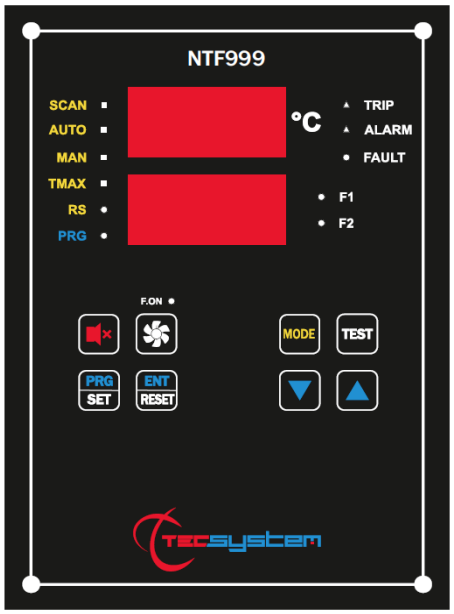
INSTRUCTION MANUAL

NTF999



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operates with ISO9001 certified quality system

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R. 1.0 29/05/2018

ENGLISH

"Translations of the original instructions"

INTRODUCTION

First of all we wish to thank you for choosing to use a **TECSYSTEM** product and recommend you read this instruction manual carefully: You will understand the use of the equipment and therefore be able to take advantage of all its functions.

ATTENTION! THIS MANUAL IS VALID AND COMPLETE FOR THE NTF999 CONTROL UNITS

CONTENTS

SAFETY REQUIREMENTS

ATTENTION:

Read the manual carefully before starting to use the control unit. Keep the instructions for future reference.

Do not open the device, touching any internal components can cause electric shock. Contact with a voltage over 50 Volts can be fatal. To reduce the risk of electric shock, do not dismantle the back of the device for any reason. Moreover its opening would void the warranty.

Before connecting the device to the power supply, make sure that all the connections are correct. Always disconnect the unit from the supply before any cabling modification.

Any work on the equipment must be entrusted to a qualified engineer.

Failure to comply with these instructions can cause damages, fires or electric shock, and possible serious injuries!

SUPPLY
The NTF999 control unit can be supplied either from 85 to 250 Vac. Before using it, make sure the power cable is not damaged, knotted or pinched. Do not tamper with the power cable. Never disconnect the unit by pulling the cable, avoid touching the pins. Do not carry out any connecting/disconnecting with wet hands. To disconnect the device, do not use objects such as levers. Do not touch the FAN outputs (F-1 and F-2) when the device is powered, voltage outputs. Disconnect the power supply immediately if you notice that the device gives off a burning smell or smoke: contact the assistance.

LIQUIDS
Do not expose the equipment to splashes or drops, do not position it in places with humidity exceeding 90% and never touch with wet or humid hands. If any liquid penetrates the control unit, disconnect it immediately and contact technical service.

CLEANING
Disconnect the power cable before cleaning the control unit, use a dry cloth to dust it, without any solvent or detergents, and compressed air.

OBJECTS
Never insert any objects into the cracks of the control unit. If this happens, disconnect the control unit and contact an engineer.

USE RESERVED TO QUALIFIED PERSONNEL
The purchased goods are a sophisticated electronic device that is totally unsuitable to be used by non-qualified personnel. Any work must be carried out by a specialist engineer.

ACCESSORIES
The use of non-original accessories or spare parts can damage the unit and endanger users' safety. In the event of faults, contact technical service.

POSITIONING
Install the control unit indoors, in a place protected from water splashes and from the sun's rays. Do not place near heat sources exceeding the parameters stated in this manual. Position on a stable surface, far from any possible vibrations. Position the unit as far as possible from any intense magnetic fields.

REPAIRS
Do not open the control unit. For any fault, always use qualified personnel. The opening of the control unit and/or the removal of the series identifying label entails the automatic forfeiture of the warranty. The Warranty seal is applied to all devices, any attempt to open the unit would break the seal and cause the consequent automatic forfeiture of the warranty.

FUNCTIONS
To control the transformer correctly from a temperature point of view, enabling the VOTING function is allowed where the load distributed between the phases of the transformer is adequately balanced.

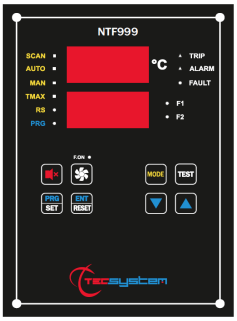
TECHNICAL INFORMATION

Mail: ufficiotecnico@tecsystem.it — tel: 02/4581861

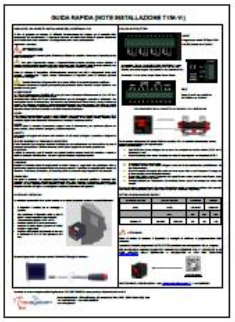
ACCESSORIES

The following objects are present inside the box:

Control unit



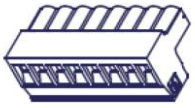
Start guide and QR code



4 Screws, Washers and Bolts nylon M5

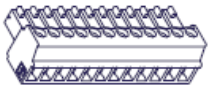
1 supply terminal 3 poles pitch 5
Code: 2PL0367 - Screws tightening torque 0.5Nm

1 relay terminal 8 poles pitch 5
Code: 2PL0374 - Screws tightening torque 0.5Nm



2 terminals 2 poles pitch 7.62 outputs FAN1-2
Code: 2PL0451 - Screws tightening torque 0.5Nm

1 Pt100 sensor terminal 12 poles pitch 3.81
Code: 2PL0420 - Screws tightening torque 0.25Nm



1 terminal 3 poles pitch 3.81 probes (only for option RS485)
Code: 2PL0366 - Screws tightening torque 0.25Nm

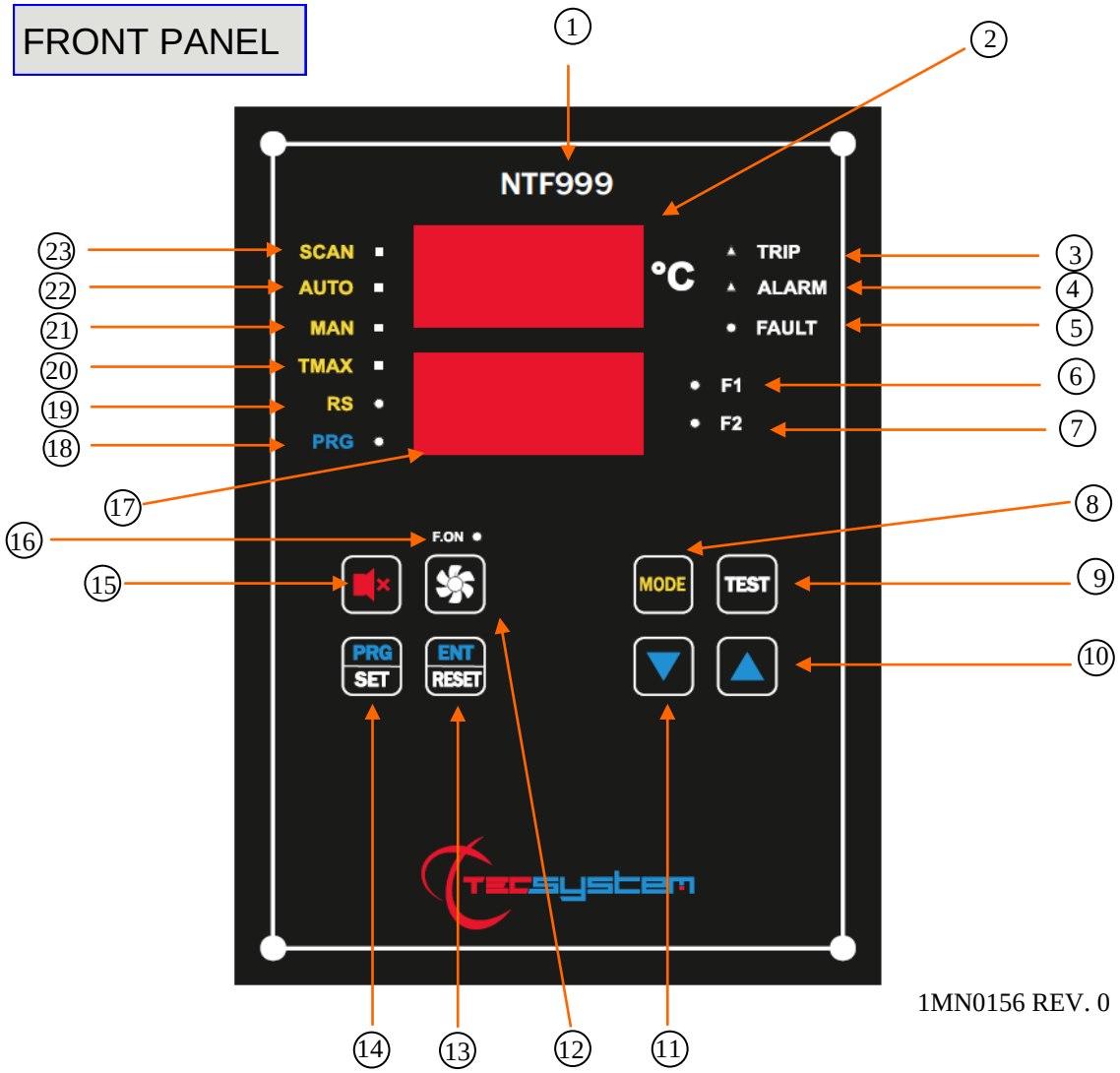
ATTENTION: always install the device using the terminals included in the pack.
The use of terminals other than those included with the control unit might cause malfunctions.

TECHNICAL SPECIFICATIONS	NTF999 PT100	NTF999 TCK
SUPPLY		
Supply rated values (fuse 2.5A del 5x20)	85-250 Vac 50/60 Hz	85-250 Vac 50/60 Hz
INPUTS		
4 inputs per sensor (max cable section 1.5mm²)	**Pt100** **3 wires**	**TCK**
Connections on removable terminal boards	•	•
Input channels protected against electromagnetic interference	•	•
Compensations for sensor cable extension	500m (1mm²)	100m with compensating cable and joints
OUTPUTS		
2 alarm relays (ALARM AND TRIP) SPDT	•	•
1 sensor or operating failure (FAULT) relay SPST	•	•
Output relays with 10A-250Vac-res COSΦ=1 contacts.	•	•
2 outputs supplied for FAN 1 and FAN 2 ventilation: MAX 6A-250Vac-res COSΦ=1 (fuse 10 A 6.3x32)	85-250 Vac (*) 50/60HZ	85-250 Vac (*) 50/60HZ
Ethernet output 10Base T/100Base-TX Modbus TCP slave.	OPTIONAL	OPTIONAL
RS485 output Modbus RTU	OPTIONAL	OPTIONAL
DIMENSIONS		
232x166 mm depth 60 mm	Hole 140 x 205 mm	Hole 140 x 205 mm
TESTS AND PERFORMANCE		
Construction in compliance with CE regulations	•	•
Protection from electrical interference EN 61000-4-4	•	•
Dielectric strength 1500 Vac for a min. between output relays and sensors, relay (excluding FAN1 and FAN2) and power supply, power supply and sensors	•	•
Accuracy ±1% full scale value, ±1 digit	•	•
Ambient operating temperature from –20°C to +60°C	•	•
Humidity 90% non-condensing	•	•
Housing Polycarbonate	•	•
Polycarbonate frontal film IP65	•	•
Absorption 8VA (ventilation FAN1 and FAN2 excluded)	•	•
Data memory 10 years minimum	•	•

(*) The FAN1 and FAN2 outputs are powered directly by the NTF999 device, in relation to the power supply value of the device itself.

