MODBUS TABLES

TWR DIN

Thermal Watch DIN

TWR IR

Thermal Watch Receiver

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1. MODBUS TABLES

MANUFACTURING DATA										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
FF01	Series	0	1	U8 [2]	ASCII	R	-	-	-	Product series
FF02	Type	1	1	U8 [2]	ASCII	R	-	-	-	Product type
FF03	Generation	2	1	U8 [2]	ASCII	R	-	-	-	Product generation
FF04	Model	3	1	U8 [2]	ASCII	R	-	-	-	Product model (01 or 05 or 13)
FF05	Firmware	4	4	U16 [4]		R	-	-	-	Firmware version (Major.Minor.Patch.Build)
FF06	Build timestamp	8	4	U64	Unix ms	R	-	-	-	Firmware build timestamp
FF07	Hardware	12	4	U16 [4]		R	-	-	-	Hardware version (Major.Minor.Patch.Build)
FF08	Serial	16	8	U8 [16]	ASCII	R	-	-	-	Serial number
FF09	Manufacturer	24	1	U8 [2]	ASCII	R	-	-	-	Manufacturer code
DIAGNOSTIC										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
DS01	System time	100	4	U64	Unix ms	R	-	-	-	Current time of the device
DS02	Application status	104	1	U16	bit-string	R	-	-	-	Alarm and error flags related to the Application (measurements from all sensors)
DS03	System status	105	1	U16	bit-string	R	-	-	-	Alarm and error flags related to the System (all system devices)
DS04	Relay output status	106	1	U16	enumeration	R	-	-	-	Status of the Relay Output coil
DS05	Command status	107	1	U16	enumeration	R	-	-	-	Status of the Command Execution
DS10	Communication config timestamp	110	4	U64	Unix ms	R	-	-	-	Timestamp of the last Communication config change
DS11	General config timestamp	114	4	U64	Unix ms	R	-	-	-	Timestamp of the last General config change
DS12	Receivers config timestamp	118	4	U64	Unix ms	R	-	-	-	Timestamp of the last Receivers config change

DS13	Sensors config timestamp	122	4	U64	Unix ms	R	-	-	-	Timestamp of the last Sensors config change

COUNTERS										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
CC01	Uptime	130	4	U64	ms	R	-	-	-	Device uptime in milliseconds
CC02	Measurements DB total count	134	2	U32		R	-	-	-	Total records counter (always going up untill DB erased manually)
CC03	Measurements DB overflows	136	2	U32		R	-	-	-	Counts overwlows of dedicated memory area (once new records start overwritinig old records)
CC04	System Journal DB total count	138	2	U32		R	-	-	-	Total records counter (always going up untill DB erased manually)
CC05	System Journal DB overflows	140	2	U32		R	-	-	-	Counts overwlows of dedicated memory area (once new records start overwritinig old records)

RECEIVER STATE										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
RS01 #0	Status	200	1	U16	bit-string	R	-	-	-	
RS02 #0	Ambient temperature	201	1	S16	0.1 °C	R	-	-	-	If supported by hardware
RS03 #0	Ambient Relative Humidity	202	1	U16	0.1 %	R	-	-	-	If supported by hardware
RS04 #0	Ambient Dew Point temperature	203	1	S16	0.1 °C	R	-	-	-	If supported by hardware
RS05 #0	Timestamp	204	4	U64	Unix ms	R	-	-	-	
RS #1	Receiver State #1	208	8				-	-	-	Same structure as for the Receiver State #0
RS #2 - #14	Receiver States #2 - #14	216	104				-	-	-	Same structure as for the Receiver State #0
RS #15	Receiver State #15	320	8				-	-	-	Same structure as for the Receiver State #0

SENSOR STATE										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
SS01 #0	Status	400	1	U16	bit-string	R	-	-	-	
SS02 #0	Voltage status	401	1	U16	bit-string	R	-	-	-	
SS03 #0	Surface temperature	402	1	S16	0.1 °C	R	-	-	-	
SS04 #0	Surface-Dew temperature difference	403	1	S16	0.1 °C	R	-	-	-	Temperatures difference between Ambient Dew Point (RS02) and Surface (SS03)
SS05 #0	Timestamp	404	4	U64	Unix ms	R	-	-	-	
SS #1	Sensor State #1	408	8				-	-	-	Same structure as for the Sensor State #0
SS #2 - #248	Sensor States #2 - #248	416	1976				-	-	-	Same structure as for the Sensor State #0
SS #249	Sensor State #249	2392	8				-	-	-	Same structure as for the Sensor State #0

