imc

An Axiometrix Solutions Brand

# imc BUSDAQ*flex*

**Getting Started**

Edition 10 - 2025-02-28

## 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

**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.

# Table of contents

# 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 6 will be happy to receive your feedback.

## 1.2  Service and maintenance

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

Phone:            (Germany):        **+49 30 629396-333** (Mon.-Fri.: 9.00 - 12.00 and 13.00 - 17.00)

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

**imc BUSDAQ*flex* devices 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 Europe[1]) 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 imc BUSDAQ*flex* devices 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 the imc BUSDAQ*flex* devices 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](#) 6

**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](#) 6 .

**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 ⌐6⌐). 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  History

### Amendments and bug-fix in Edition 10

| Section | Amendments |
| --- | --- |
| Service | Link set to the updated imc service form 2025 |

### Amendments and bug-fix in Edition 9

| Section | Amendments |
| --- | --- |
| Storage media | updated description of recommended handling |

### Amendments and bug-fix in Edition 8

| Section | Amendments |
| --- | --- |
| Batteries | new battery labeling on the name plate |

### Amendments and bug-fix in Edition 7

| Section | Amendments |
| --- | --- |
| GPS connection | maximum current = 220 mA, i.e. the 5 V can be loaded with max. 220 mA |

# 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

imc BUSDAQ*flex* is 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 imc BUSDAQ*flex* 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 BUSDAQ*flex* 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 BUSDAQ*flex* series, 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).

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*    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 appropriate LEMO plug
- Grounding set consisting of: a spring washer S3 (stainless steel), a flat washer (A3.2 DIN 433 A2) and a pan-head screw M3x8 (mounted on the rear panel).
- 1x Ethernet network cable with latch protection (uncrossed, 2 m)
- 1x protective cover for the remote control socket type 0B
- Getting started with imc BUSDAQ*flex* (one copy per delivery)


> 🛈 **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

Condensation may form on the circuit boards when the device is moved from a cold environment to a warm one. In these situations, always wait until the device warms up to room temperature and is completely dry before turning it on. The acclimatization period should take about 2 hours. This is especially recommended for devices without ET (extended environmental temperature range).

We recommend a warm-up phase of at least 30 min prior to measure.


### 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 basic 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:
>
> I.   the device is visibly damaged,
> II.  loose parts can be heard within the device,
> III. the device does not work
> IV.  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 Specs", to prevent damage to the unit through inappropriate signal connection.
2. If you are using a internal device drive, observe the notes in the imc software manual. Particular care should be taken to comply with the storage device's max. ambient temperature limitation.
3. Change the removable flash storage with care.

## 3.3.2 Supply

The range of permitted supply voltages is 10 .. 50 V DC. The table-top power supply unit which is included standard delivers 24 $V_{DC}$ at a max. power consumption of 60 W. The AC input voltage can be 110 .. 240V 50/60Hz. With regard to EN 61326-1 and EN 61010-1, the DC supply inputs are not specified for connection to a DC mains supply. DC networks are particularly extensive supply installations in the industrial sector. For these, increased safety margins are assumed for expected transient overvoltages in the event of a fault. This is comparable to the safety categories CAT II..IV in AC mains voltage systems.
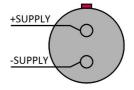
> ⓘ **Note**
>
> Please note, that the operation temperature of the desktop supply is prepared for 0°C to 40°C, even if your measurement devices is designed for extended temperature range!

Connecting a DC supply source such as a car battery is also fundamentally possible. Note when making such a connection:



*View on top of the LEMO socket*

- **Grounding** of the device must be provided. If the supply voltage source has a ground reference (ground connected to the (−) terminal), then the device is automatically grounded via the (-) terminal. The table-top power supply unit is configured in this manner.
- The **supply line** must take the form of a low-resistance cable of sufficient cross-section. Any extra (suppression) filters connected in the middle of the supply circuit should not contain any serial inductance coils of more than 1 mH. Otherwise and extra parallel capacitor is needed.

### 3.3.2.1  Supply of directly connected imc CANSASflex modules

imc BUSDAQ*flex* (BUSFX) is compatible with the imc CANSAS*flex* series (CANFX), CAN-Bus based measurement technique. All modules of the *flex* series (CANFX and BUSFX) can be joined together mechanically and electrically by means of a latching ("click") [mechanism] 40 , without the use of any tools nor the need for any extra cables.

> **❗ Note**
>
> The data sheet list the **available power consumption** for the supply of directly connected modules (click-connection) and the max. **current-limit** of the module connector.

### 3.3.2.2  DC power supply at CAN-Nodes 1 and 2

If desired, the DC power supply can be made accessible at the CAN-nodes 1 and 2 [(DSUB pin 1 and 5)] 48 . This connection is directly wired through, bidirectional and with its PTC protected against overload with max. 1 A current limit.

This option provides the possibility to use the DSUB-9 as an output and to power connected imc CANSAS modules. If it is used as an input it is possible to supply the BUSDAQ via CAN-cable (e.g. OBD). In this case there are no current reserves available to supply further connected CANSAS modules!

