

# DATARec 4



## Modular Data Acquisition and Signal Conditioning System

## System Description

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## Introduction

The requirements in view of accuracy, flexibility and speed which today's test laboratories are confronted with have been constantly increased over the last few years. Development cycles and prototype refinement have to be performed in shorter time intervals. This trend consequently has to lead to the ability to measure more channels at the same time with increased accuracy. Today many tests are carried out in test cells or on test rigs due to time and cost issues. Nevertheless there are still conditions where mobile applications require different data acquisition hardware compared to the one used in laboratories. Systems with high channel count typically installed for test rigs can not be downsized for mobile applications where normally only some few channels are required. In the past the only solution was the procurement of different systems in order to support different applications. This situation has always created large capital investments but has also had other disadvantages like difficulty in operation and in many cases incompatibility and missing integrity of data and results. Heim Systems has responded to these new requirements in the concept of the DATaRec 4 Series resulting in a totally new design of a modular data acquisition system.

## 1 Overview

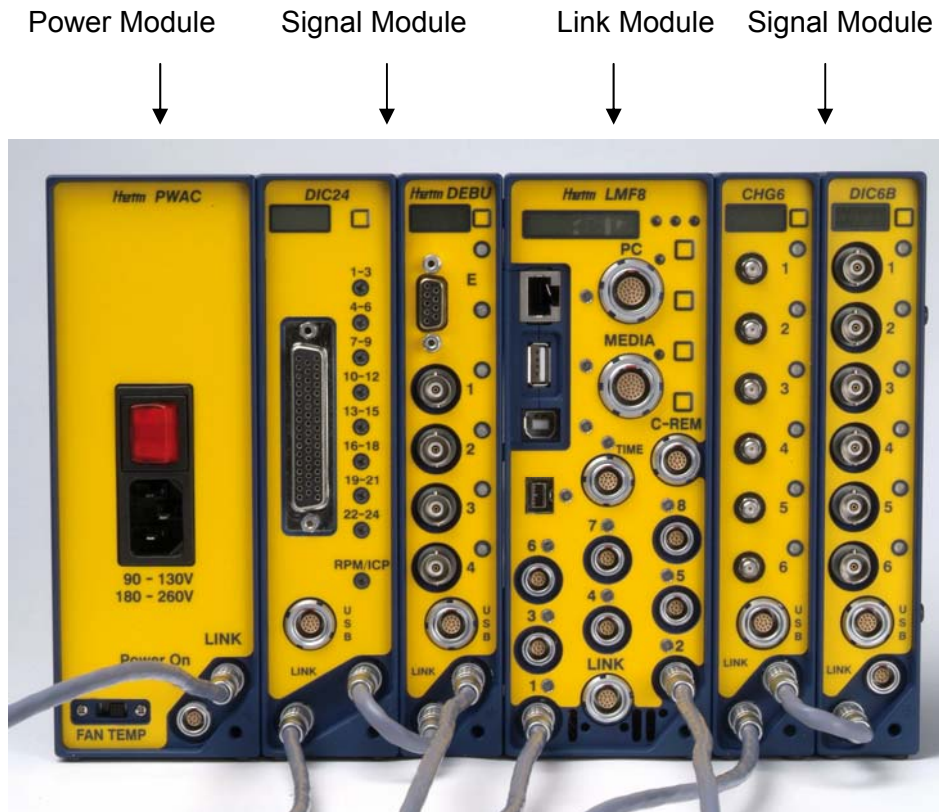
The DATaRec 4 Series represents a total modular data acquisition and signal conditioning concept which can be tailored to various applications. The modular design provides the basis to configure large multi channel systems as well as small systems for mobile applications. The DATaRec 4 Series is the result of a continuous and consequent development of data acquisition systems. Many years of expertise and experience in both the automotive as well as the flight test market have been the starting point for the development of the new family incorporating state of the art technology.

### DATaRec 4 Series key facts

- Modular architecture for quasi infinite channel count
- Design provides centralised or decentralised configuration
- System architecture offers total flexibility for user configurations
- IEEE1394b, USB 2.0, and Ethernet as standard interfaces to analysis systems
- Signal modules with integrated signal conditioning
- TEDS sensor identification for easy configuration of multi channel systems
- Special signal modules for digital data
- Digital data processing for maximum accuracy
- 24 bit A/D converter
- 102 dB dynamic; <math><0.2^\circ</math> phase error
- Modules galvanic isolated
- Compact and robust design for mobile application

## 2 DATaRec 4 System

The DATaRec 4 System components



Picture 1 - DATaRec 4 system components

The various sensor signals or data will be connected to the Signal Module. Special Signal Modules support different sensors. All modules can be arranged in any combination. The picture above shows a system configuration where a Link Module provides the interface to the analysis computer (USB 2.0, Ethernet, and IEEE 1394b).

The first Link Module firmware version supports the front-end operation via IEEE 1394b interface. Other interfaces and a recorder operation mode will be supported with later versions.

The detailed functionality of the components is described in the following.

### 3 Application Scenarios

1<sup>st</sup> application: low channel count



Picture 2 - One module system

One module based system with a maximum of 6 or 24 measuring channels. Direct PC interfacing via built-in USB link (external power needed)

2<sup>nd</sup> application: compact system



Picture 3 - Compact system using LMF2

Up to 16 signal modules can be linked together. The maximum channel count is in a range from 96 (using only 6 channel modules) to 384 (using only 24 channel modules). Direct PC interfacing via built-in USB2.0, IEEE 1394b or Ethernet link.

