



Automotive
Energy & Power Analysis
Aerospace
Transportation
General Test & Measurement

DEWE-31-64

Technical reference manual



Re-inventing Data Acquisition



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Thank you!

Thank you very much for your investment in DEWETRON's unique data acquisition systems. These are top-quality instruments which are designed to provide you years of reliable service. This guide has been prepared to help you get the most from your investment, starting from the day you take it out of the box, and extending for years into the future.

This guide includes important startup notes, as well as safety notes and information about keeping your DEWETRON system in good working condition over time.

We strongly suggest that you read this entire manual, especially the safety and care sections, as well as to avoid damaging your DEWETRON system.

What is the DEWE-31-64?

This product is used for measuring of different physical and/or electrical sizes (depending on model or configuration). The connection is depending on model or configuration and takes place via safety banana plugs, BNC connectors ($\pm 50V$ max.), D-SUB connectors ($\pm 50V$ max.), thermocouple connectors ($\pm 50V$ max.), BINDER® connectors ($\pm 50V$ max.) or LEMO® connectors.

Preface

Notes

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Training

DEWETRON offers training at various offices around the world several times each year. DEWETRON headquarters in Austria have a very large and professional conference and seminar center, where training classes are conducted on a regular basis starting with sensors and signal conditioning, A/D technology and software operation. For more information about training services, please visit:
<http://www.dewetron.com/support/training>

Dewetron Inc. in the USA also has a dedicated training facility connected to its headquarters, located in Rhode Island. For more information about training services in the US, please visit:
<http://www.dewamerica.com/support/training>

Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your DEWETRON data acquisition system is delivered, it is calibrated at our DEWETRON headquarter. Each of this system is delivered with a certificate of compliance with our published specifications. Detailed calibration reports from our calibration system are available for purchase with each order. We retain them for at least one year, so calibration reports can be purchased for up to one year after your system was delivered.

Support

DEWETRON has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or DEWETRON directly.

For Asia and Europe, please contact:

DEWETRON Ges.m.b.H.
Parkring 4
A-8074 Graz-Grambach
AUSTRIA
Tel.: +43 316 3070
Fax: +43 316 307090
Email: support@dewetron.com
Web: <http://www.dewetron.com>

The telephone hotline is available
Monday to Friday between
08:00 and 17:00 CET (GMT +1:00)

For the Americas, please contact:

DEWETRON, Inc.
10 High Street, Suite K
Wakefield, RI 02879
U.S.A.
Tel.: +1 401 284 3750
Toll-free: +1 877 431 5166
Fax: +1 401 284 3755
Email: support@dewamerica.com
Web: <http://www.dewamerica.com>

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

Service/repairs

The Team of DEWETRON also performs any kinds of repairs to your system to assure a safe and proper operation in future. For information regarding service and repairs please contact your local distributor first or DEWETRON directly.

Notice

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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.

Restricted Rights Legend

Use austrian law for duplication or disclosure.

DEWETRON GesmbH
Parkring 4
A-8074 Graz-Grambach / Austria

Printing History

Please refer to the page bottom for printing version.

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Safety instructions

Safety symbols in the manual



Indicates hazardous voltages.

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

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

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.

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



*For safety reasons max. 50 V may be applied to the BNC input-connectors!
Refer to the regulation of maximum allowable touch potential.*

Safety instructions

Your safety is our primary concern! Please be safe!

General safety and hazard warnings for all DEWETRON systems

- Use this system under the terms of the specifications only to avoid any possible danger.
- Maintenance will be executed by qualified staff only.
- During the use of the system, it might be possible to access another parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advices for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- The system is grounded via a protective conductor in the power supply cord. To avoid electric shocks, the protective conductor has to be connected with the ground of the power network. Before connecting the input or output connectors of the system, make sure that there is a proper grounding to guarantee potential free usage. For countries, in which there is no proper grounding, please refer to your local legally safety regulations for safety use.

DC systems: Every DC system has a grounding connected to the chassis (yellow/green safety banana plug).

- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please carefully read the corresponding specifications in the product manual.
- The inputs are not, unless otherwise noted (CATx identification), for connecting to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorised personnel only.
- Any use in wet rooms, outdoors or in adverse environmental condition is not allowed!
Adverse environmental conditions are:
 - Moisture or high humidity
 - Dust, flammable gases, fumes or dissolver
 - Thunderstorm or thunderstorm conditions (except assembly PNA)
 - Electrostatic fields, et cetera.
- The measurement category can be adjusted depending on module configuration.
- Any direct voltage output is protected with a fuse against short cut and reverse-polarity, but is NOT galvanically isolated (except it is explicit marked on the system).
- The system must be connected and operated to an earthed wall socket at the AC mains power supply only (except for DC systems).
- Any other use than described above may damage your system and is attended with dangers like shortcut, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened (except for changing DAQ, DAQP, PAD modules).

Safety instructions

- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore, if
 - the system is damaged obviously or causes strange noises.
 - the system does not work anymore.
 - the system has been exposed to long storage in adverse environmental.
 - the system has been exposed to heavy shipment strain.
 - DO NOT touch any exposed connectors or components if they are live wired. The use of metal bare wires is not allowed. There is a risk of short cut and fire hazard!
 - Warranty void if damages caused by disregarding this manual. For consequential damages NO liability will be assumed!
 - Warranty void if damages to property or persons caused by improper use or disregarding the safety instructions.
 - Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE). Exception: changing modules like DAQ, DAQP or PAD.
 - The assembly of the system is equivalent to protection class I. For power supply, only the correct power socket of the public power supply must be used, except the system is DC powered.
 - Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
 - The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not covered!
 - Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
 - Prevent using metal bare wires! Risk of short cut and fire hazard!
 - DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy overvoltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
 - Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
 - DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
 - Avoid operation in the immediate vicinity of:
 - high magnetic or electromagnetic fields
 - transmitting antennas or high-frequency generators
- For exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned to the specification of the system only. Fire hazard in case of overload!
 - Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
 - Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even the system has been removed from the power supply.
 - The electrical installations and equipments in industrial facilities must be observed by the security regulations and insurance institutions.

Safety instructions

- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use at humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already lower level may damage your system. For exact values please refer to enclosed specifications.
- Please also consider the detailed technical reference manual as well as the security advices of the connected systems.

This product has left the factory in safety-related flawless and proper condition.

In order to maintain this condition and guarantee safety use, the user has to consider the security advices and warnings in this manual.

EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1. Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for protection of buildings, are excluded from the scope of IEC 61326-3-1.

CAUTION

- ☐ The system BIOS is protected by password. Any change in the BIOS may cause a system crash. When the system is booting, do not press ESC-button on keyboard. This may clear the BIOS settings and cause system faults.
- ☐ Any change in the file structure as deleting or adding files or directories might cause a system crash.
- ☐ Before installing software updates contact DEWETRON or your local distributor. Use only software packages which are released by DEWETRON. Further informations are also available in the internet (<http://www.dewetron.com>).
- ☐ After power off the system wait at least 10 seconds before switching the system on again. Otherwise the system may not boot correct. This prolongs also the life of all system components.

Windows updates and antivirus/security software

Before installing Windows software updates consult with DEWETRON for compatibility guidance. Please also keep in mind that the use of any antivirus or other security software may slow down your system and may cause data loss.

Problematic network stacks

Often intrusive IT software or network processes can interfere with the primary function of the DEWETRON system: to record data. Therefore we recommend strongly against the installation of IT/MIS software and running their processes on any DEWETRON data acquisition system, and cannot guarantee the performance of our systems if they are so configured.



Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a DEWETRON system:



System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid an unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further informations about recycling on the DEWETRON web site www.dewetron.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead.

First steps

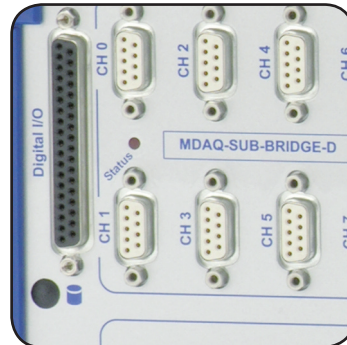
First steps

1



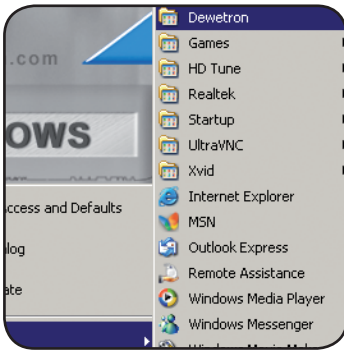
Power-on your system.

