Basic Pump control on Altivar Process

This document will guide you through the steps to configure the Altivar Process VSD for pumping with the following functions:

- PID control (pressure in this example)
- Sleep and Wake up
- Pipe fill
- HMI customisation

All steps shall be performed from the local HMI panel. Please familiarize the buttons indicated in the image below.

From any point in the menu, press the HOME button to return to the Main Menu

Application Detail

For this example we have one pump controlling the pressure on an irrigation line, with the following requirements:

- Maintain 25 Hz speed during start-up to fill the pipeline, once the pressure is above 4 bar or 5 minutes (300 seconds) has past, complete pipe-fill and begin PID control.
- Pressure set point = 5 Bar
- Go to sleep if in PID control (not pipe-fill) and the pipeline is at pressure (6 Bar) and the speed is below 27 Hz for 30 seconds
- Wake the system up when the pressure falls below 3.5 Bar
- Analogue input 1 will be configured for the pressure transducer
- Digital input 5 shall be the HP pressure switch and requires a 2 second delay
- The VSD will be as default, 2-wire control (Digital input 1 is forward)

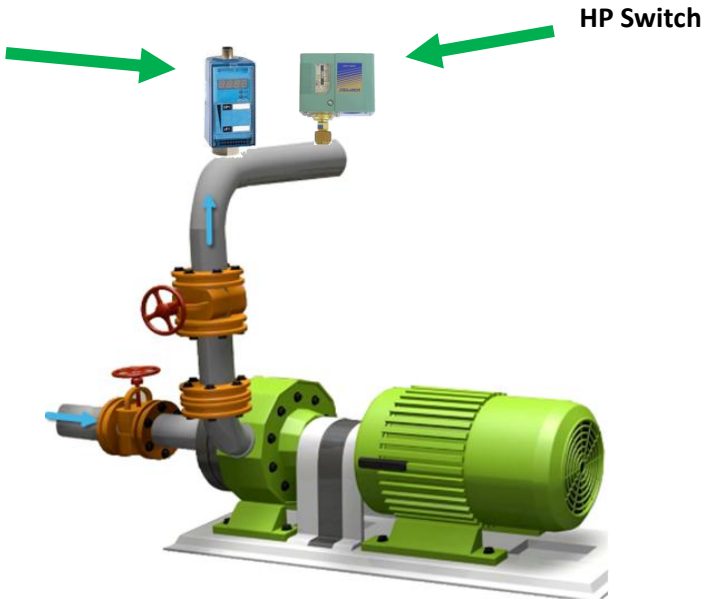
Layout:

The pump system will have a pressure transducer on the outlet side of the pump and a pressure switch for high pressure cut out.

Pressure transducer:

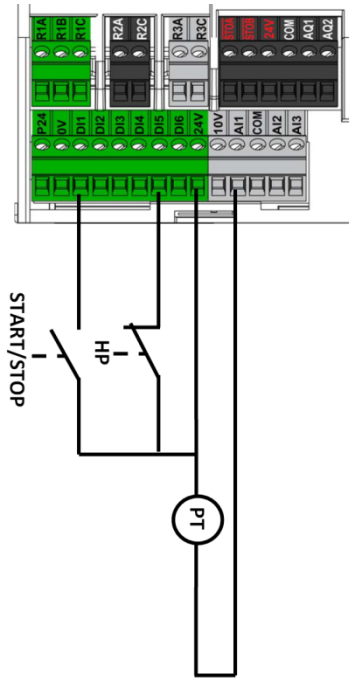
Range = 0 – 10 Bar

Output = 4 – 20 mA



Wiring:

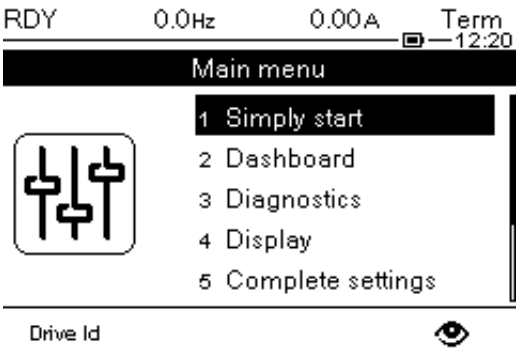
In this example, the pressure transducer requires 24vdc external supply and is wired back to Analogue input 1. There is also a switch to stop and start the pump wired to Digital input 1 and the high pressure switch to Digital input 5.



