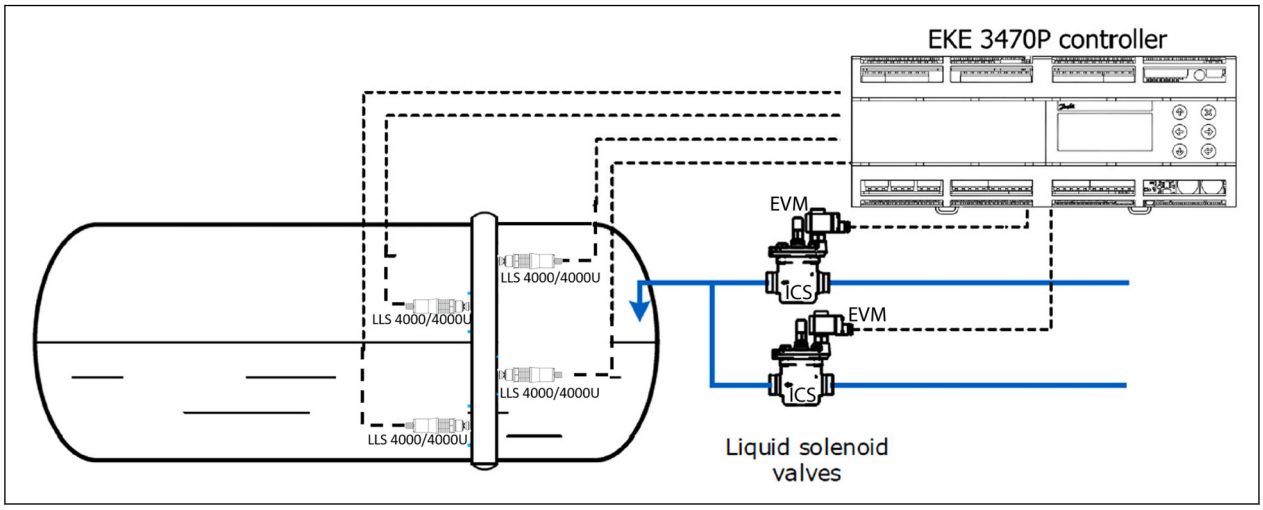
LEVEL CONTROL – Float Switches

In some situations, the controller will be fitted to older systems that may not be able to have an analog level probe sensor fitted to it. In that case, the existing float switches will need to be utilized to measure the level in the vessel. Single or dual liquid feed solenoid valves can be employed with this configuration, but variable motorized valves cannot be used.



The mechanical floats or level switches are in fixed positions and cannot be moved, therefore, the level control setpoints are fixed. The controller accepts up to seven level floats as input devices. In a normal four float configuration as shown above, the two middle floats control the two liquid feed valves. The top float is the high-level shutdown float. The bottom is the low-level pump shutdown float. If more than four floats are employed, options are configurable for a Low-Level Alarm float switch, High-Level Alarm float switch and a Transfer float switch.

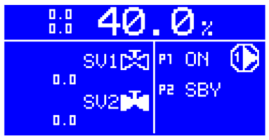
When the liquid level drops the Liquid Feed float switch closes and the input to the microprocessor is energized which in turn energizes a liquid feed solenoid after a set delay (Liquid Feed SV1 ON Delay FS; Liquid Feed SV2 ON Delay FS) to effectively prevent solenoid chatter. When the level rises and the float switch contacts open, the input to the microprocessor is de-energized and the liquid feed solenoid valve closes after a set time delay. The delay shutting off the solenoid helps prevent solenoid chatter. Delay is set in “Liquid Feed SV1 OFF Delay FS” and “Liquid Feed SV2 OFF Delay FS”.



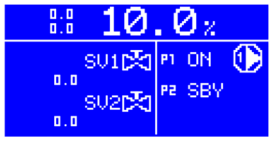
FLOAT LEVEL DISPLAY

If employing floats, the Liquid Level can be displayed on the MAIN screen by configuring each float for a particular percentage level in the Main Menu. When a particular float input becomes energized or de-energized the value will reflect the level set in parameters HSP (HLSD), HAP (HLA), S1P (SV1), S2P (SV1), LAP (LLA) and LSP (LLSD).

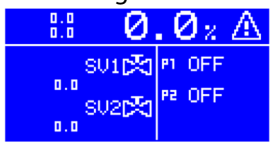
For example, if employing HLSD, SV1, SV2, and LLSD floats, ensure each float is enabled and the floats not being used are disabled in Parameters > Vessel System Config. Each float is then set a percent value in Parameters > Vessel System Config. Example: Enabled float switches, HLSD = 100, SV1 = 60, SV2 = 40, LLSD = 10. If HLSD is energized (no alarm), SV1 is energized, SV2 is de-energized and LLSD is energized then the display will look similar to this:



An energized SV2 drops the level displayed to the value set on LLSD, which in this case is 10%.



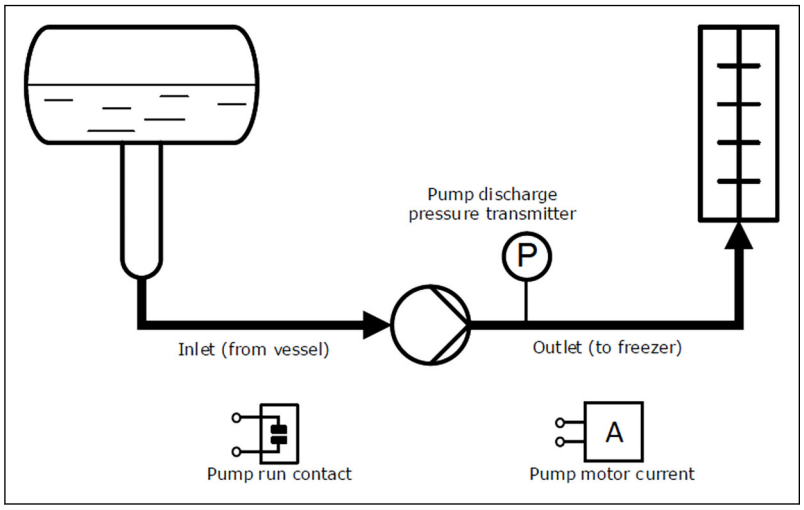
A de-energized LLSD drops the level displayed to 0%.



PUMP CONTROL

The diagram below shows a refrigerant pump with:

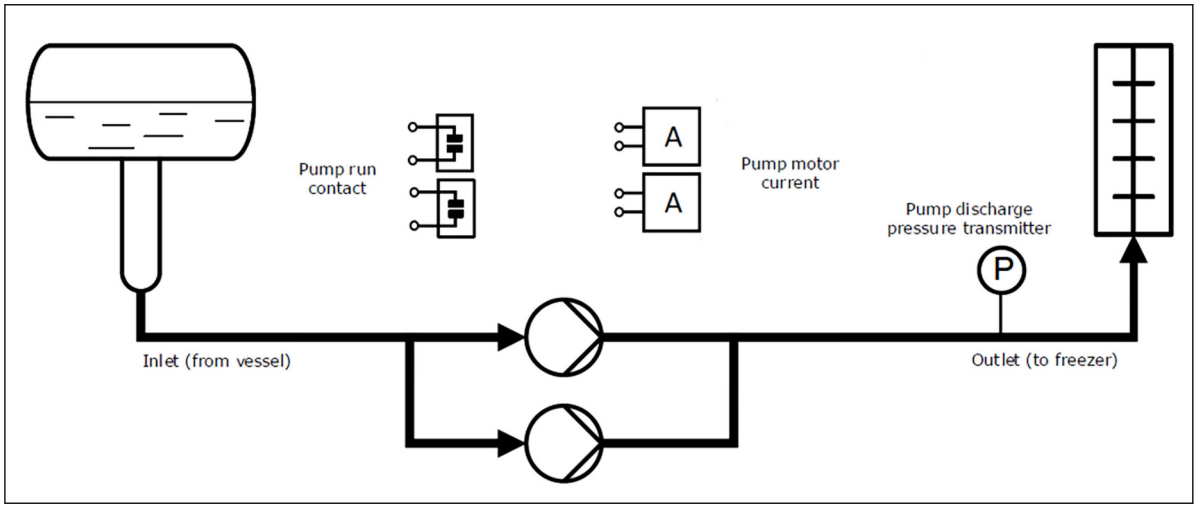
- Pump run contacts
- Pump motor current
- Pump discharge pressure sensor



The operator can manually place the pumps in the following modes if Pump Smart Mode Auto Config is set to “0” :

- Auto
- Standby
- OFF
- Manual/Hand (ON)

TWO PUMP OPERATION



In a typical two pump operation, one pump will run, and one will be in the stand-by mode. The operator can select which pump will run and which pump will be in the stand-by mode. The operator can also select that there is no standby pump by placing the second pump in “OFF” mode.

The pump(s) are energized when the PEN “Pumps Enable” input is energized. The “Pumps Enable” or PEN input must be energized for the pumps to run. If the Pumps Enable input is off or de-energized, the pumps will be “held OFF” but will stay be in AUTO mode.

Once the pump output is energized, the software will look for verification that the pump is running by confirming after a certain amount of time, that the pump auxiliary run contacts are closed. If the Aux run contacts do not close, the pump output is turned off and a “Pump Aux Alarm” is generated. If configured, the software will look at pump motor current and verifies that the motor current is above the minimum motor current set-point. If current is below after a time delay, the pump is shut down and a “Low Amps Shutdown Alarm” is generated. By default, the CT inputs for the pumps are disabled. CT’s must be individually enabled in software for use and CT ranges set appropriately.

If the pump fails due to cavitation, low or high motor amps, or aux fault, the stand-by or lag pump will be automatically started after the lead pump is shutdown. An alarm will issued due to the failure of the lead pump. If the standby pump also fails, the system is in shutdown mode and requires operator intervention.

If there is a “High Level Alarm” or “High Level Shutdown” the pumps will continue to operate.

If there is a “Low Level Shutdown Alarm (LLSD)” the pumps will stop, and the pump status will be indicated as “OFF”. Once the vessel level is above the “Low Level Alarm Shutdown” set-point in LP mode, the pumps will re-start according to level setpoint in parameter SP8 and the time delay set in parameter ALS. If the system is configured in FS (Float Switch) mode, the pumps will re-start when LLSD input is energized, after time delay set in ALS, and after the pump delay set in parameter SP7.

Other options are available for using different combinations or types of vessel and pump discharge pressure sensors.In Parameters > Vessel System Config > System Pressure Configuration, there are six different configurations to choose from.

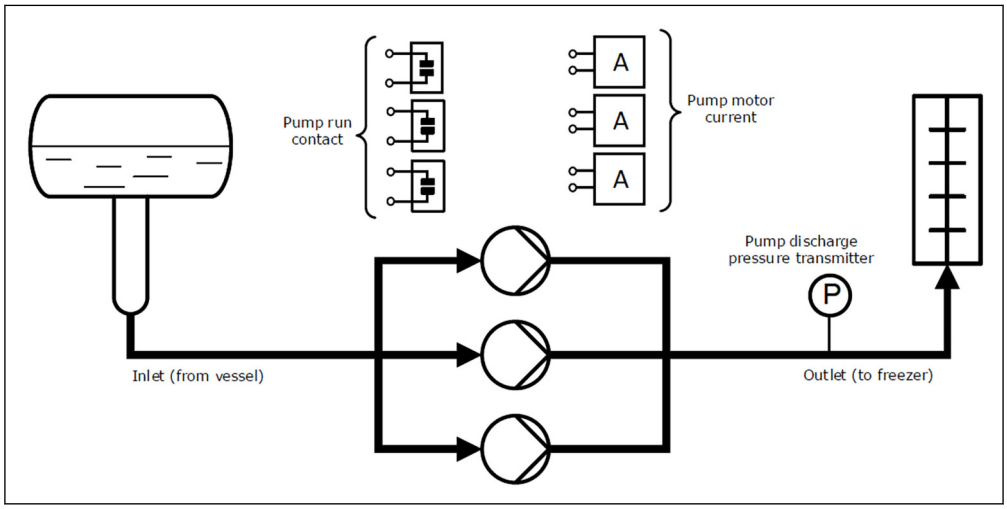
- 1 – DischargePS: This is the default configuration using one vessel pressure sensor (AI 5) and one pump discharge pressure sensor (AI 6) for a two or three pump system
- 2 – DischargePS: Two pump system. One vessel pressure sensor (AI 5) and one pump discharge pressure sensor for each pump (AI 7) and (AI 8)
- 3 – DischargePS: Three pump system. One vessel pressure sensor (AI 5) and one discharge pressure sensor for each of the three pumps on (AI 7), (AI 8) and (AI 9)
- 1 – DP Transmitter: Two pump system using a one delta/differential pressure sensor. Does not require a vessel pressure sensor. Both the vessel and pump discharge pressure lines are connected to the sensor. The sensor outputs a linear 4–20 mA differential signal to the input of (AI 6)
- 2 – DP Transmitter: Two pump system using two delta/differential pressure sensors. Does not require a vessel pressure sensor. The vessel and the pump discharge pressure lines are connected to each delta sensor. The sensor outputs a linear 4–20 mA differential signal to the inputs of (AI 7) and (AI 8)
- 3 – DP Transmitter: Three pump system using three delta/differential pressure sensors. Does not require a vessel pressure sensor. The vessel and the pump discharge pressure lines are connected to each delta sensor. The sensor outputs a linear 4–20 mA differential signal to the inputs of (AI 7), (AI 8) and (AI 9)

THREE PUMP OPERATION

The operation of a three-pump system is similar to a two-pump system. Two pumps run with the third in standby mode.

In the case of a three-pump system, one pump could fail on motor current while the other pump is OK. In this case, the offending pump will be shutdown, an alarm issued, and the standby or lag pump will be started. If both lead pumps fail due to motor current, the standby pump is started, and an alarm is issued.

If the pumps fail due to cavitation the stand-by pump will be automatically started after the two pumps are shutdown andan alarm issued due to the failure of the lead pumps. If the standby pump also fails, the system is in a shutdown mode and requires operator intervention.



PUMP CAVITATION – Two pumps (one active, one in standby)

Pump cavitation occurs when the differential pressure between the vessel and the pumps drop below the setpoint. If the pump differential pressure drops below the “Cavitation low Diff pressure SP” for a period of time set in “Cavitation -Low Diff Timer SP” (default 5s), the pump will be shut down for the time period set in parameter “Cavitation inhibit timer SP” (default 60s). If at any time during “Cavitation Event Time Period SP” (default 1hr) cavitation events reaches “Cavitation Max Events SP”, the pump will be shutdown, an alarm issued, and the standby pump will be started.

PUMP CAVITATION - Three Pumps (two active, one in standby)
The logic is the same except that both pumps will be shut down together and re-started together during cavitation period. If both pumps fail due to cavitation events reaching setpoint maximum events, the standby pump is started.

PUMP MODE - Configure
Configuring the Pump Mode parameters P1, P2, and P3 may be accessed from the Main menu in one of two ways.

By going to “Pump Modes”, and selecting the appropriate pump (see below)

or by going to “Parameters” > “Vessel System Config” , and then selecting the appropriate pump from the menu.

PUMP SPEED CONTROL

Pump speed control parameters via VFD can be accessed from the Main Menu Parameters > Pump Control Main.

The first parameter to set is the VFD Ramp time. Input the ramp up time of the VFD. This is the time for the pumps to get to the speed reference set by the analog output AO 3. Setting this ramp time tunes the and minimizes false alarms.

Analog output AO 3 value to the VFD AI input speed reference is a 0–10 V signal. The speed reference value is determined by first setting VSC parameter “VFD Speed Control – Percent or Diff.Prs.” The choice of using a constant speed value determined by a percent of the minimum and maximum speed difference of the VFD or by a using a differential pressure setpoint that varies the VFD speed based on the differential pressure between the vessel and the pump(s). The Diff.Prs method uses a PI controller with proportional and integral setpoints. For more information, reference the parameter listing “Pump Control Main”.

