



DEWETRON

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# HSI-HV Module

TECHNICAL REFERENCE MANUAL

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## WELCOME TO THE WORLD OF DEWETRON!

Congratulations on your new device! It will supply you with accurate, complete and reproducible measurement results for your decision making.

Look forward to the easy handling and the flexible and modular use of your DEWETRON product and draw upon more than 30 years of DEWETRON expertise in measurement engineering.



ISO9001



**THE MEASURABLE DIFFERENCE.**

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**Warranty Information:**

A copy of the specific warranty terms applicable to your DEWETRON product and replacement parts can be obtained from your local sales and service office.

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8074 Grambach  
Austria

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# ▼ Notice

## Safety symbols in the manual

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*Indicates hazardous voltages.*

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**WARNING** *Calls attention to a procedure, practice, or condition that could cause bodily injury or death.*

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**CAUTION** *Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.*

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### **WARNINGS**

*The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. DEWETRON Elektronische Messgeraete Ges.m.b.H. assumes no liability for the customer's failure to comply with these requirements.*

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**All accessories shown in this document are available as option and will not be shipped as standard parts.**

## Safety instructions for DEWETRON amplifiers

- The DEWETRON data acquisition systems and amplifiers may only be installed by experts.
- Read your manual carefully before operating.
- Observe local laws when using the amplifiers.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.
- DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.
- No modifications are allowed at the amplifiers.
- DO NOT service or adjust alone. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a DEWETRON sales and service office for service and repair to ensure that safety features are maintained.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- Safety of the operator and the unit depend on following these rules.

# ▼ Support

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For any support please contact your local distributor first or DEWETRON directly.

For Asia and Europe, please contact:

DEWETRON GmbH  
Parkring 4  
8074 Grambach  
AUSTRIA  
Tel.: +43 316 3070  
Fax: +43 316 307090  
Email: [support@dewetron.com](mailto:support@dewetron.com)  
Web: <http://www.dewetron.com>

The telephone hotline is available Monday to Friday between 08:00 and 12:00 CET (GMT -1:00) and Monday to Thursday between 13:00 and 17:00 CET.

For the Americas, please contact:

DEWETRON, Inc.  
2850 South County Trail, Unit 1  
East Greenwich, RI 02818  
U.S.A.  
Tel.: +1 401 284 3750  
Toll-free: +1 866 598 3393  
Fax: +1 401 284 3755  
Email: [us.support@dewetron.com](mailto:us.support@dewetron.com)  
Web: <http://www.dewetron.us>

The telephone hotline is available Monday to Friday between 08:00 and 17:00 GST (GMT +5:00)

# General Module Information

## Calibration information

All DEWETRON modules are calibrated at 25 °C after a warmup time of 30 minutes and meet their specifications when leaving the factory.

The time interval for recalibration depends on environmental conditions. Typically, the calibration should be checked once a year.

Calibration certificates are available from DEWETRON as an option. DEWETRON offers two types:

- ISO traceable DEWETRON certificate
- Calibration certificate according to ÖKD (equivalent to DKD)

This manual contains no calibration information. For self calibration, there is a separate calibration kit for the DAQ series modules available. The CAL-KIT contains the required cables, software and instructions.

## General module specifications

Module dimensions: 20 x 65 x 105 mm (0.79 x 2.56 x 4.13 in.)  
(W x H x D without front cover and connectors)

Frontcover: 20 x 87 x 2 mm (0.79 x 3.43 x 0.08 in.)  
(W x H x D without connector)

Environmental:

Temp. range storage: -30 °C to +85 °C (-22 °F to 185 °F)

Temp. range operating: -5 °C to +60 °C (23 °F to 140 °F)

Relative humidity

(MIL202): 0 to 95 % at 60 °C, non-condensing (unless otherwise noticed)

RFI susceptibility: ±0.5 % span error at 400 MHz, 5 W, 3 m

*All specifications within this manual are valid at 25 °C!*

All modules are produced according ISO9001 and ISO14001.

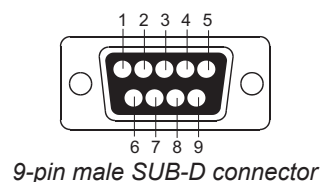
## Module connectors

Frontpanel connector: Accessable to the user. The connector type and pin assignment varies from module to module. Detailed pin assignment of each module is shown in the appropriate module description.