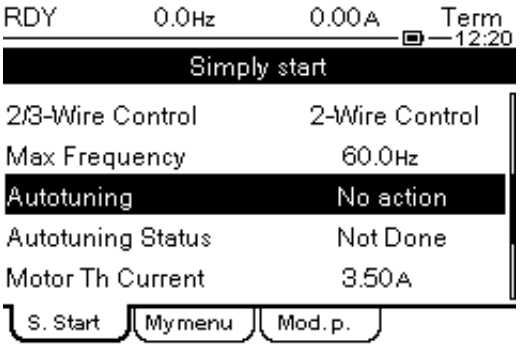
VSD Configuration:

Motor setup

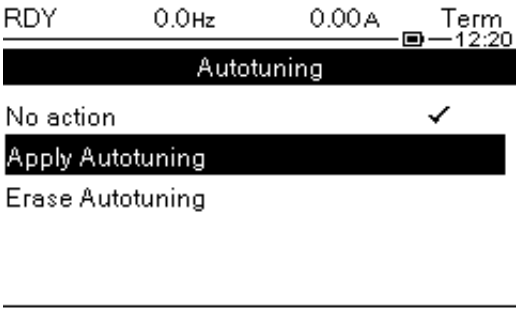
- Press the HOME key once to get to the Main Menu select “1 Simply start” and Press OK



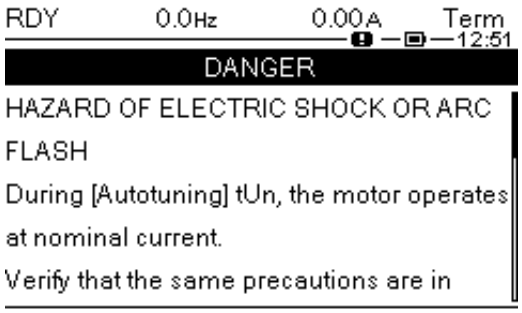
- Enter all motor nameplate details correctly
- Select “Autotuning” and press OK
- Ensure “2/3-Wire Control” is set to “2-Wire Control”



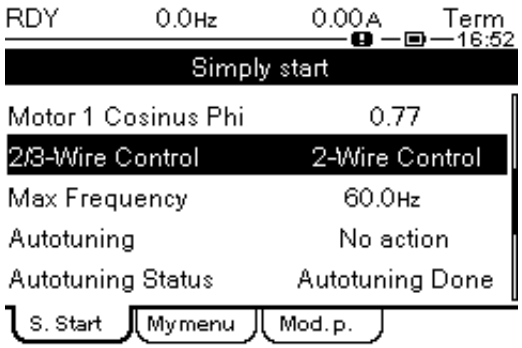
- Select “Apply Autotuning” and press OK



- A warning will appear – ensure it is safe to power the motor
- Press OK

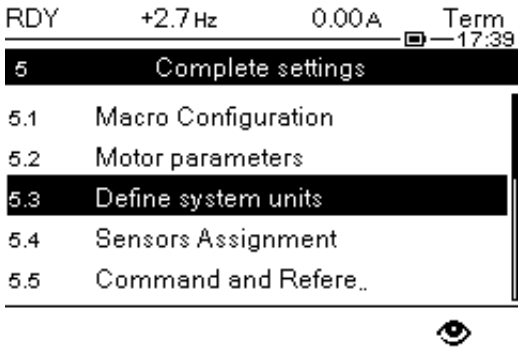


- Once the Autotune is complete you will return to the Simply start menu
- Ensure that “Autotuning Status” states – “Autotuning Done”

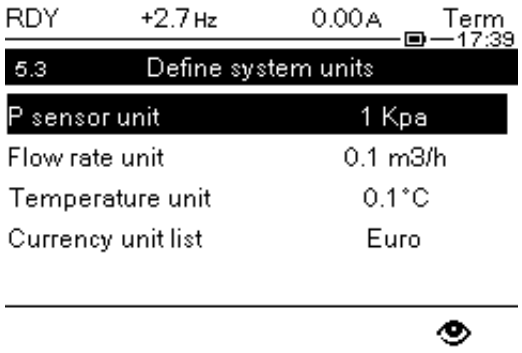


Define System units

- From the Complete settings menu, select “5.3 Define system units”

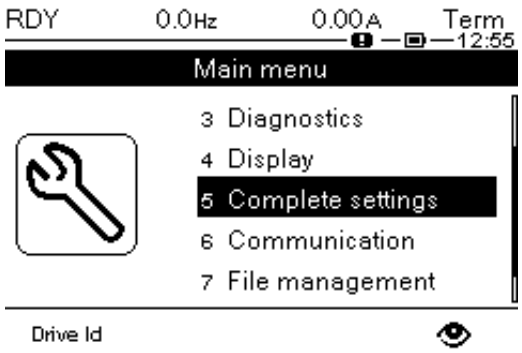


- Select “P sensor unit”, press OK
- Select “0.1 Bar” press OK
- A warning will appear, press OK

