



INSTALLATION AND OPERATION MANUAL

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GRAPHIC SYMBOLS

To differentiate the type and importance of the information in this User Manual, graphic reference symbols are used to make such information easier to interpret.



Indicates contents of sections, general instructions, notes, and other points to which the reader's attention needs to be called.



Indicates a suggestion based on the experience of GEFTRAN's Technical Personnel that could be especially useful under certain circumstances.



Indicates a particularly delicate situation that could affect the safety or correct operation of the controller, or an instruction that MUST be followed to prevent hazards.



Indicates a reference to Detailed Technical Documents available on the GEFTRAN website www.gefran.com.



Indicates a risk to the user's safety due to high voltage at the points indicated.

1 • PRELIMINARY INSTRUCTIONS



The section contains general information and warnings to be read before installing, configuring and using the controller

1.1 GENERAL DESCRIPTION

GFX4-IR is an extremely compact, independent unit for separate control of 4 zones, complete with communication interface in all popular fieldbus standards.

It offers an exclusive combination of performance, reliability, and flexibility.

In particular, this new line of Gefran controllers is the ideal solution for sectors demanding high performance and continuity of service, such as:

- *Thermoforming*
- *Blowing*
- *Hot runners for injection presses*
- *Texturizing of fibers*
- *Heat treatment furnaces*
- *Woodworking machines*
- *Glass tempering furnaces*

Series GFX4-IR controllers are based on an extremely versatile hardware and software platform, with options to select the best I/O configuration for your system.

GFX4-IR is used for the power control of single-phase and 3-phase loads, including resistive loads with high and low temperature coefficient, short wave IR lamps, or transformer primaries.



Attention: the description of programming and configuration parameters are contained in the "Programming and configuration" manual, downloadable from the website www.gefran.com

1.2 APRELIMINARY INSTRUCTION



Read the following preliminary instructions before installing and using the GFX4-IR modular power controller.

This will make start-up faster and avoid some problems that could be mistakenly interpreted as malfunctions or limitations of the controller.

Immediately after unpacking the unit, check the order code and the other data on the label attached to the outside of the container.

SN.....	(Serial Number)
CODE	(Product code)
TYPE.....	(Order code)
SUPPLY.....	(Type of electrical power supply)
VERS.....	(Firmware Version)

Write them on the following table.

This data must always be available and given to Gefran Customer Care representatives if technical service is needed. Check that the controller is in perfect condition, was not damaged during shipment, and that the package also contains the "Configuration and Programming" manual.

Immediately report any errors, shortages, or signs of damage to your Gefran dealer.

Check that the order code matches the configuration requested for the intended application by consulting the section: "Technical-Commercial Information."

Example: GFX4-IR 30 - D - 2 - F

Model _____
Total controlled power 30KW _____
Outputs 5...8 logic type _____
Auxiliary inputs absent _____
Fuse holders present _____

See paragraph 2.1 " Dimensions and mounting" before installing the GFX4-IR controller on the machine/host system control panel.

In case of PC configuration, make sure you have the configuration kit.

For the order code, see Section 6 "Technical-Commercial Information".



Users and/or system integrators who want detailed information on serial communication between Gefran standard and/or industrial PCs and Gefran Programmable Instruments can access Technical Reference Documents on serial communication and MODBus protocol, etc., in Adobe Acrobat format on the Gefran website www.gefran.com:

- Serial Communication
- MODBus Protocol



This section contains the instructions needed for correct installation of GFX4-IR controllers on the machine/host system control panel and for correct connection of the power supply, inputs, outputs and interfaces.



CAREFULLY READ THE FOLLOWING WARNINGS BEFORE INSTALLING THE INSTRUMENT!
Disregard of such warnings could create electrical safety and electromagnetic compatibility problems, as well as void the warranty.

2.1 ELECTRICAL POWER SUPPLY

- the controller DOES NOT have an On/Off switch: the user must install a 2-phase switch/isolator conforming to safety requisites (CE mark) to cut off the power supply up-line of the controller.

The switch must be installed in the immediate vicinity of the controller in easy reach of the operator.

A single switch can be used for multiple controllers.

- if the controller is connected to devices that are NOT electrically isolated (for example, thermocouples), the ground connection must be made with a specific conductor and NOT via the machine structure.
- if the controller is used in applications with risk of harm to persons or damage to machines or materials, it MUST be equipped with auxiliary alarm devices.

It is advisable to provide the ability to check for tripped alarms during regular operation.

DO NOT install the controller in rooms with hazardous (inflammable or explosive) atmosphere; it may be connected to elements that operated in such atmosphere only by means of appropriate interfaces that conform to current safety standards.

2.2 NOTES ON ELECTRICAL SAFETY AND ELECTROMAGNETIC COMPATIBILITY:

2.2.1 MARCATURA CE: EMC

(electromagnetic compatibility) conformity

in compliance with Directive 89/336/CEE and following modifications.

Series GFX4-IR controllers are mainly intended for industrial use, installed on panels or control panels of production process machines or systems.

For purposes of electromagnetic compatibility, the most restrictive generic standards have been adopted, as shown on the table. Refer to tables 1 and 2.

2.2.2 LV (low voltage) conformity

in compliance with Directive 2006/95/CE.

2.3 RECOMMENDATIONS FOR CORRECT INSTALLATION FOR PURPOSES OF EMC

2.3.1 Instrument power supply

- The power supply for the electronic instrumentation on the panels must always come directly from a cut-off device with fuse for the instrument part.
- Electronic instrumentation and electromechanical power devices such as relays, contactors, solenoids, etc., MUST ALWAYS be powered by separate lines.
- When the power supply line of electronic instruments is heavily disturbed by switching of thyristor power groups or by motors, you should use an isolation transformer only for the controllers, grounding its sheathing.
- It is important for the system to be well-grounded:
 - voltage between neutral and ground must not be $> 1V$
 - Ohmic resistance must be $< 6\Omega$;
- If the grid voltage is highly unstable, use a voltage stabilizer.
- In proximity of high-frequency generators or arc welders, use adequate grid filters.
- The power supply lines must be separate from instrument input and output lines.



- Supply from Class II or from limited energy source

2.3.2 Input and output connections

Before connecting or disconnecting any connection, always check that the power and control cables are isolated from voltage

Appropriate devices must be provided: fuses or automatic switches to protect power lines.

The fuses present in the module function solely as a protection for the GFX4-IR semiconductors.

- Connected outside circuits must be doubly isolated.
- To connect analog inputs, strain gauges, linears, (TC, RTD), you have to:
 - physically separate the input cables from those of the power supply, outputs, and power connections.
 - use braided and shielded cables, with sheathing grounded at a single point.
- To connect the control outputs and alarm outputs (contactors, solenoids, motors, fans, etc.), install RC (series of capacitors and resistors) groups parallel to inductive loads that work in AC.

(Note: all condensers must conform to VDE standards (class X2) and support voltage of at least 220Vac. Resistances must be at least 2W).

- Install a 1N4007 diode anti-parallel to the coil of inductive loads that work in DC.



GEFRAN S.p.A. assumes no liability for any damage to persons or property deriving from tampering, from incorrect or improper use, or from any use not conforming to the characteristics of the controller and to the instructions in this User Manual.

Table 1 EMC Emission

AC semiconductor motor controllers and conductors for non-motor loads	EN 60947-4-3	
Emission enclosure compliant in firing mode single cycle and phase angle if external filter fitted	EN 60947-4-3 CISPR-11 EN 55011	Class A Group 2

Table 2 EMC Immunity

Generic standards, immunity standard for industrial environments	EN 60947-4-3	
ESD immunity	EN 61000-4-2	4 kV contact discharge 8 kV air discharge
RF interference immunity	EN 61000-4-3 /A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Conducted disturbance immunity	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz-80 MHz
Burst immunity	EN 61000-4-4	2 kV power line 2 kV I/O signal line
Surge immunity	EN 61000-4-4/5	Power line-line 1 kV Power line-earth 2 kV Signal line-earth 2 kV Signal line-line 1 kV
Magnetic fields immunity	Test are not required. Immunity is demonstrated by the successfully completion of the operating capability test	
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,

Table 3 LVD safety

Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1	
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ATTENTION

This product has been designed for class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

External EMC filters

EMC filters are required in PA mode (Phase Angle, i.e., SCR trigger with phase angle modulation). The filter model and current level depend on the configuration and load used.

The power filter must be connected as close to the GFX4-IR as possible.

You can use a filter connected between the power supply line and the GFX4-IR or an LC group connected between each GFX4-IR output and the load. We recommend the following filters:

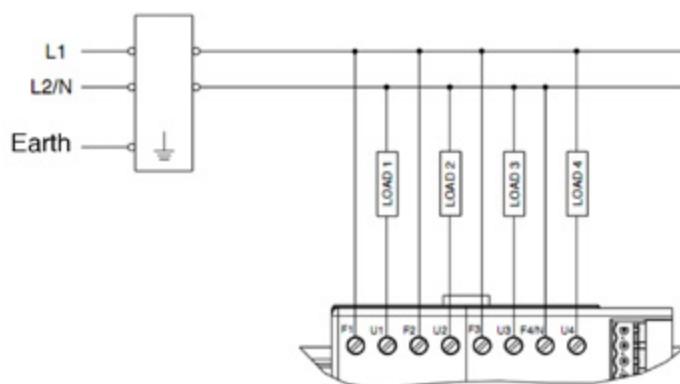
3-PHASE FILTERS WITHOUT NEUTRAL (to be connected between line and GFX4-IR)		
Model REO	Nominal voltage (Vn)	Nominal current (In)
CNW103/16	Vn = 400V	In = 16A
CNW207/20	Vn = 400V	In = 20A
CNW207/35	Vn = 400V	In = 35A
CNW207/50	Vn = 400V	In = 50A

FILTERS WITH NEUTRAL (to be connected between line and GFX4-IR)		
Model REO	Nominal voltage (Vn)	Nominal current (In)
CNW105/16	Vn = 400V	In = 16A
CNW106/25	Vn = 400V	In = 25A
CNW105/36	Vn = 400V	In = 36A
CNW105/50	Vn = 400V	In = 50A

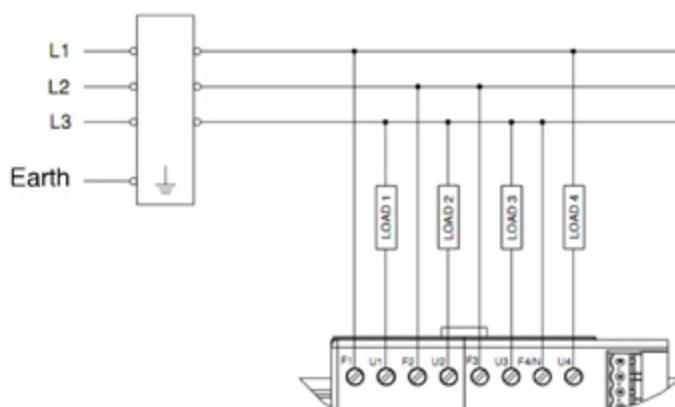
DISCRETE LC FILTERS (to be connected between GFX4-IR and load)		
MYRRA inductance code 74194	Ln = 450 μ H	In = 10A
MYRRA inductance code 74195	Ln = 250 μ H	In = 20A
KEVIN SHURTER inductance DLFP0132-16D2	Ln = 300 μ H	In = 16A
KEVIN SHURTER inductance DLFP0132-25D2	Ln = 150 μ H	In = 25A
KEVIN SHURTER inductance DLFP0132-45D2	Ln = 200 μ H	In = 45A
ELECTRONICON condenser E62.C58-102E10	C = 1 μ H	Vn = 1200V
ELECTRONICON condenser E62.C51-152E10	C = 1,5 μ H	Vn = 1200V

EMC FILTER CONNECTION EXAMPLES

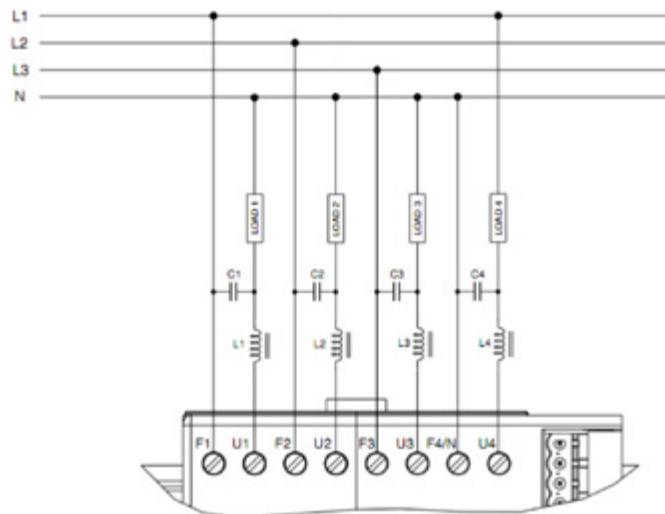
Connection for 4 single-phase loads, single-phase line



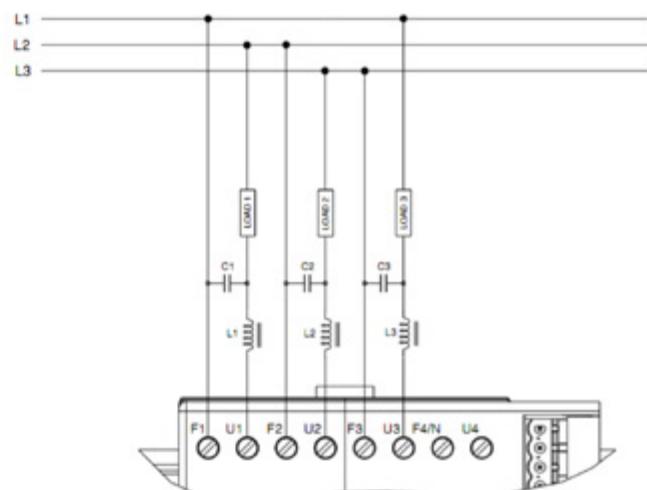
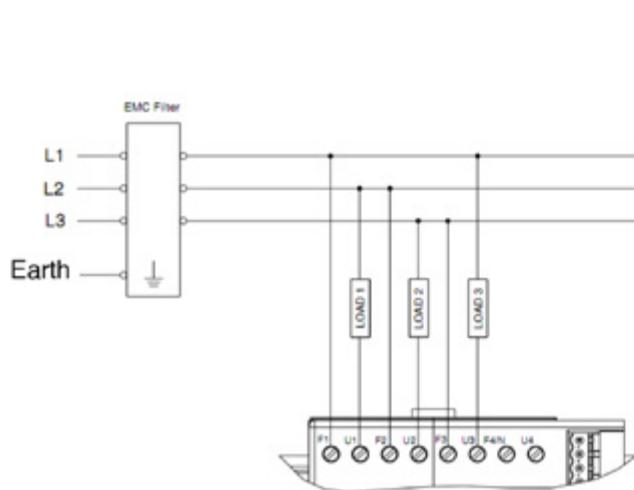
Connection for 4 single-phase loads, 3-phase line without neutral



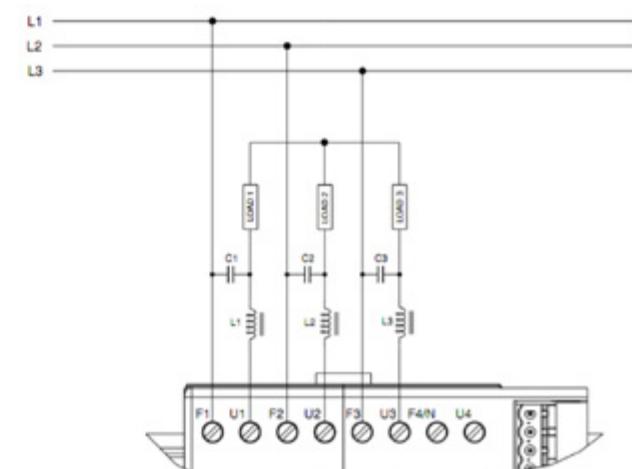
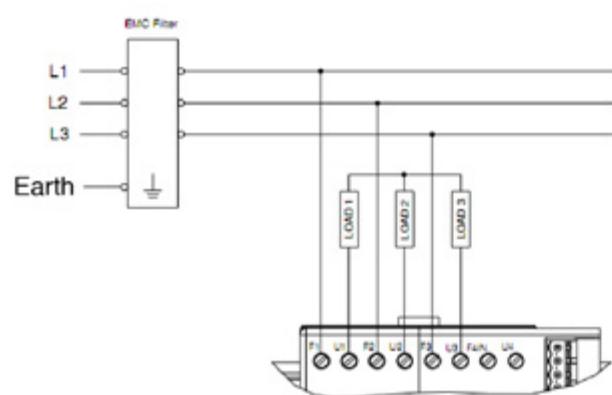
Connection for 4 single-phase loads, 3-phase line with neutral



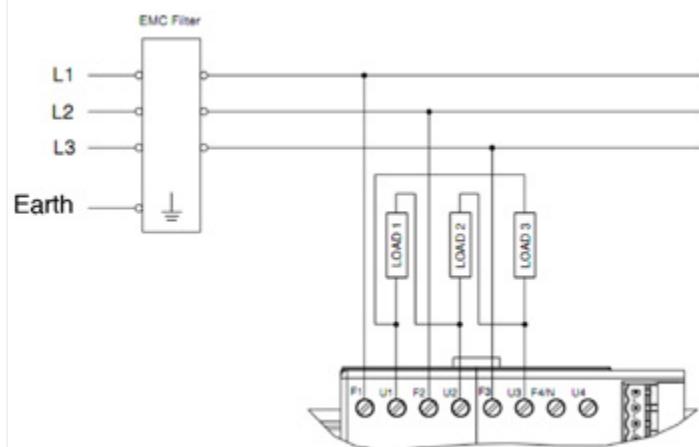
Connection for 3 independent single-phase loads in open delta, 3-phase line without neutral

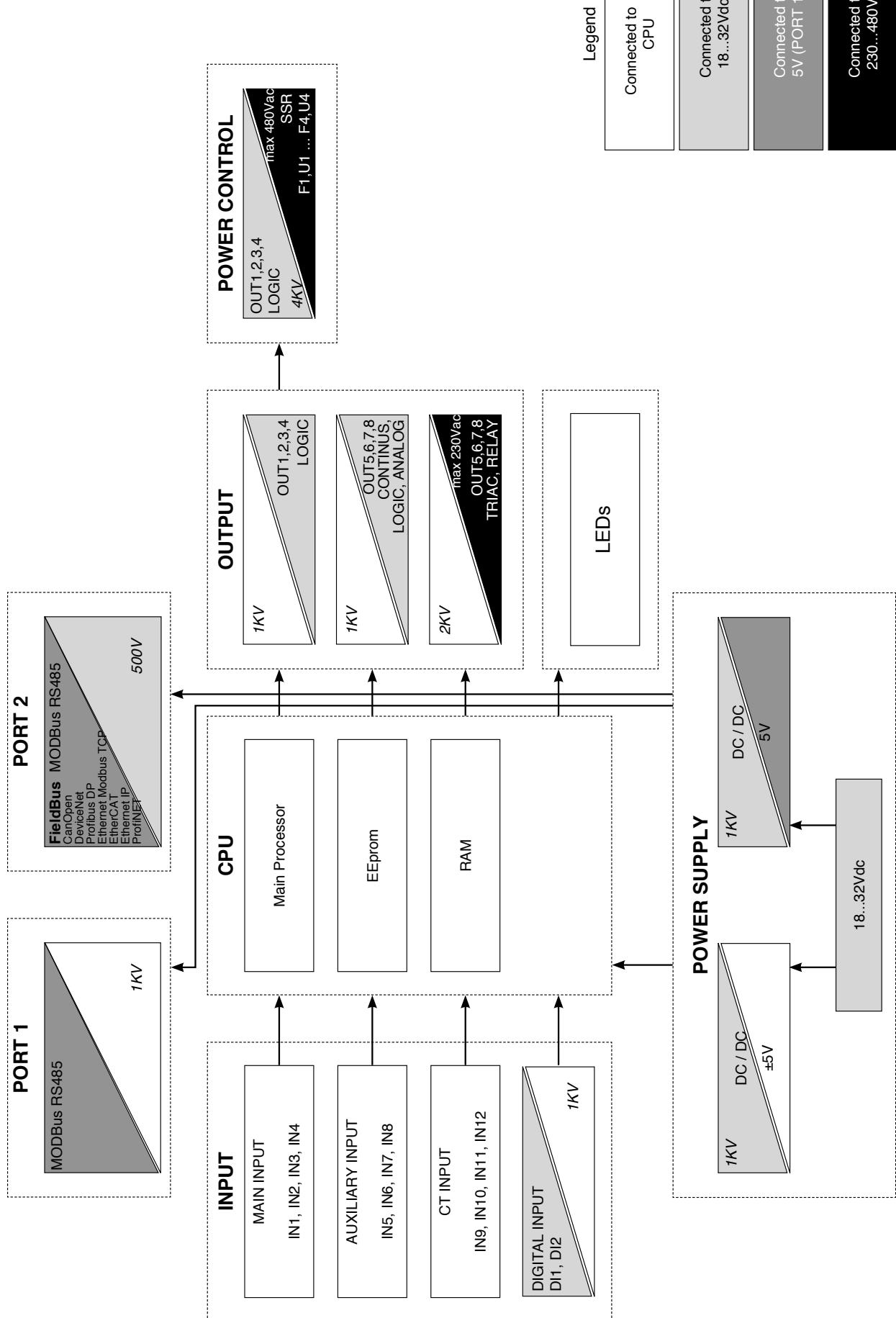


Connection for 3-phase star load without neutral



Connection for 3-phase load in closed delta





2.4 DIMENSIONS

Fastening may be done on DIN guide (EN50022) or with (5MA). See Figure 1 and Figure 2. All dimensions are expressed in mm.

Figure 1 Model without fuse holder

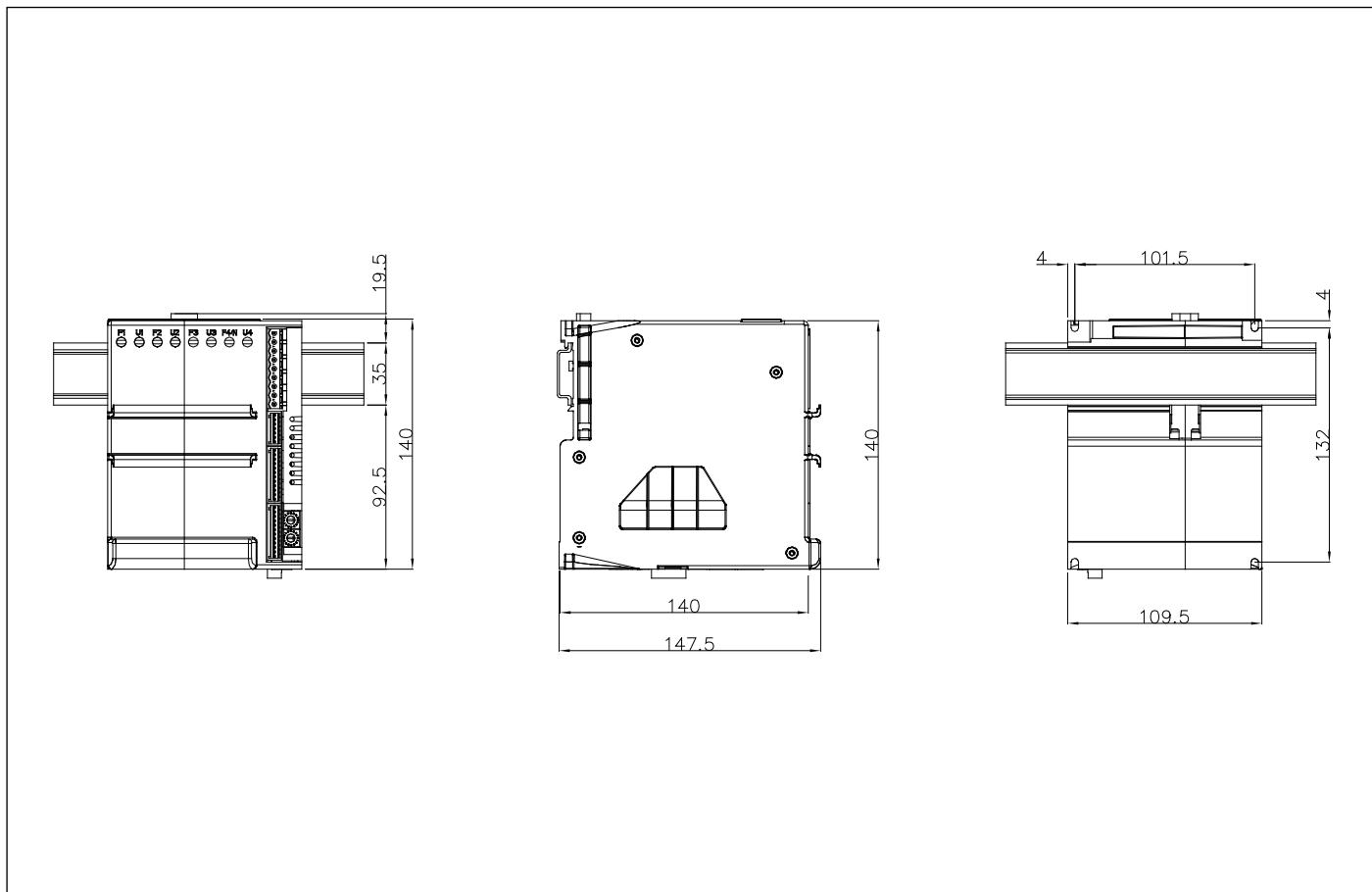
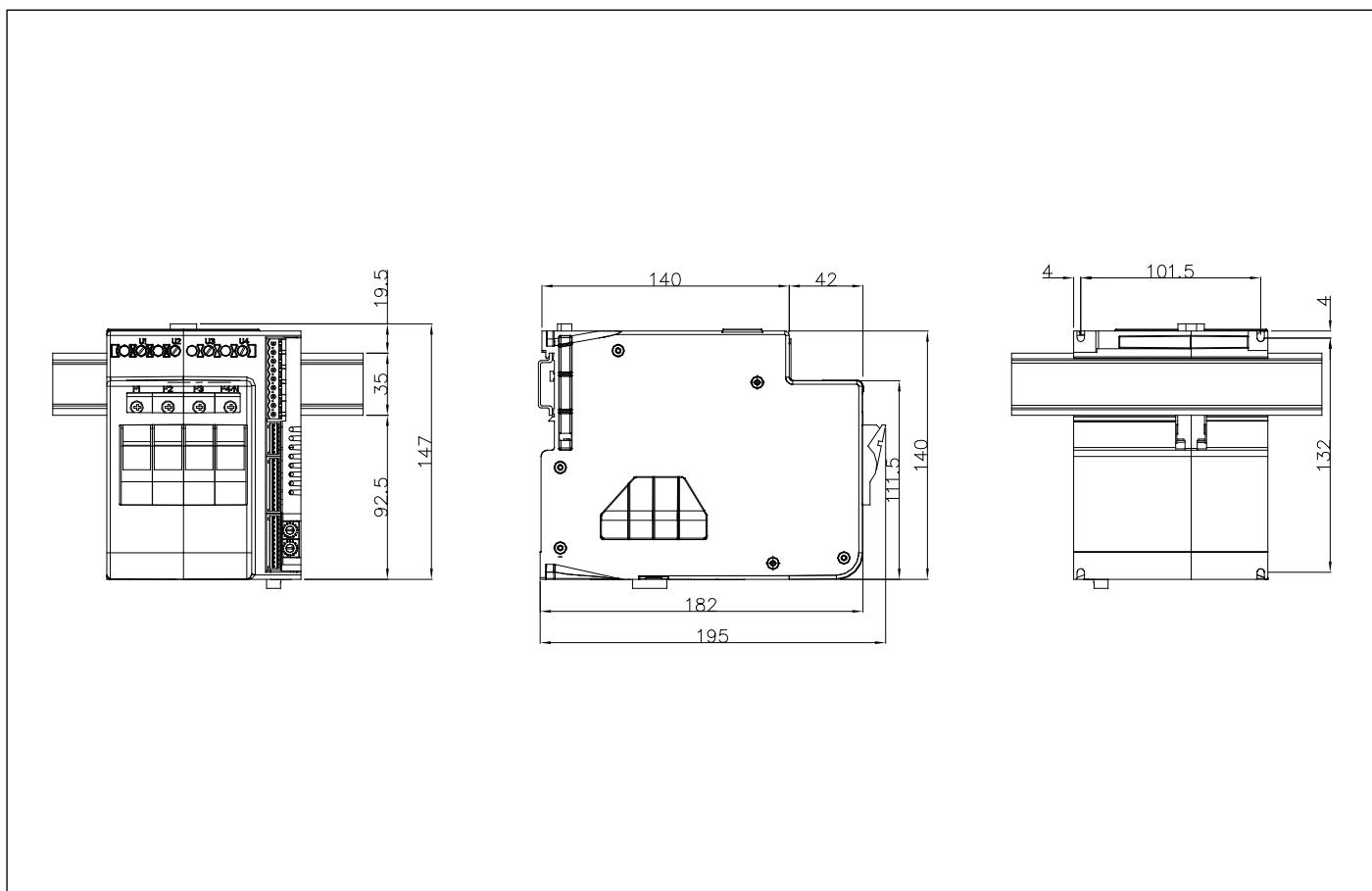


