



MANUAL FOR ETHERNET NETWORK CONFIGURATION AND INSTALLATION

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1 • INTRODUCTION

TF32s are keyboards linked to GF_VEDO family control terminals.

There are two models: TF32-65 and TF32-104 which differ only in their mechanical dimensions in line with models GF_VEDO65 and GF_VEDO104. The keyboards have 32 user-configurable buttons/LEDs (key function, LED function, removable card).

The front panel has a USB port coming from the GF_VEDO, complete with cover to ensure IP65 protection.

This provides easy access (import/export) to application data.

Different communication protocols are provided (high-speed serial, CANopen, Ethernet Modbus/TCP, PROFIBUS DP) for applications requiring remoting and/or use of multiple keyboards.

The rear panel has a series of digital inputs whose state is visible via software.

The TE electromechanical keyboard allows their immediate use.

This manual gives a detailed description of TF32 keyboard function with ETHERNET MODBUS TCP/IP interface.

This manual does not describe the “MODBUS TCP/IP”, fieldbus; it is assumed that the user is familiar with such fieldbus and that he refers (for updates) to such protocol or to the official website managed by Modbus IDA: www.modbus.org.

It is also assumed that the user is familiar with the technical characteristics of the products in the GF_VEDO family, contained in the user manuals provided with the products or downloadable from the GEFTRAN S.P.A. web-site www.gefran.com

2 • BIBLIOGRAPHICAL REFERENCES

/1/ GEFTRAN “TF32 - Fieldbus keyboard” Datasheet

/2/ Norma TIA/EIA-568B

/3/ <http://www.ieee802.org/3/>: Protocol specification IEEE802.3

/4/ www.modbus.org: Protocol specification MODBUS TCP/IP

3 • MAIN TECHNICAL CHARACTERISTICS

- ◇ Protocol: Modbus/TCP (Slave)
- ◇ Baud rate: 10/100 Mbit/s (Self-synchronizing)
- ◇ Type of transmission: Half Duplex/Full Duplex
- ◇ Connectors: RJ45 conform to CAT5 10/100 BaseT (LED Green = Activity, LED Yellow = Link)
- ◇ Node ID Hardware: ID Modbus
- ◇ Node ID Software: MAC Address, IP Address
- ◇ I/O dimension: 8 word Input, 4 word Output
- ◇ Messages supported: 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x0f, 0x10
- ◇ Diagnostics: 2 LED (LED1 Green, LED2 Red)
- ◇ Default address: 192.168.1.103
- ◇ Subnet mask: 255.255.255.0
- ◇ Default gateway: 192.168.1.1