Rear connector: 9-pin male SUB-D, interface to the DEWE-System, not accessable to the user.



HSI/DAQx and PAD module  
rear view



Interface pin assignment:

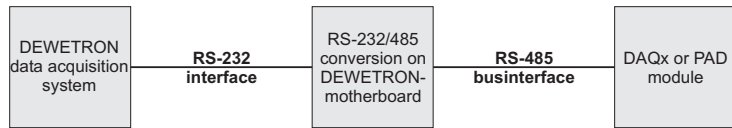
- 1 Module output ( $\pm 5$  V)
- 2 RS-485 (A)
- 3 RS-485 (B)
- 4 GND
- 5 +9 V power supply
- 6 +12 V power / sensor supply
- 7 Module input (from D/A converter of the A/D board)<sup>1)</sup>
- 8 reserved
- 9 -9 V power supply

<sup>1)</sup> Triggerout at DAQP-FREQ-A

# General Module Information

## RS-232/485 interface

HSI/DAQP modules can be configured via RS-485 interface, PAD modules require this interface for all data transfers.



For all DEWETRON systems, an internal RS-232/485 converter is available

(standard with DEWE-800, -2000, -2500, -3000, -4000, -5000 series systems). This converter allows communication with HSI/DAQP and PAD modules.

To communicate with the modules, the RS-232 interface has to be set to the following parameters:

baud rate:	9600 bps
data bits:	8
parity:	no parity
stop bits:	1
handshake:	not required

## HSI/DAQP module configuration

### 1. Push button selection

All ranges and filters can be selected directly by pressing the push buttons on the module. Approx. 15 sec. after changing range and / or filter, the range and filter information is stored in an EEPROM. This procedure increases the lifetime of the EEPROM.

The current input range setting is shown all the time by LED. To change the range just press **RANGE** button a few times until the required range is displayed.

To see the current filter setting just press the **FILTER** button once. The corresponding LED is flashing for approx. 3 seconds. Within this time, the filter can be selected by pressing the **FILTER** button again. Approx. 3 seconds after the last key activity, the information will be stored, the LED stops flashing and shows the input range again.

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**CAUTION:** Power loss during this time leaves the module in the former settings.

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### 2. RS-232/485 programming

All ranges and filters can also be selected via RS-232/485 interface. All new DEWE-800, -2000, -2500, -3000, -4000, -5000 series systems are prepared as a standard to work with HSI/DAQP modules.

The easiest way to change the configuration is to use the DEWEConfig software, which comes as a standard with the DEWETRON data acquisition system.

Detailed information about HSI/DAQP modules programming for customer applications is available in the *DEWE-Modules Programmers Reference Manual*.

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**CAUTION:** All range and filter changes which are done via RS-232/485 interface are not stored in the EEPROM of the HSI/DAQP modules! You have to store this information in a separat initialisation file to keep settings information for next system start!

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## PAD module communication

All PAD modules are only working through the RS-232/485 interface. All new DEWE-800, -2000, -2500, -3000, -4000, -5000 series systems are prepared as a standard to work with PAD modules. The easiest way to change the configuration is to use the DEWEConfig software, which comes as a standard with the DEWETRON data acquisition system.

Detailed information about PAD modules programming for customer applications is available in the *DEWE-Modules Programmers Reference Manual*.

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## Isolated high voltage amplifier

- Input ranges: 1400 V to 20 V
- Bandwidth: 2 MHz
- Isolation: 1.8 kV<sub>RMS</sub> line to line  
1.4 kV<sub>RMS</sub> line to ground
- Input resistance: 10 MΩ
- Protection: ±4 kV surge / burst