> **❗ Note**
>
> In each case, using the CAN cable for supply purposes a cable with sufficient cross-section is required.
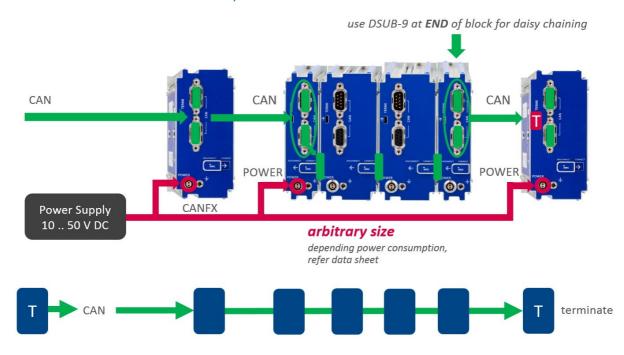
### 3.3.2.3  Notes on operation with power supply lead through the device

- With this setup, the maximum current of 1 A must not be exceeded. The CANSAS modules' low power consumption should not be underestimated, since low supply voltages can cause high power values via high current. E.g. two CAN/UNI8 modules with a power consumption of approx. 30 W (with connected sensors) already exceed the limit by having a current of 2 A at 15 V. Additional factors are the voltage drop along long wires, and small wire cross-sections. In any case, it is necessary to first calculate the power consumption and the current strengths to be expected.
- By dint of its engineering, the CAN-bus is ideally suited to re-structuring systems. However, this can easily lead to situations where the current demands and wire cross sections were correctly chosen originally, but the specifications were later violated when the system was gradually supplemented with new modules.
- It is always possible to use only one supply source. If an external supply is applied to the CAN-bus and the BUSDAQ's power supply unit is additionally connected, the BUSDAQ can be damaged irreparably. Under no circumstances may the BUSDAQ's power supply unit be used as an uninterrupted power supply for the connected CAN-Bus system.
- The current limiter attempts to ensure that the measurement is correctly closed and that data loss is thus avoided. Nevertheless, incorrect configuration may lead to data loss or damage of the BUSDAQ unit. When in doubt, please contact our Customer Service department.
- Using -SUPPLY does not replace the CAN_GND connection! CAN_GND should always be connected, independent from this power supply. CAN_GND is necessary to keep a defined level for CAN_H and CAN_L.

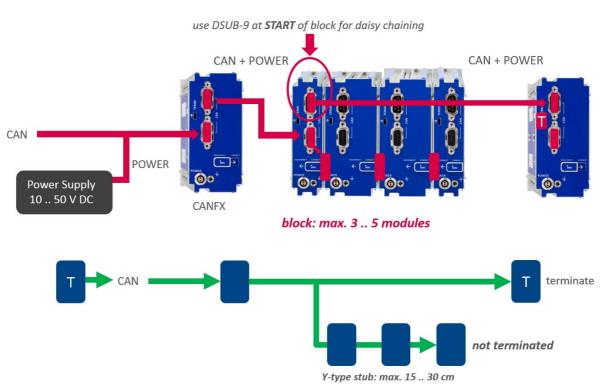## Power via CAN

The following figures: A) and B) show connection possibilities, depending on the use of power via CAN. If your device has the **Power via CAN** functionality, the **DSUB connection** on your device is labeled "**Power via CAN**".

### A) Power via CAN not used: no stubs, unlimited block size



### B) Use of Power via CAN: max. size of stub blocks (Y-type stub), according CiA®

## 3.3.2.4 UPS and power fail function

**Automatic conclusion of measurement and data saving upon power outage**

imc BUSDAQ*flex* comes with **UPS-functionality** to ensure the integrity of data in case of power outages. When power outage occurs, this functionality prevents loss of data and is referred to as Power Fail. If the power fails, the measurement stops automatically and the data are saved to the internal bulk memory ("µ-Disk": flash media or HDD) in sufficient time.

The parameter "**Buffer-time constant**" specifies the delay time which the device waits to actually initiate automatic conclusion of measurement ("Auto-Shutdown") after a power outage has been detected. This prevents a measurement from being stopped after only very short power outages. For all imc BUSDAQ*flex* device varieties, the buffer time constant is **1 second** and can not be changed by means of the device configuration (unlike in other imc device series).

After elapse of the buffer time constant, the running measurement is stopped and all open measurement files are closed and saved to the device's Flash removable memory (CF-Card, "µ-Disk"). This can typically take **up to 10 more seconds**.

The buffer capacity of the internal **UPS Super-Caps** is sufficient to securely buffer the device's power supply (aggregate buffer time: 11 sec.). The condition for this is that the Super-Caps are fully charged. Super-Caps have higher self-discharge rates than conventional rechargeable batteries and do not keep their charge for long periods even when deactivated. For this reason, it is necessary for the device to have been activated/running for a certain minimum duration (see table) in order to ensure the full function of the "Auto-Data Saving in Power Outage". Accordingly, a sufficiently long time of uninterrupted operation between successive Power-Fail events must be ensured, in order to recharge the Super-Caps and to achieve the full buffer capacity.

> ⚠ **Note**
>
> - It must be ensured that the device is always deactivated in a controlled way by means of the switch. Simply unplugging the power supply cable causes the buffering Power Fail function to become active, which unnecessarily discharges the Super-Caps.
> - If the device is always only powered very briefly for the duration of very short measurements, correct working of the Power Fail function can not be assured.

### 3.3.2.5  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. 1 sec. for the device to be deactivated.

### 3.3.2.6  Remote On/Off

The imc BUSDAQ*flex* can be activated and deactivated via the Control switch. When the pin Remote On/Off is connected with -Supply via a push-button switch, the device can be activated/ deactivated as with the blue LED-button. I.e., one short push of the button switches the device on or off after a brief delay.

If these pins are **connected via a closed two-way switch, the device remains on throughout**. In such a case, the device's blue push-button switch has no effect! In order to turn the device off, the switch must be opened and then closed again, mimicking the behavior of a push-button switch. Please note: Depending on the BUSFX variant, the behavior is different.

> **Reference**
>
> Please find here the [pin configuration of the CTRL-socket](#) 46 .