Figure 2 Model with fuse holder

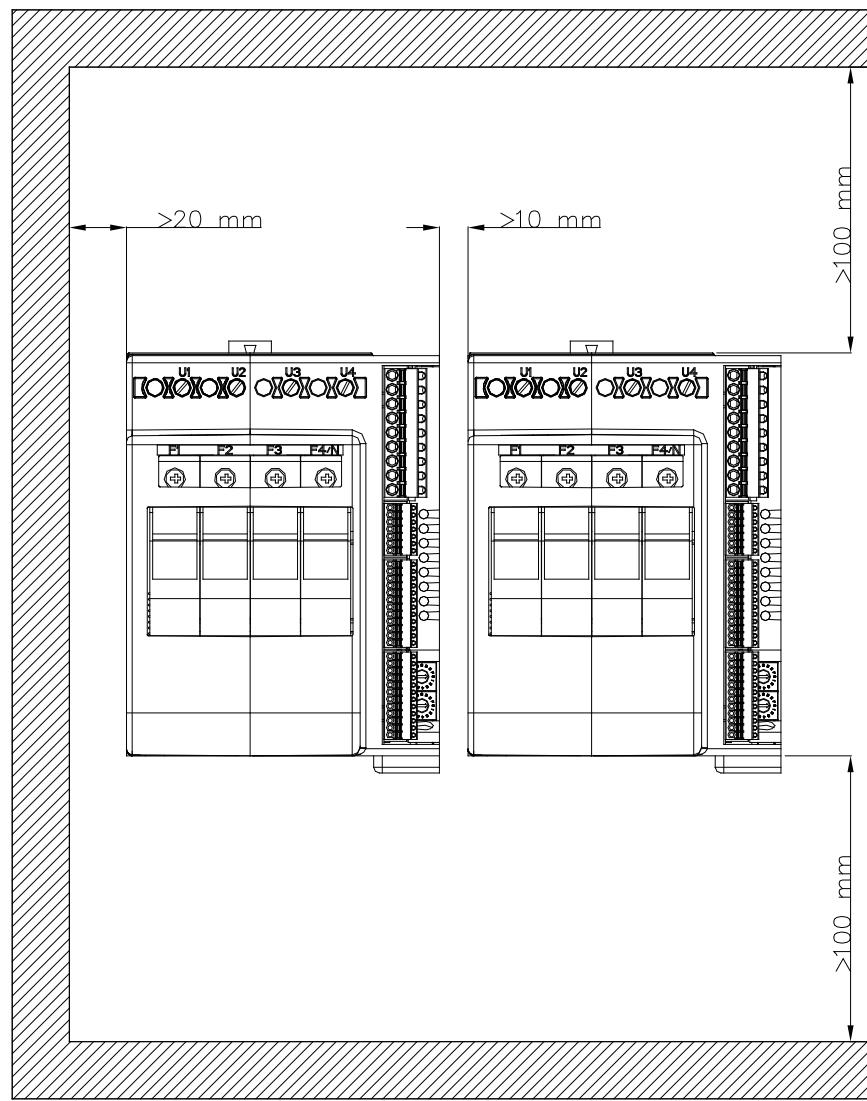


2.5 INSTALLATION



Attention: respect the minimum distances shown in Figure 3 to provide adequate air circulation.

Figure 3



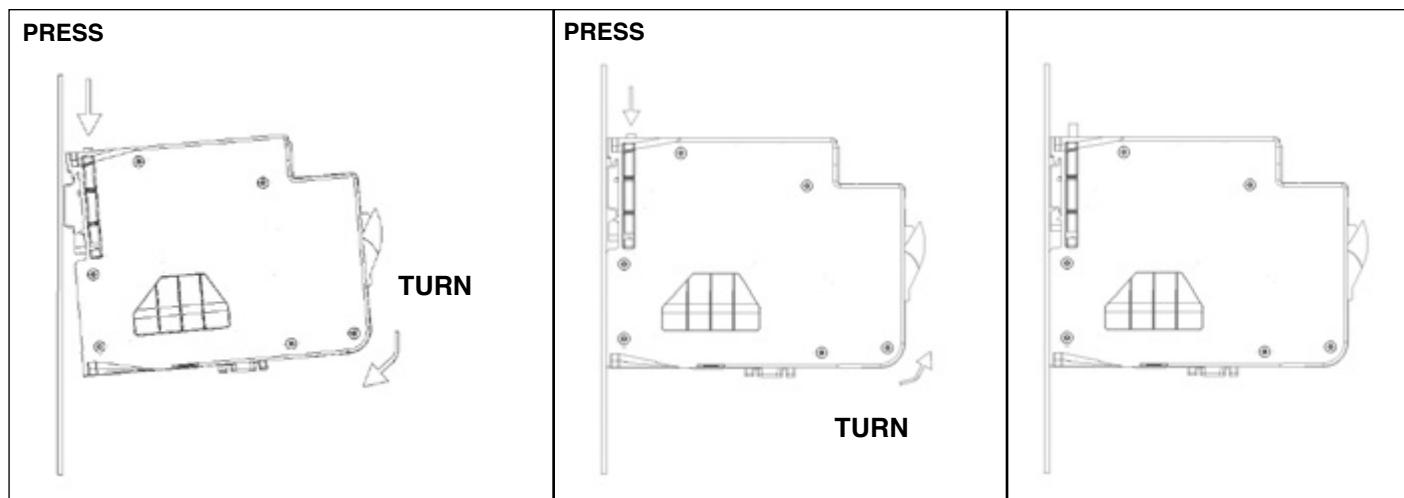
For correct attachment/release of the module on the DIN guide, do as follows:

- keep the attach/release cursor pressed
- insert/remove the module
- release the cursor

Figure 4

Figure 5

Figure 6



Products listed in table "UL508 SCCR FUSES TABLE" are suitable for use on a circuit capable of delivering not more than 100,000 A rms Symmetrical Amperes, 480 Volts maximum when protected by fuses.
Use fuses only

According to UL508, test at 100.000A were carried out with class J fuses or RK5 rated xxxA (refer to table "SCCR fuse protection table" to details of the current size fuses for the fuse).

After a shortcircuit the functioning of the device is not guaranteed.

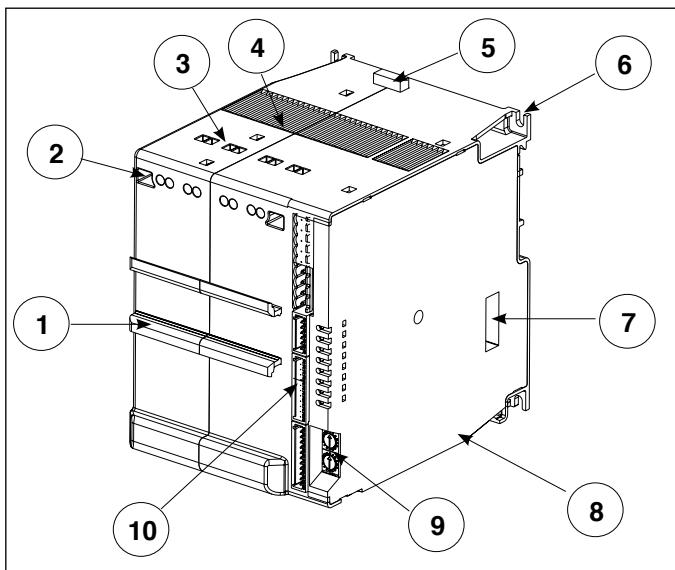
After a short circuit the operation of the device is not guaranteed. To guarantee the functioning of the device after the short circuit, it is recommend the use of extra rapid fuses as in table "EXTRARAPID FUSES".

ATTENTION: The opening of the branch-circuit protective device may be an indication that a fault has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the device should be examined and replaced if damaged. If burnout of the device occurs, the complete device must be replaced or equivalent.

UL508 SCCR FUSES TABLE				
Model	"Short circuit current [Arms]"	"Max fuse size [A]"	Fuse Class	"Max Voltage [VAC]"
GFX4-IR 30	100.000	30	RK5	600
GFX4-IR 60	100.000	30	RK5	600
GFX4-IR 80	100.000	100	J	600

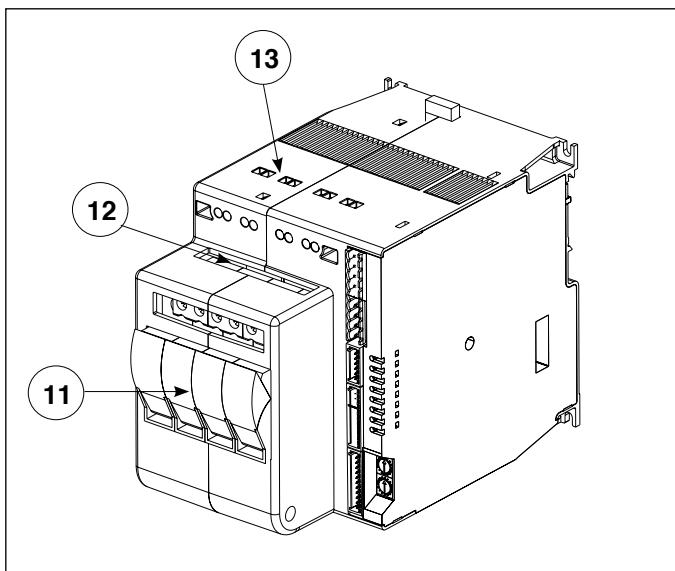
The fuses on the above table are representative of all the fuses of the same class with lower current ratings

Figure 7



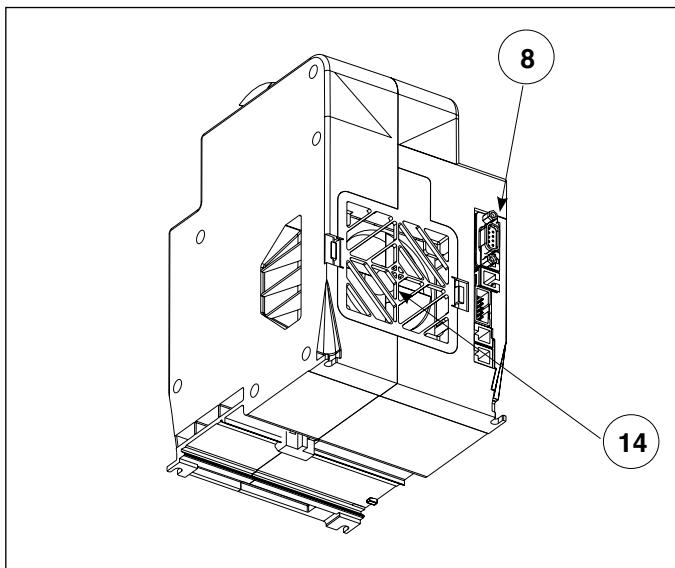
- 1 DIN bar for modules, for example, signal converters (only on models without fuse holders).
- 2 access for screwdriver to power connector screws
- 3 power connection terminals
- 4 ventilation grill: DO NOT OBSTRUCT 
- 5 cursor for insertion/removal of DIN bar attachment
- 6 screw seats for fastening module on plate
- 7 dip switches for function configuration
- 8 connectors for communication ports (Port1, Port2)
- 9 rotary switches for setting node address or number
- 10 signal and power supply connectors (J1, J2, J3, J4)

Figure 8



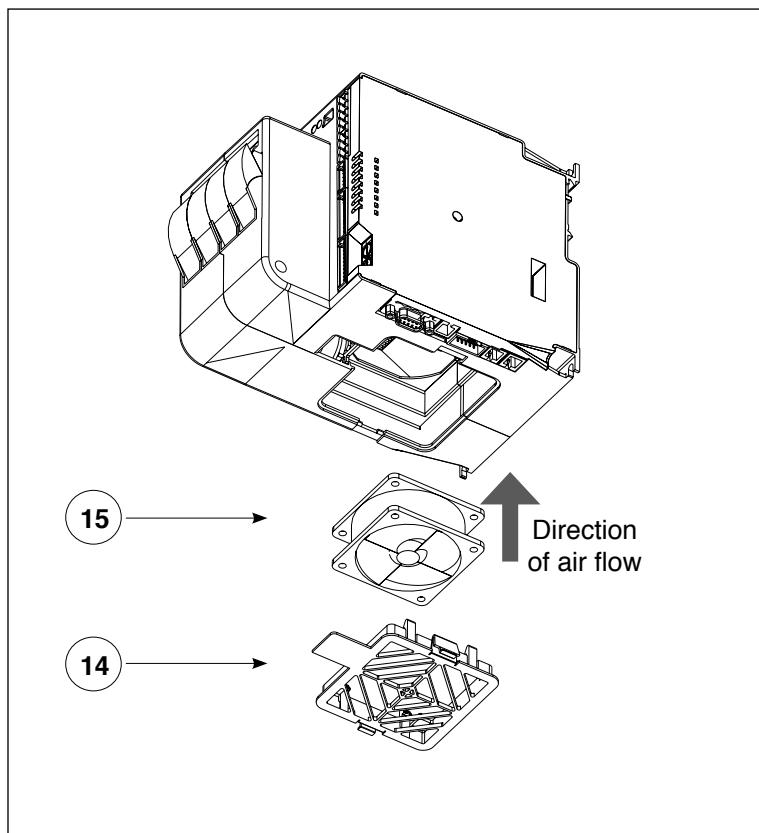
- 11. fuse holder (only for models 30KW and 60KW)
- 12. terminals for fuse holder connection (F1, F2, F3, F4/N)
- 13. terminals for load power connection (U1, U2, U3, U4)

Figure 9



- 14. ventilation air intake grill: DO NOT OBSTRUCT 

Figure 10



14 ventilation air intake grill

15 fan

PERIODIC CLEANING

Every 6-12 months (depending on the dust level of the installation) blow a compressed air jet through the upper rectangular cooling grilles (on the side opposite the fan).

This will clean the internal heat dissipater and the cooling fan.

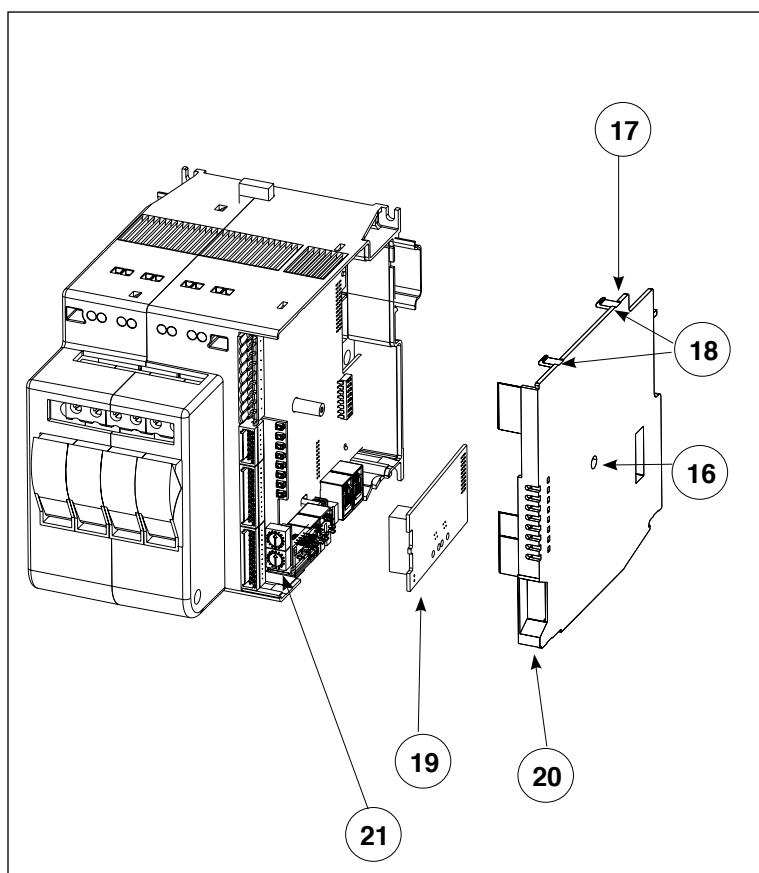
IN CASE OF OVERHEAT ALARM

If periodic cleaning does not eliminate the problem, do as follows:

- a Remove the fan support grille by detaching the two support tabs
- b Disconnect the fan connector from the board
- c Check the condition of the fan
- d Clean or replace the fan (*)
- e Insert the connector into the board
- f Insert the fan support grille until it attaches
- g Power up the device and check fan rotation when at least one load is on

(*) ATTENTION: check the fan to make sure that the arrow indicating the direction of air flow is pointed toward the heatsink.

Figure 11



Do as follows:

- a Unscrew screw 16
- b With a screwdriver, gently apply leverage at points 18
- c Remove cover 17
- d Place interface board 19 on the connectors on board 21
- e Remove pre-formed parts 20 on cover 17 based on the type of interface installed
- f Reposition cover 17 in its housing
- g Tighten screw 16

3 · ELECTRICAL CONNECTIONS

3.1 POWER CONNECTIONS

Figure 12 model without fuse holder

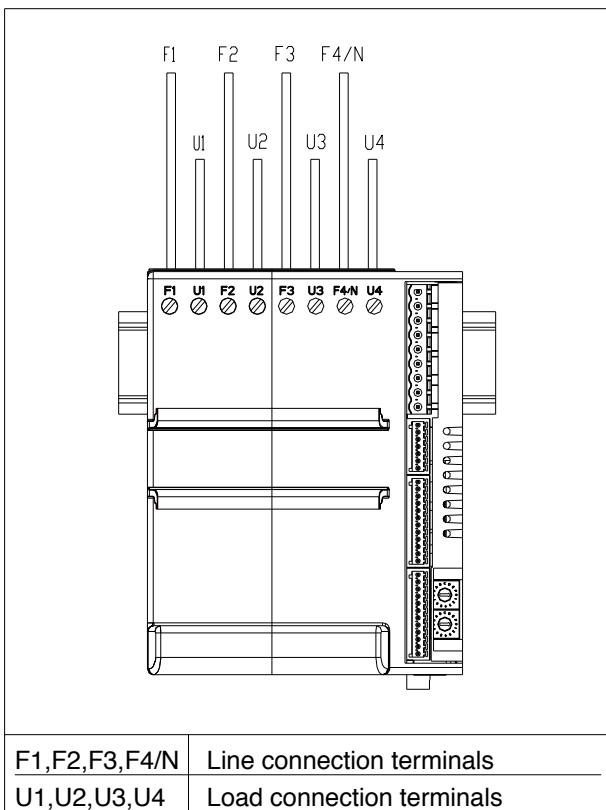


Figure 13 model with fuse holder

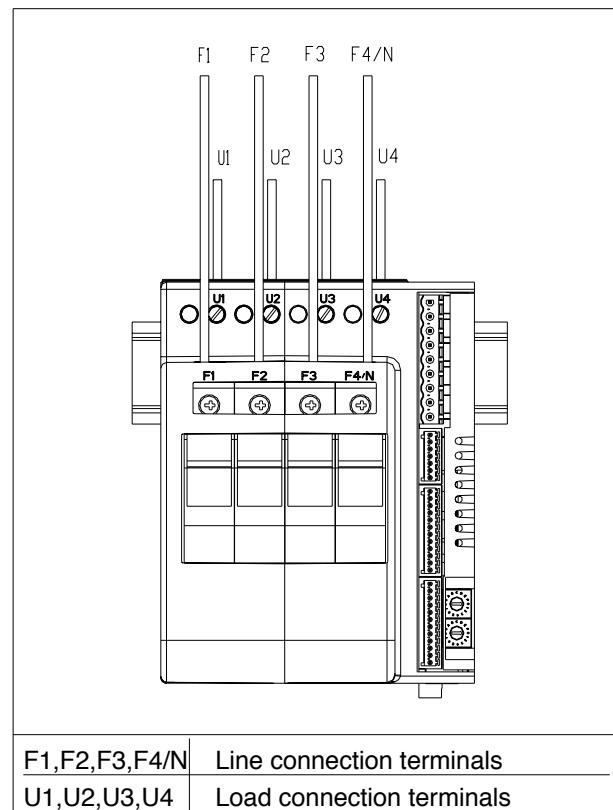


Table 4

Model	30kW		60kW		80kW	
max current	16A		32A (30A)*		57A (40A)*	
 rigid	0,2 - 6mm ²	24-10AWG	0,2 - 6mm ²	24-10AWG	0,5 - 16mm ²	20-6AWG
 flexible	0,2 - 4mm ²	24-10AWG	0,2 - 4mm ²	24-10AWG	0,5 - 10mm ²	20-7AWG
	0,25 - 4mm ²	23-10AWG	0,25 - 4mm ²	23-10AWG	0,5 - 10mm ²	20-7AWG
	0,25 - 4mm ²	23-10AWG	0,25 - 4mm ²	23-10AWG	0,5 - 10mm ²	20-7AWG
	0,5 - 0,6Nm		0,5 - 0,6Nm		1,2 - 1,5Nm	

* UL certification

3.2 INPUT/OUTPUT CONNECTIONS

Use adequate compensated cable for thermocouple inputs. Respect polarity by avoiding junctions on the cables.

If the thermocouple is grounded, the connection must be at a single point.

For resistance thermometer inputs, use copper extension cables. Resistance must not exceed 20 ohm; avoid junctions on the cables. For 2-wire resistance thermometer, connect the third wire directly on the connector.

Figure 14

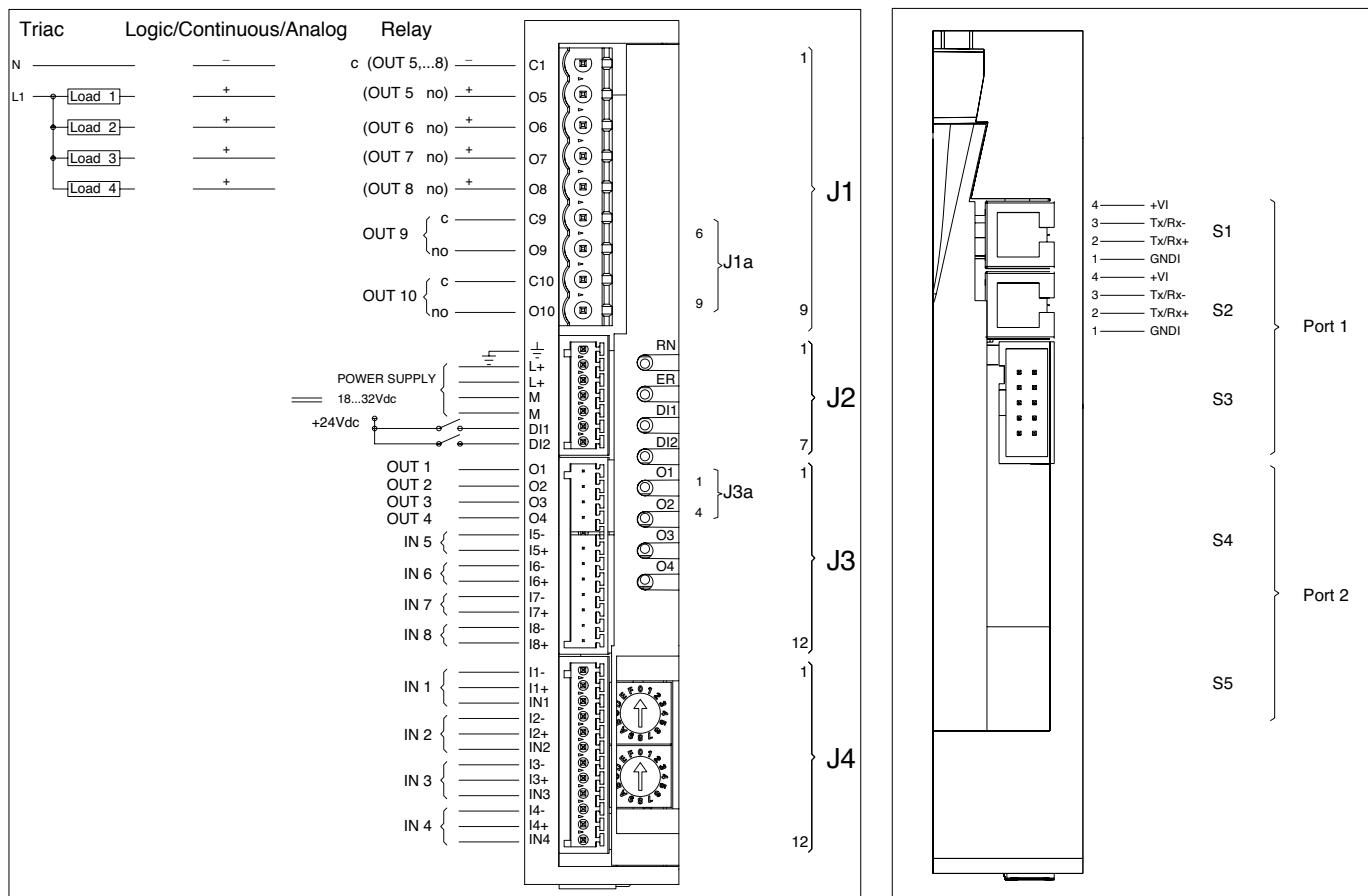


Table 5 Description of LEDs

Led	Description	color
RN	RN (green) flashing during normal operation RN (green) + ER (red) both flashing rapidly: autobaud in progress	green
ER	ER (red) on: error in one of main inputs (Lo,Hi,Err,Sbr) ER (red) flashing: overheat alarm: (OVER_HEAT or TEMPERATURE_SENSOR_BROKEN) or alarm SHORT_CIRCUIT_CURRENT (only in single-phase configuration) ER (red) - Ox (yellow) both flashing: HB alarm or POWER FAIL zone x	red
DI1	State digital input 1	yellow
DI2	State digital input 2	yellow
O1	State output Out 1	yellow
O2	State output Out 2	yellow
O3	State output Out 3	yellow
O4	State output Out 4	yellow

- All LEDs flashing rapidly except LED DI1: jumper configuration not provided for
- All LEDs flashing rapidly except LED DI2: 30%_UNBALANCED_LINE_WARNING. (only in 3-phase configuration)
- All LEDs flashing rapidly except LED O1: SHORT_CIRCUIT_CURRENT alarm (only in 3-phase configuration)
- All LEDs flashing rapidly except LED O2: TRIPHASE_MISSING_LINE_ERROR alarm (only in 3-phase configuration)

Table 6 Description of Rotary Switches

Switch	Description
	x10 Defines address of module 00...99
	x1 (in case of function mode equivalent to four Geflex units, this address is assigned to the first of the four) Hexadecimal combinations are reserved.

