Technical Note 074

Motor heating
Using the VFD to pre-heat the motor

In cold or humid installations, the extreme temperatures and/or high humidity can negatively affect the motor life. Internal motor condensation can, over time, cause a motor to fail prematurely. A motor that sits idle over a cold night can experience condensation buildup once the air temperature changes. This moisture inside the motor can cause nuisance VFD faults (i.e. Ground fault/Earth fault trips) or worse, equipment failure. The motor winding heater was the traditional way to maintain the internal motor temperature, preventing condensate within the motor. These heaters increase initial motor costs, lead time, and greatly increase installation costs.

The 580 series drive families have a programable feature to warm the motor while not in operation. The 580 series is made up of the ACH580, ACQ580, and ACS580 drives. Using this VFD feature eliminates hardware from the VFD panel, reduces installation time, and increases motor life. This document explains how to enable and adjust the motor pre-heat function in the drive, as well as the advantages of using the VFD pre-heat motor functionality compared to using a traditional motor winding heater.

Accessing and adjusting the pre-heat motor functionality

The pre-heat motor functionality is accessed on the control panel by selecting the following:

Menu > Parameters > Complete list > 21 Start/stop mode > 21.14 Pre-heating input source

Refer to the control panel screen shots below for step-by-step instructions to access the pre-heat motor functionality. Note the example below is from an ACQ580 drive, the steps are identical for the ACH580 and ACS580 drives.

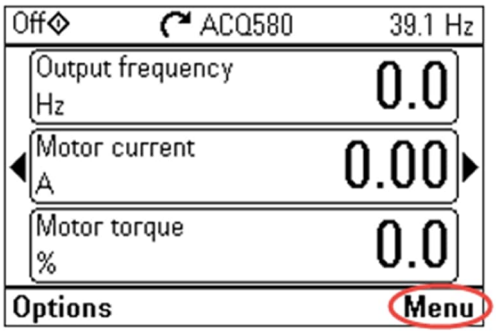

Figure 1

Open Menu

From the Home view, press the right softkey to open the Menu. See Figure 1.

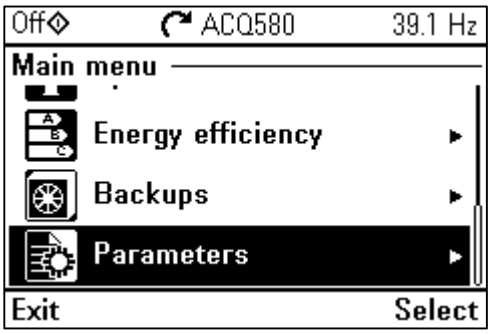

Figure 2

Navigate to Parameters

Press the down arrow key to navigate to Parameters and press the right softkey to select Parameters. See Figure 2.

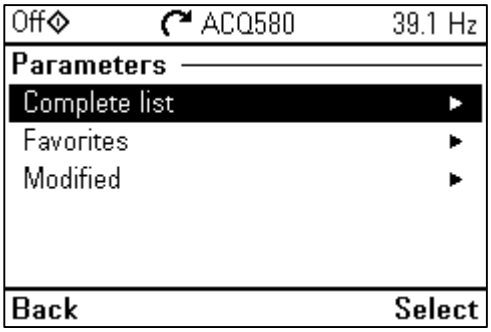

Figure 3

Navigate to Complete list

Press the down arrow key to navigate to Complete list and press the right softkey to select Complete list. See Figure 3.

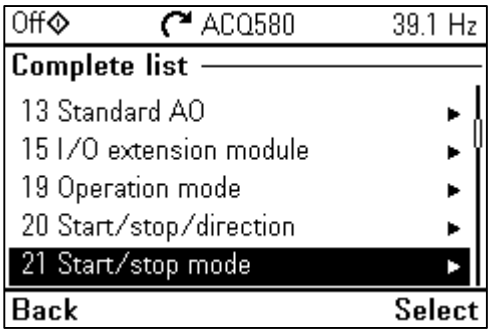

Figure 4

Navigate to 21 Start/stop mode

Press the down arrow key to navigate to 21 Start/stop mode and press the right softkey. See Figure 4.

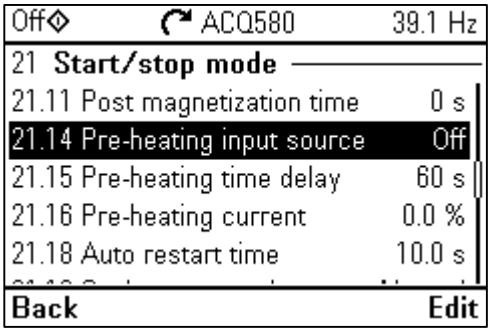

Figure 5

Navigate to 21.14 Pre-heating input source

Press the down arrow key to navigate to 21.14 Pre-heating input source and press the right softkey. See Figure 5.

