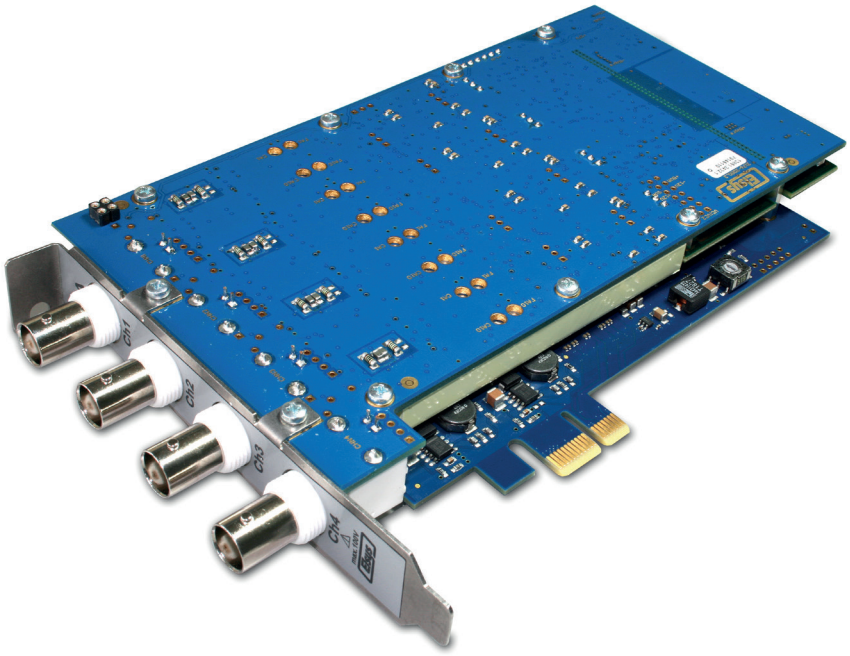
High Speed Data Acquisition Cards

TPCE
TPCE-LE
TPCE-I
TPCX

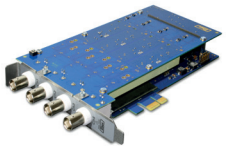


Product Overview

Elsys Data Acquisition Cards are high speed high precision digitizer modules. Based on a PCI or PCIe Interface a modular measurement system can be build up. Different Analog to Digital converters variants from 2 to 240 MHz are available for best fitting any high speed application. In addition, Elsys Data Acquisition Cards are available in 4 or 8 channel and as single ended, differential or isolated variants.

Card Family Overview

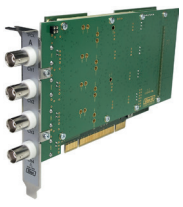
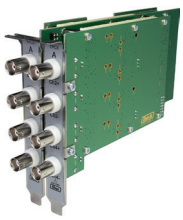
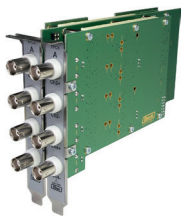
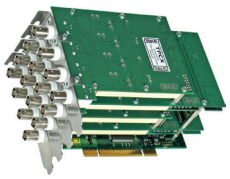





Parameter	TPCE	TPCE-LE	TPCE-I	TPCX
Interface	PCIe x4	PCIe x1	PCIe x1	PCI
Available Sample Rates	2 - 240 MHz	2 - 240 MHz	1 MHz	2 - 80 MHz
Resolution	14/16 Bit	14 Bit (16 Bit optional)	16 Bit	14/16 Bit
# of Channels	4 or 8	4 or 8	4 or 8	4 or 8
Input Ranges	100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V, 20 V, 50 V, 100V	200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V, 20 V, 50 V	200 mV, 400 mV, 1 V, 2 V, 5 V, 10 V, 25 V, 50 V	100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V, 20 V, 50 V, 100V
Input Offset	0 - 100 %	0 - 100 %	fix at 50%	0 - 100 %
Isolation	-	-	400V RMS (560V Peak)	-
Differential Mode	yes	yes	no	yes
Differential Variant	yes	yes	no	yes
CMRR	> 74 dB (DC – 1 kHz); > 60 dB (1 kHz – 100 kHz) > 40 dB (100 kHz – 5 MHz)	> 60 dB (DC – 1 kHz); > 54 dB (1 kHz – 100 kHz) > 40 dB (100 kHz – 5 MHz)	-	> 74 dB (DC – 1 kHz); > 60 dB (1 kHz – 100 kHz) > 40 dB (100 kHz – 5 MHz)
Memory (4 channel modules)	32 MS/channel (128 MS/channel optional)	32 MS/channel (128 MS/channel optional)	32 MS/channel (128 MS/channel optional)	16 MS/channel (64 MS/channel optional)
Delivery Form	Board, TraNET FE, TraNET EPC, TraNET PPC	Board, TraNET FE, TraNET EPC, TraNET PPC	Board, TraNET FE, TraNET EPC, TraNET PPC	Board, TraNET EPC

Product Variants

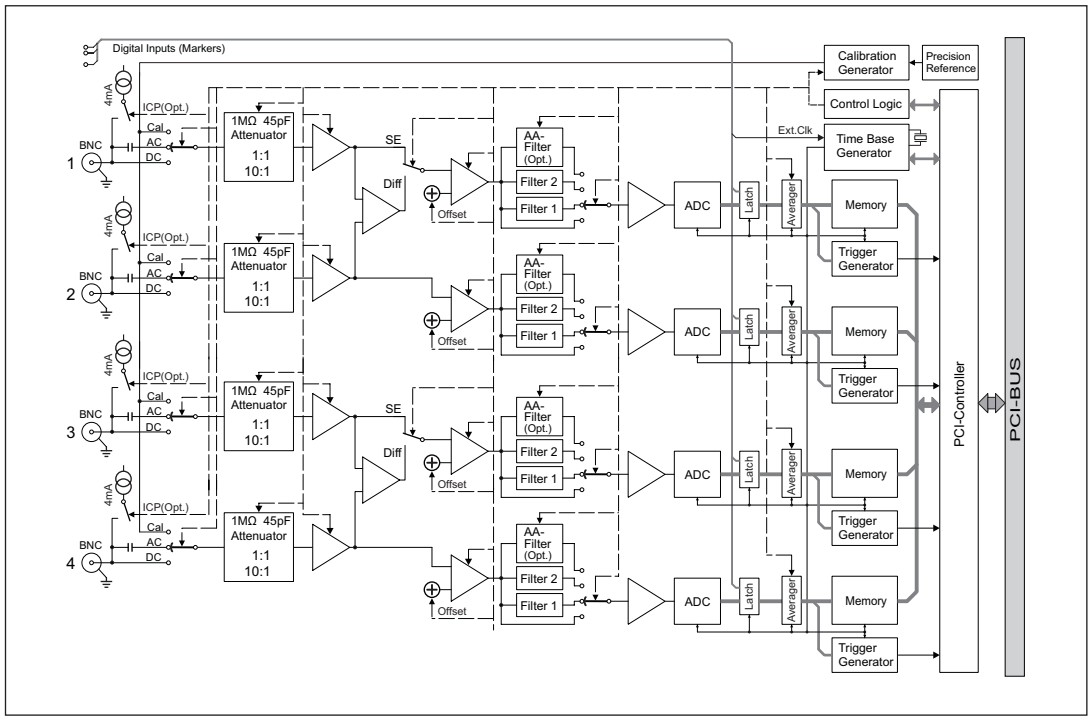
TPCX, TPCE and TPCE-LE boards are available in different input configuration

