

imc CRONOS-SL/compact

Getting Started

Edition 9 - 2024-04-22



Disclaimer of liability

The contents of this documentation have been carefully checked for consistency with the hardware and software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity.

We reserve the right to make technical modifications of the systems.

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The software described in this document may only be used in accordance with the provisions of the "imc Software License Agreement".

Open Source Software Licenses

Some components of imc products use software which is licensed under the GNU General Public License (GPL). Details are available in the About dialog.

A list of the open source software licenses for the imc measurement devices is located on the imc STUDIO/imc WAVE/imc STUDIO Monitor installation medium in the folder "*Products\imc DEVICES\OSS*" or "*Products\imc DEVICEcore\OSS*" or "*Products\imc STUDIO\OSS*". If you wish to receive a copy of the GPL sources used, please contact our tech support.

Notes regarding this document

This document is an excerpt from the manual of the device / the module.

This document provides important notes on using the device / the module. Safe working is conditional on compliance with all safety measures and instructions provided. The manual is to be used as a kind of reference book. You can skip the description of the modules you do not have.

Additionally, all accident prevention and general safety regulations pertinent to the location at which the device is used must be adhered to.

These instructions exclusively describe the device, **not how to operate** it by means of **the software!**

If you have any questions as to whether you can set up the device / module in the intended environment, please contact our tech support. The measurement system has been designed, manufactured and unit-tested with all due care and in accordance with the safety regulations before delivery and has left the factory in perfect condition. In order to maintain this condition and to ensure safe operation, the user must observe the notes and warnings contained in this chapter and in the specific sections applicable to the concrete device. Never use the device outside the specification.

This will protect you and prevent damage to the device.

Special notes

Warning

Warnings contain information that must be observed to protect the user from harm or to prevent damage to property.

Note

Notes denote useful additional information on a particular topic.

Reference

A reference in this document is a reference in the text to another text passage.

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1 General introduction

1.1 Tech support

If you have problems or questions, please contact our tech support:

Phone: (Germany): **+49 30 467090-26**
E-Mail: hotline@imc-tm.de
Internet: <https://www.imc-tm.com/service-training/>

Tip for ensuring quick processing of your questions:

If you contact us **you would help us**, if you know the **serial number of your devices** and the **version info of the software**. This documentation should also be on hand.

- The device's serial number appears on the nameplate.
- The program version designation is available in the About-Dialog.

Product Improvement and change requests

Please help us to improve our documentation and products:

- Have you found any errors in the software, or would you suggest any changes?
- Would any change to the mechanical structure improve the operation of the device?
- Are there any terms or explanations in the manual or the technical data which are confusing?
- What amendments or enhancements would you suggest?

Our [tech support](#) will be happy to receive your feedback.

1.2 Service and maintenance

Our service team is at your disposal for service and maintenance inquiries:

E-Mail: service@imc-tm.de
Internet: <https://www.imc-tm.com/service>

Service and maintenance activities include, for example calibration and adjustment, service check, repairs.

1.3 Legal notices

Quality Management



imc Test & Measurement GmbH holds DIN EN ISO 9001 certification since May 1995 and DIN EN ISO 14001 certification since November 2023. You can download the CE Certification, current certificates and information about the imc quality system on our website:

<https://www.imc-tm.com/quality-assurance/>.

imc Warranty

Subject to the general terms and conditions of imc Test & Measurement GmbH.

Liability restrictions

All specifications and notes in this document are subject to applicable standards and regulations, and reflect the state of the art well as accumulated years of knowledge and experience. The contents of this document have been carefully checked for consistency with the hardware and the software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity. We reserve the right to make technical modifications of the systems.

The manufacturer declines any liability for damage arising from:

- failure to comply with the provided documentation,
- inappropriate use of the equipment.

Please note that all properties described refer to a closed measurement system and not to its individual slices.

Guarantee

Each device is subjected to a 24-hour "burn-in" before leaving imc. This procedure is capable of detecting almost all cases of early failure. This does not, however, guarantee that a component will not fail after longer operation. Therefore, all imc devices are granted liability for a period of two years. The condition for this guarantee is that no alterations or modifications have been made to the device by the customer.

Unauthorized intervention in the device renders the guarantee null and void.

Notes on radio interference suppression

Devices of the imc CRONOS system family satisfy the EMC requirements for an use in industrial settings.

Any additional products connected to the product must satisfy the EMC requirements as specified by the responsible authority (within Europe¹) in Germany the BNetzA - "Bundesnetzagentur" (formerly BMPT-Vfg. No. 1046/84 or No. 243/91) or EC Guidelines 2014/30/EU. All products which satisfy these requirements must be appropriately marked by the manufacturer or display the CE certification marking.

Products not satisfying these requirements may only be used with special approval of the regulating body in the country where operated.

All lines connected to the devices of the imc CRONOS system family should not be longer than 30 m and they should be shielded and the shielding must be grounded.

Note

The EMC tests were carried out using shielded and grounded input and output cables with the exception of the power cord. Observe this condition when designing your setup to ensure high interference immunity and low jamming.

¹ If you are located outside Europe, please refer the appropriate EMC standards used in the country of operation.

Cables and leads

In order to comply with the value limits applicable to Class B devices according to part 15 of the FCC regulations, all signal leads connected to devices of the imc CRONOS system family must be shielded.

Unless otherwise indicated, no connection leads may be long leads (< 30 m) as defined by the standard IEC 61326-1. LAN-cables (RJ 45) and CAN-Bus cables (DSUB-9) are excepted from this rule.

Only cables with suitable properties for the task (e.g. isolation for protection against electric shock) may be used.

ElektroG, RoHS, WEEE, CE

The imc Test & Measurement GmbH is registered with the authority as follows:

WEEE Reg. No. DE 43368136

valid from 24.11.2005



Reference

<https://www.imc-tm.com/elekrog-rohs-weee/> and <https://www.imc-tm.com/ce-conformity/>

FCC-Notice

This product has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult our tech support or an experienced technician for help.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this product that are not expressly approved by imc may void the user's authority to operate this equipment.

1.4 Explanation of symbols



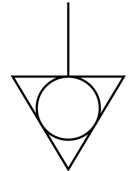
CE Conformity

see CE [chapter 1.2](#)



No household waste

Please do not dispose of the electrical/electronic device with household waste, but at the appropriate collection points for electrical waste, see also [chapter 1.2](#).



Potential compensation

Connection for potential compensation



Grounding

Connection for grounding (general, without protective function)



Protective connection

Connection for the protective conductor or grounding with protective function



Attention! General danger zone!

This symbol indicates a dangerous situation; Since there is insufficient space for indicating the rated quantity at the measuring inputs, refer to this manual for the rated quantities of the measuring inputs before operation.



Attention! Injuries from hot surfaces!

Surfaces whose temperatures can exceed the limits under certain circumstances are denoted by the symbol shown at left.



ESD-sensitive components (device/connector)

When handling unprotected circuit boards, take suitable measures to protect against ESD (e.g. insert/remove ACC/CANFT-RESET).



Possibility of electric shock

The warning generally refers to high measurement voltages or signals at high potentials and is located on devices suitable for such measurements. The device itself does not generate dangerous voltages.



DC, Direct Current

Supply of the device via a DC voltage source (in the specified voltage range)



RoHS of the PR China

The limits for hazardous substances in electrical/electronic equipment applicable in the PRC are identical to those in the EU. The restrictions are complied with (see [chapter 1.2](#)). A corresponding "China-RoHS" label is omitted for formal/economic reasons. Instead, the number in the symbol indicates the number of years in which no hazardous substances are released. (This is guaranteed by the absence of named substances).



Labeling integrated energy sources

UxxRxx are integrated in the symbolism. "U" stands for the installed UPS energy sources, if 0 = not installed. "R" stands for the installed RTC energy sources, if 0 = not installed. You can download the corresponding data sheets from the imc website:

<https://www.imc-tm.com/about-imc/quality-assurance/transport-instructions/>



Observe the documentation

Read the documentation before starting work and/or operating.



On/Off

On/Off button (no complete disconnection from the power supply)

2 Safety

This section provides an overview of all important aspects of protection of the users for reliable and trouble-free operation. Failure to comply with the instructions and protection notes provided here can result in serious danger.

Responsibility of the operator

Devices of the imc CRONOS system family are for use in commercial applications. The user is therefore obligated to comply with legal regulations for work safety.

Along with the work safety procedures described in this document, the user must also conform to regulations for safety, accident prevention and environmental protection which apply to the work site. If the product is not used in a manner specified by the manufacturer, the protection supported by the product may be impaired.

The user must also ensure that any personnel assisting in the use of the devices of the imc CRONOS system family have also read and understood the content of this document.

Operating personnel

This document identifies the following qualifications for various fields of activity:

- *Users of measurement engineering*: Fundamentals of measurement engineering. Basic knowledge of electrical engineering is recommended. Familiarity with computers and the Microsoft Windows operating system. Users must not open or structurally modify the measurement device.
- *Qualified personnel* are able, due to training in the field and to possession of skills, experience and familiarity with the relevant regulations, to perform work assigned while independently recognizing any hazards.

Warning

- **Danger of injury due to inadequate qualifications!**
- Improper handling may lead to serious damage to personnel and property. When in doubt, consult qualified personnel.
- Work which may only be performed by trained imc personnel may not be performed by the user. Any exceptions are subject to prior consultation with the manufacturer and are conditional on having obtained corresponding training.

Special hazards

This segment states what residual dangers have been identified by the hazard analysis. Observe the safety notes listed here and the warnings appearing in subsequent chapters of this manual in order to reduce health risks and to avoid dangerous situations. Existing ventilation slits on the sides of the device must be kept free to prevent heat accumulation inside the device. Please operate the device only in the intended position of use if so specified.

Danger



Lethal danger from electric current!

- Contact with conducting parts is associated with immediate lethal danger.
- Damage to the insulation or to individual components can be lethally dangerous.

Therefore:

- In case of damage to the insulation, immediately cut off the power supply and have repair performed.
- Work on the electrical equipment must be performed exclusively by expert electricians.
- During all work performed on the electrical equipment, it must be deactivated and tested for static potential.

Injuries from hot surfaces!



- Devices from imc are designed so that their surface temperatures do not exceed limits stipulated in EN 61010-1 under normal conditions.

Therefore:

- Surfaces whose temperature can exceed the limits under circumstances are denoted by the symbol shown at left.

Industrial safety

We certify that imc CRONOS systems in all product configuration options corresponding to this documentation conforms to the directives in the accident prevention regulations in "Electric Installations and Industrial Equipment" (DGUV Regulation 3)*. This confirmation applies exclusively to devices of the imc CRONOS system family, but not to all other components included in the scope of delivery.

This certification has the sole purpose of releasing imc from the obligation to have the electrical equipment tested prior to first use (§ 5 Sec. 1, 4 of DGUV Regulation 3). This does not affect guarantee and liability regulations of the civil code.

For repeat tests, a test voltage that is 1.5 times the specified working voltage should be used to test the isolation for the highly isolated inputs (e.g. measurement inputs for high-voltage applications).

* previously BGV A3.

Observe notes and warnings

Devices from imc have been carefully designed, assembled and routinely tested in accordance with the safety regulations specified in the included certificate of conformity and has left imc in perfect operating condition. To maintain this condition and to ensure continued danger-free operation, the user should pay particular attention to the remarks and warnings made in this chapter. In this way, you protect yourself and prevent the device from being damaged.

Read this document before turning on the device for the first time carefully.

Warning

Before touching the device sockets and the lines connected to them, make sure static electricity is diverted to ground. Damage arising from electrostatic discharge is not covered by the warranty.

3 Start of operation CRC, CRSL

3.1 Precautions for operation

Certain ground rules for operating the system, aside from reasonable safety measures, must be observed to prevent danger to the user, third parties, the device itself and the measurement object. These are the use of the system in conformity to its design, and the refraining from altering the system, since possible later users may not be properly informed and may ill-advisedly rely on the precision and safety promised by the manufacturer.

Note

If you determine that the device cannot be operated in a non-dangerous manner, then the device is to be immediately taken out of operation and protected from unintentional use. Taking this action is justified under any of the following conditions:

- the device is visibly damaged,
- loosed parts can be heard within the device,
- the device does not work,
- the device has been stored for a long period of time under unfavorable conditions (e.g. outdoors or in high-humidity environments).

1. Observe the specs in the manual chapter "Technical Specs" and the application hints about the individual system in order to prevent damage to the unit through inappropriate signal connection.
2. Note when designing your experiments that all input and output leads must be provided with shielding which is connected to the ground ("CHASSIS") at one end in order to ensure high resistance to interference and noisy transmission.
3. Unused, open channels (having no defined signal) should not be configured with sensitive input ranges since otherwise the measurement data could be affected. Configure unused channels with a broad input range or short them out. The same applies to channels not configured as active.
4. To measure voltages >60 V use adequate plug.
5. In case you are using a removable storage medium, please be aware that before you remove it (if the device is switched on), the button (1) must be pressed to ensure that storage medium can be safely removed. Please read the instructions in the chapter "removable storage".
6. Be aware that during a running measurement, modules should not be disconnected from the system (hot plug functionality is not supported during a running measurement).
7. Avoid prolonged exposure of the device to sunlight.
8. Make sure that there is sufficient space at the ventilation slits.
9. Note that parts that are not explicitly intended to be carried may be warmer than the handles.

3.2 Modularity

CRC systems

The devices belonging to the imc CRONOS*compact* (CRC) are modular systems. A variety of signal conditioners and digital I/O modules can be combined to a system.



Warning

Changing modules

Changing modules is only permitted for users trained by imc or imc service and in agreement with imc! Devices having HV modules (HV-2U2I etc.) do not support exchanging of modules (device safety!).

The following constraints, however, apply:

- Within the device, the necessary supply voltage is made available by a central power supply unit. A maximum supply current is specified for each supply voltage. The allowable current load on the voltage supply line is different for each module type. In addition, the power for the supply of an external sensor (e.g. supply of a strain gauge measurement bridge) must be taken into consideration. The supply power required by the power supply unit is tested at the factory. In the process, the power consumption of the modules ordered is taken into account. Power reserves can be requested from imc, if desired. If modules are subsequently added to a system which has already been shipped, it is absolutely necessary to check whether enough reserve power is available! As a matter of principle, only trained service personnel should install new system modules!
- Individual modules are distinguished by "module addresses". These module addresses must be configured prior to installing the module (e.g. DIP-switch, rotary switch, soldered jumpers). Previously existing addresses of other modules must be taken into account. If the same module address appears multiple times, conflicts will arise and the modules affected will either not be recognized by the device software at all or only incorrectly. This generally leads to errors which are hard to identify!
- The addresses of the module DI16-DO8-ENC4 can't be changed and are set to: DI4-16 (Addr. 1), DO8 (Addr. 0). That has to be considered, when addressing other digital modules (DI-16, DO-8, ENC-4). The variant of this multiboard with an additional DAC-4 will need an additional address. A further multiboard DI16(8)-DO8-ENC4(-DAC4) can be added without gap.
- For safety reasons high voltage modules (HV4U, HV2U2I etc.) are **not to be changed** by a customer!

