



ModBus Configuration for FA PV

KESSEL ModBus RTU Protocol

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Description Modbus

1

Configuration mode

Description Modbus

The Modbus implemented in the KESSEL control unit follows the Modbus standard with the Modbus/RTU protocol. The transmission mode (stop bit, parity, baud rate) can be freely set. The number of data bits are specified as 8 and cannot be changed.

The device address can be freely set between 1 and 247. A message to all devices (broadcast) within a Modbus network is not supported.

The Modbus can be used to query (read mode) and write (write mode) control unit values. A combination of write and read modes can be used, for example, to trigger a scan of the SonicControl sensor and to read out the determined values.

The following Modbus functions are released for use in the KESSEL control unit:

Code	Modbus function	Register	Cluster
01_H	Read COIL status	00001 - 09999	Contains information about all the control unit's digital outputs
02_H	Read discrete input	10001 - 19999	Contains information about all the control unit's digital inputs
04_H	Read INPUT register	30001 - 39999	Contains general information (numerical values, revision index, etc.) about the control unit
03_H	Read HOLDING register	40001 - 49000	Contains general digital information (errors and events) for the control unit
06_H	Write HOLDING register	49001 - 49999	Instruction register to write commands to the control unit

Data values and types transmitted

The information described in the register tables can be one of 4 different data types and has to be interpreted according to this type.

The 4 types are Boolean (digital) value, enumeration, numerical value and time values (dates, times, etc.).

Specific features may occur within the 4 different types; these are also described in more detail.

⇒ Boolean value (digital values)

- Values are either 0 or 1
- Values are transmitted as an individual bit
- They describe states (errors, events, digital outputs and inputs (COIL))
- Digital states for errors and digital outputs and inputs are displayed permanently (e.g. battery error) as long as they are pending.
- In the case of events, the states (0: event has not taken place; 1: event has taken place) are saved in the control unit until they have been queried via the Modbus, then they are deleted (e.g. maintenance done).

⇒ Enumeration

- Enumeration values display the selected setting (e.g. Language --> see tables) in accordance with their numerical value

⇒ Numerical value

- Numerical values must be converted in accordance with the specified values for factor and offset
- The equation for calculating the numerical values is:

$$\text{Current value} = \text{transmitted value} \times \text{factor} - \text{offset}$$

- A more detailed description can be found in chapter [Numerical values](#).

⇒ Time values

- Date values are transmitted as numerical values since 01.01.2000 (i.e. number of days since 01.01.2000)

1 = 01.01.2000

2 = 02.01.2000

3 = 03.01.2000

etc.

- Currently only 2 date values are transmitted --> last and next maintenance
- Times are transmitted as numerical values starting from 0:00 hours
 - 1 = 0:01 hours
 - 365 = 6:05 hours
 - 1387 = 23:07 hours

The maximum time is 23:59 hours and has the numerical value 1439.

2

2.1

Description

Functions

Trigger scan (Sonic sensor)

A scan of the Sonic sensor is to be triggered via the ModBus connection. Similarly, the determined data should be queried after a scan.

Triggering and querying the scan should hereby follow a set procedure so that the determined data can be assigned the correct time and safe transmission can take place.

Requirements

The scan procedure as triggered by the ModBus should be as follows:

1. Prompt the ModBus master to trigger the scan.

Register: [HOLDING 49001 | Befehlsregister 1](#)



The scan is triggered and carried out by the control unit.

2. Wait until the scan has been carried out and the data is available.

Register: [INPUT 34051 | Scan information](#)



The scan status has to be entered in the corresponding register by the control unit.

3. If the scan data is available, the values can be queried.

Register: [INPUT 34060-34315 | Scan-Werte Sonic-Sensor](#)



Each individual value is saved in a separate register.

2.2

Numerical values

2.2.1

Transmission of values

All possible data types have to be taken into account when transferring numerical values from or to the control unit via the Modbus. This includes, amongst other things, the following differentiations between integer or rational, positive or negative, large or small number range.

In order to do justice to this procedure, only integer, positive values should be transmitted when configuring the ModBus. As a result, values that are not integer and/or that are negative have to be converted so that they can be transmitted as integer, positive value. Once the values have been transmitted, they have to be converted back into their original form so that they can be shown correctly.

An offset (conversion of negative values) and a factor (conversion of the rational share) have to be specified for every value when these converting the values.

In addition, pay attention to the ModBus limitations during the transmission of values. Registers are used for transmissions on the Modbus. A register is hereby always 16 bits in size.

Since some values that have to be transmitted are (much) larger and 16 bits are not enough for the transmission, these values have to be split over 2 (or more) registers.

Some values are much smaller and need no more than 8 bits for the transmission. These values should always be transmitted as 8 bits and are combined into one register.

The transmission values are currently 8 bits, 16 bits and 32 bits.

