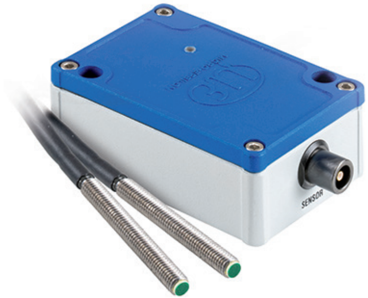


Assembly Instructions

capaNCDT CST6110

Warnings

CAUTION

Connect the power supply and the display/output device according to the safety regulations for electrical equipment.

> Risk of injury
> Damage to or destruction of the sensor

NOTICE

The supply voltage must not exceed the specified limits.

> Damage to or destruction of the sensor

Avoid shocks and impacts to the sensor.

> Damage to or destruction of the sensor

Protect the cable against damage.

> Failure of the measuring device

Intended Use

- The system is designed for use in industrial and laboratory applications.
- It is used for industrial counting tasks.
- The system must only be operated within the limits specified in the technical data, see operating instructions Chap. 2.4
- The system must be used in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure of the sensor.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

Proper Environment

- Protection class (sensor): IP67 (when connected)
- Protection class (controller): IP67 (with closed lid and when connected)
- Temperature range (operation)
  - Sensor, sensor cable: -50 ... +125 °C (-58 ... +257 °F)
  - Controller: -40 ... +85 °C (-40 ... +185 °F), briefly up to 125 °C
- Temperature range (storage)
  - Sensor, sensor cable: -50 ... +125 °C (-58 ... +257 °F)
  - Controller: -40 ... +85 °C (-40 ... +185 °F)
- Humidity: 5–95% (non-condensing)
- Ambient pressure: Atmospheric pressure
- Power supply 11 ... 32 VDC

You can find more information about the sensor in the operating instructions.
They are available online at: https://www.micro-epsilon.com/download/manuals/man--capaNCDT-CST6110--en.pdf

Power Supply and Signal Cable SCAC3/6/IP

SCAC3/6/IP is a ready-made 6-wire power supply and signal cable.

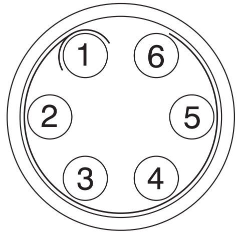
i Never bend the power supply and signal cable more tightly than the permitted bending radius: 5 x outer diameter of cable

Electrical Connections

Power Supply, Outputs

Signal	**Pin**	**Wire color SCAC3/6/IP**	**Description**
+24 V	1	White	+24 V supply, 11 ... 32 VDC, reverse polarity protection
0 V	2	Gray	Supply ground
$Analog_{out}$	3	Pink	Signal output 0 ... 5 V
AGND	4	Green	Analog ground of signal output
TTL_{out}	5	Brown	Counting pulses, digital
RAW SIGNAL	6	Blue	Analog signal (load > 5 kOhm)
Housing		Black	

Pin assignment for POWER/SIGNAL socket and SCAC3/6/IP



View on solder pin side, 6-pole cable connector

Supply voltage connection

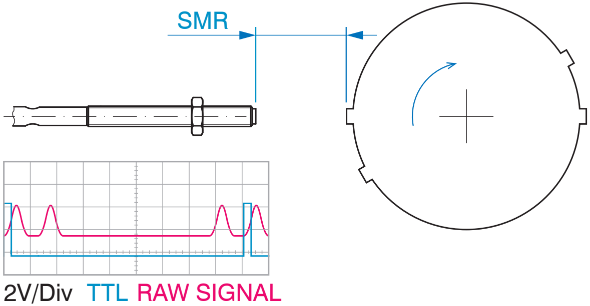
The socket housing is connected to the controller housing.

➡ Connect the controller housing to the grounding of the test bench or protective ground.

