



Operating instructions
io-key ww
AIK050

GB

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1 Preliminary note

You will find instructions, technical data, approvals, accessories and further information using the QR code on the unit / packaging or at www.ifm.com.

1.1 Symbols used

- ✓ Requirement
- Instructions
- ▷ Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference
-  Important note
Non-compliance may result in malfunction or interference.
-  Information
Supplementary note

1.2 Warnings

Warnings indicate the possibility of personal injury and damage to property. This enables safe product handling. Warnings are graded as follows:



WARNING

Warning of serious personal injury

- ▷ If the warning is not observed, fatal and serious injuries are possible.



CAUTION

Warning of minor to moderate personal injury

- ▷ If the warning is not observed, minor to moderate injuries are possible.

ATTENTION

Warning of damage to property

- ▷ If the warning is not observed, damage to property is possible.

1.3 Safety symbol on the device



Safety symbol on the device:

- Adhere to the operating instructions for the safe operation of the device.

1.4 Change history

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
 - The system architect is responsible for the safety of the system.
 - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Intended use).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, programming, configuration, operation and maintenance of the product must be carried out by personnel qualified and authorised for the respective activity.
- Protect units and cables against damage.
- Replace damaged units, otherwise the technical data and safety will be impaired.
- Observe applicable documents.

2.1 Cyber security

The device has the following security functions:

Access

- Device management exclusively via the cloud platform; no local management interfaces available

Authentication

- Individual, certificate-based authentication to the cloud platform
- Login to cloud platform with user name and password

Confidentiality

- Complete, TLS-based end-to-end transport encryption according to the latest state-of-the-art for communication to the cloud
- Secure access via HTTPS to the user interface of the cloud platform
- Identification of data sources in the cloud according to a readable name scheme

Restricted data flow

- No active connection establishment to the device by the user possible
- Device only accessible via cloud platform; no provision of services via WWAN interface

ATTENTION

Device operation in an unprotected network environment

- ▷ Unauthorised read or write access to data is possible
 - ▷ Unauthorised manipulation of the device function is possible
 - ▶ Restrict access to authorised users (e.g. password-protected access).
-

3 Intended use

The device may only be used for the following purposes:

- as IO-Link master to operate IO-Link devices (sensors)
- as mobile radio gateway between IO-Link devices and the ifm cloud

The device is designed for use outside of a control cabinet.

The device is designed for indoor use.



The system manufacturer is responsible for the physical security of the device.

- Take appropriate measures to ensure the physical safety of the device.

4 Function

4.1 Gateway

- Makes the process data of the connected IO-Link devices available in the ifm cloud via mobile radio
- Receives device description data for connected IO-Link devices
- Receives configuration data for the edge alarm function and the edge switching function of the unit

4.2 IO-Link

The device offers the following IO-Link functions:

- IO-Link master according to IO-Link specifications 1.0 to 1.1
- 2 IO-Link ports (Class A) according to IO-Link specifications 1.0 to 1.1.2
 - Each port supports the transmission of a maximum of 32 data points.

4.3 Mobile radio

Observe the additional notes: → Package insert

4.3.1 Supported mobile radio standards

The unit supports the following mobile radio standards:

- GSM of the second generation (2G)
 - LTE CAT M1 (4G)
 - LTE Cat. NB2 (NB-IoT)
- Observe frequencies used and error limits (→ [Transmission frequencies](#) □ 22)!

4.3.2 Countries covered

List of countries in which the unit can be operated: documentation.ifm.com

Country-specific certificates: documentation.ifm.com



There are no roaming charges for operation across country borders.

Outside these countries, it is not allowed to operate the unit. Operation outside of these countries is a violation of the Terms and Conditions and may result in deactivation of services.

ifm does not guarantee mobile radio coverage at every location in the listed countries.

4.3.3 Data transmission

Data transmission of the connected IO-Link devices takes place at a fixed interval the customer selects when purchasing the unit. It is possible to change the interval at a later date.

4.3.4 SIM card

Transfer of data from the unit to the ifm cloud takes place via an integrated SIM card (eSIM).



The customer is not entitled to remove the integrated SIM card from the unit, sell the chip card or act as a provider of telecommunication services.

► Use the SIM card only in accordance with the services purchased from ifm!

4.4 Digital outputs

The unit has 2 digital switching outputs. The digital outputs are at pin 2 and pin 4 of the power port. The outputs refer to the potential of the supply voltage US (pin 3).