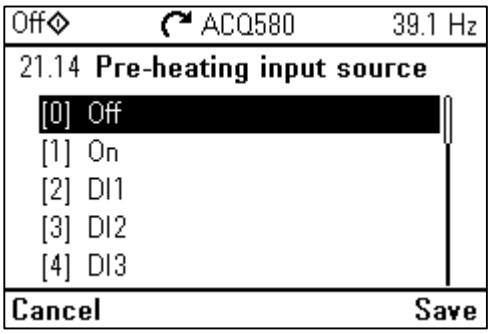

Figure 6

Navigate to [1] (On) or [2] through [19] to select the input source

Press the down arrow key to navigate to [1] (On) or [2] through [19] to select the input source and press the right softkey to save and enable the Pre-heating option. See Figure 6.

Note selecting [1] (On) will automatically turn the pre-heat motor functionality when the motor is not running.

Providing the option to select a different input source from the VFD, allows the pre-heating motor functionality to be controlled by a SCADA or Building Management System (BMS) depending upon the application or operated manually. For example, the pre-heating motor functionality most likely does not need to run during the day when it tends to be the warmest. The SCADA and BMS systems can be setup to turn on the pre-heating motor functionality during only certain times of the year or day to save energy.

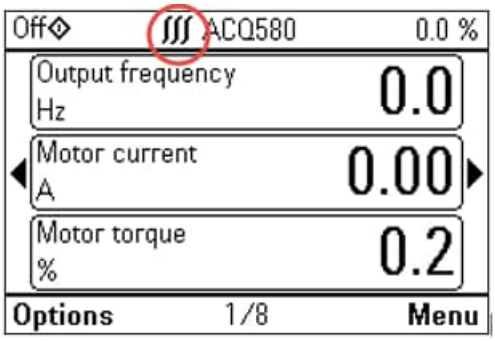

Figure 7

Programming Complete

You have completed the required steps to setup the motor pre-head function in the VFD. There are additional steps on the next page to fine-tune your settings.

The symbol circled in Figure 7 shows the pre-heat functionality is currently in operation.

Optional: Adjusting the Pre-heating time delay

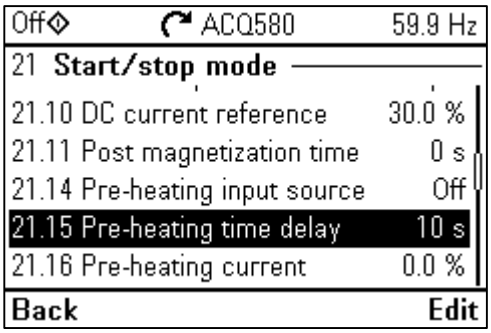

Figure 8

Navigate to 21.15 Pre-heating time delay

Press the down arrow key to navigate to 21.15 Pre-heating time delay and press the right softkey. See Figure 8.

The time delay is used so the motor heater turns on after a period of time. Depending upon the application, a motor may turn on and off several times during an hour in which case the pre-heating motor functionality would not need to be used since the motor would still be warm.

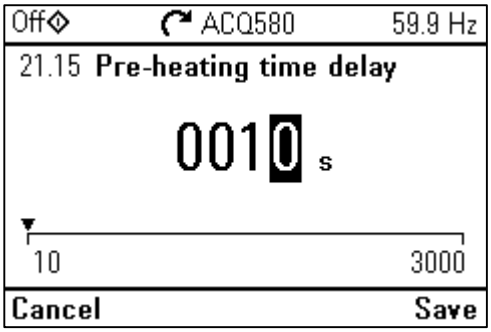

Figure 9

Select Pre-heating time delay between 10 to 3,000 seconds

Press the up and down arrows to select a value between 10 to 3,000 seconds and press the right softkey to save the value. See Figure 9.

Required: Adjusting the Pre-heating power units

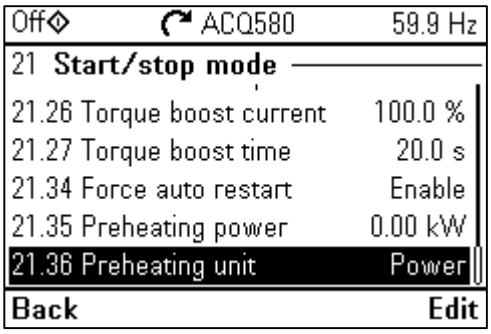

Figure 10

Navigate to 21.36 Preheating unit

Press the down arrow key to navigate to 21.36 Preheating unit and press the right softkey to select 21.36 Preheating unit. See Figure 10.

