

FlexDSL GigaFlex

DIN-RAIL UNITS

TECHNICAL DESCRIPTION AND INSTALLATION MANUAL

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VERSION CONTROL

Manual Version	Date	Major changes to previous version
1.0	07.02.2019	Initial Version
1.1	11.10.2019	Chapter 1 "Selection Guide" corrected Chapter 2 "Precaution" corrected Figure 3-2 corrected Table 3-1 corrected Chapter 3.3.1.4 "Master and Slave Mode" corrected Chapter 3.3.2.1 "Power Over Ethernet (PoE)" corrected Chapter 6.1.5 "Digital Input / Output Interface (2I2O)" corrected Chapter 6.3 "Power Supply" corrected Chapter 6.4.2 "Safety / EMC" corrected

SAFETY REGULATIONS

IF THE UNIT IS NOT USED IN ACCORDANCE TO REGULATIONS DESCRIBED AND DEFINED IN THE CHAPTERS "TECHNICAL DESCRIPTION" AND "TECHNICAL SPECIFICATIONS", FLEXDSL TELECOMMUNICATIONS AG REFUSES TO TAKE ANY RESPONSIBILITY. FURTHERMORE, NO WARRANTY IS GRANTED IN SUCH CASE!

IT'S ONLY ALLOWED TO USE EXTERNAL POWER SUPPLYS THAT ARE APPROVED ACCORDING TO THE SAFETY STANDARD IEC/EN 60950-1.

THE DISCONNECTING DEVICE FOR THE RACK IS THE MAINS PLUG AND/OR THE APPLIANCE COUPLER. THE MAINS PLUG AND/OR THE APPLIANCE COUPLER HAS/HAVE TO BE EASILY ACCESSIBLE AND THE MAINS PLUG HAS TO BE NEXT TO THE RACK IF THE MAINS PLUG SERVES AS THE DISCONNECTING DEVICE.

IT'S ONLY ALLOWED TO USE THE UNITS WITH HOUSINGS SUPPLIED FROM FLEXDSL TELECOMMUNICATIONS AG (SUBRACKS, MINIRACK, UTTX). THE RACK HAS TO BE CONNECTED PERMANENTLY TO A RELIABLE PROTECTIVE EARTH CONDUCTOR. THE LTU UNIT AND LINECARDS HAVE TO BE FIXED TO THE RACK PERMANENTLY WITH THE TWO PANEL SCREWS.

INCORRECT USE OF THIS DEVICE, USE IN ANY OTHER ENVIRONMENT AND/OR HOUSING THAN PROVIDED BY FLEXDSL MIGHT LEAD TO HARMFUL CONDITIONS. FAILURE TO FOLLOW THESE PRECAUTIONS MAY RESULT IN DEATH, SEVERE INJURY OR PROPERTY DAMAGE.

Please read this manual carefully before operating the system.

Installation of this equipment must be done by **qualified** personnel only.

EU DIRECTIVE 2002/96/EC AND EN50419



Our equipment is marked with the recycling symbol. It means that at the end of the life of the equipment you must dispose it separately at an appropriate collection point and not place it in the normal domestic unsorted waste stream. (European Union only)

1 SELECTION GUIDE

FlexDSL GigaFlex Models	2x SHDSL (EFM)	4x SHDSL (EFM)	4x Ethernet 10/100/1000Base-TX	2x SFP 1000Base-X	2x RS232/422/485/	2x Input, 2x Output	IEEE1588 PTP (1-step) SyncE	IEEE1588 PTP (2-step) SyncE	MACsec	PoE
GF-RAIL2N-6Eth-2I2O/2SER-24V,V21	√		√	√	√	√		*1	*1	
GF-RAIL2N-6Eth-2I2O/2SER-PoE-24V,V25	√		√	√	√	√		*1	*1	√
GF-RAIL2N-6Eth-24V,V26	√		√	√				*1	*1	
GF-RAIL4N-6Eth-2I2O/2SER-24V,V31		√	√	√	√	√		*1	*1	
GF-RAIL4N-6Eth-2I2O/2SER-PoE-24V,V35		√	√	√	√	√		*1	*1	√
GF-RAIL4N-6Eth-24V,V36		√	√	√				*1	*1	
GF-RAIL4N-6EthP-2I2O/2SER-24V,V41		√	√	√	√	√	*2		*2	
GF-RAIL4N-6EthP-2I2O/2SER-PoE-24V,V45		√	√	√	√	√	*2		*2	√
GF-RAIL4N-6EthP-24V,V46		√	√	√			*2		*2	

*: Future software development

1: For 10/100/1000Base-TX and DSL Ports only

2: For 10/100/1000Base-TX, DSL and SFP Ports

2 PRECAUTION

The present document describes the FlexDSL GigaFlex product family. The document contains the technical description and the installation instruction of all devices. Appendices containing additional information about the system are also an integral part of the present document.

**WARNING**

THIS EQUIPMENT IS NOT SUITABLE FOR USE IN LOCATIONS WHERE CHILDREN ARE LIKELY TO BE PRESENT.

**WARNING**

BEFORE STARTING OPERATING THE EQUIPMENT, READ CAREFULLY THE CURRENT MANUAL AND THE INSTALLATION MANUAL. FLEXDSL TELECOMMUNICATIONS AG REFUSES NEITHER TAKING ANY RESPONSIBILITY NOR GRANTING ANY WARRANTY TO ANY DEVICE MALFUNCTIONING OR ANY DAMAGES DUE TO FAILURE TO COMPLY WITH THE REQUIREMENTS STATED IN THE MANUALS, ESPECIALLY IN THE SECTION RELATED TO "SERVICE INSTRUCTIONS".

**WARNING**

IMPROPER USE OF OUR EQUIPMENT, USE IN ANY OTHER ENVIRONMENT OR IMPROPER INSTALLATION AND MAINTENANCE MIGHT LEAD TO HARMFUL CONDITIONS. FAILURE TO FOLLOW THESE PRECAUTIONS MAY RESULT IN DEATH; SEVERE INJURY OR PROPERTY DAMAGE. FLEXDSL TELECOMMUNICATIONS AG REFUSES NEITHER TAKING ANY RESPONSIBILITY NOR GRANTING ANY WARRANTY IN SUCH CASE.