The outputs are controlled via the switching function of the unit ([→ edge switching function](#)  9).

4.5 edge alarm function

The unit offers an alarm function. The function allows you to define alarms based on rules that are sent to the ifm cloud and which are independent of the selected mobile radio transmission interval.

The function can be configured via the ifm cloud and loaded to the unit via mobile radio. The configured alarms are processed directly on the unit irrespective of the connection to the ifm cloud.



Due to the nature of the Internet, it cannot be fully guaranteed that the unit will send the set alarm to the ifm cloud under all circumstances and within a specific minimum time. Normally, the sensor value and alarm transmission takes place within a few seconds.

Configuration details: [→ Online help of the ifm cloud](#)

4.6 edge switching function



WARNING

The device is not designed for safety applications or for the operation of circuits in connection with operator safety. The switching outputs are intended for the control of signal lamps and acoustic signal indicators.

► Do not trigger any actuators that can lead to hazardous movements.



The edge switching function service is intended for persons with knowledge of control technology and PLC programming. This service is intended for specialists. Specialists are people who are qualified by their appropriate training and their experience to see risks and to avoid possible hazards that may be caused during operation or maintenance of the device.

The device provides a switching function. The function allows rule-based definition of conditions in which one of the digital outputs of the device will be switched.

The switching function can be configured as follows:

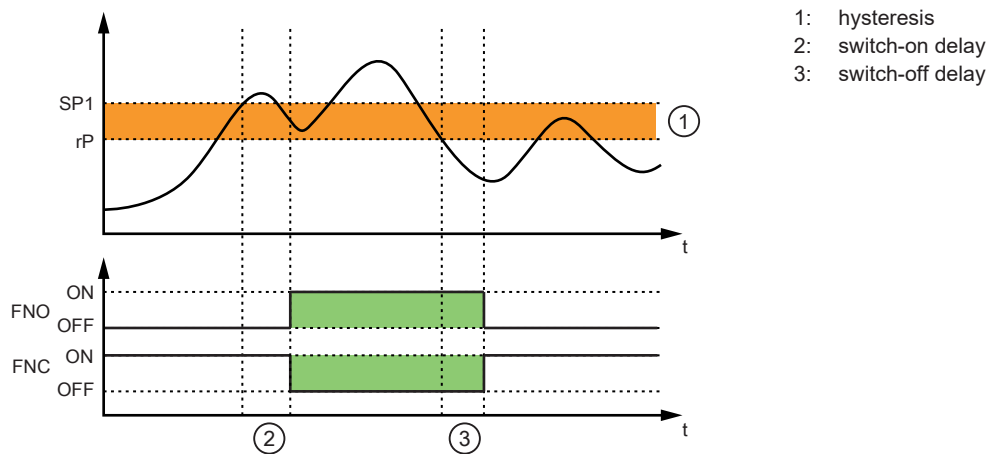
- threshold function (with hysteresis)
- Window function

The switching function can be configured via the ifm cloud and loaded to the device via mobile radio. The switching function is processed directly on the device irrespective of the connection to the ifm cloud.

Details on the configuration: [→ online help of the ifm cloud](#)

4.6.1 edge threshold function

The user can define a set point (SP) and a reset point (rP) for a hysteresis.

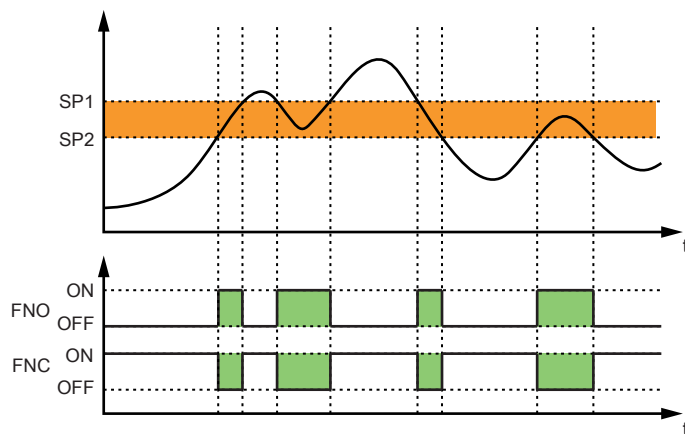


Further setting options:

- output function as normally closed (FNC) or normally open (FNO)
- switch-on delay
- switch-off delay

4.6.2 edge window function

The user can define 2 set points (SP1, SP2) as window area.