CRSL systems

The devices of the imc CRONOS-SL (CRSL) series are factory configured devices. You can freely combine signal conditioning and digital I/O modules into one system. However, you **cannot** add new modules after delivery of an imc CRONOS-SL system, as for example with imc CRONOS*compact*.

3.3 Power supply

Measurement devices of the imc CRONOS system family are powered by a DC supply voltage which is supplied via a 2-pin LEMO-plug.

Device	LEMO plug type designation	Size
imc CRONOS-SL2/-SL4	FGG.1B.302.CLAD.62ZN	(middle)
imc CRONOScompact	FGG.2B.302.CLAD.82ZN	(big)

The permissible supply voltage range with is 10 V to 32 V DC. The standard product package includes a desktop supply unit with 15 V DC (<60 W) or 24 V DC (<150 W). On the input side the AC-voltage of the desktop supply is 100 V to 240 V 50/60 Hz. The DC-supply inputs of our imc measurement devices are not designed for a connection to a DC-grid with reference to EN 61326-1.



Note

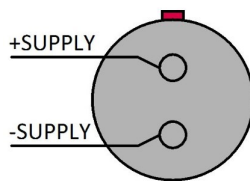
Desktop supply unit

Please note, that the operation temperature of the desktop supply is prepared for 0°C to 40°C, even if your measurement devices is designed for extended temperature range!

The package also includes a cable with a ready-made LEMO-plug which can be connected to a DC-voltage source such as a car battery. When using this, note the following:

- Grounding of the device must be ensured. If the power supply unit comes with a grounding line, it would be possible to ground the system "by force", by making a connection from this line to the plug enclosure (and thus to the device ground). The table-top power supply unit is made to allow this. This manner of proceeding may not be desirable because it may be desirable to avoid transient currents along this line (e.g. in vehicles). In this case the ground-connection must be made to the device directly. For this purpose a (black) banana jack ("CHASSIS") is provided.
- The feed line must have low resistance, the cable must have an adequate cross-section. Any interference-suppressing filters which may be inserted into the line must not have any series inductor greater than 1 mH. Otherwise an additional parallel-capacitor is needed.

Pin configuration:



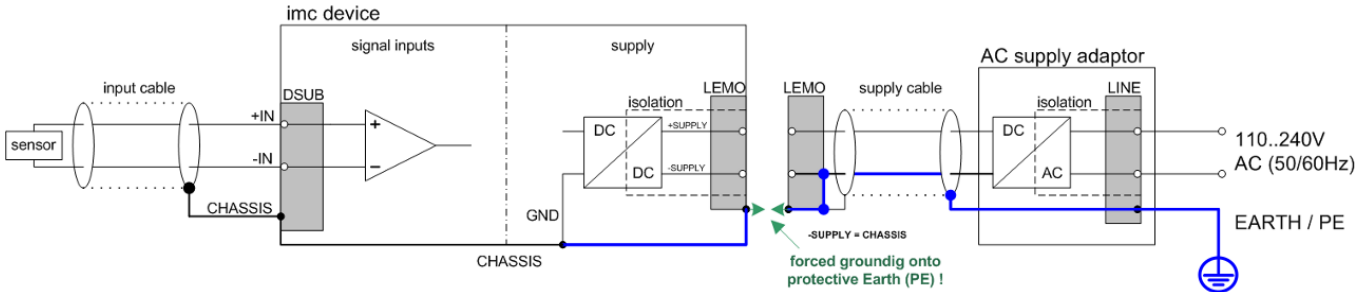
The +pin is marked with a red dot.

3.4 Grounding, shielding of the devices

In order to comply with Part 15 of the FCC-regulations applicable to devices of Class B, the system must be grounded. Grounding is also the condition for the validity of the technical specifications stated.

3.4.1 Grounding with the use of the included power adaptor

The DC-supply input on the device itself (LEMO socket, female) is **galvanically isolated** from the housing (CHASSIS): -SUPPLY input is not connected to CHASSIS internally. That means the device's internal power supply circuitry comprises isolating DC/DC converter.

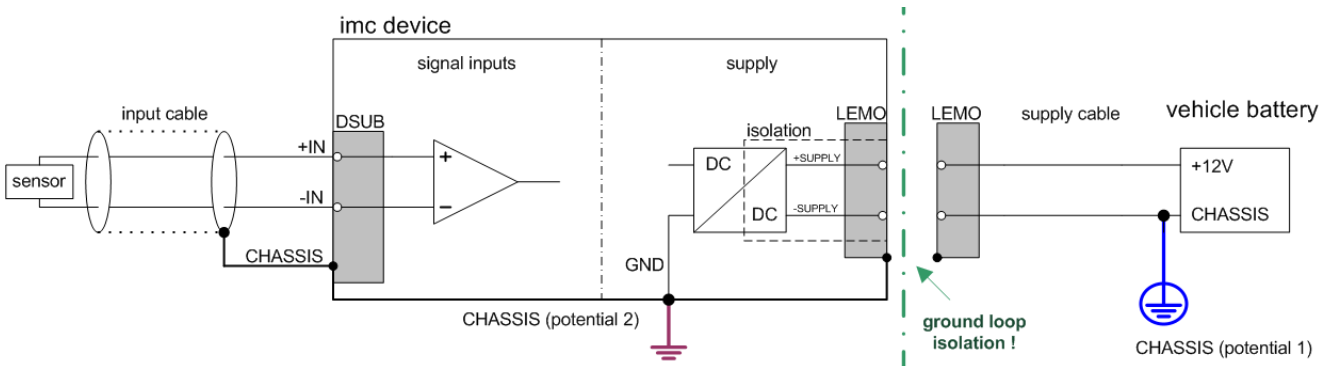


imc CRONOS-SL and imc CRONOScompact with desktop power supply unit

Use of the desktop power supply unit, included in the package, ensures proper grounding via the plug's protective earth terminal: the supply voltage's (-) pole as well as the shield and plug enclosure are connected to the cable's ground.

3.4.2 Grounding with power supplied by a car battery

If the power supply (e.g. car battery) and the measurement device are at different voltage levels, then if they were connected by the supply line, it would cause a ground loop. For such cases, the isolated internal device power supply ensures separation of the two voltage levels. The ground reference for the measurement device must then be established in a separate step.



imc CRONOS-SL and imc CRONOScompact powered by an isolated DC-voltage source (e.g. battery)

For running on an isolated DC power supply source (e.g. battery), either the grounding socket terminal, a grounding contact on the device ("CHASSIS"), or the CHASSIS contact on the imc signal plugs must be used.

Isolated power inputs avoids ground loops in distributed topologies

With stationary installations and the use of (already isolated) AC/DC adapters, any system ground differentials between the device and the central or local power supplies may not be relevant. The big issue in such a case, in contrast to mobile, in-vehicle applications, is from where to obtain a reliable ground voltage. Since it is convenient to use the AC power supply's protection ground line as the ground voltage, the LEMO-terminated AC/DC adapters for imc measurement devices are designed so that the protection ground line is connected all the way through to the LEMO plug's housing, thus securing the device's voltage level to protection ground. Additionally, in the AC/DC-adapter's LEMO-terminal (not the device's LEMO-socket!), the reference ground of the power adapter is connected with the housing's (CHASSIS) protection ground: Since the AC/DC power adapter is already isolating, as is the power input, this supply voltage's reference would not initially be defined and can be set arbitrarily. In particular for reasons of suppressing HF (high-frequency) interference signals stemming from the AC/DC switching power adapter, direct grounding is normally advisable.

3.4.3 Shielding

Also, all signal leads to the device must be shielded and the shielding grounded (electric contact between the shielding and the plug housing "CHASSIS").

To avoid compensation currents, always connect the shielding to one side (potential) only. If the imc DSUB block screw terminal plug is used, the shielding should be connected to the pull-relief clamp on the cable bushing. This part of the conductor-coated plastic plug housing has electrical contact to the device's housing, just as Terminals 15 and 16 (labeled: "CHASSIS", to the left and right of the imc-plug cable bushing) do; but is preferable to the "CHASSIS" terminals for optimum shielding.

3.5 Main switch

Switch on

The **device's main switch** is a **power-on button** with a built-in "POWER"-LED which must be pressed down for approx. 1 sec. to achieve activation, indicated by the "POWER"-LED flashing. If the device boots correctly, three short beep-tones are emitted.

Switch off

To switch the device off, press the power-on button again down for approx. 1 sec, what will cause a constant blinking of the "POWER"-LED. This causes the device to not be deactivated abruptly during a running measurement. Instead, any files on the internal hard drive involved are closed before the device switches off by itself. This process takes up to 10 sec. Holding the power-on button down is not necessary! If no measurement is currently running, it takes only approx. 1second for the device to be deactivated.

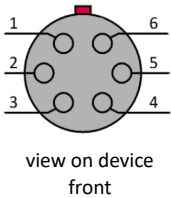
Some older imc measurement instruments may be equipped with a rocker-switch as main switch. It must be pressed down to the "ON"-side (upper portion) for approx. 1 sec to achieve activation, indicated by the "POWER"-LED flashing (e.g. CRONOS-PL devices). To switch the device off, press the rocker switch down on the OFF-side (lower portion) for approx. 1 sec.

3.6 Remote control

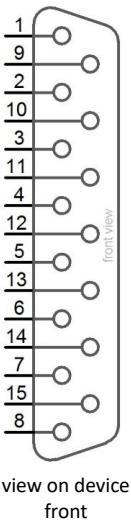
As an alternative to the manual main switch, imc devices can be switched on or off remotely with a wiring of the corresponding signals of the remote plug. There are several functions and operating modes available. The most common operating mode, available for all types, is the basic ON/OFF push button action performed with one single temporarily closing contact: connecting the signals "ON/OFF" and "SWITCH" for at least a short time, activates the device. The following table lists imc devices and the corresponding socket type.

imc device	Remote socket
CRONOScompact (CRC), CRONOS-SL (CRSL), SPARTAN (SPAR)	DSUB-15
CRONOSflex Base and the Power Handle (CRFX)	LEMO.EGG.1B.306 (6-pin, middle big)
C-SERIES (CL)	LEMO.EGG.0B.306 (6-pin, small)

Pin configuration



LEMO Pin	Signal name	Remarks
1	ON/OFF	LEMO Pin 1 and Pin 3 are internally bridged, two operating modes are supported: SWITCH and SWITCH1
2	SWITCH1	automatic activation when external power supply is connected, → permanently jumpered to ON/OFF, e.g. in vehicle
3	ON/OFF	
4	SWITCH	activation, deactivation like a push button, → briefly jumpered to ON/OFF, like the main switch
5	MUTE_GND	
6	MUTE	muting the UPS buzzer, only with the CRFX Power Handle



DSUB-15 Pin	Signal name	Remarks
1	RESET	immediate deactivation without saving, will cause lost of data
9	OFF	
2	SWITCH	activation, deactivation like a push button, → briefly jumpered to ON/OFF, like the main switch
10	ON	
3	SWITCH1	automatic activation when external power supply is connected, → permanently jumpered to ON/OFF, e.g. in vehicle
11, 4 und 12	n.c.	
5	MUTE	muting the UPS buzzer, e.g. for acoustic applications
13	ON/OFF	
6, 14, 7, 15, 8	n.c.	

Note

When the SWITCH and ON/OFF signals are bridged with a switch, the device remains permanently on. In this case, the main switch has no effect.

3.7 Potential difference with synchronized devices

When using multiple devices connected via the **SYNC socket** for synchronization purposes, ensure that all devices are at the same voltage level.

Note

The yellow ring on the SYNC socket indicates that the socket is shielded from voltage differences.

3.8 Fuses (polarity-inversion protection)

The supply input of all devices listed in this manual is provided with a maintenance-free reverse polarity protection.

Reference

In the chapter "Technical Specs" you will find information on the fuse or the overcurrent limitation of the individual devices, if applicable.

The supply voltage for external sensors wired out from the voltage channels is equipped with maintenance-free electronic fuses (current-limiters).

The incremental counter channels provide a supply voltage for external sensors, which is not protected and should be provided with an external fuse in order to be used!

3.9 UPS

Devices with DC supply input are equipped with an uninterruptible power supply (UPS). This allows for a continuous operation unaffected by temporary short-term outage of the main power supply. This type of operation is particularly useful for operation in a vehicle, permanently attached to starter lock and main power switch and thus not requiring manual control. Activation of UPS buffering is indicated by the power control LED (PWR) changing from green to yellow. With many imc measurement devices, active UPS buffering is additionally indicated by an acoustic buzzer signal.

The UPS provides backup in case of power outage and monitors its duration. If the power outage is continuous and if it exceeds the specific device's "buffer time constant", the device initiates an automatic shutdown sequence, which equals manual shutdown procedure: Any current active measurement is automatically stopped, data storage on flash card or internal harddisk is completed by securely closing all data files, and finally the device is actually switched off. This entire process may take a couple of seconds.

Thus, a typical application of this configuration is in vehicles, where the power supply is coupled to the ignition. A buffer is thus provided against short-term interruptions. And on the other hand, deep discharge of the buffer battery is avoided in cases where the measurement system is not deactivated when the vehicle is turned off.

If the power failure is not continuous but only temporary, the timer that monitors blackout duration is reset every time the main supply has returned to valid levels. The buffer time constant is a variable device parameter that can be configured according to system size and battery capacity. It can usually be written into the device under software control and is preconfigured to reasonable default values upon delivery (see description in the software manual).

Reference

Please find the technical specs (buffer duration) in the manual or in the data sheet.