2.2.2

Value calculation in the control unit

Description

Since only integer, positive numerical values can be transmitted, all other values have to be adjusted to meet these criteria.

The values in the control unit must be converted in accordance with the specified factor and offset according to the following equation:

$$\text{transmitted value} = (\text{value} - \text{offset}) / \text{factor}$$

Example

This example shows how the value -10,531.4 has to be converted before it can be transmitted.

In principle, the value -10,531.4 lies between -32,768 and 32,767 and could be transmitted in a value range with an algebraic sign. The rational share - 0.4 - would then be lost.

So as to be able to transmit the value -10,531.4, it first has to be converted in the control unit.

The **factor 0.1** and the **offset -30,000** shall apply for the specified value.

$$\text{Transmitted value} = (-10,531.4 - (-30,000)) / 0.1 = 194,686$$

The calculated value is now positive and integer number. However, the value 194,686 is greater than 65,535 and thus cannot be transmitted with one register (see "Transmission of integer values", page 7).

2.2.3

Transmission of integer values

Description

As a result of the conversion in the control unit, only positive, integer values are transmitted via the ModBus's register.

If values exist that are greater than 65,535, two registers have to be used for the transmission.

The transmitted value has to be split into two parts; one part that contains the high-order 2 bytes and one that contains the low-order 2 bytes.

The value has to be converted into a hexadecimal value for this purpose.

The resulting byte sequence is then split between the registers accordingly for transmission.

Example

The value 194,686 is to be transmitted.

A register with 16 bits (maximum value 65,535) is too small for this, so that 2 registers have to be used.

Proceed as follows for the calculation and subsequent transmission by the control unit:

1. Convert to a hexadecimal value:
 - 194,686 --> 0x2F87E
2. Split into bytes:
 - high-order bytes: 0x0002 (filled up with 0)
 - low-order bytes: 0xF87E
3. Transmit via ModBus

2.2.4

Description

Receipt of integer values

By specifying that only positive, integer values can be transmitted via the Modbus's register, those values that are received have to be converted back accordingly.

If values now exist that are greater than 65,535, two registers have to be taken into account during the reception/conversion.

The received value has to be compiled from two parts; one part that contains the high-order 2 bytes and one that contains the low-order 2 bytes.

After compilation, the value can be converted into a decimal value and used for further processing.

Example

A value is read out and received that needs 2 registers for its transmission.

The register with the lower address contains the value 0x0002.

The register with the higher address contains the value 0xF87E.

Proceed as follows for the reception and subsequent compilation:

1. Receive value of the 1st register (normally the register with the lower address):
 - 0x0002
2. Receive value of the 2nd register (normally the register with the higher address):
 - 0xF87E
3. Compile the received bytes:

high-order bytes	0x0002
low-order bytes	0xF87E
↓	
0x0002F87E	
4. Convert the overall values into a decimal value
 - 0x0002F87E --> 194,686

2.2.5

Description

Value calculation after receipt

Since only integer, positive numerical values are transmitted, all other values have to be converted back to their original format after reception.

The values must be converted in accordance with the specified factor and offset after reception according to the following equation:

$$\text{value} = \text{transmitted value} * \text{factor} + \text{offset}$$

Example

In order to interpret the received value correctly, this has to be converted back to its original value after reception.

The **factor 0.1** and the **offset -30,000** shall apply for the specified value.

$$\text{Value} = 194,686 * 0.1 + (-30,000) = -10,531.4$$

The calculated value now corresponds to the original value in the control unit again (measured value, display value, etc.).

3

Register

3.1

Description

The statuses of all of the control unit's digital outputs can be read out in the COIL registers.

These mainly include the relays to switch the various outputs.

Functions

The function code to read the COIL register is 0x01.

Register addresses

The COIL registers can be found in the address range from 00001 to 09999.

The following registers are currently used for the KESSEL control units:

- 1 - 500 (or: 00001 - 00500)
- 701 - 750 (or: 00701 - 00750)

3.1.1

COIL 00001 | Digital outputs 1

ModBus settings

Function code: **01_H**

Bit table

Register 00001																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
WDP	RS 1	RS 2	RSt	RWa	-	-	-	-	RA1	RA2	RA3	RA4	-	-	-	

Description

Bit	Size	Designation	Short name	Values	Description
0	1	Watchdog pulse	WDP	0:	off
				1:	on Watchdog pulse that changes status every 30 seconds --> can be used as a monitoring signal
1	1	Relay 1	RS 1	0:	Relay deactivated
				1:	Relay activated Shows the status of the relay for the 1st main consumer
2	1	Relay 2	RS 2	0:	Relay deactivated
				1:	Relay activated Shows the status of the relay for the 2nd main consumer
3	1	Fault relay	RSt	0:	Relay deactivated
				1:	Relay activated Shows the status of the relay for the fault signal
4	1	Warning relay	RWa	0:	Relay deactivated
				1:	Relay activated Shows the status of the relay for the warning signal
5 - 8		not used		-	
9	1	Output 1	RA1	0:	Relay deactivated
				1:	Relay activated
10	1	Output 2	RA2	0:	Relay deactivated
				1:	Relay activated
11	1	Output 3	RA3	0:	Relay deactivated
				1:	Relay activated
12	1	Output 4	RA4	0:	Relay deactivated
				1:	Relay activated