Configuration	4 Channel Single Ended	8 Channel Single Ended	4 Channel Differential	8 Channel Differential
# of Channels in SE Mode *	4	8	4	8
# of Channel in DIFF Mode	2	4	4	8
# of electrical slots needed	1	1	1	1
# of mechanical slots needed	1	2	2	4
Max Sampling Rate Available	240 MHz	20 MHz	240 MHz	20 MHz
Product Number	-ffbb-4S	-ffbb-8S	-ffbb-4D	-ffbb-8D

*) Differential boards can also be used in Single Ended mode by just using the (+) Input of the differential pair.

Analog Inputs TPCE / TPCE-LE / TPCX



TPCE / TPCE-LE and TPCX Analog Input Architecture

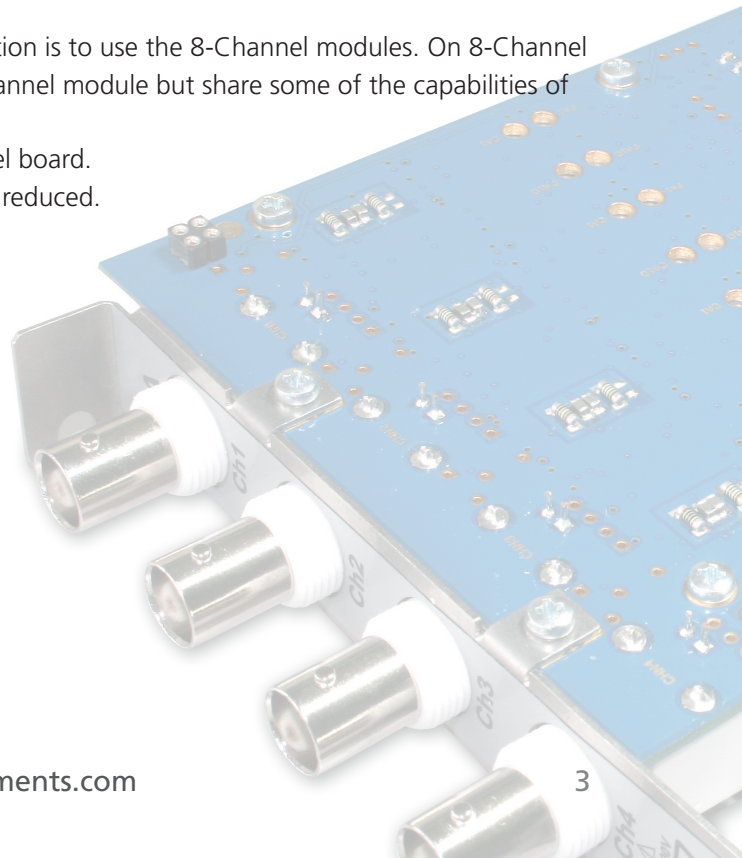
The inputs on the non-isolated data acquisition cards have all the same architecture. The ground referenced single ended BNC inputs can be DC,AC or ICP coupled. A gain programmable input stage allows to have different input ranges for having always the maximum resolution over the full input signal range. Two adjoining channels can be connected together for having a differential input configuration, width the drawback that only two ADC can be used.

If differential mode is your standard configuration we recommend using the differential cards which have additional input connectors and additional differential stages for using all four ADC converters.

All channel settings as for example input range, input coupling, offset and filter settings can be set individual per channel.
When more than 4 channels are needed a cost effective solution is to use the 8-Channel modules. On 8-Channel modules all channels have the same specification as on 4-Channel module but share some of the capabilities of the digital base board:

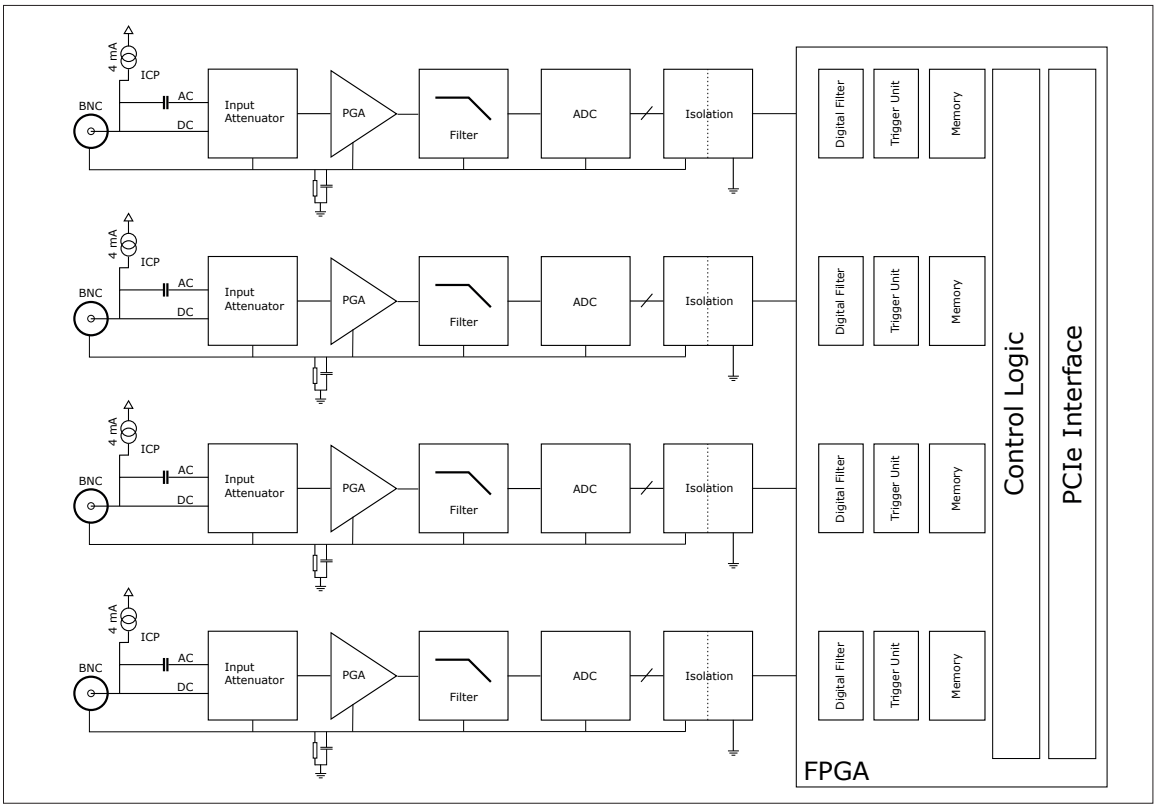
- On-board memory per channel is only 1/2 of the 4-Channel board.
- Maximum Data Throughput in continuous or ECR mode is reduced.

