DEWETRON

OXYGEN TRAINING
> COUNTER CHANNELS

COUNTER CHANNELS - HARDWARE OVERVIEW

DEWETRON

Content:

- > Hardware overview
- > Block diagram TRION-CNT
- > Internal timebase and sample rates
- > Channel settings
- > Exemplary sensor setups
  - > Tacho probe
  - > Rotational encoders
  - > Linear encoders
  - > Flow meters
  - > CDM+TRG sensors
  - > Frequency determination

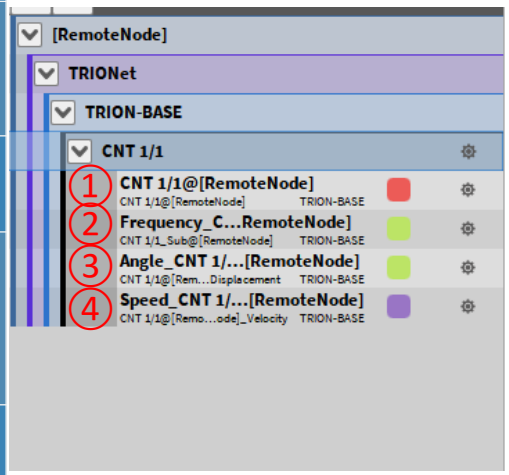
Hardware								
	TRION-CNT	TRION-BASE	TRION-TIMING	TRION-VGPS	TRION-1802/1600-dLV (EOL)	TRION(3)-18x0-MULTI	TRION-1620-ACC	TRION-2402-dACC
#Counter #Inputs/Counter	6 3 DI	2 3 DI	1 3 DI	1 3 DI	2 3 DI	2 1 AI	1 1 AI	2 1 AI
Isolation	✓	☒	☒	☒	☒	✓	✓	☒
Sensor supply	5V and 12V	5V and 12V	5V and 12V	5V and 12V	5V and 12V	0…24 V	☒	☒
Encoder (A,B,Z) support	✓	✓	✓	✓	✓	☒	☒	☒
Frequency measurement	✓	✓	✓	✓	✓	✓	✓	✓
Event counting	✓	✓	✓	✓	✓	✓	✓	✓
Trigger level	0 to 50 V 12 mV steps	CMOS/TTL	CMOS/TTL	CMOS/TTL	CMOS/TTL	75 % of input range	70 % of input range	CMOS/TTL
Counter time base	80 MHz	80 MHz	80 MHz	80 MHz	100 MHz	100 MHz	80 MHz	80 MHz
Max. input frequency	10 MHz	10 MHz	10 MHz	10 MHz	10 MHz	2 MHz	1 MHz	500 kHz

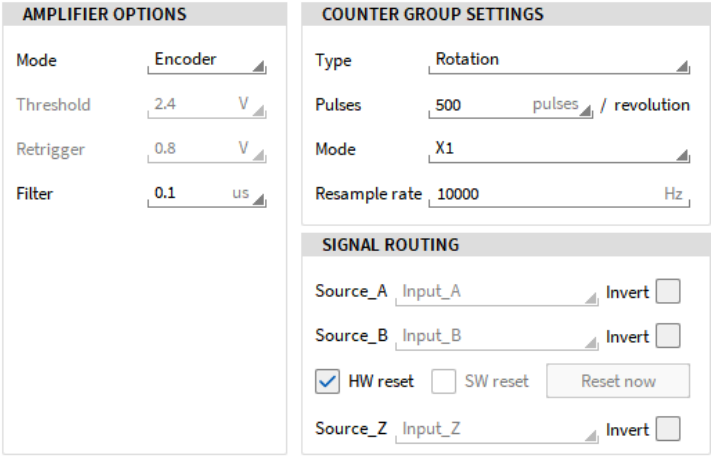
EOL… End of Line

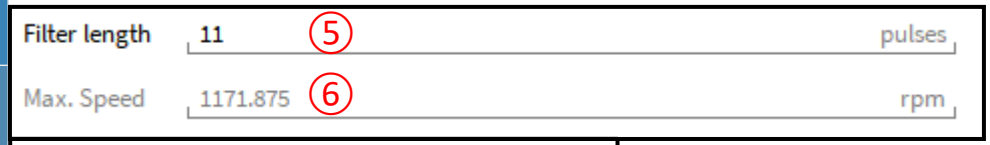
EXEMPLARY CHANNEL SETUP FOR ROTATIONAL ENCODERS

