TECHNOSOFT
MOTION TECHNOLOGY

Changing the current limit at runtime

Application Note

Easy Motion Studio II

TECHNOSOFT
MOTION TECHNOLOGY

Table of content

1. Application description

This application note describes different methods of changing the current limit (in the case of the DC brushed and brushless motors and for the closed loop driving of stepper motors) and the run current (in the case of constant current drive used in open-loop stepper motors). These parameters may be changed during setup or at runtime through the command interpreter window or using a TML function (ex: Set 16-Bit Variable).

The current limit is a user-definable parameter representing the maximum allowed current reference used by the drive to control the motor. Considering its purpose, it should be set higher than the motor nominal current, to allow high dynamic movements, but slightly lower than the motor/drive peak current to prevent possible damage.

The run current represents the constant current value used to drive open-loop stepper motors. Its value is usually set equal to the motor's nominal current.

2. Setting up the current values

During the setup process, the user may impose certain values for the current limit/running current, this is done through the ''Protections and limits'' dialogue, found in the Application Tree - Setup tab. The available current parameters depend on the chosen motor type (open-loop stepper or other motor types). The user may set the current values in either [A] and its submultiples or in internal units [IU].

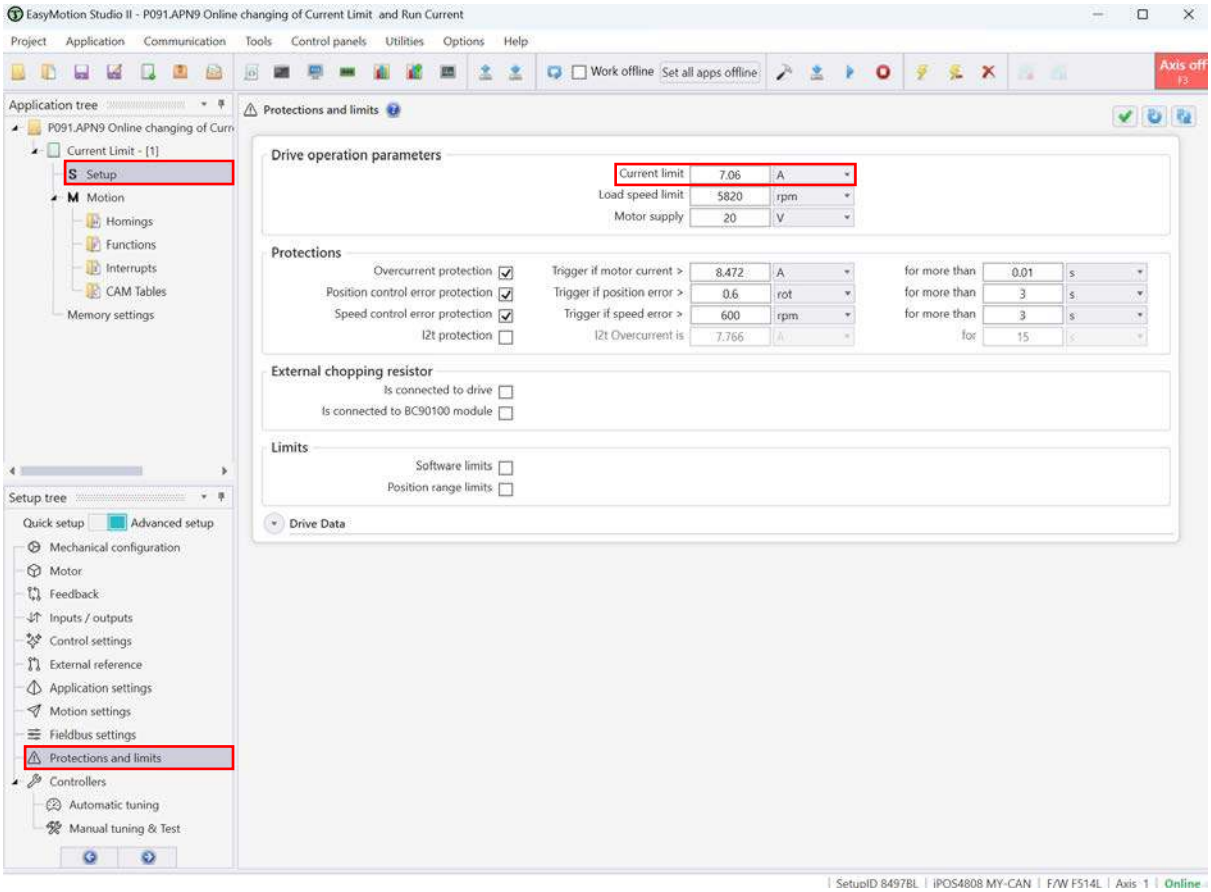

Figure 1. ***Current limit setting via the Setup - "Protections and limits" dialogue***

3. On the fly changing of the current limit parameter

In some applications, it is required to change the current limit at runtime (during the TML program execution / motor movement). This can be done through the **SATS** and **SATP** parameters, depending on the active control loops.

If the speed controller is not enabled (i.e. the control structure is set to “Position without speed loop”) the current limit parameter value can be changed by altering both “SATS” and “SATP” parameters as follows:

SATS = 32767 – New_Current_Limit [IU]
SATP = SATS

In any other case, the current limit parameter value will be modified only through **SATS** parameter, using the same relation as above.

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

New_Current_Limit [IU] = New_Current_limit [A] * 65520 / (2 * Imax [A])

where:
- **New_Current_Limit [A]** is the desired current limit value, in Amperes;
- **Imax** is the maximum measurable current, in Amperes. This value is drive-dependent and can be seen in the "Drive Data" dialogue that can be opened from the "Protections and limits" window:

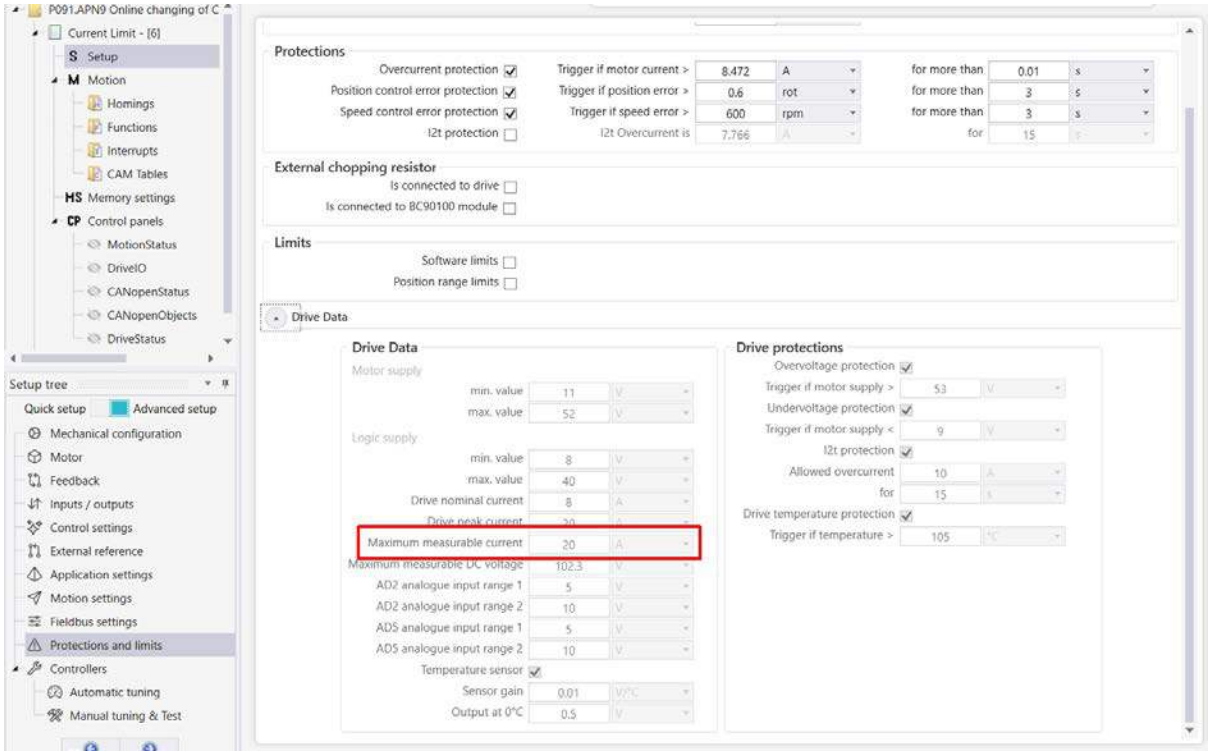

Figure 3. ***Drive Data dialogue – Maximum measurable current reading***

Example

While the actual change of the parameter is rather simple, further below will be presented 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 accelerating/braking or if load is excessive.

The following example is designed to simulate a similar case – 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, we