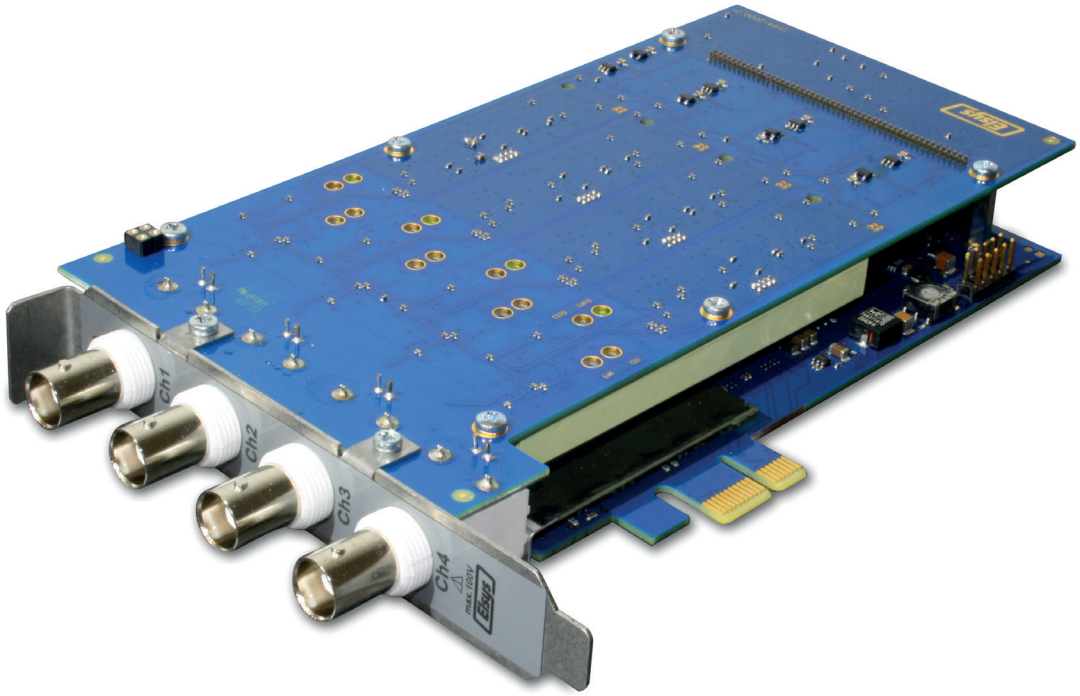
8-Channel cards are available up to 20 MHz sampling rate.



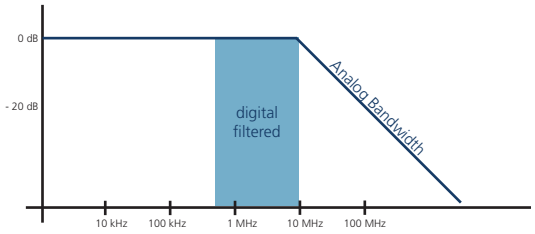
Isolated Analog Inputs with TPCE-I

TPCE-I cards have a different analog input architecture. They are fully channel to channel and channel to ground isolated up to 400V RMS or 560 V DC.





Filter



On each channel a Low-Pass First Order Filter with 100 kHz or 1 MHz (10 KHz, 100 kHz for TPCE-I) bandwidth can be activated.
The analog bandwidth of the amplifier itself is set around the half of the maximum sampling rate, eg. 10 MHz for a 20 MHz board.
When the cards are used below the maximum sampling rate an internal digital filtering is done. Therefor an Anti-Aliasing Filter is not needed in the most situations. The picture above shows a 20 MHz card used at 1MHz. High frequency noise above 10 MHz is filtered by the analog bandwidth of the amplifier with 20 dB/dec. Noise between 500 kHz and 10 MHz is digital filtered an will not produce any mirror signals at lower frequencies.

Trigger

Elsys DAQ cards cames with two different trigger packages, the standard trigger package and the Advance Trigger package:

Standard Trigger

- Positive/Negative Slope
- Window In/Out

Advance Trigger

- all Standard Trigger
- Pulse > & Pulse <
- Delay > & Delay <
- Slew Rate Trigger
- State Trigger
- AND Trigger linking
- Trigger on multiplied signals (Power Trigger)
- Trigger on Marker Inputs (TPCE only)
- Serial Protocol Trigger for I2C and CAN (TPCE only)

Each channels can be the trigger source at once. The first channel which detects a trigger will trigger the measurement. One external Slope trigger is available on the 25-Pol D-SUB connector on the Star-Hub board.

Operation Modes

There are four different operation modes in which the data acquisition cards can be used:

Scope

In this mode the board runs like an Oscilloscope. Incoming data from the ADC are written into the on-board memory until a trigger condition occurs. After the trigger condition, the measurement continuous until the post-trigger time is over and stops. The length of the measurement is limited by the maximum memory available on the board.

Multi-Block

Multi-Block Mode works like the Scope mode but with the addition that the available on-board memory is splitted up in several blocks. On each trigger, a new part of the memory is used. This way, the on-board memory can be used more effective than in the Scope mode. The maximum number of blocks is limited by the block size and the available memory.