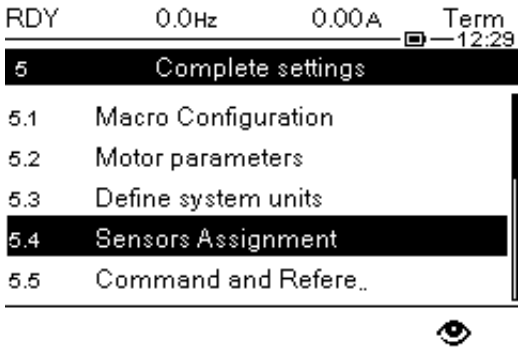


Pressure Sensor Configuration

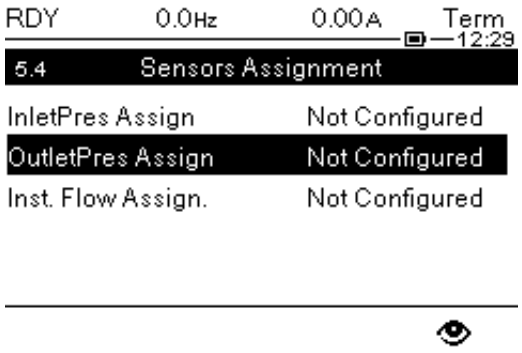
- From the Main menu select “5 Complete settings” and press OK



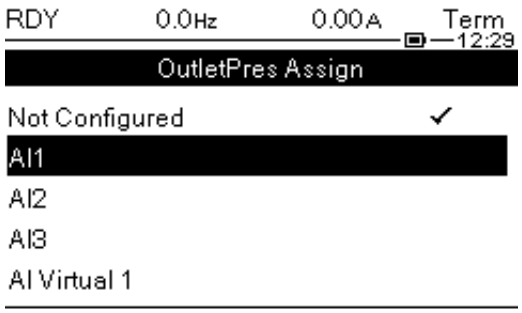
- Select “5.4 Sensors Assignment” and press OK



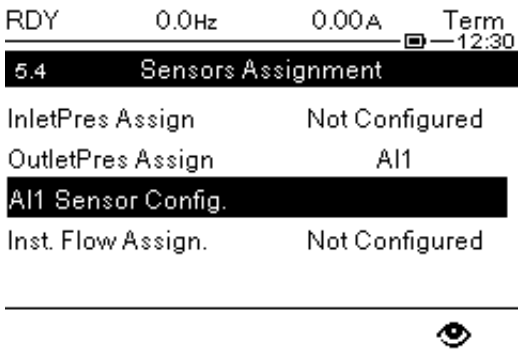
- Select “OutletPres Assign” and press OK



- Select “AI1” for analogue input 1 and press OK

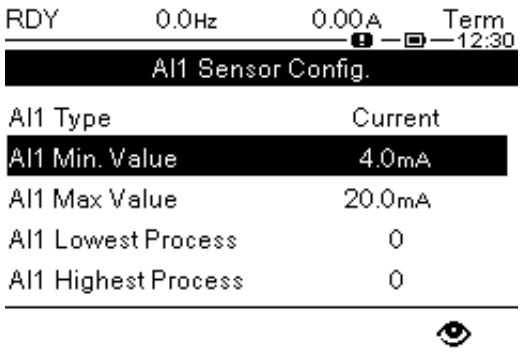


- Once back in the “Sensors Assignment” menu select “AI1 Sensor Config” and press OK

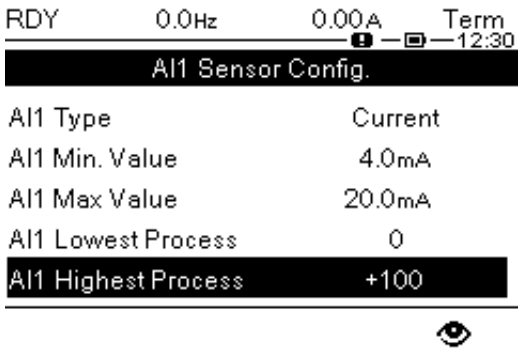


- Select “AI1 Type” and press OK
- Change from Voltage to Current
- Press OK

- Set the minimum feedback value to 4.0mA

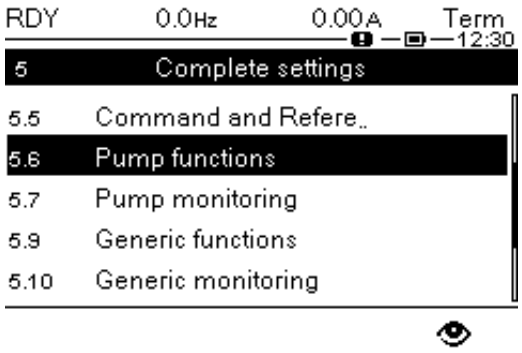


- Increase “Ai1 Highest Process” to +100, press OK
  This is because the system units are 0.1 Bar, therefore 0.1 x 100 = 10 Bar
  We could change the system units to 1 Bar, if this is done Ai1 Highest Process will = 10 (1 x 10 = 10) but for better resolution it is best to have a smaller scaling unit