3<sup>rd</sup> application: distributed system



Picture 4 - Distributed system using LMF2

Up to 16 signal modules can be interconnected via up to 50 meter long data links (10 meters between two modules). The maximum channel count may range from 96 (using only 6 channel modules) to 384 (using only 24 channel modules). Direct PC interfacing via built-in USB 2.0, IEEE 1394b or Ethernet link.

4<sup>th</sup> application: high channel count distributed system



Picture 5 - High channel count distributed system using LMF4 / LMF8

Distributed system with up to 1500 measurement channels for enhanced flexibility and performance. Direct PC interfacing via built-in USB 2.0, IEEE 1394b or Ethernet link.

## 4 System Components

### 4.1 Signal Module



The Signal Modules provide the interface to the different signal sources to be measured. A range of individual Signal Modules can be used for signal conditioning of different sensors or data sources (see ch. 9.2). A maximum of 24 channels can be connected to one Signal Module. Visualisation of the input signals is carried out by means of a display and overload LED's. The display ensures the identification of the module within a decentralised configuration by displaying the selected unique module number.

The Signal Module performs the signal conditioning and the A/D conversion (24bit). Each channel is completely independent and consists of sensor support (power), amplifier, A/D converter, anti aliasing filter and optional high or low pass filter. In view of accuracy, measurement speed, and noise characteristic the Signal Modules represent "State-of-the-art" technology. The digital and the analogue module parts and the power voltage input part are galvanic isolated to remove the noise introduced by potential differences. All modules have their own power supplies as well as their own calibration units. The low power consumption of a Signal Module and the enhanced cooling technology avoids the integration of fans in the Signal module which is a big advantage especially for acoustic measurements.

The sample rate can be set for each module individually. A special 6 channel module feature is the overload detection. An overload situation will be detected by means of a comparator already before the A/D conversion. Also one channel can be used as signal channel or as RPM channel.

One Signal Module can be connected directly to the USB interface of a PC (picture 2).

### 4.2 Link Module

If the systems consists of more than one Signal Module a Link Module will be needed.

The Link Module is the central processing module and supports a different number of subsystems (Signal module chains). A subsystem consists of max. 8 Signal Modules.

The Link Module LMF2 supports two subsystems. This means, that the LMF2 supports up to 16 Signal Modules. Multi channel Link Modules can be used to connect many Signal module chains in order to create large multi channel acquisition systems. (LMF4 up to 768 channel / LMF8 Link Modules up to 1500 channels (picture5)).

Data acquired from the Signal Modules can either be transferred via IEEE 1394b, Gigabit Ethernet and USB2.0 to an analysis computer. The first Link Module Firmware version supports the front-end operation via IEEE 1394b interface. Other interfaces as well as a recording mode will be supported in later development steps of Link Module hardware and firmware.

Since the Link Module provides the time basis for the connected Signal Modules a high precision synchronisation of the signal is always guaranteed. Furthermore the Link Module controls the calibration, the phase alignment, and the system test if a new system configuration is required.

## 4.3 Power Module

The power input voltage of all modules of the DATaRec 4 system is 17 V - 28V. Each module generates the different internal required voltages. The Power Module converts the input voltages to the 24V system voltage.

Within each chain of Signal Modules at least one Power Module must be integrated, since the Link Module does not pass the supply voltage throughout to its other link connectors.

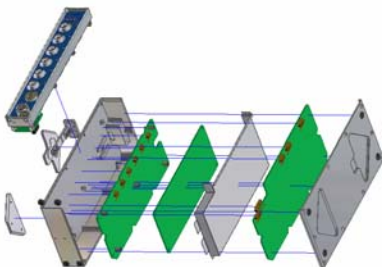
Power Modules are available for AC as well as for DC supplies.

The 9 – 36 voltage Power Module can support 50 watts. If a combination of Signal Modules and Link Modules request higher power consumption, than more than one Power Modul can be integrated in a chain.

For decentralised system configurations Power Modules with repeater functionality are available. In this case the Power Module routes also the data to the Link Module. Parallel integrated Power Modules avoid voltage drops typical in larger installations.

## 5 Design

### 5.1 Mechanics



The modules are made of milled aluminium, which copes best with the demanding environment the system is daily subjected to. All modules have a unique height and depth. They get assembled together based on an innovative mechanics that makes it possible to add, swap or remove any module within the chain without any tool required.

A series of accessories like handles, seat belt holders, hooks etc. can be added to the system, easing its installation.

### 5.2 Signal connectors and link interfaces



All connectors, displays and control elements are located on the front panel. Their arrangement ensures an easy connection to the sensors. Since they are counter sunk, no damage can occur during transport or operation of the system. The analogue modules are fitted with sensor compatible connectors, e.g. BNC for voltage transients, Micro-Dot for charge sensors.

### 5.3 Connection between modules



The connection links ensure the power supply to the modules as well as the synchronisation and configuration of the system and the transfer of acquired data. The data transfer between each single module is done over a 1.5 Gbit/s high speed serial link. The connection is realised in a compact system configuration with a simple jumper and with a cable in a distributed system. The cables may be as long as 10 meters between two modules and 50 meters within a subsystem. Such a configuration allows to install the measurement chains close to the signal sources, which reduces subsequently the complex sensor cabling and the effect of external interferences.

## 6 External Noise Reduction

One of the DATaRec 4 Series key development goals was to produce a system featuring an enhanced signal quality.