Bit	Size	Designation	Short name	Values	Description
13 - 15	3	not used	-	-	-

3.1.2 COIL 00701 | Digital outputs, extension devices

ModBus settings

Function code: **01_H**

Bit table

Register 00701																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
RS1_E1	RS2_E1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Description

Bit	Size	Designation	Short name	Values	Description
0	1	Relay 1 (400V) - Extension device 1	RS1_E1	0: Relay deactivated 1: Relay activated	Shows the status of the relay for the 1st main load at the 400V output of the 1st extension device
1	1	Relay 2 (400V) - Extension device 1	RS2_E1	0: Relay deactivated 1: Relay activated	Shows the status of the relay for the 2nd main load at the 400V output of the 1st extension device
2 - 15	14	not used	-	-	-

3.2 Discrete input

Description

The values of the control unit's digital inputs are compiled in the Modbus function group.

Functions

The function code to read the COIL register is 0x02.

Register addresses

The COIL registers can be found in the address range from 10001 to 19999.

The following registers are currently used for the KESSEL control units:

- 1 (or: 10001)

3.2.1 Discrete input 10001 | Digital inputs

ModBus settings

Function code: **02_H**

Bit table

Register 10001																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
-	ON1	ON2	ALARM	ON3	-	-	-	-	-	-	-	-	-	-	-	-

Description

Bit	Size	Designation	Short name	Values	Description
0	1	not used	-	-	-
1	1	ON1 input	ON1	0: no signal 1: Signal present	Shows the status of the ON1 input
2	1	ON2 input	ON2	0: no signal 1: Signal present	Shows the status of the ON2 input

Bit	Size	Designation	Short name	Values	Description
3	1	ALARM input	ALARM	0: no signal 1: Signal present	Shows the status of the ALARM input
4	1	ON3 input	ON3	0: no signal 1: Signal present	Shows the status of the ON3 input
5 - 15	11	not used	-		

3.3

Input register

Description

The error and status information for various control unit functions can be queried and set via the input registers.

These include the information that generally applies for the control unit as well as parameters and values for motors, pumps, flap, backwater, analogue sensors and others.

Functions

The function code to read the input register is 0x04.

Register addresses

The input registers can be found in the address range from 30001 to 39999.

The following registers are currently used for the KESSEL control units:

- 1 - 500 (or: 30001 - 30500):
 - ⇒ General data about the control unit
- 551 - 600 (or: 30551 - 30600):
 - ⇒ Parameters and values for the connected pumps and motors
- 701 - 750 (or: 30701 - 30750):
 - ⇒ Parameters and values for the extension control units
- 751 - 800 (or: 30751 - 30800):
 - ⇒ Parameters and values for grease separators and the SonicControl sensor
- 4051 - 4600 (or: 34051 - 34600):
 - ⇒ Scan data and information for the SonicSensor

3.3.1

INPUT 30001 | Control unit variant

The control unit variant can be read out via the input register 30001.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
1	16	Control unit variant	0 not defined 1 Comfort Plus 2 FA PV 3 FKA 4 Pumpfix 5 EasyClean IL	The value indicates which control unit variant is connected.

3.3.2

INPUT 30002-30004 | Firmware revision index

The revision index for the firmware can be read out via the input registers 30002-30004.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
2	16	Firmware revision high	from:	0	First digit of the firmware revision index.
			to:	655536	
3	16	Firmware revision mid	from:	0	Second digit of the firmware revision index.
			to:	655536	
4	16	Firmware revision low	from:	0	Third digit of the firmware revision index.
			to:	655536	

3.3.3

INPUT 30005 | Product type

The product type can be read out via the input register 30005.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
5	16	Product type	0	not defined	Value for product type
			9	EasyClean (EN 1825)	
			10	EURO free-standing set-up (EN 1825)	
			11	EURO underground installation (EN 1825)	
			12	DIN free-standing set-up (DIN 4040)	
			13	DIN underground installation (DIN 4040)	
			16	EasyClean free	
			17	EasyClean ground	

3.3.4

INPUT 30006 | System variant

The system variant can be read out via the input register 30006.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
6	16	System variant	39	1 pump 4-6.4A	Value for system variant / no. of pumps
			40	2 pumps 4-6.4A	
			41	1 pump 6.5-8A	
			42	2 pumps 6.5-8A	
			53	1 Pump 8,1-14A	
			54	2 Pumps 8,1-14A	

