

# MODBUS BESCHREIBUNG UND PROTOKOLL

**LAMBDA Wärmepumpen**

**Datum:**

11.04.2023



## 1 Kommunikations-Eigenschaften

### 1.1 Allgemein

Es können eine Reihe von Parameter und Istwerte von der Steuerzentrale der Wärmepumpe ausgelesen bzw. beschrieben werden. Die Steuerzentrale fungiert dabei als Slave.

Die Zeit eines Kommunikationstimeout beträgt 1min. Erfolgt in dieser Zeit kein Abruf wird die Verbindung geschlossen und muss neu aufgebaut werden.

Die Lesefunktion erfolgt über die Modbus Funktionscode 0x03 (read multiple holding register)

Die Schreibfunktion erfolgt über die Modbusfunktionscode 0x10 (write multiple writing register)

### 1.2 Modbus TCP/IP

Die Kommunikation erfolgt über den Netzwerkanschluss des Displays. Stellen Sie sicher, dass die Verbindung zum Netzwerk funktioniert und richten Sie im richtigen Sie das Gerät im Netzwerk im Menüpunkt Netzwerkeinstellungen ein (Suche einer freien IP Adresse mittel DHCP oder manuelle Vergabe).



The screenshot shows the 'NETZWERKEINSTELLUNGEN' (Network Settings) screen of the LAMBDA Wärmepumpen control interface. The interface is dark-themed with a blue header. The header displays the LAMBDA logo, a temperature of 14.9°C, and the user 'Anwender' at 'LEVEL 1'. The main content area contains the following settings:

- IP automatisch beziehen:
- IP - Adresse: 192, 168, 0, 47
- Subnetmaske: 255, 255, 255, 0
- Gateway - Adresse: 192, 168, 0, 1
- Port: 1954
- DNS IP: 8, 8, 8, 8

Navigation icons for back and confirm are visible on the left and right sides respectively. The bottom right corner shows the date '08.09.2021' and time '20:58:57'.

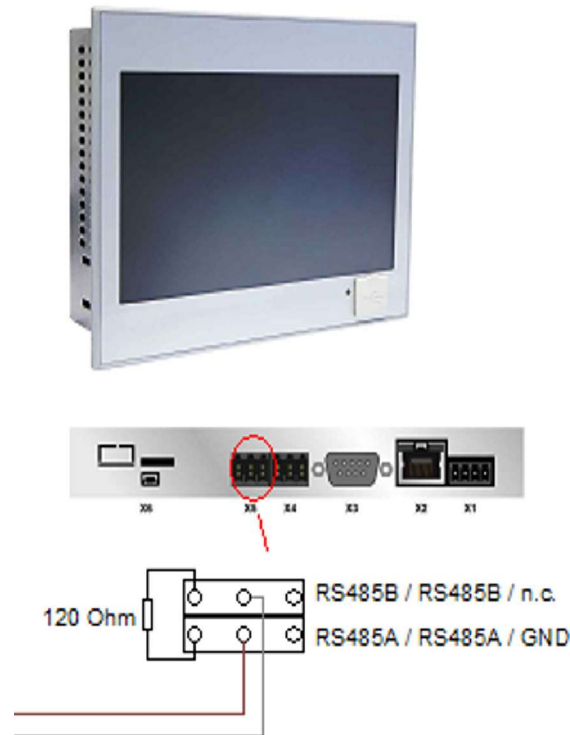
Die Modbus-TCP Kommunikation erfolgt über den Port 502.

Es können bis zu 16 Kommunikationskanäle (16 Master) bedient werden.

