# TECH NOTE #009:: Integrating Kistler RoaDyn<sup>®</sup> Wheel Force Transducers (WFT) via KiRoad Performance into QuantumX / SomatXR Data Recorder

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# Abstract

Vehicles and their components undergo numerous test runs – from concept, over component and overall prototype testing towards production; from simulation conducted on a computer to real physical testing in test stands and mobile test runs in the field.

For all kind of physical testing, measurement equipment and data acquisition systems (DAQ, DAS) are needed, analysing components or overall vehicles in real conditions of use. Whether you are testing passenger cars, commercial vehicles, military vehicles, or trains, each vehicle places special demands on field testing and requires testing in line with the target application, validating **key attributes of the products**. HBK has a great reputation in <u>mobile vehicle testing</u> delivering state of the art signal quality, easy to use operational software and powerful post-processing data analysis tools used in teams collaboration.

Wheel Force Transducers (WFT) play an essential role in mobile vehicle testing, especially in Road Load Data Acquisition (RLDA) on test tracks in proving grounds but also in the field, measuring vehicle response to typical load cases; but also in testing Vehicle Dynamics focusing on vehicles kinematics with brakes (ABS, ESP), steering, tyres, but also in Advanced Driver Assistance (ADAS)

This Tech Note describes how to connect and acquire data from RoaDyn / KiRoad Performance in a time synchronous way to all other physical quantities with the central Data Recorder CX22B / -W / -R-W from the QuantumX or the ruggedized SomatXR series. There is another Tech Note available addressing Kistler System2000 integration, the KiRoad Performance predecessor.

# General

Several engineering methods have been established in optimizing dynamics and durability of vehicle chassis and its components.

- Multi Body Simulation (MBS), which deals with computer based numerical simulation in which several systems are composed of various rigid or elastic bodies. Connections between the bodies can be modelled with kinematic constraints such as joints or force elements such as spring dampers analysing its overall motion. It is used to evaluate characteristics of comfort, safety, and performance, for example in automotive suspension design.
- 2. Life cycle simulation, which deals with Finite Element Method (FEM) simulating mechanical system parts under stress in a short period of time, discovering weak points of mechanical constructions, predicting the life cycle of vehicle components.
- 3. Road Load Data Acquisition (RLDA), which deals with generating a condensed mechanical load data file of the vehicle under development. For this purpose, wheel force transducers, strain gages, displacement and acceleration sensors are used and measure on chassis, axles, suspension and other components. Data is acquired on test tracks and proving grounds with typical road and ground conditions of the vehicle under investigation and processed afterwards to a so called "golden file".
- 4. Durability Lab Testing, which deals with replayed mechanical road load data over hydraulic or electrical actuators stressing components, system parts or overall vehicles in labs or test stands predicting life cycle.
- 5. Vehicle Dynamics, Ride & Handling, which deals with mobile vehicle testing in general on proving grounds in a variety of different pre-defined and standardized manoeuvres or on regular roads optimizing vehicles overall driving behaviour, noise and vibration and performance.

QuantumX and SomatXR are freely scalable and fully time synchronized data acquisition systems for invehicle mobile data acquisition and lab-based testing. SomatXR is the rugged variant of QuantumX. The modules are distributable, easy to install and can be powered by battery. Catman AP can acquire, analyse and process data which can be stored in many different file formats to be replayed in durability lab testing, performing lifetime and fatigue testing. For lab-based testing all sensor inputs can be viewed and analysed as well but also directed to outputs like analog voltage, CAN bus or Industrial Ethernet (EtherCAT® or PROFINET) real-time bus to be integrated into durability test stations.

QuantumX / SomatXR and catman can acquire data from:

- o <u>Analog sensors and digital timer-based inputs</u> acquiring mechanical, electrical or thermal inputs
  - o Strain, force, moments, displacement / height, acceleration / vibration and many more
    - o Rotational speed and angle
    - Voltage, current, temperature and others
- <u>Vehicle busses</u>: CAN and CAN FD (incl. CCP and xCP-on-CAN)
- <u>Wheel Force Transducers</u> (WFT) connection by voltage inputs, CAN or Ethernet bus
- <u>Kinematics and absolute position</u> by 6 DOF Inertial Measurement Units (IMU) in combination with GNSS sensors (GPS, Glonass, Baidu, Galileo, ...) and its NMEA protocol based data transfer via RS232, USB, Ethernet or CAN bus
- Digital video: USB or Ethernet based

All QuantumX / SomatXR analog inputs offer 24 bit aliasing free sampling with configurable embedded filters. Data analysis can also be done with the powerful software GlyphWorks for durability, noise, vibration, performance and handling.

