# Digital DRIVE for Brushless motors SMD Series

# Auto Tune Quick Start guide

| Read manual before installing and follow all instructions with this icon: |
|---|

SMD-Auto Tune Quick Start Guide-2107-EN

# Auto Tune Quick Start Guide

## Table of contents

| Revision | Edited by | Date | Modification |
|---|---|---|---|
| R2107 | AG (SERAD) | 15/02/2021 | Add motor configuration |
| R2001 | AG (SERAD) | 06/01/2020 | First edition |

# Auto Tune procedure

This procedure work without AND with motor load. It is advisable to do it with the motor load (inertia), because motor parameters changes with the inertia of the mechanics.

This procedure will perform rapid vibration. Then if your mechanics not support it, you can use the flywheel with the same mechanic inertia to perform the Auto Tune.

This Auto tune is a basic configuration of the motor. **It may then be possible to have to make a finer adjustment of the parameters.**
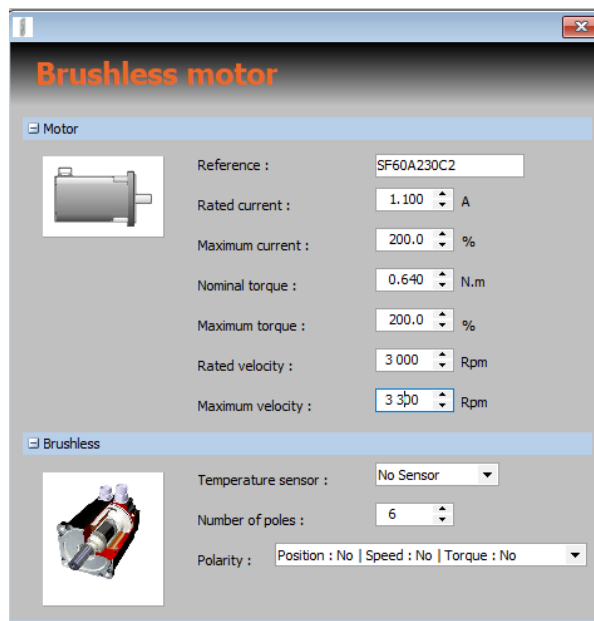
In this guide, we will get as example, the Serad motor SF60A230C2 which have the following characteristics:
- Rated speed: 3000rpm
- Rated current: 1.1A
- Rated torque: 0.64Nm
- Encoder resolution: 2500pts

## 1. Motor configuration

First you must configure some motor and feedback parameters.

For the motor, open Settings/Brushless:



- Reference: This field is only for your information, enter here the motor reference allowing identify it.
- Rated current: enter here the nominal current of the motor. 1.1A in our case.
- Maximum current: Mainly, we allowing a maximum current up to 200% of the nominal current.
- Nominal torque: enter her the nominal torque which correspond to the motor torque at nominal current.
- Maximum torque: enter here the same as Maximum current.
- Rated velocity: enter here the rated speed of the motor. 3000rpm in our case
- Maximum velocity: Over Speed detection threshold. In our case, we allowing +10%
- Temperature sensor: you can configure a motor temperature sensor if wired. You have the choice between sensor temperature of type PTC or NTC, or switch NO or NC.
- Number of pole: let dummy value, this will be found by auto tuning.
- Polarity: This is the application polarity, you can let it to "No" for the moment.
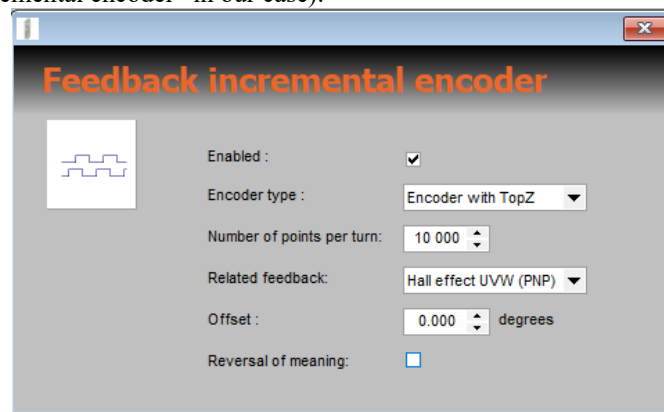
## 2. Feedback configuration

In a second step, you must indicate and configure the feedback use to get motor position.

