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Wirnet™ iFemtoCell
LoRaWAN® gateway for the Internet of Things
Quick Start Guide

Thank you for choosing Kerlink.

We are proud to be part of your project.

PEFC

KLK03496_07

(Internal use only)

1 Normal conditions of use

The Wirnet™ iFemtoCell is an indoor LoRa Gateway for IoT chain. It is based on LoRa® technology provided by Semtech Company and is fully compatible and interoperable with existing LoRa LPWAN.

Upon specific configuration, it can be used as a Helium-network compatible hotspot to mine HNT. To do so, it needs to be clearly mentioned once ordered as it use a specific cryptographic private key, a dedicated software, and Helium miner. If you have any doubt, please check directly with your reseller to ensure it is Helium-network compatible.

The Wirnet™ iFemtoCell is available in three versions to cover different countries and areas around the world:

	Wirnet™ iFemtoCell 868MHz	Wirnet™ iFemtoCell 915MHz	Wirnet™ iFemtoCell 923MHz
Geographical area	Europe, Russia Africa Middle East, India	North America Central America South America with the exception of Brazil	Asia: Indonesia, Malaysia, Korea, Japan, Taiwan, Hong Kong, Thailand, Vietnam, Singapore, Philippines Oceania: Australia, New Zealand Brazil
ISM band	863 - 876 MHz	902 - 928 MHz	915 - 928 MHz
Downstream bandwidth (Tx of the Wirnet™ iFemtoCell)	863 - 873MHz	902 - 928 MHz	915 - 928 MHz
Upstream bandwidth (Rx of the Wirnet™ iFemtoCell)	863 - 873 MHz	902 - 928 MHz	915 - 928 MHz
Certifications	See paragraph 9.1	See paragraph 9.2	See paragraph 9.3

Please check the appropriate version for the dedicated country. Contact your reseller if required.
The present document addresses all the above Wirnet™ iFemtoCell versions.

2 Description of features

Here are the main functionalities of the Wirnet™ iFemtoCell:
- Long Range support:
  - o Incorporate LoRa (TM) bidirectional communications technology:
    - ▪ 868MHz version → RX: 863- 873MHz, TX: 863-873MHz (according to HW capabilities)
    - ▪ 915MHz version → 902-928 MHz ISM band-hybrid mode (according to HW capabilities)
    - ▪ 923MHz version → RX: 915-928 MHz, TX: 915-928MHz (according to HW capabilities)
  - o 49 LoRa demodulators over 9 channels + 1 x GFSK
- Embedded, remote and open low power communication station
- Open development framework based on standard Linux OS
- Internet connectivity over Wi-Fi and Ethernet.
- USB host interface allowing local software upgrade with USB mass-storage key

3 Safety

3.1 Warnings in this manual

Warnings provide important safety information.
Warnings must be read before any action is taken that could generate risks to people or equipment.

| ⚠️	Refers to a critical situation. In case of non-compliance, it may result in property damage.
ℹ️	Refers to useful information during manipulations.

3.2 Safety instructions

Please read this user manual carefully.
It is an integral part of the described equipment, and it must be available at any time.

	• Only use the Wirnet™ iFemtoCell for its intended use, see chapter 1 "Normal conditions of use". • Only use the Wirnet™ iFemtoCell in the normal operating conditions described in chapter 10 "Technical characteristics". • Maintenance and repair must be carried out by qualified personnel authorized by the manufacturer. • The enclosure of the Wirnet™ iFemtoCell must not be opened by customer. • The Wirnet™ iFemtoCell should only be used with accessories or spare parts supplied by your reseller.

