TECH NOTE : catmanAP offline parameterization using Excel Import

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Abstract

This Tech Note describes the workflow to configure the channels of a DAQ system consisting of HBM Quantum X amplifiers and the data acquisition software catman© Easy / AP by using external sensor databases.

Overview

In catman Easy / AP, data acquisition channels can be configured in a convenient way by simply dragging sensors from the built-in sensor database onto the channels in the channel list. Some users, however, prefer to have their own sensor database which may be part of an asset management or test planning tool. In order to avoid that two separate sensor databases need to be maintained in such cases, it is possible to import data from external sensor databases into catman.

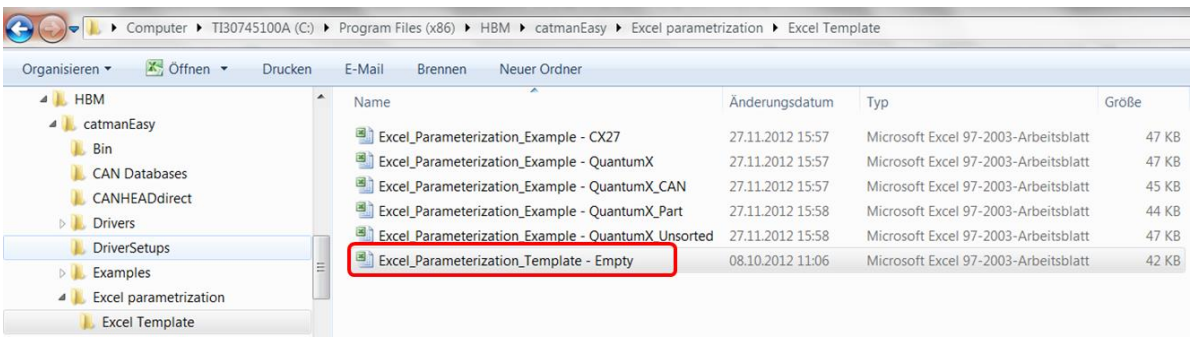
The imported data include the technical sensor characteristics (electrical circuit, measuring range, unit and scaling), but also the setup of the test system, i.e. the amplifier modules and connectors to which the sensors are connected as well as their excitation voltages, excitation modes, sample rates, filters, channel names and channel comments. In other words, complete channel configurations can be imported. A Microsoft Excel© file with a predefined structure serves as interface between the external sensor database and catman.

This functionality is available for all HBM QuantumX modules (except for the input / output modules MX878 and MX879) and for Kistler RoaDyn© wheel force transducers and requires the catman add-on module EasyPlan which is also included in the package catman AP.

Specification of Channel Configurations

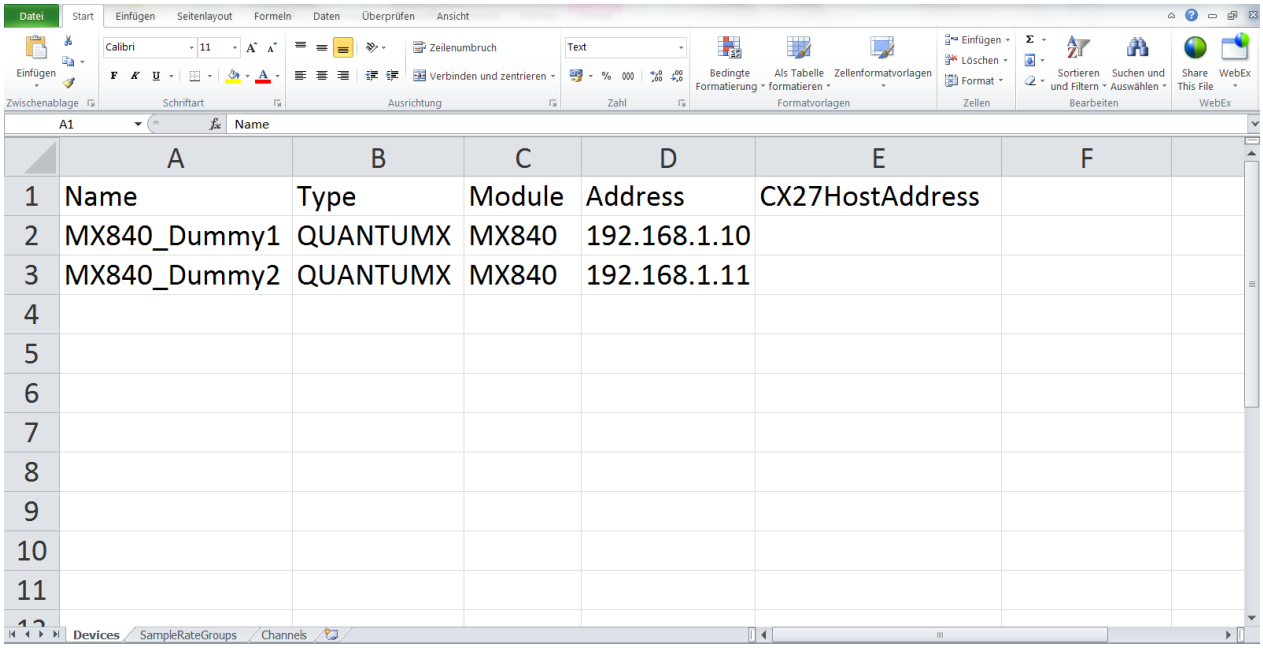
A Microsoft Excel© file with a predefined structure serves as interface between the external sensor database and catman, i.e. the channel configurations are first exported from the external sensor database into the Excel© file, and then the Excel© file is imported into a catman data acquisition project.

