# SpeedSys® T10A
## Speed monitoring systems

**Manual**
MAN_SSYT10A_20231115V0.3

# Dutch innovation, European manufacturing

Congratulations on taking this step in solidifying the monitoring and protection of your assets with SpeedSys®; Modern speed measurement solutions characterized by Dutch innovation and European manufacturing quality.

# Before you continue...

We made every effort to design this product with great usability in mind. But, as with any product, the understanding of its user is key. Therefore, we have created an online learning environment: The Istec Academy.

## Istec Academy

Our free online learning environment is intended to provide valuable (video) content to become familiar with our products and related parameters.

By registering your product, we can provide application-specific courses and support from our (over)speed specialists.

Register at https://members.istec.com

# Copyright

# Important notice

This product has been tested according to the listed standards. If the product is used in a manner not specified by manufacturer the degree of protection may be impaired. Therefore, this user manual must be read completely, carefully and all safety instructions must be followed.

ISTEC has made every effort to include all operation and safety related instructions and warnings in this manual, but the completeness and accuracy of this data cannot be guaranteed. Not all possibilities or situations are described in this manual. Before using this product, the user must evaluate it and determine its suitability to the intended application.

This manual is written for operators and integrators of the SpeedSys T10A product series.

All operating personnel is expected to follow the product specific procedures and all applicable other general and safety procedures. Operating personnel is assumed to have the necessary technical training and proven competence to enable them to install the product correctly and safely.

In case of unsafe, inexpert, or irregular use, ISTEC will decline any liability or warranty claims.

# About SpeedSys T10A

SpeedSys T10A is a device, intended for speed monitoring and switching on rotating machinery.

The small technical footprint and low impact installation enables advanced speed measurement functions to a wide range of applications.

# Index

# 1 General

| ⚠️ | Read this manual carefully and understand the safety instructions before use. |
|---|---|

This manual is applicable to the following models:

▪ SpeedSys® T10A

## 1.1 Symbols used in this manual.

| ⚠️ | This symbol indicates information, directives, procedures, or precautionary measures concerning safety and the correct use of the device. Failure to obey this information could lead to injury or damage. |
|---|---|

| [ESD symbol] | Electrostatic discharge (ESD): The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against ESD according to EN 61340-5-1 and EN 61340-5-2. |
|---|---|

## 1.2 General handling precautions

▪ Do not drop the product or subject it to physical shocks.
▪ Protect the product using suitable protective materials when handling, storing, or transporting the product. Remove all protective materials before installation and use of the product.
▪ When storing the product, respect the environmental conditions as specified for the product.

## 1.3 Maintenance and cleaning

This product is an electronic device. There are no serviceable parts inside the product. The product should not be opened, modified, transformed, or changed in any way. Return the product to the supplier for service and calibration. This product contains electrostatic sensitive components that can be damaged by electrostatic discharges.

All maintenance and repair should be carried out by the manufacturer of the product. If required, clean gently with a soft, dry cloth. Do not soak. Do not use steamer, ultrasonic, soap or brush. Avoid exposure to acids or chemicals. Damaged devices, mechanical or otherwise, must be labelled as 'unusable' and must be scrapped or returned for service.

## 1.4 Parts and accessories

**SpeedSys T10A**

- SpeedSys T10A module
- 5 removable connectors

Defective components may only be replaced by identical parts.

# 2 System overview.

## 2.1 System description.

The SpeedSys T10A, is a one channel speed monitors and switch that deliver accurate speed measurement functions to rotating equipment. The device converts the signals from speed sensors to processed outputs. The small technical footprint and versatile usability allows for a low-impact installation and to enable speed monitoring to a wide range of applications.

## 2.2 Concept.

SpeedSys T10A is a one-channel device that offers sensor signal conditioning, speed monitoring functions, highly accurate analog signal for further processing and fast responding relays.

## 2.3 Application.

SpeedSys T10A provide sensor signal conditioning and rotational speed measurement functions to general rotating equipment applications. Typical applications include turbines, compressors, engines, wind turbines and industrial automation.

## 2.4 Intended use.

This device is intended for professional, industrial environments only. It was designed for indoor use or use in a protective enclosure. It must only be operated in an altitude up to 2000 m. This device is for use in applications within a pollution degree up to 2, overvoltage category II environment.

> ⚠️ This product was not designed to meet the requirements of a safety system.

## 2.5 Environmental conditions.

| | Operating | Storage |
|---|---|---|
| **Temperature** | -20 to +60 °C | -40 to +85 °C |
| **Humidity** | 75% averaged over the year; up to 90% for max 30 days. Condensation to be avoided. | |
| **Ingress protection** | IP20 according to IEC 60529 | |

# 3 Mounting and installation

## 3.1 Module details

The front panel sticker contains basic information about the connectors, wiring connections and module status.

On the top side of the module there are connections for Modbus RTU and grounding on the back row, frequency output (FO) and digital input (DI) on the middle row, and sensor input on the front row. Denotations a, b or c on multi-channel devices indicate the channel.

The bottom side has connections for power and grounding on the back row, relay 2 and analog out (AO) on the middle row, and relay 1 (double pole) on the front row.

The LEDs show relay and system status. Details about the different status is explained in 5.10 Status LEDs.

The communication port in the front panel is used for configuration and Modbus TCP connectivity.

## 3.2 Module dimensions and installation

The product is designed to work with standard DIN rail. For installation, the device is clipped onto the upper part of the DIN rail and pressed down until the lock snaps in. For deinstallation, the spring lock is opened with a slotted screwdriver and the device is removed upwards (see following figures).
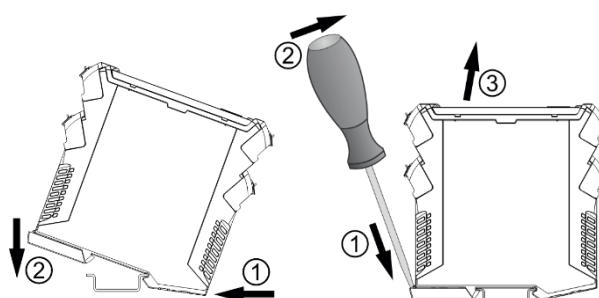


*Mounting (left) and demounting (right) of the unit.*

Install the device in a suitable housing with a suitable degree of protection in accordance with IEC 60529 to protect it from mechanical and electrical damage.

Electrostatic discharge: The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and EN 61340-5-2.