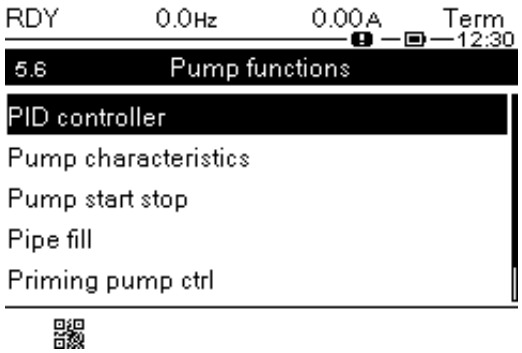


PID Setup

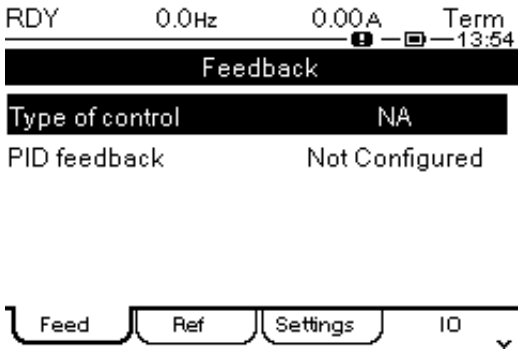
- Press the ESC button twice to return to the Complete settings menu
- Select “5.6 Pump functions” and press OK



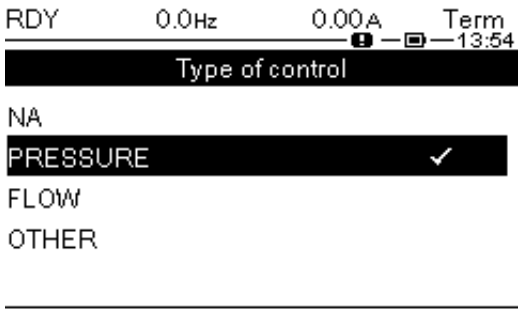
- Select “PID controller” and press OK



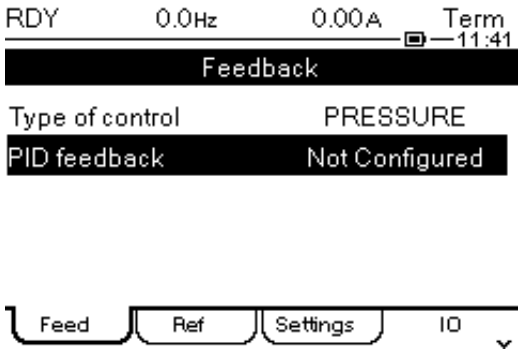
- Select “Type of control” and press OK



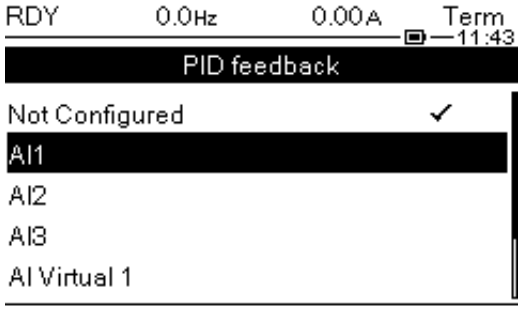
- If “PRESSURE” is not selected (default), highlight and press OK



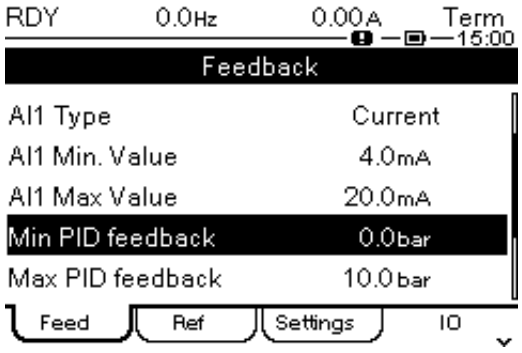
- Select “PID feedback” and press OK



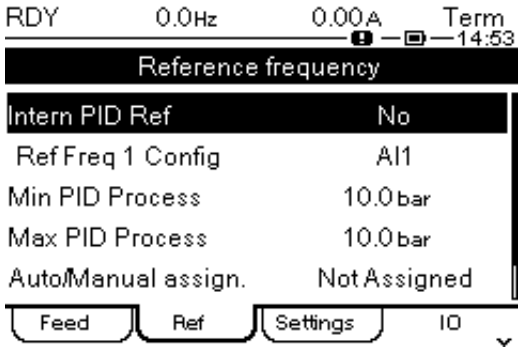
- Form the PID feedback menu, select “AI1” and press OK