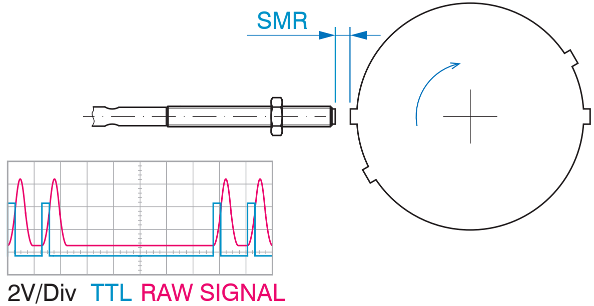
The outputs are briefly resistant to short circuits.

Raw Signal

The controller provides 0 ... 5 V analog voltage for sensor adjustment using the RAW SIGNAL, see operating instructions Chap. 5.4. Load resistance > 5 kOhm.



Distance between sensor and measuring object (ridge) too large



Distance between sensor and measuring object (ridge) OK

The system detects ridges and grooves.

NOTICE

The sensor front may not touch the measuring object/ridge!
> Damage to or destruction of the sensor

i The vibrations of a rotating mechanical shaft cause slightly larger distances between sensor and measuring object. To ensure that the RAW signal can be reliably evaluated over the entire measuring range, the signal conversion requires a sufficient buffer in the switching thresholds. You achieve this with an optimal distance between the sensor and the measuring object or by increasing the sensitivity of the controller.

Operating

Connecting the Measuring System Structure

The voltage supply for the controller is provided via the `SUPPLY/OUTPUT` socket; signals are concurrently output via that socket.

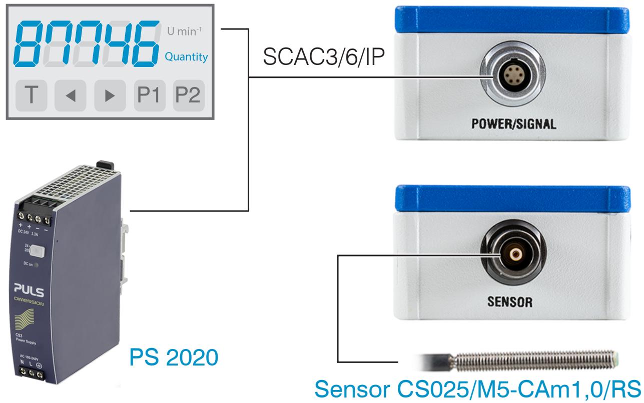
- Install the sensor in the measurement environment.
- Connect the sensor to the controller.
- Connect the controller to power supply; use the SCAC3/6/IP connection and signal cable, cable length 3 m, see operating instructions Chap. 4.4.2.

The connection and signal cable has a push-pull latch on the plug side, as does the sensor cable. Push-pull connections feature a very user-friendly latching mechanism. If the plug connector is pushed into the device, latching claws on the plug connector snap into the device component and create a reliable connection between the two components. It cannot be separated by pulling on the plug connector's cable. By contrast, the plug connector can easily be separated from the device component, if the outer sleeve is pulled back.

- If necessary, connect measuring signal displays or recording equipment to the controller via the 6-pole cable connector.
- Switch on the supply voltage at the power supply unit.

The controller initializes itself when the supply voltage is applied. This is indicated by the `Status` LED, see operating instructions Chap. 5.2. Depending on the operating mode set, the `Status` LED changes.

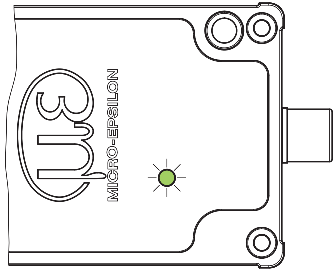
- Set the desired operating mode and the measuring object divider, see operating instructions Chap. 5.2 and Chap. 5.3.
- Position the sensor, see operating instructions Chap. 5.4.



