

1. Application note description

This application note describes how to compute and change the current limit / run current parameter.

The **current limit** is an user definable parameter and represents the maximum allowed current reference used by the drive to control the motor.

The current limit value is set during the setup phase, through the "Drive Setup" dialog. Considering its purpose, it should be set higher than the motor nominal current, to allow high dynamic movements, but slightly lower than the motor peak current.

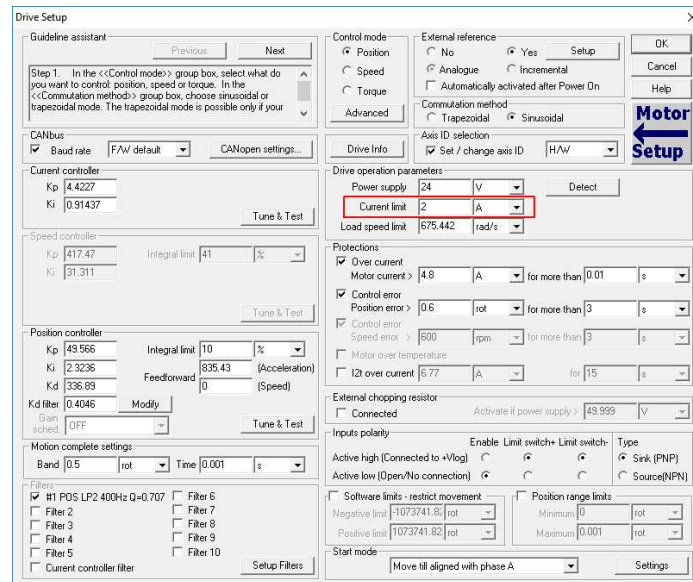


Figure 1. Current limit setting, through the "Drive Setup" dialogue

The current limit parameter is used in case of the DC brushed and brushless motors and also for closed loop step motors. In case of the open loop step motors, the current used by the drive to control the motor is constant and equal with the value of the **run current** parameter.

The "run current" parameter is set during the setup, through the "Drive Setup" dialog. Its value is usually set equal with the motor nominal current.

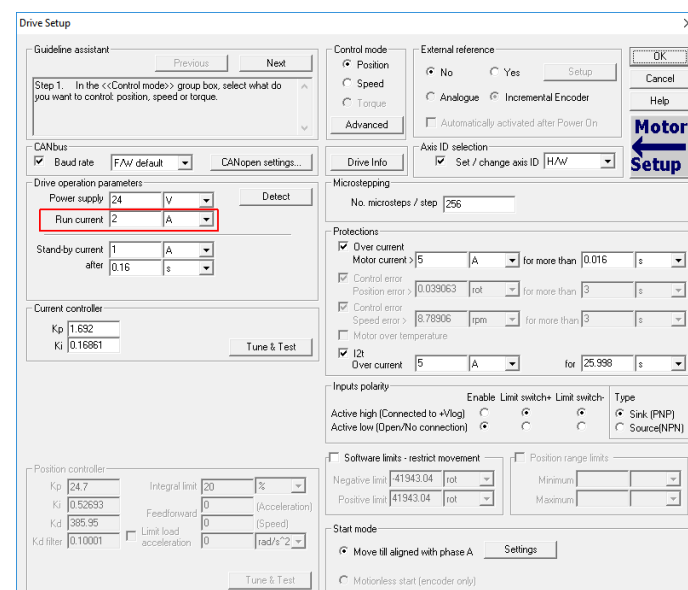


Figure 2. Run current setting, through the "Drive Setup" dialogue

2. On the fly changing of current limit parameter

In some applications, it is required to change the current limit at run-time (during the TML program execution). This can be done through the "SATS" and "SATP" parameters, depending on the active control loops.