2



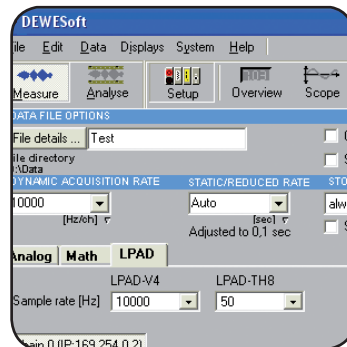
Connect your sensors to the system.

3



Run DEWESoft usually via "Start" > "Programs" > "Dewetron" > "DEWESoft x.x" > "DEWESoft x.x"

4



Start recording your data!

DEWE-31-64 signal conditioning rack

- 64 input channels
(in conjunction with DEWE-MDAQ modules)
- DEWE-MDAQ modules: see DEWE-MDAQ series manual
- Wiring to A/D converter: see appendix B



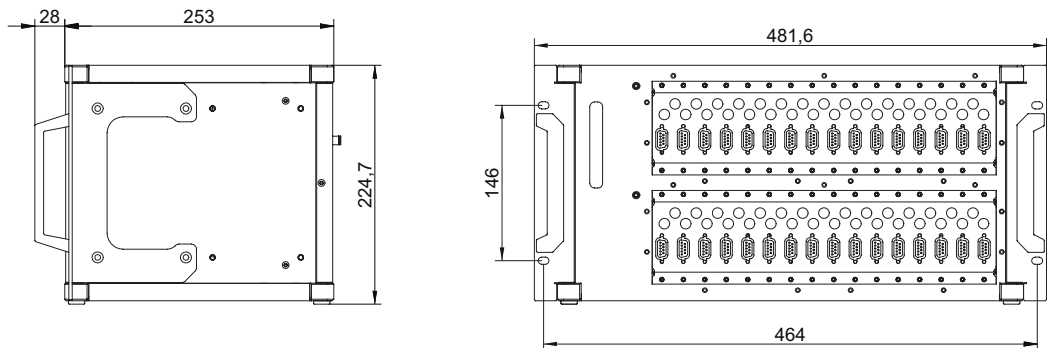
System specifications

DEWE-31-64																
	☐ MDAQ-DIRECT	☐ MDAQ-V-10	☐ MDAQ-V-100	☐ MDAQ-SUB-V-200	☐ MDAQ-SUB-ACC-x	☐ MDAQ-SUB-ACC-A-x	☐ MDAQ-SUB-BRIDGE	☐ MDAQ-SUB-STG	☐ MDAQ-BASE-5	☐ MDAQ-BASE-10	☐ MDAQ-FILT-5-BU	☐ MDAQ-FILT-5-BE	☐ MDAQ-FILT-5-BU-S1	☐ MDAQ-FILT-10	☐ MDAQ-FILT-10-S1	☐ MDAQ-AAF4-5-BU
Channel 0 to 7 Channel 8 to 15	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Channel 16 to 23 Channel 24 to 31	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Channel 32 to 39 Channel 40 to 47	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Channel 48 to 55 Channel 56 to 63	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Signal output:	☐ up to ±5 V, depending on used DEWE-MDAQ module ☐ up to ±10 V, depending on used DEWE-MDAQ module															
RS232 / 485 interface:	☐ yes															
Power supply:	☐ 100 to 250 VAC (Breakdown voltage @ 2500 V) ☐ 9 to 40 VDC ☐ 10 to 32 VDC with UPS battery and external 115 / 230 VAC power supply															
Operating temperature:	10 °C to 60 °C															
Storage temperature:	-20 °C to +70 °C															
Humidity (operating):	10 % to 85 %, non condensing															
Humidity (storing):	5 % to 95 %, rel. humidity															
Vibration:	MIL-STD 810F 514.5 procedure I operating test procedure frequency range: 5 to 200 to 5 Hz; 5 x 12 min each direction displacement amplitude ±3.5 mm (5 to 8.45 Hz) acceleration amplitude 1 g (8.45 to 92 Hz) displacement amplitude 92 to 113 Hz: ±0.029 mm acceleration amplitude 1.5 g (113 to 200 Hz)															
Shock:	MIL-STD 810F 516.5 procedure I non operating test procedure ½ sinus 11 ms 10 g, 3 shocks positive, 3 shocks negative															
Dimensions (W x D x H):	approx. 438.5 x 224 x 253 mm (17.3 x 8.8 x 9.6 in.)															
Weight:	typ. 7 kg (14 lbs), depending on configuration															

