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InsuLogix® T
MODBUS Protocol Manual

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1. Overview

The following table shows the possible combinations of all our interfaces and protocols and their resulting options.

For a successful communication with your InsuLogix® T please select your device configuration and use the specified parameters.

Table 1: Device communication parameters

Interface	Protocol	Baudrate	Databits	Parity	Stopbits	End of Line
RS232	ASCII	57600	8	none	1	CR+LF
RS485	ASCII	57600	8	none	1	CR+LF
RS485	Modbus	19200	8	even	1	none
USB (virtual port)	ASCII	57600	8	none	1	CR+LF
ETH (virtual port)	ASCII	57600	8	none	1	CR+LF
ETH (virtual port)	Modbus	19200	8	even	1	none

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2. Serial commands

The following sections detail each of the commands available in the InsuLogix® T firmware, when communicating to a InsuLogix® T over the ASCII protocol.

Temperature commands

The following is a summery of the commands available to be used to get or set temperatures:

- Get Average Temperature Of One Channel
- Get Average Temperatures Of All Channel
- Get Temperature Of One Channel
- Get Temperatures Of All Channel

Get average temperature of one channel

<div align="center">Table 2: Get average temperature of one channel</div>

Serial Command	cmd channel	
	cmd	?01
	Channel	positive value for the required channel
Response	(cmd newbit temperature) acknowledge	
	cmd	#01
	newbit	0: already read 1: new value
	temperature	temperature value without comma or 9999 in case of a channel error
	acknowledge	*00: successful *FF: fail
Example		?01 1 This will get the newbit and temperature from channel one #01 1 302 *00 unread value of 30.2°C

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Get average temperature of all channels

Serial Command	cmd	
	cmd	?02
Response	(cmd temperature[0..N]) acknowledge	
	cmd	#02
	temperature	temperature value without comma or --- in case of a channel error
	acknowledge	*00: successful There is no response in case of wrong command
Example		?02 This will get all temperatures from the device #02 --- 302 245 -206 *00 all temperature of a 4 channel device with an error on channel one

Get temperature of one channel

Table 4: Get temperature of one channel

Serial Command	cmd channel	
	cmd	?03
	Channel	positive value for the required channel
Response	(cmd newbit temperature) acknowledge	
	cmd	#03
	newbit	0: already read 1: new value
	temperature	temperature value without comma or 9999 in case of a channel error
	acknowledge	*00: successful *FF: fail
Example		?03 1 This will get the newbit and temperature from channel one #03 0 302 already read value of 30.2°C

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Get temperature of all channels

<div align="center">Table 5: Get temperature of all channels</div>

Serial Command	cmd	
	cmd	?04
Response	(cmd temperature[0..N]) acknowledge	
	cmd	#04
	temperature	temperature value without comma or --- in case of a channel error
	acknowledge	*00: successful There is no response in case of wrong command
Example		?04 This will get all temperatures from the device #04 --- 302 245 -206 *00 all temperature of a 4 channel device with an error on channel one

Additional commands

The following is a summary of the commands available to be used to get or set additional parameters:

- Get Device Address
- Set Device Address
- Get Internal Communication Flag
- Set Internal Communication Flag

Get device address

<div align="center">Table 6: Get device address</div>

Serial Command	cmd	
	cmd	?D0
Response	cmd address acknowledge	
	cmd	#D0
	address	hex value
	acknowledge	*00: successful There is no response in case of wrong command
Example		?D0 This will get the device address #D0 5 *00 device address is 0x05

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Set device address

<p align="center">**Table 7: Set device address**</p>

Serial Command	cmd	
	cmd	?D0
Response	cmd address acknowledge	
	cmd	#D0
	address	hex value
	acknowledge	*00: successful There is no response in case of wrong command
Example		?D0 This will get the device address #D0 5 *00 device address is 0x05

Get internal communication flag

<p align="center">**Table 8: Get internal communication flag**</p>

Serial Command	cmd	
	cmd	?D1
Response	cmd flag acknowledge	
	cmd	#D1
	flag	0: communication off 1: communication on
	acknowledge	*00: successful There is no response in case of wrong command
Example		?D1 This will get the internal communication flag #D1 1 *00 internal communication is active

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Set internal communication flag

Serial Command	cmd flag	
	cmd	:D1
	flag	0: communication off 1: communication on
Response	acknowledge	
	acknowledge	*00: successful *FF: fail
Example		:D1 1 This will set the internal communication flag to 1 *00 internal communication is activated

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3. MODBUS data map

Discrete output coils

Table 10: Discrete output coils

Function	Address	R/W	Description
Enable Channel [1–8]	0x00 – 0x07	X / X	0: Channel off 1: Channel on
Relay Upper Limit [1–8]	0x08 – 0x0F	X / X	0: activate Upper Limit 1: deactivate Upper Limit
Relay Lower Limit [1–8]	0x10 – 0x17	X / X	0: activate Lower Limit 1: deactivate Lower Limit
Relay Inverted [1–8]	0x18 – 0x1F	X / X	0: Normal Relay Mode 1: Inverted Relay Mode
Relay 3 Channels [1–8]	0x20 – 0x27	X / X	0: remove the channel from the logical disjunction 1: add the channel to the logical disjunction
Relay 4 Channels [1–8]	0x28 – 0x2F	X / X	0: remove the channel from the logical disjunction 1: add the channel to the logical disjunction
Restricted	0x30 – 0x37		Reserved for debug functionality
Auto Integration	0x38	X / X	0: Constant Exposure Time 1: Auto tuning
Watchdog Relay Reset	0x39	– / X	1: Reset Watchdog Relay
RTC System Register Reset	0x3A	– / X	1: Reset RTC system registers
RTC All Register Reset	0x3B	– / X	1: Reset all RTC registers
SD Erase	0x3C	– / X	1: Erase SD data
Reboot	0x3D	– / X	1: Reboot