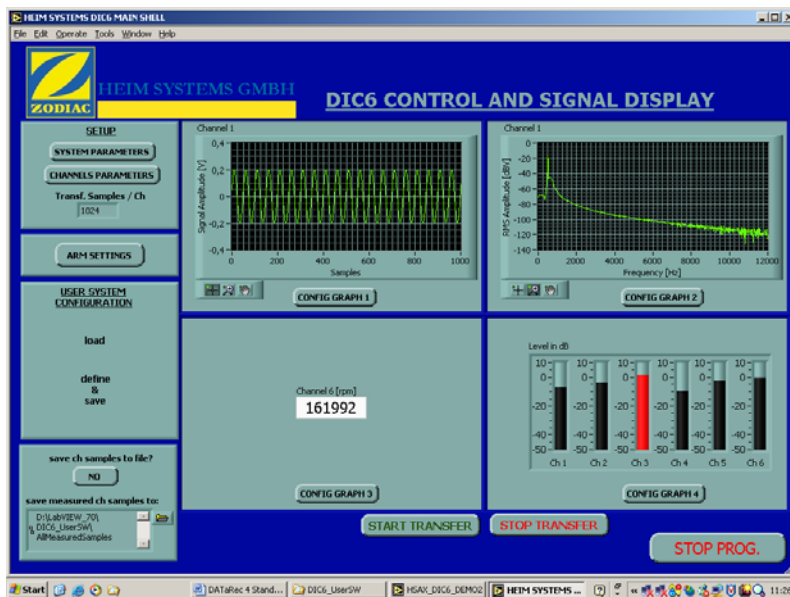
The digital conversion of the signal takes place as close to the sensors as possible.

A direct consequence is that the signal loss across the cables and the external noise, introduced by field noise sources like magnetic fields, test units, engines etc., is minimised. Furthermore, the signal conditioning electronics is galvanic isolated from the digital processors, internal signal lines and computer interfaces. This removes the noise introduced by potential differences, ground loops etc.

In order to reduce the digital noise introduced by the electronics the system was designed with high precision components, and active components like DC/DC converters, FPGA etc. are coupled to the analogue sampling frequency.

## 7 Data Format / Software

The data is converted and multiplexed to the DATaRec format. It can be transferred on the fly to a computer based system. The “State-of-the-art” time stamping techniques of the DATaRec format allow a very accurate time correlation between the various analogue and digital signal sources.



Heim Systems offer a new user friendly configuration, control and data recording software but also the well known software Ftrans supports the new DATaRec 4 series. In addition a C++ library is available for easy interfacing to existing software platforms.

In a further development step the existing DATaRec 3 format will be extended to a 32 bit data structure. (DATaRec 4 format). The current hardware supports the new data format without any changes.

## 8 Technical Specification

The DATaRec 4 Series is a high precision modular data acquisition and storage system.

- Number of Channels ..... 6 - 1500
- Number of Signal Modules..... 8 in one subsystem, currently 8 subsystems can be synchronised

### 8 Analogue Signal Modules

#### 8.1 Direct Voltage / ICP Sensor Module – DIC6B / DIC6L



- Number of Channels ..... 6
- Sampling Frequency (Fs )..... 500 Hz – 200 kHz, settable in steps of 10 Hz. Each module can work with an own sampling frequency, which is a binary divider of system FS
- Bandwidth ..... DC to max. 80 kHz (settable)
- Sampling Ratio..... 2.5; no mirroring effect
- Dynamic Range (SFDR) ..... >102 dB at 0dBV Range in DATaRec 4 Mode\*
- Dynamic Range (SFDR) ..... >96 dB at 0dBV Range in DATaRec 3 Mode
- Analogue to digital converter .... 24 bit
- Data resolution ..... 16 bit ( DATaRec 3 Mode ) or  
..... 32-bit\*( DATaRec 4 Mode ), selectable

THD .....	<-90 dB at 0dBV Range
Phase Accuracy .....	<0.2° (without optional high or low pass filter)
AC Accuracy .....	±0.02 % or ±1 mV
DC Accuracy .....	±0.1 % or ±1 mV
Input impedance .....	1 M Ohm (DIC6L differential mode)
.....	500 k Ohm (DIC6B single ended)
Signal Level .....	±10mV peak to ±10V peak in 1x, 2x, 5x, 10x steps
Coupling.....	DC, AC (-3dB at 0.2 Hz)
ICP power .....	24V DC, 4 mA constant current
TEDS sensor identification.....	IEEE 1451.4 standard for all 6 channels
An. high pass filter (optional).....	22 Hz
An. low pass filter (optional).....	500 Hz, 1 kHz or 4 kHz
RPM channel .....	one channel is useable as RPM input
RPM sampling frequency .....	DATaRec 3 – Mode :16 x Fs ( max. 3.2 MHz )
.....	DATaRec 4 – Mode :32 x Fs ( max. 6.4 MHz )
Threshold level .....	0 – 100% of the selected amplifier step
Mode .....	DIC6 B : Single Ended
.....	DIC6 L : Single Ended or Differential
Connector .....	6 x BNC DIC6B
.....	or 6 x 3 pin LEMO DIC6L
Dimensions .....	37,1 x 184 x 124,5 mm (w x h x d) including fixing system
Weight.....	940g typical
Cooling.....	no fan
Power consumption .....	10 watts typical
Power input range.....	17 up to 28 voltages
Input DC Power.....	Low Power detection
Communication .....	built-in USB 2.0, RS-232 and high speed Link interfaces

#### Functions:

Integrated calibration unit.....	1 ppm reference calibration
Galvanic isolation .....	yes
Max. isolation voltages.....	power input (48 V)
.....	digital / analogue part (48 V)
Input channel voltage safety .....	± 35 V
Joint mode .....	yes

