



**MANUAL FOR CANopen 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 CAN interface.

This manual does not describe the CANopen 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 C.i.A. – CAN in Automation GmbH. www.can.cia.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 GEFRA S.P.A. website www.gefran.com

2 • BIBLIOGRAPHICAL REFERENCES

- /1/ ISO 11898, Road vehicles – Interchange of digital information – Controller Area Network (CAN) for high speed communication, 1993
- /2/ CiA DS 301 V4.01, CANopen Application Layer and Communication Profile, 2000
- /3/ CiA DS 404 V1.20, CANopen Device Profile Measuring Device and Closed Loop Controllers, 2002
- /4/ CiA DS 305 V1.00, CANopen Layer Setting Service and Protocol (LSS), 2000
- /5/ CiA DS 205 V1.00, LMT Service and Protocol specification, 1996
- /6/ CiA DR 303 V1.00, CANopen Cabling and Connector Pin Assignment, 1999
- /7/ GEFRA XXXXX, "TF32 - Fieldbus keyboard" Datasheet

3 • MAIN TECHNICAL CHARACTERISTICS

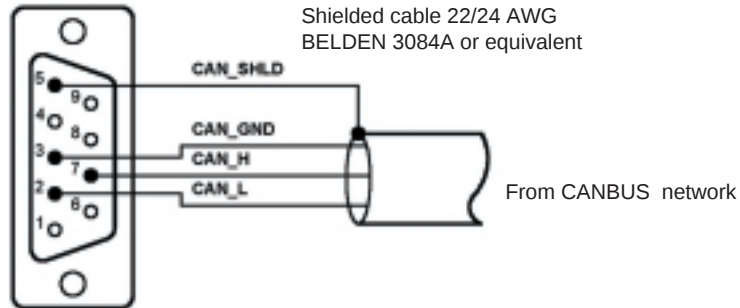
- ◇ NMT: Slave
- ◇ Baud Rate: 10, 20, 50, 100, 125, 250, 500 (default), 800, 1000 kBit/s, hardware selection via rotary switches, software selection via SDO
- ◇ Connectors: 2 D-Sub 9 pin Male (connected in parallel)
- ◇ Node ID: HW (1..99) settable via rotary switches
- ◇ File EDS: TF32_C01.eds
- ◇ Number of Service Data Object (SDO): 1 Server, 0 Client
- ◇ Number of Process Data Object (PDO): 1TXPDO, 1RXPDO
- ◇ Types of PDO: Event driven, Event timer, Sync cyclic, Sync acyclic, Remote transmission request
- ◇ Preset Messages: Life/node guarding, Heartbeat, Emergency
- ◇ PDO linking: Yes
- ◇ PDO mapping: Static
- ◇ Emergency Messages: No
- ◇ CANopen version: DS 301 V4.0
- ◇ Framework: No
- ◇ Certified: No
- ◇ Device Profile: DS 401 V2.0
- ◇ Diagnostics: 2 LED (LED1 Green, LED2 Red)

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 CANBUS NETWORK

D-SUB connector
9 pole Female



In accordance with /6/, the shielded cable must have special characteristics to guarantee correct communication among CANopen devices:

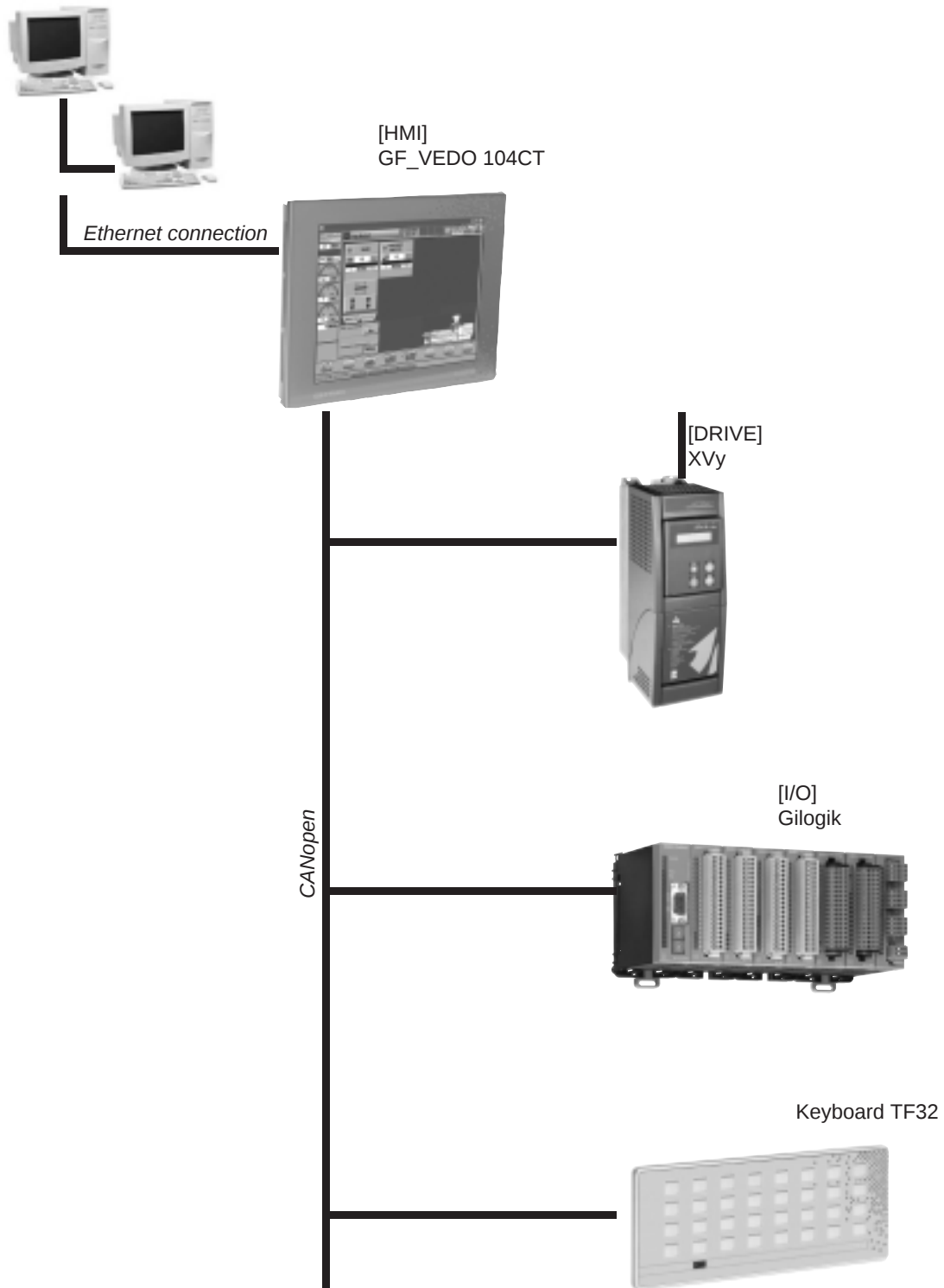
Bus length (m)	Bus cable (1)		Termination resistance (Ω)	Baudrate (Kbit/s)
	Length-related Resistance ($m\Omega/m$)	Cross-section (mm^2)		
0 ... 40	70	0.25 ... 0.34	124	1000 at 40 m
40 ... 300	< 60	0.34 ... 0.5	150 ... 300	> 500 at 100 m
300 ... 600	< 40	0.5 ... 0.6	150 ... 300	> 100 at 500 m
600 ... 1000	< 26	0.75 ... 0.8	150 ... 300	> 50 at 1 Km

(1) Recommended cable AC parameters: 120W impedance and 5nsec/m specific line delay.

GEFRAN S.p.A. supplies approved CANopen cables and connection systems as accessories to GEFLEX instruments.