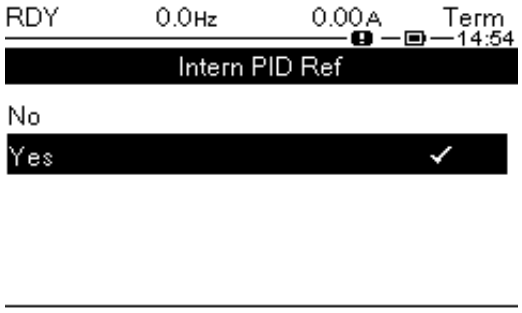
- Change “Min PID feedback” to 0.0 Bar, press OK
- Change “Max PID feedback” to 10.0 Bar, press OK



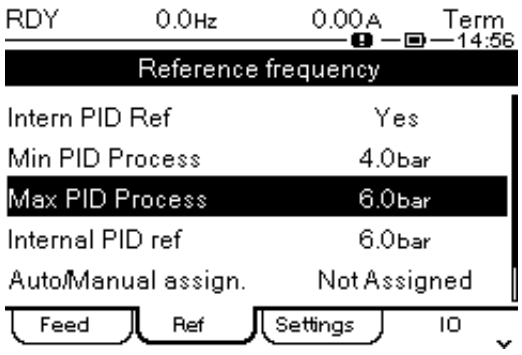
- Press the F2 key for the “Ref” TAB
- Select “Intern PID Ref” press OK



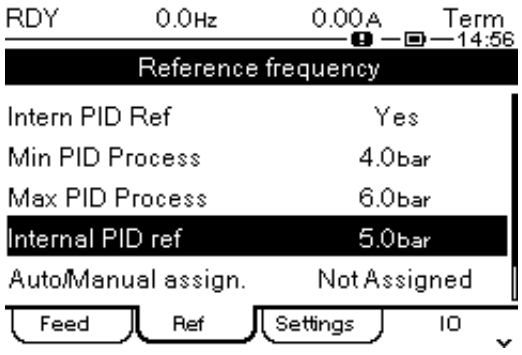
- Select “Yes” press OK



- “Min PID Process” and “Max PID Process” are to ensure the PID set point never falls outside these values. For this application we assume the system has a maximum operating pressure of 6 Bar and we do not wish to operate below 4 Bar.

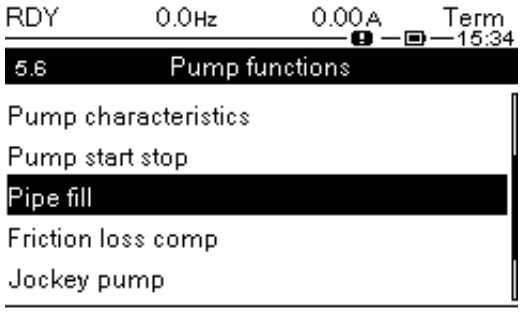


- For this example, we wish to maintain 5.0 Bar. So set “Internal PID ref” to 5.0 Bar

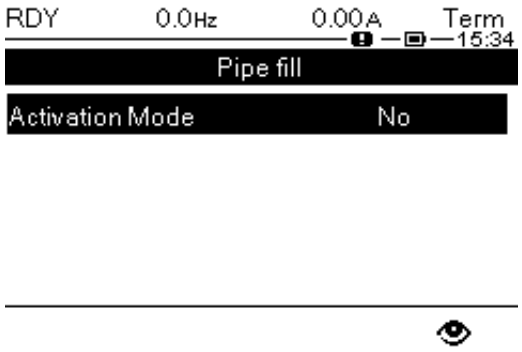


Pipe Fill

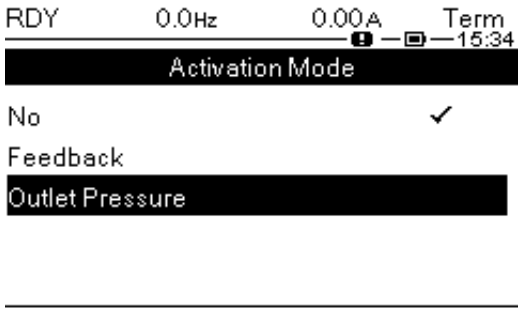
- From the Complete settings menu, select “5.6 Pump functions” press OK
- Select “Pipe fill” press OK