A template for the Excel© file with the name Excel_Parameterization_Template - Empty.xls can be found in the catman installation folder (default: C:\Program Files (x86)\HBM\catmanEasy\Excel parametrization\Excel Template).



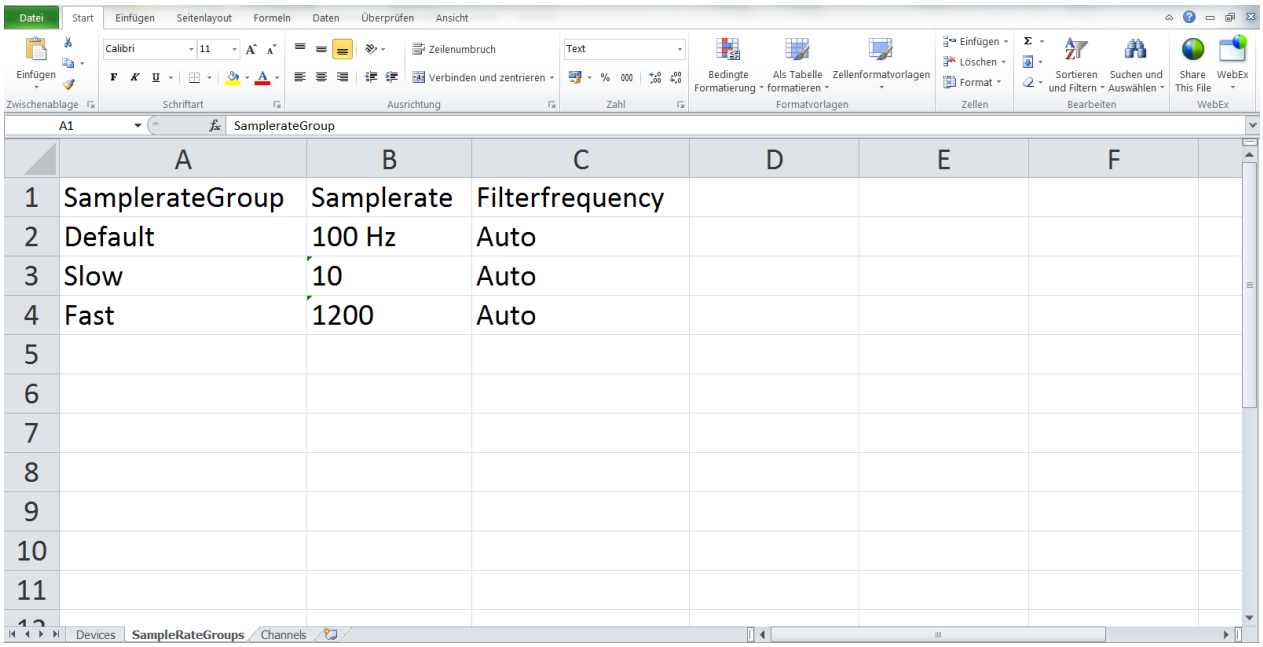
In the following, the structure of the Excel© file is explained.

The worksheet "Devices" contains the name(s), type(s) (QUANTUMX and ROADYN only), module type(s) and the IP address(es) of the amplifiers to be used:



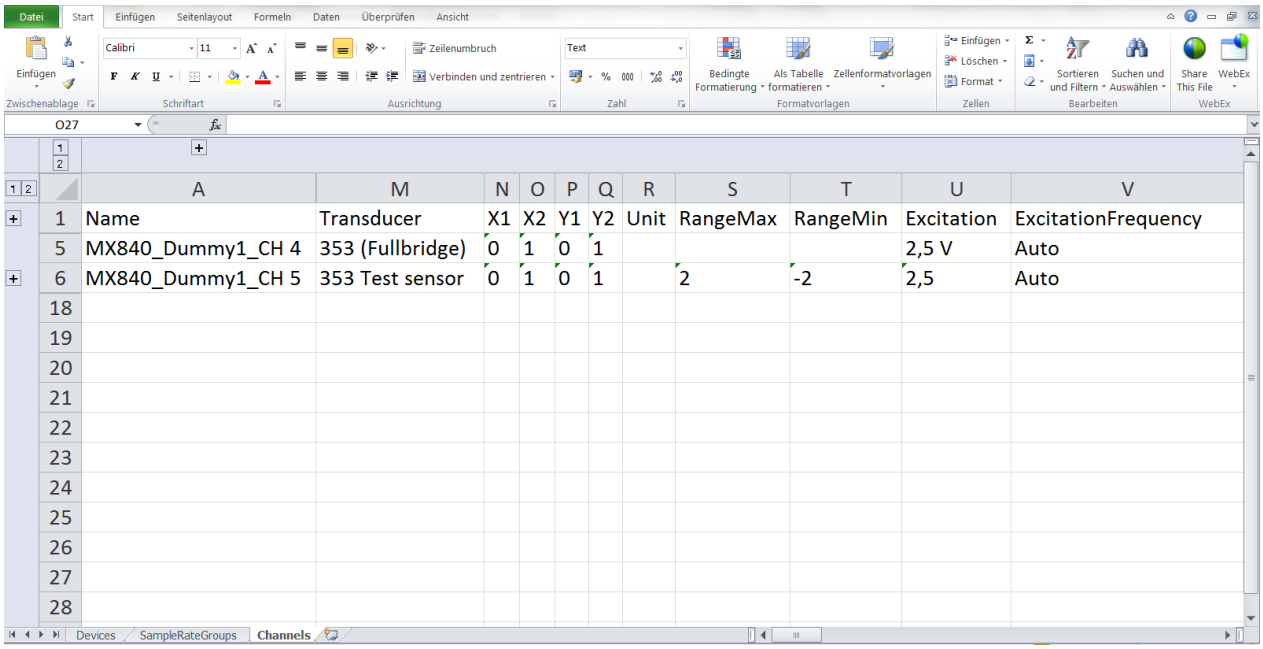
	A	B	C	D	E	F
1	Name	Type	Module	Address	CX27HostAddress	
2	MX840_Dummy1	QUANTUMX	MX840	192.168.1.10		
3	MX840_Dummy2	QUANTUMX	MX840	192.168.1.11		
4						
5						
6						
7						
8						
9						
10						
11						

The worksheet "SampleRateGroups" contains the sample rates and filter frequencies (e.g. "Auto" for automatic anti-aliasing filter) of the three sample rate groups that are used in catman:



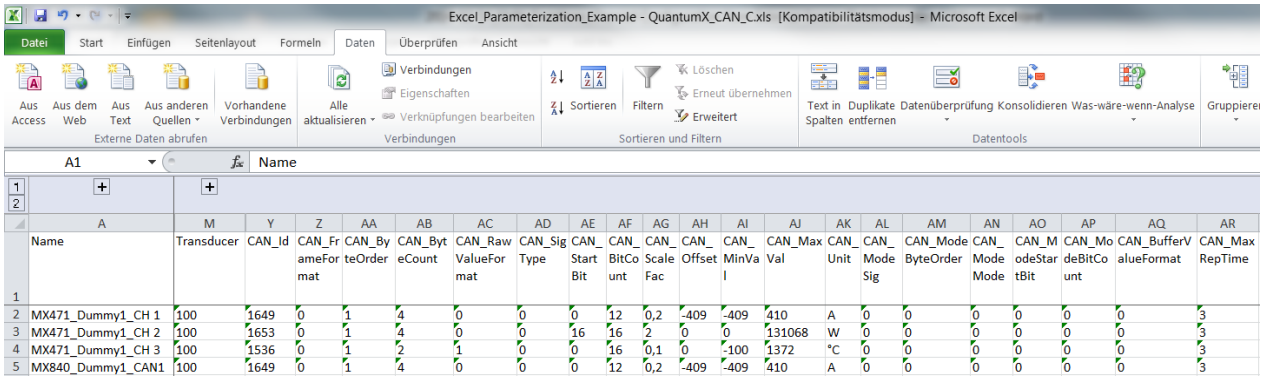
	A	B	C	D	E	F
1	SamplerateGroup	Samplerate	Filterfrequency			
2	Default	100 Hz	Auto			
3	Slow	10	Auto			
4	Fast	1200	Auto			
5						
6						
7						
8						
9						
10						
11						

For each analog channel of the DAQ project, the worksheet “Channels” contains the channel name and comment, and in columns M - X the characteristics of the connected sensor (electrical circuit, measuring range, unit and scaling) which are typically taken from the external sensor database as well as the excitation voltages and excitation modes of the amplifier:



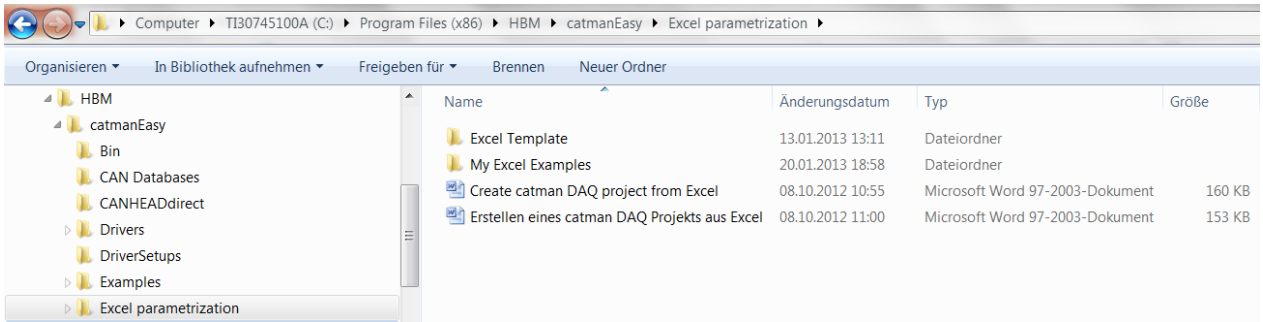
	A	M	N	O	P	Q	R	S	T	U	V
1	Name	Transducer	X1	X2	Y1	Y2	Unit	RangeMax	RangeMin	Excitation	ExcitationFrequency
5	MX840_Dummy1_CH 4	353 (Fullbridge)	0	1	0	1				2,5 V	Auto
6	MX840_Dummy1_CH 5	353 Test sensor	0	1	0	1		2	-2	2,5	Auto
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											

The parameters of CAN channels (Transducer code 100) of MX840 or MX471 modules are contained in columns Y – AR:



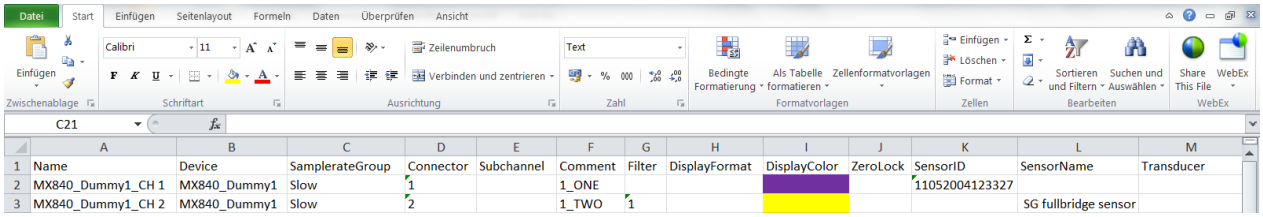
	A	M	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
1	Name	Transducer	CAN_Id	CAN_FrameFormat	CAN_ByteOrder	CAN_ByteCount	CAN_RawValueFormat	CAN_SigType	CAN_StartBit	CAN_BitCount	CAN_ScaleFac	CAN_Offset	CAN_MinVal	CAN_MaxVal	CAN_Unit	CAN_ModeSig	CAN_ModeByteOrder	CAN_ModeMode	CAN_ModeStartBit	CAN_ModeBitCount	CAN_BufferValueFormat	CAN_MaxRepTime
2	MX471_Dummy1_CH 1	100	1649	0	1	4	0	0	0	12	0,2	-409	-409	410	A	0	0	0	0	0	0	3
3	MX471_Dummy1_CH 2	100	1653	0	1	4	0	0	16	16	2	0	0	131068	W	0	0	0	0	0	0	3
4	MX471_Dummy1_CH 3	100	1536	0	1	2	1	0	0	16	0,1	0	-100	1372	°C	0	0	0	0	0	0	3
5	MX840_Dummy1_CAN1	100	1649	0	1	4	0	0	0	12	0,2	-409	-409	410	A	0	0	0	0	0	0	3

A complete listing of all the parameters and their permitted values is contained in the Word© document “Create catman DAQ project from Excel.doc” in the catman installation folder (default: C:\Program Files (x86)\HBM\catmanEasy\Excel parametrization), which is also reproduced in the Appendix of this document:



In addition to importing the channel parameters from an external sensor database, it is also possible to configure channels of the DAQ project using the catman sensor database or TEDS. Reference to sensors from the catman sensor

database can be made either by their unique SensorID or by their SensorName. The SensorName is free of duplicates in the HBM sensor database, but may not be unique in sensor databases modified by the user. In either case, the information in the subsequent columns is ignored:

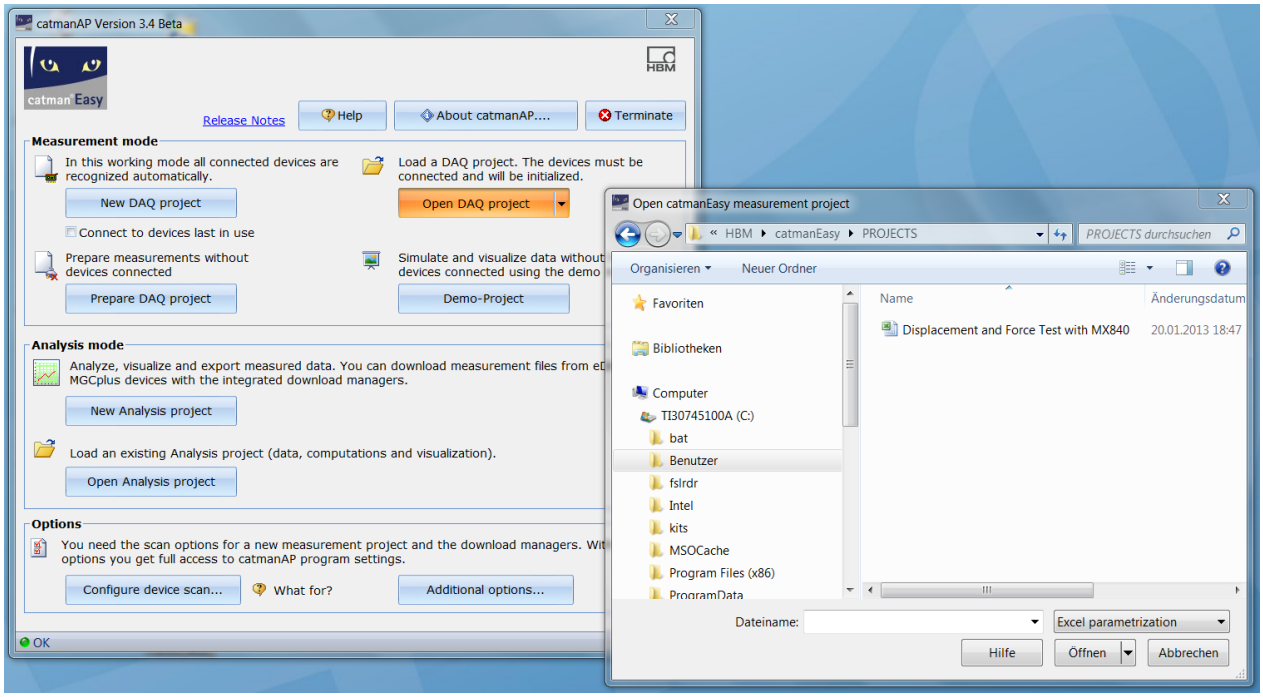


	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Name	Device	SamplerateGroup	Connector	Subchannel	Comment	Filter	DisplayFormat	DisplayColor	ZeroLock	SensorID	SensorName	Transducer
2	MX840_Dummy1_CH 1	MX840_Dummy1	Slow	1		1_ONE					11052004123327		
3	MX840_Dummy1_CH 2	MX840_Dummy1	Slow	2		1_TWO	1					SG fullbridge sensor	

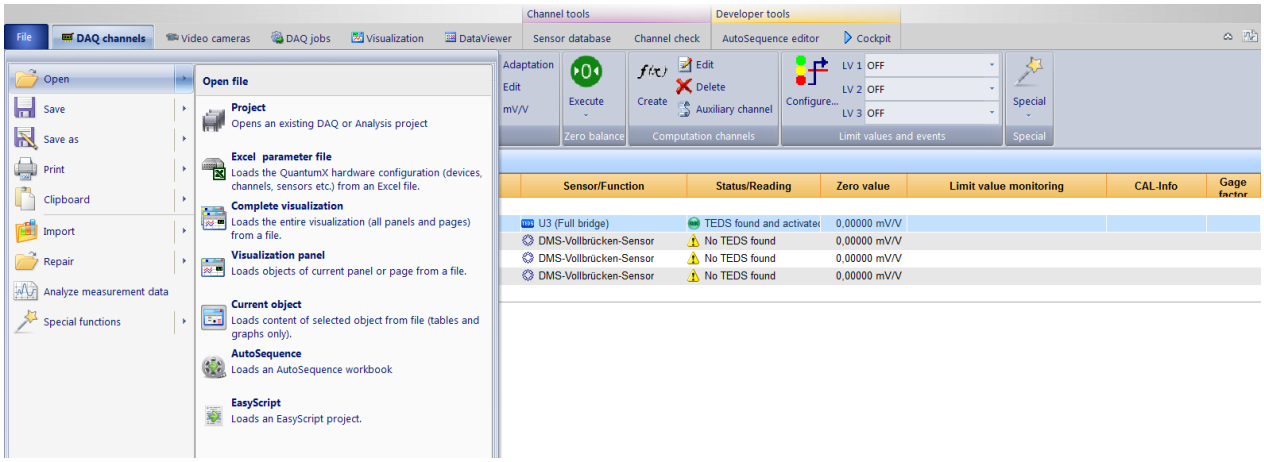
If the TEDS information of a sensor is to be used, the columns M – AR are left empty. After creating the data acquisition project as described below, a sensor scan must be initiated manually with the action ”Sensor scan selected channels” in the group “Sensor” of the “DAQ channels” ribbon in order to activate the TEDS information.