can get the drive to run into the current limit.

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

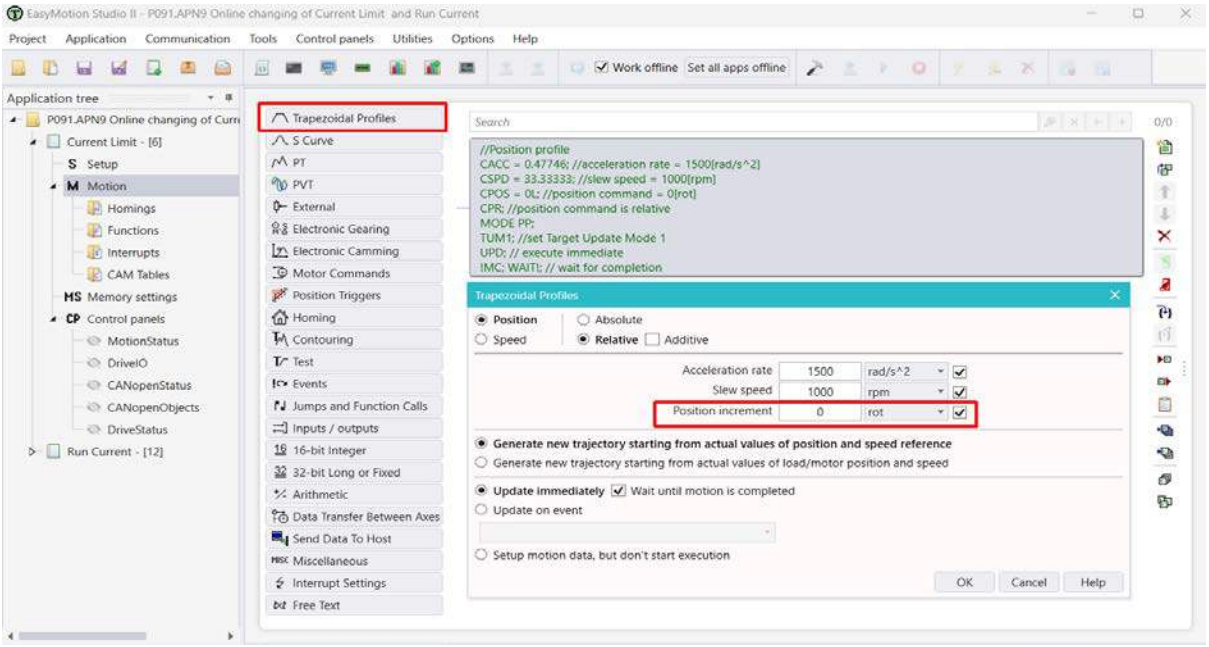

Figure 4. Inserting a trapezoidal position profile with a relative movement of CPOS = 0 rot

• **Step 2**: While the motor holds the position, try to rotate the motor shaft manually and check the "Motor Current" in the "Motion_Status" control panel.