3.3.5

INPUT 30007 | Outputs / nominal sizes

The outputs / nominal sizes can be read out via the input register 30007.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
6	16	Outputs / nominal sizes	0 not defined	Value for outputs / nominal sizes
			31 NS2	
			32 NS3	
			33 NS4	
			34 NS5	
			35 NS10	
			36 NS7	
			37 NS15	
			38 NS20	
			39 NS25	
			40 NS30	
			41 NS35	
			42 NS S	
			56 NS1	
			57 NS5,5	
			58 NS8,5	
			59 NS12,5	

3.3.6

INPUT 30009-30010 | Total running time

The total running time of the control unit can be read out via the input registers 30009 and 30010.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
9 - 10	32	Total running time	Factor: 0.1 Offset: 0 Unit: h Range: 0h to 429496729.5h	The value indicates the measured total running time since initial commissioning of the control unit.

3.3.7

INPUT 30011-30012 | Power outage time

The power outage time of the control unit can be read out via the input registers 30011 and 30012.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings

Function code: **04_H****Description**

Register	Size [bit]	Designation	Values	Description
11 - 12	32	Power outage time	Factor: 0.1 Offset: 0 Unit: h Range: 0h to 429496729.5h	The value indicates the measured power outage time since initial commissioning of the control unit.

3.3.8**INPUT 30015 | Last maintenance**

The last maintenance for the control unit can be read out via the input register 30015.

The last maintenance is output as a numerical value. 01.01.2000 is taken as the basis for the calculation.

ModBus settings

Function code: **04_H****Description**

Register	Size [bit]	Designation	Values	Description
15	16	Last maintenance	Factor: 1 Offset: 0 Unit: d Range: 0d to 65535d	Value for last maintenance (days since 01.01.2000)

3.3.9**INPUT 30016 | Next maintenance**

The next maintenance for the control unit can be read out via the input register 30016.

The next maintenance is output as a numerical value. 01.01.2000 is taken as the basis for the calculation.

ModBus settings

Function code: **04_H****Description**

Register	Size [bit]	Designation	Values	Description
16	16	Next maintenance	Factor: 1 Offset: 0 Unit: d Range: 0 d to 65535 d	Value for next maintenance (days since 01.01.2000)

3.3.10**INPUT 30022 | Language and power-up delay**

The set language and the power-up delay can be read out via the input register 30022.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
22	8	Language	0 not defined	Language value
			1 Deutsch 2 English 3 French 4 Italian 5 Dutch 6 Polish	
	8	Power-up delay	Factor: 1 Offset: 0 Unit: s Range: 0s to 255s	Power-up delay value

3.3.11**INPUT 30551-30552 | Run time pump 1**

The run time of pump 1 can be read out via the input registers 30551 and 30552.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings**Function code: **04H******Description**

Register	Size [bit]	Designation	Values	Description
551 - 552	32	Run time pump 1	Factor: 0.1	Run time pump 1 value
			Offset: 0	
			Unit: h	
			Range: 0h to 429496729.5h	

3.3.12**INPUT 30553-30554 | Operating cycles 1**

The operating cycles of pump 1 can be read out via the input registers 30553 and 30554.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings**Function code: **04H******Description**

Register	Size [bit]	Designation	Values	Description
553 - 554	32	Operating cycles 1	Factor: 1	Operating cycles pump 1 value
			Offset: 0	
			Unit: x	
			Range: 0x to 4294967295x	

3.3.13**INPUT 30555-30556 | Run time pump 2**

The run time of the control unit's pump 2 can be read out in the input registers 30555 and 30556.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
555 - 556	32	Run time pump 2	Factor:	0.1	Run time pump 2 value
			Offset:	0	
			Unit:	h	
			Range:	0h to 429496729.5h	

3.3.14

INPUT 30557-30558 | Operating cycles 2

The operating cycles of the control unit's pump 2 can be read out in the input registers 30557 and 30558.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
557 - 558	32	Operating cycles 2	Factor:	1	Operating cycles pump 2 value
			Offset:	0	
			Unit:	x	
			Range:	0x to 4294967295x	

3.3.15

INPUT 30561 | Current pump 1

The current of pump 1 can be read out via the input register 30561.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
561	16	Current pump 1	Factor:	0.1	Current pump 1 value
			Offset:	0	
			Unit:	A	
			Range:	0A to 6553.5A	

3.3.16

INPUT 30562 | Current pump 2

The current of pump 2 can be read out via the input register 30562.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
562	16	Current pump 2	Factor:	0.1	Current pump 2 value
			Offset:	0	
			Unit:	A	
			Range:	0A to 6553.5A	

3.3.17

INPUT 30571-30572 | Run time pump 3

The run time of pump 3 can be read out via the input registers 30571 and 30572.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
571 - 572	32	Run time pump 3	Factor:	0.1	Run time pump 3 value
			Offset:	0	
			Unit:	h	
			Range:	0h to 429496729.5h	

3.3.18

INPUT 30573-30574 | Operating cycles 3

The operating cycles of pump 3 can be read out via the input registers 30573 and 30574.