DEWETRON

	Based on the applied settings,
①	*CNT x/x* counts the number of detected events according to the selected counting mode
②	Frequency_*CNT x/x* will determine the frequency between two rising edges
③	Angle_*CNT x/x* will output the actual angle and be reset after 360° if *HW reset* is enabled (update rate depending on *Resample rate*)
④	Speed_*CNT x/x* will determine the running speed (update rate depending on *Resample rate*)
⑤	To read in noisy signals, a moving average filter can be applied in event and encoder mode. The filter length determines the averaging length
⑥	Based on the sample rate and the pulses per revolution a maximum speed can be calculated





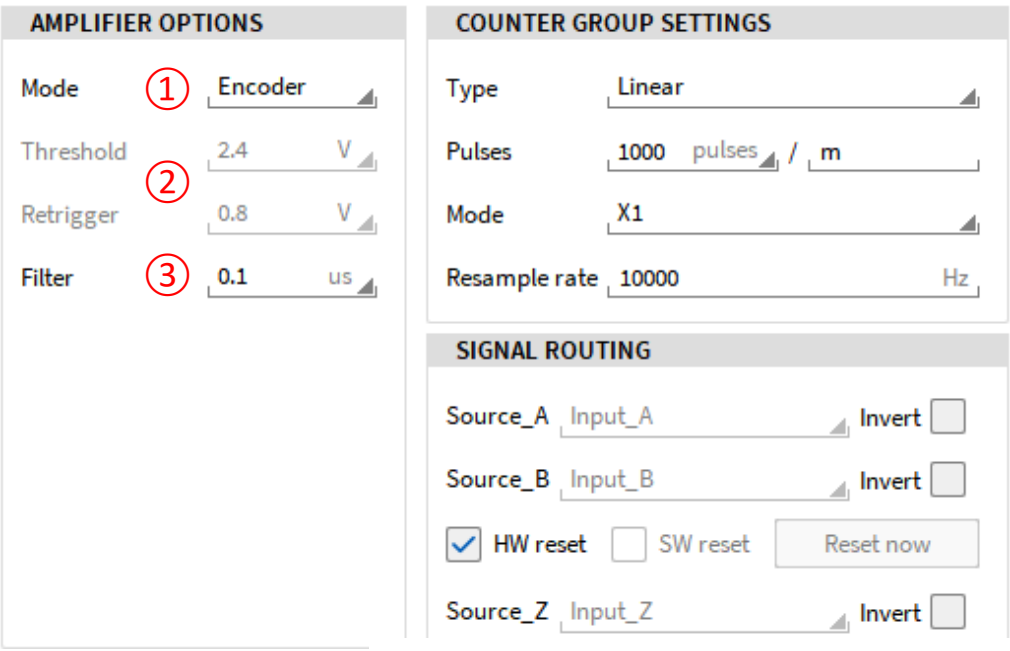


$$Max.\,speed\ [rpm] = \frac{Sample\ rate\ [Hz] * 60}{Pulses\ per\ Revolution}$$

EXEMPLARY CHANNEL SETUP FOR LINEAR (DISTANCE) ENCODERS

DEWETRON

①	Go to the general counter group settings (*CNT x/x*) and select *Encoder* Mode to count the number of pulses detected by the sensor
②	Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
③	The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.