4 • INSTALLATION

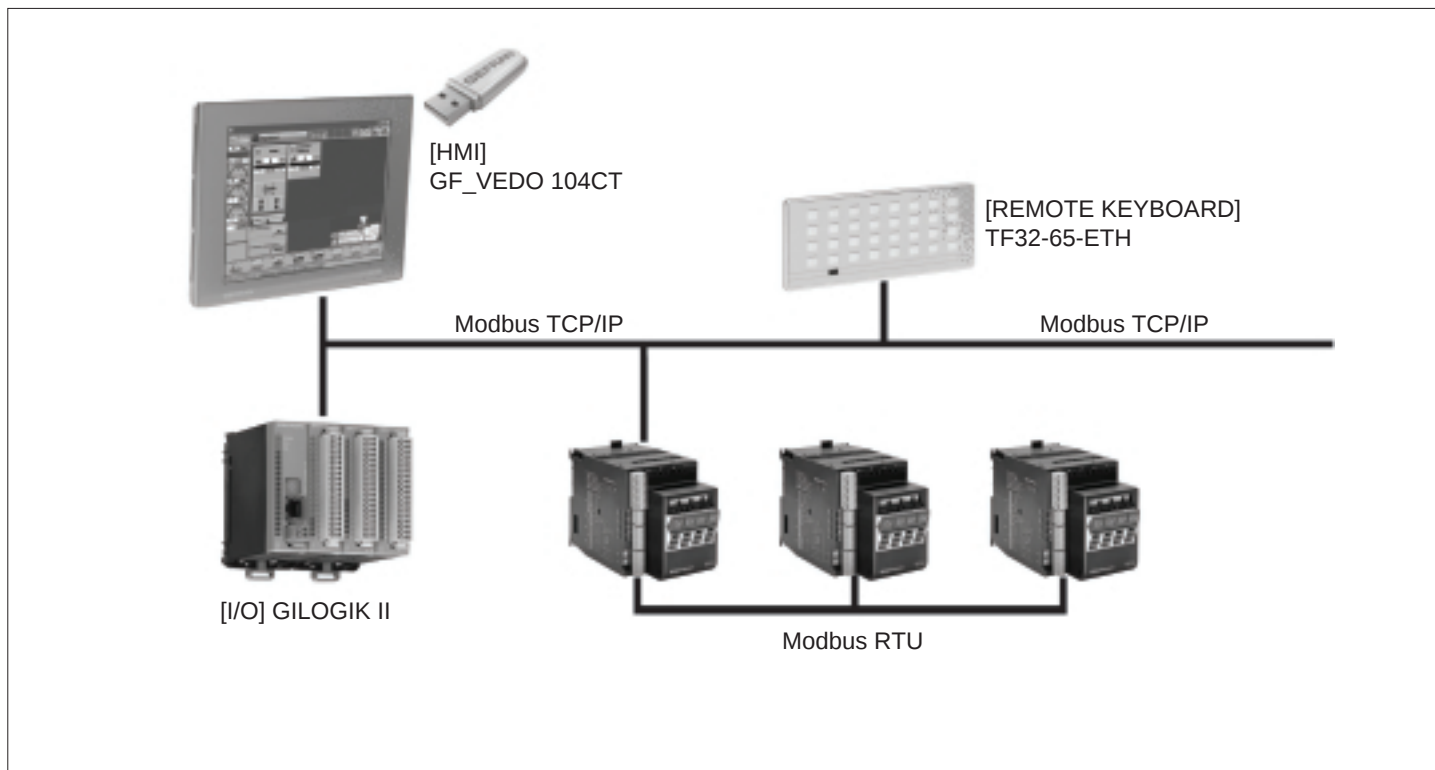
For a complete description of installation procedures and main electrical connections, see the DATASHEET of TF32, enclosed with the products.

4.1 ELECTRICAL CONNECTIONS TO THE ETHERNET NETWORK

We advise you to use standard class 5 Ethernet cables as per TIA/EIA-568B, to which reference is made for a detailed description of connections to the Ethernet.

GEFRAN S.p.A. supplies cables and connection systems conforming to MODBUS TCP/IP standard as accessories to TF32-ETH keyboards.