4.2 EXAMPLE OF CANOPEN NETWORK

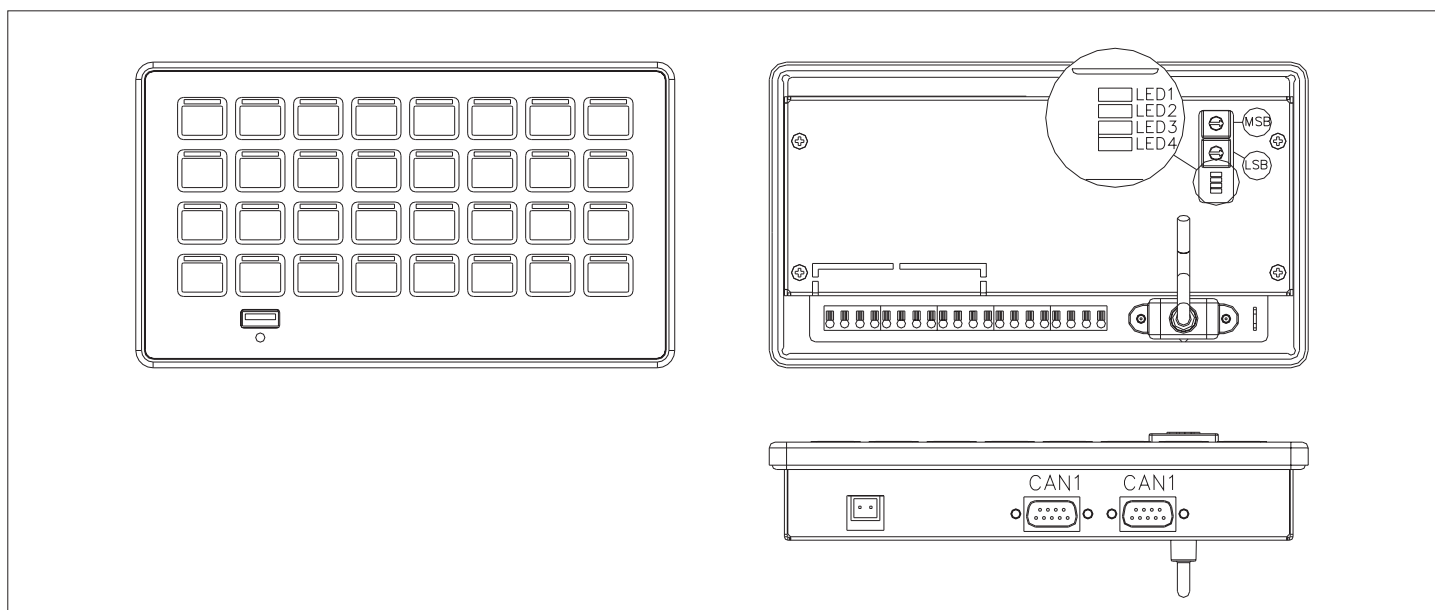
EXAMPLE OF CANOPEN NETWORK WITH HARDWARE ADDRESS SELECTION (PDO NOT ENABLED)



Max. number of TF32-CAN: 99.

5 • TF32-CAN: 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-CAN: ROTARY SWITCHES AND FUNCTION MODES

The two rotary switches MSB and LSB let you set:

- CAN NODE from 1 to 99 (in “SLAVE CANopen” function mode)
- TF32 OPERATIVE STATE

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	0	[DEFAULT]	Not managed: device resets cyclically
0	1	SLAVE CANopen	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
A	0	SET BAUD RATE CAN	Baud Rate = 1Mbps
A	1		Baud Rate = 800Kbps
A	2		Baud Rate = 500Kbps
A	3		Baud Rate = 250Kbps
A	4		Baud Rate = 125Kbps
A	5		Baud Rate = 100Kbps
A	6		Baud Rate = 50Kbps
A	7		Baud Rate = 20Kbps
A	8		Baud Rate = 10Kbps
A	9	-	Not managed: device resets cyclically
A	A	RELOAD	Device reloads factory configuration
...	...	-	Not managed: board resets cyclically
E	0	PRG	Not currently managed
E	1	TEST 1	All TF32 keyboard LEDs on steadily
E	2	TEST 2	All TF32 keyboard LEDs flash every 500ms
E	3	TEST 3	All TF32 keyboard LEDs on one at a time every 500ms
E	4	TEST 4	TF32 keyboard LEDs on according to keys pressed
E	5	-	Not managed: board resets cyclically
...	...		Not managed: board resets cyclically
F	F		Not managed: board resets cyclically