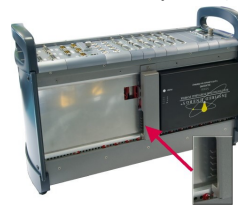
3.9.1 Rechargeable accumulators and batteries

3.9.1.1 Li-ion batteries

The Li-ion batteries (Smart Batteries) are accessible for exchange, with a keyed insertion mechanism, secured against reversed polarity. They are installed at the bottom of an imc CRONOScompact (CRC) device.



imc CRONOScompact with two Li-ion battery packs
The batteries are equipped on the bottom.



imc CRONOScompact with two Li-ion battery packs
The batteries can be inserted easily, the connections are protected against polarity reversal.

Note

- Due to the inevitable leakage and self-discharge of the Smart Batteries we recommend a regular recharging cycle at least every 3 months that a device has not been in use (device must be switched on for charging).



Do not deposit Li-ion batteries in domestic recycling containers!

 Reference

Li-ion battery

Please find the technical specs of the Li-Ion battery in the manual.

Notes on Li-ion Smart Batteries:

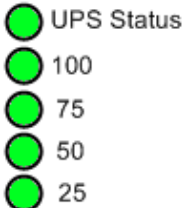
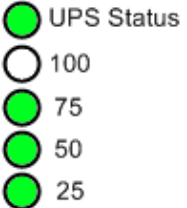
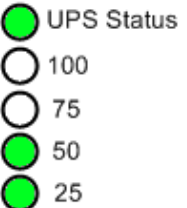
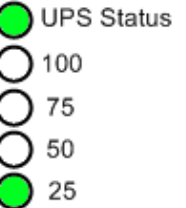
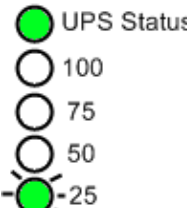
- Failing to adhere to the recommended temperature ranges for storing, charging and discharging will not render the battery pack unsafe but will reduce its life expectancy and capacity.
- If Smart Batteries are stored in low charge state (<10%) they will age faster.
- When storing discharged Smart Batteries, internal deep discharge protection circuitry may get activated. This will cause the following charge cycle to run through a reactivation procedure, starting with a very low charging current. This may prolong the required charging time.
- Prolonged storage of discharged batteries is not recommended and may cause irreversible damage to the battery!
- The battery may temporarily deactivate itself in response to:
 - excessive temperature
 - excessive discharge current (e.g. due to short circuit)
 - insufficient cell voltage (to prevent discharge)
 Otherwise the UPS is operable as long as the battery does not prevent discharge.
- Once the passive temperature fuse has been triggered, it cannot be reset and thus renders the battery pack unusable. The rated temperature may not be exceeded!
- For safety reasons, the Li-ion batteries may not be exposed to temperatures exceeding 100°C!

 Note

In order to preserve maximum life expectancy of the Smart Batteries they should be recharged at least every 3 months. The device must be switched on for charging!

State of charge indicator of the Li-ion batteries

The state of charge of the Li-ion batteries is indicated by different signal patterns of the LEDs. The position of the LEDs on your measurement device can differ from the pictures below. The following signal patterns can be interpreted as follows:

 <p>UPS Status</p> <p>100</p> <p>75</p> <p>50</p> <p>25</p> <p>state of charge:</p> <p>75% to 100%</p>	 <p>UPS Status</p> <p>100</p> <p>75</p> <p>50</p> <p>25</p> <p>50% to 74%</p>	 <p>UPS Status</p> <p>100</p> <p>75</p> <p>50</p> <p>25</p> <p>25% to 49%</p>	 <p>UPS Status</p> <p>100</p> <p>75</p> <p>50</p> <p>25</p> <p>10% to 24%</p>	 <p>UPS Status</p> <p>100</p> <p>75</p> <p>50</p> <p>25</p> <p>Flashing at 2 Hz</p> <p><10%</p>
---	--	--	---	---
















During active charging the last active one of the four green status LEDs flashes at a rate of approx one second. In contrast to this, the warning signal at very low state of charge (<10%) consists in the lowermost ("25") flashing at an even faster rate.

The UPS Status LED is bicolor. In case of an error it flashes red.

Error Conditions

If the UPS Status LED flashes alternating red and green, a long term continuous battery operation is inhibited due to high battery temperature of $60^{\circ}\text{C} \leq \vartheta < 75 \pm 5^{\circ}\text{C}$ (1). In this case, the buffer time constant of the UPS is reduced to 15 seconds, regardless of the configured setting. Thus, in case of an outage of the external power supply automatic shutdown procedure will already be initiated after 15 seconds, stopping the current measurement, storing all data and turning off the device.

The following error conditions are indicated by LED signal patterns:

<p>Battery is not present or cannot be detected</p> <p> UPS Status</p> <p> 100</p> <p> 75</p> <p> 50</p> <p> 25</p>	<p>Internal Error (UPS may not be operable)</p> <p> UPS Status</p> <p> 100</p> <p> 75</p> <p> 50</p> <p> 25</p>	<p>Battery operation is inhibited and the UPS is not operable $\vartheta \geq 75 \pm 5^{\circ}\text{C}$ (2)</p> <p> UPS Status</p> <p> 100</p> <p> 75</p> <p> 50</p> <p> 25</p>
--	--	---

(1) $\pm 5^{\circ}\text{C}$ due to tolerances of internal temperature measurement of the battery

(2) Internal protection circuitry prevents discharge at temperatures above $\vartheta \geq 75 \pm 5^{\circ}\text{C}$. The UPS may only be operable again once the batteries have cooled down to 65°C .

The following picture display the front of devices with integrated Li-ion batteries. The exact position of status LED can differ between each system.



CRC Rack



CRC portable housing



CRFX Power Handle (Li Ion)

3.10 Storage media in the device

This section describes how to handle the storage media of the imc measurement devices and how to use them with imc STUDIO.

The storage media are exclusively for data acquisition with imc STUDIO.

Storage media with verified performance can be purchased as accessories from imc. Hard drives are ordered with the device and can only be installed subsequently by imc.



Note

Manufacturer and Age of the storage medium

- imc has no way to affect the quality of the removable storage media provided by the various manufacturers.
- Storage media which come with newly purchased devices have been inspected in the framework of quality assurance and have passed the relevant tests.
- We expressly declare that the use of removable storage media is at the user's own risk.
- imc and its resellers are only liable within the framework of the guarantee and only to the extent of providing a substitute.
- imc expressly declines any liability for any damages resulting from loss of data.

3.10.1 For devices of the firmware group A (imc DEVICES)

Swapping the storage medium

Pressing the button signalizes to the system that you intend to remove the storage medium. Once this is done, the device stops access to the storage medium. If you were to remove the drive without prior announcement, it could produce defective clusters. If the storage medium is removed while a measurement is in progress, the data records are not completed. Therefore, always proceed as follows when swapping the storage medium:

1. **Important!** Before removing the storage medium from the measurement device, first announce the procedure to the system by pushing the button, in order to **avoid damage** to the storage medium.
2. Once the LED blinks, remove the storage medium.
3. Insert the new storage medium. Devices indicate by a short flash that the new drive has been successfully recognized.

Hot-Plug (exchanging the storage medium during a measurement)

It's possible to exchange the storage medium during a running measurement. This makes it possible to carry out a measurement without a PC practically without any limitations. It is only necessary to check the amount of memory available using imc Online FAMOS. To do this, use the function `DiskFreeSpace` belonging to the group "System". You can set an LED, for instance, or a digital output or a beeper to be activated when less than the minimum amount remains. One convenient solution would be to have a readout of the remaining space outputted by a display variable, which would indicate by a display on the device how the remaining memory decreases.


While swapping the storage medium during a running measurement, the data are stored in the measurement device's internal memory. If you complete the process within the specified RAM buffer duration, this is certain to work without any loss of data (see section "*RAM buffer time*"). Note that not only the time for the swap must be buffered, but that the buffered data must also be transferred to the new disk once the swap has been completed.

Swapping the storage medium

1. **Important!** Before removing the storage medium from the measurement device, first announce the procedure to the system by pushing the button, in order to **avoid data loss and damage** to the storage medium. The LED will **shine continuously** in green.
2. Once the device is ready for removal of the storage medium, the LED **blinks**.
3. Remove the already full storage medium.
4. No announcement is necessary for inserting a storage medium.

3.10.1.1 Storage media

Storage media	Description
CF Cards (Compact Flash)	For devices of group A4 and A5: The device group exclusively uses CF cards for storage medium.

Storage media	Description
USB Storage Medium	<p>Concerning devices with USB (see "<i>Device overview</i>"). Memory sticks or external hard drives can be connected at this terminal.</p> <ul style="list-style-type: none"> • Do not use multiple storage media at the same time! Devices belonging to group A6 have two USB terminals and a slot for the ExpressCard. However, the device can use only one data storage medium. The system determines which one it is upon activation, and there is no fixed order of precedence among the media. For this reason, delete any which you do not wish to use for the measurement before switching the device on. • With USB, the Hot-Plug^[25] functionality is available. Make sure that sufficient time is available for swapping the storage medium. How much time is required for de-registering and re-registering with the system depends on the particular storage medium and on the number of channels. As an orientation value, we recommend at least 30 s, even for simple configurations! <div style="border: 1px solid orange; padding: 5px; margin-top: 10px;">  <p>Do not use USB hard drives with external power supply</p> <p>Please do not use any USB hard drive which has an external power supply. Such a drive may not be connected at the imc USB-port. Otherwise, when the measurement device is powered down, the imc USB-port's current limiting mechanism may be destroyed.</p> </div>
ExpressCard	<p>Applicable to devices having ExpressCard slot (see "<i>Device overview</i>").</p> <ul style="list-style-type: none"> • Remove any connected USB storage medium! Devices belonging to group A6 have two USB terminals and a slot for the ExpressCard. However, the device can use only one data storage medium. The system determines which one it is upon activation, and there is no fixed order of precedence among the media. For this reason, delete any which you do not wish to use for the measurement before switching the device on. • With ExpressCards, the Hot-Plug^[25] functionality is available.
CFast	<p>Concerning devices with CFast slot (see "<i>Device overview</i>").</p> <ul style="list-style-type: none"> • Remove a connected USB storage medium! The device can use only one data storage medium. The system determines which one it is upon activation, and there is no fixed order of precedence among the media. For this reason, delete any which you do not wish to use for the measurement before switching the device on. • With CFast cards, the Hotplug^[25] functionality is available.
SSD	<p>Applicable to devices having a hard drive (see "<i>Device overview</i>").</p> <ul style="list-style-type: none"> • With SSD hard drives, Hot-Plug^[25] is not possible! If the SSD is used in a frame for removable data carrier, it can be exchanged while the device is deactivated. • SSD hard drives appear in the device software as a hard drive and can be read out via the Explorer-shell^[27]. • Due to the formatting, the content of the SSD in the PC is not displayed when the SSD is connected directly in the PC. SSD hard drives can only be formatted in the device^[30]. • In addition to the SSD, a CF/CFast-card can be inserted in the measurement device and used alternatively.

3.10.1.2 Data transfer

The internal storage medium can be accessed **directly via Windows Explorer**. Alternatively, the storage medium can be inserted into a **card reader** on the PC (suitable for large amounts of data due to faster transfer).

Warning



- Do **not use force** to insert or remove the device storage medium.
- During a **running measurement** having a high sampling rate, you should **never** try to **access the storage medium in the device** using the Windows Explorer shell. Otherwise, this additional burden could cause a data overflow.

Note

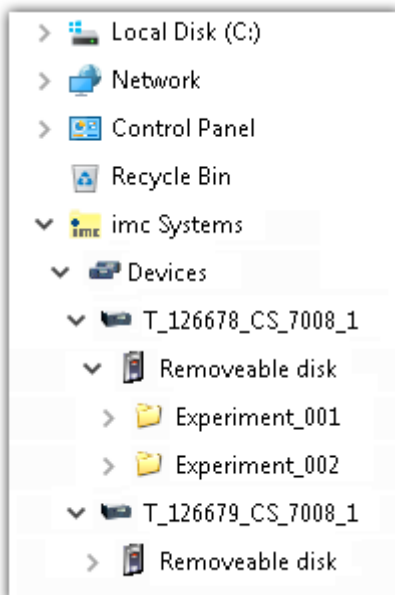
A tip on **interval saving**: Supposing the system's power supply suffers an outage during a measurement, it would not be possible to guarantee that the data file on the storage medium is terminated properly. This may lead to a failure to record the last measurement taken. Saving at intervals is a way to reduce this risk.

Access via Windows Explorer

The menu item "*Data (Device)*" () causes the Windows-Explorer to start while indicating the device selected.

Ribbon	View
Extra > Data (Device) ()	Complete
Home > Data (Device) ()	Standard

Access via "*imc Systems*" - an Explorer shell extension



While installing the operating software, if the option "*Extension for Windows-Explorer*" is activated, you are able to copy, display or delete the files of measured data saved within the device (e.g. on the removable storage medium). The method of doing this is the familiar one under Windows.

This function is independent of the device software. As well, selection of the devices in the tree diagram is independent of the device list in the operating software.

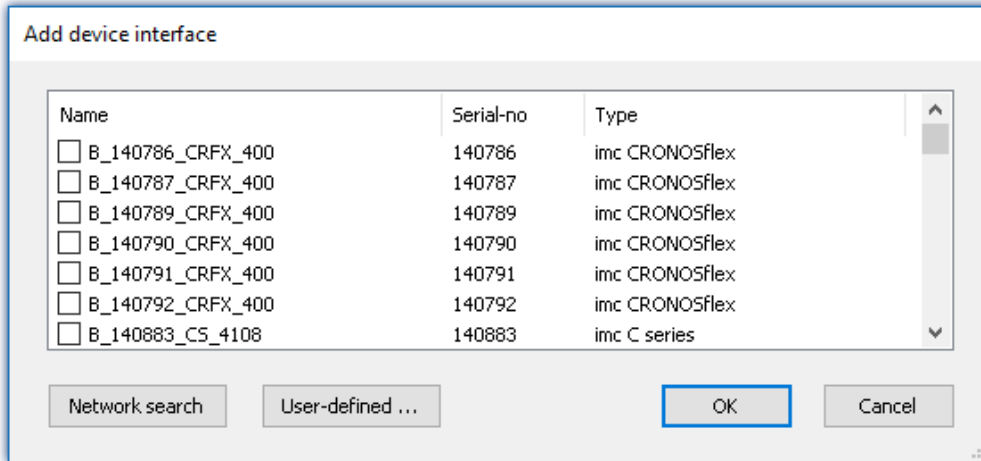
In order to get access to your device's storage medium, you must first add it to the tree diagram (see "[imc Systems - Adding a device](#)"^[28]). Subsequently, you are able to navigate to the desired data in the storage medium and thus to work with them.

