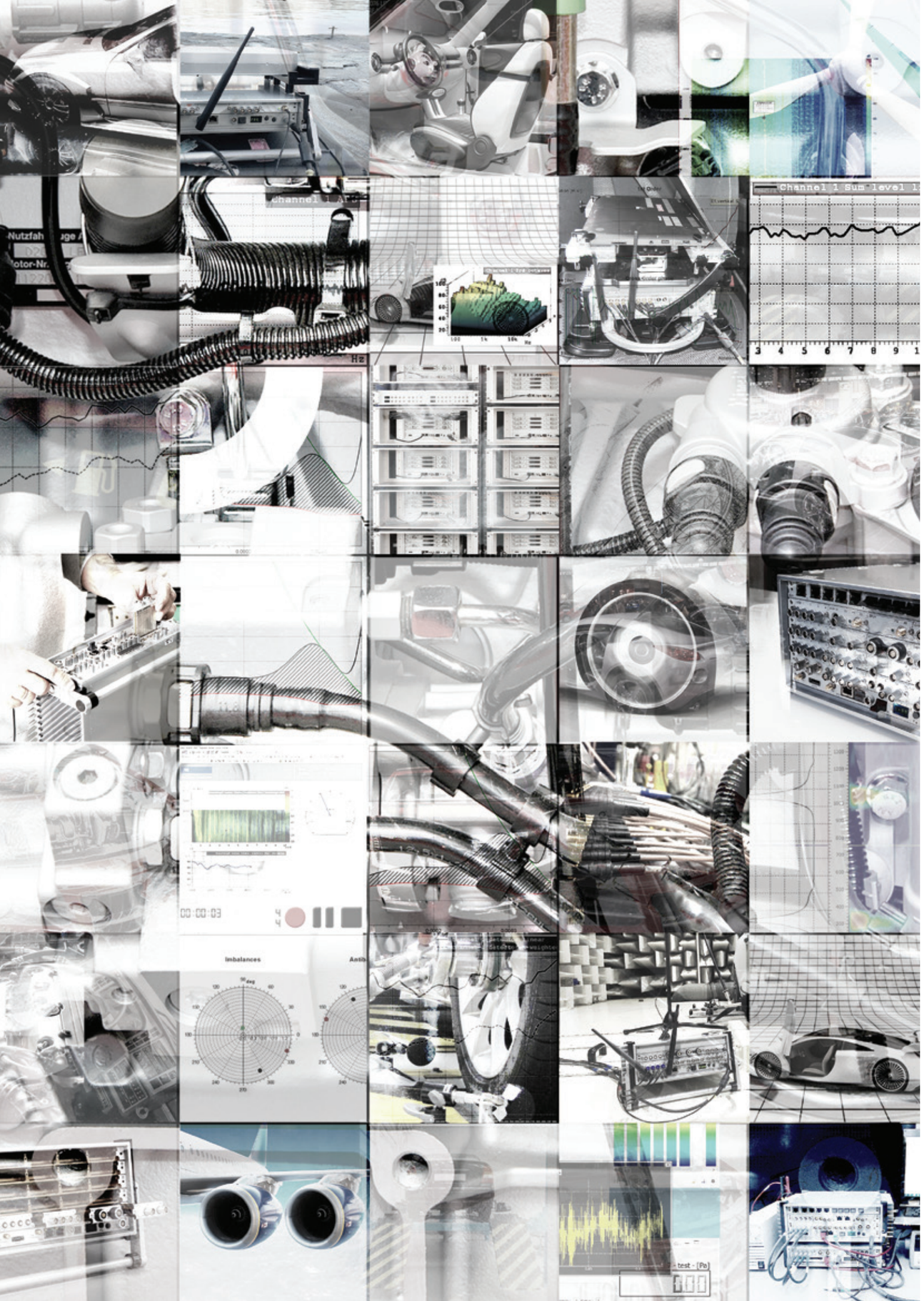
MÜLLER-BBM
VibroAkustik Systeme

PAK

Acquire Dynamic Signals

The PAK MKII is a compact, highly integrated system for the measurement and output of precise analog and digital signals. Both standard and complex multi-channel tasks are addressed by the same modular platform which can be freely configured as small troubleshooting solutions or large, distributed systems.

PAK MKII



AUTOMOTIVE

AEROSPACE AND AVIATION

CONSTRUCTION MACHINERY

CONSUMER GOODS

DEFENSE

MARITIME

MINING

PRECISE PRODUCTION EQUIPMENT

RAIL

TURBINE ENGINEERING

WIND ENERGY

AND MORE

Single Structured

SOLUTION

data recording, troubleshooting, mobile applications,

distributed systems, high-channel density applications, testbench applications

Tightly Integrated

SYSTEM

ACQUIRE

- Systems start at 2 channels and scale up to 1000+ channels
- Measures analog parameters such as:
  - Voltage
  - Acceleration
  - Vibration
  - Pulse-period
  - Sound
  - Strain
  - Force
  - Pressure
  - Displacement
  - Temperature
- Outputs analog voltage
- Interfaces with
  - GPS
  - IRIG
  - CAN
  - FlexRay™
  - EtherCAT®
- Accommodates all of the above in any combination, in any Mainframe
- 204.8 kSa/s with 24-bit resolution (up to 1 MSa/s for high speed analog input)
- High dynamic range with optimized low noise performance and distortion
- Rugged, conduction cooled and compact with an extremely high channel density
- Local storage on an internal Solid-State Disk (SSD)
- Gigabit Ethernet on all Controllers
- Optional integrated WLAN (IEEE 802.11n) for faster data transfer and robust connection
- Synchronizes multiple distributed Mainframes via PTP, SyncLink, GPS or IRIG
- Able to operate as a standalone unit
- Readily expandable

MONITOR. TRIGGER. RECORD.

PAK family software solutions capture and store dynamic data using PAK live software embedded on the PAK MKII. This intelligent operation allows the PAK MKII to run as a standalone unit as well as communicate with smart devices. Users are able to control and interact with the measurement running on the PAK MKII using a smart device or PC. In this way, users are able to check the test status of signal overloads and sensor connections on-site.

The data recorded is extremely secure and of the highest quality. Data can either be stored on an integrated SSD or streamed live over Ethernet to a storage solution. The data is stored in the open ASAM ODS NVH ATF/XML format.

MANAGE

A reliable and accessible data portal is available for storing, browsing, filtering and viewing ASAM ODS compatible data. As time domain data is stored, it is possible to access the acquired data for online analysis or for post-processing.

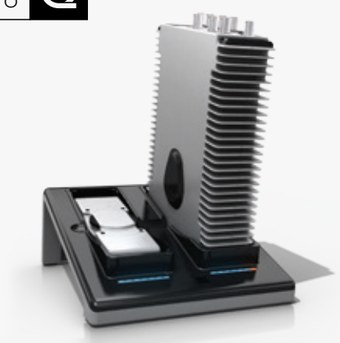
ANALYZE

PAK MKII hardware is tightly integrated with any PAK software component to form a formidable hardware/software partnership. The resulting system environment combines highly modular, multi-channel data acquisition hardware with high performance analysis and graphical processing for various applications. Integrated data management is also available.

PAK software components include:

- High-performance real-time analysis with different data types and multiple sampling groups in parallel
- A wide range of applications addressing standard measurements, signatures and highly specialized applications
- Easy workflows from setup to measurement
- Storage of raw time domain data as well as analyzed data
- Close monitoring of test candidate behavior while post-processing results quickly
- Native support of ASAM ODS NVH ATF/XML as well as standard data formats for importing and exporting measurement data e.g. Universal, SDF
- To be used in both mobile and laboratory environments, in quality control or when troubleshooting

MEET THE MICRO Q

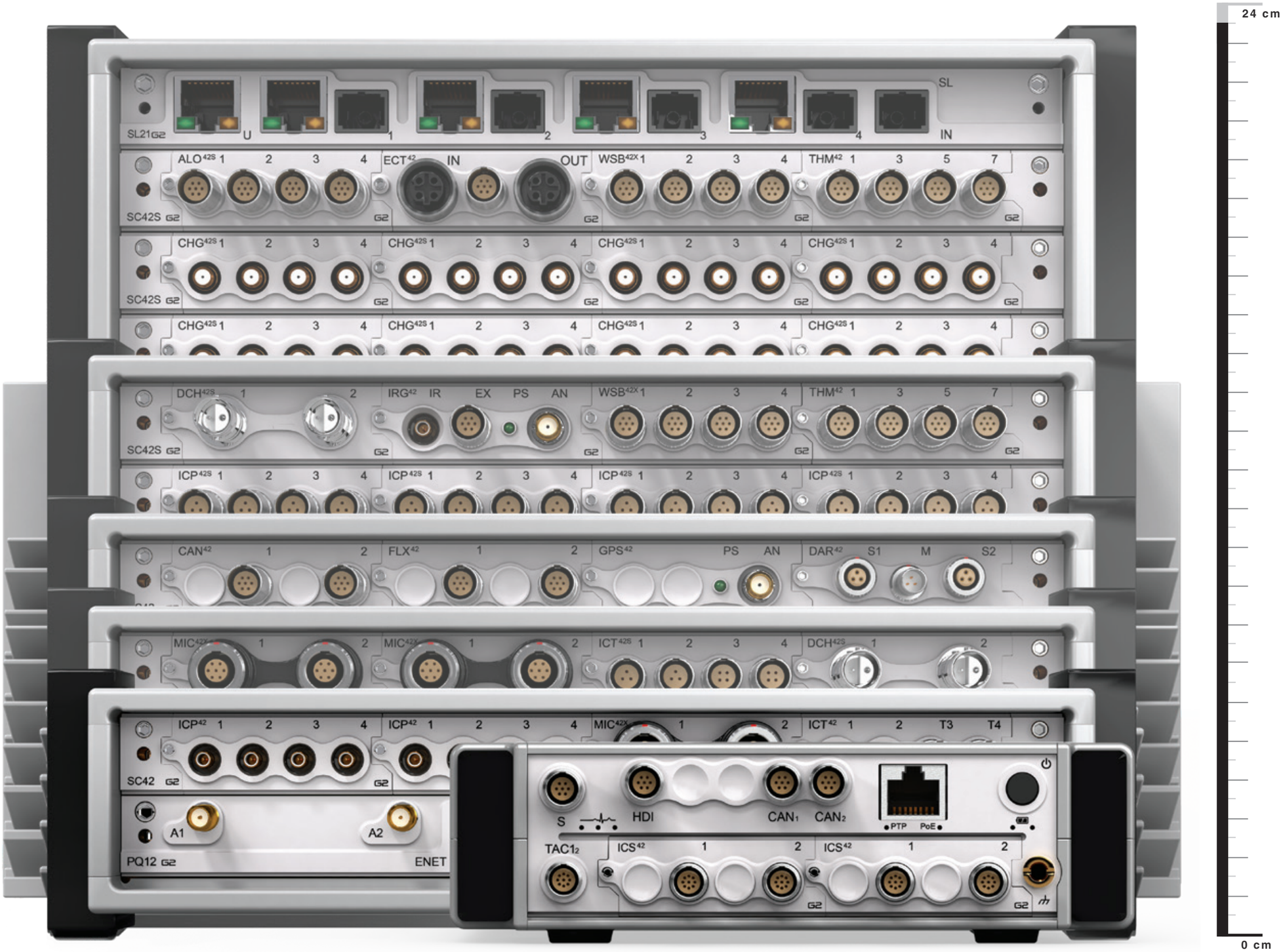


Designed for convenient recording, troubleshooting and laboratory quality portable measurements, this hand held 2-18 channel system impresses users with its simple approach and robust handling.

The MICROQ's features include high quality signal conditioning channels, modular capability to adapt to any measurement scenario, a strong power management concept for all day operation, as well as the freedom to move and store data securely with built-in WLAN, GPS and a 128 GB SSD card.

Truly unlimited, the MICROQ can be an out-of-the-box solution or synchronize with multiple MICROQs over PTP to create larger measurement landscapes.

ALL PAK MKII MAINFRAMES ARE RUGGED, LIGHTWEIGHT AND PORTABLE. THROUGH THEIR COMPACT FORM FACTOR, CHANNEL FOOTPRINT AND DENSITY IS OPTIMIZED.



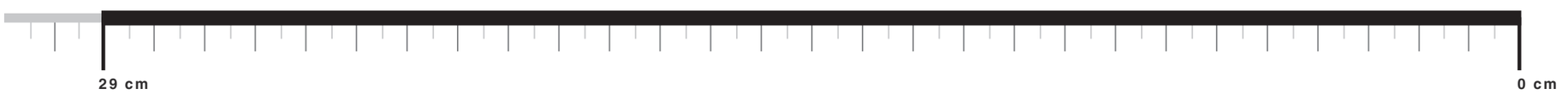
This image shows MICRO**Q**, 2-, 3-, 4-, 6- and 10-slot Mainframes placed behind one another in real size.

PAK MKII

MICRO Q

REAL SIZE

Scale 1:1



Measurement and Monitoring of

SIGNALS

Modules to accommodate every signal type

By having access to all required parameters in one system, a high level of phase accuracy is achieved as analog and digital signals are sampled at exactly the same time. A wide range of Signal Conditioning Modules exists to:

- Measure parameters such as voltage, vibration, acceleration, pulse-period, sound, strain, force, pressure, displacement and temperature
- Output analog voltages
- Interface with GPS, IRIG, CAN, FlexRay™ and EtherCAT®

Signal integrity built upon strong infrastructure

Highly accurate signal conditioning combined with high speed data handling is paramount to any frontend. The PAK MKII accomplishes this through advanced signal conditioning supported by powerful digital circuitry and data handling capabilities. This enables the PAK MKII to achieve high-speed data acquisition with the highest analog and digital signal quality, translating into a high dynamic range with low noise performance and distortion.

Apart from regularly scheduled calibration, all input Modules are automatically calibrated upon start-up or upon request.

TAILOR YOUR SYSTEM ACCORDING TO YOUR SPECIFIC TESTING DEMANDS

MATCH YOUR

SENSOR

to our range of signal conditioning amplifiers

REAL SIZE

Scale 1:1

CHOOSE FROM OUR BROAD RANGE OF 22 MODULES

Each Module is optimized for a specific task while some combine different functions in one Module. Modules are continuously under development to accommodate new features and the latest technologies.