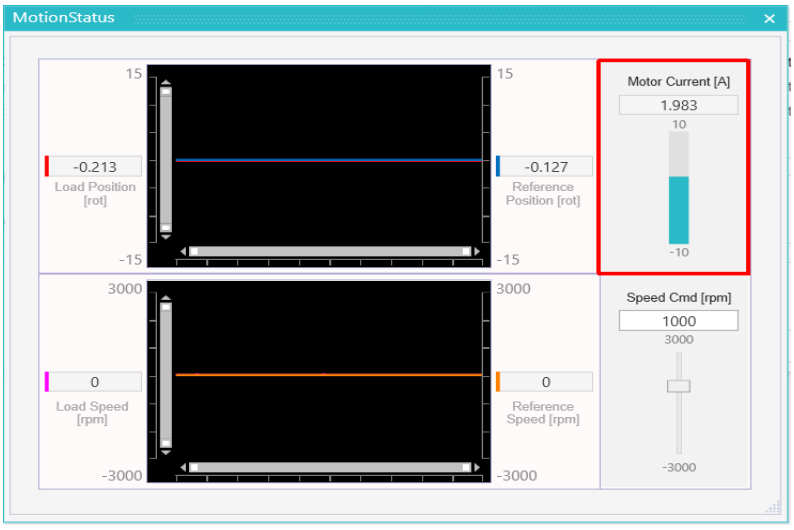

Figure 5. Monitoring the Motor current using the "Motion_Status" panel

Remark: The ‘’Motion_Status’’ panel is found in the Control Panels tab in the toolbar. The motor current among other variables is monitored by default, in a predefined format.

Remark: If you move the motor shaft too much, the “Control Error” protection may be triggered (when the position error becomes greater than the predefined limit) and this will disable the motor. For the purpose of this exercise, you can deactivate it from the “Protections and limits” tab in the Setup menu by unchecking the “Position control error protection”. The new setup must then be downloaded to the drive and the drive must be reset before the new settings become active.