Further setting options:

- Output function as normally closed (FNC) or normally open (FNO)
- switch-on delay
- switch-off delay

5 Installation

5.1 Installation instructions

5.1.1 Device temperature

The device primarily heats up due to the following factors:

- Solar radiation
- Ambient temperature
- Installation conditions
- External heating
- Electricity consumption

The device temperature is always approx. 20°C higher than the current ambient temperature.

The device temperature must not exceed the maximum permissible value of 70°C.

ATTENTION

The internal temperature exceeds the maximum permissible value.

- ▷ Malfunction or damage to the device
- ▷ Reduce device temperature.
- ▷ Take appropriate measures to prevent further heating up of the device.

To reduce the device temperature, measures such as the following can be taken:

- ▷ Observe the maximum permissible ambient temperature (→ Data sheet).
- ▷ Protect the device from external heating (e.g. from other devices, direct sunlight).
- ▷ Warn users if the permissible device temperature is exceeded (**NOTE! The device temperature is transferred to the moneo cloud**).

5.1.2 Mobile radio

Sufficient mobile radio coverage must be available at the mounting location.

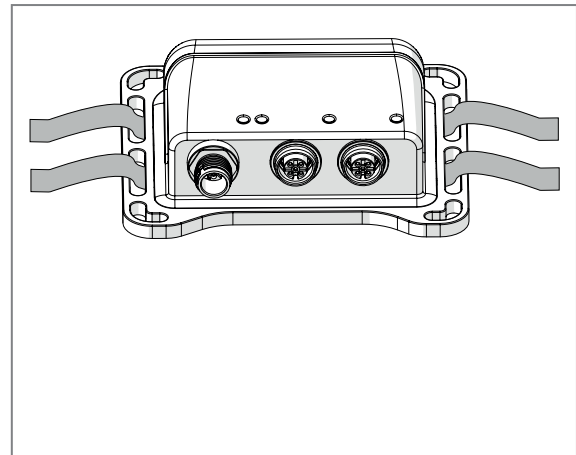
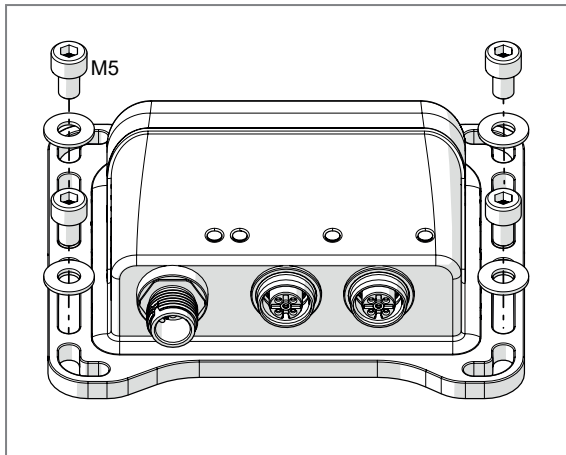
The device has an internal mobile radio antenna.

- ▷ Ensure that no shielding objects interfere with or prevent mobile radio reception at the mounting location (e.g. metal housing).
- ▷ Install the device as exposed as possible.

5.2 Install the unit

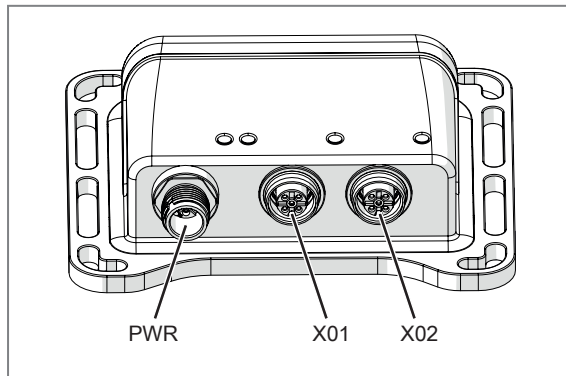


- ▷ Disconnect power before installation!
- ▷ Use a flat mounting surface for installation.
 - ▷ When mounting the unit, observe the minimum distance between the unit and the user: 20 cm
- ▷ Fix the unit to the mounting surface using 4 M5 mounting screws and washers. Minimum screw length: 15 mm.
- ▷ Optional: Adjust the unit additionally, e.g. with cable ties.