In Settings/Regulation:
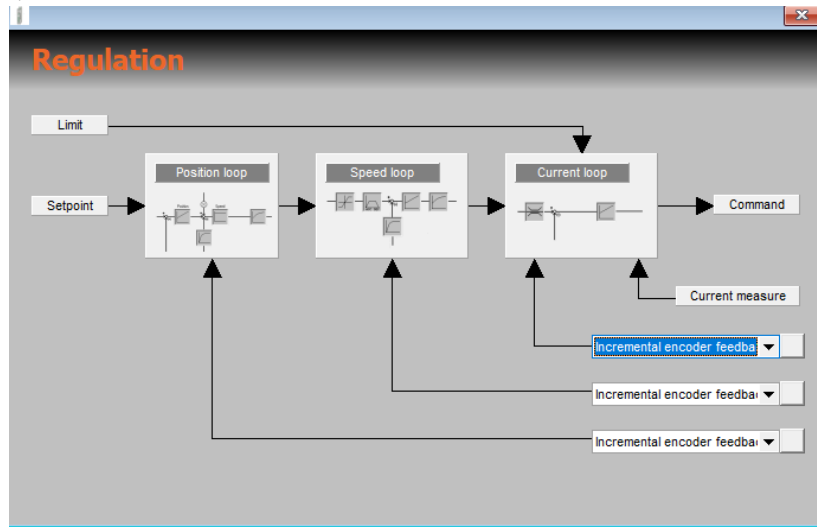


Set the associated feedback of each loop (Current, Speed, position).
In our case, all value are get with the same incremental feedback.

In Settings/*Feedback* ("Incremental encoder" in our case):



- Enabled: Must be ticked to enable this feedback
- Encoder Type: Set here the type of encoder (With/without TopZ, Pulse/Dir…)
- Number of point per turn: Number of pulse for one motor turn. As the incremental is quadrature signal of 2500pts per turn, we get 10000pulses per turn. So set 10000 in our case.
- Related feedback: indicate which method is use to get the initial position on the first motor torque on.
- Offset: let auto-tuning set it.
- Reversal of meaning: If the feedback sense of rotation is the reverse of the motor, tick this box.

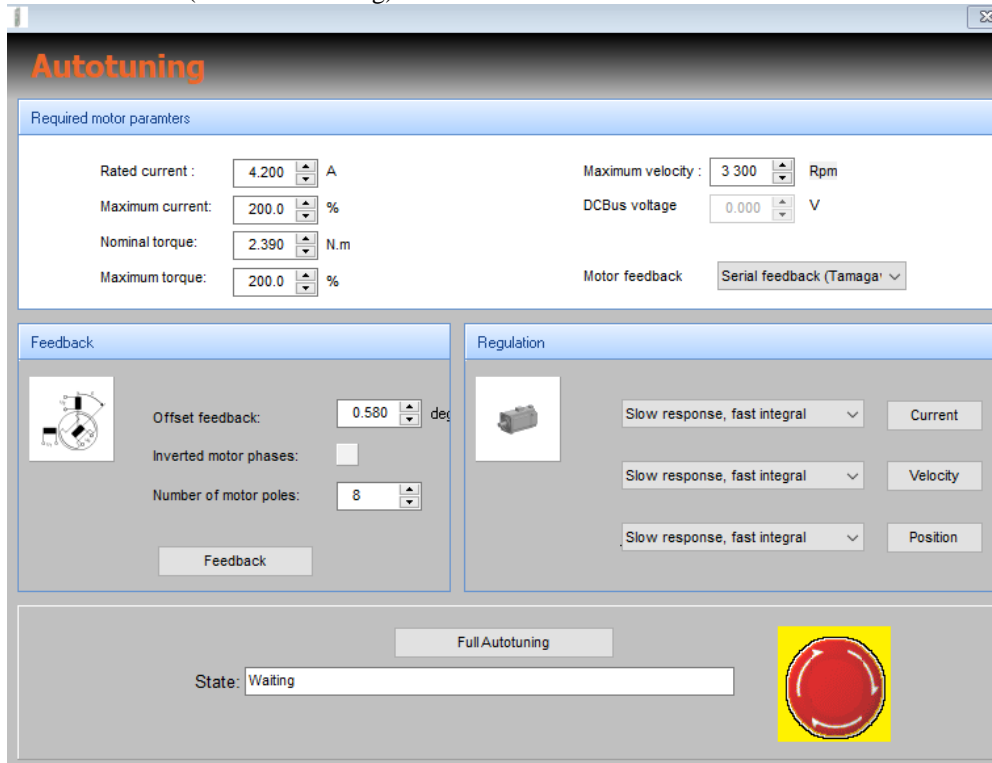For other feedback explanation, please refer to the end of this document.