3.10.1.2.1 imc Systems - Adding a device (Add)

Even if you have already been connected with the device by means of the imc STUDIO software, it is still not listed in the Explorer. It's possible to measure with one device while copying data from another.

- Click on "Devices" under "imc Systems" to highlight that entry.
- Open the context menu over the "Devices"-area and select "Add".

The "Add device interface" dialog appears:



Add Device interface

Search for devices	Description
Network search	<p>"Network search" causes the system to search the network for any suitable devices. How long this will take depends on how many devices are connected and on the network type. Ultimately, the devices found are listed.</p> <p>Select your measurement device and confirm your selection with "OK". The measurement device is then available.</p>
User-defined	<p>In a structured network (network with routers, Internet, ...), imc devices could not be integrated by means of a network search. With the knowledge of the IP address or of the domain name (DNS name), it is now possible to integrate a device into the list.</p>

Reference

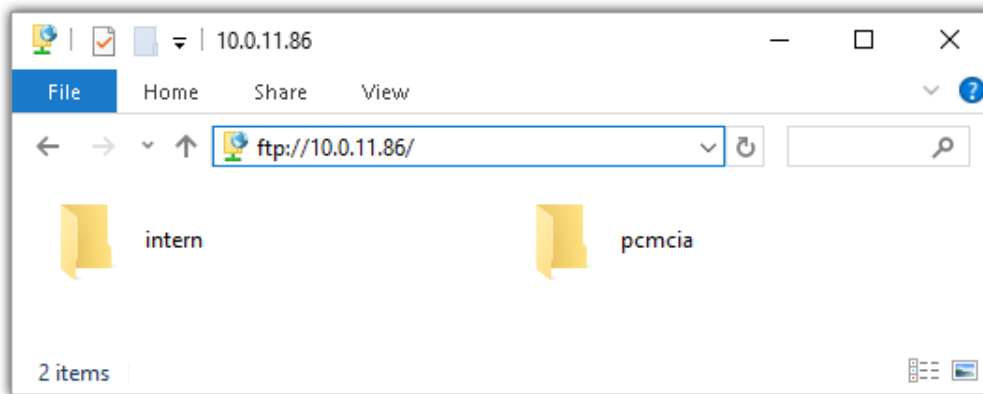
More information is presented in the section: "Setting Up - Connect the device"

- General: "Device connection via LAN"
- "Connection via a direct address"

3.10.1.2.2 FTP access

It is also possible to access the device's internal data via FTP, as well as to transfer data. Other goals are to change the configuration of devices via FTP and to restart the device for measurement with the altered configuration. Application areas include test drives, where there is no way to connect the devices directly with the device software. The Diskstart/Autostart capabilities are applied and enhanced. For this purpose, the device is usually configured for autostart. Upon activation, the configuration is loaded and the measurement, as well as data transmission, starts automatically.

Start the explorer and enter "`ftp://`" and the IP address of the device:



Note

- In general it is a read only operation. If you intend to delete files via FTP, you have to add "`imc@`" between "`ftp://`" and the IP address:
Example: <ftp://imc@10.0.10.219>
- Furthermore, a password can be assigned to protect access via FTP. This password is entered into the device properties.

Warning

The following limitations apply when accessing the storage media in a device via an FTP-client:

- The device can't delete folders, accessed by a FTP-client.
- It is not possible to replace the storage medium during measurement (Hot-Plug).

3.10.1.3 File system and formatting

Storage media with the file systems FAT32 and FAT16 (maximum 2 GB) are supported. It is recommended that a memory card be [formatted](#) and possibly partitioned before use.



Note

Routine formatting protects the memory card

Routine formatting is recommended

Take every opportunity to format the storage medium. **Recommendation:** at least every **six months**.

In this way, any **damaged storage medium** can be detected and repaired if possible. A damaged file system may cause **data loss**. Or the **measurement system may fail to start** correctly.

In order to avoid data loss, any data still needed should first be saved!

Using a data storage medium in different devices

There are no known limitations. But it is recommended to always format the medium whenever transferring it in order to avoid data loss.

Additional notes

- To select the appropriate file system for the respective application, observe the notes on the data rate and on "[Avoidance of Data Overflow](#)".
- No limitations regarding the currently available storage medium volumes are known.
- The maximum filesize is 2 GB. In case a signal would exceed that limit, use interval saving.



Notes

General restrictions applicable to file systems

Please observe the general restrictions regarding the respective file systems.

3.10.1.3.1 Formatting

The formatting can be performed directly in the PC's hard drive by the Windows operating system, or in the device using the Explorer shell.



Note

Recommendation

- **imc recommends formatting in the device:** In comparison to formatting by Windows, this provides higher data writing rates for high-speed channels.
- Only **one(!)** partition may be created. Multiple partitions may cause the measuring device not to recognize the storage medium.



Warning

Please back up the data first

Formatting causes all data on the storage medium to be deleted. Before performing the formatting, ensure that all data have been saved on a different storage medium.

Note**Cluster size - Avoidance of Data Overflow**

The size and number of assignment units (clusters) and thus also the [file system](#)^[30] used have a substantial effect on the storage medium's speed! Small clusters can dramatically reduce the speed! If high data rates are required, it is normally recommended to have a size of 8 kB/cluster.

The optimum size of the clusters must be determined for each storage medium separately. For all of them, the following applies:

- **Few channels having a high data rate**

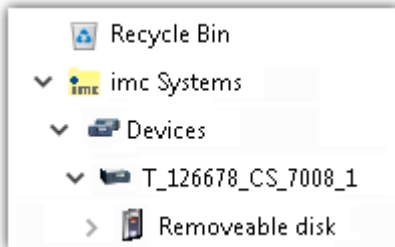
If a few channels having a high data rate are being recorded, then **large clusters** on the data carrier provide better advantage. Formatting with FAT32 on the PC and drive sizes < 8 GB creates disadvantageously small clusters, which in conjunction with the full aggregate sampling rate can lead to a data overflow.

Whenever using cards of up to 8 GB, always use the formatting by the device.

In the device, cards larger than 512 MB are formatted with 8 kByte clusters and cards larger than 4 GB are formatted with 16 kByte clusters. Cards of up to 1 GB can alternatively be formatted by the PC with FAT16. With cards of 16 GB onward, there is no difference whether the formatting is done in the PC or in the device.

- **Very many channels with a low data rate**

If hundreds of channels having a low data rate (e.g. CAN channels) are saved, the exact opposite is true. Here, **small clusters** are an advantage. This means that drives with up to 8 GB should in such cases be formatted in the PC with FAT32.

Formatting in the device (Recommended)

For **formatting in the device**, navigate via the Explorer shell "[imc Systems](#)"^[27] to the desired device.

There, open the properties of the drive: context menu > "*Properties*" (not via the Navigation pane in the Explorer).

Go to the Property dialog under the tab: "*Tools*".

Start the formatting by clicking on "*Format now!*".

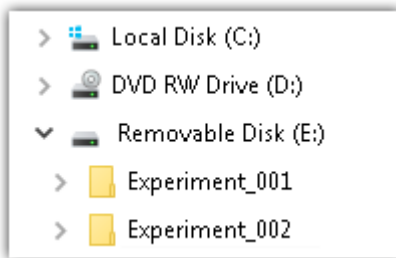
The device performs the formatting according to the following rule:

Drive size	Cluster size	File system
<= 512 MB	2 kB	FAT16
<= 4 GB	8 kB	FAT32
> 4 GB	16 kB	FAT32

Note

Formatting the storage medium is not allowed if an experiment whose data are to be saved internally has just been prepared.

Formatting using the Windows-Explorer



To perform **formatting of a storage medium via the [Windows-Explorer](#)**²⁹, navigate to the desired storage medium. Run the formatting by means of the context menu, for example.

Select one of the following two file systems: "FAT32" or "FAT" ("FAT16").

The file system "FAT32" is designed for media **larger** than 32 MB. Under no circumstances can smaller media can be formatted to "FAT32". With "FAT32", Windows generates 4 kByte clusters when the drive size is up to 8 GB, which is inconvenient for high-speed writing rates.

SSD hard drives are inherently formatted with Ext2 and for that reason **can not be formatted directly in the PC**, but only in the [device](#)³⁰.

However the Ext2 format offers these advantages:

- Mistaken duplicate occupation of individual clusters is not possible.
- Integration into the operating system is accomplished much more quickly than with FAT32.
- Higher writing output than with FAT32.

3.10.1.4 Known issues and limitations

Known issues and limitations	Description
If the memory card can not be read under Windows	The memory cards must first be partitioned (formatted) under Windows. Windows automatically generates the correct partitioning information. Subsequently, the memory card should be formatted again in the device. When in doubt, please contact our tech support ^[6] .
The system won't recognize the data storage drive	<ul style="list-style-type: none"> • Answer 1: Check the file system: The device supports FAT32/FAT16 ^[30]. • Answer 2: If there are two storage media simultaneously plugged into your device, only one media will be detected (e.g. USB and CFast). Only the first plugged media will be detected.
File system becoming gradually slower	As the count of folders increases, so does the time required by the system to access the data. In consequence, the data saving procedure becomes slower and data loss becomes possible. For this reason, creating more than 1000 folders is to be avoided.
Errors in accessing the storage medium	<p>Errors can have the following causes, among others:</p> <ul style="list-style-type: none"> • The data rate is too high, the storage medium can't keep up and data overflow results. • The storage medium is full. <p>The device signals any error by flashing this LED. Its further responses depend on whether or not the device is connected to the PC.</p> <ul style="list-style-type: none"> • If no PC is connected, for instance in cases involving automatic self-start capability, the button lights continuously. At the end of an experiment, always check for this if measurements are taken without PC aid. • If the PC is connected to the measuring device, imc STUDIO documents the error with an message in the Logbook and switches the LED off. Any one-time data overflow only shows up in the Logbook, since the LED is reset afterwards. If data overflow occurs repeatedly, The LED is activated again, the PC records the message again, and as a result the LED blinks intermittently.
Data overflow due to improper cluster size	<ul style="list-style-type: none"> • With a storage medium formatted by Windows to FAT32 ^[30], data overflow can occur if a high aggregate sampling rate is generated by a few high-speed channels. • With a storage medium formatted in the device ^[30], data overflow can occur if a high aggregate sampling rate is generated by very many low-speed channels.

3.11 Signal connection

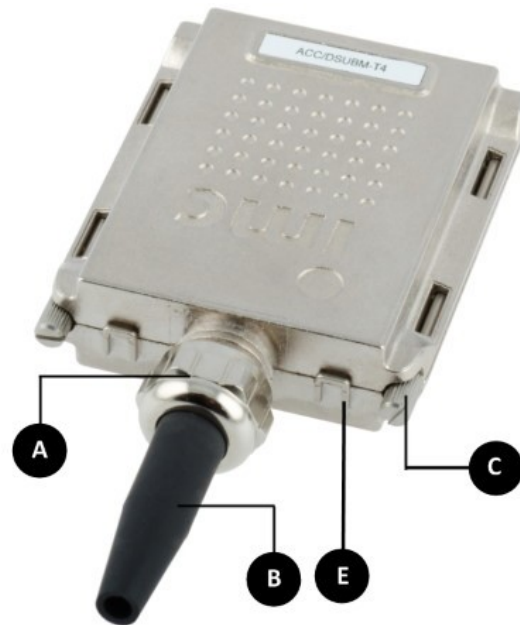
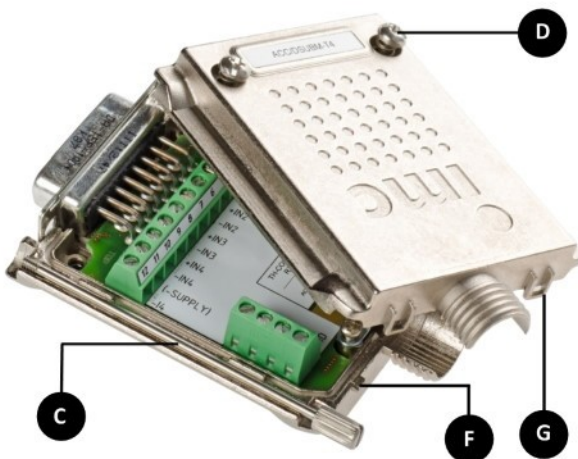
For devices with DSUB-15 connection technology, the convenient imc terminal plugs for solderless screw terminal connection are available as optional accessories.



ACC/DSUBM-xxx: snap the nose into the slot

Open the Metal plug:

1. Unscrew the cable fitting (cable gland) [A]
2. Remove the bend protection [B]
3. Unscrew the lid screws [D]
4. Lift the lid in the DSUB connection area and unfasten the nose of the slot



- A: Cable fitting (cable gland)
 B: Bend protection
 C: Fastening screw for the devices' front panel
 D: Lid screws
 E: Locking key (Nose / Slot)
 G: Slot
 F: Nose

Close the Metal plug:

1. Assemble the lid by snapping the nose into the slot (see the picture above)
2. Audible click when the lid snaps in the front of the DSUB pod
3. Insert the bend protection
4. The pressure nut must be screwed back on
5. The lid screws can be tightened

 [Reference](#)

[Pin configuration](#)

Please find the pin configuration of each available plug in the [chapter: Pin configuration](#) ⁴³.

4 Maintenance and servicing

imc recommends performing a service check every 12 months. An imc service check includes system maintenance in accordance with the service interval plan as specified by the manufacturer and a complete function test (maintenance, inspection and revision).

Maintenance (*repair*) work may only be carried out by qualified personnel from imc Test & Measurement GmbH.

For service and maintenance work, please use the [service form](#) that you download from our website and fill out: <https://www.imc-tm.com/service>



Reference

Device certificates and calibration protocols

Detailed information on certificates, the specific contents, underlying standards (e.g. ISO 9001 / ISO 17025) and available media (pdf etc.) can be found on [our website](#), or you can contact us directly.

4.1 Cleaning

- Always unplug the power supply before cleaning the device. Only [qualified personnel](#) ¹¹ are permitted to clean the housing interior.
- Do not use abrasive materials or solutions which are harmful to plastics. Use a dry cloth to clean the housing. If the housing is particularly dirty, use a cloth which has been slightly moistened in a cleaning solution and then carefully wrung out. To clean the slits use a small soft dry brush.
- Do not allow liquids to enter the housing interior.
- Ensure that the ventilation slots on the housing - depending on the housing type - remain free.

