



DEWETRON

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# DAQP-LV 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.

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ISO9001



**THE MEASURABLE DIFFERENCE.**

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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.

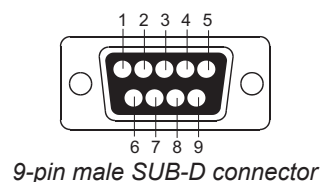
## Module connectors

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 accessible to the user.



HSI/DAQx and PAD module  
rear view



Interface pin assignment:

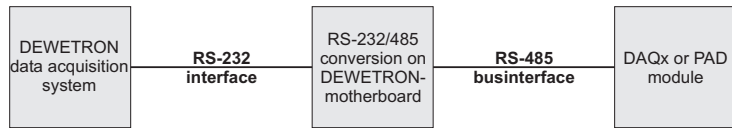
- 1 Module output ( $\pm 5$  V)
- 2 RS-485 (A)
- 3 RS-485 (B)
- 4 GND
- 5 +9 V power supply
- 6 +12 V power / sensor supply
- 7 Module input (from D/A converter of the A/D board)<sup>1)</sup>
- 8 reserved
- 9 -9 V power supply

<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 voltage amplifier

- Filter bandwidth: 300 kHz, 10 selectable lowpass filters
- Input ranges: 12 ranges (10 mV to 50 V)
- Input type: AC and DC coupling software selectable
- TEDS: Supports electronic data sheet sensors
- Signal connection:
  - DAQP-LV-B: Banana plugs
  - DAQP-LV-BNC: BNC connector
  - DAQP-LV-D: 9-pin D-SUB connector
  - DAQP-LV-LEMO: 7-pin LEMO connector (non-standard version)
  - DAQP-LV-SC: Screw terminals (non-standard version)



## Module specifications

DAQP-LV	
Input ranges unipolar and bipolar	10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2.5 V, 5 V, 10 V, 25 V, 50 V
Push button selectable ranges	10 mV, 50 mV, 200 mV, 1 V, 5 V, 10 V, 50 V
Rated input voltage	33 V <sub>RMS</sub> ; 46.7 V <sub>PEAK</sub> ; 70 V <sub>DC</sub> according to EN-61010-1 and EN-61010-2-30
Accuracy <sup>(1)</sup>	
Unipolar	
10 mV to 50 mV	DC ±0.04 % of reading ±40 µV
100 mV to 50 V	DC ±0.04 % of reading ±0.05 % of range
Bipolar	
10 mV to 50 mV	DC ±0.02 % of reading ±40 µV
	1 Hz to 1 kHz ±0.12 % of reading ±0.1 % of range ±40 µV
	1 kHz to 10 kHz ±0.32 % of reading ±0.1 % of range ±40 µV
100 mV to 50 V	DC ±0.02 % of reading ±0.05 of range
	1 Hz to 1 kHz ±0.12 % of reading ±0.15 of range
	1 kHz to 10 kHz ±0.32 % of reading ±0.15 of range
Input coupling	DC or AC software selectable (1.5 Hz standard, custom on request down to 0.01 Hz)
Gain linearity	0.01 % of full scale
Gain drift range	Typically 10 ppm/°K (max. 20 ppm/°K)
Offset drift	Uni- and bipolar
10 mV to 200 mV	3 µV/°K
500 mV to 50 V	10 ppm of Range/°K
Long term stability	100 ppm/sqrt (1000 hrs)
Input resistance	1 MOhm
Bandwidth (-3 dB)	300 kHz
Filter selection	Push button or software
Filters (low pass)	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz
Filter characteristics	10 Hz to 100 kHz: Butterworth or Bessel 40 dB/dec (2nd order; ±1.5 dB @ f0) 300 kHz: Bessel 60 dB/dec (3rd order; 0 to -3 dB @ 300kHz)
Typical SFDR and SNR:	
	300 kHz bandwidth      100 kHz bandwidth      10 kHz bandwidth
	SFDR      SNR      SFDR      SNR      SFDR      SNR
20 mV	100 dB      72 dB      98 dB      76 dB      97 dB      84 dB
1 V	102 dB      82 dB      99 dB      93 dB      97 dB      96 dB
50 V	102 dB      82 dB      99 dB      93 dB      97 dB      96 dB
Typical CMRR	10 mV to 1 V range: 2.5 V to 50 V range: >100 dB @ 50 Hz      90 dB @ 50 Hz >100 dB @ 1 kHz      65 dB @ 1 kHz 83 dB @ 10 kHz      55 dB @ 10 kHz
Input overvoltage protection	350 V <sub>DC</sub>
Isolation voltage	1 kV <sub>RMS</sub> <sup>(2)</sup>
Sensor supply	±9 V (±1 %), 12 V (±5 %), 200 mA resettable fuse protected <sup>(2)</sup>
Output voltage	±5 V