When the control structure is based on the Current and Position loops, the current limit parameter value can be changed through "SATS" and "SATP" parameters as follows:

$$\begin{aligned} \text{SATS} &= 32767 - \text{New_Current_Limit [IU]} \\ \text{SATP} &= \text{SATS} \end{aligned}$$

In any other case, the current limit parameter value will be modified only through "SATS" parameter, using the relation below.

$$\text{SATS} = 32767 - \text{New_Current_Limit [IU]}$$

The "New_Current_Limit" variable represents the desired current limit value (in drive internal units) and is computed using the following formula:

$$\text{New_Current_Limit [IU]} = \text{New_Current_limit [A]} * 65520 / (2 * I_{\text{peak}} [\text{A}])$$

where:

- "New_Current_Limit [A]" is the desired current limit value, in Amperes;
- "I_{peak}" is the drive peak current, in Amperes. This value is drive dependent and can be seen in the "Drive Info" dialogue that can be opened from the "Drive Setup" window:

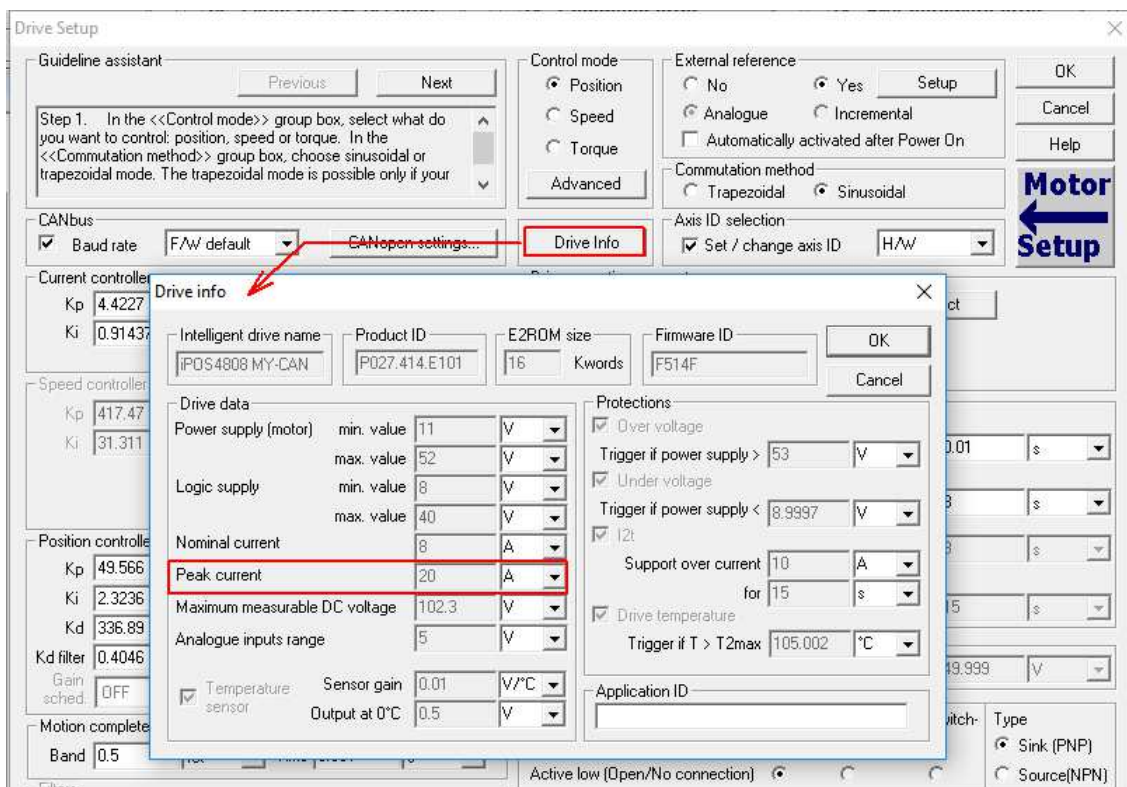


Figure 3. Drive Info dialog

Example

While the actual change of the parameter is rather simple, next pages present a complete example that shows not only how to change the limits but also how to easily test these changes.

Since the motor current (torque) command is tuning dependent and based on the velocity or position error, the current limit will be reached only in certain cases – most often when the load is driven against mechanical limit. The following example is designed to simulate a similar situation – the motor is asked to hold position, but it will be deviated from outside (by hand). The higher the deviation (position error) the bigger will be the current response of the drive in an effort to eliminate the error. In this way, given enough force we can get the drive to run into the current limit.

- **Step 1:** Run a relative trapezoidal position profile with a null position increment (CPOS = 0 rot), to force the motor to hold the current position.