⚠️ After modify feedback parameters, the drive MUST be restarted.

Check the feedback work properly by move with hand the motor axis and check into the following views the motor position is coherent:
- Tools/Motor
- Tools/Motion

# 3. Auto Tuning

1. Start Auto tune tools (Tools/Autotuning):



2. Find the electrical shift by click on "Feedback". Motor will move and the result will appears into "Feedback section". If motor positive sense is the revere to the feedback positive sense, the "Inverted motor phases" will Red light On. In this case, many solutions:
    a. Swap physically the motor phase V and W.
    b. On the feedback parameter list, set "Polarity" to Yes:
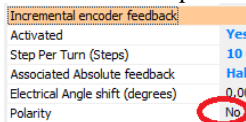


3. Into "Regulation" window, you can set first the Current loop, then Velocity loop and then Position loop.

For each loop you can choose the response time (Slow, medium, fast) and integral configuration (Slow, Fast).

For the position loop, it is recommended to set "Fast Integral". By this way, the integral will be set to 0 and the speed anticipation coefficient Kv will be set to 1 (optimum configuration).
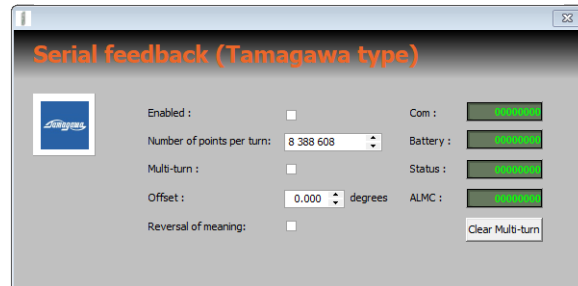
| | | Current Loop | Speed Loop | Position Loop |
|---|---|---|---|---|
| Proportional | Slow | 30% | 15% | 15% |
| | Normal | 55% | 33% | 27% |
| | Fast | 130% | 60% | 40% |
| Integral | Slow | 627% | 140% | 100% |
| | Fast | 200% | 1300% | 0% (Kv) |

Recomended for Serial Motor

Recommended for Resolver Motor

# Annexes

Below are presented other feedback type configuration:
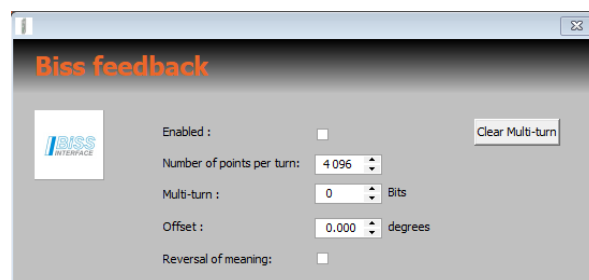
**Serial type Tamagawa**



- Enabled: Must be ticked to enable this feedback
- Number of point per turn: Indicate the accuracy of the feedback. i.e: if feedback is a 23bits feedback for the MonoTurn value, indicate $2^{23}$= 8 388 608
- Multi-turn:Tick this case if the feedback has mutli-turn value and if you want use it.
- Offset: let auto-tuning set it.
- Reversal of meaning: If the feedback sense of rotation is the reverse of the motor, tick this box.
- Clear Multi-turn: For multi-turn feedback, you are allowing by this button to clear the multi-turn value.