5.2 - TF-32: DIAGNOSTICS LEDs

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

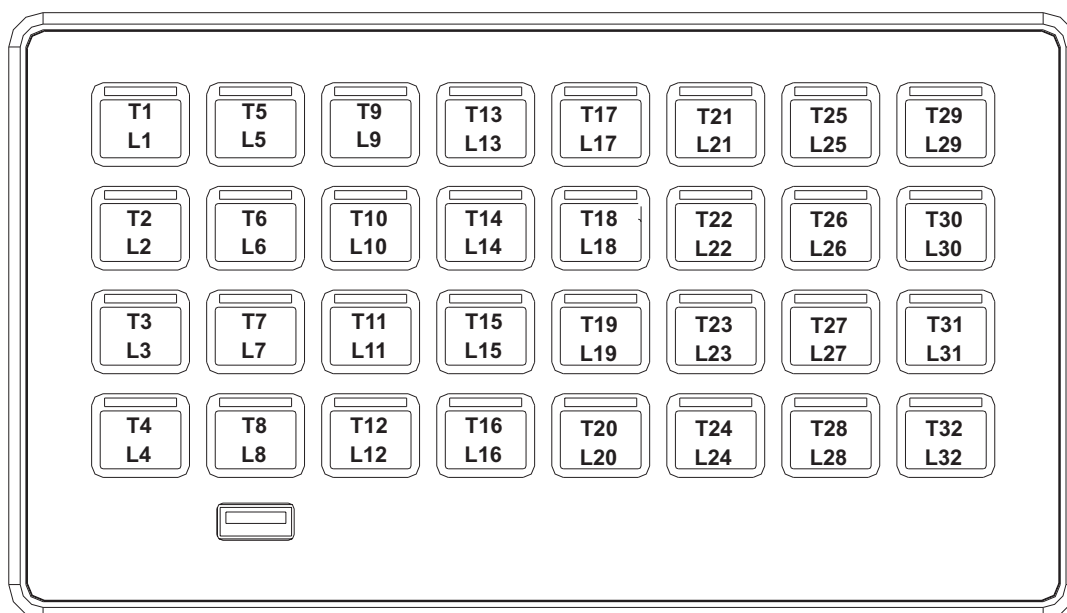
Specifically:

- 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
SLAVE CANopen "PREPARED" state No Error	LED 1 (GREEN)	Flashes	1000ms
	LED 2 (RED)	OFF	-
SLAVE CANopen "PREOPERATIONAL" state No Error	LED 1 (GREEN)	Flashes	200ms
	LED 2 (RED)	OFF	-
SLAVE CANopen "OPERATIONAL" state No Error	LED 1 (GREEN)	ON	Fisso
	LED 2 (RED)	OFF	-
SLAVE CANopen "PREOPERATIONAL" state "Warning" Error	LED 1 (GREEN)	Flashes	200ms
	LED 2 (RED)	Flashes	1000ms
SLAVE CANopen "PREOPERATIONAL" state "BUS OFF" Error	LED 1 (GREEN)	Flashes	200ms
	LED 2 (RED)	ON	Fisso
Rotary switches in movement	LED 1 (GREEN)	OFF	-
	LED 2 (RED)	OFF	-

6 • PROCESS DATA STRUCTURE

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



RXPDO1			
OUTPUT BYTE 1		OUTPUT BYTE 2	
bit	Description	bit	Description
0	Control LED L1	0	Control LED L9
1	Control LED L2	1	Control LED L10
2	Control LED L3	2	Control LED L11
3	Control LED L4	3	Control LED L12
4	Control LED L5	4	Control LED L13
5	Control LED L6	5	Control LED L14
6	Control LED L7	6	Control LED L15
7	Control LED L8	7	Control LED L16
OUTPUT BYTE 3		OUTPUT BYTE 4	
bit	Description	bit	Description
0	Control LED L17	0	Control LED L25
1	Control LED L18	1	Control LED L26
2	Control LED L19	2	Control LED L27
3	Control LED L20	3	Control LED L28
4	Control LED L21	4	Control LED L29
5	Control LED L22	5	Control LED L30
6	Control LED L23	6	Control LED L31
7	Control LED L24	7	Control LED L32