#### Environmental specifications

Vibration.....	5g
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Shock ..... 10g  
Operating temp. ....-30°C - +65°C  
Storage temp. ....-40°C - +90°C  
Humidity ..... 0 - 95% relative, non-condensing

\* further development step

## 8.2 High Channel Count Volt / ICP Sensor Module – DIC24



- Number of Channels ..... 24
- Sampling Frequency (Fs )..... up to 50 kHz, settable in steps of 10 Hz. Each module can work with an own sampling frequency, which is a binary divider of system FS
- Bandwidth ..... to max. 20 kHz (settable)
- Sampling Ratio..... 2.5; no mirroring effect
- Dynamic Range (SFDR) ..... > 90 dB at 0dBV Range in DATaRec 3 Mode
- Analogue to digital converter .... 24 bit
- Data resolution ..... 16 bit ( DATaRec 3 Mode ) or  
..... 32-bit\*( DATaRec 4 Mode ), selectable
- THD ..... <-90 dB at 0dBV Range
- Phase Accuracy ..... <0.2°
- AC Accuracy ..... ±0.1 % or ±1 mV
- DC Accuracy ..... ±0.1 % or ±1 mV
- Input impedance ..... 1 M Ohm
- Signal Level ..... ±10mV peak to ±10V peak
- Coupling..... AC (-3dB at 0.75 Hz typical)
- ICP power ..... 22V DC, 4 mA constant current
- TEDS sensor identification..... IEEE 1451.4 standard for all 24 channels
- RPM channel ..... channel 24 is useable as RPM input
- RPM sampling frequency..... DATaRec 3 – Mode :16 x Fs ( max. 800 kHz )
- Threshold level ..... 0 – 100% in 5 % steps of the selected amplifier step

Mode ..... Single Ended  
 Connector ..... 1 \* 50 pin D-sub  
 Dimensions ..... 48.1x 184 x 124,5 mm (w x h x d) including fixing system  
 Weight ..... 1100 g typical  
 Cooling ..... no fan  
 power consumption ..... 15 watts typical  
 power input range ..... 17 up to 28 voltages  
 Input DC Power ..... Low Power detection  
 Communication ..... built-in USB 2.0, RS-232 and high speed Link interfaces

#### Functions:

Integrated calibration unit ..... 1 ppm reference Calibration  
 Galvanic isolation ..... yes  
 Max. isolation voltages ..... power input (48 voltage)  
 ..... digital / analogue part (48 voltage)  
 Input channel voltage safety .....  $\pm 35$  V peak

#### Environmental specifications

Vibration ..... 5g  
 Shock ..... 10g  
 Operating temp. .... -30°C - +65°C  
 Storage temp. .... -40°C - +90°C  
 Humidity ..... 0 - 95% relative, non-condensing

#### note

If the ICP is activated on one channel than the 10 V input range for the whole module will be automatically disabled

\* further development step

### 8.3 Charge Sensor Module – CHG6



Number of Channels .....	6
Sampling Frequency (Fs ).....	500 Hz – 200 kHz, settable in steps of 10 Hz. Each module can work with an own sampling frequency, which is a binary divider of system FS
Bandwidth .....	DC to max. 80 kHz (settable)
Sampling Ratio.....	2.5; no mirroring effect
Dynamic Range (SFDR) .....	> 90 dB at 1 nC Range in DATaRec 3 Mode
Analogue to digital converter ....	24 bit
Data resolution .....	16 bit ( DATaRec 3 Mode ) or ..... 32-bit*( DATaRec 4 Mode ), selectable
THD .....	<-95 dB at 5nC range
Phase Accuracy .....	<0.2° Coupling (without optional low pass filter)
Accuracy .....	±0.1 % or ±1 pC
Input impedance .....	10 <sup>13</sup> Ohm
Signal Level .....	3 pC peak to 10000 pC peak in 1x, 2x, 5x, 10x steps
Coupling.....	AC (-3dB at 1 or 0.4 Hz selectable ≥ 200 pC peak / ..... 1.0 Hz < 200 pC)
An. low pass filter (optional).....	500 Hz, 1 kHz, 2 KHz or 5 kHz (selectable)
RPM channel .....	one channel is useable as RPM input
RPM sampling frequency .....	DATaRec 3 – Mode :16 x Fs ( max. 3.2 MHz ) ..... DATaRec 4 – Mode :32 x Fs ( max. 6.4 MHz )
Threshold level .....	0 – 100% of the selected amplifier step

Mode ..... Single Ended  
 Connector ..... 6 x Micro Dot  
 Dimensions ..... 37.1 x 184 x 124,5 mm (w x h x d) including fixing system  
 Weight ..... 940g typical  
 Cooling ..... no fan  
 power consumption ..... 11 watts typical  
 power input range ..... 17 up to 28 voltages  
 Input DC Power ..... Low Power detection  
 Communication ..... built-in USB 2.0, RS-232 and high speed Link interfaces

#### Functions:

Integrated calibration unit ..... 1 ppm reference Calibration  
 Galvanic isolation ..... yes  
 ..... power input (48 voltage)  
 ..... digital / analogue part (48 voltage)  
 Joint mode ..... yes

#### Environmental specifications

Vibration ..... 5g  
 Shock ..... 10g  
 Operating temp. .... -30°C - +65°C  
 Storage temp. .... -40°C - +90°C  
 Humidity ..... 0 - 95% relative, non-condensing