PUMP RUNTIME HOURS and EQUALIZATION

Pump runtime hours parameters can be accessed from the Main Menu “Service”. Login to level 3 with password (default is 300). This gives visibility to all pertinent runtime parameters.

- First ensure runtime clock is set correctly. Under the “Service” menu, select “RTC setup” and input the current date and time using the left, right, up, down and enter buttons on the keypad.
- Next, initialize the pump period runtime hours for first use by performing a reset. Under the “Service” menu, select “Reset PeriodRun Hrs”. Highlighted will be RS PeriodRunHrs Pump1. Press the ENTER or RETURN button to initialize. Repeat the same action for the remaining two pumps. Period runtime hours can be reset based on a maintenance schedule. The reset date will be captured and can be viewed in the Pump Runtime Hrs screen.
- Initialize the pump life runtime hours for first use in the same way above but go to “Reset LifeRun Hrs”. Resetting Lifetime hours after first use is only recommended when a new pump is put into service.

Pump runtime equalization parameters can be accessed from the Main Menu “Service” > “Pump RT Equalization”.

- By default, runtime equalization feature is enabled. Go to parameter PRE “Enable Pump Runtime Equalization” to disable.
- The pump runtime equalization can be based on either lifetime run hours or current period runtime hours. By default period runtime hours is used.
- Pump runtime equalization will occur once a week at a certain time. This weekly time is set in parameters WDY “Weekday”, HR “Hour”, and MIN “Minutes”. If there is one pump in “Auto” mode and at least one other in “SBY”, the pump with the most hours is put in “SBY” mode and the pump with the least amount of hours is put in “Auto” mode.

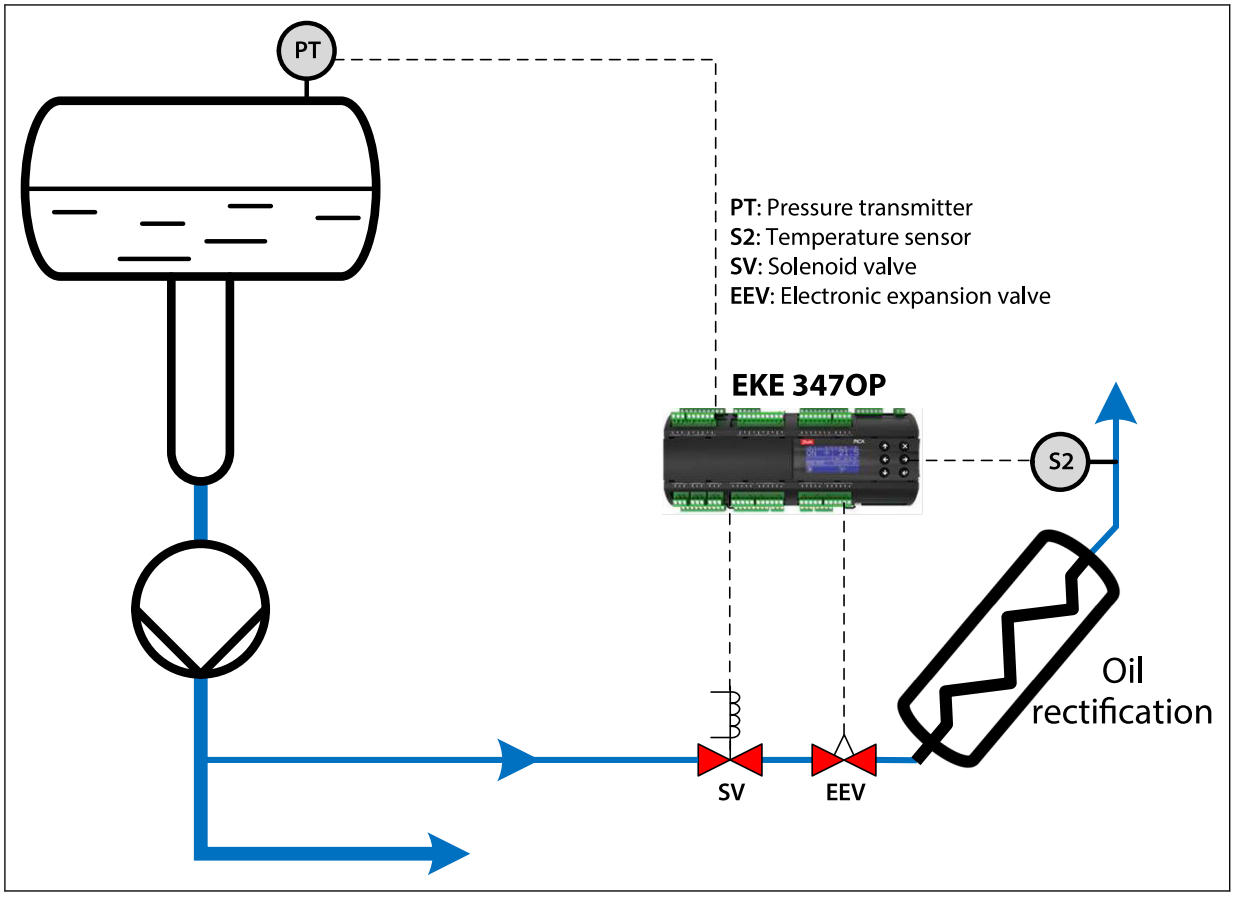
SUPERHEAT for OIL RECTIFIER

Superheat is controlled by an EEV valve on the inlet of the HEX. Regulation of the EEV valve is done through a single loop control principle using one pressure transmitter, in this case the vessel, and an RTD sensor (S2) to measure temperature of the superheated gas. The vessel pressure correlates to a saturated temperature. The difference between the vessel saturated temperature and the S2 temperature sensor at the outlet of the HEX is the Superheat value (K). The uses a similar approach to that of the Danfoss EXD316 superheat controller. Please refer to document “Data sheet Superheat controller type EXD 316; DKRCC.PDRT0.A1.02” for more detailed information. The superheat oil rectifier functionality can be employed by setting the parameter ORE “Superheat Main Switch” to “ON”.

The oil rectifier will only run when both DI16 (SH Oil Rectifier Activation) is energized and a minimum of one pump is running. This will also energize output DO9, the oil rectifier safety solenoid or ball valve. If not employing a safety valve a UPS backup to the EEV is recommended for full closure. A Danfoss EKF 1A/2A stepper valve driver module (080G5030/080G5035S) for the EEV is easily setup for use with the Analog output value at AO5. AO5 is a 0–10 V output signal to the stepper valve driver input.

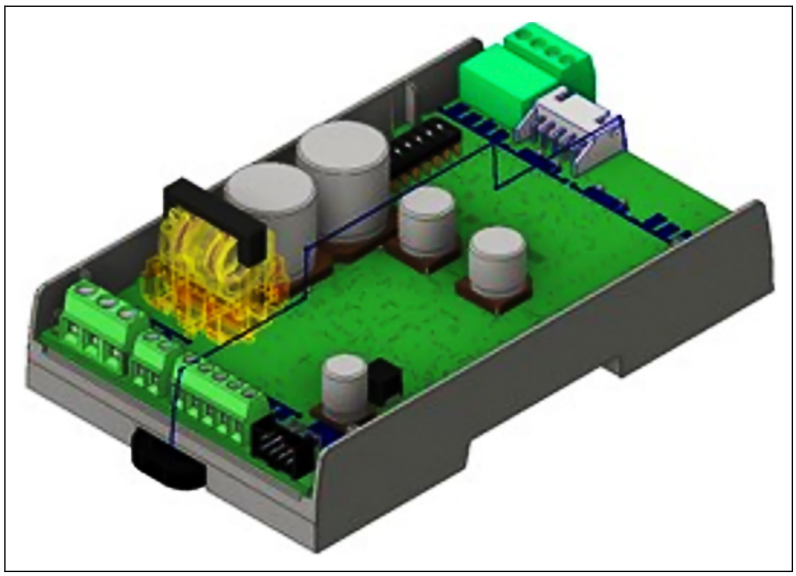
NOTE:
For CO_2 systems with more than one compressor rack, returning oil in the suction line might lead to unequal oil distribution between the racks. In this case, it is recommended to return the oil to a common oil collection point (Oil Accumulation Vessel) that can be used to equally distribute to racks in need of oil.