TXPDO1					
INPUT BYTE 1		INPUT BYTE 2		INPUT BYTE 3	
bit	Description	bit	Description	bit	Description
0	State Key T1	0	State Key T7	0	State Key AUX3
1	State Key T2	1	State Key T8	1	State Key AUX11
2	State Key T3	2	State Key AUX2	2	State Key T13
3	State Key T4	3	State Key AUX10	3	State Key T14
4	State Key AUX1	4	State Key T9	4	State Key T15
5	State Key AUX9	5	State Key T10	5	State Key T16
6	State Key T5	6	State Key T11	6	State Key AUX4
7	State Key T6	7	State Key T12	7	State Key AUX12
INPUT BYTE 4		INPUT BYTE 5		INPUT BYTE 6	
bit	Description	bit	Description	bit	Description
0	State Key T17	0	State Key T23	0	State Key AUX7
1	State Key T18	1	State Key T24	1	State Key AUX15
2	State Key T19	2	State Key AUX6	2	State Key T29
3	State Key T20	3	State Key AUX14	3	State Key T30
4	State Key AUX5	4	State Key T25	4	State Key T31
5	State Key AUX13	5	State Key T26	5	State Key T32
6	State Key T21	6	State Key T27	6	State Key AUX8
7	State Key T22	7	State Key T28	7	State Key AUX16

7 • OBJECT DICTIONARY

7.1 COMMUNICATION PROFILE

INDEX (hex)	SUB INDEX	DESCRIPTION	DATA TYPE	ACC.	DEFAULT (hex)
1000	0	Device type	unsigned32	ro	00320191
1001	0	Error register	unsigned8	ro	-
1002	0	Manufacturer status register	unsigned32	ro	-
1003	0	Number of error in pre-defined error field	unsigned8	rw	-
	1	Error field n	unsigned32	ro	-
	2	Error field n-1	unsigned32	ro	-
	3	Error field n-2	unsigned32	ro	-
	4	Error field n-3	unsigned32	ro	-
	5	Error field n-4	unsigned32	ro	-
	6	Error field n-5	unsigned32	ro	-
	7	Error field n-6	unsigned32	ro	-
	8	Error field n-7	unsigned32	ro	-
1005	0	COB-IB SYNC message	unsigned32	rw	00000080
1008	0	Manufact. device name (GFX)	string	ro	42435446
1009	0	Manufacturer hardware version	string	ro	20203130
100A	0	Manufacturer software version	string	ro	31303030
100B	0	Node-ID	unsigned32	ro	-
100C	0	Guard Time	unsigned16	rw	0000
100D	0	Life Time Factor	unsigned8	rw	00
100E	0	Node Guarding Identifier	unsigned32	rw	00000700+ID
100F	0	Number of SDOs supported	unsigned32	ro	00000001
1010	0	Number of Store parameters function	unsigned8	ro	01
	1	Save all parameters	string	rw	00
1011	0	Number of Restore parameters function	unsigned8	ro	01
	1	Resore all parameters	string	rw	00
1014	0	COB-IB Emergency Object	unsigned32	rw	00000080+ID
1016	0	Number of Consumer Heartbeat Time	unsigned8	ro	01
	1	Consumer Heartbeat Time	unsigned32	rw	00000000
1017	0	Producer Heartbeat Time	unsigned16	rw	01F4
1018	0	Number of Identity Object	unsigned8	ro	04
	1	Vendor ID	unsigned32	ro	01000093
	2	Product code	unsigned32	ro	0x000000D3
	3	Revision number	unsigned32	ro	-
	4	Serial number	unsigned32	ro	-
1029	0	Number of Error Classes	unsigned8	ro	03
	1	Communication Error	unsigned8	rw	00
	2	Output Error	unsigned8	rw	00
	3	Input Error	unsigned8	rw	00
1200	0	Number of Server SDO Parameter	unsigned8	ro	02
	1	COB-ID RX SDO	unsigned32	ro	00000600+ID
	2	COB-ID TX SDO	unsigned32	ro	00000580+ID

