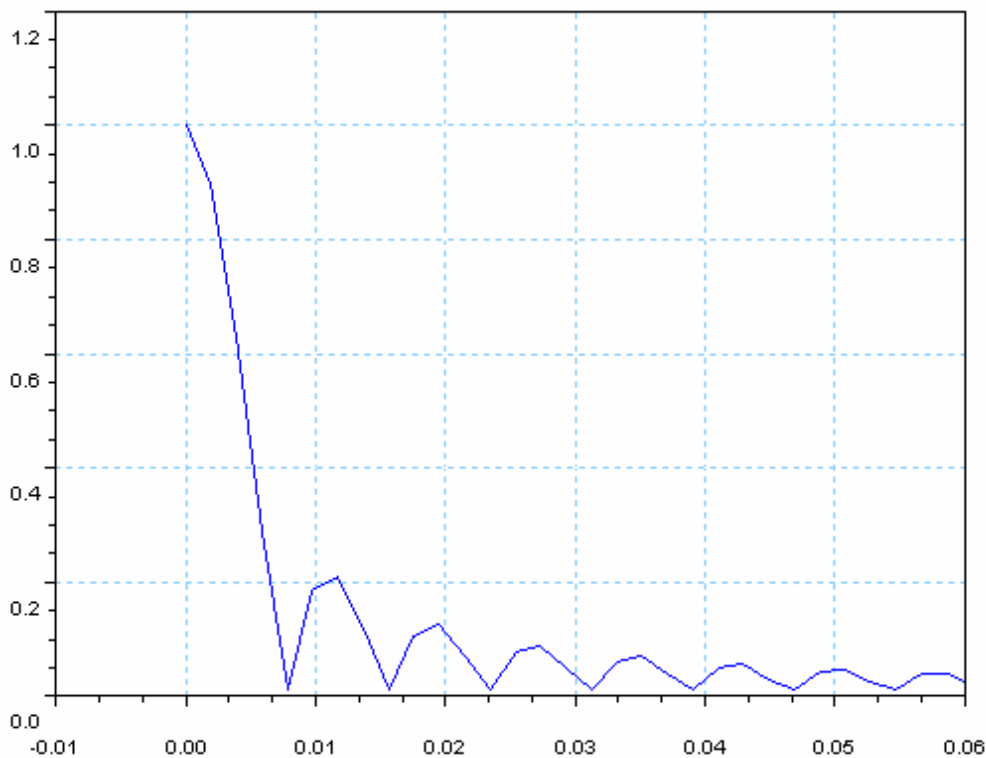


## Signal Filtering

In the L350/S350 Sensor it is possible to smooth the output signals (e.g. v, angle,...) by a filter. Therefore you can select between a Moving Average (MA) filter and a symmetrical FIR low pass filter. Independent of the used filter you can say: The smoother the signal is received by filtering the lower is the dynamic of the signal.

### Moving Average Filtering:

By the MA filter the amplitude of the signal is reduced during increasing frequency (dynamic). This can be clearly seen on drawing No.1. It is shown the frequency curve of the MA filter above the standardized frequency axis.



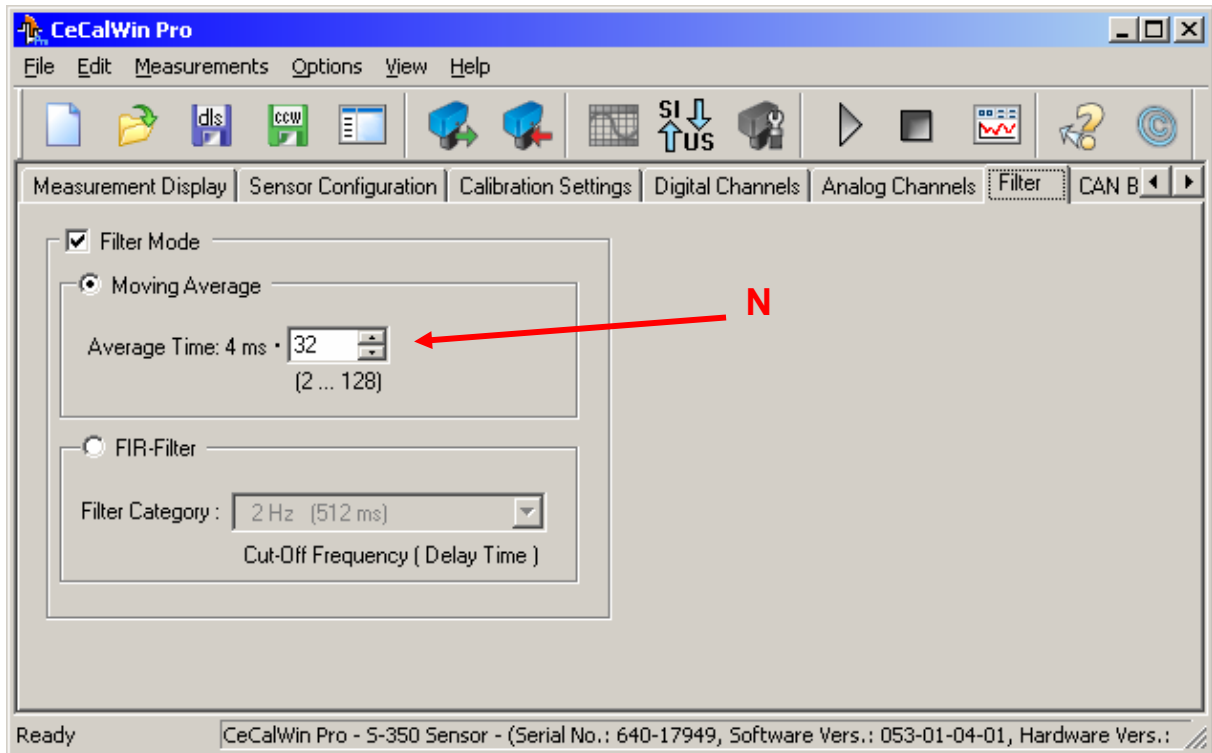
Drawing No.1: Frequency curve of a MA filter