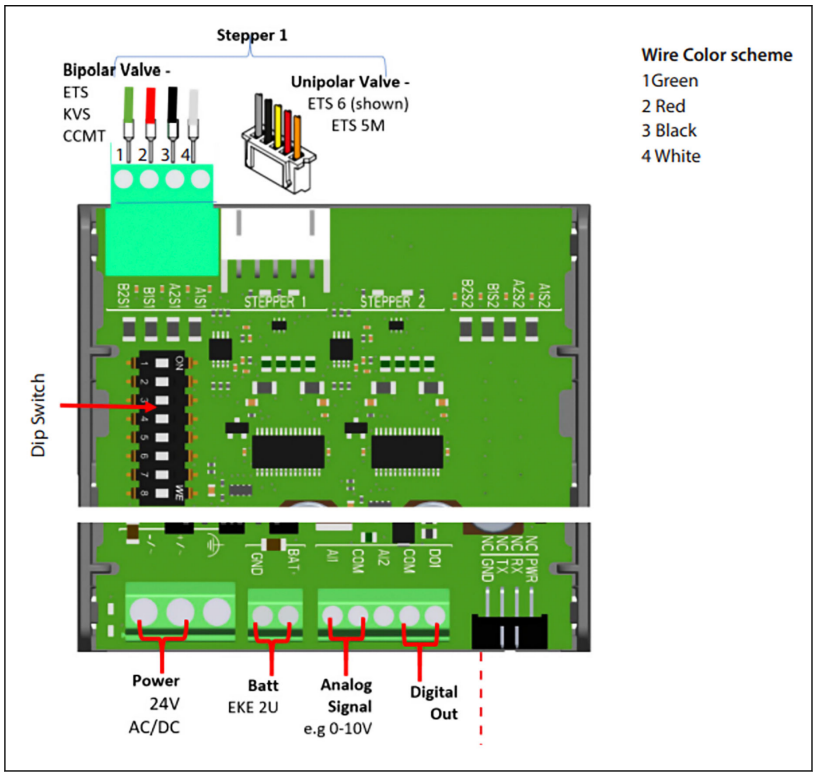
Figure 1: Oil rectification



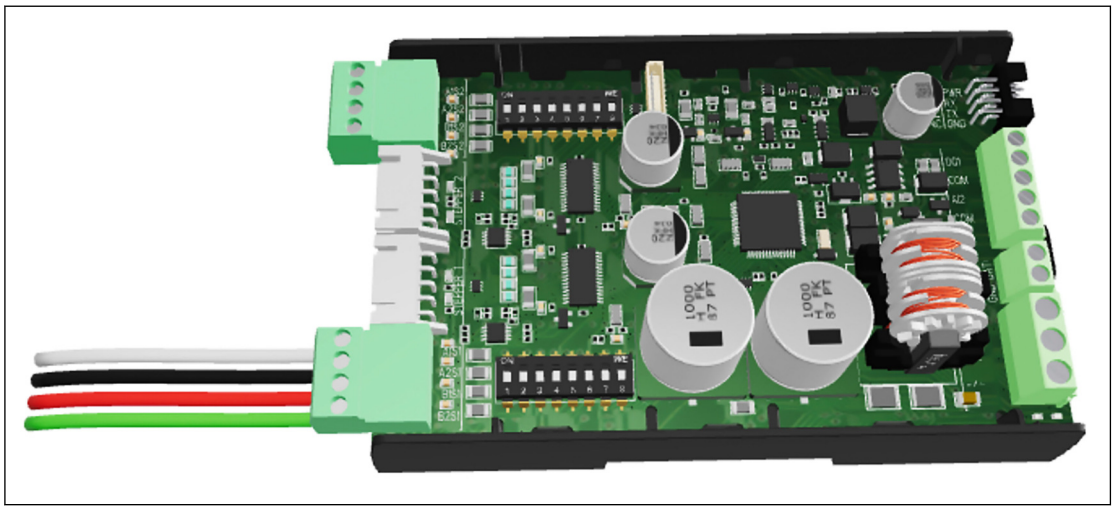
Stepper Valve Driver EKF 1A

Refer Documentation – Installation Guide: Stepper Valve Driver





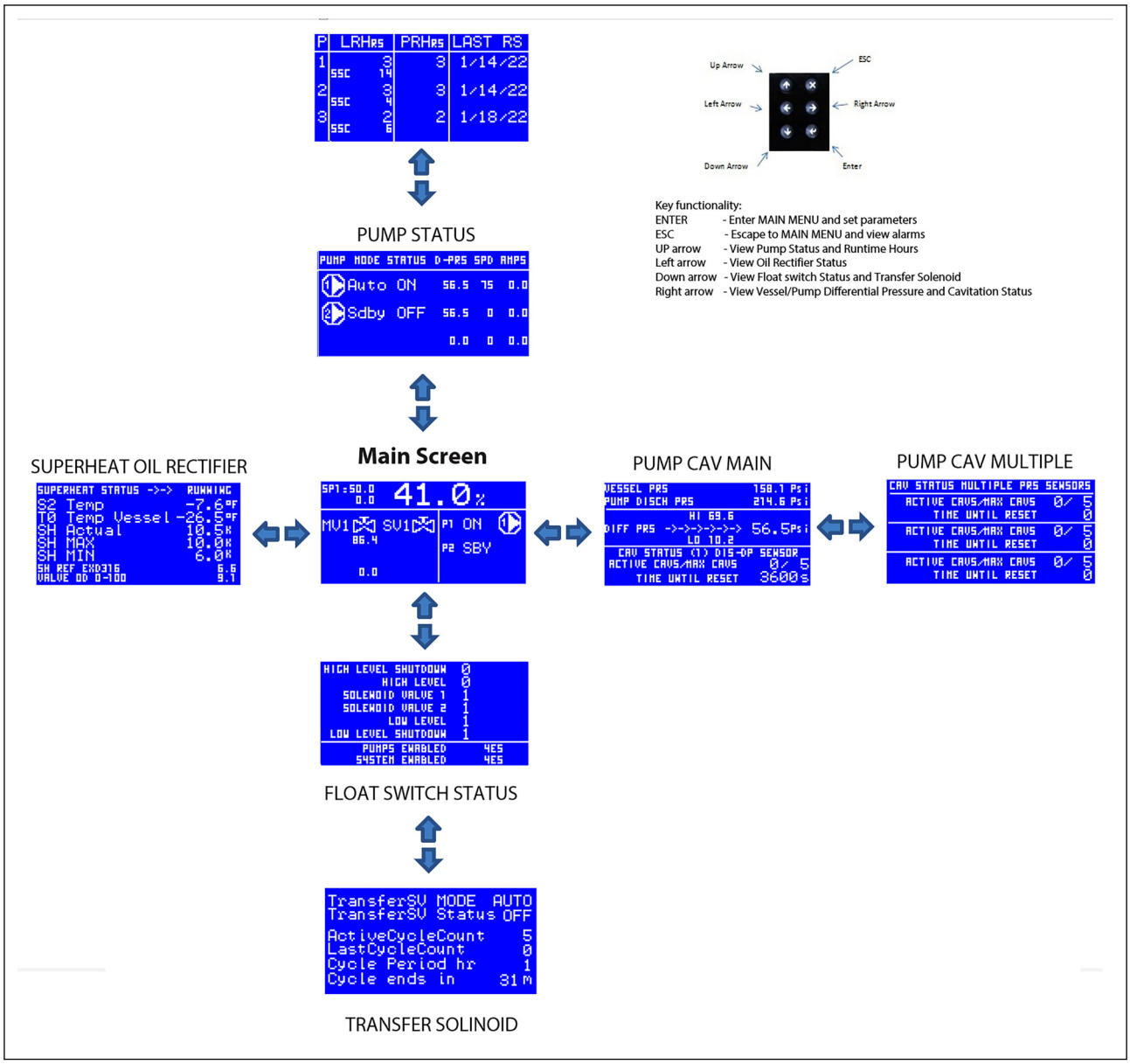
Stepper Valve Driver EKF 2A



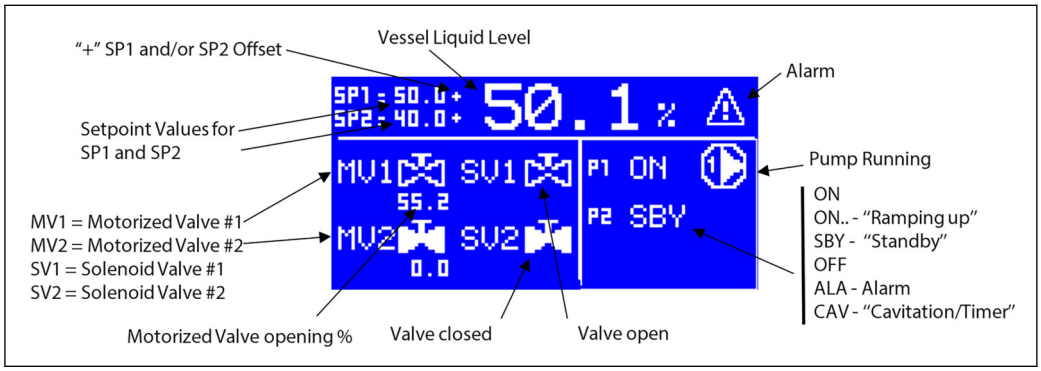
Status Screens

Screen Navigation

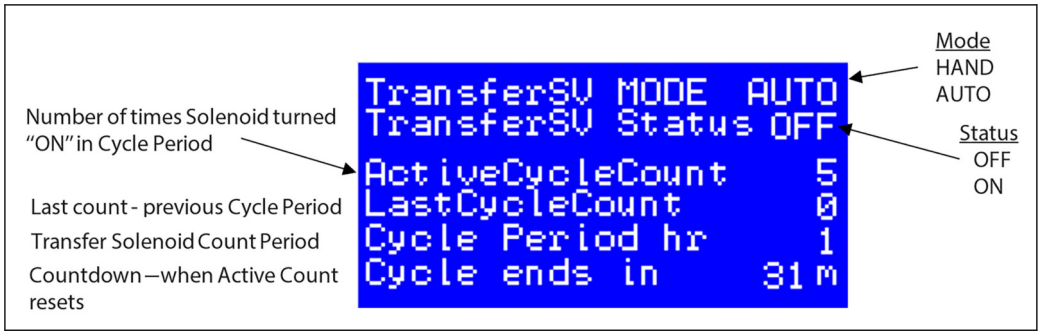
PUMP RUNTIME HOURS



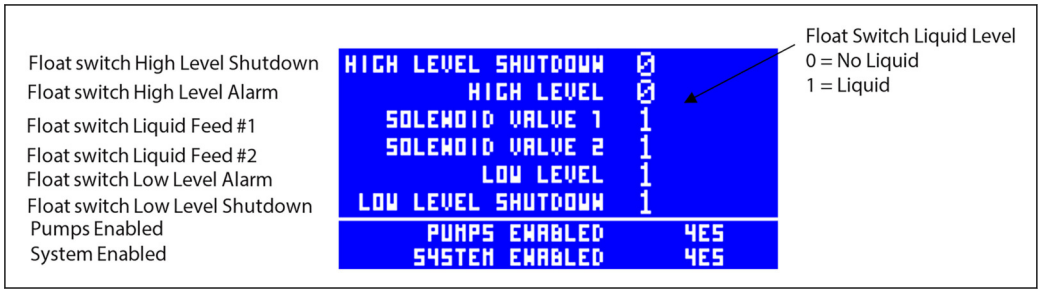
Main Status Screen



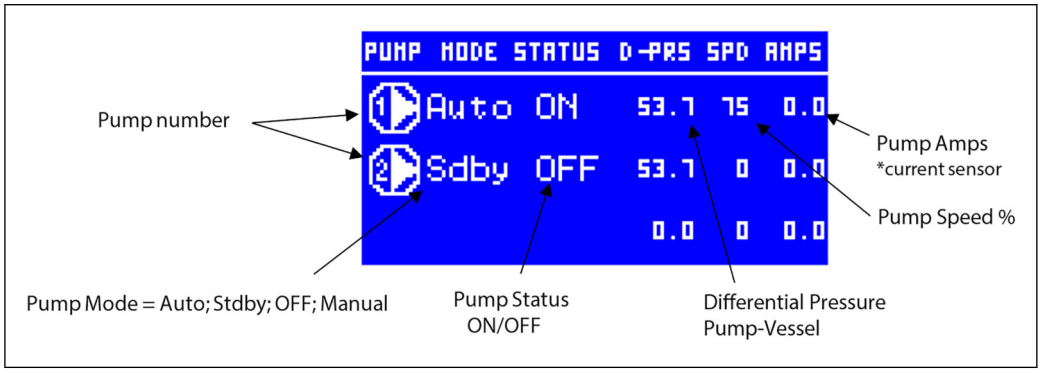
Transfer Solenoid Status Screen



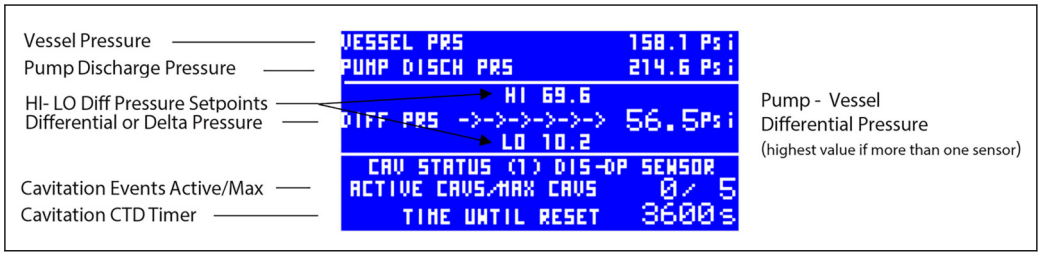
Float Switch Status Screen



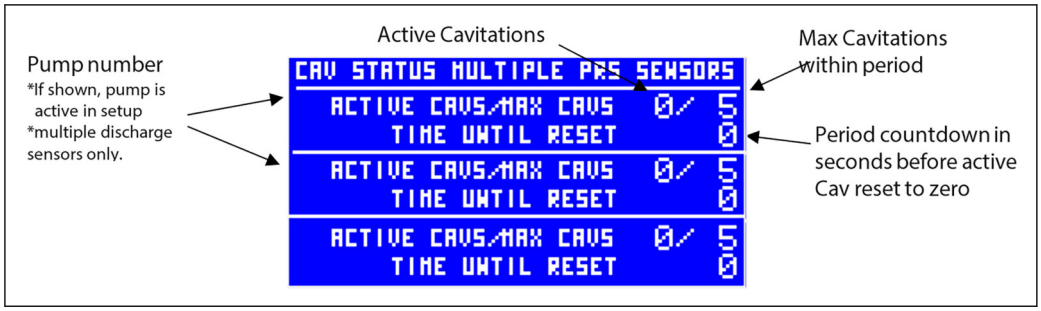
Pump Status Screen



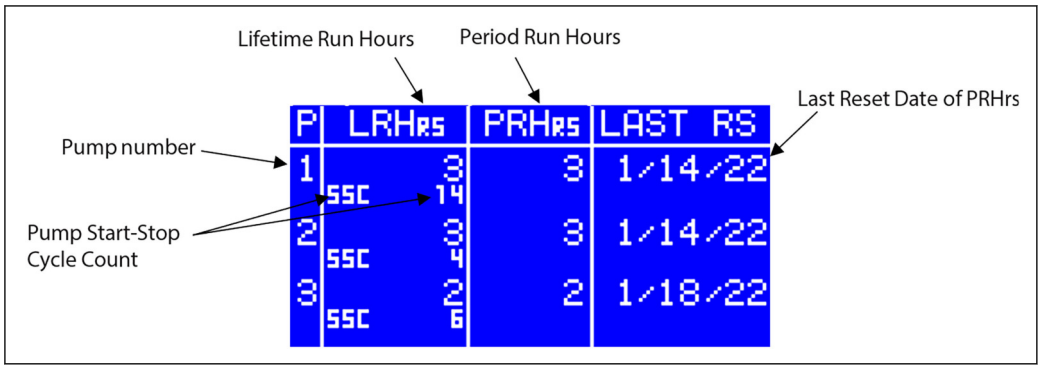
Vessel/Pump Prs. CAV Main – One Discharge Pressure Sensor



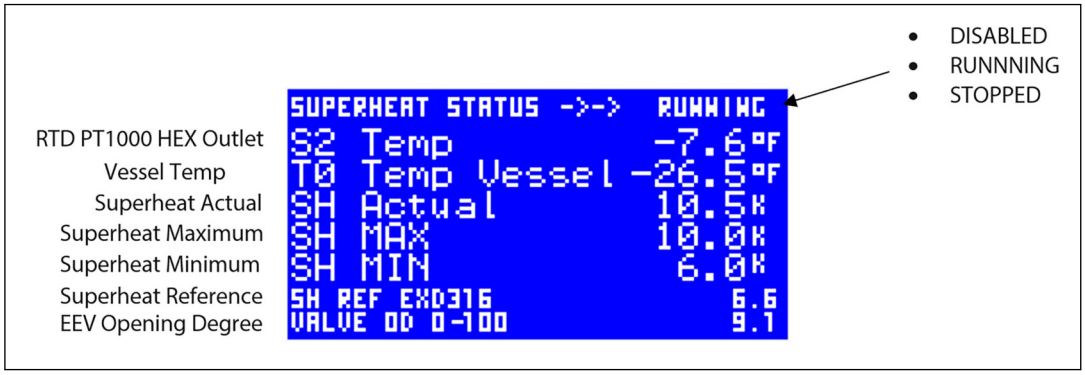
Pump CAV-Multiple Discharge Pressure Sensors Screen



Pump Runtime Hours Screen



Superheat Oil Rectifier Status Screen

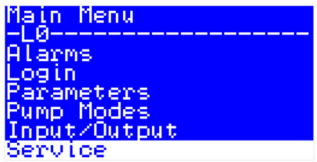


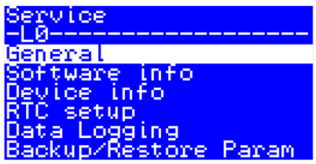
Setting or Viewing Parameters

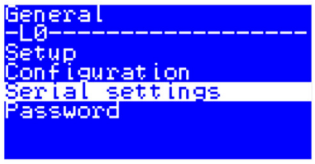
From the main screen,set or view parametersby pressing the Enter button (lower right button) on the controller keypad.

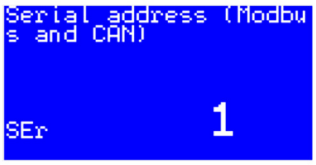
Once the Main Menu is accessed use the Up/Down arrows to scroll to the parameter you want to change or view. Press the ENTER button to edit the parameter and scroll up or down or left to right to change value. Once value is changed, press the ENTER button again to save. Press the X button on the keypad to escape out to previous menu or the main screen.

Example: Change Modbus Address
Select Service → General → Serial Settings to edit the Modbus communication Address of the control.









BIOS and Application upgrade–USB Flash Drive

A USB flash drive can be used to upgrade the BIOS and application of 15B2.

It can also be upgraded via Myk programmer or the web interface, see User Guide MCX15B2-MCX20B2, Programmable controller – User Guide to upgrade through Web Interface.

Install application upgrades from USB flash drive

To update the 15B2 application from a USB flash drive:

- Make sure the USB flash drive is formatted as FAT or FAT32
- Save the firmware in a file named app.pk in the root folder of the USB flash drive
- Insert the USB flash drive into the USB connector of the device; turn it off and on again and wait a few minutes for the update

NOTE:
Do not change the file name of the application (it must be app.pk) or it will not be accepted by the device.

Install BIOS upgrades from USB flash drive

To update the 15B2 BIOS from USB flash drive:

- Make sure the USB flash drive is formatted as FAT or FAT32
- Save the BIOS in the root folder of the USB flash drive
- Insert the USB flash drive into the USB connector of the device; turn it off and on again and wait a few minutes for the update

NOTE:
- Do not change the file name of the BIOS (must be *20b2.bin* - compatible with 15b2) or it will not be accepted by the device
- In certain instances, some manufactures of flash drives are not compatible with. *Recommendation: SanDisk*

Web Interface

The controller has inbuilt web server capabilities. This means that by following the instructions below, the user may create their own web interface. Please note that a web interface is not already setup within the controller. Refer to Danfoss User Guide 15B2/20B2 Programmable Controller for more detailed information MCX15B2/MCX20B2, Programmable controller

Brief Overview

- Access to Web Interface can be accessed with most mainstream internet browsers. Best viewed in Chrome or Microsoft Edge
- Gateway to access controllers connected with CAN bus
- Displays History log data, real time graphs and alarms
- System Configuration – enable Modbus TCP slave, FTP, Syslog, HTTPS port etc..
- Firmware (BIOS) and application software update

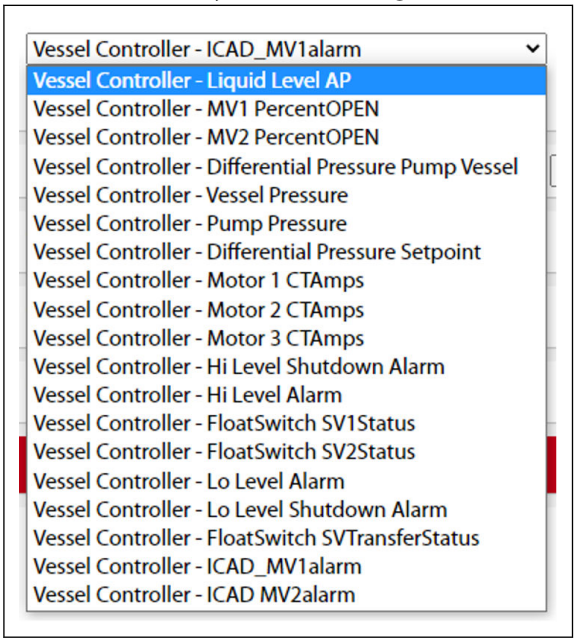
Login

- By default, controller is configured for DHCP, dynamic IP address assigned by server
- Enter IP address in web browser address bar. – see below **Modbus TCP/IP** on how to find IP addres
- Login in with default credentials: Username=admin ; Password=PASS. Password change is requested at first login
- Once connected, you can start to configure users, web interface, other networked devices connected to the main 15B controller through CAN bus

Once connected, you can start to configure users, web interface, other networked devices connected to the main 15B controller through CAN bus.

