

Plustherm TNX

Profibus protocol description

Date: 31.08.2012
Editor: Adrian Barmet, Stephan A. Wicki
Version: 1.75
GSD: PTNX0B89 (V1.4)

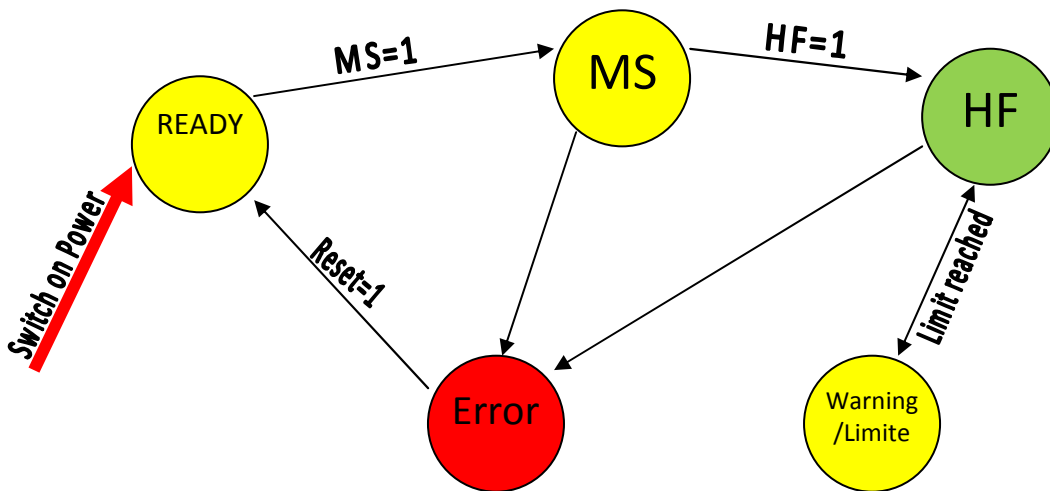
Contents

1. Project references/ contacts	1
2. Generally	2
3. Status structure (feedback)	3
4. Control structure (request)	4
5. Connection failure	5
6. Parameter ID table	6
7. Power-Control	7
8. Fault codes.....	8
9. Warnings.....	9
10. Installation guide lines.....	10

1. Project references/ contacts

Contractor : Plustherm Point GmbH (Generator)
Address : Seminarstrasse 102 CH-5430 Wettingen Switzerland
Telephone : +41(0)56 426 80 81
Contact : Stephan A. Wicki (stephan.wicki@plustherm.ch)
www.plustherm.ch
info@plustherm.ch

2. Generally



State Meaning:

- READY: First state after power on the unit
- MS: Unit is ready for heating. Capacitors are loaded
- HF: Unit is heating. High frequency is working
- Warning/limit: Operation value is in critical range. Reduce power or check the troubleshooting manual.
- Error: Error occurs. Set Reset and release HF and MS bit.

Adjustment:

The following adjustment must be changed to control the unit by Profibus.

- Control MS: ->USER MENU -> MS Control: Set parameter to "remote".
- Control HF: ->USER MENU -> HF Control: Set parameter to "remote".
- Control Reset: Always activ
- Control Power: ->USER MENU -> Power Reference: Set parameter to "Profibus".

Stepping Sequence:

- If TNX_Status_Error is false, you can switch on MS (TNX_Control_MS).
- If Error bit is set, you have to release MS, reset fault and switch on MS again. MS can also be used as "ready-state", as some errors (flows...) are only indicated in this state.
- If TNX_Status_MS is true, you can set HF (TNX_Control_HF). To switch off heating first release TNX_Control_HF, after (if needed) TNX_Control_MS.
- Reset should only set for 1 cycle.

