XELAN

SPE Ethernet extendeur

USER GUIDE

The XELAN products family is designed and manufactured by

ETIC TELECOM

405 rue Lavoisier
38330 MONTBONNOT SAINT MARTIN
FRANCE

TEL : + (33) (0)4-76-04-20-05
E-mail : hotline@etictelecom.com
web : www.etictelecom.com

DECLARATION OF CONFORMITY

The manufacturer, ETIC Telecom – 405 rue Lavoisier – 38330 Montbonnot Saint Martin – France, Hereby declares under sole responsibility that the listed products conform to

- the Electromagnetic Compatibility (EMC) Directive 2014/30/UE ,
- the Low Voltage Directive (LVD) 2014/35/UE ,
- the Restriction of the use of certain Hazardous Substances (RoHS) Directive 2011/65/UE.

Type of product: SPE Ethernet extender
Models:
XELAN-110
XELAN-210
XELAN-BP210

The harmonized standards to which these products comply are:

Standard	Title
EN 61000-6-2 2006	Immunity: EN61000-4-2 Electrostatic Discharge EN61000-4-3 RF Radiated Immunity EN61000-4-4 EFT/Burst Immunity EN61000-4-5 Surge Immunity EN61000-4-6 RF Conducted Immunity EN61000-4-8 Power Frequency Magnetic Field Immunity
EN 61000-6-4 2007 A1/2011	Emission: EN55032 Radiated and conducted emission
EN 62368-1 2014	Safety and Health

Date : 21th February 2024

Philippe Duchesne
Technical Director

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PRESENTATION

1 Purpose of this manual

The present user guide describes the features and the installation of the XELAN family of Ethernet extenders.

In the rest of the document the term " XELAN " is used to designate the product.

2 Products Identification

The XELAN is an industrial Ethernet extender that provides 1 to 2 SPE ports to extend the Ethernet transmission up to 1 or 2 kilometers using any existing copper pair. The range depends on the nature and quality of the cable and can be up to 2 km.

The XELAN family consists of the models XELAN-110, XELAN-210 and XELAN-BP210.

The XELAN-110 has 1 SPE port while the XELAN-210 and XELAN-BP210 have 2 SPE ports.
The XELAN-BP210 also has the By-pass function.

XELAN models

XELAN-110

XELAN-210

XELAN-BP210

3 Specifications

General characteristics	
Dimensions	120 x 37 x 88 mm (h,w,d)
Weight	0.44 kg
Casing	Metallic IP31 – IEC60529 DIN rail mounted
Temperature	Storage: -40°/ +85°C Operating: -40°/ +70°C
Humidity	5 to 95 % relative (non-condensing)
Power supply	Protected against reverse polarity Nominal : 12-24 VDC (min 10 VDC - max 30 VDC) 2 points Phoenix type connector
Consumption	XELAN-110 : 0.5 W XELAN-210 : 0.75 W XELAN-BP210 : 1.2 W
MTBF	>500 000 h at 25 °C - MIL-HDBK-217F-N2 GB
Electrical safety	IEC/EN 62368-1
Hazardous substances	2011/65/UE (RoHS) REACH

SPE (Single Pair Ethernet)	
Modulation	IEEE 802.3cg : 10BaseT1L
Data rate	10 Mb/s on 1 pair
Amplitude of the transmitted signal	1 V or 2.4 V peak to peak on 100 Ohms
Emission power	8.6 dBm at 2.4 V 1 dBm at 1 V
Signal spectrum	See IEEE 802.3cg (page 154)
Isolation	1500 V
Connection time	Typical : < 1s (< 3s from power on)
Plug & play	Master / Slave auto-negotiation
Latency	PTP (Precision Time Protocol) propagation delay : 110 µs.