3.3 CONNECTOR J1 OUTPUTS 5...10

If auxiliary outputs (O5...O8), are present, connector J1a becomes J1.

Figure 15 Connector J1

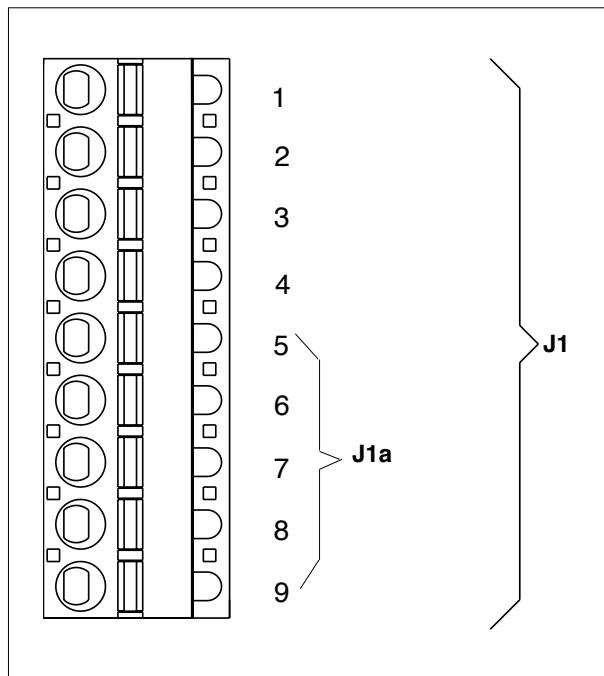


Table 7

	0,2 - 2,5mm ²	24-14AWG
	0,25 - 2,5mm ²	23-14AWG

OUTPUTS 5...8 LOGIC / CONTINUOUS / ANALOG types

Logic outputs: 18...36Vdc max 20mA

Continuous outputs: voltage (default) 0/2...10V, max 25mA
current 0/4...20mA, max 500Ω

Uscite tipo analogico: voltage (default) 0/2...10V, max 25mA
current 0/4...20mA, max 500Ω

Figure 16 Connection scheme for logic/continuous outputs

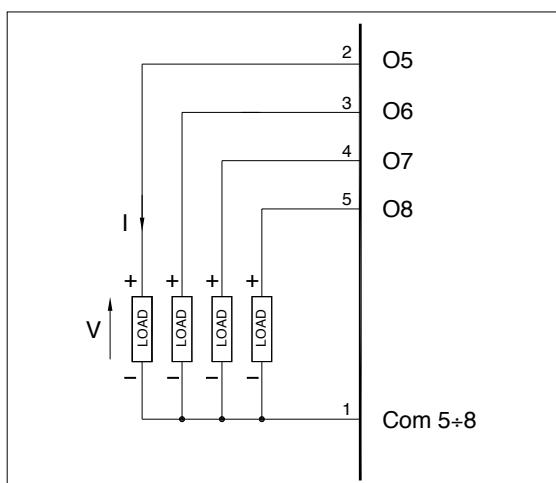
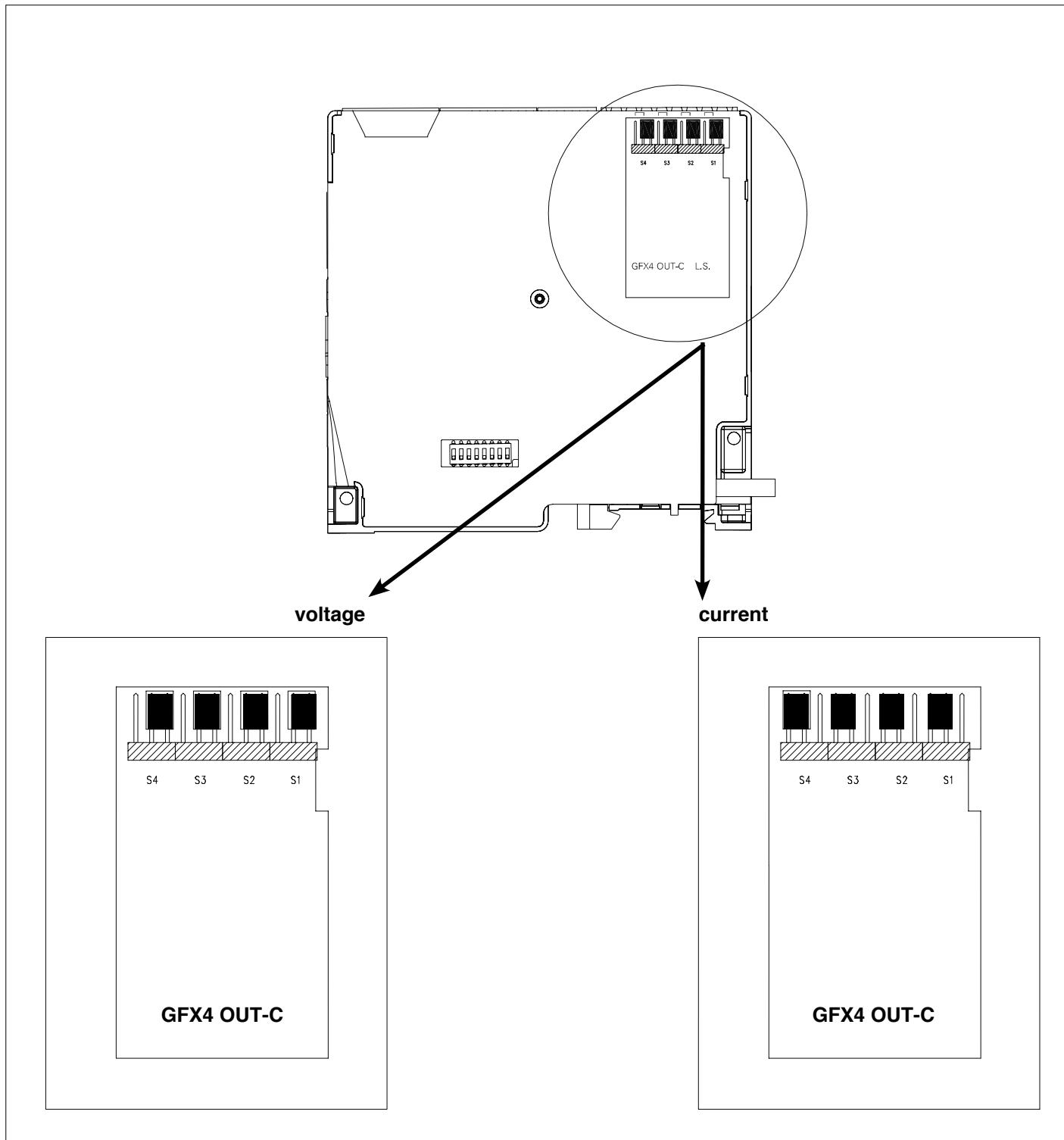


Table 8

PIN	Name	Description		
		Logic	Continuous	Analog
1	Com 5-8	Outputs common	(-)	(-)
2	O5	Output 5	(+)	(+)
3	O6	Output 6	(+)	(+)
4	O7	Output 7	(+)	(+)
5	O8	Output 8	(+)	(+)

When using the continuous “C” output option, voltage or current is set using jumper links on the board (Figure 17 refers).

Figure 17 Connection for logic/continuous outputs



Outputs 5...8 triac type

Triac outputs Vac = 24...230Vac, max 1A

Figure 18 Connection scheme for triac outputs

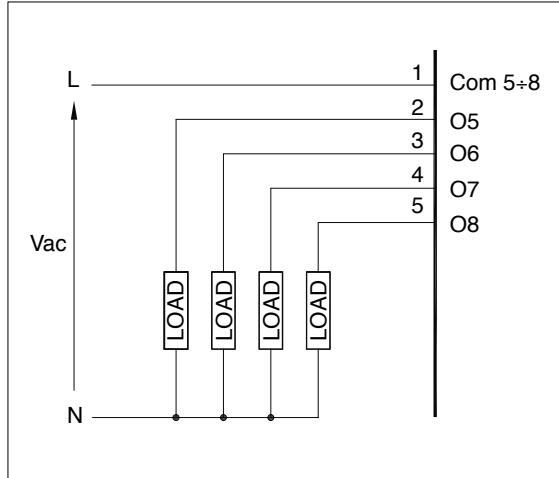


Table 9

PIN	Name	Description
1	Com 5-8	Outputs common
2	O5	Output 5
3	O6	Output 6
4	O7	Output 7
5	O8	Output 8

Outputs 5...8 relay type

Outputs Out 5...8 relay Ir = 3A max, NO

V = 250V/30Vdc cos φ = 1; I = 12A max

Figure 19 Connection scheme for relay outputs

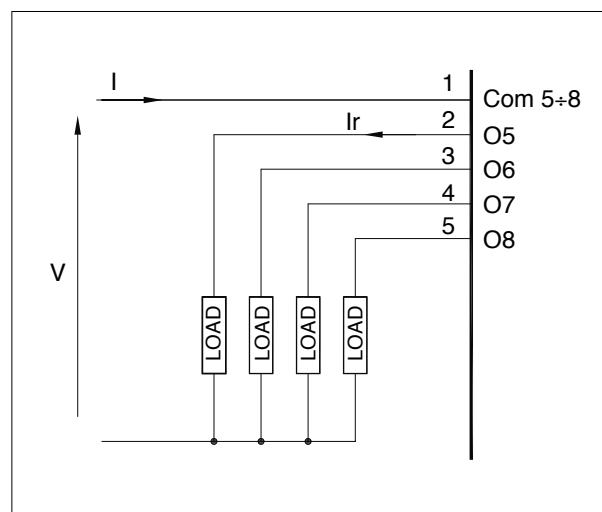


Table 10

PIN	Name	Description
1	Com 5-8	Outputs common
2	O5	Output 5
3	O6	Output 6
4	O7	Output 7
5	O8	Output 8

Outputs 9, 10 relay type

Outputs Out 9, 10 relay 5A max,

V = 250V/30Vdc cos φ = 1; I = 5A max

Figure 20 Connection scheme for relay outputs

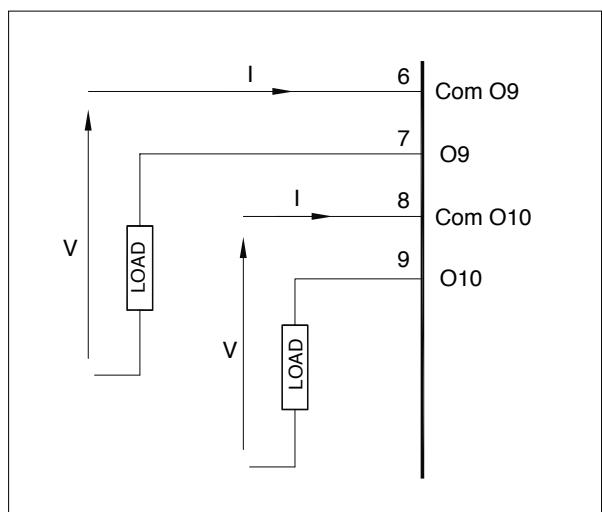


Table 11

PIN	Name	Description
1	Com O9	Output common O9
2	O9	Output O9
3	Com O10	Output common O10
4	O10	Output O10

3.4 CONNECTOR J2 POWER SUPPLY, DIGITAL INPUTS 1, 2

Figure 21

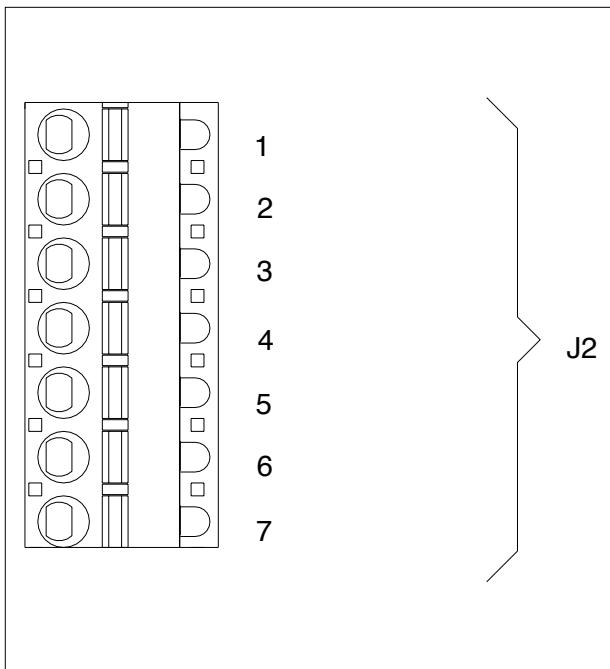


Table 12

	0,14 - 0,5mm ²	28-20AWG
	0,25 - 0,5mm ²	23-20AWG

Figure 22 Connection scheme for digital inputs and power supply

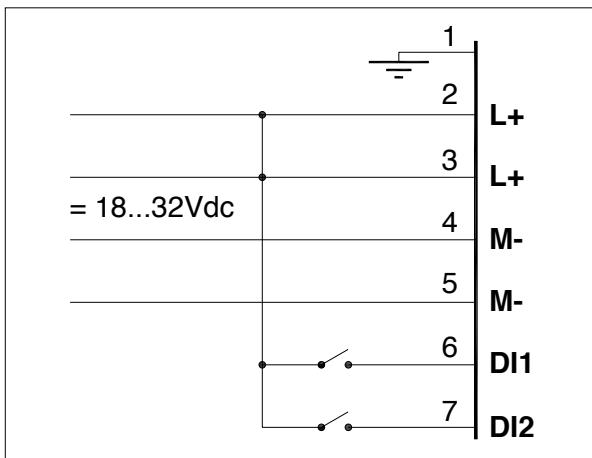


Table 13

PIN	Name	Description
1		Ground
2	L+	
3	L+	
4	M-	
5	M-	
6	DI1	Power supply 18...32Vdc
7	DI2	Digital input 1
		Digital input 2

Figure 23

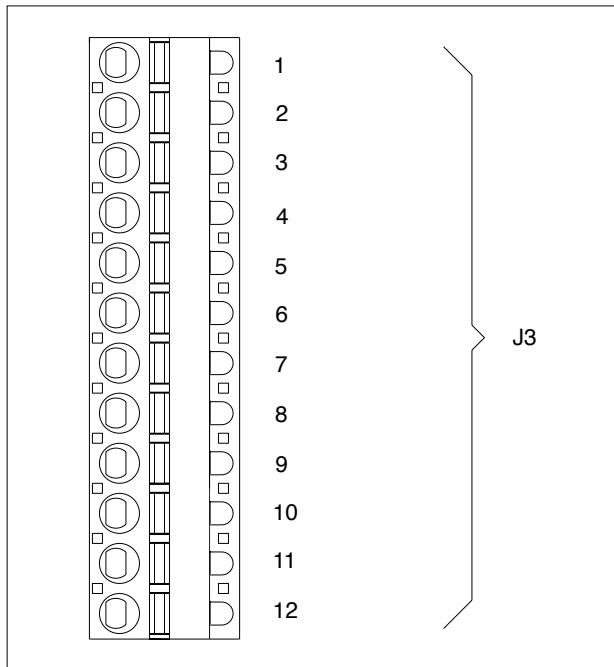


Table 14

	0,14 - 0,5mm ²	28-20AWG
	0,25 - 0,5mm ²	23-20AWG

Figure 24 Connection scheme for 60mV/TC auxiliary linear inputs

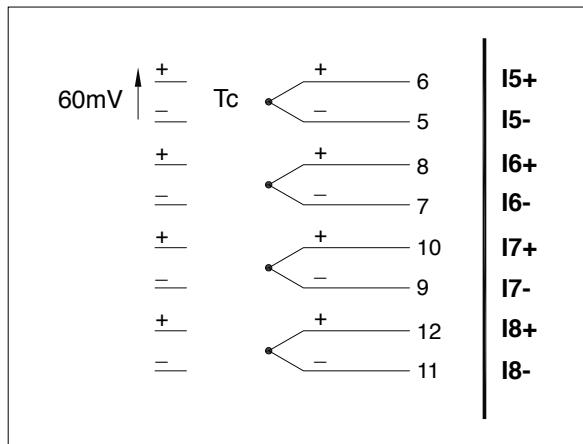


Table 15

PIN	Name	Description
1	-	nc
2	-	nc
3	-	nc
4	-	nc
5	I5-	Auxiliary input 5
6	I5+	
7	I6-	Auxiliary input 6
8	I6+	
9	I7-	Auxiliary input 7
10	I7+	
11	I8-	Auxiliary input 8
12	I8+	

3.6 CONNECTOR J4 INPUTS 1...4

Figure 25

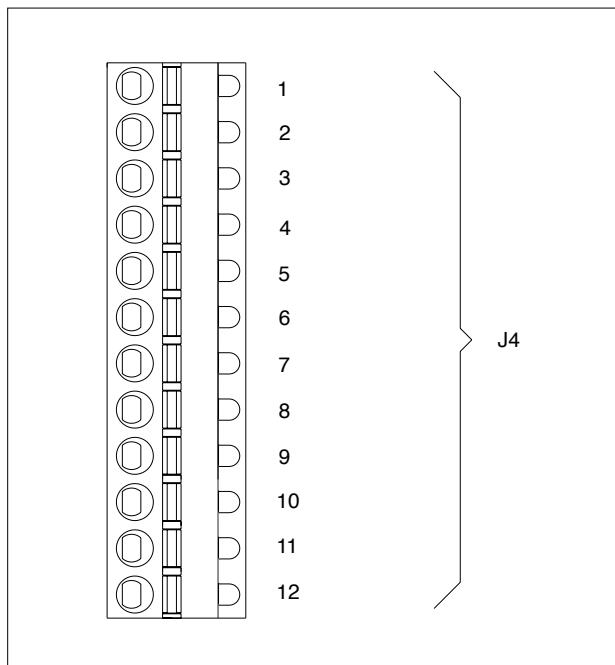


Table 16

	0,2 - 2,5mm ²	24-14AWG
	0,25 - 2,5mm ²	23-14AWG

Figure 26 Connection scheme for 60mV TC/ linear input

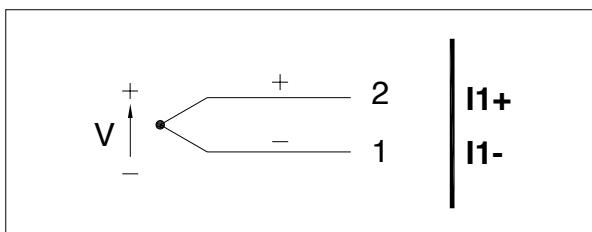
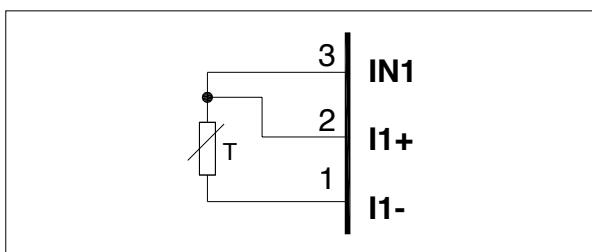


Figure 27 Connection scheme for Pt100 input



NOTE: In the case of a two-wire thermoresistance, connect the third wire directly to the connector.

Figure 28 Connection scheme for 1V/10V/20mA linear input

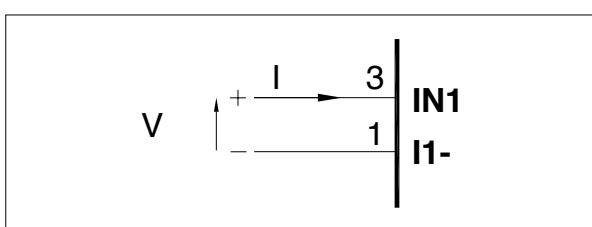


Table 17

PIN	60mV/Tc linear input	1V/10V/20mA linear input	Pt100 input
1	I1-	I1-	I1-
2	I1+		I1+
3		IN1+	IN1
4	I2-	I2-	I2-
5	I2+		I2+
6		IN2+	IN2
7	I3-	II3-	I3-
8	I3+		I3+
9		IN3+	IN3
10	I4-	I4-	I4-
11	I4+		I4+
12		IN4+	IN4

Figure 29

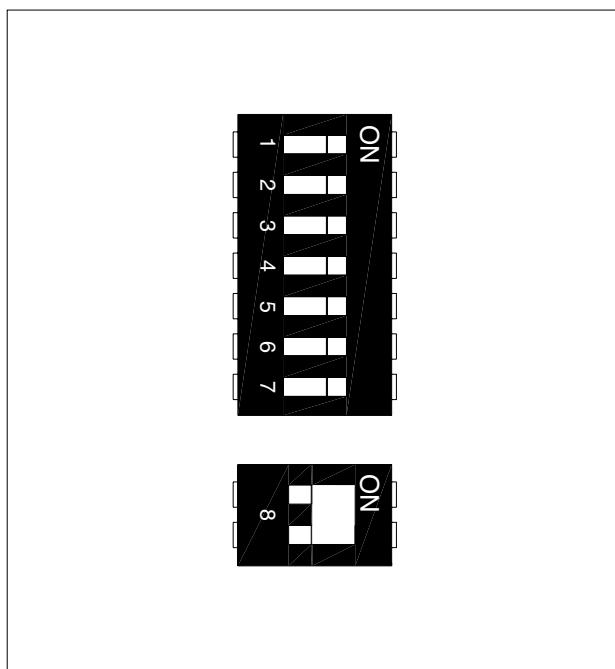


Table 18

dip-switches	Description
1	Connection type: (see Table 19)
2	Connection type: (see Table 19)
3	Connection type: (see Table 19)
4	Connection type: (see Table 19)
5	OFF = resistive load ON = inductive load (transformer primary control)
6	ON = reset factory configuration
7	ON = Geflex simulation function
8	ON = insert line termination for Port1 / RS485

Table 19

OFF = Single phase load ON = Three-phase load	OFF = Star ON = Triangle	OFF = Open Triangle ON = Closed Triangle	OFF = With Neutral ON = Without Neutral	OFF: resistive load ON: inductive load (transformer primary control)	Connection type
Dip 1	Dip 2	Dip 3	Dip 4	Dip 5	
OFF	OFF	OFF	OFF	OFF/ON	4 single-phase loads
OFF	ON	OFF	ON	OFF/ON	3 independent single-phase loads in open delta
ON	ON	OFF	ON	OFF/ON	3-phase load open delta
ON	ON	ON	ON	OFF/ON	3-phase load closed delta
ON	OFF	-	ON	OFF/ON	3-phase star load without neutral
ON	OFF	-	OFF	OFF/ON	3-phase star load with neutral

IMPORTANT!