## 3.3.3  Grounding, shielding

In order to comply with Part 15 of the FCC-regulations applicable to devices of Class B, the system must be grounded. The same applies to the specified technical data.

### 3.3.3.1  Grounding

The grounding set supplied with the device can be used to ground your device. This grounding set consists of: a spring washer S3 (stainless steel), a flat washer (A3.2 DIN 433 A2) and a pan-head screw M3x8 (mounted on the rear panel).

When using the included table-top power adapter, this is ensured by the protection ground terminal: at the **LEMO terminal of the included table-top power adapter**, both the power supply's negative contact, and the shielding and connector pod are connected with the network cable's protection ground.

The DC power voltage applied to the device itself (**LEMO-socket**) is **not isolated**, i.e. it has contact with the electrical system ground ("GND") or the frame ("CHASSIS")!

When drawing power from an isolated DC power supply (e.g. battery), be sure to provide grounding by making a connection to the frame.

### 3.3.3.2  Shielding

As a matter of principle, the use of shielded and grounded cabling is required in order to comply with the relevant EMC and interference suppression limits.

In many cases, the use of an affordable multi-wire single-layer shielded cable (even for multiple channels) is adequate.

> 🛈 **Note**
>
> - Protect the CAN-H-L against common mode voltage using shielded cables.
> - Connect chassis with earth ground.
> - Use CAN-Ground.
> - Use shielded cables, connect shield to chassis.
> - To avoid compensation currents, always connect the shielding to one side (potential) only.

## 3.3.4  Fuses (polarity-inversion protection)

The device supply input is equipped with maintenance-free polarity-inversion protection. No fuses or surge protection is provided here. Particularly upon activation of the device, high current peaks are to be expected. When using the device with a DC-voltage supply and custom-designed supply cable, be sure to take this into account by providing adequate cable cross-section.

## 3.3.5  Batteries

For an uninterruptable power supply (UPS) Super-Caps are used to supply the imc BUSDAQ*flex* device. imc BUSDAQ*flex* devices delivered by imc after November 2022 will have a "battery label" [10] on the nameplate for integrated energy sources.

## 3.3.6  Power LED: meaning and codes

|  | Code | Function |
|---|---|---|
|  | Permanent blue | Normal operation |
|  | Blue blinking | Power fail recognized or device is switching off |

## 3.3.7  LED Codes

|  | Code | Function |
|---|---|---|
|  | Blue blinking upon activation | Normal booting process. After successful booting, the LED extinguishes. |
|  | Blue blinking at 1 s rhythm | Device is in sleep mode. |
|  | Permanent blue | Error after Auto- or Diskstart (e.g. data overflow at the internal drive) |
|  | Permanent orange | Sleep signal recognized - device is within delay time. |
|  | Permanent red | Error |

After booting or a successful started measurement after sleep mode the LED is switched off.

# 3.3.8  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.

## 3.3.8.1  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 in the imc STUDIO manual "*Setup pages - Configuring device*" > "*Storage options and directory structure*" > "*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.

## 3.3.8.1.1  Storage media

| Storage media | Description |
|---|---|
| CF Cards (Compact Flash) | For devices of <span>group A4 and A5</span> 38: <br><br>The device group exclusively uses CF cards for storage medium. |

## 3.3.8.1.2  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.
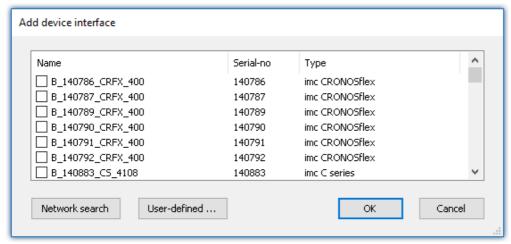
In order to get access to your device's storage medium, you must first add it to the tree diagram (see "*imc Systems - Adding a device* 24 "). Subsequently, you are able to navigate to the desired data in the storage medium and thus to work with them.

## 3.3.8.1.2.1  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 | "*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.<br><br>Select your measurement device and confirm your selection with "*OK*". The measurement device is then available. |
| User-defined | 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. |

### ✥ Reference
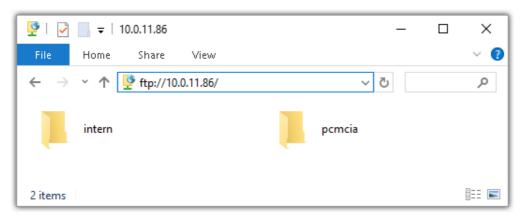
More information is presented in the imc STUDIO manual in the section: "*Setting Up - Connect the device*"

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

### 3.3.8.1.2.2  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).

### 3.3.8.1.3  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] 26 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* 26".
> - 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.

### 3.3.8.1.3.1  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 ⌐26⌐ 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 rue. 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* ⌐23⌐ " 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!*".

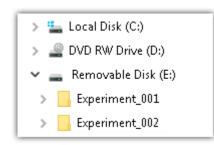The device performs the formatting according to the following rule:

| 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](25)** [25], 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](26) [26].

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.

### 3.3.8.1.4 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><li>Answer 1: Check the file system: The device supports FAT32/FAT16 [26].</li><li>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.</li></ul> |
| 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 | Errors can have the following causes, among others:<ul><li>The data rate is too high, the storage medium can't keep up and data overflow results.</li><li>The storage medium is full.</li></ul>The device signalizes any error by flashing this LED. Its further responses depend on whether or not the device is connected to the PC.<ul><li>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.</li><li>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**.</li></ul> |
| Data overflow due to improper cluster size | <ul><li>With a storage medium formatted by Windows to FAT32 [26], data overflow can occur if a high aggregate sampling rate is generated by a few high-speed channels.</li><li>With a storage medium formatted in the device [26], data overflow can occur if a high aggregate sampling rate is generated by very many low-speed channels.</li></ul> |

# 4  Maintenance and servicing

## 4.1  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.

## 4.2  Cleaning

Always unplug the power supply before cleaning the imc BUSDAQ*flex* 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.