ETHERNET & IP	
Ethernet	10/100 Mb/s Half/Full duplex Auto MDI/MDIX
Switch	Store and forward - 1024 MAC addresses

4 EMC & Environment compliances

EMC Immunity, EN61000-6-2			
Standard	**Criteria**	**Port**	**Level pass**
EN61000-4-2 ESD	B	Enclosure	+/-4kv contact +/-8kv air discharge
EN61000-4-3 Radiated	A	Enclosure	10V/M AM @ 1khz 80Mhz to 3Ghz
EN61000-4-4 Burst	B	SHDSL	+/- 2kv
		Power supply	+/- 2kv
		Ethernet	+/- 2kv
EN61000-4-5 Surge	B	SHDSL	+/- 5kv common mode (Normal and Telecom surge)
	B	Power supply	+/- 0,5kV common mode
			+/- 0,5kV differential mode
		Ethernet	+/- 4kv direct shield coupling
EN61000-4-6 RF conducted	A	SHDSL	10VAM 80% 1khz, 150khz to 80Mhz
		Power supply	
		Ethernet	
EN61000-4-8 Magnetic	A	Enclosure	30 A/M at 50hz/60hz
EN61000-4-18 Damped wave	A	Power supply	+/- 0,5kV differential
	B		+/- 1kV common mode
	A	Ethernet	+/- 1kV common mode
	B	SHDSL	+/- 1kV common mode

EMC Emissions, EN61000-6-4		
Emission test	**Criteria**	**Limits**
conducted Disturbance	Power supply	EN55032, Class A: 150khz to 30Mhz
	SHDSL	
	Ethernet	
Radiated emission	Enclosure	EN55032, Class A: 30Mhz to 1Ghz

Climatic		
Standard	**Test**	**Level**
EN 60068-2-1 Cold	Ab	-40 °C - 16 hours – Non-operating
	Ad	-40 °C - 16 hours – Operating
EN 60068-2-2 Dry heat	Bb	+85 °C - 16 hours – Non-operating
	Bd	+70 °C - 16 hours – Operating
EN 60068-2-14 Change of temperature	Na	-25 °C à +70 °C – Non-operating 5 cycles of 2 hours
	Nb	-40 °C à +70 °C – Operating 3 °K/mn - 5 cycles de 2 hours

5 Product overview

The XELAN is a « Plug & Play » product. It does not require any configuration. Just make the different connections. The link is established almost instantly. Equipment located on either side of the line can communicate with each other as if they were connected locally.

The XELAN is designed to operate in harsh environments, climatic and electromagnetic. In particular, it is equipped with lightning protection.

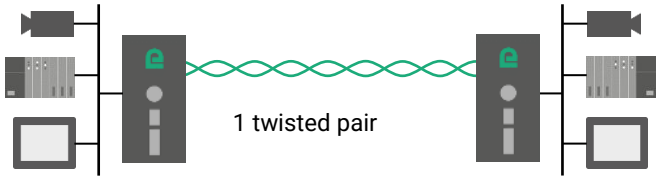
The XELAN is eco-friendly. It consumes very little energy. The level of the electromagnetic emission is also very low.

The XELAN adds very little latency to transmission. It is therefore compatible with the PTP protocol (Precision Time Protocol).

The XELAN Ethernet extender family allows you to achieve the following configurations:

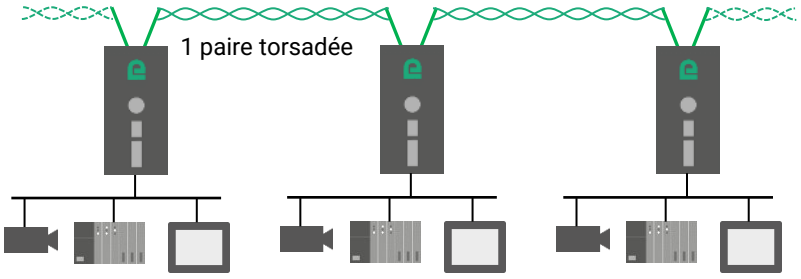
Point to point link on a single twisted pair

Two XELAN extend Ethernet over one twisted pair. The data rate is 10 Mb/s up to 1 or 2 km depending on the cable.



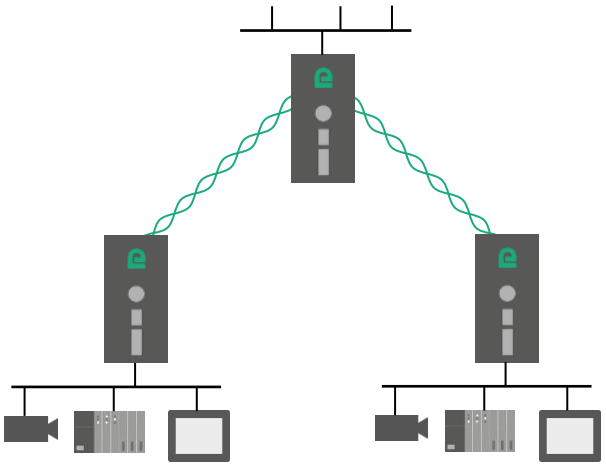
Daisy chain link

XELAN-210 and XELAN-BP210 allow you to interconnect a series of Ethernet networks using a single twisted pair.
Thanks to the Store and Forward principle, the number of extenders is not limited.