\* further development step

### 8.4 Digital Signal Modules

### 8.5 Volt / EBU Module – DEBU



Number of Channels .....	2 channel digital audio input and 4 Volt/ICP input channels
Volt /ICP channels	
Sampling Frequency (Fs ).....	800 Hz – 200 kHz, settable in steps of 10 Hz. Each module can work with an own sampling frequency, which is a binary divider of system FS
Bandwidth .....	DC to max. 80 kHz (settable)
Sampling Ratio.....	2.5; no mirroring effect
Dynamic Range (SFDR) .....	>102 dB at 0dBV Range in DATaRec 4 Mode*
Dynamic Range (SFDR) .....	>96 dB at 0dBV Range in DATaRec 3 Mode
Analogue to digital converter ....	24 bit
Data resolution .....	16 bit ( DATaRec 3 Mode ) or ..... 32-bit*( DATaRec 4 Mode ), selectable
THD .....	<-90 dB at 0dBV Range
Phase Accuracy .....	<0.2° (without optional high or low pass filter)
AC Accuracy .....	±0.02 % or ±1 mV
DC Accuracy .....	±0.1 % or ±1 mV
Input impedance .....	1 M Ohm (differential mode) ..... 500 k Ohm (single ended)
Signal Level .....	±10mV peak to ±10V peak in 1x, 2x, 5x, 10x steps

Coupling ..... DC, AC (-3dB at 0.2 Hz)  
 ICP power ..... 24V DC, 4 mA constant current  
 TEDS sensor identification ..... IEEE 1451.4 standard for all 6 channels  
 An. high pass filter (optional) ..... 22 Hz  
 An. low pass filter (optional) ..... 500 Hz, 1 kHz or 4 kHz  
 RPM channel ..... one channel is useable as RPM input  
 RPM sampling frequency ..... DATaRec 3 – Mode :16 x Fs ( max. 3.2 MHz )  
 ..... DATaRec 4 – Mode :32 x Fs ( max. 6.4 MHz )  
 Threshold level ..... 0 – 100% of the selected amplifier step  
 Connector ..... 4 x BNC singled ended mode  
 ..... or 4 x 3 pin LEMO single ended or differential mode

#### Functions:

Integrated calibration unit ..... 1 ppm reference Calibration  
 Galvanic isolation ..... yes  
 ..... power input until 48 voltage  
 ..... digital / analogue part until 48 voltage  
 Input channel voltage safety .....  $\pm 35$  voltage  
 Joint mode ..... yes

#### AES/EBU channels

Digital Input ..... AES/EBU data according AES3 standard  
 Digital re sampling ..... yes  
 Clock rate .....  $1/60 \times F_s \leq F_s \leq 8 \times F_s$   
 Sampling rate ..... max. 192 KHz  
 Connector ..... 1 \* 9 pin female D-SUB  
 Signal Level ..... RS-422  
 Coupling ..... galvanically isolated (transformer-coupled)  
 Input termination ..... 110 Ohm switchable  
 Input synchronization ..... empty AES/EBU frame supported on the outputs for  
 ..... synchronization of the input signal  
 artificial head setup function ..... RS232 interface

Dimensions ..... 37.1 x 184 x 124,5 mm (w x h x d) including fixing system  
 Weight ..... 940g typical  
 Cooling ..... no fan  
 Power consumption ..... 9 watts typical  
 Power input range ..... 17 up to 28 voltages

Input DC Power ..... Low Power detection  
 Communication ..... built-in USB 2.0, RS-232 and high speed Link interfaces

#### Environmental specifications

Vibration ..... 5g  
 Shock ..... 10g  
 Operating temp. .... -30°C - +65°C  
 Storage temp. .... -40°C - +90°C  
 Humidity ..... 0 - 95% relative, non-condensing

#### Note

The max. module sampling rate is directly related to the AES/EBU input sampling rate. Please see table below:

32 KHz AES/EBU input sampling rate	max. 41 kHz module sampling rate
44.1 KHz AES/EBU input sampling rate	max. 50 kHz module sampling rate
48 KHz AES/EBU input sampling rate	max. 50 kHz module sampling rate

Higher module sampling rate in the different modes causes a delay between the AES/EBU signals and the analog channels.

## 8.6 Power Modules

The power modules can be optionally fitted with a bus repetition function.



### 8.6.1 DC Power Module – PWD9D

Input Power .....	9 - 36 V DC
Max Power .....	typically 50 W
Functions .....	EMI filter, galvanic isolation
Connector .....	1 x 2 pin LEMO DC in, 2 x 6 pin LEMO (Link)
On/off switch .....	yes
LED indicators .....	for Power on
Dimensions .....	48,1 x 184 x 124,5 mm (w x h x d) including fixing system
Weight .....	940 g typical
Cooling .....	no fan
Environmental specifications	
Vibration .....	5g
Shock .....	10g
Operating temp. ....	-30°C - +65°C
Storage temp. ....	-40°C - +90°C
Humidity .....	0 - 95% relative, non-condensing

### 8.6.2 AC Power Module - PWAC

Input Power .....	90 – 132V AC or 180 -264 V AC, 50-440 Hz
Max Power .....	150 W
Functions .....	EMI filter, galvanic isolation
Connector .....	1 x AC connector, 2 x 6 pin Lemo (Link)
On/off switch .....	yes
LED indicators.....	for Power on
Dimensions .....	70,1 x 184 x 124,5 mm (w x h x d) including fixing system
Cooling.....	fan (switchable)
Environmental specifications	
Vibration.....	3g
Shock.....	5g
Operating temp. ....	-10°C - +45°C
Storage temp. ....	-20°C - +60°C
Humidity .....	0 - 95% relative, non-condensing