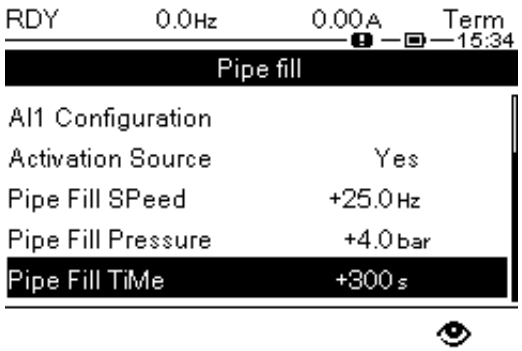
- Select “Activation Mode” press OK



- In the Activation Mode menu select “Outlet Pressure” press OK

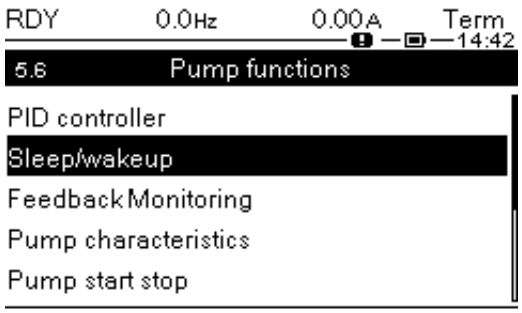


- Once back in the Pipe fill menu change “Pipe Fill Speed” to 25 Hz
- Change “Pipe Fill Pressure” to 4.0 Bar
- Change “Pipe Fill Time” to 300 seconds

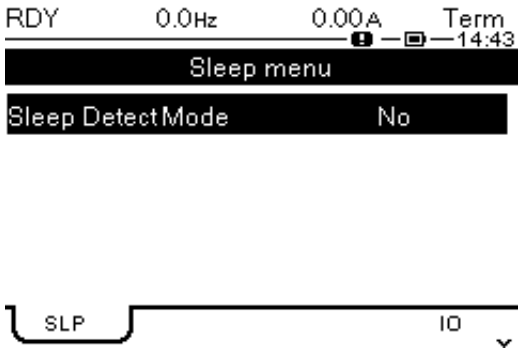


Sleep/Wake Up

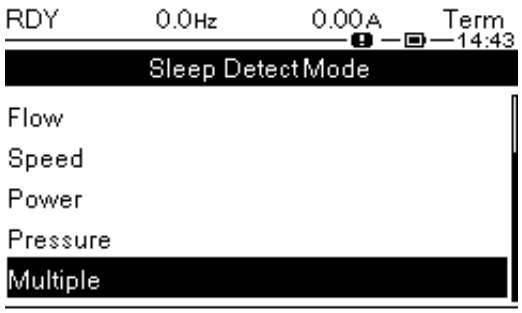
- From the Complete settings menu, select “5.6 Pump functions” press OK
- Select “Sleep/wakeup” press OK



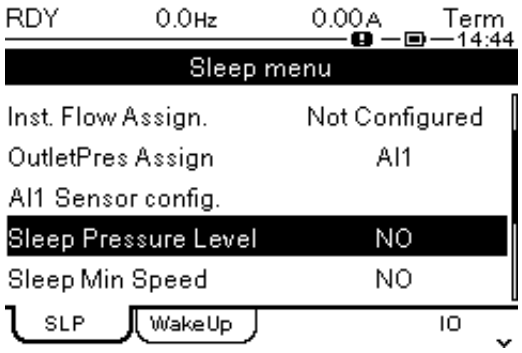
- Once in the Sleep menu, press OK (on Sleep Detect Mode)