6 Electrical connection

6.1 Overview



PWR: Voltage supply

X01: IO-Link Port

X02: IO-Link Port

6.2 General notes

The device must be connected by a qualified electrician.

► Observe the national and international regulations for the installation of electrical equipment.

The device is designed for operation using SELV/PELV voltages.

The device may only be operated with a power supply approved and certified in accordance with EN 62368-1 or EN 60601-1 (max. output current: 2 A).

► Please note the information concerning IO-Link wiring!

Accessible surfaces and circuits of the unit are separated from each other by a basic insulation to IEC 61010-1 (secondary circuit with max. 32 V DC, supplied from the mains circuit up to 300 V of overvoltage category II).

The external wiring has to be carried out in a way that ensures the required separation from other circuits.

6.2.1 General notes on wiring

The threaded connections in the device correspond to the M12 standard. To ensure compliance with the specified protection rating, only cables that comply with this standard may be used. In the case of self-assembled cables, the system manufacturer is responsible for the protection rating.

- Use connectors with gold-plated contacts.
- During installation, place the connectors vertically so that the coupling nut will not damage the thread.
- Before connecting the connector, check that there is an undamaged O-ring in the socket.
- Observe the coding of the connectors during installation.

All cables connected to the device have to comply with the following:

- Conductors with conductor cross-section of 0.5mm² or larger must meet IEC 60332-1-2 and IEC 60332-1-3.
- Conductors with conductor cross-section less than 0.5mm² must meet IEC 60332-2-1 and IEC 60332-2-2.
- Alternatively, IEC/TS 60695-11-21 or UL2566 VW-1 tested cables can also be accepted.

6.3 IO-Link ports

IO-Link devices are connected to the device via the IO-Link ports X01 / X02.

Information on IO-Link wiring:

- The device has 2 supplies for IO-Link devices.
- The voltage supply of the connected IO-Link devices may only be provided via the device.
- Max. current rating at both IO-Link ports (total current): 1 A.
- The ports have an additional digital input (type 3, according to IEC-61131-2).
- The IO-Link ports have a short circuit protection.
- The IO-Link ports have overload protection.
- Maximum cable length: 20 m



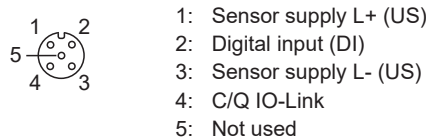
The device offers no function to configure the connected IO-Link devices.

- ▶ Configure IO-Link devices in accordance with the process requirements before connecting them to the device.



The device does not offer the possibility to control actuators.

Wiring:



To avoid malfunction of the device, do not electrically connect pin 5 of the IO-Link ports.

- ▶ Tighten the cable plug using 1.0 ± 0.1 Nm.
- ▶ For connection, use M12 connectors (with at least protection rating: IP 65).
- ▶ Cover unused connections with protective covers. Tightening torque: 1.0 ± 0.1 Nm

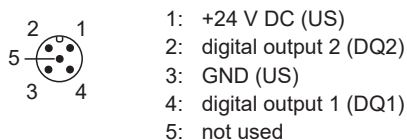
6.4 Switching outputs

The actuators are connected to the switching outputs via the PWR port.

Wiring information:

- Max. current rating at both switching outputs (total current): 400 mA.
- Max. cable length: 30 m

Wiring:



- ▶ Connect pins DQ1 / DQ2 of the PWR port with the actuators.

6.5 Voltage supply

The device is connected to the supply voltage via the PWR port.

Wiring:

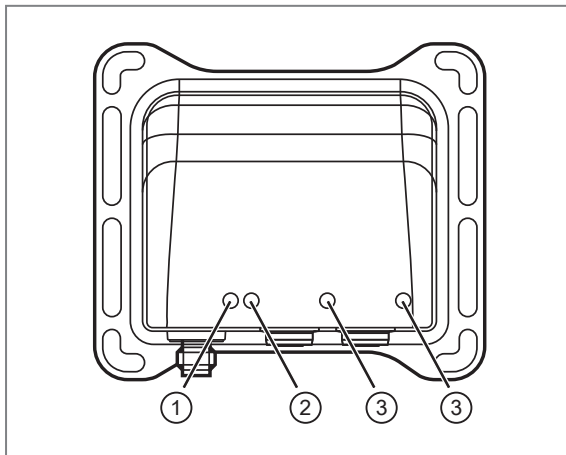


- 1: +24 V DC (US)
- 2: digital output 2 (DQ2)
- 3: GND (US)
- 4: digital output 1 (DQ1)
- 5: not used