Connection examples for CST6110

LEDs Controller, Operating Modes

Operating mode	LED	Meaning			
0	Turquoise	Not enough movement detected, ridges/grooves not identified			Signal test RAW SIGNAL
	Green	Signal test without error			
	Red	Error, irregular pulse pattern			
1	Green ...	Blue ...	Red	Test for Analog $_{OUT}$ and TTL $_{OUT}$, changing color pattern	
2	Purple	TTL pulse per measuring object divider (blade)			
3	Blue	TTL pulse per rotation or per X measuring object dividers (blades)			
4 … 9	Turquoise	No movement detected / ridges/grooves not identified			Rotational speed measurement
	Green	Measurement inside the measuring range			
	Orange	Measurement outside the measuring range			

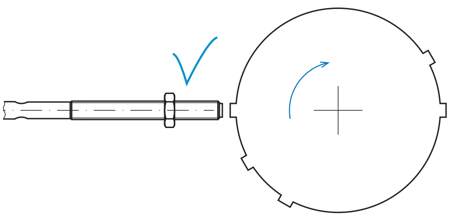
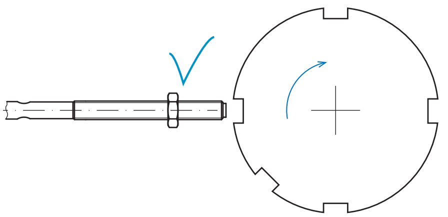
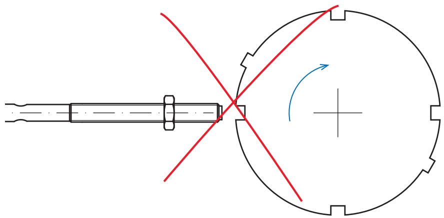


Status LED on the Controller

MODE rotary switch	Description	Measuring range	Number of blades X	Output signals	
				Analog	TTL
0	Signal Test	up to 110 kHz	Adjust measuring object divider (BLADES)	0…5V VDC RAW SIGNAL	Pulse (variable) per ridge or groove
1	Output Test				
2	TTL pulse per blade		Not used		
3	TTL pulse per rotation or per X blades	10 … 400,000 rpm (@ 16 blades)	Adjust measuring object divider (BLADES) 1 ... 16	-	Pulse 100 μs per rotation/all X ridges or grooves
7	Rotational speed measurement	0 ... 100,000 rpm		0…5V VDC	Pulse (variable) per ridge or groove
8		0 ... 200,000 rpm			
9		0 ... 400,000 rpm			
4	Frequency measurement	0 ... 10,000 Hz	Not used		
5		0 ... 50,000 Hz			
6		0 ... 100,000 Hz			

Measuring Object Divider

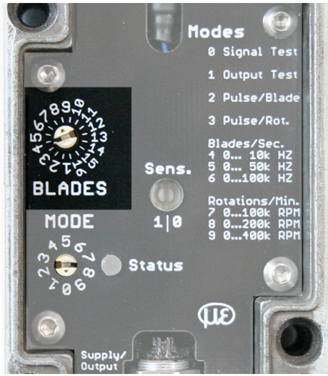
Adjusting the measuring object divider with the BLADES switch provides the controller with the information about the nature of the measuring object. It does not matter whether you measure against ridges or grooves.

		
Measurement against ridges: possible	Measurement against grooves: possible	Measurement against ridges/grooves: not possible

The controller evaluates the pulses provided by the sensor. For the `Rotational speed measurement` modes (MODES 7, 8, 9) and `TTL pulse per rotation` (MODE 3), the controller must know the number of ridges or grooves of the measuring object. For the `Signal Test` and the `Output Test`, the measuring object divider must also be defined.

The controller can evaluate measuring objects with up to 16 ridges or grooves.

➡ Define the number of ridges or grooves of your measuring object. Therefore, use the `BLADES` switch on the controller.



BLADES switch, set to 8 ridges or grooves

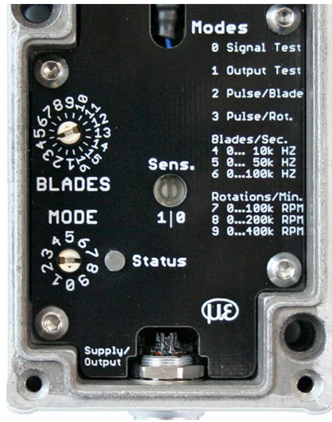
Positioning the Sensor

With Open Housing

The sensor is best installed when the inside of the measuring object and the sensor front are visible.

➡ Install the sensor incl. locknut flush to the housing wall. Connect the sensor to the controller.