- Select “Multiple” and press OK

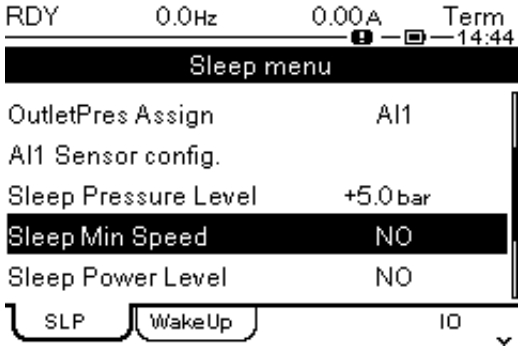


- Once back in the Sleep menu, select “Sleep Pressure Level”, press OK

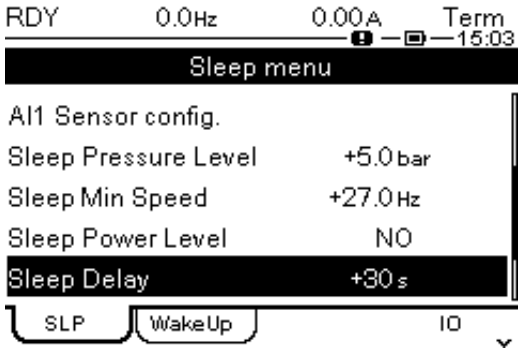


- Increase the pressure level to 5 Bar, press OK

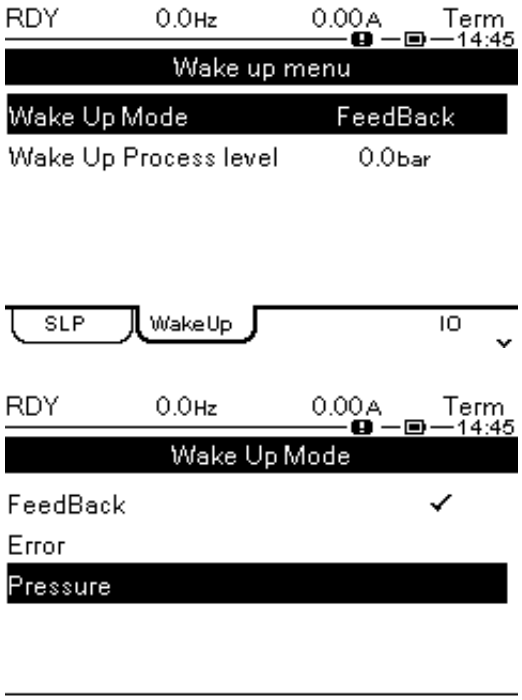
- Once back in the Sleep menu, select “Sleep Min Speed”, press OK



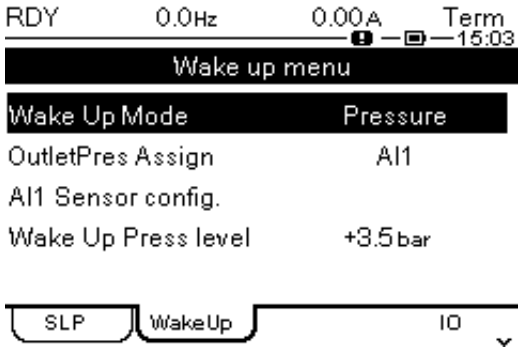
- Increase “Sleep Min Speed” to 27Hz (this parameter must always be more than LSP Low Speed) or the VSD can sit at LSP and never go to sleep because it is not below “Sleep Min Speed”
- Once back in the Sleep menu, select “Sleep Delay”, press OK
- Change to 30 seconds and press OK



- Press the F2 Key “WakeUp”
- Select “Wake Up Mode” press OK
- Change to Pressure – Wake up based on Outlet pressure feedback

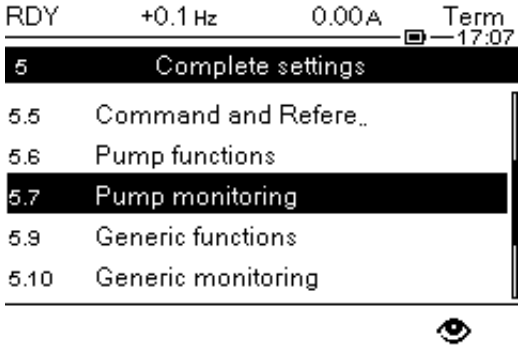


- Once back in the Wake up menu, select “wake Up Press level” press OK
- Change to 3.5 Bar

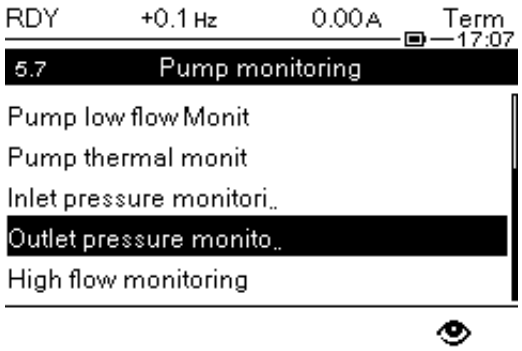


High Pressure Switch

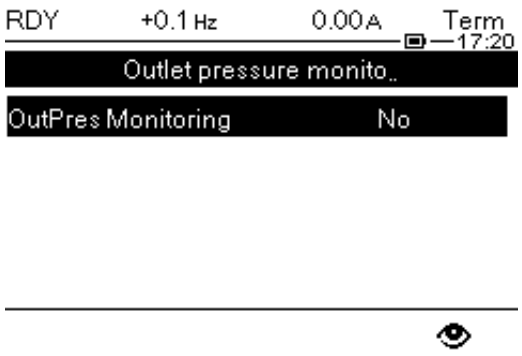
- From the Complete settings menu select “5.7 Pump monitoring” press OK