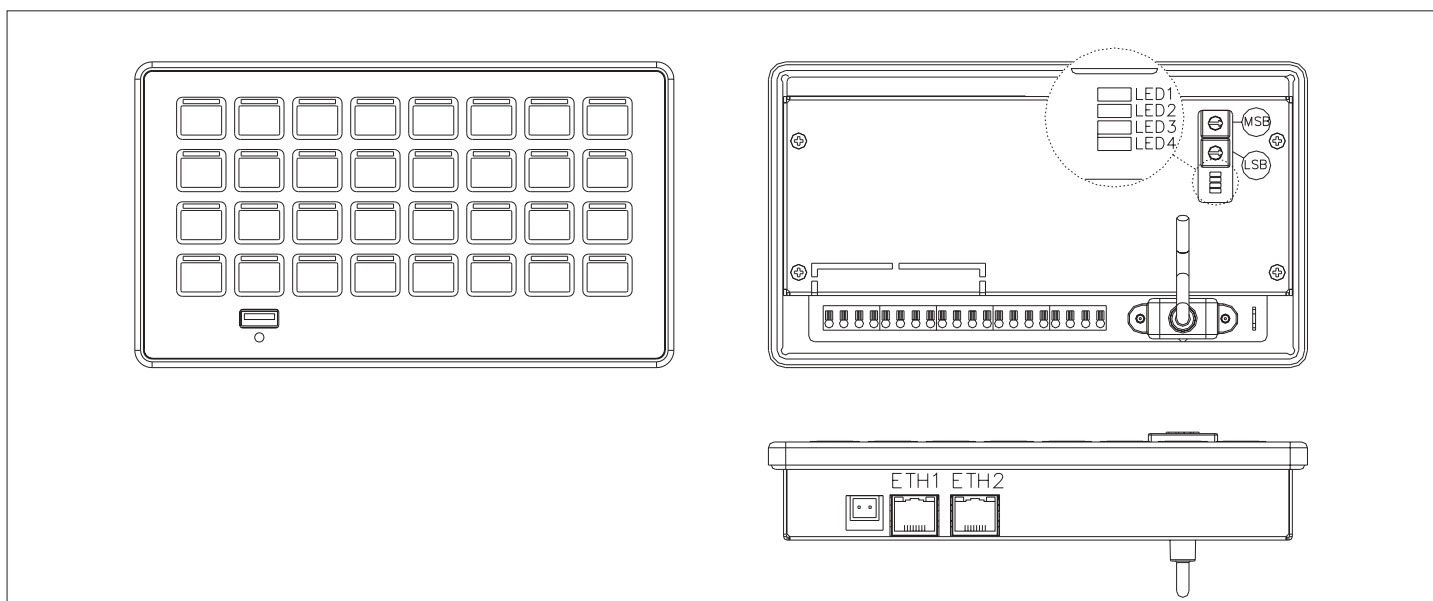
4.2 EXAMPLE OF MODBUS TCP/IP NETWORK



Max. number node Ethernet: 1024

5 • TF32-ETH: FUNCTION MODES AND DIAGNOSTICS

From the rear of the TF32 keyboard, you can access two hexadecimal rotary switches and display the state of the 3 diagnostics LEDs.



5.1 - TF32-ETH: ROTARY SWITCHES AND FUNCTION MODES

The two rotary switches MSB and LSB let you set:

- PROFIBUS NODE from 0 to 99 ("MODBUS TCP/IP" function mode)
- TF32 OPERATIVE STATE :
 - MODBUS TCP/IP
 - PRG
 - TEST 1
 - TEST 2
 - TEST 3
 - TEST 4

The position of the rotary switches can be changed during normal operation of the device by keeping switch position steady for at least 3 seconds.

NODE ID		DEVICE OPERATIVE STATE	DESCRIPTION
MSB	LSB		
0	1	MODBUS TCP/IP	Node-ID = 00 (hex) [DEFAULT]
0	1		Node-ID = 01 (hex)
...	...		Node-ID = n
9	9		Node-ID = 99 (hex)
9	A		Not managed: board resets cyclically
...	...	-	Not managed: board resets cyclically
E	0		PRG
E	1		TEST 1
E	2		TEST 2
E	3		TEST 3
E	4		TEST 4
E	5		TF32 keyboard LEDs on according to keys pressed
...	...		Not managed: board resets cyclically
F	F		Not managed: board resets cyclically
F	F		Not managed: board resets cyclically

5.2 - TF32-ETH DIAGNOSTICS LEDs

The operative state of the device can be displayed by means of the diagnostics LEDs on the rear of the TF32 keyboard.

Specifically:

- LED 1 (GREEN) "Status" LED: indicates operative state
- LED 2 (RED) "Fail" LED: indicates error state
- LED 3 (YELLOW) "Power" LED: index "TF32 keyboard powered"
- LED 4 (YELLOW) Reserved for future uses

DEVICE OPERATIVE STATE	LED	DESCRIPTION OF BEHAVIOUR	
		BEHAVIOUR	TIME
PRG	LED 1 (GREEN)	Flashes alternately with LED 2	50ms
	LED 2 (RED)	Flashes alternately with LED 1	50ms
TEST 1	LED 1 (GREEN)	Flashes alternately with LED 2	250ms
	LED 2 (RED)	Flashes alternately with LED 1	250ms
TEST2	LED 1 (GREEN)	Flashes alternately with LED 2	250ms
	LED 2 (RED)	Flashes alternately with LED 1	250ms
TEST 3	LED 1 (GREEN)	Flashes alternately with LED 2	250ms
	LED 2 (RED)	Flashes alternately with LED 1	250ms
TEST 4	LED 1 (GREEN)	Flashes alternately with LED 2	250ms
	LED 2 (RED)	Flashes alternately with LED 1	250ms
MODBUS TCP/IP "NO COMUNICAtION" No Error	LED 1 (GREEN)	Flashes	1000ms
	LED 2 (RED)	OFF	-
MODBUS TCP/IP "DATA EXCHANGE" No Error	LED 1 (GREEN)	Flashes	200ms
	LED 2 (RED)	OFF	-
SLAVE PROFIBUS State "WAIT PARAMETER" "Parameterisation" Error	LED 1 (GREEN)	Flashes	250ms
	LED 2 (RED)	Flashes	250ms
Rotary switches in movement	LED 1 (GREEN)	OFF	-
	LED 2 (RED)	OFF	-

