# The more you measure...

# ...the more you achieve









#### Your applications are our focus...



- With more than
  - 100.000 channels
  - In different applications
  - worldwide,

the MGCplus system has achieved acceptance as a measurement standard.

- The wide spectrum of
  - supported transducers,
  - fieldbus connections and
  - standard PC interfaces

are some of the features, which indicate that it is a truly integrated measurement device

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#### R&D

- 24 Bit ADC on every channel
- Sample Rates up to 19.2kHz
- Parallel and simultaneous sampling
- Three independent sample rates
- High Speed Data Transfer via Ethernet & USB



## **Test Rigs**

- All Transducers supported
- Simultaneous DAQ via Ethernet, USB Profibus, CAN
- Several PC's can be simultaneous connected to an MGCplus
- Scalable System
- Comprehensive Trigger Facilities





## Calibration

- Highest precision (0.0025% accuracy class – ML38)
- Worldwide references in national calibration laboratories
- Dynamic calibration through simultaneous sampling
- Digital filter with high damping (16th order on ML38)



## Manufacturing

- Press Fit Monitoring
- Fieldbus support (ProfibusDP, CAN)
- Digital I/O, PLC compatible
- Embedded SoftPLC (ML70)





#### **Mobile Data Acquisition**

- Intelligent Data Reduction
- CANBus support
- Simultaneous acquisition of GPS Data
- Simultaneous DAQ to hard disk and PC
- Power supply from 8V to 58V



## **Experimental Stress Analysis**

- Full cable influence compensation
- Built-in completion resistors
- Patented transducer identification (T-ID<sup>™</sup>, TEDS)
- Online Rosette Calculation

# **Get Flexible**

- Configure your own system. **Choose your** 
  - Housing,
  - Connection boards and
  - Measuring cards.
- You need a display and a communication processor ? No problem:
  - System Expansion is always possible.
- Best of all...
  - You can do it yourself !











### **MGCsplit**









#### **Environmental Conditions**

- MGCsplit works in sunny, icy, windy, high and low temperature conditions, in dirt and mud and in high humidity
- Shockproof metal enclosure
- IP65 protection permits installation directly on the test object
- Temperature range between –30°C and +70°C
- Reliable gas-proof plugs
- Galvanically isolated inputs

#### **For Mobile DAQ**

- Stand alone storage with a PC Card hard disk or flash card
- Can be operated by non-skilled personnel
- Connection to base station via wireless Ethernet or GSM
- GPS measurement for position and true velocity
- Saving evaluation time through
- intelligent data compression
- Enhanced Confidence in Data (ECID)
- by storing all measurement
- parameters together with the data:
- Full traceability of tests even years later



## **MGCsplit**

#### **Typical MGCsplit system**











Expand a basic MGCplus unit with MGCsplit modules. Simple expansion within a minute





## **Physical Quantities**

HBM-Transducer Conversion principle					MGCplus										Spider8		PME			DigiClip					
Physical quantity	Measured quantity			(2H 009	Sin (2H SL	225 Hz) B	4.8 kHz)	4.8 kHz / 9.6kHz)		N	4.8 kHz)		Spe	ecial	CANHEAD (00 Hz, square)	4.8 kHz)	140	600 Hz)		600 Hz)	4.8 kHz)	-	4.8 kHz)/DC	4.8 kHz)/DC	(2H 009)
		ВС	ЫС	CF (	CF (	CF (	CF (	CF (		DC	CF (				CF (	CF (	DC	CF (	ВС	CF (	CF C		CF (	CF (	CF
		ML01B	ML10B	ML30B	ML35B	ML38B	ML50B	ML55B (S6)	ML60B	ML801B	ML455	ML460	ML70B	ML/IB(56) ML78B	CB1014-XXX	SR55	SR01	SR30	MP01	MP30	MP55	MP60	MP80	MP85	DF30CAN DF30DP
Force, Pressure, Torque, Load, accel.	Resistive full bridge		X	X		X		X		X	X					X		Х		X	<b>X</b>		X	Х	Х
	Resistive half bridge		X					X		X	X					Х		Х			X		X	Х	
Strain Gauge	Resistive quarter bridge									X					Х			Х							
Displacement	Inductive half bridge						X	Х			X					Х					X		X	Х	
	Inductive full bridge						X	Х			X					Х					X		X	Х	
	LVDT										X										X		X	Х	
	Piezoresistive		X																						
	Passive piezoelectric	Х																							
	Current fed piezoelectric	Х	X							X															
Torque, Rotation freq.	Impulse / frequency								Х			X				Х						X	X	Х	
	PWM, Pulse Duration											X													
	Potentiometer									X													XĽ	Х	
	Themocouple	X							_	X							Х		X				$\perp$		
	Thermoresistive				X				_	X							Х		X				$\perp$		
WA-Displacement	Voltage	X							_	X						Х	Х	X	X				<u>X</u>	Х	
WA-Displacement	Voltage (with transducer supply)									X													$\rightarrow$		
	Current	X						_	_	X		_					X		X				_	_	
	Digital output							_	_				X	X						$\rightarrow$	$\rightarrow$	_	4		
	Digital input	_											X	<u>X</u>						$\rightarrow$	$\rightarrow$	$\rightarrow$			
	Analog Out	Х	X	X	X		Х	Х	Х				X	X						_	_		4		
Torque (112), Force (C16i)	CAN												X	x							_	_	4		
FII-LOad Cell	RS232/RS422/RS485												X												
	551																						X	Х	