Getting Started

- For each device on the Network configuration, an application description file .CDF must be associated with it. The .CDF file must be created by Shape tool, loaded to controller through webserver > Files, and then associated to the corresponding device
- Update the Network configuration, and SAVE. SAVE “Settings”
- For viewing History, enable in main menu. The hisdata.log file is generated by the controller and saved on a USB thumb drive (1:/hisdata.log) the following variables/tags are available for data access through the “History” Main menu item. Add any of the following to view with “DRAW”



- History records can be reset or sampling frequency modified on the Controller in parameters

Modbus TCP/IP Communications

Read current network configuration without web interface

If you can't access the web interface, you can still read the network configuration using a USB flash drive:

- Make sure the USB flash drive is formatted as FAT or FAT32
- Within 10 minutes of 15/20B2 powering up, insert the USB flash drive into the USB connector of the device
- Wait about 5 seconds
- Remove the USB flash drive and insert into a PC. The file 20b2.cmd will contain the basic information about the product

Here is an example of the content:

- Or enter BIOS to find IP address by pressing X+ENTER on power up. GEN SETTINGS>TCP/IP
- Or through the software tool Wfinder.exe, which may be downloaded from the website

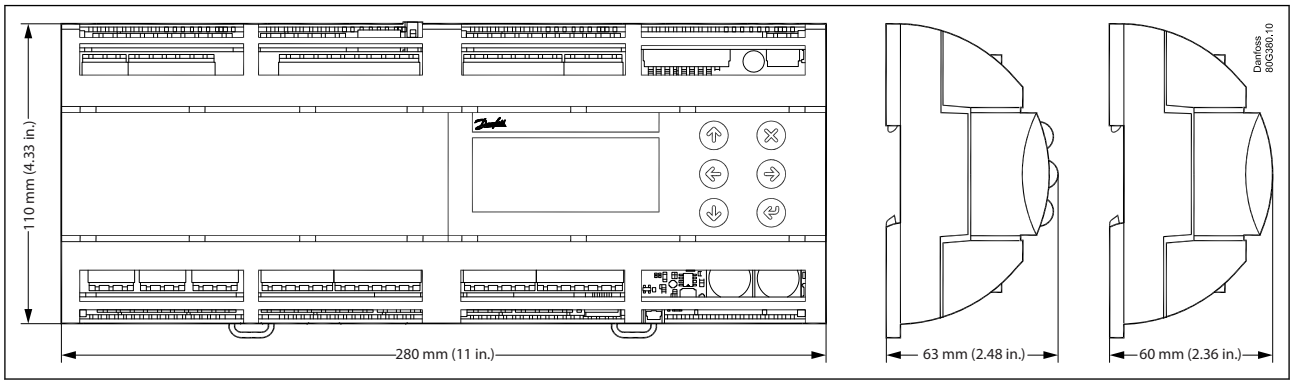
[node_info] ip=10.10.10.45/24 mac_address=00:07:68:ff:ff:f6 sw_descr=20B2 0c41 node_id=1 CANBaud=50000 Key=bsFJt3VWi9SDoMgz	< - Current ip address < - Mac address < - Bios software description < - CANbus Node ID < - CANbus baudrate < - Temporary key generated at file creation

Backup/Restore Parameters

A USB flash drive can be used backup and restore parameters.

- Insert a USB flash drive to the controller and go to Main menu item Service > Backup/Restore Parameters
- Highlight and select Backup Parameters to write a backup file "dev001.dat" to drive
- Highlight and select Restore Parameters to load backup file "dev001.dat" to the controller

Dimensions



Parameter table

For system configuration, It is recommended to set parameters in the “Vessel System Config” menu first. Observe that many of the individual parameters listed below will only be visible when particular parameters have been set in “Vessel System Config” menu, thereby, irrelevant parameters are filtered out during the setup of the Vessel Controller.

Vessel System Config

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Vessel System Config								
LLS	Liquid Level Sensor Type	**Select the type of sensor used for level control**. 0 = PROBE - Analog liquid level probe (LP) 1 = FLOAT – Float/Level switches (FS) **Note**: In FLOAT (FS) mode, both liquid feed floats (SV1-SV2), High Level Shutdown (HLSD), and Low Level Shut-down (LLSD) are enabled by default.	0	1	0 - PROBE		RW	3001
FPD	Liquid Feed Switch Control w/ Probe for level Display	**Liquid Feed Switch Control w/Probe for level Display** Enable to use an analog Probe for liquid level display when using switches for liquid feed control. 0= No 1 = Yes	0	1	0 - No		RW	3002
VCF	Liquid Feed Valve Configura-tion	**Select Liquid Feed Valve configuration of system.** 0 = 1SV – One liquid feed solenoid valve 1 = 2SV – Two liquid feed solenoid valves 2 = 1MV – One liquid feed motorized valve (LP only) 3 = 2MV – Two liquid feed motorized valves (LP only) 4 = None – No Liquid feed control. SV1 and SV2 disabled.	0	4	2 - 1MV		RW	3003
PN	Number of Pumps	**Number of pumps used in system.** 0 = No pumps 1 = One pump 2 = Two pumps (one is in standby) 3 = Three pumps (one or two are in standby)	0	3	2		RW	3004
PSC	System Pressure Sensor Config	**System Pressure Configuration** 0 = 1-DischargePS (1-Pump and 1-Vessel) 1 = 2-DischargePS (2-Pump and 1-Vessel) 2 = 3-DischargePS (3-Pump and 1-Vessel) 3 = 1-DP Transmitter (1-Delta Pump/Vessel Sensor) 4 = 2-DP Transmitter (2-Delta Pump/Vessel Sensors) 5 = 3-DP Transmitter (3-Delta Pump/Vessel Sensors)	0	5	0		RW	3005
P1	Pump 1 Mode	**Pump 1 configuration.** 0 = Auto - system controlled 1 = StdBy – standby/ready 2 = Off 3 = Manual - On	0	3	0 - Auto		RW	3006
P2	Pump 2 Mode	**Pump 2 configuration.** Same as above P1	0	3	1 - StdBy		RW	3007
P3	Pump 3 Mode	**Pump 3 configuration.** Same as above P1	0	3	2 - Off		RW	3008
HSF	High Level Shutdown Float Switch	**Decide if a High Level Shutdown Float switch will be employed.** 0 = NO 1 = YES	0	1	1 - YES		RW	3009
HSP	High Level Shutdown Float Switch % FS	**High Level Shutdown Float/Level Switch Percent** In Float mode (FS), set percent to be shown on Main Screen when HLSD Float input is de-energized.	0	100	100	%	RW	3010
HAF	High Alarm Float Switch	**Decide if a High Alarm Float switch will be employed.** 0 = NO 1 = YES	0	1	0 - NO		RW	3011
HAP	High Alarm Float Switch % FS	**High Level Float/Level Switch Percent** In Float mode (FS), set percent to be shown on Main Screen when HLA Float input is de-energized.	0	100	80	%	RW	3012
S1P	SV1 Solenoid Float Switch % FS	**SV1 Solenoid Valve Float Switch Percent** In Float mode (FS), set percent to be shown on Main Screen when SV1 Float Switch input is de-energized.	0	100	60	%	RW	3013
S2P	SV2 Solenoid Float Switch % FS	**SV2 Solenoid Valve Float Switch Percent** In Float mode (FS), set percent to be shown on Main Screen when SV2 Float Switch input is de-energized.	0	100	40	%	RW	3014

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Vessel System Config								
LAF	Low Level Alarm Float Switch	**Decide if a Low Level Alarm Float switch will be employed.** 0 = NO 1 = YES	0	1	0 - NO		RW	3015
LAP	Low Level Alarm Float Switch % FS	**Low Level Float/Level Switch Percent** In Float mode (FS), set percent to be shown on Main Screen when SV2 is energized and Low Level Float is still energized.	0	100	20	%	RW	3016
LSF	Low Level Shutdown Alarm Float Switch	**Decide if a Low Level Shutdown Float switch will be employed.** 0 = NO 1 = YES	0	1	0 - NO		RW	3017
LSP	Low Level Shutdown Alarm Float Switch % FS	**Low Level Shutdown Float/Level Switch Percent** In Float mode (FS), set percent to be shown on Main Screen when Low Level Float Alarm (LLA) is de-energized and Low Level Shutdown Float (LLSD) is energized. NOTE: When the Low Level Shutdown float is de-energized the display will show 0%.	0	100	10	%	RW	3018
TSV	Transfer Solenoid Valve	**Decide if a Transfer Solenoid Valve will be employed.** 0 = NO 1 = YES	0	1	0 -NO		RW	3019
TFS	Transfer Float Switch	**Decide if a Transfer Float switch will be employed.** 0 = NO 1 = YES	0	1	0 - NO		RW	3020
LED	Level Output	**Selection of Liquid Level Output Voltage Range (A04)** 0 = 0-10V 1 = 2-10V *LED Liquid Level Display *Note: 4-20mA (A04+) output available at terminal strip (panel)	0	1	1 – 2-10V		RW	3021
IOE	Enable Custom I/O Configuration	**Enable Custom I/O Configuration** 0 = NO 1 = YES (access to IOC parameter)	0	1	NO		RW	3022
IOC	Custom I/O Configuration	**Custom I/O Config for liquid feed switch control only FS** 0 = Default (SV1 and SV2 outputs energized when Inputs DI9 or DI10 are Closed or Energized) 1 = Configuration 1 (SV1 and SV2 outputs are energized when Inputs DI9 or DI10 are Open or De-energized)	0	1	DEF		RW	3023

Level Control

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Level Control								
SP1	Liquid Level Control Setpoint 1 LP	**Liquid Level Control Setpoint 1** Setpoint for when Liquid feed valve1 is energized. Liquid feed valve1 maybe either one solenoid valve (SV1) or one motorized valve with solenoid valve safety. (MV1 + SV1)	0	100.0	50.0	%	RW	3024
SP2	Level Control Setpoint 2 LP	**Liquid Level Control Setpoint 2** Setpoint for when Liquid feed valve2 is energized. Liquid feed valve2 maybe either one solenoid valve (SV2) or one motorized valve with solenoid valve safety. (MV2 + SV2)	0	100.0	40.0	%	RW	3025
NZ1	Dead Band Setpoint 1 LP	**Dead Band Setpoint 1 – Motorized Valve Only** When liquid Level reaches SP1, this value as a percentage of SP1, creates a band around SP1 where no regulation from the PI controller will take place or motorized valve position locked. Example: SP1 = 50% NZ1 = 2% Dead band Liquid Level = 49 – 51%	0	10.0	4.0	%	RW	3026
NZ2	Dead Band Setpoint 2 LP	**Dead Band Setpoint 2 – Motorized Valve Only** When liquid Level reaches SP2, this value as a percentage of SP2, creates a dead band around SP2 where no regulation from the PI controller will take place. Example: SP2 = 25% NZ2 = 2% Dead band Liquid Level = 24.5 – 25.5%	0	10.0	2.0	%	RW	3027

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Level Control								
SP3	High Level Shutdown Setpoint LP	**Liquid level setpoint for activating a High Level Shutdown Alarm (HLSD)** Dedicated HLSD DO1 output Alarm type is selectable in parameter AHR and resets after delay. (set delay time OFF in alarms menu)	50	100.0	90.0	%	RW	3028
SP4	High Level Alarm Setpoint LP	**Liquid level setpoint for activating a High Level (HLA) Alarm.** Dedicated HLA DO12 output Alarm is auto reset (set On/Off delay time in alarms menu)	50	100.0	80.0	%	RW	3029
SP6	Low Level Alarm Setpoint LP	**Liquid level setpoint for activating a Low Level Alarm** DO15 output active when parameter SCA is set to (3) Alarm is auto reset (set On/Off delay time in alarms menu)	0	50.0	25.0	%	RW	3030
SP5	Low Level Shutdown Setpoint LP	**Liquid level setpoint for activating a Low Level Shutdown (LLSD) Alarm** Shuts down pumps after delay due to low liquid level Dedicated LLSD DO13 output (set On/Off delay time in alarms menu)	0	50.0	10.0	%	RW	3031
SP8	Low Level Shutdown Reset Pumps ON LP	**Low Level Shutdown Reset Pumps ON SP LP** When using a level probe, sets the liquid level that clears LLSD alarm and turns pumps back "ON".	0	100.0	35.0	%	RW	3032
SP9	Low Level Shutdown Reset Limit Switch Select	**Low Level Shutdown Reset Alarm with Limit Switch** When employing a low level shutdown float switch, select the desired switch that resets the alarm and restarts the pumps when the liquid level rises. 0 = HLSD 1 = HLA 2 = SV1 3 = SV2 4 = LLA 5 = Delay only	0	5	Delay only		RW	3034
SP7	Low Level Shutdown Pumps Delay ON	**Low Level Shutdown Float Switch – Pumps Delay ON** When using a low level shutdown float switch, sets the delay time when the pumps restartafter liquid level rises above the low level shutdown switch.	0	3600	20	s	RW	3033
DB1	Liquid Feed SV1 ON DIFF LP	**Liquid feed solenoid valve #1 ON differential setpoint**. SP1 – DB1 = Level control setpoint that opens Solenoid Valve1. Example: SP1 = 50% DB1 = 5% Liquid level that turns on Solenoid Valve1 = 50 – 5 = 45% *Not configured if Motorized Valve1 is employed for liquid feed. SV1 will open at when liquid level is at SP1 setpoint.	0	100.0	5.0	%	RW	3035
DB2	Liquid Feed SV2 ON DIFF SP LP	**Liquid feed solenoid valve #2 ON differential setpoint**. SP2 – DB2 = Level control setpoint that opens Solenoid Valve2 Example: SP2 = 35% DB2 = 5% Liquid level that turns on Solenoid Valve2 = 35 – 5 = 30% *Not configured if Motorized Valve2 is employed for liquid feed. SV2 opens at SP2 value.	0	100.0	5.0	%	RW	3037
SV1	Liquid Feed SV1 OFF DIFF SP LP	**Liquid feed solenoid valve #1 OFF differential setpoint**. SP1 + SV1 = Level control setpoint that closes Solenoid Valve1. Example: SP1 = 50% SV1 = 5% Liquid level that turns off Solenoid Valve1 = 50 + 5 = 55% Must configure for motorized valves or if employing solenoid valves only. If employing a motorized valve, set value equal to or higher then NZ1 parameter.	0	100.0	5.0	%	RW	3036
SV2	Liquid Feed SV2 OFF DIFF SP LP	**Liquid feed solenoid valve #2 OFF differential setpoint**. SP2 + SV2 = Level control setpoint that closes Solenoid Valve2 Example: SP2 = 35% SV2 = 5% Liquid level that turns off Solenoid Valve2 = 35 + 5 = 45% Must configure for motorized valves or if employing solenoid valves only. If employing a motorized valve, set value equal to or higher then NZ2 parameter.	0	100.0	5.0	%	RW	3038
VD1	Liquid Feed SV1 OFF Delay FS	**Liquid feed solenoid valve #1 OFF delay time** When Float switch SV1 de-energizes, sets time delay before solenoid valve SV1 starts to close	0	120	20	s	RW	3040
VD3	Liquid Feed SV1 ON Delay FS	**Liquid feed solenoid valve #1 ON delay time** When Float switch SV1 energizes, sets time delay before solenoid valve SV1 starts to open	0	120	5	s	RW	3039

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Level Control								
VD2	Liquid Feed SV2 OFF Delay FS	**Liquid feed solenoid valve #2 OFF delay time** When Float switch SV2 de-energizes, sets time delay before solenoid valve SV2 starts to close	0	120	20	s	RW	3042
VD4	Liquid Feed SV2 ON Delay FS	**Liquid feed solenoid valve #2 ON delay time** When Float switch SV1 energizes, sets time delay before solenoid valve SV1 starts to open	0	120	5	s	RW	3041
TSD	Transfer Solenoid ON delay FS	**Transfer solenoid valve ON delay time** Sets time delay before transfer solenoid valve starts to open	0	1200	2	s	RW	3043
TSP	Transfer Solenoid SP LP	**Transfer solenoid setpoint level** Sets the level at which the transfer solenoid opens.	0	100.0	75.0	%	RW	3044
THA	Transfer Solenoid HAND/AUTO	**Transfer solenoid set to HAND or AUTO MODE** MODE: 0 = HAND (manual-ON) 1 = AUTO (System controlled)	0	1	1 - AUTO		RW	3045
THL	Transfer Solenoid HAND Level OFF SP LP	**Transfer solenoid "OFF" setpoint in HAND mode employing Level Probe control** Sets the liquid level that the Transfer Solenoid valve will close when MODE is set to HAND.	0	100.0	70.0	%	RW	3046
THT	Transfer Solenoid HAND Time ON SP FS	**Transfer solenoid "ON" time setpoint in HAND mode employing Float Switch** Sets the time the Transfer Solenoid Valve will be "ON" before it closes when in HAND mode.	0	600	30	s	RW	3047
THS	Transfer Solenoid HAND Safety Float Selection FS	**Transfer solenoid Float Safety in HAND mode** As a safety precaution, if the time is set to high in parameter THT above which causes the liquid level to decrease to the selected float below, the transfer solenoid will close. 0 = Low level Shutdown Float switch (LLSD) 1 = Low level Alarm Float switch (LLA) 2 = Liquid Feed Float switch SV2 (LFSV2) 3 = Liquid Feed Float switch SV1 (LFSV1)	0	3	1 - LLA		RW	3048
TRC	Transfer Solenoid Counter Reset	**Transfer solenoid Counter Reset** Manual reset of Transfer solenoid counter 0 = no reset 1 = reset counter	0	1	0		RW	3049
TCT	Transfer Solenoid Count Time Period	**Transfer solenoid Count Time period** Set the time period for counting how many times the transfer solenoid has turned on and off (events).	0	9999	1	h	RW	3050
PRO	MV Proportional Differential	**Motorized Valve Proportional-Differential** Sets the differential or proportional band of PI controller (Kp) for both motorized valves MV1 and MV2.	0	50.0	5.0		RW	3051
INT	MV Integral	**Motorized Valve Integral Time** Sets the Integral Time value of PI controller in seconds for motorized valves MV1 and MV2.	0	600	30	s	RW	3052
RVP	Run Liquid Feed Valves in Parallel	**Run Liquid Feed Valves in Parallel** Sets MV2 to run in parallel with MV1 and parameter setpoints. 0 = NO 1 = YES Provides a faster response to liquid demand. **Note:** *All MV2 settings for sequential operation are not changed, but are ignored.*	0	1	0 - NO		RW	3053