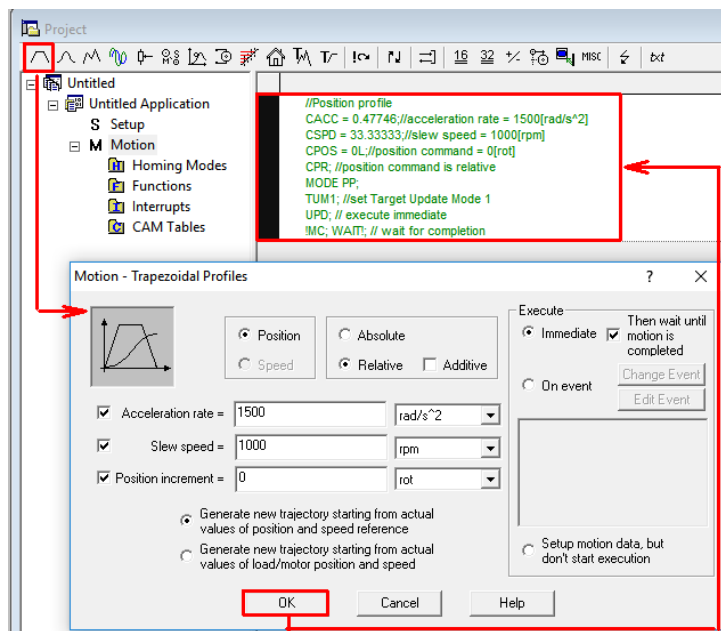


Figure 4. How to insert a relative position profile with CPOS = 0 rot

- **Step 2:** While the motor holds the position, rotate the motor shaft manually and check the “Motor Current” in the “1_Motion_Status” control panel. It will reach the current limit when the deviation on the motor is big enough.

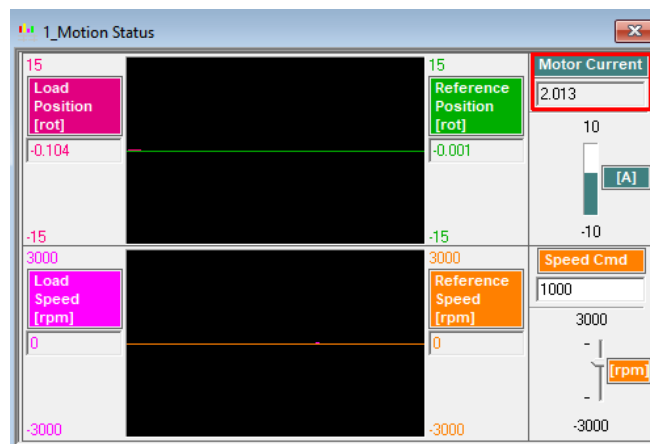


Figure 5. Check the current limit value

The “1_Motion_Status” control panel can be opened from the “View” pop-up menu.

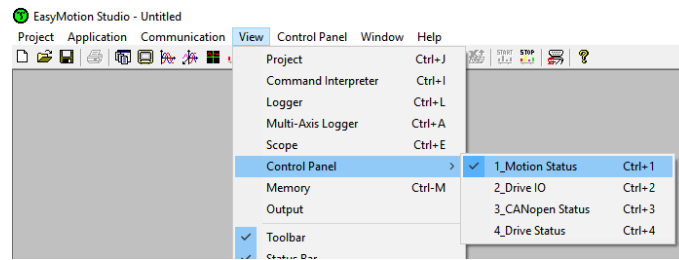


Figure 6. Open the “Motion Status” control panel

To start the control panel, press the right click while the mouse pointer is over the control panel surface and select the start option.

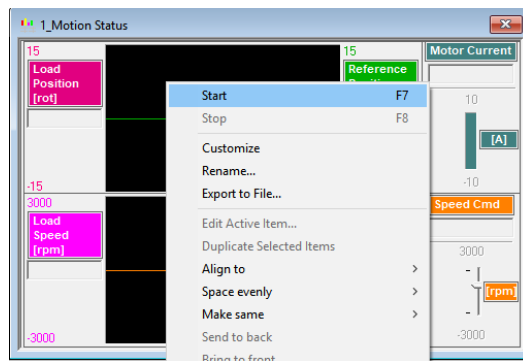


Figure 7. Start the “Motion Status” control panel

Remark: When the motor shaft is manually moved, the “Control Error” protection may be triggered (depending on how much the position error increases). As the default behaviour of any protection is to disable the axis, it can be deactivated from the “Drive Setup” dialog.