**Resolver type:**
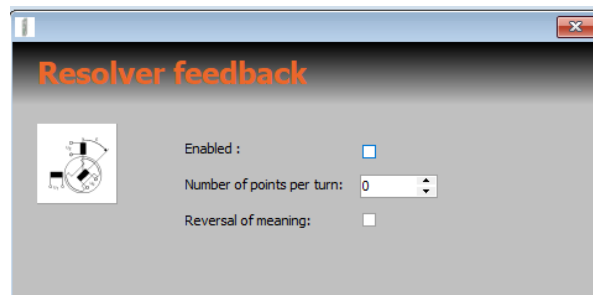


- Enabled: Must be ticked to enable this feedback
- Number of point per turn: Only use to emulate the object 0x608F and 0x6090 which return the encoder increment. Indicate here, the number of point you want for one turn.
- Reversal of meaning: If the feedback sense of rotation is the reverse of the motor, tick this box.
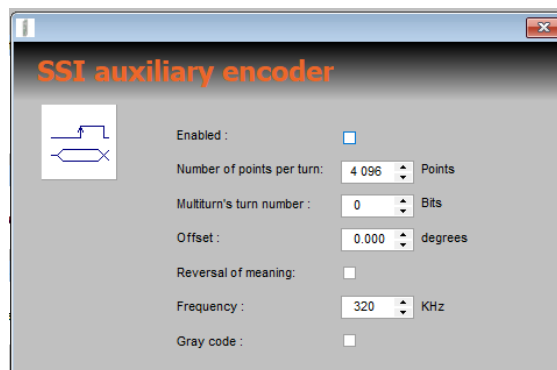
**Biss type:**



- Enabled: Must be ticked to enable this feedback
- Number of point per turn: Indicate the accuracy of the feedback. i.e: if feedback is a 12bits feedback for the MonoTurn value, indicate $2^{12}$= 4096
- Multi-turn: Indicate the number of bits of the Multi-turn value. If you do not use multi-turn, set to 0.
- Offset: let auto-tuning set it.
- Reversal of meaning: If the feedback sense of rotation is the reverse of the motor, tick this box.
- Clear Multi-turn: For multi-turn feedback, you are allowing by this button to clear the multi-turn value.

**EnDat type:**
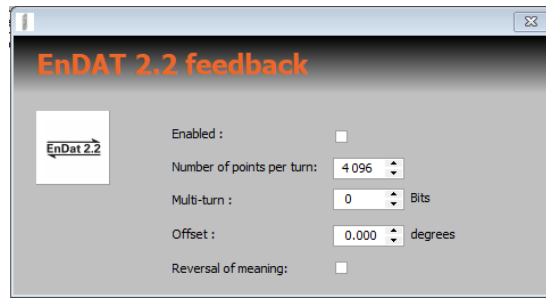


- Enabled: Must be ticked to enable this feedback
- Number of point per turn: Indicate the accuracy of the feedback. i.e: if feedback is a 12bits feedback for the MonoTurn value, indicate $2^{12} = 4096$
- Multi-turn: Indicate the number of bits of the Multi-turn value. If you do not use multi-turn, set to 0.
- Offset: let auto-tuning set it.
- Reversal of meaning: If the feedback sense of rotation is the reverse of the motor, tick this box.
- Clear Multi-turn: For multi-turn feedback, you are allowing by this button to clear the multi-turn value.

**SSI Type:**



- Enabled: Must be ticked to enable this feedback
- Number of point per turn: Indicate the accuracy of the feedback. i.e: if feedback is a 12bits feedback for the MonoTurn value, indicate $2^{12} = 4096$
- Multi-turn: Indicate the number of bits of the Multi-turn value. If you do not use multi-turn, set to 0.
- Offset: let auto-tuning set it.
- Reversal of meaning: If the feedback sense of rotation is the reverse of the motor, tick this box.
- Frequency: Indicate the Clock SSi Frequency. Fmin(Khz) = (TotalBits + 1.5) x 20
- Gary code: tick this box if the used encoder is coded with Gray code.