This filter has a good signal smoothing. However it is not suitable for dynamical driving tests as in the dynamical case the filter does slightly fade (reduce) the signal amplitude (e.g. speed curve). For constant driving the delay time is to be determined as follows:

$t = \frac{N-1}{2} * 4ms$  , whereas N - the average multiplicand is to be set in CeCalWinPro

(see drawing No. 2).

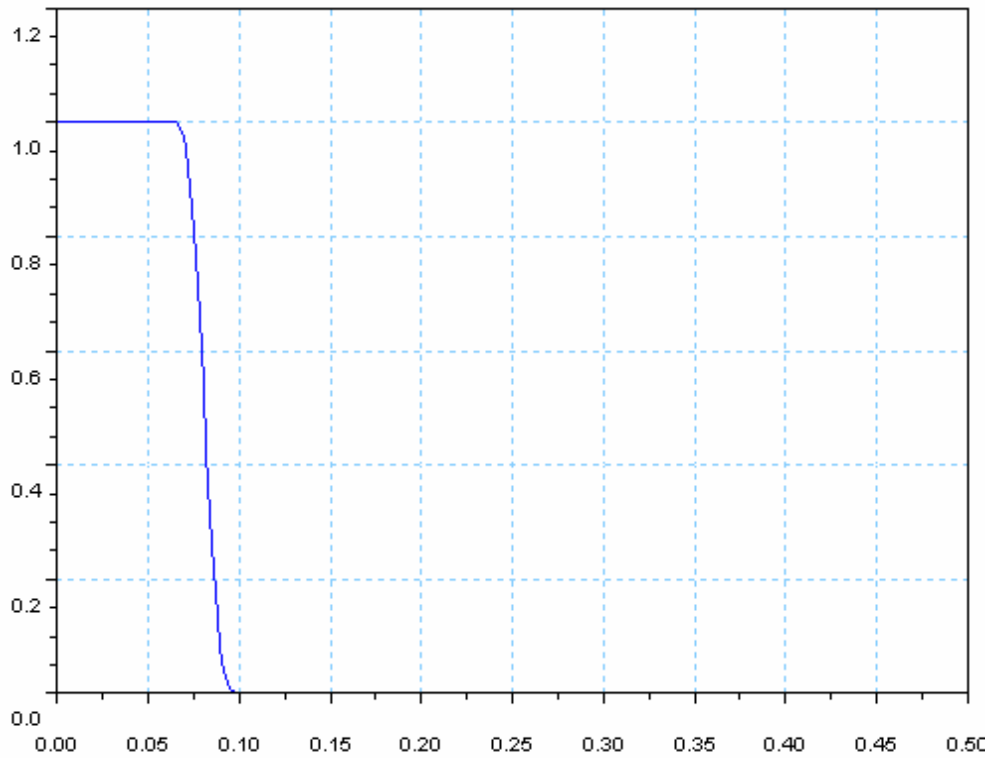
In this example the delay time would be:  $t = \frac{32-1}{2} * 4ms = 62ms$  .