Continuous

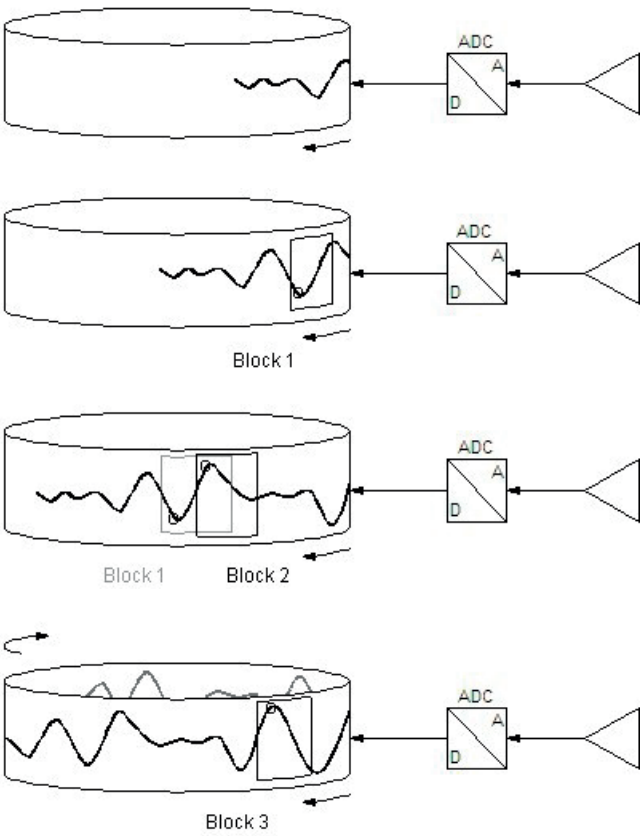
In the Continuous mode incoming data from the ADC's are buffered on the on-board memory an then transfered immediately to the hard disk. The maximum recording length is only limited by the hard disk size. The amount of data produced per second depend on the used sampling rate and the number of activated channels. If the data rate is higher than the PCI or PCIe interface or the hard-disk write throughput, some data from the on-board buffer get lost.

ECR (Event Controlled Recording)

The ECR mode allows targeted acquisition of cyclic or sporadically arising events. This implies that the registration of measuring data only occurs if certain signal conditions (trigger, time window, repetitions, etc.) are fulfilled. Thus many unwanted and unneeded signal data will not be stored

ECR - Mode of Operation

- The digitalized signal will be stored to the on-board memory which acts as a ring buffer.
- As soon as the trigger is released, a block of samples will be read from the ring buffer and will be saved to the hard disk.
- If a new trigger event within the actual block occurs, a new overlapping block will be saved.
- If the ring buffer is full, the oldest measurement data will be overwritten with new incoming data. Usually, the overwritten data would be transferred to the hard disk before this happens. If too many events occur in a period of time, the ring buffer may overflow.



An other feature of ECR is the "Dual Mode". It allows to store a continuous measurement at a slower sampling rate than the captured blocks. For example fast transient can be captured at 10 MS/s by the triggered blocks while storing slower signals at 100 kHz over a long period of time.

Any of these operation modes are ready to use in all driver interfaces or Application software.

Multi-Board Systems

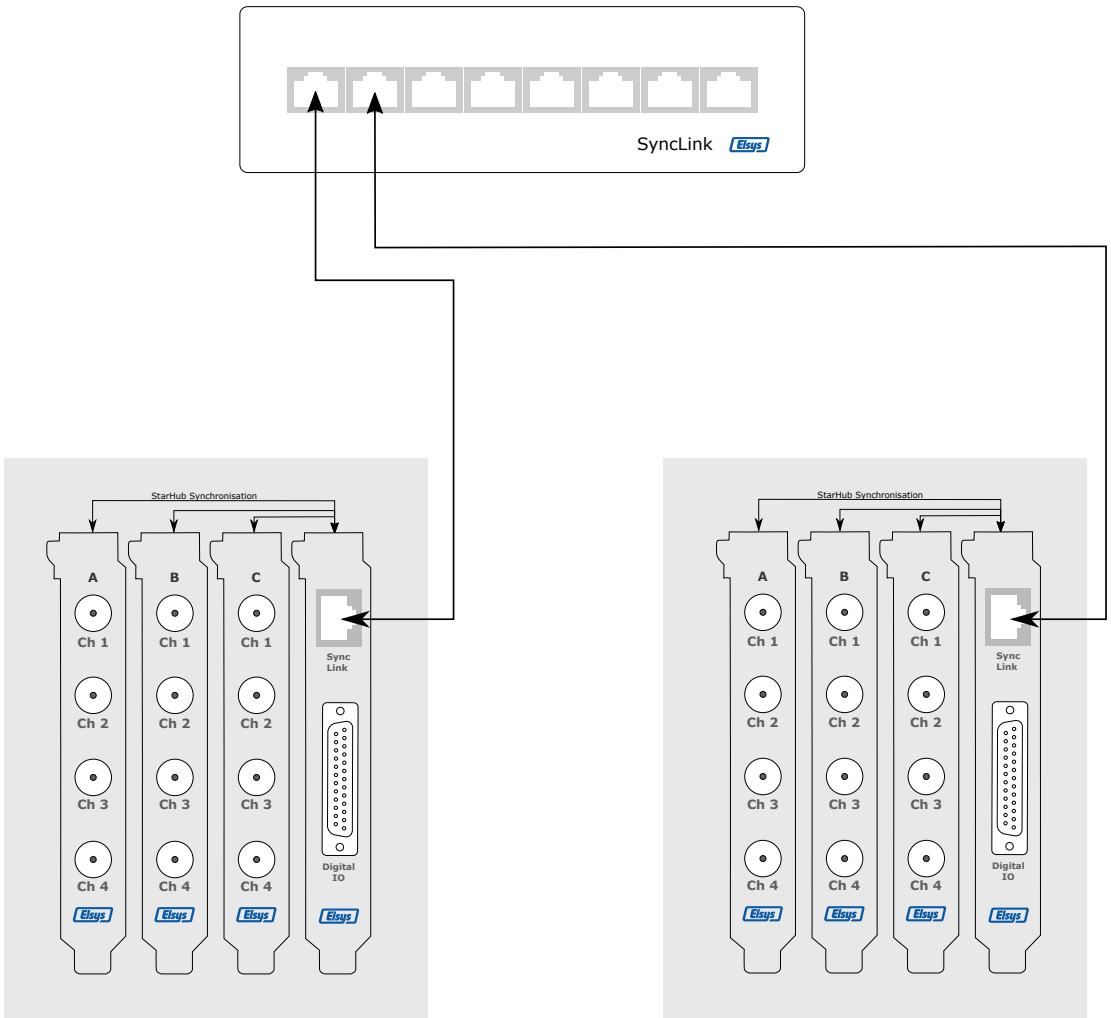
Based on all Elsys DAQ cards, large data acquisition systems can be build-up. Depending on the host system, instruments up to 64 channel in one device can be realized. Larger or distributed systems can be build-up by synchronizing several instruments together. The maximum number of channel is 1024 by taking 16 devices with 64 channel per device.

Star-Hub

The Star-Hub synchronization board allows to synchronize up to 16 Boards inside of an instruments. The Star-Hub generates a master Clock and distributes any Trigger event from and to all connected boards. This way every board in the system can be source and destination of any trigger event. The synchronization precision is one sample over all connected boards.