- ▶ Disconnect power.
- ▶ Connect the device to 24 V DC via the PWR port.
- ▶ For connection, use an M12 connector (minimum protection rating: IP 65).
- ▶ Tighten the cable sockets according to the torque specifications indicated by the cable vendor.
Maximum permissible tightening torque: 2.0 Nm

7 Operating and display elements

7.1 LEDs



- 1: LED: PWR
- 2: LED: 
- 3: LED:  X01 /  X02

7.1.1 Voltage supply

LED	Description	Colour	State	Description
PWR	Voltage supply status	Green	Off	No supply voltage is applied or the applied supply voltage is too low
			On	Supply voltage US is connected

7.1.2 Mobile radio

LED	Description	Colour	State	Description
	Mobile network connection status	Yellow	Off	Error in the mobile network connection
			Flashes (1 Hz)	Firmware update is being executed
			Flashes (2 Hz)	Communication to the radio cell established (data connection to the radio cell, but not to the services)
			On	Radio connection to the ifm cloud is established
		Red	Flashes (2 Hz)	No login information for the ifm cloud available and connection cannot be established for at least 15 minutes
			On	Connection to the ifm cloud cannot be established or has been inactive for at least 15 minutes

7.1.3 IO-Link ports (Class A)

LED	Description	Colour	State	Description
	IO-Link port status	Green	Off	No IO-Link device connected
			Flashes (1 Hz)	IO-Link device connected: connection is being established and IODD being provided
			Flashes (4 Hz)	Error during the connection or the IO-Link transmission
			On	IO-Link device connected: transmission functions properly

8 Set-up

8.1 Initial installation

- ▶ Open a browser and select www.io-key.ifm.
 - ▷ Website opens.
- ▶ Follow the instructions on the screen for activation and set-up.
 - ▷ The customer will receive a message confirming successful activation via e-mail.

8.2 Cloud login

- ▶ Open a browser and enter the selected URL:
Customer name requestURL.io-key.ifm
- ▶ Enter your user name and password.
- ▷ Cloud user interface appears.

8.3 Mount and connect the unit

Requirement:

- ✓ The ifm cloud is activated.
- ▶ Install the unit correctly.
- ▶ Connect the unit to the voltage supply.
- ▷ Units starts ("power" status LED is on).
- ▷ Unit establishes the connection to the ifm cloud (📶 status LED is on).

8.4 Connect IO-Link devices

The unit has a special mode to set up the IO-Link devices automatically. As soon as an IO-Link device is connected to an IO-Link port, the unit transmits data for five minutes in the transmission interval variant L (1x / 10 seconds). After set-up, the unit returns to the ordered transmission interval.



If this set-up function is abused, ifm electronic reserves the right to deactivate the device account in the ifm cloud and to discontinue the provision of services.

Requirement:

- ✓ The unit has been properly mounted and electrically connected.
- ✓ The unit is connected with the ifm cloud (status LED 📶 lights yellow).
- ✓ The parameters of the IO-Link device have been set.
- ▶ Connect the IO-Link device with a free IO-Link port.
- ▷ The unit recognises the connected IO-Link device.
- ▷ The unit loads the up-to-date device description of the IO-Link device (IODD) from the IODD finder database.
- ▷ The status LED 🟢 of the IO-Link port lights green.
- ▷ The unit transfers the configured process data of the IO-Link device into the ifm cloud.

If not successful: [Fault detection](#) (→ [19](#))

9 Parameter setting

9.1 Configure the unit

The following device functions can be configured:

- edge alarm function
- edge switching function

A maximum of 67 data points can be configured for the transmission of process data to the ifm cloud.

- 32 data points per IO-Link port
- 2 data points for additional digital inputs of the IO-Link ports
- 1 data point for internal temperature sensor of the device

The device supports the transmission of the following data formats:

- Floating Point
 - 39 digits before the decimal point and 2 digits after the decimal point
- Boolean
 - 0: FALSE
 - 1: TRUE
- Octet string
 - Lower case only
 - No spaces
 - Length: depending on the IOOD of the IO-Link device, max. 32 bytes

The parameters are set via the ifm cloud.

