

imc BUSDAQ / BUSLOG

Getting started

Version 3 R 6 - 2018-10-17



Foreword

Thank you for deciding to purchase our product. We wish you total success in accomplishing your measurement assignments with the help of your hardware and software. If you have any open questions about our products, please contact our Hotline (hotline@imc-tm.de).

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 gratefully accept any suggestions for improvements, please contact our Hotline (hotline@imc-tm.de).

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

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

imc Software and Microsoft® Windows

imc software runs on the Microsoft® Windows operating system.

GPL Sources

Some components of our hardware use software, that is licensed under GNU General Public License (GPL). If you would like a copy of the GPL source code contained in this product please contact our Hotline.

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1 General

1.1 Notes / Quality Management

Quality Management



Management System
ISO 9001:2015

www.tuv.com
ID 0910085152



imc Test & Measurement GmbH holds DIN-EN-ISO-9001 certification since May 1995. You can download the CE Certification, current certificates and information about the imc quality system on our Webpage: www.imc-tm.com/about-imc/quality-assurance.

imc Warranty

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

ElektroG, RoHS 2, WEEE, CE




Reference

The manufacturer's declaration on [ElektroG, RoHS, WEEE](#) and the [CE certification](#) can be found on the imc website: www.imc-tm.com

Product Improvement and change requests

Please help us to improve our documentation:

- What terms or descriptions are incomprehensible?
- What additions and enhancements you suggest?
- Where have material mistakes slipped in?
- Which spelling or typing errors have you found?

Responses and other feedback should be directed to the [Hotline](#)  (phone / e-mail)

or by writing to: imc Test & Measurement GmbH, Voltastrasse 5 in 13355 Berlin, Germany

Remarks Concerning EMC

imc BUSDAQ / BUSLOG satisfies the EMC requirements for unrestricted use in industrial settings.

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

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

All signal lines connected to imc BUSDAQ / BUSLOG must 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 experiment 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.

FCC-Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules (CFR 15.105)². 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 [imc hotline](#) ⁷ or an experienced radio or television technician for help.

Modifications

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

² FCC - United States Federal Communications Commission

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC Rules and Regulations.

Industrial Safety

We certify that imc BUSDAQ / BUSLOG 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)³.

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.

³ Formerly BGV-A3

Observe Notes and Warnings

The measurement system has 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 manual **before turning the device** on for the first time.



Warning

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

Ambient temperature

The limits of the ambient temperature cannot be given as a lump sum because they depend on many factors of the specific application and environment, such as air flow/convection, heat radiation balance in the environment, mounting structure, system configuration/single or block (click), 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.

1.2 imc Customer Support / Hotline

If you have problems or questions, please contact our Customer Support/Hotline:

imc Test & Measurement GmbH

Hotline Berlin (Germany): **+49 (0)30 / 467090-26**

Hotline Frankfurt (Germany): **+49 (0)6172 / 59672-40**

E-Mail: hotline@imc-tm.de

Internet: www.imc-tm.com

International partners

For our international partners see www.imc-tm.com/our-partners/distributor.

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. Thank you!

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

1.3 Instruction manual

This instruction manual provides important notes on using the device. The safe working is conditional on compliance with all safety measures and instruction specified.

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

This instruction manual exclusively describes **the device (hardware)**, not how to operate the **imc software!** The instructions for the imc measurement software are provided in their own manual. Read carefully the manual before beginning any work!

1.4 Liability limitations

All specifications and notes in the operating instruction manual are subject to applicable standards and regulations, and reflect the state of the art well as accumulated years of knowledge and experience.

The manufacturer declines any liability for damage arising from:

- failure to comply with the instructions provided,
- inappropriate use of the equipment,
- additionally, the general terms and conditions of the company imc Test & Measurement GmbH apply.

1.5 Guarantee

Each device is subjected to a 24-hour "burn-in" before leaving imc. This procedure is capable of recognizing 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 guaranteed to function properly for 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.

1.6 Before starting

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.

Existing ventilation slits must be kept unimpeded to avoid heat buildup in the device interior.

The devices have been designed for use in clean and dry environments. It is not to be operated in 1) exceedingly dusty and/ or wet environments, 2) in environments where danger of explosion exists nor 3) in environments containing aggressive chemical agents.

1.7 Notes on maintenance and servicing

No particular maintenance is necessary.



The specified maximum errors are valid for 1 year following delivery of the device under normal operating conditions (note ambient temperature!).

For devices with UPS functions, we recommend maintenance every 2-3 years. Please read the notes in the chapter [rechargeable accumulators and batteries](#)¹⁶. When returning the device in connection with complaints, please include a written, outlining description of the problem, including the name and telephone number of the sender. This will help expedite the process of problem elimination.

For questions by telephone please be prepared to provide your device's serial number and have your imc installation software, as well as this manual at hand, thanks! The serial number, necessary power supply, interface type and software version included can be determined from the plaque on the side of the device.

1.8 Safety

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

1.8.1 Responsibility of the user

The device 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 instruction manual, the user must also conform to regulations for safety, accident prevention and environmental protection which apply to the work site.

The user must also ensure that any personnel assisting in the use of the device have also read and understood the instruction manual.

1.8.2 Operating personnel

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.

The manual distinguishes the following degrees of qualification for performing various actions:

- Users of the measurement equipment. Fundamentals of measurement engineering. Recommended: knowledge of foundations of electrical engineering. Familiarity with the Microsoft Windows operating system. Users may not open or modify the device.
- Qualified personnel is 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.