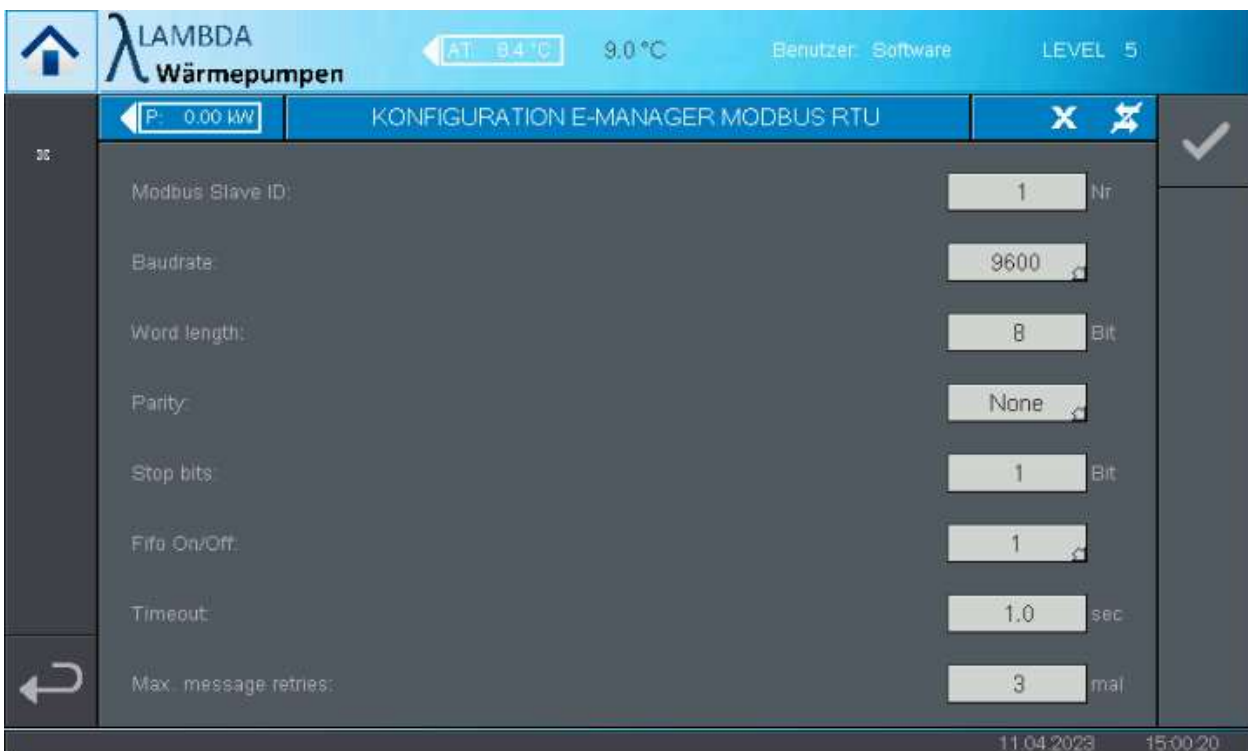
### 1.3 Modbus RTU

Die Kommunikation erfolgt über den RS485 Anschluss auf der Rückseite der Bedienteils. Der 120 Ohm Endwiderstand kann bei Bedarf entfernt werden, sofern das Bedienteil nicht das letzte Gerät im Busnetzwerk ist.

### Display



Die Standardkonfiguration ist in nachstehender Darstellung sichtbar.



## 1.4 Modbus Protokoll

Die Register Adresse ist wie folgt strukturiert.

- X -> Erste Stelle: Index (wird von Modultyp vorgegeben)
- X -> Nächste Stelle: Subindex (wird von Modulnummer vorgegeben)
- XX -> letzte 2 Stellen: Number (wird von Datenpunkt vorgegeben)

### 1.4.1 Subindex

Die Modulnummer ergibt sich aus der Reihenfolge wie gleichartige Modultypen im Konfigurationsmodul angelegt wurden. Module die weiter oben gereiht sind (niedrigerer Nr.) werden über den niedrigeren Subindex angesprochen.

**Beispiel:**



The screenshot shows the 'KONFIGURATION MODULE' screen in the LAMBDA Wärmepumpen control system. The interface includes a top status bar with a home icon, the LAMBDA logo, a temperature display (AT: 19.0°C, 17.8°C), and user information (Benutzer: Anwender, LEVEL 1). The main area contains a table with the following data:

Nr.:	Modultyp:	Gruppe:	Modulnamen:	Anzeige:
1	Wärmepumpe	0	WP Heizen M	1
2	Brauchwasser	1	Brauchwasser	5
3	Puffer	1	Puffer	2
4	Heizkreis	1	Heizkreis 1	7
5	Heizkreis	1	Heizkreis 2	8
6	Heizkreis	1	Heizkreis 3	9

The interface also features a left sidebar with navigation icons, a right sidebar with a trash icon, and a bottom status bar showing the date and time (08.09.2021, 21:40:50).