Sync-Link

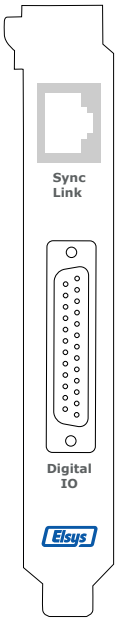
The Sync-Link is the next higher level of synchronization and allows to synchronize up to 16 instruments. The connection is made over standard Cat. 6 Ethernet cables up to 10 m length. When connected, the SyncLink act as master clock generator and distributes any trigger event from and to all devices. Any device can be the source of the trigger.



Digital Input / Output

The 25 Pol D-Sub connector on the StarHub board provides sever dedicated digital inputs and outputs signals.

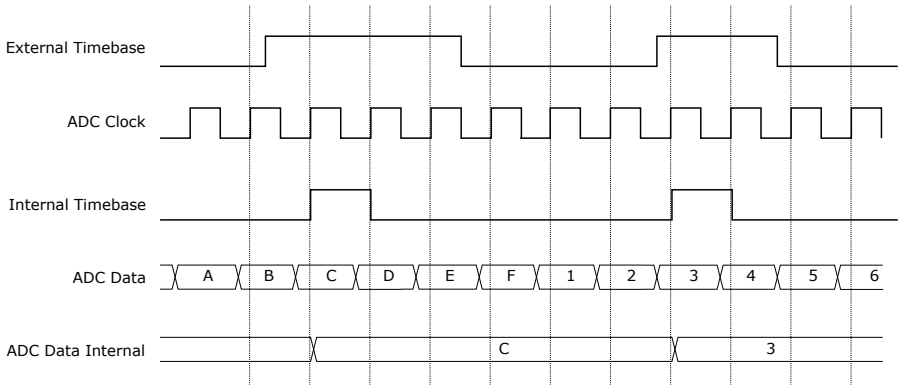
Function	Description	Pin #	Input / Output
Trigger Out	TTL Pulse when device has triggered	1	Output
Armed Sync Clock Out	High when device is ready for trigger / Synchronization Clock Output (Configured in TranAX)	14	Output
!Disarm	Deactivate any trigger when low	15	Input
Start Recording	Start Recording at negative slope	3	Input
Trigger In	TLL Trigger input	16	Input
Timebase In / PPS	External Timebase input or GPS PPS Input	4	Input
+5V	Power Output (max 500 mA)	17	Power Output
GND	Chassis Ground	5	
Marker A1	Digital Inputs Board A TTL Level (with internal Pull-Up)	18	Input
Marker A2		6	Input
Marker A3		19	Input
Marker A4		7	Input
Marker A5		20	Input
Marker A6		8	Input
Marker A7		21	Input
Marker A8		9	Input
Marker B1	Digital Inputs Board B TTL Level (with internal Pull-Up)	22	Input
Marker B2		10	Input
Marker B3		23	Input
Marker B4		11	Input
Marker B5		24	Input
Marker B6		12	Input
Marker B7		25	Input
Marker B8		13	Input



Digital Marker inputs are captured synchronous with the ADC clock and are available when 14 bit resolution is used. In 16 bit mode, additional memory bits are needed and therefor no Marker are available.

External Timebase

The External Timebase can be used for capturing the measurement data at a specific moment. The external timebase is not a reference clock but will be synchronized to the internal ADC sampling clock. Therefor the external timebase must be at least two time slower than the ADC clock.



The data acquisition card detects any rising edge on the external timebase input and capture the incoming ADC data.

Specification TPCE 40 - 240 MHz

Module Type	TPCE-24016-4	TPCE-12016-4	TPCE-8016-4	TPCE-4016-4	
Number of Input Channels SE Module	4 single ended or 2 differential software switchable		4 single ended or 2 differential software switchable		
Number of Input Channels DIF Module	4 single ended or **4 differential** software switchable		4 single ended or **4 differential** software switchable		
Max. Sample Rate (all channels are sampled simultaneously)	**240 MHz**	**120 MHz**	**80 MHz**	**40 MHz**	
Amplitude Resolution	16 Bit up to 60 MHz 14 Bit up to 240 MHz	16 Bit up to 60 MHz 14 Bit up to 120 MHz	16 Bit up to 20 MHz 14 Bit up to 80 MHz	16 Bit up to 10 MHz 14 Bit up to 40 MHz	
Memory (per Module)	Standard: 4 x 32 MWords (= 256 MByte) Optional: 4 x 128 MWords (= 1 GByte)				
Input Amplifier					
Measurement Ranges	±50 mV – ±50 V rsp. 0.1 V – 100 V (100 V limited to 70 V) in 1, 2, 5 Steps				
Offset	0 – 100 % in steps of 0.1% (Resolution 0.01 %)				
Input Impedance	1 MΩ (± 0.2 %) or 50 Ω (± 0.5 %) // 26 pF (± 5 %)		1 MΩ (± 0.2 %) // 35 pF (± 5 %)		
Coupling	AC / DC software switchable (AC: -3 dB at < 5 Hz), Inputs invertible				
Bandwidth at Range ≥ 1 V	120 MHz	60 MHz	30 MHz	18 MHz	
Bandwidth at Range < 1 V	80 MHz	50 MHz	8 MHz	7 MHz	
Slew Rate (10 – 90 %) @ Range ≥ 1 V	4 ns	6 ns	13 ns	25 ns	
Slew Rate (10 – 90 %) @ Range < 1 V	6 ns	9 ns	50 ns	60 ns	
Settling Time to 1%	< 200 ns	< 200 ns	< 200ns	< 200 ns	
Low Pass Filter (RC-Filter)	2 Steps (1 MHz and 100 kHz) software switchable				
Antialiasing-Filter (optional)	200 Hz – 5 MHz, min. 4. order Butterworth, software setable				
Common Mode Range	Differential-Mode: ±8 V or +/-80 V at ranges. > 5 V				
Common Mode Rejection	> 74 dB (DC – 1 kHz); > 60 dB (– 100 kHz); > 40 dB (– 5 MHz)				
Range Error (±)	max. 0.1 % typ. 0.07 % (after autocalibration)		max. 0.1 % typ. 0.03 % (after autocalibration)		
Offset Error (±)	max. 0.1 % typ. 0.07 % (after autocalibration)		max. 0.1 % typ. 0.02 % (after autocalibration)		
Offset Drift (±)	max. (0.0100 % + 0.1 mV) per °C, typ. (0.0050 % + 0.03 mV) per °C (will be compensated by autocalibration)				
Input Noise: @ max. Sample Rate @ 5 MHz Sample Rate @ 1 MHz Sample Rate @ 100 kHz Sample Rate @ 10 kHz Sample Rate	 < 0.250 mVrms < 0.120 mVrms < 0.070 mVrms < 0.040 mVrms < 0.025 mVrms	 < 0.200 mVrms < 0.120 mVrms < 0.070 mVrms < 0.040 mVrms < 0.025 mVrms	 < 0.200 mVrms < 0.120 mVrms < 0.070 mVrms < 0.040 mVrms < 0.020 mVrms	 < 0.180 mVrms < 0.110 mVrms < 0.060 mVrms < 0.040 mVrms < 0.015 mVrms	*2
Signal to Noise Ratio SNR: @ max. Sample Rate @ 10 MHz Sample Rate @ 5 MHz Sample Rate @ 1 MHz Sample Rate @ 100 kHz Sample Rate @ 10 kHz Sample Rate	 58 dB 70 dB 72 dB 77 dB 81 dB 84 dB	 60 dB 70 dB 72 dB 77 dB 81 dB 84 dB	 59 dB 62 dB 66 dB 69 dB 79 dB 89 dB	 62 dB 68 dB 70 dB 74 dB 82 dB 90 dB	*3
Channel Isolation (Crosstalk) @ 10 kHz Ranges < 1V	> 74 dB		> 80 dB > 60 dB		
Special : Autocalibration	Auto adjustment of gain and offset in all measurement ranges. (Initiated by software)				
Trigger					
Number of Trigger Channels	4 coupled to analog inputs, pos./neg.Edge, with or without hysteresis, Window IN, Window OUT				
Advanced Trigger (Option)	On all analog inputs: Slew Rate, Pulse Width, Pulse Pause or Period (too short or too long = Missing Event), State (above / below), AND link, Product (trigger signal is calculated from 2 channels)				
External Trigger input	1 per System (TTL), pos. or neg. Edge				
Trigger Delay	-100 % (Pretrigger) to +200 % (Posttrigger) in 1 % steps				
Miscellaneous					
Digital Inputs (Marker)	8 (2 per analog channel) (TTL) Optocoupler Connection Box (5 to 48 V) as additional option				
Ext. Control Inputs (TTL))	Trigger, Arm/Disarm, Ext. Sampling (fmax = 10 MHz), external command to start recording				
Status Outputs (TTL)	Trigger Output, Armed (=True during recording)				
ICP® Sensor Supply (Option)	4mA Integrated Current Power for piezo sensors				