EXEMPLARY CHANNEL SETUP FOR LINEAR (DISTANCE) ENCODERS

DEWETRON

④ Select *Linear* Type

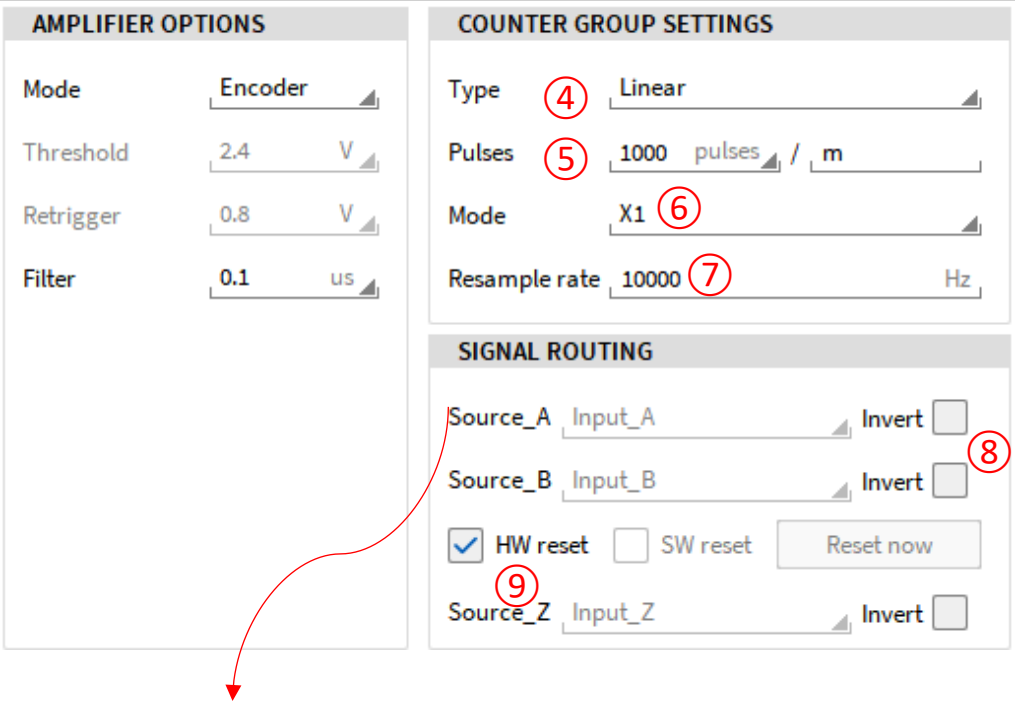
⑤ Enter the number of pulses per meter delivered by the sensor (i.e. 360, 500, 512 or 1800)

⑥ Select the encoder counting mode with which the event count channel will increase or decrease the event count: *X1, X2, X4 or A-up/B-down*. For more details, please refer to the TRION series modules technical reference manual

⑦ Enter the resample rate (sample rate for software channels Angle_*CNT x/x* , Speed_*CNT x/x*)

⑧ Possibility to invert the signals

⑨ If *HW reset* is selected, the event count and angle will be reset if the signal connected to Z has a rising edge.
No reset will be applied if *HW reset* is deselected



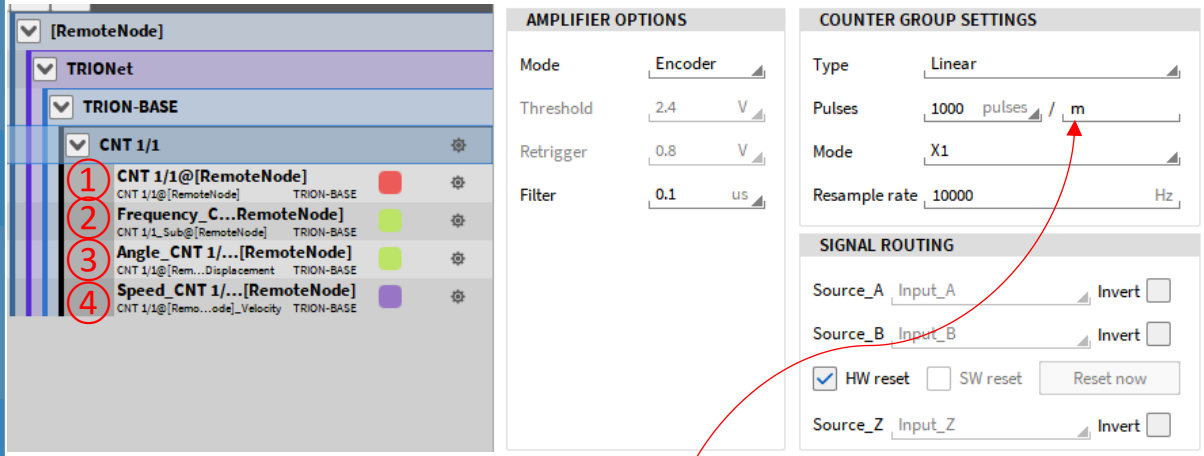
Remark:
The hardware Signal Routing cannot be changed for Encoder channels

EXEMPLARY CHANNEL SETUP FOR (DISTANCE) ENCODERS

DEWETRON

Based on the applied settings,

1. *CNT x/x* counts the number of detected events according to the selected counting mode
2. Frequency_*CNT x/x* will determine the frequency between two rising edges
3. Angle_*CNT x/x* will output the absolute distance from the Zero position (Input *Z*) if *HW reset* is enabled and the relative distance otherwise
4. Speed_*CNT x/x* will determine the velocity [m/s]