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# DAQP-LV

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Output resistance	<10 Ohm
Maximum output current	5 mA
Output protection	Short to ground for 10 sec.
Power On default settings	Software programmable
Power supply	$\pm 9 V_{DC} \pm 1 \%$
Power consumption	1.05 W without sensor supply
RS-485 interface	Yes
TEDS	Hardware support for TEDS (Transducer Electronic Data Sheet)
Supported TEDS chips	DS2406, DS2430A, DS2432, DS2433, DS2431
Supported MSI	MSI-V-ACC; MSI-V-RTD, MSI-V-CH-50
<sup>1)</sup> Conditions for accuracy: Module temperature is calibration temperature $\pm 5 \text{ }^\circ\text{C}$ ; humidity is 30 to 90 RH; AC accuracy: the highest filter (300 kHz) must be activated. For the 2 year accuracy multiply all % of range and % of reading values by 1.5	
<sup>2)</sup> Although the rated input voltage is $33 V_{RMS}$ , $46.7 V_{PEAK}$ or $70 V_{DC}$ according to EN-61010-1 and EN-61010-2-30, the galvanic isolation has been tested with $1 kV_{RMS}$ for 1 min.	
<sup>3)</sup> Overall current should not exceed DEWE-30-xx maximum power.	

## LED state

The DAQP-LV modules have a set of 8 LEDs showing the current input range (constant active), the filter range (flashing) and the input mode setting. Seven of the different input ranges are indicated directly by the LEDs. The additional four input ranges (only software selectable) are indicated by lightening the two "neighbour" ranges. For example the 25 V input range is shown by the LEDs 50 V and 10 V.

Due to the large number of low pass filters, two LEDs are used to display the current frequency. The left LED indicates the multiplier, the right one shows the exponent with the base of 10. Example: for the 10 kHz frequency range, the lower left and the upper right LED are flashing ( $1 \times 10^4 \text{ Hz} = 10\,000 \text{ Hz}$ ).

The U/B LED shows the input mode: If this LED is off, the bipolar input range is selected, otherwise the unipolar mode is selected.