*1) At 16 bit modules, the resolution will be reduced to 14 bits at sample rates over 1/4 of the max. sample rate.
*2) The input noise depends on the sample rate.
*3) At 14 bit modules the SNR will be reduced by 2 dB
*4) At 8-channel modules the SNR will be reduced by 3 dB

Specification TPCE 2 - 20 MHz

Module Type	TPCE-2016-4/8	TPCE-1016-4/8	TPCE-0516-4/8	TPCE-0216-4/8	
Number of Input Channels SE Module	4-Channel Modules: 4 single ended or 2 differential 8-Channel Modules: 8 single ended or 4 differential				
Number of Input Channels DIF Module	4-Channel Modules: 4 single ended or **4 differential** 8-Channel Modules: 8 single ended or **8 differential**				
Max. Sample Rate (all channels are sampled simultaneously)	**20 MHz**	**10 MHz**	**5 MHz**	**2 MHz**	
Amplitude Resolution	16 Bit up to 5 MHz 14 Bit up to 20 MHz	16 Bit up to 5 MHz 14 Bit up to 10 MHz	16 Bit up to 5 MHz	16 Bit up to 2 MHz	
Memory 4 Channel Module	Standard: 4 x 32 MWords (= 256 MByte) Optional: 4 x 128 MWords (= 1 GByte)				
Memory 8 Channel Module	Standard: 8 x 16 MWords (= 256 MByte) Optional: 8 x 64 MWords (= 1 GByte)				
Input Amplifier					
Measurement Ranges	±50 mV – ±50 V rsp. 0.1 V – 100 V (100 V limited to 70 V) in 1, 2, 5 Steps				
Offset	0 – 100 % in steps of 0.1% (Resolution 0.01 %)				
Input Impedance	1 MΩ (± 0.2 %) // 35 pF (± 5 %)				
Coupling	AC / DC software switchable (AC: -3 dB at < 5 Hz), Inputs invertible				
Bandwidth at Range ≥ 1 V	10 MHz	5 MHz	2.5 MHz	1 MHz	
Bandwidth at Range < 1 V	6 MHz	4 MHz	2.5 MHz	1 MHz	
Slew Rate (10 – 90 %) @ Range ≥ 1 V	40 ns	70 ns	80 ns	180 ns	
Slew Rate (10 – 90 %) @ Range < 1 V	70 ns	80 ns	80 ns	180 ns	
Settling Time to 1%	< 200ns	< 200 ns	< 300 ns	< 500 ns	
Low Pass Filter (RC-Filter)	2 Steps (1 MHz and 100 kHz) software switchable				
Antialiasing-Filter (optional)	200 Hz – 5 MHz, min. 4. order Butterworth, software setable				
Common Mode Range	Differential-Mode: ±8 V or +/-80 V at ranges. > 5 V				
Common Mode Rejection	> 74 dB (DC – 1 kHz); > 60 dB (– 100 kHz); > 40 dB (– 20 MHz)				
Range Error (±)	max. 0.1 % typ. 0.03 % (after autocalibration)				
Offset Error (±)	max. 0.1 % typ. 0.03 % (after autocalibration)				
Offset Drift (±)	max. (0.0100 % + 0.1 mV) per °C, typ. (0.0050 % + 0.03 mV) per °C (will be compensated by autocalibration)				
Input Noise: @ max. Sample Rate @ 5 MHz Sample Rate @ 1 MHz Sample Rate @ 100 kHz Sample Rate @ 10 kHz Sample Rate	 < 0.080 mVrms < 0.060 mVrms < 0.030 mVrms < 0.020 mVrms < 0.010 mVrms	 < 0.080 mVrms < 0.060 mVrms < 0.030 mVrms < 0.020 mVrms < 0.010 mVrms	 < 0.060 mVrms < 0.060 mVrms < 0.030 mVrms < 0.020 mVrms < 0.010 mVrms	 < 0.060 mVrms - < 0.030 mVrms < 0.020 mVrms < 0.010 mVrms	*2
Signal to Noise Ratio SNR: @ max. Sample Rate @ 10 MHz Sample Rate @ 5 MHz Sample Rate @ 1 MHz Sample Rate @ 100 kHz Sample Rate @ 10 kHz Sample Rate	 67 dB 70 dB 72 dB 79 dB 84 dB 90 dB	 70 dB 70 dB 72 dB 79 dB 84 dB 90 dB	 72dB - 72 dB 79 dB 84 dB 90 dB	 72 dB - - 79 dB 84 dB 90 dB	*3 *4
Channel Isolation (Crosstalk) @ 10 kHz Ranges < 1V	> 80 dB > 60 dB				
Special : Autocalibration	Auto adjustment of gain and offset in all measurement ranges. (Initiated by software)				
Trigger					
Number of Trigger Channels	4 or 8, coupled to analog inputs, pos./neg.Edge, with or without hysteresis, Window IN, Window OUT				
Advanced Trigger (Option)	On all analog inputs: Slew Rate, Pulse Width, Pulse Pause or Period (too short or too long = Missing Event), State (above / below), AND link, Product (trigger signal is calculated from 2 channels)				
External Trigger input	1 per System (TTL), pos. or neg. Edge				
Trigger Delay	-100 % (Pretrigger) to +200 % (Posttrigger) in 1 % steps				
Miscellaneous					
Digital Inputs (Marker)	8 rsp. 16 (2 per analog channel) (TTL) Optocoupler Connection Box (5 to 48 V) as additional option				
Ext. Control Inputs (TTL))	Trigger, Arm/Disarm, Ext. Sampling (fmax = ¼ of the max sample rate), external command to start recording				
Status Outputs (TTL)	Trigger Output, Armed (=True during recording)				
ICP® Sensor Supply (Option)	4mA Integrated Current Power for piezo sensors				