TECHNICAL SPECIFICATIONS	NTF999 PT100	NTF999 TCK
Digital linearity of sensor signal	•	•
Self-diagnostic circuit	•	•
Protection treatment of the electronic part	Optional	Optional
DISPLAY AND DATA MANAGEMENT		
2 x 20,5mm displays with 3 digits to display temperatures, messages and channels	•	•
4 leds selection of display mode (SCAN-AUTO-MAN-T-MAX)	•	•
3 LEDs to display the state of the alarms of the selected channel **(ALARM-TRIP-FAULT)**	•	•
2 LEDs to display the state of FAN1 and FAN2	•	•
1 LED PRG/VIS status	•	•
Temperature reading range from -20°C to 220°C. Alarm settings 0°C to 220°C	•	•
1 ALARM threshold for CH1-CH2-CH3	•	•
1 TRIP threshold for CH1-CH2-CH3	•	•
1 ALARM threshold for CH4	•	•
1 TRIP threshold for CH4	•	•
2 ON-OFF thresholds FAN 1 and FAN 2 ventilation	•	•
Sensor diagnostics (Fcc-Foc-Fcd)	•	•
Data memory diagnostics (Ech)	•	•
Ventilation lines fault diagnostics FAN1-2 (HI-LO)	•	•
Access to programming through front keyboard	•	•
Automatic exit from programming, display and relay test after 1 minute of inactivity	•	•
Incorrect programming warning	•	•
Selection between channels automatic scanning, hottest channel or manual scanning	•	•
Storage of maximum temperatures reached by channels and alarm status	•	•
Front key to reset the alarms	•	•
Audible alarm (ALARM) with silent key	•	•
Intellifan function	•	•
Voting Function	•	•
Hysteresis function ALARM and TRIP (HYS)	•	•
Failsafe function	•	•
Key and Led enable forced ventilation F.ON	•	•

FRONT PANEL



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1)	Control unit series	13)	Enter/Reset button
2)	3-digit temperature display	14)	Programming/Setting key
3)	TRIP (red) LED	15)	Alarm silent key
4)	ALARM (yellow) LED	16)	F.ON (yellow) LED
5)	FAULT (red) LED	17)	3-digit channel display
6)	FAN 1 (yellow) LED	18)	PRG ON (yellow) LED
7)	FAN 2 (yellow) LED	19)	RS communication (green) LED
8)	Display mode selection key	20)	T-max mode selection (red) LED
9)	Led/relay test key	21)	Man mode selection (yellow) LED
10)	UP key	22)	Auto mode selection (green) LED
11)	DOWN key	23)	Scan mode selection (yellow) LED
12)	Key enable forced ventilation		

DISPLAY

The first display is dedicated to temperatures.

The second display to the monitored channel.

When the device is switched on or after a reset, the display shows: the control unit model, NTF999, together with VER "00" (firmware version), communication option (RS485 or ETH) if available, option type sensor (PT100 or TCK), temperature range.

Pressing the MODE key, the display modes can be set :

- *SCAN*: the monitoring unit displays all the activated (°C) and deactivated (NO) channels scanning every 2 seconds.
- *AUTO*: the control unit displays the hottest channel automatically.
- *MAN*: manual reading of the channel temperature using the up/down keys▲▼.
- *T.MAX*: the control unit displays the maximum temperature reached by the sensors, any situations of: alarm or fault occurring after the last reset. Select channels with the up/down key▲▼, reset values with RESET.

OPERATING PROGRAM CONTROL

To control the protection levels programmed, press the PRG key twice to access the **VIS** display mode. Repeatedly pressing the PRG key, you can scroll through all the previously loaded values in sequence.
After 1 minute's keyboard inactivity, the programming display procedure is automatically abandoned.

To stop the display, press the ENT key.

NOTES ON SCAN AND MAN FUNCTIONS

During the SCAN and MAN modes, the operation of the NTF999 can be displayed.
1) RUN cPU:
This message appears when the device operates regularly without any system error.
2) Ech Err:
This message appears when damage in the EEPROM memory is detected.
Pressing Reset will cancel the message and restore the original default parameters, listed in the programming paragraph on pages 13-14. Return the control unit to TECSYSTEM for repairs.
3) CAL Err:
This message appears when damage is found in the measurement circuit.
The temperature values displayed might be incorrect. Return the control unit to TECSYSTEM for repairs.
4) Pt Err :
This message appears when it is detected that one or more sensors are not working correctly, FOC, FCC and FCD indications in the temperature sensor diagnostics paragraph on page 17.
5) Hi (F-1 and/or F-2):
This message appears when on one and/or both FAN lines a greater absorption than the value programmed for FAN 1 HI or/and FAN 2 HI is found, see the section on fan diagnostics on page 18.
6) Lo (F-1 and/or F-2):
This message appears when absorption of less than approximately 0.2A is detected on one and/or on both FAN lines, see fan diagnostics on page 18.

In case of Err the FAULT relay will be de-energised.

The above messages will be displayed following the 1-2-3-4 priority stated. The signals 5-6 indicated follow the CH channels display

NOTE: regardless of the display mode, in case of a sensor fault (fcc, foc, fcd, FAN1/2 Hi or Lo), the control unit will automatically switch to **SCAN (PRIVILEGED SCAN)** mode, immediately allowing you to see the fault on the relative channel **CH** (**Mode** key is disabled).

LED TEST

We suggest carrying out the control unit LED test regularly.
For this operation, press the TEST key briefly; all the displays turn on for 2 seconds.
If one of the LEDS does not work, please return the control unit to TECSYSTEM for repair.

ALARM RELAY TEST

This function allows you to carry out a test of the relay operation without having to use further devices. To start the test procedure, keep the TEST button pressed for about 5 seconds: TST appears for 2 seconds, confirming you have entered the Relay Test mode.

The LED that is lit shows the relay to be tested; use the up/down key ▲▼to select the desired relay.
Press the SET and RESET keys to energise and de-energise the relay to be tested; the display will show ON-OFF.
After 1 minute's keyboard inactivity, the RELAY TEST procedure will be automatically abandoned.
To stop the RELAY TEST procedure, press the TEST key.

ALARM RELAY SILENCING

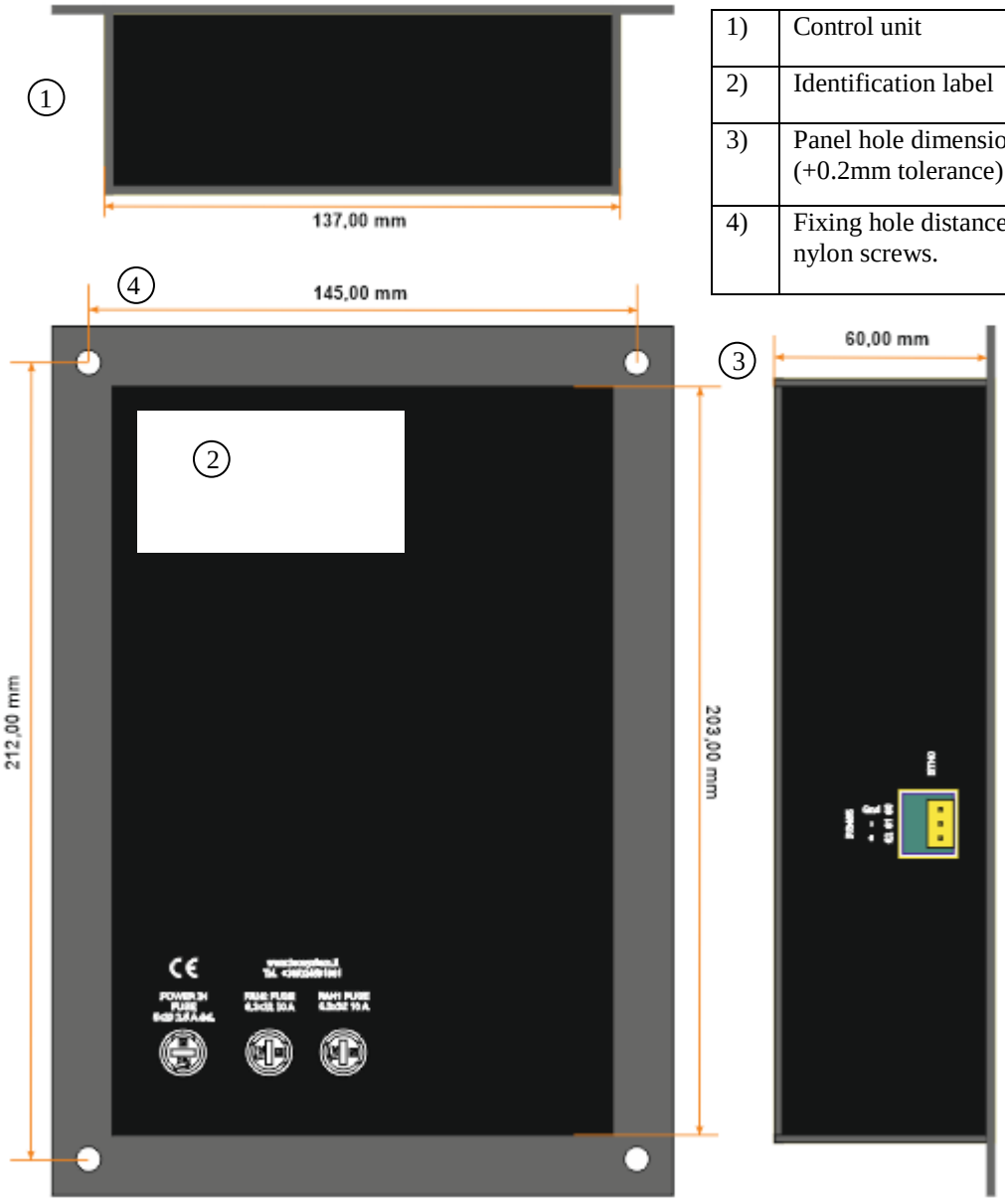
To silence the ALARM signal, press the RESET key: the relay will de-energise and the ALARM LED, which lights up steady, will start to flash. Silencing is automatically disabled when the temperature goes below the ALARM threshold.

NOTE: you can stop the acoustic alarm by pressing the silent key  **. It works only for the acoustic signal, it doesn't change the alarm relay status .**

MOUNTING

Drill a hole in the panel sheet with dimensions of 205mm x 140mm.

Drill four holes size Ø5.5mm distance 145mm X 212mm, see drawing below.



1)	Control unit
2)	Identification label
3)	Panel hole dimensions (+0.2mm tolerance)
4)	Fixing hole distance for nylon screws.