## 4.3  Storage

As a rule, the imc BUSDAQ*flex* devices must be stored in a temperature range of -40°C to +85°C.

## 4.4  Transport

When transporting, 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.

| ⚠ Warning |
|---|

A protective cover in the CTRL socket is intended to protect the device from accidental insertion of the power supply plug. This cover is included in delivery [14].

# 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 or 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* 32 " 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.
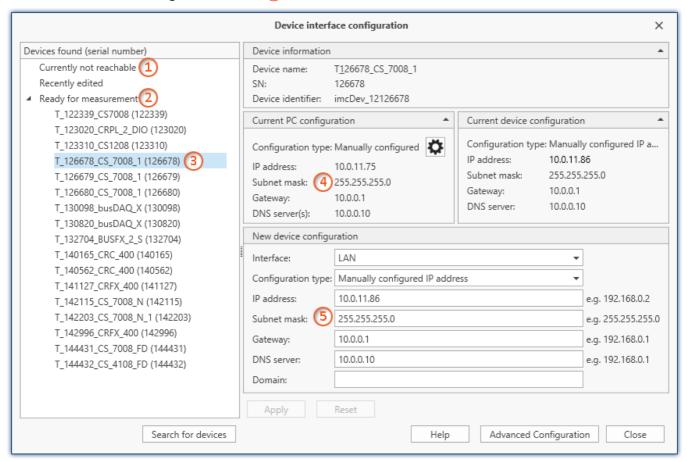
| Ribbon | View |
|---|---|
| Setup-Configuration > Device interfaces (⬛) | Complete |

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.

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

Select the device for making modifications ③.



*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 |
|---|---|---|---|---|
| ▶ | ☑ | T_124835_C1_1_LEMO_ET | 124835 | imc C1-1 LEMO |
| | ☐ | T_130039_busDAQ_X | 130039 | busDAQ-X |
| | ☐ | 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!
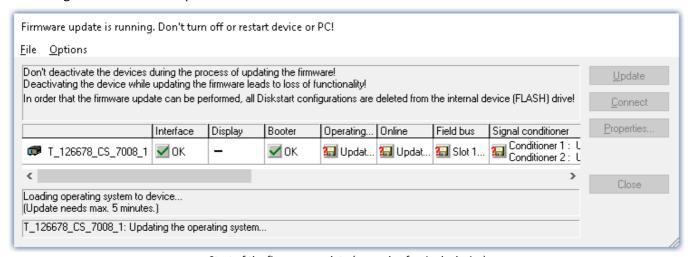
Depending on the device type, the following components are loaded automatically: Interface-firmware (Ethernet, modem, ...), booting program, amplifier firmware, firmware for the signal processors.
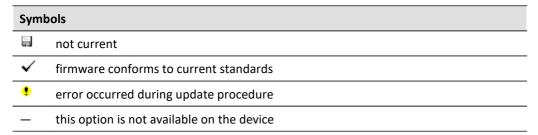
The dialog for the firmware-update looks like this:



*Start of the firmware update (example of a single device)*
*The state of the components of the firmware is diaplayed 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 |

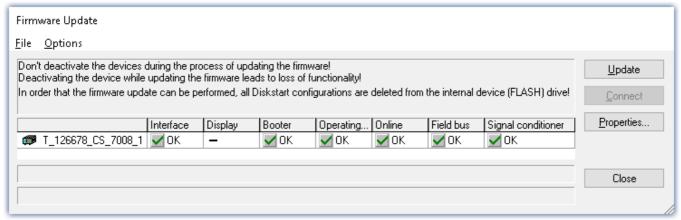The following symbols for the individual firmware components appear in the list:

| 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⎡ 6 ⎤. 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*".

# 6  Properties

## 6.1  Device overview

Some of the capabilities discussed in this document only pertain to certain device models. The associated device groups are indicated at the respective locations. The groups are shown in the following table.

| — not available | ● standard | ○ optional |
|---|---|---|
| CRXT  imc CRONOS-XT | CRFX  imc CRONOS*flex* | CRC  imc CRONOS*compact* |