> ⚠️ Observe the minimum clearances as shown in the figures below to allow for sufficient cooling.
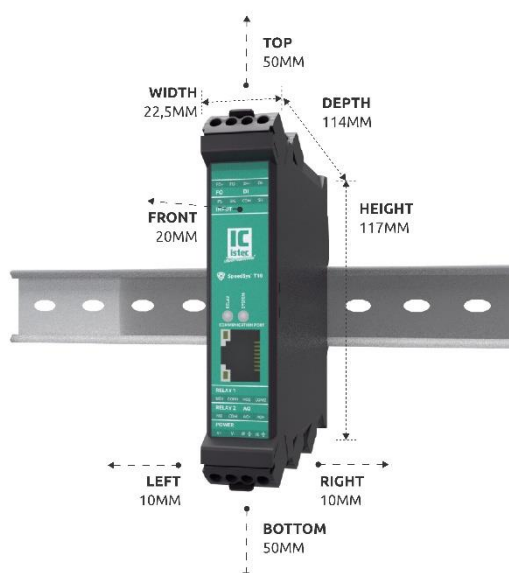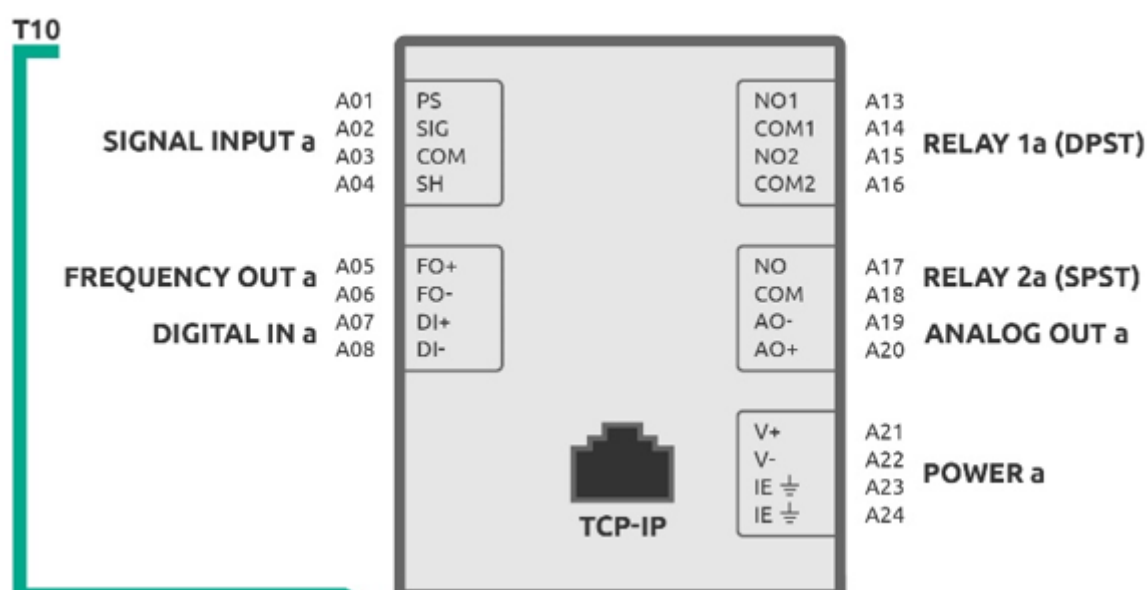


The electrical connections are established via push terminals. Use a matching screwdriver to release a wire from the connector. The entire pluggable terminal block, containing 4 contacts, can be removed by flipping the lever.
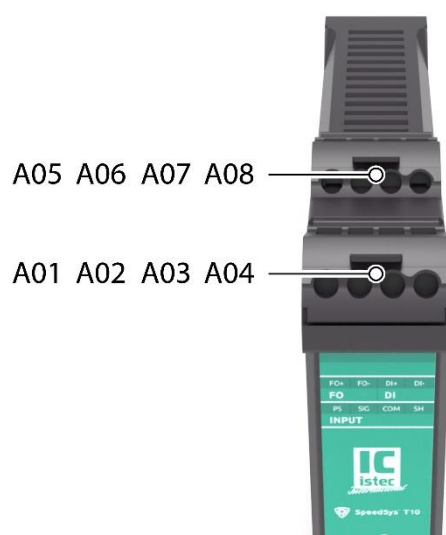
## 3.3  Connection diagram

The figure below shows the electrical interfaces for the product. The sensor inputs are short circuit proof.

⚠️  Observe the information in the datasheet before connecting electrical interfaces.

## 3.4 Connector arrangement

A05  A06  A07  A08

A01  A02  A03  A04

A13  A14  A15  A16

A17  A18  A19  A20

A21  A22  A23  A24

## 3.5   Functional grounding

This product requires functional grounding to avoid potential ground noise and EMI effects that can cause unfavorable operating conditions. Each SpeedSys T10A module must be grounded through the instrument earth connections on all the power supply connectors. All connections must be installed with shielded cables. Connect all cable shields to instrument earth at the SpeedSys T10A module. For the 3-wire voltage sensor (Hall sensor) or the 2-wire voltage sensor, the cable shield must be connected to instrument earth at the device side. If both sides of the shield/screen are connected to instrument earth, due to induction, the signal might pick up disturbance.

> ⚠️ Note: in case of two-sided connection of the shields, verify that electromagnetic disturbances due to differences in grounding potential do not occur.

## 3.6   Cable lengths

Please take careful consideration of the cable lengths. When longer wires are required, these can be extended by placing an isolator in the wire and so still complying to the certification and the lengths specified in the table below for wires directly attached to the SpeedSys T10A

> ⚠️ When exceeding the specified cable length special precaution must be taken to comply with the certification.

|  | Max. cable length | Type |
|---|---|---|
| Sensor | 30 meters | 3-wire twisted and shielded |
| I/O | 30 meters | 2-wire twisted and shielded |
| Power supply | 3 meters | 2-wire twisted and shielded |
| TCP/IP | 30 meters | CAT 5/6 |
| Modbus RS485 | 30 meters | 3-wire twisted and shielded |

Additionally, it is prudent to also consider the cable's cross section. The summary below can be used as a rule.

1. Up to 100 m cable length: 0.5 mm$^2$ cross section
2. From 100 m up to 300 m cable length: 0.75 mm$^2$ cross section

# 4  Programming

A SpeedSys T10A unit can be configured using the software application named SpeedSysTool. The latest version of this software can be freely downloaded from the Istec website www.istec.com.

The software requires Java Runtime Environment (JRE) to be running on the computer and does not require any additional installation for the application itself. Therefore, if Java JRE is present and running, the application can be exchanged between computers with impunity.

> ⚠️  Note: the software has not been tested for JREs older than version 8 update 361.

**Information circles and field types**

For each field and button, a corresponding help text is available to provide guidance to the user. This help text can be seen by hovering the mouse over the information circle icon 'ⓘ' located next to each field or over the button.

The fields are categorized into three types indicated by the first word of the associated help text. These types are defined as follows:

- [TEXT]: denotes an editable field that does not have any impact on the operation of the unit.
- [INPUT]: denotes an editable field that has a direct effect on the operation of the unit.
- [OUTPUT]: denotes a non-editable field that provides feedback data from the unit.