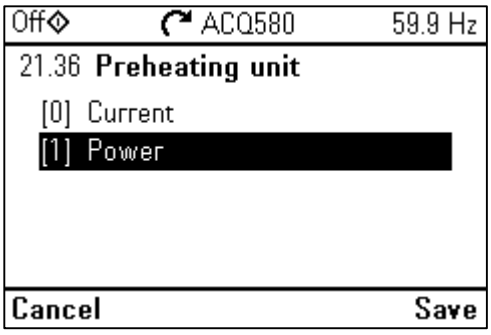

Figure 11

Select Preheating unit

Press the up and down arrows to select [1] Power and press the right softkey to save the value. See Figure 11.

Required: Adjusting the Preheating power

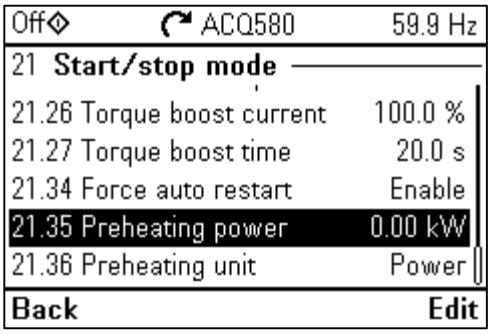

Figure 12

Navigate to 21.35 Preheating power

Press the down arrow key to navigate to 21.35 Preheating power and press the right softkey to select 21.35 Preheating power. See Figure 12.

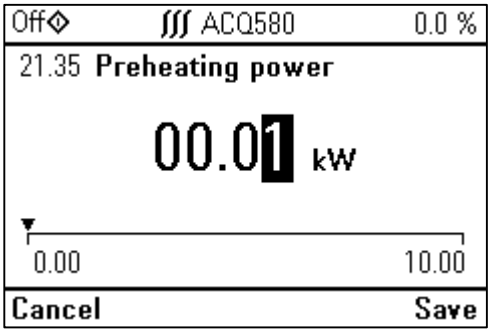

Figure 13

Select Preheating power

Press the up and down arrows to select a heating value. See Figure 13. Note the default value is 0.00 and must be adjusted. The motor manufacturer can provide a heating value in Watts.

Note the pre-heat motor functionality can also be controlled based on a percentage of the nominal motor current (parameter 21.16 Pre-heating current).

Advantages of using the VFD pre-heat functionality

Using the VFD pre-heat motor functionality, will provide cost savings as compared to a special-order motor winding heater. The VFD pre-heat motor functionality can be setup within minutes. Utilizing motor winding heaters increases project costs and delivery time. The layer of logic and wiring must also be coordinated with the electrician and controls contractor, leading to increased installation costs and increased troubleshooting complexity. Figure 14 shows the additional circuitry which is required for a traditional motor winding heater. Additionally, power must be supplied from the VFD panel to the motor heater which leads to increased installation time and costs. The VFD allows for consistent and adjustable heating across the motor through its internal windings not just where the motor heaters are installed.

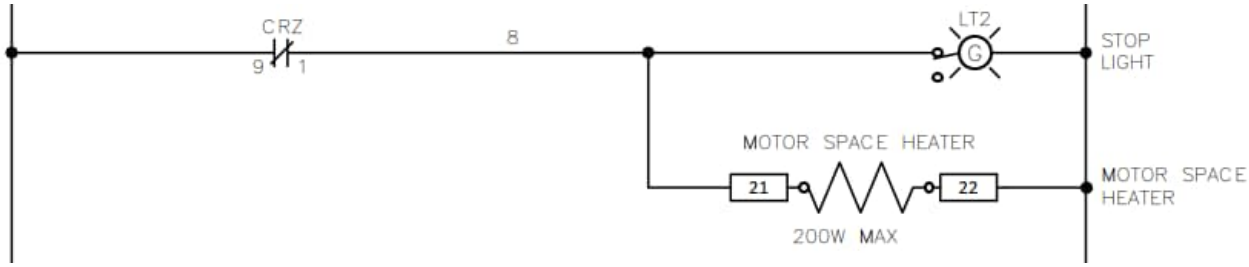

Figure 14

Note using the VFD pre-heat functionality holds the motor shaft in place and does not allow it to rotate. If the motor is not going to run for an extended period and the pre-heat functionality is

running, then motor manufacturers recommend exercising the motor on a routine basis especially if the motor is exposed to vibration. The frequency of exercising the motor is based on the application and how much vibration the motor is subjected to.

In summary, the 580 series drive family's pre-heat option can be used in lieu of a special motor winding heater. Using the VFD pre-heat motor option saves money, delivery time, and installation costs versus the installation of a traditional motor heater. The VFD pre-heat option provides customization by allowing the user to adjust the current sent to the motor for heating along with the ability to adjust the time delay.