| imc device | SPARTAN | BUSDAQ | BUSLOG*flex* | BUSDAQ*flex* | SPARTAN-R SPARTAN-N | CRSL-N CRC-400 | C1-N C-SERIE-N | C1-FD C-SERIE-FD | CRFX-400 | CRFX-2000 | CRC-2000G | CRC-400GP | CRFX-2000G | CRFX-2000GP | CRXT | EOS | ARGUS*fit* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Driver package | imc DEVICES | | | | | | | | | | | | | | | imc DEVICE*core* | |
| **Firmware group** | A | | | | | | | | | | | | | | | B | |
| **Device group** | **A4** | | | | **A5** | | | | | **A6** | **A7** | | | | | **B10** | **B11** |
| SN[1] | 13 | | | | 14 | | | | | 16 | 19 | | | | | 4120 | 416 |
| TCP/IP Interface [MBit/s] | 100 | | | | 100 | | | | | 100 | 1000 | | | | | 1000 | 1000 |
| Sampl.Rate[2] [kHz] | 400 | | | | 400 | | | | | 2000 / 400[3] | 2000 / 400[3] | 2000 / 400[3] | 2000 | 2000 | 2000 | 4000 | 5000 |
| STUDIO Monitor supported | ● | | | | ● | | | | | ● | ● | | | | | — | — |
| Connections[4] | 4 | | | | 4 | | | | | 4 | 4 | | | | | — | — |
| **Signal processing in the device** | | | | | | | | | | | | | | | | | |
| Online FAMOS | ○ | ○ | — | ○ | ○ | ● | ● | ● | ● | ● | ● | | | | | — | ● |
| Preprocessing original channel | ● | — | — | — | ● | ● | ● | ● | — | ● | ● | ● | — | — | — | — | — |
| Preprocessing monitor channel | ● | — | — | — | ● | ● | ● | ● | — | ● | ● | ● | — | — | — | — | ● |
| **Data Storage** | | | | | | | | | | | | | | | | | |
| CF | ● | | | | ● | | | | | — | — | | | | | — | — |
| Express Card | — | | | | — | | | | | ● | — | | | | | — | — |
| CFast | — | | | | — | | | | | — | | ● | | | | — | — |
| USB | — | | | | — | | | | | ● | ● | ● | ● | ● | — | — | — |
| microSD | — | | | | — | | | | | — | — | | | | | — | ● |
| Storage on network drive | ● | | | | ● | | | | | ● | ● | | | | | — | — |
| Internal hard disk | ○ | (○)[5] | — | — | ○ | ○ | — | — | ○ | ○ | ○ | | | | | ● | — |
| **Synchronization** | | | | | | | | | | | | | | | | | |
| DCF | ● | | | | ● | | | | | ● | ● | | | | | — | — |
| IRIG-B | — | — | ● | ● | ● | | | | | ● | ● | | | | | ● | ● |
| GPS | ● | ● | — | (●)[6] | ● | | | | | ● | ● | | | | | — | ● |
| NTP | — | — | ● | ● | ● | | | | | ● | ● | | | | | ● | ● |
| PTP | — | | | | — | | | | | — | — | ● | — | ● | ● | — | — |
| Phase offset correction | — | — | ● | ● | ● | | | | | ● | ● | | | | | ● | ● |

1 Extend serial number range by four digits (three for imc EOS)
2 Max. aggregate sampling rate (see data sheet)
3 2000 via EtherCAT else 400
4 Number of imc STUDIO Monitor-connections or imc REMOTE (as of 14xxxx) connections
5 not available for imc BUSDAQ-2
6 not available for imc BUSDAQ*flex*-2-S

# 6.2  imc BUSDAQflex device series

imc BUSDAQ*flex* is a series of data loggers for CAN, CAN FD, LIN, ARINC, FlexRay, XCPoE, MVB and EtherCAT. The basic configuration with default configuration with 2 CAN-nodes can be expanded to up to 12 nodes in the larger device models for various fieldbuses and vehicle buses. Along with recording of streaming raw data and log channels, live decoding of individual channels and of complex protocols such as CCP, KWP2000, XCP, OBD2, UDS, DiagOnCan, TP2.0, GMLAN is also supported.

The BUSDAQ*flex* devices works autarkic autonomously (without PC) and they are specified are rated for the extended temperature range (-40 to +85°C), making them ideal for mobile applications. The BUSDAQ*flex* series has very low power consumption and thanks to built-in UPS (uninterruptible power supply) the BUSDAQ*flex* they ensure complete data integrity even in case of power failure/ breakdown outages. As a CAN or LIN-bus logger, imc BUSDAQ*flex* supports a signal-governed Sleep-mode (Wake-on-CAN) with a start-up time of only 200 ms and is thus highly suitable for the car fleet testing experiment.

Recorded data are stored in the device on a removable storage media (in particular Flash) and can also be pre-processed or analyzed on the device by online analyzes (imc Online FAMOS). This allows e.g. threshold monitoring, min./max. values, digital filters, spectral analysis, order analysis, classification, and more. With imc BUSDAQ, measurement data and status information of any bus subscribers can be recorded, such as control devices, sensors and CAN-based measuring amplifier (e.g. imc CANSAS). In particular, modules of the imc CANSAS*flex* series (CANFX) can be directly docked and thereby build up a very compact measuring system. The tool-free click mechanism connects a data logger and measuring modules both mechanically and electrically and requires no additional connecting cables.

imc BUSDAQ, like all imc measurement systems, is operated with the imc STUDIO software. The software provides a complete manual and automatic setting of the measurement parameters, real-time functions, triggering machines and storage modes. The measurement curve display in the curve window and the documentation in the report generator are an integral part.

**Characteristics and abilities**

Logger-operation:
- Autonomous operation without PC possible, self-start (timer, absolute time)
- Integrated real-time signal analysis, control and regulation with imc Online FAMOS
- Optional recording with time stamp (on receipt, 100 µs resolution) or fixed sampling rates (equidistant sampled)
- Also supports sending via CAN bus (via imc Online FAMOS)

Storage and Trigger:
- Storage possibilities onboard removable media (CF card) and/or on PC
- Circular buffer storage operation
- Complex trigger functionality, PC-independent, incl. Multi-Trigger machines and different sampling rates

Power supply:
- Intelligent power supply (10 to 50 V DC) with UPS-function and data saving when power failure
- CAN/LIN-Logger: Sleep-Mode with Wake-on-CAN (200 ms) or wake up when control signal
- Remote control and Suspend/Resume function

# 6.3  Topology and Mounting

Click-connection:

- Modules joinable to module-blocks: mechanical and electrical connection (CAN and supply)
- No tools or additional cabling required
- With guide grooves, magnetic catches and locking slider
- Both short and long housing versions joinable:
  with electrical connection: align on rear side; mechanically only: align on front side

1. Please insert the guiding noses of the first module in die guiding notches of the second module.

   The white arrow on the side module side indicates, where the module has to be aligned. The magnets will help to find the correct position (**LOCK**).