> ⚠️  Note:  Availability of information fields is dependent of version.

## 4.1  Get started: making a LAN connection.

To configure the SpeedSys T10A it must be connected to a computer over a Local Area Network (LAN) or as P2P connection. It may require some technical expertise and knowledge of network configurations, of which the details are beyond the scope of this manual. If you require support with this procedure, please consult your local IT department.

- Turn SpeedSys T10A on by supplying 24 $V_{DC}$ (18 -31.2 $V_{DC}$) to the unit.
- Connect SpeedSys T10A to a computer using the TCP/IP interfaces on both devices and a suitable UTP cable.

To connect to the SpeedSys T10A in the software, the computer and SpeedSys T10A will have to be in the same IP range and have suitable subnet masks.
The SpeedSys T10A comes with the following factory settings:

- Fixed IP:        10.10.1.100
- Subnet mask:   255.255.255.0
- Gateway:       Empty

- Configure the TCP/IP settings of the computer such that is has a suitable IP and subnet mask to communicate with the SpeedSys T10A.
  Example:

| | PC | SpeedSys T10A |
|---|---|---|
| IP address | 10.10.1.101 | 10.10.1.100 |
| Subnet mask | 255.255.255.0 | 255.255.255.0 |
| Gateway | Empty | Empty |

- Run the software by double clicking the icon.
  Note: Some anti-virus suites may block or require additional approvals to run third party applications.

When the computer and SpeedSys T10A are configured to communicate but not yet coupled the software shows the 'Not connected' status in the top right corner as shown in the figure below.



⚠ Note: Depending on the version the SN (Serial Number) will be visible or not. The Input and Config counters will increase the green digit for each successful connection and red for each connection that failed.

- To establish a connection, click Settings and Interface Settings. Enter the IP address in the prompt that will appear and click connect as shown in the figure below.
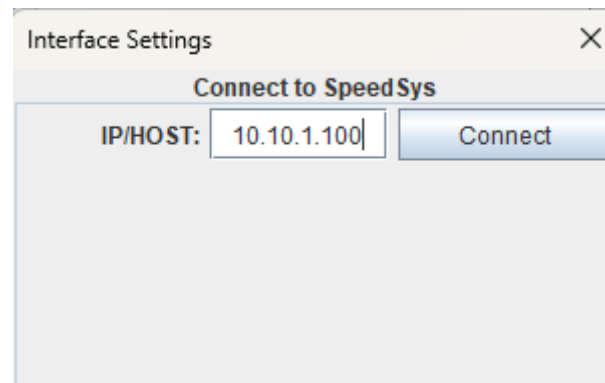
After clicking the 'Connect' button a connection is establish, and the software is displaying the text 'Connected!' to indicate a successful connection has been made as shown in the figure below. Also, the buttons 'Read Configuration' and 'Write to Device' will become active.
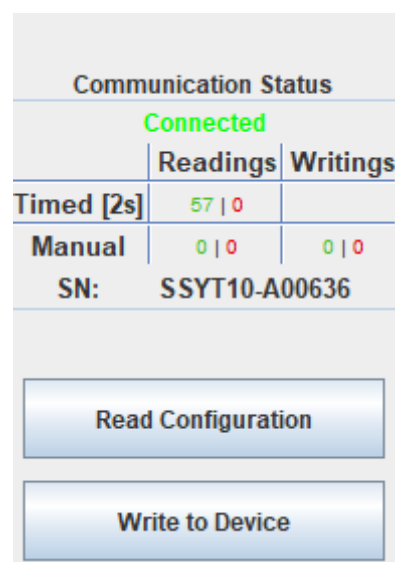


The SpeedSysTool will automatically load the SpeedSysT10A the configuration of the current connected Speedsys.

## 4.2 Loading and saving configuration files

Loading and saving configuration files in the SpeedSys T10A application is a straightforward process. However, it's important to note that the software will save the exact input that is <u>visible</u> in the application, which allows for the creation of offline configurations.
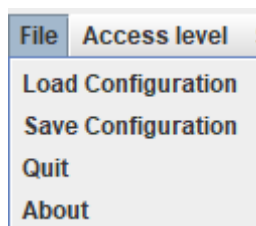


To save the configuration that is currently programmed on a unit, it is essential to first click the "Read Configuration" button. This will ensure that the current configuration is displayed before saving it to a file.

⚠️ Note: the unit will reset itself when writing a new configuration. E.g., errors will be cleared and latched relays will be released.
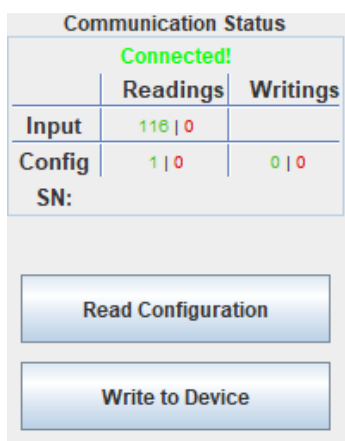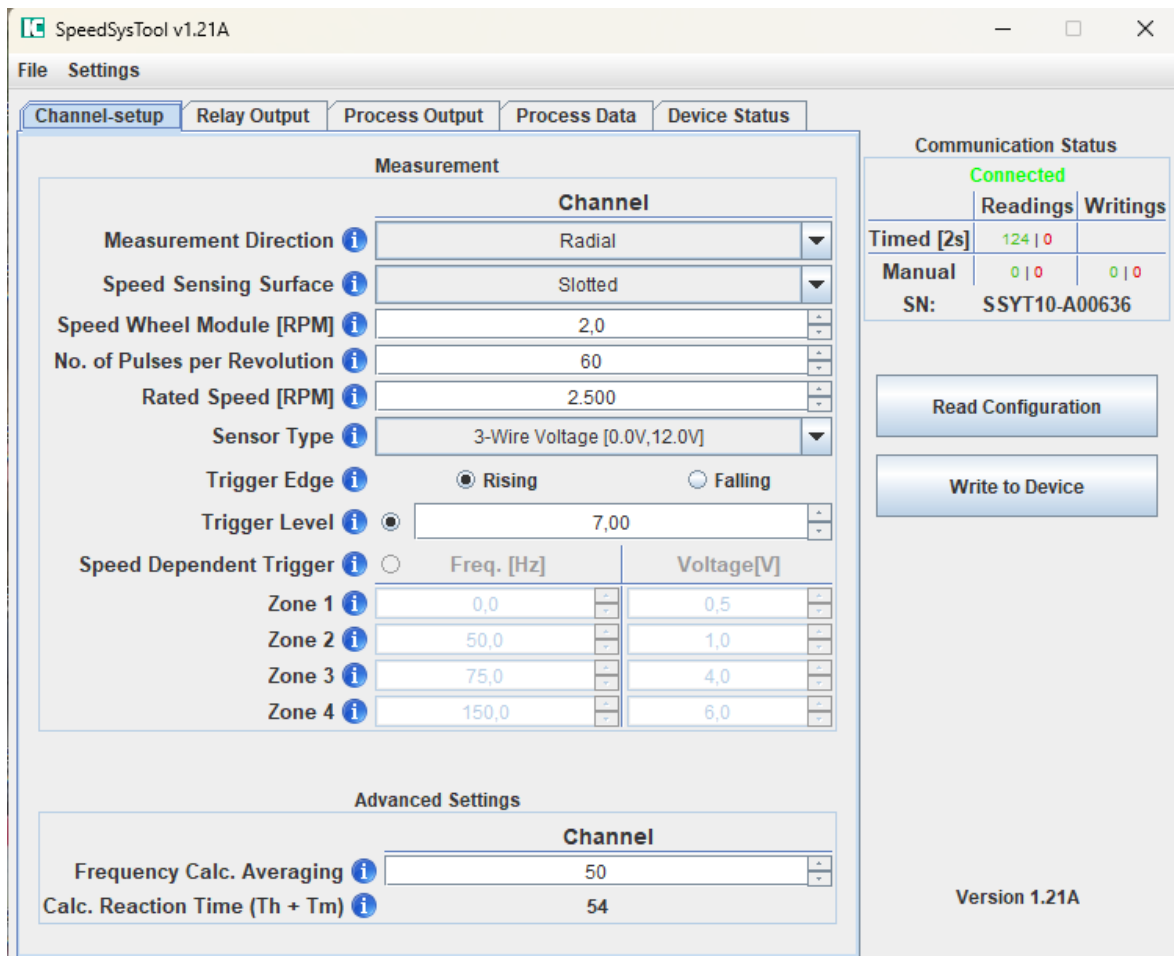
# 5 Commissioning

