

imc CRONOS-XT

Getting Started

Edition 5 - 2024-04-09



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.

Copyright

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This documentation is the intellectual property of imc Test & Measurement GmbH. imc Test & Measurement GmbH reserves all rights to this documentation. The applicable provisions are stipulated in the "imc Software License Agreement".

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. A liability claim requires particularly careful handling of the unprotected individual slices (e.g. CRXT 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)

1.5 Last changes in content

Amendments and bug-fix in Edition 5

Section	Amendments
Storage media	updated description of a recommended handling

Amendments and bug-fix in Edition 4

Section	Amendments
Batteries	new battery labeling on the name plate

Amendments and bug-fix in Edition 3

Section	Amendments
Signal connection	instructions for DSUBM plug added

Amendments and bug-fix in Edition 2

Section	Amendments
General	we reviewed the chapter " <i>General introduction</i> " former " <i>General</i> "
Connecting via LAN	The dialog for configuring the IP address of the device also provides the IP address of the PC. Thus, the first step was removed from the documentation, which presented different possibilities in Windows to determine the IP address.

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.

imc CRONOS-XT may only be operated as a completely closed system.

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.

The [click mechanism](#)¹⁶⁾ allows CRFX- or CRXT slices to be quickly connected and disconnected. The click connections should always be secured to prevent unintentional unlocking.

In a wet environment, even low voltages can lead to dangerous flow through the body. For this reason, assemble the CRXT modules with special care, ensuring that the seals are clean and greased (e.g. with Vaseline) and use the supplied connecting elements. In a wet environment, no special modules with a protection degree lower than IP67 may be used.

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 Assembly and connection


3.1 After unpacking...

Check the delivered system immediately upon receiving it for completeness and for possible transport damage. In case of damage visible from outside, proceed as follows:

- Do not accept the delivery or only accept it with reservations
- Note the extent of the damage on the packing documents or on the delivery service's packing list.
- Begin the claims process.

Please check the device for mechanical damage and/ or loose parts after unpacking it. The supplier must be notified immediately of any transportation damage! Do not operate a damaged device!

Check that the list of accessories is complete (product package):

- AC/DC-power adaptor with cable and pre-assembled XT-Con plug ([Fig. 1 item A](#) )
- Getting started with your imc measurement device (printed)




Note

File a claim about every fault as soon as it is detected. Claims for damages can only be honored within the stated claims period.

3.2 Before commissioning

If components are brought into the operating room from a cold environment, condensation may occur. Wait until the CRXT slices are adapted to the ambient temperature and absolutely dry before clicking them together to form a system.

The [click mechanism](#)  allows CRFX- or CRXT slices to be quickly connected and disconnected. The click connections should always be secured to prevent unintentional unlocking.

Good radiation and convection conditions must be ensured to prevent heat build-up inside the device. The devices must not be operated if there is a danger of explosion or if they are exposed to aggressive chemicals.

Ambient temperature

The limits of the ambient temperature cannot be strictly specified because they depend on many factors of the specific application and environment, such as air flow/convection, heat radiation balance in the environment, contamination of the housing / contact with media, mounting structure, system configuration, connected cables, operating mode, etc. This is taken into account by specifying the operating temperature instead. Furthermore, it is not possible to predict any sharp limits for electronic components. Basically, reliability decreases when operating under extreme conditions (forced ageing). The operating temperature data represent the extreme limits at which the function of all components can still be guaranteed.

3.3 Notes on connecting

3.3.1 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 data in the manual chapter "Technical Spes" 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 immunity to interference and noisy transmission.
3. Note that parts that are not explicitly intended to be carried may be warmer than the handles. The **use of handles is mandatory** for safe use. Otherwise other suitable methods must be used to ensure acceptable protection against burns. Under normal conditions, the surface temperature of the enclosure/housing does not exceed the limits for accidental contact according to IEC 61010-1.
4. For the correct use of the imc click mechanism please observe to the instructions in the chapter "[Attachment mechanism](#)¹⁶". The rubber seals must be clean (see Cleaning) before connecting CRXT modules together.
5. Unused, open channels (having no defined signal) should not be configured with sensitive input ranges since otherwise signal quality of the device could be affected. Configure unused channels with an insensitive input range or short them out. The same applies to channels not configured as active.
6. 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 must be pressed to ensure that storage medium can be safely removed.
7. The CRXT device may only be disassembled into its slices in a controlled environment and must also be clicked together to form a closed CRXT device in a controlled environment. Only complete (closed) CRXT devices may be used in a non-controlled environment.

3.3.2 Attachment mechanism

Stacking the modules

1. Check the greased rubber seal for cleanliness
2. Make sure that the blue slider (protective function) is in position "open" (the blue handles of the slider are not aligned with the cooling fins of the housing)
3. Hook the front side of the modules into each other
4. Compress the rear side of the modules
5. For checking press the locking rocker and
6. Check the protective function: the blue handles of the slider are in alignment with the cooling fins of the housing, see [Fig. 1](#) ¹⁷

Detaching modules

1. Release the protective function and press the locking rocker
2. Detach modules from each other

Protective function

Until May 2020 the locking rocker was equipped with a locking screw so that the rocker cannot be operated. As of May 2020 the rocker will be equipped with a **locking slide in blue color**. With this slider the rocker can be fixed without tools.

Warning

All sliders respectively locking screws should be tightened before switching on the system.

Note

- During operation respectively powered device: modules should not be disconnected from the system To avoid damage:
Before clicking together or removing modules, switch off the system and disconnect the supply lines. (hot plug functionality is not supported during a running measurement).
- A **maximum total length** of 0.5 m of attached (clicked) modules should be observed!
- The **rubber seals** must be greased and clean so that the system is well sealed.
- The **CRXT handles** are mandatory for the safe transport, handling and sealing of a module block.