Main System

Dimensions*

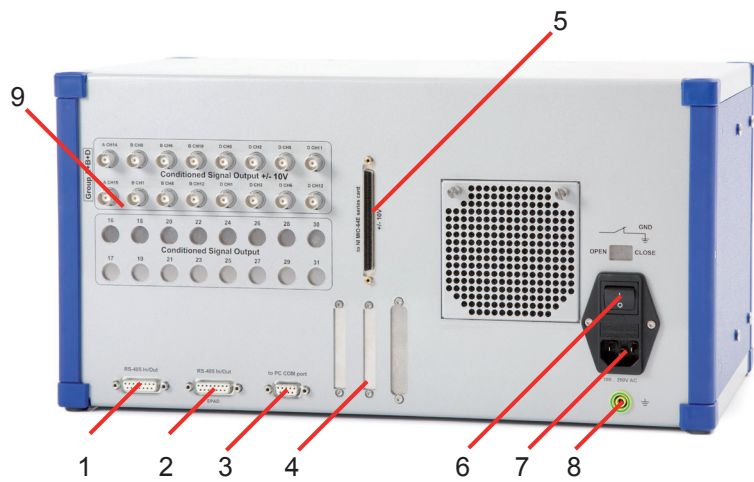
with 19" mounting kit



* Dimensions in mm
(1 inch = 25.4 mm)

Connectors

- 1 RS-485 interface connector
- 2 RS-485 interface connector (EPAD)
- 3 COM interface connector
- 4 Digital I/O connector (opt.)
- 5 Connector to A/D board
- 6 Main power switch
- 7 Power supply connector
- 8 Ground connector
- 9 Conditioned signal output (opt.)

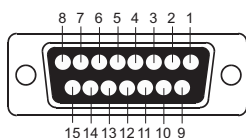


Typically DEWE-31-64 rear view

Note: The location of the connectors might vary from system to system and depends on system configuration

RS-485 interface connector

The RS-485 interface connector is prepared to communicate with additional EPAD modules and to supply them.

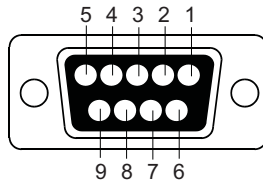


15-pin SUB-D connector (female)

- Pin assignment
- 1 RS-485 A
 - 2 RS-485 B
 - 3 RS-485 GND
 - 14 GND (EPAD supply)
 - 15 + 12 V (EPAD supply)
- the remaining pins are not connected

COM port

The COM port can be used to control the DEWETRON modules instead of the internal USB to RS485 converter. In special cases it could also be used as a serial configuration port.



9-pin DSUB female connector

Pin assignment

1	n.c	6	n.c
2	to PC RX	7	n.c
3	to PC TX	8	n.c
4	n.c	9	n.c
5	to PC GND		

Digital I/O interface connector

This connector supports digital input and output lines of the built-in A/D board. If this board does not support digital I/O's, the connector is not available.

The pin assignment is depending on the used A/D board - details are available in appendix B.

Power supply connector

Supply voltage for the DEWE-31-64 depends on used power supply.

Main power switch

The main power switch is used to power on / off the system.

Ground connector

For some kind of measurements, it's necessary to give the system an additional ground connection.

Connector to A/D board

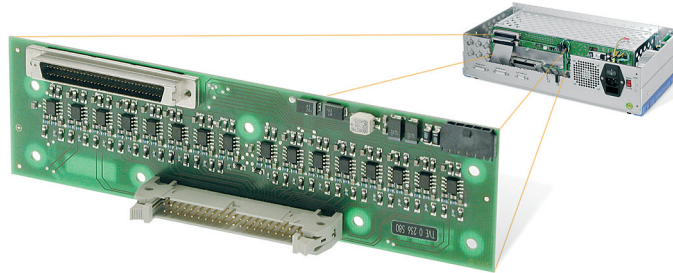
For more information regarding this connector please refer to appendix B.