## 5.1 Measurement parameters and settings

The MEAS. CHANNEL SETUP tab defines the sensor input and the signal processing.

To create a configuration, all the necessary fields and boxes need to be filled and /or selected.

**Measurement**

- **Measurement Direction**

  [TEXT]

  Three measurement directions can be selected: Axial, Radial and Tangential. If Axial is selected, the sensor measures along the machine's axis. Selecting Radial switches to measuring perpendicular to the machine's axis. Tangential means measuring the axis under a certain angle.

- **Speed sensing surface**

  [TEXT]

  Five options for the speed sensing surface are available: Involute (typical gear wheel shape), Slotted (squared teeth on speed wheel), Pole band (toothed band around machine shaft), Holes (drilled holes which are typically located axially), and Blades (e.g., when the sensor is intended to detect turbine blades).

- **Module**

  [TEXT]

  [Range Min 0.0 / Max 100]
  [Default 2]

  Factor of speed wheel diameter divided by the number of teeth (e.g., a diameter of 200 mm and 100 teeth result in a module of 2).

- **Number of pulses per revolution**

  [INPUT]

  [Range Min 1 / Max 1500]
  [Default 60]

  Defines how many pulses refer to one revolution of the rotary setup. Required for correct rotational speed calculation.

- **Rated speed**

  [TEXT]

  Document the operational speed for of the machine.

- **Sensor type**

  [INPUT]

The device supports two different sensor input types that activate the corresponding trigger functionality in the software upon activation:

3-wire voltage is used for powered voltage sensors, e.g., Hall-effect sensors. Selecting it only allows for fixed triggering.

2-wire voltage is used for self-generating types of probes, e.g., variable reluctance (VR) or electromagnetic probes (MPU). The input voltage ranges from 100 mV$_{RMS}$ to 80 V$_{RMS}$. Selecting this function also allows the options adaptive triggering and speed dependent triggering.

▪ **Trigger edge**

[INPUT]

Defines the trigger type as either a rising or falling flank.

▪ **Static Trigger level [V]**

[INPUT]

Configures the threshold for voltage signals. A signal that exceeds the trigger level is counted as a pulse. The following can be selected:

- o 3-wire voltage: trigger 6.5V per default, trigger range 0 – +12.0 V₀lt
  - ▪ 6 Volt equals ) Volt trigger level, this is due to an internal generated off-set.
- o 2-wire voltage: trigger 1V per default, trigger range +/- 12.0 Volt.

▪ **Speed Dependent Trigger**

[Input Frequency]

[Range Min 0.0 Hz / Max 40.000 Hz]
[Default: Zone Dependent]

[Input Voltage]

[Range Min 0.0 V / Max 12.0 V]
[Default: Zone Dependent]

{2 wire voltage input only}

Speed Dependent Trigger configures a voltage threshold for four different frequencies, where any signal that exceeds the threshold is identified as a pulse. For 2-wire input:

- o 0 Hz (fixed frequency) - Trigger level programmable (0.5 V default)
- o 25 Hz (programmable) - Trigger level programmable (2 V default).
- o 75 Hz (programmable) - Trigger level programmable (4 V default).
- o 150 Hz (programmable) - Trigger level programmable (6 V default).

The Speed Dependent Trigger is used to increase the trigger level based on preset actual speed values.

▪ **Zone 1-4**

[Input Frequency]

[Range Min 0.0 Hz / Max 40.000 Hz]
[Default: Zone Dependent]

[Input Voltage]

[Range Min 0.0 V / Max 12.0 V]

The speed dependent trigger are used to compensate the trigger level for phenomena caused by very specific speed wheels. E.g., blades or flattened surfaces, where a secondary pulse with a lower amplitude is superimposed onto the main signal and can inadvertently trigger the pulse detection.
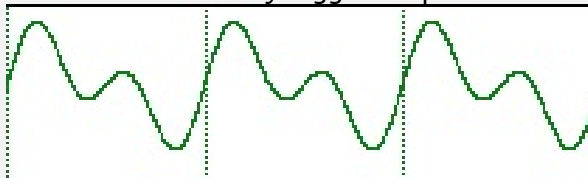


The second pulse amplitude increases with speed. To allow for a correct measurement at high speed and thus higher signal amplitude, the trigger level needs to increase with the speed.
To program the settings of the speed dependent trigger, it is important to know the relation between the speed and the amplitude of the first and second pulse.

The pulse width of duty cycle is an important factor when selecting adaptive triggering or speed dependent triggering. Adaptive Triggering works up to approx. 4000 HZ for signals with a duty cycle of 10% or higher. For higher frequencies or smaller duty cycles the Speed Dependent Triggering is a better option.