2. In order to connect the modules correctly, the modules has to be positioned as shown in the picture above.

> ✛ **Reference**

The different available housing variants are specified in each data sheet.



3. Switch the locking slider in "**CONNECT**"-position. The modules are now electrically connected and mechanically saved. In order to separate the module, switch the locking slider back into the "**DISCONNECT**"-position.

> ⚠ **Warning**

In order to secure the mechanical handling and avoid displacement, the locking slider of each module in a block of modules should be closed (locking slider in "CONNECT" position).

> ⚠ **Warning**

According to current scientific knowledge, **magnetic fields** of permanent magnets do not affect human health. For this reason, health **hazards due to the magnetic field are unlikely**. However, the functioning of heart pacemakers and implanted defibrillators can be affected (e.g. a heart pacemaker may be switched into test mode). Persons wearing such devices should maintain adequate distance.

The magnetic fields are so strong in the immediate vicinity that sensitive electronic equipment such as data carriers, credit and debit cards, hearing aids, loudspeakers or sensitive ferromagnetic mechanical equipment such as pocketwatch mechanisms can also be affected or damaged.
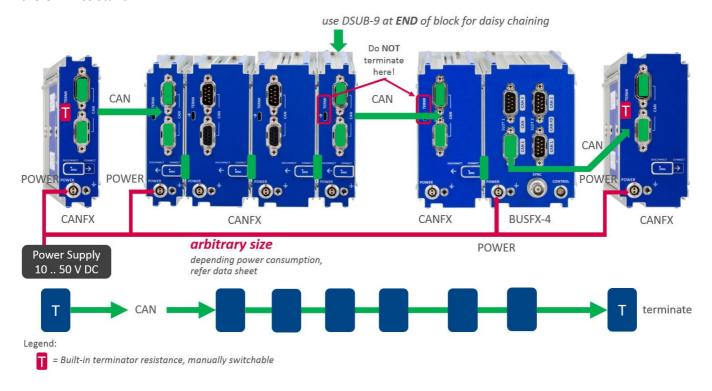
Contact with the magnets by food should be avoided. The magnets are protected with a coating (Ni, Au, Zn) to which some persons can have an allergic reaction Nickel allergy).

# 6.4  CAN Termination

Each imc BUSDAQ*flex* (BUSFX) offers 2 CAN nodes as basic equipment. The imc CANSAS*flex* modules (CANFX), which are connected to the BUSFX device via the click connection, are located at the **CAN 1 node of slot 1** (see labeling on the device, *CAN 1*).

Terminators must be provided at the end of the CAN bus. The BUSFX device has internal terminators that can be activated by software. These can be activated individually for each node. If the BUSFX device is connected to one end, the termination can be activated in the CAN Assistant. As soon as CAN modules are connected to the CAN 1 node and additional clicked modules are connected to the BUSFX device, no additional termination is allowed in the CAN Assistant.



---

|  | Notes | CAN Terminator |
|--|-------|----------------|

- A *Y-type stub* cannot be terminated. Only the **bus end** has to be terminated: last module or **end** (not beginning) of the last block!
- A *Y-type stub* must not exceed a maximum length of 30 cm.


- **Connection of the terminators:**
  - **CANFX modules** are equipped with built-in terminator resistances which are **manually switchable**. Alternatively, terminator resistances can be connected between pin 2 and 7, using resistances of 120 Ω according to the CiA® standard.
  - **Terminate end of entire CAN bus** only. Otherwise, no further terminators may be connected.
  - Termination resistors, which are **activated via software to the BUSDAQ*flex* nodes**, remain active even if the device is set into sleep mode.

# 6.5  Device variants and options

Key:  ● standard,  o  optional,  (●) restricted

## imc BUSDAQflex device models and functions

| | BUSLOGflex | BUSDAQflex-2S | BUSDAQflex-2 | BUSDAQflex-4 / 6 / 8 / 12 | BUSDAQflex-4 / 6 / 8 / 12 |
|---|---|---|---|---|---|
| **General** | | | | **CAN only** | **+ others** |
| CAN nodes | 2 | 2 | 2 | 4 / 6 / 8 / 12 | >= 2 |
| Extension modules | | | | | 1 / 2 / 3 / 5 |
|    CAN, CAN FD, Lin, FlexRay, J1587, ARINC | | | | | o |
|    XCPoE, MVB, RoaDyn, APPMOD | | | | | o |
| Housing type (size) | L0 | L0 | L1 | L2/L3/L4/L6 | L2/L3/L4/L6 |
| **Autonomous device capabilities** | | | | | |
| Sleep/Standby, Wake-on-CAN | ● | ● | ● | ● | |
| Real-time data analysis (imc Online FAMOS) | | o | o | o | o |
| Network storage (NAS) | ● | ● | ● | ● | ● |
| **Synchronization and clock** | | | | | |
| DCF 77, NTP, IRIG-B | ● | ● | ● | ● | ● |
| GPS (via ext. GPS Mouse) | | | ● | ● | ● |
| **Connectivity** | | | | | |
| WLAN (WiFi)  internal | | | | o | o |
| Wireless UMTS, 3G/4G (external) | o | o | o | o | o |
| GPS, Display connection ports (2 x DSUB-9) | | | ● | ● | ● |
| Prozess control (digital I/O): 4+4 Bit (2 x DSUB-15) | | | | ● | ● |
| Remote controlled main switch | LEMO.0B | LEMO.0B | LEMO.0B | LEMO.0B | LEMO.0B |
| Synchronization signal | SMB | SMB | BNC | BNC | BNC |
| Programmable status feedback (LEDs) | | | ● | ● | |
| **Software** | | | | | |
| Vector data base  (*.dbc import) | ● | o | o | o | o |
| ECU protocols | | o | o | o | o |
| Web-Server (imc REMOTE) | o | o | o | o | o |

# 7  Pin configuration

## 7.1  DSUB-15

The Standard imc plug is a 1:1 DSUB-15 to screw terminal adaptor. It is offered in a number of variants.