## 8.7 Link Modules



Link Module Bit Rate .....	up to 500 Mbit/s, depending on signal modules, sampling frequencies, computer interfaces
Data Link Bit Rate .....	1.02 – 2.04 Gbit/s (physical layer)
Data Link Throughput	
Data Rate .....	max. 600 Mbit/s – 1.5 Gbit/s,
Cable Length Subsystem .....	max. 50 m
Cable Length between two modules .....	max. 10 m
Contact Remote Input .....	7 Digital Inputs
Input Level .....	max. 24 V
Status Output .....	7 Open Collector
Status Output Current .....	max. 60 mA, max. 36V
Time Code Inputs/Outputs .....	IRIG-A,-B,-G In / Out, (optional) .....
	PPS In / Out GPS Serial RS232/RS422
Computer Interface .....	IEEE 1394a/b, USB2.0 ( Target ), Gbit Ethernet (10/100/1000 Base T) and RS232/422 Remote, 2 x SAS/SATA (optional)
Storage Interface (optional) .....	IEEE 1394a/b, USB2.0 ( HOST ), Gbit Ethernet (10/100/1000 Base T) and 2 x SAS/SATA (optional)

RTC.....yes, battery powered  
 Time accuracy..... 1 ppm  
 HPO .....optional  
 Time accuracy.....0,001 ppm  
  
 Dimensions ..... 70,1 x 184 x 124,5 mm (w x h x d) including fixing system  
 Weight..... 1,1 Kg typical  
 Cooling..... fan (temp. regulated and switchable)  
 power consumption.....20 watts typical  
 power input range ..... 17 up to 28 voltages  
 Input DC power monitoring ..... yes, with Low Power detection  
 Power Source ..... Link connector

#### Environmental specifications

Vibration.....5g  
 Shock..... 10g  
 Operating temp. ....-30°C - +65°C  
 Storage temp. ....-40°C - +90°C  
 Humidity..... 0 - 95% relative, non-condensing

#### 8.7.1 2 Channel Link Module – LMF2

Connectable Subsystems ..... up to 2

#### 8.7.2 4 Channel Link Module – LMF4

Connectable Subsystems ..... up to 4

#### 8.7.3 8 Channel Link Module – LMF8

Connectable Subsystems ..... up to 8

#### note

This is the description of the maximum Link Module functionality.

There are different options available. Please see the following configuration sheet.



Order numberr	Designation	Description	Interfaces	Connector	Connector
HS300-0100/0	LMF2 Front-end / LMF2 2ch. FE	2 channel Link Modul Front end operation / LMF2 2ch. FE/USB,IEEE1394,GigE/PC	Firewire USB Target USB Host Ethernet Service contact Remote	IEEE 1394 USB Target USB Host RJ45 Service Lemo C-Rem	
HS300-0110/0	LMF2 Front-end Rugged  LMF2 2ch. FE/PC+LEMO	2 channel Link Modul Front end operation rugged version  LMF2 2ch. FE/USB,IEEE1394,GigE/PC+LEMO	Firewire USB Target USB Host Ethernet Service contact Remote RS232 RS422	IEEE 1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC Lemo PC	or Lemo PC or Lemo PC  or Lemo PC
HS300-0120/0	LMF2 Front-end /Storage  LMF2 2ch. FE+REC	2 channel Link Modul Front end / storage operation  LMF2 2ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO	Firewire USB Target USB Host Ethernet Service contact Remote RS232 RS422 Firewire 2 Ethernet 2 time IRIG / GPS	IEEE 1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC Lemo PC Lemo Media Lemo Media Lemo time	or Lemo PC or Lemo PC or Lemo Media or Lemo PC
HS300-0130/0	LMF2 Frontend / Storage / SAS  LMF2 2ch. FE+REC/SAS	2 channel Link Modul Front end / storage operation inclusive SAS operation  LMF2 2ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO	Firewire USB Target USB Host Ethernet	IEEE 1394 USB Target USB Host RJ45	or Lemo PC or Lemo PC or Lemo Media or Lemo PC



Model	Front-end	Link Modul	Operation	Services	Media
HS300-0200/0	LMF4 Front-end LMF4 4ch. FE	4 channel Link Modul	Front end operation LMF4 4ch. FE/USB,IEEE1394,GigE/PC	Service contact Remote RS232 RS422 Firewire 2 Ethernet 2 time IRIG / GPS SAS/SATA SAS/SATA	Service Lemo C-Rem Lemo PC Lemo PC Lemo Media Lemo Media Lemo time Lemo Media Lemo PC
HS300-0210/0	LMF4 Front-end Rugged LMF4 4ch. FE/PC+LEMO	4 channel Link Modul	Front end operation rugged version LMF4 4ch. FE/USB,IEEE1394,GigE/PC+LEMO	Firewire USB Target USB Host Ethernet Service contact Remote RS232 RS422	IEEE 1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC Lemo PC or Lemo PC or Lemo PC or Lemo PC
HS300-0220/0	LMF4 Front-end /Storage LMF4 4ch. FE+REC	4 channel Link Modul	Front end / storage operation LMF4 4ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO	Firewire USB Target USB Host Ethernet Service contact Remote RS232 RS422 Firewire 2 Ethernet 2 time IRIG / GPS	IEEE 1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC Lemo PC Lemo Media Lemo Media Lemo time or Lemo PC or Lemo PC or Lemo Media or Lemo PC