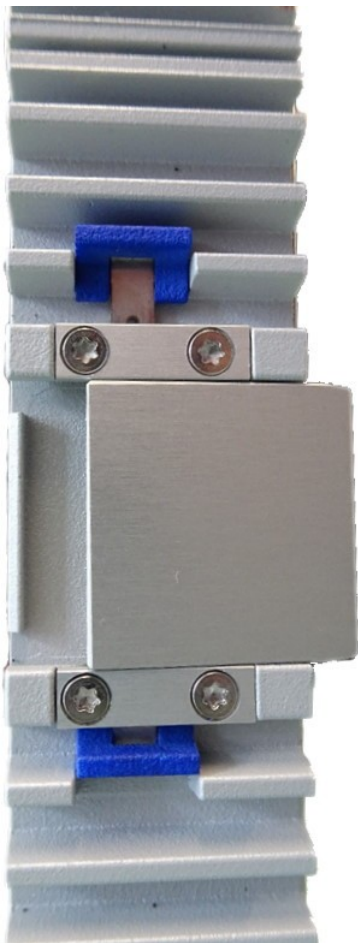
Sealing, IP rating and environmental specs

A single base unit or single CRXT slices cannot achieve an IP protection level at first because it is left open at the side. The given specifications are always only valid for a complete in a controlled environment clicked (closed) CRXT system. Only after it has been combined with a CRXT base unit (plus power module), CRXT slices if applicable, and the final sealing handles to form a complete CRXT system, sealing and environmental properties can be determined. The specification for shock, vibration and IP degree of protection applicable to the entire device is then derived from the weakest specification of the CRXT slices used in this combination (given in the technical data sheets of the respective CRXT slices). They assume that the individual CRXT slices are each mounted in conjunction with the additional stabilizing interconnect brackets (included in the standard accessories supplied).

According to IEC 60529 the Ingress Protection (IP) rating refer to protection classes provided by a housing, the protection of the electrical parts within the housing shell. If all functionally accessible contacts of the sockets are also to be protected, the corresponding plugs must be connected to all sockets. In many cases, a protective cover can also be used alternatively on unused sockets.

Reference

The sizes (drawings) of all available modules are listed in the data sheets of the modules and the base unit. The dimensions, the spacing of threadings for available mounting elements are stated in this separate document: "[Description of the mounting systems](#)".



Note

For the protective function: The blue handles of the slider have to be in alignment with the cooling fins.

Fig. 1 shown: open, unlocked state

3.3.3 Signal connection

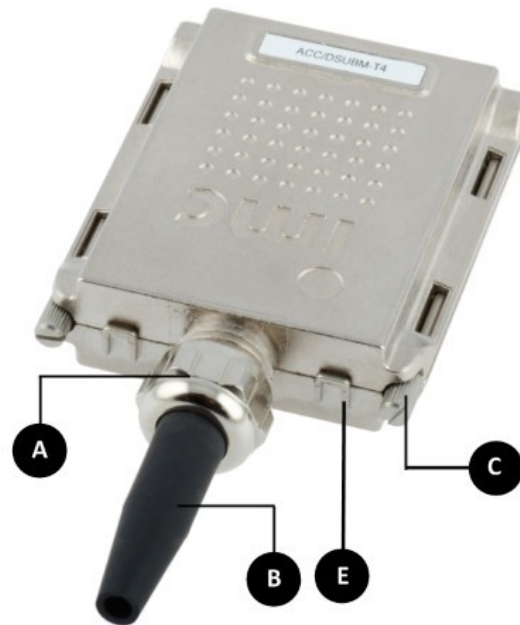
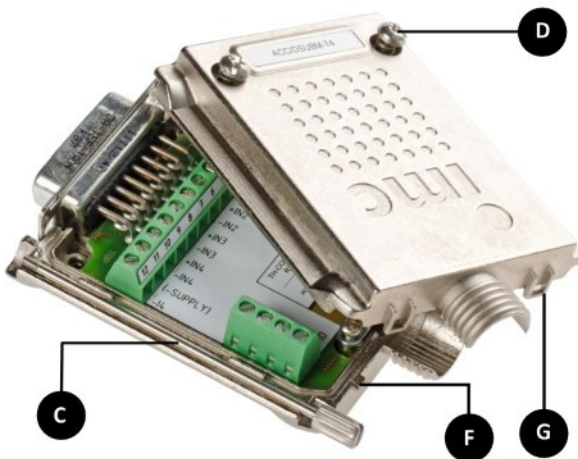
For devices with DSUB-15 connection technology, the convenient imc terminal plugs for solderless screw terminal connection are available as optional accessories.



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 connector:

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.

3.3.4 Building Block Principle

An imc CRONOS-XT (CRXT) system is composed of a base unit plus a power supply module and one or more CRXT modules as well as the system sealing handles (left and right). The individual modules are constructed to form a tight mechanical connection. At the same time, the "click" establishes an electrical connection to the system bus and the power supply. Clicking (or releasing) the CRXT slices together is only allowed in a controlled environment. The resulting measurement system can be managed from a PC which serves as the configuration tool and repository for measured data. Additional [fastening elements](#) ¹⁶ are recommended for particularly harsh conditions. Please refer to the CRXT base unit data sheet for vibration specifications and IP protection level.

3.3.5 Networking and power supply

The power supply of a CRXT system is provided exclusively via the power socket (Fig. 2 item A) by the POWER Module. If the supply voltage fails, an internal buffer keeps the base unit of the device active for a few seconds to complete the measurement save data files and then automatically shuts itself off. Short-time buffering to ensure data integrity is always a standard part of the system.

Main switch

The CRXT base unit has a central main switch (Fig. 2 item B) by which the complete block of directly clicked (stacked) modules is activated/deactivated. As an alternative to the manual main switch on the device's front panel, a remote-controllable electric contact can be used to switch the system on and off. Both the extended POWER module (CRXT/POWER-X) and the base unit are equipped with a [REMOTE socket](#) ²².



Fig. 2: CRXT/POWER and CRXT/2000

Legend:

A	power socket
B	main switch
C	REMOTE socket
D	cap of the data storage slot
E	grounding

3.3.6 POWER-X functions

Within an imc CRONOS-XT device the POWER-X module fulfills the function of an extended system supply. It can be used as an alternative to the simple POWER module, which only provides the simple supply voltage feed via XT-Con socket. The POWER-X module offers the following extended functions:

- Voltage converter for internal 34 V DC link
- Available interface for connection of distributed EtherCAT-based amplifiers of the imc CRONOS series (CRXT and CRFX)
- Support of Power-over-EtherCAT (PoEC) for distributed CRXT systems
- centrally remote controlled switching on of distributed amplifier blocks

3.3.6.1 Voltage converter

In the sense of a "Step-Up" converter the connected supply voltage is raised to a constant device-internal intermediate circuit of 31 V to 35 V. This allows in particular the operation of larger devices with low supply voltages, such as the 12 V on-board power supply in vehicles, since the currents via the module click connectors (subject to limits) are reduced accordingly.