### Pin configuration

Metal connector

| ACC/DSUBM- | | DI2-4 | DO4 |
|---|---|---|---|
| DSUB Pin | Terminal | DIGITAL IN | DIGITAL OUT |
| 9 | 1 | +IN1 | BIT1 |
| 2 | 2 | +IN2 | BIT2 |
| 10 | 3 | -IN1/2 | BIT3 |
| 3 | 4 | +IN3 | BIT4 |
| 11 | 5 | +IN4 | |
| 4 | 6 | -IN3/4 | |
| 12 | 7 | | |
| 5 | 8 | | |
| 13 | 9 | LEVEL 1/2 ** | |
| 6 | 10 | | |
| 14 | 11 | | HCOM |
| 7 | 12 | LEVEL 3/4 ** | LCOM |
| 15 | 15 | | LCOM |
| 8 | 18 | | |
| | 13 | | |
| | 14 | | |
| ⏚ | 16 | CHASSIS | CHASSIS |
| ⏚ | 17 | CHASSIS | CHASSIS |

** : open = 24 V
   LEVEL 1/2 and IN 1/2 jumpered respectively
   LEVEL 3/4 and IN 3/4 jumpered = TTL

> ⓘ   Note                            1.5 mm$^2$ cross section

To connect the measurement leads with the screw terminals, suitable leads should have a maximum cross section of 1.5 mm$^2$ 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 connectors, $V_{CC}$ (5 V) is available, with a maximum load current of typically 135 mA per plug.

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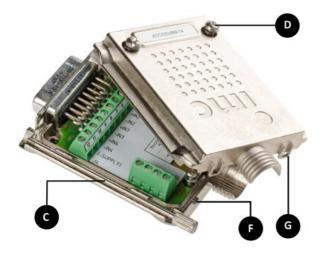
For devices with DSUB-15 connection technology, the convenient imc terminal plugs for solderless screw terminal connection are available as optional accessories.
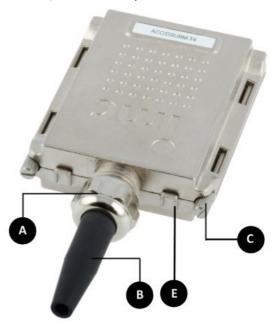


*ACC/DSUBM-xxx: snap the nose into the slot*

**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

# 7.3  LEMO.0B (6-pin) CTRL socket

| Pin contact | Signal | Description |
|---|---|---|
| 1 | -Supply | 0 V |
| 2 | Remote On/Off | On/Off via a short-period connection to pin1 (–Supply) |
| 3 | Sleep/Resume Mode enable/disable | Activate the Sleep/Resume mode with jumper top pin1 (-Supply) |
| 4 | +V$_{AUX}$ | 5 V or 10 V to 55 V (Voltage of the power supply (via R = 1 kΩ))<br>**Only for control functions. No load!** |
| 5 | +Sleep / Resume High | Sleep mode:  0..1 V ;  Resume mode: 4..55 V |
| 6 | -Sleep / Resume Low | 0 V |

> **Note**          **Sleep Mode**
>
> The Sleep Mode is available with devices equipped exclusively with CAN/LIN. The Sleep Mode is **not available** with devices equipped with other fieldbus such as FlexRay, CAN FD, etc.

> **Warning**
>
> A protective cover in the CTRL socket is intended to protect the device from accidental insertion of the power supply plug.
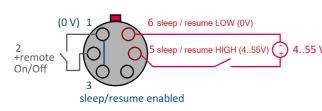
The sleep mode is controlled by a voltage applied at the CTRL-socket's contact +Sleep/Resume High. The sleep mode is activated when this voltage is switched off (<1 V). The devices will wake up and start the measurement as soon as the voltage (4 to 55 V) is applied.

To enable the Sleep/Resume Mode, there must be a connection between *Sleep/Resume Mode* enable/disable and -*Supply*, see pin configuration of the .

## Possible Sleep / Resume configuration

**1. Configuration with external voltage source**
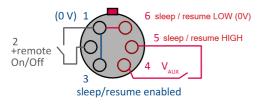


*View on top of the socket*

Pins 1 and 3 are connected to activate the Sleep/ Resume mode.

An external voltage source at Pin 5 wakes the device from the sleep mode.

The reference of the external voltage source must be connected to Pin 6.

**2. Configuration with supply voltage at Pin 4**



*View on top of the socket*

Here too, Pins 1 and 3 are connected in order to activate the Sleep/Resume mode.

The module's auxiliary voltage is led through Pin 4, and is used for applying voltage to Pin 5.

The reference of the Sleep/Resume circuit at Pin 6 is implemented by a jumper to Pin 1.

## Remote On/Off

The device can be powered on or off by the control-socket's **Remote On/Off pin**. Therefore, Remote On/Off (**Pin 2**) has to be connected with -Supply (**Pin 1**) using a pushbutton.