Main System

Differential output converter (option 30-xx-OUT-xx)

-5, ± 5 V output of DAQx-modules
-10, ± 10 V output of DAQx-modules

- 16 channel single ended to balanced differential output converter
- High output current of ± 60 mA
- Stable with high capacitive load of 50 nF
- Short circuit proofed output
- High bandwidth up to 1 MHz

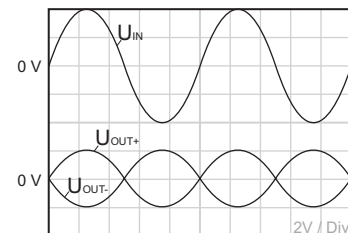


Specifications

	30-xx-OUT-xx
Input range:	± 5 V
Output range:	± 5 V (± 2.5 V referenced to GND), ± 10 V
Input configuration:	Single ended
Output configuration:	Balanced differential
Input impedance:	1 k Ω
Output impedance:	< 1 Ω
Output current:	± 60 mA
Bandwidth:	
-5 %	500 kHz
-3 dB	1,5 MHz
Gain accuracy:	typ. ± 0.08 % (± 0.15 % max.)
Gain linearity:	< 0.04 %
Output offset:	typ. < ± 0.8 mV (± 5 mV max.)
Output offset drift:	< 10 μ V/K
Output noise: (0.1 Hz to 500 kHz)	< 0.08 mV _{RMS}
Power supply voltage:	± 5 V
Power consumption:	
without output load	2.5 W
maximum	8 W
Dimensions:	180 x 55 mm

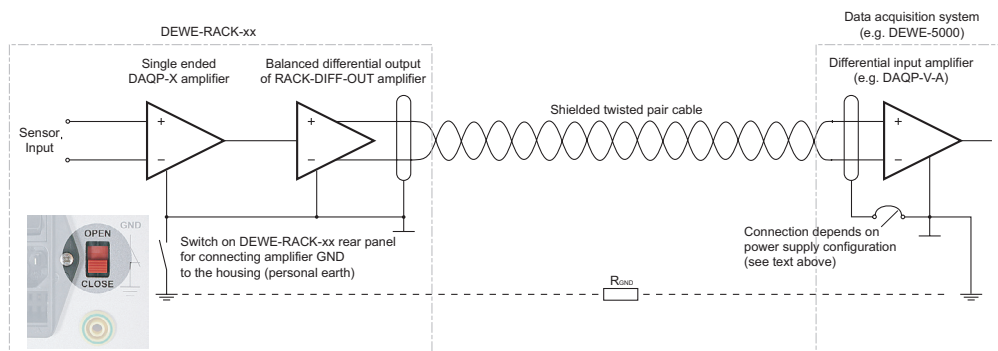
General description

Having wide distance between the DEWE-30-xx and the data acquisition unit (DEWE-5000, DEWE-4010, DEWE-3020, DEWE-2010 ...) causes some problems if high bandwidth and low distortion and noise is required. Similar to all high speed digital signal layer protocols (LAN, IEEE1394, USB, PCI-Express) symmetric signal transfer using twisted pair cables have to be used to achieve this. The 30-xx-OUT converts the standard single ended DEWE-30 output to a balanced differential output with high output current, needed to drive cables up to 500 m without losing the high accuracy of the signal amplifier.



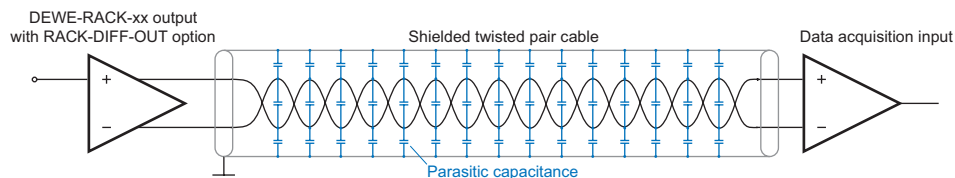
Cable configuration

The usage of shielded twisted pair cables is recommended for the connection between DEWE-30-xx and the data acquisition unit. Please note that at the data acquisition unit differential input amplifiers are needed. The shield of the cable have to be connected to the GND pin of the 37-pin SUB-D connector (female) of the DEWE-30-xx. In usual system configuration the GND of the DEWE-30-xx and the GND of the data acquisition unit are tied together via the personal earth of the AC power supply. Therefore the cable shield should not be connected to the GND of the data acquisition system to avoid GND loops. But if the GND of both devices are nowhere tied together (at power supply without protected earth) it is also recommended to connected the shield to the GND of the data acquisition device.