**WARNING**

ELECTRONIC MODULES CAN BE DAMAGED OR DECREASED IN RELIABILITY BY STATIC ELECTRICAL DISCHARGE. BEFORE HANDLING MODULES, WEAR AN ANTISTATIC DISCHARGE WRIST STRAP TO PREVENT DAMAGE TO ELECTRONIC COMPONENTS. PLACE MODULES IN ANTISTATIC PACKING MATERIAL WHEN TRANSPORTING OR STORING. WHEN WORKING ON MODULES, ALWAYS PLACE THEM ON AN APPROVED ANTISTATIC MAT THAT IS ELECTRICALLY GROUNDED. TO PREVENT ELECTRICAL SHOCK, DO NOT INSTALL EQUIPMENT IN A WET LOCATION OR DURING A LIGHTNING STORM.

**WARNING**

THE PROTECTIVE GROUND CONNECTION MUST BE APPLIED TO THE UNIT. MAKE SURE THAT THE UNIT AND ALL EQUIPMENT CONNECTED TO IT USE THE SAME PROTECTIVE GROUND FOR THE PURPOSE OF REDUCING NOISE INTERFERENCE AND SAFETY HAZARDS.

3 TECHNICAL DESCRIPTION

3.1 General Information

The FlexDSL GigaFlex product family is designed to support high speed data transmission over copper and fiber cables with a complete Layer 2/3 Ethernet switching functionality. It fully complies with the field-proven ITU-T G.991.2 SHDSL technology and IEEE 802.3ah Ethernet in the First Mile (EFM) encapsulation. Unlike ATM encapsulation, the EFM frames have the same structure as Ethernet IEEE 802.3 frames. This makes the bandwidth utilization more effective. The EFM-based G.SHDSL transceiver operates as PHY (Physical Layer of OSI model). It can combine several physical links into one logical link for obtaining more bandwidth. This process is called bonding. SHDSL represents the best of several symmetric DSL technologies that have been combined into a single industry standard providing rate adaptation, greater reach and performance, spectral compatibility, lower power and application flexibility.

The FlexDSL GigaFlex product family offers the following features:

- A dual wide range 24/48VDC power input in case power supply redundancy is needed.
- An USB 2.0 Host interface to connect an additional USB flash stick for saving/restoring configuration/firmware.
- A microSD card tray to insert a formatted microSD card with any capacity for saving/restoring configuration/firmware.
- A Factory Default button to switch the devices configuration to factory default settings.
- Two cages for SFP modules support the 1000Base-X standard. They can be used for data transmission over fiber-optic cables as well as copper cables (Ethernet 10/100/1000Base-TX or VDSL2), depending on inserted SFP modules.
- Four standard 10/100/1000Base-TX Ethernet interfaces.
- Up to four SHDSL interfaces with up to 60Mbps.
- Two configurable RS232/422/485 serial interfaces.
- Two Inputs (current detection) and two Outputs (relays).
- Easy installation on DIN-rail (TS 35, EN 50022).
- Robust metal housing.



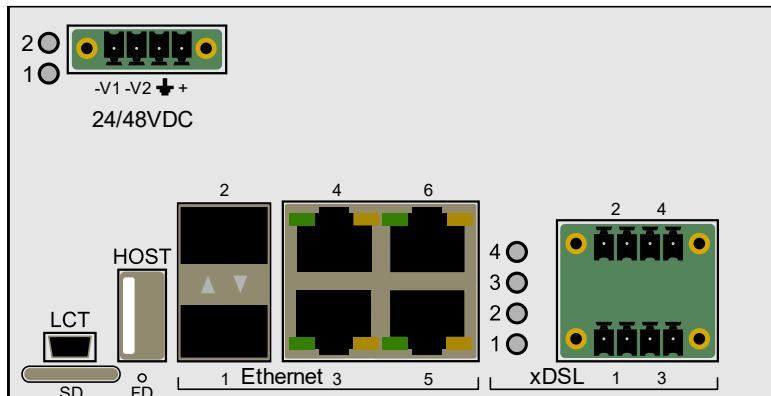
Figure 3-1. The GigaFlex DIN-rail SHDSL and Fiber model

The following protocols are supported to grant an easy and secure access by a network administrator:

- Local Command Line Interface (CLI) access over the Local Craft Terminal (LCT) with USB or RS232.
- Remote Command Line Interface (CLI) access over Telnet or SSH.
- The Graphical User Interface (GUI) over HTTP or HTTPS.
- Simple Network Management Protocol: SNMPv1, V2c and V3.

3.2 LED Indicator and Connector Pin Assignment on Front Panel

The front panel for models without serial and IO interfaces is shown on Figure 3-2.

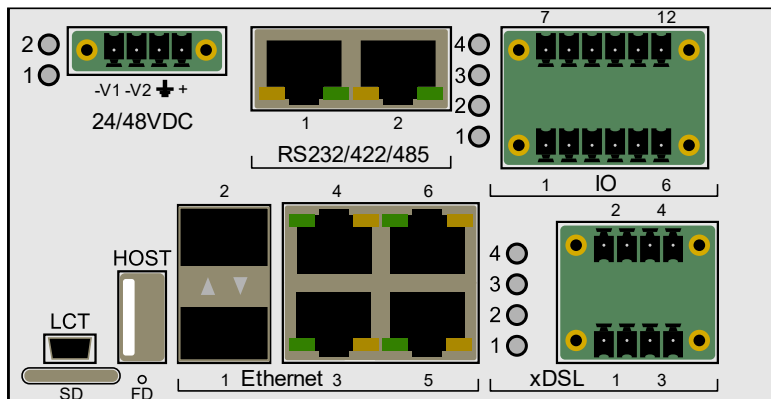


Following models:

- GF-RAIL2N-6Eth-24V,V26
- GF-RAIL4N-6Eth-24V,V36
- GF-RAIL4N-6EthP-24V,V46

Figure 3-2. Front panel for models without serial and IO interfaces.