After setting the required DIP-SWITCH configuration, run the following parameter initialization procedure once:

- Check the correct setting of DIPS 1-2-3-4-5
- Set DIP 6 to "ON" (factory configuration)
- Power the device with 24 VDC
- Wait for correct and regular flashing of the GREEN RUN LED
- Set DIP 6 to "OFF"
- The device is correctly configured

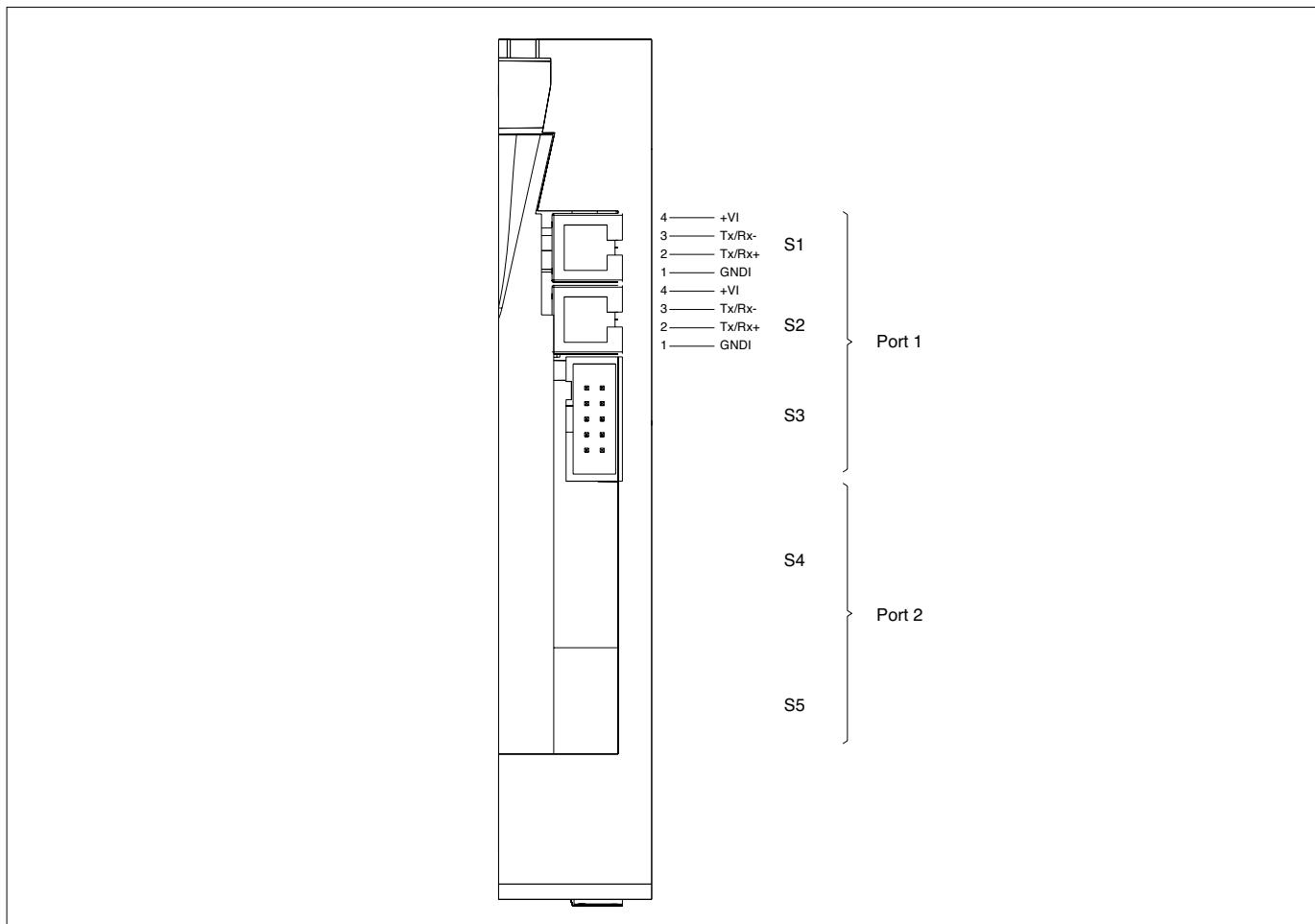
Note: If the hardware DIP-Switches are not accessible you can switch to virtual DIP-Switch management (via serial) using the configuration kit. Refer to the product software manual, HW/SW INFORMATION paragraph.



3.8 SERIAL COMMUNICATION PORTS

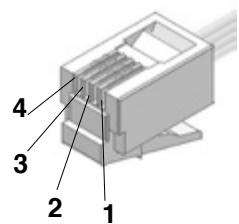
Port1 (local bus): Modbus serial interface – connectors S1, S2, S3

Figure 30



Connector S3 to connection at GFX-OP terminal or to Geflex slave modules (GFX-S1, GFX-S2)

Table 20

Connector S1/S2 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(*) Insert the RS485 line termination in the last device on the Modbus line, see dip-switches. (**) Connect the GND signal among Modbus devices with a line distance > 100 m.
	2	Tx/Rx+	Data reception/transmission (A+)	
	3	Tx/Rx-	Data reception/transmission (B-)	
	4	+V (reserved)	-	

Cable type: flat telephone cable for pin 4-4 conductor 28AWG

Port2 (fieldbus): connectors S4, S5 MODBUS RTU/MODBUS RTU

Figure 31 Port2: Fieldbus Modbus RTU/Modbus RTU interface

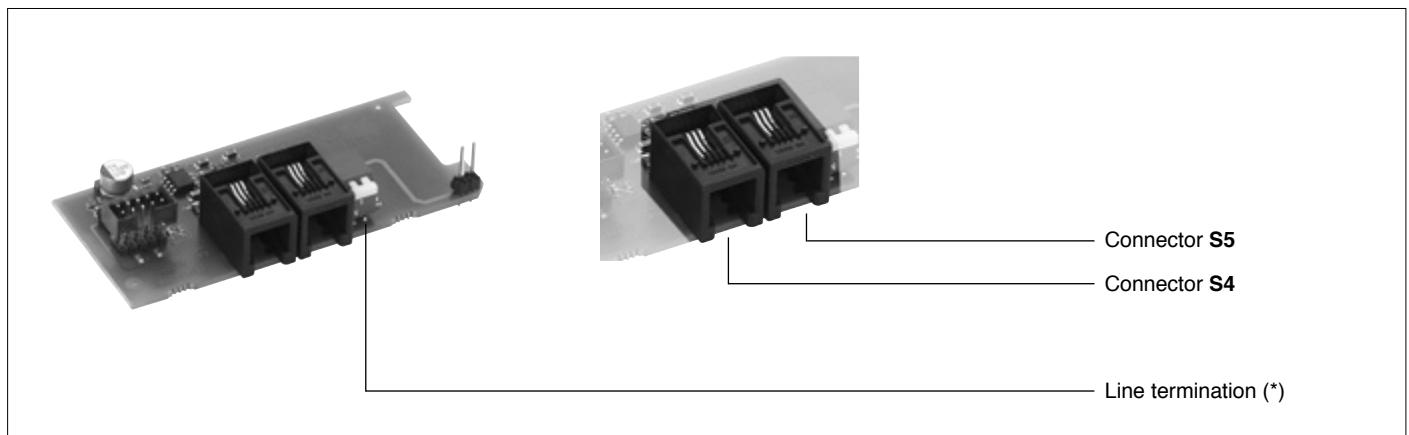
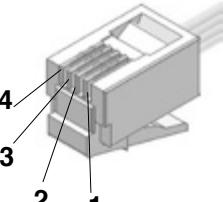


Table 21

Connector S4/S5 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(*) Insert the line termination in the last device on the Modbus line. (**) Connect the GND signal among Modbus devices with a line distance > 100 m.
	2	Tx/Rx+	Data reception/transmission (A+)	
	3	Tx/Rx-	Data reception/transmission (B-)	
	4	+V (reserved)	-	

Cable type: flat telephone cable for pin 4-4 conductor 28AWG

Port2 (fieldbus): connectors S4, S5 MODBUS RTU/Profibus DP

Figure 32 Port2: Fieldbus Modbus RTU/Profibus DP interface

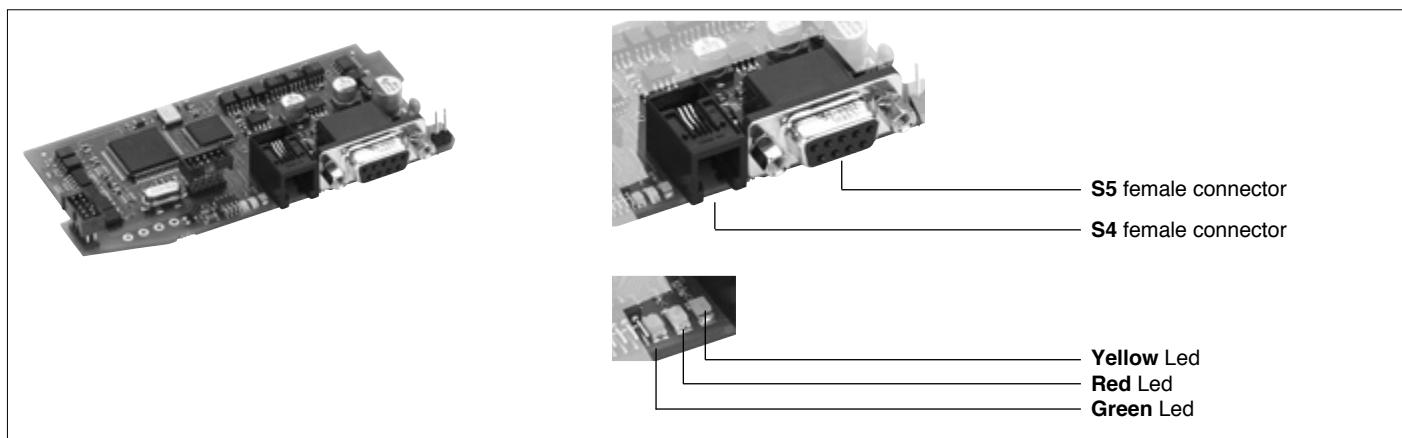


Table 22

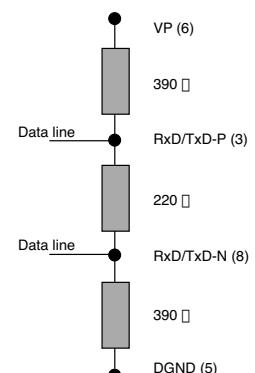
Connector S4 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal among Modbus devices with a line distance > 100 m.
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V (reserved)	-	

Cable type: flat telephone cable for fin 4-4 conductor 28AWG

Table 23

Connector S5 D-SUB 9 pins male	Nr. Pin	Name	Description	Note
	1	SHIELD	EMC protection	Connect the terminal resistances as shown in the figure.
	2	M24V	Output voltage - 24V	
	3	RxD/TxD-P	Data reception/transmission	
	4	n.c.	n.c.	
	5	DGND	Data Ground	
	6	VP	Positive power supply +5V	
	7	P24V	Output voltage +24V	
	8	RxD/TxD-N	Data reception/transmission	
	9	n.c.	n.c.	

Cable type: Shielded 1 pair 22AWG conforming to PROFIBUS.



Port2 (fieldbus): connectors S4, S5 MODBUS RTU/CANopen or EUROMAP 66

Figure 33 Port2: Fieldbus Modbus RTU/CANopen interface or EUROMAP 66

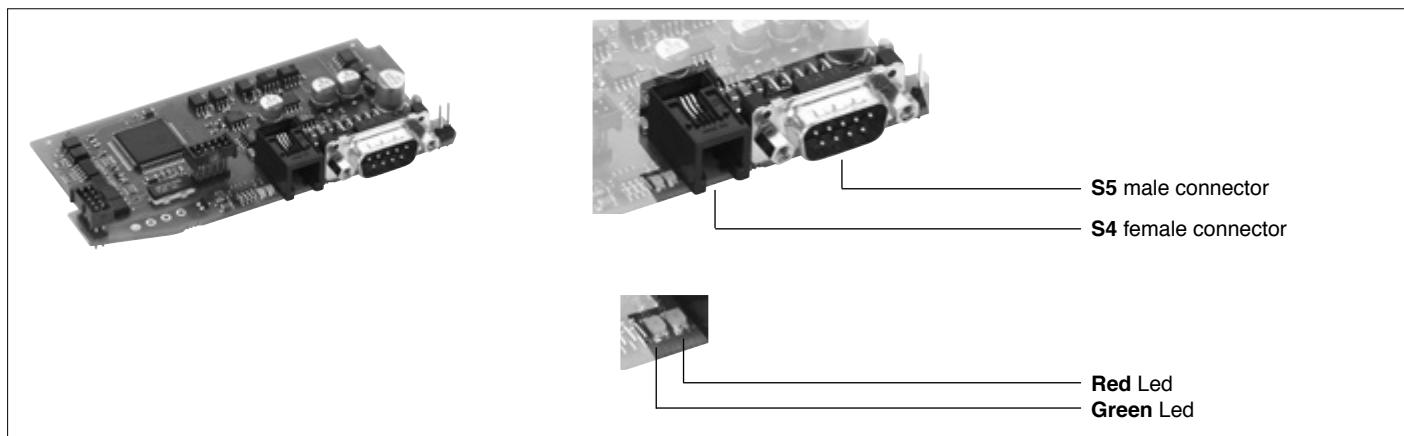


Table 24

Connector S4 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal among Modbus devices with a line distance > 100 m.
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V (reserved)	-	

Cable type: flat telephone cable for fin 4-4 conductor 28AWG

Table 25

Connector S5 D-SUB 9 pins female	Nr. Pin	Name	Description	Note
	1	-	Reserved	Connect the terminal resistances as shown in the figure.
	2	CAN_L	CAN_L bus line (domination low)	
	3	CAN_GND	CAN Ground	
	4	-	Reserved	
	5	(CAN_SHLD)	Optional CAN Shield	
	6	(GND)	Optional Ground	
	7	CAN_H	CAN_H bus line (domination high)	
	8	-	Reserved	
	9	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies)	

Cable type: Shielded 2 pairs 22/24AWG conforming to CANopen.

Port2 (fieldbus): connectors S4, S5 MODBUS RTU/DeviceNet

Figure 34 Port2: Fieldbus Modbus RTU/DeviceNet interface

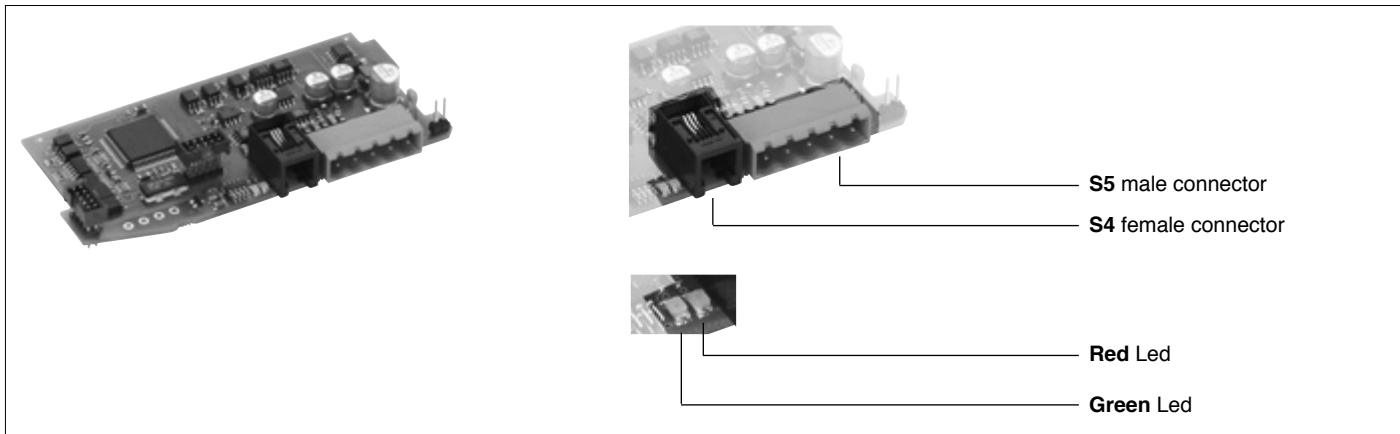


Table 26

Connector S4 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal among Modbus devices with a line distance > 100 m.
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V (reserved)	-	

Cable type: flat telephone cable for fin 4-4 conductor 28AWG

Table 27

Connector S5 MC-1,5/5 - ST1-5,08 5 pole female	Nr. Pin	Name	Description	Note
	1	V-	Negative power supply	Connect a 120Ω / 1/4W resistance between the "CAN_L" and "CAN_H" signals at each end of the DeviceNet network.
	2	CAN_L	Low signal	
	3	SHIELD	Shield	
	4	CAN_H	high signal	
	5	V+	Positive power supply	

Cable type: Shielded 2 pairs 22/24AWG conforming to DeviceNet.

Port2 (fieldbus): connectors S4, S5 Modbus RTU / Ethernet Modbus TCP

Figure 35 Port2: Modbus RTU / Ethernet Modbus TCP interface

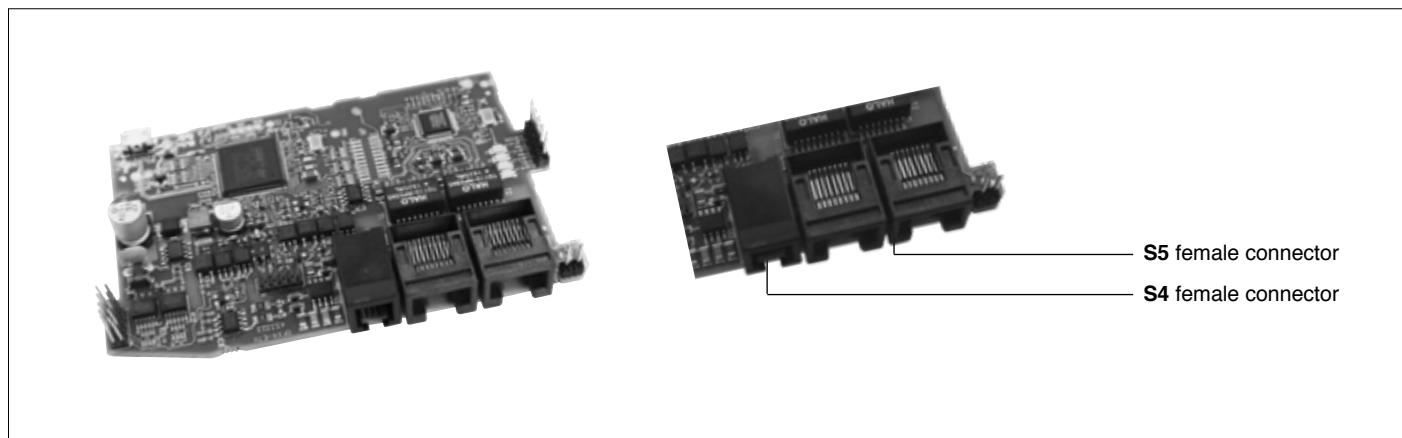


Table 28

Connector S4 RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal between Modbus devices with a line distance > 100 m.
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V (reserved)	-	

Cable type: flat telephone cable for pin 4-4 conductor 28AWG

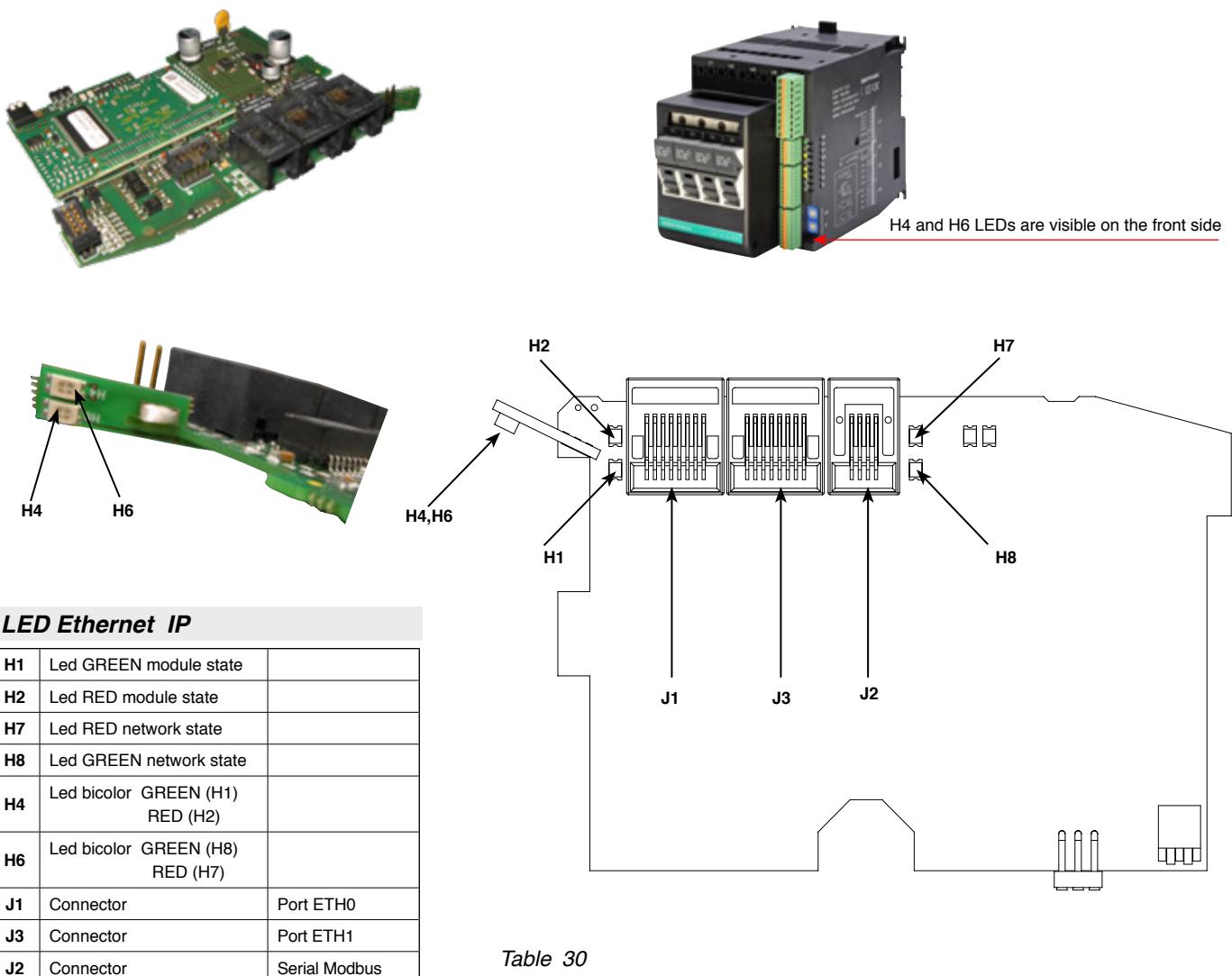
Table 29

Connector S5 RJ45	Nr. Pin	Name	Description	Note
	1	TX+	Data + transmission	
	2	TX-	Data - transmission	
	3	RX+	Data + reception	
	4	n.c.		
	5	n.c.		
	6	RX-	Data - reception	
	7	n.c.		
	8	n.c.		

Cable type: Use standard category 6 cable according to TIA/EIA-568A

Port2 (fieldbus): connectors S4, S5 Modbus RTU/ Ethernet IP or Modbus RTU / EtherCAT or Modbus RTU / ProfiNET

Figure 36 Port2: Modbus RTU / Ethernet IP or Modbus RTU/EtherCAT or Modbus RTU / ProfiNET Interfaces



LED EtherCAT

H1	Led GREEN link/activity	Port ETH0
H2	Led RED run	Run
H7	Led RED run	Run
H8	Led GREEN link/activity	Port ETH1
H4	Led bicolor GREEN (H1) RED (H2)	Port ETH0
H6	Led bicolor GREEN (H8) RED (H7)	Port ETH1
J1	Connector	Port ETH0 (IN)
J3	Connector	Port ETH1 (OUT)
J2	Connector	Serial Modbus

LED ProfiNET

H1	Led GREEN LINK	Port ETH0
H2	Led RED signal	Port ETH0
H7	Led RED activity	Port ETH1
H8	Led GREEN LINK	Port ETH1
H4	Led bicolor GREEN (H1) RED (H2)	Port ETH
H6	Led bicolor GREEN (H8) RED (H7)	Port ETH
J1	Connector	Port ETH0
J3	Connector	Port ETH1
J2	Connector	Serial Modbus

Table 30

Connector J2 RJ10 4-4 pin				
	N°Pin	Name	Description	Note
	1	GND1 (**)	-	(***) It is advisable to also connect the GND signal between Modbus devices with a line distance > 100 m
	2	Rx/Tx+	Data reception/transmission (A)	
	3	Rx/Tx-	Data reception/transmission (B)	
	4	+V (reserved)	-	

Cable type: flat telephonic for 4-4 pin 28AWG conductor

Table 31

Connector J1 and J3 RJ45				
	N°Pin	Name	Description	Note
	1	TX+	Data transmission +	- TX- and RX+ swapped
	2	TX-	Data transmission -	
	3	RX+	Data reception +	
	4	n.c.		
	5	n.c.		
	6	RX-	Data reception -	
	7	n.c.		
	8	n.c.		