6 • MODBUS OBJECT DICTIONARY

6.1 - KEYS

Each key on the TF32-ETH keyboard is seen as a READ ONLY object.

The keys of the keyboard matrix can be accessed in two ways:

- single bit, as DISCRETE INPUT (starting from the Modbus object at address 0x0000)
- register (16 bit), as INPUT REGISTER (starting from the Modbus object at address 0x2000)

6.2 - LEDs

Each LED is seen as an object accessible in READ and in WRITE.

The LEDs of the keyboard matrix can be accessed in two ways :

- single bit, as COIL, starting from the Modbus object at address 0x1000
- register (16 bit), as HOLDING REGISTER, starting from the Modbus object at address 0x3000.

6.3 - DIAGNOSTICS AND CONFIGURATION

In addition to LED and KEY objects, the TF32 has other registers containing diagnostics and configuration data.

This data is shown starting from logic address 0x8000.

All diagnostics registers are accessible in read; some are also accessible in write, using the same address.

The list of objects is shown below:

MODBUS ADDRESS	TYPE	DESCRIPTION
0x8000	R	ID code of TF32 Gate MODBUS (=0x0003)
0x8001	R	Firmware version of TF-32 (= 0x-- ÷ 0x--)
0x8002	R	MAC-Address [1-0] (=0x-- ÷ 0x--)
0x8003	R	MAC-Address [3-2] (=0x0A ÷ 0x--)
0x8004	R	MAC-Address [5-4] (=0x00 ÷ 0x02)
0x8005 ⁽¹⁾	R/W	Network parameters: IP Addr. [1-0]
0x8006 ⁽¹⁾	R/W	Network parameters: IP Addr. [3-2]
0x8007 ⁽¹⁾	R/W	Network parameters: Subnet Mask [1-0]
0x8008 ⁽¹⁾	R/W	Network parameters: Subnet Mask [3-2]
0x8009 ⁽¹⁾	R/W	Network parameters: Default Gateway [1-0]
0x800A ⁽¹⁾	R/W	Network parameters: Default Gateway [3-2]
0x800B	R	Module function status (RUN_AND_KEYBOARD_MANAGED, RUN_NO_KEYBOARD_MANAGED)
0x800C	R	Watchdog Status
0x800D	R/W	ENABLE/DISABLE Watchdog pf Modbus dialog
0x800E	R/W	Watchdog period value of Modbus dialog (in mSec)
0x800F	R	Global ERROR signal flag (=0x0000=>NO_ERROR ÷ ≠0x0000=>ERROR)
0x8010	R	Reserved for future uses
0x8011	R	No. Modbus objects to access KEYs as bit
0x8012	R	No. Modbus objects to access LEDs as bit
0x8013	R	No. Modbus objects to access KEYs as 16 bit register
0x8014	R	No. Modbus objects to access LEDs as 16 bit register
0x8015	R	No. Registers of global describer of TF32-ETH
0x8016	R	Number of TCP/IP sockets

⁽¹⁾ For example, if the IP address of the TF32-ETH is: 192.168.104.123 (=0xC0:0xA8:0x68:0x7B), then the 0x8005 and 0x8006 objects will be structured as follows:

0x8005	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
	0x68								0x7B							
0x8006	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
	0xC0								0xA8							

6.3.1 Network parameters of TF32-ETH (objects from 0x8005 to 0x800A)

The network parameters of the TF32-ETH can be changed by means of the registers between addresses 0x8005 and 0x800A. Specifically:

- registers 0x8005 and 0x8006 let you change the node IP address by using the notation described in note 2 of the preceding paragraph;
- registers 0x8007 and 0x8008 let you change the node Subnet mask by using a notation analogous to the one used for the IP address;
- registers 0x8009 and 0x800A let you change the node Gateway by using a notation analogous to the one used for the IP address.

