

# PowerXL Series Cold Weather Functionality

## Introduction

The Eaton PowerXL Series variable frequency drive has integrated cold weather functionality that will give the drive the ability operate below the lower limit of the ambient rated temperature. The functionality provides a safe and cost effective way to perform warming of both the motor and the drive inside enclosure. The method of executing and setting up this functionality is explained below.

## Cold Weather Functionality Concept

The PowerXL Series Variable Frequency Drive has a parameter group that supply's a selectable AC voltage to the motor at a very low frequency for a desired period of time to allow the drive to warm up in cold environments, it also lowers the temperature fault level to help . This design uses the current draw through the IGBT modules to warm up the unit temperature by sending a 0.5Hz output frequency to the motor. The drives standard low temperature fault point is -10°C which in most applications this is sufficient. In extreme temperature regions that often reach below this point, this can cause a fault, preventing operation of the drive. With the cold weather functionality enabled, the trip point is taken from a -10°C fault level and moves it down to -30°C with an alarm trip point at -20°C. Therefore, the adjustable frequency drive will start the motor in a normal operational mode when the unit temperature is above the -20°C level. If the drives unit temp is between -20°C and -30°C and the drive is stopped, when the run command is given the drive will go into the cold weather warm up feature to enable the motor to start when it reaches -20°C, using the previously mentioned 0.5Hz frequency and a user settable Voltage level.

## Parameter Setup

There are four parameters that are used to perform the cold weather protection functionality with the primary one being the under temperature fault condition setting. These parameters provide a safe way to warm up the drive instead of enabling full voltage output in cold environments. Each of these settings is described in detail below:

- **DG1 - P9.23/DH1 - P6.2.8: Unit Under Temp Protection** – This parameter is used to define the function of the unit under temperature which is the highest drive heat sink temperature taken from the IGBT gate and a thermal temperature sensor in the power board. This parameter comes defaulted as a *Fault* but can be changed to *No Action*, a *Warning*, or *Fault and Coast to a stop*. To use the cold weather warm up feature, this parameter should be left on either one of the *Fault* actions. The *No Action* and *Warning* will allow the drive to start and run up to the set reference when the start command is given. This could potentially damage the capacitors and IGBT module.
- **DG1 - P9.39/DH1 - P6.2.12: Cold Weather Mode** – This parameter is used to enable the cold weather warm up feature when the *Unit Under Temp Protection* is set to one of the fault conditions. With this enabled, it causes the unit temperature trip to be adjusted from -10°C to -30°C. In addition, it activates a warm up sequence when the unit temperature is between -30°C and -20°C. When a run command is given, the output frequency will be set to 0.5 Hz and run for a selectable voltage percentage and time. It will also indicate the drive is in the mode with an *Alarm 90 Cold Weather Warm* in this operational state. Once temperature goes above -20°C, the drive will ramp up to the set reference value. If the temperature does not rise above -20°C in the specified time, the drive will go into a *Fault F13 Under Temp Fault* which can be reset and the sequence could be repeated.



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- DG1 - P9.40/DH1 - P6.2.13: Cold Weather Voltage Level** – This parameter is used to select the percentage of volt-age output the drive will provided at 0.5Hz when in the cold weather warm up mode. This value can be set from 0 to 20% of the motor rated voltage setting in the drive. This value should be set based off the ambient temperature and how quickly the user would like the drive to warm up. A higher voltage will cause more current to flow through the motor heating it up faster, but this also can cause additional heating which can cause increased winding wear over long periods of time. It is recommended that the voltage level be set to the lowest level that will effectively meet the user's application requirements.
- DG1 - P9.41/DH1 - P6.2.14: Cold Weather Time Out** – This parameter is used to select the time limit for the drive to run at the 0.5Hz level at the selected voltage. This time can be set from 0 to 10 minutes, the longer the time the more likely the drive will warm itself up to a starting condition. However, as the time is increased, the motor life may be reduced due to significant heating of the motor windings over long periods of time. It is recommended that the voltage level be set to the lowest level that will effectively meet the user's application requirements.

## Parameter Summary

**PowerXL DG1 Parameter table**

Code	Parameter	Min	Max.	Unit	Default	ID	Note
<b>P9.23</b>	Unit Under Temp Protection	0	3		2	1564	0 = No Action 1 = Warning 2 = Fault 3 = Fault, Coast
<b>P9.39</b>	Cold Weather Mode	0	1		0	2126	0 = No 1 = Yes
<b>P9.40</b>	Cold Weather Volt. Level	0	20.0	%	2.0	2127	
<b>P9.41</b>	Cold Weather Time Out	0	10	min	3	2128	

**PowerXL DH1 Parameter table**

Code	Parameter	Min	Max.	Unit	Default	ID	Note
<b>P6.2.8</b>	Unit Under Temp Protection	0	3		2	1564	0 = No Action 1 = Warning 2 = Fault 3 = Fault, Coast
<b>P6.2.12</b>	Cold Weather Mode	0	1		0	2126	0 = No 1 = Yes
<b>P6.2.13</b>	Cold Weather Volt. Level	0	20.0	%	2.0	2127	
<b>P6.2.14</b>	Cold Weather Time Out	0	10	min	3	2128	

## Override Mode

If the drive is not able to start in the most extreme ambient conditions and it is required to run, then you go to the Unit Under temperature protection and set it to No Action or Warning. Note that this will change the selection permanently until it is reversed, therefore it is suggested to switch this protection back to a fault once the temperature value has risen above the drive rated level of -10°C.

## Additional Help

In the US or Canada: please contact the Technical Resource Center at 1-877-ETN-CARE or 1-877-326-2273 option 2, option 6.

All other supporting documentation is located on the Eaton web site at [www.eaton.com/Drives](http://www.eaton.com/Drives)