Two registers have to be used for the output because the value range (maximum value) is too high for one register.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
573 - 574	32	Operating cycles 3	Factor:	1	Operating cycles pump 3 value
			Offset:	0	
			Unit:	x	
			Range:	0x to 4294967295x	

3.3.19

INPUT 30575 | Current pump 3

The current of pump 3 can be read out via the input register 30575.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
575	16	Current pump 3	Factor:	0.1	Current pump 3 value
			Offset:	0	
			Unit:	A	
			Range:	0A to 6553.5A	

3.3.20**INPUT 30751 | Current value for SonicControl sensor**

The grease layer thickness and temperature of the grease separator can be read out via the input register 30751.

The values are the last measured values and are output when the corresponding sensor has been installed and activated.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values		Description
751	8	Layer thickness	Factor:	1	Layer thickness value
			Offset:	0	
			Unit:	cm	
			Range:	0cm to 255cm	
	8	Grease separator temperature	Factor:	1	Grease separator temperature value
			Offset:	0	
			Unit:	°C	
			Range:	0 °C to 255 °C	

3.3.21**INPUT 30752 | Alarm layer thickness**

The pre-set alarm layer thickness and pre-alarm layer thickness for the SonicControl sensor can be read out via the input register 30752.

The pre-alarm layer thickness indicates the thickness as of which a disposal of the grease separator should be considered.

If the alarm layer thickness is reached, the grease separator has to be disposed of.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
752	8	Alarm layer thickness	Factor: Offset: Unit: Range:	Pre-set alarm layer thickness value 1 0 cm 0cm to 255cm
	8	Pre-alarm layer thickness	Factor: Offset: Unit: Range:	Pre-set pre-alarm layer thickness value 1 0 cm 0cm to 255cm

3.3.22**INPUT 30753 | Sensing zone**

The sensing zone of the SonicControl sensor can be read out via the input register 30753.

The register is divided into 2 ranges with 8 bits each. Firstly, the start of the sensing zone is output. And secondly, the end of the sensing zone can be read out.

ModBus settings**Function code: 04_H** **Description**

Register	Size [bit]	Designation	Values	Description
753	8	Start of sensing zone	Factor: Offset: Unit: Range:	Initial value of the sensing zone 1 0 cm 0cm to 255cm
	8	End of sensing zone	Factor: Offset: Unit: Range:	Final value of the sensing zone 1 0 cm 0cm to 255cm

3.3.23**INPUT 30754 | Start of measuring interval**

The start time for the control unit's measuring interval can be read out via the input register 30754.

The start time is shown in minutes starting from 00:00 hours.

ModBus settings**Function code: 04_H** **Description**

Register	Size [bit]	Designation	Values	Description
754	16	Start of measuring interval	Factor: Offset: Unit: Range:	Start time in minutes for the measuring interval (calculated from 0:00 hours) 1 0 min 0 min to 65535 min

Example

The measuring interval should start at 14:45 hours.

885 min is output as the start value.

3.3.24

INPUT 30755 | End of measuring interval

The end time for the control unit's measuring interval can be read out via the input register 30755.

The end time is shown in minutes starting from 00:00 hours.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
755	16	End of measuring interval	Factor: 1 Offset: 0 Unit: min Range: 0 min to 65535 min	End time in minutes for the measuring interval (calculated from 0:00 hours)

Example

The measuring interval should end at 16:55 hours.

1015 min is output as the end value.

3.3.25

INPUT 30756 | Level comparison and density

The level comparison and density values can be read out via the input register 30756. These values are needed for the SonicControl sensor settings.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
756	8	Level comparison	Factor: 1 Offset: 0 Unit: cm Range: 0cm to 255cm	Level comparison value
	8		Factor: 0,1 Offset: 0 Unit: g/cm ³ Range: 0g/cm ³ to 255g/cm ³	Density value

3.3.26

INPUT 30757 | Conductivity

The conductivity can be read out via the input register 30757. The conductivity is needed for the SonicControl sensor settings.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
757	16	Conductivity	Factor: 1 Offset: 0 Unit: $\mu\text{S}/\text{cm}$ Range: 0 $\mu\text{S}/\text{cm}$ to 65535 $\mu\text{S}/\text{cm}$	Conductivity value

3.3.27**INPUT 30758 | Trigger and SNR (signal noise ratio)**

The trigger / SNR (signal noise ratio) can be read out via the input register 30758. These values are needed for the SonicControl sensor settings.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
758	8	Trigger	Factor: 1 Offset: 0 Unit: % Range: 0% to 255%	Trigger value
	8	SNR (signal noise ratio)	Factor: 1 Offset: 0 Unit: dB Range: 0dB to 255dB	SNR (signal noise ratio) value

3.3.28**INPUT 30759 | Noise and AVR (average)**

The pre-set noise and AVR (average) value for the SonicControl sensor can be read out via the input register 30759.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
759	8	Noise	Factor: 1 Offset: 0 Unit: dB Range: 0dB to 255dB	Noise value
	8	AVR (average)	Factor: 1 Offset: 0 Unit: min Range: 0min to 255min	AVR (average) value

3.3.29**INPUT 30760 | Alarm sensor dry and cleaning program**

The time during which the (alarm) sensor was dry and the strength of the cleaning programme can be read out via the input register 30760.