Once received, the new Network parameters are saved in EEPROM; the device now switches off the LEDs and interrupts the Modbus network dialog.

The TF32-ETH is switched off, and will use the newly assigned parameters when switched on again.

6.3.2 Management of Modbus dialog watchdog (objects 0x800D and 0x800E)

The TF32-ETH manages the Modbus dialog watchdog; if the client that is dialoguing with the keyboard does NOT send a valid Modbus request within a defined period, all of the LEDs will be switched off (the keys will continue to be read).

This management is active by default each time the TF32-ETH is started; to inhibit this function, simply send a zero write request in register 0x800D.

If you decide to keep the Modbus dialog watchdog, you can set the period by writing a number other than zero in register 0x800E; the value is expressed in milliseconds (the maximum watchdog period value is 65535 ms = 65,535 s).

6.3.3 Keyboard error signals (object 0x800F)

The TF32-ETH lets the client monitor the function status of the keyboard by using the register at logic address 0x800F.

As long as this register remains at zero, it means that no malfunction has been detected on the keyboard.

If at least one error is detected on the keyboard, the register assumes a value other than zero.

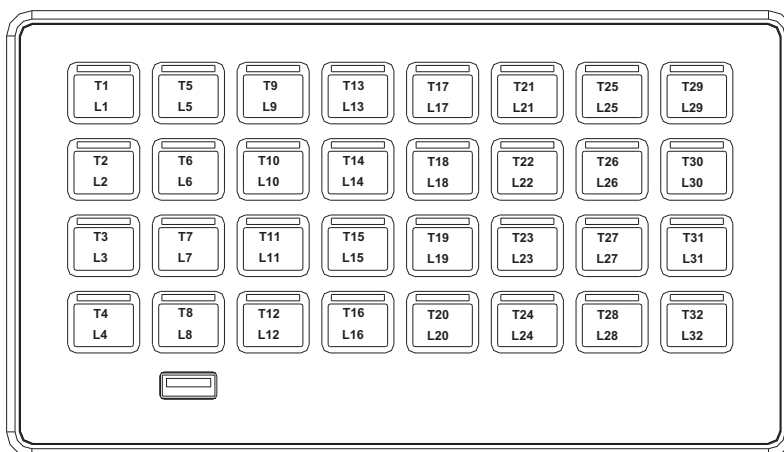
6.3.4 Type of keyboard (object 0x8010)

The TF32-ETH lets the client know the type of keyboard by means of the content of the register at logic address 0x8010.

- If the register equals 0 the keyboard is a TF-32.
- If the register equals 1 the keyboard is an M-61.

6.4.1 TF32 - KEYS AND LEDS STRUCTURE

The TF32 keyboards have 32 KEYS and 32 LEDs, indicated in the following figure with “Tx” and “Lx” respectively.

**6.4.2 KEYS - ACCESS TO BIT**

MODBUS ADDRESS	DESCRIPTION	MODBUS ADDRESS	DESCRIPTION
0x00	T1 State Key	0x18	T17 State Key
0x01	T2 State Key	0x19	T18 State Key
0x02	T3 State Key	0x1A	T19 State Key
0x03	T4 State Key	0x1B	T20 State Key
0x04	AUX1 State Key	0x1C	AUX5 State Key
0x05	AUX9 State Key	0x1D	AUX13 State Key
0x06	T5 State Key	0x1E	T21 State Key
0x07	T6 State Key	0x1F	T22 State Key
0x08	T7 State Key	0x20	T23 State Key
0x09	T8 State Key	0x21	T24 State Key
0x0A	AUX2 State Key	0x22	AUX6 State Key
0x0B	AUX10 State Key	0x23	AUX14 State Key
0x0C	T9 State Key	0x24	T25 State Key
0x0D	T10 State Key	0x25	T26 State Key
0x0E	T11 State Key	0x26	T27 State Key
0x0F	T12 State Key	0x27	T28 State Key
0x10	AUX3 State Key	0x28	AUX7 State Key
0x11	AUX11 State Key	0x29	AUX15 State Key
0x12	T13 State Key	0x2A	T29 State Key
0x13	T14 State Key	0x2B	T30 State Key
0x14	T15 State Key	0x2C	T31 State Key
0x15	T16 State Key	0x2D	T32 State Key
0x16	AUX4 State Key	0x2E	AUX8 State Key
0x17	AUX12 State Key	0x2F	AUX16 State Key