PARAMETER	NO. OF CHANNELS	MAXIMUM DATA RATE	RESOLUTION	MODULE
ICP® based microphones, accelerometers, load cells and pressure sensors	2	102.4 kSa/s	24-bit	ICT42 G2 [2]
	4	102.4 kSa/s	24-bit	ICP42 G2
	6	102.4 kSa/s	24-bit	ICS42 G2; CHS42X G2
	2	204.8 kSa/s	24-bit	ICT42S G2 [2]; MIC42X G2
	4	204.8 kSa/s	24-bit	ICP42S G2; WSB42X G2
	16	204.8 kSa/s	24-bit	ICM42S [4]
±10 V voltage input	8	6.4 kSa/s	24-bit	THM42 G2
	2	102.4 kSa/s	24-bit	ICT42 G2 [2]
	4	102.4 kSa/s	24-bit	ICP42 G2; WSB42 G2
	6	102.4 kSa/s	24-bit	ICS42 G2; CHS42X G2
	2	204.8 kSa/s	24-bit	ICT42S G2 [2]; MIC42X G2
	4	204.8 kSa/s	24-bit	ICP42S G2; WSB42X G2
	16	204.8 kSa/s	24-bit	ICM42S [4]
	2	1 MSa/s [5]	24-bit	ALI42 G2; ALI42B G2
±60 V voltage input	2	204.8 kSa/s	24-bit	ICT42S G2 [2]
	4	204.8 kSa/s	24-bit	ICP42S G2
Tacho pulse input with 204.8 kSa/s Scope Mode	2	up to 700 kPulse/s [3]	20 ns	ICT42 G2 [1]
Tacho pulse input with 4.9 MSa/s Scope Mode	2	up to 1 MPulse/s [3]	14 ns	ICT42S G2 [1]
200 V or non-polarized microphones	2	204.8 kSa/s	24-bit	MIC42X G2
Piezoelectric based accelerometers, load cells, etc. (Single-Ended)	4	204.8 kSa/s	24-bit	CHG42S G2
	6	102.4 kSa/s	24-bit	CHS42X G2
Piezoelectric based accelerometers, load cells, etc. (Differential)	2	204.8 kSa/s	24-bit	DCH42S G2
Strain gauges, load cells, pressure sensors, strain based accelerometers, inductive displacement (LVDT) and rope displacement sensors	4	102.4 kSa/s	24-bit	WSB42 G2
	4	204.8 kSa/s	24-bit	WSB42X G2
	2	1 MSa/s [5]	24-bit	ALI42 G2
Current-excited strain gauges including dynamic strain	4	204.8 kSa/s	24-bit	WSB42X G2
E, J, K, T and U thermocouples as well as Pt100 sensors	8	6.4 kSa/s	24-bit	THM42 G2
±10 V voltage output with status handshake	4	204.8 kSa/s	24-bit	ALO42S G2
Monitoring output capability	16	Analog	NA	ICM42S [4]
Internal GPS	1	10 Hz	NA	GPS42S G2
IRIG-A / IRIG-B	1	Standard specific	NA	IRG42 G2
CAN	1 network	8 Mbit/s	NA	CAN42S G2
CAN	2 networks	2 Mbit/s (simultaneous)	NA	CAN42S G2
FlexRay™	1 pair	10 Mbit/s	NA	FLX42 G2
EtherCAT®	NA	Application specific	NA	ECT42 G2
Digital audio receiver	2 stereo	96 kFrames/s	24-bit	DAR42 G2

Note 1: Also has two ICP®/Analog input channels
Note 2: Also has 2 tacho pulse input channels
Note 3: Pulse rate for sum of both channels
Note 4: Compound-Module
Note 5: 409.6 kSa/s for 2 channels and 1 MSa/s for 1 channel
NA: Not Applicable

THE PAK MKII'S STABILITY AND INHERENT LONGEVITY ENCOURAGES USERS TO GROW THEIR SYSTEMS ACCORDING TO THEIR REQUIREMENTS IN MEASUREMENT DEMANDS AND TECHNOLOGY.

DESIGN

Proven to withstand fluctuations in technology

With a heritage dating back to 1989, the PAK MKII has maintained the same solid foundation since its inception. Today our single structured platform remains unchanged with only continuous improvements and expansions made to incorporate on-going pathbreaking technologies. Standards incorporated into the PAK MKII like VMEbus, PCIe, WLAN and Ethernet, are not only powerful and versatile but most importantly, stable and sustainable. This is mainly due to these standards' common use in aerospace, defense as well as professional instrumentation and control systems.

The PAK MKII makes use of a professional real time operating system, namely Windriver's VxWorks®, on all its System Controllers. This ensures fast, logical and safe decisions when operating as a standalone unit.

Robust mechanics

Machined from aluminum, the PAK MKII is designed to withstand shock and vibration while operating in environmental temperatures from -20 °C up to +55 °C depending on system configuration. All Mainframes are internally conduction cooled ensuring that no dusty air circulates within the Mainframe. Some Mainframes never require fan cooling while others contain fans which only operate under high temperatures. In all cases fans can be switched off during sensitive acoustic measurements. The period for which the fans can remain switched off depends on the system configuration and environmental conditions. The fan of an MF06 Mainframe (if fully populated with 80 ICP® channels), can remain off for up to 2 hours when operating at 22 °C.

All signal conditioning Modules are encased in aluminum providing good thermal management and protection. All sensor, power and communication cables are plugged into the front panel of the Mainframe for ease of use. An optional battery is housed in the rear of the Mainframe.

Modular configuration

All Modules are designed to be readily interchangeable. This enables each measurement test to be perfectly configured. Many users own more Modules than can fit into their Mainframes so that the perfect combination for every test is always achieved. To reduce power consumption, Modules which are not required for a particular test can be switched off.

Expandable in part

Additional Modules can simply be added to provide more channels in a particular system, or to support a new sensor. In this way, users benefit from consistent improvements like finer performance balances, higher dynamic ranges, higher sampling rates, improved analog quality as well as lower noise and distortion. Some users start with a larger Mainframe than what is initially required and close off the empty Module slots with blank front panels. These blank front panels are then easily replaced with new Modules as the need arises. Partial upgrades are usually possible. This allows users to upgrade existing configurations. As our standards-based concept is extremely sustainable, components from different generations can often coexist in the same Mainframe. Users are able to take advantage of this concept by refreshing their system on a regular basis for different or more advanced measurement tasks.

EMPOWER

LATEST TECHNOLOGY, MORE CHANNELS

Multifaceted mobility

Due to the PAK MKII's compact form factor and extremely high channel density, larger Mainframes are often used for mobile applications. In other applications some users may prefer a smaller Mainframe or a number of smaller synchronized Mainframes for the same task.

Meets the demands of multi-channel high-speed measurements

For higher channel counts or distributed measurement positions, an unlimited number of synchronized Mainframes can operate together as a single Mainframe. Users consequently benefit from shorter signal cables, reduced cable noise and reduced cabling faults as each Mainframe can be positioned exactly where it needs to be, close to the measurement position or test candidate.

Able to operate as a standalone unit

Standalone mode is an optional feature that allows the PAK MKII to operate independently. When acquiring data as a standalone system, an Android™ or iOS™ mobile device can be used to setup, control and monitor measurements on the PAK MKII through PAK capture suite over WLAN. The interfacing device can connect or disconnect without affecting the measurement.

Writes data to local storage for enhanced security

Local Storage allows the PAK MKII user to store measurement data on an internal Solid-State Disk (SSD). Data can be retrieved and analyzed independently at a later stage. Local storage has two distinctive purposes - the first is so that the PAK MKII can operate as a standalone unit and the second is to provide a local copy of critical data should problems occur with the external Ethernet link.

WHY SYNCHRONIZE?

INCREASE CHANNEL COUNT

SHORTEN SIGNAL CABLES

By placing Mainframes alongside the test candidate, the acquisition system can be positioned as close as possible to the sensor. This reduces cable lengths between sensor and input Module.

OPTIMIZE MEASUREMENT INFRASTRUCTURE

Multiple systems can be used separately in smaller applications but can also work together for larger tests.

REACH REMOTELY PLACED SENSORS

AVOID DATA BOTTLENECKS

STANDALONE UNIT WITH SMART DEVICES

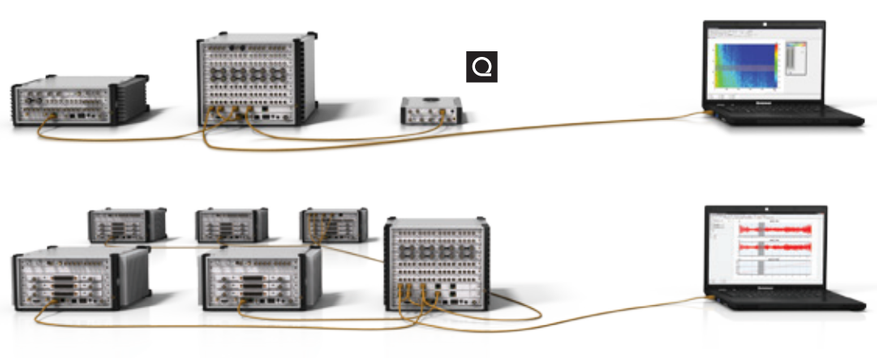
This is an example of an entry level configuration using only one 2-slot Mainframe. The same could apply to any Mainframe. The PAK MKII connects to the smart device over WLAN. An internal SSD is necessary for WLAN configuration.

STANDARD ETHERNET CONNECTION

Here the connection to the notebook is through Gigabit Ethernet.

PTP SYNCHRONIZATION

Precision Time Protocol (PTP) is an IEEE 1588-2008 standard with high precision, accuracy and robustness using Ethernet as the communications medium.

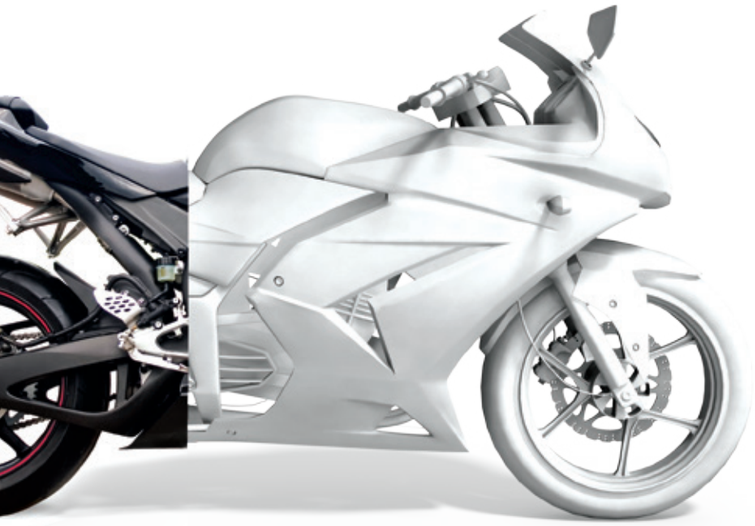


GPS AND IRIG SYNCHRONIZATION

By adding a GPS42S G2 or IRG42 G2 Module to each Mainframe, timing and position data is provided. This option allows any number of Mainframes to conveniently form a larger system through GPS or IRIG synchronization. Users may choose to connect their Mainframes over WLAN or Ethernet to a workstation.

IN ACTION

SMALL PORTABLE MEASUREMENTS



When getting ready for your measurement involves stuffing your system into an overhead compartment or strapping it to a motorcycle tank, being compact is always appreciated.

Being away from your home base also means you want to be sure to collect all the data you think you need, plus enough extra data to prevent a repeated trip. In these types of situations it is always helpful to be able to collect the data of interest and all the possible supporting data.

This often means a combination of analog data, such as acceleration and sound, along with digital data from the CAN bus that brings in all the embedded data of the system.

This fuller picture often enables the source of unwanted behaviors to be traced and resolved versus only having the symptomatic data without an explanation.

For this holistic picture to come together, the digital and analog data need to be synchronized not only channel to channel but potentially between multiple systems as well.

Hardware to Consider

The MICRO**Q** is the perfect fit, with its compact form factor and built-in channels. Securely control your MICRO**Q** with your tablet, iPad or smart phone, while enjoying laboratory quality measurements.

- MICRO**Q** – battery powered, built-in GPS, tachometer, and CAN FD
- ICS42 – 6 ICP® / Voltage inputs tri-axial connector

LARGER PORTABLE MEASUREMENTS

In the product development timeline there never seems to be an allowance for instrumentation. If you barely have time to do it once you certainly don't have time to do it again. With priceless prototype vehicles in heavy demand, every department is pressured to optimize or reduce their testing hours.

One potential option for increasing efficiency is to work on instrumentation and testing in parallel. Consider a test plan that includes both mobile and dynamometer measurements. Our intelligent systems allow this through a combination of smart device interfaces and synchronization.

Using only an app with a tablet, iPad or smart phone, it is possible for mobile and fixed systems to be installed and verified independent of any external software. The test sequence can start with mobile measurements and once completed, the mobile and fixed systems can be combined in the dynamometer chamber via the fiberoptic SyncLink cable.

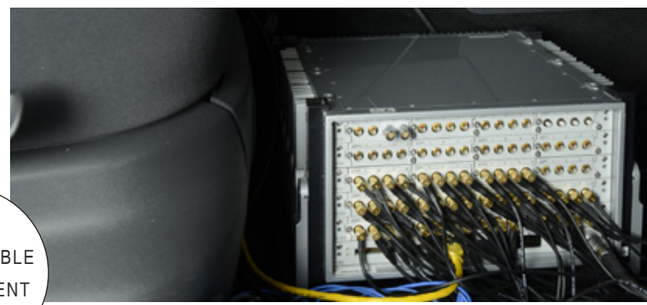
An example of this type of testing is Operational Transfer Path Analysis coupled with simulated Pass-by. By combining the highly instrumented vehicle with the microphone arrays in the chamber, it is possible to do contribution analysis to identify noise sources and energy paths that result in either excessive exterior noise or unwanted interior noise artifacts.

Hardware to Consider

Choose the PAK MKII for up to 192 channels, unrivalled signal conditioning quality, simplified cabling, and high precision synchronization.