In diesem Fall besitzt:

Nr	Modulname	Subindexname	Subindex
Nr. 1	WP Heizen M	heat pump 1	0
Nr. 9	WP Heizen+WW S	heat pump 2	1
Nr. 2	Brauchwasser	boiler 1	0
Nr. 3	Puffer	buffer 1	0
Nr. 10	Pool	buffer 2	1
Nr. 4	Heizkreis 1	circute 1	0
Nr. 5	Heizkreis 2	circute 2	1
Nr. 6	Heizkreis 3	circute 3	2
Nr. 7	Heizkreis 4	circute 4	3
Nr. 8	Poolkreis	circute 5	4

Z.B. Register zum Auslesen der Vorlauftemperatur (flowline temperature) der Wärmepumpe „Heizen+WW S“:

1	1	04	=	1104
Index	Subindex	Number		

### 1.4.2 Number

Die Number ist dem spezifischen Datenpunkt der ausgelesen oder beschrieben werden soll zugeordnet (siehe Modbusprotokoll). Datenpunkte zwischen 00-49 die beschrieben werden sollen müssen regelmäßig beschrieben werden (Timeout nach 5min), ansonsten fallen sie einem zugeordneten Defaultwert zurück. Datenpunkte über 50 können einmalig beschrieben werden. Der Wert wird dauerhaft gespeichert.

## 1.5 Besondere Datenpunkte

Folgende Datenpunkte müssen separat in der Bedienoberfläche aktiviert werden, um über Modbus beschrieben werden zu können.

### Außentemperatur



### Überschussenergie (PV Überschuss)

The screenshot shows the 'KONFIGURATION E-MANAGER' screen. At the top, there is a header with the LAMBDA logo, 'Wärmepumpen', and system status: 'AT: 14.2 °C', '12.4 °C', 'Benutzer: Software', and 'LEVEL 5'. Below the header, a sub-header shows 'P: 0.00 kW' and 'KONFIGURATION E-MANAGER'. The main area contains several configuration items:

- E-Meter Kommunikationsart: A dropdown menu is open, showing options 'Keine', 'ModBus RTU', and 'ModBus TCP'. 'ModBus TCP' is highlighted in yellow.
- E-Meter Messpunkt: (empty)
- Anlagengrundlast: (empty)
- Leistungsanforderung Minimum: 0.0 kW
- Leistungsanforderung Maximum: 4.0 kW
- Leistungsanforderung Einschaltverzögerung: 15 min
- Leistungsanforderung Ausschaltverzögerung: 15 min
- Leistungsmittelwerte zurücksetzen: (button)

At the bottom right, the date and time are '09.09.2021' and '07:29:50'.

### Raumfühler

The screenshot shows the 'EG FBH Wohnzimmer' screen. At the top, there is a header with the LAMBDA logo, 'Wärmepumpen', and system status: 'AT: 14.2 °C', '12.4 °C', 'Benutzer: Software', and 'LEVEL 5'. Below the header, a sub-header shows 'VL: 0.0 °C' and 'EG FBH Wohnzimmer'. The main area contains several configuration items:

- Hydraulische Anbindung: Ohne Mischer
- Betriebsart Heizkreispumpe: Dauerbetrieb
- Betriebsfunktion: Heizen
- Raumgerätetyp: A dropdown menu is open, showing options 'Kein Gerät', 'Analoges Gerät', 'Digitales Gerät', 'Funk Gerät', and 'ModBus TCP'. 'ModBus TCP' is highlighted in yellow.
- Maximale Vorlauftemperatur: (empty)
- Minimale Drehzahl WP-Ladepumpe: (empty)

At the bottom right, the date and time are '09.09.2021' and '07:30:50'.

Holding Register - Reading with modbus function code 0x03 (read multiple holding registers) / Writing with modbus function code 0x10 (write multiple holding registers)

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
General Ambient	0	0	00	Error number	RO	INT16	[Nr]	0 = No Error
			01	Operating state	RO	UINT16	[Nr]	0 = OFF, 1 = AUTOMATIK, 2 = MANUAL, 3 = ERROR
			02	Actual ambient temp.	RW	INT16	[0.1°C]	Actual ambient temperature (min = -50.0°C; max = 80.0°C)
			03	Average ambient temp. 1h	RO	INT16	[0.1°C]	Arithmetic average temperature of the last 60 minutes
			04	Calculated ambient temp.	RO	INT16	[0.1°C]	Temperature for calculations in heat distribution modules

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
General E-Manager	0	1	00	Error number	RO	INT16	[Nr]	0 = No Error
			01	Operating state	RO	UINT16	[Nr]	0 = OFF, 1 = AUTOMATIK, 2 = MANUAL, 3 = ERROR, 4 = OFFLINE
			02	Actual power (input or excess)	RW	UINT16 or INT16	[Watt]	Actual input power [UINT16 (min = 0W; max = 65535W)] or actual excess power [INT16 (min = -32768W; max = 32767W)] (depends on settings in Module)
			03	Actual power consumption	RO	INT16	[Watt]	Actual power consumption of all configured heat pumps
			04	Power consumption setpoint	RO	INT16	[Watt]	Power consumption setpoint as a sum for for all heat pumps

