The more you measure...

...the more you achieve

Own the Best Measurement Data...

MGC plus...
Your applications are our focus...

...We have the solution
One Platform for many applications...

- 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
One Platform for many applications...

**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
One Platform for many applications...

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)
HBM Data Acquisition Systems

One Platform for many applications...

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™, 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

<table>
<thead>
<tr>
<th>HBM-Transducer</th>
<th>Conversion principle</th>
<th>MGCplus</th>
<th>Spider8</th>
<th>PME</th>
<th>DigiClip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Single</td>
<td>Multi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC</td>
<td>DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC</td>
<td>DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force, Pressure, Torque, Load, accel.</td>
<td>Resistive full bridge</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Resistive half bridge</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Resistive quarter bridge</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Strain Gauge</td>
<td>Inductive half bridge</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td></td>
<td>Inductive full bridge</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Displacement</td>
<td>LVDT</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Piezoresistive</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Passive piezoelectric</td>
<td>X</td>
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<tr>
<td></td>
<td>Current fed piezoelectric</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Torque, Rotation freq.</td>
<td>Impulse / frequency</td>
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<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>PWM, Pulse Duration</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Potentiometer</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Thermocouple</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Thermoresistive</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>WA-Displacement</td>
<td>Voltage</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Voltage (with transducer supply)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Current</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>WA-Displacement</td>
<td>Digital output</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Digital input</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Analog Out</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Torque (T12), Force (C16)</td>
<td>CAN</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>FIT-Load Cell</td>
<td>RS232/RS422/RS485</td>
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<td>X</td>
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<td>SSI</td>
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HBM Data Acquisition Systems

Assemble your MGCPplus system...

<table>
<thead>
<tr>
<th>Single Channel Amplifiers</th>
<th>ML01B</th>
<th>ML10B</th>
<th>ML30B</th>
<th>ML35B</th>
<th>ML38B</th>
<th>ML50B</th>
<th>ML55B</th>
<th>ML55BS6</th>
<th>ML60B</th>
</tr>
</thead>
</table>

**Legend**
- ![Image]: resistive fullbridge
- ![Image]: resistive halfbridge
- ![Image]: resistive quarterbridge
- ![Image]: inductive halfbridge
- ![Image]: inductive fullbridge
- ![Image]: piezoresistive transducer
- ![Image]: Thermo resistors PT100, PT1000
- ![Image]: Thermocouples
- ![Image]: Voltage
- ![Image]: Current
- ![Image]: passive piezoelectric transducer
- ![Image]: current fed piezoelectric transducer
- ![Image]: Torque / rotary speed T3...T10
- ![Image]: Torque T1, T4, T5, TB1
- ![Image]: min -1 T4Wa
- ![Image]: impulse / frequency
- ![Image]: Potentiometer 200Ω-5000Ω
- ![Image]: LVDT
- ![Image]: ProfiBus
- ![Image]: CAN
- ![Image]: serial I/O
- ![Image]: RS232, RS422, RS485 I/O
Assemble your MGCplus system...

### Multi Channel Amplifiers

<table>
<thead>
<tr>
<th></th>
<th>ML801B</th>
<th>ML455</th>
<th>ML460</th>
</tr>
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<tbody>
<tr>
<td>AP401</td>
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<tr>
<td>AP409</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AP418i</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP801</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP801S6</td>
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<td>AP809</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AP810</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP814Bi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP815i</td>
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<td></td>
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<td>AP835</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AP836</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Legend
- resistive fullbridge: Voltage
- resistive halfbridge: Current
- resistive quarterbridge: passive piezoelectric transducer
- inductive halfbridge: current fed piezoelectric transducer
- inductive fullbridge: Torque / rotary speed
- piezo resistive transducer: T3...T10
- thermo resistors: T1, T4, T5, TB1
- thermocouples: min T4W, T4WA
- impulse / frequency: rotate speed T4WA

#### Connectors
- digital output
- digital input
- analogue output
- Profibus
- CAN
- RS232, RS422, RS485 I/O
- Potentiometer
  - 2000...5000Ω
- LVDT
HBM Data Acquisition Systems

Assemble your MGCplus system...