Remark:
Other encoders (i.e. flow meters) can surely be connected to counter channels as well. The engineering unit can be changed in the Counter Group Settings

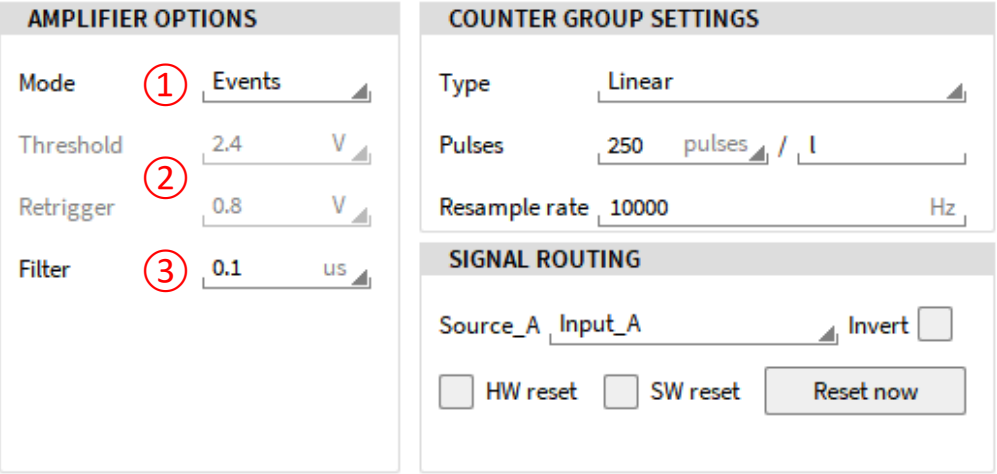
EXEMPLARY CHANNEL SETUP FOR FLOW METERS

DEWETRON

① Go to the general counter group settings (*CNT x/x*) and select *Events* mode to count the number of pulses detected by the sensor

② Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level

③ The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*.
For more details, please refer to the TRION series modules technical reference manual.



EXEMPLARY CHANNEL SETUP FOR FLOW METERS

DEWETRON

④ As flow meters determine flow of a medium like water per time, the sensor outputs a linear signal. Thus, *Linear* Type must be selected

⑤ Enter the number of pulses per reference unit output by the sensor

⑥ Enter the resample rate (sample rate for software channels Angle_*CNT x/x* , Speed_*CNT x/x*)

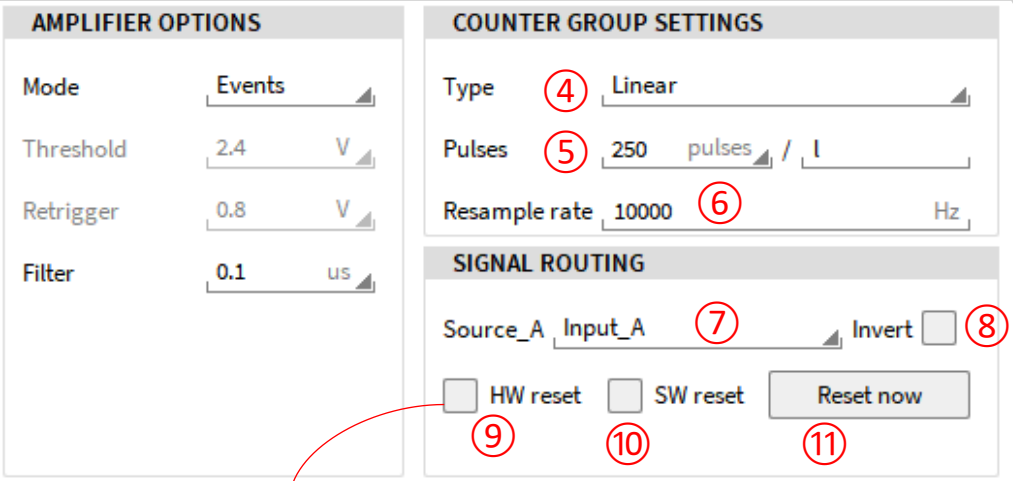
⑦ Select the input of the counter channel (A, B or Z) to which the sensor signal is connected