4.2 Storage

As a rule, the measurement device can be stored at temperatures ranging from -40°C to +85°C.

4.3 Transport

When transporting, always use the original packaging or a appropriate packaging which protects the device against knocks and impacts. Transport CRONOS components / slices preferably as a closed device. If transport damages occur, please be sure to contact our tech support. Damage arising from transporting is not covered in the manufacturer's guarantee. Possible damage due to condensation can be limited by wrapping the device in plastic sheeting.

The represented handling label for lithium ion batteries can be attached also independently printed on the package (e.g. by gluing on the package or in a transparent unlabeled document bag). Note however that the form and the format are accurately given by IATA and the expression has to take place in color. Format: 120 x 110 mm.

Lithium Battery Handling Label:
UN 3480 / UN3481



5 Start of operation Software / Firmware

5.1 Installation - Software

The associated measurement engineering software imc STUDIO, the configuration and operating interface for all imc instruments, provides the devices with exceedingly versatile functionality. It achieves comprehensive total solutions for everything from laboratory tests through mobile data logger application all the way to complete industrial test stations.

Use of the software requires a license, subject to the purchase order and configuration (see e.g. imc STUDIO manual product configuration / license).

In order to be able to install or uninstall imc STUDIO products, you must be registered with a user account possessing administrator rights to the PC. This applies to the overwhelming majority of all installations of Windows. However, if you are only logged on to your PC without administrator rights, log off and log back on with an administrator user account. If you do not possess an administrator user account, you will need the support of your system administrator or IT department.

You will find a detailed description to the installation of the software in the adequate manual or getting started.

5.1.1 System requirements

The minimum requirements of the PC, the recommended configuration for the PC, the supported operating system are mentioned in the data sheets and the imc STUDIO manual.

5.2 Connect the device

There are multiple ways to **connect the imc measurement devices with the PC**. In most cases, the **connection via LAN** (local area network, Ethernet) is implemented. See section "[Connecting via LAN in three steps](#)³⁷" for the **quickest way to connect** PC and measurement device.

But there are also other connection types:

- WLAN
- LTE, 4G, etc. (via appropriate routers)

These are described in a separate chapter in the software manual: "*Special options for connecting to the device*".

The devices use the **TCP/IP protocol** exclusively. With this protocol, some settings and adaptations for your local network may be necessary. For this purpose, the support of your network administrator may be necessary.

Recommended network configuration

The latest and high-performance network technologies should be used to achieve the maximum transfer bandwidth. This means especially 1000BASE-T (GBit Ethernet). GBit Ethernet network devices (switches) are downward compatible, so that imc devices that only support 100 MBit Fast Ethernet can also be operated on them.

The cable length between the switch and a PC or a device should be less 100 m. Use a shielded cable. If the length of 100 m is exceeded, then you have to insert another switch.

If the system is being integrated into an existing network, you must ensure that the minimum data rate can be guaranteed. Under some circumstances, this may require using switches to subdivide the network into separate segments in order to govern the data traffic in a targeted way and thus optimize the data rate.

In very demanding applications, you might consider grouping multiple GBit Ethernet devices via even higher-performance sections lines of the network (e.g. via 5 GBit Ethernet) and to connect these groups to NAS-components, for instance, via these lines.

When such imc devices are included which use network-based PTP-synchronization (e.g. CRXT or CRFX-2000GP), then it is necessary to use network switches which fully support this protocol on the hardware side. Appropriate network components are also available as imc accessories (e.g. CRFX/NET-SWITCH-5) and are then electrically and mechanically fully compatible with the imc systems.

5.3 Connecting via LAN in three steps

The most common case is described below: the PC and the device are connected via cable or network switch. The device's IP address must be set in the PC's address range. Subsequently, the device can be connected with the PC. If a connection has ever been established previously, the software recognizes the device's hardware configuration. In that case, experiment configurations can be prepared without any connection to the device.


Step 1: Connecting the measurement device


To connect via LAN there are two options:

1. The measurement device is connected to an **existing network**, e.g. via network switch. Only with a switch is it possible to run multiple devices.
2. The measurement device is connected directly to a network adapter on the PC (**point-to-point**).

In a LAN, the first case is typically implemented. Modern PCs and network switches are usually equipped with Auto-MDI(X) automatic crossover recognition, so that it is not necessary to distinguish between crossed and uncrossed connection cables. Thus both cable types can be used.

Step 2: IP-configuration

Start imc STUDIO. Click the "Device interfaces" button () to open the dialog for configuring the IP address of the device.

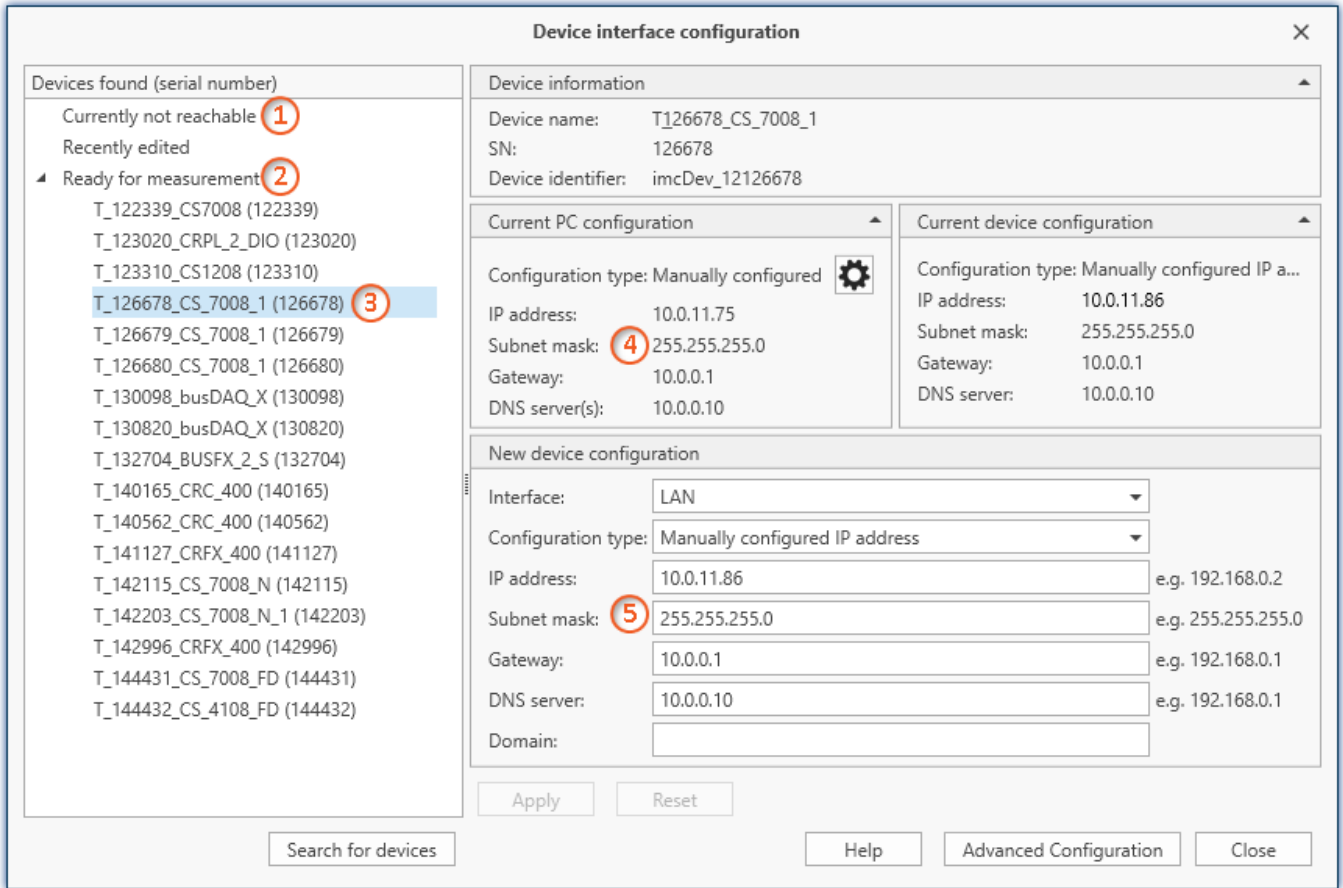
Ribbon	View
Setup-Configuration > Device interfaces ()	Complete

If this **button** is **not present** in the view, it is also possible to open the dialog after a device search if it failed to find any new devices. Subsequently, a prompt appears asking whether to search for devices with an inappropriately configured network interface. Close this message box by clicking "Yes".

Once the dialog starts, the system automatically searches for all devices in the network. In the tree diagram, all available devices are indicated. If the device appears among the group "Currently not reachable" ①, it is necessary to modify the device's LAN-settings. If the device appears among the group "Ready for measurement" ②, you can leave the settings as they are or review them.

Select the device for making modifications ③.

If there is any IP-conflict, devices affected will not be listed.



Display of measurement devices found and of the IP address

Set the **IP address manually** if you are not using DHCP. The device's IP address ⑤ must match with the PC's address ④. To conform to the network mask, only the device portion may be different (see example).

Example

In the example shown, the fixed IP 10.0.11.75 with subnet mask 255.255.255.0 is selected for the PC. For measurement devices, any numbers would be suitable which begin with 10.0.11. and then do not contain 0, 75, or 255. The 0 and the 255 should not be used, if possible, due to their special significance. The 75 is the computer's number.

Example for IP settings	PC	Device
IP address	10 . 0 . 11 . 75	10 . 0 . 11 . 86
Network mask	255 . 255 . 255 . 0	255 . 255 . 255 . 0

If the configuration type: "DHCP" is used, **the IP address is obtained automatically** from the DHCP-server. If it is **impossible to obtain any setting values** via DHCP, the **alternative values are used**. These could lead to errors in the connection (different networks, same IP addresses, etc.).

If there is a **direct connection** between the device and the PC by a cable, then **DHCP should not be used**.

In order to apply the changes, click on the button "Apply". Wait for the device to restart and then close the dialog.



Note

Connection via modem or WLAN

If the connection to the device is established via a modem or WLAN, start the program "imc DEVICES Interface Configuration" by clicking on the button: "Advanced Configuration" (see previous figure). An exact description is found in the software manual chapter: "Setting Up - Connect the device" > "Special options for connecting to the device".

Step 3: Integrating a device into an experiment

Now you are ready to add the device to the imc STUDIO experiment. If your device is unknown to the system, first perform the "device search".

Ribbon	View
Home > Search for devices ()	all
Setup-Control > Search for devices ()	Complete

Select the desired device: Once you click in the checkbox "Selected" for the desired device, it is ready to use in the experiment.

Selected	Device name	SN	Device specification
<input checked="" type="checkbox"/>	T_124835_C1_1_LEMO_ET	124835	imc C1-1 LEMO
<input type="checkbox"/>	T_130039_busDAQ_X	130039	busDAQ-X
<input type="checkbox"/>	T_130311_SPARTAN_U32_CAN	130311	imc SPARTAN

You can also select multiple devices for your experiment.

Now the device is "known". After the next program start it is available for selection. For further information, see the documentation on the component "Setup".

Reference

Time zone

Now check whether the correct time zone is set for the device. For more info, see the description of the software manual under the keyword "Device properties".

5.4 Firmware update

Every software version comes with matching firmware for the hardware. The software only works with devices having the right firmware.

Once the program connects up with the unit, the device's firmware is checked. If the software version doesn't match the device's firmware version, you are asked if you want to perform a firmware-update.

Note

The firmware update is only required if the software was obtained as an update. If you obtained your hardware equipment together with the software, no firmware update is necessary.

Warning

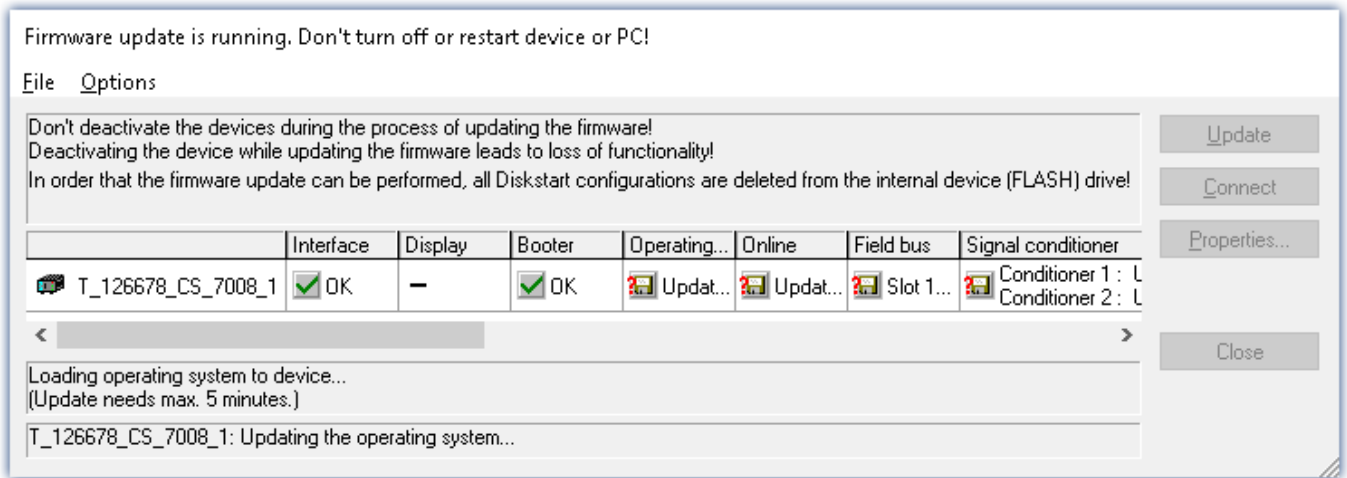
Do not interrupt the firmware update!

Be absolutely certain to observe the following:

1. Under no circumstances should the device or its power supply be deactivated during the firmware update!
2. The network connection may not be interrupted. Use a cable connection, not WLAN!

Depending on the device type, the following components are loaded automatically: Interface-firmware (Ethernet, modem, ...), booting program, amplifier firmware, firmware for the signal processors.