### Special Multichannel modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP71</td>
<td>CAN</td>
</tr>
<tr>
<td>AP72</td>
<td>serial I/O</td>
</tr>
<tr>
<td>AP74</td>
<td>CANHEAD</td>
</tr>
<tr>
<td>AP75</td>
<td>CANHEAD</td>
</tr>
<tr>
<td>AP77</td>
<td>CANHEAD</td>
</tr>
<tr>
<td>AP78</td>
<td>CANHEAD</td>
</tr>
</tbody>
</table>

### Legend

- **resistive fullbridge**
- **resistive halfbridge**
- **resistive quarterbridge**
- **inductive halfbridge**
- **inductive fullbridge**
- **piezo resistive transducer**
- **Thermo resistors**
- **Thermocouples**
- **Voltage**
- **Current**
- **passive piezoelectric transducer**
- **current fed piezoelectric transducer**
- **Torque / rotary speed**
- **impulse / frequency**
- **digital output**
- **digital input**
- **analogue output**
- **Profibus**
- **CAN**
- **serial I/O**
- **RS232, RS422, RS485 I/O**
- **Potentiometer 200Ω - 5000Ω**
- **LVDT**
Assemble your MGCplus system

20.03.2008, Folie 16
Hottinger Baldwin Messtechnik GmbH
Dr.-Ing. Andreas Geißler
# The amplifiers

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Single Chan.</th>
<th>Multi Chan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Rate [Hz]</td>
<td>19200</td>
<td>2400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(each channel)</td>
</tr>
<tr>
<td>Remote Contacts</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Online DSP with predefined fctns.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>(PV, CPV, HullCurve)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit Value Sw.</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Analog output</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Limit Value contacts</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Zero, Tara, Filter</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## The amplifiers

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

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

Monitor, change and load programs During measurement via a separate Debug interface in ML70
HBM Data Acquisition Systems

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)
PC connections to MGCplus: Ethernet

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

PC connections to MGCplus: Ethernet

- **Direct Connection**
  - Computer
  - Cross
  - Patch
  - Server
  - Patch
  - Clients
  - Sync

- **Client/Server**
  - Computer
  - Cross
  - Patch
  - Server
  - Patch
  - Clients
  - Synch

- **Multi Client**
  - Computer
  - Cross
  - Patch
  - Patch
  - Clients
  - Sync
PC connections to MGCplus: Multi-Client

Multi-Client Ability with communication processor CP42

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

Σ: 8 clients
PC connections to MGCplus: Worldwide Access

- Worldwide Access to MGCplus
  - IP address
  - Subnet mask
  - Router A address

<table>
<thead>
<tr>
<th>Ethernet</th>
<th>Adresse: 192.168.169.134</th>
</tr>
</thead>
<tbody>
<tr>
<td>SubNetMask: 255.255.255.0</td>
<td></td>
</tr>
<tr>
<td>Routeradress: 0.0.0.0</td>
<td></td>
</tr>
</tbody>
</table>

OK  Abbruch
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® (NI)
  - Beam (AMS)
  - LabView®, DasyLab® (NI) via ActiveX®
  - Data Importer
    - jBeam
    - MatLab
      - MEA-files (MGC+)
      - Catman 4.5 / 5.0
HBM Data Acquisition Systems

Software for your MGCplus

- **catman® 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™)

- **catman® 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® script
  - Open ActiveX interface

- **catman® 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

20.03.2008, Folie 32
Hottinger Baldwin Messtechnik GmbH
Dr.-Ing. Andreas Geiβler
Thanks... 
... for your attention

Own the Best Measurement Data...

MGCplus...