- ▶ Start web browser.
- ▶ Access the ifm cloud via the selected URL.
- ▶ Configure the desired functions.
- ▶ Activate the configured functions on the device.

10 Fault detection

Error description	Cause of the fault	Troubleshooting
Status LED "Power" is not on	No supply voltage is applied or the applied supply voltage is too low.	► Check the voltage supply
Status LED is not on	Error in the mobile network connection	► Change the location of the device ► Check the distance to metals and shielding materials
Status LED Port X01 / X02 is flashing (4 Hz)	Error during connection or IO-Link transmission or Short circuit to GND	► Replace the IO-Link device ► Remove short circuit
Status LED Port X01 / X02 is not on even though an IO-Link device has been connected	Error during connection or IO-Link transmission or IO-Link device is defective	► Replace the IO-Link device

11 Maintenance, repair and disposal

The unit is maintenance-free.

The unit cannot be repaired.

- ▶ After use, dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.

11.1 Cleaning

Clean the surface of the unit when necessary.

- ▶ Disconnect the unit from the voltage supply.
- ▶ Clean the unit from dirt using a soft, chemically untreated and dry micro-fibre cloth.

11.2 Firmware updates

The firmware of the device is updated via the ifm cloud. New firmware files are made available by ifm in the ifm cloud.



During the update, the control functions of the device are disabled. There is no data transmission between the device and the ifm cloud.

- ▶ Take all necessary safety precautions.
- ▶ Start web browser.
- ▶ Access the ifm cloud via the selected URL.
- ▶ Update firmware.

11.3 Bluetooth service interface

The device has a Bluetooth service interface. The interface may only be used for maintenance work by ifm service personnel.

12 Appendix

12.1 Security

12.1.1 Mobile data transmission

The mobile service of all units used by the customer is switched in the mobile service provider's own M2M/IoT Access Point Name (APN). The data is transferred directly from the M2M/IoT service gateway to the ifm cloud via Cloud Interconnect.

12.1.1.1 APN

The mobile access point (APN) defines the way how the unit connects to the mobile radio network. The unit connects itself via the APN with the M2M/IoT application in the ifm cloud. Each unit receives a dedicated private IP address from the mobile operator network.

12.1.2 Data storage and data processing

The ifm cloud is run on servers operated in Germany.

The ifm cloud is hosted at Amazon Web Services (AWS). AWS is certified according to ISO 27001, DSS and other standards. It provides extensive physical security measures and is subject to independent audits. For security reasons, not all details will be published.

Each sub-client (also called tenant) of the ifm cloud is operated in a separate instance. This prevents data from being swapped between sub-clients.

12.1.3 User administration and access control

The ifm cloud uses a standard authentication and authorisation process based on realms, users, user groups and authorities. A realm is a database of users and user groups that share the same authentication and authorisation policy. A user is a person or external system authorised to access protected resources within the ifm cloud.

Access is controlled by means of authorisations. Authorisations define what a user may do in ifm cloud applications. To make it easier to administer the authorisations, they are grouped in "roles".

Each user can be linked to a number of roles (e.g. administrator, read or change rights), which add up the user's authorisations.

Each user has its own user and password administration. All logins are personalised and may only be used by the corresponding authorised user. The user is obliged to keep the login and the password secret and to protect them from unauthorised access by third parties.

12.2 Invoicing

12.2.1 Hardware

The physical device is invoiced in analogy to the standard sales process of ifm products. The invoice will be issued directly after the product is purchased.

You will find detailed information in the Terms and Conditions.

12.2.2 Interval-related services

The interval-related services, such as data transmission, data storage and SMS service, are already included in the selected tariff. The costs are calculated per device. The invoice is issued annually (prepaid function).

You will find detailed information in the Terms and Conditions.

12.3 Contract terminations or amendments

To change or cancel the services, please contact customer service in writing at: support@io-key.ifm

You will find further information on contract termination in the Terms and Conditions.