Firmly tighten the device with the 4 screws (nylon) supplied

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5)	Screws, Washers and Bolts nylon M5	6)	Line-head screwdriver #1X100mm

ELECTRICAL CONNECTIONS

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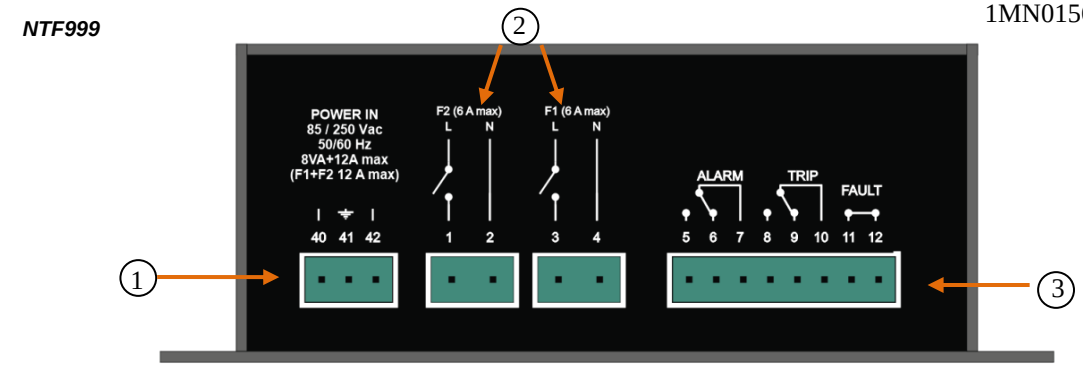
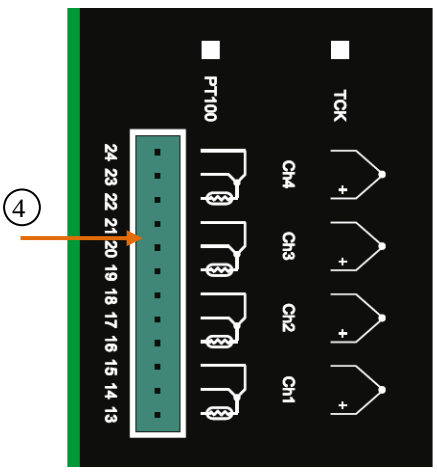
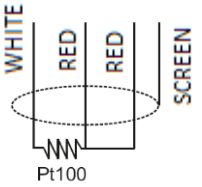
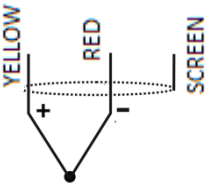


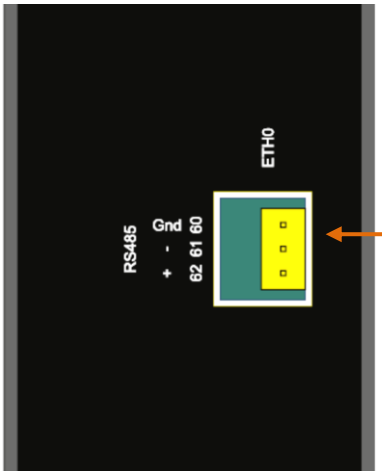


Pt100 CONNECTION EXAMPLE



TCK CONNECTION EXAMPLE

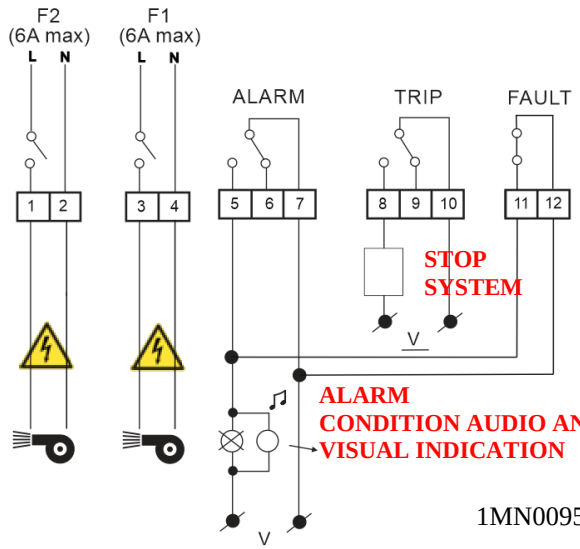




1)	Power supply 85-250Vac 50/60Hz 8VA+12A max (F1-F2 6A max for line)	4)	Pt100 or TCK sensors
2)	Power Outputs ventilation (FAN2-FAN1) (85-250Vac 6A max) outputs powered.	5)	RS485 or ETHERNET output (options on request)
3)	Relays (ALARM-TRIP-FAULT)	6)	Fuses: Power- Fan1 and Fan2

Note: before connecting the sensors to the control unit, read the Measurement signal transfer paragraph on page 16.

RELAY CONNECTION EXAMPLE



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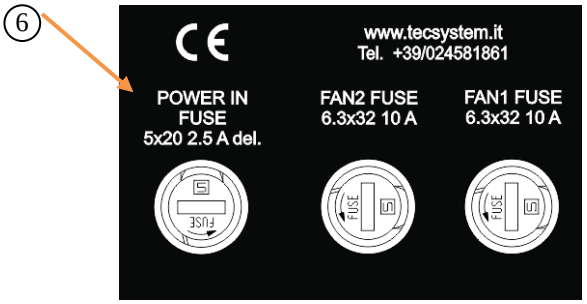


Note: relay contact image in non-alarm condition, with the exception of the FAULT relay that opens: contact 11-12 open (NO) contacts 11-12 closed (NC) fault condition identification. Read the Alarms and Ventilation paragraph on page 12 and see the opening of the fault contact.

Output relay with contacts of 10A-250Vac-res COSΦ=1. Outputs FAN 1 and FAN 2 powered 6A-250Vac-res COSΦ=1

SUPPLY

The NTF999 control unit can be supplied either from 85 to 250 Vac, 50/60Hz (terminals 40-42).

The ground must always be connected to terminal 41.

When the unit is supplied directly by the secondary of the transformer to protect, it can be burnt out by strong overvoltages. This happens if the main switch is closed and the transformer has no load (blank test).
The above is much more evident when the 220 Vac voltage is taken directly from the transformer secondary bars and there is a fixed capacitor bank for power factor correction of the transformer itself.

To protect the control unit against line overvoltages, we recommend the use of an isolation transformer.

If an existing control unit must be replaced with a new one, to guarantee its correct and safe operation, the sensor/relay/supply connecting terminals must be replaced with the new terminals supplied.

ALARMS AND VENTILATION

Carry out the electrical connections on the removable terminal blocks only after disconnecting them from the unit.
When the control unit is in one of the modes mentioned below, it does not monitor the temperature and the relays are all blocked.

- Vis. programming display
- PRG Programming
- Relay test

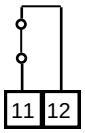
The ALARM and TRIP relays switch only when the set temperature thresholds are exceeded.

The FAULT contact opens (11-12) when the equipment is supplied , only if the unit detects no fault on switching on, and stays in this condition until one of the following events occurs:

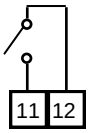
- Data memory fault (Ech message).
- Pt100/TCK sensor fault (FCC short-circuited sensor, FOC interrupted sensor or Fcd quick temperature increase)
- CAL damage to the measurement circuit.
- Insufficient supply voltage.
- During the power on reset after programming (PRG), displaying the data (VIS) and test relay.
- Hi-Lo signalling on FAN1 and/or FAN2 lines.

NOTE: do not connect the FAULT relay to the transformer tripping circuit to avoid unwanted system interruptions.

FAULT CONTACT SWITCHING



FAULT 11-12 NC: ALARM FAULT OR POWER OFF



FAULT 11-12: NC POWER ON – NO FAULT

The FAN1 and FAN2 contacts can be used to control the cooling fans, or they can be inserted in the conditioning system of the transformer room, see paragraph cooling fan control on page 18.

NOTE: always disconnect the unit before performing any electrical connections.

FAULT AND RESET MESSAGE SEQUENCE

Find below the sequence of fault messages and RESET function condition.

1) ECH	eeprom fault	erasable message
2) CAL	measurement circuit fault	erasable message
3) FCD	quick temp. increase fault	resettable condition
4) ERR PT	FCC or FOC sensor fault	non-resettable condition
5) HI	over current F-1 or F-2 signalling	resettable condition
6) Lo	under current F-1 or F-2 signalling	resettable condition

PROGRAMMING

NTF999

STEP	PRESS	EFFECT	PRESS	NOTES
1	PRG SET	Keep the PRG key pressed until the display shows PRG LED PRG will blink quickly		PRG
2	PRG SET	Select SET (for Programming Manual) 1-2-3-4-5 table to call default programming.	▼ ▲	Default SET/1 tables: 1- 2-3-4-5 see at page 15.
3	ENT RESET	Press PRG to continue programming manual (SET) Press ENT to confirm the programming of the selected table		
4		The ALARM CH1-CH2-CH3 threshold for is displayed Set the desired threshold, the Alarm LED flashes		Default 90°C
5		Set the desired threshold	▼ ▲	
6	PRG SET	The TRIP CH1-CH2-CH3 threshold for is displayed Set the desired threshold, the Trip LED flashes		Default 119°C
7		Set the desired threshold	▼ ▲	
8	PRG SET	The display shows FAN 1 (CH 1-2-3) led Fan1 flashes.		Default YES
9		Select YES/NO/INT	▼ ▲	If you select INT read notes page 19 function.
10	PRG SET	Enabling CH4		Default YES
11		Select YES or NO	▼ ▲	To enable YES NO to disable CH4
12	PRG SET	The ALARM CH4 threshold for is displayed Set the desired threshold, the Alarm LED flashes		If not enabled, skip to step 16
13		Set the desired threshold	▼ ▲	Default 120°C
14	PRG SET	The TRIP threshold for CH4 appears and the Trip LED flashes.		
15		Set the desired threshold	▼ ▲	Default 140°C
16	PRG SET	The display shows FAN 2 (CH4)		Default Yes
17		Select YES/NO	▼ ▲	YES to enable FAN2 No to disable
18	PRG SET	The display shows ON (CH 1-2-3), the FAN1 flashes		Default 70°C
19		Set the desired threshold FOR FAN1 ON	▼ ▲	Selecting FAN 1 NO skip to step 24 selecting INT the LEDs FAN1 and FAN2 flash
20	PRG SET	The display shows OFF (CH 1-2-3), the LED FAN1 flashes		Default 60°C
21		Set the desired threshold FAN1 OFF	▼ ▲	
22	PRG SET	The display shows ON (CH4) FAN2 flashes		Default 45°C
23		Set the desired threshold FAN2 ON	▼ ▲	
24	PRG SET	The display shows OFF (CH4) FAN2 flashes		Default 35°C

25		Set the desired threshold FAN2 OFF		
26		HFN (NO) is displayed The FAN1-FAN2 LEDs flash		Fan cyclic test for 5 min. every “n” hours
27		Set the desired number of hours		Default NO = function disabled
28		FCD (NO) is displayed		Fault for quick temperature of the temperature (°C/sec)
29		Set the desired value (FCD info on page 32)		Default NO (function excluded)
30		VOT (NO) is displayed (VOTING info on page 17)		Default NO (function excluded)
31		Select YES/NO		For YES enable Voting NO to disable Voting
32		The display shows FLS (ALARM) Blinking LED ALARM		Info FAIL SAFE on page 31. Read carefully before modifying the parameter
33		Select YES or NO		Default NO
34		The display shows FLS (TRIP) Blinking LED TRIP		
35		Select YES or NO		Default NO
36		HYS ALARM is displayed		See paragraph hysteresis page 17
37		Select YES or NO		Default NO
38		HYS TRIP is displayed		See paragraph hysteresis page 17
39		Select YES or NO		Default NO
40		Steps 40-45 only for RS485 version BASIC and ETH jumps to step 46		
41		ADR <> "datum" is displayed		Modbus address Default 001
42		Set the address		From 1 to 255
43		BDR <> "datum" is displayed		Modbus transmission speed Default 19.2 Kb/s
44		Set the desired speed		From 2.4 Kb/s to 38.4 Kb/s
45		PAR <> "datum" is displayed		Parity bit selection EVE Default
46		Set the desired parity bit		None (No), Even (EVE), Odd (ODD)
47		The display shows HI-F1 the LED FAN1 flashes		Default 5A
48		Set the desired threshold FAN1 HI		From 1A to 6A
49		The display shows HI-F2 the LED FAN2 flashes		Default 5A
50		Set the desired threshold FAN2 HI		From 1A to 6A
51		END is displayed Press ENT to save the set data and exit programming		Programming end Err: incorrect programming of the values indicated by the LEDs (note 6)
52		PRG to return to step 1		

DEFAULT PROGRAMMING TABLES

The tables programming: SET-1-2-3-4-5 allow a fast and optimal programming, basic, of the device.
They are simplified and useful support iteration man - machine.
The table in SET shows the default parameters for-set. By accessing to the SET programming the value can be changed manually, the other tables (1-2-3-4-5) are not editable. To access the table in SET see the programming step 3 at page 13.