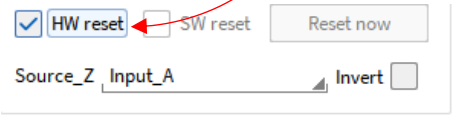
⑧ Possibility to invert the signal

⑨ If *HW reset* is selected, an additional counter input can be selected to reset the event count and angle if a rising edge is detected

⑩ *SW reset* is not required for this sensor type

⑪ Immediately resets events and angle

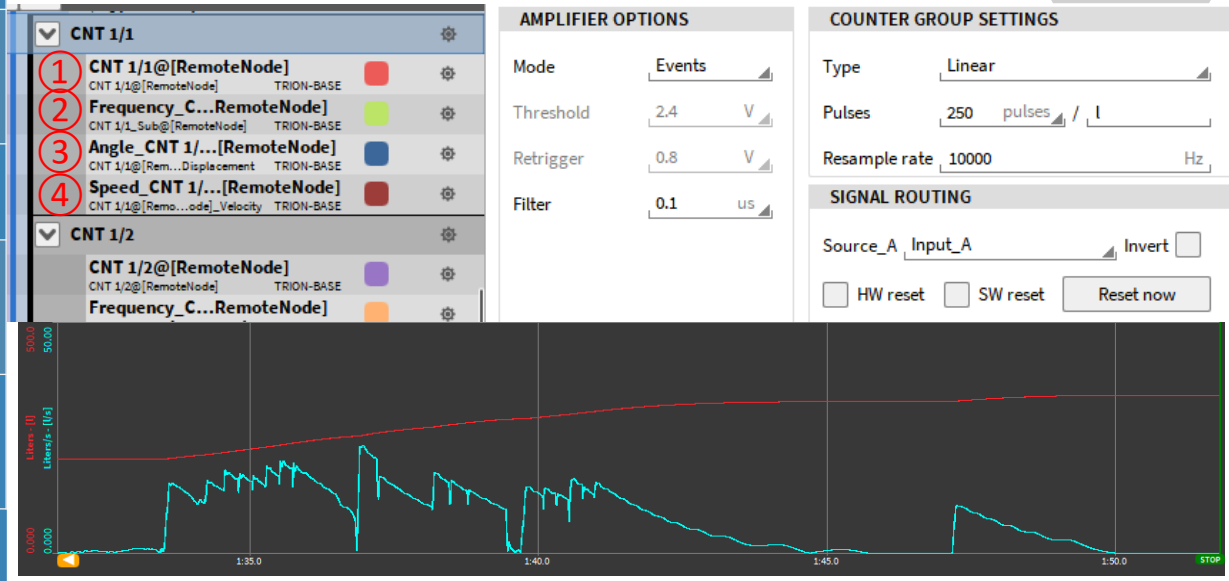




EXEMPLARY CHANNEL SETUP FOR FLOW METERS

DEWETRON

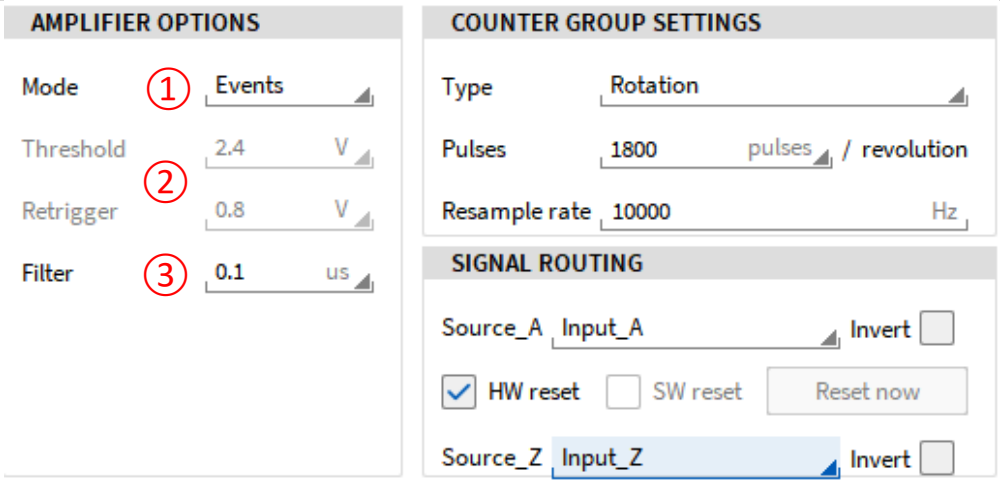
	Based on the applied settings,
①	*CNT x/x* counts the number of detected events and increases by 1 every time a rising edge is detected
②	Frequency_*CNT x/x* will determine the frequency between two rising edges
③	Angle_*CNT x/x* will output overall flow measured by the sensor, i.e. the liters detected since acquisition start
④	Speed_*CNT x/x* will determine the throughput per time, i.e. the liters detected per second