**Advanced settings**

- **Frequency Calculating Averaging**

  [INPUT]

  [Range Min 1 / Max 1000]
  [Default: 4]

  Number of pulses for the calculation of the moving average of the frequency. Be aware that a higher setting negatively affects the system reaction time to speed events.
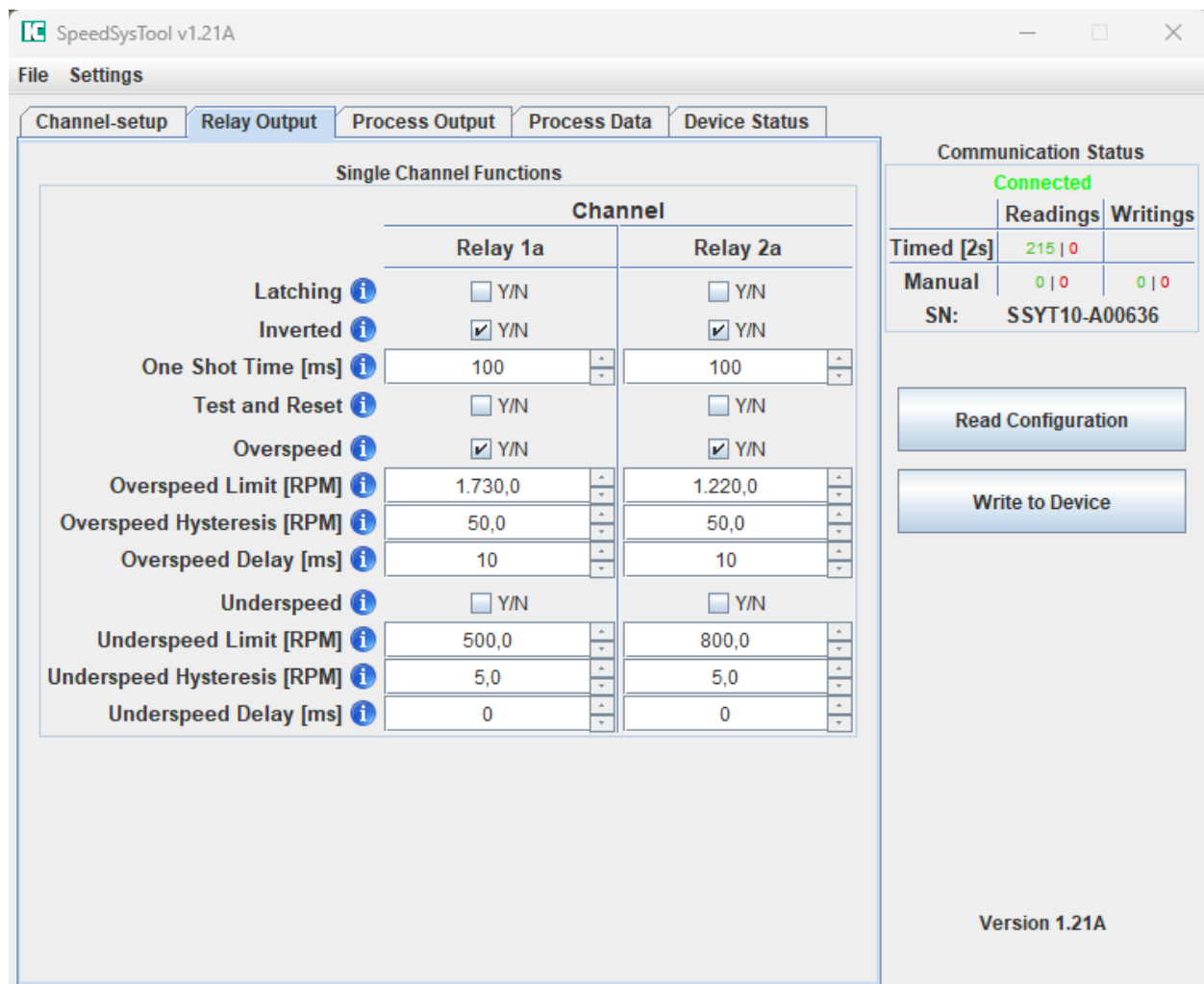
- **Calc. reaction time ($T_h + T_m$).**

  [OUTPUT]

  This value is an estimation of the SpeedSys response time. It is the sum of the hardware, and measurement reaction time ($T_h + T_{m+}$). $T_h$ is a fixed value (4 ms). $T_m$ is a predefined value in the settings and explained above.

## 5.2 Relay Output

The RELAY OUTPUT tab enables the user to define the behavior of the digital outputs.

Each relay can be configured individually. Note that relay 1x is a DPST relay intended to provide alarm status to a control device and can be used to hardwire voting structures with. It is recommended to program this relay as energized closed (inverted). Relay 2x is a SPST relay and can be used for warning signals and is not suitable for hardwired voting structures.

**Digital outputs**

- **Latching.**

  [INPUT]

  Upon activation of an alarm the selected relay will switch to the NOT OK state and remain in this state, even when the alarm has ceased. The relay will return to its normal state after a reset. To reset the relay, use the "Test and Reset" function on the Process Data tab.

- **Inverted**

  [INPUT]

  Determines the energized/de-energized state of the relay.
      Enabled: Energized - normally closed
      Disabled: De-energized - normally open

- **One shot time.**

  [INPUT]

  Inoperable when latching is activated. It determines how long the relay is held after switching and it is released back to operational, given that a new alarm event does not occur, as that will reset the timer. This could be seen as a timed latch.

- **Test and reset.**

  [INPUT]

  Test and reset is activating the selected relay.

- **Overspeed**

  [INPUT]

  This category parametrizes the overspeed alarm condition. Enable the checkbox to activate overspeed alarm for the respective output. The upper limit value of the rotational speed, as well as the hysteresis and delay can be individually configured.

- **Overspeed Limit [RPM]**

  [INPUT]

  When the limit for overspeed has been violated, the alarm signal automatically latches.

- **Overspeed hysteresis [RPM]**

[Input]

A latched speed limit will be reset when the speed drops below the limit value minus the hysteresis value.

- **Overspeed delay [ms]**

[Input]

The delay slows down the response of the output relay by the duration of the programmed time, this time is added to the total reaction time. Note: that the alarm is only initiated if the alarm conditions are continuously met during this time frame of the delay.

- **Underspeed**

[INPUT]

This category parametrizes the underspeed alarm condition. Enable the checkbox to activate overspeed alarm for the respective output. The lower limit value of the rotational speed, as well as the hysteresis and delay can be individually configured.

NOTE: After a power cycle, underspeed only becomes activated after a pulse on the input is detected.

- **Underspeed Limit [RPM]**

[INPUT]

When an underspeed limit has been violated, the alarm signal latches until it rises above the limit plus the hysteresis.

- **Underspeed hysteresis [RPM]**

[Input]

A latched underspeed limit will be reset when the speed rises above the limit value plus the hysteresis value.