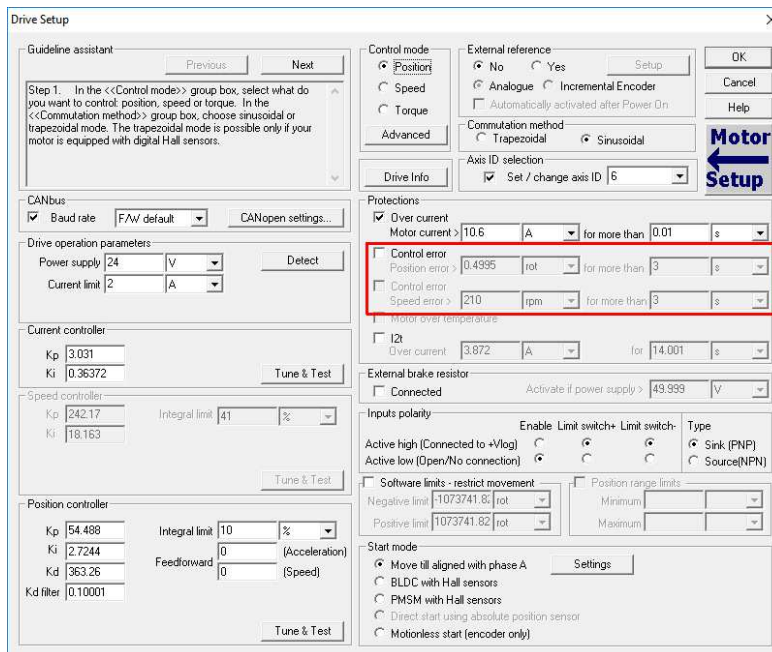


Figure 7. Disable the “Control Error” protection

After the “Control Error” is disabled, the new setup needs to be downloaded to the drive and the application must be run again.

- **Step 3:** Check the SATS and SATP initial values, compute the new SATS and SATP values and set the current limit value to 1 A.

For this example an iPOS4808 MY CAN drive was used. This drive has a peak current of 20A.

$$\text{New_Current_Limit [IU]} = 1 \text{ [A]} * 65520 / (2 * 20 \text{ [A]}) = 1638 \text{ IU}$$

$$\text{SATS} = 32767 - 1638 \text{ [IU]} = 31129 \text{ IU}$$

$$\text{SATP} = 31129 \text{ IU}$$

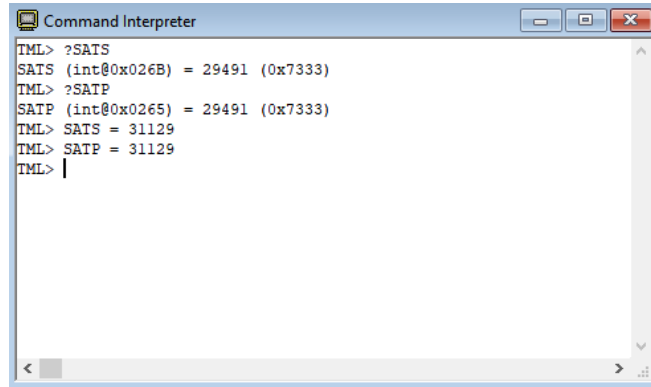


Figure 8. Check the SATS and SATP values and change the current limit to 1 A

Remark: The “Command Interpreter” window can be opened from the “View” pop-up menu in EasyMotion Studio.

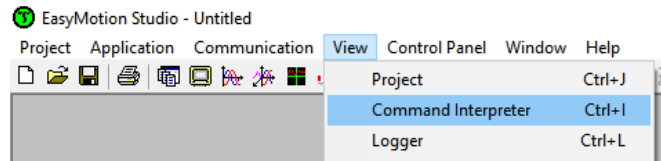


Figure 9. Open the command interpreter dialogue

- **Step 4:** Rotate the motor shaft manually again and watch the “Motor Current, using the same control panel.