The models with serial and IO interfaces have a front panel as shown on Figure 3-3.

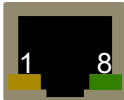


Following models:

- GF-RAIL2N-6Eth-2I2O/2SER-24V,V21
- GF-RAIL2N-6Eth-2I2O/2SER-PoE-24V,V25
- GF-RAIL4N-6Eth-2I2O/2SER-24V,V31
- GF-RAIL4N-6Eth-2I2O/2SER-PoE-24V,V35
- GF-RAIL4N-6EthP-2I2O/2SER-24V,V41
- GF-RAIL4N-6EthP-2I2O/2SER-PoE-24V,V45

Figure 3-3. Front panel for models with serial and IO interfaces.

The front panel LED indicator behavior as well as the connector pin assignment are summarized on the next two tables.

Element		Description				
Power LEDs		Two bicolor LEDs red/green representing -V1 and -V2 input voltages status				
LED1	LED2	LED Status	Device Status			
		Off	No input voltage detected			
		Green	Input voltage detected, No Alarm			
		Amber	Input voltage detected, Minor Alarm			
		Red	Input voltage detected, Major Alarm / Device Boot			
Power Connector		4-pin Phoenix Mini Combicon MC 1,5/4-GF-3,81 (female)				
		Pin No.	Signal	Description		
		1	-V1	Negative power supply terminal 1		
		2	-V2	Negative power supply terminal 2		
		3	FPE	Functional Protective Earth		
		4	+0V	Positive power supply terminal		
		Matching Type for the cable:		FK-MCP 1,5/ 4-STF-3,81 For AWG 16-26 Area 0.14–1.5 mm ² or Diameter 0.4-1.4 mm		
Serial Interface		Two RS232/422/485 Serial Interfaces on RJ45				
		Pin No.	Signal Direction from / to the Unit (DCE)	Corresponding DTE line RS232 / RS485 full(RS422) / RS485 half	Contact location	
		1	Out	RXD / Rx- / D-		
		2	Out	CTS / Rx+ / D+		
		3	In	TXD / Tx+ / nc		
		4		GND		
		5		GND		
		6	In	RTS / Tx- / nc		
		7		CC (cable connect)		
8		GND				
IO LEDs		Four bicolor red/green LEDs representing Input / Output status				
		LED Number	IO	State	Color	
					Normal Input state	
		1	In 1	Closed (current present)	Green	Red
				Open (no current)	Red	Green
		2	In 2	Shutdown	Off	Off
				Configured, but no Network	Yellow	Yellow
		3	Out 1	Normal	Green	
				Inverted	Red	
4	Out 2	Shutdown	Off			
		Configured, but no Network	Yellow			
IO Lines		Two Input and Two Output lines.				
		12-pin Phoenix Mini Combicon MCD 1,5/ 6-G1F-3,81 (female)				
		Pin No.	IO	Description		
		1	O	Output 1 normally open		
		2	O	Output 1 common		
		3	O	Output 1 normally closed		
		4	O	Output 2 normally open		
		5	O	Output 2 common		
		6	O	Output 2 normally closed		
		7	I	Input 1a		
		8	I	Input 1b		
		9	I	Input 2a		
		10	I	Input 2b		
		11		+3.3Vdc Power		
12		GND				
Matching Type for the cable:		FK-MCP 1,5/ 6-STF-3,81 For AWG 16-26 Area 0.14–1.5 mm ² or Diameter 0.4-1.4 mm	 with 6 contacts			



with 6 contacts

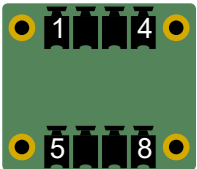
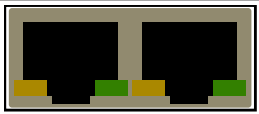
Element	Description		
SD	Slot for MicroSD card with Tray		
LCT	USB Type Mini-B female connector for Console access		
HOST	USB Type A female connector for Flash Stick		
FD	Factory Default button		
SFP	Two SFP cages for mini GBIC 1000Base-X modules		
RJ45	Four 10/100/1000Base-TX Ethernet connectors with MDI/MDIX support		
DSL LEDs	Four bicolor red/green LEDs representing DSL status		
	LED No.	LED Color	DSL Status
	1	Off	DSL 1 in shutdown state
		Red	DSL 1 Major Alarm
		Red, blinking	DSL 1 training with remote end
		Amber	DSL 1 Minor Alarm
		Green, blinking	DSL 1 Physical Layer up, Data Layer down
		Green	DSL 1 operates, no Alarm
	2	Off	DSL 2 in shutdown state
		Red	DSL 2 Major Alarm
		Red, blinking	DSL 2 training with remote end
		Amber	DSL 2 Minor Alarm
		Green, blinking	DSL 2 Physical Layer up, Data Layer down
		Green	DSL 2 operates, no Alarm
	3	Off	DSL 3 in shutdown state
		Red	DSL 3 Major Alarm
		Red, blinking	DSL 3 training with remote end
		Amber	DSL 3 Minor Alarm
		Green, blinking	DSL 3 Physical Layer up, Data Layer down
		Green	DSL 3 operates, no Alarm
	4	Off	DSL 4 in shutdown state
		Red	DSL 4 Major Alarm
		Red, blinking	DSL 4 training with remote end
		Amber	DSL 4 Minor Alarm
		Green, blinking	DSL 4 Physical Layer up, Data Layer down
		Green	DSL 4 operates, no Alarm
DSL Connector	Phoenix Mini Combicon MCD 1,5/4-G1F-3,81 Female, 8 pins.		
	Pin No.	Description	Contact location
	1	SHDSL interface 2	
	2	SHDSL interface 2	
	3	SHDSL interface 4	
	4	SHDSL interface 4	
	5	SHDSL interface 1	
	6	SHDSL interface 1	
	7	SHDSL interface 3	
	8	SHDSL interface 3	
	Matching Type for the cable:	FK-MCP 1,5/ 4-STF-3,81 For AWG 16-26 Area 0.14–1.5 mm ² or Diameter 0.4-1.4 mm	

Table 3-1. Connectors and LEDs on the front panel.