WFTs are typically 6 component transducers measuring 3 forces and 3 moments, plus rotational angle and speed in a car or commercial vehicle. WFT can be used spinning / rotating in mobile testing or static in structural durability bench testing. WFTs are mounted on any kind of vehicles from F1 race cars over regular cars to commercial vehicles like tractors, trucks or harvesting machines. In most of the test cases vehicles with WFTs are driven along a predetermined proving ground track for force and torque analysis on one or two axles or two or four wheels together with other physical quantities acquired in parallel.

WFTs are available from many suppliers like AIM, A&D, CAEMAX, Datron, Kistler, Michigan Scientific, PCB, Kyowa, and others – all supported by QuantumX / SomatXR and its software catman by different integration aspects.

**RoaDyn** WFT is an established product from Kistler measuring wheel forces (F<sub>x</sub>, F<sub>y</sub> and F<sub>z</sub>) as well as moments / torques (M<sub>x</sub>, M<sub>y</sub>, M<sub>z</sub>). **KiRoad Performance** is the central electronic system and interface transferring telemetric data from all corners to an Ethernet based Kistler proprietary protocol. In this special field HBK and Kistler are partners giving the end user and customer an easy to integrate solution via a single Ethernet fully digital solution together into their data recorder QuantumX / SomatXR data recorder in terms of an open eco system aspect. RoaDyn wheel force transducers are available for several different vehicles like passenger cars, SUVs, trucks, agricultural and off-highway vehicles, and race cars. The acquired wheel forces are transferred wirelessly from the turning wheel to the vehicle (telemetry) and are then transferred to a central gateway.

#### System Overview

SomatXR measurement modules can be connected via a single cable KAB272 to the Data Recorder CX22B and are synchronized, powered and data linked. The Kistler mobile control unit KiRoad Performance is connected to the SomatXR in the following way:



- Direct clock and sync line from Kistler KiRoad Performance to MX840B-R (or any other voltage input)
- Ethernet TCP/IP connection to CX22B directly

All incoming data from KiRoad Performance is time stamped directly with the catman kernel task. Run-time variances on package-based Ethernet protocol leads to a little time shift. Time shifts in the signals can generally occur by inappropriate filter settings caused by different measurement electronics.

### **Telemetry system and Kistler KiRoad Performance**

The telemetry counterparts of the WFTs are installed in the chassis and all components are wired to **KiRoad Performance**, which is the central control unit. KiRoad Performance consists of an integrated voltage supply unit, network connection and signal conditioning to convert force and torque signals from the wheel force transducer into data signals referenced to its origin. Parameterization is mainly done via web-based graphical user interface.

The preferred connection of KiRoad Performance to the SomatXR system is via Ethernet. Alternatively, it may also be integrated via CAN bus to SomatXR module MX840B port 1 or any of the MX471C CAN ports.

The firmware of KiRoad Performance should have as a minimum the following firmware version:

- Firmware version: 2.0.0.6 or higher
- Kernel version: 1.0.8.27 or higher

Check latest firmware on: https://www.kistler.com/en/product/type-9817a/

The Ethernet interface supports

- TCP/IP communication for fast data streaming and for communication
- Pre-configured net mask: 255.255.255.0
- Pre-configurable IP address: **192.168.160.70** (default)
- Integrated web server for functional check
- Used Ethernet ports: 6155 Control (EMCOP), 6157 Status (EMCOP) and 6158 Data (DAQ streaming protocol) for communication over TCP/IP
- o Data format of measurement quantities: FLOAT with 4 Byte

**Synchronisation** with SomatXR: direct trigger line (start) and clock

SomatXR Data Recorder CX22B can acquire up to 5 MS/sec as sum data rate. The AD inputs deliver 4 Byte per sample. KiRoad Performance delivers also 4 Byte per sample.