PARAMETERS	Table SET/1	Table 2	Table 3	Table 4	Table 5
ALARM CH1CH2-CH3	90°C	110°C	120°C	130°C	130°C
TRIP CH1CH2-CH3	119°C	130°C	140°C	145°C	145°C
FAN 1 CH1-CH2-CH3	YES	YES	INT	INT	YES
CH4	YES	YES	YES	YES	YES
ALARM CH4	120°C	45°C	145°C	145°C	125°C
TRIP CH4	140°C	50°C	150°C	150°C	140°C
FAN 2 CH4	YES	YES	INT	INT	YES
FAN 1 ON	70°C	70°C	90°C	90°C	90°C
FAN 1 OFF	60°C	60°C	80°C	80°C	80°C
FAN 2 ON	45°C	40°C	90°C	90°C	40°C
FAN 2 OFF	35°C	30°C	80°C	80°C	30°C
HFN	NO	NO	NO	NO	NO
FCD	NO	NO	NO	NO	NO
VOTING	NO	NO	NO	NO	NO
FAIL SAFE ALARM	NO	NO	NO	NO	NO
FAIL SAFE TRIP	NO	NO	NO	NO	NO
HYS ALARM	NO	NO	NO	NO	NO
HYS TRIP	NO	NO	NO	NO	NO
HI FAN1	5A	5A	5A	5A	5A
HI FAN2	5A	5A	5A	5A	5A

The communication parameters for Modbus RS485: ADR-BDR-PAR are not included in the predefined tables, they can be edited independently selecting the SET table and modifying it manually.

Note: the user is obliged to check the parameters and select the appropriate table to its application. The first time you turn on the unit the table is SET 1, then it will keep the selected parameters stored by the user.

PROGRAMMING NOTES

1) The MODE key allows reversing the programming steps according to the sequence 1-10-28-30-47
2) The TEST key allows exiting programming without saving the modified data.
3) After 1 minute's keyboard inactivity programming is abandoned without saving the data.
4) During programming the control unit does not control/protect the monitored machine.
5) At the end of programming the control unit is restarted and the FAULT relay is disabled until the unit is fully restarted.
6) If pressing ENT, “Err” appears, it means that one of the following mistakes has been made:

ERR ALL. = ALARM ≥ TRIP (CH1-CH2-CH3 or CH4)
ERR FAN = FAN-OFF ≥ FAN-ON. (FAN1 OR FAN2)

Press PRG to return to step 1 and to correct the data.

NOTE: EVERY TIME THE CONTROL UNIT IS PROGRAMMED WITH DATA SAVING CONFIRMATION, THE VALUES STORED IN T-MAX ARE RESET TO THE TIME OF SAVING.

ATTENTION:

We recommend you check the device's programming before starting the device.

The default parameters set by TECSYSTEM might not match your requirements.

Programming the device is the end user's responsibility, the settings of the alarm thresholds and the enabling of the functions described in this manual must be checked (by a specialised engineer) according to the application and features of the system the control unit is installed on.

TEMPERATURE SENSORS

Each Pt100 temperature sensor has a white wire and two red (CEI 75.8), each temperature sensor TCK has one conductor yellow and one red, in the picture on page 11 shows the disposition in the terminal board of the connection cables to the control unit.
CH2 must always be referred to transformer central column.
The CH4 channel must be referred either to the transformer core, or to the room probe, in order to thermostat the transformer room using the NTF999 control unit.

TCK NOTE: For a correct temperature measurement is necessary that the cold junction of the probe is stabilized at room temperature, in the control unit operating range -20 ° C + 60 ° C.

MEASUREMENT SIGNAL TRANSFER

All the cables transferring the sensors measurement signals must comply with the following under all circumstances:

All the cables transferring the sensors measurement signals must comply with the following under all circumstances:

1. Every Pt100 must be connected with a three-wire cable having a minimum section of 0.35mm² and a maximum of 1 mm².
2. Every TCK must be connected with a 2-wire cable compensated: Chromium - aluminum (yellow-red), joints or terminal support must also be compensated.
3. The extension cable must be screened with tinned copper braid with an 80% cover
4. Conductors must be twisted, maximum recommended step 60mm
5. The cable screening must be grounded only with a termination, preferably on the unit side.
6. The sensors' signal transfer cable must not be near electrical cables, either low or medium-high voltage.
7. The sensors cable and the signal transfer cable must be laid in a straight line, withour any winding.
8. Any caps used to butt conductors must be crimped properly to avoid false contacts.

NOTE: to install the sensors and signal transferring cable correctly, read the sensor and SCS installation note manual.

What may happen when the installation rules are not complied with.

1)The electrical field propagating from the power line of another circuit couples capacitively with the conductors (in particular with unsheathed cables). The effect of this coupling creates a signal that overlaps the signal transmitted by the nearby conductors, causing incorrect readings.

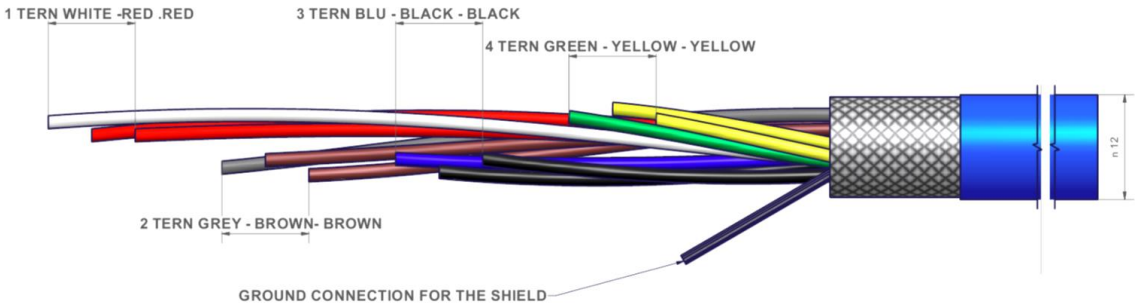
2) The variations in magnetic flux in the power lines may induce an electromotive force on the signal transferring cables (in particular non-twisted cables), that, being a closed circuit, generates a current. This interference current, multiplied by the circuit resistance, gives a voltage value that overlaps the signal to be transmitted, distorting the sensor measurement.

3) False contacts can alter the signal with the consequent variation in the temperature detected.

In specific cases, when the rules for connecting the Pt100 sensors are not complied with, the following anomalies can occur between the SCS box and the temperature control unit:

a) incorrect temperature readings, alarms or anomalous tripping.
b) mechanical/electrical fault of the Pt100 sensors
c) damage of the inputs of the control unit.

For the Pt100 sensor connection , TECSYSTEM S.r.l. has designed its own special cable to transfer the measurement signals, CEI-compliant, with all the protection requirements provided for: CT-ES



NOTE: *the use of cables not complying with the above might cause reading anomalies. It is always important to take into account that any interference on the signal lines might cause anomalies on the Pt100 inputs (CH1-CH2-CH3-CH4.) or on the sensors themselves.*

All "NTF" series control units have linearity of the sensor signal, with a maximum error of 1% of full scale value.

TEMPERATURE SENSOR DIAGNOSTICS

In case of failure or exceeded full scale value of one of the thermometric sensors installed on the machine to protect, the FAULT relay opens immediately with the relative warning of faulty sensor on the corresponding channel.

Fcc indicates sensor short-circuited (Pt100) or minimum full scale value of the control unit exceeded -23°C

Foc indicates sensor interrupted (Pt100) or maximum full scale value of the control unit exceeded 228°C

To eliminate the message and reset the opening of the Fault contact, it is necessary to check the sensors connections and replace the faulty sensor (if any). If the minimum/maximum full scale value has been reached, check that the ambient conditions match the control unit reading.

Note: exceeding the minimum/maximum full scale value can also be caused by interference on the sensor lines; in this case we recommend that you check:

The correct installation of the sensors and above all of the extension cable (as stated in the paragraph MEASUREMENT SIGNAL TRANSFER)
The activation of these functions: VOTING (see below) or FCD (see page 32) according to the work conditions of the system.

CAL message display: the indication appears when the measurement circuit is damaged. The temperature values displayed might be incorrect. Return the control unit to TECSYSTEM for repairs.

VOTING FUNCTION

The voting function derives from the redundancy concept that consists of duplicating the components of a system to increase their **reliability**.

How does VOTING work?
Using the redundancy principle, we use the sensors installed on the three phases U-V-W to monitor the transformer's operation, and at the same time to ascertain that the sensors are working correctly, discriminating against any false alarms (generated by installation errors).

By activating the **VOTING "YES"** function, the control unit compares the temperature values recorded on the monitored CH1-CH2-CH3 channels and enables the switching of the **TRIP** contact only if the **TRIP** threshold has been exceeded on at least two channels over the same period T.

By selecting **VOTING "NO"** the function will be disabled.

Note: if you program Voting "Yes", the switching of the **ALARM** contact will signal the exceeding of the alarm threshold on each individual channel.

To enable the Voting function, read the programming section on pages 13-14.

Attention: To control the transformer correctly from a temperature point of view, enabling the VOTING function is allowed where the load distributed between the phases of the transformer is adequately balanced. In addition, any conditions of FAULT: FCC-FCC-FCD on two or more channels, with active voting, can determine the TRIP contact inhibition.

TEMPERATURE DIAGNOSTICS

When one of the temperature sensors senses a temperature 1°C higher than the alarm threshold, 5 seconds later, the **ALARM** relay switches and the *ALARM* LED of reference of the channel (CH*n*) lights up.
When the trip temperature limit is exceeded, 5 seconds later, the **TRIP** relay switches and the *TRIP* LED of reference of the channel (CH*n*) lights up.

As soon as the recorded temperature returns to values equal to or lower than the limit set for the **ALARM** and **TRIP** relays switching, these relays de-energise and the corresponding LEDs switch off.