The front panel contains several connectors with integrated LEDs:

Element	Description		
Serial Interface	Two RJ45 Female connectors with integrated LEDs		
	LED	Description	Connector overview
	Green	Act Rx or Act TX	
	Yellow	RTS or CTS High (RS232 Only)	

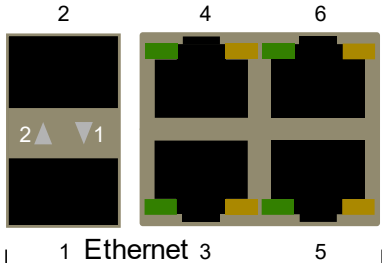
Element	Description		
Gigabit Ethernet LEDs	Four RJ45 Female connectors with integrated LEDs and two SFP cages		
	LED	Description	Connector overview
	Green	Ethernet Act blinking: 340ms: 10H/10F 170ms: 100H/100F 84ms: 1000H/1000F	
	Yellow	100/1000Base-TX mode	
SFP LEDs	1	Ethernet Act blinking for Port 1: 84ms: 1000H/1000F	
	2	Ethernet Act blinking for Port 2: 84ms: 1000H/1000F	

Table 3-2. Integrated LEDs in Serial and Ethernet connectors.

3.3 GigaFlex Interface Description

3.3.1 SHDSL Interface

The GigaFlex models are available with 2 or 4 EFM-based SHDSL channels. Every channel can operate independently or two and more interfaces can create a group. This process is called **bonding**. Up to two bonding groups can be created. A single SHDSL channel or a group of channels carry useful data traffic, called **payload**.

The EFM acronym means Ethernet on a First Mile. The EFM-based SHDSL transceiver operates as PHY (Physical Layer of OSI Model). Upper Layers of OSI Model forms data flow that should be transmitted over physical media. The SHDSL transceiver encodes data flow using TC-PAM (Trellis-Coded Pulse Amplitude Modulation) and sends a data flow to the receiving end over a twisted copper pair cable.

3.3.1.1 Modulation and Data Rates

The GigaFlex firmware supports TC-PAM4/8/16/32/64/128 modulations. Here the digit means the number of levels in a signal pulse. Less number of levels means more distance between them. More distance between the levels means more immunity to any kind of noise.

From the other hand, a modulation with low number of signal levels carries less data bits per single pulse. This means that high data rates are not available for modulations with low number of signal levels.

Modulation	Levels	Normal Mode		Extended Mode		
		Rate Min	Rate Max	Rate Min	Rate Max	Data Rate [kbit/s]
TC-PAM4	4	N/A	N/A	3	39	2'496
TC-PAM8	8	N/A	N/A	3	79	5'056
TC-PAM16	16	3	60	3	119	7'616
TC-PAM32	32	12	89	3	159	10'176
TC-PAM64	64	N/A	N/A	3	199	12'736
TC-PAM128	128	N/A	N/A	4	238	15'232

Table 3-3. Modulation, signal pulse levels and possible data rates.

The available data rate can be calculated as $Rate \cdot 64$, while formula $Rate \cdot 64 \text{ kbps} + 8 \text{ kbps}$ will calculate the speed on the wire, displayed in all statistical information of the GigaFlex models. As it's shown in Table 3-3, the available modulation and data rates are dependent on the operational mode. The GigaFlex models support two modes of operation: Normal and Extended.

- Normal Mode: only TC-PAM16 and TC-PAM32 modulations are supported.
- Extended Mode: offers all modulations from TC-PAM4 to TC-PAM128; extends maximum possible data rates for TC-PAM16 and TC-PAM32 modulations.

3.3.1.2 SHDSL Annex A/B

The GigaFlex models support two PSD (Power Spectral Density) operation modes: Annex A and Annex B. The Annex A is designed for the use in North America and has less impact on ADSL systems if they work over neighbor pairs in the same cable. The output signal level is 13.5dBm @ 135Ohm. The Annex B is designed for the use in Europe. The output signal level is 14.5dBm @ 135Ohm.

3.3.1.3 Bonding Group

The GigaFlex models support up to two bonding groups. Any two from four SHDSL channels can create **bonding group 1**, while other two channels can create **bonding group 2**. Three or four independent channels can be added into bonding group as well. If bonding is not required, four independent channels can work into four independent directions.

3.3.1.4 Master and Slave Mode

An SHDSL link can be created if two transceivers on it ends operate in different modes. It is required that one transceiver is configured as Master and the other one as Slave. The GigaFlex models can have up to four SHDSL transceivers. They all work independently and must be configured separately. The available SHDSL settings are dependent on the Master/Slave transceiver operation mode.

Parameter	Values for Master	Values for Slave
Bonding Group*	1, 2, no	1, 2, no
Master / Slave*	Master	Slave
Extended	disable, enable	disable, enable
PAM	If Extended disabled: • 16, 32 If Extended enabled: • 4, 8, 16, 32, 64, 128	auto
Baserate	If Extended off: • 3 ... 60 for PAM16 • 12 ... 89 for PAM32 • auto If Extended on: • 3 ... 238	auto
Annex	A, B	auto

^{*)} All channels in one bonding group must be configured in the same way: either as a Master or as a Slave.

Table 3-4. Possible values for SHDSL-transceiver configuration parameters.

3.3.1.5 Topologies

3.3.1.5.1 Point-to-Point

A point-to-point connection is a direct connection between two devices. This can be realized with just one or up to four copper pairs.

