

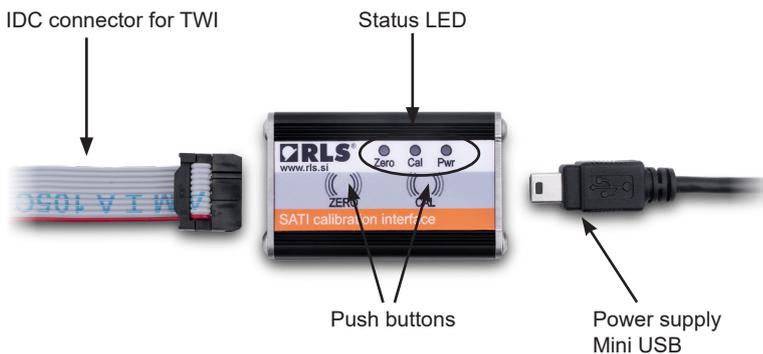
SATI stands for Stand Alone Trimming Interface. It enables zeroing and trimming of the encoder after it has already been installed. Successful trimming process done with SATI improves the system's absolute position error down to  $\pm 0.2^\circ$ . It can be used for encoders made with RLS AM4096 sensor ICs only.

## Features

- Stand alone device
- Require external power supply
- Connections to encoder: 4 contacts (Vdd, GND, SDA, SCL)
- Digital inputs for external triggering
- Two functions realized by two push-buttons or external triggering: Trimming the sensor and setting the encoder Zero position
- Three status LEDs
- Digital outputs for device status



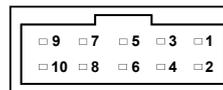
## Description, connections and basic requirements



### IDC connector pin assignment

| Pin nr. | Signals      |
|---------|--------------|
| 1       | Vdd          |
| 2       | GND          |
| 3       | SDA (TWI)    |
| 4       | SCL (TWI)    |
| 5       | CAL trigger* |

| Pin nr. | Signals       |
|---------|---------------|
| 6       | ZERO trigger* |
| 7       | B0 output**   |
| 8       | B1 output**   |
| 9       | B2 output**   |
| 10      | ZERO out      |



\* Trigger is digital input, from high to low pulse.

\*\* For digital status outputs, see table **Status outputs** on [page 3](#).

After power up, SATI03 is reading status of connected encoder.

### Basic requirements:

- Encoder current consumption: <100 mA
- TWI lines must be HIGH – the encoder must have pull-up resistors on SDA / SCL lines, recommended value for pull-up resistors is 4.7 k $\Omega$

**SATI03 will not perform without fulfilling the requirements listed.**

## Trimming procedure

Required conditions for successful trimming:

- Basic requirements fulfilled
- Distance to magnet within specified tolerance
- Required rotational speed: 100–8,000 rpm (1.6–133 Hz)

Trimming process can start after required conditions are fulfilled. It starts by pushing the **CAL** push-button or applying adequate trigger pulse to digital input **CAL trigger**.

The results are indicated by status LED **Cal** and digital outputs B0, B1, B2.

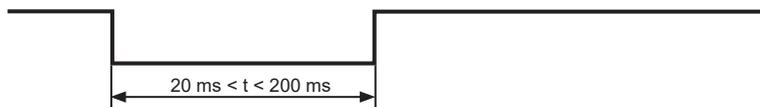
LED **Cal** must be off before starting the trimming process (status B0 = 0, B1 = 0, B2 = 0).

To reset the status, press the **CAL** push-button or apply adequate pulse to digital input **CAL trigger**.