### Step by Step integration of KiRoad Performance via Ethernet to QuantumX CX22B-W

- 1. Cabling
  - Connect all measurement modules via KAB272 to the CX22B data recorder and power them. All modules can be powered with 10 - 30 V DC.
  - Connect *Kistler KiRoad Performance* via Ethernet (LAN port) to CX22B data recorder. KiRoad Performance device can be powered with max. 36 V DC (max. 150 W).
  - Connect your Notebook via Ethernet (port 2 or WLAN) to CX22B for configuration. Alternatively, you can directly connect a display or touch screen (USB, DVI-D), keyboard and mouse to CX22B.
  - To connect KiRoad Performance to MX840B module, use '*Kistler KiRoad Performance Synchronization Cable*'. An adapter cable is needed to connect both devices. According to the labelling, line 1 (*trigger signal*) connects to MX840B connector 7 and line 2 (*clock signal*) to MX840 number 8 connector.











#### 2. IP address configuration

Note: Make sure to configure both used Ethernet interfaces of CX22B!

Start 'HBM Device Manager' software on your PC and search your network for CX22B.

- configure Ethernet adapter you work with, • recommended: dynamic IP addressing (DHCP/APIPA)
- connect KiRoad Performance to the second Ethernet adapter of your recorder, go to Windows • and configure IP address, recommended: 192.168.160.50

subnet mask: 255.255.255.0

KiRoad Performance is configured with a static IP address: KiRoad Performance: 192.168.160.70 fix

subnet mask: 255.255.255.0





3. **Configure RoaDyn system** (number of channels or signals, etc.) using the associated configuration software or remote control.

Therefore enter IP-address of the KiRoad Performance in a browser (http://**192.168.160.70**). In order to be able to change settings you must have admin rights (see General Settings), the default password is 'kistler'.

← → Ø http://192.168.160.70/5	iensor/ENG/user.html?t=15263689715 🔎 🗸	් 🏉 KiRoad Performanc	ie ×		
KiRoad Perform	mance	Refresh fr	Language: Eng	<sup>jish</sup> Y Spinnin	g mode
Status Measurement Display Sensor Adjustment Sensor Settings	System Stat	us	System General Use DHCP: IP-Address:	OFF 192.168.160.70	
Analog Output Calibration System Information	KISTLER	00000	Subnet Mask: System Time: Status:	255.255.255.0 09:20:51 AM OK	
Event Log	Wheel 1 Wheel Type: Innerpart Number: Status:	N/A  OK	Wheel 2 Wheel Type: Innerpart Number: Status:	N/A  OK	
	Wheel 3 Wheel Type: Innerpart Number: Status:	N/A  OK	Wheel 4 Wheel Type: Innerpart Number: Status:	N/A : OK	

In 'Digital Output' panel, set

- Sample rate = 300.00 (recommended)
- Use trigger = Output
- Tick 'Output Clock'
- Pulse width = 10000 (recommended).

← → Ø http://192.168.160.70/Sen:	or/ENS/user/htmlft=15263669711 D + C 🦉 KiRoad Peformance ×
<b>KiRoad Perform</b>	ance Refersh to drive Arrise Language: English V Spinning mode
Status	Digital Output Configuration
Measurement Display	
Sensor Adjustment	Interface Digital Channels Digital Scalings Check Output Filter Settings
Sensor Settings	Select Interfaces Ethernet V
Digital Output	Fibernat interface. Retirinas
Analog Output	Ethernet data output uses the same settings as the Ethernet Configuration Interface.
Calibration	Please check Ethernet settings on tab "General Settings".
System Information	Sample Cock
General Settings	Output Clock :
Event Log	Use trigger : Output V Pulse width [ns] :
	10000 🗘

In 'Digital Channels' tab select the channels you wish to have available in catman. The sample rate is of no concern, it will later on be modified by catman.