Drawing No.2: CeCalWinPro

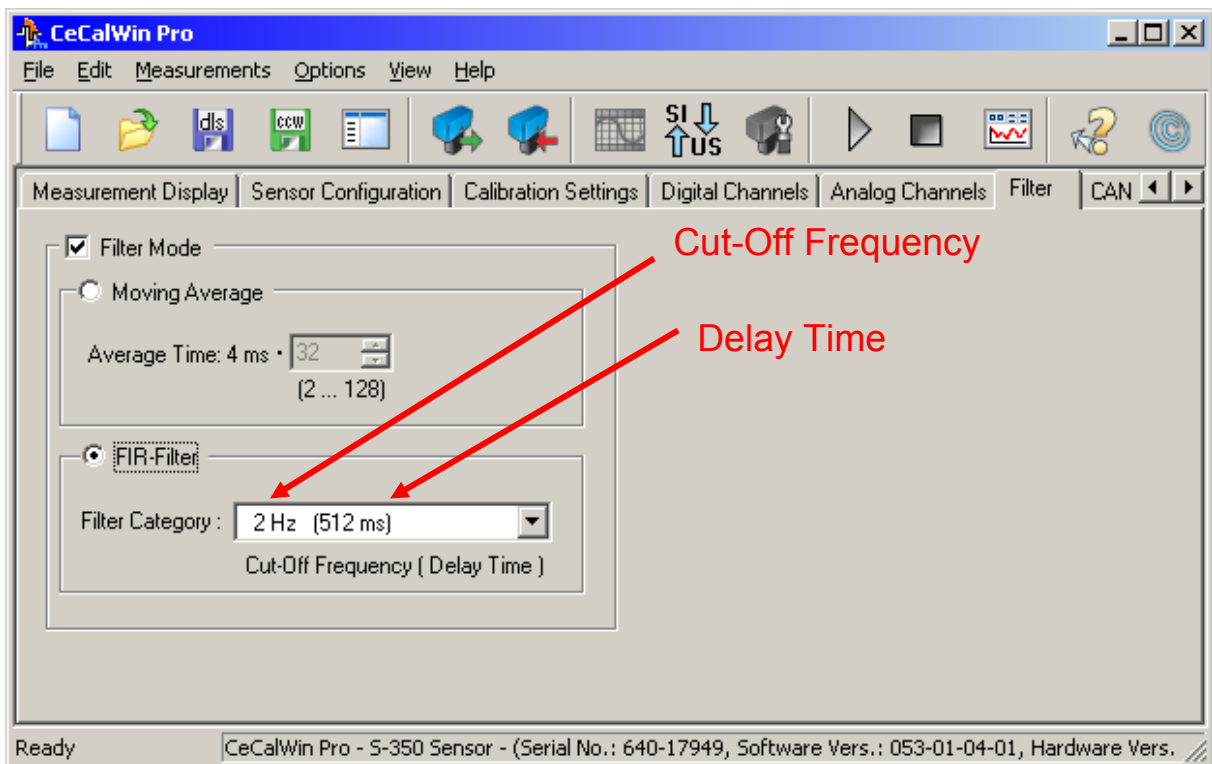
**Symmetrical FIR low pass filter:**

By the FIR filter the dynamic of the signal is shown in the selected frequency range (from 0Hz to selected frequency) without a reduction of the signal amplitude (see drawing No. 3). The delay is constant in the complete frequency range and is stated in CeCalWinPro.



Drawing No.3: Frequency curve of a FIR filter

The cut-off frequency of the FIR filter can be set in CeCalWinPro (see drawing No. 4).

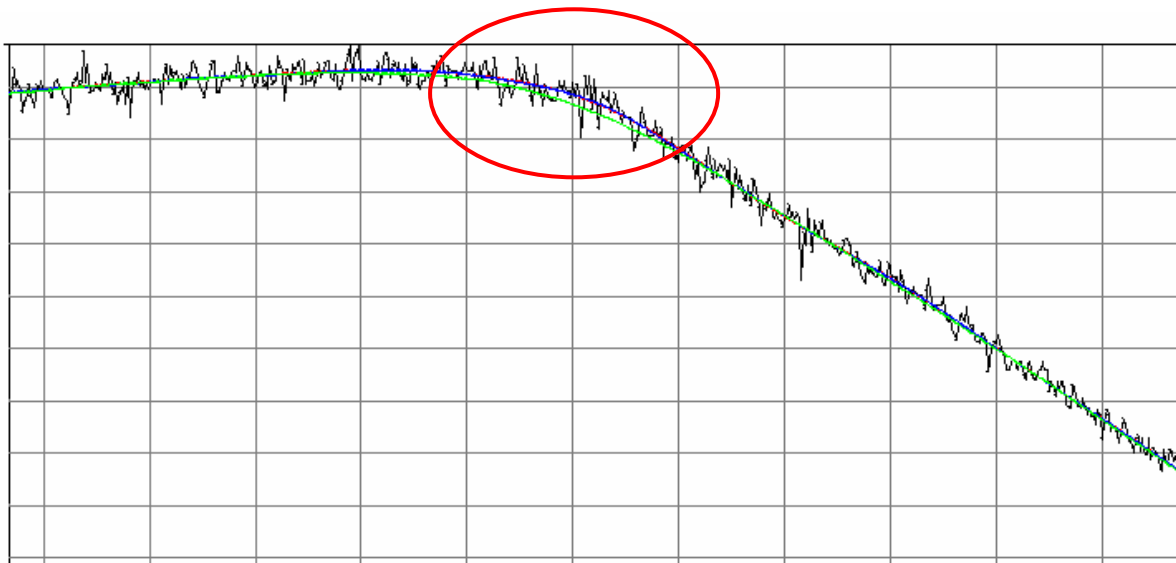


Drawing No. 4: CeCalWinPro

**Resume:**

The MA filter has a better signal smoothing but is not suitable for dynamical tests. Drawing No. 5 shows a comparison of the different filters. The unconditioned signal (black) has been filtered by a MA filter (green) and a FIR filter (blue).

Then the delay times of the filters have been corrected. For comparison the signal has still been filtered by an IIR filter (red) with reversible filtering and the same cut-off frequency.



Drawing No. 5: Comparison of the different filtering