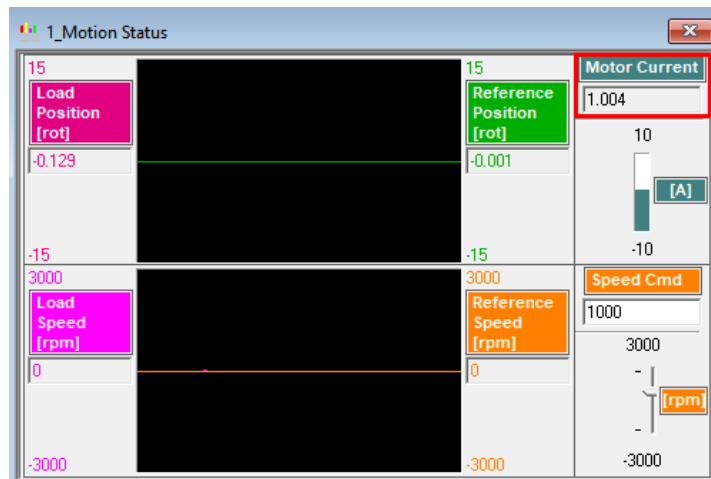


Figure 9. Check the new current limit value

This time the maximum current that the drive will apply to the motor will be around 1A (the “Current Limit”).

3. On the fly changing of run current parameter

As mentioned, in case of stepper motors driven in open loop, the current used by the drive to control the motor is constant. It is set during the setup phase, through the **run current** parameter in the “Drive Setup” dialog.

The run current parameter can be also changed at run-time, through the “**IDRSTEP**” parameter.

$$\text{IDRSTEP} = \text{New_Run_Current_value [A]} * 65520 / (2 * I_{\text{peak}} [\text{A}])$$

where “I_{peak}” is the drive peak current (see the “Drive Info” dialog in the previous chapter).

If the step motor doesn't receive any position / speed command for a while, it enters in a stand-by mode. During this stand-by mode, the current through the motor is reduced to the “stand-by current” parameter value.

The “stand-by current” and the time interval after which the stepper motor enters in the stand-by mode can be set during the setup phase, through the “Drive setup dialog”.

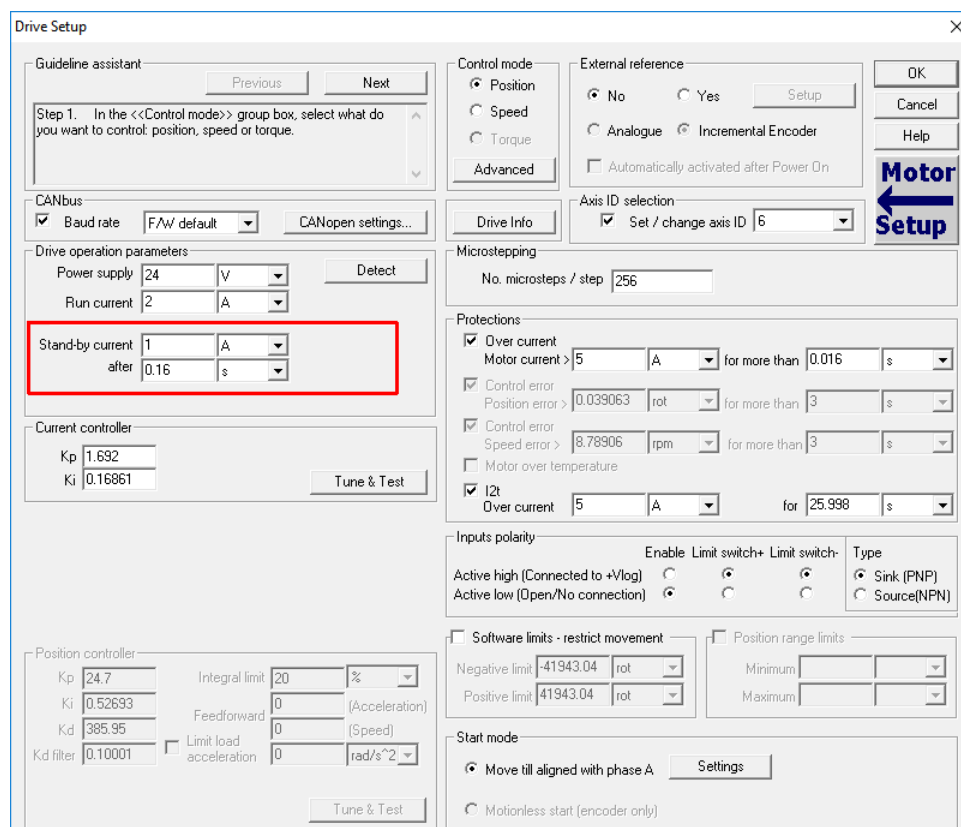


Figure 9. Stand-by current setting

If needed, the stand-by current can be changed online too. The related parameter is “**SBYCRT**”.

$$\text{SBYCRT} = \text{New_StandByCurrent_value [A]} * 65520 / (2 * I_{\text{peak}} [\text{A}])$$

Example

Change the run current to 1.5 A, using the “Command Interpreter” window in EasyMotion Studio

- **Step 1:** Run a speed profile with a small “Jog Speed” (e.g. 100 rpm).