The values of **ALARM** and **TRIP** are kept in the internal memories: they can be recalled by entering the Vis modes (displaying programmed parameters) and modifiable in the PRG mode (programming).

HYSTERESIS FUNCTION HYS (RELAY ALARM AND TRIP)

Activating the function **HYS ALARM "YES",** the control unit switches the relay ALARM just found to a temperature higher than 1°C, with respect to the value set as alarm limit and keeps the relay energised until the temperature has dropped to 5°C below the threshold alarm.

Activating the function **HYS TRIP "YES** the controller switches the TRIP relay just found to a temperature higher than 1°C, with respect to the value set as trip limit and keeps the relay energised until the temperature has dropped to 5°C below the trip threshold.

Selecting **HYS "NO**" the activation of ALARM relay or TRIP will behave as described in paragraph TEMPERATURE SENSOR DIAGNOSTICS on page 17.

PROGRAMMED DATA DIAGNOSTICS

In case of failure of the internal memory or corruption of programmed data, just after switching on, **Ech** appears with the relevant Fault contact.
In this case, for safety reasons, the default parameters are loaded automatically (see programming table on pages 13-14).
Eliminate **Ech** by pressing RESET and run programming to enter the desired values.
Finally switch the unit off and back on to check the memory works correctly, if it is damaged **Ech** will be displayed again (send the control unit to TECSYSTEM s.r.l. for repairs).

COOLING FAN CONTROL

The NTF999 control unit has two active FAN lines (FAN1 and FAN2).

The outputs F1 and F2 are powered directly by the NTF999 device, in relation to the power supply value of the device itself, supply range from 85 to 250 Vac, maximum current supports 6A (10A fuse for short circuit protection).

If appropriately programmed, the NTF999 can control the ON-OFF of the fans to cool the transformer.

The FAN1 and FAN2 lines can manage the cooling of the transformer and the environment in which the booth operates..

By connecting FAN1 to the tangential cooling system (the two bars on the transformer) and FAN2 to the extractor, you will improve the air flow in the cabin; moreover, the cabin temperature will no longer need to be managed by a thermostat outside the system.

The fans can be controlled in two different ways:

- Using the temperatures sensed by the sensors on the three columns (FAN1)

  CHF 1.2.3 (e.g. ON at 70°C - OFF at 60°C)

- Using the extra sensor (**CH4/YES**) dedicated to the ambient temperature inside the transformer room (FAN2).

  CHF 4 (e.g. ON at 45°C - OFF at 35°C)

The ON and OFF values are programmable according to the device range from 1°C to 220°C.

The FAN 1/2 LED lights up when the temperature exceeds the FAN ON threshold by 1°C, the FAN 1/2 output is powered, and they turn off when the temperature goes below 1°C with respect to the FAN OFF, the FAN 1/2 output is de-energised.

If it is necessary to use both contacts, FAN1 and FAN2, the INTELLIFAN function can be enabled for managing of the bars on board the transformer, see description on page 19.

The key enabling forced ventilation allows you to: manually start the outputs of active fans (FAN1 e FAN2). The manual activation is indicated of the light on of the led F.ON.
By pressing the forced ventilation button it is possible to reset the FAULT conditions: FAN HI and FAN LO.

FAN DIAGNOSTICS

The NTF999 device introduces, for the first time in combined operation, the monitoring of the two ventilation lines.
By programming the FAN1 HI and FAN2 HI values (maximum current value on the single line), programming steps from 47-50 on page 14, the device can monitor the operating status of the two FAN outputs.
Let's see how:

During the operation of the fans, connected on the FAN1/2 line, the control unit checks the current absorption of the lines comparing it with the programmed values, FAN1 HI and FAN2 HI, and will signal to you:

- **HI F-1 -** This message appears on the display after 10 seconds, when on the FAN 1 line a greater absorption is found than the value programmed for FAN 1 HI, programmable value from 1A to 6A.
- **HI F-2 -** This message appears on the display after 10 seconds, when on the FAN 2 line a greater absorption is detected than the value programmed for FAN 2 HI, programmable value from 1A to 6A.
- **LO F-1 -** This message appears on the display after 10 seconds when an absorption of less than 0.2A is detected on the FAN 1 line.
- **LO F-2 -** This message appears on the display after 10 seconds when an absorption of less than 0.2A is detected on the FAN 2 line.

The above indications reporting HI/LO involve the switching of the FAULT contact, moreover the HI signalling also entails stopping of the indicated ventilation line. It is advisable to check the operating status of the connected fans.

NOTE: on page 34 there is the programming table of the suggested FAN HI values for the Tecsystem bars.

FAN TEST

By programming (**HFn**), it is possible to have the fans operating 5 minutes every "*xxx*" hours, regardless of the column or ambient temperature values (i.e.: with HFn=001 the fans are activated for 5 minutes every hour).
This function aims at verifying the fan operation and their control apparatus periodically.

By setting **NO** this function is inhibited.

To enable the HFN function, read the programming section on pages 13-14.

IMPORTANT WARNING

Before carrying out the isolation test of the electrical panel the control unit is installed on, disconnect it together with the sensors from the power supply to prevent it from being seriously damaged.

INTELLIFAN FUNCTION

What it is used for:

The Intellifan function allows reducing the transformer's thermal shock by partially anticipating (one bar at the time) the activation of the tangential ventilation system.

The reduction in the transformer's thermal shock will extend the life of the transformer and of the ventilation system itself.

Enabling the function **FAN 1. "INT"** the control unit will alternate the activation (every 30 minutes) of the FAN1 and FAN2 contacts, anticipating the activation of the ventilation system at the intermediate value between FAN1 ON AND FAN1 OFF.

E.G. FAN1 ON = 70°C and FAN1 OFF = 60°C **ACTIVATION FAN INT. = 65°C**

Before enabling the function, check that the connection of the two ventilation bars is distributed in such a way that the RH bar is connected to the FAN2 relay, pins 1-2, and the LH bar is connected to FAN1, pins 3-4.

Selecting **FAN 1. "NO or YES"** the function will be disabled.

once the FAN1 threshold is exceeded, the control unit will activate both bars.

To enable the ***INTELLIFAN*** function, read the programming section on pages 13-14.

Note: for correctly working of the INTELLIFAN function we recommend you observe ΔT 10°C between FAN1 ON and FAN1 OFF. Furthermore, it will be necessary to check the correct programming of FAN1 HI and FAN2 for both lines.

OPTIONAL OUTPUTS

INTRODUCTION TO THE MODBUS INSIDE MODULE (only RS485 version)

The MODBUS INSIDE expansion module is built in the monitoring unit and allows data transfer on a RS485 network with MODBUS RTU protocol.

OPERATING NOTES

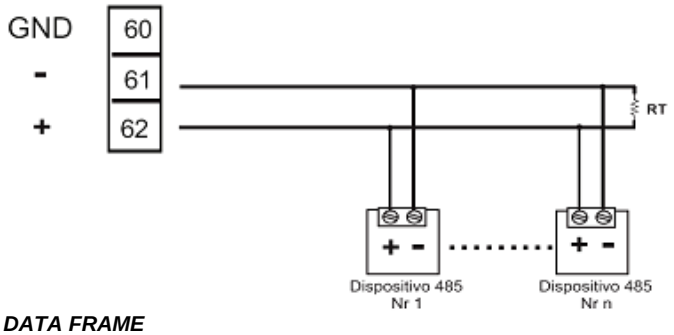
For the module to work correctly, it is necessary to set the RS485 network set-up parameters: address, baud rate, parity bit.
See programming steps 40 to 45 on page 14.
The serial communication of the temperature control monitoring unit is active only when the NTF999 is in temperature control mode in one of the intended modes (Scan, Auto, Man and T.Max).
When other functions such as programming, programming display and relay test are activated, the ModBus communication is temporarily deactivated.

DATA TRANSMISSION ON MODBUS NETWORK

The MODBUS INSIDE internal module allows connecting of the NTF999 control unit to an RS485 network with Modbus RTU protocol in order to be able to read the data indicated in the Modbus table pag. 22 and to be able to write those indicated in the notes section for remote programming, the module is always in slave mode.
The NTF999 control unit is in communication with the network only when it is in temperature reading mode, while it is inactive when it is in the following modes: display, programming and relays test.

RS485 ELECTRICAL CONNECTIONS

As far as the signal cable to be used in order to ensure the correct network operation is concerned, we recommend you follow the provisions of the EIA RS485 standard which suggests using a 24AWG twisted pair.
The twisted pair that connects units in RS485 might need a 120 ohm end resistor on the last unit of the series.
Connect the twisted pair paying attention to polarities and lay the network avoiding to make sharp bends or ring windings in order not to modify line impedance. If necessary, the GND terminal for grounding is also available.
Always position the RS485 twisted pair far from power cables.



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DATA FRAME

The frame in asynchronous transmission consists of: 1 start bit, 8 data bits, 1 parity bit (even or odd, if the parity has been set) and 1 stop bit. with selection NO parity (none) set 2 stop bits.
The permitted baud rates are: 2400, 4800, 9600, 19200 and 38400 .
If not otherwise specified, the word length (DATA) is 16 bits.

INTRODUCTION TO THE ETHERNET MODULE (ONLY ETH VERSION)

The Ethernet connectivity of the NTF999 allows you to implement the functions of the Tecsystem control units directly within your monitoring system.
The integrated module includes all the essential network features, among which a 10Base T/100Base-TX Ethernet connection, TCP/IP full stack suitable to work as Modbus TCP slave.
The unit can be used for remote configuration, monitoring in real time or problem solving. The Windows-based Telnet system allows configuring of the NTF999 easily within a sub-network with specific IP addresses.

DATA TRANSMISSION

The Ethernet module allows you to connect to the control unit through Modbus TCP slave so that you can: read the data on the Modbus table on page 22 and write those in the paragraph regarding the remote programming notes.
The ETH module is always in slave mode.
The NTF999 control unit is in communication with the network only when it is in temperature reading mode, while it is inactive when in the following modes: display, programming and test relays.

OPERATING NOTES

The communication of the temperature control monitoring unit is active only when the NTF999 is in temperature control mode (Scan, Auto, Man and T.Max).
When other functions such as programming, programming display and relay test are activated, the ModBus communication is temporarily deactivated.

NOTES ON ETHERNET ELECTRICAL CONNECTIONS

As to the signal cable to use in order to guarantee correct operation, it is necessary to use a CAT 7 Ethernet cable with RJ45 connector with the following specifications:

- 4 twisted pairs 23AWG
- Tinned copper braid with an 80% cover (shielding).
- Always position the Ethernet cable far away from power cables.

FUNCTION CODE

The ModBus module supports the following function codes:

$3_{(10)}$: - holding register reading

$16_{(10)}$: - register multiple writing

If ModBus receives a message and a CRC error is detected, no answer is given.

CODE $3_{(10)}$.

Request:
Slave address, code $3_{(10)}$, Starting address HI, Starting address LO, Number of Point HI, Number of Point LO, Crc LO, Crc HI.

Response:
Slave address, code $3_{(10)}$, Byte count, Data HI, Data LO……., Crc LO, Crc HI.

CODE $16_{(10)}$.

Request:
Slave address, code $16_{(10)}$, Starting address HI, Starting address LO, Number of Point HI, Number of Point LO, Byte count, Data HI, Data LO……., Crc LO, Crc HI.

Response:
Slave address, code $16_{(10)}$, Starting address HI, Starting address LO, Number of Register HI, Number of register LO, Crc LO, Crc HI.