4 Overview of Wirnet™ iFemtoCell
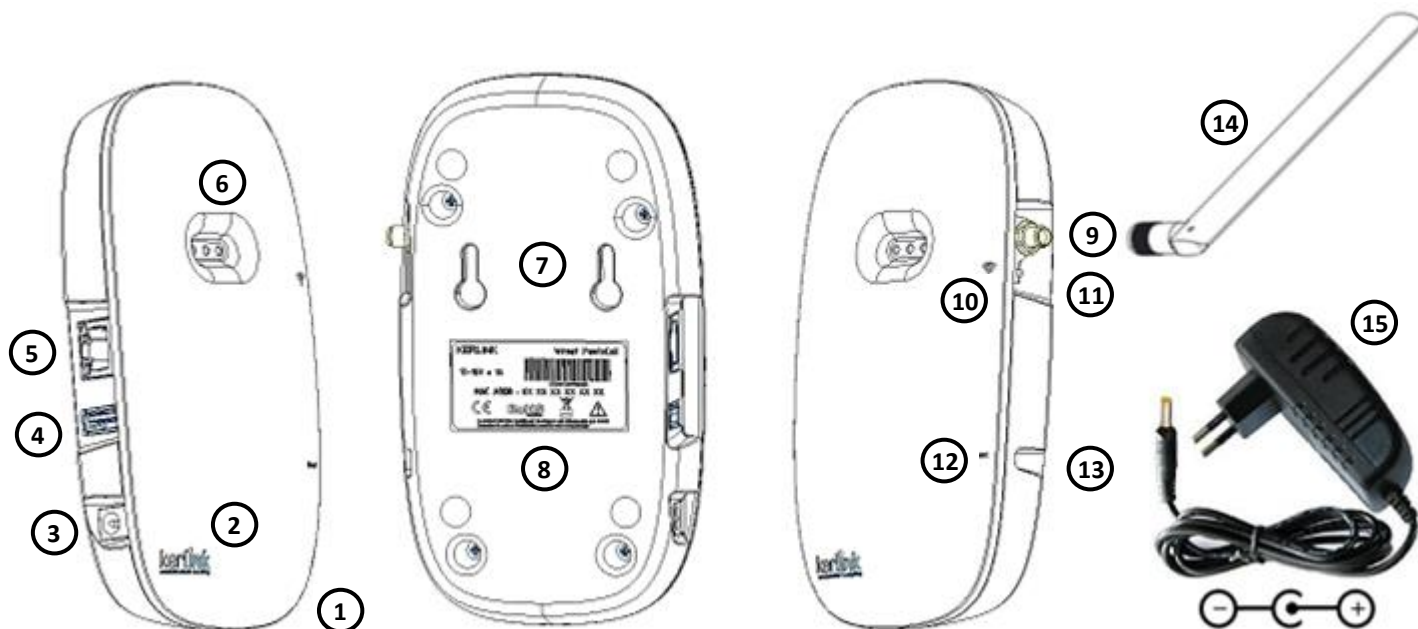
(EU version used here as example - non contractual view)

Nomenclature:

N°	Components	N°	Components
1	Wirnet™ iFemtoCell	9	SMA connector for LoRa antenna
2	Silkscreened Kerlink marking	10	Silkscreened Wi-Fi (WPS) marking
3	Jack connector (for power supply)	11	Wi-Fi (WPS) push button
4	USB connector	12	Silkscreened Reset marking
5	RJ45 connector (Ethernet)	13	Reset push button
6	3 bicolor LEDs	14	LoRa antenna (862-873MHz, 902-928MHZ, 3dBi, 50Ω; vertical polarization)
7	Wall mounting oblong holes	15	AC power supply
8	Sticker with markings	16	User manual (this document)

5 Markings

5.1 Markings on sticker

| Symbol	Description	Symbol	Description
Wirnet™ iFemtoCell	Type of equipment	[QR code]	QR code
10-15V ⎓ 1A	Power supply informations	CE or other marking	CE marking indicating that the product complies with current European directives, or other marking depending on the country
Board ID	Serial number of board	RoHS	Marking indicating that the product complies with RoHS directives
Final product ID	Serial number of product	[crossed-out bin]	Do not dispose of with domestic waste
MAC ADDR	MAC address	[warning triangle]	Product must be installed on a non-flammable substrate (UL 94V0) Refer to the installation instructions before powering up