1.8.3 Special dangers

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.

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.

DANGER!



- 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.

1.9 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 (not for racks) with cable and pre-assembled connector
- DC-power connector
- Getting started with your imc measurement device (printed)

Note

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

1.10 Transport

When transporting imc BUSDAQ / BUSLOG, 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 the imc Customer Support. Damage arising from transporting is not covered in the manufacturer's guarantee. Possible damage due to condensation can be limited by wrapping the device in plastic sheeting. The represented handling label for lithium ion batteries can be attached also independently printed on the package (e.g. by gluing on the package or in a transparent unlabeled document bag). Note however that the form and the format are accurately given by IATA and the expression has to take place in color. Format: 120 x 110 mm.

Lithium Battery Handling Label:
UN 3480 / UN3481



1.11 Storage

As a rule, the measurement device can be stored at temperatures ranging from -20°C to +85°C.

1.12 Cleaning

- Always unplug the power supply before cleaning the device. Only qualified service technicians are permitted to clean the housing interior.
- Do not use abrasive materials or solutions which are harmful to plastics. Use a dry cloth to clean the housing. If the housing is particularly dirty, use a cloth which has been slightly moistened in a cleaning solution and then carefully wrung out. To clean the slits use a small soft dry brush.
- Do not allow liquids to enter the housing interior.
- Be certain that the ventilation slits remain unobstructed.

2 Start of operation with the Hardware

2.1 Precautions for operation

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

Note

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

- 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 chapter "Technical Specs", to prevent damage to the unit through inappropriate signal connection.
 2. If you are using an 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.

2.2 Supply

The range of permitted supply voltages is 10 .. 50 V DC. The table-top power supply unit which is included standard delivers 15 V_{DC} at a max. power consumption of 60 W. The AC input voltage can be 110 .. 240V 50/60Hz.

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:

- **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 an extra parallel capacitor is needed.

Pin configuration supply connector:

Binder connector	
Pin 1	+ Supply
Pin 2	- Supply, Ground
Pin 3	n. c.



Type: ESTO RD03 series 712 3-poles

2.2.1 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). This connection is protected by a current limiter and provides either supply of the imc BUSDAQ's from the CAN-bus or supply of connected imc CANSAS modules from the imc BUSDAQ's power supply unit.

2.2.2 DC power supply of connected CANSAS units

Not only the imc BUSDAQ device can be supplied with power externally, as described above, but also, it is possible to power connected imc CANSAS modules from the imc BUSDAQ's power supply unit. Here, too, a cable of sufficient cross-section is needed. The load current can have a maximal value of 1 A per node, which is provided by a current limiter.

2.2.3 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.

2.2.4 UPS and power fail function

Automatic conclusion of measurement and data saving upon power outage

imc BUSDAQ comes with a UPS-function (uninterruptable power supply) for the power supply. In case of a power outage, this prevents data loss, and is referred to "Power Fail". This function ensures that in case of power failure, the measurement is automatically closed correctly and the collected data are saved to the internal μ -Disk in time.

The **buffer-time** constant determines the duration for which imc BUSDAQ can continue to perform measurement after a power outage. Thus, brief interruptions of the power supply will not cause a measurement to be aborted.

The buffer time constant is ten seconds for **imc BUSLOG** and **imc BUSDAQ-2** ten, and fifteen seconds for **imc BUSDAQ-X**. Immediately after the running measurement is completed, that takes another 10 seconds.

Note

- Always be sure to shut the device off by means of the power switch. If the power supply line is simply disconnected instead, the Power Fail function is activated and the storage battery is needlessly run down.
- The stated specifications are valid for a fully charges rechargeable battery at room temperature. For temperatures below 20°C, these times are no longer guaranteed.
- If the resulting channel sampling time is > 5 seconds, closing the measurement takes longer than the guaranteed buffer time constant.
- The buffer time constant can be changed using the device software. See the device software manual *Device properties...*: Entry *USV*.
- If the device is only supplied with power for the brief duration of a measurement, the Power Fail function can not be guaranteed to work! In particular with imc BUSLOG and imc BUSDAQ, the capacitors' charging time is not sufficient to bridge the buffer duration and conclude the measurement.

2.2.5 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.

2.2.6 Remote On/Off

The imc BUSDAQ 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 green 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 green 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.

The remote operation with **imc BUSDAQ-X** devices is only possible with a switch at the control socket not with a push-button. In case of a closed switch on the control socket the device will be activated permanently and it will turn off when the switch has been opened.

Reference

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

2.3 Grounding, shielding

In order to comply with Part 15 of the FCC-regulations applicable to devices of Class B, the system must be grounded.

2.3.1 Grounding

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

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.

2.3.2 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.

Remarks

- 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.

2.3.3 Potential difference with synchronized devices



When using multiple devices connected via the **Sync terminal** for synchronization purposes, ensure that all devices are the same voltage level. Any potential differences among devices may have to be evened out using an additional line having adequate cross section.

Alternatively it is possible to isolate the devices by using the module **ISOSYNC**, see also chapter Synchronization in the software manual, or use fibre optic converter ACC/SYNC-FIBRE..

2.4 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.

2.5 Batteries

There is a Li-battery (3.0 V) soldered onto the motherboard.

For an uninterruptable power supply (UPS) capacitors are used to supply the *imc BUSLOG* and *imc BUSDAQ-2* device. *imc BUSDAQ-X* are equipped with two lead cell storage batteries (4 V), 0.5 Ah. No special maintenance should be necessary. No fuses are included in the device.