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11         Wheel Ch 10         Channels           15         Wheel Ch 14         Image: Channels         Channels           16         Wheel Ch 16         Image: Channels         Argin Odjot           17         Wheel Ch 16         Image: Channels         Argin Odjot           18         Wheel Ch 16         Image: Channels         Argin Odjot           20         Wheel Ch 20         Image: Channels         Argin Odjot           21         Wheel Ch 21         Image: Channels         Image: Channels           22         Wheel Ch 23         Image: Channels         Image: Channels           23         Wheel Ch 25         Image: Channels         Image: Channels           24         Wheel Ch 25         Image: Channels         Image: Channels	Evention	11. Wheel 1 C 12. Wheel 1 C	h 10 h 11		CI	n 0 Ch 1 C	h 2	A11
1         CV/meil 1 Ch 15         - Loadcell C           1         V/meil 1 Ch 16         - Loadcell C           2         V/meil 1 Ch 20         - Loadcell E           2         V/meil 1 Ch 21         - Loadcell E           2         V/meil 1 Ch 23         - Loadcell F           2         V/meil 1 Ch 25         - Loadcell F           2         V/meil 1 Ch 25         - Loadcell F	Event Log	13. Wheel 1 C 14. Wheel 1 C	h 12 h 13					channels
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19. Wheel T Ch 18     → Loadcell D       20. Wheel T Ch 29     → Loadcell D       21. Wheel T Ch 20     → Loadcell E       22. Wheel T Ch 23     → Loadcell E       23. Wheel T Ch 24     → Loadcell F       25. Wheel T Ch 24     → Loadcell F       26. Wheel T Ch 25     → Additional Channels		17. Wheel 1 C 18. Wheel 1 C	h 16 h 17		→ Lo	adcell C		Angle Output
21. Wheel 1 Ch 20         → Loadcell E           22. Wheel 1 Ch 23         → Loadcell F           23. Wheel 1 Ch 24         → Loadcell F           25. Wheel 1 Ch 25         → Loadcell F           26. Wheel 1 Ch 25         → Loadcell F           27. Wheel 1 Ch 25         → Additional Channels		19. Wheel 1 C 20. Wheel 1 C	h 18 h 19		→ Lo	adcell D		Filtered V
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27. Wheel 1 Ch 25 28. Wheel 1 Ch 27		25. Wheel 1 C 26. Wheel 1 C	h 24 h 25					
		27. Wheel 1 C	h 26 h 27		→ Addi	tional Channels		
		30. Wheel 1 C 31. Wheel 1 C	h 29 h 30		~			

! Do not forget to save your changes via 'Save to device'.

#### 4. CX22B-W / catman software requirements

Ensure that you use the latest version of catman on your CX22B-W. Ensure that you have a catman AP license.

5. Start catman on Data Recorder and open dialogue 'General Options'.

	catmanEasy Version 5.3
	😃 🔎 catman <sup>®</sup> Easy
Measure	Prepare new DAQ project Specify the devices you want to work with in your DAQ project. In addition you can
Analyze	specify more hardware options like automatic TEDS scan, QuantumX-OnBoard math Hardware or GPS.
Projects	General options Specify general piogram options (e.g. available functions, storage location, sensor database colors control.
Options	General These options car also be modified during program run!
Terminate	
нвм	



6. Open 'Configure device scan' dialogue.





7. Start 'New DAQ project'.

		catmanEasy Version 5.3
	U,	💙 catman <sup>®</sup> Easy
Measure	•	Resume my last session Continue working with devices, sensor settings, visualizations etc. last in use
Analyze	Continue	
Projects		Start a new DAQ project (Hybrid system) Select device type, interface and additional hardware options.
Options	New	
Info		Load an existing DAQ project
Terminate	Open	A project contains the entire device configuration, DAQ and saving settings, visualization, computation channels and events Demo projects
		Prepare a new DAQ project without connected devices
	Offline	You can select and save the settings to be used later on: device, channel configuration, sensors, visualization and DAQ jobs
НВМ		

8. Connect to the HBK devices you want to work with.

HBM De	BM Device Manager										
The o	The device manager lists all modules found by your PC in the network. Select the modules with which you want to work in catmanEasy/AP in column "Selection".										
Addit	tional in	formation about de	evice manager	Information a	oout firmware	compatibility					
Mo	duloc	found Change	modulo addrocc	Modulo info							
	uuies	Change I	module address	Module Into							
	Conne	ection possible	Connection	not possible	🔲 Search f	or modules with firm	ware olde	er than 4.0 a	as well		
		Address/UUID	Selection (1)	Туре		Name	Δ.	UUID		Firmwar	e 🔺
	🝸 🔵	24.0.27.111	MX8	40A MX84	A Universal		9E5	001B6F	4.6.1.24994		
	🝸 😔	24.0.132.128	MX8	09B MX80	ЭB		9E5	008480	4.6.14.0		
											-
	ر New ۱	module scan	Add additional de	vices	Flash LED	🗐 Rename	Firmv	ware			
<u> </u>										1	
	Help								Con	nect	Cancel