COMMUNICATION CONFIGURATION										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
SP01	Serial Port baudrate	3000	2	U32	b/s	RW	9600	9600	115200	Serial port speed of TWR-DIN (RS-485, RJ45 connector)
SP02	Serial Port data bits	3002	1	U16		RW	8	8	8	Number of bits per data character
SP03	Serial Port stop bits	3003	1	U16		RW	1	1	2	Number of stop bits
SP04	Serial Port parity	3004	1	U16	enumeration	RW	0	0	2	Serial port parity check
SP05	Modbus RTU Unit ID	3005	1	U16		RW	1	1	255	Address of the device for the Modbus RTU protocol
SP06	Receiver Port timeout	3006	1	U16	ms	RW	1000	100	1000	Timeout for communication requests between TWR-DIN and TWR-IR
SP07	Receiver Port retries	3007	1	U16		RW	3	1	10	Number of retries for communication requests between TWR-DIN and TWR-IR

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SYSTEM CONFIGURATION										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
GC01	Relay Output mode	3010	1	U16	enumeration	RW	2 (Normal Off)	0	2	Defines whether the Relay Output is activated by an alarm or by good conditions
GC02	Relay Output trigger	3011	1	U16	enumeration	RW	1 (All)	0	2	Defines whether the Relay Output is triggered by Application or System status or both
GC03	Enable button-reset	3012	1	U16	boolean	RW	1	0	1	Enable alarms reset by the front panel button
GC04	Enable system auto-reset	3013	1	U16	boolean	RW	1	0	1	Enable or disable auto-reset of System alarms
GC05	Enable application auto-reset	3014	1	U16	boolean	RW	0	0	1	Enable or disable auto-reset of Application alarms
GC06	Discard unchanged data	3015	1	U16	boolean	RW	0	0	1	If enabled, unchanged measured values will not be saved to Measurements DB
GC07	Duplicates timeout	3016	1	U16	ms	RW	1000	0	15000	Defines the timeframe within which duplicated transmissions will be discarded
GC08	Receiver recording interval	3017	1	U16	minutes	RW	60	2	1440	Interval for saving ambient measurements to Measurements DB
GC20	Enable time synchronization alarm	3020	1	U16	boolean	RW	1	0	1	Enable or disable an alarm related to reset of the System Clock (RTC)
GC21	Enable connection alarms	3021	1	U16	boolean	RW	1	0	1	Enable alarms caused by connection errors with receivers or sensors
GC22	Enable battery alarms	3022	1	U16	boolean	RW	1	0	1	Enable alarms caused by sensor batteries with low voltage
APPLICATION CONFIGURATION										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
GC30	Enable surface temperature alarms	3030	1	U16	boolean	RW	1	0	1	Enable alarms caused by low or high surface temperatures
GC31	Enable ambient temperature alarms	3031	1	U16	boolean	RW	1	0	1	Enable alarms caused by low or high ambient temperatures
GC32	Enable Relative Humidity alarms	3032	1	U16	boolean	RW	1	0	1	Enable alarms caused by low or high Relative Humidities

GC33	Enable Dew Point temperature alarms	3033	1	U16	boolean	RW	0	0	1	Enable alarms caused by low or high Dew Point temperatures
GC34	Enable Surface-Dew difference alarms	3034	1	U16	boolean	RW	0	0	1	Enable alarms caused by lthe low difference between Surface Temperature and Dew Point Temperature