The dialog for the firmware-update looks like this:



*Start of the firmware update (example of a single device)
The state of the components of the firmware is displayed in the list.*

Component	Description
Interface	Interface-Firmware (Ethernet)
Booter	Start-up program for the device upon switching-on
Operating system	Device operating system
Online	Online-functions and hard drive controller
Display	Operating system of the connected displays
Fieldbus	Fieldbus interfaces (e.g. CAN etc.)
Signal conditioners	Amplifiers

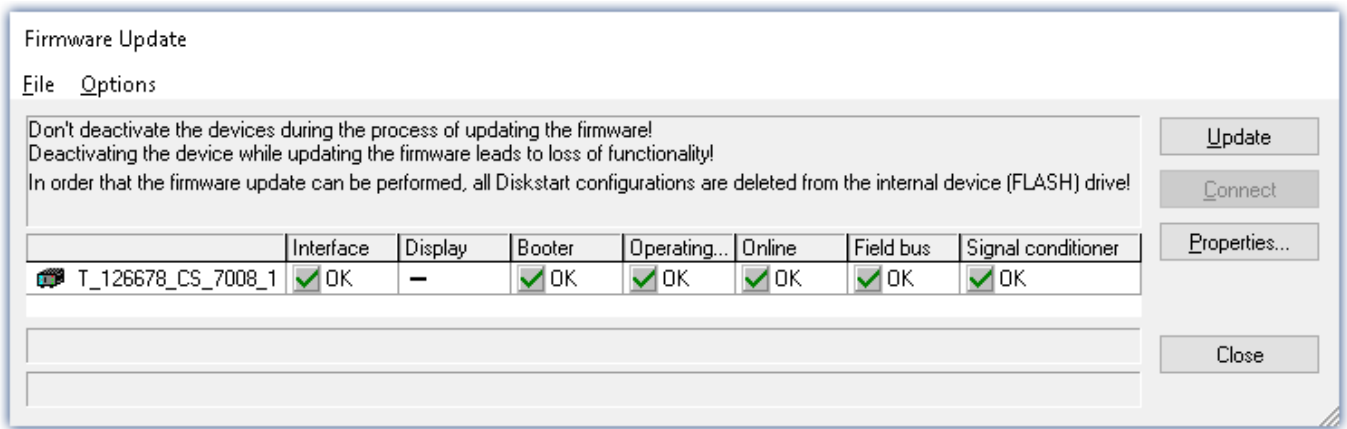
The following symbols for the individual firmware components appear in the list:

Symbols	
	not current
	firmware conforms to current standards
	error occurred during update procedure
	this option is not available on the device

If no status indicators are displayed, no connection could be made to the corresponding device.

The duration of the update depends on the number of amplifiers (can last up to several minutes). You will be informed on the progress.

You are notified when the firmware setup concludes successfully, as shown below:



Conclusion of the firmware update (example of a single device)

Choose "Close". The device can now be used with the product software.

**Warning****Be sure to observe in case of error**

- For a variety of reasons, the firmware update sometimes does not conclude properly, for example due to interruption of the power supply. For instance, the "handshake signal" at the end of the procedure may be missing. In this case, no measurement channels would be displayed initially. However, restarting the device and its software and performing the firmware update again usually restores everything to normal. It may be necessary to call the menu function "Update all components" in the Firmware update dialog's Options menu. This scenario only results in permanent damage in the most rare cases, and it is very worthwhile to repeat the procedure before sending a device in for repair.
- Behaviour under error condition, Windows cuts off the network connection without the user's knowledge; but this can be prevented using the PC's Control Panel.
Background: During the firmware updates there is no data transfer for a few minutes and thus no network activity; Windows detects inactivity of the connection and the following mechanisms are set in motion:
 - a) Windows' energy saving mode switches the LAN adapter off, consequently interrupting the network connection!
 - b) Windows switches to the next LAN adapter if there is one (some PCs have multiple adapters in order to, for instance, to access services in parallel that are accessible via separate networks.)
 - c) Other scenarios are feasible, e.g. if switches are activated, which can also respond to missing data traffic.

If an error message is posted during the firmware update, leave the device on and contact our [tech support](#). The firmware update may be continued with guidance from the tech support.

**Note****Firmware logbook**

The "*File*" menu offers a function for working with the firmware log file. Every action taken during a firmware update plus any errors which may occur are recorded in a log file. This log file can be displayed with menu "*File*" > "*Show log file*".

Update all components

The "*Options*" menu offers the option to "*Update all components*". This makes it possible to earmark all the components of the selected device for an update. The function is only to be used in compliance with instructions from the tech support.

6 Pin configuration

6.1 Connecting DSUB-15 adaptor plug

The **Standard plug** is a 1:1 DSUB-15 to screw terminal adapter. It can be used for all modules which come with the corresponding pin configuration.

The **Special plugs** do not offer direct adaption from the DSUB pins to the screw terminals, but instead come with extra functions:

- For current measurement (up to 50 mA) with voltage channels the **Shunt plug** (ACC/DSUBM-I2 and I4) have a built-in 50 Ω shunt. The scaling factor 0.02 A/V must be set in order to display the current value.
- For temperature measurements, a special, patented **Thermo plug** (ACC/DSUBM-T4) is available. This DSUB-15 plug is suited for measurement of voltages as well as temperatures with PT100 and thermocouples with integrated cold junction compensation (CJC). Any types of thermocouples can be connected at the differential inputs (+IN and -IN). It also has additional "auxiliary contacts" for connecting PT100 in 4-wire configurations, where the reference current loop is already pre-wired internally. The Thermo plug can also be used for normal voltage measurement.
- The **IEPE/ICP plug** (ACC/DSUB-ICP2 and ICP4) provide a current supply source as well as a capacitive coupling.
- The **TEDS plugs** store sensor information according to IEEE1451.4 for use with imc Plug & Measure (integrated TEDS chips DS 2433).

Note

The screw terminals of the plug

- To connect the measurement leads with the screw terminals, suitable leads should have a maximum cross section of 1.5 mm² incl. cable end-sleeve.
- The terminals' screw heads only have secure electrical contact once they are tightened to a connection wire. For this reason, a control measurement (for instance with multimeter probe tips) at "open" terminals can falsely mimic a missing contact!
- Cable shielding must be connected at CHASSIS (DSUB frame) as a rule. At some plugs, V_{CC} (5 V) is available, with a maximum load current of typically 135 mA per plug.

6.1.1 Device models overview

		Voltage	Current	Bridge	Thermocouple	PT100	Current feed sensors IEPE (ICP)	Universal
Analog amplifier	UNI2-8	UNI2 B2	UNI2 I2	UNI2 B2	UNI2	UNI2	ICP2	UNI2
	UNI-4	UNI2	UNI2 I2	UNI2 B2	UNI2	UNI2	ICP2	UNI2
	DCB2-8	B2 UNI2	I2	B2 UNI2			ICP2	
	BR2-4	B2	I2	B2			ICP2	
	LV-16	U4	I4					
	LV3-8	U4	I4				ICP4	
	SC2-32	U4	I4				ICP4	
	OSC-16	U4 T4	I4		T4	T4		
	C-8	U4 T4	I4		T4	T4		
	ISO2-8	U4 T4	I4		T4	T4	ICP4	
	ISOF-8	U4 T4	I4		T4	T4	ICP4	

		INC.-ENCODER	FREQUENCY	DIGITAL IN	DIGITAL OUT	DIGITAL OUT HIGH CURRENT	RELAYS	ANALOG OUT
Digital modules	ENC-4, HRENC-4	ENC4, ENC4-IU						
	FRQ2-4		FRQ2					
	DI-16			DI8				
	DIOINC	ENC4		DI2-8			REL4	
	DIO-PL2			DI8			REL4	
	DI2-16			DI4-8				
	DO-16				DO-8			
	DO-16-HC					DO8-HC		
	DAC-8							DAC4
	DI16-DO8-ENC4	ENC4		DI4-8	DO-8			
	DI8-DO8-ENC4-DAC4	ENC4		DI4-8	DO-8			DAC4

6.2 DSUB-15 pin configuration

In general: DSUB pin 1 is internally reserved.

6.2.1 Universal plug

Metal plug

ACC/DSUBM-		UNI2
DSUB Pin	Terminal	UNIVERSAL
9	1	+VB1
3	2	-VB1
2	3	+IN1
10	4	-IN1
11	5	I1_1/4B1 ⁽¹⁾
4	6	-SENSE1
5	7	+IN2
13	8	-IN2
14	9	I2_1/4B2 ⁽¹⁾
7	10	-SENSE2
12	11	+VB2
6	12	-VB2
15	15	(GND)
8	18	(+5V)
	13	
	14	
⊕	16	CHASSIS
⊕	17	CHASSIS

The abbreviation VB stands for the bridge sensor supply and can be equated with the sensor supply, abbreviation: SUPPLY.

(1) if the special version of the amplifier is equipped with the ±15 V option, then this pin = -15 V

6.2.2 Standard plug

ACC/DSUBM-		B2	U4
DSUB Pin	Terminal	BRIDGE	VOLTAGE
9	1	+VB1	(RES.)
2	2	+IN1	+IN1
10	3	-IN1	-IN1
3	4	-VB1	(+SUPPLY)
11	5	[+SENSE1_1/4B1]	+IN2
4	6	-SENSE1	-IN2
12	7	+VB2	(-SUPPLY)
5	8	+IN2	+IN3
13	9	-IN2	-IN3
6	10	-VB2	(GND) *
14	11	[+SENSE2_1/4B2]	+IN4
7	12	-SENSE2	-IN4
15	15	GND	(GND)
8	18	+5V	(+5V)
	13		
	14		
⊕	16	CHASSIS	CHASSIS
⊕	17	CHASSIS	CHASSIS

[] : 1/4 Bridge with UNI2-8 and DCB2-8 +SENSE with BR2-4 and UNI-4

* if special version with ±15 V option, then this pin 6 is the reference

ACC/DSUBM-	ENC4, ENC4-IU	FRQ2	DO-8	REL4	DAC4	
DSUB Pin	Terminal	INC.-ENCODER	FREQUENCY	DIGITAL OUT	RELAIS	ANALOG OUT
9	1	+INA	+IN1	BIT1	IN1	
2	2	-INA	-IN1	BIT2	IN2	DAC1
10	3	+INB		BIT3	IN3	AGND
3	4	-INB		BIT4	IN4	
11	5	+INC	+IN2	BIT5	OFF1	DAC2
4	6	-INC	-IN2	BIT6	OFF2	AGND
12	7	+IND		BIT7	OFF3	
5	8	-IND		BIT8	OFF4	DAC3
13	9	+INDEX			ON1	AGND
6	10	-INDEX			ON2	
14	11	+5V	+5V	HCOM	ON3	DAC4
7	12	GND *	GND	LCOM	ON4	AGND
15	15	(-SUPPLY)		LCOM	(GND)	
8	18	(+SUPPLY)		OPDRN	(+5V)	
	13					
	14					
⊕	16	CHASSIS	CHASSIS	CHASSIS	CHASSIS	CHASSIS
⊕	17	CHASSIS	CHASSIS	CHASSIS	CHASSIS	CHASSIS

[] : 1/4 Bridge with UNI2-8 and DCB2-8 +SENSE with BR2-4 and UNI-4 * if special version with ±15 V option, then this pin 6 is the reference

ACC/DSUBM-	DI8	DI2-8	DI4-8	PWM	
DSUB Pin	Terminal	DIGITAL IN	DIGITAL IN	TTL PULSE	
9	1	BIT1	+IN1	+IN1	PWM1_OPDRN
2	2	BIT2	+IN2	+IN2	PWM2_OPDRN
10	3	BIT3	-IN1/2	+IN3	PWM1_TTL
3	4	BIT4	+IN3	+IN4	PWM2_TTL
11	5	BIT5	+IN4	-IN1/2/3/4	PWM3_OPDRN
4	6	BIT6	-IN3/4	+IN5	PWM4_OPDRN
12	7	BIT7	+IN5	+IN6	PWM3_TTL
5	8	BIT8	+IN6	+IN7	PWM4_TTL
13	9	CLK	-IN5/6	+IN8	
6	10		+IN7	-IN5/6/7/8	
14	11	HCOM	+IN8	+HCOM	+5V
7	12	LCOM	-IN7/8	LCOM	GND
15	15	LCOM	LEVEL	LCOM	GND
8	18	LEVEL	LCOM	LEVEL	
	13				
	14				
	16	CHASSIS	CHASSIS	CHASSIS	CHASSIS
	17	CHASSIS	CHASSIS	CHASSIS	CHASSIS

¹ The DI4-8 plug is used by the latest digital input modules such as DI2-16 and the DI8-DO8-ENC4 multi-boards. In these cases, each 4-bit group has its own ground reference .

² The DI2-8 plug is used by the predecessor version DI-16. All of the plug's 8 bits share a common ground reference.