- PAK MKII 10 - 192 channels of ICP® / Charge and SyncLink high precision synchronization
- ICS42 – 6 ICP® / Voltage inputs tri-axial connector
- SNAV – Inertial aided GPS for precision maneuver documentation
- PAK MKII Wrangler – cabling solution and laptop carrier

CLEVER CABLE MANAGEMENT



LABORATORY APPLICATIONS

In large scale testing laboratories, several unique considerations can include long cable runs, a heterogeneous environment and a combination of challenging factors such as high channel counts, high data rates, and the inability to retest.

When safety or environmental considerations prevent the placement of data acquisition equipment close to the test article and its sensors, consideration must be given to the effects of long leads on the signal.

Our hardware offers features such as variable ICP® current and constant current strain modes. The multiple synchronization methods we offer, i.e. SyncLink, PTP, IRIG and GPS, allow us to work seamlessly with other systems such as low speed pressure and temperature systems.

In critical testing environments, such as preflight checks where tests cannot be repeated, our features such as data redundancy and large channel configurations allow for one-shot testing with confidence.

Hardware to Consider

Channel counts are limited only by your measurement requirements. Choose as many PAK MKIIs as you need and synchronize them in our large RackMounts with simplified, no-nonsense cabling.

- ICM42S – ICP® with multipin connector, variable ICP® current, and buffered output
- WSB42X – strain with constant voltage and constant current
- IRG42S – combination IRIG and GPS for synchronization
- PQ30 – PTP capable controller with local SSD storage and 1 GB Ethernet

DISTRIBUTED SYSTEMS

When faced with testing scenarios which involve either relative motion between components of interest or large physical dimensions, distributed measurement systems offer a way to accomplish the measurement task.

In these situations, a cluster of small battery powered systems synchronized over GPS can offer the most efficient solution.

The example of a wind turbine demonstrates both testing scenarios. Combining strain measurements on the turbine blades with stresses in the gearbox calls for relative motion testing, whereas testing the noise generated by the turbine will require measuring large areas.

GPS synchronization, Wi-Fi communication, and intelligent, independent operation are all necessary for efficient measurement of standards like the IEC61400-Part 11 concerning generated noise.

Hardware to Consider

The MICROQ's compact form factor, built-in channels, capacity for extra measurement channels and ability to synchronize via PTP or GPS makes it the ideal solution for distributed measurements.

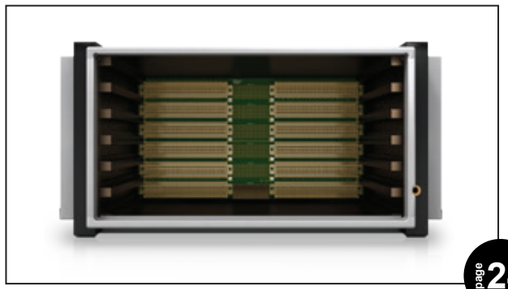
- MICROQ – battery powered, built-in GPS and Wi-Fi
- WSB42X – strain with constant voltage and constant current
- ICS42 – 6 ICP® / Voltage inputs tri-axial connector
- THM42 – 8 temperature / voltage / current inputs

MODULAR

SYSTEM GROWS ACCORDING TO YOUR NEEDS

CONFIGURE YOUR SYSTEM

MAINFRAMES



page 24

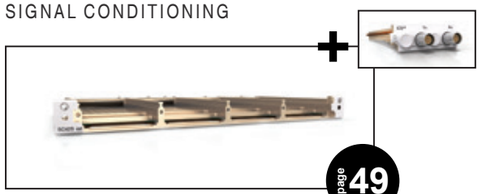
+

COMBINED SYSTEM CONTROLLER,
POWER SUPPLY AND
SYNCHRONIZATION ENGINE

page 28

+

SIGNAL CONDITIONING

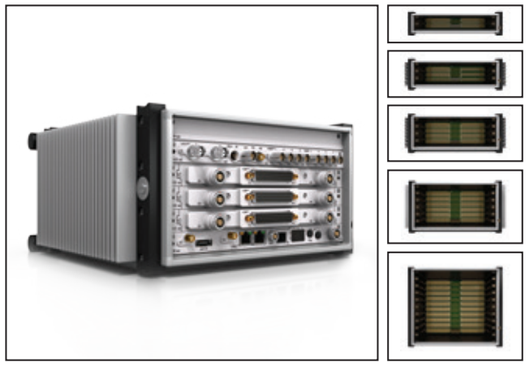


page 49

+

ACCESSORIES

page 50



MAINFRAMES

5 Mainframes are available to accommodate the number of boards and Modules required to configure a suitable system. Any number of slots can be left open for planned later expansion. An optional battery is housed at the rear.

page 24

COMBINED SYSTEM CONTROLLER AND POWER SUPPLY BOARDS

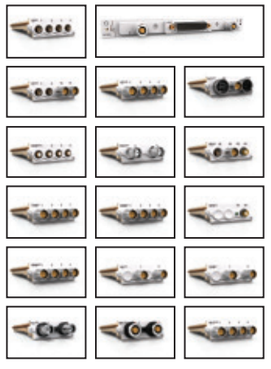
The VMEbus, with the IEEE 1588-2008 standard for synchronization, was chosen to be the core of the PAK MKII concept as any modular concept should be powerful and versatile, as well as stable and sustainable.

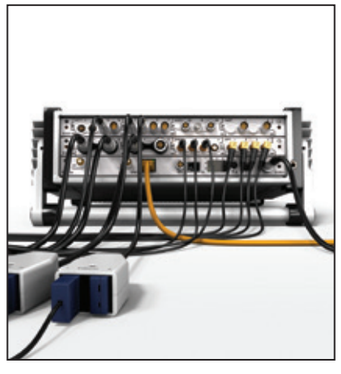
page 32

MODULES

To address nearly all sensor types and dynamic parameters, a more compact tier of modularity is required for signal conditioning amplifiers. A Sub-VMEbus concept was therefore devised where 4 Modules fit onto a single Signal Conditioning VMEbus board which provides the mechanical and electronic infrastructure for these Modules. There are currently 22 Modules to choose from in order to match a user's sensors.

page 36





ACCESSORIES

Accessories are used to personalize a system. For example, SubModules could be required to provide a special interface to an individual sensor, such as when both a Pt100 temperature sensor and K-type thermocouple are plugged into the same Module. Here a SubModule is used to satisfy each specific signal and connector need. Other accessories include Rack Mounts and SeatFrames.

page 50

HOUSING SIGNALS

5 MAINFRAMES - ALL FOR BOTH MOBILE AND LABORATORY

The PAK MKII Mainframe series consists of a 2-, 3-, 4-, 6- and 10-slot VMEbus based Mainframe. Their mechanical design has been optimized for thermal performance together with resistance to shock and vibration while retaining its compact form factor. A convenient carrying handle is provided on all Mainframes (except the 10-slot) for enhanced portability. This can be removed if required.

The external surfaces of the smaller 2- and 3-slot Mainframes are cooled through natural convection alone. The 4- and 6-slot Mainframes are cooled through a combination of natural and forced convection while the 10-slot Mainframe's external surfaces are cooled by forced convection only. The fan speed is controlled by software to maintain a suitable running temperature. For noise sensitive measurements the fan can be switched off. During this time the Mainframe acts as a large thermal mass.

All Mainframes have been designed for both mobile and laboratory applications. Battery backup is provided using a battery housed in the rear of the Mainframe which allows operation without an external power supply.

MAINFRAMES

The tables below show a few important parameters to consider when selecting your Mainframe.

Operating ambient temperatures range from -20 °C to 55 °C. A convenient carrying handle is provided on all Mainframes (except the 10-slot) for enhanced portability. This can be removed if required.

MF04

MF04: 4-slot Mainframe

24-72 channels

Number of VMEbus slots:	4	Power Supply and System Controller:	Any
Maximum number of channels (if 6 ch/Module):	72	Number of slots for SC42 boards:	3
Fan:	Yes	Cooling of external surfaces:	Natural/Forced Convection
Dimensions (W H D):	307 x 109 x 287 mm	Cooling of internal surfaces:	Conduction
Mass, fully populated with battery:	9.9 kg	Mass, fully populated without battery:	9.1 kg
Volume:	9.6 L	Battery capacity:	40 Wh

MF02

MF02: 2-slot Mainframe

12-24 channels

Number of VMEbus slots:	2	Power Supply and System Controller:	Any
Maximum number of channels (if 6 ch/Module):	24	Number of slots for SC42 boards:	1
Fan:	None	Cooling of external surfaces:	Natural Convection
Dimensions (W H D):	291 x 68 x 267 mm	Cooling of internal surfaces:	Conduction
Mass, fully populated with battery:	5.1 kg	Mass, fully populated without battery:	4.8 kg
Volume:	5.3 L	Battery capacity:	20 Wh

MF03

MF03: 3-slot Mainframe

12-48 channels

Number of VMEbus slots:	3	Power Supply and System Controller:	Any
Maximum number of channels (if 6 ch/Module):	48	Number of slots for SC42 boards:	2
Fan:	None	Cooling of external surfaces:	Natural Convection
Dimensions (W H D):	307 x 88 x 267 mm	Cooling of internal surfaces:	Conduction
Mass, fully populated with battery:	7.1 kg	Mass, fully populated without battery:	6.3 kg
Volume:	7.2 L	Battery capacity:	40 Wh

All Mainframe masses have been calculated fully populated with ICS42 G2 Modules as well as WLAN and SSD

MF06

MF06: 6-slot Mainframe

48-120 channels

Number of VMEbus slots:	6	Power Supply and System Controller:	Any
Maximum number of channels (if 6 ch/Module):	120	Number of slots for SC42 boards:	5
Fan:	Yes	Cooling of external surfaces:	Natural/Forced Convection
Dimensions (W H D):	307 x 151 x 287 mm	Cooling of internal surfaces:	Conduction
Mass, fully populated with battery:	15.2 kg	Mass, fully populated without battery:	12.6 kg
Volume:	13.3 L	Battery capacity:	72 Wh

MF10

MF10: 10-slot Mainframe

72-192 channels

Number of VMEbus slots:	10	Power Supply and System Controller:	PQ20 G2 PTP PQ30 G2 PTP
Maximum number of channels (if 6 ch/Module):	192*	Number of slots for SC42 boards:	8*
Fan:	Yes	Cooling of external surfaces:	Forced Convection
Dimensions (W H D):	291 x 231 x 333 mm	Cooling of internal surfaces:	Conduction
Mass, fully populated with battery:	22.7 kg	Mass, fully populated without battery:	20.2 kg
Volume:	22.3 L	Battery capacity:	72 Wh

*Could be higher depending on Module configuration, power supply voltage, Module sampling rate and environmental temperature

MICRO Q

So much more than simply another small Data Acquisition System.

2-18 channels

Record hundreds of hours of data on a 128 GB SSD		Encrypted Wi-Fi network for communication with smart devices	
Ethernet: 1000BASE-T Power: 9-30 VDC input		Precision Time Protocol (PTP IEEE 1588-2008)	
Fan:	None	Cooling of external surfaces:	Natural Convection
Dimensions (W H D):	172 x 251 x 53 mm (6.77 x 9.88 x 2")	Cooling of internal surfaces:	Conduction
Mass with battery:	2.25 kg (4.96 lbs)	Mass without battery:	1.85 kg (4.08 lbs)
Maximum Volume:	2.2 L	Battery capacity:	40 Wh each

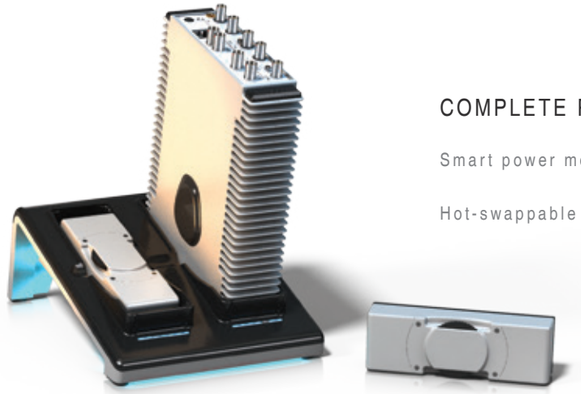
CUT THE CORD

Freedom to move, with built-in SSD, Wi-Fi, GPS and External MICRO**Q** Batteries

COMPLETE POWER MANAGEMENT CONCEPT

Smart power modes optimize power usage to extend operation time

Hot-swappable External Batteries



STRONG DATA MANAGEMENT

Accessible open data formats

Record hundreds of hours of data safely on the built-in 128 GB SSD

Cloud capable

EASY INTERACTION

Intuitive app for setup and control

LASTING VALUE

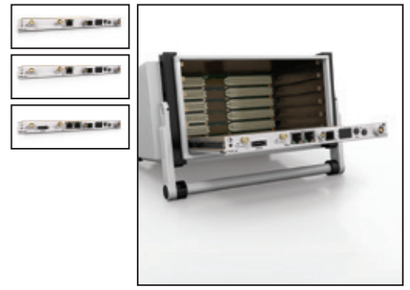
Laboratory quality portable measurements, with the freedom to grow your measurement landscape by synchronizing with other larger systems or adding Signal Conditioning Modules to measure new parameters