INDEX (hex)	SUB INDEX	DESCRIPTION	DATA TYPE	ACC.	DEFAULT (hex)
1400	0	Nr. of RPDO1 Communication parameter	unsigned8	ro	02
	1	COB-ID 1st RPDO Geflex Master	unsigned32	rw	00000200+ID
	2	Transmission type 1st RPDO	unsigned8	ro	FD
1600	0	Nr. of RPDO1 Mapping parameter	unsigned8	ro	04
	1	1st object mapped for 1st RPDO	unsigned32	ro	620000108
	2	2nd object mapped for 1st RPDO	unsigned32	ro	620000208
	3	3rd object mapped for 1st RPDO	unsigned32	ro	620000308
	4	4th object mapped for 1st RPDO	unsigned32	ro	620000408
1800	0	Nr. of TPDO1 Communication parameter	unsigned8	ro	05
	1	COB-ID 1st TPDO	unsigned32	rw	00000180+ID
	2	Transmission type 1st TPDO	unsigned8	rw	FF
	3	Inhibit time 1st TPDO	unsigned16	ro	0
	4	Reserved	unsigned16	ro	-
	5	Event timer 1st TPDO1	unsigned16	rw	0000
1A00	0	Number of TPDO1 Mapping parameter	unsigned8	ro	06
	1	1st object mapped for 1st TPDO	unsigned32	ro	600000108
	2	2nd object mapped for 1st TPDO	unsigned32	ro	600000208
	3	3st object mapped for 1st TPDO	unsigned32	ro	600000308
	4	4th object mapped for 1st TPDO	unsigned32	ro	600000408
	5	5th object mapped for 1st TPDO	unsigned32	ro	600000508
	6	6th object mapped for 1st TPDO	unsigned32	ro	600000608

7.2 DEVICE AND MANUFACTURER PROFILE

INDEX (hex)	SUB INDEX	DESCRIPTION	DATA TYPE	ACC.	DEFAULT (hex)
6000	0	Number of Input 8 bit	unsigned8	ro	06
	1	Read Input 1 to 8	unsigned8	ro	-
	2	Read Input 9 to 16	unsigned8	ro	-
	3	Read Input 17 to 24	unsigned8	ro	-
	4	Read Input 25 to 32	unsigned8	ro	-
	5	Read Input 33 to 40	unsigned8	ro	-
	6	Read Input 41 to 48	unsigned8	ro	-
6200	0	Number of Output 8 bit	unsigned8	ro	04
	1	Write Output 1 to 8	unsigned8	rw	00
	2	Write Output 9 to 16	unsigned8	rw	00
	3	Write Output 17 to 24	unsigned8	rw	00
	4	Write Output 25 to 32	unsigned8	rw	00

INDEX (hex)	SUB INDEX	DESCRIPTION	DATA TYPE	ACC.	DEFAULT (hex)
2000	0	Keyboard type ⁽¹⁾	unsigned8	ro	00
2001	0	Baud rate CANBUS ⁽²⁾	unsigned8	rw	02

Where: ⁽¹⁾: The "Keyboard type" value depends on a switch installed in the TF32 keyboards (not user-accessible).

"Keyboard type" values:

- 0 = TF32
- Other values = Reserved for other devices

⁽²⁾: Baud Rates: 0 = 1 Mbits 1 = 800 Kbits 2 = 500 Kbits
 3 = 250 Kbits 4 = 125 Kbits 5 = 100 Kbits
 6 = 50 Kbits 7 = 20 Kbits 8 = 10 Kbits

The new Baud Rate will be acquired the next time the keyboard is switched on.