- **Underspeed delay [ms]**

[Input]

The delay slows down the response of the output relay by the duration of the programmed time, this time is added to the total reaction time. Note: that the alarm is only initiated if the alarm conditions are continuously met during this time frame of the delay.
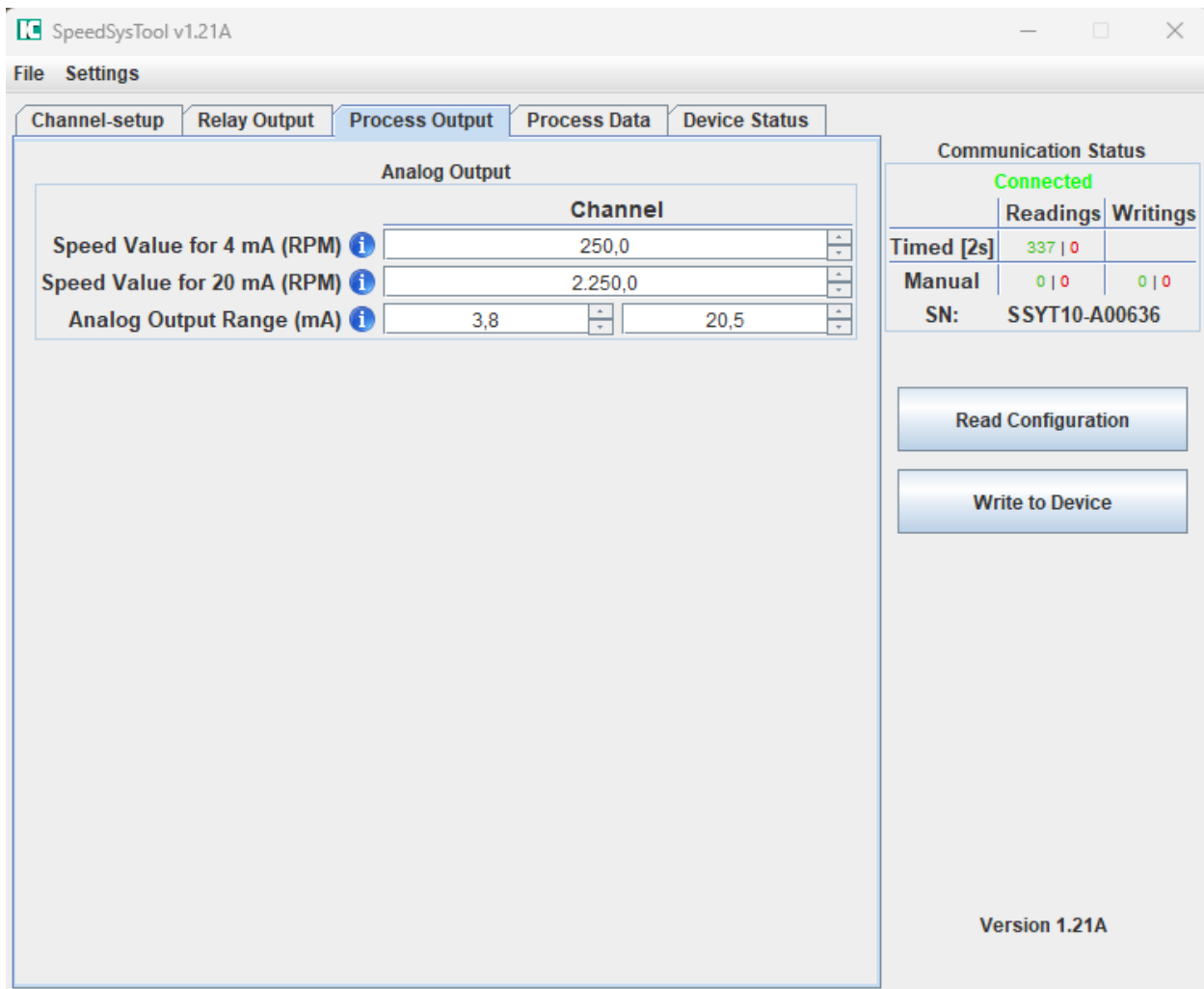
## 5.3  Process outputs

The current graph of the analog OUT as shown below can be defined with five values: the speed values for 4 and 20 mA, the two limits of the analog output range and the error output current.
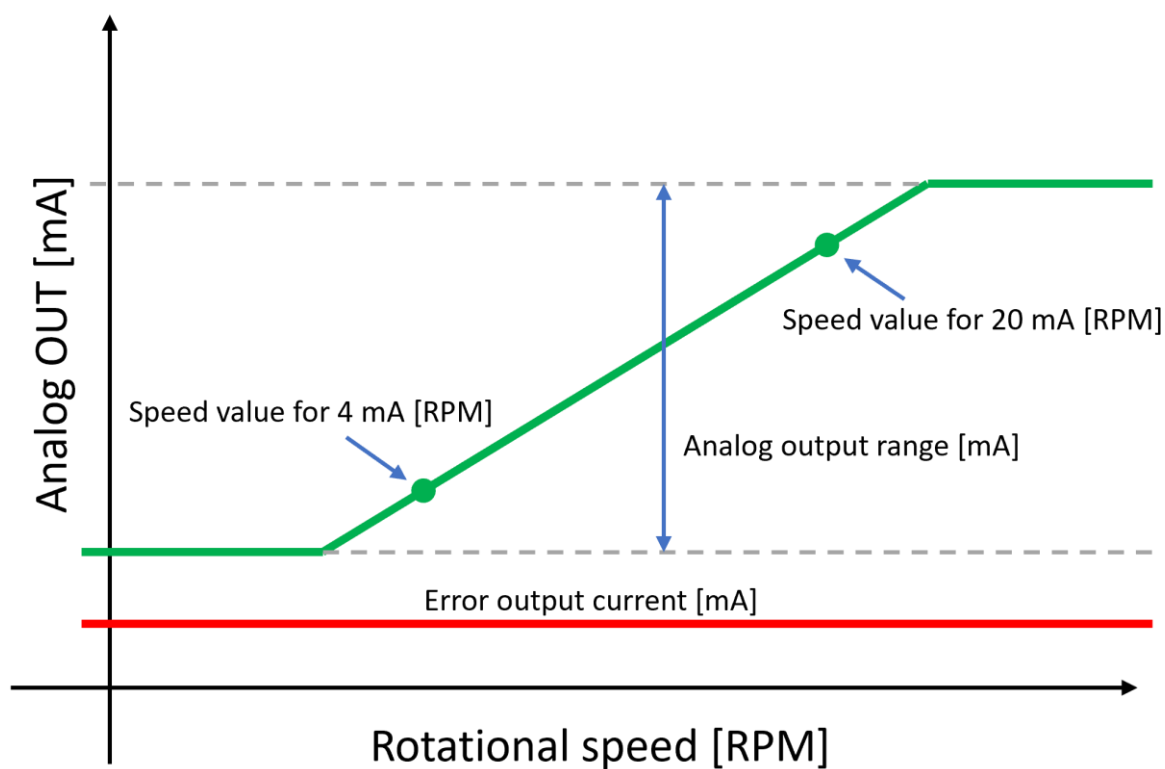


The values can be entered into the software on the PROCESS OUTPUTS tab shown below.