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HS300-0230/0	LMF4 Frontend / Storage / SAS	4 channel Link Modul Front end / storage operation inclusive SAS operation	Firewire USB Target USB Host Ethernet Service contact Remote RS232 RS422 Firewire 2 Ethernet 2 time IRIG / GPS SAS/SATA SAS/SATA	IEEE1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC Lemo PC Lemo Media Lemo Media Lemo time Lemo Media Lemo PC	or Lemo PC or Lemo PC or Lemo Media or Lemo PC
	LMF4 4ch. FE+REC/SAS	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO			
HS300-0400/0	LMF8 Front-end	8 channel Link Modul Front end operation	Firewire USB Target USB Host Ethernet Service contact Remote	IEEE1394 USB Target USB Host RJ45 Service Lemo C-Rem	
	LMF8 8ch. FE	LMF8 8ch. FE/USB,IEEE1394,GigE/PC			
HS300-0410/0	LMF8 Front-end Rugged	8 channel Link Modul Front end operation rugged version	Firewire USB Target USB Host Ethernet Service contact Remote RS232 RS422	IEEE 1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC Lemo PC	or Lemo PC or Lemo PC or Lemo PC
	LMF8 8ch. FE/PC+LEMO	LMF8 8ch. FE/USB,IEEE1394,GigE/PC+LEMO			
HS300-0420/0	LMF8 Front-end /Storage	8 channel Link Modul Front end / storage operation	Firewire USB Target USB Host Ethernet Service contact Remote RS232	IEEE1394 USB Target USB Host RJ45 Service Lemo C-Rem Lemo PC	or Lemo PC or Lemo PC or Lemo Media or Lemo PC
	LMF8 8ch. FE+REC	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO			



			RS422	Lemo PC	
			Firewire 2	Lemo Media	
			Ethernet 2	Lemo Media	
			time IRIG / GPS	Lemo time	
HS300-0430/0	LMF8 Frontend / Storage / SAS	8 channel Link Modul Front end / storage operation inclusive SAS operation	Firewire	IEEE1394	or Lemo PC
			USB Target	USB Target	or Lemo PC
			USB Host	USB Host	or Lemo Media
	LMF8 8ch. FE+REC/SAS	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO	Ethernet	RJ45	or Lemo PC
			Service contact Remote	Service Lemo C-Rem	
			RS232	Lemo PC	
			RS422	Lemo PC	
			Firewire 2	Lemo Media	
			Ethernet 2	Lemo Media	
			time IRIG / GPS	Lemo time	
			SAS/SATA	Lemo Media	
			SAS/SATA	Lemo PC	
HS300-01xx/2	LMF2 wie xx / HPO Option	2 channel Link Modul xx with HPO Option	wie HS300-01xx/0		
HS300-0100/2	LMF2 2ch. FE/HPO	LMF2 2ch. FE/USB,IEEE1394,GigE/PC/HPO	plus HPO option	intern	
HS300-0110/2	LMF2 2ch. FE/PC+LEMO/HPO	LMF2 2ch. FE/USB,IEEE1394,GigE/PC+LEMO/HPO			
HS300-0120/2	LMF2 2ch. FE+REC/HPO	LMF2 2ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/HPO			
HS300-0130/2	LMF2 2ch. FE+REC/SAS/HPO	LMF2 2ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/HPO			
HS300-02xx/1	LMF4 wie xx /Sync Option	4 channel Link Modul xx with Sync. Option	wie HS300-02xx/0		
HS300-0200/1	LMF4 4ch. FE/SYNC	LMF4 4ch. FE/USB,IEEE1394,GigE/PC/SYNC	plus sync option	Lemo Link	
HS300-0210/1	LMF4 4ch. FE/PC+LEMO/SYNC	LMF4 4ch. FE/USB,IEEE1394,GigE/PC+LEMO/SYNC			
HS300-0220/1	LMF4 4ch. FE+REC/SYNC	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/SYNC			
HS300-0230/1	LMF4 4ch. FE+REC/SAS/SYNC	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/SYNC			
HS300-02xx/2	LMF4 wie xx / HPO Option	4 channel Link Modul xx with HPO Option	wie HS300-02xx/0		
HS300-0200/2	LMF4 4ch. FE/HPO	LMF4 4ch. FE/USB,IEEE1394,GigE/PC/HPO	plus HPO option	intern	