Communication:

Default Profibus Address (PROFIBUS_NETWORK_ID) is **12**. You can change this Address through SSA or directly via Basic Setup on generator display (Basic Setup No. 38, Userpassword (Enter-Down-Menu-Down-Enter-Down))

Each message between TNX and Profibus master consists of 10 bytes:

- Byte 1: Control/Status Hi-byte
- Byte 2: Control/Status Lo-byte
- Byte 3: Command byte
- Byte 4: Parameter ID byte (see end of document for ID descriptions)
- Byte 5: Data byte 0
- Byte 6: Data byte 1
- Byte 7: Data byte 2
- Byte 8: Data byte 3
- Byte 9: Power Control/Status Hi-byte
- Byte 10: Power Control/Status Lo-byte

Master should read/ write these 10 bytes as a module in consistency mode.

Byte 1&2 are transmitted as word, if you want to access bitwise you have to swap the bytes (Siemens PLC standard), or use column "Bit**" as reference.

3. Status structure (feedback)

This 2 bytes reflect status of following bits:

No.:	Bit.**:	Name:	Description:	
0	8	TNX_Status_MS	True= MS ON	Generator is ready
1	9	TNX_Status_HF	True = HF ON	Generator is heating
2	10	TNX_Status_Warning	True= Warnings activated	Warnings is active
3	11	TNX_Status_Limit	True= Power limitation activated	Powerlimit is active
4	12	TNX_Status_Error	True= Error present	Error (generator OFF)
5	13	TNX_Status_Reduced	True= Reduced Power	Reduced power level
6*	14	TNX_Status_Laser_Pyrometer	True= laser pointer is ON	Not used
7*	15	TNX_Status_Bit7	Spare	Not used
8*	0	TNX_Status_Bit8	Spare	Not used
9*	1	TNX_Status_Bit9	Spare	Not used
10*	2	TNX_Status_Bit10	Spare	Not used
11*	3	TNX_Status_Bit11	Spare	Not used
12	4	TNX_PB_Error_1	Invalid Parameter ID	Transmission error
13	5	TNX_PB_Error_2	Write to read-only parameter attempted	Transmission error
14	6	TNX_PB_Error_3	Parameter out of range during write	Transmission error
15*	7	TNX_Status_Bit15	StartupBit	1=Generator ready

Bit 12..14 reflects status of actual transfer

*project specific bits

4. Control structure (request)

This 2 bytes control status of following bits:

No.:	Bit.**:	Name:	Description:	
0	8	TNX_Control_MS	True= MS ON	True= MS ON
1	9	TNX_Control_HF	True = HF ON	True = HF ON
2	10	TNX_Control_Error_Reset	True= reset Error	True= reset Error
3	11	TNX_Control_Reduce	True= Set power to reduced level	True= Set power to reduced level
4*	12	TNX_Control_Laser_Pyrometer	True= Switch on laser pointer	Not used
5*	13	TNX_Control_Bit5	Spare	Not used
6*	14	TNX_Control_Bit6	Spare	Not used
7*	15	TNX_Control_Bit7	Spare	Not used
8*	0	TNX_Control_Bit8	Spare	Not used
9*	1	TNX_Control_Bit9	Spare	Not used
10*	2	TNX_Control_Bit10	Spare	Not used
11*	3	TNX_Control_Bit11	Spare	Not used
12*	4	TNX_Control_Bit12	Spare	Not used
13*	5	TNX_Control_Bit13	Spare	Not used
14*	6	TNX_Control_Bit14	Spare	Not used
15*	7	TNX_Control_Bit15	Spare	Not used

*project specific bits

Command byte structure:

D7	D6	D5	D4	D3	D2	D1	D0
EC3/DT3	EC2/DT2	EC1/DT1	EC0/DT0		Flash*	Error**	R/W

R/W bit – selects between data read/write. If set, new value will be written to the selected parameter and TNX will respond with the newly set value.

Error - Profibus master should always clear this bit**. Only TNX can set it. If set, parameter fault was detected. Fault code will be in the bits D7..D4:

D7..D4	Error type
D4	Invalid Parameter ID
D5	Write to read-only parameter attempted
D6	Parameter value out of range during write
D7	Reserved

***Flash:**

Enable if you wish to write parameter changes to flash (non volatile memory).

Generally this should not be used all the time, as flash write cycles are limited.

All data are sent with highest byte first. Parameters that use less than 4 bytes will return zeros on additional bytes and ignore additional bytes on writes.