Cable type: use standard category 5 cable according to TIA/EIA-568B

3.9 CONNECTION EXAMPLE: COMMUNICATION PORTS

Integration of GFX4 with GEFLEX modules connected in RS485 Modbus

Figure 37

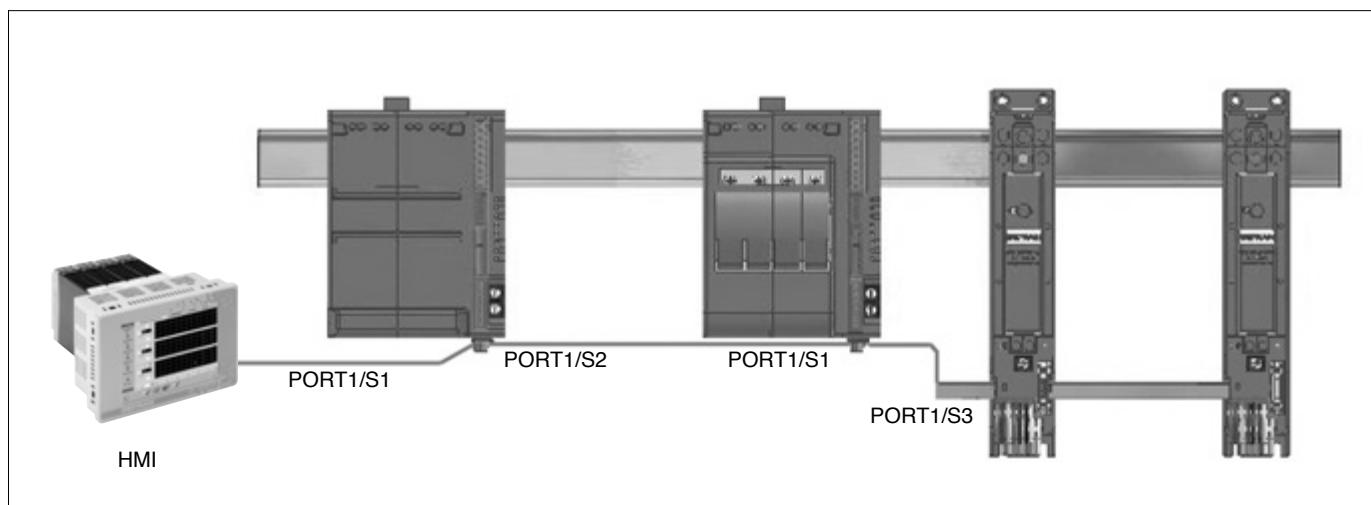


Figure 38

Supervision from PC/PLC simultaneous with GFXOP configuration terminal (each module must have a fieldbus interface)

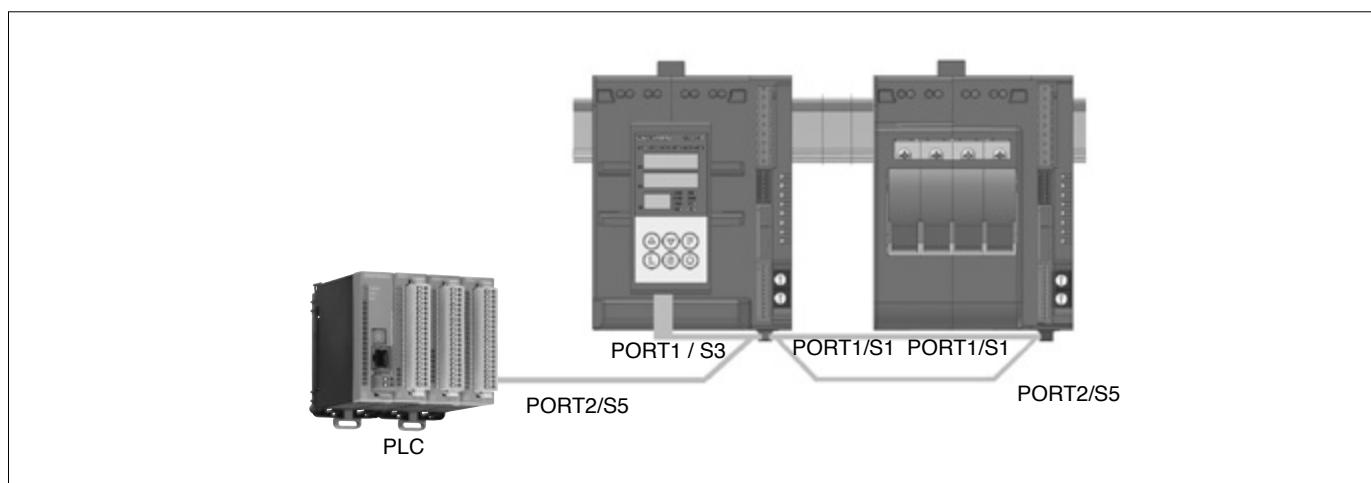
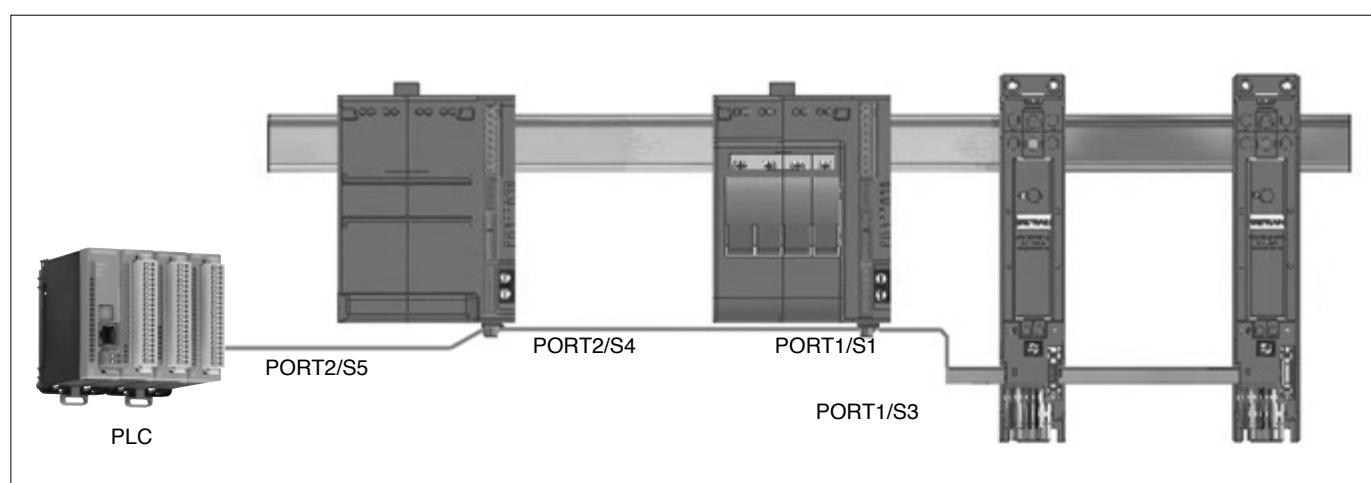


Figure 39

Supervision from PC/PLC via a single module equipped with fieldbus interface



3.10 CONNECTION EXAMPLE: POWER SECTION

Figure 40 Connection example for 4 single-phase loads, single-phase line L1-L2/N

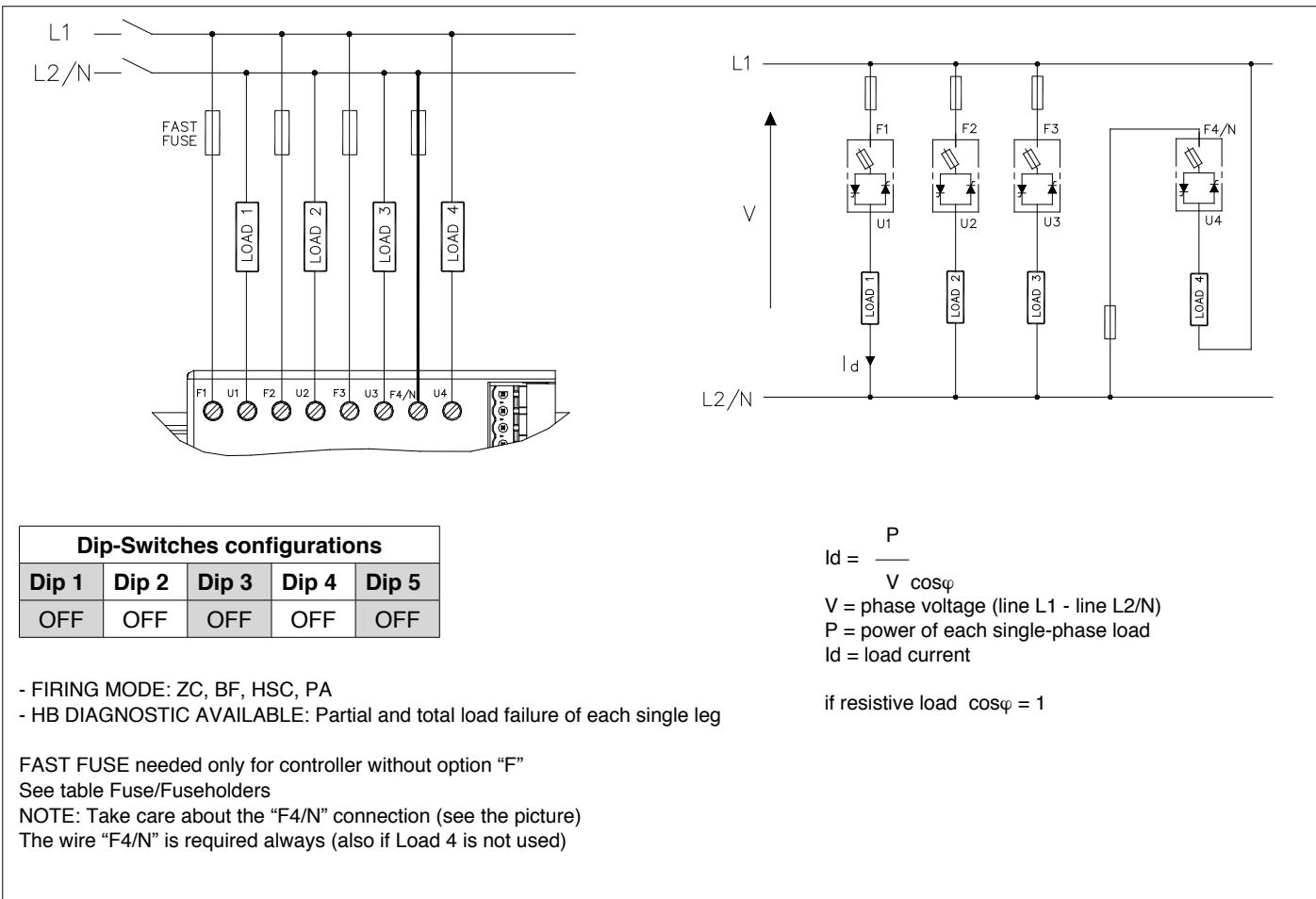


Figure 41 Connection example for 4 single-phase loads, 3-phase line without neutral

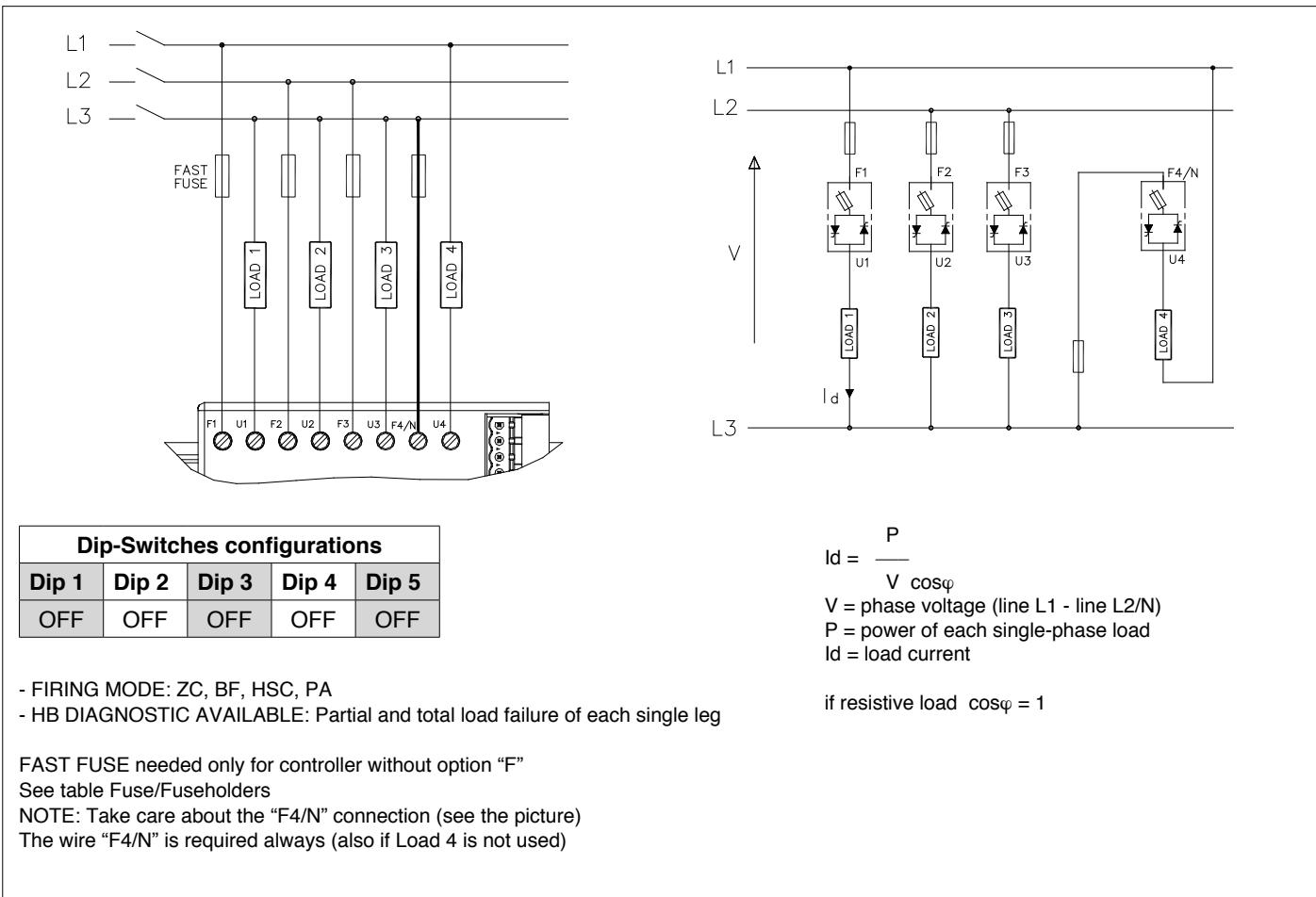
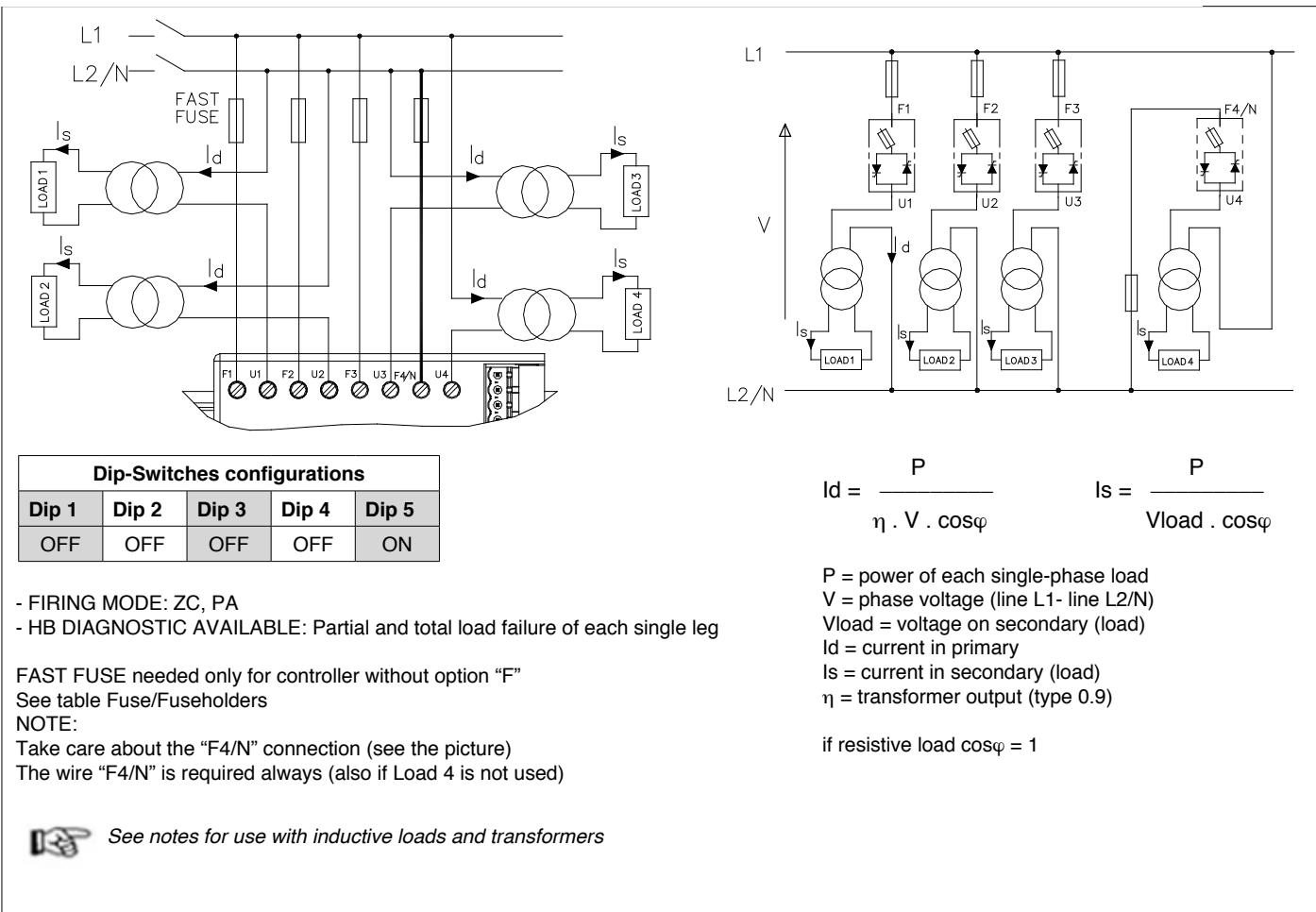


Figure 42 Connection example for 4 single-phase transformer loads, single-phase line L1-L2/N



$$Id = \frac{P}{\eta \cdot V \cdot \cos\varphi}$$

$$Is = \frac{P}{Vload \cdot \cos\varphi}$$

P = power of each single-phase load

V = phase voltage (line L1- line L2/N)

Vload = voltage on secondary (load)

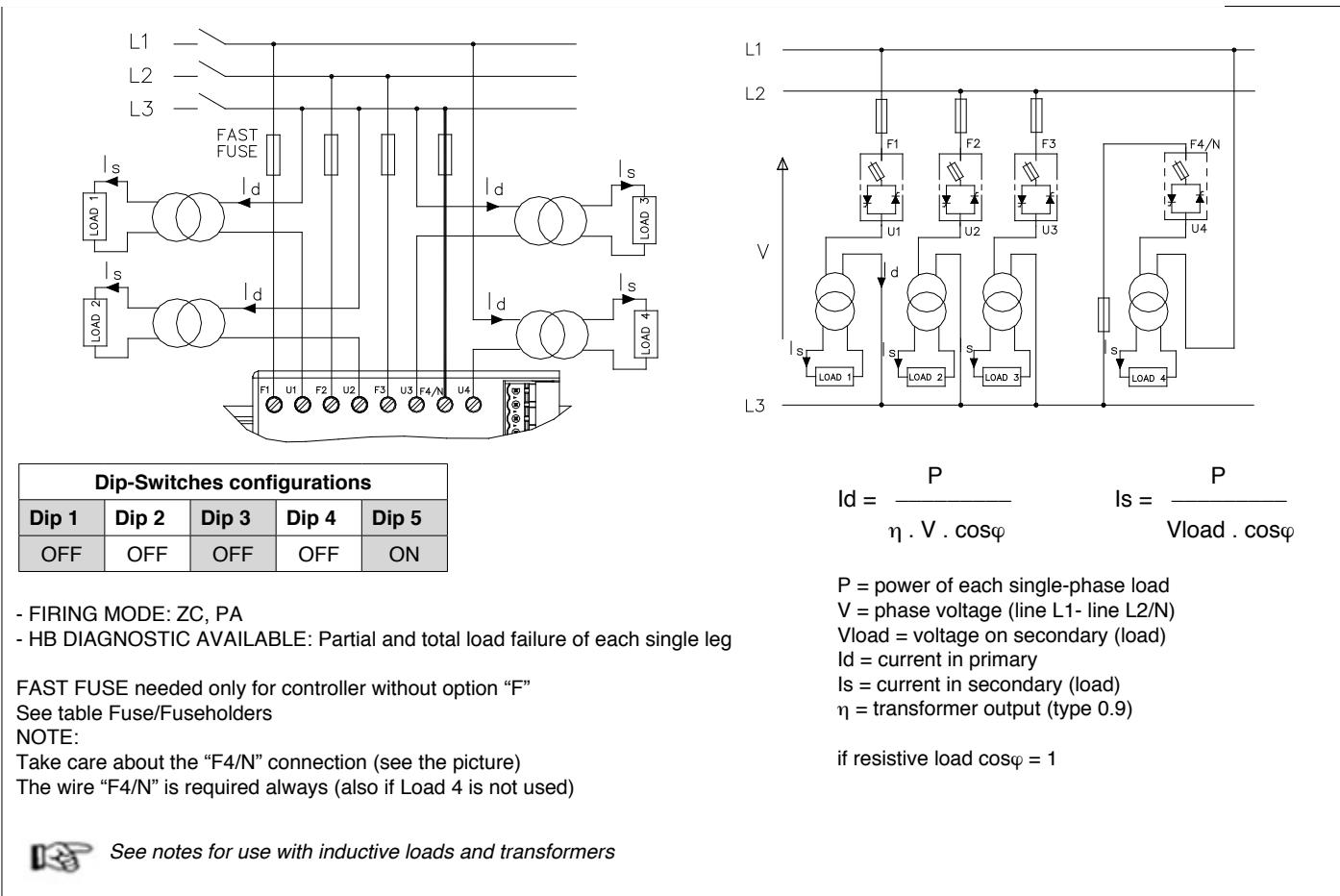
Id = current in primary

Is = current in secondary (load)

η = transformer output (type 0.9)

if resistive load $\cos\varphi = 1$

Figure 43 Connection example for 4 single-phase transformer loads, 3-phase line without neutral



$$Id = \frac{P}{\eta \cdot V \cdot \cos\varphi}$$

$$Is = \frac{P}{Vload \cdot \cos\varphi}$$

P = power of each single-phase load

V = phase voltage (line L1- line L2/N)

Vload = voltage on secondary (load)

Id = current in primary

Is = current in secondary (load)

η = transformer output (type 0.9)

if resistive load $\cos\varphi = 1$

Figure 44 Connection example for 4 single-phase loads, 3-phase line with neutral

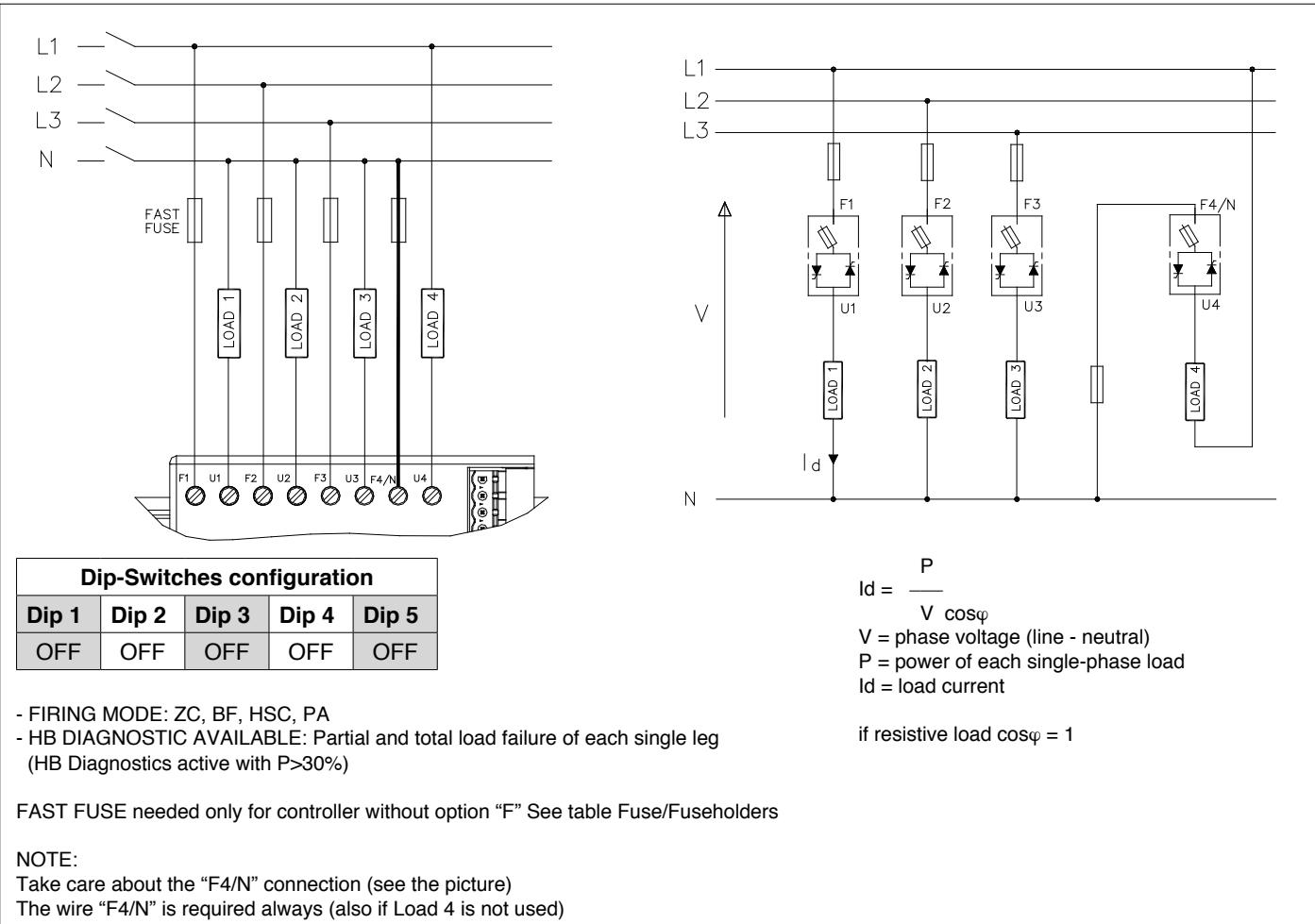


Figure 45 Connection example for 4 single-phase transformer loads, 3-phase line with neutral

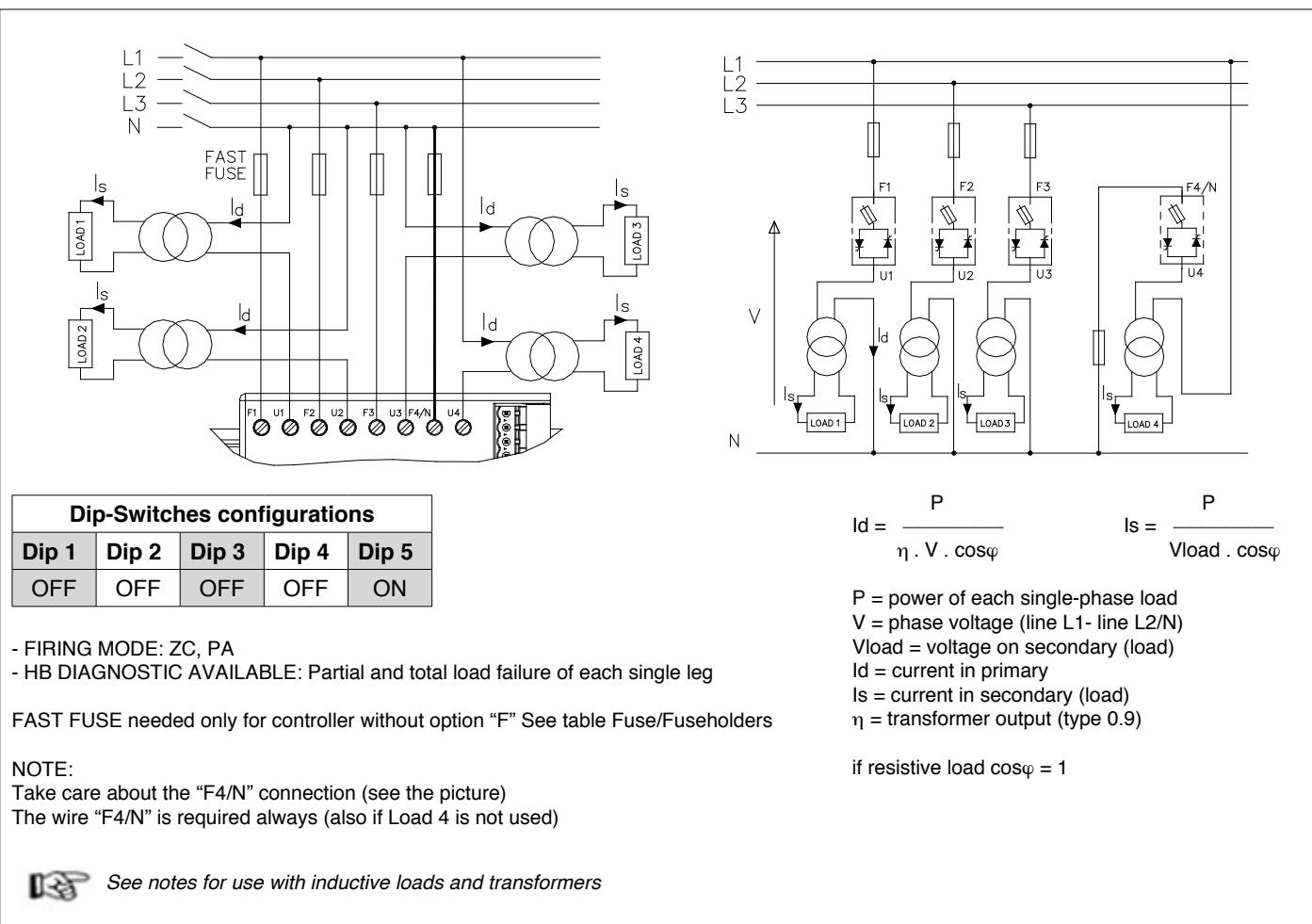


Figure 46

Connection example for 3 independent single-phase loads in open delta, 3-phase line without neutral