Point to multipoint link

XELAN-210 and XELAN-BP210 allow you to interconnect a central site with two remote sites

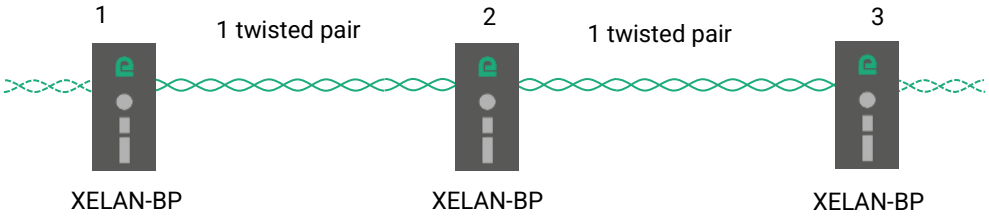


Daisy chain link with by-pass

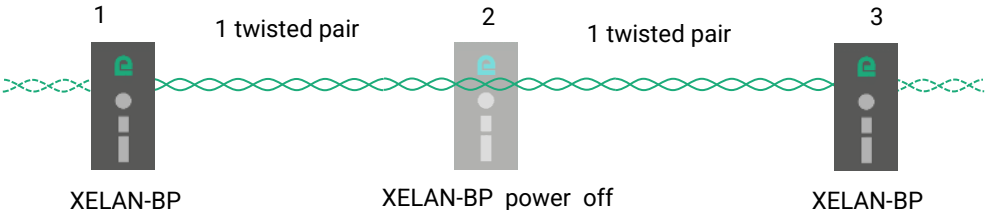
When the network is a daisy chain, the XELAN-BP offers a very useful function called the “By-pass function”.

The XELAN-BP210 includes an electro-mechanical relay between both lines; that relay is automatically closed to connect the two lines when the XELAN-BP210 is switched off.

For instance, if the XELAN #2 cabinet is switched off for maintenance, the by-pass relay inside the XELAN #2 will automatically connect the line coming from the XELAN #1 to the line going to the XELAN #3.



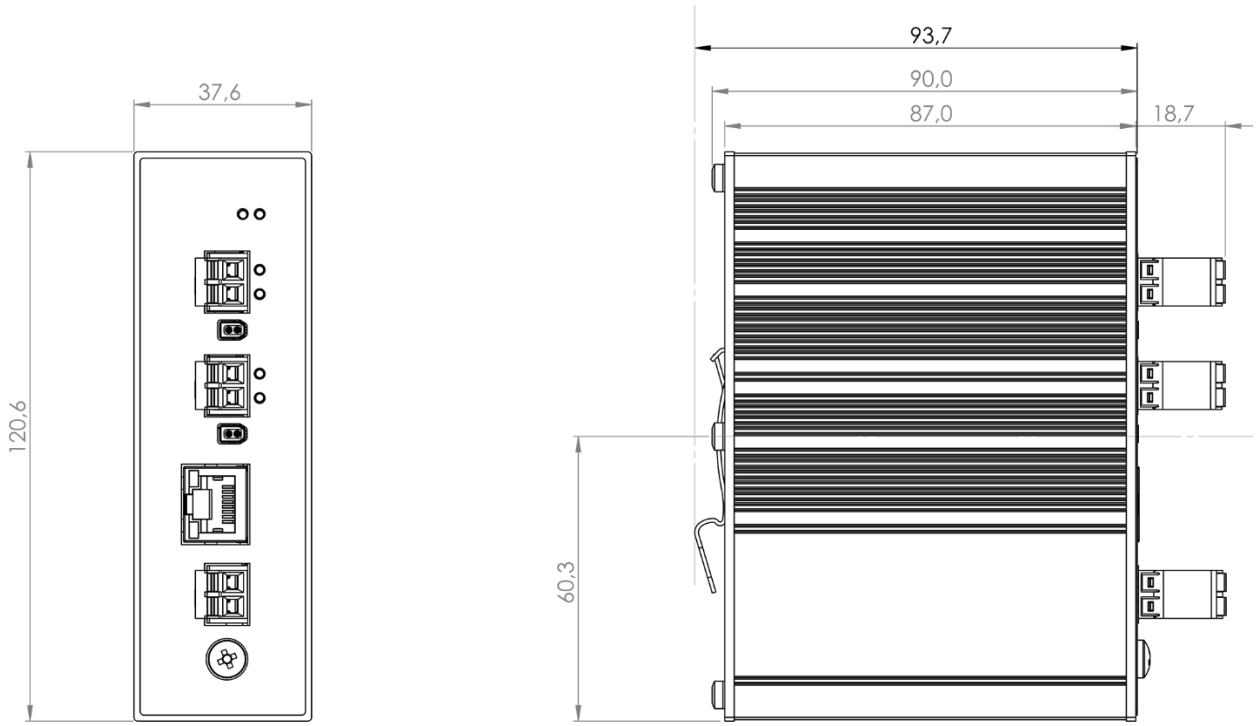
The XELAN #1 establishes immediately the connection with the XSLAN #3.



