

## For the S300 and/or S600 Drives: non-Brake application note: ADDENDUM

### Category-1: APPLICATION of Motors

**'all motion must stop before the removal of power' !**

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● It is desirable for most applications to design for category-1 (all motion must stop before the removal of DC bus power) 'with or without' a brake over category-0 (removal of DC bus power regardless of the status of any motion being accomplished by that axis). Only the machine designer/OEM/USER can determine if category-0 is as safe, or a requirement, due to some exception within the process that does not allow for the option of category-1.

**Category-1** - 'all motion must stop before the removal of power'; 'removal of power' is for the 3-phase going to the drive to develop the DC bus, NOT the 24 VDC logic supply; and make sure:

#### 24 VDC logic supply is maintained

**MBRAKE=0** - dis-ables drive brake functions.

**Tbrake0** = n/a

**Tbrake** = n/a

**ACTFAULT=1** - if a fault occurs, an Emergency Stop procedure is initiated. (Consult: DECstop).

**EMRGTO** = x - set x to some minimum time - default [5000mSec] is to long for most applications.

•EMRGTO defines <sup>1</sup> the emergency time out for the ACTFAULT=1 and STOPMODE=1 operations.

**DECDIS**= x (mSec) - default [20mSec] - should be set to the minimum time that the axis can be stopped without exceeding the maximum capability of the weakest part in the drive transmission and/or Ipeak for the time available.

**VELO**= x - this number should be as low as possible, even 1 rpm, but needs to/should be less than 3% of maximum application speed.

**STOPmode** =1 - disables the output stage by decelerating the motor to '0rpm' utilizing the defined ramp set by 'DECDIS'; the output stage is disabled after the velocity falls below the absolute value(abs) threshold: 'VELO'. (consult: DECDIS).

**DECStop**= x (mSec) - should be set to the minimum time that the axis can be stopped in, without exceeding the maximum capability of the weakest part in the drive transmission and/or Ipeak for the time available. Normally set to the same value as DECDIS.

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If for some reason it is undesirable to have an E-Stop wired into the Hardware-Enable, one can notify the drive of an E-Stop condition (that an E-Stop is present) by the utilization of an Input: x with the mode (INxMODE=27) for that specific Input: x.

**INxMODE=27** or equivalent - utilize one of the Inputs to change state when the E-stop button is engaged;

mode: '27' defines an E-stop button is engaged when a LOW input signal is presented to Input: 'x'.

In addition, an Output: y can be utilized to present a signal back to a controller, operator panel, or other, for the control/disengagement of the 3-phase contactor by setting the mode (**0yMODE=1**) of the specific output: y, that motion has stopped within the speed/velocity set by **0yTRIG = z**.

**●●●● 3-phase breaker to disengage:**

**0xMODE=1** output: 'x' will have a high signal out as long as the motor velocity is below the absolute value(abs) of 01TRIG; output: 'x' will become low again if  $\text{abs}(V) > \text{abs}(01\text{TRIG}) + (0.01 * \text{abs}(\text{MSPEED}))$ .

**0xTRIG = z** - this number should be as low as possible, even 1 rpm, but needs to/should be less than 3% of maximum application speed; set it  $\leq \text{VEL0}$ , or some external time delay requirement to make sure all motion has stopped before the removal of the 3-phase to the drive.

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**Notations:**

●●●●● These variable settings will cover E-stop, and the removal of the enable line when an axis is moving, and faults within the drive; if the velocity reduction to ~0rpm fails the power stage will be disabled after the set EMRGTO time has lapsed.

The values set above engage the brake after a set time delay after the motor has gone below the value of VEL0 and the 3-phase breaker will disengage power after 0xTRIG.

After an E-Stop/fault one will need to clear faults by an input, or serial communication, or cycle 24VDC logic power.

**For time diagrams:**

Reference: Stop and Emergency Stop Application Note: Section: III.1 and/or go to the *Table of contents* of the appropriate Installation manual (S300, S601-S620, or S640/S670) and refer to the page/pages entitled: *Control for motor-holding brake*.

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<sup>1</sup> After a ACTFAULT (drive error) or STOPMODE (power stage enable) event, the drive tries to reduce the velocity to zero. If this fails, the power stage will be disabled after the set EMRGTO time has lapsed. This condition may happen in the event of a run away where we no longer have control over the amplifier during the [desired] controlled shut down.