Pump control main

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Pump Control Main								
PSM	Pump Smart Mode	**Pump Smart Mode Auto Configuration** 0 = No – Operator required to set pump mode when an alarm is cleared.. 1 = Yes - Pump modes are set automatically when an alarm is cleared. Furthermore, when all pumps are in alarm state and cleared, the pumps will be automatically configured (standby/auto) according to period runtime hours.	0	1	YES		RW	3054
CDS	Cavitation - Low Diff Prs SP	**Cavitation – Low Differential Pressure Setpoint** Low differential pressure setpoint between vessel pressure and pump discharge pressure. If the differential pressure falls below this point for longer than the value set in "POD" parameter "Cavitation – Low Diff Timer SP", a cavitation event will occur in which the pumps will be held "OFF" for a period of time set in parameter CIT "Cavitation Inhibit Timer SP".	0	725.0 / 50.0	10.2 / 0.7	Psi / Bar	RW	3055
POD	Cavitation - Low Diff Timer SP	**Cavitation – Low Differential Timer Setpoint** Time delay, in a low differential pressure condition, before a Cavitation event will occur. *If differential pressure drops below CDS but then rises above CDS within set time period POD, a Cavitation event (Pumps held off) will **not** occur.	0	60	5	s	RW	3056
CIT	Cavitation Inhibit Timer SP	**Cavitation Inhibit Timer Setpoint** Time value in seconds that active pumps will be held "OFF" when a cavitation event occurs.	0	600	60	s	RW	3057
CTP	Cavitation Time Period SP	**Cavitation Time Period Setpoint** Time period in hours when Cavitation events are counted.	0.1	24	1.0	h	RW	3058
CMS	Cavitation Max Events SP	**Cavitation Maximum Events Setpoint** Count setpoint for maximum cavitation events within the "Cavitation Time period SP" before a Cavitation failure occurs. If a failure occurs, pumps will be held "OFF" indefinitely until an operator manually reconfigures pumps in parameter P1,P2,P3 and then resets the alarms.	0	99	5		RW	3059
CVR	Cavitation Reset Counter	**Cavitation Reset Counter** Manual reset of Cavitation Counter 0 = NO 1 = YES	0	1	0 = NO		RW	3060
CR1	Pump1 Cavitation Counter Reset	**Pump1 Cavitation Counter Reset** Manual reset of Cavitation Counter for Pump1 when employing more than one differential or delta pressure sensor. 0 = NO 1 = YES	0	1	0 = NO		RW	3061
CR2	Pump2 Cavitation Counter Reset	**Pump2 Cavitation Counter Reset** Manual reset of Cavitation Counter for Pump1 when employing more than one differential or delta pressure sensor. 0 = NO 1 = YES	0	1	0 = NO		RW	3062
CR3	Pump3 Cavitation Counter Reset	**Pump3 Cavitation Counter Reset** Manual reset of Cavitation Counter for Pump1 when employing more than one differential or delta pressure sensor. 0 = NO 1 = YES	0	1	0 = NO		RW	3063
DTA	Pump Aux Alarm Delay Time	**Pump Aux/Run Alarm Delay Time** Time delay before pump(s) output is de-energized and an alarm issued due to the pump(s) aux or run contacts not closing.	0	60	2	s	RW	3064
PAR	Pump Aux Alarm Reset Type	**Pump Aux Alarm Reset Type** -1 = Automatic reset of alarm 0 = Manual reset of alarm 1-100 = Semi-automatic reset of alarm	-1	100	0		RW	3065
HDP	High Differential Pressure SP	**High Differential Pressure Setpoint** High differential pressure setpoint between vessel pressure and pump discharge pressure. If the pressure exceeds this value an Alarm (High Differential Pressure) will be issued and the Pumps will be held in an "OFF" state.	0	725.0 / 50.0	69.6 / 4.8	Psi / Bar	RW	3066

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Pump Control Main								
HPA	High Differential Pressure Alarm Type	**High Differential Pressure Alarm Type** Sets the mode or functionality of the High Differential Pressure alarm. **-1 = Automatic reset of alarm** If pressure goes above HDP SP (Alarm set) and then pressure goes below HDP SP, the alarm will automatically reset. **0 = Manual reset of alarm** If pressure goes above HDP SP (Alarm set) and then pressure goes below HDP SP, the alarm will require a manual reset. **1-100 = Semi-automatic reset of alarm** If pressure goes above HDP SP (Alarm set) and then pressure goes below HDP SP, the alarm will reset automatically until it reaches the number of times (set/reset) of a value greater than 0, at which time a manual reset of the alarm will be required.	-1	100	-1		RW	3067
HPS	High Differential Pressure Alarm Pumps At-Speed Delay	**High Differential Pressure Alarm delay when Pumps are at Speed.** When the pumps are at-speed or running, and a High Differential pressure occurs (greater than HDP), this setting will Delay the time, in seconds, before a High Differential Pressure Alarm is generated.	0	120	5	s	RW	3068
HPR	High Differential Pressure Alarm Pumps Ramp-up Delay	**High Differential Pressure Alarm delay when Pumps are ramping-up or starting.** When the pump(s) start or begin ramping up, occasionally a High Differential pressure may be present above HDP. This value will set a delay time, in seconds, before a High Differential Pressure Alarm is generated. Minimizes nuisance trips	0	120	20	s	RW	3069
PMO	Pump Minimum OFF Time	**Pump Minimum OFF Time** If the pumps were commanded to stop, this time will prevent the pumps from restarting immediately if a run command was given soon after the stop command.	0	9999	5	s	RW	3070
VRT	VFD Ramp time	**Variable Frequency Drive Ramp Time** Ramp time acceleration of VFD from Min speed to reference speed (up). This setpoint will fine tune the controller, it will not adjust the actual VFD ramp time. Input the actual ramp up time of the VFD.	0	120	10	s	RW	3071
VSC	Pump Speed Control – Percent or Diff.Prs	**Pump Speed Control – Percent or Differential Pressure** Control Pump speed either by Percent of VFD Max – Min speed or by the differential pressure between the Vessel and the Pumps 0 = Percent 1 = Differential Pressure	0	1	0		RW	3072
VMS	Pump Speed - Percent	**Variable Frequency Drive Maximum-Minimum speed percent** Adds an offset to the VFD minimum speed as a percentage of the difference between min and max VFD setpoints. Example: If max speed setpoint on VFD = 60Hz, min speed = 30Hz and setpoint = 50%, Then VFD speed is ((60-30) x .5) + 30Hz | 15Hz + 30Hz = 45Hz	0	100.0	75.0	%	RW	3073
VDS	Pump Speed Differential Prs.	**Pump Speed Differential Pressure** Sets the differential pressure setpoint for pump speed control. If the differential pressure is below this setpoint - dead band, the speed will continue to increase until the differential pressure is greater than or equal to setpoint. VFD speed will then remain constant in the dead band. If differential pressure rises above setpoint + dead band, the VFD speed will continue to decrease until the differential pressure drops below this setpoint. VFD speed will then remain constant in the dead band.	0	1500.0 / 103.4	29.0 / 2.0	Psi / Bar	RW	3076
VDB	Pump Speed Differential Prs. PI Dead Band	**Pump Speed Differential Pressure PI Dead Band** Adds a plus/minus percent dead band around value set in VDS. No regulation when diff. prs. reaches VDS value and then stays within this dead band, the VFD speed will be constant. Example: If VDS = 30psi and VDB = 10%, then dead band would be 27 – 33psi.	0	50.0	15.0	%	RW	3077
VSP	Pump Speed Differential Prs. Proportional Gain	**Pump/VFD Speed Differential Pressure Proportional Gain** Sets the proportional gain of the PI controller that regulates the VFD speed using differential pressure control.	0	100.0	40.0		RW	3078

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Pump Control Main								
VSI	Pump Speed Differential Prs. Integral Time	**Pump/VFD Speed Differential Pressure Integral Time** Sets the Integral Time of the PI controller that regulates the VFD speed using differential pressure control.	0	1000	30	s	RW	3079
EVH	Enable Vessel High Prs. – Pumps OFF	**Enable Vessel High Pressure – Pumps OFF** 0 = Disable 1 = Enable	0	1	Disable		RW	3080
VHP	Vessel High Pressure – Pumps OFF SP	**Vessel High Pressure Setpoint – Pumps OFF** Pressure setpoint when the Vessel is considered to be under high pressure. Once vessel pressure reaches this point the pumps will be forced to stop.	0	1500.0 / 103.4	161.0 / 11.1	Psi / Bar	RW	3081
VHO	Vessel High Pressure – Pumps ON Options	**Vessel High Pressure – Pumps ON Options** Decide when pumps restart when vessel pressure falls below VHP parameter setpoint. 0 = Delay (seconds) 1 = SP (Vessel pressure falls below setpoint in VPO parameter) 2 = Delay or SP (whichever event occurs first will restart pumps) 3 = Delay and SP (both events must occur before pumps restart)	0	3	0 - Delay		RW	3082
VPD	Vessel High Pressure – Pumps ON Delay	**Vessel High Pressure – Pumps ON** Delay time in seconds when pumps restart once the vessel pressure drops below VHP parameter SP	0	600	20	s	RW	3083
VPO	Vessel High Pressure – Pumps ON SP	**Vessel High Pressure Setpoint – Pumps ON** Pressure setpoint in the Vessel that will restart the pumps.	0	1500.0 / 103.4	145.0 / 10.0	Psi / Bar	RW	3084
PDO	Pump Mode Select DO14	**Select the Pump Mode Status that Energizes DO14** 0 = Auto (Min. one pump in Auto mode) 1 = Standby (Min. one pump in Standby mode) 2 = Auto and Standby (Min. one pump in Auto mode, and min. one pump in Standby mode) Note: Recommended use: Evaporator Release signal	0	2	Auto		RW	3085

Motor 1 Config

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Motor 1 Config								
CT1	Pump Motor 1 CT	**Pump Motor 1 CT** 0 = Disable 1 = Enable	0	1	Disable		RW	3086
CL1	CT Low Amps Motor 1	**Low range amp value of current transducer (CT) for motor/pump #1**	0	50.0	0.0	A	RW	3087
CH1	CT High Amps Motor 1	**High range amp value of current transducer (CT) for motor/pump #1**	0	250.0	10.0	A	RW	3088
HT1	High Amp Trip Motor 1	**High Amp Trip Motor/Pump #1** Setpoint when a High Amp motor condition occurs. When motor current rises to or above High Amp Trip SP, an alarm will occur which must be reset manually.	0	300.0	10.0	A	RW	3089
HA1	High Amp Alarm Motor 1	**High Amp Alarm Motor/Pump #1** Setpoint when a High Amp motor condition occurs. If motor current rises to High Amp Alarm SP, an alarm will occur which is auto-reset when condition is cleared.	0	250.0	10.0	A	RW	3090
LA1	Low Amp Alarm Motor 1	**Low Amp Alarm Motor/Pump #1** Setpoint when a Low Amp motor condition occurs. When motor current decreases to Low Amp Alarm SP, an alarm will occur which is auto-reset when condition is cleared.	0	100.0	0.0	A	RW	3091

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Motor 1 Config								
LT1	Low Amp Trip Motor 1	**Low Amp Trip Motor/Pump #1** Setpoint when a Low Amp motor condition occurs. If motor current decreases below Low Amp Trip SP an alarm will occur which must be reset manually.	0	100.0	0.0	A	RW	3092
M1S	Motor 1 Alarm-Fault Delay Running-at SPD	**Motor 1 Alarm-Fault Delay - Motor running at Speed Ref.** Sets the delay time in seconds before a High Amp Alarm or Fault occurs when the motor is running at speed reference.	0	120	5	s	RW	3093
M1R	Motor 1 Alarm-Fault Delay Ramping	**Motor 1 Alarm-Fault Delay - Motor Ramping to Speed Reference.** When the pump motor is starting or ramping to speed reference, this sets the delay time in seconds before a High Amp Alarm or Fault is generated.	0	120	10	s	RW	3094

Motor 2 Config

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Motor 2 Config								
CT2	Pump Motor 2 CT	**Pump Motor 2 CT** 0 = Disable 1 = Enable	0	1	Disable		RW	3095
CL2	CT Low Amps Motor 2	**Low range amp value of current transducer (CT) for motor/pump #2**	0	50.0	0.0	A	RW	3096
CH2	CT high Amps Motor 2	**High range amp value of current transducer (CT) for motor/pump #2**	0	250.0	10.0	A	RW	3097
HT2	High Amp Trip Motor 2	**High Amp Trip Motor/Pump #2** Setpoint when a High Amp motor condition occurs. When motor current rises to High Amp Trip SP, an alarm will activate which must be reset manually, either remotely or locally on .	0	300.0	10.0	A	RW	3098
HA2	High Amp Alarm Motor 2	**High Amp Alarm Motor/Pump #2** Setpoint when a High Amp motor condition occurs. When motor current rises to High Amp Alarm SP, an alarm will activate that is auto-resettable when condition is alleviated.	0	250.0	10.0	A	RW	3099
LA2	Low Amp Alarm Motor 2	**Low Amp Alarm Motor/Pump #2** Setpoint when a Low Amp motor condition occurs. When motor current decreases to Low Amp Alarm SP, an alarm will activate that is auto-resettable when condition is alleviated.	0	100.0	0.0	A	RW	3100
LT2	Low Amp Trip Motor 2	**Low Amp Trip Motor/Pump #2** Low motor Amps setpoint. When motor current decreases to Low Amp Trip Motor 2 SP an alarm will occur which must be reset manually, either remotely or locally on .	0	100.0	0.0	A	RW	3101
M2S	Motor 2 Alarm-Fault Delay Running-at SPD	**Motor 2 Alarm-Fault Delay -Motor running at Speed Ref.** Sets the delay time in seconds before a High Amp Alarm or Fault/Trip occurs when the motor is running at speed reference.	0	120	5	s	RW	3102
M2R	Motor 2 Alarm-Fault Delay Ramping	**Motor 2 Alarm-Fault Delay -Motor ramping to Speed Ref** When the pump motor is starting or ramping to speed reference, this sets the delay time in seconds before a High Amp Alarm or Fault is generated.	0	120	10	s	RW	3103

Motor 3 Config

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Motor 3 Config								
CT3	Pump Motor 3 CT	**Pump Motor 3 CT** 0 = Disable 1 = Enable	0	1	Disable		RW	3104
CL3	CT Low Amps Motor 3	**Low range amp value of current transducer (CT) for motor/pump #3**	0	50.0	0.0	A	RW	3105
CH3	CT High Amps Motor 3	**High range amp value of current transducer (CT) for motor/pump #3**	0	250.0	10.0	A	RW	3106