INSTALLATION

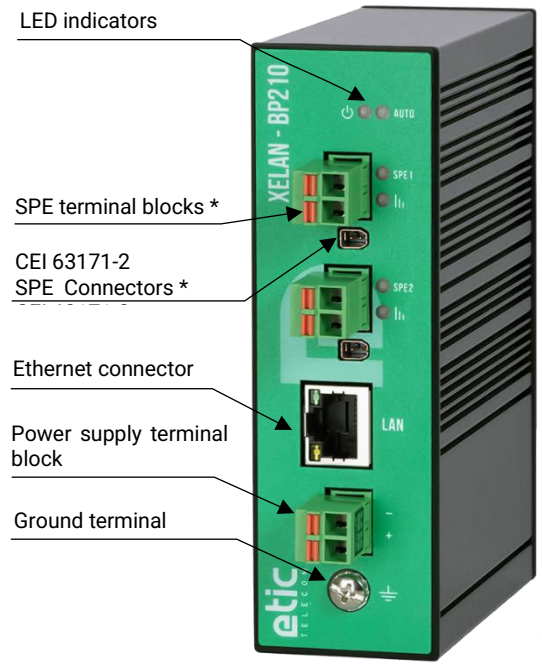
1 Description

1.1 Dimensions



All dimensions in millimeters.

1.2 Sides

Front side	Rear side
	

*1 or 2 depending on model

1.3 Micro-switches

Micro-switches				
N°	**Function**	**Position OFF (défaut)**	**Position ON**	**Description**
SW1	negotiation	Auto	Forced (1)	Auto-negotiation is an exchange mechanism to select the host/slave role and the amplitude of the transmitted signal.
SW2	Role	Master	Slave	Only effective when SW1 is ON
SW3	Transmission signal amplitude	Auto (2) or 2.4V forced if SW1 ON	1V forced (ATEX)	1V mode is for ATEX environment.
SW4	Remote power PODL	Disable	Enable	To remotely power a repeater (option)
SW5	Ethernet data rate	10/100 Mb/s auto	10 Mb/s forced	Half/Full duplex and Auto MDI/MIX.
SW6	Reserved	-	-	Must be in the OFF position
SW7	Reserved	-	-	Must be in the OFF position
SW8	Reserved	-	-	Must be in the OFF position

SW1 to SW4 apply to all SPE ports of the product.

(1) In forced mode :

- One XELAN must be the Master and the other one the Slave
- Both XELANs must transmit with the same voltage level

(2) When Auto is selected on both XELAN, the signal amplitude is 2.4V.