9. Add additional device in catman

dules f		module settings	Information a Module info	bout firmware compatibility		
Conne	ction possible	Connection no	t possible			
	Address/UUID	<ul> <li>Selection (4)</li> </ul>	Туре	Name	UUID	Firmware
열 🔵 열 🔵	25.0.112.199 25.0.188.222	y y	MX1601B-R MX840B	Create new device		×
°2" ●	25.0.717.66 25.0.7.248	2	MX471C MX840	RoaDyn         Kistler RoaDyn/KiRoad         Ethernet (TCP/IP)         192.168.160.70	N V V I V I	lame Device type nterface P address:Port
{ New ⊓	nodule scan	Add additional dev	ices			OK Cancel

10. After device scan you see all DAQ channels. Select the channels you connected **start** and **clock signal** coming from KiRoad Performance with and rename them to '**Trigger**' and '**Clock**' for better traceability.



**11. Configure external time synchronization** Open synchronization dialog via '*Additional Functions*':

A	dd	Å itional tions ~							
e	4	Add mode	ule/device						
e	×	Remove n	nodule/device						
p	3	Excel import							
6	D	Device reset							
0	AN	CAN configuration							
6	6	Configure	external time synchronization						
E		Diagno C	onfigure external time synchronization	•					
6	0	Check 11 X 12 X	Synchronize devices by external time sources (NTP, PTP, IRIG). You can configure the time services of the devices in this dialog.		ļ				

Go to *'synchronization via trigger and clock line'* tab: Choose 'Trigger' as input for Trigger signal and 'Clock' as *input for Clock signal*.

3	Check and configure time synchronization services	×							
Settings and status	Synchronization of hybrid systems Check sync quality								
Time synchroni	Time synchronization via hardware time channels								
In projects with M NTP or PTP timest	3Cplus+opt. Interrogator, MGCplus+QuantumX or QuantumX+opt.Interrogator the different devices ma amps. This requires that your project has option HARDWARE TIME CHANNELS activated.	y be synchronized via							
Synchronize de	vices via hardware time channels								
••	▼ Master channel default sam	nple rate							
•	▼ Master channel slow sampl	e rate							
•••	<ul> <li>Master channel fast sample</li> </ul>	e rate							
50   Max. time     100   Output d     0   Manual s	50       Max. time deviation of device clocks allowed (ms)         100       Output delay of master device in ms (increase this value if you commonly notice plateaus in the DAQ values)         0       Manual synchronization correction in ms								
■ Time synchroni: In projects with de fed into a Quantur Synchronize de	tation via trigger and clock line vice combination QuantumX and Kistler RoaDyn/KiRoad the synchronization is realized with trigger and nX module. vices via trigger and clock line	clock signals which are							
MX840_Kistler_Tr	gger								
MX840_Kistler_C	◆ Clock signal								
Help about time sy	nchronization Additional info about time synchronization	Close							

12. Configure Trigger channel as a 10V DC Voltage input and Clock input as a counter by double-clicking on currently selected sensor/function.