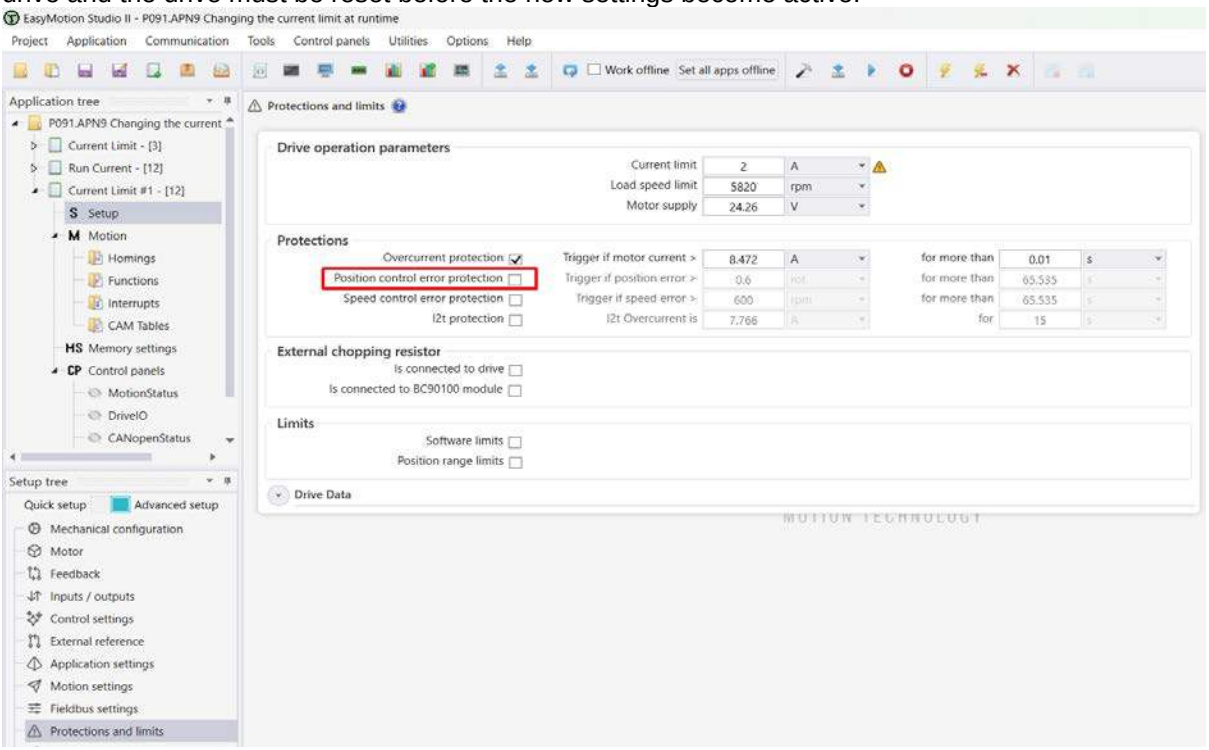

Figure 6. Disabling the Position control error protection

• **Step 3**: Using the Command Interpreter tool, check the **SATS** and if needed **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 maximum measurable current of 20A.

New_Current_Limit [IU] = 1 [A] * 65520 / (2 * 20 [A]) = 1638 IU
SATS = 32767 - 1638 [IU] = 31129 IU
SATP = 31129 IU

Figure 9. Checking the SATS and SATP values and changing the current limit to 1A

Remark: The “Command Interpreter” window can be opened from the “Tools” pop-up menu in the toolbar.

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

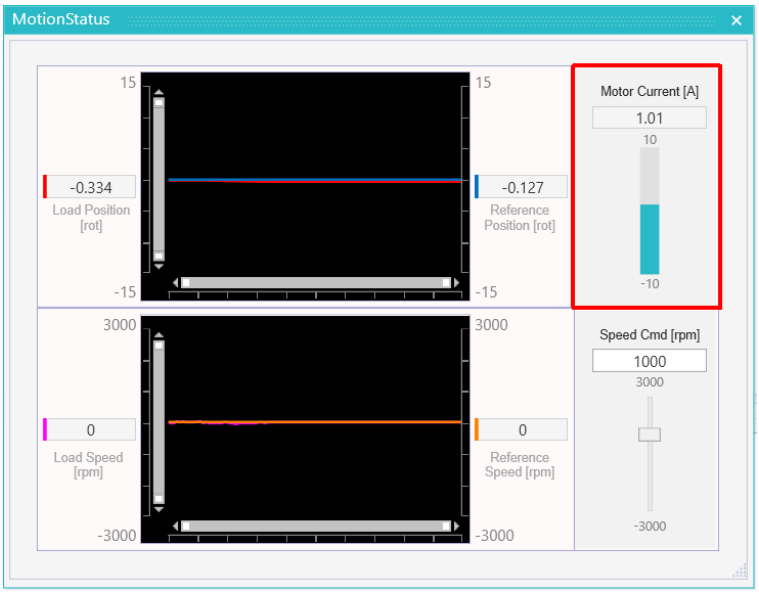

Figure 10. Check the new Current limit value

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

4. On the fly changing of the run current parameter

In the case of stepper motors driven in open loop, the **Run current** used by the drive to control the motor movement is constant.

When the position command of the motor doesn't change for a while, the drive enters in standby mode where the current is set to a smaller value to reduce the power consumption and the heating of the system.

The **Run current**, **Standby current** and the **Standby current time** interval after which the stepper motor enters in the standby mode can be set during the setup phase, through the "Protections and limits" dialogue, in the "Drive operation parameters" section.