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Motor 3 Config								
HT3	High Amp Trip Motor 3	**High Amp Trip Motor/Pump #3** Setpoint when a High Amp motor condition occurs. When motor current is equal or above High Amp Trip SP, an alarm will activate which must be reset manually, either remotely or locally on .	0	300.0	10.0	A	RW	3107
HA3	High Amp Alarm Motor 3	**High Amp Alarm Motor/Pump #3** Setpoint when a High Amp motor condition occurs. When motor current is equal or above High Amp Alarm SP, an alarm will activate that is auto-resettable.	0	250.0	10.0	A	RW	3108
LA3	Low Amp Alarm Motor 3	**Low Amp Alarm Motor/Pump #3** Setpoint when a Low Amp motor condition occurs. When motor current equal or below Low Amp Alarm SP, an alarm will activate that is auto-resettable.	0	100.0	0.0	A	RW	3109
LT3	Low Amp Trip Motor 3	**Low Amp Trip Motor/Pump #3** Setpoint when a Low Amp motor condition occurs. When motor current decreases to or below Low Amp Trip SP an alarm will activate which must be reset manually, either remotely or locally on .	0	100.0	0.0	A	RW	3110
M3S	Motor 3 Alarm-Fault Delay Running-at SPD	**Motor 3 Alarm-Fault Delay - Motor running at Speed Ref.** Sets the delay time in seconds before a High Amp Alarm or Fault/Trip occurs when the motor is running at speed reference.	0	120	5	s	RW	3111
M3R	Motor 3 Alarm-Fault Delay Ramping	**Motor 3 Alarm-Fault Delay - Motor Ramping to Speed Reference.** When the pump motor is starting or ramping to speed reference, this sets the delay time in seconds before a High Amp Alarm or Fault is generated.	0	120	10	s	RW	3112

Vessel/Pump Prs Main

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Vessel/Pump Prs Main								
VPS	Vessel Pressure Sensor Enable - Disable	**Vessel Pressure Sensor Enable – Disable** Enable or Disable Vessel pressure sensor			Enable			3113
VLP	Vessel MIN Pressure Sensor Value	**MIN range value of Vessel pressure sensor**	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3114
VHV	Vessel MAX Pressure Sensor Value	**MAX range value of Vessel pressure sensor**	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3115
PPS	Pump Pressure Sensor Enable - Disable	**Pump Discharge Pressure Sensor Enable – Disable** Enable or Disable pump discharge pressure sensor			Enable			3117
DLP	Discharge MIN Pressure Sensor Value	**MIN range value of Pump discharge pressure sensor**	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3118
DHP	Discharge MAX Pressure Sensor Value	**MAX range value of Pump discharge pressure sensor**	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3119
DML	Vessel/Pump DP Transmitter MIN Value	**Vessel/Pump Delta Transmitter Minimum Value** Minimum or low range value of DP transmitter	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3120
DMH	Vessel/Pump DP Transmitter MAX Value	**Vessel/Pump Delta Transmitter Maximum Value** Maximum or high range value of DP transmitter	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3121

Vessel/Pump 1 Prs Cfg

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Vessel/Pump 1 Prs Cfg								
D1L	Vessel/Pump1 DP Transmitter MIN Value	**Vessel/Pump1 Delta Pressure Transmitter MIN Value** Minimum or low range value of DP transmitter	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3122
D1H	Vessel/Pump1 DP Transmitter MAX Value	**Vessel/Pump1 Delta Pressure Transmitter MAX Value** Maximum or high range value of DP transmitter	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3123
P1L	Pump1 Dis.Prs Sensor MIN Value	**Pump1 Discharge Pressure Sensor MIN Value** Minimum or low range value of discharge pressure sensor	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3124
P1H	Pump1 Dis.Prs Sensor MAX Value	**Pump1 Discharge Pressure Sensor MAX Value** Maximum or high range value of discharge pressure sensor	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3125
P1A	Vessel-Pump1 Pressure Sensor Fault Mode	**Vessel (DP) – Pump1 Pressure Sensor Fault Mode** When using multiple pressure sensors choose the mode or action occurs when a pressure sensor error/alarm is active. 0 = Auto OFF (Pump will stay in "AUTO" mode and will be held "OFF" until the sensor is back online and functioning) 1 = Lag Pump (Pump will go to "OFF" mode, de-energize, and Standby/Lag pump will energize "AUTO" "ON")	0	1	Lag Pump		RW	3126

Vessel/Pump 2 Prs Cfg

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Vessel/Pump 2 Prs Cfg								
D12L	Vessel/Pump2 DP Transmitter MIN Value	**Vessel/Pump2 Delta Pressure Transmitter MIN Value** Minimum or low range value of DP transmitter	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3127
D2H	Vessel/Pump2 DP Transmitter MAX Value	**Vessel/Pump2 Delta Pressure Transmitter MAX Value** Maximum or high range value of DP transmitter	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3128
P2L	Pump2 Dis.Prs Sensor MIN Value	**Pump2 Discharge Pressure Sensor MIN Value** Minimum or low range value of discharge pressure sensor	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3129
P2H	Pump2 Dis.Prs Sensor MAX Value	**Pump2 Discharge Pressure Sensor MAX Value** Maximum or high range value of discharge pressure sensor	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3130
P2A	Vessel-Pump2 Pressure Sensor Fault Mode	**Vessel (DP) – Pump2 Pressure Sensor Fault Mode** When using multiple pressure sensors choose the mode or action occurs when a pressure sensor error/alarm is active. 0 = Auto OFF (Pump will stay in "AUTO" mode and will be held "OFF" until the sensor is back online and functioning) 1 = Lag Pump (Pump will go to "OFF" mode, de-energize, and Standby/Lag pump will energize "AUTO" "ON")	0	1	Lag Pump		RW	3131

Vessel/Pump 3 Prs Cfg

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Vessel/Pump 3 Prs Cfg								
D3L	Vessel/Pump3 DP Transmitter MIN Value	**Vessel/Pump3 Delta Pressure Transmitter MIN Value** Minimum or low range value of DP transmitter	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3132
D3H	Vessel/Pump3 DP Transmitter MAX Value	**Vessel/Pump3 Delta Pressure Transmitter MAX Value** Maximum or high range value of DP transmitter	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3133
P3L	Pump3 Dis.Prs Sensor MIN Value	**Pump3 Discharge Pressure Sensor MIN Value** Minimum or low range value of discharge pressure sensor	-14.4 / -1.0	72.5 / 5.0	0.0 / 0.0	Psi / Bar	RW	3134
P3H	Pump3 Dis.Prs Sensor MAX Value	**Pump3 Discharge Pressure Sensor MAX Value** Maximum or high range value of discharge pressure sensor	72.5 / 5.0	2175.0 / 150.0	435.0 / 30.0	Psi / Bar	RW	3135
P3A	Vessel-Pump3 Pressure Sensor Fault Mode	**Vessel (DP) – Pump3 Pressure Sensor Fault Mode** When using multiple pressure sensors choose the mode or action occurs when a pressure sensor error/alarm is active. 0 = Auto OFF (Pump will stay in "AUTO" mode and will be held "OFF" until the sensor is back online and functioning) 1 = Lag Pump (Pump will go to "OFF" mode, de-energize, and Standby/Lag pump will energize "AUTO" "ON")	0	1	Lag Pump		RW	3136

Sensor Filters

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW RO	Modbus Address
Parameters > Sensor Filters								
APF	Probe Filter Value	**Level Probe Sensor Filter Value** Measurement samples for averaging Level probe value. 0 = No filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	2		RW	3138
PPF	Pump Pressure Sensor Filter	**Pump Pressure Sensor Filter** Measurement samples for averaging Pump discharge pressure value. 0 = No filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	1		RW	3139
VPF	Vessel Pressure Sensor Filter	**Vessel Pressure Sensor Filter** Measurement samples for averaging Vessel pressure value. 0 = No filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	1		RW	3140
ORF	Oil Rectifier SH Temp Sensor Filter	**Oil Rectifier Superheat Temperature Sensor Filter** Measurement samples for averaging Vessel pressure value. 0 = No filter 1 = 2 sample average 2 = 4 sample average 3 = 16 sample average	0	3	3		RW	3141

Oil Rectifier Settings

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Parameters > Oil Rectifier Settings								
ORE	Oil Rectifier Main Switch	**Oil Rectifier Main Switch** Enables Oil Rectifier 0 = OFF 1 = ON	0	1	OFF		RW	3142
o30	Superheat Gas Type	**Select the refrigerant gas for the Oil rectifier -** o30 0-R12 1-R22 31-R413a 32-R422d 2-R134a 33-R427a 34-R438a 3-R502 35-R513a 36-R407a 4-R717 37-R1234ze 38-R1234yf 5-R13 39-R488a 40-R449a 6-R131b1 40-R449a 41-R452a 7-R23 8-R500 9-R503 10-R114 11-R142b 12-Invalid 13-R32 14-R227ea 15-R401a 16-R507a 17-R402a 18-R404a 19-R407c 20-R407a 21-R407b 22-R410a 23-R170 24-R290 25-R600 26-R600a 27-R744 28-R1270 29-R417a 30-R422a	0	41	R744		RW	3143
n04	Superheat Proportional Gain Kp	**Superheat Proportional Gain**	0.5	30.00	3.0		RW	3144
n05	Superheat I: Tn Integral Time	**Superheat I: Tn Integral Time**	20	600	120	s	RW	3145
n09	Superheat Maximum Reference	**Superheat Maximum Reference**	2.0	50.0	12.0	K	RW	3147
n10	Superheat Minimum Reference	**Superheat Minimum Reference**	1.0	100.0	7.0	K	RW	3148
n11	Superheat MOP Max Operating Pressure	**Superheat MOP Max Operating Pressure**	0.0 / 0.0	2900.0 / 200.0	290.0 / 20.0	Psi / Bar	RW	3149
n15	Superheat Start Time	**Superheat Start Time**	0	90	5	s	RW	3150
n17	Superheat Start Opening Degree	**Superheat Start Opening Degree** Note: This will give a fixed opening degree for the duration of the start time, regardless of the superheat value.	0	100	10	%	RW	3151
n18	Superheat Stability Factor	**Superheat Stability Factor**	0	10	5		RW	3152
n19	Superheat Damping Factor	**Superheat Damping Factor – SH Reference** Damping of amplification around SH Reference value	0.0	1.0	0.3		RW	3153
n20	Superheat Amplification Factor KpT0	**Superheat Amplification Factor KpT0** Amplification factor for superheat	0.0	1.0	0.4		RW	3154
n21	Superheat Control Mode	**Superheat Regulation Mode** 1 = MSS (Minimum stable superheat) 2 = LoadAp (Load Define Application)	1	2	MSS		RW	3155
n22	Superheat Close Reference	**Superheat Close Reference** Min superheat reference for loads < 10%	1.0	30.0	4.0	K	RW	3156
SHR	Superheat Close Reference Offset	**Superheat Close Reference Offset** Offset to add to Superheat close reference	-40.0	140.0	0.0	K	RW	3158
n32	Superheat MAX Valve Opening Degree	**Superheat MAX Valve Opening Degree**	0.0	100.0	100.0	%	RW	3157

Advanced App Settings

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW RO	Modbus Address
Parameters > Advanced App Settings								
SO1	Setpoint 1 Offset Pumps OFF/No Cooling Demand	**Setpoint 1 Offset Pumps OFF/No Cooling Demand** Adds a positive offset value to SP1. Use to effectively increase the liquid level in the vessel above the original setpoint during periods when there is no cooling demand or when the pumps are "OFF". SP1 returns to the original setpoint value when the pump(s) restart. Example: SP1=50 SO1=10%, SP1=55 when pumps "OFF"	0	100	0	%	RW	3159
SO2	Setpoint 2 Offset Pumps OFF/No Cooling Demand	**Setpoint 2 Offset Pumps OFF/No Cooling Demand** Adds a positive offset value to SP2. Use to effectively increase the liquid level in the vessel above the original setpoint during periods when there is no cooling demand or when the pumps are "OFF". SP2 returns to the original setpoint value when the pump(s) restart.	0	100	0	%	RW	3160
SO3	Multiple Pump Prs Sensors to AI2 AI3 AI4 (4-20mA)	**Multiple Pump Prs Sensors to AI2 AI3 AI4 (4-20mA)** Move multiple pump discharge pressure sensor inputs from AI7 AI8 and AI9 which are 0-10V inputs to AI2 AI3 and AI4 which are 4-20mA inputs. Pump1,2, and 3 Amp inputs will become non-operational. 0=NO 1=YES In addition, configure Analog Inputs in parameters at: Main Menu>Input/Output>I/O Config>Analog Input Note: Ensure AI7,8 and 9 are configured for no AI Tag or --------	0	1	NO		RW	3161
MSH	Hide Valves on Main Screen	**Hide Valves on Main Screen** Hides the images of solenoid valve 1 (SV1) and solenoid valve 2 (SV2) on the Main Screen. 0 = NO 1 = YES	0	1	NO		RW	3163
FSN	Rename Solenoid Float Switches	**Rename Solenoid Float Switches in Float Status Screen** 0 = NO 1 = YES -Rename "Solenoid Valve 1" -> "MID – HIGH LEVEL" Rename "Solenoid Valve 2" -> "MID – LOW LEVEL"	0	1	NO		RW	3164

Pump Modes

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Main Menu > Pump Modes								
P1	Pump 1 Setup	**Pump #1 Setup** 0 = Automatic (on/off) 1 = Standby 2 = OFF 3 = Manual (on)	0	3	0 - Auto		RW	3006
P2	Pump 2 Setup	**Pump #2 Setup** 0 = Automatic (on/off) 1 = Standby 2 = OFF 3 = Manual (on)	0	3	1 - SBY		RW	3007
P3	Pump 3 Setup	**Pump #3 Setup** 0 = Automatic (on/off) 1 = Standby 2 = OFF 3 = Manual (on)	0	3	2 - Off		RW	3008

Service

Setup

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > General > Setup								
y01	ON/OFF	**System Controller State** Turns off all Digital and Analog outputs 0 = OFF 1 = ON	0	1	1 - ON		RW	3165
y07	Restore default parameters	**Restore default parameters** 0 = NO 1 = YES	0	1	0 - NO		RW	3166
y05	Measurement Units	**Measurement Units** 0 = Metric 1 = US	0	1	1 - US		RW	3167

Alarm Configuration

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW RO	Modbus Address
Service > General > Alarm Configuration								
AdL	Alarm relay activation delay	**Alarm relay activation delay**	0	999	0	s	RW	3168
ASD	Alarm Delay Time - Startup	**Alarm delay time at startup of controller** Increase Time Delay to avoid false alarms at startup. Time delay to cycle though a few iterations/loops to read and write all measurement data from sensors to controller	0	100	20	s	RW	3169
ADP	Alarm Delay Time – Probe Startup	**Alarm Delay Time at Startup for Probe Transmitter** Increase Time Delay to avoid false alarms at startup.	0	100	20	s	RW	3170
AHR	Alarm HLSD Reset Type	Alarm High Level Shutdown Reset Type Set the type of reset functionality for HLSD Alarm. **-1 = Automatic reset of alarm** If liquid level goes above parameter SP3 + delay (Alarm set) and then goes below parameter SP3 + delay, the alarm will automatically reset. May use also with HLSD float alarm. **0 = Manual reset of alarm** If pressure goes above parameter SP3 + delay (Alarm set) and then goes below parameter SP3 + delay, the alarm will require a manual reset. May use also with HLSD float alarm.	-1	0	-1		RW	3171
AHS	Alarm Delay Time ON – High Level Shutdown HLSD	**Alarm Delay Time ON – High Level Shutdown HLSD** Sets the delay time before a high level shutdown alarm is issued after liquid level surpasses HLSD setpoint SP3 or when HLSD float alarm is de-energized.	0	360	5	s	RW	3172
AHO	Alarm Delay Time OFF – High Level Shutdown HLSD	**Alarm Delay Time OFF – High Level Shutdown HLSD** Sets the delay time before a high level shutdown alarm is cleared after the liquid level falls blow HLSD setpoint SP3 or when HLSD float alarm is re-energized.	0	360	5	s	RW	3173
AHL	Alarm Delay Time - High Level HLA	**Alarm Delay Time – High Level HLA** Sets the delay time before a high level alarm is issued when the liquid level surpasses HLA setpoint SP4 or when HLA float alarm is de-energized. Delay time is also used to clear alarm after liquid level falls below parameter SP4 SP or when HLA alarm float is re-energized.	0	360	5	s	RW	3174
HLN	High Level - Alarm	**High Level – Alarm** 0 = No Alarm – Output only 1 = Yes Alarm – with Output	0	1	Yes Alarm			3175
ALA	Alarm Delay Time - Low Level LLA	**Alarm Delay Time – Low Level LLA** Sets the delay time before a Low level alarm is issued when the liquid level falls below LLA parameter setpoint SP6 or when LLA float alarm is de-energized. Delay time is also used to clear alarm after liquid level rises above parameter SP6 SP or when LLA alarm float is re-energized.	0	360	5	s	RW	3176
LLN	Low Level - Alarm	**Low Level – Alarm** 0 = No Alarm – Output only (see parameter SCA) 1 = Yes Alarm – with Output (see parameter SCA)	0	1	Yes Alarm			3177