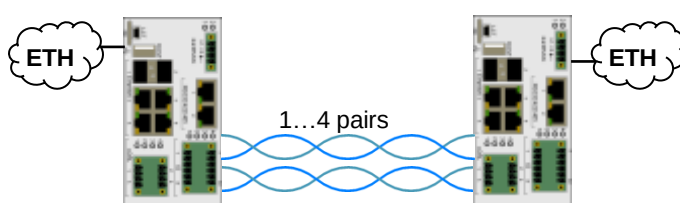


Figure 3-4. Point-to-point connection

3.3.1.5.2 Point-to-Multipoint (Star Structure)

A point-to-multipoint connection is a connection of different places with a central point. This can be realized with just one or multiple copper pairs.

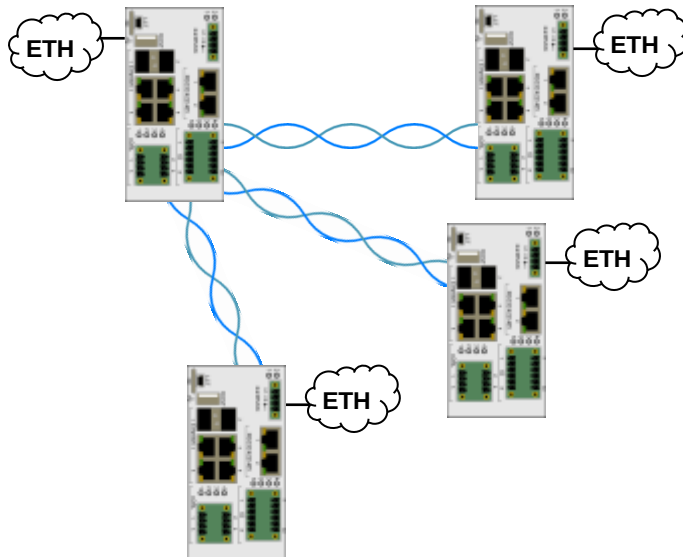


Figure 3-5. Point-to-multipoint connection

3.3.1.5.3 Daisy Chain (Line Structure)

In a daisy chain you connect the devices in series and in each device, you can add/drop Ethernet data. This can be realized with just one or multiple copper pairs.

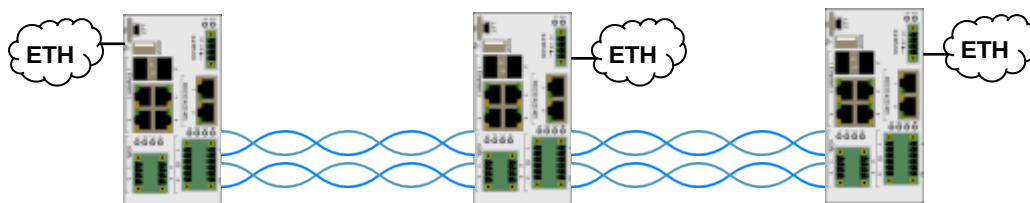


Figure 3-6. Daisy chain connection

3.3.1.5.4 Ring Structure

A ring structure is mainly realized to have redundancy for the data transmission. It means when a single copper connection fails, you still have a correct working application. For a ring structure you must enable the RSTP protocol.

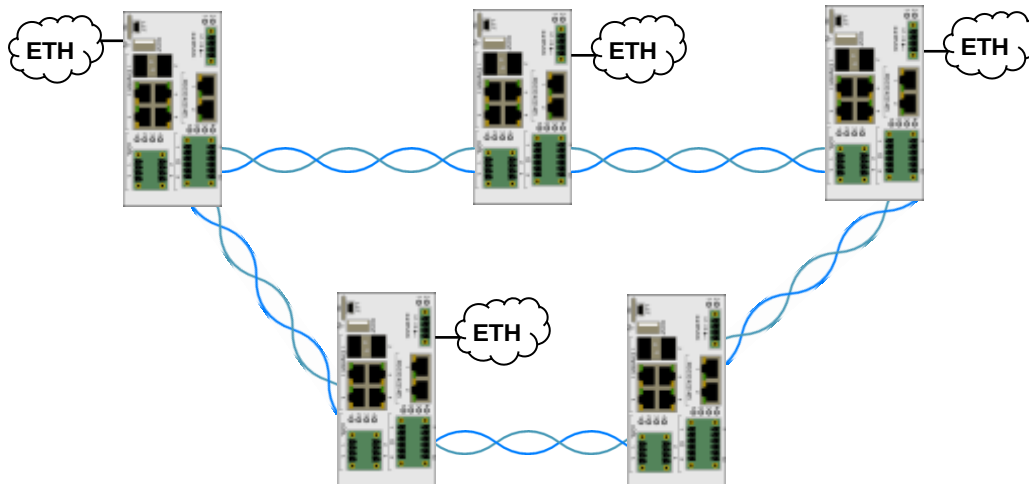


Figure 3-7. Ring structure connection

3.3.1.5.5 Interface Conversion and Redundancy

The GigaFlex models support redundant data connections. Redundancy can be achieved by following ways:

- Data connection by multiple copper pairs
- Data connection by multiple fiber cables
- Data connection by copper and fiber
- Ring structures

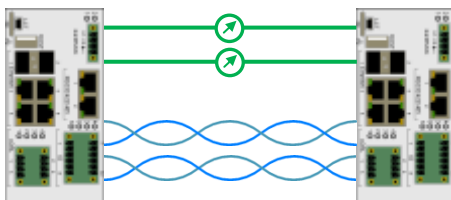


Figure 3-8. Redundant connection with copper and fiber

3.3.2 Ethernet Interfaces

The GigaFlex models have ten Gigabit Ethernet interfaces. Six of them are located on the front panel (2x SFP, 4x 10/100/1000Base-TX) and four are connected to the SHDSL ports because the EFM chip operates as PHY. These ports are not visible but must be configured according to desired application.