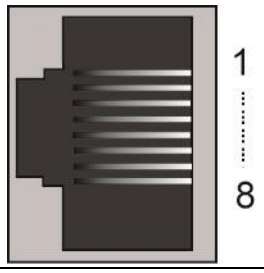
1.4 Connectors

Ground terminal	
Symbol	**Description**
	M4 screw terminal

2 positions screw terminal: Supply voltage Protected against reverse polarity		
Position	**Signal**	**Function**
1	+	12 – 24 VDC
2	-	0V

2 positions terminal block : SPE1 & SPE2		
Position	**Signal**	**Function**
1	Line	SPE line
2	Line	SPE line

IEC 63171-2 connector : SPE1 & SPE2		
Position	**Signal**	**Function**
1	Line	SPE line
2	Line	SPE line

Ethernet RJ45 connector			
Position	**Signal**	**Function**	**RJ45**
1	Tx +	Emission polarity +	
2	Tx -	Emission polarity -	
3	Rx +	Reception polarity +	
4	N.C	-	
5	N.C	-	
6	Rx -	Reception polarity -	
7	N.C.	-	
8	N.C.	-	

1.5 LED indicators

LED indicators Depending on models			
Function	**LED**	**Description**	
Operation	⏻	Off Steady green Steady red	Power off Ready Startup – Otherwise hardware failure
Mode	**AUTO**	Off Vert fixe	SPE auto-négotiation disabled SPE auto-négotiation enabled
SPE connection	**SPE1** **SPE2**	Off Steady green Flashing Red	Not connected Connection established Traffic on the link PODL enabled
SPE link quality		Off 1 flash 2 flashes 3 flashes	Not connected Low (SNR < 24.6 dB) Good (24.6 dB < SNR < 29 dB) Très bonne (SNR > 29 dB)
Ethernet LAN	**Upper indicator**	Off Steady green Flashing green	Not connected Connected at 100 Mb/s Traffic on link
	Lower indicator	Off Steady orange Flashing orange	Not connected Connected at 10 Mb/s Traffic on link

2 Safety instructions

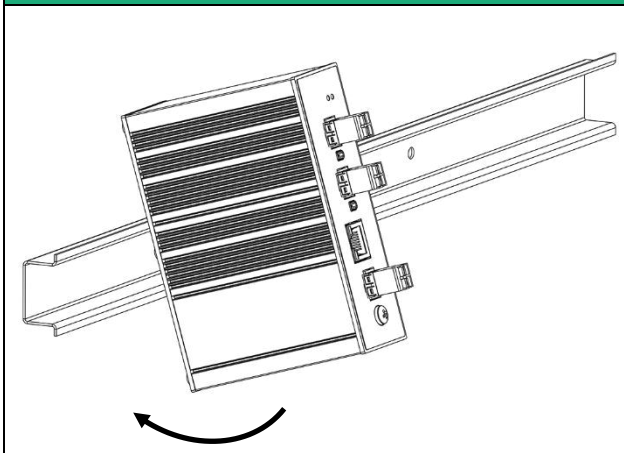
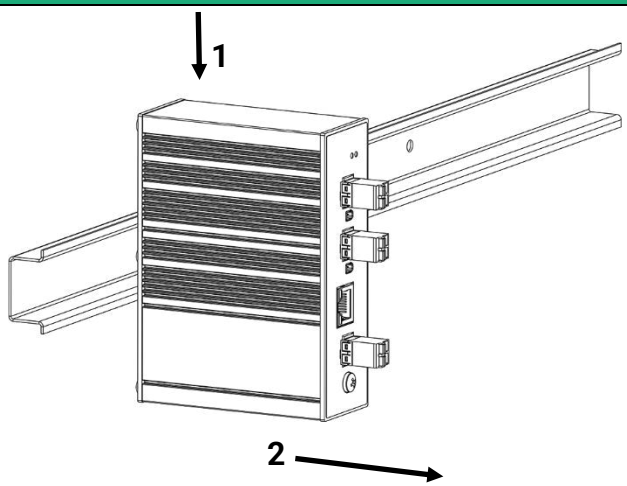
The product shall be installed in a fire electrical resistant cabinet by a qualified operator.

The product must be connected only to equipment that complies with the IEC60950-1 or IEC62368-1 standards and that meets the following classifications:

- IEC60950-1 : Limited power circuits and SELV type – §2.2 and 2.5
- IEC62368-1 : ES1 & PS2

⚠ To avoid any risk of burns, it is strongly recommended to wear gloves to handle the product in operation when the ambient temperature exceeds 30 °C.

3 DIN rail mounting

Mounting the unit on the 35 mm DIN rail	Removing the unit from the DIN rail
	

4 Cooling

The product is designed to be mounted on a 35mm DIN rail.
To avoid obstructing the airflow around the unit, the spacing must be at least 25 mm above and below, and 10 mm left and right.