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW RO	Modbus Address
Service > General > Alarm Configuration								
ALS	Alarm Delay Time - Low Level Shutdown LLSD	**Alarm Delay Time – Low Level LLSD** Sets the delay time before a Low level shutdown alarm is issued after the liquid level falls below LLSD parameter setpoint SP5 or when LLSD float alarm is de-energized. Delay time is also used to clear alarm after liquid level rises above parameter SP5 SP or when LLSD alarm float is re-energized.	0	360	10	s	RW	3178
SCA	General Alarm Select DO15	**General Alarm Select DO15** Select Alarm or function that activates DO15 0 = General Alarm 1 DI18 1 = General Alarm 2 DI19 2 = General Alarm 3 DI20 3 = Low Level Alarm	0	3	Low Level Alarm		RW	3179
A1A	General Alarm 1 Active State	**General Alarm 1 Active State** 0 = Energized 1 = De-energized	0	1	De-energized		RW	3180
A1D	General Alarm 1 Time Delay	**General Alarm 1 Time Delay**	0	120	5	s	RW	3181
A2A	General Alarm 2 Active State	**General Alarm 2 Active State** 0 = Energized 1 = De-energized	0	1	De-energized		RW	3182
A2D	General Alarm 2 Time Delay	**General Alarm 2 Time Delay**	0	120	5	s	RW	3183
A3A	General Alarm 3 Active State	**General Alarm 3 Active State** 0 = Energized 1 = De-energized	0	1	De-energized		RW	3184
A3D	General Alarm 3 Time Delay	**General Alarm 3 Time Delay**	0	120	5	s	RW	3185
AOF	Alarm relay active if unit in OFF	**Alarm Relay active if unit is OFF** 0 = NO 1 = YES	0	1	1 - YES		RW	3186
BUZ	Buzzer activation time	**Buzzer activation time** Buzzer on time if an alarm occurs 0 = OFF 1-14 = Minutes ON 15 = Always ON	0	15	0	Min	RW	3187
APP	Alarm Delay Time – Multi Pump Pressure Sensors	**Alarm Delay time – Employing Multiple Pump Pressure Sensors.** Time delay before a pump pressure sensor alarm becomes active.	0	360	5	s	RW	3188

Serial settings

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > General > Serial settings								
SEr	Serial address (Modbus and CAN)	**Serial Modbus address of Controller**	1	120	1		RW	3189
bAU	Serial baud rate (Modbus)	**Serial Modbus baud rate (bps)** 0 = 0 1 = 1200 2 = 2400 3 = 4800 4 = 9600 5 = 14400 6 = 19200 7 = 28800 8 = 38400	0	8	6 - 192		RW	3190
COM	Serial settings (Modbus)	**Serial Modbus Protocol setting** 0 = 8N1 (8bits, no parity, 1 stop bit) 1 = 8E1 (8bits, even parity, 1 stop bit) 2 = 8N2 (8bits, no parity, 2 stop bits)	0	2	0 - 8N1		RW	3191

Password

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > General > Password (login password level 3 to view)								
L01	Password level 1	**Password for level one parameter access**	0	999	100		RW	3192
L02	Password level 2	**Password for level two parameter access**	0	999	200		RW	3193
L03	Password level 3	**Password for level three parameter access**	0	999	300		RW	3194

Backup/Restore Parameters

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > Backup/Restore Parameters								
Cmd	Backup Parameters							
Cmd	Restore Parameters							

RTC Setup

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > RTC Setup								
Service > Data Logging > Log Data USB Drive								
NDR	Max Number of Records	**Max Number of Records**	0	10000	1000		RW	3195
DST	Data Sample Time (sec)	**Data Sample Time (sec)** Interval in seconds that data is logged	0	10000	30	s	RW	3196

Pump RT Equalization

Label ID	Parameter Name	Description and selection options	Min	Max	Factory Setting	Unit	RW RO	Modbus Address
Service > Pump RT Equalization								
PRE	Enable Pump Runtime Equalization	**Enable Pump Runtime Equalization** 0 = Disable 1 = Enable	0	1	Disable		RW	3197
POL	Use Period or Lifetime Hrs for Equalization	**Use Period or Lifetime Hrs for Equalization** 0 = Period 1 = Lifetime	0	1	Period		RW	3198
WDY	Weekday	**Weekday** 0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday	0	6	Sunday		RW	3199
HR	Hour	**Hour - Military Time – 24 hr. clock** 0 = 12am 0:00 Minimum 1 = 1am etc.. 11 = 11am 12 = 12pm 13 = 1pm etc.. 23 = 11pm 24 = 12am 24:00 Maximum	0	24	3	h	RW	3200
MIN	Minute	**Minute** 0-59	0	59	0	min	RW	3201

Reset Pump Period Run Hours

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > Reset PeriodRun Hrs [Reset Pump Period Run Hours] (login password level 2 to view)								
Cmd	RS PeriodRunHrs Pump1	When in level 2, this command will appear. Command will reset the runtime hours of the pump. To Reset, highlight command and press the return or enter key.						
Cmd	RS PeriodRunHrs Pump2	**Same as above.**						
Cmd	RS PeriodRunHrs Pump3	**Same as above.**						

Reset Pump Lifetime Run Hours

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > Reset LifetimeRun Hrs [Reset Pump Lifetime Run Hours] (login password level 3 to view)								
Cmd	RS LifeRunHrs Pump1	When in level 3, this command will appear. Command will reset the runtime hours of the pump. To Reset, highlight command and press the return or enter key.						
Cmd	RS LifeRunHrs Pump2	**Same as above.**						
Cmd	RS LifeRunHrs Pump3	**Same as above.**						

Reset Pump Start-Stop Cycle count

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Service > Reset Pump Start-Stop Cycle count								
Service > Testing of I/O								
TEN	Test Mode Enable	**Test Mode Enable** 0 = NO 1 = YES	0	1	0		RW	3202
AO1	Test AO1	**Test AO1** Enter from keypad or Write MB value between 0.00 and 10.00	0.00	10.00	0.00	V	RW	3203
AO2	Test AO2	**Test AO2**	0.00	10.00	0.00	V	RW	3204
AO3	Test AO3	**Test AO3**	0.00	10.00	0.00	V	RW	3205
AO4	Test AO4	**Test AO4**	0.00	10.00	0.00	V	RW	3206
AO5	Test AO5	**Test AO5**	0.00	10.00	0.00	V	RW	3207
AO6	Test AO6	**Test AO6**	0.00	10.00	0.00	V	RW	3208
DO1	Test DO1	**Test DO1** Enter from keypad or Write MB value: 0 = De-energize relay 1 = Energize relay	0	1	0		RW	3209
DO2	Test DO2	**Test DO2**	0	1	0		RW	3210
DO3	Test DO3	**Test DO3**	0	1	0		RW	3211
DO4	Test DO4	**Test DO4**	0	1	0		RW	3212
DO5	Test DO5	**Test DO5**	0	1	0		RW	3213
DO6	Test DO6	**Test DO6**	0	1	0		RW	3214
DO7	Test DO7	**Test DO7**	0	1	0		RW	3215
DO8	Test DO8	**Test DO8**	0	1	0		RW	3216
DO9	Test DO9	**Test DO9**	0	1	0		RW	3217
D10	Test DO10	**Test DO10**	0	1	0		RW	3218
D11	Test DO11	**Test DO11**	0	1	0		RW	3219
D12	Test DO12	**Test DO12**	0	1	0		RW	3220
D13	Test DO13	**Test DO13**	0	1	0		RW	3221
D14	Test DO14	**Test DO14**	0	1	0		RW	3222
D15	Test DO15	**Test DO15**	0	1	0		RW	3223

Other Status variables

Modbus Registers

Table 1: Status variables

Label ID	Description	Minimum	Maximum	Default	Units	Decimals	Data Type	Read Write	Modbus Register
C01	Reset Alarms 2 = Reset	0	2			0	U16	R/W	1858
V01	System On/Off					0	S16	Read	8101
V03	Solenoid 1 ON					0	S32	Read	8104
V04	Liquid Level AP	0.0	100.0		%	1	S32	Read	8106
V06	Solenoid 2 ON					0	S32	Read	8110
V10	Any Alarm Active					0	S16	Read	8116
V11	Hi Level Shutdown Alarm					0	S16	Read	8117
V12	Hi Level Alarm					0	S16	Read	8118
V13	Lo Level Alarm					0	S16	Read	8119
V14	Lo Level Shutdown Alarm					0	S16	Read	8120
V22	Motor 1 CTAmps					0	S32	Read	8126
V23	Motor 2 CTAmps					0	S32	Read	8128
V24	Motor 3 CTAmps					0	S32	Read	8130
V25	Pump 3 Mode					0	S16	Read	8132
V26	Pump 2 Mode					0	S16	Read	8133
V27	Pump 1 Mode					0	S16	Read	8134
V28	Pump 1 Aux Fault					0	S16	Read	8135
V29	Pump 2 Aux Fault					0	S16	Read	8136
V30	VesselPressureBar				Bar	1	S32	Read	8137
V31	VesselPressurePSI				Psi	1	S16	Read	8139
V32	Pump Discharge Pressure BAR				Bar	1	S32	Read	8140
V33	Pump Discharge Press PSI				Psi	1	S16	Read	8142
V34	Differential Pressure Pump Vessel				Bar/Psi	1	S32	Read	8143
V43	Pump 3 Aux Fault					0	S16	Read	8145
V47	Pump 1 Status 0 = stopped 1 = running					0	S32	Read	8146
V48	Pump 2 Status					0	S32	Read	8148
V49	Pump 3 Status					0	S32	Read	8150
V54	Pump 1 Ramp UP					0	S16	Read	8155
V57	Pump 2 Ramp UP					0	S16	Read	8158
V58	Pump 3 Ramp UP					0	S16	Read	8159
V59	Pump 1 Faults					0	S16	Read	8160
V60	Pump 3 Faults					0	S16	Read	8161
V61	Pump 2 Faults					0	S16	Read	8162
V62	Pump 1 Failure					0	S16	Read	8163
V63	Pump 3 Failure					0	S16	Read	8164
V64	Pump 2 Failure					0	S16	Read	8165
V70	VFD Percent Max Speed					0	S16	Read	8169
V71	Probe Sensor Fault					0	S16	Read	8170
V72	Pump Pressure Sensor Fault					0	S16	Read	8171
V73	Vessel Pressure Sensor Fault					0	S16	Read	8172
V74	Active Standby Pump					0	S16	Read	8173
V76	Pump 1 Setup Parm ID					0	U16	Read	8175
V77	Pump1InStandyValue					0	S32	Read	8176
V78	Pump 2 Setup Parm ID					0	U16	Read	8178
V79	Pump2InStandyValue					0	S32	Read	8179
V80	Pump 3 Setup Parm ID					0	U16	Read	8181
V81	Pump3InStandyValue					0	S32	Read	8182
V82	Transfer Solenoid Active Counts					0	S32	Read	8184
V84	Last Count of Transfer Solenoid Cycles					0	S16	Read	8187

Label ID	Description	Minimum	Maximum	Default	Units	Decimals	Data Type	Read Write	Modbus Register
V85	Transfer Solenoid - Time Remaining in Cycle Period Min					0	S32	Read	8188
V92	Pump1 Manual Mode Active					0	S16	Read	8194
V93	Pump 2 Manual Mode Active					0	S16	Read	8195
Status variables - Modbus Registers									
V94	Pump 3 Manual Mode Active					0	S16	Read	8196
V102	Pump Pressure				Bar/Psi	1	S32	Read	8200
V103	Vessel Pressure				Bar/Psi	1	S32	Read	8202
V111	PumpStartEvapRequest Pumps Enable status (PEN)					0	S16	Read	8211
V113	Transfer solenoid status					0	S32	Read	8213
V114	FloatSwitch SV1Status					0	S16	Read	8215
V115	FloatSwitch SV2Status					0	S16	Read	8216
V119	Pump1 Reset Run time hours					0	U16	R/W	9901
V120	Pump2 Reset Run time hours					0	U16	R/W	9902
V121	Pump3 Reset Run time hours					0	U16	R/W	9903
V140	High Differential Pressure vessel - pump					0	S32	Read	8223
V148	RTC YEAR					0	S16	Read	8226
V149	RTC MONTH					0	S16	Read	8227
V150	RTC DAY					0	S16	Read	8228
V154	Pump1 CRT hrs					0	S32	Read	8235
V155	Pump1 LRT hrs					0	S32	Read	8237
V159	Pump3 CRT hrs					0	S32	Read	8245
V160	Pump3 LRT hrs					0	S32	Read	8247
V161	Pump2 LRT hrs					0	S32	Read	8249
V162	Pump2 CRT hrs					0	S32	Read	8251
V166	Pump1RS LRT hrs -reset Lifetime run hours					0	U16	R/W	9904
V167	Pump3RS LRT hrs – reset Lifetime run hours					0	U16	R/W	9905
V168	Pump2RS LRT hrs – reset Lifetime run hours					0	U16	R/W	9906
V169	Motor1AmpFault					0	S16	Read	8259
V170	Motor2AmpFault					0	S16	Read	8260
V171	Motor3AmpFault					0	S16	Read	8261
V173	MV2 PercentOPEN	0.0	100.0		%	0	S32	Read	8263
V174	MV1 PercentOPEN	0.0	100.0		%	1	S32	Read	8265
V175	FloatSwitch SVTransferStatus					0	S16	Read	8267
V180	BACKUP parameters					0	U16	R/W	9907
V181	RESTORE parameters					0	U16	R/W	9908
V184	BackupRestoreStatus -2 = Failed -1 = No Operation 1 = Operation Started 2 or > = Operation succeeded	-2	800			0	S16	Read	8274
V188	AnyPumpRunning					0	S16	Read	8279
V189	Pump Cavitation Active					0	S16	Read	8280
V190	Cavitation Inhibit Status					0	S16	Read	8281
V194	Cavitation Inhibit count down timer					0	S32	Read	8285
V195	Cavitations Counter					0	S32	Read	8287
V198	Cavitation Pump 1 Fault					0	S16	Read	8291
V199	Cavitation Pump 2 Fault					0	S16	Read	8292
V201	Cavitation Pump 3 Fault					0	S16	Read	8294
V206	Time remaining until Cav Events is reset to zero – one pump discharge press. sensor					0	S32	Read	8299
V208	Pump1DisPrsSenFault With more than one discharge pressure sensors (pump 2,or 3)					0	S16	Read	8302
V209	Pump1DisPrsBAR With more than one discharge pressure sensors (pump 2,or 3)					0	S32	Read	8303