	Ð	Channel name	Reading Sample rate/Fi		lter	Slot	Sensor/Function		
1	a	MY4604 Vistler							
5	1000	MX1601_Kistler CH 1	No signal			>> 300 Hz / BE 50 Hz	(Auto)	1	DC Voltage
6	100	Testsional MX1601	0.02860 V				(into)	2	X DC Voltage
7	100	MX1601 Kistler CH 3	No signal	<b>1</b>	Adapt sense	or 📉 📉	(to)	3	X DC Voltage
8	10	MX1601 Kistler CH 4	No signal				ito)	4	X DC Voltage
a	100	MX1601 Kistler CH 5	No signal	Channel: Trigge	r	Help	ito)	5	X DC Voltage
10	LECS.	MX1601 Kistler CH 6	No signal	Voltage		-	ato)	6	X DC Voltage
11	100	MX1601 Kistler CH 7	No signal				ito)	7	X DC Voltage
12	ERES .	MX1601 Kistler CH 8	No signal	Input charact	teristic Sensor para	meter	(to)	8	X DC Voltage
13	100	MX1601 Kistler CH 9	No signal	2-point	Table		ito)	9	X DC Voltage
14	100	MX1601 Kistler CH 10	No signal	- Set 1st point	of input characteristics		(to)	10	X DC Voltage
15	ESCO	MX1601 Kistler CH 11	No signal	et a start	h oooooo		ato)	11	X DC Voltage
16	100	MX1601 Kistler CH 12	No signal	Electrical	p.000000 V		uto)	12	X DC Voltage
17	ERES	MX1601 Kistler CH 13	No signal	Physical	0.000000 V	*	ato)	13	X DC Voltage
18	100	MX1601 Kistler CH 14	No signal				uto)	14	X DC Voltage
19	CREES.	MX1601 Kistler CH 15	No signal	Set 2nd point	of input characteristic	s	uto)	15	X DC Voltage
20	1000	MX1601_Kistler_CH_16	No signal	Electrical	10.000000 V		uto)	16	DC Voltage
			-	1	40.000000				-
21	ິ 📟	MX840_Kistler		Physical	10.000000 V				
25	d 🚥	DashDisplay_CargoAmbientTemperature	le Overflow					1-1	No CAN sensor assigned
26	CAN	DashDisplay_EngineOilFilterDiffPressure	le Overflow	Correct for	cable resistance (4-w	ire)		1-2	🔤 No CAN sensor assigned
27	CAN	DashDisplay_FuelFilterDiffPressure	Overflow	mV/V Cal	2 mV/1	/		1-3	No CAN sensor assigned
28	CAN	DashDisplay_FuelLevel	le Overflow	P-Bridge	350 Obm	Detaile		1-4	Mo CAN sensor assigned
29	CAN	DashDisplay_WasherFluidLevel	Overflow	K-bridge	USU ONIN	Detailon		1-5	🔤 No CAN sensor assigned
30	CAR	CAN 6	Overflow	- Physical mea	nuring range			1-6	No CAN sensor assigned
31	CAN	CAN 7	Overflow	Filyaical Inea	soring range			1-7	No CAN sensor assigned
32	C4K	CAN 8	Overflow	Maximum	10 V	Details		1-8	Mo CAN sensor assigned
33	a 💑	Testsignal_MX840	😑 0.02926 V	Minimum	-10 V		uto)	2	DC Voltage
34	~	LF BalUoint Lat_Loc Force	Overflow				uto)	3	SG half bridge
35		RF Balloint F/A_Loc Force	le Overflow	Type of meas	urement		uto)	4	SG half bridge
36	~	RF Balloint Lat_Loc Force	No signal				uto)	5	SG half bridge
37		LF StabLink Axial Force	😑 No signal	Current value	e 🔻 2	s duration	uto)	6	X DC Voltage
38	~	Trigger	😑 0.00427 V				uto)	7	DC-Spannung 10 V
39	~	Clock	😑 40513 imp	Update in sen	sor database		uto)	8	X Counter
40	ථ 📻	RoaDyn NG#EMCOP [192.168.160.70]		Create new	concor	OK Cancel	1		
41	1000	Hub channel 0 FL	👄 0.00000 N	Create new	001001	Candel		1	I OFF
1 m				1					50