3.3.6.2 EtherCAT System bus

The internal EtherCAT system bus of the device is provided to the outside via M8 sockets, thus enabling the operation of distributed systems. These can be composed of a master device (base unit with or without further amplifier modules) and spatially separated blocks of amplifiers (slaves). CRXT amplifier blocks must in turn be equipped with a POWER-X module. Such distributed systems can also be combined from slices of imc CRONOS-XT (CRXT) and imc CRONOSflex (CRFX). This means that distributed flex amplifier modules can be operated on an XT device and a flex base unit can also be combined with an XT amplifier block (with POWER-X). Suitable connection cables with mixed connection technology (M8 to RJ45) are available. Networking via EtherCAT can also extend over several stages:

A further slave can be connected to a slave block via cable (EtherCAT IN/OUT).

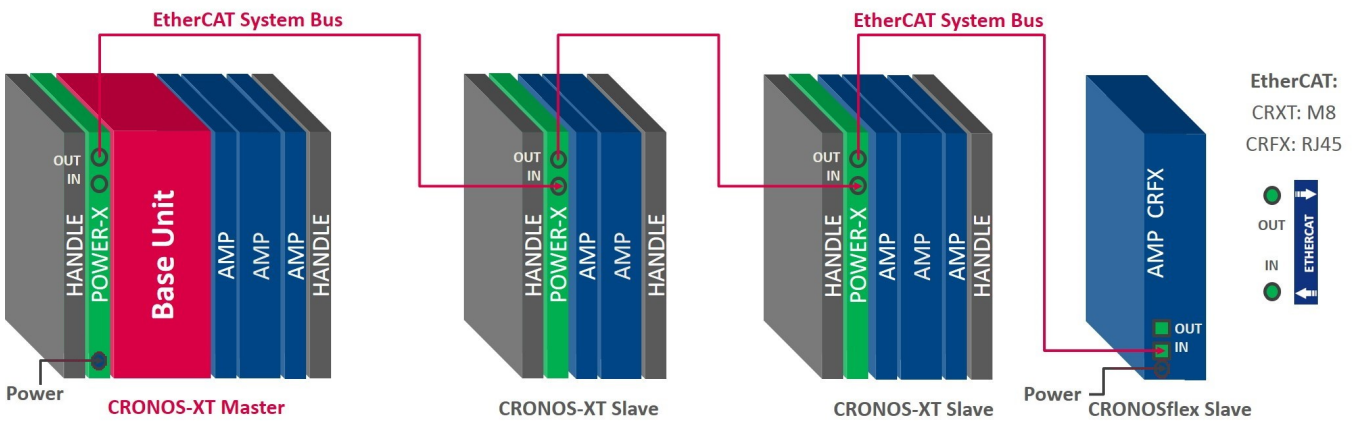


Fig. 3: distributed system configuration with CRONOS-XT and CRFX components

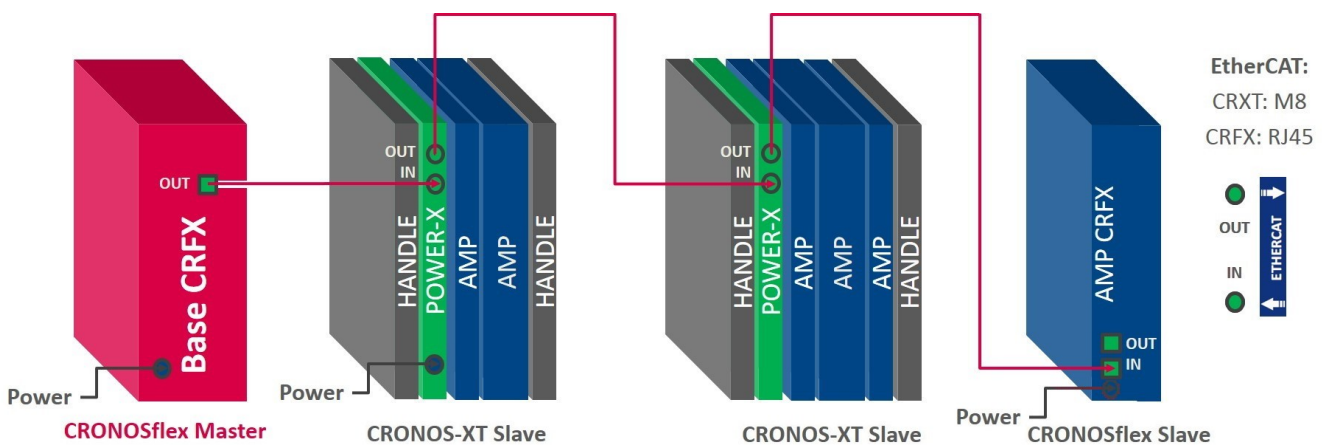


Fig. 4: distributed system configuration with a CRFX Base Unit, CRONOS-XT and CRFX components



Note

Notes concerning the EtherCAT System bus

- The internal EtherCAT system bus **directly provided** at the POWER-X serves exclusively for networking with the EtherCAT-based components of imc CRONOS. General EtherCAT **components of third party suppliers** are not supported!
- The CRONOS-XT base unit can be equipped with an EtherCAT **slave fieldbus interface**. However, this interface **is not related to** the EtherCAT system bus (master) described here, which is accessible at the POWER-X module and allows networking of imc modules.
The ECAT slave interface does NOT **directly** provide the internal system bus, but rather forms a **decoupled** interface to the overall system: This slave interface (with its own interface processor) then allows selected channels of the overall CRONOS device, in the sense of a complex slave subsystem, to be exchanged with a **foreign external** EtherCAT master (automation systems, e.g. TwinCAT)!

3.3.6.3 Power-over-EtherCAT (PoEC)

Via the EtherCAT system bus interface, the imc components involved can also be supplied via Power-over-EtherCAT (PoEC) using the same cable. This makes a separate supply connection for remote amplifiers generally unnecessary. The available operating supply power exchanged between the imc CRONOS-XT slices can be sufficiently large (max. 1.5 A).

3.3.6.4 Remote controlled switch-on (REMOTE)

The distributed amplifier units can be switched on remotely via the central main switch of the base unit. Although this function uses PoEC signals, it is independent of whether remote modules are actually supplied via PoEC.

Furthermore, the POWER-X module has its own REMOTE socket (XT-Con) with control signals for switching on and off. In connection with an XT base unit, its main switch is decisive for manual switch-on, but the REMOTE connection of the base is not effective.

3.3.7 Operation

3.3.7.1 Switching on and off

The POWER module does not have a separate push button for switching on and off, rather the main switch (push button) of the base unit installed in the same device is decisive. The device (or an amplifier block) combined with the POWER-X module switches on when

- the button of the base unit (if available) is pressed.
The REMOTE connection of the base is not considered!
- a button connected to the REMOTE socket of the POWER-X is pressed.
- a switch connected to the REMOTE socket of the POWER-X is closed and at the same time an external supply via the XT-Con socket is present.
- a PoEC voltage is present at the module's own EtherCAT input socket (≥ 30 VDC). This mode is especially relevant for the operation of distributed amplifier blocks.