6.2.3 Special plug

Metal plug

ACC/DSUBM-	T4	
DSUB Pin	Terminal	TH-COUPLE/RTD
9	1	+I1
3	2	(+SUPPLY)
2	3	+IN1
10	4	-IN1
11	5	+IN2
4	6	-IN2
5	7	+IN3
13	8	-IN3
14	9	+IN4
7	10	-IN4
12	11	(-SUPPLY)
6	12	-I4 (GND) *
	15	-I3
	18	+I2
15	13	GND
	14	+I3
	16	+I4
	17	-I1
	19	-I2
	20	CHASSIS

Metal plug

ACC/DSUBM-	I4		I2
DSUB Pin	Terminal	CURRENT	CURRENT
9	1	(RES.)	+SUPPLY1
2	2	+IN1	+IN1
10	3	-IN1	-IN1
3	4	(+SUPPLY)	-SUPPLY1
11	5	+IN2	
4	6	-IN2	
12	7	(-SUPPLY)	+SUPPLY2
5	8	+IN3	+IN2
13	9	-IN3	-IN2
6	10	(GND)	-SUPPLY2
14	11	+IN4	
7	12	-IN4	
15	15	(GND)	(GND)
8	18	(+5V)	(+5V)
	13		
	14		
⊕	16	CHASSIS	CHASSIS
⊕	17	CHASSIS	CHASSIS

DSUB- Terminal	ICP4 ICP	ICP2 ICP
1	+ICP1	+ICP1
2	-ICP1	-ICP1
3	+ICP2	
4	-ICP2	
5	+ICP3	+ICP2
6	-ICP3	-ICP2
7	+ICP4	
8	-ICP4	
9		
10		
11		
12		
13		
14	CHASSIS	CHASSIS
15	CHASSIS	CHASSIS
16	CHASSIS	CHASSIS
17	+5V	+5V
18	AGND	AGND

* if the special version of the amplifier is equipped with the ±15 V option, then this pin 6 is the reference

Metal plug

ACC/DSUBM-	DO-HC-8	
DSUB Pin	Terminal	DIGITAL OUT HIGH CURRENT
9	1	BIT1
2	2	BIT2
10	3	BIT3
3	4	BIT4
11	5	BIT5
4	6	BIT6
12	7	BIT7
5	8	BIT8
13	9	HCOM_1-4
6	10	LCOM_1-4
14	11	HCOM_5-8
7	12	LCOM_5-8
15	15	LCOM
8	18	OPDRN
	13	
	14	
⊕	16	CHASSIS
⊕	17	CHASSIS

Metal plug

ACC/DSUBM-	SYNTH4	
DSUB Pin	Terminal	SYNTHESIZER
9	1	DOUT1
2	2	AOUT1
10	3	AGND
3	4	DOUT2
11	5	AOUT2
4	6	+5V
12	7	HCOM
5	8	AOUT3
13	9	AGND
6	10	DIN1
14	11	AOUT4
7	12	LCOM
15	15	LEVEL
8	18	OPDRN
	13	
	14	
⊕	16	CHASSIS
⊕	17	CHASSIS

6.2.4 TEDS plug

ACC/DSUBM-TEDS-		UNI2
DSUB Pin	Terminal	UNIVERSAL
9	1	+VB1
3	2	-VB1
2	3	+IN1
10	4	-IN1
11	5	I1_1/4B1 ⁽¹⁾
4	6	-SENSE1
5	7	+IN2
13	8	-IN2
14	9	I2_1/4B2 ⁽¹⁾
7	10	-SENSE2
12	11	+VB2
6	12	-VB2
15	15	TEDS_GND
8	18	(+5V)
	13	TEDS2
	14	TEDS1
⊕	16	CHASSIS
⊕	17	CHASSIS

ACC/DSUBM-TEDS-		B2	U4
DSUB Pin	Terminal	BRIDGE	VOLTAGE
9	1	+VB1	(RES.)
2	2	+IN1	+IN1
10	3	-IN1	-IN1
3	4	-VB1	(+SUPPLY)
11	5	[+SENSE1_1/4B1]	+IN2
4	6	-SENSE1	-IN2
12	7	+VB2	(-SUPPLY)
5	8	+IN2	+IN3
13	9	-IN2	-IN3
6	10	-VB2	GND
14	11	[+SENSE2_1/4B2]	+IN4
7	12	-SENSE2	-IN4
15	15	(GND), TEDS_GND	TEDS_GND
8	18	(+5V)	(+5V)
	13	TEDS1	TEDS1
	14	TEDS2	TEDS2
⊕	16	CHASSIS	CHASSIS
⊕	17	CHASSIS	CHASSIS
	19		TEDS3
	20		TEDS4

(1) if the special version of the amplifier is equipped with the ±15 V option, then this pin = -15 V

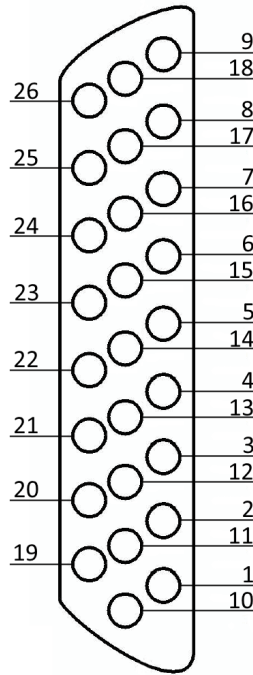
(2) if special version with ±15 V option, then this pin 6 is the reference [] : 1/4 Bridge with UNI2-8 and DCB2-8

ACC/DSUBM-TEDS-		T4
DSUB	Terminal	TH-COUPLE/RTD
9	1	+I1
3	2	(+SUPPLY)
2	3	+IN1
10	4	-IN1
11	5	+IN2
4	6	-IN2
5	7	+IN3
13	8	-IN3
14	9	+IN4
7	10	-IN4
12	11	(-SUPPLY)
6	12	-I4
	15	-I3
	18	TEDS4
15	13	TEDS_GND
	14	+I3
	16	+I4
	17	TEDS3
	19	TEDS2
	20	TEDS1
	21	-I1
	22	+I2
	23	-I2
	24	CHASSIS

ACC/DSUBM-TEDS-		I4	I2
DSUB Pin	Terminal	CURRENT	CURRENT
9	1	(RES.)	+SUPPLY1
2	2	+IN1	+IN1
10	3	-IN1	-IN1
3	4	(+SUPPLY)	-SUPPLY1
11	5	+IN2	
4	6	-IN2	
12	7	(-SUPPLY)	+SUPPLY2
5	8	+IN3	+IN2
13	9	-IN3	-IN2
6	10	GND	-SUPPLY2
14	11	+IN4	
7	12	-IN4	
15	15	TEDS_GND	TEDS_GND
8	18	(+5V)	(+5V)
	13	TEDS1	TEDS1
	14	TEDS2	TEDS2
	16	CHASSIS	CHASSIS
	17	CHASSIS	CHASSIS
	19	TEDS3	
	20	TEDS4	

6.3 DSUB-26 pin configuration (high density)

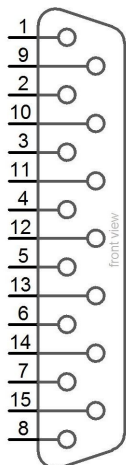
ACC/DSUBM-		HD-I4	HD-B4
DSUB	Klemme	CURRENT	BRIDGE
13	1	+IN2	+IN2
4	2	-IN2	-IN2
14	3		[+SENSE2_1/4B2]
5	4		-SENSE2
15	5	+IN3	+IN3
6	6	-IN3	-IN3
16	7		[+SENSE3_1/4B3]
7	8		-SENSE3
23	9	+SUPPLY3	+VB3
24	10	-SUPPLY3	-VB3
25	11	+SUPPLY4	+VB4
26	12	-SUPPLY4	-VB4
17	13	+IN4	+IN4
8	14	-IN4	-IN4
18	15		[+SENSE4_1/4B4]
9	16		-SENSE4
21	17	+SUPPLY2	+VB2
22	18	-SUPPLY2	-VB2
19	19	+SUPPLY1	+VB1
20	20	-SUPPLY1	-VB1
11	21	+IN1	+IN1
2	22	-IN1	-IN1
12	23		[+SENSE1_1/4B1]
3	24		-SENSE1



Please use the screw for a contact with Chassis.

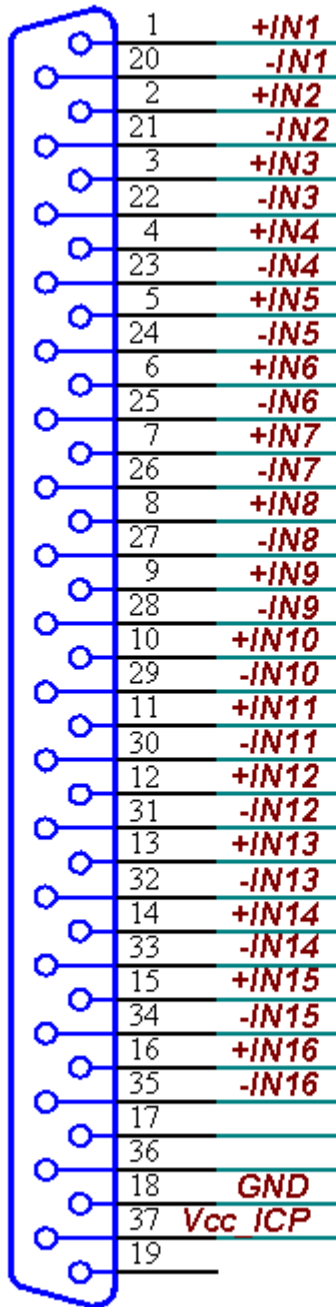
6.4 DSUB configuration of scanner SC2-32

6.4.1 Variety 8 x DSUB 15

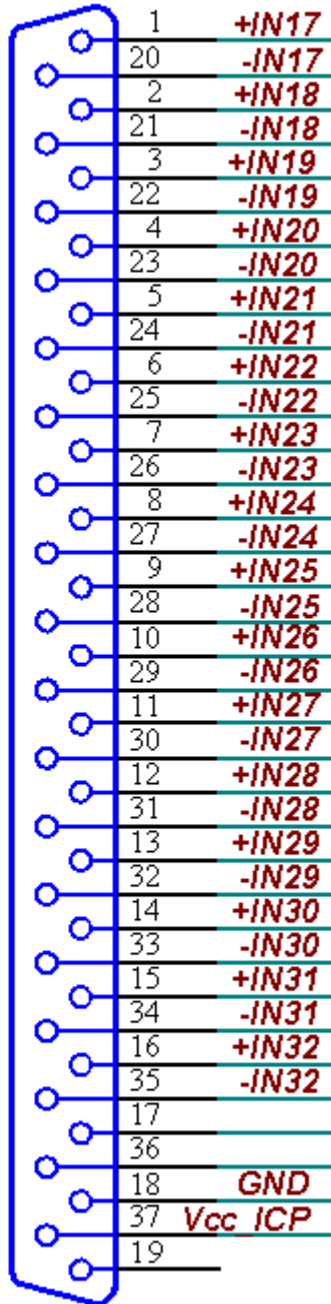


Pin	Signal	Plug 1	Plug 2	Plug 3	Plug 4	Plug 5	Plug 6	Plug 7	Plug 8
1	reserved								
9	reserved								
2	+IN A	+IN 17	+IN 21	+IN 25	+IN 29	+IN 1	+IN 5	+IN 9	+IN 13
10	-IN A	-IN 17	-IN 21	-IN 25	-IN 29	-IN 1	-IN 5	-IN 9	-IN 13
3	+V ext								
11	+IN B	+IN 18	+IN 22	+IN 26	+IN 30	+IN 2	+IN 6	+IN 10	+IN 14
4	-IN B	-IN 18	-IN 22	-IN 26	-IN 30	-IN 2	-IN 6	-IN 10	-IN 14
12	-V ext								
5	+IN C	+IN 19	+IN 23	+IN 27	+IN 31	+IN 3	+IN 7	+IN 11	+IN 15
13	-IN C	-IN 19	-IN 23	-IN 27	-IN 31	-IN 3	-IN 7	-IN 11	-IN 15
6	reserved								
14	+IN D	+IN 20	+IN 24	+IN 28	+IN 32	+IN 4	+IN 8	+IN 12	+IN 16
7	-IN D	-IN 20	-IN 24	-IN 28	-IN 32	-IN 4	-IN 8	-IN 12	-IN 16
15	GND								
8	Vcc ICP								

6.4.2 Variety 2 x DSUB 37



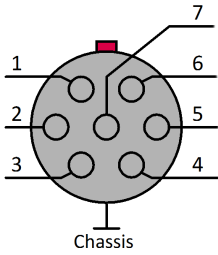
DSUB-37



DSUB-37

6.5 LEMO pin configuration

6.5.1 LEMO.1B (7-pin)



LEMO PIN	ISO2-8	ISOF-8(-SUPPLY, bipolar ±15 V)	C-8, OSC-16	LV3-8, LV-16, SC2-32	LV3-8-L-SUPPLY
1	+IN	+IN	+IN	+IN	+IN
2	-IN	-IN	-IN	-IN	-IN
3	+SUPPLY	+SUPPLY	+SUPPLY	+SUPPLY	+SUPPLY
4	GND (-SUPPLY*)	GND (-SUPPLY, -15 V)	GND (-SUPPLY*)	-SUPPLY (GND)	GND
5	TEDS OneWire	TEDS OneWire (SUPPLY GND) TEDS is omitted with ±15 V option	TEDS OneWire	TEDS OneWire	TEDS OneWire
6	PT100 current source	PT100 current source	PT100 current source	n.c.	-SUPPLY (-15 V)
7	+I (pos. signal input for current measurement)	+I (pos. signal input for current measurement)	n.c.	n.c.	n.c.

LEMO PIN	DCB2-8, B-8	UNI-8, UNI2-8	UNI-4	BR-4, BR2-4 **
1	+IN	+IN	+IN	+IN
2	-IN	-IN	-IN	-IN
3	+SUPPLY	+SUPPLY	+SUPPLY	+SUPPLY
4	-SUPPLY (GND)	-SUPPLY (GND)	-SUPPLY (GND)	-SUPPLY
5	TEDS (OneWire)	TEDS (OneWire)	TEDS (OneWire)	
6	-SENSE	-SENSE/PT100 current source	-SENSE	-SENSE
7	quarter bridge completion	quarter bridge completion / sense for PT100 3-wire configuration	+SENSE_1/4B	+SENSE

LEMO PIN	ENC-4, HRENC-4 ***
1	+IN X
2	-IN X
3	+SUPPLY
4	-SUPPLY (GND)
5	+INDEX
6	+IN Y
7	-IN Y

* sensor supply voltages available via the optional sensor supply module, see data sheet
Default ranges: +5 V to +24 V

** Upon request BR2-4 with TEDS - then with 8-pin LEMO (because -SUPPLY is not GND and is also not TEDS-GND)

*** Reference of +INDEX is -SUPPLY (GND)
sensor supply voltage 5 VDC/ 100 mA (optional 300 mA)
other sensor supply voltages available via the optional sensor supply module

6.6 DSUB-9 pin configuration

6.6.1 Display

DSUB-PIN	Signal	Description	Use in device
1	DCD	Vcc 5V	connected
2	RXD	Receive Data	connected
3	TXD	Transmit Data	connected
4	DTR	5V	connected
5	GND	ground	connected
6	DSR	Data Set Ready	connected
7	RTS	Ready To Send	connected
8	CTS	Clear To Send	connected
9	R1	Pulldown to GND	connected

Supply for the graphical display

Connector	+9 V to 32 V	- (0V)	nc
Binder	1	2	3
Souriau	B	C	A

6.6.2 GPS

DSUB-9		GPS 18 LVC	GPS 18 - 5Hz
Pin	Signal	Color	Color
1	Vin	Red	Red
2	RxD1*	White	White
3	TxD1	Green	Green
4	-	-	-
5	GND, PowerOff	2x Black	2x Black
6	-	-	-
7	PPS (1 Hz clock)	Yellow	Yellow
8	-	-	-
9	-	-	-

* Pin configuration at measurement device. At the GPS-mouse Rx and Tx are interchanged.