5. Connection failure

To detect bus failures, there is a timeout-counter set to 1000ms. For each transfer (bus activity) that counter is reseted. If there is no request for more than those 1000ms, TNX-generator is set to error mode, display shows : " Profibus conn. Lost"

6. Parameter ID table

Parameter ID	Description	Comment	
	Read-only variables		
0	RO_Software_Version_Silabs [*100]	To display scale /100, e.g. 236=2.36	←
1	RO_Error_Code	See fault codes	←
2	RO_Output_Current [in Amps *10]	To display scale /10, e.g. 105=10.5A	←
3	RO_Output_Voltage [in Volts]	←	←
4	RO_Output_Power [in Watts]	←	←
5	RO_Output_Frequency [Hz]	←	←
6	RO_Output_Load [in Ohms *10]	scale /10, e.g. 22=2.2Ohm	←
7*	RO_External_Reference [0..100.0% *10]	scale /10, e.g. 505=50.5%	Not used
8	RO_Water_Flow_1 [in l/min*10]	scale /10, e.g. 65=6.5l/min	Water flow C-Box
9*	RO_Water_Flow_2 [in l/min*10]	"	Water flow cabinet
10	RO_Internal_Pos_15V [in Volts*10]	To display scale /10, e.g. 150=15.0V	←
11	RO_Internal_Neg_15V [in Volts*10]	"	←
12	RO_Internal_Pos_5V [in Volts*10]	"	←
13	RO_Internal_Neg_5V [in Volts*10]	"	←
14	RO_Temperature_T1 [in °C*10]	To display scale /10, e.g. 305=30.5°C	Not used.
15	RO_Temperature_T2 [in °C*10]	"	H-Bridge heat sink
16	RO_Temperature_T3 [in °C*10]	"	Choke
17	RO_Temperature_T4 [in °C*10]	"	Not used
18	RO_Temperature_T5 [in °C*10]	"	Coil
19	RO_Temperature_T6 [in °C*10]	"	Not used
20	RO_Temperature_T7 [in °C*10]	"	Not used
21	RO_Temperature_T8 [in °C*10]	"	Not used
22	RO_Temperature_T9 [in °C*10]	"	Not used
23	RO_Temperature_T10 [in °C*10]	"	Not used
24	RO_Temperature_Ambient (CPU) [°C*10]	"	←
25	RO_Total_Watt_Hours [in Wh]		←
26	RO_Total_Piece_Count		←
27	RO_Total_Operating_Hours [in s]		←
28	RO_Total_HF_Hours [in s]		←
29	RO_UBat (capacitor bank) [V]		←
30	RO_Software_Version_EPLD_MAX		←
31	RO_PWM_Chopper [%]		←
32*	RO_T_Pyrometer [°C]		Not used
33	RO_I_max [A]		←
34	RO_U_max [V]		←
35	RO_P_max [W/ 10 (10W Steps)]	scale*10, e.g. 1'000*10=10kW	←
36*	RO_Water_Flow_3 [in l/min*10]	scale /10, e.g. 65=6.5l/min	Not used
37*	RO_Water_Flow_4 [in l/min*10]	scale /10, e.g. 65=6.5l/min	Not used
38	RO_Warnings_code	See warning codes	←
39*	RO_Spare0		Not used
* project specific ID's			

Parameter ID	Description	Comment	
	Read-write variables*		
40*	RW_Spare1	Spare	Not used
41*	RW_Scale_Reference_Power [0..200%*10 (0.1% Steps)]	To display scale /10, e.g. 1'005=100.5%	Not used
42*	RW_Selected_Program_Number		Not used
43*	RW_Reduced_Power_Level [0..100% of nominal power]	e.g. 50=50% (TNX20=10kW)	Not used
44*	RW_HF_Filter [2..255] TNX<=30kW: 3000/HF_Filter [kHz], TNX>=60kW: 255/HF_Filter [kHz]	TNX20: value 30= 100kHz	Not used
45*	RW_Emissivity [2..100%]		Not used
46*	RW_Set_Temperature [°C] min/max=Pyrometer-min/max		Not used
47*	RW_Analog output 1 mode [0..12]		Not used
48*	RW_Set_Voltage [V]		Not used
49*	RW_Spare9	Spare	Not used
50*	RW_Spare8	"	Not used
51*	RW_Spare7	"	Not used
52*	RW_Spare6	"	Not used
53*	RW_Spare5	"	Not used
54*	RW_Spare4	"	Not used
55*	RW_Spare3	"	Not used
56*	RW_Spare2	"	Not used
57*	RW_Spare1	"	Not used
58*	RW_Spare0	"	Not used
* project specific ID's			
	Read only		
	Alterable		