EXEMPLARY CHANNEL SETUP FOR CDM+TRG SENSORS

DEWETRON

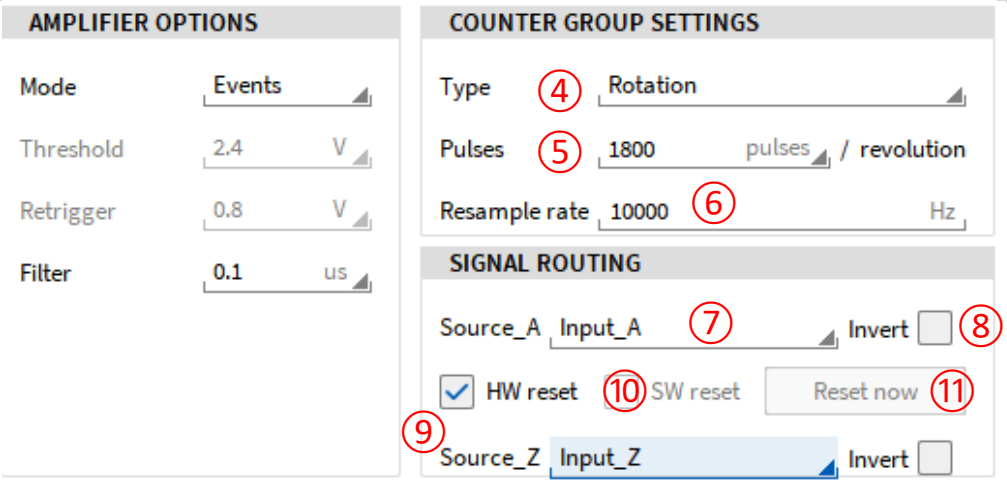
①	Go to the general counter group settings (*CNT x/x*) and select *Events* mode to count the number of pulses detected by the sensor
②	Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
③	The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.



EXEMPLARY CHANNEL SETUP FOR CDM+TRG SENSORS

DEWETRON

④	As CDM+TRG sensors determine the rotation speed of a DUT, *Rotation* Type must be selected
⑤	Enter the number of pulses per revolution delivered by the sensor (i.e. 360, 720 or 1800)
⑥	Enter the resample rate (sample rate for software channels Angle_*CNT x/x* , Speed_*CNT x/x*)
⑦	Select the input of the counter channel (A, B or Z) to which the sensor signal is connected
⑧	Possibility to invert the signal
⑨	Select *HW reset* and specify the counter channel to which the reference pulse (TRG) is connected
⑩	As *HW reset* is activated, *SW reset* is not applicable here
⑪	As *HW reset* is activated, *Reset now* is not applicable here



EXEMPLARY CHANNEL SETUP FOR CDM+TRG SENSORS

DEWETRON

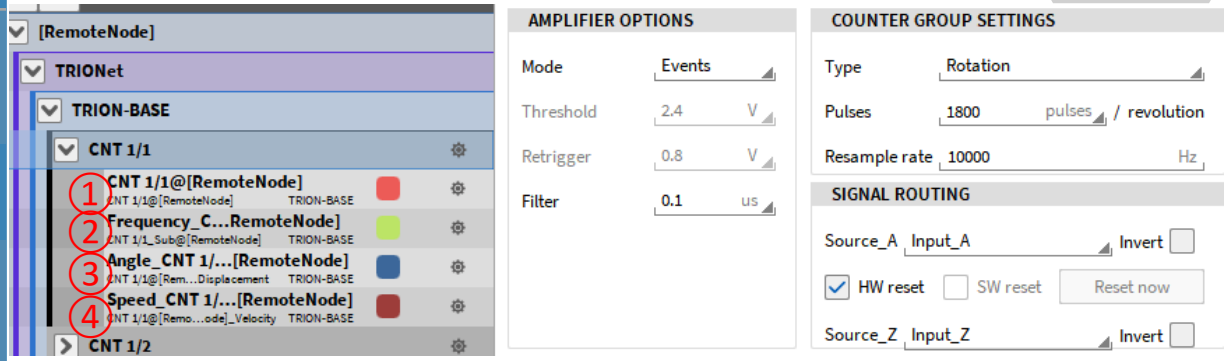
Based on the applied settings,

① *CNT x/x* counts the number of detected events according to the selected counting mode