Label ID	Description	Minimum	Maximum	Default	Units	Decimals	Data Type	Read Write	Modbus Register
V210	Pump1DisPrsPSI With more than one discharge pressure sensors (pump 2,or 3)					0	S16	Read	8305
V211	Pump1DischargeOrDPS With more than one discharge pressure sensors (pump 2, or 3)					0	S16	Read	8306
V212	Pump2 DisPrsOrDPS Scaled With more than one discharge pressure sensors (pump 1,or 3)					0	S16	Read	8307
Status variables - Modbus Registers									
V213	Pump2DisPrsSenFault With more than one discharge pressure sensors (pump 1,or 3)					0	S16	Read	8308
V214	Pump2DisPrsBAR With more than one discharge pressure sensors (pump 1,or 3)					0	S32	Read	8309
V215	Pump2DisPrsPSI With more than one discharge pressure sensors (pump 1,or 3)					0	S16	Read	8311
V216	Pump3 DisPrsOrDPS Scaled With more than one discharge pressure sensors (pump 1,or 2)					0	S16	Read	8312
V217	Pump3DisPrsSenFault With more than one discharge pressure sensors (pump 1,or 2)					0	S16	Read	8313
V218	Pump3DisPrsBAR With more than one discharge pressure sensors (pump 1,or 2)					0	S32	Read	8314
V219	Pump3DisPrsPSI With more than one discharge pressure sensors (pump 1,or 2)					0	S16	Read	8316
V238	Pump2DPTransFault Delta pressure sensor					0	S16	Read	8341
V239	Pump3DPTransFault Delta pressure sensor					0	S16	Read	8342
V240	Pump1DPTransFault Delta pressure sensor					0	S16	R/W	8343
V241	P1P2P3 HighestDP Pump with highest differential or Delta pressure (vessel-pump) Employing more than one discharge or delta pressure sensor					0	S16	Read	8344
V257	RTC Weekday 0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday					0	S16	Read	8364
V258	RTC Hour					0	S16	Read	8365
V259	RTC Minutes					0	S16	Read	8366
V260	P1 CavEvtReset CTDtimer More than one pump press sensor				s	0	S32	Read	8368
V261	P1 CavitationEvtCounter More than one pump press sensor					0	S32	Read	8370
V262	P2 CavEvtReset CTDtimer More than one pump press sensor				s	0	S32	Read	8372
V263	P2 CavitationEvtCounter More than one pump press sensor					0	S32	Read	8374
V264	P3 CavEvtReset CTDtimer More than one pump press sensor				s	0	S32	Read	8376
V265	P3 CavitationEvtCounter More than one pump press sensor					0	S32	Read	8378
V267	VesselHiPressure 0 = No 1 = Yes					0	S32	Read	8381
V268	General Alarm 1 Status – DI18					0	S16	Read	8383

Label ID	Description	Minimum	Maximum	Default	Units	Decimals	Data Type	Read Write	Modbus Register
V269	General Alarm 2 Status – DI19					0	S16	Read	8384
V270	General Alarm 3 Status – DI20					0	S16	Read	8385
V271	SH RTD S2 Temperature Fault 0 = no alarm 1 = alarm					0	S32	Read	8386
V272	SH S2 Temperature Value - Celsius				°C	0	S32	Read	8388
V273	LevelSwitch3 Liquid feed solenoid valve 2 status DI10 0 = Off / de-energized 1 = On / energized	0	1			0	S16	Read	8390
V274	LevelSwitch4 Liquid feed solenoid valve 1 status DI9 0 = Off / de-energized 1 = On / energized					0	S16	Read	8391
V275	LevelSwitch2 Low Level alarm float switch status DI11 0 = OK / energized safe 1 = Alarm / de-energized					0	S16	Read	8392
V276	LevelSwitch1 Low Level shutdown float switch status DI12 0 = OK / energized safe 1 = Alarm / de-energized					0	S16	Read	8393
Status variables - Modbus Registers									
V277	LevelSwitch5 High Level alarm float switch status DI7 0 = OK / energized safe 1 = Alarm / de-energized					0	S16	Read	8394
V278	LevelSwitch6 High Level shutdown float switch status DI3 0 = OK / energized safe 1 = Alarm / de-energized					0	S16	Read	8395
V279	OilRectMainSwitchStatus	0	1			0	S16	Read	8396
V280	StepperValveDriverAlarm					0	S16	Read	8397
V284	Pump1OnOffCycle Count					0	S32	Read	8404
V285	Pump2OnOffCycle Count					0	S32	Read	8406
V286	Pump3OnOffCycle Count					0	S32	Read	8408
V287	PumpSpeed	0	100.0		%	1	S32	Read	8410
V288	ResetPumpStartStopCycles 1 = Reset SSC count	0	1			0	U16	R/W	9908
V289	PumpSpeedPercent	0	100	75	%	0	S32	Read	8412
V296	Pump2VFDSpd Speed based on differential pres. Between vessel and pump2					0	S32	Read	8420
V297	Pump2VFDspdPercent					0	S32	Read	8422
V298	Pump3VFDSpd					0	S32	Read	8424
V299	Pump3VFDspdPercent					0	S32	Read	8426
V300	FloatLevelSwitchPercent					0	S32	Read	8428
V303	LowLevel Liquid low level Alarm					0	S32	Read	8432
V304	HighLevel Liquid high level Alarm					0	S32	Read	8434
V305	SV1 Float Status for level display when SEN active					0	S32	Read	8436
V306	SV2 Float Status for level display when SEN active					0	S32	Read	8438
V310	USB Data log code >=0=OK <0=Error					0	S16	Read	8442
V311	USB Data logging Fault 0=ok 1=Fault					0	S16	Read	8443
V312	Reset Log Data to USB Drive					0	U16	R/W	9910
V313	ICAD_MV1alarm					0	S16	Read	8444
V314	ICAD MV2alarm					0	S16	Read	8445
V315	Pressure Sensors Alarm Vessel or Pump Pres. Alarm					0	S16	Read	8446
V318	ABS VesselTempCelsius				°C	0	S16	Read	8450

Label ID	Description	Minimum	Maximum	Default	Units	Decimals	Data Type	Read Write	Modbus Register
V319	VesselTempFarenheight				°F	0	S16	Read	8451
V321	VesselTemp T0 Calculated from vessel pressure				°C / °F	0	S32	Read	8454
V322	OilRectSHtempFarenheight				°F	0	S16	Read	8456
V323	S2_OilRectSuperHeatPT1000Temp S2 Temperature				°C / °F	0	S32	Read	8457
V324	SH_TargetK				k	0	S16	Read	8458
V325	OilRectifierRunning Pump Running and DI16 energized					0	S16	Read	8459
V327	GasType					0	S32	Read	8463
V328	OilRect DI ActiveH	0	1			0	S16	Read	8464
V329	SHcntl ReferenceK				k	1	S16	Read	8465
V330	SHcntl ValueK Superheat actual				k	1	S16	Read	8467
V331	OR ValveOpeningDegree				%	0	S32	Read	8468
V332	OilRect_StepperVolts_0-10					0	S32	Read	8470
V334	PumpAuto PumpStandby					0	S16	Read	8472
V336	PumpLeastCRThrs 5 = Pump 1 6 = Pump 2 7 = Pump 3					0	S32	Read	8475
V337	PumpMostCRThrs 5 = Pump 1 6 = Pump 2 7 = Pump 3					0	S32	Read	8477
Status variables - Modbus Registers									
V338	SystemOnOff SystemOnOffDI Both internal main switch and external main switch (SEN) are active	0	1			0	S16	Read	8478
V339	MAINswitch SHcontrollerInput Oil Rectifying Active	0	1			0	S32	Read	8480
V340	Multi Pump2PrsSensorFaultDisOrDP	0	1			0	S16	Read	8481
V341	Multi Pump3PrsSensorFaultDisOrDP	0	1			0	S16	Read	8482
V342	Multi Pump1PrsSensorFaultDisOrDP	0	1			0	S16	Read	8483
V343	Pump2offTimeNOK	0	1			0	S16	Read	8484
V344	Pump2OffTimeCount	0	9000		s	0	S32	Read	8486
V345	Pump1OffTimeCount	0	9000		s	0	S32	Read	8488
V346	Pump1offTimeNOK	0	1			0	S16	Read	8489
V347	Pump3offTimeNOK	0	1			0	S16	Read	8490
V348	Pump3OffTimeCount	0	9000		s	0	S32	Read	8492
V350	Status of A04_0-10V or 2-10V	0	10.00		V	2	S32	Read	8495
V351	AI1 Vessel Level	4.00	20.00		mA	2	S16	R/W	8496
V352	AO1 LF MV1 OD	0.0	100.0		%	1	S32	Read	8498
V353	AO2 LF MV1 OD	0.0	100.0		%	1	S32	Read	8500
V354	DO11 Shutdown Output	0	1			0	S32	Read	8501
V355	DO10 General Alarm	0	1			0	S32	Read	8503
V356	DO15 Status – Alarm select (SCA)	0	1			0	U16	Read	8504
C01	Reset Alarms 2 = Reset	0	2			0	U16	R/W	1858

Alarms

Label ID	Parameter Name	Description and selection options	Min.	Max.	Factory Setting	Unit	RW/RO	Modbus Address
Alarms>								
A01	General alarm	**General alarm – Auto-resetting** 0 = Inactive 1 = Active	0	1			RO	1901 .08
A03	Pump1 Aux Fault	**Pump1 Aux Fault – Manual reset**	0	1			RO	1901 .09
A05	Pump2 Aux Fault	**Pump2 Aux Fault – Manual**	0	1			RO	1901 .10
A07	Pump3 Aux Fault	**Pump3 Aux Fault - Manual**	0	1			RO	1901 .11
A08	Level Sensor Fault	**Level Sensor Fault - Auto**	0	1			RO	1901 .12
A09	Vessel Pressure Sensor Fault	**Vessel Pressure Sensor Fault - Auto**	0	1			RO	1901 .13
A10	Pump Pressure Sensor Fault	**Pump Pressure Sensor Fault - Auto**	0	1			RO	1901 .14
A11	High Level Shutdown Fault	**High Level Shutdown Fault - Manual**	0	1			RO	1901 .15
A12	High Level Alarm	**High Level Alarm - Auto**	0	1			RO	1901 .00
A13	Low Level Shutdown Alarm	**Low Level Shutdown Alarm - Auto**	0	1			RO	1901 .01
A14	Low Level Alarm	**Low Level Alarm - Auto**	0	1			RO	1901 .02
A15	High Amp Fault Motor 1	**High Amp Fault Motor 1 - Manual**	0	1			RO	1901 .03
A16	High Amp Alarm Motor 1	**High Amp Alarm Motor 1 - Auto**	0	1			RO	1901 .04
A17	Low Amp Fault Motor 1	**Low Amp Fault Motor 1 - Manual**	0	1			RO	1901 .05
A18	Low Amp Alarm Motor 1	**Low Amp Alarm Motor 1 - Auto**	0	1			RO	1901 .06
A19	High Amp Fault Motor 2	**High Amp Fault Motor 2 - Manual**	0	1			RO	1901 .07
A20	High Amp Alarm Motor 2	**High Amp Alarm Motor 2 - Auto**	0	1			RO	1902 .08
A21	Low Amp Fault Motor 2	**Low Amp Fault Motor 2 - Manual**	0	1			RO	1902 .09
A22	Low Amp Alarm Motor 2	**Low Amp Alarm Motor 2 - Auto**	0	1			RO	1902 .10
A23	High Amp Fault Motor 3	**High Amp Fault Motor 3 - Manual**	0	1			RO	1902 .11
A24	High Amp Alarm Motor 3	**High Amp Alarm Motor 3 - Auto**	0	1			RO	1902 .12
A25	Low Amp Fault Motor 3	**Low Amp Fault Motor 3 - Manual**	0	1			RO	1902 .13
A26	Low Amp Alarm Motor 3	**Low Amp Alarm Motor 3 - Auto**	0	1			RO	1902 .14
A27	Cavitation Pump(s) OFF Fault	**Cavitation Pump(s) OFF Fault - Manual**	0	1			RO	1902 .15
A28	Cavitation ON alarm	**Cavitation ON alarm - Auto**	0	1			RO	1902 .00
A29	Cavitation Pump 1 Fault	**Cavitation Pump 1 Fault - Manual**	0	1			RO	1902 .01
A30	Cavitation Pump 2 Fault	**Cavitation Pump 2 Fault - Manual**	0	1			RO	1902 .02
A31	Cavitation Pump 3 Fault	**Cavitation Pump 3 Fault - Manual**	0	1			RO	1902 .03
A32	High Differential Pressure Alarm	**High Differential Pressure Alarm - Programmable Configurable in menu Pump Control > Parameter "HPA"**	0	1			RO	1902.04
A33	ICAD MV1 Alarm	**ICAD MV1 Alarm - Auto**	0	1			RO	1902.05
A34	ICAD MV2 Alarm	**ICAD MV2 Alarm - Auto**	0	1			RO	1902.06
A35	Diff.Prs Transmitter 1 Fault	**Differential Pressure Transmitter 1 Fault**	0	1			RO	1901.14
A36	Diff.Prs Transmitter 2 Fault	**Differential Pressure Transmitter 2 Fault**	0	1			RO	1901.15
A37	Diff.Prs Transmitter 3 Fault	**Differential Pressure Transmitter 3 Fault**	0	1			RO	1901.00
A38	Pump1 Dis.Prs Sensor Fault	**Pump1 Dis.Prs Sensor Fault**	0	1			RO	1901.01
A39	Pump2 Dis.Prs Sensor Fault	**Pump2 Dis.Prs Sensor Fault**	0	1			RO	1901.05
A40	Pump3 Dis.Prs Sensor Fault	**Pump3 Dis.Prs Sensor Fault**	0	1			RO	1901.06
A41	Pump1 High Diff.Prs Alarm	**Pump1 High Diff.Prs Alarm**	0	1			RO	1901.02
A42	Pump2 High Diff.Prs Alarm	**Pump2 High Diff.Prs Alarm**	0	1			RO	1901.03
A43	Pump3 High Diff.Prs Alarm	**Pump3 High Diff.Prs Alarm**	0	1			RO	1901.04
A44	Pump1 Cavitation Fault DP	**Pump1 Cavitation Fault DP**	0	1			RO	1903.00
A45	Pump2 Cavitation Fault DP	**Pump2 Cavitation Fault DP**	0	1			RO	1903.01
A46	Pump3 Cavitation Fault DP	**Pump3 Cavitation Fault DP**	0	1			RO	1903.02
A47	Vessel High Prs. Alarm	**Vessel High Prs. Alarm**	0	1			RO	1903.3
A48	Oil Rectifier Superheat RTD Fault	**Oil Rectifier Superheat RTD Fault**	0	1			RO	1903.4
A49	General Alarm 1	**General Alarm 1**	0	1			RO	1903.5
A50	General Alarm 2	**General Alarm 2**	0	1			RO	1903.6
A51	General Alarm 3	**General Alarm 3**	0	1			RO	1903.7
A52	Stepper Valve Driver Alarm	**Stepper Valve Driver Alarm**	0	1			RO	1904.8

Ordering

Description	Code Number
EKE 3470P Pump and Level controller	080G5012

Certificates, declarations and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

Certificates, declarations and approvals

EU Declaration of Conformity
This product is in conformity with the following directive(s), standard(s) or other normative document(s), provided that the product is used in accordance with our instructions.

EMC directive 2014/30/EU
By fulfilling the requirements in the following standards
EN 61000-6-3: 2007 +A1: 2011 (Emission standard for residential, commercial and light-industrial environments)
EN 61000-6-2: 2005 Generic standards. Immunity for industrial environments

LVD directive 2014/35/EU
By fulfilling the requirements in the following standards
EN60730-1: 2011 Automatic electrical controls for household and similar use. General requirements
EN60730-2-9: 2010 Particular Requirements for Temperature Sensing Controls

RoHS Directive 2011/65/EU and 2015/863/EU
By fulfilling the requirements in the following standards EN 50581:2012

UL Approval
UL file: E31024

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