Import of Channel Configurations

The channel configurations can be imported into a catman data acquisition (DAQ) project from the catman start screen using the action “Open DAQ project” / “Open from Excel parametrization file”:



The Excel© file can also be imported from an active project with the action “File” / “Open” / “Excel parameter file”:



After loading the channel configurations from the Excel© file into catman, the new DAQ project is ready for data acquisition. However, the catman default settings for visualizations and data recording modes (start, stop, data reduction) may still have to be modified, and channels may still have to be zeroed before starting the data acquisition.

Appendix: Channel Configuration Parameters and Values

Worksheet 1: Devices

Each row describes one QuantumX module.
If the device name in a row is omitted, this device will be skipped and not shown up in the generated project.

Column name	Description
Name	Device name. catman transfers this name into the QuantumX module.
Type	Currently only texts “QUANTUMX” and “ROADYN” are allowed.
Module	Contains the QuantumX module type as text. Allowed entries: MX840, MX840A, MX410, MX411, MX440A, MX471, MX1601, MX1609, MX1615 and CX27. For the Kistler RoaDyn System: ROADYN.
Address	Here it can be either an IP address (xxx.xxx.xxx.xxx) or an UUID (0009E5xxxxxx). In the case of an UUID a FireWire connection will be accepted (which is clearly different from an IP address). catman determines in this case the corresponding IPoFW address (24.0.x.x) automatically from the UUID.
CX27HostAddress	Address of a CX27, if the module is connected to a CX27 via FireWire and communicates through this gateway. The CX27 must also appear in the device list.
CAN Baudrate1	Baud rate for CAN slot 1 in bit/s. Only for MX471, MX840 and MX840A. Available baud rates for MX471: 1000000, 500000, 250000, 125000, 100000, 50000, 20000 and 10000 bit/s. Available baud rates for MX840 and MX840A: 1000000, 500000, 250000, 125000 and 100000 bit/s.
CAN Baudrate2	Baud rate for CAN slot 2 in bit/s. Only for MX471.
CAN Baudrate3	Baud rate for CAN slot 3 in bit/s. Only for MX471.
CAN Baudrate4	Baud rate for CAN slot 4 in bit/s. Only for MX471.

Example (QuantumX modules over TCP/IP connection):

Name	Type	Module	Address	CX27HostAddress
MX840_TestDevice	*QUANTUMX*	*MX840*	*192.168.1.10*	
MX410_TestDevice	*QUANTUMX*	*MX410*	*192.168.1.11*	

Example (QuantumX modules via gateway module CX27):

Name	Type	Module	Address	CX27HostAddress
CX27_TestDevice	*QUANTUMX*	*CX27*	*192.168.0.1*	
MX840_TestDevice	*QUANTUMX*	*MX840*	*0009E5000A01*	*192.168.0.1*
MX410_TestDevice	*QUANTUMX*	*MX410*	*0009E5000A02*	*192.168.0.1*

Example (QuantumX CAN modules):

Name	Type	Module	Address	CAN Baudrate1	CAN Baudrate2	CAN Baudrate3	CAN Baudrate4
MX471_Test	*QUANTUMX*	*MX471*	*192.168.1.12*	*10000*	*10000*	*50000*	*50000*
MX840_Test	*QUANTUMX*	*MX840*	*192.168.1.10*	*100000*			

Worksheet 2: SampleRateGroups

Contains three rows of 2-4 (row 1 contains the column header) according to the measuring sample rate groups "Standard" (row 2), "Slow" (row 3) and "Fast" (row 4).
All those three measuring sample rate groups are required for the generated project.

Column name	*Description*
SamplerateGroup	Sample rate group: "Standard", "Slow" and "Fast".
Samplerate	Contains the sample rate in Hz.
Filterfrequency	Contains the frequency in Hz for a low-pass filter that is applied to all channels of the group. It can be overwritten individually for each channel in the worksheet "Channels". "AUTO" is allowed - catman determines automatically the frequency that appropriates to the measuring sample rate. The characteristic of the filter can be specified by a preceding "BU" or "BE" (e.g. "BU 2000"). If the prefix is missing, "BE" (Bessel) will be used.