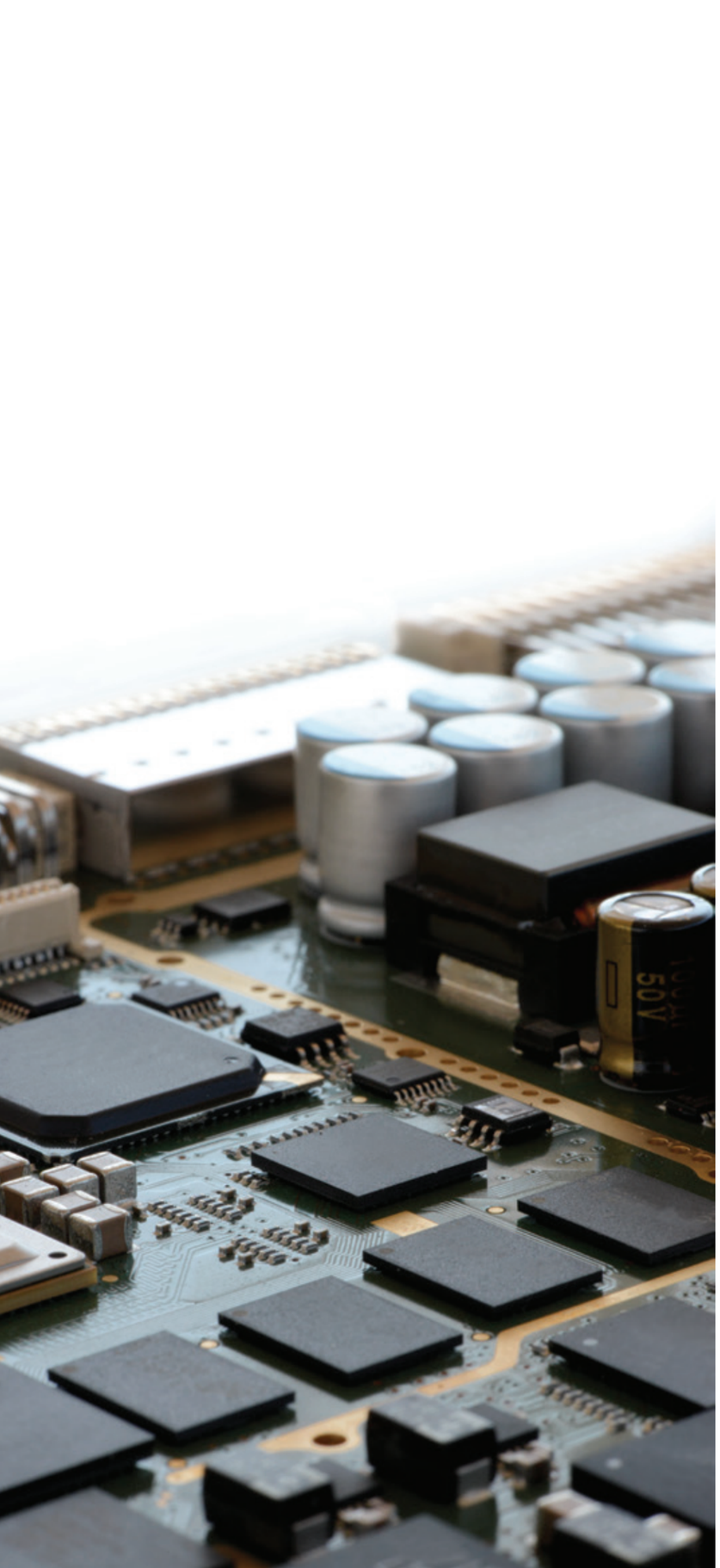
FREEDOM OF CHOICE

Choose from a variety of Signal Conditioning Modules to be ready for any measurement scenario

COMBINED SYSTEM CONTROLLER

AND POWER SUPPLY BOARDS





PROCESSING SIGNALS

Stable Core

All VMEbus boards are inserted into a Mainframe which provides a stable infrastructure to house VMEbus boards.

Combined System Controller and Power Supply boards

This board is a dual function board which combines a VMEbus System Controller with a Power Supply for all other boards in its Mainframe. The choice of combined Power Supply and VMEbus System Controller depends solely on its data processing ability and the size of its power supply. Combining the Power Supply and Controller on a single VMEbus board enhances the modularity of the whole system as the power supply can be readily maintained and upgraded.

These boards also provide an easy and accurate way to synchronize multiple Mainframes by using Precision Time Protocol (PTP) IEEE 1588-2008 through the Ethernet interface.

Blank VMEbus board

This board is used to close off an empty slot when configuring systems with future expansion in mind. The blank VMEbus board is then either replaced by a Signal Conditioning Engine and Infrastructure board or a Synchronization Engine.

PQ12

PQ12 G2: VMEbus System Controller and Power Supply

The PQ12 G2 PTP is a dual function board combining a VMEbus System Controller, Master, Arbiter and Interrupt Handler with VMEbus Power Supply. It can be used in an MF02, MF03, MF04 and MF06 Mainframe. Options include WLAN IEEE 802.11n for communication to external devices (including smart devices) as well as an internal Solid-State Disk (SSD) for local storage.

PQ12 G2 PTP features:

- Combined VMEbus System Controller Master, Arbiter and Interrupt Handler
- Supports 2eVME standard
- Gigabit Ethernet
- SyncLink input for synchronization in a Cluster or SuperCluster
- Precision Time Protocol (PTP) IEEE 1588-2008 synchronization through Ethernet port
- Multipurpose Serial-Timing-Power (STP) port for a MiniTerminal, synchronization to timing sources as well as providing 5 and 12 V to external devices
- VMEbus Power Supply
- 10-30 VDC input from external power source
- Uninterrupted Power Supply (UPS) between external power and internal battery
- Input power protection circuitry with over-voltage and under-voltage lockout
- Fast battery charger for internal battery
- Comprehensive monitoring of internal power supply circuits
- Power on/off function via front panel or MiniTerminal
- Automatic power up capability
- Web server providing information and control functions

PQ12 G2 PTP options:

- Optional WLAN IEEE 802.11b, g and n
- Optional internal 128 GB Solid State Disk (SSD) for local data storage

Where used:

- In slot 1 of MF02, MF03, MF04 or MF06
- Can be used with up to 5 Signal Conditioning boards
- Supports a maximum channel count of 120*

Performance:

- Maximum throughput of 10 MB/s over Gigabit Ethernet when streaming data over LAN
- 800 MHz PowerPC processor with 512 Mbyte DDR2 memory

* depending on Module configuration and sampling rate

PQ20

PQ20 G2: VMEbus System Controller and Power Supply

The PQ20 G2 PTP is a dual function board combining a VMEbus System Controller, Master, Arbiter and Interrupt Handler with VMEbus Power Supply for use in all Mainframes. It is particularly suited for small and medium sized Mainframes when higher data rates or larger, additional processor capability are required. Options include WLAN IEEE 802.11n for communication to external devices (including smart devices) as well as an internal Solid-State Disk (SSD) for local storage.

PQ20 G2 PTP features:

- Combined VMEbus System Controller Master, Arbiter and Interrupt Handler
- Supports 2eVME standard
- Gigabit Ethernet
- SyncLink input for synchronization in a Cluster or SuperCluster
- Precision Time Protocol (PTP) IEEE 1588-2008 synchronization through Ethernet port
- Multipurpose Serial-Timing-Power (STP) port for a MiniTerminal, synchronization to external devices as well as providing 5 and 12 V to external devices
- VMEbus Power Supply
- 10-30 VDC input from external power source
- Uninterrupted Power Supply (UPS) between external power and internal battery
- Input power protection circuitry with over-voltage and under-voltage lockout
- Fast battery charger for internal battery
- Comprehensive monitoring of internal power supply circuits
- Power on/off function via front panel or MiniTerminal
- Automatic power up capability
- Web server providing information and control functions

PQ20 G2 PTP options:

- Optional WLAN IEEE 802.11b, g and n
- Optional internal 128 GB Solid State Disk (SSD) for local data storage

Where used:

- In slot 1 of all Mainframes
- Can be used with up to 8 Signal Conditioning boards
- Supports a maximum channel count of 192*

Performance:

- Maximum throughput of 20 MB/s when streaming data over LAN
- 1.0 GHz PowerPC processor with 512 Mbyte DDR2 memory

* depending on Module configuration and sampling rate

PQ30

PQ30 G2: VMEbus System Controller and Power Supply

G2

The PQ30 G2 PTP is the top of the line Combined System Controller and Power Supply board, clearly benchmarking high end controller performance. As a powerful dual function board combining a VMEbus System Controller, Master, Arbiter and Interrupt Handler with VMEbus Power Supply, the PQ30 G2 PTP can be used in all Mainframes. It is particularly suited to Mainframes when higher data rates or larger additional processor capability are required. Options include WLAN IEEE 802.11n for communication to external devices (including smart devices) as well as an internal Solid-State Disk (SSD) for local storage.

PQ30 G2 PTP features:

- Combined VMEbus System Controller Master, Arbiter and Interrupt Handler
- Supports 2eVME standard
- Gigabit Ethernet
- Advanced computational ability
- SyncLink input for synchronization in a Cluster or SuperCluster
- Precision Time Protocol (PTP) IEEE 1588-2008 synchronization through Ethernet port
- Multipurpose Serial-Timing-Power (STP) port for a MiniTerminal, synchronization to external devices as well as providing 5 and 12 V to external devices
- VMEbus Power Supply
- 10-30 VDC input from external power source
- Uninterrupted Power Supply (UPS) between external power and internal battery
- Input power protection circuitry with over-voltage and under-voltage lockout
- Fast battery charger for internal battery
- Comprehensive monitoring of internal power supply circuits
- Power on/off function via front panel or MiniTerminal
- Automatic power up capability
- Web server providing information and control functions

PQ30 G2 PTP options:

- Optional WLAN IEEE 802.11b, g and n
- Optional internal 256 GB Solid State Disk (SSD) for local data storage and external eSATA port (with power) for use with an external SATA hard drive

Where used:

- In slot 1 of all Mainframes
- Can be used with up to 9* Signal Conditioning boards
- Supports a maximum channel count of 192*

Performance:

- Maximum throughput of 45 MB/s when streaming data over LAN
- 1.3 GHz PowerPC processor with 1 Gbyte DDR2 memory
- Second 1000 BASE-T for peripherals or independent second Network

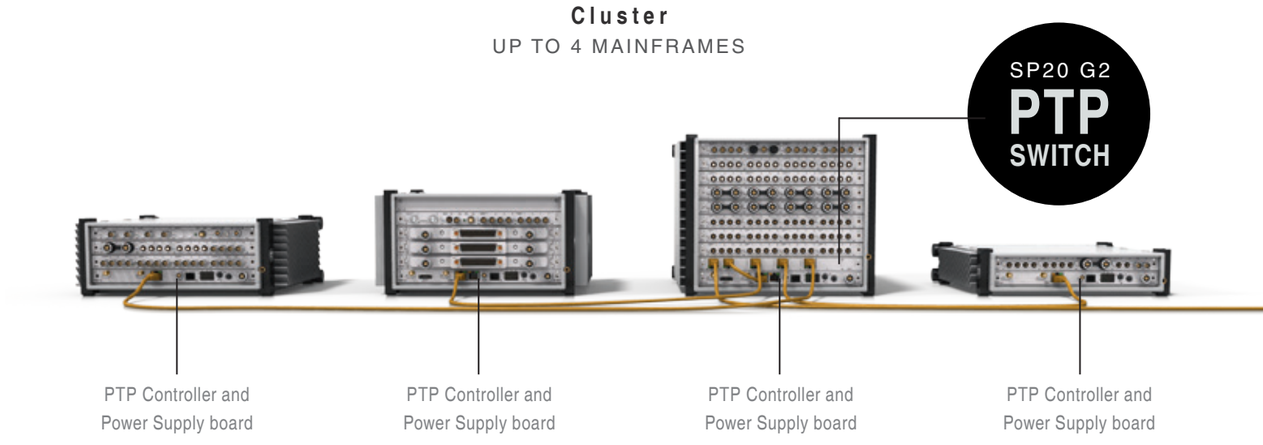
* depending on Module configuration, voltage of supplied power, Module sampling rate and environmental temperature

PTP SYNCHRONIZATION

PTP Synchronization according to the IEEE 1588-2008 standard enables easy expansion across multiple systems. All Mainframes are connected to the same network with Ethernet as the communication medium. This concept achieves clock frequency and phase synchronization between multiple Mainframes with only a single cable.

THE COMBINATION OF THE SP20 G2 INTERNAL PTP SWITCH FOR UP TO 4 PAK MKIIs AND PTP ENABLED COMBINED SYSTEM CONTROLLER AND POWER SUPPLY BOARDS, COMPLETES THE PTP CLUSTER.

Cluster HUNDREDS OF CHANNELS



PTP

Synchronization PTP: Internal PTP Switch

Precision Time Protocol (PTP) IEEE 1588-2008

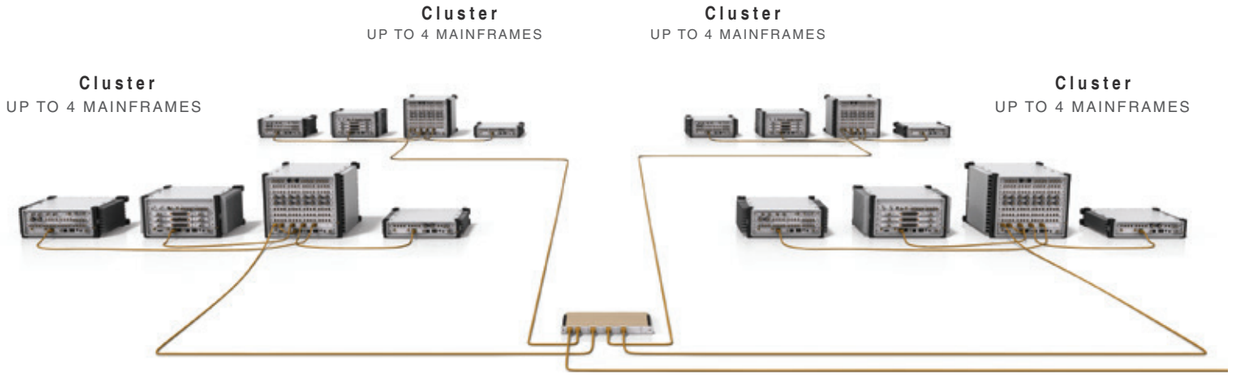
Synchronization SyncLink: **SYNCLINK**

SuperCluster THOUSANDS OF CHANNELS

SIMPLIFIED

SETUP AND CABLING

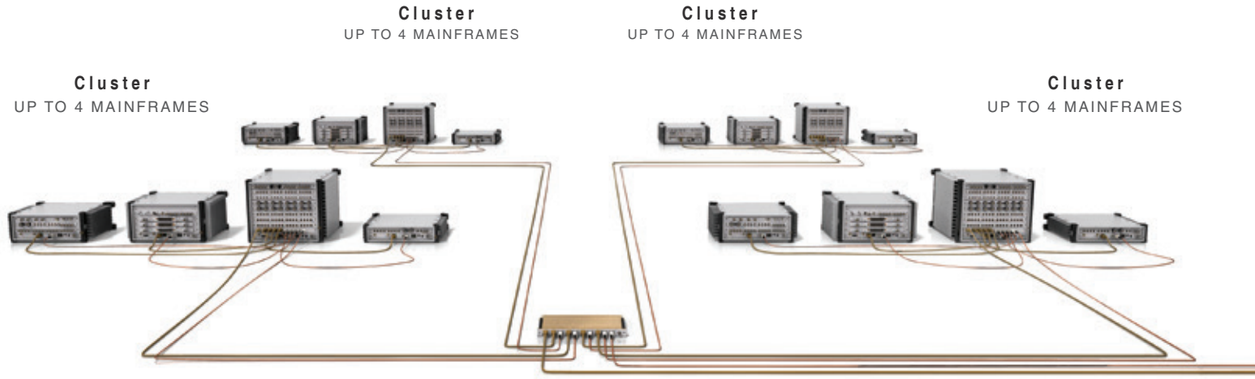
SUPPORTED BY PTP COMBINED SYSTEM CONTROLLER AND POWER SUPPLY BOARDS.



