EMERSON
Industrial Automation

Application Note
CTAN #227

The Application Note is pertinent to the Unidrive SP Family

Understanding
Heavy Duty vs. Normal Duty Ratings

This application note will attempt to clarify the heavy duty vs. normal duty current ratings of the Unidrive SP and how they affect the current limit settings (#4.05, #4.06 and #4.07).

In the Unidrive SP User Guide, under drive ratings (section #2) each drive model is given two maximum continuous current ratings; I_H (heavy duty) and I_N (normal duty). The maximum allowable values in the current limit parameters **#4.05**, **#4.06** and **#4.07** for these two ratings (i.e. motor rated current equals drive rated current) are pretty straight forward;

In general, the Unidrive SP heavy duty rating is basically the same as the constant torque ratings in the Unidrive Classic and the normal duty rating is basically the same as the variable torque rating in the Classic. The only difference is that there is that there are not discrete units for constant torque and variable torque as there was with the Unidrive Classic.

Open Loop

I_H → #4.05 = 165%
#4.06 = 165%
#4.07 = 165%

I_N → #4.05 = 110%
#4.06 = 110%
#4.07 = 110%

Closed Loop / Servo

I_H → #4.05 = 175%
#4.06 = 175%
#4.07 = 175%

I_N → #4.05 = 110%
#4.06 = 110%
#4.07 = 110%

If the motor current is greater than the heavy duty maximum continuous current rating (by any amount) then the "drive" assumes that it has a "**Normal Duty**" rating and the maximum over load will be based on 1.10 times the normal duty continuous current rating. The following equations can be used to calculate the maximum allowable values in the current limit parameters **#4.05**, **#4.06** and **#4.07.**

FLA = Motor Full Load amps PF = motor power Factor

#4.05, **#4.06** and **#4.07** = $\frac{(I_N) \times (1.10) \times 100}{(FLA) \times (PF)}$ **Eq #1 (All Modes)**

OR

#4.05, **#4.06** and **#4.07** = $\frac{(I_H) \times (1.50) \times 100}{(FLA) \times (PF)}$ **Eq #2 (Open Loop)**

OR

#4.05, **#4.06** and **#4.07** = $\frac{(I_H) \times (1.75) \times 100}{(FLA) \times (PF)}$ **Eq #3 (Closed Loop /Servo)**

Examples:

Drive Size – SP1405-LED

Maximum Continuous Normal Duty Amps = 8.9 **(I_N)**
Maximum Continuous Heavy Duty Amps = 7.6 **(I_H)**

Open Loop

#1 – Motor - **7.5** amp induction motor, pf = 0.88 drive in **open loop**

Since the motor current (7amps) is less than the heavy duty rating of the drive (7.6amps) and the drive is in open loop mode Eq #2 is used.

#4.05, **#4.06** and **#4.07** = $\frac{(7.6) \times (1.50) \times 100}{(7.5) \times (0.88)}$ = **172.7%**

#2 – Motor - **7.7** amp induction motor, pf = 0.88 drive in **open loop**

Since the motor current (7.7 amps) is greater than the heavy-duty rating of the drive (7.6amps) and the drive is in open loop mode Eq #1 is used.

#4.05, **#4.06** and **#4.07** = $\frac{(8.9) \times (1.10) \times 100}{(7.7) \times (0.88)}$ = **144.5%**

Closed Loop Vector

#3 – Motor - **7.5** amp induction motor, pf = 0.88 drive in **closed loop vector**

Since the motor current (7.5 amps) is less than the heavy-duty rating of the drive (7.6amps) and the drive is in closed loop mode Eq #3 is used.

#4.05, **#4.06** and **#4.07** = $\frac{(7.6) \times (1.75) \times 100}{(7.5) \times (0.88)}$ = **201.5%**

#4 – Motor - **7.7** amp induction motor, pf = 0.88 drive in **closed loop vector**

Since the motor current (7.7 amps) is greater than the heavy-duty rating of the drive (7.6amps) and the drive is in closed loop mode Eq #1 is used.

#4.05, **#4.06** and **#4.07** = $\frac{(8.9) \times (1.10) \times 100}{(7.7) \times (0.88)}$ = **144.5%**

Closed Loop Servo

#5 – Motor - **7.5** amp servomotor, drive in **closed loop servo**

Since the motor current (7.5 amps) is less than the heavy-duty rating of the drive (7.6amps) and the drive is in closed loop mode Eq #3 is used.

#4.05, **#4.06** and **#4.07** = $\frac{(7.6) \times (1.75) \times 100}{(7.5) \times (1.0)}$ = **177.3%**

#6 – Motor - **7.7** amp servomotor, drive in **closed loop servo**

Since the motor current (7.7 amps) is greater than the heavy-duty rating of the drive (7.6amps) and the drive is in closed loop mode Eq #1 is used.

#4.05, **#4.06** and **#4.07** = $\frac{(8.9) \times (1.10) \times 100}{(7.7) \times (1.0)}$ = **127.1%**

From all of the examples above, it can be seen that a 200 milliamp difference in motor current can make a tremendous difference in the available overload current / torque.

Questions: Ask the author ??
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