② Frequency_*CNT x/x* will determine the frequency between two rising edges

③ Angle_*CNT x/x* will output the actual angle and reset after 360° as *HW reset* is enabled (update rate depending on *Resample rate*)

④ Speed_*CNT x/x* will determine the running speed (update rate depending on *Resample rate*)



EXEMPLARY CHANNEL SETUP FOR FREQUENCY DETECTION (1)

DEWETRON

There are 2 possibilities to detect he frequency of a signal connected to a CNT channel.
The first one is the following:

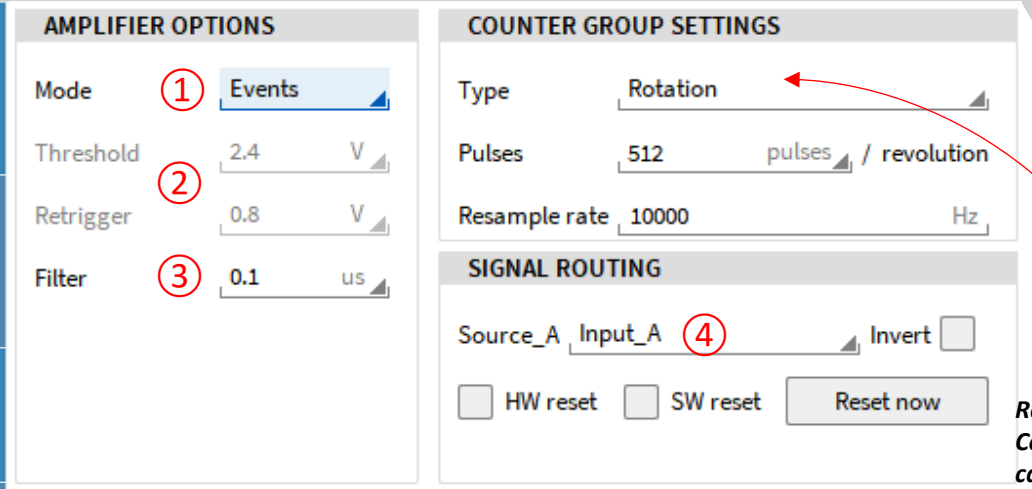
① Go to the general counter group settings (*CNT x/x*) and select *Events or Encoder* Mode to count the number of pulses detected by the sensor

② Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level

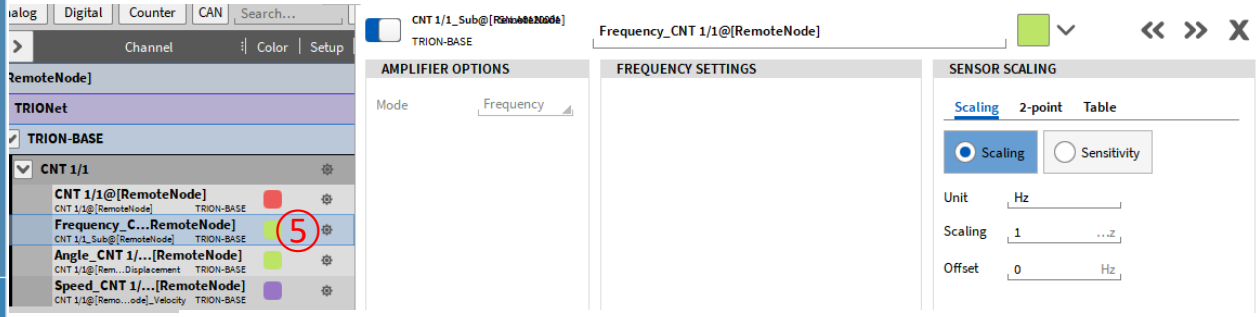
③ The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*.
For more details, please refer to the TRION series modules technical reference manual.