5.2 Markings on packaging

Symbol	Description	Symbol	Description
Wirnet™ iFemtoCell	Type of equipment		QR code
Final product ID	Serial number of product	$C\epsilon$ or other marking	CE marking indicating that the product complies with current European directives, or other marking depending on the country
Packaging ID	Identifier of packaging	RoHS	Marking indicating that the product complies with RoHS directives
Software version	Version of embedded software	(waste bin symbol)	Do not dispose of with domestic waste
MAC ADDR	MAC address	(warning symbol)	Product must be installed on a non-flammable substrate (UL 94V0) Refer to the installation instructions before powering up

6 Installation of Wirnet™ iFemtoCell

6.1 Mounting of the enclosure

⚠	The Wirnet™ iFemtoCell enclosure must be mounted on any concrete pedestal, concrete wall, or any non-flammable surface (UL94-V0). It must not be mounted on a flammable surface.

40mm
R2mm
R4mm

The Wirnet™ iFemtoCell may be mounted on a wall using the two oblong holes.
Only two screws (not included) are needed, all mounting information is mentioned on the following drawing:
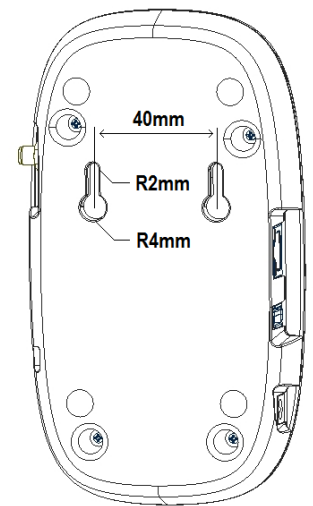
6.2 Setting connections

⚠	Before setting all connections, ensure that the power supply is not connected to the mains supply.

When the Wirnet™ iFemtoCell is installed, 2 configurations are possible regarding the technology used to access Internet:
- Ethernet connection, requiring an Ethernet access through a dedicated RJ45 cable
- Wi-Fi connection, requiring a Wi-Fi access point

The 2 configurations may be used in parallel. A typical example is the possibility to insure Wi-Fi connection by an Ethernet backup.

The following connections are required to operate the Wirnet™ iFemtoCell (see chapter 4 "Overview" for details of connectors):
- Power supply
- Ethernet cable (not included)
- LoRa antenna
- USB mass-storage key (not included)

ℹ	The Ethernet cable is not provided and must consist of two RJ45 T 568A (or 568B) plugs on each side. Kerlink recommends using a cable with the following characteristics: • Category: 6A • Shielding: STP (U/FTP) or SSTP (S/FTP) • Section conductors: AWG26 • External jacket: LSZH or PUR • Maximum length: 100 meters • Operating temperature range: -20°C to +50°C

ℹ Information	*This radio transmitter 20637-KLK915MWIFC has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.* *Le présent émetteur radio 20637-KLK915MWIFC a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.* **Authorized antennas / Antennes autorisées :** 868/915 MHz Rubber Dipole WHITE antenna (Swivel RP-SMA Male). REF : KLK02887 Electrical Characteristics : Frequency range : 862/873 MHz, 902-928MHz Impedance : 50 ohms Technology : Dipole VSWR : <1.7 :1 Max Gain : 3dBi Polarization : Vertical Whip material : ABS Color : White Connector (Wirnet™ iFemtoCell 915) : RP-SMA Size : 135x20mm Weigh : 15g Antenna operating temperature range : -20°C to +55°C

6.3 Power ON

Once the LoRa RF antenna, the Ethernet cable (if used) and the power supply jack connector are connected, the Wirnet™ iFemtoCell can be powered ON by connecting the power supply onto the 230VAC mains supply.