The Ethernet subsystem of the GigaFlex models is based on a high-performance SoC (System on Chip) with 48 Gbps nonblocking switching capability. The SoC with its operation system support various Layer 2 and Layer 3 protocols including:

- IEEE 802.1D:2004 MAC Bridges and Spanning Tree
- IEEE 802.1Q:2005 VLAN, MSTP, Multiple VLAN Registration (GVRP/MVRP)
- RFC 4330 SNTP
- RFC 3339 Date and Time on the Internet
- RFC 2865 RADIUS
- IEEE 802.1X:2004 Port-based Access Control
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- RFC 4303 IPsec
- RFC 4787 NAT
- RFC 2131 DHCP
- RFC 3046 DHCP Relay Agent

- RFC 2453 RIPv2
- RFC 5798 VRRPV3
- RFC 3228 OSPF v 2
- RFC 5340 OSPF v 3
- RFC 3164 Syslog
- RFC 2819 RMON1
- RFC 4502 RMON2
- IGMP

Detailed configuration examples of selected protocols can be found in the GigaFlex Configuration Manual.

3.3.2.1 Power Over Ethernet (PoE)

In some GigaFlex models the four 10/100/1000Base-TX Ethernet interfaces (RJ45) can generate Power over Ethernet (PoE) according standard IEEE 802.3af, Mode A.. The maximum common power output for all four Ethernet ports is 15 Watts.

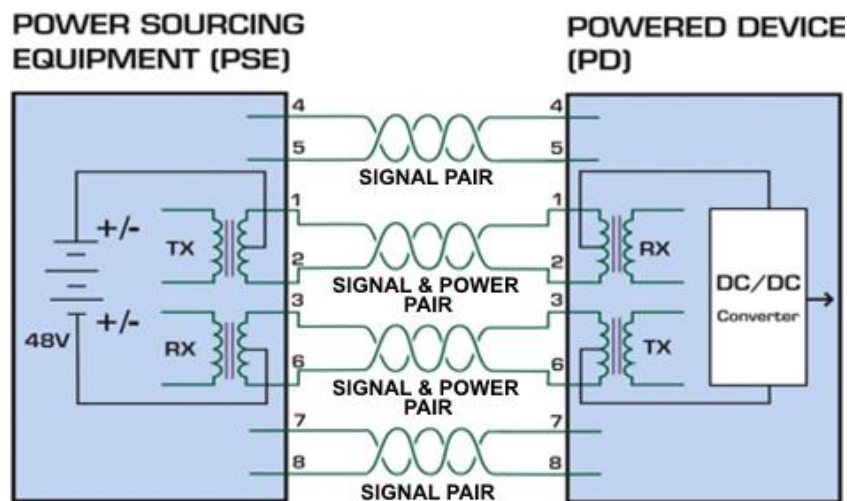


Figure 3-9. 802.3af PoE Mode A combine's power onto the same wires as the data signal.

MDI to MDI-X crossover or an external power source for PoE functionality is possible by special internal jumper settings. Please contact the manufacturer.

3.3.3 Serial Interface

The Serial interface of some GigaFlex models operates according to RS232/422/485 standards. It transmits serial data over an IP-based Network using TCP or UDP messages. Point-to-Point and Point-to-Multipoint topologies are supported.

The Serial interface has the following features:

- Rates: 150, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 57600, 115200, 230400
- Number of data bits: 7, 8
- Number of stop bits: 1, 1.5, 2
- Parity: None, Even, Odd
- Flow Control (RS232 only): CTS/RTS

Detailed configuration examples can be found in GigaFlex Configuration Manual.

3.3.4 Inputs and Outputs

Some GigaFlex models have 2 Inputs and 2 Outputs.

Input is a pair of contacts, connected to a current detector. If the current is present in the electric

circuit the Input switches its state to "closed". The Input changes its state into "open" if no current detected in the electric circuit.

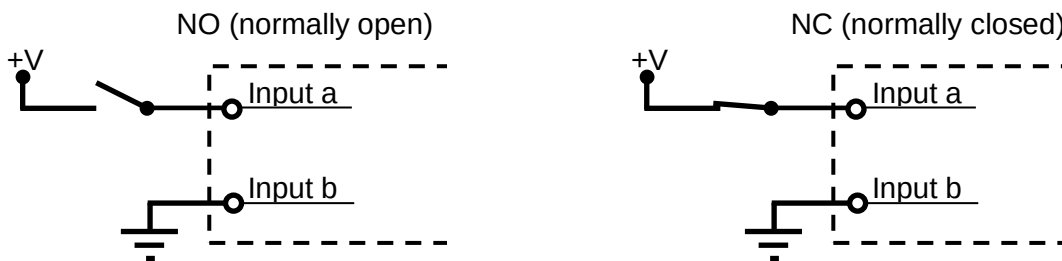


Figure 3-10. Schematics of the inputs

Output is a pair of contacts (normally-open and normally-closed) and common wire connected to a relay. The relay may stay either on "active" or in "inactive" state. Active state means that the current passes through the relay coil and the common contact is connected to the normally-open contact. Inactive state means that no current passes through relay coil and the common contact is connected to the normally-closed one.

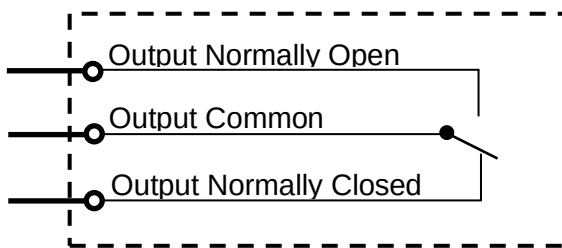


Figure 3-11. Schematic of the outputs

The IO status is transmitted over an IP-based channel either by UDP or by TCP messages. Point-to-Point and Point-to-Multipoint network scenarios are supported.

Detailed configuration examples can be found in the GigaFlex Configuration Manual.

3.3.5 LCT USB Connector

The Local Craft Terminal (LCT) Type Mini-B USB connector allows local access to the command line interface of the GigaFlex models. If connected to a PC, a new serial port will be available for communication with the device. Start your favorite terminal emulation program and select new serial interface to initiate configuration session.

3.3.6 SD Card and USB Host

A Micro SD card and USB flash stick can be used for saving and restoring configuration and firmware. Check the configuration manual for details.