7. Power-Control

Byte 9: Power Control/Status Hi-byte

Byte 10: Power Control/Status Lo-byte

To set desired power level write output in W/100, e.g. 20.5kW= 20'500W= 205.

Feedback (status) is output power in W/100, e.g. 100.1kW= 100'100W= 1001.

Depending on TNX-setup, set-value/ status-value is in W/100, V or %*10 of generator nominal power (Parameter No. 35) or %*10 of maximum voltage (Parameter No. 34). Voltage regulation is used to automatically adapt power to coil-load (coil impedance changes with load situation, by keeping voltage constant, power changes accordingly to actual load). (USER MENU, Power ref. Profibus/ PB %, Reference Power/ Volt.)

8. Fault codes

No.	Bit**	Error-display (TNX):	Description:	Dez:	Hex:	Bin:
1	24	"E-Stop remote"	External	1	0x00000001	0000'0000'0000'0000'0000'0000'0000'0001
2	25	"Output overcurrent"	Overcurrent	2	0x00000002	0000'0000'0000'0000'0000'0000'0000'0010
3	26	"Output overvoltage"	Overvoltage	4	0x00000004	0000'0000'0000'0000'0000'0000'0000'0100
4	27	"Frequency abnormal"	Frequency out of	8	0x00000008	0000'0000'0000'0000'0000'0000'0000'1000
5	28	"One phase missing"	Supply voltage	16	0x00000010	0000'0000'0000'0000'0000'0000'0000'1000
6	29	"Battery voltage low"	Capacitor bank	32	0x00000020	0000'0000'0000'0000'0000'0000'0000'0100
7	30	"CH-Driver fault"	Chopper driver	64	0x00000040	0000'0000'0000'0000'0000'0000'0000'0100
8	31	"HB-driver #1 fault"	HB-Driver No. 1	128	0x00000080	0000'0000'0000'0000'0000'0000'0000'1000
9	16	"HB-Driver #2 fault"	HB-Driver No. 2	256	0x00000100	0000'0000'0000'0000'0000'0000'0001'0000
10	17	"HB-Driver #3 fault"	HB-Driver No. 3	512	0x00000200	0000'0000'0000'0000'0000'0000'0010'0000
11	18	"HB-Driver #4 fault"	HB-Driver No. 4	1'024	0x00000400	0000'0000'0000'0000'0000'0000'0100'0000
12	19	" +15V supply failure"	Controller supply	2'048	0x00000800	0000'0000'0000'0000'0000'0000'1000'0000
13	20	" -15V supply failure"	Controller supply	4'096	0x00001000	0000'0000'0000'0000'0000'0001'0000'0000
14	21	" +5VA supply failure"	Controller supply	8'192	0x00002000	0000'0000'0000'0000'0000'0010'0000'0000
15	22	" -5VA supply failure"	Controller supply	16'384	0x00004000	0000'0000'0000'0000'0000'0100'0000'0000
16	23	"Overtemp Chopper "	T1-temperature	32'768	0x00008000	0000'0000'0000'0000'1000'0000'0000'0000
17	8	"Overtemp HBridge"	T2-temperature	65'536	0x00010000	0000'0000'0000'0001'0000'0000'0000'0000
18	9	"Overtemp H2O int. "	T3-temperature	131'072	0x00020000	0000'0000'0000'0010'0000'0000'0000'0000
19*	10	"Overtemp Busbar "	T4-temperature	262'144	0x00040000	0000'0000'0000'0100'0000'0000'0000'0000
20	11	"Overtemp Coil"	T5-temperature	524'288	0x00080000	0000'0000'0000'1000'0000'0000'0000'0000
21*	12	"Overtemp C-Bank"	T6-temperature	1'048'576	0x00100000	0000'0000'0001'0000'0000'0000'0000'0000
22*	13	" "	T7-temperature	2'097'152	0x00200000	0000'0000'0010'0000'0000'0000'0000'0000
23*	14	" "	T8-temperature	4'194'304	0x00400000	0000'0000'0100'0000'0000'0000'0000'0000
24*	15	" "	T9-temperature	8'388'608	0x00800000	0000'0000'1000'0000'0000'0000'0000'0000
25*	0	" "	T10-temperature	16'777'216	0x01000000	0000'0001'0000'0000'0000'0000'0000'0000
26	1	"No water coil"	Water flow	33'554'432	0x02000000	0000'0010'0000'0000'0000'0000'0000'0000
27*	2	"No water int"		67'108'864	0x04000000	0000'0100'0000'0000'0000'0000'0000'0000
28*	3	" "		134'217'728	0x08000000	0000'1000'0000'0000'0000'0000'0000'0000
29*	4	" "		268'435'356	0x10000000	0001'0000'0000'0000'0000'0000'0000'0000
30*	5	THS too low (Twater)*	Not used	536'870'912	0x20000000	0010'0000'0000'0000'0000'0000'0000'0000
31*	6	Powerlimit reached*	Not used	1'073'741'824	0x40000000	0100'0000'0000'0000'0000'0000'0000'0000
32	7	"Profibus conn. lost"	Profibus	2'147'483'648	0x80000000	1000'0000'0000'0000'0000'0000'0000'0000

