Al Conrad <aconrad@lbto.org>

Inrush current iLocater Cryomech CP2850 + PT90 [#48081]

1 message

James Riedl <jriedl@lbto.org> Wed, Feb 21, 2024 at 11:58 AM
To: Al Conrad <aconrad@lbto.org>, "Crass, Jonathan" <crass.7@osu.edu>, Mark Smithwright <msmithwright@lbto.org>, Dan Rapoza <drapoza@lbto.org>, John Prothro <jprothro@lbto.org>, Daniel Pappalardo <pappalardo.1@osu.edu>, David Carroll <dcarroll@lbto.org>, demars@arizona.edu

---------- Forwarded message ---------
From: **Andrew Rathbone** <support@cryomech.com>
Date: Mon, Feb 27, 2023, 11:44 AM
Subject: Re: UPS requirement for CP2850 + PT90 [#48081]
To: <jriedl@lbto.org>

Hi James,

It sounds to me that you are on the right lines with your assumptions but there are a few quirks regarding our system, therefore some of this doesn't apply.

As far as inrush goes as our systems doesn't really see a tough load until it gets up and running, so it only needs to overcome the mass of its own rotor and an unloaded compressor scroll set.

This means that there is 5 times current inrush for the first few cycles, which is less than 100 milli seconds and then it drops back down to single digit amps which rise up to the nominal running current over the next few seconds.

The system is wired permanently in Wye and can't be changed as the connections are hermetically sealed.
Soft started could be an option, but you bring up a good point regarding the turn on time.

Regards
Andrew

> On Mon, 27 Feb at 9:42 AM , James Riedl <jriedl@lbto.org> wrote:
> Greetings, I'm the chief engineer at LBT Observatory and working on a requirement from Notre Dame (iLocater program) using at least one your cryocoolers. My background is in mixed signal electronic design and unfortunately not power design. The iLocater requirement involves maintaining cryocooler operation during the numerous power fluctuations we have at the observatory. We're planning on using 208V three phase power, but have the option of 480V . We haven't defined the UPS capacity and imagine that we could potentially size something to last at least 10-15 minutes to help us weather short duration interruptions and other spurious events.
>
> I'm reaching out to you folks because I don't have information on the inner workings of your system. I imagine the design challenge for a UPS selection is inrush current at startup. A typical UPS might be able to handle a 1.5x overload for a minute, but is typically not equipped to handle the inrush of a motor unless the UPS is significantly oversized. We're also likely to be in a derated environment. Our application is at 10,200 feet altitude and we have less convection cooling available for UPS at sea level.
>
> This is my generic understanding about three phase motors or motors that you might have in your system
> :
>
> 1.) Inrush can be 8-10 times the normal running current during the first AC cycle
> 2.) Subsequent startup can be 4-7 times the normal running current until the motor achieves final

speed
3.) Motor doesn't like anything but sine wave power
4.) Using a VFD might be out of the question if the motors' shafts aren't grounded to prevent EDM corrosion on the bearings.
5.) Terrible power factor ~ 0.1 at startup, but will improve at terminal RPM around 0.8

There are a few external ways to reduce inrush current include and some might have adverse issues with harmonics. Using one of these approaches might not be straightforward. In order to provide the current regulation at startup, I believe these approaches assume we just have a motor and starting it when we say "go". I think your system has a remote start, but it might not start at that moment due to interlocks or something else. Anyway, here are some ways to reduce the inrush (if you're not doing it already).

1.) Wye Delta - simple contactor arrangement that feeds a Wye power for a short duration (reduction of inrush current), then a timer switches the power to Delta
2.) Soft starter
3.) Speed drive or VFD

Any help or advice you could provide in selecting a UPS for this application would help.

Thanks, James Riedl
(520) 419-5582

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