For BUSDAQ-X (MP0,5-4 4V Pb) the manufacturer specifies 5-7 years @ T<20°C and less than 1 year @ 50°C, if the discharge is very little (Trickle-life). Charging these internal backup batteries is accomplished automatically when the activated device receives a supply voltage. Due to the inevitable leakage of charge we recommend that the device be activated at least every 3 months to prevent the batteries from dying.

In case the UPS is used a lot (many discharge and recharge cycles), the life time depends on how much (deep) it has been discharged (is the UPS buffering only for a short time or is the UPS discharged completely every time?). The manufacturer specifies 200 cycles @100% discharging and 1200 cycles @ 30% and 25°C ambient temperature. (that should be true in general for all Pb accus.)

For *imc BUSLOG* and *imc BUSDAQ-2* capacitors are used as batteries (EPCOS UltraCap). The manufacturer specifies more than 10 years @ T<45°C and 2 years @ 65°C. The number of discharge/recharge cycles is specified with 500000 @ 25°C and 0.5 A discharge current (*imc BUSLOG* needs up to 0.6 A).

imc recommends maintenance every 2-3 years.

2.6 LEDs and Beeper

6 Status LEDs and a beeper are provided at imc BUSDAQ-X devices as additional visual and acoustic "output channels". They can be used just as standard output channels in imc Online FAMOS by assigning them the binary values "0" / "1" or functions taking the Boolean value range. Interactive setting and Bit-window display for these output channels is neither especially useful nor supported.

It is not possible to deactivate the beeper by software. The beeper indicates the starting buffering period of the UPS.



LEDs and Beeper are only provided with imc BUSDAQ-X devices!

3 Start of operation Software / Firmware

3.1 Installation - Software

The associated measurement engineering software, 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 software requires a license, subject to the purchase order and configuration (see e.g. imc STUDIO manual product configuration / license).

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

You will find a detailed description to the installation of the software in the adequate manual or getting started (imc STUDIO / imc DEVICES).

3.1.1 System requirements

The minimum requirements of the PC, the recommended configuration for the PC, the supported operating system are mentioned in the datasheets and the adequate manual or getting started (imc STUDIO / imc DEVICES).

3.2 Connecting via LAN in four steps

The most common case is described below: the PC and the device are connected via cable or 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 knows the device's hardware configuration. In that case, experiment configurations can be prepared without any connection to the device.

Step 1: Determining the PC's IP-address

Before starting the configuration of your measurement device, you should **determine your computer's IP-address** (the following screenshots and texts refer to MS Windows 10). There are multiple ways to do this, of which some may not be possible on your PC, depending on the administrator rights you have. In such cases, you should contact your responsible administrator/IT-service.

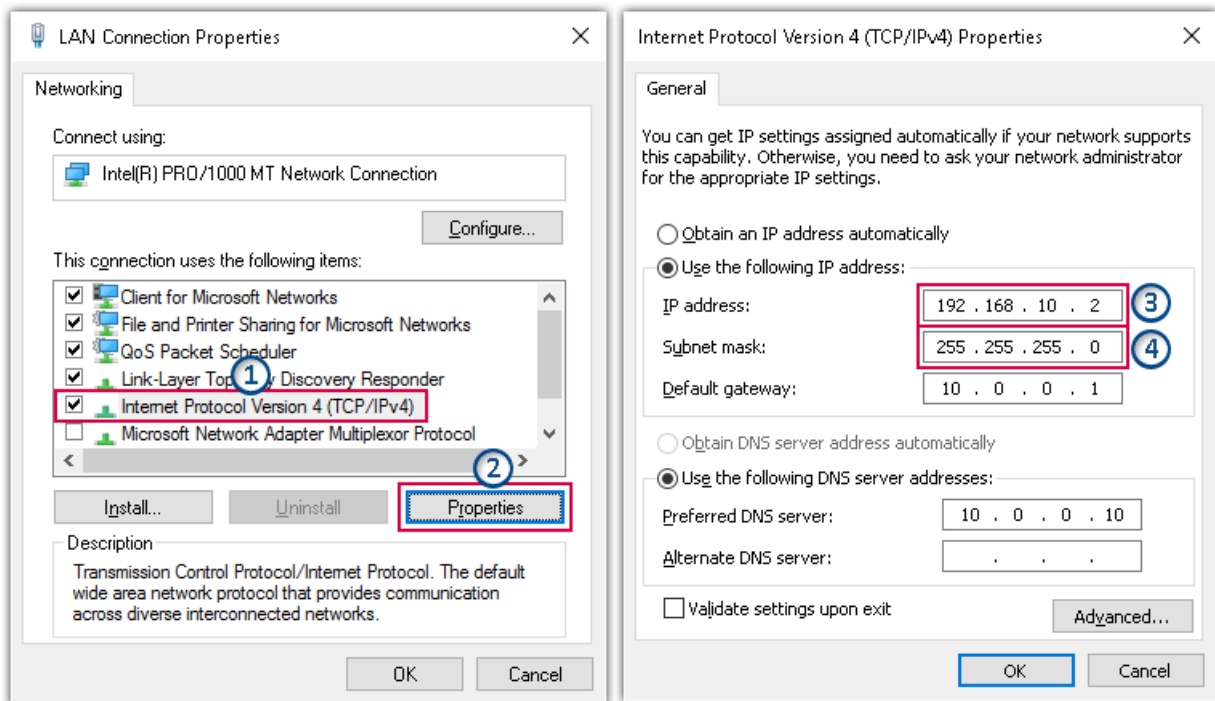
Before determining the IP-address, connect the measurement device with the PC and activate it.