*1) At 16 bit modules. the resolution will be reduced to 14 bits at sample rates over 1/4 of the max.

*1) At 16 bit modules, the resolution will be reduced to 14 bits at sample rates over 1/4 of the max. sample rate.

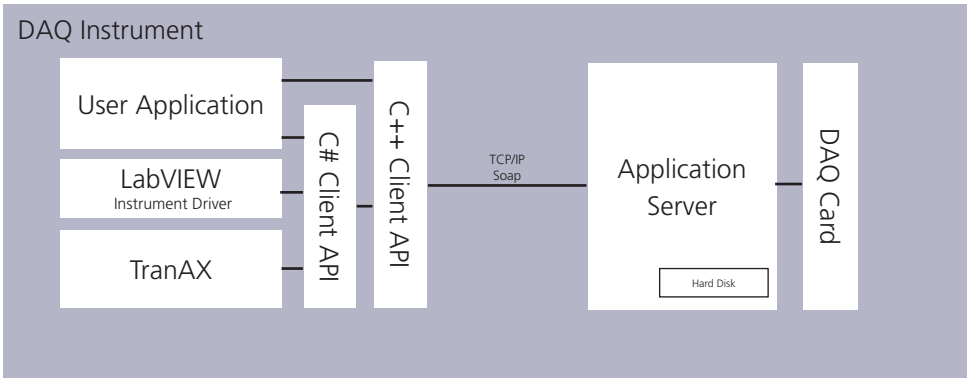
*2) The input noise depends on the sample rate.

*3) At 14 bit modules the SNR will be reduced by 2 dB

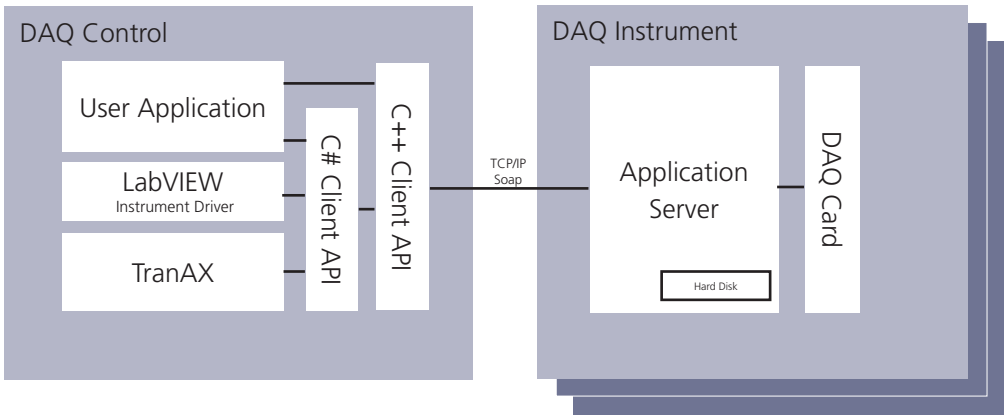
*4) At 8-channel modules the SNR will be reduced by 3 dB

Software API

All DAQ cards as also the TraNET devices are based on the same Server-Client Software architecture. Any client application can access the data acquisition device over an IP address either locally or over a network. This way distributed measurement set-ups can be easily built-up.
The lowest level accessible from a user application is a C++ interface. This interface handles all network communication between the Application and the Application Server.



Control/DAQ Software runs on machine where the DAQ cards are installed

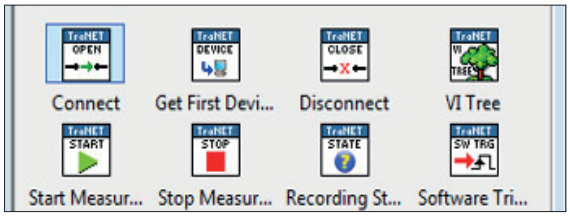


Control/DAQ Software runs on a different machine and controls multiple DAQ instruments.

C# Applications can access a high level API for easy software integration. Several application can access the same device on the same time and get updated about any status change of the device automatically.

Elsys provides a LabVIEW instrument driver which is fully compliant with the NI driver design guidelines.

The application server encapsulates all necessary task for controlling the different measurement modes described above, including data streaming to the hard drive. Therefor no challenging programming is needed for streaming application as this is already integrated into the Server software.



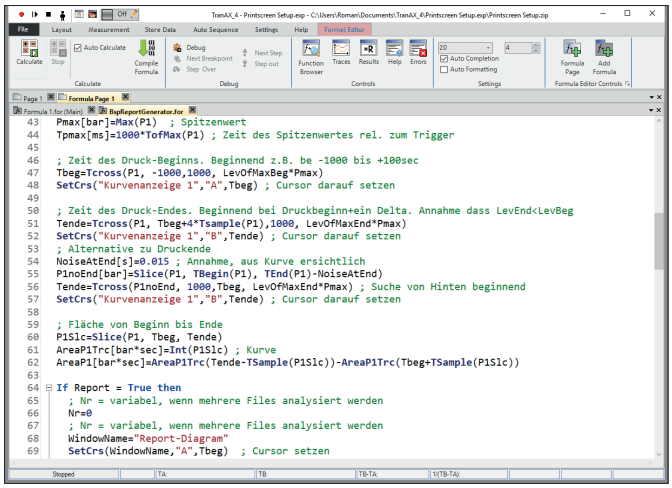
Software

TranAX 4

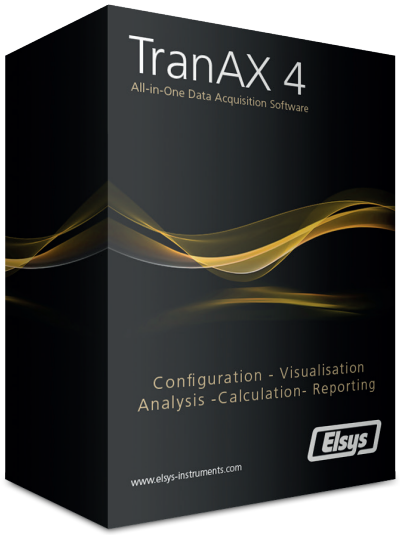
TranAX 4 is the universal data acquisition software from Elsys designed for TPCX/TPCE/TPCE-I data acquisition cards and the turnkey TraNET data acquisition instruments.