3.3.7 Factory Default Button, Default IP Address

It is possible to restore the default configuration of a unit if the Factory Default (FD) button will be pressed and held for 15 seconds during boot process. The IP address will be overwritten to the default IP address 192.168.0.235.

NOTE: The FD Button erases startup configuration, so the factory default values will be loaded. Please note that FD button doesn't restore the initial firmware.

4 INSTALLATION

4.1 General Requirements

Before installing the device, read carefully the present manual. Take care about all warnings inside this manual. Please note that the warrantee and free-of-charge repair will not be granted if the device failed due to one of the following conditions:

- a) Misuse and improper installation, including but not limited to:
 - installation and use of the product in a conflicting way with the actual technical or safety standards in the country where it is installed;
 - connection to the power source that don't match the requirements for power input source;
 - installation and operation in an environment that exceed defined climatic conditions of the device.
- b) Maintenance or repair performed by unauthorized service centers or persons.
- c) Accidents, lighting strokes, flooding, water, fire, mud and dust, improper ventilation, voltage drops and peaks, excessive moisture, excessive electro-magnetic impacts or insects or any creatures have been penetrated the device causing its malfunction, as well as other reasons laying beyond the manufacturer control and don't corresponding with defined technical specification.
- d) Improper transportation.
- e) Defects of the system, where the device was integrated.

It is strictly prohibited:

- a) to alter, remove or make illegible the serial number of the device;
- b) to adapt, adjust or change the device in order to improve or to extend its functionality without prior written consent of the manufacturer.

4.2 Unpacking the Unit

Before unpacking, check if the packaging is intact and if the model matches the purchase order or contract.

Unpack the unit and make a visual inspection.

Write down model and serial number for internal records.

4.3 Mounting on DIN-rail

The GigaFlex models should be mounted on DIN-rail. The Figure 4-1 shows mounting options.

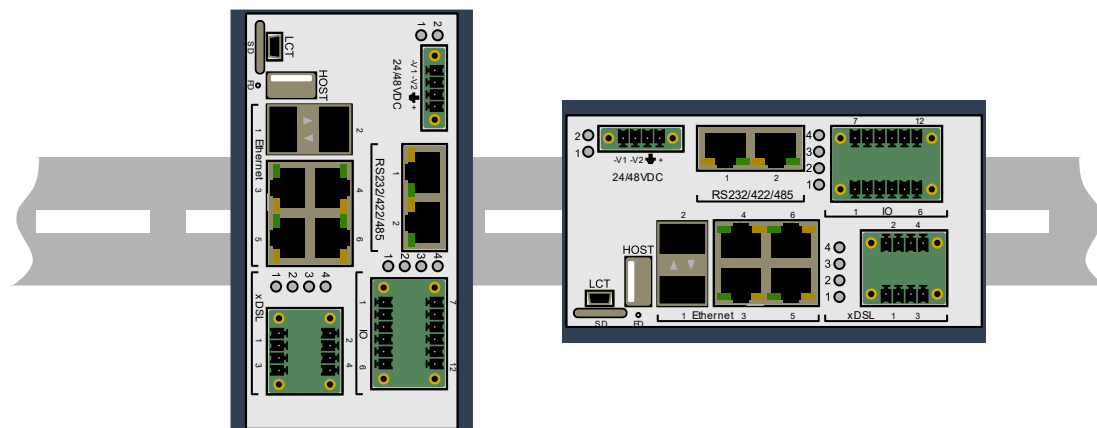


Figure 4-1. DIN-rail mounting options.

Although the unit can be located either vertically or horizontally, the vertical position is preferred because this enables a better airflow.

A comfort clip **FG-RAIL-ComfortClip-Orion2/3** can be purchased separately. It simplifies the device installation on a DIN-rail.

4.4 Connecting Power Input and Protective Ground

Connect the power, for example -24VDC, to the power input terminal as it is shown on Figure 4-2. Please refer to Chapter 6.3 for Input Power Supply specification.

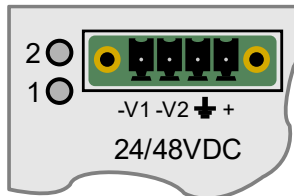


Figure 4-2. Power Connector

Be sure that the rail where you mount the GigaFlex device is proper connected to the Protective Earth. If you are not sure about a proper Protective Earth connection through the DIN-rail mechanics, please connect the Protective Earth to the corresponding connector on Figure 4 2.

If you have single power supply, it's recommended to connect -V1 and -V2 with a wire bridge. The Unit will not show you an alarm indicating that one power supply input is not present.

4.5 Connecting Interface Cables

Connect all required interface cables. Use Table 3-1 as a reference for wiring.

Plug SFP modules and connect fiber cables.

Connect a PC with USB cable to the LCT jack and start a Terminal emulation program. The Serial port settings are:

- Rate: 9600
- Bits: 8
- Parity: None
- Stop bits: 1
- Flow Control: Off

4.6 Power on the Device

Power on the device. The LEDs 1 and 2 on Figure 4-2 should be red during boot process.

Refer to the GigaFlex Configuration Manual for configuration steps and examples.

5 MAINTENANCE

The GigaFlex models do not contain parts that require constant service or tuning during daily operation. You should keep the enclosure clean and periodically check the quality of contacts in jacks and in junctions.

We recommend that you perform the following measurements and keep the following records:

- SHDSL Speed and Signal to Noise ratio for every working link
- SFP DDM values: Attenuation
- Device Temperature
- CPU usage

The above-mentioned list may be increased according to the internal rules and norms of your organization.