HS300-0210/2	LMF4 4ch. FE/PC+LEMO/HPO	LMF4 4ch. FE/USB,IEEE1394,GigE/PC+LEMO/HPO		
HS300-0220/2	LMF4 4ch. FE+REC/HPO	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/HPO		
HS300-0230/2	LMF4 4ch. FE+REC/SAS/HPO	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/HPO		
HS300-02xx/3	LMF4 wie xx / HPO Option "+ Sync option"	4 channel Link Modul xx with HPO Option "+ Sync option"	wie HS300-04xx/0 plus HPO option	intern
HS300-0200/3	LMF4 4ch. FE/SYNC/HPO	LMF4 4ch. FE/USB,IEEE1394,GigE/PC/SYNC/HPO	syn option	Lemo Link
HS300-0210/3	LMF4 4ch. FE/PC+LEMO/SYNC/HPO	LMF4 4ch. FE/USB,IEEE1394,GigE/PC+LEMO/SYNC/HPO		
HS300-0220/3	LMF4 4ch. FE+REC/SYNC/HPO	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/SYNC/HPO		
HS300-0230/3	LMF4 4ch. FE+REC/SAS/SYNC/HPO	LMF4 4ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/SYNC/HPO		
HS300-04xx/1	LMF8 wie xx /Sync Option	8 channel Link Modul xx with Sync. Option	wie HS300-04xx/0	
HS300-0400/1	LMF8 8ch. FE/SYNC	LMF8 8ch. FE/USB,IEEE1394,GigE/PC/SYNC	plus sync option	Lemo Link
HS300-0410/1	LMF8 8ch. FE/PC+LEMO/SYNC	LMF8 8ch. FE/USB,IEEE1394,GigE/PC+LEMO/SYNC		
HS300-0420/1	LMF8 8ch. FE+REC/SYNC	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/SYNC		
HS300-0430/1	LMF8 8ch. FE+REC/SAS/SYNC	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/SYNC		
HS300-04xx/2	LMF8 wie xx / HPO Option	8 channel Link Modul xx with HPO Option	wie HS300-04xx/0	
HS300-0400/2	LMF8 8ch. FE/HPO	LMF8 8ch. FE/USB,IEEE1394,GigE/PC/HPO	plus HPO option	intern
HS300-0410/2	LMF8 8ch. FE/PC+LEMO/HPO	LMF8 8ch. FE/USB,IEEE1394,GigE/PC+LEMO/HPO		
HS300-0420/2	LMF8 8ch. FE+REC/HPO	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/HPO		
HS300-0430/2	LMF8 8ch. FE+REC/SAS/HPO	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/HPO		
HS300-04xx/3	LMF8 wie xx / HPO Option "+ Sync option"	8 channel Link Modul xx with HPO Option "+ Sync option"	wie HS300-04xx/0 plus HPO option	intern
HS300-0400/3	LMF8 8ch. FE/SYNC/HPO	LMF8 8ch. FE/USB,IEEE1394,GigE/PC/SYNC/HPO	syn option	Lemo Link
HS300-0410/3	LMF8 8ch. FE/PC+LEMO/SYNC/HPO	LMF8 8ch. FE/USB,IEEE1394,GigE/PC+LEMO/SYNC/HPO		
HS300-0420/3	LMF8 8ch. FE+REC/SYNC/HPO	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/PC+LEMO/SYNC/HPO		

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HS300-0430/3	LMF8 8ch. FE+REC/SAS/SYNC/HPO	LMF8 8ch. FE+REC/USB,IEEE1394,GigE/SAS/PC+LEMO/SYNC/HPO			
HS610-3001/1	Link modul GSS	4 channel Link Modul for GSS	Firewire	IEEE1394	or Lemo PC
			USB Target	USB Target	or Lemo PC
			USB Host	USB Host	
			Ethernet	RJ45	or Lemo PC
			Service	Service	
			contact Remote	Lemo C-Rem	
			RS232	Lemo PC	
			RS422	Lemo PC	
			time IRIG / GPS	Lemo time	
			SAS/SATA	Lemo PC	
			Sync option	Lemo Link	
HS610-3001/3	Link Modul GSS with HPO option	4 channel Link Modul for GSS with HPO option	wie HS610-3001/1 plus HPO option		intern

## 9) Appendix

### Connectors:

#### AxDIC24 – 24 Channel Analog Input Module Connector

Pin	Function	Description
2	ANIN1	Channel 1 Analog Input
3	ANINGND1	Channel 1 Analog Ground
18	ANIN2	Channel 2 Analog Input
19	ANINGND2	Channel 2 Analog Ground
34	ANIN3	Channel 3 Analog Input
35	ANINGND3	Channel 3 Analog Ground
38	ANIN4	Channel 4 Analog Input
39	ANINGND4	Channel 4 Analog Ground
22	ANIN5	Channel 5 Analog Input
23	ANINGND5	Channel 5 Analog Ground
6	ANIN6	Channel 6 Analog Input
7	ANINGND6	Channel 6 Analog Ground
10	ANIN7	Channel 7 Analog Input
11	ANINGND7	Channel 7 Analog Ground
26	ANIN8	Channel 8 Analog Input
27	ANINGND8	Channel 8 Analog Ground
42	ANIN9	Channel 9 Analog Input
43	ANINGND9	Channel 9 Analog Ground
46	ANIN10	Channel 10 Analog Input
47	ANINGND10	Channel 10 Analog Ground
30	ANIN11	Channel 11 Analog Input
31	ANINGND11	Channel 11 Analog Ground
14	ANIN12	Channel 12 Analog Input
15	ANINGND12	Channel 12 Analog Ground
4	ANIN13	Channel 13 Analog Input
5	ANINGND13	Channel 13 Analog Ground
20	ANIN14	Channel 14 Analog Input
21	ANINGND14	Channel 14 Analog Ground
36	ANIN15	Channel 15 Analog Input
37	ANINGND15	Channel 15 Analog Ground
40	ANIN16	Channel 16 Analog Input

41	ANINGND16	Channel 16 Analog Ground
24	ANIN17	Channel 17 Analog Input
25	ANINGND17	Channel 17 Analog Ground
8	ANIN18	Channel 18 Analog Input
9	ANINGND18	Channel 18 Analog Ground
12	ANIN19	Channel 19 Analog Input
13	ANINGND19	Channel 19 Analog Ground
28	ANIN20	Channel 20 Analog Input
29	ANINGND20	Channel 20 Analog Ground
44	ANIN21	Channel 21 Analog Input
45	ANINGND21	Channel 21 Analog Ground
48	ANIN22	Channel 22 Analog Input
49	ANINGND22	Channel 22 Analog Ground
32	ANIN23	Channel 23 Analog Input
33	ANINGND23	Channel 23 Analog Ground
16	ANIN24	Channel 24 Analog Input
17	ANINGND24	Channel 24 Analog Ground
1	Case	Shield
50	Case	Shield

<b>Connector</b>	<b>Mate Connector</b>
D-Type 50 Pin Socket (female)	D-Type 50 Pin Plug (male)

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