Procedure result:

- Absolute position error after successful trimming:  $< \pm 0.2^\circ$

## CAL trigger timing



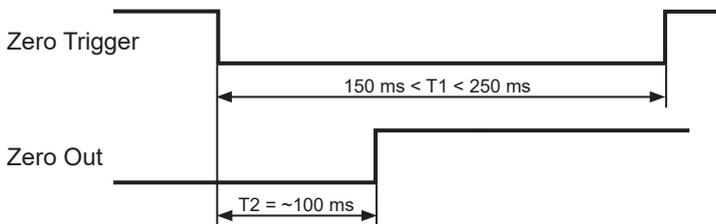
## Setting zero position - Zeroing

Required conditions for successful zeroing:

- Basic requirements
- Distance to magnet within specified tolerance
- The encoder position must be steady for  $>3\text{ s}$

To set the encoder zero position push and hold the **ZERO** button for  $>3\text{ s}$  or apply adequate trigger pulse to digital input **ZERO trigger**.

## ZEROING timing



When Zeroing procedure is accomplished, the digital output **ZERO Out** goes High after  $T2 = \sim 100\text{ ms}$ . If **ZERO Out** remains Low for time  $T1$ , the Zeroing procedure failed; it can be restarted.

## Status LEDs

| LED Pwr shows the status of SATI / encoder power consumption: |  |
|---|--|
| OFF   | No power   |
| Green   | The interface is powered, no encoder connected or encoder powered by external power supply |
| Yellow  | Encoder powered by SATI with current consumption between 15 and 100 mA                     |
| Red   | Too high current consumption (>100 mA); the encoder power supply automatically turned off  |
| LED Cal shows the status of calibration:                      |  |
| OFF   | SATI is ready for use  |
| Red   | TWI communication error  |
| Red flashes   | Rotational speed out of specification  |
| Yellow flashes  | Distance to magnet out of specification  |
| Yellow  | Trimming procedure in progress   |
| Red/Green flashes alternately                                 | Not successful trimming, encoder absolute position error greater than $\pm 0.4^\circ$      |
| Green flashes   | $\pm 0.4^\circ > \text{position error} > \pm 0.2^\circ$                                    |
| Green   | Successful trimming, position error $< \pm 0.2^\circ$                                      |
| LED Zero shows the status of zeroing procedure:               |  |
| Green   | Encoder normal operation, not at zero position   |
| OFF   | The zeroing procedure in progress  |
| Red   | Encoder at zero position   |

## Status outputs

| Nr. | B2 | B1 | B0 | Status  |
|-----|----|----|----|---|
| 1   | 0  | 0  | 0  | Encoder / SATI ready for use  |
| 2   | 0  | 0  | 1  | TWI communication error   |
| 3   | 0  | 1  | 0  | Rotational speed out of specification   |
| 4   | 0  | 1  | 1  | Distance to magnet out of specification   |
| 5   | 1  | 0  | 0  | Too high current consumption (>100 mA); the encoder power supply automatically turned off |
| 6   | 1  | 0  | 1  | Not successful trimming, encoder absolute position error bigger than $\pm 0.4^\circ$      |
| 7   | 1  | 1  | 0  | $\pm 0.4^\circ > \text{position error} > \pm 0.2^\circ$                                   |
| 8   | 1  | 1  | 1  | Successful trimming, position error $< \pm 0.2^\circ$                                     |

## Setting the factory default parameters

SATI can set (restore) the chip operating parameters to factory default values.

Required conditions for successful setting the factory default parameters:

- Basic requirements

Default parameters can be restored by pressing the CAL button for more than 5 seconds or apply adequate pulse to digital input CAL trigger.

### Trigger timing for setting the factory default parameters:



When **CAL** button is used, all three LEDs (Pwr, Cal and Zero) turn red for 1.5 s and then switch back to ready state.

When **CAL trigger** is used, **ZERO output** goes to high state. It remains high for min. 350 ms; maximum time can be several seconds. After setting the factory default parameters is accomplished, the **ZERO output** goes Low.

## Head office

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## Document issues

| Issue | Date        | Page | Corrections made              |
|-------|-------------|------|-------------------------------|
| 1     | 13. 1. 2020 | -    | New document                  |
| 2     | 29. 6. 2023 | 1    | Pull up resistors value added |

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