If an external supply (10 to 35 VDC) is available via the XT-Con socket at the same time, the block connected to the POWER-X is only supplied via the XT-Con socket, while the PoEC signal may only control the power-on.

Accordingly, power off is controlled by the main switch of the adjacent base unit, as well as the control options, which are also supported for amplifier blocks:

- pressed button via REMOTE socket on the POWER-X
- open switch via REMOTE socket on POWER-X
- a PoEC voltage at the EtherCAT input socket drops to <25 VDC.

3.3.7.2 Switching on of a distributed system

When operating a master device (with one POWER-X) together with a unit of amplifiers (with another own POWER-X), the master device always provides a "valid" PoEC voltage at the EtherCAT interface (M8) at power-on thanks to the 31 V voltage converter. The amplifier expansion block connected via this cable is therefore switched on and off remotely via the PoEC signal. The actual supply of the slave system can be done either via the XT-Con socket or via PoEC, which then has to be considered as part of the output power of the master system.

3.3.7.3 Remote socket

The assignment of the REMOTE socket of the CRXT/POWER-X is identical to the CRXT base unit ([Fig. 2 item C](#)^[19]) except for pin 5 and pin 6. A static switch (between pin 1 and pin 2) or a push button (between pin 3 and pin 4) can be connected for switching on and off (In the following section you will [find the pin assignment](#)^[44]).

3.3.7.4 LED status indicators

The CRXT/POWER-X module is equipped with two multi-color LEDs that provide information about various operating states:

"POWER"-LED	State
green	operation without special limitation of the output power, device is supplied by external supply voltage 10 V to 35 VDC
yellow	operation with particularly limited output power, device is supplied via external supply voltage <10 VDC
alternately flashing green and yellow	Operation without special limitation of output power, device is powered by PoEC due to an external supply voltage <10 VDC
red ("LIMIT"-LED is off)	An error has occurred. The following causes are possible: <ul style="list-style-type: none"> - Device is shut down, but cannot switch off, e.g. because the remote switch is closed or PoEC voltage is present. - Output voltage is less than 26 VDC and therefore too low (hardware defect) - internal error

"LIMIT"-LED	State
green	current output power at less than 80 % of the permissible output power
yellow	current output power between 80 % to 95 % of the permissible output power
red	current output power over 95 % of the permissible output power; there is a risk of forced shutdown due to overload
red flashing	the short-circuit protection of the device has deactivated the output voltage for 4 seconds; the output voltage is then switched on again

3.3.8 Technical performance data (CRXT/POWER-X)

3.3.8.1 Output voltage and connection of additional measuring modules

The CRXT/POWER-X module boosts any external supply voltages (via XT-Con sockets) in the range of 7 to 31 VDC high to a constant output voltage of 34 VDC. If the external supply voltage is higher than 31 VDC, it is passed on to the output unregulated.

A PoEC voltage, fed into the EtherCAT input socket is passed to the output if its level is higher than 31 VDC and the external supply voltage at the XT-Con socket is lower than 10 VDC. At a PoEC level lower than 31 VDC the output voltage is increased to constant 31 VDC. The output voltage is available at the lateral "click" mechanism that connects to the adjacent device block as well as at the EtherCAT output socket. The available output power is divided between both sockets.

3.3.8.2 Output-side overcurrent protection

To protect against overloads caused by a configuration of unacceptably large systems, the POWER-X module has two independent current limiting circuits:

1. Short circuit protection (response time 10 to 30 ms)
2. static overload protection (reaction time approx. 1 second)

The **short-circuit protection** limits the output current to approx. 2.5 A (=85 W @ 34 VDC). If this limit is exceeded, the output voltage is cut off after approx. 10 to 30 ms and is only enabled again after approx. 4 seconds. If the short-circuit has not yet been eliminated, the system waits another 4 seconds and so on. During this "wait" the **"LIMIT" LED** of the Power Module flashes red every second.

The overload protection continuously evaluates the current output power and initiates a shutdown process after 10 seconds if the permissible static output power of 70 W is exceeded. The "LIMIT"-LED lights up yellow at an output power >80 % and red at an output power >95 % of the maximum permissible static output power.

3.3.8.3 Fuse

The CRXT/POWER-X module is protected by a non-resettable 16 A fuse at the input.

3.3.9 Grounding concept

Grounding with the use of the included power adaptor

The DC-supply input of the CRONOS-XT device itself is galvanically isolated from the housing (CHASSIS) as well as the measurement inputs. For the case of the configuration with a POWER-X module, a further step-up converter is integrated in the input circuit. For the purpose of controlled grounding, each of the imc CRONOS-XT Modules has a dedicated grounding contact on the lower part of its front panel (Fig. 2 item E¹⁹).

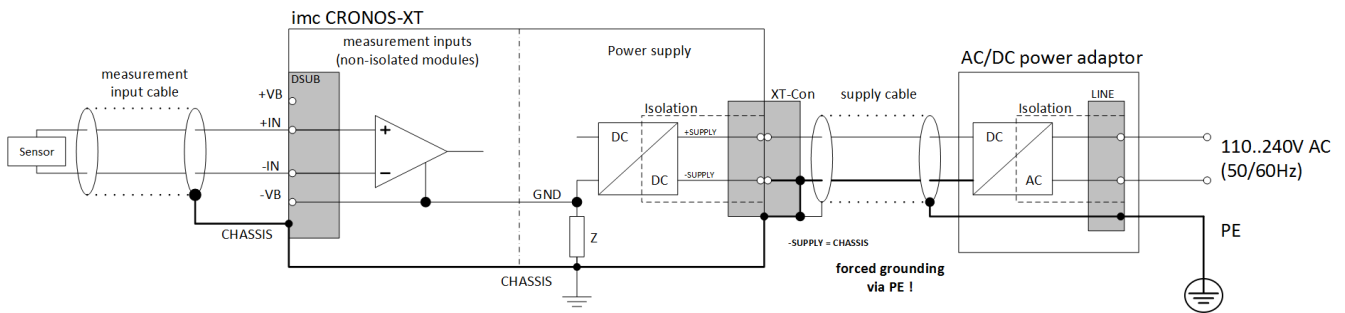


Fig. 5

Z corresponds to a high-impedance connection that capacitively short-circuits RF interference.

Use of the desktop power supply unit (AC/DC adaptor), 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.

Attention

The isolated supply input is thus grounded.

Please note that the supplied standard power adaptor does not have a suitable degree of protection for harsh environments. A sealed version is available as an optional accessory.

