

1 Description

Digistart D3 motor overload protection is provided by a second order thermal model. This highly advanced protection method combines co-dependent thermal modelling of the motor windings and the motor body (the iron case), with allowance for different cooling rates when the motor is running and when it is off, at an assumed ambient temperature of 40° C. Thermal modelling is active in all modes of operation, including while the motor is not running, and the state of the thermal model is stored in memory even if control voltage is removed from the starter.

Motor temperature is calculated based on the measured motor current and the programmed parameter settings for the motor overload protection. The Digistart D3 provides optimal motor protection if accurate data is programmed into the motor settings. The thermal model allows the motor to operate to its full thermal capability, allowing for periodic overloads without nuisance tripping.

2 Motor Overload Protection Settings

Pr **1A** to **1D** are used to thermally model the motor when using the primary motor profile (start/stop Pr **2A** to **2N**).

Pr **11A** to **11E** are used to thermally model the motor when using the secondary motor profile (start/stop Pr **12A** to **12N**).

To make full use of the Digistart D3's motor overload protection, the following information is required:

- Motor nameplate full load current (FLC). This is programmed into Pr **1A** and **11A** (*Motor FLC*).
- Motor locked rotor time. This is the maximum time the motor can sustain locked rotor current at full line voltage from cold before the motor's thermal capacity is exceeded. This is programmed into Pr **1C** and **11D** (*Locked Rotor Time*).
- Motor locked rotor current (LRC) at full line voltage, as a percentage of the motor full load current. This is programmed into Pr **1B** and **11C** (*Locked Rotor Current*).
- Motor service factor (MSF). This indicates the maximum level of current for the motor to continuously operate without exceeding its thermal capability. This is programmed into Pr **1D** and **11E** (*Motor Service Factor*).

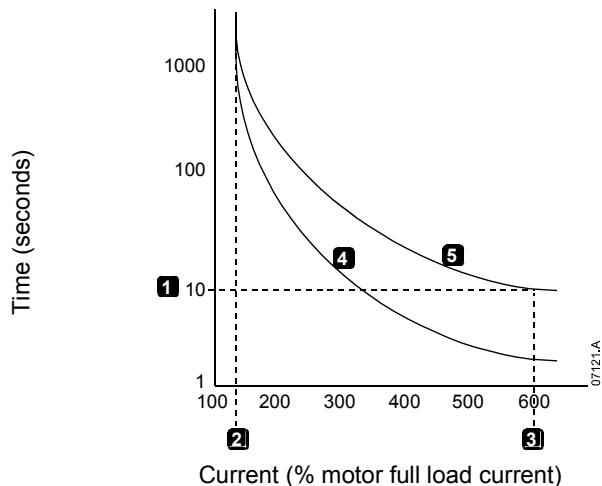
If accurate information for the motor is not available, the default settings for locked rotor time, LRC and MSF will be sufficient for most applications.



NOTE

If you experience regular motor overload trips, increase the locked rotor time setting (Pr **1C** and **11D**) by 5 seconds. In most cases this will eliminate the problem.

The following curve illustrates the motor overload protection provided by the Digistart D3 primary motor set with default settings for Pr **1C** to **1D**.



- 1: Locked rotor time (Pr **1C**)
- 2: Motor service factor (Pr **1D**)
- 3: Locked rotor current (Pr **1B**)
- 4: Overload protection curve (hot)
- 5: Overload protection curve (cold)

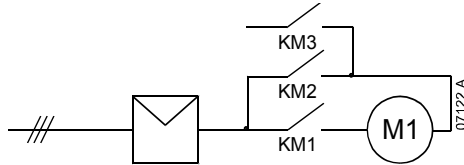
3 Applications

The Digistart D3 can be programmed with two motor profiles using the primary and secondary motor settings. This can be used to configure the Digistart D3 for use with two separate motors, or to provide two different control profiles for a single motor.

3.1 Single motor overload protection

The Digistart D3 can control a two speed motor where the high speed and low speed motor full load currents have a 2:1 ratio. A starter controlling a single motor uses a single thermal model (M1) for motor overload protection. To select the single thermal model, program Pr **11B Dual Thermal Model** to single.

Two speed motor application: Single thermal model overload protection using primary and secondary motor sets

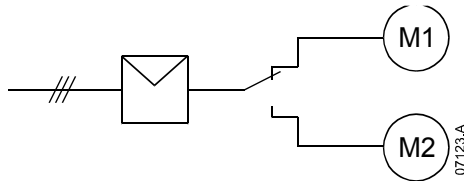


When using the primary motor set, the Digistart D3 controls the motor using the Start/Stop Modes-1 parameter group and uses the parameters in Primary Motor Set for the thermal model (M1). When using the secondary motor set, the secondary motor is controlled using the parameters in Start/Stop Modes-2 and the thermal model (M1) is based on the parameters in Secondary Motor Set.

3.2 Dual motor overload protection

The Digistart D3 can control two separate motors, for example in a duty/standby pump arrangement. A starter controlling two separate motors uses two thermal models (M1 and M2) for motor overload protection. To select dual thermal modelling, program Pr **11B Dual Thermal Model** to dual.

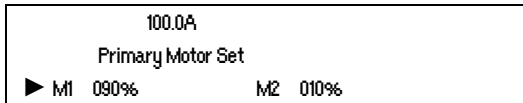
Dual motor application: Dual thermal model overload protection using primary and secondary motor sets



When using the primary motor set, the Digistart D3 controls the primary motor using the Start/Stop Modes-1 parameter group and uses the parameters in Primary Motor Set for the thermal model (M1). When using the secondary motor set, the secondary motor is controlled using the parameters in Start/Stop Modes-2 and the thermal model (M2) is based on the parameters in Secondary Motor Set.

3.3 Temperature screen

The temperature screen shows the following information:



The top line shows the level of current for the motor that is running.

The second line shows whether the motor is being operated using the primary or secondary motor set.

The third line shows the state of both motor thermal models. The active thermal model is indicated by an arrow (▶). If Pr **11B Dual Thermal Model** is set to single, the secondary thermal model (M2) will always be 000%.