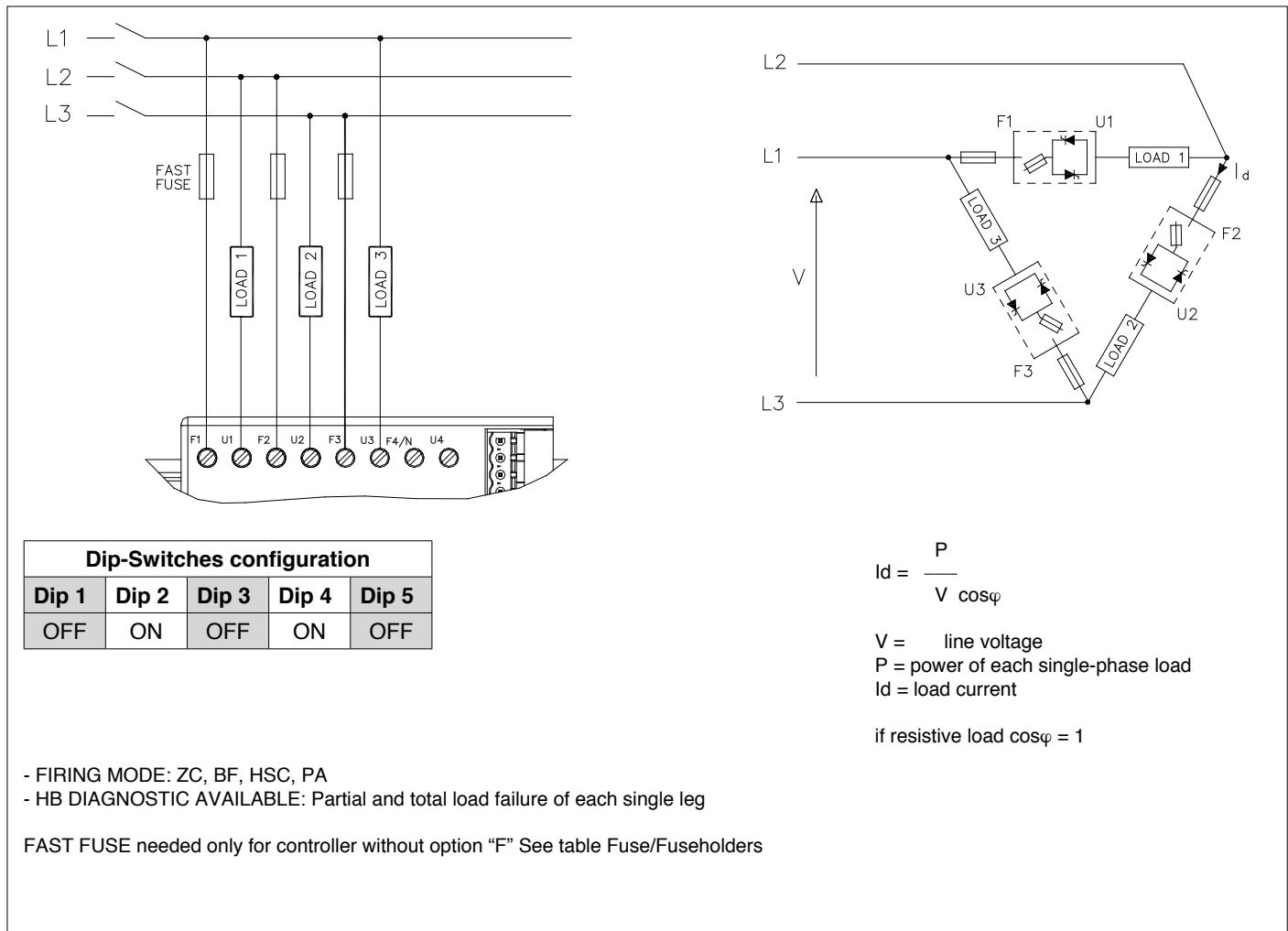


Figure 47

Connection example for 1 3-phase star load without neutral (3 wires)

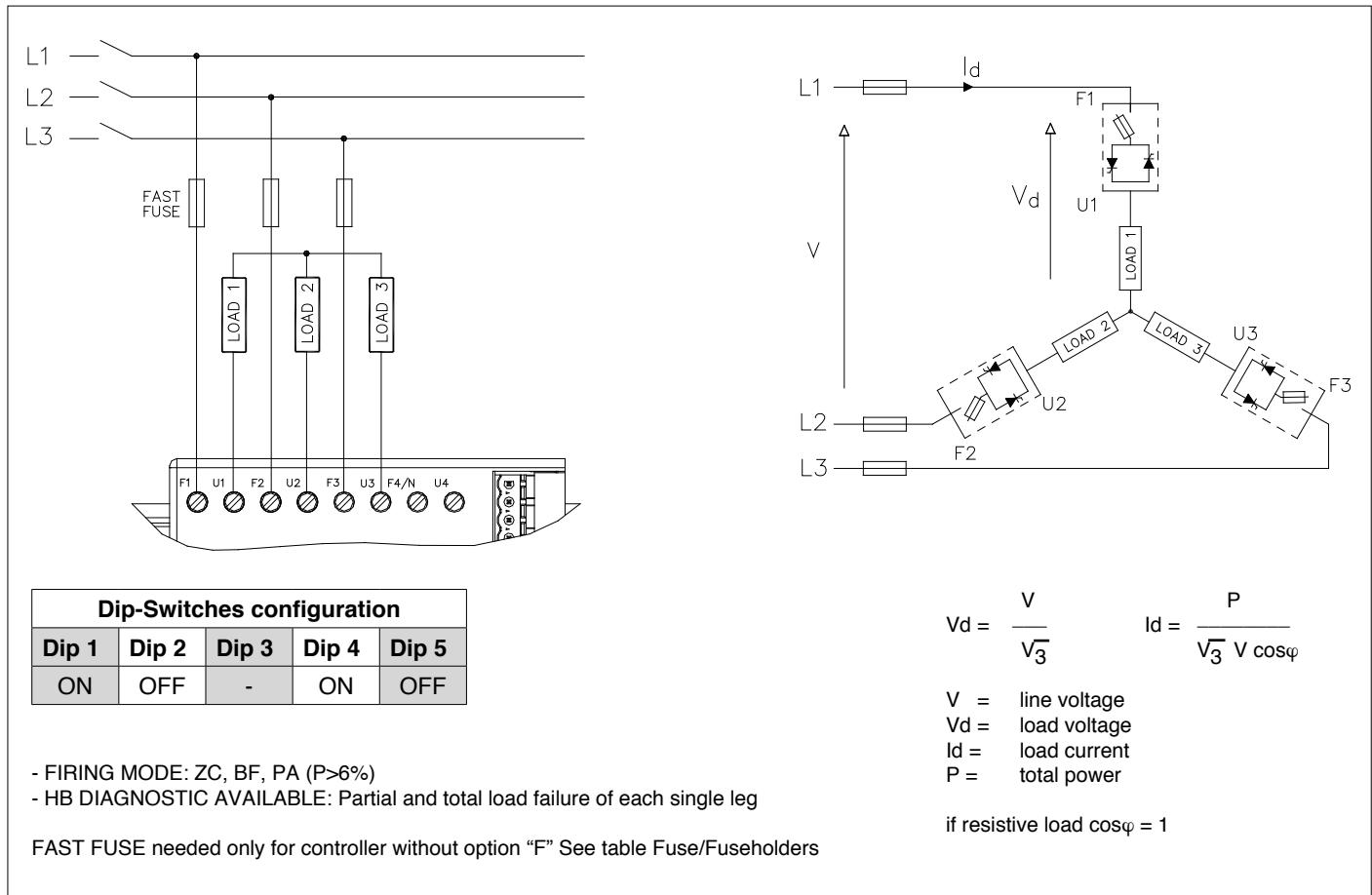
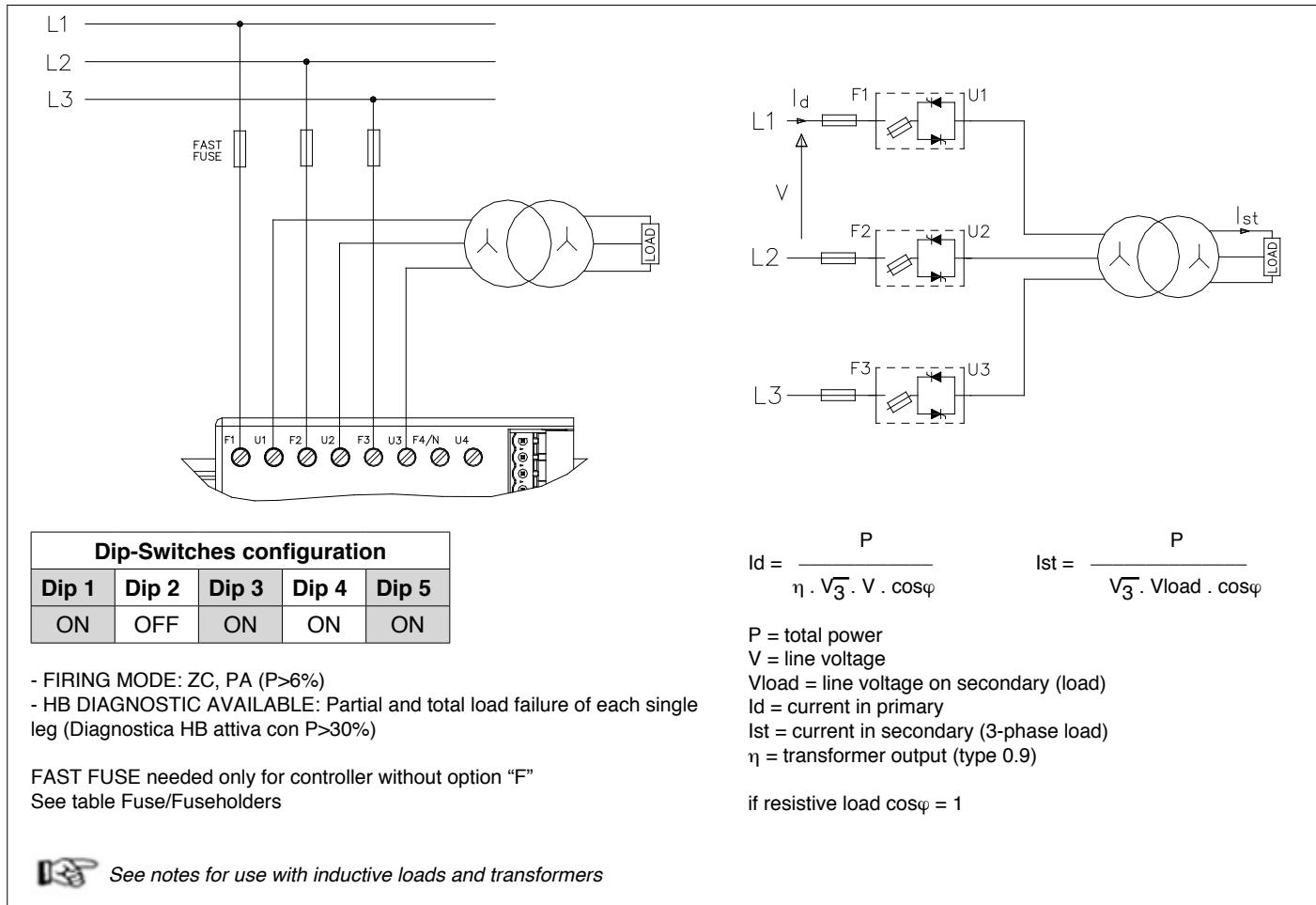


Figure 48 Connection example for 1 3-phase star transformer without neutral (3 wires) with 3-phase load



$$Id = \frac{P}{\eta \cdot \sqrt{3} \cdot V \cdot \cos\varphi}$$

$$Ist = \frac{P}{\sqrt{3} \cdot V_{load} \cdot \cos\varphi}$$

P = total power
V = line voltage
Vload = line voltage on secondary (load)
Id = current in primary
Ist = current in secondary (3-phase load)
 η = transformer output (type 0.9)

if resistive load $\cos\varphi = 1$

Figure 49 Connection example for 1 3-phase star load with neutral (4 wires) + possible single-phase load

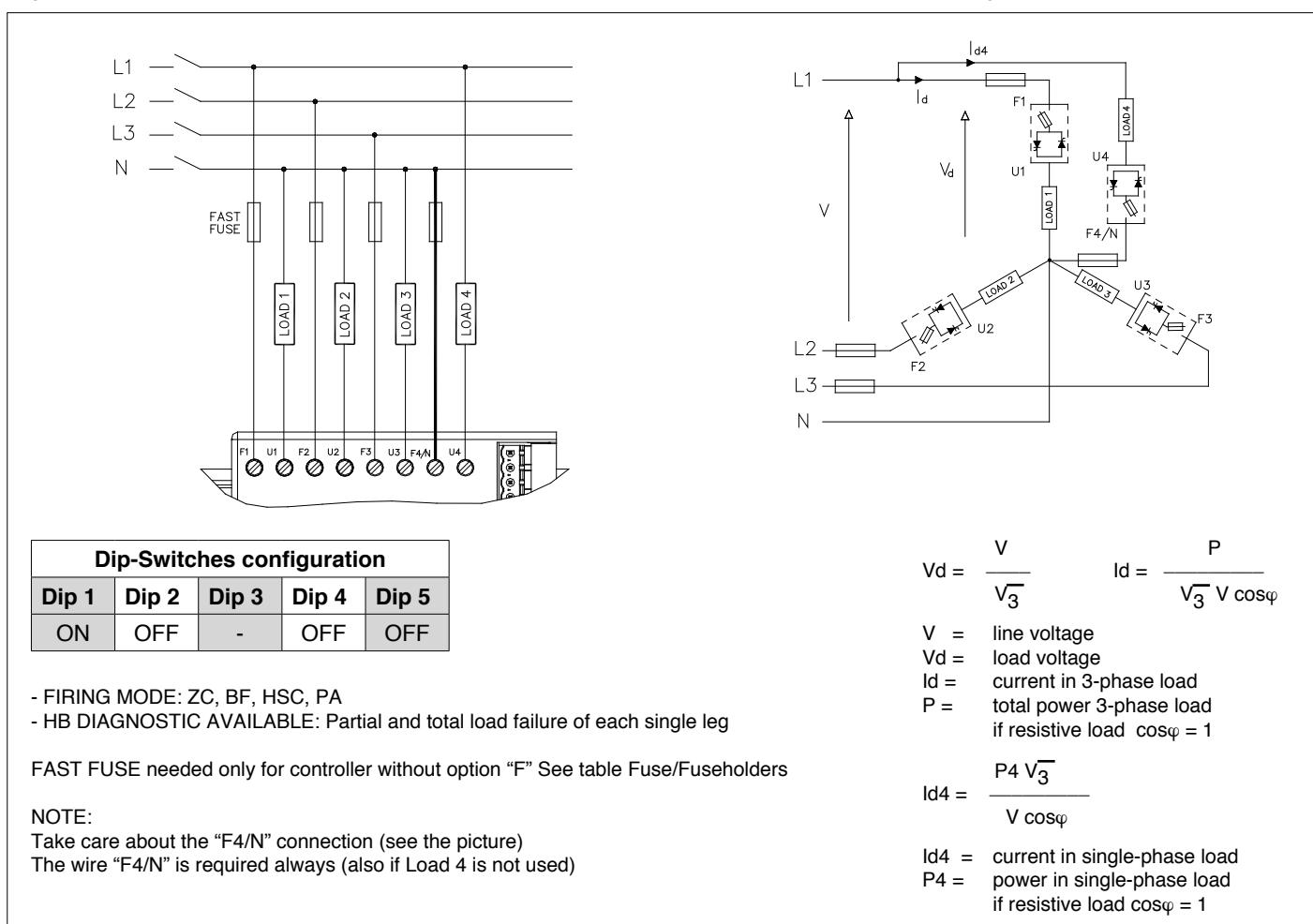
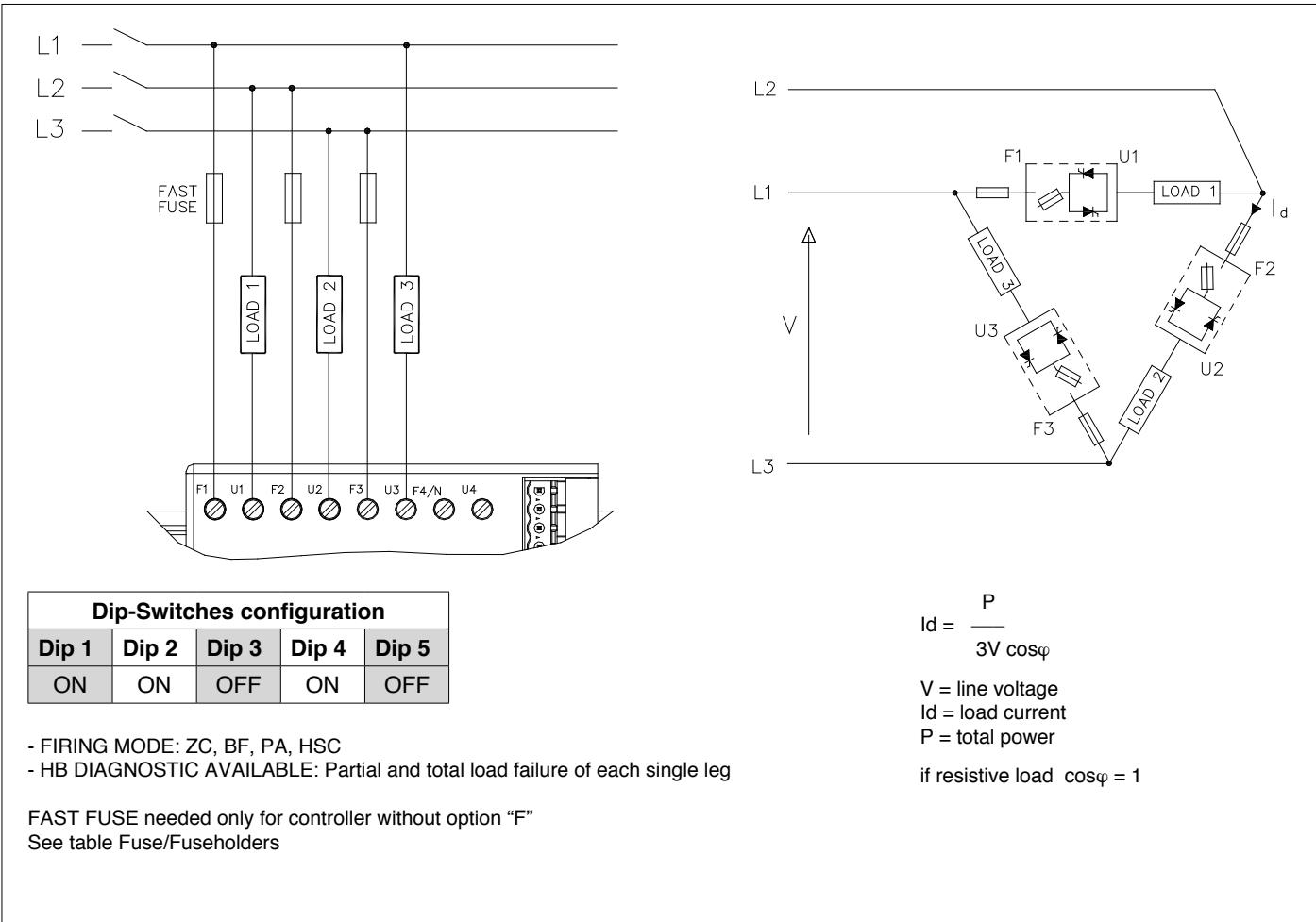


Figure 50

Connection example for 1 3-phase open delta load (6 wires)



$$Id = \frac{P}{3V \cos\varphi}$$

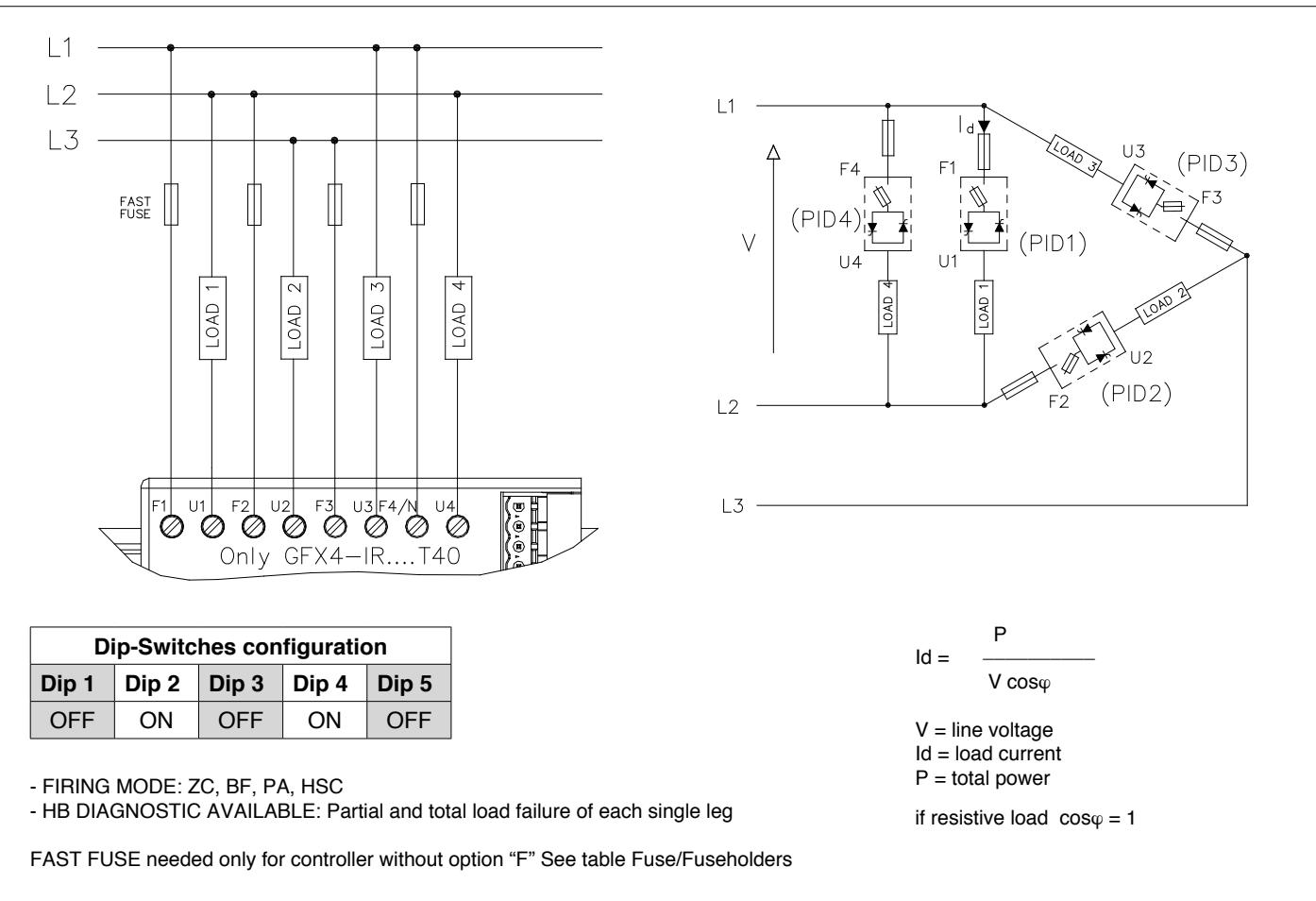
V = line voltage

Id = load current

P = total power

if resistive load $\cos\varphi = 1$

Figure 51 Control of 4 independent loads open delta GFX4-IR...T40



$$Id = \frac{P}{V \cos\varphi}$$

V = line voltage

Id = load current

P = total power

if resistive load $\cos\varphi = 1$

Figure 52 Control of 1 triphase load open delta, and 1 single load on CH4 GFX4-IR...T40

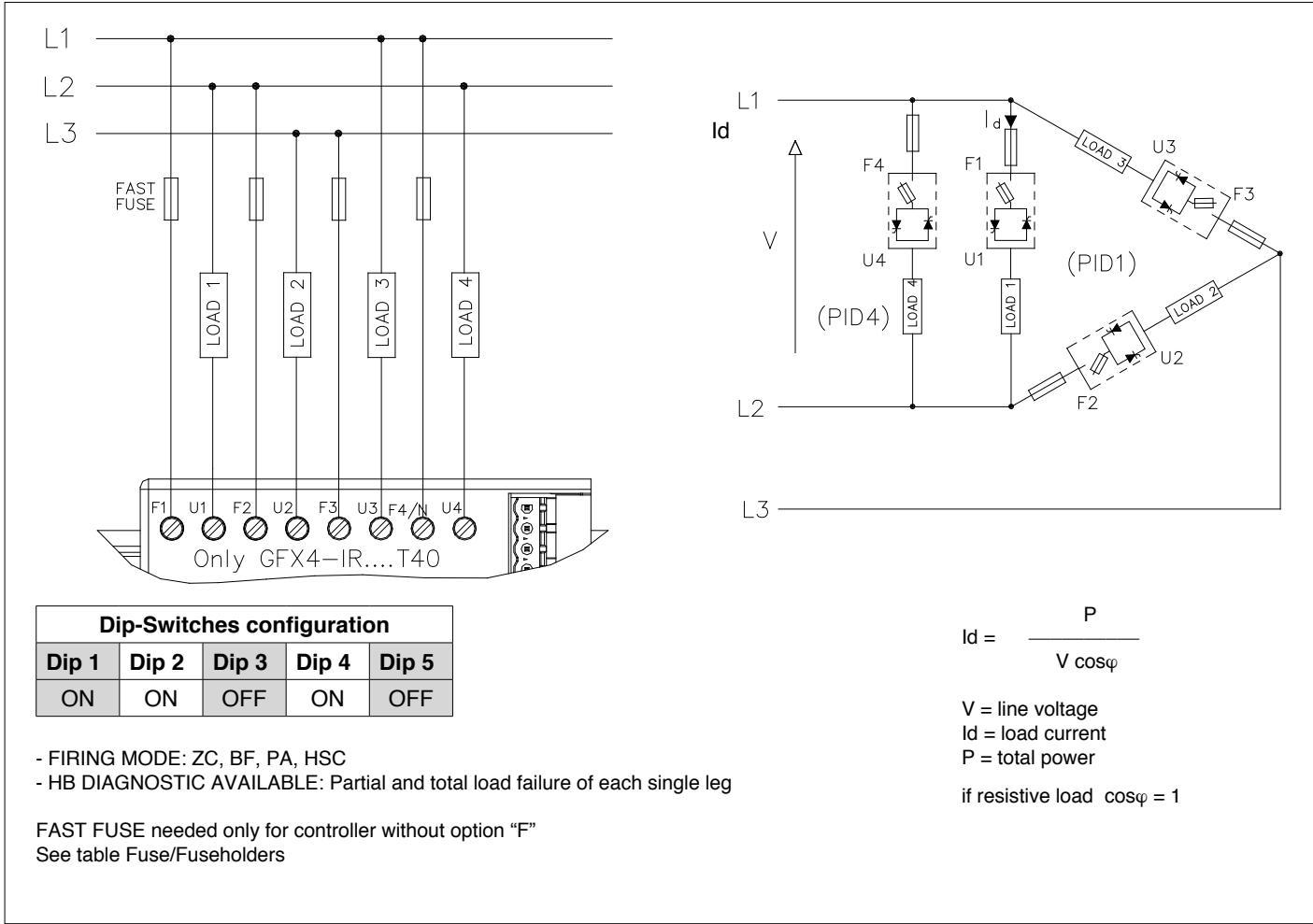


Figure 53 Wiring example of three GFX4-IR...T40 with optimized line current sharing