ModBus settings

Function code: **04_H****Description**

Register	Size [bit]	Designation	Values	Description
760	8	Alarm sensor dry	Factor: 1 Offset: 0 Unit: h Range: 0h to 255h	Alarm sensor dry value
	8	Cleaning programme	0 not defined 1 weak 2 normal 3 strong	Cleaning programme value

3.3.30**INPUT 30761 | Legionella flushing, interval**

The interval for legionella flushing of the grease separator can be read out via the input register 30761.

ModBus settings

Function code: **04_H****Description**

Register	Size [bit]	Designation	Values	Description
761	8	Legionella flushing, interval	Factor: 1 Offset: 0 Unit: d Range: 0d to 255d	Legionella flushing interval value
	8	not used	-	

3.3.31**INPUT 30762 | Legionella flushing, cold**

The duration of legionella flushing with cold water can be read out via the input register 30762.

ModBus settings

Function code: **04_H****Description**

Register	Size [bit]	Designation	Values	Description
762	16	Legionella flushing, cold	Factor: 1 Offset: 0 Unit: s Range: 0s to 65535s	Legionella flushing cold value

3.3.32**INPUT 30763 | Legionella flushing, hot**

The duration of legionella flushing of the grease separator with hot water can be read out via the input register 30763.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
763	16	Legionella flushing, hot	Factor: 1 Offset: 0 Unit: s Range: 0s to 65535s	Legionella flushing hot value

3.3.33

INPUT 34051 | Scan information

Information about the scan by the SonicControl sensor in the separator can be read out via the input register 34051.

The type of scan and scan status can be analysed.

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
1	8	Scan type	0 not defined 1 xy-scan, grease sensor 2 Noise scan, grease sensor 3 xy scan, sludge sensor 4 Noise scan, sludge sensor 5 ... (not used)	Indicates which type of scan is currently set.
			0 not defined 1 Scan not carried out 2 Scan running 3 Data available 4 ... (not used)	

3.3.34

INPUT 34060-34315 | Scan value

A scan of the Sonic sensor can be read out via the input registers 34060 up to and including 34315. The scan contains 256 values in total. Each value is transferred via a register.

All registers for transferring the scan values have an identical layout. 3 registers are shown below by way of example (registers for scan value 1, 2 and 256).

ModBus settings

Function code: **04_H**

Description

Register	Size [bit]	Designation	Values	Description
34060	8	Scan value 1	Factor: 1	Scan value 1 value
			Offset: 0	
			Unit:	
			Range: 0 to 65535	

Register	Size [bit]	Designation	Values		Description
34061	8	Scan value 2	Factor:	1	Scan value 2 value
			Offset:	0	
			Unit:		
			Range:	0 to 65535	
...		...			
34315	8	Scan value 256	Factor:	1	Scan value 256 value
			Offset:	0	
			Unit:		
			Range:	0 to 65535	

3.4

Holding register

Description

The error and status information for various control unit functions can be queried via the holding registers.

These include the information that generally applies for the control unit as well as status values for motors, pumps, flap, backwater and others.

Functions

The function code to read the holding register is 0x03.

Register addresses

The holding registers can be found in the address range from 40001 to 49999.

The following registers are currently used for the KESSEL control units:

- 1 - 500 (or: 40001 - 40500):
 - ⇒ General data about the control unit
- 551 - 600 (or: 40551 - 40600):
 - ⇒ Error and status display for the connected pumps and motors
- 701 - 750 (or: 40701 - 40750):
 - ⇒ Error and status display for the extension control units
- 751 - 800 (or: 40751 - 40800):
 - ⇒ Error and status display, SonicControl sensor and grease separator
- 9001 - 9999 (or: 49001 - 49999):
 - ⇒ Instruction register for the ModBus master

3.4.1

HOLDING 40001 | General status and errors

ModBus settings

Function code: **03_H**

Bit table

Register 40001																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
SYS	AkA	DrF	PhF	-	-	-	Init	-	-	Manual	PTyp	-	ParW	ExpW	Quit	