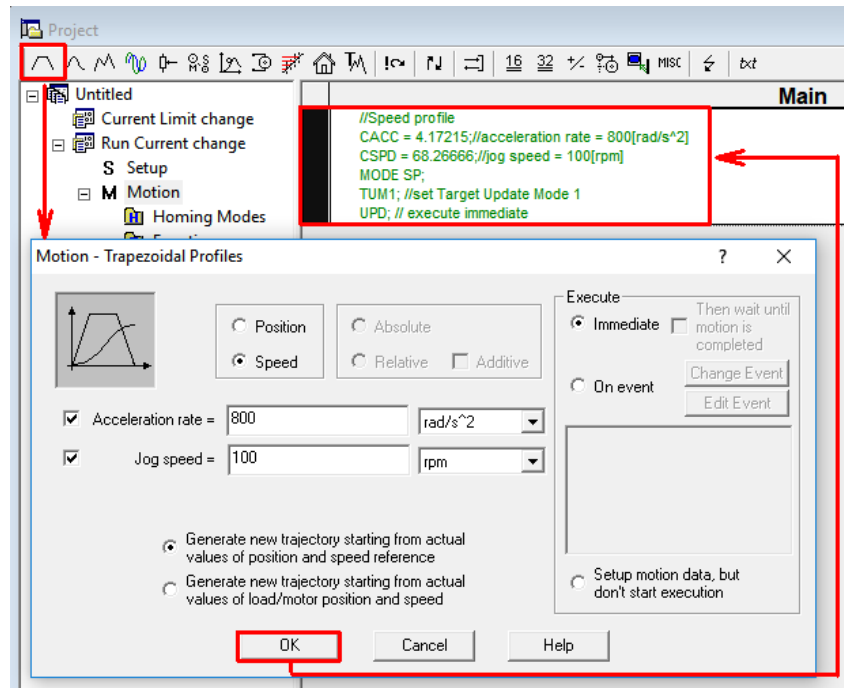


Figure 4. How to insert a speed position with CSPD = 100 rpm

- **Step 2:** While the motor is rotating, check the “Motor Current” parameter in the “1_Motion_Status” control panel. It should be equal with the value under the “Run Current” field in the “Drive Setup” dialog.

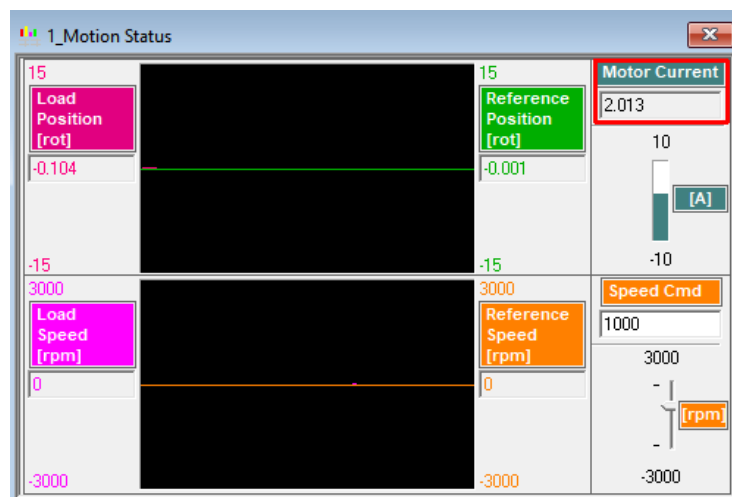


Figure 5. Check the run current value

Remark: By default the “Motor Current” field in the “Motion Status” dialog, shows the current component for the closed loop step motors. To see the run current, the control panel should be customized.