NOTES FOR REMOTE PROGRAMMING

The writable registers are shown in TABLE MODBUS MAPPING referred to as W or RW (**write or read/write**). max number of registers 80, see table page 22.

In the case in which the channel is not enabled and/or the information is not provided we have the following answers:

1. Temperatures measured = 0000 (0°C)
2. Temperatures AL./TRP = Value written in E2PROM
3. Channel state = 0000
4. Channel setting = %00000000, %xxxxxxx0 (x=n.d.)

If WRITE the data must always respect the rule T_trip> T_alarm and FAN_ON> FAN_OFF.

Hysteresis ALARM/TRIP: 0 = no hysteresis; 1 = YES Hysteresis (5 ° C).
This function must be interpreted as:

- Hysteresis = NO → Alarm/Trip become active if T> threshold, are disabled if T ≤ threshold;
- Hysteresis = YES → Alarm/Trip become active if T> threshold, are disabled if T ≤ (threshold-5 ° C);

When trying to set these thresholds incorrectly, the control unit NTF999 will not proceed with the programming and storage of data, therefore in subsequent readings the data will be read from the previous schedule.

After having sent a request for writing, the control unit will take a time of approximately 1" to store the data in eeprom, during the step of storing the module ModBus will not be able to process additional requests.
If the demand for programming is successful, the unit automatically resets and loads the new settings.

In the event that information is sent in writing to a register can't be written (only READ) data will be trashed without affecting the received message.

The information "RELAY STATUS" indicates the state of excitation of the coils of the relays, so it will be subject to the commands of "FAIL SAFE".

In the case of writing data "CPU SETTING" with bits "Failsafe Fault" = 0, it will be forced = 1 so as not to affect the validity of the data packet.

Prog. FAN1-2 current: The programmable values of the maximum current vary from 1 → 6 A with steps of 1 A; in the case of out-of-range values, 1 A will be stored without affecting the received message.

From the point of view of the Modbus connection, the control unit is considered as a normal NTF999.

At the end of the write command (Write) is carried out a check of compatibility data:

- If you have a non-compatibility "exception" for an answer and the data packet is rejected in its entirety. The code of the first incorrect data can be requested by reading the register "Error received data" (N.B.: this code is lost in the RESET phase, i.e. new power on or writing data in E2PROM);
- if the data are correct, they are transferred to the non-volatile memory (E2PROM), resets the historical data (Tmax = 0 ° C) and is subsequently forced a reset of the system
- If the WRITE command implies only writing "COMMANDS" it will be implemented autonomously and without RESET, i.e. without affecting the data of the control unit.

To avoid a long time both in reception that transmission is placed a limit of data equal to "80 Registers"

ERROR CODES (exception codes)

In case of a wrong request, ModBus will answer with modified codes and codified errors according to the following:

1: - Unsupported function code
2: - Incorrect data address
3: - Wrong data (for instance length)

The memory area containing the HFN datum must undergo no forcing.
In the case in which all the fans are turned off (FAN1, FAN2 and INT) the test of the relay will not take place.

ILLEGAL DATA

On the other hand, some combinations are programming errors because they are wrong settings; in this case the error code is ILLEGAL_DATA ,This information is accessible to ModBus reading the register 7, see at page 22.

NO ERROR	No error 00
CH_1 Trip ≤ Alarm	Code error 01
CH_2 Trip ≤ Alarm	Code error 02
CH_3 Trip ≤ Alarm	Code error 03
CH_4 Trip ≤ Alarm	Code error 04
FAN_1 ON ≤ OFF	Code error 017
FAN_2 ON ≤ OFF	Code error 018
No channel enabled	Code error 019
Value HFN > max see table: SYSTEM - Setting and Status	Code error 020
Value FCD > max see table: SYSTEM - Setting and Status	Code error 021
Value 4.20 > max see table: SYSTEM - Setting and Status	Code error 022
Value Voting > max see table: SYSTEM - Setting and Status	Code error 023
Voting wrong function (channels not enabled)	Code error 024

Note. If the value of Voting is higher than the max value expected for the model in question, it will be set equal to "0", that is NO_VOTING.

GENERAL UNIT NOTE

The models of the unit can be equipped with different options ; to avoid disruption of production , their existence is defined by Fw indicated power , with messages dedicated on display LEDs .

This information can be accessed by reading the Modbus register 6 (option) with the following meaning :
LOW Byte

Bit_1 : option Ethernet
Bit_2/3 : type sensors 11=PT100; 00=TCK
Bit_4 : option RS485

HIGH Byter

Bit_1/1 = 01 - Range -20°C + 220°C

Ethernet functions has disabled ModBus and 4.20 mA from panel will be readable from the center

Note: in case the values programmed from ModBus are out of range, it will generate a "exeption" error response to date.

FREQUENCY OF QUESTION (Polling).

It is advisable to adopt polling frequencies greater than or equal to 1 second. Questions frequently can overload the system, without bringing any benefit. In multi-device RS485 lines, interrogated in sequence, it may be useful to enter a delay between polls in relation to: the number of connected devices, the communication speed and the number of read registers.

MODBUS MAPPING TABLE

HEADER (Information and commands):

Address LO (10)	**Data HI**	**Data LO**	**R: read W:write RW: read/write**
1	Model – MSD (ASCII)	Model - 3° Digit (ASCII)	R
2	Model - 2° Digit (ASCII)	Model – LSD (ASCII)	R
3	Space (20H)	Vers. Fw – MSD(ASCII)	R
4	Vers. Fw - 2° Digit (ASCII)	Vers. Fw – LSD(ASCII)	R
5	Channels qty (2*ASCII)		R
6	Options (see note)	Options (see note)	R
7	00	Wrong datum received	R-see tab.
8	00	Info various causes	R-see tab.
9	00	Controls	W-see tab.

SYSTEM: Setting and Status

Address LO (10)	**Data HI**	**Data LO**	**Notes 1**	**Notes 2**	**R: read W:write RW: read/write**
10	00	HFN (Fan test)	0=No test	1÷200h	RW
11	00	FCD	temperature increment	0=No FCD 1÷30°/sec	RW
12	00	Voting	0=No Voting 1=YES Voting		RW
13	00	CPU Setting	See Notes		RW
14	00	CPU Error	See Notes		R
15	00	Relays Status	See Notes		R
16	00	FREE	FREE		

17	00	Address	Modbus address	1÷255	R
18	00	Bdr	Modbus baud rate	0=2400 1=4800 2=9600 3=19200 4=38400	R
19	00	Parity	Modbus parity bit	0=No 1=Even 2=Odd	R
20	00	FAN 1-2 Status	See Notes		R

TEMPERATURE FANs:

Address LO (10)	Date HI	Data LO	Notes 1	Notes 2	R: read W:write RW: read/write
21	2'compl. sign	Fan_1 ON	1° to÷ 220°		RW
22	2'compl. sign	Fan_1 ON	1° to÷ 220°		RW
23	2'compl. sign	Fan_2 ON	1° to÷ 220°		RW
24	2'compl. sign	Fan_2 ON	1° to÷ 220°		RW

TEMPERATURE Channels 1÷4:

Address LO (10)	Data HI	Data LO	Notes 1	Notes 2	R: read W:write RW: read/write
25	2'compl. sign	2'compl. Ch1 temper.	–23° ÷ 228°		R
26	2'compl. sign	2'compl. Ch1 max temperat.	1° ÷ 220		R
27	2'compl. sign	2'compl. Ch1 temper. alarm set point	1° ÷ 220°	(AL)	RW
28	2'compl. sign	2'compl. Ch1 temper. trip set point	1° ÷ 220°	(TRP)	RW
29	2'compl. sign	2'compl. Ch2 temper.	–23° ÷ 228°		R
30	2'compl. sign	2'compl. Ch2 max temperat.	1° ÷ 220		R
31	2'compl. sign	2'compl. Ch2 temper. alarm set point	1° ÷ 220°	AS (AL)	R
32	2'compl. sign	2'compl. Ch2 temper. trip set point	1° ÷ 220°	AS (TRP)	R
33	2'compl. sign	2'compl. Ch3 temper.	-23° ÷ 228		R
34	2'compl. sign	2'compl. Ch3 max temperat.	1° ÷ 220		R

35	2'compl. sign	2'compl. Ch3 temper. alarm set point	1° ÷ 220	AS (AL)	R
36	2'compl. sign	2'compl. Ch3 temper. trip set point	1° ÷ 220	AS (TRP)	R
37	2'compl. sign	2'compl. Ch4 temper.	-23° ÷ 228		R
38	2'compl. sign	2'compl. Ch4 max temperat.	1° ÷ 220		R
39	2'compl. sign	2'compl. Ch4 temper. alarm set point	1° ÷ 220	(AL)	RW
40	2'compl. sign	2'compl. Ch4 temper. trip set point	1° ÷ 220	(TRP)	RW
41	00	00	00		R
42	00	00	00		R
43	00	00	00		R
44	00	00	00		R
45	00	00	00		R
46	00	00	00		R
47	00	00	00		R
48	00	00	00		R
49	00	00	00		R
50	00	00	00		R
51	00	00	00		R
52	00	00	00		R
53	00	00	00		R
54	00	00	00		R
55	00	00	00		R
56	00	00	00		R

CHANNELs 1÷4: Setting

Address LO (10)	Data HI	Data LO	Notes 1	Notes 2	R: read W:write RW: read/write
57	00	Ch1 Setting	See Note CHx		R
58	00	Ch2 Setting	See Note CHx		R
59	00	Ch3 Setting	See Note CHx		R
60	00	Ch4 Setting	See Note CHx		R
61	00	00	00		R
62	00	00	00		R
63	00	00	00		R
64	00	00	00		R

CHANNELs 1÷4: Status

Address LO (10)	Data HI	Data LO	Notes 1	Notes 2	R: read W:write RW: read/write
65	Ch1 story	Ch1 status	See Note CHx		R
66	Ch2 story	Ch2 status	See Note CHx		R
67	Ch3 story	Ch3 status	See Note CHx		R
68	Ch4 story	Ch4 status	See Note CHx		R
69	00	00	00		R
70	00	00	00		R
71	00	00	00		R
72	00	00	00		R

Various Records

Address LO (10)	Data HI	Data LO	Notes 1	Notes 2	R: read W:write RW: read/write
73	Prog. FAN_1 Current	Prog. FAN_2 Current	value = 1÷6	WRØ=1	W/R
74	00	00			W/R
75	00	00			R
76	00	00			R
77	00	00	Reserved		R
78	00	00	Reserved		R
79	00	00			R
80	00	00			R

INFO various causes (READ)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	--	--	-	-	-	*Status manual fan*	*(*) RESET (R) has taken place*

COMMANDS (WRITE)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	--	--	Reset fan FAULT	Manual fan 1=toggle	*(*) Reset Reg. CPU_Error*	*(*) Reset historical data*	*(*) Zero. BIT: RESET has taken place*

CHn SETTING

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	--	--	--	FAN_INT	FAN2	FAN1	CAN_enabled

CHn STATUS

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
FAN_INT	TRIP	ALARM	FAN_2	FAN_1	FCD	FOC	FCC

CHn STORY

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	TRIP	ALARM	--	--	--	FOC	FCC

RELAY STATUS (coil energizing status)

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	--	--	Relay FAULT 1=No fault	Relay TRIP 1=ON	Relay ALARM 1=ON	Relay FAN_2 1=ON	Relay FAN_1 1=ON

CPU ERROR

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	--	--	--	PT Error	CAL	FCD Fault	ECH

CPU SETTING

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
--	--	--	Failsafe fault (always=1)	Failsafe trip	Failsafe alarm	HYSTERISIS TRIP	HYSTERISIS ALARM

FAN STATUS

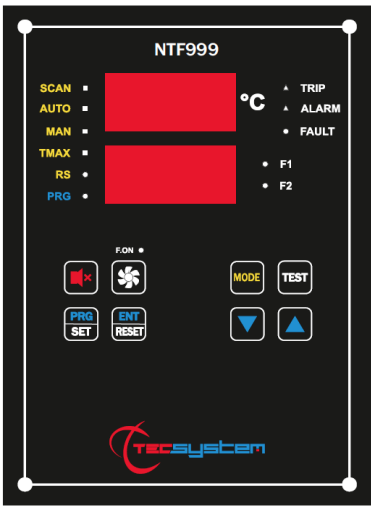
BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
Function FAN=ON	--	--	--	Fan_2 HI Over_current	Fan_2 LO Under_current	Fan_1 HI Over_current	Fan_1 LO Under_current

ETHERNET MODULE PROGRAMMING PARAMETER

X Windows Vista, 7, 8.