RECEIVER CONFIGURATION										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
RC01 #1	Enabled	3100	1	U16	boolean	RW	1	0	1	Enable or disable operation of the receiver connected to the related port
RC02 #1	High ambient temperature threshold	3101	1	S16	0.1 °C	RW	70.0	-3276.8	3276.7	High level threshold of the ambient temperature
RC03 #1	Low ambient temperature threshold	3102	1	S16	0.1 °C	RW	3.0	-3276.8	3276.7	Low level threshold of the ambient temperature
RC04 #1	Ambient temperature hysteresis	3103	1	U16	0.1 °C	RW	3.0	0	6553.5	Histeresis of the ambient temperature
RC05 #1	Enable High ambient temperature alarm	3104	1	U16	boolean	RW	1	0	1	Enable the high level alarm for the ambient temperature
RC06 #1	Enable Low ambient temperature alarm	3105	1	U16	boolean	RW	0	0	1	Enable the low level alarm for the ambient temperature
RC07 #1	High Relative Humidity threshold	3106	1	U16	0.1 °C	RW	60.0	0	100.0	High level threshold of the Relative Humidity
RC08 #1	Low Relative Humidity threshold	3107	1	U16	0.1 °C	RW	40.0	0	100.0	Low level threshold of the Relative Humidity
RC09 #1	Relative Humidity Hysteresis	3108	1	U16	0.1 °C	RW	2.0	0	100.0	Histeresis of the Relative Humidity
RC10 #1	Enable High Relative Humidity alarm	3109	1	U16	boolean	RW	1	0	1	Enable the high level alarm for the Relative Humidity
RC11 #1	Enable Low Relative Humidity alarm	3110	1	U16	boolean	RW	1	0	1	Enable the low level alarm for the Relative Humidity
RC12 #1	High ambient Dew Point temperature threshold	3111	1	S16	0.1 °C	RW	15.0	-3276.8	3276.7	High level threshold of the Dew Point temperature
RC13 #1	Low ambient Dew Point	3112	1	S16	0.1 °C	RW	3.0	-3276.8	3276.7	Low level threshold of the Dew Point temperature

	temperature threshold									
RC14 #1	Dew Point hysteresis	3113	1	U16	0.1 °C	RW	3.0	0	6553.5	Histeresis of the Dew Point temperature
RC15 #1	Enable High Dew Point temperature alarm	3114	1	U16	boolean	RW	1	0	1	Enable the High Dew Point temperature alarm
RC16 #1	Enable Low Dew Point temperature alarm	3115	1	U16	boolean	RW	0	0	1	Enable the Low Dew Point temperature alarm
RC #2	Receiver Configuration #2	3116	16							Same structure as for the Receiver Configuration #1
RC #3 - #15	Receiver Configurations #3 - #15	3132	208							Same structure as for the Receiver Configuration #1
RC #16	Receiver Configuration #16	3340	16							Same structure as for the Receiver Configuration #1

SENSOR CONFIGURATION										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
SC01 #1	Identifier	3400		U16		RW	0	0	2047	Unique ID of the wireless sensor bounded to this position
SC02 #1	Expected transmissions interval	3401		U16	minutes	RW	120	1	1440	Expected normal transmission period of the wireless sensor in minutes
SC03 #1	Use hardware threshold	3402		U16	boolean	RW	1	0	1	Enable the sensor hardware threshold for the High surface temperature
SC04 #1	High surface temperature threshold	3403		S16	0.1 °C	RW	70.0	-3276.8	3276.7	High level threshold of the surface temperature
SC05 #1	Low surface temperature threshold	3404		S16	0.1 °C	RW	30.0	-3276.8	3276.7	Low level threshold of the surface temperature
SC06 #1	Surface temperature hysteresis	3405		U16	0.1 °C	RW	30.0	0	6553.5	Histeresis of the surface temperature
SC07 #1	Enable High surface temperature alarm	3406		U16	boolean	RW	1	0	1	Enable the high level alarm for the surface temperature
SC08 #1	Enable Low surface temperature alarm	3407		U16	boolean	RW	0	0	1	Enable the low level alarm for the surface temperature
SC09 #1	reserved	3408		U16		RW	-	-	-	

SC10 #1	Low Surface-Dew temperature difference threshold	3409		S16	0.1 °C	RW	5.0	-3276.8	3276.7	Low level threshold for the temperatures difference (see SS04)
SC11 #1	Surface-Dew temperature difference hysteresis	3410		U16	0.1 °C	RW	3.0	0	6553.5	Hysteresis of the difference value (see SS04 and SC10)
SC12 #1	reserved	3411		U16		RW	-	-	-	
SC13 #1	Enable Low Surface-Dew difference alarm	3412		U16	boolean	RW	0	0	1	Enable the alarm when the difference value becomes lower than the threshold (see SS04 and SC10)
SC14 #1	reserved	3413		U16		RW	-	-	-	
SC15 #1	reserved	3414		U16		RW	-	-	-	
SC16 #1	reserved	3415		U16		RW	-	-	-	
SC #2	Sensor Configuration #2	3416	16							Same structure as for the Sensor Configuration #1
SC #3 - #249	Sensor Configurations #3 - #249	3432	3952							Same structure as for the Sensor Configuration #1
SC #250	Sensor Configuration #250	7384	16							Same structure as for the Sensor Configuration #1