To customize the “Motion Status” control panel, press the right click over the control panel and select the “Customize” option.

Once the control panel switches to the customize mode, double click on the “Motor Current” box and select the “Motor_Current_OpenLoop” variable, to be displayed in the respective gauge object.

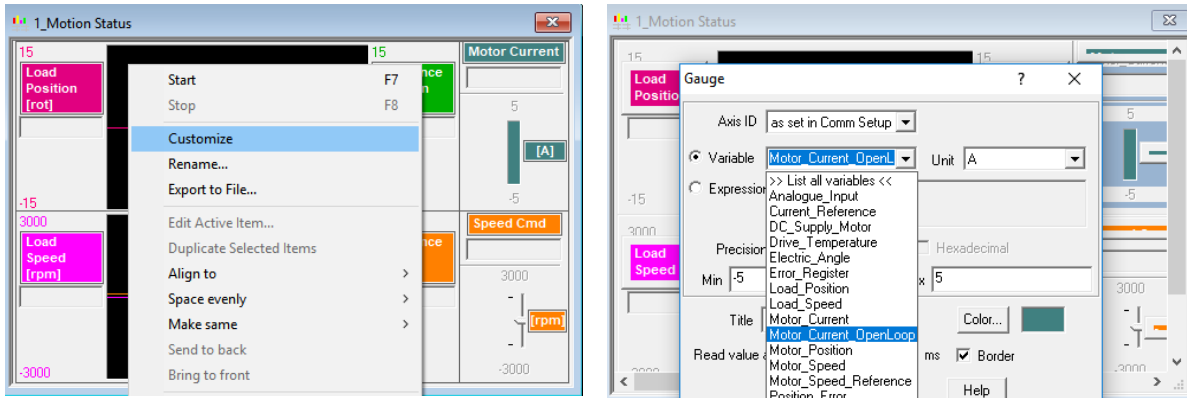


Figure 6. Customize the “Motion Status” control panel to show the Open Loop Motor Current

- **Step 3:** Check the initial value of the IDRSTEP parameter, compute the new value for the IDRTEP parameter and set the run current parameter to 1.5 A

$$IDRSTEP = 1.5 [A] * 65520 / (2 * I_{peak} [A]) = 2457 IU$$

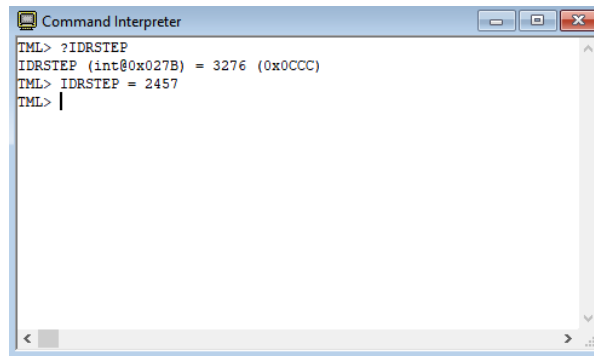


Figure 8. Check the IDRSTEP parameters initial value and set the Run Current to 1.5 A

- **Step 4:** Check the “Motion Status” control panel to see the Motor Current.

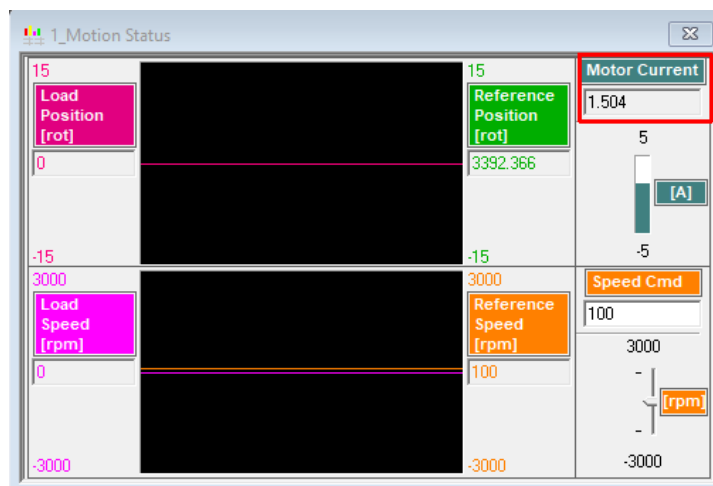


Figure 9. Check the run current value