Grounding with power supplied by a vehicle battery

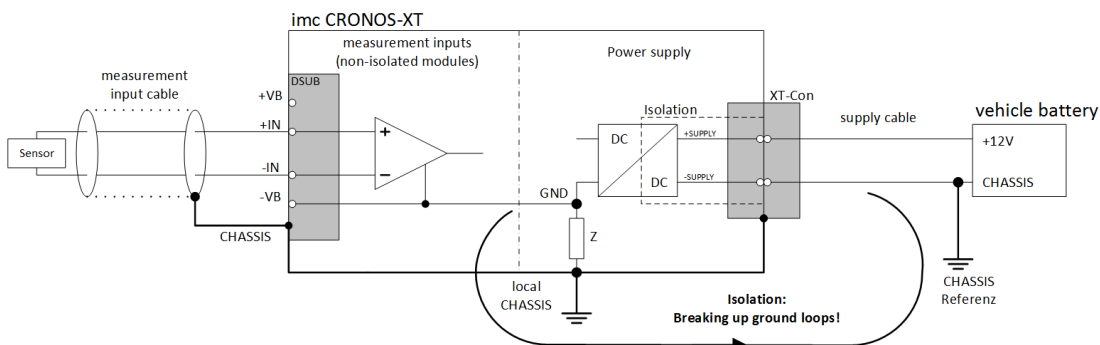


Fig. 6

Z corresponds to a high-impedance connection that capacitively short-circuits RF interference.

3.3.10 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.

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

Swapping the storage medium

Pressing the button signals 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.

3.3.10.1.1 Storage media

Storage media	Description
CFast	<p>Concerning devices with CFast slot (see "Device overview").</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 ²⁶ functionality is available.

Storage media	Description
SSD	<p>Applicable to devices having a hard drive (see "Device overview").</p> <ul style="list-style-type: none"> With SSD hard drives, Hot-Plug ^[26] 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 ^[31]. In addition to the SSD, a CF/CFast-card can be inserted in the measurement device and used alternatively.

3.3.10.1.2 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

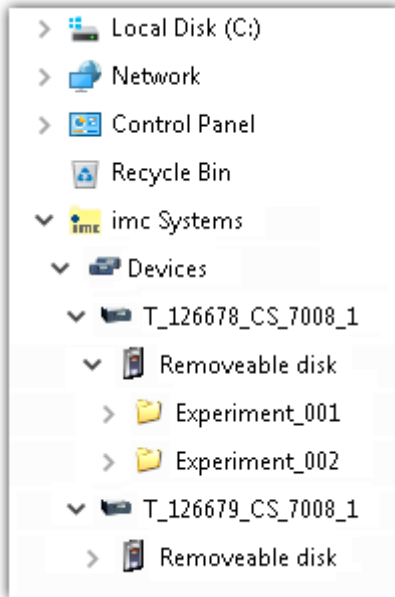
A tip on **interval saving**: Supposing the system's power supply suffers an outage during a measurement, it would not be possible to guarantee that the data file on the storage medium is terminated properly. This may lead to a failure to record the last measurement taken. Saving at intervals is a way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

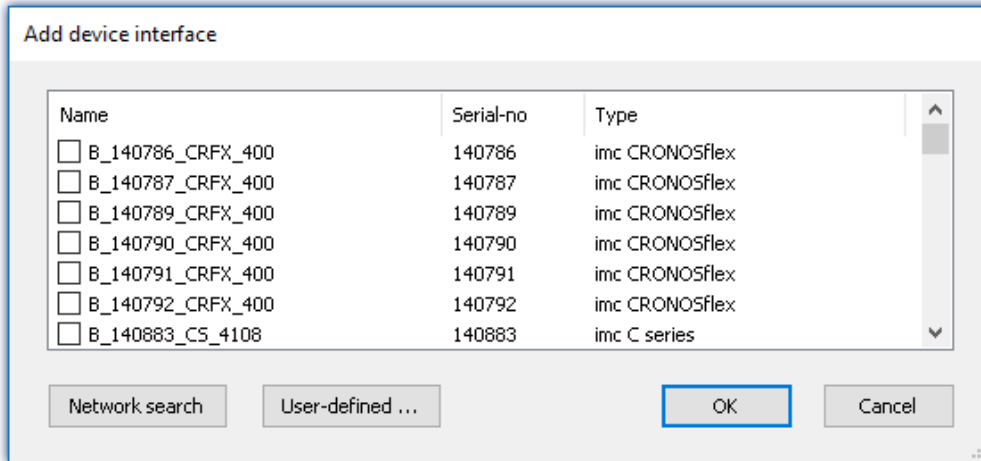
In order to get access to your device's storage medium, you must first add it to the tree diagram (see "[imc Systems - Adding a device](#)"²⁹). Subsequently, you are able to navigate to the desired data in the storage medium and thus to work with them.

3.3.10.1.2.1 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

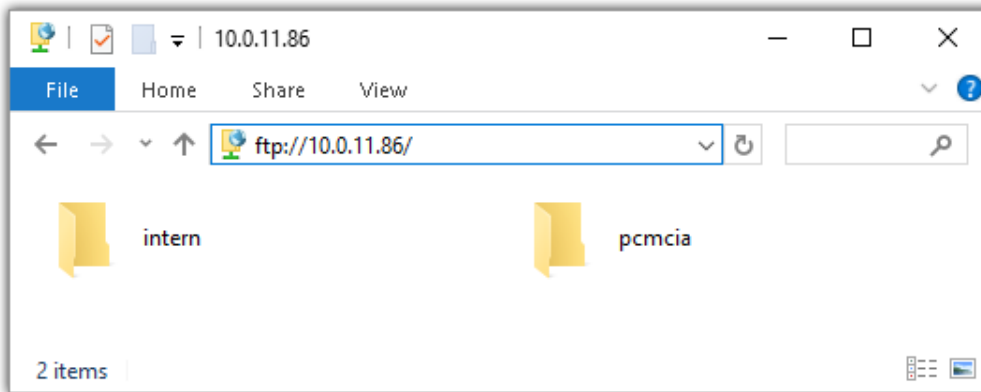
More information is presented in the section: "*Setting Up - Connect the device*"

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

3.3.10.1.2.2 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).

3.3.10.1.3 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](#)^[31] 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](#)"^[31].
- 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.