12.4 Transmission frequencies

Technology	Performance class	Frequency band (frequency in MHz)	Max. nominal output power (dBm)	Max. antenna gain (dBi)	Max. transmitted channel frequency power (dBm)
GSM	1	B2 (1900)	29.5	3.5	33.0
	E2	B2 (1900)	26.0	3.5	29.5
GSM	1	B3 (1800)	29.5	3.5	33.0
	E2	B3 (1800)	26.0	3.5	29.5
GSM	4	B5 (850)	32.5	2.3	34.8
	E2	B5 (850)	27.0	2.3	29.3
E-GSM	4	B8 (900)	32.5	2.3	34.8
	E2	B8 (900)	27.0	2.3	29.3
4G	3	B1 (2100)	23.0	3.5	26.5
4G	3	B2 (1900)	23.0	3.5	26.5
4G	3	B3 (1800)	23.0	3.5	26.5
4G	3	B4 (AWS1700)	23.0	3.5	25.5
4G	3	B5 (850)	23.0	2.3	25.3
4G	3	B8 (900)	23.0	2.3	25.3
4G	3	B12 (700)	23.0	2.5	25.5
4G	3	B13 (750)	23.0	2.5	25.5
4G	3	B20 (800)	23.0	2.3	25.3
4G	3	B25 (1900)	23.0	3.5	26.5
4G	3	B26 (850)	23.0	2.5	25.5
4G	3	B28 (700)	23.0	2.5	25.5
4G	3	B66 (1700)	23.0	3.5	26.5
4G	3	B71 (600)	??	??	??
4G	3	B85 (700)	23.0	2.5	25.5
BLE	-	2.4 GHz	4.0	3	7

12.5 Operation of the servers and system components

12.5.1 System components

All servers and system components required for the operation of the infrastructure of the device data transmission and ifm cloud are operated in a technically and organisationally secure, high-performance computer network.

The latter is protected by a firewall system against attacks and unauthorised access from the Internet.

12.5.2 Maintenance of servers and system components

For maintenance purposes – in particular for changes and updates of the server configuration and system components – services of the Customer Portal may be temporarily taken out of operation (maintenance window). The customer and the user will be notified via the maintenance window at least 5 working days in advance.

Maintenance tasks that are necessary in the short term (unplanned maintenance work), especially in case of events with acute need for action (e.g. defence against hacker attacks or viruses or worms) can be carried out at any time, even without prior notice, to ensure fastest possible protection.

The times attributable to maintenance windows used by ifm and its service providers are not included in the calculation of availability (→ [Service availability](#) ▢ 23).

12.6 Service availability

The annual availability is usually at least 99.0% on average for the ifm cloud, in combination with the mobile radio services to the device. The stated availability is subject to external disturbances or failures of the mobile network, maintenance work and force majeure. System availability in percentage terms is calculated as follows:

- System availability = (total number of minutes per month – downtime) / total number of minutes per month. Definitions:
- “Downtime” means the total number of minutes per month during which the ifm cloud is not available. The “Excluded downtime” will not be counted as downtime (→ [Excluded downtime](#) ▢ 23).
- “Month” indicates a calendar month.
- The “total number of minutes per month” is collected 24 hours, 7 days a week, within one month.

12.6.1 Excluded downtime

The excluded downtime is the total number of minutes per month attributable to the following:

- downtime for maintenance work

OR

- other scheduled downtime of which the customer and the user have been notified at least five working days in advance

OR

- periods of unavailability due to factors beyond ifm’s control, e.g. due to unforeseeable events that could not have been prevented even with reasonable care.

12.6.2 Restrictions

Performance or availability problems are excepted from this:

- if they are due to factors beyond ifm's control (e.g. natural disasters, war, acts of terrorism, government measures or network or equipment failures outside the provider's computer centres, including those at the customer's location or between the customer's location and the provider's computer centres)
- if they result from the use of hardware, software or services that are not provided by ifm, including issues attributable to insufficient bandwidth
- that occur in relation to the use of a preview, preliminary version, beta version or test version of a service, function or software
- caused by unauthorised use or failure to observe security measures, in particular by employees, vicarious agents or contractors of the customer or persons with access to the customer's passwords or access to ifm cloud services via the customer's equipment, or caused by the relevant security measures not being observed in some other way
- if the problems occur because the customer fails to adhere to the required configurations, uses unsupported platforms or uses a service in a manner incompatible with the functions of the service
- resulting from incorrect entries or attempts to carry out operations that exceed the allocated quotas
- if the customer uses service functions outside the relevant support window

OR

- for services that were reserved at the time of the incident but have not been paid for.

12.6.3 Modifications

This Service Level Agreement is subject to change. ifm will inform the customer and the user of any changes to this agreement within a reasonable period.