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
			00	Hp Error state	RO	UINT16	[Nr]	0 = NONE, 1 = MESSAGE, 2 = WARNING, 3 = ALARM, 4 = FAULT
			01	Hp Error number	RO	INT16	[Nr]	Scrolling through all active error numbers (Nr.1 - Nr.99)
			02	Hp State	RO	UINT16	[Nr]	0 = INIT, 1 = REFERENCE, 2 = RESTART-BLOCK, 3 = READY, 4 = START PUMPS, 5 = START COMPRESSOR, 6 = PRE-REGULATION, 7 = REGULATION, 8 = Not Used, 9 = COOLING, 10 = DEFROSTING, 20 = STOPPING, 30 = FAULT-LOCK, 31 = ALARM-BLOCK, 40 = ERROR-RESET



Heat pump (ModulNr. 1-3)	1	heat pump 1 = 0 heat pump 2 = 1 heat pump 3 = 2	03	Operating state	RO	UINT16	[Nr]	0 = STBY, 1 = CH, 2 = DHW, 3 = CC, 4 = CIRCULATE, 5 = DEFROST, 6 = OFF, 7 = FROST, 8 = STBY-FROST, 9 = Not used, 10 = SUMMER, 11 = HOLIDAY, 12 = ERROR, 13 = WARNING, 14 = INFO-MESSAGE, 15 = TIME-BLOCK, 16 = RELEASE-BLOCK, 17 = MINTEMP-BLOCK, 18 = FIRMWARE-DOWNLOAD
			04	T-flow	RO	INT16	[0.01°C]	Flow line temperature
			05	T-return	RO	INT16	[0.01°C]	Return line temperature
			06	Vol. sink	RO	INT16	[0.01/min]	Volume flow heat sink
			07	T-EQin	RO	INT16	[0.01°C]	Energy source inlet temperature
			08	T-EQout	RO	INT16	[0.01°C]	Energy source outlet temperature
			09	Vol. source	RO	INT16	[0.01/min]	Volume flow energy source
			10	Compressor-Rating	RO	UINT16	[0.01%]	Compressor unit rating
			11	Qp heating	RO	INT16	[0.1kW]	Actual heating capacity
			12	Fl power consumption	RO	INT16	[Watt]	Frequency inverter actual power consumption
			13	COP	RO	INT16	[0.01%]	Coefficient of performance
			14	Modbus request release password	RW	UINT16	[Nr]	Password register to release modbus request registers
			15	Request type	RW	INT16	[Nr]	0 = NO REQUEST, 1 = FLOW PUMP CIRCULATION, 2 = CENTRAL HEATING, 3 = CENTRAL COOLING, 4 = DOMESTIC HOT WATER
			16	Request flow line temp	RW	INT16	[0.1°C]	Requested flow line temperature. (min = 0.0°C, max = 70.0°C)
			17	Request return line temp	RW	INT16	[0.1°C]	Requested return line temperature. (min = 0.0°C, max = 65.0°C)
			18	Request heat sink temp. diff	RW	INT16	[0.1K]	Requested temperature difference between flow line and return line. (min = 0.0K, max = 35.0K)
			19	Relais state for 2nd heating stage	RO	INT16	0/1	1 = NO-Relais for 2nd heating stage is activated
			20	Statistic VdA E since last reset	RO	INT32	[Wh]	Accumulated electrical energy consumption of compressor unit since last statistic reset
			22	Statistic VdA Q since last reset	RO	INT32	[Wh]	Accumulated thermal energy output of compressor unit since last statistic reset
			50	Set.: Error Quitt	RW	UINT16	0/1	1 = Quit all active heat pump errors

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
			00	Error number	RO	INT16	[Nr]	0 = No Error

<b>Boiler (ModulNr. 1-5)</b>	2	boiler 1 = 0 boiler 2 = 1 boiler 3 = 2 boiler 4 = 3 boiler 5 = 4	01	Operating state	RO	UINT16	[Nr]	0 = STBY, 1 = DHW, 2 = LEGIO, 3 = SUMMER, 4 = FROST, 5 = HOLIDAY, 6 = PRIO-STOP, 7 = ERROR, 8 = OFF, 9 = PROMPT-DHW, 10 = TRAILING-STOP, 11 = TEMP-LOCK, 12 = STBY-FROST
			02	Actual high temp.	RO	INT16	[0.1°C]	Actual temperature boiler high sensor
			03	Actual low temp.	RO	INT16	[0.1°C]	Actual temperature boiler low sensor
			50	Set.: Maximum boiler temp.	RW	INT16	[0.1°C]	Setting for maximum boiler temperature (min = 25.0°C; max = 65.0°C)