⚠️  Note: Error output current is not supported by the T10A

- **Speed value for 4 mA (RPM)**

  [OUTPUT}

  Calibrates the minimum value of the output.
  Note that the output can be configured for the complete range of the application or a split range (e.g., 1,000 – 2,500 RPM).

- **Speed value for 20 mA (RPM)**

  [OUTPUT}

  Calibrates the maximum value of the output.
  Note that the output can be configured for the complete range of the application or a split range (e.g., 1,000 – 2,500 RPM).
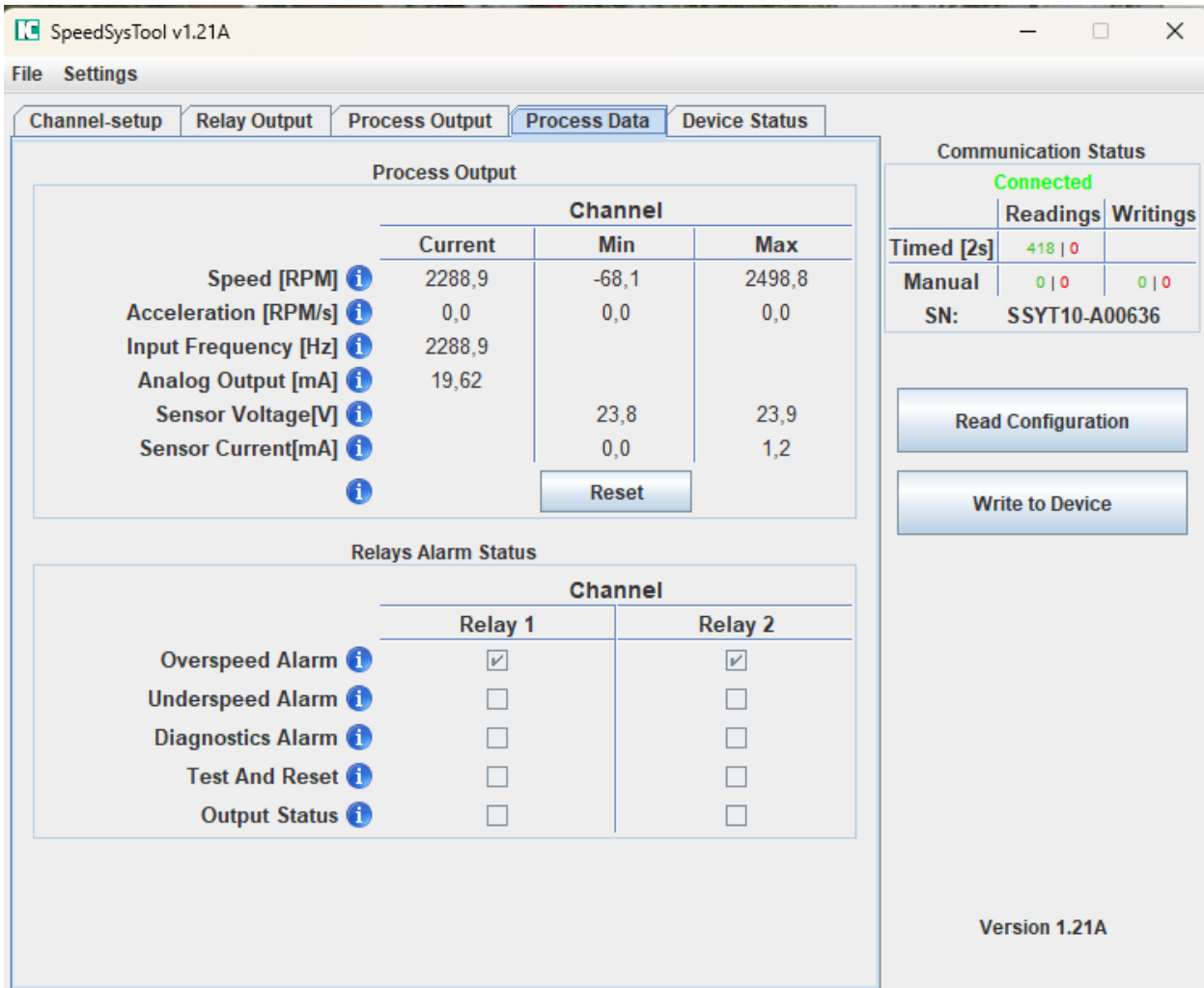
- **Analog output range**

  [INPUT]

  The output range defines the possible range of the 4-20 mA output. When exceeding the defined values for the 4-20 range, the output will be limited to the output range values

## 5.4 Process data

The PROCESS DATA tab displays relevant information about the current state of the process parameters as well as the status of the alarm relays. Furthermore, the minimum and maximum measurement values are stored for the speed and acceleration.



Note: Acceleration [RPM/s] is not supported by the T10A

- **Speed (RPM)**

  [OUTPUT]

  The values are representing the actual, min. and max. values of the speed measurements. The representation of the min. and max. values are the values registered after the last reset command.

- **Acceleration (RPM/S)**

  [OUTPUT]

  The values are representing the actual, min. and max values. of the speed measurements. The representation of the min. and max. values are the values registered after the last reset command.

- **Input Frequency (Hz)**

  [OUTPUT]

  The values are representing the actual, min. and max. values of the speed measurements. The representation of the min. and max. values are the values registered after the last reset command.

- **Analog Output (mA)**

  [OUTPUT]

  The values are representing the actual, min. and max. values of the speed measurements. The representation of the min. and max. values are the values registered after the last reset command.

- **Sensor voltage (V)**

  [OUTPUT]

  The values represent the actual, min. and max. values of the speed sensor supply voltage measurements. The representation of the min. and max. values are the values registered after the last reset command.

- **Sensor Current (mA)**

  [OUTPUT]

  The values represent the actual, min. and max. values of the speed supply current measurements. The representation of the min. and max. values are the values registered after the last reset command.

registered after the last reset command.

- **Reset** (button)

  [INPUT]

  Clicking the Reset button will clear the min. / max. memories and reset the relays.

- **Overspeed Alarm**

  [OUTPUT]

  When the tick box is empty the function is not used or in-active
  When the tick box is acknowledged the function is active and limits are exceeded.

- **Underspeed Alarm**

  [OUTPUT]

  When the tick box is empty the function is not used or in-active
  When the tick box is acknowledged the function is active and limits are exceeded.
  .

- **Diagnostics Alarm**

  [OUTPUT]

  When the tick box is empty the function is not used or in-active
  When the tick box is acknowledged the function is active and limits are exceeded.