3.3.10.1.3.1 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](#)^[31] 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**

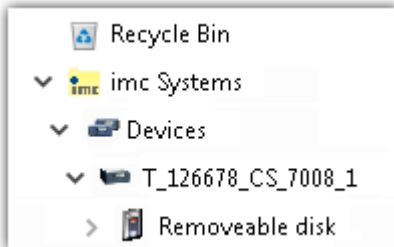
If a few channels having a high data rate are being recorded, then **large clusters** on the data carrier provide better advantage. Formatting with FAT32 on the PC and drive sizes < 8 GB creates disadvantageously small clusters, which in conjunction with the full aggregate sampling rate can lead to a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

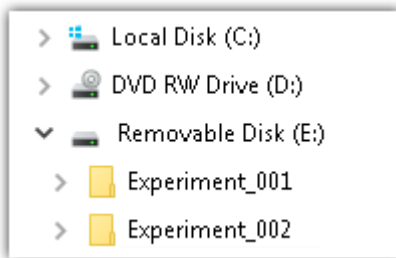
The device performs the formatting according to the following rule:

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](#)**³⁰, 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](#)³¹.

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.

3.3.10.1.4 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 ^[31]. • 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 ^[31], 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 ^[31], data overflow can occur if a high aggregate sampling rate is generated by very many low-speed channels.

4 Maintenance and servicing

4.1 Maintenance and servicing notes

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.

4.2 Cleaning

- Always unplug the power supply before cleaning the device. Only qualified service technicians 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.
- If you clean the rubber seals with commercially available household cleaning products, please follow the respective cleaning instructions of the manufacturer. The seal is thus protected against premature aging because no air can reach the seal. Before connecting CRXT slices together ([Attachment mechanism](#)¹⁶), the rubber seals must be clean and greased (e.g. with Vaseline).

4.3 Storage

As a rule, the measurement device can be stored at temperatures ranging from -40°C to +85°C. Special care is required when storing individual CRXT slices. The rubber seals on the sides must be handled and maintained with care. Before storage we recommend that the rubber seals are cleaned (see Cleaning) and greased. The seal is thus protected against premature aging because no air can reach the seal. CRXT slices should preferably be stored as a closed CRXT unit.

4.4 Transport

imc CRONOS-XT slices should preferably be transported as a [closed CRXT-device](#)¹⁶, always use the original packaging or a appropriate packaging which protects the device against knocks and impacts. 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.

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.

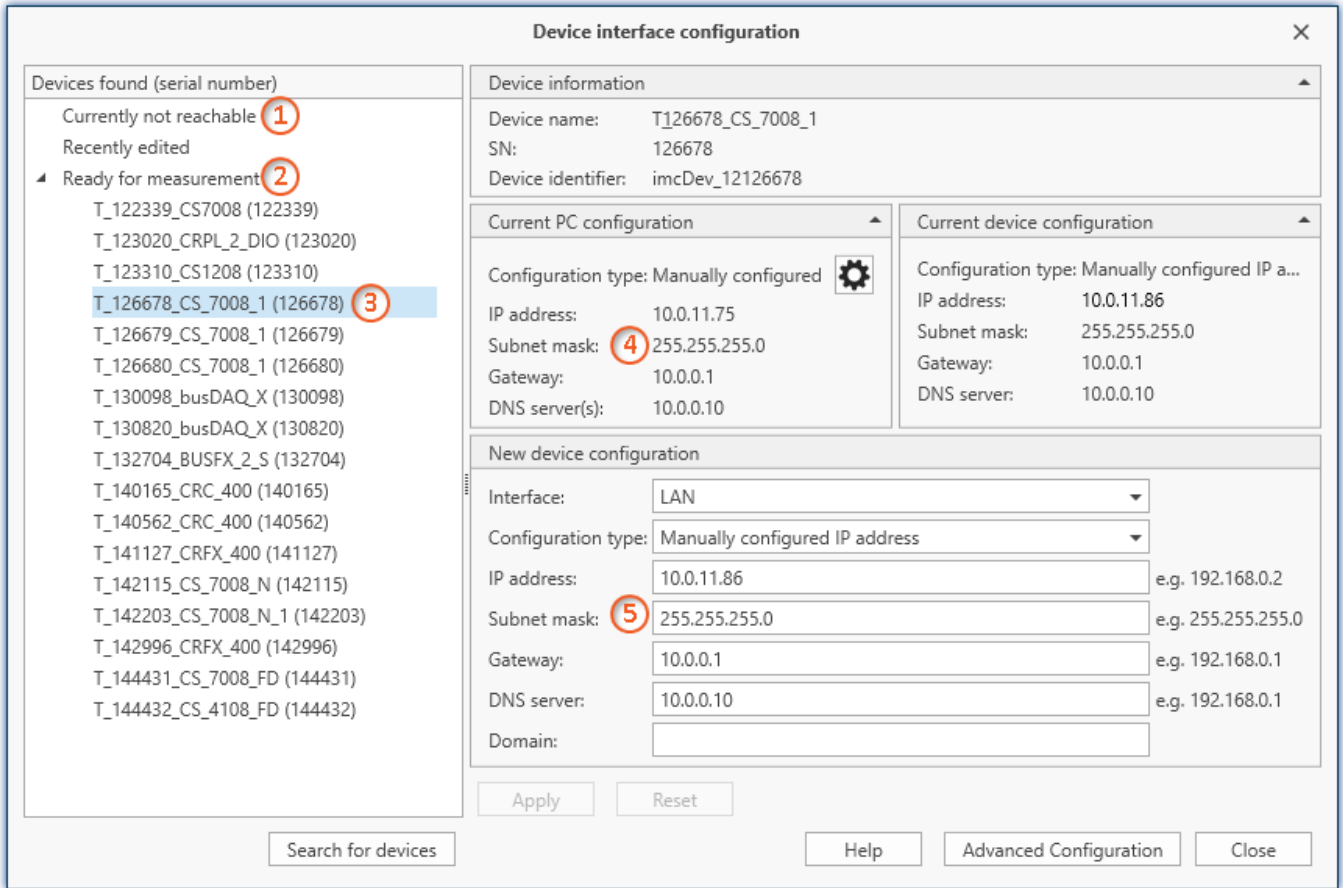
Ribbon	View
Setup-Configuration > Device interfaces ()	Complete