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
<b>Buffer (ModulNr. 1-5)</b>	3	buffer 1 = 0 buffer 2 = 1 buffer 3 = 2 buffer 4 = 3 buffer 5 = 4	00	Error number	RO	INT16	[Nr]	0 = No Error
			01	Operating state	RO	UINT16	[Nr]	0 = STBY, 1 = HEATING, 2 = COOLING, 3 = SUMMER, 4 = FROST, 5 = HOLIDAY, 6 = PRIO-STOP, 7 = ERROR, 8 = OFF, 9 = STBY-FROST
			02	Actual high temp.	RO	INT16	[0.1°C]	Actual temperature buffer high sensor
			03	Actual low temp.	RO	INT16	[0.1°C]	Actual temperature buffer low sensor
			50	Set.: Maximum buffer temp.	RW	INT16	[0.1°C]	Setting for maximum buffer temperature (min = 25.0°C; max = 65.0°C)

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
<b>Solar (ModulNr. 1-2)</b>	4	solar 1 = 0 solar 2 = 1	00	Error number	RO	INT16	[Nr]	0 = No Error
			01	Operating state	RO	UINT16	[Nr]	0 = STBY, 1 = HEATING, 2 = ERROR, 3 = OFF
			02	Collector temp.	RO	INT16	[0.1°C]	Actual temperature collector sensor
			03	Buffer 1 temp.	RO	INT16	[0.1°C]	Actual temperature buffer 1 sensor
			04	Buffer 2 temp.	RO	INT16	[0.1°C]	Actual temperature buffer 1 sensor
			50	Set.: Maximum buffer temp.	RW	INT16	[0.1°C]	Setting for maximum buffer temperature (min = 25.0°C; max = 90.0°C)
			51	Set.: Buffer changeover temp.	RW	INT16	[0.1°C]	Setting for buffer changeover temperature (min = 25.0°C; max = 90.0°C)

Modul	Index	Subintex	Number	Register name	Read / Write	Data format	Unit	Register description
			00	Error number	RO	INT16	[Nr]	0 = No Error

Heating circuit (ModulNr. 1-12)

5

circuit 1 = 0  
 circuit 2 = 1  
 circuit 3 = 2  
 circuit 4 = 3  
 circuit 5 = 4  
 circuit 6 = 5  
 circuit 7 = 6  
 circuit 8 = 7  
 circuit 9 = 8  
 circuit 10 = 9  
 circuit 11 = 10  
 circuit 12 = 11

01	Operating state	RO	UINT16	[Nr]	0 = HEATING, 1 = ECO, 2 = COOLING, 3 = FLOORDRY, 4 = FROST, 5 = MAX-TEMP, 6 = ERROR, 7 = SERVICE, 8 = HOLIDAY, 9 = CH-SUMMER, 10 = CC-WINTER, 11 = PRIO-STOP, 12 = OFF, 13 = RELEASE-OFF, 14 = TIME-OFF, 15 = STBY, 16 = STBY-HEATING, 17 = STBY-ECO, 18 = STBY-COOLING, 19 = STBY-FROST, 20 = STBY-FLOORDRY,
02	Flow line temp.	RO	INT16	[0.1°C]	Actual temperature flow line sensor
03	Return line temp.	RO	INT16	[0.1°C]	Actual temperature return line sensor
04	Room device temp.	RW	INT16	[0.1°C]	Actual temperature room device sensor (min = -29.9°C; max = 99.9°C)
05	Setpoint flow line temp.	RW	INT16	[0.1°C]	Setpoint temperature flow line (min = 15.0°C; max = 65.0°C)
06	Operating mode	RW	INT16	[0.1°C]	0 = OFF(RW), 1 = MANUAL(R), 2 = AUTOMATIK(RW), 3 = AUTO-HEATING(RW), 4 = AUTO-COOLING(RW), 5 = FROST(RW), 6 = SUMMER(RW), 7 = FLOOR-DRY(R)
50	Set.: Offset flow line temp. setpoint	RW	INT16	[0.1°C]	Setting for flow line temperature setpoint offset (min = -10.0K; max = 10.0K)
51	Set.: Setpoint room heating temp..	RW	INT16	[0.1°C]	Setting for heating mode room setpoint temperature (min = 15.0°C; max = 40.0 °C)
52	Set.: Setpoint room cooling temp.	RW	INT16	[0.1°C]	Setting for cooling mode room setpoint temperature (min = 15.0°C; max = 40.0 °C)