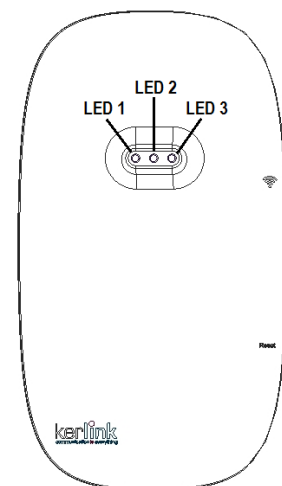|	
ℹ Information	The power supply is provided with E/F type cable (Europe) or B type cable (USA).

6.4 First connection

When the Wirnet™ iFemtoCell is installed, the first connection can be done by three different ways:
- Using Ethernet connection:
  o Plug the Wirnet™ iFemtoCell to your box or internet router with an Ethernet cable
  o The connection will be established automatically
- If you have a WPS (Wi-Fi Protected Setup) compatible AP:
  o Press the WPS button on the Wirnet™ iFemtoCell (see chapter 4 "Overview") then press the WPS button on the Wi-Fi access point of the installation
  o The connection will be established automatically
- Using the Wi-Fi direct connection:
  o Please contact your reseller for more information about this connection mode

6.5 Functional check

To ensure the Wirnet™ iFemtoCell is started up, check the behavior of the LED indicators:

LED	Specification
LED 1: Power	RED blinking during the kernel boot GREEN blinking during system boot GREEN when boot is finished
LED 2: Backhaul	RED during boot **If the applicative software provided by Kerlink is installed:** • RED if applicative software is disconnected • GREEN blinking during applicative software connection • GREEN fix if applicative software is connected
LED 3: LoRa traffic	RED during boot **If the applicative software provided by Kerlink is installed:** • Applicative software management • Rx: GREEN blinking • Tx: RED blinking

	Applicative software stands for embedded software running on the Wirnet™ iFemtoCell like **Kerlink** Small Private Network or another Packet Forwarder (software that forwards RF packets received to a server and emits RF packets that are sent by the server).

	Please contact your reseller to know the LEDs behavior if the applicative software installed on the Wirnet™ iFemtoCell is not the one officially provided by **Kerlink**.

6.6 Configuration

For Helium-network configuration, please check with your reseller on how to proceed. More information on:
https://www.kerlink.com/customer-support/support-kerlink-helium-network-compatible-products/

For other usage, once the connection of your Wirnet™ iFemtoCell is established (Ethernet, Wi-Fi in infrastructure mode or not), a Web configuration interface is available.

You will be greeted with the following screen:

Please contact your reseller for more information and get the credentials.

For information the host name of the Wirnet™ iFemtoCell is:
"klk-wifc-xxxxxx" where xxxxxx is the end of the board ID. This information is present on the sticker placed on the rear side of the product. For example, for a board ID 704BEc030178, xxxxxx value is 030178.

The Web interface allows to configure the following items:
- Ethernet configuration:
    - o IPv4 mode: Automatic (DHCP), Manual (static) or Off (disabled)
    - o In manual configuration:
        - ▪ IPv4 address
        - ▪ IPv4 gateway address and network mask
        - ▪ IPv4 DNS resolver
- Wi-Fi configuration:
    - o SSID
    - o Password
    - o Scanning (SSID, RSSI)

- Security credentials:
    - o Change of admin user password

	Described behavior is based on Keros firmware 4.0, it can be modified in newer firmwares.

7 Problems

Problem	Cause	How to fix?
The LEDs never turn on	The Wirnet™ iFemtoCell is not well powered	• Check the position/good connection of the power supply jack connector • Check that the power supply is properly connected to the mains supply
No LoRa data received	The LoRa antenna is not well connected	• Check that a LoRa endpoint is within range of the Wirnet™ iFemtoCell • Check the tightening of the LoRa antenna (SMA connector) • Check that the LoRa antenna is not deteriorated
No Internet access	No technology to access Internet is activated/available on the Wirnet™ iFemtoCell	**In case of Ethernet connection:** • Check the position/good connection of the RJ45 Ethernet connector • Check that the RJ45 cable is not deteriorated **In case of Wi-Fi connection:** • Check that the Wi-Fi access point is within range of the Wirnet™ iFemtoCell

In case of a problem that cannot be resolved immediately from the table, contact your reseller. Do not use the Wirnet™ iFemtoCell to prevent further damage.