## Module specifications

HSI-HV	
Input ranges	±20 V <sup>1)</sup> , ±50 V <sup>1)</sup> , ±100 V, ±200 V, ±400 V, ±800 V, ±1400 V
1 year accuracy <sup>2)</sup>	Range                      Signal frequency                      Accuracy
	20 V; 50 V                      DC                      ±0.05 % of reading ±60 mV
100 V to 1400 V	DC                      ±0.05 % of reading ±0.05 % of range
	0.1Hz to 500 Hz                      ±0.05 % of reading ±0.05 % of range
	>500 Hz to 5 kHz                      ±0.1 % of reading ±0.05 % of range
	>5 kHz to 50 kHz                      ±0.4 % of reading ±0.05 % of range
	>50 kHz to 100 kHz                      ±(0.016*f) % of reading ±0.1 % of range
	>100 kHz to 2 MHz                      ±(0.010*f) % of reading ±1 % of range ±(0.014*f) % of reading ±3 % of range f = signal frequency in kHz
Gain linearity	0.05 %
Gain drift range	Typically 20 ppm/°C (max. 50 ppm/°C)
Offset drift	
20 V to 100 V	typical 1.5 mV/°C of range                      max. 4 mV/°C
200 V to 1400 V	typical 5 ppm/°C                      max. 20 ppm of range/°C
Long term stability	100 ppm/sqrt (1000 hrs)
Input resistance	10 MΩ    2.2 pF
-3 dB Bandwidth	2 MHz
Signal delay @ full bandwidth	approx. 390 ns
Filter selection	Push button or software
Filter (lowpass)	100, 300, 1k, 3k, 10k, 30k, 100k, 300 kHz, 1 MHz, 2 MHz <sup>3)</sup>
Filter type	Bessel or Butterworth 40 dB/decade
Filter characteristics	
100 Hz to 1 MHz	Butterworth or Bessel 40 dB/dec (2 <sup>nd</sup> order; ±1.5 dB @ f <sub>0</sub> )
2 MHz	Butterworth 60 dB/dec (3 <sup>rd</sup> order; 0 to -3 dB @ 2 MHz)
Typical SFDR and SNR	
	10kHz bandwidth                      100kHz bandwidth                      1MHz bandwidth                      2 MHz bandwidth
	SFDR                      SNR                      SFDR                      SNR                      SFDR                      SNR                      SFDR                      SNR
50 V	110 dB                      91 dB                      110 dB                      82 dB                      94 dB                      76 dB                      84 dB                      73 dB
400 V	110 dB                      95 dB                      110 dB                      92 dB                      94 dB                      82 dB                      84 dB                      77 dB
1400 V	110 dB                      95 dB                      110 dB                      95 dB                      94 dB                      82 dB                      84 dB                      77 dB
Typical CMRR	>80 dB @ 50 Hz                      60 dB @ 1 kHz 70 dB @ 400 Hz                      48 dB @ 10 kHz
Isolation voltage	Line to Ground 1.4 kVrms Line to Line 1.8 kVrms
Protection	CAT III 600 CAT IV 300
Surge (1.2/50)	±4000 V
Burst (5 kHz)	±4000 V
Output voltage	±5 V
Output resistance	10 Ohm
Output current maximum	35 mA                      CAUTION: do not exceed maximum output current!
Power supply	±9 V <sub>DC</sub> ± 1%
Power consumption	1.2 W
Power On default settings	Software programmable
Special functions	Integrated temperature sensor
Programming interface	RS-485
<sup>1)</sup> 20 V and 50 V are auxiliary ranges and have a limited bandwidth. 20 V range typically 0.9 Mhz 50 V range typically 1.9 Mhz	
<sup>2)</sup> Conditions for accuracy: Module temperature is calibration temperature ±5 °C; humidity is 30 to 90 RH; AC accuracy: the highest filter (2 Mhz) has to be activated. f = signal frequency in kHz. for the 2 year accuracy multiply all % of range and % of reading values by 1.5.	
<sup>3)</sup> 2 MHz filter: exclusively Butterworth 60 dB/decade. Please consider possible bandwidth limitation of further components in the measuring chain, e.g. A/D cards or signal conditioning mainframe	

# HSI-HV

## Front panel control

### LED indication:

The HSI-HV series module has a set of 8 LEDs showing the current input range (constant active) and filter range (flashing) setting.