ETH0 CONNECTIONS

Using an Ethernet cable, connect the ETH0 of the NTF999 control unit to the Ethernet card of a PC.

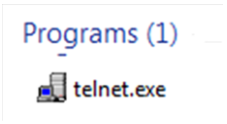


TELNET ENABLING

Use the Telnet program to set the Ethernet IP parameters.

1) START menu (Windows)

If already enabled, the program appears



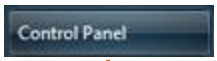
2) Start the search with the Telnet program Entering telnet in SEARCH.

Press ENTER to launch the program.

(Go to step 12 on page 28)

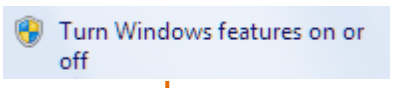
If the Telnet program is not enabled:

3) START menu (Windows):



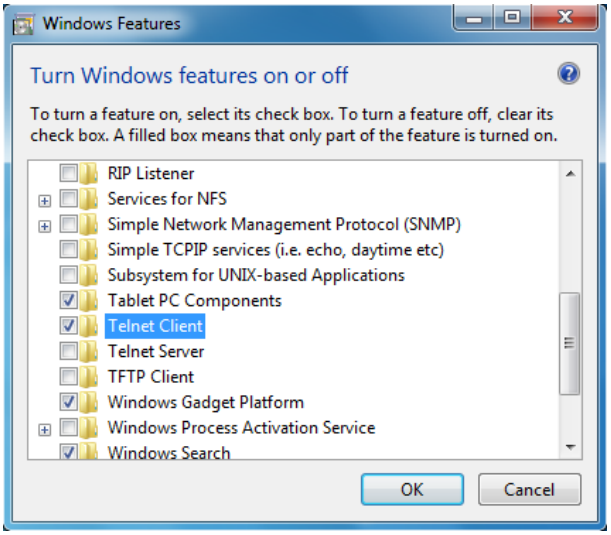
4) Select Control Panel

5) Select Programs, followed by Features or Programs and Features

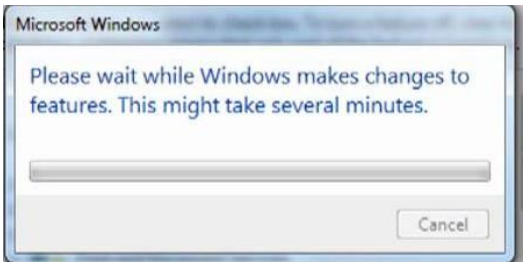


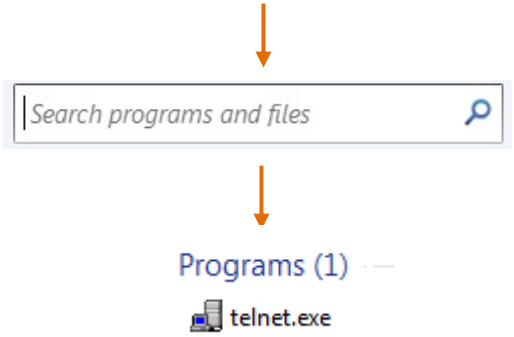
6) Select Turn Windows features on or off

7) Enable Telnet Client and click "OK"



The screen below will open.
Wait for the Telnet function to activate.





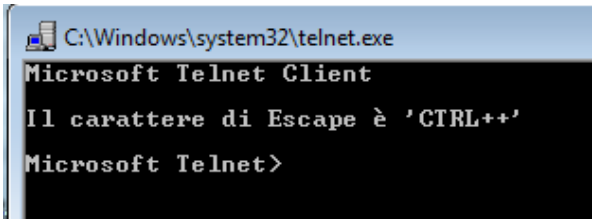
8) Close the open screens and restart the PC if required

9) START menu (Windows)

10) Search for the Telnet program

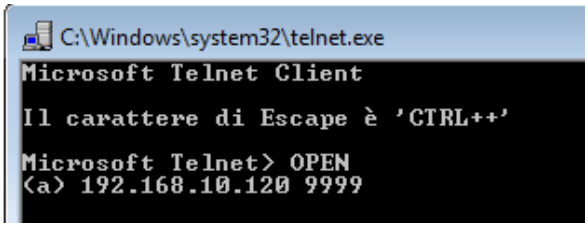
11) Press ENTER to launch the program

12) TELNET SCREEN



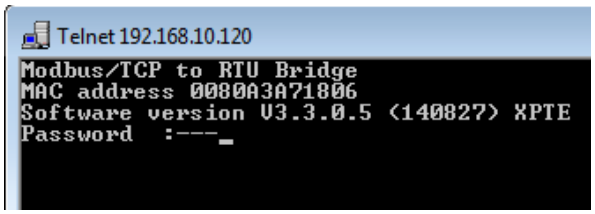
13) Enter: OPEN

14) Press ENTER



15) Enter: 192.168.10.120 9999

16) Press ENTER

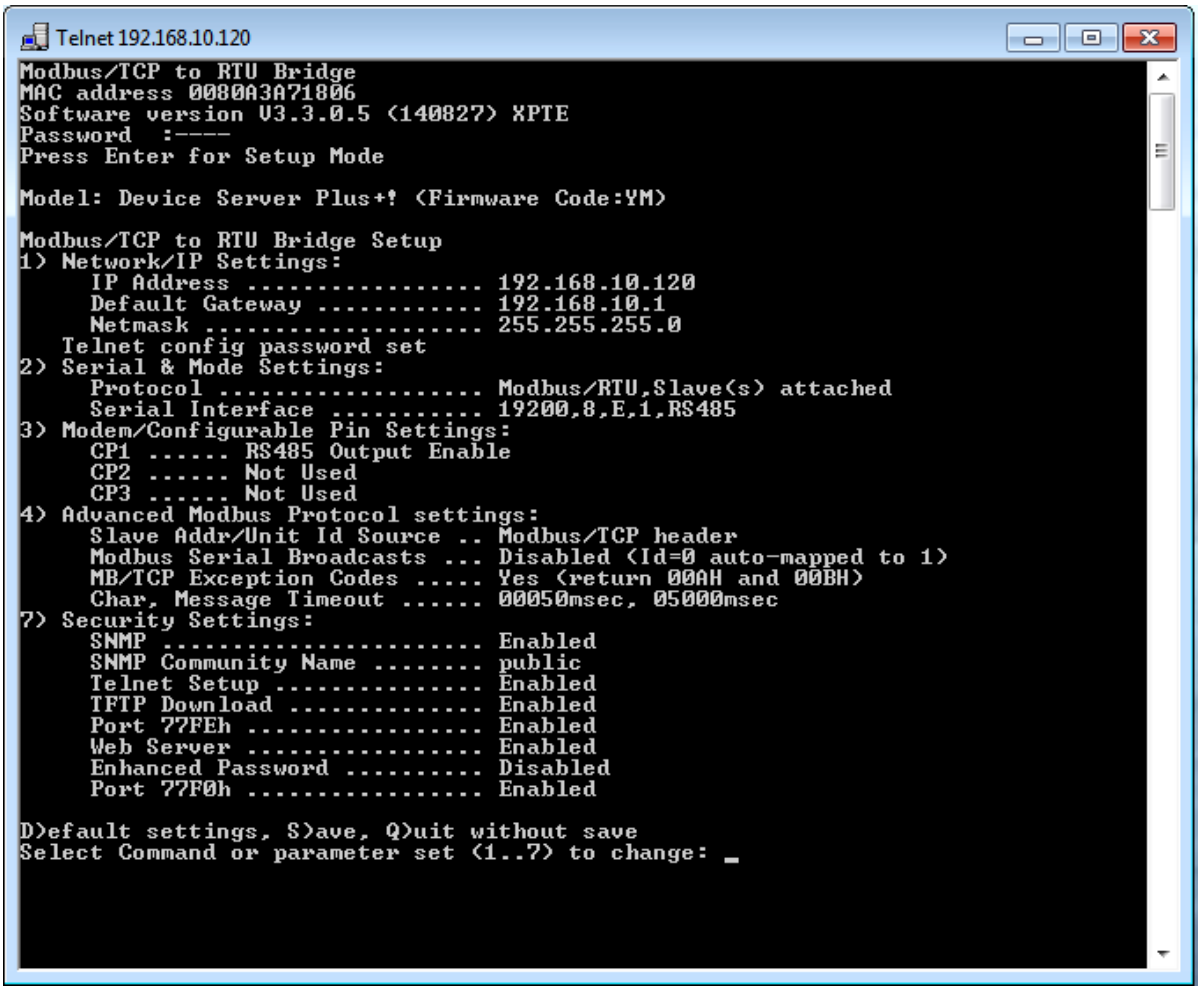


17) Enter the Password: TECS

18) Press ENTER

Note: In this screen we have the **MAC address** and the **software** version of the ETH port available.

19) IP PARAMETER PROGRAMMING MENU



IP PARAMETER PROGRAMMING MENU (TELNET)

The TELNET menu allows you to modify the configuration parameters of the Ethernet port.

The information available to you is:

Parameters that can be modified by the operator
1) Parameter modification (IP Address - Gateway- Netmask -Telnet password).

Parameters that cannot be modified by the operator
2) Communication parameters between the ETH0 port and the control unit.
3) Communication configuration between the ETH0 port and the control unit.
4) Communication advanced settings between the ETH0 port and the control unit.
7) Security settings between the ETH0 port and the control unit.

IMPORTANT WARNING

For the device to work correctly, we advise you not to access or modify menus 2-3-4-7. The modification of the values in the stated menus might cause communication anomalies with the loss of the Ethernet IP communication.

MENU MODIFICATION PROCEDURE 1) IP parameters:

enter the command: 1

IP Address:

```
IP Address (192) 192.(168) 168.(010) .(120) 120_
```

1) Enter the desired new IP address, if you wish to keep the set address press ENTER 4 times.