To open the configuration dialog, use one of the following:

- Open the Windows Control Panel and search for "**View network connections**"
 - Select "View network connections"
- Open Windows' input box by using the keyboard combination of Windows-key + R [Win+R].
 - Enter the following command in the edit box:
`control netconnections`

The "**Network Connections**" window appears. Then right-click the mouse over the entry for your network connection and then select the item "**Properties**" in the context menu once again. Then the Connection Properties window appears.

Select Version 4 of the **Internet Protocol Version 4 (TCP/IP4)** and click on **Properties**. Now the current settings are visible. Please note the computer's **IP address** (3) and the **subnet mask** (4).



Select Internet Protocol (TCP/IP)

Settings for TCP/IP

Warning

Be careful in changing settings, since if the same network card is used, there may be difficulties later in the company network. Please discuss this with your responsible administrator/IT-service.

Note: Obtain IP-address automatically (DHCP)

If "Obtain IP address automatically" (DHCP) is selected, no IP address is displayed. In this case, you have to determine the current IP-address using the Command Prompt/Command line.

Note, however, that automatically obtained IP-addresses might change the next time the operating system is started!

Determine the IP address using the Command line

Open Windows' input box by using the keyboard combination of Windows-key + R [Win-R]. Type `cmd` in the text box and confirm by pressing Return. In the command line window which then appears, type in `ipconfig`.

Now you can read the IP-address of the desired network connection:

```

C:\>ipconfig

Windows IP Configuration

Ethernet adapter LAN Connection:

    Connection-specific DNS Suffix . . . : 
    IPv4 Address. . . . . : 192.168.10.2 IP address of the PC
    Subnet Mask . . . . . : 255.255.255.0 Subnet mask
    Default Gateway . . . . . : 10.0.0.1
  
```

Result of the command "ipconfig"

For the present case, the PC uses the IP 192.168.10.2 with the subnet mask 255.255.255.0. For this reason the measurement device should have a number which differs from the PC in the last block.

In the example shown, the fixed IP 192.168.10.2 with subnet mask 255.255.255.0 is selected. For measurement devices, any numbers would be suitable which begin with 192.168.10. and then do not contain 0, 2, or 255. The 0 and the 255 should not be used, if possible, due to their special significance, and 2 is the computer's number and so not suitable for the measurement device.

Step 2: Connecting the measurement device

When you **connect** the measurement device **directly to your PC**, you may need to use a "**crossed**" **network cable** in some circumstances. If the measurement device is connected to the network **via a network hub** or switch, or a patch box, use an **uncrossed network cable**. Modern PCs and network switches are able to switch electronically. Hence you can use both cable types.

Step 3: IP-configuration

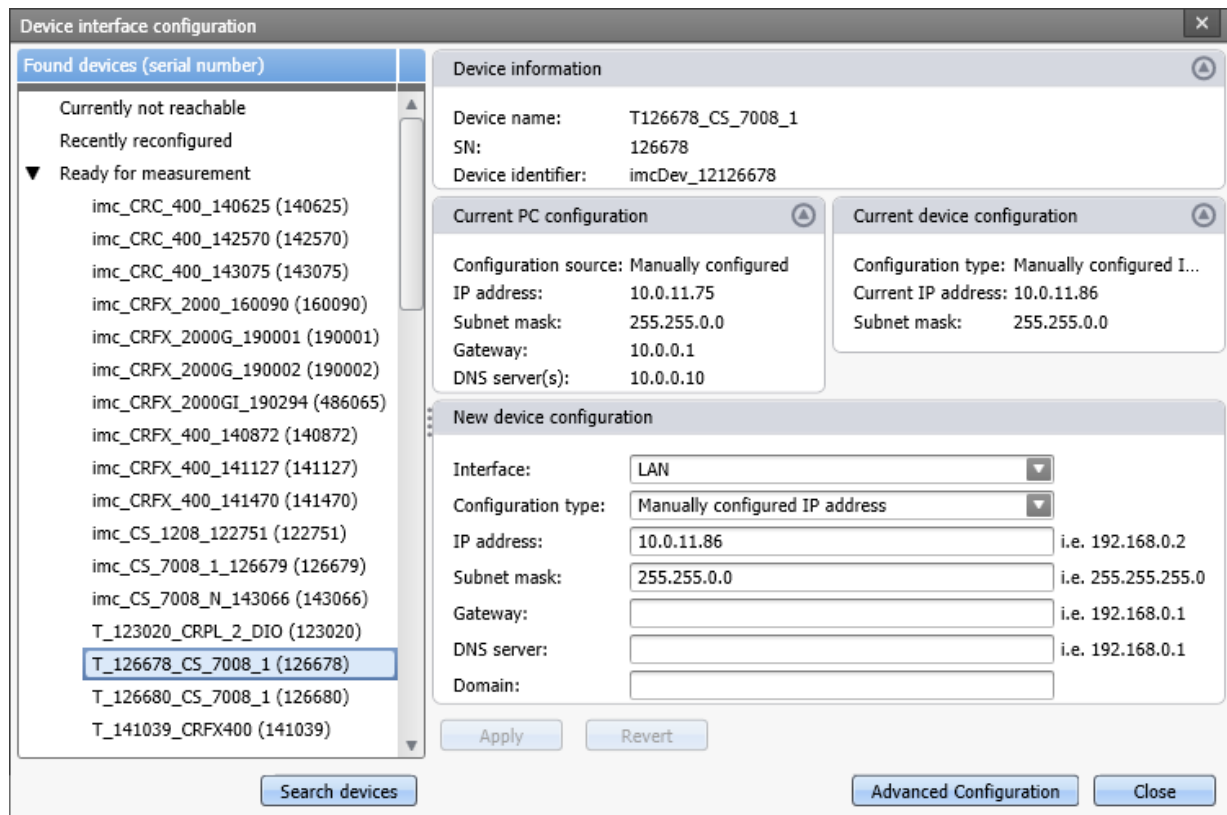
Start imc STUDIO. Open the dialog for configuring the device IP address by clicking on the button

Device interfaces (.