Example:

SamplerateGroup	*Samplerate*	*Filterfrequency*
Default	***100 Hz***	***Auto***
Slow	***10 Hz***	***Auto***
Fast	***1200 Hz***	***100 Hz***

Worksheet 3: Channels (Name, comment, sensor parameter and filter)

Each row describes a channel. It should be noted that the maximum number of channels of a module are created in the generated project (e.g. 16 for a MX1615). This table describes only which channels are really configured, that are used (index begins with 1). catman sets automatically the other channels to "inactive". Due to the current architecture of catman, this is unfortunately not different to "delete".
If the channel name in a row is omitted, this row will be skipped and the channel configuration will be ignored. Instead an inactive channel with a default name will be created automatically in the generated project.

Column name	*Description*
Name	Channel name (max. 64 characters).
Comment	Channel comment (max. 128 characters).
Device	Device name (as in worksheet "Devices"), to which the channel belongs.
SamplerateGroup	Sample rate group: "Default", "Slow" or "Fast".
Connector	Slot (Channel) of module. Begins with 1. MX840, MX840A: 1…8 MX440A, MX410, MX411: 1…4 MX1609, MX1601, MX1615: 1….16 MX471: 1…4
Subchannel	Only for MX840, MX840A and MX471 CAN channels. Sub channel number (1….128).
TriggerSignal	Trigger signal for the synchronization between Kistler RoaDyn System and QuantumX module. 0 or omitted = not specified 1 = use current channel as trigger signal
ClockSignal	Clock signal for the synchronization between Kistler RoaDyn System and QuantumX module. 0 or omitted = not specified 1 = use current channel as clock signal
SensorID	Sensor-ID from the sensor database. If this column is filled, no further parameters are required. catman will take over all settings from the current sensor

	database. If there are other columns with individual parameters (such as e.g. Transducer, X1…Y2, RangeMin, RangeMax or Excitation), those parts of sensor parameterization will be overwritten.
SensorName	Sensor name from the sensor database. If this column is filled, no further parameters are required. catman will take over all settings from the current sensor database. If there are other columns with individual parameters (such as e.g. Transducer, X1…Y2, RangeMin, RangeMax or Excitation), those parts of sensor parameterization will be overwritten.
Transducer	ID of the transducer circuit (defined in section "Transducer circuits"). E.g. “353” for full-bridge. Any further text can be appended to the enumeration number (e.g. “353 strain gage full-bridge”).
X1	The first electric characteristic point of the base unit of the amplifier (e.g. “mV/V”) depending on the type of transducer circuit.
X2	The second electric characteristic point of the base unit of the amplifier (e.g. “mV/V”) depending on the type of transducer circuit.
Y1	The first physical characteristic point of physical unit (engineering unit).
Y2	The second physical characteristic point of physical unit (engineering unit).
RangeMax	Maximum value (nominal value) of the sensor of physical unit. If this column is missing, the value Y2 will be used as the maximum value which is defined via X1…Y2.
RangeMin	Minimum value (nominal value) of the sensor of physical unit. If this column is missing, but the RangeMax has been specified, the value –RangeMax will be used as the minimum value. Otherwise the value -Y2 will be used as the minimum value which is defined via X1…Y2 (symmetric range).
Unit	Physical unit (engineering unit) of channels as text. Maximal 12 characters.
Excitation	The supply voltage in volt. For non-bridges (e.g. DC 10V transducer) this is interpreted as an active supply.
ExcitationFrequency	Carrier frequency of the supply voltage in Hz. 0 = DC AUTO = automatically best-fit settings by the module.
Gagefactor	Gage factor (k-factor).
Bridgefactor	Bridge factor.
Filter	Contains the frequency in Hz for a low-pass filter. The possible existing, general setting for the entire measuring sample rate group (worksheet “SampleRateGroups”) will thereby be overwritten. The entry “AUTO” is allowed - catman automatically determines the frequency that appropriates to the measuring sample rate. The characteristic of the filter can be specified by a preceding “BU” or “BE” (e.g. “BU 2000”). If the prefix is missing, “BE” (Bessel) will be used. If OFF is given, the internal low-pass filters in the

	device are deactivated.
DisplayFormat	Display format for numeric value (e.g. "0.000").
DisplayColor	Display color in catman (e.g. curve in graphic). Use the cell background color of this column to specify the display color of a channel.
ZeroLock	Zero balancing. Only for QuantumX module. 0 or omitted = unlock zero balancing 1 = lock zero balancing.
AutoCal	Auto calibration. Only for QuantumX module. 0 or omitted = Off 1 = automatically best-fit settings by the module.