## Assemble your MGCplus system...

	Single Channel Amplifiers										
	ML01B	ML10B	ML30B	ML35B	ML38B	ML50B	ML55B ML55BS6	ML60B			
AP01i	φφ	ΔR 1,45,B1 1,45,B1	$\diamond$	- <del>0</del>		$\diamond$	()	ŢŢ.			
AP03i	фф		$\diamond$			$\diamond$	()	ΨĻ			
AP07/1								13⊺0 ↓↓↓↓ min <sup>-1</sup> T4Wa			
AP08	-101-	-0-									
AP09	>¢¢										
AP11i	фф	<ul> <li>↓ ↓</li> <li>↓ ↓</li></ul>	$\diamond$			$\diamond$	\$\langle\$		resistive fullbridge	Voltage	Legend- ∬⇔ digital output
AP12	фф	ΔR 1,45,81 1,45,81	$\diamond$	-07		$\diamond$	(2) (145.81)	1310 ↓↓↓↓ min <sup>-1</sup> T4Wa	resistive halfbridge	Current	$\begin{array}{c} \downarrow \\ \hline \\$
AP13i	фф	<ul> <li>↓ □</li> <li>↓ □</li></ul>	$\diamond$			$\diamond$	()		inductive halfbridge	Current fed piezo- electric transducer	POPPP CAN CAN
AP14									$\frac{\Delta R}{ U }$ piezoresistive transducer	13110     Torque     T1, T4, T5, TB1     min <sup>-1</sup> rotay speed T4WA	serial I/O RS232, RS422, RS485 I/O
AP17								T10F(S)	Thermocouples		200Ω-5000Ω
AP18i	-DF	-0-							,	+++	



#### Assemble your MGCplus system...

	Multi Channel Amplifiers									
	ML801B	ML455	ML460							
AP401	φ									
AP409	⇒									
AP418i	-0-									
<b>AP455i</b> AP455iS6										
AP460i			ŢŢŢ							
AP801 AP801S6	φ									
AP809	⇒									
AP810	$\langle \diamondsuit$									
AP814Bi										
AP815i										
AP835										
AP836										





## Assemble your MGCplus system...

	Special Multichannel modules									
	ML70B	ML71B ML71BS6	ML74	ML77B	ML78B					
AP71	CAN	CAN								
AP72	serial I/O									
AP74			CANHEAD							
AP75										
AP77				<u> </u>						
AP78										



				-	
$\diamond$	resistive fullbridge	φ	Voltage	Į⇒	digital output
K	resistive halfbridge	¢	Current	⇒∥	digital input
1 S. S. J.	resistive quarterbridge	HOH	passive piezoelectric transducer	₽	analogue output
$\rightarrow$	inductive halfbridge	-D¢	current fed piezo- electric transducer	<del>99999</del>	ProfiBus
$\diamond$	inductive fullbridge	13110	Torque / rotary speed T3T10	CAN	CAN
- ( <mark>∆R</mark>	piezoresistive transducer	(1,4,5,B1	Torque T1, T4, T5, TB1	serial I/O	RS232, RS422, RS485 I/O
- <del>"/-</del>	Thermo resistors PT100, PT1000	min⁻¹ T4Wa	rotary speed T4W A		Potentiometer 200Ω-5000Ω
⇒	Thermocouples	ΠŢ	impulse / frequency	6	LVDT