Description

Bit	Size	Designation	Short name	Values	Description
0	1	System status	SYS	0: OK 1: ALARM	All of the system's error messages are compiled in the system status.
1	1	Acoustic alarm	AkA	0: inactive 1: active	Indicates whether the control unit's acoustic alarm is active
2	1	Rotary field error	DrF	0: no error 1: error	Rotary field error status
3	1	Phase error	PhF	0: no error 1: error	Phase error status
4 - 6	3	not used	-	-	
7	1	Initialisation	Init	0: not done 1: done	Shows whether initialisation has been carried out.
8 - 9	2	not used	-	-	
10	1	Manual operation	Manual	0: deactivated 1: activated	Manual operation status (compilation of manual operations)
11	1	Product type changed	PTyp	0: no event 1: event has taken place	Product type changed status
12	1	not used	-	-	
13	1	Parameter changed	ParW	0: no event 1: event has taken place	Parameter changed status
14	1	Expert parameter changed	ExpW	0: no event 1: event has taken place	Expert parameter changed status
15	1	Failure confirmed	Quit	0: no event 1: event has taken place	Failure confirmed status

3.4.2**HOLDING 40002 | General status and errors****ModBus settings**Function code: **03_H****Bit table**

Register 40002																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
Lgb	SDS	SDSE	USB	-	-	-	-	-	-	-	AnP	LNg	-	-	-	

Description

Bit	Size	Designation	Short name	Values	Description
0	1	Log book read	Lgb	0: no event 1: event has taken place	Log book read status
1	1	SDS	SDS	0: not necessary 1: done	SDS status

Bit	Size	Designation	Short name	Values	Description
2	1	SDS result	SDSE	0: no error 1: error	SDS result status
3	1	USB stick	USB	0: not detected 1: detected	USB stick status
4 - 10	7	not used	-		
11	1	System variant / number of pumps changed	AnP	0: no event 1: event has taken place	System variant / number of pumps changed status
12	1	Output / nominal size changed	Lgg	0: no event 1: event has taken place	Output / nominal size changed status
13 - 15	3	not used	-		

3.4.3

HOLDING 40501 | Status and error signals for the control unit communication

ModBus settings

Function code: **03_H**

Bit table

Register 40501																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
Kom	LIN	-	KomF	KomF2	-	-	-	-	-	-	-	-	-	-	-	-

Description

Bit	Size	Designation	Short name	Values	Description
0	1	Communication	Kom	0: no error 1: error	Communication status
1	1	LIN error	LIN	0: no error 1: error	LIN error status
2	1	not used	-		
3	1	Communication error, extension device 1	KomF	0: no error 1: error	Communication error, extension device 1 status
4	1	Communication error, extension device 2	KomF2	0: no error 1: error	Communication error, extension device 2 status
5 - 15	11	not used	-		

3.4.4

HOLDING 40551 | Status and error signals for motors and pumps

ModBus settings

Function code: **03_H**

Bit table

Register 40551																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	

Register 40551

MS1	-	RF1	-	Th1A	-	-	-	ÜP1	-	UP1	-	-	-	GzP1	-
-----	---	-----	---	------	---	---	---	-----	---	-----	---	---	---	------	---

Description

Bit	Size	Designation	Short name	Values		Description	
0	1	Motor protection 1	MS1	0: no error 1: error		Motor protection 1 status	
1	1	not used	-				
2	1	Relay error 1	RF1	0: no error 1: error		Relay error 1 status	
3	1	not used	-				
4	1	Thermal protection 1A or TF1	Th1A	0: no error 1: error		Thermal protection 1A or TF1 status	
5 - 7	3	not used	-				
8	1	Overcurrent pump 1	ÜP1	0: no error 1: error		Overcurrent pump 1 status	
9	1	not used	-				
10	1	Undercurrent pump 1	UP1	0: no error 1: error		Undercurrent pump 1 status	
11 - 13	3	not used	-				
14	1	Max run time pump 1	GzP1	0: Max. time not reached 1: Max. time reached		Max. run time pump 1 status	
15	1	not used	-				

3.4.5**HOLDING 40552 | Status and error signals for motors and pumps****ModBus settings**Function code: **03_H****Bit table****Register 40552**

Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15
-	-	MSP1	-	-	-	-	-	-	FStm	-	-	-	-	-	-

Description

Bit	Size	Designation	Short name	Values		Description	
0 - 1	2	not used	-				
2	1	Maximum operating cycles for pump 1 exceeded	MSP1	0: Max. not reached 1: Max. reached		Maximum operating cycles for pump 1 exceeded status	
3 - 8	6	not used	-				
9	1	Actuator fault	FStm	0: no error 1: error		Actuator fault status	
10 - 15	6	not used	-				

3.4.6

HOLDING 40701 | Status and error signals for the extension devices

ModBus settings

Function code: **03_H**

Bit table

Register 40701																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
-	-	-	-	PhFE1	PhFE2	DFE1	DFE2	ME1	ME2	ÜE1	ÜE2	UE1	UE2	TFE1	TFE2	