Be aware that BUSDAQ*flex*-2 behaves differently in this situation than the larger model variants:

- **BUSFX-2(/S), BUSLOG**:              Switch On/Off by briefly jumpering using a **pushbutton**.
- **BUSFX-4/6/8/12**:                   Switch On/Off by means of a **switch**.

> ⊙ Note              **BUSFX-4/6/8/12: On/Off via the power supply**

If there is a **permanent connection** between Remote On/Off and Pin1 (-Supply), the device can be switched On/Off automatically **via the power supply** circuit. So for instance, if an autostart configuration is saved in the device, this can be used to automatically start a measurement on board a vehicle once the vehicle's battery power is switched on.

Note that in the case of such a switching configuration, the device **can no longer be switched off by means of the Power-On button**!

# 7.4  DSUB-9 pin configuration

## 7.4.1  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 |

## 7.4.2  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 |
| 5 | GND, PowerOff | 2x Black | 2x Black |
| 7 | PPS (1 Hz clock) | Yellow | Yellow |
| 4,6,8 and 9 | - | - | - |

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

# 7.5  Pin configuration of the fieldbusses

## 7.5.1  CAN-Bus, CAN FD (DSUB-9)

| DSUB-PIN | Signal | Description | Use in device |
|---|---|---|---|
| 1 | +CAN_SUPPLY | optional supply | unused as per standard* (supply I < 1 A) |
| 2 | **CAN_L** | **dominant low bus line** | connected |
| 3 | **CAN_GND** | **CAN Ground** | connected |
| 4 | nc | reserved | do not connect |
| 5 | -CAN_SUPPLY | optional supply | 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 |

* Optional and only at CAN node 1 and 2, see DC power supply on CAN-Nodes 1 or 2.

## 7.5.2  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. | |

# 7.5.3  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 |

# 7.5.4  XCPoE (RJ45)

Standard Ethernet 1x RJ45.

## 7.5.5 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 |

# 7.5.6 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. | |

# 7.5.7 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 |
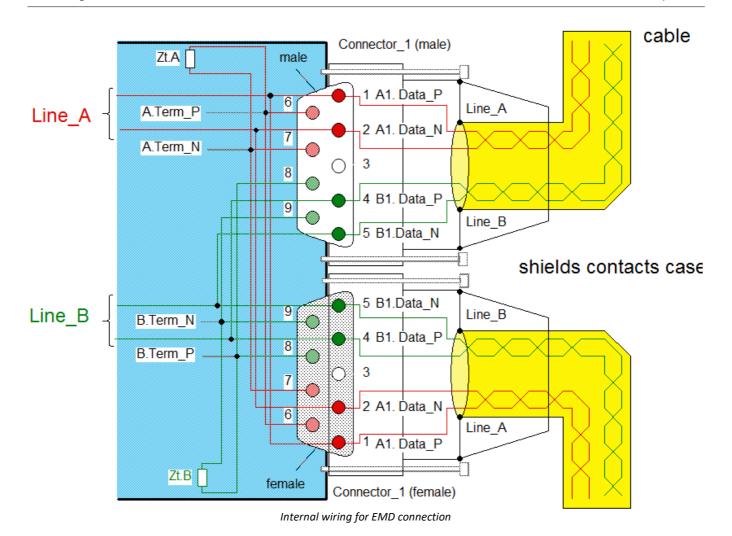


# 7.5.8 MVB-Bus (DSUB-9)

## 7.5.8.1 EMD Pin configuration - DSUB-9

EMD connection with double-occupancy. Standard DSUB-9 terminals are used.
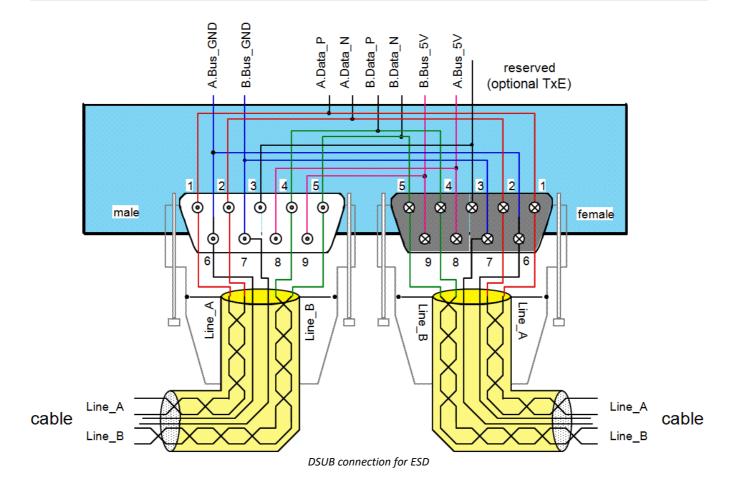
| DSUB-PIN | Signal | Description | as termination terminal |
|---|---|---|---|
| 1 | A1. Data_P | data line A | jumper to 6 |
| 2 | A1. Data_N | data line A | jumper to 7 |
| 3 | NC | not connected | |
| 4 | B1. Data_P | data line B | jumper to 8 |
| 5 | B1. Data_N | data line B | jumper to 9 |
| 6 | 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 |

*Internal wiring for EMD connection*

## 7.5.8.2  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 | |
| 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 | $Rm = 143\ \Omega;\ Ru = Rd = 383\ \Omega$ |

*DSUB connection for ESD*

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# Contact imc

## Address

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## 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/

## Service and maintenance

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

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## imc ACADEMY - Training center

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.

E-Mail:          schulung@imc-tm.de

Internet:        https://www.imc-tm.com/service-training/imc-academy

## International partners

You will find the contact person responsible for you in our overview list of imc partners:

Internet:        https://www.imc-tm.com/imc-worldwide/

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