6.4.3 KEYS - ACCESS TO REGISTER

MODBUS ADDRESS		
ADDRESS	bit	DESCRIPTION
0x2000	0	T1 State Key
	1	T2 State Key
	2	T3 State Key
	3	T4 State Key
	4	AUX1 State Key
	5	AUX9 State Key
	6	T5 State Key
	7	T6 State Key
	8	T7 State Key
	9	T8 State Key
	10	AUX2 State Key
	11	AUX10 State Key
	12	T9 State Key
	13	T10 State Key
	14	T11 State Key
	15	T12 State Key
0x2001	0	AUX3 State Key
	1	AUX11 State Key
	2	T13 State Key
	3	T14 State Key
	4	T15 State Key
	5	T16 State Key
	6	AUX4 State Key
	7	AUX12 State Key
	8	T17 State Key
	9	T18 State Key
	10	T19 State Key
	11	T20 State Key
	12	AUX5 State Key
	13	AUX13 State Key
	14	T21 State Key
	15	T22 State Key
0x2002	0	T23 State Key
	1	T24 State Key
	2	AUX6 State Key
	3	AUX14 State Key
	4	T25 State Key
	5	T26 State Key
	6	T27 State Key
	7	T28 State Key
	8	AUX7 State Key
	9	AUX15 State Key
	10	T29 State Key
	11	T30 State Key
	12	T31 State Key
	13	T32 State Key
	14	AUX8 State Key
	15	AUX16 State Key

6.4.4 LED - ACCESS TO BIT

MODBUS	
MODBUS ADDRESS	DESCRIPTION
0x00	Control LED L1
0x01	Control LED L2
0x02	Control LED L3
0x03	Control LED L4
0x04	Control LED L5
0x05	Control LED L6
0x06	Control LED L7
0x07	Control LED L8
0x08	Control LED L9
0x09	Control LED L10
0x0A	Control LED L11
0x0B	Control LED L12
0x0C	Control LED L13
0x0D	Control LED L14
0x0E	Control LED L15
0x0F	Control LED L16
0x10	Control LED L17
0x11	Control LED L18
0x12	Control LED L19
0x13	Control LED L20
0x14	Control LED L21
0x15	Control LED L22
0x16	Control LED L23
0x17	Control LED L24
0x18	Control LED L25
0x19	Control LED L26
0x1A	Control LED L27
0x1B	Control LED L28
0x1C	Control LED L29
0x1D	Control LED L30
0x1E	Control LED L31
0x1F	Control LED L32

6.4.5 LED - ACCESS TO REGISTER

MODBUS ADDRESS		
ADDRESS	bit	DESCRIPTION
0x3000	0	Control LED L1
	1	Control LED L2
	2	Control LED L3
	3	Control LED L4
	4	Control LED L5
	5	Control LED L6
	6	Control LED L7
	7	Control LED L8
	8	Control LED L9
	9	Control LED L10
	10	Control LED L11
	11	Control LED L12
	12	Control LED L13
	13	Control LED L14
	14	Control LED L15
	15	Control LED L16
0x3001	0	Control LED L17
	1	Control LED L18
	2	Control LED L19
	3	Control LED L20
	4	Control LED L21
	5	Control LED L22
	6	Control LED L23
	7	Control LED L24
	8	Control LED L25
	9	Control LED L26
	10	Control LED L27
	11	Control LED L28
	12	Control LED L29
	13	Control LED L30
	14	Control LED L31
	15	Control LED L32