Ribbon	View
Setup-Configuration > Device interfaces (	Complete

If this **button** is **not present** in the view you are in, 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 is found in the group "**Currently not reachable**", you need to configure the LAN settings. If the device is found in the group "**Ready for measurement**", you can retain the current settings or view them. Select the device.



Display of measurement devices found and of the IP-address

If the configuration type: *DHCP* is used, **the IP-address is obtained automatically** from the DHCP-server. If there is a direct connection between the device and the PC with a crossed cable, you should deactivate the DHCP. 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.).

Without DHCP, you must **set the IP-address manually**. Please note that the device's and PC's IP-address must fit together, in other words that in the network mask only the portion representing the device is different (see example).

Example for IP settings	PC	Device
IP-address	10. 0. 0. 34	10. 0. 0. 45
Network mask	255.255.255. 0	255.255.255. 0


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

Note: Connection via modem

If the connection to the device is established via a modem, start the program **imc DEVICES Interface Configuration** by clicking on the button: **Advanced Configuration**. An exact description is found in the chapter: *Setup - Connect the device > Special options for connecting to the device*.

Step 4: 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**. Use the menu button **Search for devices** ()

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

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

You can also select multiple devices for your experiment.

Now the device is *known*. After the next program start it is available for selection. For further information, see the documentation on plug-in Setup.

3.3 Firmware Update

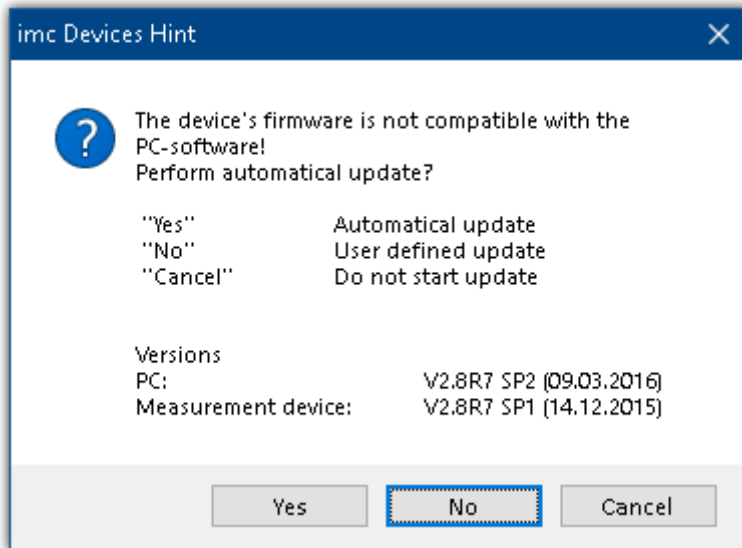
Every software version comes with matching firmware for the hardware. The software only works with devices having the right firmware. Upon the first connection/preparation, the versions are compared. If they don't match, the **firmware update** is carried out.

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

Note

- The firmware update is only required if the software was obtained as an update. If you obtained your measurement with the software, no firmware update is necessary.
- With imc DEVICES 2.7 / imc STUDIO 3.0 R4 and higher:
Before transfer to the device module is completed, the system checks whether the firmware already in the device does not match the software used. The firmware update for the device module is only performed if it does not.

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.



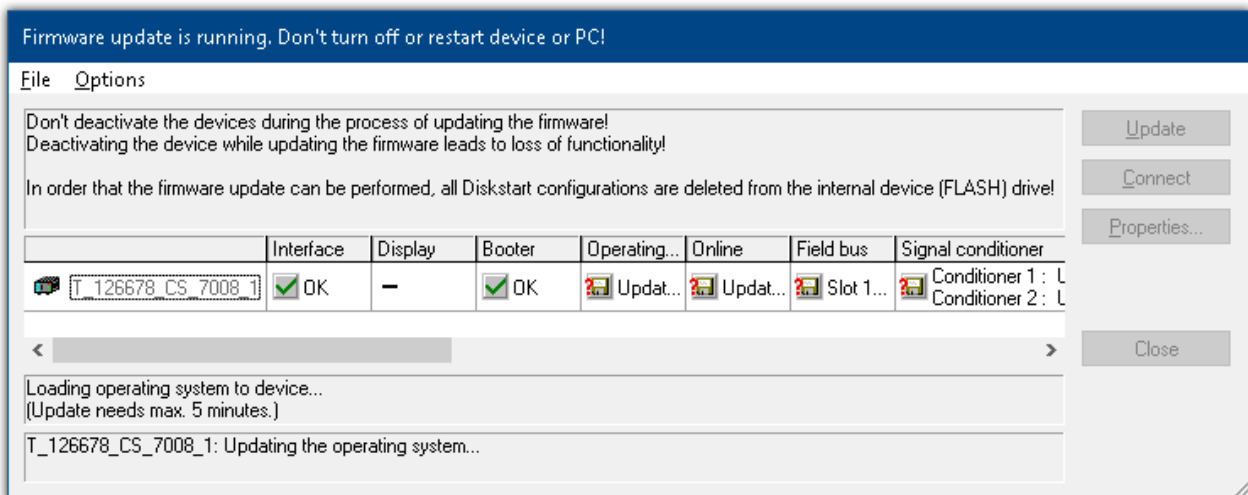
- Choose Yes.