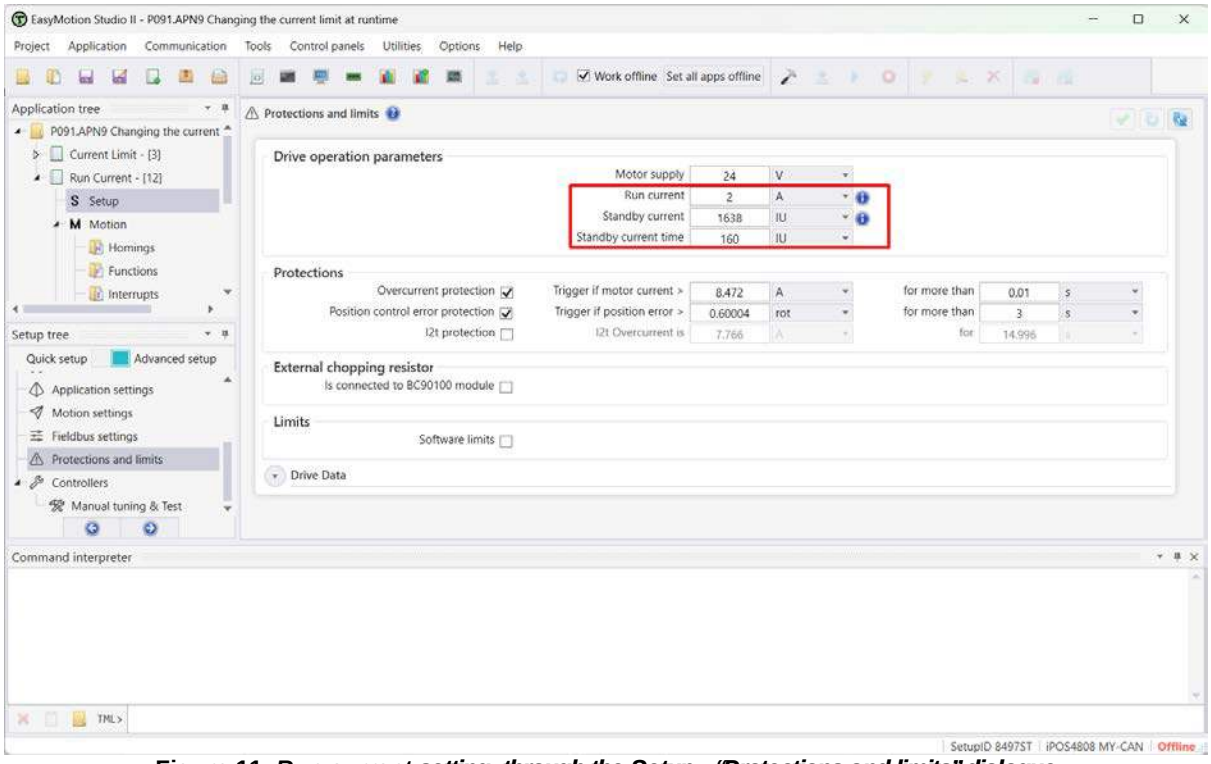

Figure 11. ***Run current setting, through the Setup - "Protections and limits" dialogue***

The run current, just like the standby current parameters can be also changed at run-time, through the **IDRSTEP** / **SBYCRT** parameters.

IDRSTEP = New_Run_Current_value [A] * 65520 / (2 * Imax [A])

where **Imax** is the drive maximum measurable current (see the "Drive data" dialog in the previous chapter).
If needed, the stand-by current can be changed online too. The related parameter is **SBYCRT**.

SBYCRT = New_StandByCurrent_value [A] * 65520 / (2 * Imax [A])

The stand-by time interval can also be changed via the parameter **TIMESBC.**

TIMESBC = time[IU]

where the time unit of the drive is the slow loop sample time (default 1IU = 1ms)