* project specific errors

You should "mask" the variable as multiple errors can be transmitted!

Parameter is transmitted as double-word!

If you want to access bitwise you have to swap the bytes (Siemens PLC standard).

No. 16-29: Error display (TNX) is project specific

9. Warnings

No.	Bit**	Warning-display	Description:	Dez:	Hex:	Bin:
1	24	"Flow-coil xx.x l/min"	Water flow coil critical low	1	0x00000001	0000'0000'0000'0000'0000'0000'0000'0001
2	25	"Flow-int. xx.x l/min"	Water flow generator critical	2	0x00000002	0000'0000'0000'0000'0000'0000'0000'0010
3*	26	" "		4	0x00000004	0000'0000'0000'0000'0000'0000'0000'0100
4*	27	" "		8	0x00000008	0000'0000'0000'0000'0000'0000'0000'1000
5	28	"T- Chopper critical!"	Temp.-1 critical high	16	0x00000010	0000'0000'0000'0000'0000'0000'0000'1000
6	29	"T- HBridge critical!"	Temp.-2 critical high	32	0x00000020	0000'0000'0000'0000'0000'0000'0000'0010'0000
7	30	"T- H2O int. critical!"	Temp.-3 critical high	64	0x00000040	0000'0000'0000'0000'0000'0000'0000'0100'0000
8*	31	"T- Busbar critical!"	Temp.-4 critical high	128	0x00000080	0000'0000'0000'0000'0000'0000'0000'1000'0000
9	16	"T- Coil critical!"	Temp.-5 critical high	256	0x00000100	0000'0000'0000'0000'0000'0000'0000'0001'0000'0000
10*	17	"T- C-Bank critical!"	Temp.-6 critical high	512	0x00000200	0000'0000'0000'0000'0000'0000'0000'0010'0000'0000
11	18	" "	Temp.-7 critical high	1'024	0x00000400	0000'0000'0000'0000'0000'0000'0000'0100'0000'0000
12	19	" "	Temp.-8 critical high	2'048	0x00000800	0000'0000'0000'0000'0000'0000'0000'1000'0000'0000
13	20	" "	Temp.-9 critical high	4'096	0x00001000	0000'0000'0000'0000'0000'0000'0000'0001'0000'0000'0000
14	21	" "	Temp.-10 critical high	8'192	0x00002000	0000'0000'0000'0000'0000'0000'0000'0010'0000'0000'0000
15	22	"T- Chopper < Tmin!"	Temp.-1 critical low	16'384	0x00004000	0000'0000'0000'0000'0000'0000'0000'0100'0000'0000'0000
16	23	"T- HBridge < Tmin!"	Temp.-2 critical low	32'768	0x00008000	0000'0000'0000'0000'0000'0000'0000'1000'0000'0000'0000
17	8	"T- H2O int. < Tmin!"	Temp.-3 critical low	65'536	0x00010000	0000'0000'0000'0000'0000'0000'0000'0001'0000'0000'0000
18	9	"T- Busbar < Tmin!"	Temp.-4 critical low	131'072	0x00020000	0000'0000'0000'0000'0000'0000'0000'0010'0000'0000'0000
19	10	"T- Coil < Tmin!"	Temp.-5 critical low	262'144	0x00040000	0000'0000'0000'0000'0000'0000'0000'0100'0000'0000'0000
20	11	"T- C-Bank < Tmin!"	Temp.-6 critical low	524'288	0x00080000	0000'0000'0000'0000'0000'0000'0000'1000'0000'0000'0000