SuperCluster

LIMITLESS MAINFRAMES

SuperCluster THOUSANDS OF CHANNELS



SuperCluster

LIMITLESS MAINFRAMES

PTP Clusters

The Internal PTP Switch (SP20 G2) together with PTP enabled Combined System Controller and Power Supply boards (PQxx G2 PTP) synchronize PAK MKII systems over PTP IEEE 1588-2008. The SP20 G2 forms a Cluster (up to 4 PAK MKIIs) and an unlimited number of Clusters form a SuperCluster. There is no limit to synchronizing additional Mainframes as long as the appropriate number of SP20 G2 and PQxx G2 PTP are added. This modern approach is suited to all applications in mobile or rack mounted configurations due to its incredibly simplified cabling. Another advantage of the IEEE 1588-2008 standard is the ability to synchronize PAK MKII systems or Clusters with other PTP masters or grandmasters. External PTP slaves can also be synchronized to the PAK MKII systems or PTP Clusters.

SP20

SP20 G2: Internal PTP Switch for up to 4 PAK MKIIs

G2

SP20 G2 features:

- 5 x 1 Gb/s PTP aware Ethernet ports synchronizing a Cluster of PAK MKII frontends
- One cable for network communication and synchronization
- Relative time accuracy <30 ns can be achieved depending on system configurations and Ethernet traffic load

Where used:

- Provides a synchronized clock between multiple PAK MKIIs over IEEE 1588-2008 PTP standard

SyncLink Clusters

SyncLink synchronizes up to 4 PAK MKII systems together to form a Cluster and up to 4 Clusters to form a SuperCluster and so on. There is no limit to synchronizing additional Mainframes as long as the appropriate SL21 G2 Synchronization engines are added. This solution is especially suited to rack mounted systems.

SL21

SL21 G2: Synchronization engine for creating SyncLink Clusters

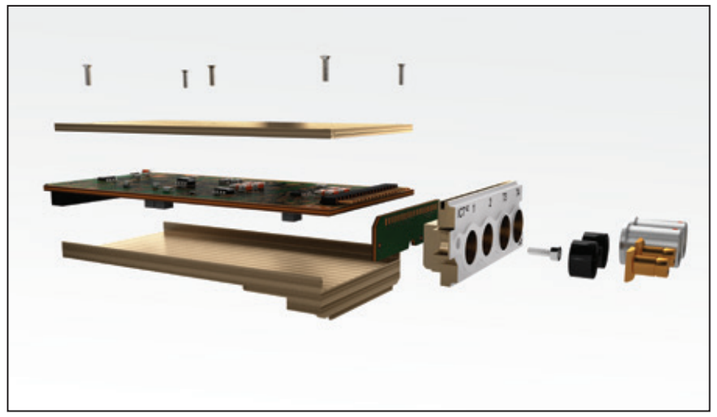
G2

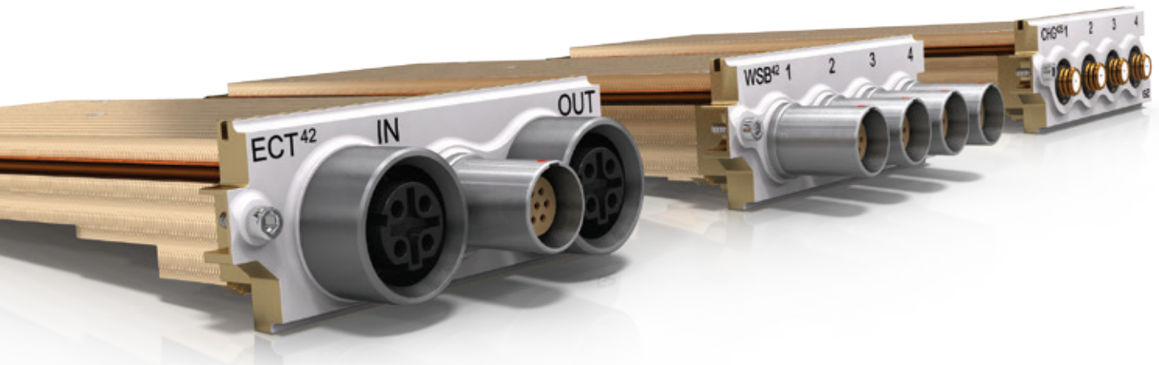
SL21 G2 features:

- Combined Gigabit Ethernet switch and SyncLink hub
- 5 port Gigabit Ethernet switch for data communication
- 5 port SyncLink hub for synchronization clock distribution

Where used:

- Provides a synchronized clock between multiple PAK MKIIs
- Provides Gigabit Ethernet to multiple PAK MKIIs





ACQUIRING SIGNALS

Modules for every signal type

Whereas the VMEbus Signal Conditioning Engine provides the common infrastructure for 4 Module slots, the individual Modules provide the unique signal conditioning detail. This concept results in an effective and upgradeable solution, especially for those users who configure and reconfigure their measurement systems differently for specific tests. Modules are packaged in a robust aluminum casing so as to optimize size and thermal performance, as well as to provide electronic protection. All Modules include the following features:

- 50 V galvanic isolation from one Module to another
- Automatic internal calibration capability
- All settings are software configurable
- Very high channel density
- Excellent signal to noise performance
- Excellent spurious free-dynamic range, total harmonic distortion and crosstalk
- Finely tuned for the best performance at the lowest possible power
- Protection to accommodate both transient and continuous over-voltages
- Strong Electromagnetic Interference (EMI) screening for lower noise floor
- Firmware protection from excessive external EMI events
- Low power consumption

RPM sensor | rotational speed and rotation angle | fast tacho | angle transducer | incremental encoder | RPM from CAN | airborne sound | ICP® microphone | 200 Volt polarized microphone | head phone | analog artificial head | digital artificial head | conducted sound | piezoelectric accelerometer | ICP® accelerometer | strain gauge | laser vibrometer | high speed voltage input | electrical energy management | digital inputs: digital audio | CAN | GPS for time and position | IRIG for time | FlexRay™ | EtherCAT® | control outputs, e.g. function generator: white noise, ramp, fade, chirp, sine, square, triangular | playback from file | temperatures: E, J, K, T, U thermocouple | Pt100 sensor | load cell pressure transducer | displacement | rope transducer | inductive transducer (LVDT) | stress and fatigue | force transducer | differential accelerometer, and more

ICP42

ICP42 G2: 4 Channel ICP® and Voltage Input Amplifier

G2

The ICP42 G2 Module can be used with ICP® based accelerometers, force and pressure sensors, as well as to measure analog voltages. All 4 channels operate independently of each other, each with their own setting of mode, gain and coupling.

Where used:

- With any ICP® based sensor commonly used to measure vibration, acceleration, force or pressure
- With any voltage source up to ±10 V in voltage input mode

ICP42 G2 features:

- 4 channels
- 2 input modes of operation:
  - ICP® mode with 4 mA constant current at ±12 V or 24 V excitation
  - Voltage input mode with AC or DC coupling
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1)
- 24-bit resolution, 102.4 kSa/s sampling rate per channel, 49 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ±(10 V, 1 V and 100 mV) input ranges
- There are 3 distinctive input mode options for both ICP® and voltage input modes:
  - Differential or Balanced Float (ICP® mode provides ±12 V excitation)
  - Single-Ended or Unbalanced Float (ICP® mode provides 24 V excitation)
  - Single-Ended or Unbalanced Ground (ICP® mode provides 24 V excitation)
- Short and open circuit cable monitoring
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- 2 MΩ differential and 1 MΩ single-ended input resistance
- SMB connectors

ICP42S

ICP42S G2: Advanced 4 Channel ICP® and Voltage Input Amplifier

G2

The ICP42S G2 Module can be used with ICP® based accelerometers, force and pressure sensors, as well as to measure analog voltages. All 4 channels operate independently of each other, each with their own setting of mode, gain and coupling. The ICP42S G2 furthers the ICP42 G2 by sharing many of the same features and advancing others.

Where used:

- With any ICP® based sensor commonly used to measure vibration, acceleration, force or pressure
- With any voltage source up to ±60 V in voltage input mode

ICP42S G2 features:

- 4 channels
- 2 input modes of operation:
  - ICP® mode with 4 mA, 8 mA or 12 mA constant current at ±12 V or 24 V excitation
  - Voltage input mode with AC or DC coupling
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1)
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 100 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ±(60 V, 10 V, 1 V and 100 mV) input ranges
- There are 3 distinctive input mode options for both ICP® and voltage input modes:
  - Differential or Balanced Float (ICP® mode provides ±12 V excitation)
  - Single-Ended or Unbalanced Float (ICP® mode provides 24 V excitation)
  - Single-Ended or Unbalanced Ground (ICP® mode provides 24 V excitation)
- Short and open circuit cable monitoring
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- 2 MΩ differential and 1 MΩ single-ended input resistance
- Lemo 3-way EHG.0B connectors

ICS42

ICS42 G2: 6 Channel ICP® and Voltage Input Amplifier

G2

The ICS42 G2 Module can be used with ICP® based accelerometers, force and pressure sensors, as well as to measure analog voltages. All 6 channels can operate independently of each other, each with their own setting of mode, gain and coupling.

Where used:

- With any ICP® based sensor commonly used to measure vibration, acceleration, force or pressure
- With any voltage source up to ±10 V in voltage input mode

ICS42 G2 features:

- 6 channels
- 2 input modes of operation:
  - ICP® mode with 4 mA constant current at ±12 V or 24 V excitation
  - Voltage input mode with AC or DC coupling
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1)
- 24-bit resolution, 102.4 kSa/s sampling rate per channel, 49 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ±(10 V, 1 V and 100 mV) input ranges
- Highly configurable to accommodate single ended and triaxial sensors
- Supports a number of known industry triaxial cables
- Short and open circuit cable monitoring
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- 2 MΩ differential and 1 MΩ single-ended input resistance
- Lemo 9-way EHG.0B connectors

Related SubModules

These SubModules are provided if a sensor to input cable available on the market is not suitable for the application.

TBNC10

The Tri-BNC (TBNC) SubModule is used to split signals from a 9-way or 7-way Lemo connector into 3 BNC connectors.

TSMB10

The Tri-SMB (TSMB) SubModule is used to split signals from a 9-way Lemo connector into 3 SMB connectors.

CHS42X

CHS42X G2: 6 Channel Charge or ICP® and Voltage Input Amplifier

G2

The CHS42X G2 Module has 6 independent charge input channels as well as 6 ICP® and voltage input channels. It can be used with Quartz or Piezoelectric Ceramic sensors, ICP® based accelerometers, force and pressure sensors, as well as to measure analog voltages. The setting of mode, gain and coupling is available on all channels. Various grounding options allow for low noise measurements regardless of external grounding constraints.

Where used:

- With any piezoelectric (charge) sensors when improved signal performance such as low noise and low distortion is required or where high temperature or nuclear radiation prevents the use of other sensors
- All ICS42 G2 use cases

CHS42X G2 features: ICP® channels

- See ICS42 G2 for more details regarding the 6 ICP® and voltage input mode channels

CHS42X G2 features: Charge channels

- 6 channels
- Charge input mode with sensitivity range settings
- 24-bit resolution, 102.4 kSa/s sampling rate per channel, 49 kHz bandwidth
- ±(10 V, 1 V and 100 mV) input ranges
- 3 Sensitivity settings of 1 mV/pC, 0.1 mV/pC and 0.01 mV/pC for charge inputs
- Maximum charge input of ±1 000 000 pC
- Low discharge time constant provides a 0.016 Hz high pass frequency (-3 dB) for all charge input sensitivities
- The cable shield can be connected or disconnected from the Module ground
- Highly configurable to accommodate single ended and triaxial sensors
- Supports a number of known industry triaxial cables using SubModules
- Pre-and post-filter overflow monitoring
- Selectable low and high pass digital filters
- Lemo 7-way EHG.0B connectors

TMDT10

The Tri-Microdot (TMDT) SubModule is used to split signals from a 7-way Lemo connector to 3 Microdot connectors.

ICM42S

ICM42S: Advanced 16 Channel ICP® and Voltage Input Amplifier with 16 Monitoring Output Channels

Four high speed ICP® based Modules are integrated with an SC42S Signal Conditioning board to provide a single Compound-Module, the ICM42S. This provides 16 ICP® or voltage input mode channels as well as 16 monitoring output channels.

Where used:

- With any ICP® based sensor commonly used to measure acceleration, force or pressure
- With any voltage source up to ±10 V in voltage input mode
- When the conditioned input signal needs to be provided to external equipment

ICM42S features:

- 16 channels
- 2 input modes of operation:
  - ICP® mode with 8 mA constant current at ±13 V excitation
  - Voltage input mode with AC or DC coupling
- 16 monitoring output channels of conditioned signal inputs
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1)
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 100 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ±(10 V, 1 V and 100 mV) input ranges
- There are 3 distinctive input mode options:
  - Differential or Balanced Float (ICP® mode provides ±13 V excitation) for both ICP® and voltage input modes
  - Single-Ended or Unbalanced Float for voltage input mode
  - Single-Ended or Unbalanced Ground for voltage input mode
- Short and open circuit cable monitoring
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- 2 MΩ differential and 1 MΩ single-ended input resistance
- Input channels use a DB50 for 16 input channels
- Monitoring channels use 2 Lemo 16-way EGG.0B connectors

Additional compound Module features:

- Includes SC42S Signal Conditioning Board

Related SubModules

BBOX10

The BBOX10 is a 48 channel Buffer Box, accepting an input signal from three ICM42S boards and providing five independent outputs of the input signal. One output is routed to the front patch panel for easy access and monitoring while the other four outputs are routed to 37-way D-sub connectors at the back of the BBOX10. The BBOX10 includes a self-test feature that tests and verifies if all input and output channels are functional. When used in non ICM42S applications, inputs can be differential or single ended signals.