MEASUREMENTS HISTORY										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
DH01	Requested page	8000	2	U32		W	-	0	U32_MAX	Number of the requested history page.
DH02	Loaded page	8002	2	U32		R	-	-	-	Number of the loaded history page. Each page contains 10 records.
DR01 #0	Timestamp	8004	4	U64	Unix ms	R	-	-	-	Timestamp of the record
DR02 #0	Receiver index	8008	1	U16		R	-	-	-	Index of the related receiver (port)
DR03 #0	Sensor index	8009	1	U16		R	-	-	-	Index of the related wireless sensor
DR04 #0	Sensor identifier	8010	1	U16		R	-	-	-	Unique identifier of the related wireless sensor
DR05 #0	Battery voltage status	8011	1	U16	enumeration	R	-	-	-	Battery voltage status of the related wireless sensor (0 means OK)
DR06 #0	Surface temperature	8012	1	S16	0.1 °C	R	-	-	-	Surface temperature measured by the sensor (not defined if this record is only for the receiver measurements)

DR07 #0	Ambient temperature	8013	1	S16	0.1 °C	R	-	-	-	Ambient Temperature measured by the receiver (not defined if the receiver doesn't support measurements)
DR08 #0	Relative Humidity	8014	1	S16	0.1 %	R	-	-	-	Relative Humidity measured by the receiver (not defined if the receiver doesn't support measurements)
DR09 #0	Record status	8015	1	S16	enumeration	R	-	-	-	Status of the record data in the memory (0 means OK)
DR #1	Record #1	8016	12							Same structure as for the Record #0
DR #2 - #8	Records #2 - #8	8028	84							Same structure as for the Record #0
DR #9	Record #9	8112	12							Same structure as for the Record #0

SYSTEM JOURNAL

Identifier	Name	Address	Quantity	Data Type	Units	Access	Default	Min	Max	Description
EH01	Requested page	9000	2	U32		W	-	0	U32_MAX	Number of the requested system journal page
EH02	Loaded page	9002	2	U32		R	-	-	-	Number of the loaded system journal page. Each page contains 10 records.
ER01 #0	Timestamp	9004	4	U64	Unix ms	R	-	-	-	Timestamp of the record
ER02 #0	Receiver index	9008	1	U16		R	-	-	-	Index of the related receiver (port)
ER03 #0	Sensor index	9009	1	U16		R	-	-	-	Index of the related wireless sensor
ER04 #0	Sensor identifier	9010	1	U16		R	-	-	-	Unique identifier of the related wireless sensor
ER05 #0	Value	9012	2	S32		R	-	-	-	Related value
ER06 #0	Severity	9013	1	U16		R	-	-	-	Severity of the record
ER07 #0	Message code	9014	1	U16		R	-	-	-	Message Code
ER08 #0	Record status	9015	1	U16	enumeration	R	-	-	-	Status of the record data in the memory (0 means OK)
ER #1	Record #1	9016	12							Same structure as for the Record #0
ER #2 - #8	Records #2 - #8	9028	84							Same structure as for the Record #0
ER #9	Record #9	9112	12							Same structure as for the Record #0

COMMANDS										
Identifier	**Name**	**Address**	**Quantity**	**Data Type**	**Units**	**Access**	**Default**	**Min**	**Max**	**Description**
EX01	Synch Time	65000	4	U64	Unix ms	W	-	0	U64_MAX	Write time in Unix-ms to synchronize the system time of the device
EX02	Reboot	65004	1	U16		W	-	0	1	Reboot device
EX03	Reset alarms	65005	1	U16		W	-	0	1	Reset pending alarms
EX04	Restore defaults	65006	1	U16		W	-	0	1	Restore configuration defaults
EX05	Erase Measurements DB	65007	1	U16		W	-	0	1	Erase Measurements DB
EX06	Erase System Journal DB	65008	1	U16		W	-	0	1	Erase System Journal DB
EX07	Register wireless sensor	65009	1	U16		W	-	0	1	Command to register a new sensor within the certain period