21*	12	" "	Temp.-7 critical low	1'048'576	0x00100000	0000'0000'0000'0000'0000'0000'0000'0000'0000'0000
22*	13	" "	Temp.-8 critical low	2'097'152	0x00200000	0000'0000'0000'0000'0000'0000'0000'0000'0000'0000
23*	14	" "	Temp.-9 critical low	4'194'304	0x00400000	0000'0000'0000'0000'0000'0000'0000'0000'0000'0000
24*	15	" "	Temp.-10 critical low	8'388'608	0x00800000	0000'0000'0000'0000'0000'0000'0000'0000'0000'0000
25	0	"Power-Lim. Pmax!"	Powerlimit (maximum power)	16'777'216	0x01000000	0000'0001'0000'0000'0000'0000'0000'0000'0000'0000
26	1	"Power-Lim. VOLT! "	Powerlimit (maximum voltage)	33'554'432	0x02000000	0000'0010'0000'0000'0000'0000'0000'0000'0000'0000
27	2	"Power-Lim. AMPS!"	Powerlimit (maximum current)	67'108'864	0x04000000	0000'0100'0000'0000'0000'0000'0000'0000'0000'0000
28	3	"Power-Lim. PWM! "	Powerlimit (maximum PWM)	134'217'728	0x08000000	0000'1000'0000'0000'0000'0000'0000'0000'0000'0000
29	4	"Power-Lim. USER!"	Powerlimit (maximum user)	268'435'356	0x10000000	0001'0000'0000'0000'0000'0000'0000'0000'0000'0000
30	5	"Power-Lim. R>MAX!"	Powerlimit (maximum	536'870'912	0x20000000	0010'0000'0000'0000'0000'0000'0000'0000'0000'0000
31*	6	" "	Not used	1'073'741'824	0x40000000	0100'0000'0000'0000'0000'0000'0000'0000'0000'0000
32*	7	" "	Not used	2'147'483'648	0x80000000	1000'0000'0000'0000'0000'0000'0000'0000'0000'0000

* project specific warnings

You should "mask" the variable as multiple warnings can be transmitted!

Parameter is transmitted as double-word!

If you want to access bitwise you have to swap the bytes (Siemens PLC standard).

No. 1-24: Warning display (TNX) is project specific

10. Installation guide lines

- Please check that all connections are properly connected to PE!
Especially on M12 round-connector assure tight connection to maintain good shield to PE contact!
- Always use termination-resistor on first & last device in the Profibus-chain!
If TNX-generator is placed on the end of the chain, you can switch on the termination-resistor inside the generator cabinet on the SUB-D-connector (right-hand-side of TNX-cabinet, switch to “OFF”):

TNX-Profibus-connector with built-in termination-resistor:



- Profibus-ID-No. (Address):
Default Profibus Address (PROFIBUS_NETWORK_ID) is **12**. You can change this Address through SSA or directly via Basic Setup on generator display (Basic Setup No. 38, Userpassword (Enter-Down-Menu-Down-Enter-Down)).
After setting a new address you have to reboot TNX-controller to connect with new address.