Discrete input coils

Table 11: Discrete input coils

Function	Address	R/W	Description
New Value [1–8]	0x00 – 0x07	X / –	0: Temperature already read 1: new Temperature
Relay State [1–4]	0x08 – 0x0B	X / –	0: Relay open 1: Relay closed
Channel Disturbed [1–8]	0x10 – 0x17	X / –	0: Channel OK 1: Channel with Error
Analog Type	0x18	X / –	0: Voltage 1: Current

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Analog input registers

Table 12: Analog input registers

Function	Address	R/W	Description
Last Edge [1–8]	0x00 – 0x07	X / –	
Temperature [1–8]	0x08 – 0x0F	X / –	
Average Temperature [1–8]	0x10 – 0x17	X / –	
Error [1–8]	0x18 – 0x1F	X / –	0: Channel OK 1: No Sensor 2: No Signal 3: Signal too low 4: Signal too high 5: Channel off
Extended Channel 1	0x20 – 0x27	X / –	Register 1: New Temperature Flag
Extended Channel 2	0x28 – 0x2F	X / –	Register 2: Average Temperature Register 3: Year
Extended Channel 3	0x30 – 0x37	X / –	Register 4: Month
Extended Channel 4	0x38 – 0x3F	X / –	Register 5: Day Register 6: Hour
Extended Channel 5	0x40 – 0x47	X / –	Register 7: Minute
Extended Channel 6	0x48 – 0x4F	X / –	Register 8: Second
Extended Channel 7	0x50 – 0x57	X / –	The timestamp is only available when Logging is
Extended Channel 8	0x58 – 0x5F	X / –	activated
Channel Count	0x60	X / –	
Actual Channel	0x61	X / –	
Device Temperature	0x62	X / –	Temperature from the RTC
SD Usage and Size	0x63	X / –	Register 1: SD Usage High Byte Register 2: SD Usage Low Byte Register 3: SD Size High Byte Register 2: SD Size Low Byte must read as block

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Analog output holding registers

Table 13: Analog output registers

Function	Address	R/W	Description
Temperature Offset [1–8]	0x00 – 0x07	X / X	The write value is a delta to the existing offset
Temperature Averaging[1–8]	0x08 – 0x0F	X / X	Amount of values for the Average Temperature
Analog Low Temp. [1–8]	0x10 – 0x17	X / X	
Analog High Temp. [1–8]	0x18 – 0x1F	X / X	
Relay Low Temp. [1–8]	0x20 – 0x27	X / X	
Relay High Temp [1–8]	0x28 – 0x2F	X / X	
Integration Time [1–8]	0x30 – 0x37	X / X	When the Auto Integration is active, writing into this register have no effect
Restricted	0x38 – 0x137		Reserved for Calibration values
Spectrum Average Count	0x138	X / X	Amount of accumulate Spectres
Spectrum Smoothing Factor	0x139	X / X	Matrix size of the smoothing algorithm
Next Lamp Delay	0x13A	X / X	Preglowing time before a measure starts on this Channel
Real Time Clock	0x13B	X / X	Register 1: Year Register 2: Month Register 3: Weekday Register 4: Day Register 5: Hour Register 6: Minute Register 7: Second Register 8 Set To read the clock read the first seven registers as block. To write a specific time write all 8 registers as block. The value in the 8 register is arbitrary.
Log Mode	0x143	X / X	0: Logging deactivated 1: Logging activated (each new Temperature will be logged)
Log Interval	0x144	X / X	Activate Logging with an interval
Restricted	0x145 – 0x154		Reserved for Debug functionality

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Function code FC43 – read device identification

This function code allows reading the identification and additional information relative to the physical and functional description of a device. The InsuLogix® T supports the following Object Id´s.

Table 14: Device identification parameters

Object Id	Object Name	Category
0x00	Vendor Name	Basic
0x01	Product Code	Basic
0x02	Major Minor Revision	Basic
0x03	Vendor Url	Regular
0x04	Product Name	Regular
0x05	Model Name	Regular
0x80	Major Minor Lib Revision	Extended
0x81	Hardware Configuration	Extended

Broadcast registers

The Broadcast Address is 0 and the registers can be set with the function code 06.

Commands over the broadcast address are always single value force-write commands without any response.

Table 15: Broadcast registers

Function	Address	R/W	Description
Master Address	0x01	– / X	Set the modbus address of the master board
Restricted	0x02		Reserved for device configurations
Slave Address	0x03	– / X	Set the modbus address of the slave board and the intercommunication address on the master board
Restricted	0x04		Reserved for device configurations
Intercommunication	0x05	– / X	0: Intercommunication off 1: Intercommunication on