

P788x Oscillator Selection



Our ultra-fast TOF/Multiscaler/Photon Counters of the P788x-Series are normally equipped with a standard 10 MHz quartz reference oscillator. The requirements for the reference oscillators quality depend on the selected sweep length - the longer the sweep lengths the better the reference oscillator has to be.

What do we offer ?

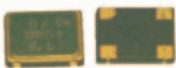
We offer 10 MHz reference oscillators with tighter specifications as as options.


- Standard Quartz Oscillator: <100 ppm over temperature range
- Temperature compens. QO +/- 1ppm (P7889 only)
- Ovenized QO +/-0.03 ppm over temperature range
- Rubidium Oscillator +/-0.00005 ppm over temp.

How to select the right oscillator ?

One has to calculate the relative accuracy of the clock and compare it to the relative channel resolution. Both numbers should be about equal (if possible).

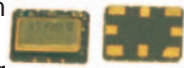
Examples: (calculated for an ambient temperature variation of 10 deg C)

- 1) **P7888:** (1ns time res.), 10.000 time bins / sweep: the relative resolution is 10.000 to 1. (10 μ s) 
 normal oscillator: 50 ppm x 10 deg = 500ppm = 1 / 2000 (max). typ: 100ppm over temp range: 1/10.000
conclusion: the normal reference oscillator should be ok.

- 2) **P7888:** (1ns time res.), 1.000.000 time bins / sweep: rel. resolution is 1.000.000 to 1. (1 ms)
normal oscillator: 50 ppm x 10 deg = 500ppm = 1 / 2000 (max). typ: 100ppm over temp range: 1/10.000
conclusion: normal ref oscillator is 100 times worse than the time bin resolution.
oven oscillator: 0,03 ppm (over temp range) = 1 / 30.000.000 ageing: 0,2ppm over one year
conclusion: oven ref oscillator is ok up to 30.000.000 time bins (30ms for the P7888).
 (5.000.000 time bins for long term measurements) 

- 3) **P7889:** 100ps time res., 100.000 time bins / sweep: relative resolution is 100.000 to 1. (10 μ s)

improved quartz oscillator: 1 ppm (over temp range) = 1 / 1.000.000

conclusion: improved ref oscillator should be ok. 

- 4) **P7889:** 100ps time res., 10.000.000 time bins / sweep: rel. resolution is 10.000.000 to 1 (1 ms)
improved quartz oscillator: 1 ppm (over temp range) = 1 / 1.000.000

conclusion: improved ref oscillator is not ok.

oven oscillator: 0,03 ppm (over temp range) = 1 / 30.000.000 (ageing: 0,2 ppm over one year)

conclusion: oven ref oscillator is ok up to 30.000.000 time bins (3ms for the P7889).

- 5) **P7889:** 100ps time res., 10.000.000.000 time bins / sweep: rel. resolution is 10.000.000.000 to 1 (1 s).



improved quartz oscillator: 1 ppm (over temp range) = 1 / 1.000.000

conclusion: improved ref oscillator is not ok.

oven oscillator: 0,03 ppm (over temp range) = 1 / 30.000.000 (ageing: 0,2ppm over one year)

conclusion: oven ref oscillator is not ok.

Rubidium oscillator: 0,00005 ppm (over temp range) = 1 / 20.000.000.000

(ageing: 0,0001ppm over one year)

conclusion: Rubidium oscillator is ok up to 100.000.000.000 time bins (10s for the P7889).



SUMMARY

for sweep length up to :	use:
20.000 time bins	normal quartz oscillator.
1.000.000 time bins	improved osc. (P7889).
30.000.000 time bins	ovenized quartz oscillator.
100.000.000.000 bins	Rubidium oscillator

Oscillator selection 09112006



Grünwalder Weg 28A • 82041 Oberhaching • Germany
 phone: 49-(0)89 665180 50 • fax: 49-(0)89 665180 40 • <http://www.fastcomtec.com>