Warning

Do not under any circumstances deactivate the device during the firmware update. If any error messages appear during the firmware update, do not switch the device off, but contact the imc Hotline. The firmware update may be continued with guidance from the Hotline.





The dialog for the firmware-update looks like this:



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

Component	Description
Interface	Interface-Firmware (Ethernet)
Booter	Start-up program for the device upon switching-on
Operating system	Device operating system
Online	Online-functions and hard drive controller
Display	Operating system of the connected displays
Field bus	Field bus
Signal conditioners	Amplifiers

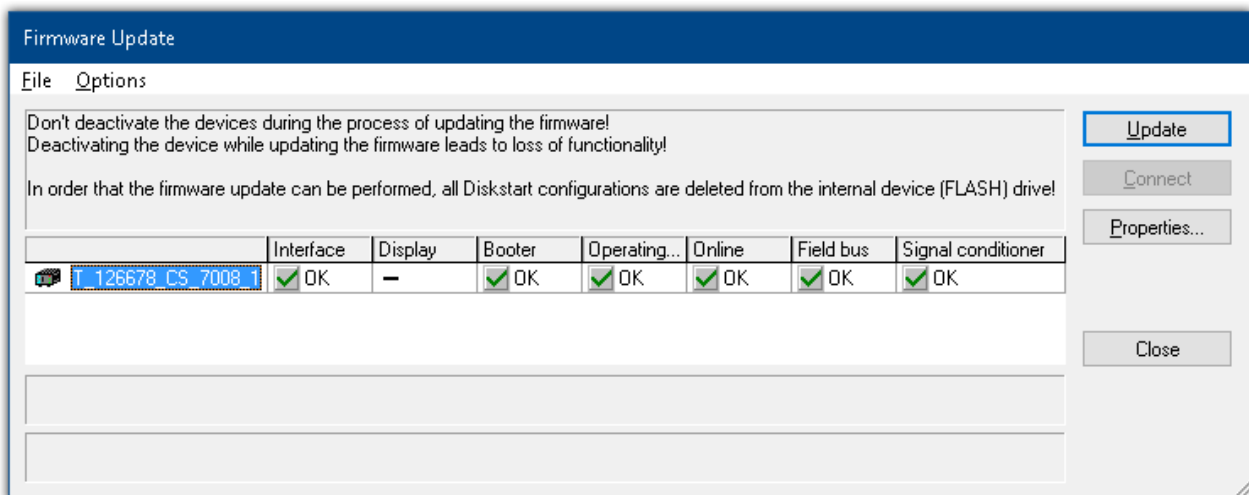
The following symbols for the individual firmware components appear in the list:

	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 amount 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.

 **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!

- 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 FW-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:

- Windows' energy saving mode switches the LAN adapter off, consequently interrupting the network connection!
- Windows switches to the next LAN adapter if there is one (some PCs have multiple adapters in order to, for instance, access SAP or Novell in parallel, which are often running on separate networks.)
- 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 the imc Hotline. It may be possible to continue the firmware-update under the guidance of the Hotline using a service program.



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

 **Note**

- A message box will appear to notify you if and when the firmware-update has been completed successfully.
- The File menu offers a function for working with the 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*
- The firmware belonging to the amplifiers installed in the device is only updated if there was a firmware change along with the respective imc STUDIO software version.