8 Technical characteristics

Characteristic	Wirnet™ iFemtoCell
Enclosure material	PC + ABS
LED gasket material	Elastomer compound based on styrene-butadiene-styrene (SBS)
Dimensions L x H x P in mm: • Without LoRa antenna • With LoRa antenna	 160 x 90 x 35 mm 220 x 125 x 35 mm
Weight in g (with AC power supply and LoRa RF antenna)	280g
Operating temperature range	Enclosure: -20°C to +50°C Power supply: country dependent, please refer to power supply itself or contact your reseller
Power supply output voltage	12 VDC
Power consumption: • CPU module (20% load), Ethernet link ON • Wi-Fi (25%Tx,75%Rx) • Radio in Rx mode (x8 demodulator on)	 1.3W max 0.5W max 1.6W max
Ingress protection	IP30 / EN 60529
Humidity	95% non-condensing
Impact resistance	IK07
Flammability rating	UL94-V0
Connectors	1 x SMA or RP-SMA (LoRa antenna) 1 x jack connector (power supply) 1 x USB 1 x RJ45

9 Declaration of conformity

9.1 Wirnet™ iFemtoCell 868MHz

The Wirnet™ iFemtoCell 868 complies with:

- Directive 2014/53/EU relating to radio equipment (RED)
- Directive 2014/35/EU relating to electrical equipment designed for use within certain voltage limits (Low Voltage)
- Directive 2014/30/EU relating to Electromagnetic Compatibility
- Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS)
- Council Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)
- UK SI 2017/1206 - Radio Equipment Regulations 2017

- UK SI 2012/3032 - Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (RoHS2)

The Wirnet™ iFemtoCell 868 is considered as a category 1.5 receiver according to the EN 300 220.

The Wirnet™ iFemtoCell 868 has CE marking: $C\,\epsilon$

The Wirnet™ iFemtoCell 868 has UKCA marking: UK CA

In Europe, the Wirnet™ iFemtoCell 868 station must comply with the ERC 70-3 requirements regarding duty cycle and maximum EIRP. They are summarized in the following table:

ERC 70-03 Band	Frequency (MHz)	Power	Duty cycle
h1.3	863-865	14dBm ERP	0,1%
h1.4	865-868	14dBm ERP	1%
h1.5	868-868,6	14dBm ERP	1%
h1.7	869,4-869,65	27dBm ERP	10%

(i) Information	The power supply of the Wirnet™ iFemtoCell 868 must be a limited power source.

(i) Information	• If the LoRa antenna is changed, the output power must be adjusted to consider the gain of the antenna to not overrule the ERC 70-3 regulation. • Be careful, some countries in Europe may have specific frequency range, EIRP and duty cycles regulations. Check the local regulations before installing and commissioning the Wirnet™ iFemtoCell 868. • For other countries, outside Europe, check the frequency range, the maximum EIRP and duty cycle allowed.

9.2   Wirnet™ iFemtoCell 915MHz

The Wirnet™ iFemtoCell 915 complies with both FCC and IC regulations.

The associated FCC and IC identifiers of the Wirnet™ iFemtoCell 915 are:

Model: Wirnet™ iFemtoCell 915MHz
FCC ID: 2AFYS-KLK915MWIFC
IC: 20637-KLK915MWIFC

(i) Information	• The power supply of the Wirnet™ iFemtoCell 915 must be a limited power source. • Any changes or modifications to this equipment not expressly by **Kerlink** may cause, interference and void the FCC authorization to operate this equipment. • This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: 1. This device may not cause harmful interference, and 2. This device must accept any interference received, including interference that may cause undesired operation of the device.