6 TECHNICAL SPECIFICATION

6.1 Interfaces

6.1.1 SHDSL Interface

Specification:	ITU-T G.991.2-G.SHDSL, ITU-T G.991.2-G.shdsl.bis IEEE 802.3ah (Ethernet in the First Mile)
Line Code:	TC-PAM16/32, Extended: TC-PAM4/8/64/128
Impedance:	135Ω
Transmit Power:	13.5 (Annex A) or 14.5 (Annex B) dBm @ 135Ω
Number of Pairs:	2 or 4
Bit Rate:	192 to 5704kbit/s, Extended: 128 to 15232kbit/s
Connector Type	Phoenix Mini Combicon MCD 1,5/4-G1F-3,81 Female, 8 pins.
Overvoltage Protection:	ITU-T Rec. K.20/K.21

6.1.2 1000Base-X Ethernet (SFP)

Standard:	IEEE-802.3
Data Rate:	1000Base-X Full Duplex
Protocols:	Layer 2, Layer 3
Connector Type:	SFP

6.1.3 10/100/1000Mbps Ethernet (GE)

Standard:	IEEE-802.3
Data Rate:	10/100Base-TX, Full/Half Duplex 1000Base-TX, Full Duplex
Protocols:	Layer 2, Layer 3
Signal Level:	Ethernet
MDI / MDI-X auto crossover:	Supported
Auto Negotiation:	Supported
Connector Type:	RJ45

6.1.4 Serial Interface

Specification:	RS-232/422/485
Number of Interfaces:	2
Bit Rate:	150, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 57600, 115200, 230400 bps
Format:	Bits: 7, 8 Stop bits: 1/1.5/2 Parity: none/even/odd
Features:	RTS and CTS support for RS232 Termination on/off & Full/Half duplex for RS485
Connector Type:	RJ45, 8 pins

6.1.5 Digital Input / Output Interface (2I2O)

Inputs:

Number of Inputs:	2
Type:	Isolated, 2 lines / input, with rectifier bridge
Maximum Voltage:	≤ 72Vdc
Isolation:	≥ 2kVrms @ 1min
Sampling rate:	≤ 1ms

Outputs:

Number of Outputs:	2
Type:	Isolated, 3 lines / relay output
Max Voltage:	≤ 120Vdc
Max Current:	≤ 1A

Power: ≤ 30W
Isolation (between contacts & coil): ≥ 2500Vdc (2x10us Telcordia)
+3.3Vdc Power Output: max 100mA
Connector Type: 12 pin Phoenix Mini Combicon MCD 1,5/ 6-G1F-3,81 (female)

6.1.6 USB Host

Specification: USB V2.0 full and low speed
Data Rate: 12Mbit/s
Protocol: Master, Uses the USB Mass Storage device class (MSC) for communication with external flash drives.
Connector Type: USB Type A female connector

6.1.7 Monitor or Local Craft Terminal USB Interface

Specification: USB V2.0 full and low speed
Data Rate: 12Mbit/s
Protocol: Master/Slave, Uses the USB communication device class (CDC) drivers to take advantage of the installed PC RS-232 software to talk over the USB.
Connector Type: USB Type mini B female connector

6.1.8 SD Card Slot

Specification: Micro SD
Type: Host
Class: Class 2

6.2 Power over Ethernet (PoE)

Specification: PSE, IEEE 802.3af (15.4W Output Power)
Power Input: 18 – 72Vdc
Electrical Isolation: 1.5kVac @ 1 min
PoE Voltage: -56Vdc
PoE Output Power: 15W max
Power Sourcing: Mode A
Power Polarity: MDI and MDI-X (jumpers selectable). Make a note when order if MDI-X is required.

6.3 Power Supply

Specification: ETSI ETS 300 132-2
Voltage for -24V models: 18 – 72Vdc local power
Max Current: ≤ 2.1A
Power Consumption @ -24V
(All DSL links up, all interfaces on, PoE on (if present)):
Max. 18W, GF-RAIL2N-6Eth-2I2O/2SER-24V,V21
Max. 48W, GF-RAIL2N-6Eth-2I2O/2SER-PoE-24V,V25
Max. 18W, GF-RAIL2N-6Eth-24V,V26
Max. 20W, GF-RAIL4N-6Eth-2I2O/2SER-24V,V31
Max. 50W, GF-RAIL4N-6Eth-2I2O/2SER-PoE-24V,V35
Max. 20W, GF-RAIL4N-6Eth-24V,V36
Max. 20W, GF-RAIL4N-6EthP-2I2O/2SER-24V,V41
Max. 50W, GF-RAIL4N-6EthP-2I2O/2SER-PoE-24V,V45
Max. 20W, GF-RAIL4N-6EthP-24V,V46
Isolation: ≥ 1.5kVdc @ 1min
Connector Type: 4 pin Phoenix Mini Combicon MC 1,5/4-GF-3,81 (female)

6.4 Environment

6.4.1 Climatic Conditions

Storage: ETS 300 019-1-1 Class 1.2 ext. (-25°C ... +70°C)

Transportation: ETS 300 019-1-2 Class 2.3 (-40°C ... +70°C)

Operation: ETS 300 019-1-3 Class 3.2 ext. (-25°C ... +70°C)

6.4.2 Safety / EMC

Safety: IEC 60950-1:2005+A1:2009+A2:2013
EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 + A2:2013
EN 62368-1:2014 + AC:2015
IEC 62368-1:2018

EMC emissions: EN 300 386 V1.6.1
EN 55032:2015 (CISPR 32:2015)
EN 50121-4:2015
EN 61000-3-2:2014
EN 61000-3-3:2013

EMC immunity: EN 300 386 V1.6.1
EN 55035:2017 (CISPR 35:2016)
EN 50121-4:2015
IEC 61000-4-2:2008
IEC 61000-4-3:2006/A1:2007/A2:2010
IEC 61000-4-4:2012
IEC 61000-4-5:2014/A1:2017
IEC 61000-4-6:2013
IEC 61000-4-8:2009
IEC 61000-4-9:2016
IEC 61000-4-11:2004/A1:2017

RoHS: RoHS2 Directive 2011/65/EU

WEEE: WEEE Directive 2012/19/EU

6.5 Physical Dimensions and Weight

Dimensions (without clip):

128 (W) x 144 (D) x 74 (H) mm

Weight: 1.3 kg