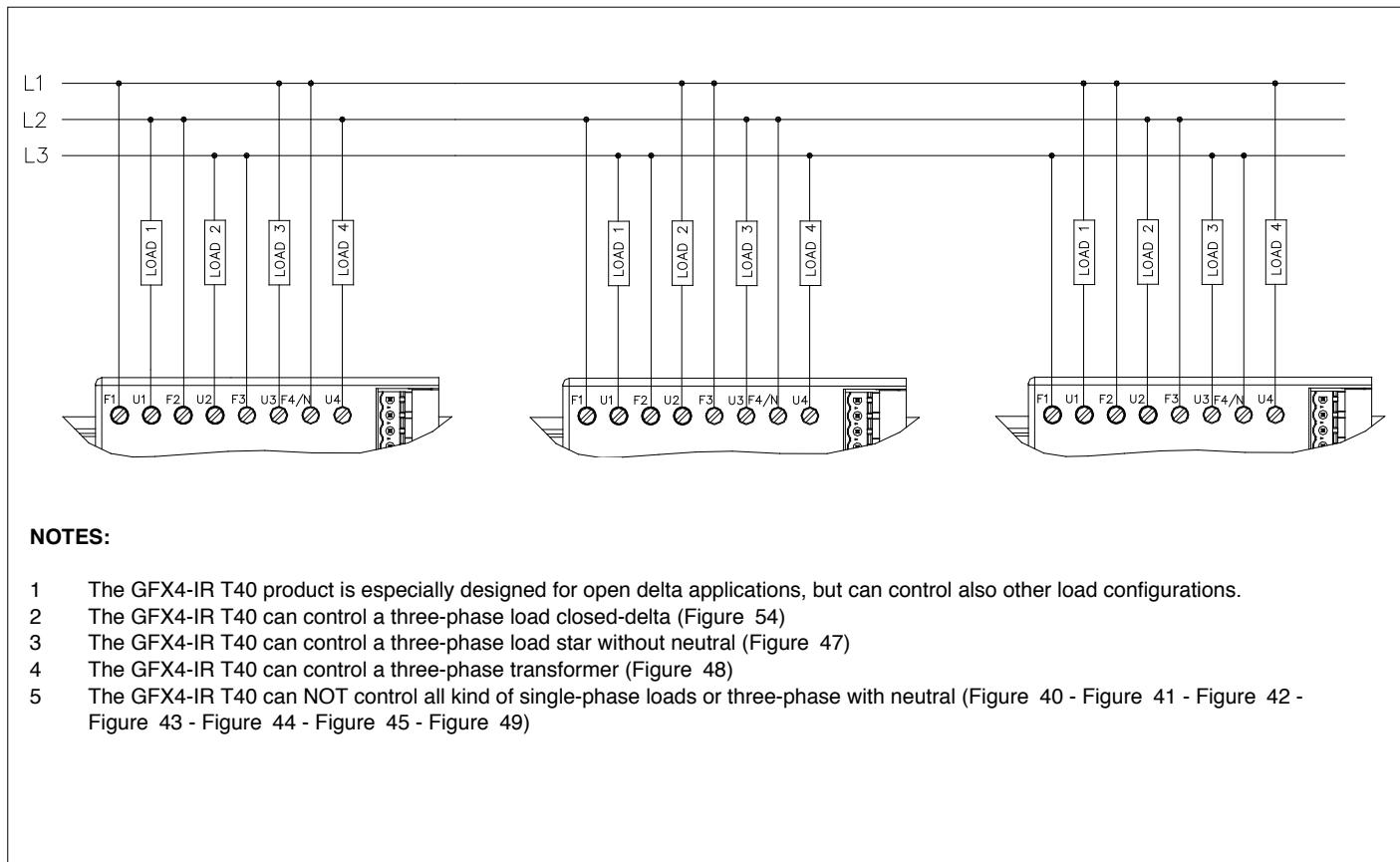
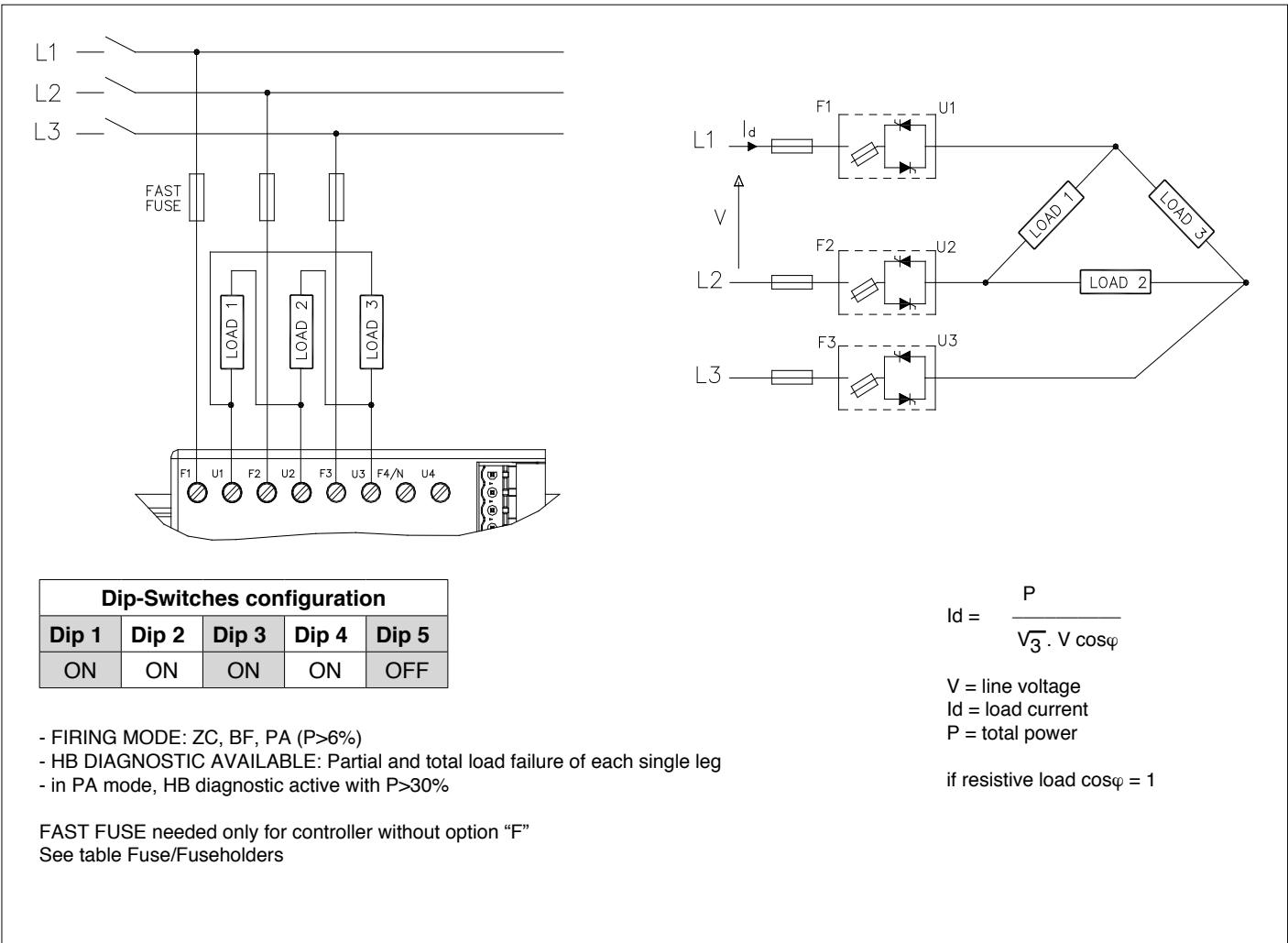


Figure 54

Connection example for 1 3-phase closed delta load (3 wires)





NOTES: USE WITH INDUCTIVE LOADS AND TRANSFORMERS

- a) Connect a varistor (MOV) between each wire of the primary transformer and ground.
Varistor data: rated voltage 660Vrms,..., 1000Vrms; minimum energy 100J
- b) The maximum current controllable by the device is less than the product's rated value (see technical data).
- c) In ZC and BF trigger mode, use the Delay-triggering function to limit peak magnetization current.
- d) In PA trigger mode, use the Softstart function.
- e) DO NOT use HSC trigger mode.
- f) DO NOT connect RC snubbers in parallel to the transformer primary.
- g) Always set Dip-Switch 5 to ON (and run the initial configuration procedure described in paragraph 3.7)

Trigger modes

The GFX4-IR has the following power control modes:

- modulation via variation of number of conduction cycles with zero crossing trigger.
- modulation via variation of phase angle.

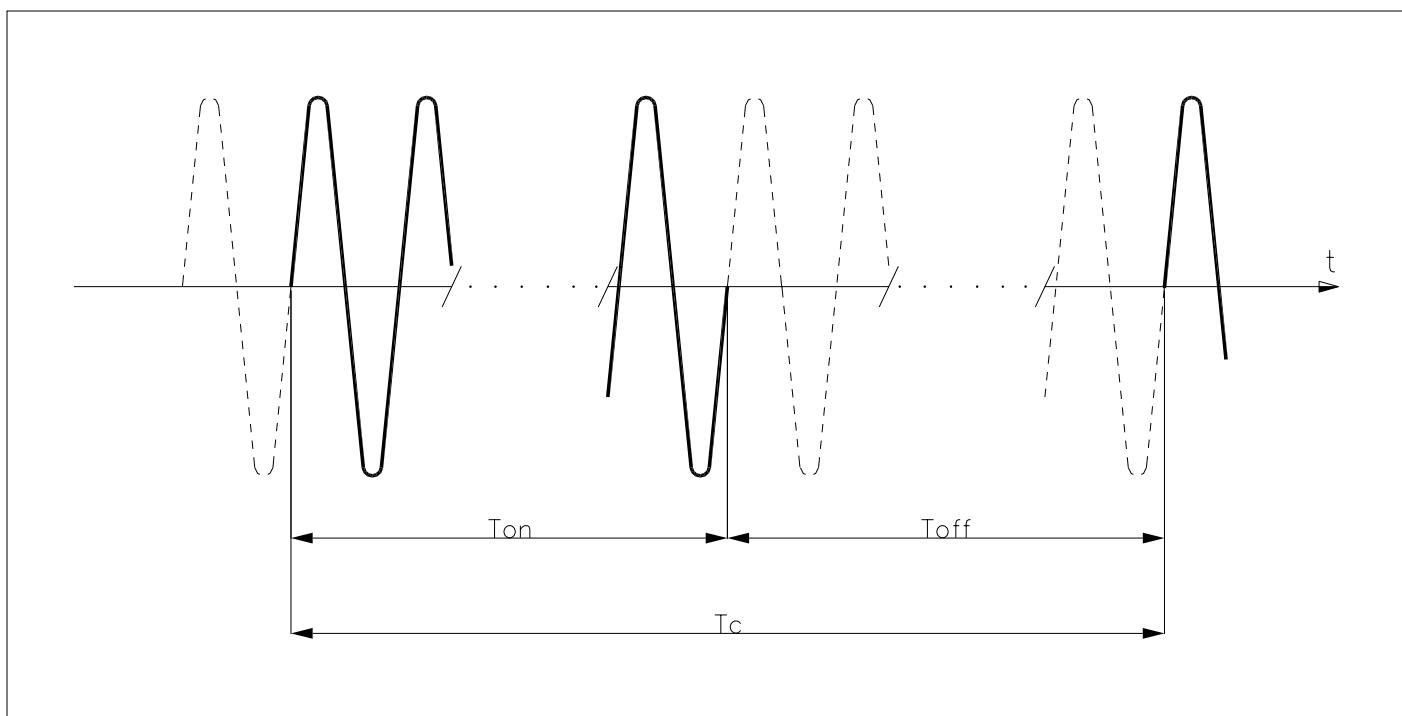
Zero Crossing mode

This function eliminates EMC noise. This mode controls power on the load via a series of conduction ON and non conduction OFF cycles.

ZC - constant cycle time ($T_c \geq 1$ sec, settable from 1 to 200 sec)

Cycle time is divided into a series of conduction and non conduction cycles in proportion to the power value to be transferred to the load.

Figure 55



For example, if $T_c = 10$ sec, if the power value is 20% there is conduction for 2 sec (100 conduction cycles @ 50Hz) and non conduction for 8 sec (400 non conduction cycles @ 50Hz).

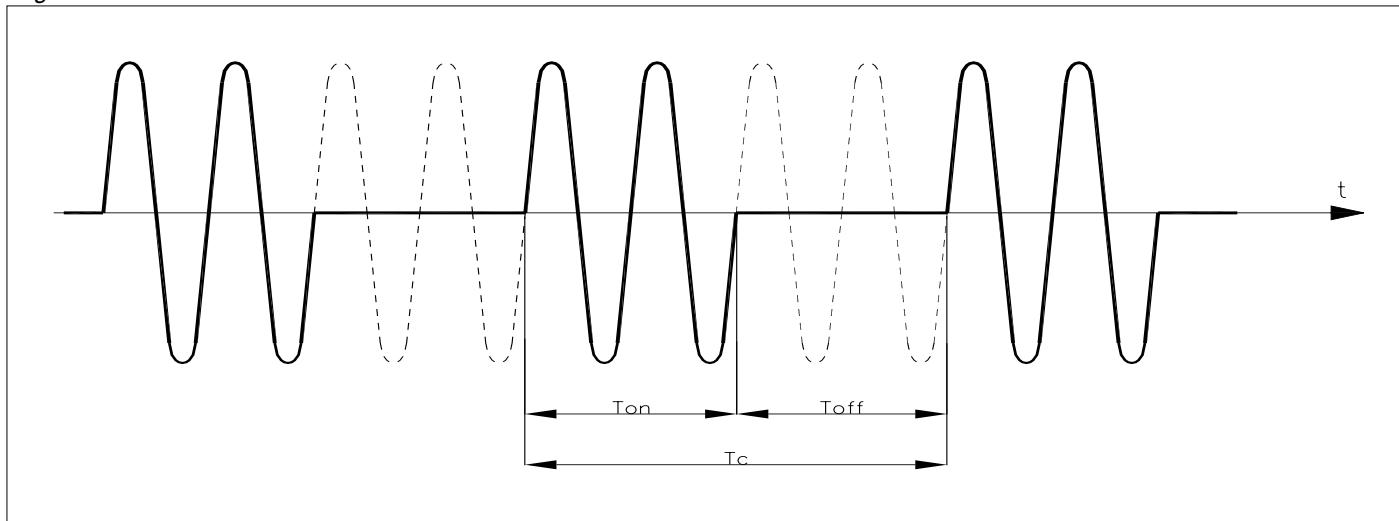
BF - variable cycle time (GTT)

This mode controls power on the load via a series of conduction ON and non conduction OFF cycles.

The ratio of the number of ON cycles to OFF cycles is proportional to the power value to be supplied to the load.

The CT repeat period is kept to a minimum for each power value (whereas in ZC mode the period is always fixed and not optimized).

Figure 56



parameter defines the minimum number of conduction cycles settable from 1 to 10.

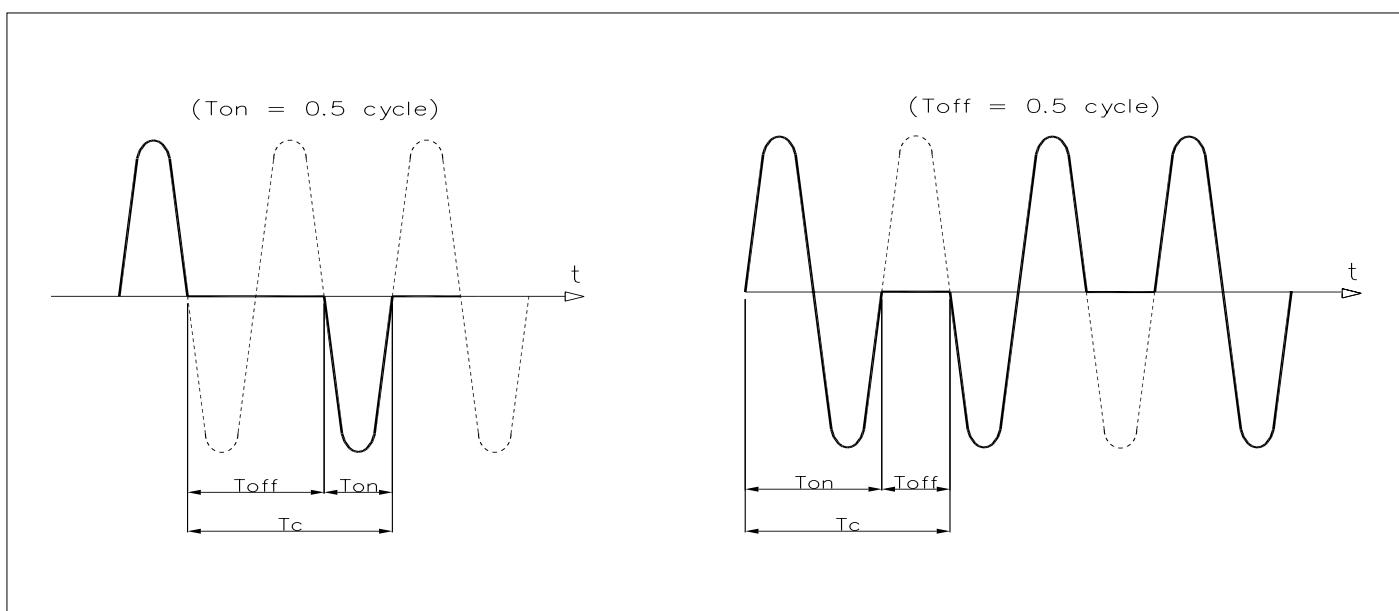
In the following example, the parameter = 2.

HSC - Half single cycle

 This mode corresponds to Burst Firing that manages ON and OFF half-cycles. It is useful for reducing the flickering of filaments with short/medium-wave IR lamp loads. With these loads, to limit operating current with low power, it is useful to set a minimum power limit (for example, Lo.p = 10%).

NB: This mode is NOT allowed with inductive loads (transformers) It is used with resistive loads in singlephase, star with neutral, or open delta configuration.

Figure 57



Example of operation in HSC mode with power at 33 and 66%.

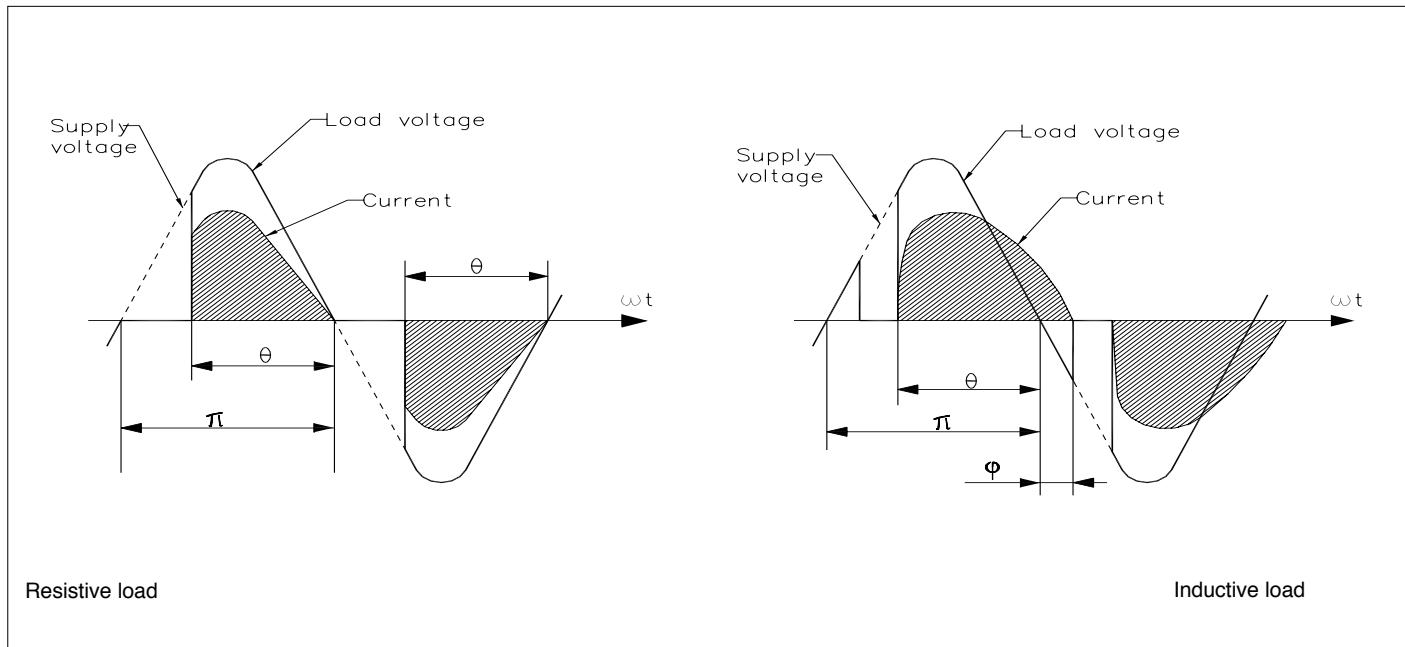
Phase angle (PA)

This mode controls power on the load via modulation of trigger angle θ

if power to be transferred to the load is 100%, $\theta = 180^\circ$

if power to be transferred to the load is 50%, $\theta = 90^\circ$

Figure 58



ADDITIONAL FUNCTIONS

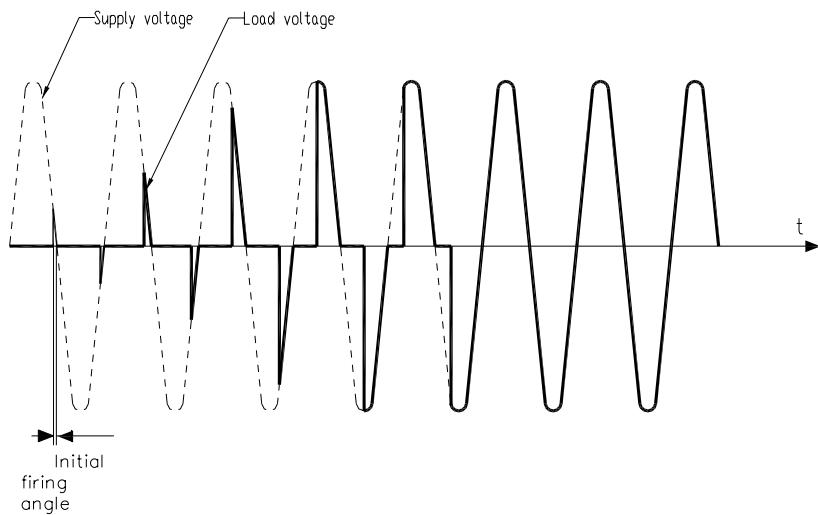
Softstart

This type of start can be enabled either in phase control or pulse train mode and in zero-crossing mode (ZC, BF, HSC).

In phase control, the increment of conduction angle α stops at the corresponding value of the power to be transferred to the load.

Control of maximum peak current (useful in case of short circuit on the load or of loads with high temperature coefficients to automatically adjust start time to the load) can be enabled during softstart. When the load shut-off time (settable) is exceeded, the ramp is reactivated at the next power-on.

Figure 59



Example of firing ramp with phase Soft-Start

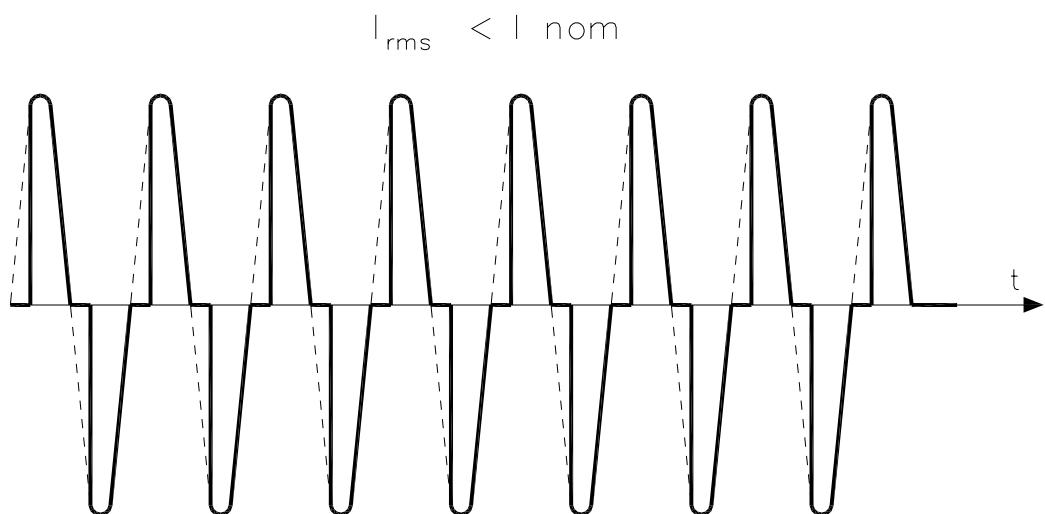
RMS current limit

The option for controlling the load current limit is available in all work modes.