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

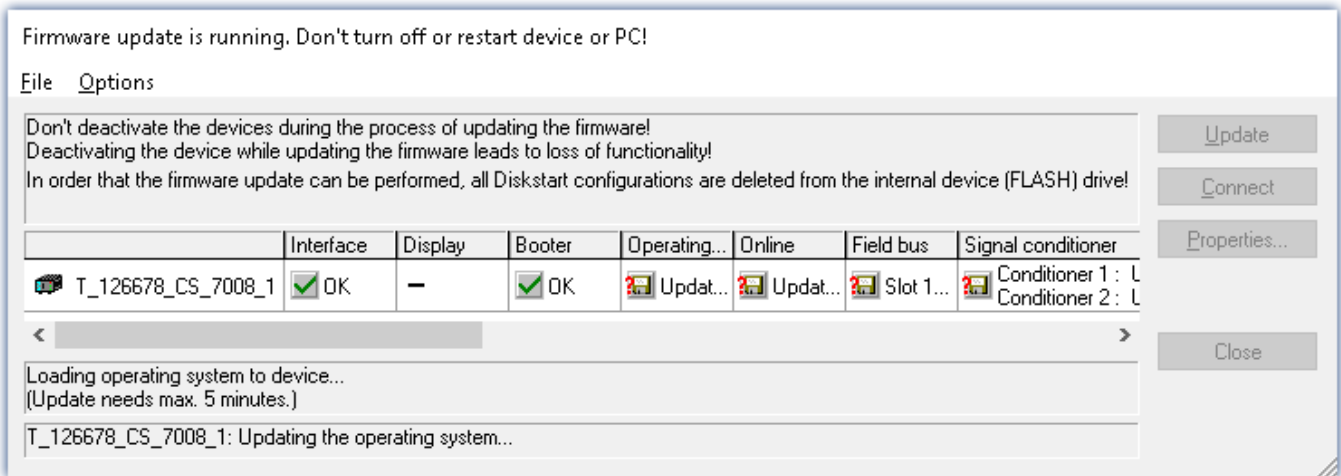
Do not interrupt the firmware update!

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

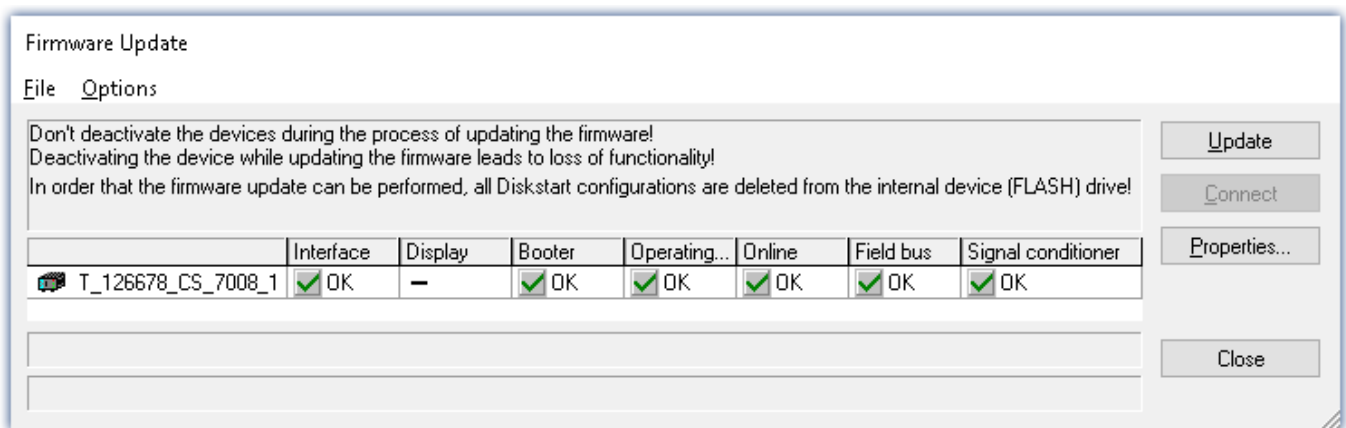
The following symbols for the individual firmware components appear in the list:

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

Sealing and circular plugs/sockets (XT-Con)

The connection technology of the CRXT base units uses sealed DSUB-9 and circular plugs of type "XT-Con". This plug/socket family is available from imc as an accessory and has the following properties:

- XT-Con is mechanically compatible with sealed LEMO.1T series:
However, the specified tightness is only guaranteed with the appropriate plugs (XT-Con) available from imc as accessories!
- XT-Con is not compatible with the LEMO.1B series:
This LEMO plug family is not mechanically compatible and does not snap and latch!

The standard AC/DC power adaptor is not sealed. IP65 compatible adaptors are available as optional accessories, as well as sealed connector plugs for installation in vehicles, etc.

The same applies to network cables with RJ-45 plugs: The cable included in the standard scope of delivery is a non-sealed laboratory version for commissioning purposes. A cable is available as an accessory with the RJ-45 plug sealed on one side and suitable for connection to standard equipment such as computers or network switches on the other side.

The standard connection technology for amplifier modules is sealed DSUB-15 sockets. When equipped with other customer-specific plugs such as LEMO.1B, the respective IP ratings of the selected plugs apply to the complete device.

The sockets on the device side must be sealed either with the supplied sealed protective caps or with suitable sealing plugs.

DSUB-15 Plug

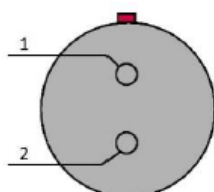
For modules with DSUB-15 connection technology, the convenient imc terminal plugs for solderless screw terminal connection are available as optional accessories. These are to be used in the special IP65 version. This applies regardless of whether sealing properties are required: The simple standard terminal plugs have shorter locking screws and therefore cannot be fixed to CRXT devices. The two types are not mutually compatible, but long screws are available as accessories for retrofitting: long bolts: only for CRXT, short standard bolts: only for CRFX, CRC, C-SERIES, etc.

The DSUB plugs are made of robust metal and adapt the signals of the DSUB-15 sockets to solderless screw terminals.

6.1 XT-Con

6.1.1 Power supply

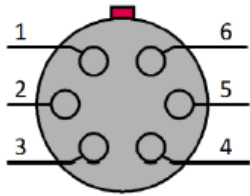
The Power Module is equipped with a XT-Con socket ([Fig. 1 item A](#)¹⁹) for an ultra-wide DC power input. The DC power input is not designed for a connection to a DC-grid according to EN 61326-1.



Supply, XT-Con
View on the socket at the slice

PIN	Signal
1	+Supply
2	-Supply

6.1.2 Remote



Remote, XT-Con
View on the socket at the slice

CRXT base unit	
PIN	Signal
1	GND
2	REMOTE switch
3	GND
4	REMOTE push button
5, 6	n.c.

