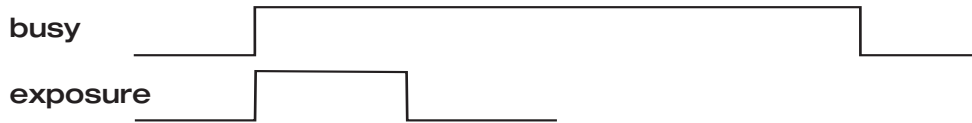# pco.camera – timing issues

1. Output signals - general

The [busy] signal indicates (busy = TRUE) whether the camera is recording or reading out the image sensor, or if busy = FALSE, an external trigger input is accepted.
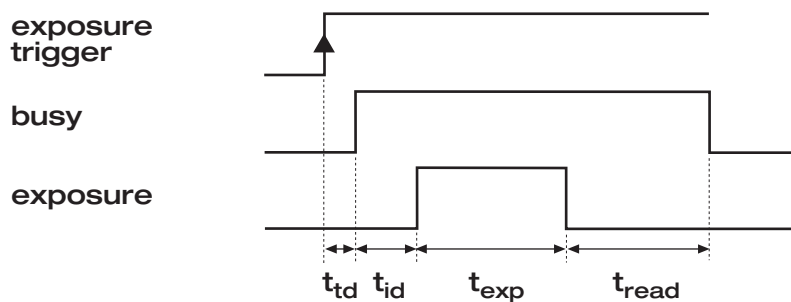The [exposure] signal (exposure = TRUE) only reflects the exposure of the image sensor.

2. Output signals - auto sequence recording

In automatique recording mode the [busy] signal is always set to TRUE, while the [exposure] indicates the real exposure of the image sensor.

3. Output & input signals - exposure trigger start

In external trigger operation mode (also soft trigger & exposure trigger control) the [busy] signal is set to FALSE, if the camera is ready to accept a new trigger signal or command. The [exposure] signal indicates after a successful trigger event the subsequent exposure. Bevor the [exposure] signal and therefore the exposure are starting, the [busy] signal turns to TRUE to indicate that no further trigger signal can be accepted. After a successful exposure and read out the [busy] signal is set back to FALSE. After that new trigger events or exposures can be started.
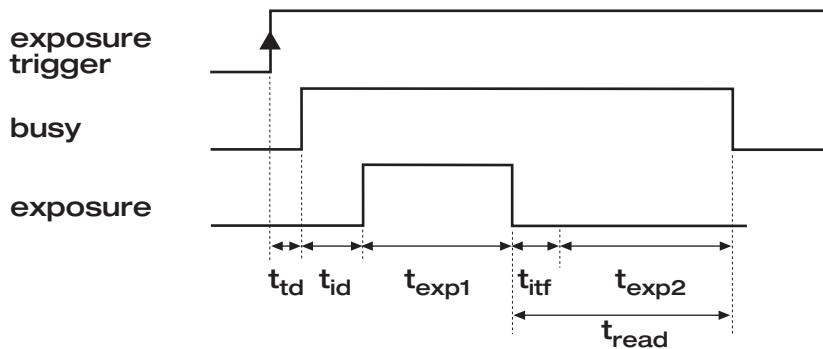

time	description	pco.1600	pco.2000	pco.4000	pco.1200hs
t_{td}	trigger ackn. delay	200±13ns	200±13ns	200±13ns	220±16ns/ 200±13ns (66MHz/86MHz)
t_{id}	intrinsic delay	5.3µs	5.3µs	6.4µs	4.8µs/3.7µs (66MHz/86MHz)
t_{exp}	exposure time	0.5µs..49d	0.5µs..49d	5µs..49d	0.05µs..5s
t_{read}	readout time (full frame)	33ms..208ms (10MHz/1ADC.. 40MHz/2ADC)	68ms..452ms (10MHz/1ADC.. 40MHz/2ADC)	199ms..1390ms (8MHz/1ADC.. 32MHz/2ADC)	2.1ms/1.6ms (66MHz/86MHz)

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pco.camera – timing issues

4. Output signals - double shutter or double exposure (piv)

All pco.cameras posess a double shutter/exposure operation mode, which is especially useful for particle image velocimetry (piv) applications. The first exposure time t_{exp1} can be any exposure time of the available range of each camera. The 2nd exposure time t_{exp2} can not be directly adjusted. The length of the 2nd exposure is exactly determined by the readout time of the first image. The interframing time t_{itf} denotes the transition time between end of exposure 1 and start of exposure 2.

time	description	pco.1600	pco.2000	pco.4000	pco.1200hs
t_{td}	trigger ackn. delay	200±13ns	200±13ns	200±13ns	220±16ns/ 200±13ns (66MHz/86MHz)
t_{id}	intrinsic delay	5.3µs	5.3µs	6.4µs	4.8µs/3.7µs (66MHz/86MHz)
t_{exp}	exposure time	0.5µs..49d	0.5µs..49d	5µs..49d	0.05µs..5s
t_{read}	readout time (full frame)	33ms..208ms (10MHz/1ADC.. 40MHz/2ADC)	68ms..452ms (10MHz/1ADC.. 40MHz/2ADC)	199ms..1390ms (8MHz/1ADC.. 32MHz/2ADC)	2.1ms/1.6ms (66MHz/86MHz)
t_{itf}	interframing time	180ns	180ns	180ns	75ns