If the current value exceeds the limit (settable in the nominal full-scale range) in mode PA the conduction angle is limited, while in zero-crossing mode (ZC, BF, HSC) the cycle time conduction percentage is limited.

This limitation ensures that the RMS value (i.e., not the instantaneous value) of the load current does NOT exceed the set RMS current limit.

Figure 60



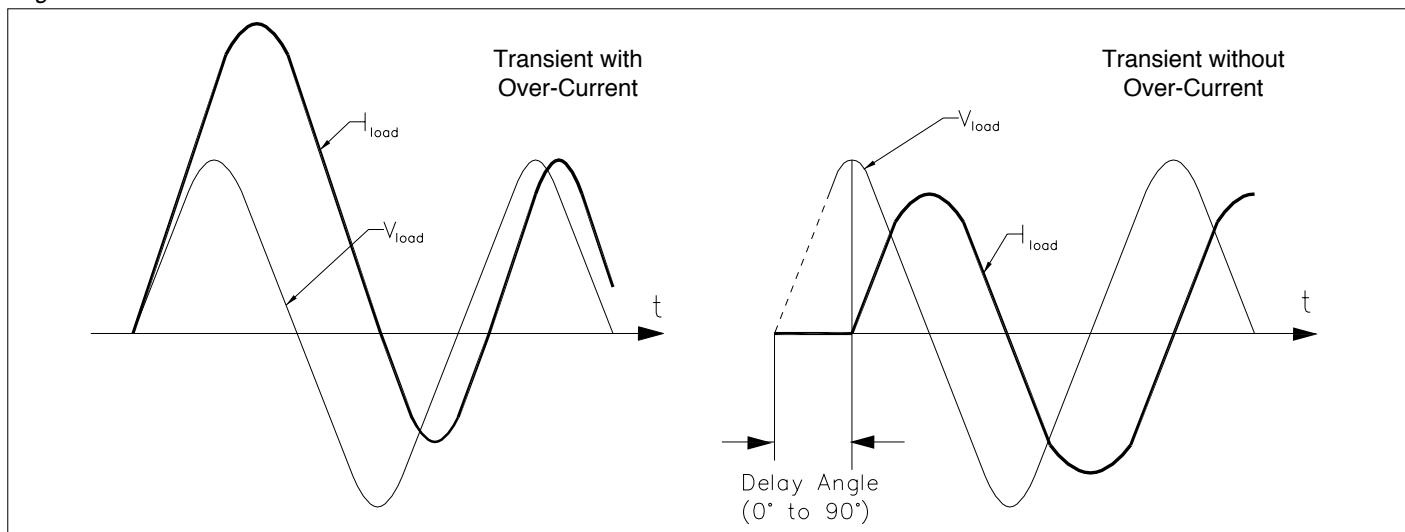
Example of conduction angle limitation in PA mode to respect an RMS current limit below the nominal current of the load.

DT - “Delay triggering” (for ZC, BF control modes only)

Settable from 0° to 90°.

Useful for inductive loads (transformer primaries) to prevent current peak that in certain cases could trip the high-speed fuses that protect the SCRs.

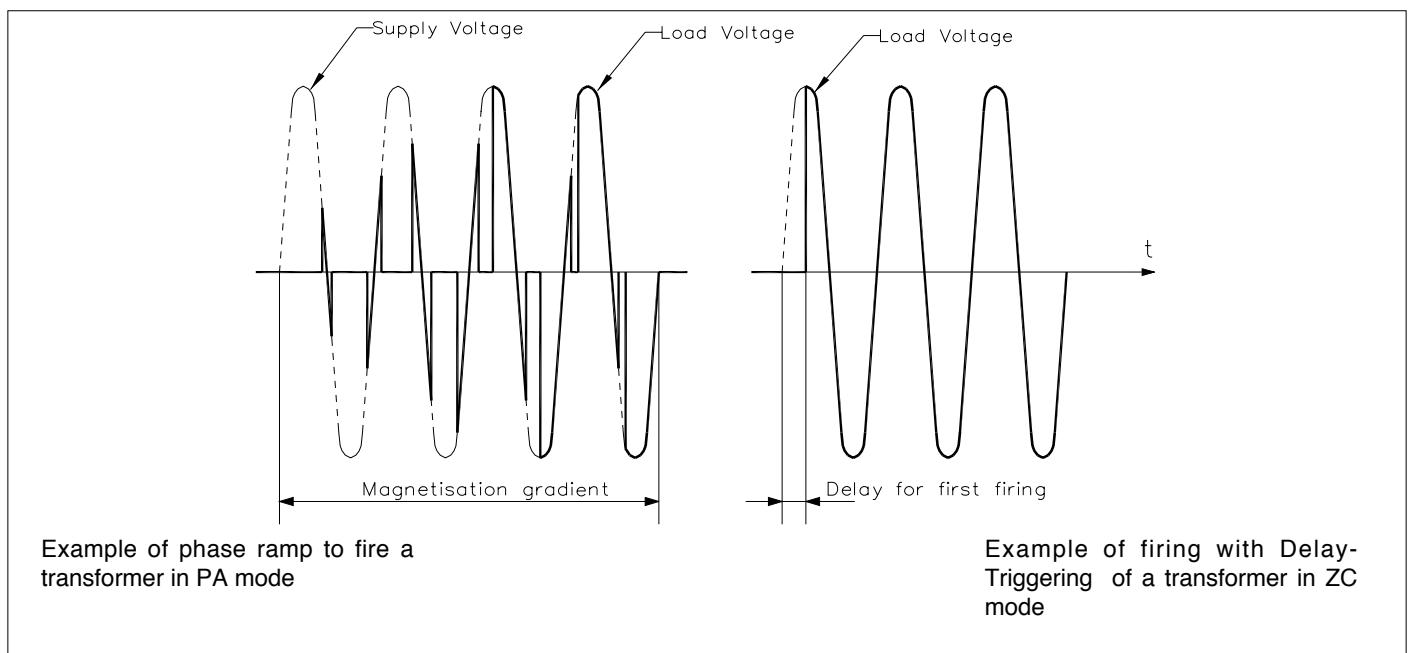
Figure 61



Example of firing of inductive load with/without delay-triggering.

To conduct inductive loads controlled in PA mode, do not use delay triggering; instead, use the phase Soft-Start ramp.

Figure 62



Comparison of method to fire a transformer: Soft-Start Ramp (for PA mode) / Delay triggering (for ZC and BF mode)

4 • INSTALLATION OF “MODBUS” SERIAL NETWORK

A network typically has a Master that “manages” communication by means of “commands,” and Slaves that carry out these commands.

GFX4-IR modules are considered Slaves to the network master, which is usually a supervision terminal or a PLC.

They are positively identified by means of a node address (ID) set on rotary switches (tens + units).

A maximum of 99 GFX4-IR, modules can be installed in a serial network, with node address selectable from “01” to “99” in standard mode or can also create a network with GFX4-IR and Geflex mixed in Geflex compatible mode, in which each GFX4-IR identifies 4 zones with sequential node address starting with the code set on the rotary switches.

1 GFX4-IR modules have a ModBus serial (Serial 1) and, optionally (see order code) a Fieldbus serial (Serial 2) with one of the following protocols: Modbus RTU, Profibus DP, CANopen, DeviceNet, Ethernet Modbus TCP, Ethernet IP, EtherCAT, Profinet..

The MODBUS RTU port 1 has the following factory settings (default):

Parameter	Default	Range
ID	1	1...99
BaudRate	19,2Kbit/s	1200...115kbit/s
Parity	None	parity/odd parity/none
StopBits	1	-
DataBits	8	-

The following procedures are indispensable for the Modbus protocol. For the other protocols, see the specific Geflex manuals.

The use of rotary switches (A...F) letters is for particular procedures described in the following paragraphs.

Here are the tables showing them:

Procedure	Positions of rotary switches		Description
	Tens	Units	
AutoBaud	0	0	It enables to set the correct BaudRate value
*AutoNode	A	0	It enables to transfer of the correct node (ID) address (tens) to eventual GEFLEX S1/S2



* **Note:** the AutoNode procedure is also required for Profibus DP, CANOpen, DeviceNet, Ethernet Modbus/TCP protocols.
Check its correct address in the specific manuals in question.

4.2 “AUTOBAUD SERIAL 1” SEQUENCE

Function

Adapt the serial communication speed and parity of the GFX4-IR modules to the connected supervision terminal or PLC.



Green LED L1 “STATUS” mentioned in the procedure can vary its behavior based on parameter Ld.1, which is set to a default value of 16.

Procedure

- 1) Connect the serial cables for all modules on the network to serial 1 and to the supervision terminal.
- 2) Set the rotary switch on the GFX4-IR modules to be installed, or on all modules present in case of first installation, to position “0+0”.
- 3) Check that the green “STATUS” LEDs flash at high frequency (10Hz).
- 4) The supervision terminal must transmit a series of generic “MODBUS” read messages to the network.
- 5) The procedure is over when all of the green L1 “STATUS” LEDs on the Geflex modules flash at a normal frequency (2Hz) (if parameter 197 Ld.1 = 16 as default).

The new speed parameter is saved permanently in each GFX4-IR; therefore, the “AUTOBAUD SERIAL 1” sequence does not have to be run at subsequent power-ups.



When the rotary switch is turned, the green “STATUS” LED stays on steadily for about 6 seconds, after which it resumes normal operation and saves the address.

4.1 ““AUTONODE PORT 1” SEQUENCE

Function

Assigning the Function

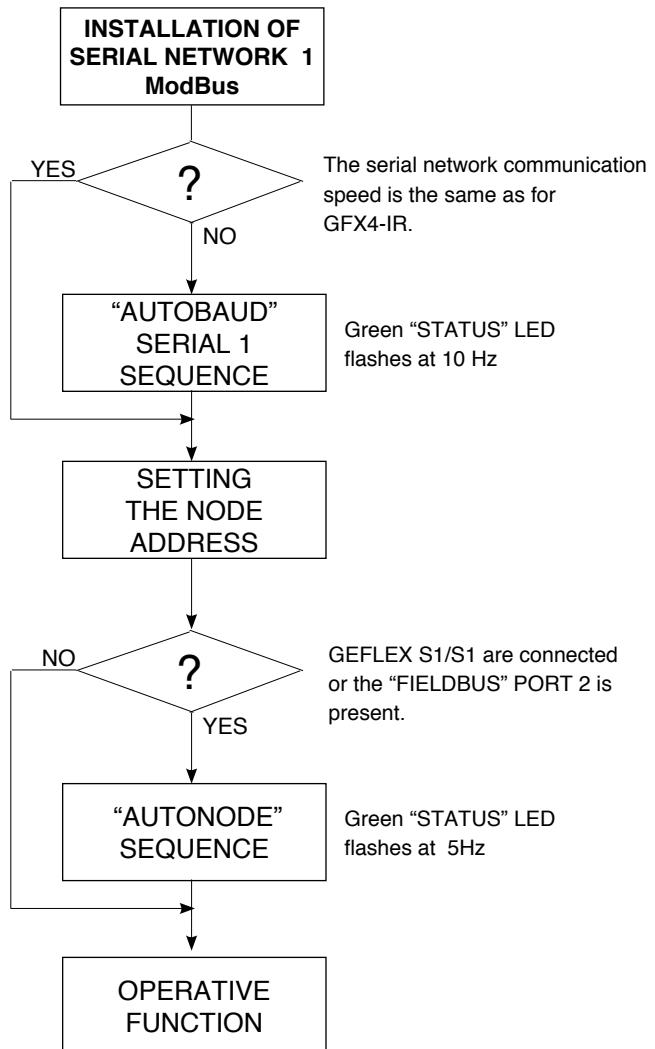
Adapt the serial communication speed and parity of the GFX4-IR modules to the connected supervision terminal or PLC.



Green LED L1 “STATUS” mentioned in the procedure can vary its behavior based on parameter Ld.1, which is set to a default value of 16.

Procedure

- 1) Connect the serial cables for all modules on the network to serial 1 and to the supervision terminal.
- 2) Set the rotary switch on the GFX4-IR modules to be installed, or on all modules present in case of first installation, to position “0+0”.
- 3) Check that the green “STATUS” LEDs flash at high frequency (10Hz).
- 4) The supervision terminal must transmit a series of generic “MODBUS” read messages to the network.



5 • TECHNICAL CHARACTERISTICS

INPUTS

IN1,...,IN4 analog process inputs

Function	Acquisition of process variable
Max. error	0.2% f.s. \pm 1 scale point at room temperature of 25°C
Thermal drift	< 100 ppm/°C on f.s.
Sampling time	120 ms
Thermocouple Tc (ITS90)	J,K,R,S,T (IEC 584-1,CEI EN 60584-1, 60584-2) Error cold junction comp. 0,1°/C
Resistance thermometer RTD (ITS90)	Pt100 (DIN 43760) Max line resistance 20ohm
Voltage	Linear: 0...60mV, Ri>1MOhm; 0...1V, Ri>1MOhm; 0...10V, Ri>1MOhm
Current	Linear: 0/4...20mA, Ri =50ohm a 32-segment custom linearization can be inserted

IN5,...,IN8 auxiliary analog inputs (option)

Function	Acquisition of variables (mV or Thermocouple)
Accuracy	1% f.s. \pm 1 scale point at room temperature of 25°C
Thermocouple Tc (ITS90)	480 ms
Resistance thermometer RTD (ITS90)	J,K,R,S,T (IEC 584-1,CEI EN 60584-1, 60584-2) Error cold junction comp. 0,1°/C
Voltage	Linear: 0,...,60mV, Ri>1MOhm

Line Voltage and Current measurement

RMS current measurement function	Load current read; minimum measurable current.
Accuracy RMS current measurement	2% f.s. at room temperature of 25°C in start mode ZC and 3% f.s. at an ambient temperature of 25°C in PA ignition mode.
RMS voltage measurement function	Line voltage read; (acquisition of voltage values is valid for voltage in range 90...530Vac)
Accuracy RMS voltage measurement	1% f.s. with neutral connected; 3% f.s. without neutral.
Current and Voltage sampling time	0,25 ms

DI1,...,DI2 digital inputs

Function	Configurable (default: disabled)
Type	PNP, 24Vdc, 8mA isolation 3500V

OUTPUTS

OUT1,...,OUT4 heat control outputs connected directly to solid-state units

Function	Configurable (default: heat control) State of control is displayed by LED (O1,...,O2)
----------	---

OUT5,...,OUT8 auxiliary (option)

Function	Configurable (default: cooling control)
Relay	Contact NO 3A, 250V/30Vdc cos φ =1
Continuous	0/2...10V (default), max 25mA short circuit protection 0/4...20mA, max. load 500ohm isolation 1500V
Logic	24Vdc, > 18V a 20mA
Triac	230V/ max 4A AC51 (1A for each channel)
Analog type:	0/2...10 V (default), max 25 mA short circuit protection 0/4...20 mA, max load 500ohm Isolated: 500 V Resolution: 12 bit Accuracy: 0.2% fs

OUT9, OUT10 alarms

Function	Configurable (default alarms)
Relay	Contact NO 5A, 250V/30Vdc cos φ =1

COMMUNICATION PORTS

POR1 (always present)

Function	Local serial communication
Protocol	ModBus RTU
Baudrate	Settable 1200,...,115200, (default 19,2Kbit/s)
Node address	Settable with rotary-switches
Type	RS485 isolation 1500V, double connector RJ10 telephone type 4-4

PORT 2 (Fieldbus option)			
Function	Fieldbus serial communications		
Protocol	ModBus RTU, tipo RS485, baudrate 1200...115000Kbit/s CANOpen 10K...1Mbit/s DeviceNet 125K...0,5Mbit/s Profibus DP 9,6K...12 Mbit/s Ethernet Modbus TCP, Ethernet IP 10/100Mbps EtherCAT, Profinet 100Mbps		
POWER (Solid-state power units, 4 units)			
Load type	AC 51 resistive or low inductance loads AC 55b short wave infrared lamps (SWIR) AC 56a transformers, resistive loads with high temperature coefficient		
Trigger mode	PA - load control via adjustment of firing phase angle ZC - Zero Crossing with constant cycle time (settable in range 1-200sec) BF - Burst Firing with variable cycle time (GTT) optimized minimum. HSC - Half Single Cycle corresponds to Burst Firing that includes ON and OFF half-cycles. Useful for reducing flicker with short-wave IR loads (applied only to single-phase resistive or 3-phase 6-wire open delta loads).		
Feedback mode	V Voltage feedback: proportional to RMS voltage value on load to compensate possible variations in line voltage. I Current feedback: proportional to RMS current value on load to compensate variations in line voltage and/or variations in load impedance. W Power feedback: proportional to real power value on load to compensate variations in line voltage and/or variations in load impedance. You have to calibrate each time you change feedback mode.		
Max rated voltage	480Vac		
Work voltage range	90...530Vac		
Non-repetitive voltage	1200Vp		
Rated frequency	50/60Hz auto-determination		
Rated current AC51 non-inductive or slightly inductive loads, resistance furnaces	30KW 4x16A	60KW 4x32A (4x30)*	80KW 4x40A (4x40)* (single channel 57A $\Sigma I = 160A$)
Nominal current AC55b short wave infrared lamps	30KW 4x8A	60KW 4x16A	80KW 4x20A
	for applications in which you can set a minimum power output limit (ex: Lo.P = 10%) by also limiting the lamp power variation speed with gradient limit (ex: G.out = 20%, PS.TM = 20s). Under these conditions, the nominal currents shown on the table can be raised up to the values indicated for AC51 type loads.		
Rated current AC56A load transformer permitted trigger modes: ZC, BF con DT (Delay Triggering), PA with softstart	30KW 4x12A	60KW 4x25A	80KW 4x32A
Non-repetitive overcurrent (t=20msec)	400A	600A	1150A
I ² t for melting (t=1...10msec)	645A ² s	1010A ² s	6600A ² s
Critical Dv/dt with output deactivated	10,000V/μs High static dv/dt		
Rated isolation voltage	4000V		
FUNCTION			
Safety	Detection of short circuit or opening of inputs, absence of input feed, LBA alarm, HB alarm		
Selection of °C/°F	Configurable		
Linear scale range	-1999...9999		
Control actions	4 control loops: Double action (heat/cool) PID, on-off Self-tuning at start, continuous Autotuning, one-shot Autotuning		
PID Parameters: pb-dt-it	0,0...999,9 % – 0,00...99,99 min – 0,00...99,99 min		
Action – control outputs	heat/cool – ON/OFF, PWM, GTT		
Max limit heat/cool power	0,0...100,0 %		
Fault power setting	-100,0...100,0 %		
Shutdown function	Maintains sampling of PV; maintains control off		
Configurable alarms	The alarm is assignable to an output and configurable as: maximum, minimum, symmetrical, absolute/deviation, LBA, HB		
Alarm masking	Exclusion at power-on, latch, reset from digital input		

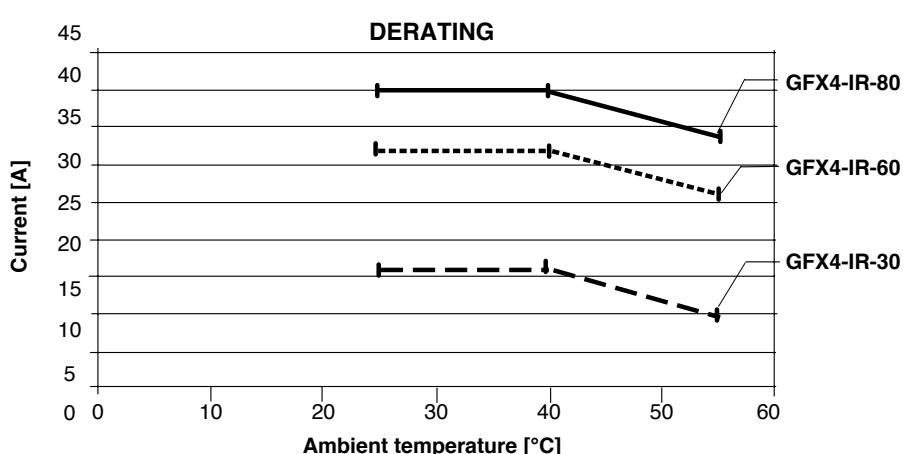
OPTIONS	
Options	<ul style="list-style-type: none"> - Timed Soft-Start firing ramp, with or without peak current control - Soft-Start firing ramp, specific for infrared lamps - Timed shut-off ramp - Limitation of RMS current in load - 0-90° Delay-Triggering for firing inductive loads in ZC and BF mode
Diagnostic	<ul style="list-style-type: none"> - SCR in short circuit (presence of current with OFF control) - No voltage - No current due to open SCR/interrupted load • Overheat alarm <p><u>Current read</u></p> <ul style="list-style-type: none"> • HB alarm interrupted or partially interrupted load • Automatic calibration of HB alarm setpoint starting from current value in load • Alarm for load in short circuit or overcurrent <p><u>Voltage read</u></p> <ul style="list-style-type: none"> • 3-phase line imbalanced • Incorrect phase rotation in configuration of 3-phase load • Signalling phase rotation 1-3-2 in three-phase load configuration
Type of connection and load Selection via dip-switches	4 single-phase loads 3 independent single-phase loads open delta 1 3-phase load open delta 1 3-phase load closed delta 1 3-phase load star with neutral 1 3-phase load star without neutral
GENERAL DATA	
Power supply	24Vdc ±25%, max 8VA Class II
Signals	Eight LEDs: RN run state of CPU ER error signal DI1, DI2 state of digital inputs O1,...,O4 state of SCR control
Protection	IP20
Work/storage temperature	0...50°C (refer to dissipation curves) / -20...70°C
Relative humidity	20...85% RH non-condensing
Ambient conditions for use	indoor use, altitude up to 2000m
Installation	DIN bar EN50022 or panel with screws
Installation requirements	Installation category II, pollution level 2, double isolation Max. temperature of air surrounding device 50°C Device type: "UL Open Type"
Weight	30Kw, 60Kw, 80Kw models 1200g. 30Kw, 60Kw models with fuses 1600g
(*) UL Certification	

5.1 VOLTAGE/CURRENT TABLE

Model GFX4-IR	Current (Amp)	Voltage (Vac)			Power (kW)		
		max for channel	range	nominal	working	total contemporary	single channel
30 (4x16A)	16	90...530	480	110	(4x16x110) 7	(16x110) 1,7	(1x16x110) 1,7
				230	(4x16x230) 14,7	(16x230) 3,6	(1x16x230) 3,6
				400	(4x16x400) 25,6	(16x400) 6,4	(1x16x400) 6,4
				480	(4x16x480) 30,7	(16x480) 7,6	(1x16x480) 7,6
60 (4x32A) (4x30A)*	32 (30)*	90...530	480	110	(4x32x110) 14	(32x110) 3,5	(32x110) 3,5
				230	(4x32x230) 29,4	(32x230) 7,3	(1x32x230) 7,3
				400	(4x32x400) 51,2	(32x400) 12,8	(1x32x400) 12,8
				480	(4x32x480) 61,4	(32x480) 15,3	(1x32x480) 15,3
80 (4x40A)	40* 57	90...530	480	110	(4x40x110) 17,6	(40x110) 4,4	(1x57x110) 62,7
				230	(4x40x230) 36,8	(40x230) 9,2	(1x57x230) 13,1
				400	(4x40x400) 64	(40x400) 16	(1x57x400) 22,8
				480	(4x40x480) 76,8	(40x480) 19,2	(1x57x480) 27,3

* UL certification

5.2 DISSIPATION CURVES



5.3 FUSES / FUSESHOLDERS

Model	EXTRARAPID FUSES				FUSES-HOLDER ISOLATORS
	Size I ² t	Code Format	Model Code	Power Dissipated @ In	
GFX4-IR 30 kw	16A 150 A ² s	FUS-016 10x38	FWC16A10F 338470	3,5 W	PFI-10x38 337134 UR30A@690V
GFX4-IR 60 kw	30A 675 A ² s	FUS-030 10x38	FR10GR69V30 338481	4,8 W	PFI-10x38 337134 UR30A@690V
GFX4-IR 80 kw	63A 3080 A ² s	FUS-063 22x58	FWP63A22F 338191	11 W	PFI-22x58 337223 UR80A@600V

6 · TECHNICAL / COMMERCIAL INFORMATION



This section contains information on order codes for the Controller and its main accessories.

As mentioned in the Preliminary Instructions in this User

GFX4-IR							FIELDBUS - Port 2	
POTENCIA NOMINAL							0	Absent
30KW	30						M	Modbus RTU
60KW	60						P	Profibus DP
80KW	80						C	CANopen
AUXILIARY OUTPUTS							C1	Euromap 66
Absent	0						D	DeviceNet
Relay	R						E	Ethernet Modbus TCP
Logic	D						E1	Ethernet IP (***)
Analog continuos	C						E2	EtherCAT
Triac	T						E4	ProfiNET
Analog 12bit 0/2-10V; 0/4-20mA	W						E5	Ethernet IP (ODVA Certification - C.T. 9) (***)
INGRESSI AUSILIARI							E8	Ethernet IP (ODVA Certification - C.T. 15) (***)
Absent	2						FUSIBILI	
4 Linear inputs (**)	4						0	Absent
							F	fuses-holder + fuses extrarapid (*)

(*) Available only for 30, 60kW power.

(**) Option NOT available with fieldbus E1, E2, E4, E5, E8.

(***) To check the compatibility between the different product releases please look at the specific technical documentation on the web site www.gefran.com.

GEFRAN spa reserves the right to make any aesthetic or functional changes at any time and without notice.

6.1 ACCESSOIRES

CONFIGURATION KIT



Configuration/supervision kit for GFX by means of PC with USB (Windows environment).

Lets you read or write all of the parameters of a single GFX

A single software for all models

- Easy and rapid configuration
- Saving and management of parameter recipes
- On-line trend and saving of historical data

Component Kit:

- Connection cable PC USB <----> GFX RS485 port
- Serial line converter
- CD SW GF Express installation

ORDER CODE

GF_eXK-2-0-0.....Cod. F049095

GFX-OP



Operator terminal for in-field configuration of the entire Geflex line.

Two types of terminals:

- for installation on Geflex heatsink or on DIN guide
- for panel installation

ORDER CODE

Programming terminal for Geflex (installation on DIN guide or on heatsink), complete with cables for connection to Geflex (L = 0.2m) **GFX-OP-D**
 [Note: for other connection cable lengths, see the cable section in the accessories catalog]

Programming terminal for Geflex (panel installation) **GFX-OP-P**
 [Note: for connection cable, see the cable section in the accessories catalog]

Kit consists of:

- power supply, PC <--> GFX-OP-D connection cable (L=2 m),
- adapter for Geflex power supply..... **GFX-OP-K**

GEFRAN

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