➡ Check the RAW SIGNAL from the controller and optimize the distance between the sensor and the measuring object. There are two options for this:

<table>
<tr><td>Possibility 1:
Status LED</td><td>➡ Open the controller housing.
➡ Use the MODE switch to select operating mode <code>0</code>.
➡ Use the <code>BLADES</code> switch to define the measuring object divider.</td><td rowspan="3">

Controller electronics with adjusting elements</td></tr>
<tr><td colspan="2">➡ Start to rotate the measuring object and carefully screw the sensor onto the thread of the housing during running operation.
The sensor position should always be fastened by the locknut, except while it is being screwed onto the thread.
➡ Observe how the color of the <code>Status</code> LED changes.</td></tr>
<tr><td><code>Status</code> LED: turquoise
Too few pulses to check the signal transformation</td><td>- Measuring object does not turn/turns very slowly
➡ Increase rotational speed
- Sensor identifies too few signal peaks
➡ Continue to carefully screw in the sensor or increase the controller’s sensitivity using the <code>Sens</code> potentiometer (sensitivity).
If sensitivity is at the maximum, continue to screw in the sensor.</td></tr>
<tr><td><code>Status</code> LED: red
Signal faulty</td><td colspan="2">- Ridges/grooves are not identified as such
➡ Carefully continue to screw in the sensor or increase the sensitivity
- Sensitivity is at the maximum, faults are detected as ridges/grooves
➡ Reduce the sensitivity and continue to carefully screw in the sensor</td></tr>
<tr><td><code>Status</code> LED: green
Signal faultless</td><td colspan="2">Pulses are detected at regular time intervals. The RAW signal is correctly transformed into digital pulses without faults or pulse drops.</td></tr>
</table>

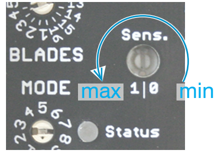
<table>
<tr>
<td>Possibility 2:

RAW SIGNAL

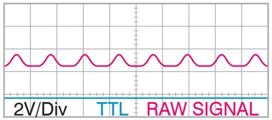
and

Oscilloscope</td>
<td colspan="2">

- ➡ Open the controller housing. Use the MODE switch to select the operating mode `0`.
- ➡ Use the `BLADES` switch to define the measuring object divider.
- ➡ Connect the TTL (channel) and RAW (channel II) signals to an oscilloscope.
- ➡ Start to rotate the measuring object and carefully screw the sensor onto the thread of the housing.

The sensor position should always be fastened by the locknut, except while it is being screwed onto the thread.
</td>
<td>


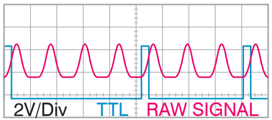
Sensitivity potentiometer
</td>
</tr>
<tr>
<td><code>Status</code> LED: turquoise

Measurement not possible</td>
<td>


Screenshot of oscilloscope; long distance, low sensitivity
</td>
<td colspan="2">
The raw signal on the oscilloscope should already show a small signal boost for each ridge/groove, distance between sensor and ridge approx. 5 mm.

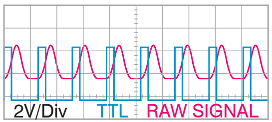
➡ Carefully continue to screw in the sensor.

i The connector on the sensor cable can be turned in the socket without needing to be pulled off. You can continue to screw in the sensor while it is plugged in without the cable being twisted.
</td>
</tr>
<tr>
<td><code>Status</code> LED: red

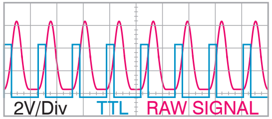
Measurement not possible</td>
<td>


Screenshot of oscilloscope; medium distance, low sensitivity
</td>
<td colspan="2">
Once the raw signal includes clear signal boosts per ridge/groove, pulse transformations can occur. However, if the controller‘s sensitivity is too low, the raw signal is not transformed correctly. Pulse drops in the TTL signal are gaps.