5 Power supply

The supply voltage must be regulated and strictly between 10 and 30 Volt DC (nominal: 12 – 24 VDC).

At power up the inrush current can reach 20 A for 100 µs.

6 Earthing

The enclosure of the XELAN is metallic ; For safety and EMC reasons, the ground terminal must be connected to the protective earth of the installation.

7 Preparing and checking the line

7.1 Type of cable

It is best to use a cable made of a single twisted pair. The range of the connection depends on the quality of the cable. If you have the choice, you will preferably use a Siemens 6XV1830-5EH10 type cable or equivalent.

Cable made of several twisted pairs
A cable can consist of several twisted pairs. Each pair can usually be used for a different transmission if necessary. However, care will be taken to check that the crosstalk between the pairs is not excessive.

Cable made of quads
It often happens that the twisted pairs of the same cable are wound in groups of two pairs; a group of two pairs rolled into each other is called a quad.
This type of cable is suitable. However, we will try to use only one pair per quad to avoid crosstalk (see below).

Shielded cable
It is better to use a shielded cable.
The shielding avoids or reduces the noise induced on the line by the transport of high electrical power in neighboring cables. Shielding also reduces the risk of breakdown due to lightning.

7.2 Shield earthing

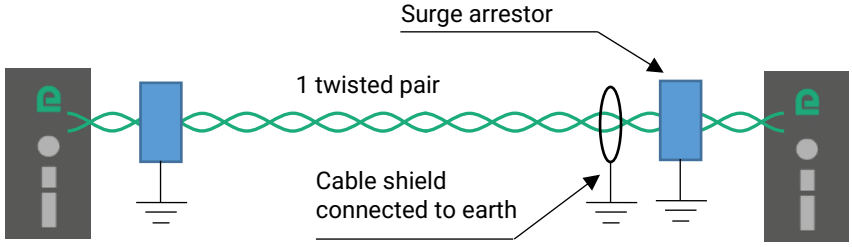
A shielded cable provides better noise immunity and surges protection during thunderstorms.

The best protection is provided when the shield is earthed at each end of the line.
However, there may be a large potential difference between the connection points to the earth, especially when the line is long.
Therefore, to avoid a large current flowing in the shield, it is recommended to connect the shield to the earth at only one end of the cable.

7.3 Protection against line surges due to thunderstorms

The XELAN is coupled to the line by a transformer which provides isolation between the circuit board and the line. Moreover, the XELAN is equipped with internal protections against overvoltage.

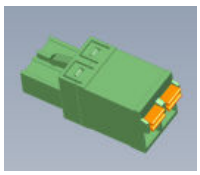
However, if the line is vulnerable to thunderstorms, for example if it is an overhead line, or if it is several kilometers long, or if the installation is in a very exposed area, it is recommended to protect each XELAN with a surge protector, as described below.



8 Connecting the XELAN to the line

The SPE signal is not polarized; the two wires of the twisted pair can be interchanged.

Either the 2-point connector supplied as standard or an IEC 63171-2 connector supplied as an option will be used.

Socket	To mate with	Description	Supported diameters
		2 poles standard 5.08 pitch connectors (not shielded)	26 to 14 AWG
		IEC 63171-2 SPE connector (shielded)	26 to 21AWG

COMMISSIONING

The commissioning procedure below describes the "Plug & play" mode, without the need to configure the micro-switches of the XELAN which corresponds to the most common cases.

- Make sure that all micro-switches are on the OFF position.
- Power on the 2 XELAN. The LED indicator  lights up red then green after 2 to 3 s.

- Make sure that the AUTO LED is ON on both XELANs.
- The connection is established in less than 1 s.
- The SPEx LED indicates the connection progress as described in the following table:

State of the connection	SPEx LED
The other XELAN was not detected (for example when the line is not connected)	Off
Connected	Steady on
Traffic on the link	Flashing

- Once the line is connected, the LED  indicates the signal for that connection.
- Check the correct operation by transmitting a periodic PING from the PC to another device through the SPE link.

405 rue Lavoisier
38330 Montbonnot Saint Martin
France

Tel : +33 (0)4 76 04 20 00
contact@etictelecom.com

www.etictelecom.com