13. Disable filter for Trigger and Clock channel.

ŏ	T MA1601_0_CH 4	🥑 no signal	> JUU NZ / DE SU NZ (AUTO) 4 M UC VORAge
9	10 MX1601_0_CH 5	😑 No signal	300 Hz / BE 50 Hz (Auto) 5 S DC Voltage
10	10 MX1601_0_CH 6	O Reviewal	300 Hz / BE 50 Hz (Auto) 6 X DC Voltage
11	100 MX1601_0_CH 7	Configure sample rate groups and filters	300 Hz / BE 50 Hz (Auto) 7 X DC Voltage
12	100 MX1601_0_CH 8		300 Hz / BE 50 Hz (Auto) 8 X DC Voltage
13	10 MX1601_0_CH 9	Classic (e.g. 1200, 2400, 4800 Hz) 🔹 Sample rate domain 🥨	300 Hz / BE 50 Hz (Auto) 9 OC Voltage
14	Testsignal_MX1601	Sample rate groups	300 Hz / BE 50 Hz (Auto) 10 X DC Voltage
15	1 MX1601_0_CH 11	Useful sample rates	➡ 300 Hz / BE 50 Hz (Auto) 11
16	12 MX1601_0_CH 12		300 Hz / BE 50 Hz (Auto) 12 X DC Voltage
17	13 MX1601_0_CH	Slow sample rate 5 Hz •	300 Hz / BE 50 Hz (Auto) 13 X DC Voltage
18	14 MX1601_0_CH 14	Default sample rate 300 Hz 🔹 🕨	300 Hz / BE 50 Hz (Auto) 14 X DC Voltage
19	15 MX1601_0_CH	Fast sample rate 2400 Hz V	300 Hz / BE 50 Hz (Auto) 15 X DC Voltage
20	1601_0_CH 16		300 Hz / BE 50 Hz (Auto) 16 DC Voltage
~	0	Channel: MX840_Kistler_Trigger	
21	MX840_Kistler	O Use current device settings	
25	ය 🚧 CAN 1	Filter is set via TEDS or Setup Assistant.	300 Hz / NA 1-1 Mo CAN sensor assigned
26	CAN 2		300 Hz / NA 1-2 Mo CAN sensor assigned
27	CAN 3	O Use automatic Anti-Alias filters	300 Hz / NA 1-3 Mo CAN sensor assigned
28	CAN 4	The frequency will be determined before DAQ start based upon the sample rate. Usually a Bessel characteristic will be selected	300 Hz / NA 1-4 Mo CAN sensor assigned
29	CAN 5	sumple rater obacity a besser endracemente init de selectedir	300 Hz / NA 1-5 M No CAN sensor assigned
30	CAN 6	Working without filter	300 Hz / NA 1-6 Mo CAN sensor assigned
31	CAN 7	Chasse shareteristics and frequency	300 Hz / NA 1-7 Mo CAN sensor assigned
32	CAN 8	Choose characteristics and nequency	300 Hz / NA 1-8 Mo CAN sensor assigned
33	් 🖑 MX840_Kistler_FunGenSignal	If the frequency selected is not supported by the device the best	300 Hz / BE 50 Hz (Auto) 2 OC Voltage
34	MX840_Kistler_CH 3	possible inequency will be selected.	300 Hz / BE 50 Hz (Auto) 3 SG half bridge
35	MX840_Kistler_CH 4	Butterworth 0.01 Hz	300 Hz / BE 50 Hz (Auto) 4 SG half bridge
36	MX840_Kistler_CH 5	Butterworth 0.05 Hz	300 Hz / BE 50 Hz (Auto) 5 Counter
37	MX840_Kistler_CH 6	Butterworth 0.1 Hz	300 Hz / BE 50 Hz (Auto) 6 SG full bridge
38	MX840_Kistler_Trigger	Butterworth 0.5 Hz	300 Hz / BE 50 Hz (Auto) 7 DC Voltage
39	MX840_Kistler_Clock	Butterworth 1 Hz	300 Hz / BE 50 Hz (Auto) 8 S Counter
40	0	Butterworth 2 Hz	
	RoaDyn_NG#EMCOP [192.168.160.]	Butterworth 10 Hz	
41	Hub channel_0_FL	Butterworth 20 Hz	▶ 300 Hz / NA 1 🛛 OFF
42	I Hub channel_1_FL	Help regarding filter settings	▶ 300 Hz / NA 1-1 🗶 OFF
43	Hub channel_2_FL		▶ 300 Hz / NA 1-2 🛛 OFF
44	Hub channel_3_FL	OK Cancel	▶ 300 Hz / NA 1-3 🗶 OFF
45	Hub channel_4_FL		▶ 300 Hz / NA 1-4 🕺 OFF

14. Start measurement.

With every measurement the Clock counter will be reset to zero automatically.



15. Finalize all settings by saving everything permanently and restarting the unit!



## Proof of Time Synchronization

Synchronization between analog inputs and digital Ethernet based RoaDyn wheel force transducer has been tested in the following way:

- Force z-direction front left tire analog output from Kistler to analog input of an MX module
- Force z-direction front left tire digital Ethernet TCP/IP protocol to CX22B Data Recorder
- Both inputs compared to each other with different signal load to the Recorder.



#### **Screenshots**



Picture: Kistler wheel, remote control and screenshot showing live data acquired over Ethernet

## Troubleshooting

If connection to RoaDyn electronics is missing please check the IP address and parameterize accordingly with software or handheld device from Kistler.

**Legal Disclaimer:** TECH NOTEs are designed to provide a quick overview. TECH NOTEs are continuously improved and so change frequently. HBK assumes no liability for the correctness and/or completeness of the descriptions. We reserve the right to make changes to the features and/or the descriptions at any time without prior notice.



# **Inputs QuantumX**

#### **Pining Trigger Signal**





## Inputs SomatXR



#### **Pining Clock Signal**