ICPM10 and ICPM10S

The ICPM10 provides a DB50 connector for each set of 4 ICP42 G2 or 4 ICP42S G2 Modules. As a compound SubModule, it takes the form of a breakout box which can be secured on the top of any Mainframe. A 16 or 32 channel option is available.

ALSO AVAILABLE AS ICM42S (OPTIONAL):

- ICP® mode with 4 mA constant current at ±12 V excitation
- Monitoring channels use 4 Lemo 7-way EHG.1B connectors

ICT42

ICT42 G2: 2 Channel ICP® and Voltage Input Amplifier with 2 Channel Tacho Input Amplifier

G2

The ICT42 G2 Module is a hybrid Module which combines 2 channels from the ICP42 G2 Module with 2 tacho input channels. The tacho channels provide tacho period measurements with a 20 ns resolution, sampled where the signal intersects its trigger level settings. Triggering of tacho signals can be set for rising or falling edges with adjustable hysteresis while additionally providing AC coupling for sensors with varying DC voltage offsets. A 204.8 kSa/s scope mode is provided to view the tacho signals in order to assist with the definition of trigger levels.

Where used:

- When measuring the pulse rate and time between pulses such as rpm and crank angle
- With any ICP® based sensor commonly used to measure vibration, acceleration, force or pressure
- With any voltage source up to ±10 V in voltage input mode

ICT42 G2 features: ICP® channels

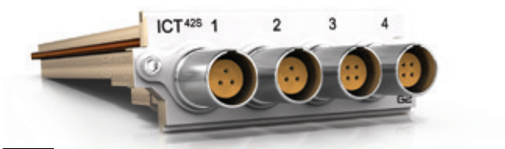
- See ICP42 G2 for more details regarding the 2 ICP® or voltage input mode channels

ICT42 G2 features: Tacho channels

- 2 tacho channels
- Tacho input can be DC/AC coupled
- 20 ns tacho resolution
- 700 kPulse/s rate for the sum of the 2 tacho channels
- 16-bit tacho trigger level adjustment
- ±(60 V, 30 V, 12 V and 2 V) input ranges
- 2 MHz analog bandwidth for all input ranges
- Adjustable trigger level hysteresis (Schmitt trigger implementation)
- Triggering on the n'th edge
- Tacho trigger level self-calibration
- Scope mode for each tacho channel, sampled at 204.8 kSa/s
- ±12 V or 12 V voltage excitation output to tacho sensor
- Lemo 4-way EHG.0B connectors

ICT42S

ICT42S G2: Advanced 2 Channel ICP® and Voltage Input Amplifier with 2 Channel Tacho Input Amplifier



G2

The ICT42S G2 Module is a hybrid Module which combines 2 channels from the advanced ICP42S G2 Module with 2 advanced tacho input channels. The tacho channels provide tacho period measurements with a 14 ns resolution, sampled where the signal intersects its trigger level settings. Triggering of tacho signals can be set for rising or falling edges with adjustable hysteresis while additionally providing AC coupling for sensors with varying DC voltage offsets. A high speed 4.9 MSa/s scope mode is provided to view the tacho signals in order to assist with the definition of trigger levels.

Where used:

- When measuring the pulse rate and time between pulses such as rpm and crank angle
- With any ICP® based sensor commonly used to measure vibration, acceleration, force or pressure
- With any voltage source up to ±60 V in voltage input mode

ICT42S G2 features: ICP® channels

- See ICP42S G2 for more details regarding the 2 ICP® or voltage input mode channels

ICT42S G2 features: Tacho channels

- 2 tacho channels
- Tacho input can be DC/AC coupled
- 14 ns (70 MHz) tacho resolution
- 1 MPulse/s rate for the sum of the 2 tacho channels when used with the SC42S G2
- 16-bit tacho trigger level adjustment
- ±(60 V, 30 V, 12 V and 2 V) input ranges
- 2 MHz analog bandwidth for all input ranges
- Adjustable trigger level hysteresis (Schmitt trigger implementation)
- Triggering on the n'th edge
- Tacho trigger level self-calibration
- Scope mode for each tacho channel, sampled at 4.9 MSa/s resolution
- ±12 V or 12 V voltage excitation output to tacho sensor
- Lemo 4-way EHG.0B connectors

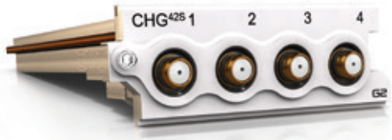
Related SubModule

ICTV11

A BNC connector is provided on the SubModule to interface with the appropriate tacho sensor. The SubModule connects to the ICT42, ICT42S or ICT42 G2, ICT42S G2 Module through a 300 mm fly-lead ending with a 4-pin Lemo FGG 0B connector.

CHG42S

CHG42S G2: 4 Channel Charge Input Amplifier



G2

The CHG42S G2 Module has 4 independent input channels for Quartz or Piezoelectric Ceramic sensors. These sensors are typically used when improved signal performance such as low noise and low distortion is required, or where high temperature or nuclear radiation prevents the use of ICP® based sensors. Various grounding options allow for low noise measurements regardless of external grounding constraints.

Where used:

- With piezoelectric sensors commonly used to measure vibration, acceleration, force, torque and pressure

CHG42S G2 features:

- 4 channels
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 90 kHz bandwidth
- <0.5° @ 10 kHz phase accuracy when in similar range
- 3 Sensitivity settings of 0.1 mV/pC, 1 mV/pC and 10 mV/pC
- ±(10 V, 1 V and 100 mV) input ranges
- Maximum charge input ranges from ±10 pC to ±100 000 pC
- Low discharge time constant provides a 0.016 Hz high pass frequency (-3 dB) for 0.1 mV/pC and 1 mV/pC sensitivities
- Drift is lower than 4 mV/h at any sensitivity and gain
- The cable shield can be connected or disconnected from the Module ground
- Selectable low and high pass digital filters
- Overvoltage detection on frontend input signals
- High input impedance
- 10-32 Microdot connectors

DCH42S

DCH42S G2: 2 Channel Differential Charge Input Amplifier

G2

The DCH42S G2 Module has 2 independent differential input channels for Quartz or Piezoelectric Ceramic sensors. These sensors are typically used when improved signal performance such as low noise and low distortion is required, or where high temperature and nuclear radiation prevents the use of ICP® based sensors. Additionally a differential charge measurement offers further noise immunity and higher bandwidth and is particularly suited to applications using long cables.

Where used:

- With piezoelectric sensors commonly used to measure vibration, acceleration, force, torque and pressure
- Where long cables are required necessitating the use of balanced twisted pair cables

DCH42S G2 features:

- 2 channels
- There are 2 distinctive input mode options:
  - Single-Ended
  - Differential
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 90 kHz bandwidth
- <0.5° @ 10 kHz phase accuracy when in similar range
- 2 Sensitivity settings of 0.1 mV/pC and 1 mV/pC when in Single-Ended mode
- 2 Sensitivity settings of 0.2 mV/pC and 2 mV/pC when in Differential mode
- ±(10 V, 1 V and 100 mV) input ranges
- Maximum charge input ranges from ±100 pC to ±100 000 pC in Single-Ended mode and from ±50 pC to ±50 000 pC in Differential mode
- Low discharge time constant provides a 0.016 Hz high pass frequency (-3 dB)
- Selectable low and high pass digital filters
- Overvoltage detection on frontend input signals
- Amphenol 31-2225 Twin BNC connectors

THM42

THM42 G2: 8 Channel E, J, K, T and U Thermocouple and Pt100 Input Amplifier

G2

The THM42 G2 Module contains 8 channels for use with any thermocouple type as well as Pt100 sensors. Remote cold junction compensation is provided through a SubModule (which is thermocouple type specific) while linearization is provided in the SC42 G2. The Module also includes a calibrated 0.2 mA current source for Pt100 sensor excitation. SubModules are available which contain a pair of commonly used miniature E, J, K, T and U thermocouple connectors (other types available upon request) with cold junction circuitry for thermocouple applications. Another SubModule contains a pair of Lemo connectors for Pt100 applications. Any combination of applicable SubModules can be connected to the THM42 G2 Module. The THM42 G2 Module also includes 8 channels for measuring voltage inputs up to ±10 V.

Where used:

- When measuring E, J, K and T thermocouples (other types available upon request)
- When measuring Pt100 sensors in constant current mode
- With any voltage source up to ±10 V in voltage input mode

THM42 G2 features:

- 8 channels
- 3 input modes of operation:
  - Thermocouples
  - Pt100 based temperature measurement
  - Voltage input mode
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 2)
- 24-bit resolution, 6.4 kSa/s sampling rate per channel, 2.5 kHz bandwidth
- ±(10 V and 100 mV) input ranges
- 0.2 mA Pt100 excitation current
- Open circuit cable monitoring
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Selectable low and high pass digital filters
- 2 MΩ Differential input resistance
- Lemo 7-way EHG.0B connectors with 2 channels sharing one connector

Related SubModules

A wide range of SubModules is available providing the appropriate alloy connectors and a cold junction. SubModules are identified through a TEDS interface and connected to the Module through a 300 mm fly lead.

THMx10

7 thermocouple based SubModules provide dedicated thermocouple connectors of the appropriate alloy and color, according to either IEC or ANSI standards. Cold-junction-compensation is facilitated through a 0.5 °C accurate temperature sensor.

THMP10

Provides 2 sets of 4-way Lemo EGG.0B connectors for use with 2 Pt100 sensors. These connectors provide current to a Pt100 sensor and sense the voltage across it.

THMS10

Provides 2 sets of 4-way general purpose screw terminals to connect to a pair of E, J, K and T thermocouples or a pair of Pt100 sensors. Cold-junction-compensation is facilitated through the use of a 0.5 °C accurate temperature sensor. Constant current is provided for Pt100 use.

WSB42

WSB42 G2: 4 Channel Bridge and Voltage Input Amplifier

G2

The WSB42 G2 Module is used with AC and DC bridge measurements including strain gauges configured as full, half or quarter bridges and inductive displacement transducers (LVDT). The Module offers numerous software selectable features such as constant voltage excitation (AC or DC), bridge sensing, bridge completion resistors and shunt calibration. The bridge can be balanced on command or a previous balance value can be recalled.

Where used:

- With any strain gauge in quarter, half and full bridge, load cell and pressure transducer
- Inductive displacement transducer (LVDT)

WSB42 G2 features:

- 4 channels
- 3 input modes of operation:
  - Analog input mode
  - Wheatstone bridge voltage-excitation mode with 0-5 V (AC or DC) and limited to >90 Ω bridges
  - LVDT inductive displacement transducer mode
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 2)
- 24-bit resolution, 102.4 kSa/s sampling rate, 49 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ±(200 mV, 20 mV, 2 mV) input ranges for bridge mode
- ≤10 kHz excitation
- Balanced differential signal input, differential voltage-excitation output and balanced sense input
- Full, half and quarter bridge configurations
- Internal half and quarter bridge completion resistors for 120 Ω and 350 Ω bridge elements
- Local and remote sense options
- 100 kΩ internal shunt calibration resistor
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- Lemo 7-way EHG.0B connectors

WSB42X

WSB42X G2: Advanced 4 Channel Bridge, ICP® and Voltage Input Amplifier

G2

The WSB42X G2 Module provides all the functionality of the WSB42 G2. Additional features have been added including constant current excitation (DC), dynamic strain mode, ICP® sensor support and a higher sampling rate.

Where used:

- All WSB42 G2 use cases
- With any voltage source up to ±10 V in voltage input mode
- Current-excited sensors in 4-wire mode (full bridge or 1 external element, DC and AC)
- Current-excited sensors in 2-wire mode (dynamic strain only)
- With any ICP® based sensor commonly used to measure vibration, acceleration, force or pressure

WSB42X G2 features:

- 4 channels
- 7 modes of operation:
  - Analog input mode
  - ICP® mode with 4, 8 or 12 mA constant current at ±12 V excitation
  - Bridge voltage-excitation mode:
    0-6 V (AC or DC) for 350 Ω full bridges, 120 Ω and 350 Ω half or quarter bridges
    0-4 V (AC or DC) for 120 Ω full bridges
  - Bridge voltage-excitation mode: 8-10 V (DC) for 1 kΩ bridges
  - Bridge current-excitation mode: 4, 8 or 12 mA (DC)
  - 2 and 4 wire current-excitation strain mode: 4, 8 or 12 mA (DC)
  - LVDT inductive displacement transducer mode (AC)
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1 and 2)
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 100 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ±(10 V, 1 V, 100 mV, 10 mV) input ranges for all modes
- ≤10 kHz AC excitation
- Balanced differential signal input, differential voltage-excitation output and balanced sense input
- Full, half and quarter bridge configurations
- Internal half and quarter bridge completion resistors for 120 Ω and 350 Ω bridge elements
- Local and remote sense options
- 100 kΩ internal shunt calibration resistor
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- Lemo 7-way EHG.0B connectors

ALI42

ALI42 G2: 2 Channel High Speed Bridge and Voltage Input Amplifier

G2

The ALI42 G2 Module is a 2 channel high speed Module with sample rates of up to 1 MSa/s and a bandwidth of 390 kHz. Both channels operate independently of each other, each with its own mode, gain, coupling, etc. and with all settings done in software. The ALI42 G2 has two 7-way Lemo connectors and can be used for both high bandwidth analog input as well as full bridge measurement applications.