- **Test and Reset**

  [OUTPUT]

  When the itick box is empty, the function is not used in-active
  When the indicator is acknowledged the function is active.
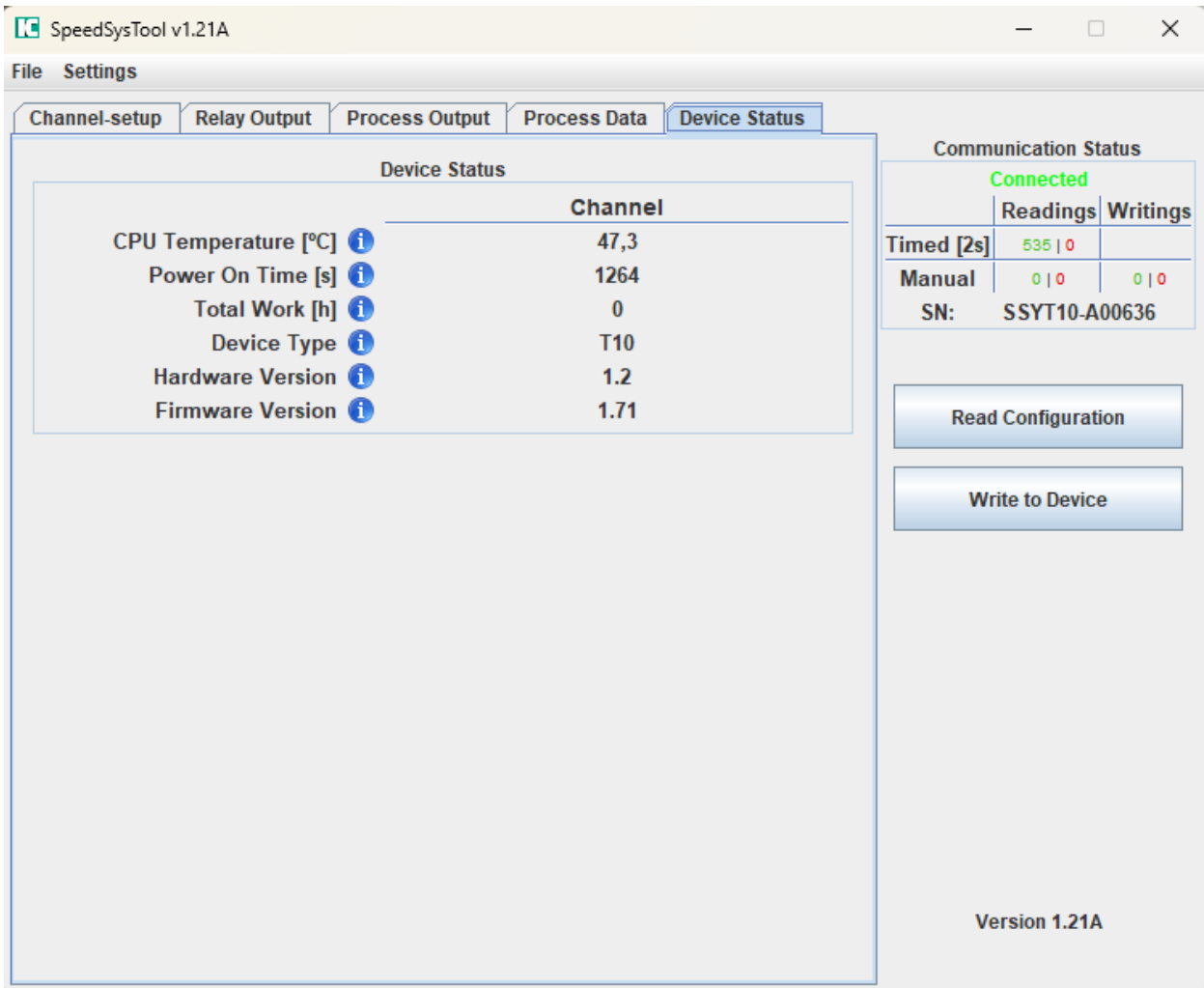  .

- **Output Status**

  [OUTPUT]

  The output status is representing the relay status. The status is based on the alarm status of one or more coupled functions and the inverse (energised normally closed) or not inverse (de-energised normally open).

## 5.5 Device status

The DEVICE STATUS tab displays real-time information on different parameters. The CPU temperature, operating hours, and other relevant parameters for commissioning are service, are displayed on this tab.



| | |
|---|---|
| ⚠️ | Note: Total work time function is not supported by the T10A |

- **CPU Temperature**

  [OUTPUT]

  Actual CPU temperature.

- **Power On Time**

  [OUTPUT]

  The power-on time is the time passed since the unit is switched on. This value resets to 0 after each power cycle.

- **Total Work**

  [OUTPUT]

  Not available for this FW version.

- **Device Type**

  [OUTPUT]

  Device type shows the type of SpeedSys Tx0 that is connected.

- **Firmware Version**

  [OUTPUT]

  The Firmware version shows the FW version of the connected device.

- **Hardware Version**

  [OUTPUT]

  The Hardware version shows the HW version of the connected device.

## 5.6 Saving a configuration on to the SpeedSys T10A

After configuring all parameters, the configuration must be written to the device. This is done by clicking on the Write to Device button.

## 5.7 Status LEDs

The front panel of the SpeedSys has two LEDs per channel. See the table below for a detailed description of their status.

| LED | Status | Description |
| --- | --- | --- |
| Relay LED (yellow) | On | Relay 1 and Relay 2 switched |
| | Flashing | Relay 1 or Relay 2 switched |
| System LED (green) | On | Unit is powered |
| | Flashing | System error |

# 6  Service

⚠️ **HAZARD**: The circuits inside the device must not be accessed. Do not repair the device yourself but replace it with an equivalent device. Repairs may only be carried out by the manufacturer.

## 6.1  Spare parts

Non listed.

## 6.2  Contact information.

Istec International
Meer en Duin 8
2163 HA  LISSE
NETHERLANDS

+31 (0)252 433 400
www.istec.com

## 6.3  Questions and support.

We are ready to help you!
Visit www.istec.com/support

# 7 Technical information

## 7.1 Labels and certifications

Power supply: 24 $V_{DC}$ (18..31.2 $V_{DC}$), max. 160 mA

Instrument earth connection (functional earth)

The manufacturer declares that the product conforms to the applicable standards.

The manufacturer declares that the product conforms to the applicable standards

The manufacturer declares that the product conforms to the applicable RoHS 2 directive 2011/65/EU.

## 7.2 Product identifiers

| | |
|---|---|
| **MFR** | H7368 |
| **Model** | SSYT10-A00-001 |
| **SER** | SSYT10-Axxxxx |
| **PNR** | ISTSSYT10A |

## 7.3 Specifications

Please consult the datasheet for system specifications.