#### Assemble your MGCplus system



#### The amplifiers



Parameter	Single Chan.	Multi Chan.
Sample Rate [Hz]	19200	<b>2400</b> (each channel)
Remote Contacts	Yes	Νο
Online DSP with predefined fctns. (PV, CPV, HullCurve)	Yes	Νο
Limit Value Sw.	4	4
Analog output	Yes	Νο
Limit Value contacts	Yes	Νο
Zero, Tara, Filter	Yes	Yes

#### The amplifiers



Parameter	Single Chan.	Multi Chan.	CAN Head
Sample Rate [Hz]	19200	2400 (each channel)	<b>25 300</b> (each channel)
Remote Contacts	Yes	No	No
Online DSP with predefined functions. (PV, CPV, Envelope curve)	Yes	Νο	No
Limit Value Switch	4	4	No
Analog output	Yes	No	No
Limit Value contacts	Yes	No	No
Zero, Tara, Filter	Yes	Yes	Yes (no Tara)





## **Multichannel Carrier Frequency**

- Surpress systematic noise
- Eliminate Drift effects
  - Thermo Offset Voltages
  - General Drift Effects
- Until 2004 only Single Channel Solution !
- Need for higher densitiy of CF channels
  - High channel amount of displacement transducers (WA electronics unsufficient solution)
  - High channel count for SG applications in noisy environment (Railways applications)

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# **Embedded Intelligence**

- Realtime calculation directly inside MGCplus
- Soft PLC with Digital I/O, analog output, CAN I/O, RS232C/RS485
- Programmable with standardized languages IEC 61131-3
- Program development system
   CoDeSys included in delivery
- Full access and control of all MGCplus resources









# PC connections to MGCplus: Ethernet

#### Ethernet TCP/IP, 10/100MBit/s

- CP42: 307.200 MV/s
- CP22: 153.600 MV/s
- Network Hardware inside !

#### Connection

- Cross Cable
- (Patch Cable, if PC has integrated Switch or Hub)







- Typical High Channel Count Solution
- Best Software: catman enterprise
- Clients can work with data during DAQ without risk for the DAQ process









## **PC connections to MGCplus: Multi-Client**

**Multi-Client Ability with communication processor CP42** 

- 5 Ethernet clients / CP42
- I USB client
- I RS232C client
- I GPIB client





#### **PC connections to MGCplus: Worldwide Access**





#### **Software for MGCplus**



#### MGCplus Assistant

Signal Conditioning Setup Included in delivery

- Easy setup of (multiple) MGCplus and MGCsplit systems
- Several User Profiles
- Diagnosis and service functions

#### Non HBM software



- \_
- DIAdem<sup>®</sup> (NI)
- BEAM Beam (AMS)



LabView®, DasyLab®(NI) via ActiveX®



- Data Importer
  - jBeam
    - MatLab
      - MEA-files (MGC+)
      - Catman 4.5 / 5.0

#### Software for your MGCplus



- catman<sup>®</sup> easy simple software for acquiring measurement data
  - Get DAQ results quickly thanks to modern, intuitive user guidance
  - Library for exp. Stress analysis
  - Graphical data analysis
  - Export to commonly used formats (Excel, ASCII, DiaDem<sup>™</sup>)



#### catman<sup>®</sup> professional

The complete solution for measurement, visualization, analysis and documentation

- Free definition of individual interfaces for visualization and logging
- Math. Evaluation (Signal analysis, statistics etc.)
- Automation by means of sequence macros
- Develop your own applications with catman<sup>®</sup> script
- Open ActiveX interface



 catman<sup>®</sup> enterprise
 Easy configuration of up to 10.000 channels

- common access to measurement data in client/server network
- Online distribution of Data to multiple client PC's
- Comprehensive Trigger functions
- Logging entire measurement sequence in a logfile
- Trend analysis



# Thanks...

# ... for your attention