➡ Continue to carefully screw in the sensor and/or increase the sensitivity using the `Sens` potentiometer.
</td>
</tr>
<tr>
<td><code>Status</code> LED: green

Measurement possible</td>
<td>


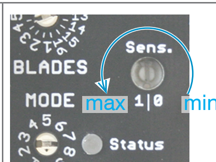
Screenshot of oscilloscope; medium distance, high sensitivity
</td>
<td colspan="2">
Pulses are detected at regular time intervals.
The RAW signal is correctly transformed into digital pulses without faults or pulse drops.
</td>
</tr>
</table>

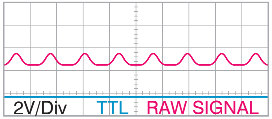
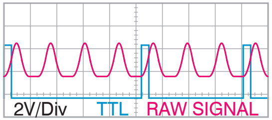
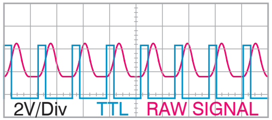
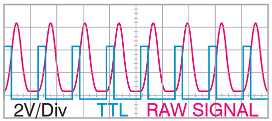
Status LED: green Measurement possible	 *Screenshot of oscilloscope; short distance, low sensitivity*	Signals on oscilloscope after distance between sensor and measured object has been reduced without changing sensitivity.

The RAW SIGNAL is exclusively used for sensor installation. Signal range: 0 ... 5 V.

With Closed Housing

The distance between the sensor and the measuring object is not visible. You can determine the optimal distance between the sensor and the measuring object using the RAW signal or the Status LED. Sensor and controller are connected with each other.

Possibility 1: **RAW SIGNAL** **and** **Oscilloscope**	➡ Open the controller housing. Use the MODE switch to select the operating mode 0. ➡ Use the BLADES switch to define the measuring object divider. ➡ Connect the TTL (channel) and RAW (channel II) signals to an oscilloscope. ➡ Start to rotate the measuring object. ➡ Screw a locknut on the sensor and carefully turn the sensor onto the thread of the housing. The sensor position should always be fastened by the locknut, except while it is being scre-wed onto the thread. ➡ Check the RAW SIGNAL from the controller and optimize the distance between the sensor and the measuring object.	 *Sensitivity potentio-meter*

Status LED: turquoise Measurement not possible	 *Screenshot of oscilloscope; long distance, low sensitivity*	The raw signal on the oscilloscope should already show a small signal boost for each ridge/groove, distance between sensor and ridge approx. 5 mm. ➡ Carefully continue to screw in the sensor. i The connector on the sensor cable can be turned in the socket without needing to be pulled off. You can continue to screw in the sensor while it is plugged in without the cable being twisted.
Status LED: red Measurement not possible	 *Screenshot of oscilloscope; medium distance, low sensitivity*	Once the raw signal includes clear signal boosts per ridge/groove, pulse transformations can occur. However, if the controller's sensitivity is too low, the raw signal is not transformed correctly. Pulse drops in the TTL signal are gaps. ➡ Continue to carefully screw in the sensor and/or increase the sensitivity using the Sens potentiometer.
Status LED: green Measurement possible	 *Screenshot of oscilloscope; medium distance, high sensitivity*	Pulses are detected at regular time intervals. The RAW signal is correctly transformed into digital pulses without faults or pulse drops.
Status LED: green Measurement possible	 *Screenshot of oscilloscope; short distance, low sensitivity*	Signals on oscilloscope after distance between sensor and measured object has been reduced without changing sensitivity.

The RAW SIGNAL is exclusively used for sensor installation. Signal range: 0 ... 5 V.

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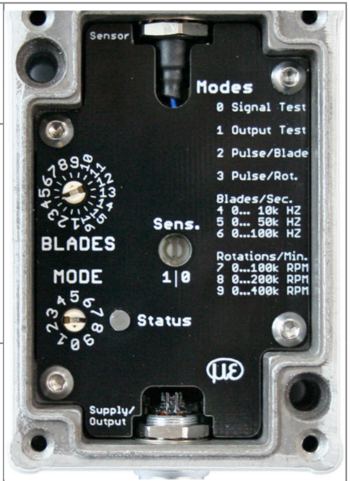
➡ Use the BLADES switch to define the measuring object divider.</td><td rowspan="3">

Controller electronics with adjusting elements</td></tr>
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MICRO-EPSILON

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