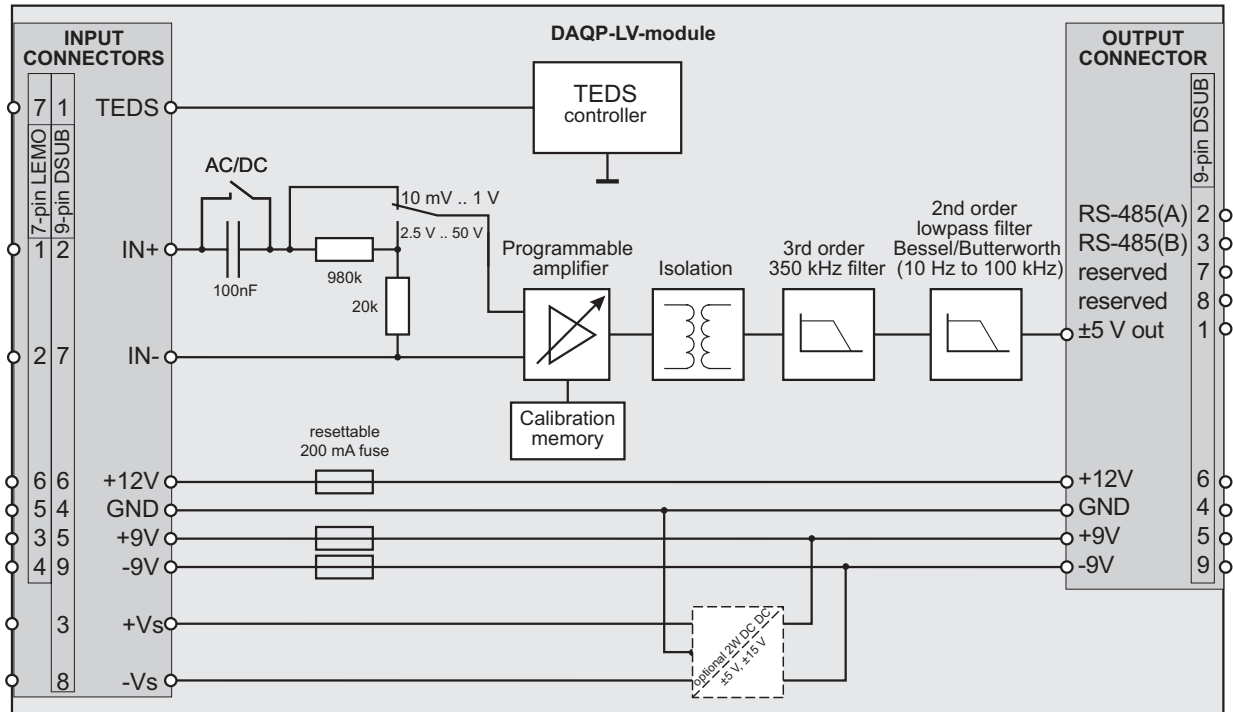
## Input range and filter selection

The DAQP-LV module has two push buttons with multiple functions.

- Range button:** Push the **RANGE** button several times until the LED displays the desired input range.  
  
Pressing the **RANGE** button for more than three seconds changes the input mode from bipolar to unipolar.
- Filter button:** 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.

## Block diagram

The base block diagram of the DAQP-LV gives an idea of the internal structure.



**CAUTION: TEDS terminal is not isolated!**

## 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  $f_0$ .

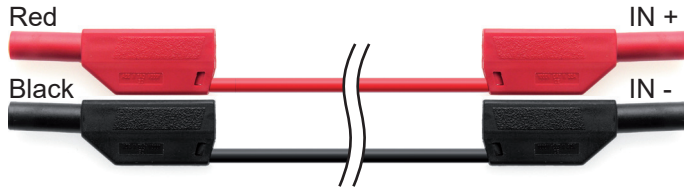
Frequency	additional error with activated Butterworth filter	additional error with activated Bessel filter
$f/f_0$	% of reading	% of reading
<0.1	0	0
0.01	0.00	0.00
0.02	0.00	0.02
0.03	0.00	0.04
0.05	0.00	0.11
0.1	0.01	0.47
0.2	0.14	1.9
0.3	0.73	4.3
0.5	5.24	12
0.75	20.34	25
1	40.45	40.45

# DAQP-LV

## Signal connection

### DAQP-LV-B module

Voltage measurement via banana plug cords



### DAQP-LV-BNC module

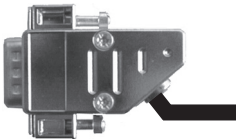
Voltage measurement via BNC cord



Hot: IN +  
Shield: IN -

### DAQP-LV-D module

Voltage measurement via D-SUB cord



- 1 TEDS
- 2 IN +
- 3 Reserved for custom sensor supplies
- 4 GND (not isolated)
- 5 +9 V (200 mA max.)
- 6 +12 V (200 mA max.; +15 V in conjunction with a DEWE-30-4)
- 7 IN -
- 8 Reserved for custom sensor supplies
- 9 -9 V (200 mA max.)