Description

Bit	Size	Designation	Short name	Values	Description
0 - 3	4	not used	-	-	
4	1	Phase error, extension device 1	PhFE2	0: no error 1: error	Phase error, extension device 1 status
5	1	Phase error, extension device 2	PhFE2	0: no error 1: error	Phase error, extension device 2 status
6	1	Rotary field error, extension device 1	DFE1	0: no error 1: error	Rotary field error, extension device 1 status
7	1	Rotary field error, extension device 2	DFE2	0: no error 1: error	Rotary field error, extension device 2 status
8	1	Motor protection, extension device 1	ME2	0: no error 1: error	Motor protection, extension device 1 status
9	1	Motor protection, extension device 2	ME2	0: no error 1: error	Motor protection, extension device 2 status
10	1	Overcurrent, extension device 1	ÜE1	0: no error 1: error	Overcurrent, extension device 1 status
11	1	Overcurrent, extension device 2	ÜE2	0: no error 1: error	Overcurrent, extension device 2 status
12	1	Undercurrent, extension device 1	UE1	0: no error 1: error	Undercurrent, extension device 1 status
13	1	Undercurrent, extension device 2	UE2	0: no error 1: error	Undercurrent, extension device 2 status
14	1	Temperature error, extension device 1	TFE1	0: no error 1: error	Temperature error, extension device 1 status
15	1	Temperature error, extension device 2	TFE2	0: no error 1: error	Temperature error, extension device 2 status

3.4.7

HOLDING 40702 | Status and error signals for the extension devices

ModBus settings

Function code: **03_H**

Bit table

Register 40702																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
RFE1	RFE2	GE1	GE2	FSE1	FSE2	MSE1	MSE2	-	-	-	-	-	-	-	-	-

Description

Bit	Size	Designation	Short name	Values	Description
0	1	Relay error, extension device 1	RFE1	0: no error 1: error	Relay error, extension device 1 status
1	1	Relay error, extension device 2	RFE2	0: no error 1: error	Relay error, extension device 2 status
2	1	Max run time, extension device 1	GE1	0: no error 1: error	Max run time, extension device 1 status
3	1	Max run time, extension device 2	GE2	0: no error 1: error	Max run time, extension device 2 status
4	1	Actuator error, extension device 1	FSE1	0: no error 1: error	Actuator error, extension device 1 status
5	1	Actuator error, extension device 2	FSE2	0: no error 1: error	Actuator error, extension device 2 status
6	1	Maximum operating cycles for extension device 1 exceeded	MSE2	0: Max. not reached 1: Max. reached	Maximum operating cycles for extension device 1 exceeded status
7	1	Maximum operating cycles for extension device 2 exceeded	MSE2	0: Max. not reached 1: Max. reached	Maximum operating cycles for extension device 2 exceeded status
8 - 15	8	not used	-		

3.4.8

HOLDING 40751 | Status and error signals for SonicControl sensor and grease separator

ModBus settings

Function code: **03_H**

Bit table

Register 40751																
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	
SKomm	STemp	STr	LIN	SRph	W	Wd	SHand	FA	FVA	AbW	AbW	AbE	AbEab	-	-	

Description

Bit	Size	Designation	Short name	Values	Description
0	1	Sensor communication	SKomm	0: no error 1: error	Sensor communication status
1	1	Sensor temperature	STemp	0: Max. not reached 1: Max. reached	Sensor temperature status
2	1	Sensor dry	STr	0: not dry 1: dry	Sensor dry status
3	1	LIN tunnel sensor	LIN	0: deactivated 1: activated	LIN tunnel sensor status
4	1	Sensor - no rest phase detected	SRph	0: Rest phase 1: No rest phase	Sensor - no rest phase detected status
5	1	Sensor maintenance	W	0: not necessary 1: due	Sensor maintenance status
6	1	Sensor maintenance done	Wd	0: not done 1: done	Sensor maintenance done status
7	1	Sensor manual operation	SHand	0: deactivated 1: activated	Sensor manual operation status
8	1	Grease layer thickness alarm	FA	0: Max. not reached 1: Max. reached	Grease layer thickness alarm status
9	1	Grease layer thickness pre-alarm	FVA	0: no error 1: error	Grease layer thickness pre-alarm status
10	1	Separator maintenance	AbW	0: not necessary 1: due	Separator maintenance status
11	1	Separator maintenance done	AbW	0: not done 1: done	Separator maintenance done status
12	1	Separator disposal	AbE	0: not done 1: done	Separator disposal status
13	1	Separator disposal interrupted	AbEab	0: not interrupted 1: interrupted	Separator disposal interrupted status
14 - 15	1	not used	-	-	-

3.4.9

HOLDING 49001 | Instruction register to trigger commands/actions in the control unit

ModBus settings

Function code: **03_H**

Bit table

Register 49001															
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15
BSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Description

Bit	Size	Designation	Short name	Values	Description
0	8	SonicControl sensor commands	BSC	0: not defined 1: trigger xy scan 2: trigger noise scan	SonicControl sensor commands