Where used:

- With any voltage source up to ±10 V
- With any pressure transducer, load cell, strain gauge and other bridge based sensors

ALI42 G2 features:

- 2 channels
- 2 modes of operation:
  - Analog input (ALI) mode
  - Bridge voltage-excitation mode:
    - 0-6 V (DC) for >120 Ω full bridges
    - 0-4 V (DC) for 120 Ω full bridges
    - 8-10 V (DC) for 1 kΩ full bridges
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1 & 2)
- 24-bit resolution
- 1 MSa/s sampling rate for 1 channel, 390 kHz bandwidth
- 409.6 kSa/s sampling rate for 2 channels, 195 kHz bandwidth
- <0.3° @ 10 kHz phase accuracy when in similar range
- ±(10 V, 1 V, 100 mV) input ranges for all modes
- Input resistance: 2 MΩ
- Input capacitance: <100 pF
- DC or AC coupling
- Balanced differential signal input
- Sensors and bridges providing a full bridge are supported
  - Local and Remote Sense options
  - 100 kΩ internal shunt calibration resistor
  - Differential voltage-excitation output and balanced sense input
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- Lemo 7-way EHG.0B connectors

ALI42B

ALI42B G2: 2 Channel High Speed Voltage Input Amplifier

G2

The ALI42B G2 Module is a 2 channel high speed Module with sample rates of up to 1 MSa/s and a bandwidth of 390 kHz. Both channels operate independently of each other, each with its own mode, gain, coupling, etc. and with all settings done in software. The ALI42B G2 has two BNC connectors and is specifically targeted for high bandwidth analog input applications requiring terminated or unterminated inputs.

Where used:

- With any voltage source up to ±10 V
- Signal sources requiring 50 Ω termination
- Signal sources requiring high input resistance

ALI42B G2 features:

- 2 channels
- 2 modes of operation:
  - Analog input (ALI) mode, terminated with 50 Ω
  - Analog input (ALI) mode, unterminated
- 24-bit resolution
- 1 MSa/s sampling rate for 1 channel, 390 kHz bandwidth
- 409.6 kSa/s sampling rate for 2 channels, 195 kHz bandwidth
- <0.3° @ 10 kHz phase accuracy when in similar range
- ±(10 V, 1 V, 100 mV) input ranges for all modes
- Input resistance: Software switchable between 50 Ω or 2 MΩ
- Input capacitance: <100 pF
- DC or AC coupling
- Balanced differential signal input
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre- and post filter overflow monitoring
- Selectable low and high pass digital filters
- 50 Ω BNC connectors

ALI42B G2 option:

- An enhanced anti-aliasing filter option is available, making it ideal for pyroshock or similar applications

MIC42X

MIC42X G2: Advanced 2 Channel Microphone, ICP® and Voltage Input Amplifier

G2

In addition to providing excellent performance for microphone measurements, the MIC42X G2 Module also offers ICP® and voltage input modes.

Where used:

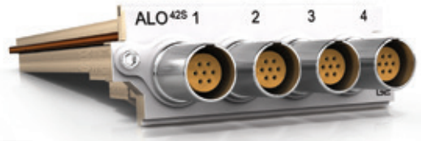
- With any 200 V or self-polarized microphones with pre-amplifier
- With any ICP® based sensor commonly used to measure vibration, acceleration, force and pressure
- With any voltage source up to ±12 V in voltage input mode

MIC42X G2 features:

- 2 channels
- 3 input modes of operation:
  - Microphone mode with 200 V or self-polarized microphone capsules with pre-amplifier
  - ICP® mode with 4 mA, 8 mA or 12 mA constant current at ±12 V or 24 V excitation
  - Voltage input mode with AC or DC coupling
- Supports TEDS IEEE 1451.4 V0.9, V1.0 (Class 1 and 2)
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 100 kHz bandwidth
- <0.2° @ 10 kHz phase accuracy when in similar range
- ± (12 V, 1.2 V, 120 mV) input ranges
- ±14.5 V microphone pre-amplifier excitation voltage
- 0 or 200 V polarization output
- Microphone calibration output to inject test signals into microphone pre-amplifiers
- Exceptionally low distortion and noise design
- There are 3 distinctive input mode options for both ICP® and voltage input modes:
  - Differential or Balanced Float (±12 V excitation)
  - Single-Ended or Unbalanced Float (24 V excitation)
  - Single-Ended or Unbalanced Ground (24 V excitation)
- Software selectable connection of cable shield to Ground
- Short and open circuit cable monitoring
- Signal integrity circuit continuously monitors the input and disconnects sensitive circuits during overload conditions
- Pre-amplifier excitation short circuit protection
- Pre- and post filter overflow monitoring
- Lemo 7-way EGG.1B connectors

ALO42S

ALO42S G2: 4 Channel Voltage Output Source



G2

The ALO42S G2 Module provides 4 independent output channels for the generation of analog signals. Each channel also incorporates Status Input and Output signals, enabling further communication with external equipment for applications such as test supervision or workflow control.

Where used:

- Excitation signals for shaker / modal testing
- Drive signals for acoustic testing
- Arbitrary analog signals to feed into other circuits requiring ±10 V static or dynamic signals

ALO42S G2 features:

- 4 channels
- 24-bit resolution, 204.8 kSa/s sampling rate per channel, 20 kHz 0.1 dB passband flatness
- Excellent low noise and distortion performance
- Excellent DC gain and offset stability
- ±10 V @ 30 mA output
- <0.5° @ 10 kHz phase accuracy when in similar range
- Provides Module Status output
- Monitors Device Under Control input
- Automatic safe shutdown upon fault condition
- Lemo 7-way EHG.0B connectors

Related SubModules

QBNC11

The Quad BNC (QBNC) SubModule is used to split signals from a 7-way Lemo connector into 4 BNC connectors.

ALOP10

The ALOP10 is a rack mountable SubModule for routing the analog output signals from up to eight ALO42S G2 Modules to individual male SMB connectors.

CAN42S

CAN42S G2: Interface to 2 Controller Area Networks (CAN)

G2

The CAN42S G2* provides an interface to connect to up to 2 independent Controller Area Networks (CAN). Each channel of the interface also supports the CAN with Flexible Data-Rate (CAN FD) protocol. Fully implemented features include Listen-Only mode, Self-Reception of CAN messages and transmission of Remote Frames. The CAN42S G2 Module provides independent channel filtering.

Where used:

- When monitoring CAN based messages
- When controlling CAN based devices

CAN42S G2 features:

- Two CAN FD channels that support CAN 2.0B mode, or mixed CAN2.0B and CAN FD mode
- Two Lemo EHG.0B.307 (7-pin) connectors that bring out the two CAN FD channels
- The channels are self-powered, electrically isolated from each other and the rest of the system
- Conforms to ISO 11898-1:2015 (“ISO CAN FD”)
- Supports Arbitration Bit Rates from 14.4 kbps to 1000 kbps
- Supports Data Bit Rates from 14.4 kbps to 8000 kbps (single channel only), or 2000kbps (both channels simultaneously)
- Supports Sample Point configuration for the arbitration phase
- 3 modes of operation:
  - Participate – actively acknowledges messages on the bus; and sends messages
  - Listen only – passively interprets messages that are sent between other nodes on the bus
  - Loopback – forms an internal virtual bus that only receives its own sent messages
- Each CAN message received and accepted by the CAN Module will be time stamped in order to synchronize the received CAN messages with the rest of the measurement data with microsecond accuracy
- Individually configurable identifier list per channel to provide acceptance filtering for all CAN messages received from the CAN bus
- Individually configurable CAN message transmission
- A sequence of messages may be scheduled to be transmitted periodically
- Safe handling of Bus faults (can be queried for diagnostic purposes)
- Configurable built-in 120 Ω split termination per channel

**Also available in CAN42, which excludes CAN FD (i.e. with original CAN protocal only).*

FLX42

FLX42 G2: Interface to FlexRay™ Network

G2

The FLX42 G2 Module provides an interface to connect to a FlexRay™ network for the monitoring of FlexRay™ based messages and interfacing with FlexRay™ based sensors. The FLX42 G2 Module contains two dependent FlexRay™ channel interfaces to support either single channel or dual channel topologies. For the transmission and reception of FlexRay™ messages, selectable bit rates of 2.5, 5, 8 or 10 Mbit/s are available. The FLX42 G2 Module provides independent channel filtering and provides status and error information to the user.

Where used:

- When monitoring FlexRay™ based messages
- When interfacing with FlexRay™ based sensors

FLX42 G2 features:

- 2 dependent channels configured as:
  - Dual Channel Device or
  - Single Channel Device (connector 2 disabled)
- Compatible with FlexRay™ Protocol Specification V2.1A and FlexRay™ Electrical Physical Layer Specification V2.1A
- 3 modes of operation:
  - Operational mode – active network interaction (cold start, transmission and reception of messages enabled)
  - Listen only mode – passive network interaction (no transmission or cold start, only reception of messages)
  - Simulation or self-test mode – used for Module debugging
- FlexRay™ Bit Rate Range of 2.5, 5, 8 or 10 Mbit/s
- FlexRay™ messages are time-stamped with a resolution of 62.5 ns
- Configurable cold start
- Software selectable 110 Ω termination per channel
- Extensive firmware protection from EMI
- Lemo 7-way EHG.0B connectors
- 9-way D-sub connectors are provided with FLXB20 SubModules

Related SubModule

FLXB20

The FLXB20 provides an interface to a 9-way D-sub connection for both CAN42 G2 and FLX42 G2. There are three cable length options: 300 mm, 3000 mm and 6000 mm.

GPS42S

GPS42S G2: Internal GPS Interface

G2

The GPS42S G2 provides accurate GPS time and position data to the PAK MKII Mainframe. Accurate timing information is in the form of a pulse per second (pps) logical signal.

The GPS42S G2 can also be used for synchronization purposes. Here the GPS42S G2 Module provides the G2 System Controller with the PPS signal to align its internal clock. Mainframes with this capability are able to synchronize with one another without limitations as to their position or the total number of Mainframes.

Where used:

- Synchronizing numerous channels over multiple Mainframes
- When requiring accurate time and position information

GPS42S G2 features:

- Internal GPS channel
- NMEA and UBX Protocols available
- 1 Hz, 4 Hz and 10 Hz position updates
- Time-stamping for received GPS time and position data to 5 µs resolution
- 3.3 V antenna voltage
- GPS internal receiver accuracy of <3 m
- SMA connector for antenna
- Time-Pulse RMS accuracy: 30 ns

IRG42

IRG42 G2: Interface to IRIG, External GPS and Internal GPS

G2

In addition to the same internal GPS functionality as described in the GPS42S G2, the IRG42 G2 Module provides an additional functional unit of being able to interface to IRIG. Here IRIG-A and IRIG-B data (both analog and digital formats) are digitized by a high speed ADC and decoded. The external IRIG data is time-stamped to synchronize its data with other Modules in the same system.

The IRG42 G2 can also be used for synchronization purposes. Here the IRG42 G2 Module provides the G2 System Controller with a signal to align its internal clock. Mainframes with this capability are able to synchronize with one another (limited only by the customer's installed IRIG facility).

Where used:

- Synchronization of numerous channels over multiple Mainframes
- When requiring time and other IRIG based information to synchronize other measurements

IRG42 G2 features: GPS

- See GPS42S G2 for more details

IRG42 G2 features: IRIG

- Operation modes include:
  - Internal IRIG receiver mode
  - Serial data and timing interface for possible future application
- IRIG formats supported:
  - A003, A133, B003, B123
- Time-stamping of IRIG messages to 5 µs resolution

GPS
SYNCHRONIZATION

NO CABLES

LIMITLESS DISTANCE

GPS AND IRIG CLUSTERS

Synchronize multiple Mainframes through GPS synchronization. Each Mainframe must contain a GPS42S G2 or IRG42 G2 Module and be connected to the same network by WLAN. This approach is particularly useful when two test objects are moving in relation to one another or when cabling is difficult due to large distances or under unfavorable environmental conditions. There is no limit to the number of synchronized Mainframes a GPS and IRIG Cluster can contain.

DRIFT COMPENSATION SYNCHRONIZES MAINFRAMES TO WITHIN 100 ns OF EACH OTHER.

IRIG
SYNCHRONIZATION

ECT42

ECT42 G2: Interface to EtherCAT® Network

G2

Data which is acquired in the PAK MKII system can be shared synchronously with other EtherCAT® devices via the high speed Ethernet backbone using the EtherCAT® protocol and EtherCAT® system time. This data is presented along with miscellaneous parameters including units and scaling factors.

Where used:

- Provides the ability to interface with other networked EtherCAT® slave devices within a factory, laboratory or test chamber environment
- When acquiring data via other networked EtherCAT® slave devices

ECT42 G2 features:

- Supports slave-to-slave communication in passive mode
- Conforms to EtherCAT® standards IEC 61158, ISO 15745-4 and SEMI E54.20
- Supports CANopen over EtherCAT® (CoE) and Service Delivery Object (SDO) access
- Full duplex 100-BASE-TX in upstream and downstream directions, with galvanic isolation on each interface
- Time-stamping of data in 64-bit EtherCAT® system time
- Distributed clocks synchronized to an absolute maximum error of 100 ns
- Supports hot-connect and slave alias addressing for high availability
- Cycle times across the entire EtherCAT® network less than 100 µs
- Slave Information Interface (SII) implemented for device description
- ERNI M12 connectors