- **At the end of the operation, the system will ask if you wish to modify the Gateway IP:**

```
IP Address (192) 192.(168) 168.(010) .(120) 120
Set Gateway IP Address (N) ?
```

Enter: **Y** **to modify the Gateway IP.**
N **not to modify the Gateway IP and go to the following step.**

2) Enter the desired new Gateway IP address, press ENTER; if you wish to keep the set address press ENTER 4 times.

```
IP Address (192) 192.(168) 168.(010) .(120) 120
Set Gateway IP Address (N) ? Y
Gateway IP Address : (192) 192.(168) 168.(010) 10.(001) 001_
```

- **At the end of the operation, the system will ask if you wish to modify Netmask:**

```
IP Address (192) 192.(168) 168.(010) .(120) 120
Set Gateway IP Address (N) ? Y
Gateway IP Address : (192) 192.(168) 168.(010) 10.(001) 001
Set Netmask (N for default) (N) ?
```

Enter: **Y** **to modify Netmask.**
N **not to modify Netmask and go to the following step.**

3) Enter the new Netmask, press ENTER; if you wish to keep the set address press ENTER 4 times.

```
IP Address (192) 192.(168) 168.(010) .(120) 120
Set Gateway IP Address (N) ? Y
Gateway IP Address : (192) 192.(168) 168.(010) 10.(001) 001
Set Netmask (N for default) (N) ? Y
(255) .(255) .(255) .(000) _
```

- **At the end of the operation, the system will ask if you wish to modify the Telnet Password:**

```
IP Address (192) 192.(168) 168.(010) .(120) 120
Set Gateway IP Address (N) ? Y
Gateway IP Address : (192) 192.(168) 168.(010) 10.(001) 001
Set Netmask (N for default) (N) ? Y
(255) .(255) .(255) .(000)
Change telnet config password (N) ? _
```

Enter: **Y** **to modify the Telnet Password.**
N **not to modify the Telnet Password and to skip to the following step.**

```
IP Address (192) 192.(168) 168.(010) .(120) 120
Set Gateway IP Address (N) ? Y
Gateway IP Address : (192) 192.(168) 168.(010) 10.(001) 001
Set Netmask (N for default) (N) ? Y
(255) .(255) .(255) .(000)
Change telnet config password (N) ? Y
Enter new Password:
```

4) Enter the new Telnet Password (4 digits max), press ENTER; if you wish to keep the set Password, press ENTER.

```
D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change: _
```

Enter: S to save the modified data.
Q to exit Telnet without saving the data.

The following screen will be displayed:

```
D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..7) to change:

Parameters saved, Restarting ...
```

To check the programmed parameters or repeat programming, follow the TELNET SCREEN from step 12 to step 19, page 28.

Indications of LEDs 1-2 of the Ethernet port:

LED 1: Link
- Off = No link
- Amber = 10 Mbps
- Green = 100 Mbps

LED 2: Activity
- Off = No Activity
- Amber = Half Duplex
- Green = Full Duplex

FAIL SAFE FUNCTION

The NTF999 has n.o selection (contact) / n.c (normally closed contact) for alarm and trip relays, programming steps 32 to 35 page 14. The selection of the setting no / nc introduces functions Fail Safe and No Fail Safe.

Setting n.o (No Fail safe) normally open contacts are in positions 5-7 and 8-10 Alarm Trip, they switch only when limits are reached preset temperature.

By setting n.c (Fail Safe) normally closed contacts are in positions 5-7 and 8-10 Alarm Trip, they switch only when limits are reached preset temperature or for lack of power.

NOTE: When the unit is located in one of the methods described below does not monitor heat, also the relay will all be banned:
- Vis. display programming.
- PRG programming.
- Test of the relays.

Pt100 EXTENSION CABLE TECHNICAL SPECIFICATIONS

1. Cable 20 x AWG 20/19 Cu/Sn
2. Section 0.55 mm²
3. Flame retardant insulation PVC105
4. CEI 20.35 IEC 332.1 regulations
5. Maximum operating temperature: 90°C
6. Conformation: 4 sets of three twisted and coloured conductors
7. Shield in Cu/Sn
8. Flame retardant PVC sheath
9. External diameter 12mm
10. Standard conformation in 100m coils

FCD FUNCTION

The NTF series equipment boasts an innovative control function combined with the dynamic status of the sensor.

Activating FCD, the control unit analyses the increase in temperature ΔT (*) recorded in a second (**°C/sec**).

Enabling the function, the user can select the value (ΔT) from a minimum of 1°C/sec to a maximum of 30°C/ sec. If the value sensed is higher than the value set by the user, the control unit inhibits the possible activation of the ALARM and TRIP alarms and switches the FAULT relay (11-12), displaying the message **"Fcd fault".**

Example: if we set the function to 5°C, FAULT will switch for FCD only if the control unit senses an increase in ΔT of over 5°C in a second on the monitored system.

Setting "no" disables the FCD function.

When a channel is in FAULT for FCD, the relative Alarm and Trip warnings are inhibited on the single channel; therefore only the over-quick temperature increase is highlighted.

Press Reset to delete the FCD warnings on all channels and reset the FAULT relay.

Possible FCD applications

Identification of a possible induced interference on the sensor line

If the installation instructions are not complied with (see page 16), any interference on the sensor line can cause false readings or anomalous alarms.

Setting the FCD function in a temperature range of between 1°C and 10°C (5°C recommended), the effects caused by false readings can be suppressed and the alarm relay activation can be prevented, as shown above.

Corrective actions: check the installation of the sensor extension cable is in line with the instructions given in the paragraph on the measurement signal transfer on page 16.

Identification of a sensor fault or faulty connection

In case of a faulty connection or sensor fault, a quick positive or negative variation in temperature might occur, leading to the system tripping or the alarms of the monitored system to be triggered.

In this specific case we recommend the FCD function to be set in a temperature range of between 10°C and 20°C.

Corrective actions: check the terminals the sensor is connected to are tightened and replace the faulty sensor, if required.

Identification of the electrical motor rotor block

In case of temperature control of the electrical motors, the quick temperature increase might be due to a blocked rotor.

In this specific case we recommend the FCD function to be set in a temperature range of between 20°C and 30°C**.** This setting is recommended in order to prevent the FCD function from activating during motor start-up, or where the **ΔT/sec.** increase varies quickly.

(*) The ΔT value shows the temperature range for each second.

NOTE: you should not enable the FCD function with active VOTING.

WARRANTY CONDITIONS

The Product purchased is covered by the manufacturer's or seller's warranty at the terms and conditions set forth in the "Tecsystem s.r.l's General Conditions of Sale", available at www.tecsystem.it and / or purchase agreement.
The warranty is considered valid only when the product is damaged by causes attributable to TECSYSTEM srl, such as manufacturing or components defects.
The warranty is invalid if the Product proves to have been tampered with / modified or incorrectly connected and causing voltages outside the set limits and does not comply with the technical data for use and assembly, as described in this instruction manual.
The warranty is always ex Corsico as stated in the "General Conditions of Sale".

TROUBLESHOOTING	**CAUSES AND *SOLUTIONS***
The control unit does not switch on and the supply to terminals 40-42 is correct.	Check that: the plug is firmly secured in place, the connection wires are tight, the fuse is not blown. there are no obvious signs of burn marks on the connectors. Remove power and run as previously indicated, turn it ON (replace the fuse).
The channel CH4 is in FAULT for FOC	Programming error of the CHn/YES control unit. *Check and repeat programming as per page 13-14, select CH4/NO.*
One of the three/four channels is in FAULT to FCC or shows a negative temperature (TCK)	Check connections + yellow and - red, restore the correct connection.
One of the three/four channels is in FAULT for FOC/FCC (PT100)	Check the connections of the Pt100 sensors; check the instructions given in the paragraphs: measurement signal transfer and temperature sensor diagnostics on page 16-17.
One of the three/four channels is in FAULT for FOC/FCC (PT100)	Check whether the temperature has reached the minimum/maximum full scale values of the -23°C and + 228°C probes, or check the correct connection of the probes.
When turned on, the indication "ECH" appears	A strong disturbance has damaged the memory data. See the paragraph on programmed diagnostics page.18.
All the PT100 sensors are in FCC.	Incorrect sensor connection, the terminal block has been inserted upside down. Check the connections and the terminal board.
The temperature shown by one or more channels is wrong.	Contact the TECSYSTEM Technical Department.
Sudden trip of the main switch. The temperature is on standard levels. Just one channel has caused the trip.	Check the temperatures recorded in T-MAX; check the instructions given in the paragraphs: measurement signal transfer and temperature sensor diagnostics on page 16-17. Activate the FCD function.
FCD warning	See the FCD function on page 32.
The indication F1-HI or F2-HI is displayed	Check that the FAN1 Hi or FAN2 HI programming, on page 14 step 46-49 is in line with the absorption of the connected bars.
The indication F1-LO or F2-LO appears on the display	Check the status of FAN1 (F1) and FAN2 (F2) fuses, replace any faulty fuses.
Contact *TECSYSTEM Technical Department if the problem persists.*	

EQUIPMENT DISPOSAL

European directives 2012/19/EC (WEEE) and 2011/65/EC (RoHS) have been approved to reduce electrical and electronic waste and to promote the recycling and reuse of the materials and components of this equipment, reducing the disposal of residues and harmful components of electrical and electronic materials.

All the electrical and electronic equipment supplied after 13 August 2005 is marked with this symbol, pursuant to European directive 2002/96/EEC on electrical and electronic waste (WEEE). Any electrical or electronic equipment marked with this symbol must be disposed of separately from normal domestic waste.

Returning used electrical appliances: contact TECSYSTEM or the TECSYSTEM agent to receive information on the correct disposal of the appliances.

TECSYSTEM is aware of the impact its products have on the environment and asks its customers active support in the correct and environmentally-friendly disposal of its devices.

USEFUL CONTACTS

TECHNICAL INFORMATION : ufficiotecnico@tecsystem.it

SALES INFORMATION : info@tecsystem.it

TECSYSTEM BAR PROGRAMMING TABLE

TECSYSTEM BAR MODEL	SUPPLY	FAN HI VALUE SUGGESTED
BAR 400	230Vac 50Hz	2A
BAR 600	230Vac 50Hz	2A
BAR 800	230Vac 50Hz	2A
BAR 1200	230Vac 50Hz	2A
BAR 1800	230Vac 50Hz	2A
BAR 3600	230Vac 50Hz	2A
BAR 1200	230Vac 60Hz	2A
BAR 1800	230Vac 60Hz	3A
BAR 3600	230Vac 60Hz	3A
BAR 1200	120Vac 60Hz	4A
BAR 1800	120Vac 60Hz	6A
BAR 3600	120Vac 60Hz	6A
TG1000 X1	230Vac 50Hz	2A
TG1000 X2	230Vac 50Hz	3A
TG1000 X3	230Vac 50Hz	4A

UL SPECIFICATION AND RATINGS

CABLE SPECIFICATION	Dimension for main circuit 18AWG, working temperature over 90°C
MASS OF THE EQUIPMENT	0,62 Kg
INPUT SUPPLY	100 – 240 Vac / Vdc ±10%, 50/60 Hz 8VA max
PROTECTION	External switch or circuit breaker
OUTPUTS RELAYS	3 Outputs relays: 10A – 250Vca-res COS=1 + 2 Outputs relays: 6A – 250Vca-res COS=1
OPTIONAL PORTS	RS485 or Ethernet