aim arnold intelligente messsysteme

Measuring Wheel For Two-Wheelers

ROLS*mc*

Overview

The measuring wheel system **ROLS*mc*** has been designed to acquire operating loads as well as to carry out vehicle dynamics tests. It was developed especially for the conditions experienced by two-wheelers. For instance low power consumption as well as restricted space requirements were taken into account. With a supply voltage of $12V$, the current consumption is only $0.4A$. Besides the cable connecting to the vehicle battery and the data recorder **ROLS*mc*** does not require any additional external components. All control functions (angular offset, configuration, etc.) as well as the data output are conducted via the CAN (FD) interface.

Design and Function

The wheel loads are detected by five strain gauge based 3-component measuring elements, which are arranged around the hub in circumferential direction. The complete force flow is introduced through the tire to the rim ring. Two CFC-discs are connecting the rim ring with the sensor unit, which contains the 5 measuring elements. All electronic components are placed in a co-rotating housing, which is located in the wheel hub. The power supply and the data transfer takes place through a connector on the non rotating side.

The 15 bridge signals from the strain gauge measuring elements are amplified and digitally processed by the co-rotating electronics with an integrated powerful DSP. In this procedure wheel forces and wheel moments are calculated by means of calibration information and wheel geometry in physical units. The transformation into the non-rotating coordinate system is executed by using the angle of rotation determined via the signal from the integrated optical encoder. Output of the data with $16/24/32bit$ resolution takes place via a CAN (FD) interface. An additional line which can be operated in master or slave mode provides synchronization with further systems.

Sensor ROLS*mc* (standard values)

Measuring channel	Measuring range	Linearity error	Crosstalk*
Fx	16 kN	$< 1\%$	$< 1\%$
Fy	3 kN	$< 1\%$	$< 1\%$
Fz	16 kN	$< 1\%$	$< 1\%$
Mx	900 Nm	$< 2\%$	$< 1\%$
My	3000 Nm	$< 1\%$	$< 1\%$
Mz	900 Nm	$< 2\%$	$< 1\%$
Angle encoder	360° / 96.000 steps	$< 0.1\%$	–
Temperature drift	–	$< 0.02\%$ FS/°C	–
* The crosstalk is defined as signal reading of one channel caused by applying a load to another channel. The calculation of the values takes place by the signals, normalized by FS of each channel.			

Measurement/Electronics ROLS*mc*

Type	Unit	Value
A/D Converter	Bit	SAR 16
Samping rate	MHz	1, synchronous
Output format	-	CAN (FD) 16/24/32bit, more on request
Output rate	Hz	250...8000
Output channels	-	Fx, Fy, Fz, Mx, My, Mz, Ang, Asp
Signal processing	-	DSP Control of sampling, digital filtering, calibration of input channels, calculation of wheel forces, coordinate transformation, output formatting, control of all functions via CAN
Supply voltage	V	10...18
Current consumption at 12V	A	≈ 0.4
Temperature range	°C	$-20...80$
Weight front wheel*	kg	< 13
* Exemplary 17"x3,5"front wheel with break discs and tire.		

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