Filter	Range	Filter [ Hz ]	Range	Filter
20 Hz	1400 V	20 1k4	100 V	$10^5$
10 Hz	800 V	10 800	50 V	$10^4$
3 Hz	400 V	3 400	20 V	$10^3$
1 Hz	200 V	1 200		$10^2$

### Push button operation:

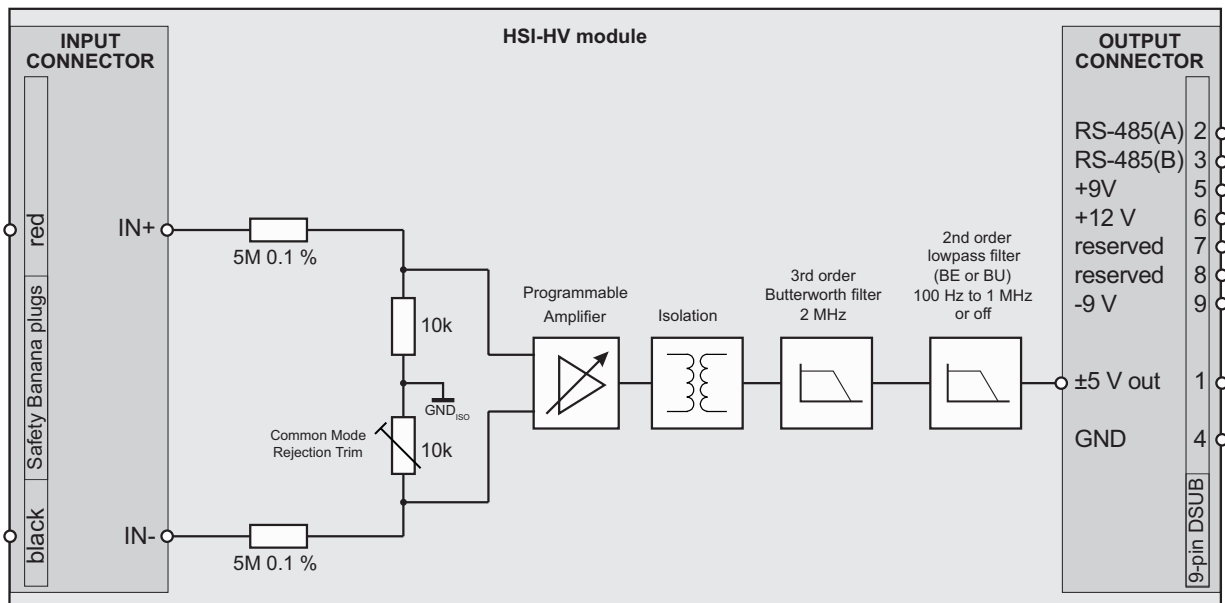
- Select range:** Push the **RANGE** button several times shortly until the LED displays the desired input range.
- Select filter:** Push the **FILTER** button once - the LEDs will flash for approx. 3 seconds and display the current filter setting. Push the **FILTER** button within the three seconds several times until the flashing LED displays the desired filter range.

## Power On Default function

You can store the actual settings of the module in the internal EE-Prom memory. Once the module restarts, it comes up automatically with these setting. This is important for stand alone applications and for fail save reasons. If the function is deactivated the module automatically remembers the last pushbutton selected range and filter.

## Block diagram

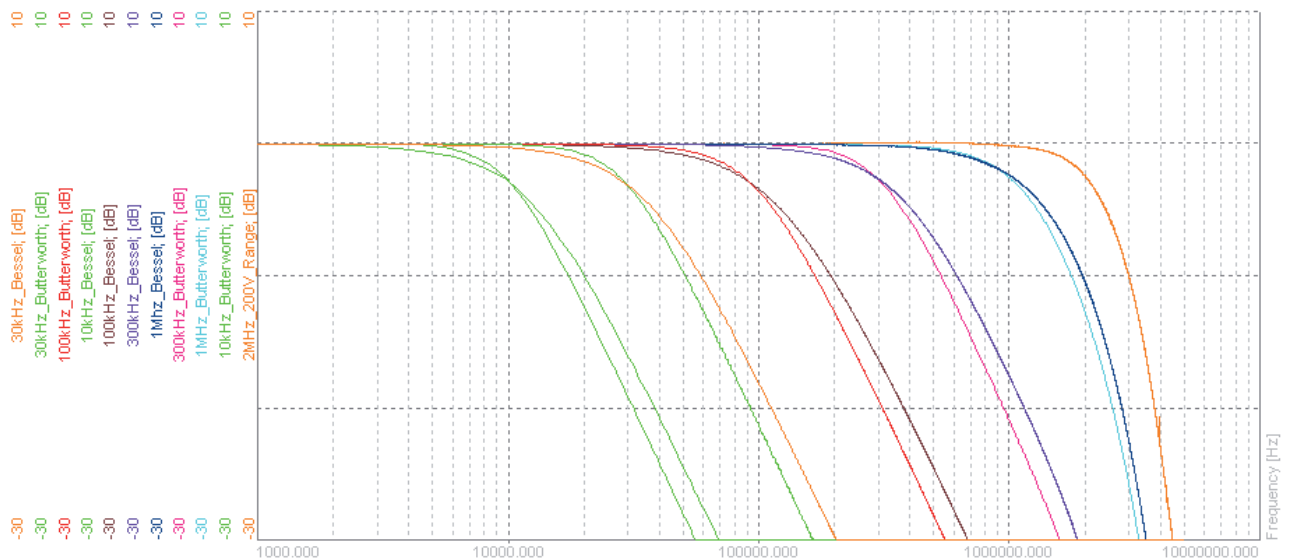
The basic block diagram of the HSI-HV gives an idea of the internal structure.