Bandwidth and cable length

Although the bandwidth of the RACK-30-OUT amplifier itself is above 1 MHz the total reached bandwidth is depending on the used cable length. The longer the cable the lower the efficient bandwidth. The reason is the parasite cable capacitance which is around 30-200 pF per meter.



Therefore a 100 m cable can have a capacitance of around 10 nF. This capacitive load have to be driven by the 30-xx-OUT amplifier. The needed current for driving this load depends on the signal level but also of the signal frequency since

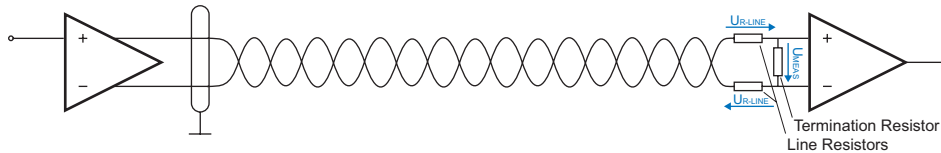
$$X_C = \frac{1}{2 \cdot \pi \cdot f \cdot C}$$

So current needed for driving a 100 m cable at 5 V_{pp} and 100 kHz is already around 30 mA. The maximum output current of the 30-xx-OUT is specified with ±60 mA. If the signal frequency increase or the cable is longer it is possible to get out of this specification.

Main System

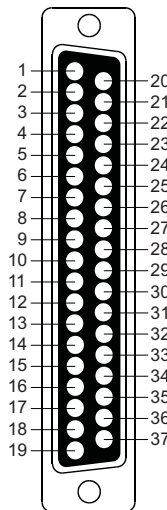
Cable termination

Like in any higher frequency application (RS-485, CAN, IEEE1394 ...) the cable has to be terminated at the end to avoid signal reflections at the signal line. The value of this resistor should have to be the same value like the characteristic impedance of the used cable. This resistor causes on the one hand additional load for the 30-xx-OUT amplifier but on the other hand also errors because of the voltage dropout at cable.

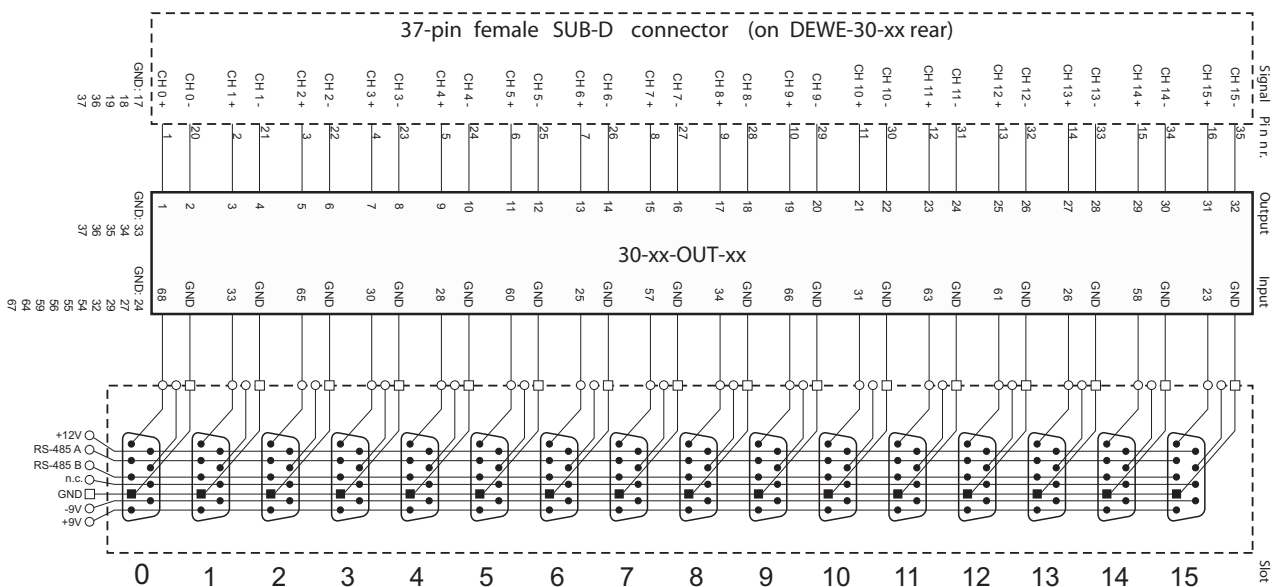
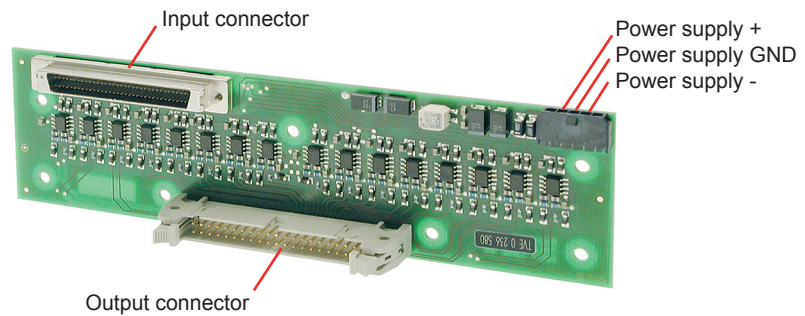