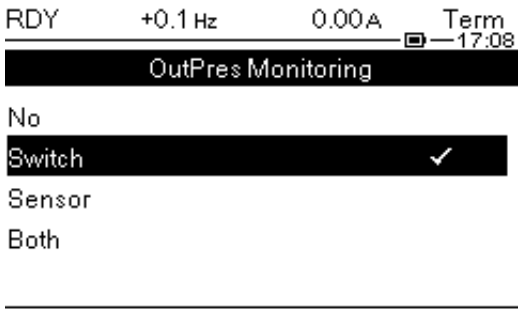
- Select “Outlet pressure monitoring” press OK



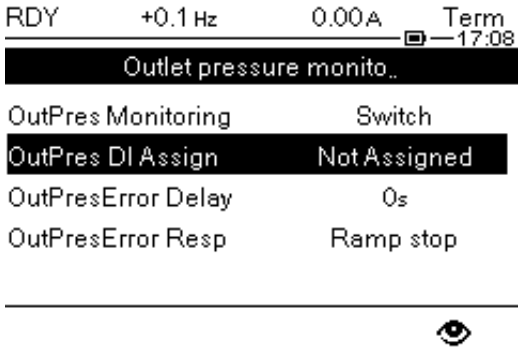
- From the Outlet pressure monitoring menu select “OutPres Monitoring” press OK



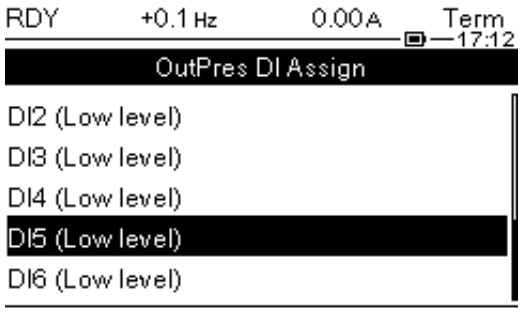
- Select “Switch” press OK



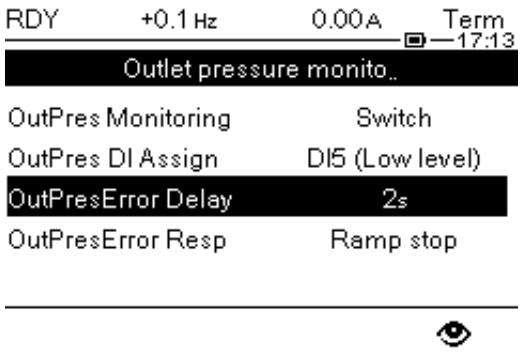
- In the Outlet pressure monitoring menu, select “OutPres DI Assign” press OK



- Select DI5 (Low Level) which means a normally closed fail safe contact

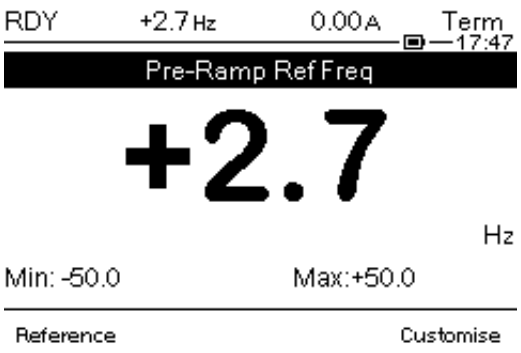


- In the Outlet pressure monitoring menu, select “OutPresError Delay” press OK
- Change to 2 seconds, press OK

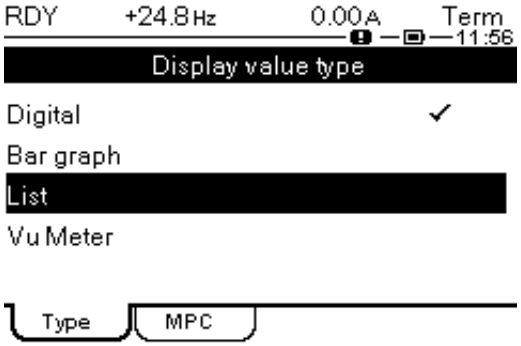


HMI Customisation

- From the Main menu (press the HOME button) press the ESC button once to get to the display/monitoring screen. (Should be similar to image below disregarding the value shown)



- Press the F4 key “Customise”
- Select “List” and press OK
- Press the F2 Key “MPC”



- From here we select all of the parameters we wish to display on the main screen
- For this example, we deselect Pre-Ramp Ref Freq and select the following –
    - Application state (displays if the VSD is in Pipefill, sleep, PID control)
    - Outlet pressure
    - Motor frequency
    - Motor current