6.7 APPMOD

RS 232

Signal	PIN
n.c.	1
RX	2
TX	3
n.c.	4
DG	5
n.c.	6
RTS	7
CTS	8
n.c.	9

RS 422 / RS 485 Full-Duplex

Signal	PIN
Rx+	2
Rx-	8
TX+	3
Tx-	7

RS 485 Half-Duplex

Signal	PIN
+D	3
-D	7

6.8 Pin configuration of the fieldbusses

6.8.1 CAN, CAN FD Interface

DSUB-PIN	Signal	Description	Use in device
1	nc	reserved	do not connect
2	CAN_L	dominant low bus line	connected
3	CAN_GND	CAN Ground	connected
4	nc	reserved	do not connect
5	nc	reserved	do not connect
6	CAN_GND	optional CAN Ground	connected
7	CAN_H	dominant high bus line	connected
8	nc	reserved (error line)	do not connect
9	nc	reserved	do not connect

6.8.2 LIN-Bus (DSUB-9)

DSUB-PIN	Signal	Description
3	LIN_GND	LIN Ground
6	LIN_GND	Optional LIN Ground
7	LIN_INPUT/OUTPUT	LIN bus line
1, 2, 4, 5, 8 and 9	n.c.	

6.8.3 FlexRay-Bus (DSUB-9)

imc standard: One DSUB-9 socket with two channels

DSUB-Pin	Signal	Description
1	nc	
2	BM channel A	negative bus line channel A
3	GND	FlexRay ground
4	BM channel B	negative bus line channel B
5	GND	FlexRay ground
6	nc	
7	BP channel A	positive bus line channel A
8	BP channel B	positive bus line channel B
9	nc	

Option: Two DSUB-9 sockets (CON1 and CON2) with one channel each

DSUB-Pin	CON1	CON2
1	nc	nc
2	BM channel A (negative bus line channel A)	BM channel B (negative bus line channel B)
3	GND	GND
4	nc	nc
5	GND	GND
6	nc	nc
7	BP channel A (positive bus line channel A)	BP channel B (positive bus line channel B)
8	nc	nc
9	nc	nc

6.8.4 XCPoE (RJ45)

Standard Ethernet 1x RJ45.

6.8.5 ARINC-Bus (DSUB-15)

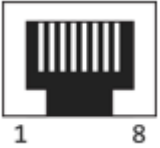
CON 1					
ARINC-Interface with 8 Rx channels			ARINC-Interface with 8 Rx and 4 Tx channels		
DSUB Pin	Signal	Description	DSUB Pin	Signal	Description
Standard 4x Rx			Standard 4x Rx; 2x Tx		
1	Rx1A	receiving channel 1A	1	Rx1A	receiving channel 1A
9	GND	GND	9	Tx1A	sending channel 1A
2	Rx1B	receiving channel 1B	2	Rx1B	receiving channel 1B
10	GND	GND	10	Tx1B	sending channel 1B
3	Rx2A	receiving channel 2A	3	Rx2A	receiving channel 2A
11	GND	GND	11	GND	GND
4	Rx2B	receiving channel 2B	4	Rx2B	receiving channel 2B
12	GND	GND	12	GND	GND
5	Rx3A	receiving channel 3A	5	Rx3A	receiving channel 3A
13	GND	GND	13	Tx2A	sending channel 2A
6	Rx3B	receiving channel 3B	6	Rx3B	receiving channel 3B
14	GND	GND	14	Tx2B	sending channel 2B
7	Rx4A	receiving channel 4A	7	Rx4A	receiving channel 4A
15	GND	GND	15	GND	GND
8	Rx4B	receiving channel 4B	8	Rx4B	receiving channel 4B

CON 2					
ARINC-Interface with 8 Rx channels			ARINC-Interface with 8 Rx and 4 Tx channels		
DSUB Pin	Signal	Description	DSUB Pin	Signal	Description
Standard 4x Rx			Standard 4x Rx; 2x Tx		
1	Rx5A	receiving channel 5A	1	Rx5A	receiving channel 5A
9	GND	GND	9	Tx3A	sending channel 3A
2	Rx5B	receiving channel 5B	2	Rx5B	receiving channel 5B
10	GND	GND	10	Tx3B	sending channel 3B
3	Rx6A	receiving channel 6A	3	Rx6A	receiving channel 6A
11	GND	GND	11	GND	GND
4	Rx6B	receiving channel 6B	4	Rx6B	receiving channel 6B
12	GND	GND	12	GND	GND
5	Rx7A	receiving channel 7A	5	Rx7A	receiving channel 7A
13	GND	GND	13	Tx4A	sending channel 4A
6	Rx7B	receiving channel 7B	6	Rx7B	receiving channel 7B
14	GND	GND	14	Tx4B	sending channel 4B
7	Rx8A	receiving channel 8A	7	Rx8A	receiving channel 8A
15	GND	GND	15	GND	GND
8	Rx8B	receiving channel 8B	8	Rx8B	receiving channel 8B

6.8.6 PROFIBUS (DSUB-9)

DSUB-PIN	Signal	Description
3	DATA+	B-Line
5	GND	PROFIBUS Ground
8	DATA-	A-Line
1, 2, 4, 6, 7 and 9	n.c.	

6.8.7 PROFINET (RJ45)

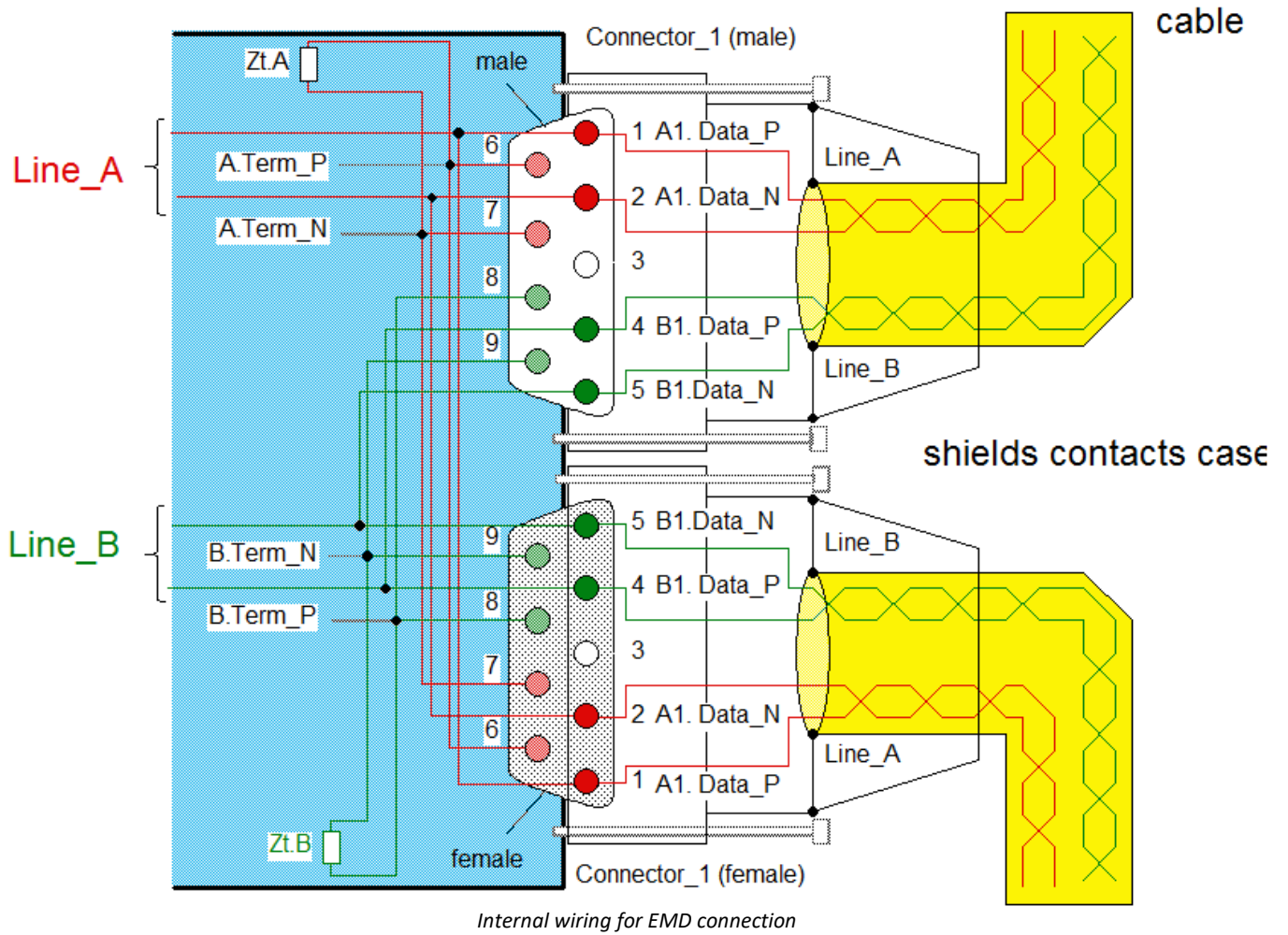
Pin configuration of the network socket type modular 8P8C	Pin	Signal	
	1	TX+	
	2	TX-	
	3	RX+	
	6	RX-	
4, 5, 7, 8	via RC to ground		

6.8.8 MVB-Bus (DSUB-9)

6.8.8.1 EMD Pin configuration - DSUB-9

EMD connection with double-occupancy. Standard DSUB-9 terminals are used.

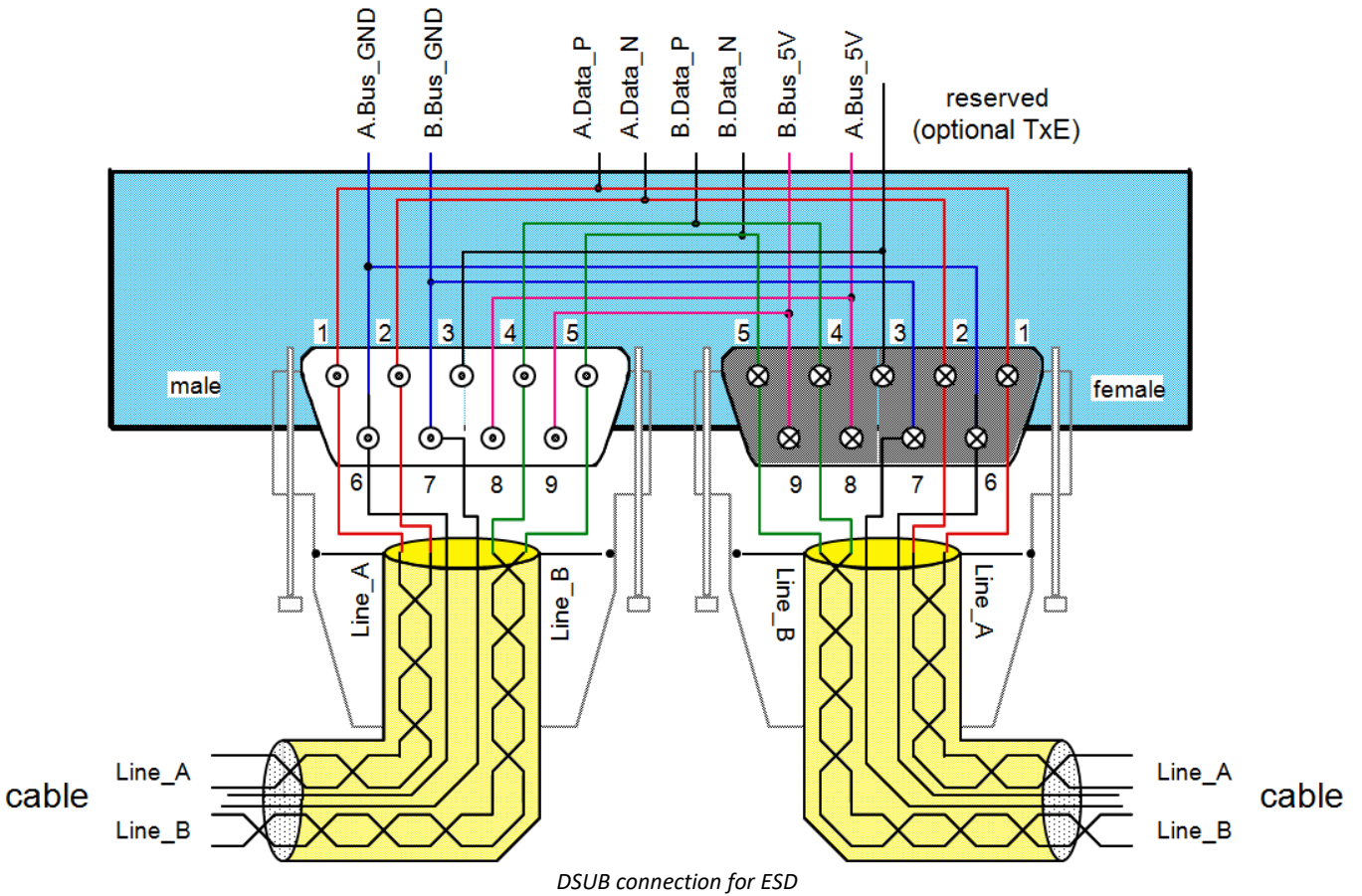
DSUB-PIN	Signal	Description	as termination terminal
1	A1. Data_P	data line A	jumper to 6
2	A1. Data_N	data line A	jumper to 7
3	NC	not connected	
4	B1. Data_P	data line B	jumper to 8
5	B1. Data_N	data line B	jumper to 9
6	Terminator A	internal	jumper to 1
7	Terminator A	interna	jumper to 2
8	Terminator B	interna	jumper to 4
9	Terminator B	interna	jumper to 5



6.8.8.2 ESD Pin configuration - DSUB-9

ESD Connection. Standard DSUB-9 terminals are used.

DSUB-PIN	Signal	Description	Termination
1	A. Data_P	Data lead A	<p style="text-align: center;">$R_m = 143 \Omega; R_u = R_d = 383 \Omega$</p>
2	A. Data_N	Data lead A	
3	NC	not connected	
4	B. Data_P	Data lead B	
5	B. Data_N	Data lead B	
6	A.Bus_GND	Ground A	
7	B.Bus_GND	Ground B	
8	A.Bus_5V	5V Supply A	
9	B.Bus_5V	5V Supply B	



6.9 Pin configuration of the REMOTE socket

 Reference

Remote control

The assignment and the description of the modes can be found in the chapter "[Start of operation](#)".

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The safe handling of measurement devices requires a good knowledge of the system. At our training center, experienced specialists are here to share their knowledge.

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