For example a 100 meter 2 x 0.25 mm² cable has a line resistance of around 7 Ohm. If the termination resistor is 120 Ohm (typical value for twisted pair cable) this error is already around 5%. This influence should be recognized in the measurement result or should be rescaled in the measurement setup.

Connectors



37-pin SUB-D connector



DEWESoft

DEWESoft turns your hardware into a powerful data acquisition system. Our award-winning data acquisition package is second to none when it comes to both pure recording power and ease of use. Normally this is a difficult balancing act: providing lots of capability and performance, without making the user interface hard to learn. But we've done it!

DEWESoft is the solution to acquire signals synchronous from different sources, display and store them together and offer the data for post analysis.

Measure



Scope



Recorder



FFT



Video



Export



Print



One of the most powerful and yet easy to use aspect of DEWESoft is the creation of displays. Of course, a few standard displays are built-in for you, like screens for these instruments:

- Recorder (vertical and horizontal recorder screens are included)
- Oscilloscope (free run, triggered, with 2D and 3D waterfall displays, and more)
- FFT (with selectable axes, line length, window, type, averaging, overlapping, weighting, and more)
- Video – Scalable video window with an assignable recorder graph below
- GPS – Track with background map, plus speed, distance, heading, etc.

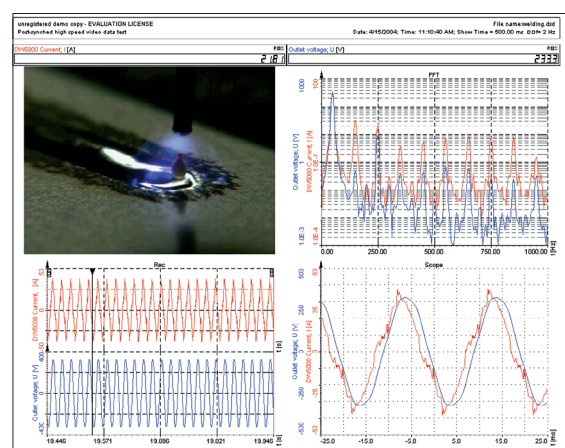


Analyze Mode

REPLAY, EXPORT, SHARE DATA!

Here you can replay any captured data file, zoom in with the recorder graph cursors, make measurements, print in full color to any Windows printer, and export the data to a wide variety of formats compatible with today's popular analysis software packages, like Flexpro, Matlab, Excel, and many more.

You can even export a AVI video file from your recorded data to create "moving documentation." NO LICENSE is needed to use DEWESoft in the ANALYZE mode, so you can install the software on all your computers, or even distribute it to your customers, and they can install it. In this way, all of your colleagues and customers can replay your data files and do all of the functions that you can – just give them the data file to open.



Notes

Internal Wiring

Please find information about the MDAQ amplifiers in the attached DEWE-MDAQ series manual. The latest version of the manual can be downloaded from:

<http://download.dewetron.com/dl/products/signal/mdaq>

Internal Wiring

Notes

CE-Certificate of conformity



Manufacturer:

DEWETRON Elektronische Messgeraete Ges.m.b.H.

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Name of product:

DEWE-31-64

Kind of product:

Data acquisition system

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:

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

Graz, October 14, 2008

Place / Date of the CE-marking

Dipl.-Ing. Roland Jeutter / Managing director

Notes