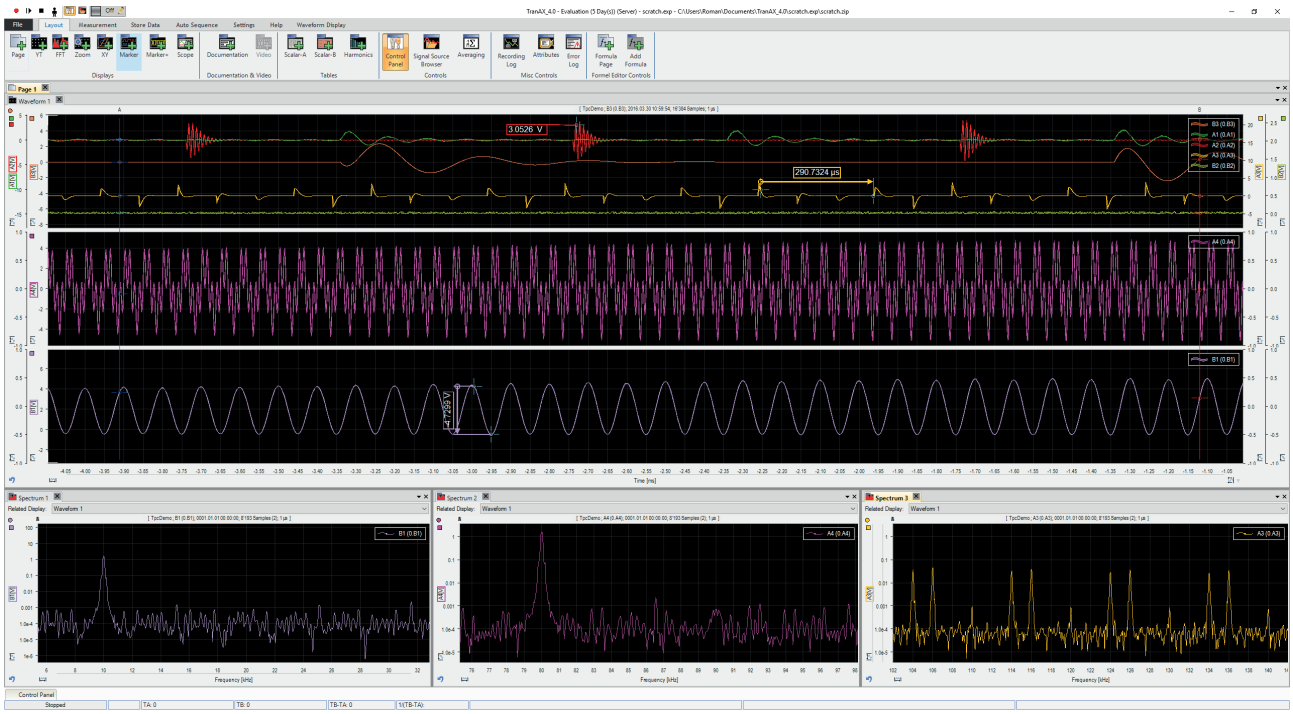
Key Features:

- Configures quick and easy many analog input channels, no programming required
- Data visualization in Multi-Waveform displays
- Several cursor for easy data readout and reporting
- X-Y data display
- FFT Analysis width different scaling and windows function
- Measurement data - video synchronization
- More than 40 scalar functions to measure any significant waveform parameter on time or FFT curves
- Powerful formula editor for more than 60 mathematics functions, syntax highlighting, for-loops, array calculations, string manipulations, etc.
- Curve fitting (Polynomial regression)
- Autosequence-macro's for easy to set up, fast automated measurements
- English and German version



```
Pmax[bar]=Max(P1)  ; Spitzenwert
Tpmax[ms]=1000*TofMax(P1) ; Zeit des Spitzenwertes rel. zum Trigger

; Zeit des Druck-Beginns. Beginnend z.B. be -1000 bis +100sec
Tbeg=Tcross(P1, -1000,1000, LevOfMaxBeg*Pmax)
SetCrs("Kurvenanzeige 1","A",Tbeg) ; Cursor darauf setzen

; Zeit des Druck-Endes. Beginnend bei Druckbeginn+ein Delta. Annahme dass LevEnd<LevBeg
Tende=Tcross(P1, Tbeg+4*Tsample(P1),1000, LevOfMaxEnd*Pmax)
SetCrs("Kurvenanzeige 1","B",Tende) ; Cursor darauf setzen
; Alternative zu Druckende
NoiseAtEnd[s]=0.015 ; Annahme, aus Kurve ersichtlich
P1noEnd[bar]=Slice(P1, TBegin(P1), TEnd(P1)-NoiseAtEnd)
Tende=Tcross(P1noEnd, 1000,Tbeg, LevOfMaxEnd*Pmax) ; Suche von Hinten beginnend
SetCrs("Kurvenanzeige 1","B",Tende) ; Cursor darauf setzen

; Fläche von Beginn bis Ende
P1Slc=Slice(P1, Tbeg, Tende)
AreaP1Trc[bar*sec]=Int(P1Slc) ; Kurve
AreaP1[bar*sec]=AreaP1Trc(Tende-TSample(P1Slc))-AreaP1Trc(Tbeg+TSample(P1Slc))

If Report = True then
  ; Nr = variabel, wenn mehrere Files analysiert werden
  Nr=0
  ; Nr = variabel, wenn mehrere Files analysiert werden
  WindowName="Report-Diagram"
  SetCrs(WindowName,"A",Tbeg)  ; Cursor setzen
```





Elsys AG

Elsys AG
Mellingerstrasse 12
CH-5443 Niederrohrdorf
Switzerland

Phone: +41 56 496 01 55
Email: info@elsys.ch
www.elsys-instruments.com

NeoMore
5 rue de la Plaine
78860 St Nom-la-Bretèche
Tel. +33 1 30 64 15 81
sales@neomore.com
www.neomore.com
www.moreneo.com