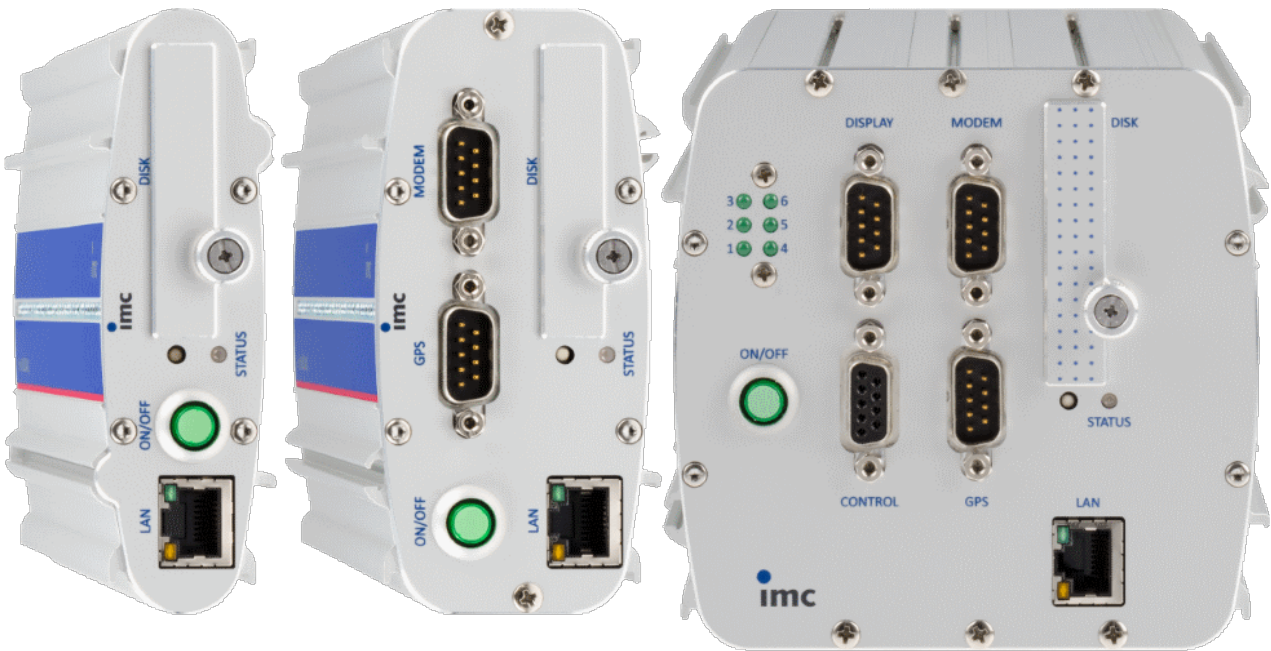
4 Pin configuration

Rear view



imc BUSLOG | imc BUSDAQ-2 | imc BUSDAQ-X

Front view



imc BUSLOG | imc BUSDAQ-2 | imc BUSDAQ-X

4.1 Pin configuration of the field busses

4.1.1 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](#) ¹³.

4.1.2 LIN-Bus (DSUB-9)

DSUB-PIN	Signal	Description
1	nc	
2	nc	
3	LIN_GND	LIN Ground
4	nc	
5	nc	
6	LIN_GND	Optional LIN Ground
7	LIN_INPUT/OUTPUT	LIN bus line
8	nc	
9	nc	

4.1.3 J1587-Bus (DSUB-9)

DSUB-PIN	Signal	Description	Use in device
1	nc	reserved	unused
2	TX/RX +	J1587 bus line	connected
3	TX/RX -	J1587 Ground	connected
4	nc	reserved	unused
5	nc	reserved	unused
6	TX/RX +	J1587 bus line	connected
7	TX/RX -	J1587 Ground	connected
8	nc	reserved	unused
9	nc	reserved	unused

4.1.4 FlexRay-Bus (DSUB-9)

imc standard: One DSUB-9 connector 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 connectors (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

4.1.5 XCPoE (RJ45)

Standard Ethernet 1x RJ45.

4.1.6 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

4.2 DSUB-9 pin configuration

4.2.1 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

4.2.2 Modem (external)

For imc BUSDAQ-2 and imc BUSDAQ-X only

DSUB-PIN	Signal	Description	Use in device
1	DCD	Data Carrier Detect	connected
2	RxD	Receive Data	connected
3	TxD	Transmit Data	connected
4	DTR	Data Terminal Ready	connected
5	GND	Ground	connected
6	DSR	Data Set Ready	connected
7	RTS	Ready To Send	connected
8	CTS	Clear To Send	connected
9	nc	reserved	unused

4.2.3 GPS

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

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

4.3 CTRL-plug pin configuration

LEMO type 0B for imc BUSLOG

Pin	Signal	Description
1	-Supply	0 V
2	Remote On/Off	On/off by a short-period connection (push-button) 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 power supply (over R=1 kW)) Only for control functions, no load!
5	+Sleep / Resume High	sleep mode: 0 V to 1 V; Resume Mode: 4 V to 55 V
6	-Sleep / Resume Low	0 V

DSUB-9 for imc BUSDAQ-2 and BUSDAQ-X

Pin	Signal	Description
1	-Supply	0 V
2	-Sleep / Resume Low	0 V
3	Remote On/Off	On/off by a short-period connection (push-button) ¹ to pin1 (-Supply)
4	NC	
5	Sleep/Resume Mode enable/disable	Activate the Sleep/Resume mode with jumper top pin1 (-Supply)
6	+V _{AUX}	5 V or 10 V to 55 V (Voltage of power supply (over R=1 kW)) Only for control functions, no load!
7	+Sleep / Resume High	sleep mode: 0 V to 1 V; Resume Mode: 4 V to 55 V
8	NC	
9	NC	

1 imc BUSDAQ-X devices can be powered on or off with a switch (or with the standard Power-On) and not with push button.

4.4 DI/DO pin configuration (DSUB-15)

imc BUSDAQ-X only

Plastic Metal connector

ACC/DSUB-		ACC/DSUBM-		DI2-4		DO4	
DSUB Pin	Terminal	DSUB Pin	Terminal	DIGITAL IN		DIGITAL OUT	
				standard * until MultiIO6	from MultiIO7 on	standard * until MultiIO6	from MultiIO7 on
1				+IN1		BIT1	
9	1	9	1	-IN1/2	+IN1	HCOM	BIT1
2	2	2	2	+IN2	+IN2	BIT2	BIT2
10	3	10	3	LEVEL 1/2	-IN1/2	HCOM	BIT3
3	4	3	4	+IN3	+IN3	BIT3	BIT4
11	5	11	5	-IN3/4	+IN4	HCOM	
4	6	4	6	+IN4	-IN3/4	BIT4	
12	7	12	7			HCOM	
5	8	5	8			LCOM	
13	9	13	9		LEVEL 1/2 **		
6	10	6	10				
14	11	14	11				HCOM
7	12	7	12		LEVEL 3/4 **		LCOM
15	14	15	15				LCOM
8	17	8	18				
	13		13				
	18		14				
	15		16		CHASSIS		CHASSIS
	16		17		CHASSIS		CHASSIS

*

IMPORTANT NOTE

The pin configuration does not match with any imc-DSUB15 plug! From hardware version Multi IO7 on, the imc DSUB connector ACC/DSUB-DI2-4 and ACC/DSUB-DO4 can be used.