DAR42

DAR42 G2: Digital Audio Receiver

G2

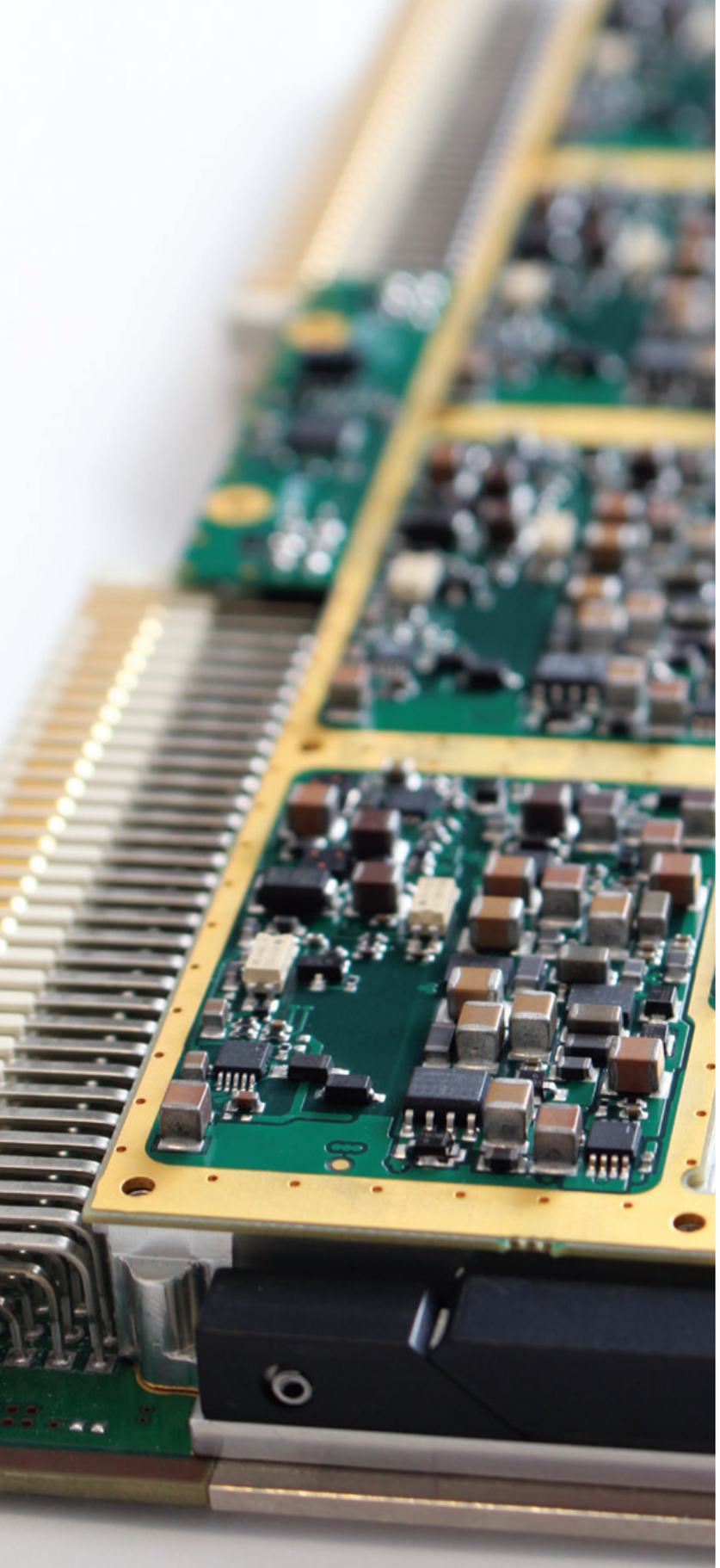
The DAR42 G2 Module provides interfaces to receive 2 stereo AES3 digital audio streams. For synchronization between the DAR42 G2 and external digital audio transmission equipment, the DAR42 transmits a synchronization signal which can be selected to be either an AES3 output signal (data at digital zero) or word clock signal.

Where used:

- With measuring devices which provide an AES3 based digital audio signal, such as a digital artificial head

DAR42 G2 features:

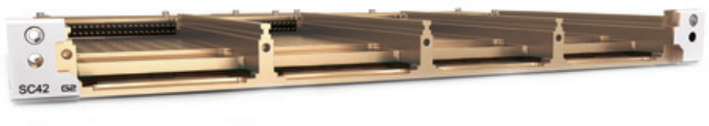
- 2 stereo input channels
- Frame rates of 44.1, 48.0, 88.2 and 96.0 kHz
- Single AES3 or master word clock output
- Lemo 3-way EGG.0B connectors for AES3 input and Lemo 3-way FAG.0B connector for synchronization output



SC42

SC42 G2: VMEbus Signal Conditioning Engine and Infrastructure

G2



The SC42 G2 board provides the isolated power, signal processing and mechanical infrastructure for up to 4 signal conditioning Modules. It is a highly advanced board using 5 powerful 24-bit DSPs to process large volumes of data transferred between each Module and the VMEbus. It also provides isolated power for each Module, sample timing infrastructure, as well as internal communication interfaces used to set parameters for each channel. The flexibility of easy interchangeability of Modules within the same Mainframe or between Mainframes is provided by the SC42 G2 board. This allows users to include additional Modules to satisfy their measurement and control requirements. Modules are plugged in through the front panel of the SC42 G2 and can be inserted and removed without removing the SC42 G2 board itself.

SC42 G2 features:

- VMEbus slave and interrupter
- Supports the latest 2eVME specifications
- Mechanics to accommodate 4 Modules
- Provides accurate timing infrastructure for 4 Modules
- 5 separate 24-bit DSPs, one per Module and one on the board
- 4 isolated power supplies, one per Module
- Houses the Module's self-calibration engine
- Thermally optimized and encased in aluminium

SC42S G2 option:

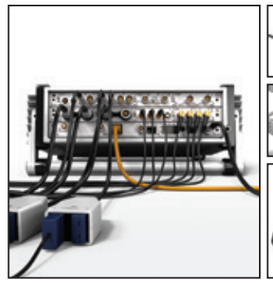
- For high-speed multi-channel measurements
- Specially designed for the S line Modules with faster data rates

Where used:

- In any slot of all Mainframes except slot 1 which is reserved for the VMEbus System Controller and Power Supply
- With G2 series Modules

ACCESSORIES

PERSONALIZING SYSTEMS



SubModules

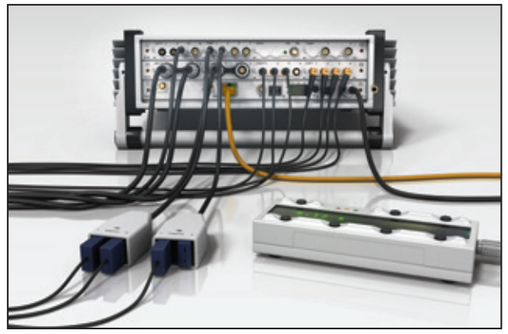
SubModules provide a special interface to an individual sensor. They're are used to personalize a Module as the final interface to a sensor or provide features like cold junction temperature sensing.

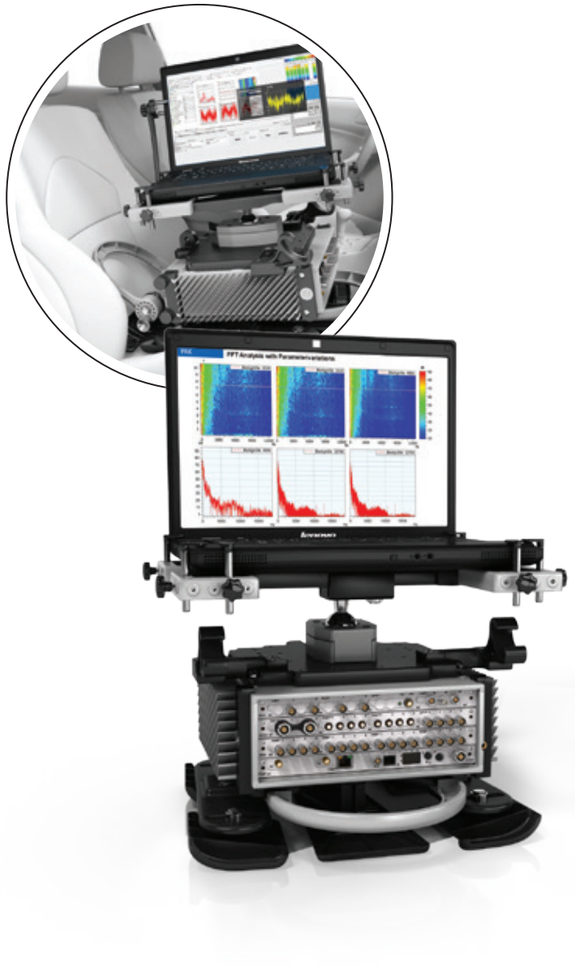
MiniTerminal

The MT12 MiniTerminal provides a large, bright LED display as a practical solution to show test information as well as to receive commands from a user such as start or stop. It connects to any one of the System Controller and Power Supply boards found in any Mainframe.

Rack Mounted System Accessories

The RM04, RM06 and RM10 RackMounts are compact, machined aluminum Rack Mounting Kits which house 4-, 6- and 10-slot PAK MKII Mainframes in 19 inch racks. The Mainframe has specifically been recessed in each Mounting Kit to ensure that all cables are contained behind the rack's front face. These cables can then be routed to the left and right sides of the Mainframe. At the rear, a horizontal brace provides a mounting point for cable connector flanges should this be required.





SeatFrame

The SF10 SeatFrame optimally secures 2-, 3-, 4- or 6-slot Mainframes and a notebook onto a car seat for mobile measurements. It consists of machined aluminum members which can be adjusted to optimally fit the seat, Mainframe and notebook. To prevent sideways movement, the side and rear sleds can be adjusted to best hug the seat. The rear SeatFrame handle can also be adjusted to push against the seat's backrest to prevent it flipping over. It is strapped to the seat using the seat's safety belt. A notebook is placed on an adjustable base mounted above the PAK MKII.

Accessories Brochure

Please refer to the Accessories Brochure for more information on these and other SubModules and Accessories.

Our Customers include:

AUDI | BMW | CLAAS | DAF TRUCKS | DAIMLER | FIAT | GENERAL MOTORS | HONDA | HYUNDAI | ISUZU MOTORS | IVECO MAGIRUS | KIA | KTM MOTORRAD | MAN TRUCK & BUS | MERCEDES | NISSAN | PIAGGIO | PSA PEUGEOT CITROËN | JAGUAR | SAME DEUTZ-FAHR | PORSCHE | SHENZHEN BYD AUTO | SUZUKI | TATA DAEWOO | TOYOTA | VOLKSWAGEN | VOLVO | AIRBUS | SANDIA AEROSPACE | BOEING | AVIC | EADS | ESTEC | IABG | I.T.P. | LOCKHEED MARTIN | MTU AERO ENGINES | NASA JOHNSON SPACE CENTER | NORTHROP GRUMMAN | GKN AEROSPACE | ROLLS-ROYCE DEUTSCHLAND | THALES ALENIA SPACE | AISIN SEIKI | AVL LIST | BASF | BORGWARNER | BRIDGESTONE | CONTINENTAL | DANA SEALING | DENSO | EATON FLUID | EBERSPÄCHER | FAURECIA | FEV | GETRAG | JOHNSON CONTROLS | MAGNA POWERTRAIN | MAGNA STEYR | MAHLE | MANN+HUMMEL | MICHELIN | MYUNGHWA INDUSTRIES | NINGBO TUOPU | ROBERT BOSCH | RÖCHLING AUTOMOTIVE | SCHAEFFLER GROUP | SGL BRAKES | TENNECO | SOGEFI | TRW | VALEO GROUP | WUHU JAPHL | ZF GROUP | ABB | AB ELECTROLUX | AB VOLVO PENTA | ALSTOM HYDRO POWER | ANDREAS STIHL | ASML | BOSE | BSH BOSCH UND SIEMENS HAUSGERÄTE | CANON | CHEIL INDUSTRIES | CNR TANGSHAN RAILWAY | HAWE HYDRAULIK | IPETRONIK | KAESER | KOHLER | KOMATSU | KRAUSS-MAFFEI WEGMANN | KUKJE HEAVY INDUSTRY | LG ELECTRONICS | LIEBHERR MACHINES | PADMINI | LINDE MATERIAL HANDLING | MAN TURBO | MEYER BURGER | PHILIPS ELECTRONICS | SENVION | SAMSUNG | SIEMENS | SONY | SUMITOMO CONSTRUCTION | ZANUSSI ELETTROMECCANICA | CSI | DEUTSCHE BAHN | EDF DER | MAHINDRA & MAHINDRA | MBTECH | SNCF | NUMEROUS RESEARCH AND ACADEMIC BODIES

Headquarters

Müller-BBM VibroAkustik Systeme GmbH
Robert-Koch-Strasse 13, 82152 Planegg, Germany
Tel. +49-89-264860-0 • info.de@mbbm-vas.com
www.mbbm-vas.com

Subsidiaries

BeNeLux & UK: Müller-BBM VibroAkustik Systeme B.V.
Veldweg 81, 8051NP Hattem, The Netherlands
E-Mail: DdeKlerk@MuellerBBM-VAS.nl
Tel. +31-621-574-851 • Fax +31-38-8450-177

China: Müller-BBM VibroAkustik Systeme Beijing Ltd
Unit 1002-1003, North Ring Center, #18 Yumin Road,
Xicheng District, Beijing 100029, China
Tel. +86-10-5128-5118 • Fax +86-10-8225-1626
E-Mail: info@MuellerBBM-vas.cn

France: Müller-BBM VibroAkustik Systeme S.A.R.L.
Parc Saint Christophe, 10 avenue de l'Entreprise,
95865 Cergy-Pontoise Cedex, France
Tel: +33-1-34-22-58-84 • Fax: +33-1-3422-5885
E-Mail: info.fr@MuellerBBM-vas.fr

South Korea: Müller-BBM VibroAkustik Systeme Korea Ltd
3rd Fl., Daesong Bld., BaumeoRo 27Gil, 7-11, SeochoGu,
06752, Seoul, South Korea
Tel. +82-2-529-0375 • Fax +82-2-529-0378
E-Mail: info@PAKsystem.co.kr

USA: Müller-BBM VibroAkustik Systeme, Inc.
3891 Ranchero Drive, Suite 30, Ann Arbor, MI 48108, USA
Tel. +1-734-327-4147 • Fax +1-734-327-4143
E-Mail: info.us@MuellerBBM-vas.com

Distributors

India: Welan Technologies
'Nissim', Plot 10A, Lane No 13, Ganesh Kripa Society, Paud Road,
Pune 411038, India
Tel. +91-922-5510-908 • Fax +91-20-25393126
E-Mail: info@welantechnologies.com

Japan: TOYO Corporation
1-6, Yaesu 1-chome, Chuo-ku, Tokyo 103-8284, Japan
Tel. +81-3-3279-0771 • Fax +81-3-5205-2030
E-Mail: murata@toyo.co.jp

Turkey: BİAS Mühendislik Ltd. Sti.
Haluk Türksoy st. 12/3 Altunizade, 34662, Üsküdar Istanbul, Turkey
Tel. +90-216-474-57-01 • Fax +90-216-474-57-05
E-Mail: info@bias.com.tr

---

a mecalc design

MECALC IS A HIGHLY SPECIALISED ENGINEERING DESIGN HOUSE WHICH ENJOYS PUSHING INNOVATION AHEAD OF THE GAME.

Driven to position ourselves at the forefront of new developments and thinking, we research, design, develop and manufacture advanced acquisition and control systems. Used to optimise noise, vibration and structural integrity in prototype or quality control testing, our PAK MKII and QuantusSeries hardware are crucial to markets where exceptional development and production quality are essential.

CHARGED TO INNOVATE, we're inspired to create products for those who are as passionate about creating theirs.

www.mecalc.com