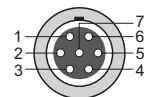
**If signals above 60 V may appear, don't use the metal housing of D-SUB connector!**

### DAQP-LV-LEMO module (EoL: 01/2017)

Voltage measurement via LEMO cord



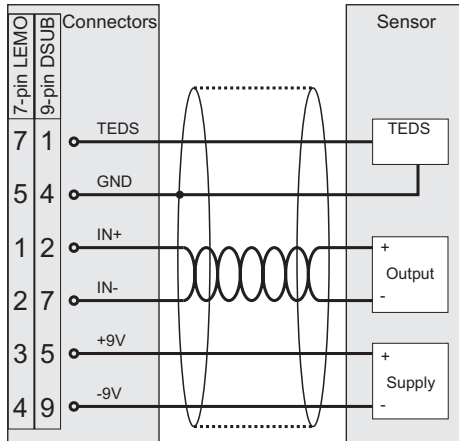
- 1 IN +
- 2 IN -
- 3 +9 V (200 mA max.)
- 4 -9 V (200 mA max.)
- 5 GND
- 6 +12 V (200 mA max.; +15 V in conjunction with a DEWE-30-4)
- 7 TEDS



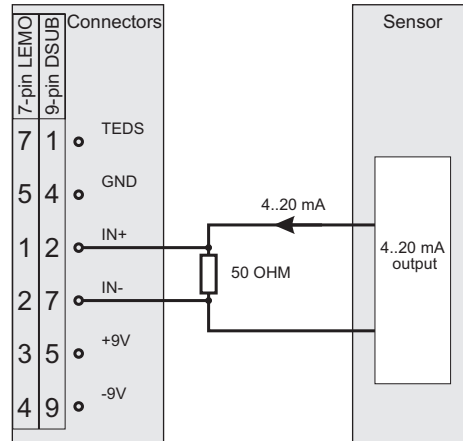
7-pin LEMO connector female  
EGG.1B.307

## Typical sensor connection

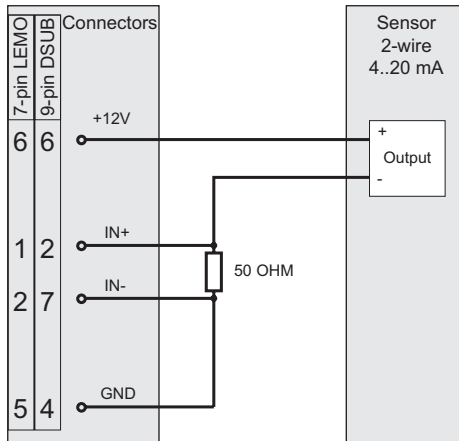
*Sensor with differential output powered by the module*



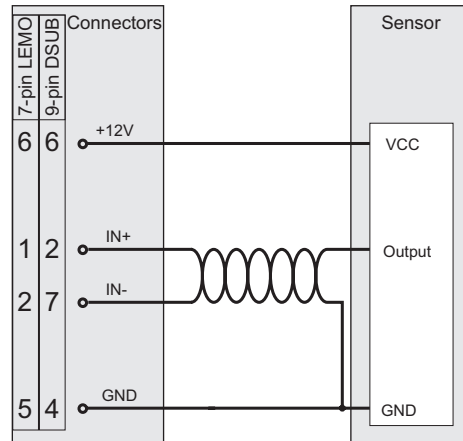
*Current measurement*



*Loop powered sensor*



*Sensor with common ground*



▼  
DAQP-LV

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Notes

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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

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Notes

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