** LEVEL open = 24V; LEVEL 1/2 and -IN 1/2 or (LEVEL 3/4 and -IN 3/4) jumpered=TTL

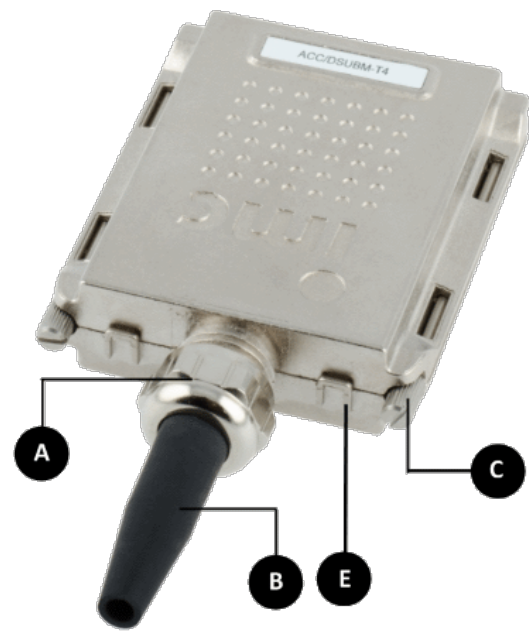
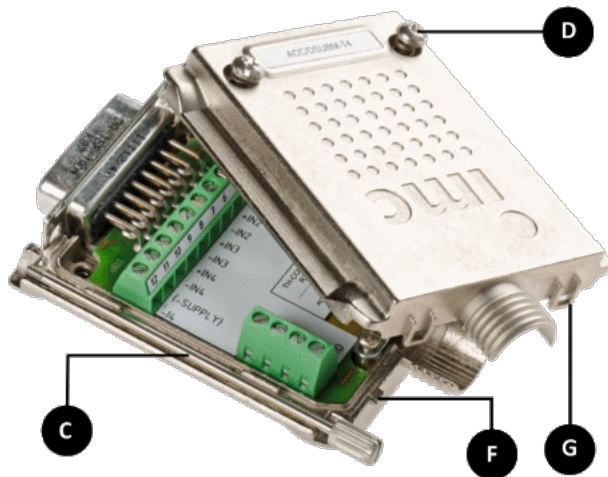
The different MultiIO varieties can be distinguished by the button for exchanging the CF card. From Multi IO7 onwards, the button is countersunk, so that to press it a sharp object like a pen is needed. Up until Multi IO6 the button was black and protruding. Please also observe the different pictures at the corresponding locations in the manual.

4.4.1 Metal connector

ACC/DSUBM-xxx

Open the Metal connector:

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



- A: Pressure nut
 B: Bend protection
 C: Fastening screw for the devices' front pane
 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 following picture)
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



5 Last Changes

Amendments and bug-fix in Version 3 R 6

General	New
	Company name: imc Test & Measurement GmbH

Amendments and bug-fix in Version 3 R 5

Chapter	Bug-fix
ARINC	DSUB pinning revised!

Amendments and bug-fix in Version 3 R 4

Chapter	Amendments
General	smaller changes and improvements imc BUSDAQ-X devices can be powered on or off with a switch (or with the standard Power-On) and not with push button.

Amendments and bug-fix in Version 3 R 3

Chapter	Amendments
General	file size reduced by optimizing the pictures

Amendments and bug-fix in Version 3 R 2

Chapter	Amendments
Power Supply ¹²⁾	new pic of the pin configuration added
product package	new network cable with latch protection
Chapter	Bug-fix
FlexRay	typing error in the pin configuration

Amendments and bug-fix in Version 3 R 1

Chapter	Amendments
General	improved structure

6 Symbols and legend

Tips and recommendations



Note!

... highlights useful tips, recommendations and information for efficient and trouble-free operation.



Reference

...indicates where to find more detailed or otherwise related information.

Drawings of the pin alignment

The number in each connection drawing is meant to be the correspondent LEMO pin.

Notes of caution

Warning notes are denoted in this manual by symbols. The notes begin with a signal phrase characterizing the extent of the danger. Be certain to observe these notes carefully to avoid accidents and harm to persons and equipment.



Caution!

...indicated a potentially hazardous situation which could cause slight injury if not avoided.



Danger of electric shock!

... warns of danger from electrical voltages at the measurement object which are conducted into the measurement inputs. The device itself does not produce dangerous voltages.



Caution!

...refers to potentially hazardous situations which can cause equipment damage if not avoided.

Symbols on your measurement device



Caution! Danger area!

Due to the insufficient space at the measurement inputs the calculation parameters can not be stated nearby. Before starting consider the calculation parameters of the measurement inputs in this manual.



Danger of electrical shock!

... points on both, the danger outgoing from the measurement source and on the danger at the measurement inputs (e.g. HV modules) and dangerous voltage coming from the measurement device (e.g. MIC-SUPPLY).

Recycling!



... points out, concerning WEEE guideline, that the product may not be thrown in the domestic refuse. The product was brought into the market after 2005 August 13th.

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