④ Select the correct counter input to which the signal is connected (A, B or Z)

⑤ Frequency_*CNT x/x* will output the signal frequency in [Hz]



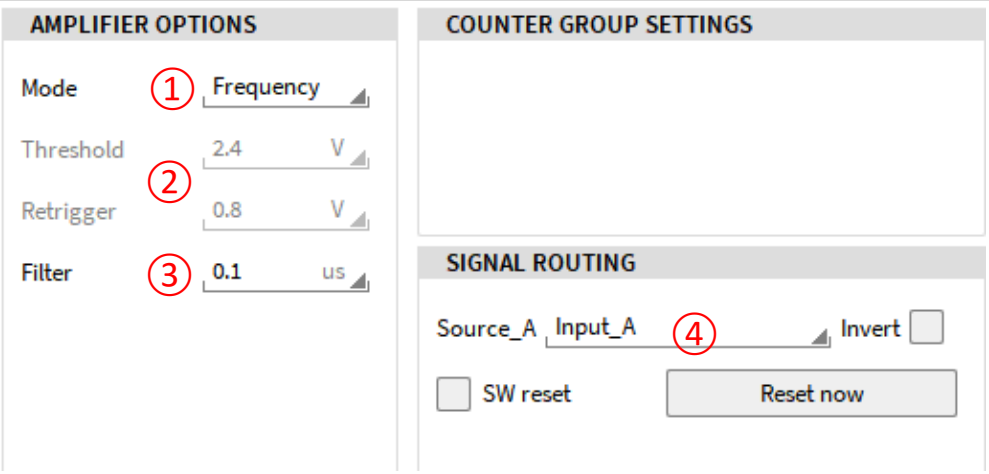
Remark:
Counter Group Settings can remain unchanged



EXEMPLARY CHANNEL SETUP FOR FREQUENCY DETECTION (2)

DEWETRON

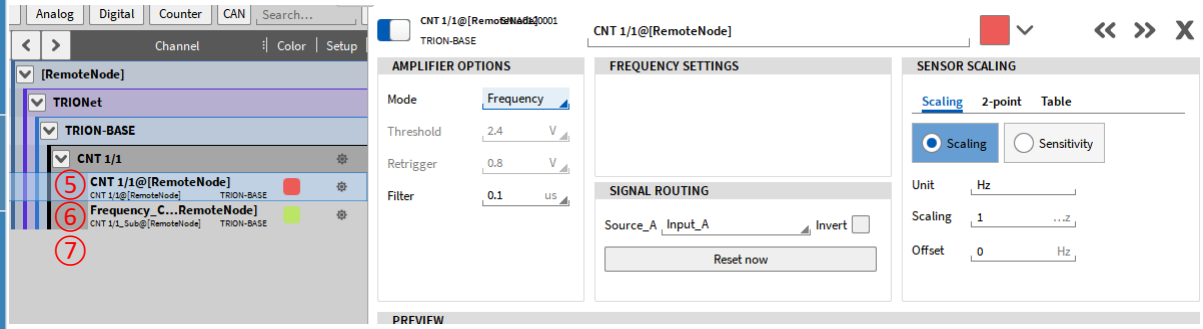
	There are 2 possibilities to detect he frequency of a signal connected to a CNT channel. The second one is the following:
①	Go to the general counter group settings (*CNT x/x*) and select *Frequency* Mode
②	Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
③	The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.
④	Select the correct counter input to which the signal is connected (A, B or Z)
⑤	Frequency_*CNT x/x* will output the signal frequency



EXEMPLARY CHANNEL SETUP FOR FREQUENCY DETECTION (3)

DEWETRON

	There are 2 possibilities to detect he frequency of a signal connected to a CNT channel. The second one is the following:
⑤	The channel *CNT x/x* will now output the detected frequency in [Hz]
⑥	The channel *Frequency*_CNT x/x will not output any data in this case and may be deactivated
⑦	The software channels *Angle*_CNT x/x and *Speed*_CNT x/x will not be created with these settings



Remark:
This possibility to determine the frequency was mainly integrated into OXGYEN to ensure the compatibility to old setup files which were created with OXYGEN version 2.5.1 or prior when the encoder support wasn't available in OXYGEN yet.
For creating a new setup, the first possibility of frequency detection is recommended.

EXEMPLARY CHANNEL SETUP FOR Two Pulse Edge Separation (1)

DEWETRON

	Similar to pulse width measurement, but with 2 input signals. After a rising edge on Input A the counter starts until there is a rising edge detected on Input B.
①	Go to the general counter group settings (*CNT x/x*) and select *TwoPulseEdgeSep*
②	The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.
③	Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
④	If acitve, the last determined result value will be hold, otherwise the value will be reset.