

## **Appendix B** release 1.1

### **1. Occurrence of initial calibration delay time $t_{d,input}$**

If there is no input signal (standstill), a new initial calibration is triggered each 0.7s. This calibration has a duration  $t_{d,input}$  of max. 300 $\mu$ s. No input signal change is detected during that initial calibration time.

In normal operation (signal startup) the probability of  $t_{d,input}$  to come into effect is:  $t_{d,input} / \text{time frame for new calibration } 300\mu\text{s}/700\text{ms} = 0,05\%$ .

After IC resets (e.g. after a significant undervoltage)  $t_{d,input}$  will always come into effect.

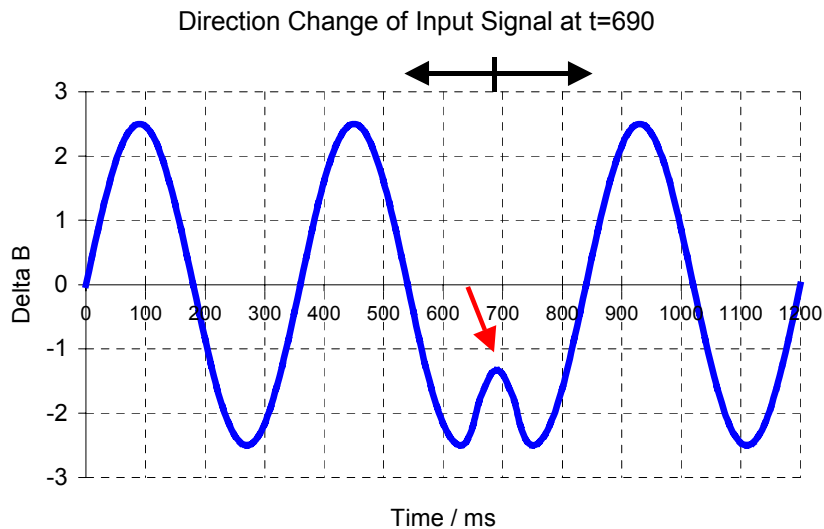
### **2. Magnetic input signal extremely close to a PGA switching threshold during signal startup:**

After signal startup normally all PGA switching into the appropriate gain state happens within less than one signal period. This is included in the calculation for  $n_{DZ-Start}$ . For the very rare case that the signal amplitude is extremely close to a PGA switching threshold and the full range of the following speed ADC respectively, a slight change of the signal amplitude *can* cause one further PGA switching. It can be caused by non-perfect magnetic signal (amplitude modulation due to tolerances of pole-wheel, tooth wheel or air gap variation). This additional PGA switching *can* result in a further delay of the output signal ( $n_{DZ-Start}$ ) up to three magnetic edges leading to a worst case of  $n_{DZ-Start}=9$ . Due to the low probability of this case it is not defined as max. value in the data sheet.

(For a more detailed explanation please refer to the document "TLE4941/42 - Frequently Asked Questions").

### 3. Fast change of direction signal at small fields:

The described behaviour *can* happen when rotation direction is changed in  $t < 0.7s$



A local extreme (maximum or minimum) of the magnetic input signal can be caused during a reversal of rotation direction. In this case the local extreme can be detected by the IC and used for offset calibration. (E.g. a local maximum marked by an arrow in the above diagram.) Obviously the calculated offset value will be incorrect with respect to the following signal. As worst case a duty cycle up to max. 15% to 85% could occur for a few pulses. After a re-calibration, which typically takes place after 2...3 zero-crossings the offset will be correct again and hence the duty cycle also.

As a result of "bad" duty cycle after fast direction reversal the sampling points for direction detection are at unusual signal phase angles also. At small magnetic input signals ( $\Delta B < 1.7 \cdot \Delta B_{\text{warning}}$ ) this can lead to incorrect direction information. Duration: max. 7 pulses, in very rare cases (additional PGA transition during calibration similar to 2.) max. 9 pulses.

A local extremum close to the zero-crossing theoretically could lead to distances down to  $45\mu s$  of two consecutive output pulses at the point of direction reversal as well as a  $B_{\text{warning}}$  pulse also.

### 4. Behaviour close to the magnetic thresholds $B_{\text{warning}}$ , $B_{\text{Limit}}$ , ( $B_{\text{EL}}$ )

Real non-perfect magnetic signals and intrinsic thermal noise cause amplitude variations. Very close to the magnetic thresholds a mix of output pulse widths representing the referring magnetic values occur. For similar reasons pulse widths of 90, 180, 360,  $720\mu s$  can be observed occasionally for single pulses at  $B_{\text{Limit}}$ .

**5. Behaviour close to speed v5 ( $f_{EL-bit} = ca. 117 \text{ Hz}$ )**

Signal imperfections like duty cycle and jitter result in a mix of output pulses with and without assembly bit (EL) information. Input signal duty cycles apart from 50% increase the range where both pulse widths appear.

**6. Dependency of direction detection on input signal pitch:**

The direction detection is optimised for a target wheel pitch of 5mm where it will work down to  $B_{warning}$ . ( $B_{warning}$  and direction detection thresholds meet at 5mm pitch.) For pitches other than 5mm the magnetic input signal has to be increased to compensate for the inevitable signal attenuation.