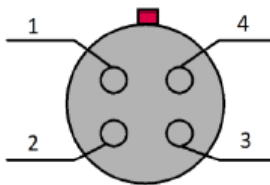
CRXT/POWER-X	
PIN	Signal
1	GND
2	REMOTE switch
3	GND
4	REMOTE push button
5	GND
6	reserved

Optional accessory: CRXT/REMOTE-PLUG (11100036), XT-Con (6-pin)

Reference

[Please find here a description of the remote control.](#) ¹⁹

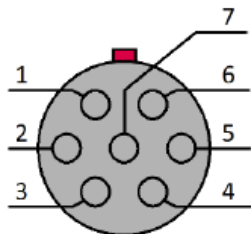
6.1.3 SYNC



SYNC, XT-Con

PIN	Signal
1	SYNC
2	GND
3	reserved
4	reserved

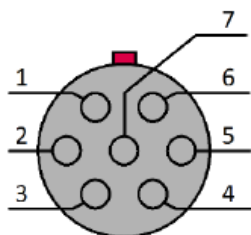
6.1.4 Display



Display, XT-Con
View on the socket

PIN	Signal
1	5V
2	RxD
3	TxD
4	CTS
5	GND
6	RTS
7	n.c.

6.1.5 GPS



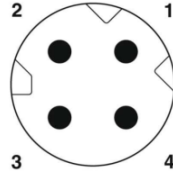
GPS, XT-Con
View on the socket

PIN	Display
1	Vin (5 V)
2	RxD
3	TxD
4	CTS
5	GND
6	n.c.
7	PPS-Signal

6.2 M8

EtherCAT

Pin	Signal
1	+TxD
2	+RxD
3	-TxD
4	-RxD



M8 socket, D-coded
(view on top of the stiches)

6.3 DSUB-9

6.3.1 CAN, CAN FD

DSUB-PIN	Signal	Description	Use in device
1	+CAN_SUPPLY	Power via CAN: +Supply (optional)	output current $I < 1$ A (permanently) both CAN nodes together, see CRXT technical specs
2	CAN_L	dominant low bus line	connected
3	CAN_GND	CAN Ground	connected
4	nc	reserved	do not connect
5	-CAN_SUPPLY	Power via CAN: -Supply (optional)	unused as per standard* (supply $I < 1$ A)
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

6.3.2 LIN-Bus

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.	

6.4 DSUB-15

In general: DSUB pin 1 is internally reserved.

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

TEDS variant

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

[] : 1/4 Bridge with UNI2-8 and DCB2-8

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

ACC/DSUBM-		ENC4, ENC4-IU	FRQ2	DI4-8	DO-8	DAC4
DSUB Pin	Terminal	INC.-ENCODER	FREQUENCY	DIGITAL IN	DIGITAL OUT	ANALOG OUT
9	1	+INA	+IN1	+IN1	BIT1	
2	2	-INA	-IN1	+IN2	BIT2	DAC1
10	3	+INB		+IN3	BIT3	AGND
3	4	-INB		+IN4	BIT4	
11	5	+INC	+IN2	-IN1/2/3/4	BIT5	DAC2
4	6	-INC	-IN2	+IN5	BIT6	AGND
12	7	+IND		+IN6	BIT7	
5	8	-IND		+IN7	BIT8	DAC3
13	9	+INDEX		+IN8		AGND
6	10	-INDEX		-IN5/6/7/8		
14	11	+5V	+5V	+HCOM	HCOM	DAC4
7	12	GND *	GND	LCOM	LCOM	AGND
15	15	(-SUPPLY)		LCOM	LCOM	
8	18	(+SUPPLY)		LEVEL	OPDRN	
	13					
	14					
⊕	16	CHASSIS	CHASSIS	CHASSIS	CHASSIS	CHASSIS
⊕	17	CHASSIS	CHASSIS	CHASSIS	CHASSIS	CHASSIS

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

With HRENC-4 the INDEX channel is only on the first socket (CON1) available

Special 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

TEDS variant

ACC/DSUBM-TEDS-		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
	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

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

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

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	

Universal plug

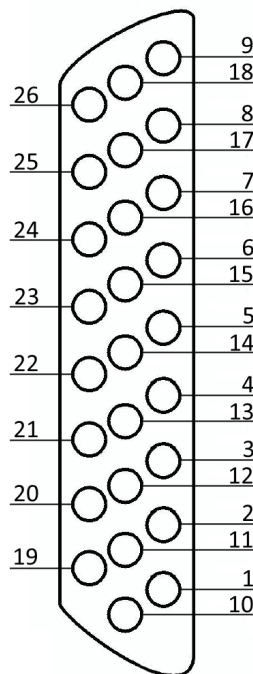
ACC/DSUBM-		UNI2
DSUB Pin	Terminal	UNIVERSAL
9	1	+VB1
3	2	-VB1
2	3	+IN1
10	4	-IN1
11	5	I1_1/4B1
4	6	-SENSE1
5	7	+IN2
13	8	-IN2
14	9	I2_1/4B2
7	10	-SENSE2
12	11	+VB2
6	12	-VB2
15	15	(GND)
8	18	(+5V)
	13	
	14	
⊕	16	CHASSIS
⊕	17	CHASSIS

TEDS variant

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
4	6	-SENSE1
5	7	+IN2
13	8	-IN2
14	9	I2_1/4B2
7	10	-SENSE2
12	11	+VB2
6	12	-VB2
15	15	TEDS_GND
8	18	(+5V)
	13	TEDS2
	14	TEDS1
⊕	16	CHASSIS
⊕	17	CHASSIS

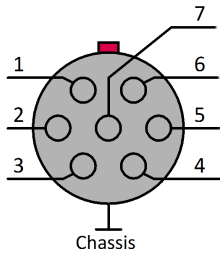
6.5 DSUB-26 (High Density)

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.

6.6 LEMO.1B (7-pin)



View on the LEMO socket

LEMO PIN	ISO2-8	ISOF-8 (± 15 V, bipolar)	LV3-8	LV3-8-L-SUPPLY
1	+IN	+IN	+IN	+IN
2	-IN	-IN	-IN	-IN
3	+SUPPLY *	+SUPPLY	+SUPPLY	+SUPPLY
4	GND (-SUPPLY)	GND (-SUPPLY, -15 V)	-SUPPLY (GND)	SUPPLY GND
5	TEDS OneWire	TEDS OneWire (SUPPLY GND) TEDS is omitted with ± 15 V option	TEDS OneWire	TEDS OneWire
6	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.

LEMO PIN	DCB2-8, B-8	UNI2-8	UNI-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	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

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An Axiometrix Solutions Brand

Contact imc

Address

imc Test & Measurement GmbH
Voltastr. 5
13355 Berlin

Phone: (Germany): +49 30 467090-0

E-Mail: info@imc-tm.de

Internet: <https://www.imc-tm.com>

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/>

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