The following columns with CAN_ prefix are only relevant for Transducer = 100 (CAN).	
CAN_Id	CAN message ID
CAN_FrameFormat	0 (Standard 11 Bit ID) 1 (Extended 29 Bit ID)
CAN_ByteOrder	0 (Motorola) 1 (Intel)
CAN_ByteCount	Data byte count (1..8)
CAN_RawValueFormat	0 (Unsigned int 32 Bit) 1 (Signed int 32 Bit) 2 (Unsigned int 64 Bit) 3 (Signed int 64 Bit) 4 (Real 32 Bit) 5 (Real 64 Bit)
CAN_SigType	0 (Standard signal) 1 (Mode signal) 2 (Mode-dependent signal)
CAN_StartBit	0...63
CAN_BitCount	1...32
CAN_ScaleFac	Scaling factor
CAN_Offset	Offset
CAN_MinVal	Minimum value (will not be evaluated by HBM systems)
CAN_MaxVal	Maximum value (will not be evaluated by HBM systems)
CAN_Unit	Engineering unit
CAN_ModeSig	Reserved
CAN_ModeByteOrder	0 (Motorola) 1 (Intel)
CAN_ModeMode	Reserved
CAN_ModeStartBit	0...63
CAN_ModeBitCount	1...32
CAN_BufferValueFormat	Reserved. The output format of HBM QuantumX has always a 64-bit double precision.
CAN_MaxRepTime	Transmission interval of the signal in ms.

Examples:

Name	Device	SamplerateGroup	Connector	SensorName	Transducer	X1	X2	Y1	Y2	Unit	Excitation
Accel	DEV_1	Default	1	DC_10V		0	10	0	100	g	
Pedal force	DEV_1	Default	5		353 (Fullbridge)	0.04	2.06	0	250	N	5 V
Oil_level	DEV_2	Default	16	SA_ABC_123							

Name	Device	SamplerateGroup	Connector	Subchannel	Comment	Filter	DisplayFormat	DisplayColor	ZeroLock
CH1	DEV_1	Default	1		CH_One	Auto	0.00		0
CH2	DEV_1	Slow	2		CH_Two	BE 5	0.0000		1
CH3	DEV_1	Fast	3		CH_Three	BU 20	0.00000000		1

Name	Device	SamplerateGroup	Connector	Subchannel	Comment
MX471_CAN1_1	MX471_Test	Default	1	1	MX471_CAN_SLOT_1_CHANNEL_1
MX471_CAN1_2	MX471_Test	Default	1	2	MX471_CAN_SLOT_1_CHANNEL_2
MX471_CAN2_1	MX471_Test	Default	2	1	MX471_CAN_SLOT_2_CHANNEL_1
MX471_CAN2_2	MX471_Test	Default	2	2	MX471_CAN_SLOT_2_CHANNEL_2
MX840_CAN1_1	MX840_Test	Fast	1	1	MX840_CAN_SLOT_1_CHANNEL_1
MX840_CAN1_2	MX840_Test	Fast	1	2	MX840_CAN_SLOT_1_CHANNEL_2
MX840_CH2	MX840_Test	Slow	2		MX840_ CHANNEL_2
MX840_CH3	MX840_Test	Slow	3		MX840_CHANNEL_3

Transducer circuits

ID	TYP
353	Strain gage transducers full-bridge
354	Strain gage transducers half-bridge
356	Inductive full-bridge
357	Inductive half-bridge
362	Strain gage bridges full-bridge 120 Ohm (with k-factor)
363	Strain gage bridges full-bridge 350 Ohm (with k-factor)
364	Strain gage bridges full-bridge 700 Ohm (with k-factor)
365	Strain gage bridges half-bridge 120 Ohm (with k-factor)
366	Strain gage bridges half-bridge 350 Ohm (with k-factor)
367	Strain gage bridges half-bridge 700 Ohm (with k-factor)
368	Strain gage bridges quarter-bridge 4-wire 120 Ohm (with k-factor)
369	Strain gage bridges quarter-bridge 4-wire 350 Ohm (with k-factor)
370	Strain gage bridges quarter-bridge 4-wire 700 Ohm (with k-factor)
371	Strain gage bridges quarter-bridge 3-wire 120 Ohm (with k-factor)
372	Strain gage bridges quarter-bridge 3-wire 350 Ohm (with k-factor)
373	Strain gage bridges quarter-bridge 3-wire 700 Ohm (with k-factor)
376	Strain gage bridges quarter-bridge 4-wire 1000 Ohm (with k-factor)
380	LVDT
385	Potentiometer
420	DC voltage
421	DC current
450	Thermo J
451	Thermo K
452	Thermo T
453	Thermo S
454	Thermo B
455	Thermo E
456	Thermo R
457	Thermo N
475	Resistance
500	Pt10
501	Pt100
502	Pt500
503	Pt1000
520	Frequency
521	Frequency + F2 Signal
523	Frequency 4-time
524	Time
525	Counter
581	IEPE
100	**CAN (only MX471, MX840 and MX840A CAN channels)**