## Filter

The module has 9 selectable low pass filters from 100 Hz to 1 MHz. The filter characteristic could be chosen between Butterworth 2<sup>nd</sup> order or Bessel 2<sup>nd</sup> order. The highest filter is a 3<sup>rd</sup> order filter with a guaranteed -3 dB bandwidth of 2 MHz. This filter structure is the same for all HSI modules.

Typical filter transfer function:



## AC accuracy with activated filter

With activated hardware filter an additional % of reading error has to be considered due to the damping of the filter. This error depends on the signal frequency  $f$  and the selected filter frequency  $f_0$ .

Frequency	additional error with activated Butterworth filter	additional error with activated Bessel filter
$f/f_0$	% of reading	% of reading
<0.1	0	0
0.01	0.00	0.00
0.02	0.00	0.02
0.03	0.00	0.04
0.05	0.00	0.11
0.1	0.01	0.47
0.2	0.14	1.9
0.3	0.73	4.3
0.5	5.24	12
0.75	20.34	25
1	40.45	40.45



# HSI-HV

## HSI Ready

Please ensure that also the Hardware that carries the HSI Module is not limiting the 2 MHz bandwidth.

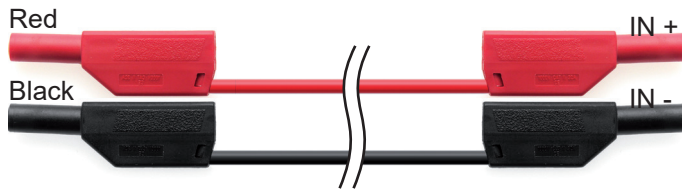
Older systems may have a fix installed 350 kHz filter. The HSI series modules will also work in these systems, but the bandwidth will be limited to the system bandwidth.



## Signal connection

### HSI-HV module

Voltage measurement via banana plug cords



*Voltage measurement up to  $\pm 1000$  V  
only with safety banana plug cords!*

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# CE-Certificate of conformity



Manufacturer:

**DEWETRON GmbH**

Address:

**Parking 4  
8074 Grambach, Austria**

Tel.: +43 316 3070 0

Fax: +43 316 3070 90

e-mail: sales@dewetron.com

<http://www.dewetron.com>

Name of product:

**DEWE-MODULES**

Kind of product:

*Signal conditioning modules*

The product meets the regulations of the following EC-directives:

**73/23/EEC**

**"Directive on the approximation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits amended by the directive 93/68/EEC"**

**89/336/EEC**

**"Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility amended by the directives 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC"**

The accordance is proved by the observance of the following standards:

<b>L V E M C</b>	<b>Safety</b>	IEC/EN 61010-1:1992/93 IEC 61010-1:1992/300 V CATIII Pol. D. 2 IEC/EN 61010-2-031 IEC 1010-2-031
	<b>Emissions</b>	EN 61000-6-4 EN 55011 Class B
	<b>Immunity</b>	EN 61000-6-2 Group standard

**Graz, April 28, 2010**

Place / Date of the CE-marking

Dipl.-Ing. Roland Jeutter / Managing director

▼  
Notes

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