(i) Information	• Some conditions must be respected to maintain the FCC and IC compliance of the devices in USA and Canada. Please contact your reseller to have details. • For other countries, check the specific regulations regarding maximum EIRP and duty cycle allowed.
⚠	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. 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 off and on, 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 receiver.* —*Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.* —*Consult the dealer or an experienced radio/TV technician for help*

	This equipment complies with RSS102's and FCC radiation exposure limits set forth for an uncontrolled environment under the following conditions: 1. This equipment should be installed and operated such that a minimum separation distance of 20cm is always maintained between the radiator (antenna) and user's/nearby person's body. 2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

9.3 Wirnet™ iFemtoCell 923MHz

The Wirnet™ iFemtoCell 923 complies with:

- Directive 2014/53/EU relating to radio equipment (RED)
- Directive 2014/35/EU relating to electrical equipment designed for use within certain voltage limits (Low Voltage)
- Directive 2014/30/EU relating to Electromagnetic Compatibility
- Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS)
- Council Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

The Wirnet™ iFemtoCell 923 is considered as a category 1.5 receiver according to the EN 300 220

The Wirnet™ iFemtoCell 923 has CE marking: $\mathsf{C}\mathsf{E}$

⚠	This transmitter must be installed to provide a minimum separation distance of at least 20 cm from any person and must not be co-located with any other transmitter

ℹ Information	The power supply of the Wirnet™ iFemtoCell 923 must be a limited power source.

The Wirnet™ iFemtoCell 923 is certified for the following countries:

Country	Label, identification and comments
Australia New Zealand	
Japan	R 005-101716
Malaysia	MCMC CIDF18000021
Thailand	CLASS A NTC ID. A59001-18-3723

Hong Kong	Certified for use in Hong Kong 經驗證可在香港使用 Certificate No. 證書號碼 HK0021800048 通訊事務管理局 COMMUNICATIONS AUTHORITY
Singapore	Complies with IMDA Standards DB106667
Taïwan	**CCAN18LP0430T4** 低功率電波輻射性電機管理辦法 第十二條經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。 第十四條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。 前項合法通信，指依電信法規定作業之無線電通信。 低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。
South Korea	R-CRM-klk-WIFC923
Vietnam	NAME CODE ICT
Indonesia	66932/SDPPI/2020 11019
Brazil	ANATEL 02829-18-11272 "Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados".

Philippines	 NTC Type Accepted No.: ESD-1817186C
Argentina	R! C-28064

Information	• Depending on the countries, check the specific regulations applying, especially regarding frequency range, maximum EIRP, duty cycle allowed, maximum transmit duration, carrier sense mandatory or not… • Please contact your reseller to have details on specific rules for specific countries.

10 Disposal / Recycling

	Do not dispose of the product with domestic waste. For proper disposal, contact a waste disposal company. The product packaging (cardboard and liners) can be disposed of with the used paper.

11 Warranty

Contact your reseller for warranty conditions of the Wirnet™ iFemtoCell.

⚠️	The Wirnet™ iFemtoCell is not warranted by **Kerlink** in case the enclosure is opened by customer for any reason.

12 Accessories & Professional Services

For additional information, on available accessories and Professional Services please contact your reseller.

13 Give us your feedback

Your shopping and operational experiences are very important to us.
We would like to invite you to leave review on our products and services. We will appreciate your time and efforts.
We would be very proud to get any photo of your gateway installation. Can you share them to dmk@kerlink.com

14 Find us on social media

We would like to hear from you: any tips, any news to share?

@kerlink_news

Kerlink

Kerlink channel

Contact & support

For additional information or if you need any assistance to use the product, please contact your reseller. You can also find more information here:
https://www.kerlink.com/customer-support/

15 Manufacturer

Kerlink, 1 Rue Jacqueline Auriol 35235 Thorigné-Fouillard, France
Tel.: +33 (0)2 99 12 29 00 – Fax: +33 (0) 2 99 12 29 11
www.kerlink.com

We stay at your disposal for any help on your project.
Yours sincerely.
Kerlink Team