2. ENUMARATIONS

DS02	bit-string	Application Status (related to measurements from all sensors)
Flag	**Bit**	**Note**
	0	
HT	1	High ambient temperature from one of receivers
LT	2	Low ambient temperature from one of receivers
HRH	3	High ambient Relative Humidity from one of receivers
LRH	4	Low ambient Relative Humidity from one of receivers

HDP	5	High ambient Dew Point temperature from one of receivers
LDP	6	Low ambient Dew Point temperature from one of receivers
	7	
SHT	8	High surface temperature from one of wireless sensors
SLT	9	Low surface temperature from one of wireless sensors
	10	
SLDT	11	Low Surface-Dew temperature difference alarm from one of wireless sensors
	12	
	13	
	14	
	15	

DS03	bit-string	System Status (related to all system devices)
Flag	**Bit**	**Note**
EHW	0	Undefined hardware error
EDATA	1	Error occured on initialization of Measurements DB
ESYSJ	2	Error occured on initialization of System Journal DB
FDATA	3	Measurements DB is full (need to erase manually)
FEVNT	4	System Journal DB is full (need to erase manually)
ECFG	5	One of configs is corrupted
ETIME	6	Time is not synchronized
RCN	7	Connection error with one of receivers
SBAT	8	Low battery alarm from one of wireless sensors
SCN	9	Connection error with one of wireless sensors
	10	

	11	
	12	
	13	
	14	
	15	

DS04	enumeration	Relay Output status
Value	**Number**	**Note**
OFF	0	Relay Output coil is not energized
ON	1	Relay Output coil is energized

DS05	enumeration	Command status
Value	**Number**	**Note**
IDLE	0	No active commands
RUNNING	1	Command is running

RS01	bit-string	Receiver status
Flag	**Bit**	**Note**
HT	0	High ambient temperature (receiver sensor)
LT	1	Low ambient temperature (receiver sensor)
HRH	2	High ambient Relative Humidity (receiver sensor)
LRH	3	Low ambient Relative Humidity (receiver sensor)
HDP	4	High ambient Dew Point temperature (receiver sensor)

LDP	5	Low ambient Dew Point temperature (receiver sensor)
	6	
ECN	7	Connection error with this receiver
SHT	8	High surface temperature from one of wireless sensors in range of this receiver
SLT	9	Low surface temperature from one of wireless sensors in range of this receiver
	10	
SLDT	11	Low difference between Surface and Dew Point temperatures from one of wireless sensors in range of this receiver
SLBAT	12	Low battery alarm from one of wireless sensors in range of this receiver
SECN	13	Connection error with one of wireless sensors in range of this receiver
	14	
DISABLED	15	This receiver is disabled

SS01	bit-string	Sensor status
Flag	**Bit**	**Note**
HT	0	High surface temperature
LT	1	Low surface temperature
	2	
LDT	3	Low difference between Surface and Dew Point temperatures
LBAT	4	Low battery alarm
	5	
	6	
ECN	7	Connection error with this wireless
	8	
	9	
	10	

	11	
	12	
	13	
	14	
DISABLED	15	This sensor is disabled

SP04	enumeration	Serial port parity
Value	**Number**	**Note**
None	0	Parity check is disabled
Odd	1	Odd parity check
Even	2	Even parity check

GC01	enumeration	Mode of Relay Output coil
Value	**Number**	**Note**
Disabled	0	Relay Output is disabled
Normal ON	1	Relay Output is energized if there is no active alarms
Normal OFF	2	Relay Output is not energized if there is no active alarms

GC02	enumeration	Relay Output triggers
Value	**Number**	**Note**
None	0	Alarms can not trigger Relay Output
All	1	All types of alarms can trigger Relay Output
App-Only	2	Only application (measurements) related alarms can trigger Relay Output

ER05	enumeration	System Journal severity
Value	**Number**	**Note**
Debug	0	All messages with this level or higher will be saved to System Journal DB
Information	1	All messages with this level or higher will be saved to System Journal DB
Warning	2	All messages with this level or higher will be saved to System Journal DB
Alarm	3	All messages with this level or higher will be saved to System Journal DB

3. Contact

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