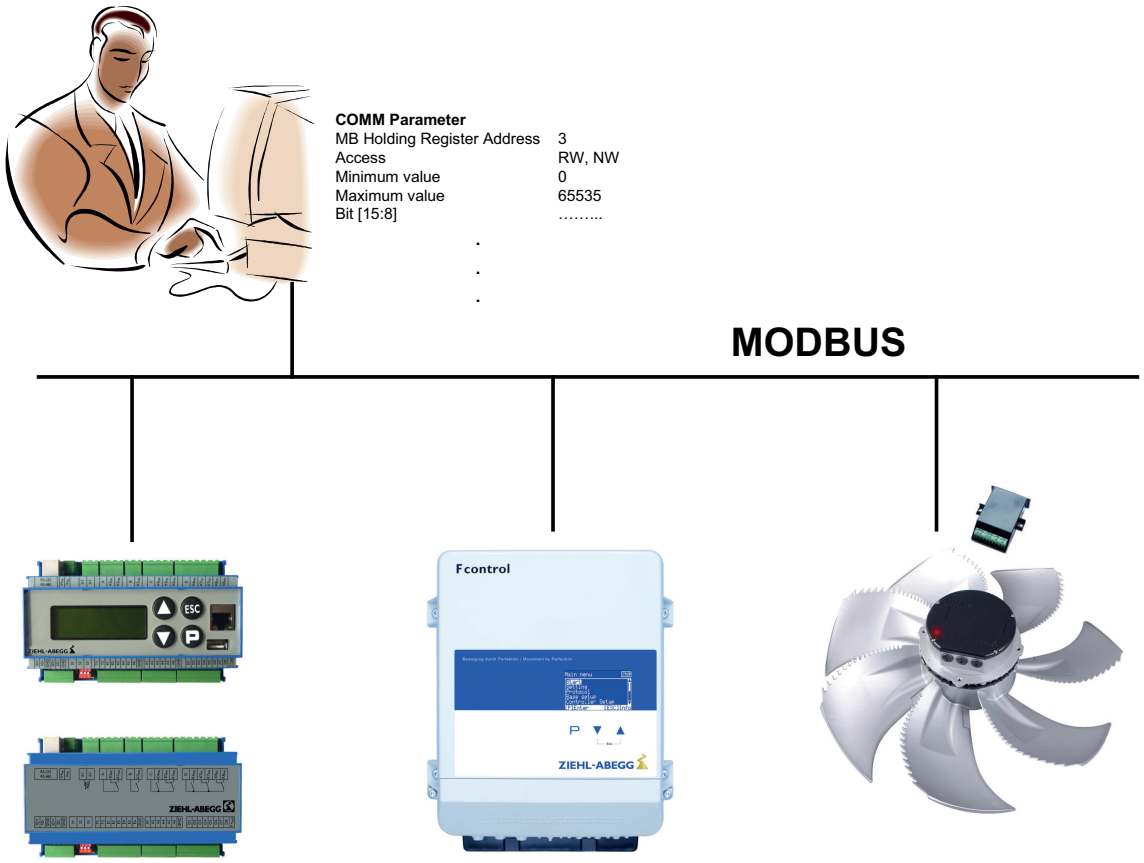
Description MODBUS Communication

ECblue MODBUS



Software version: ECblue Firmware from 1.03, valid up to Firmware 14
MODBUS Firmware from 06

ZIEHL-ABEGG

Content

1 General notes

1.1 Target group

This specification addresses users with excellent knowledge of serial bus systems and in particular of the MODBUS RTU protocol.
The MODBUS RTU protocol specification is not part of this document.

1.2 Exclusion of liability

Concurrence between the contents of these document and the described software has been examined. It is still possible that non-compliances exist. No guarantee is assumed for complete conformity.- To allow for future developments given are subject to alteration.We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided. ZIEHL-ABEGG SE is not liable for damage due to misuse, incorrect or improper use.

1.3 Copyright

2 Safety instructions

Attention!
Remarks concerning safety, installation and connection must be followed (see Assembly instructions or Operating Instructions).

3 MODBUS Register Description

3.1 Explanations

- The device can be controlled and parameterised by the MODBUS-RTU protocol. The MODBUS-RTU protocol implementation of the device complies with the standards as described in the MODBUS Application Protocol Specification 1.1b3. Not all the function codes contained therein are implemented in the device. The device basically supports all functions which are available for Holding, Input and Coil registers.
- In order to be able to write a register, the respectively necessary PIN protection level (write protection) must be taken for ECblue fans and devices with communication modul AM-MODBUS (Icontrol Basic, Fcontrol Basic, ..) into account (see according Operating Instructions).
- All registers marked with "NV" have limited write cycles (10.000). Registers of this type must only be used for configuration purpose.
- The device supports all standard MODBUS functions for register write and read (Read Register, Write Single Register, Write multiple Register, see chapter Data model and access options).
- The default COMM parameters are 19200, 8, E, 1 Address 247 (if not otherwise specified).
- Changes to the COM parameters only become effective after a device reset or input of a certain PIN (see corresponding Operating instructions).
- If the auto addressing feature is supported multiple devices in a network can be addressed automaticaly. For this purpose a suitable PC software (ZAset) or a ZIEHL-ABEGG hand held terminal is required.
- Communication via MODBUS TCP/IP possible by separate gateway (e.g. Part.-No. 380091). The register description is also valid for MODBUS TCP/IP.

Kind of register

Abbreviation	Possible access
R	**Register readable**
RW	**Register readeable and writeable**
NV	**Register permanent stored (non-volotile)**

Abbreviations for registers/coils/discrete inputs

h18	Example for access to holding register 19 with address 18
i12	Example for access to input register 13 with address 12
c0	Example for access to coil register 1 with address 0
d5	Example for access to discrete input 6 with address 5

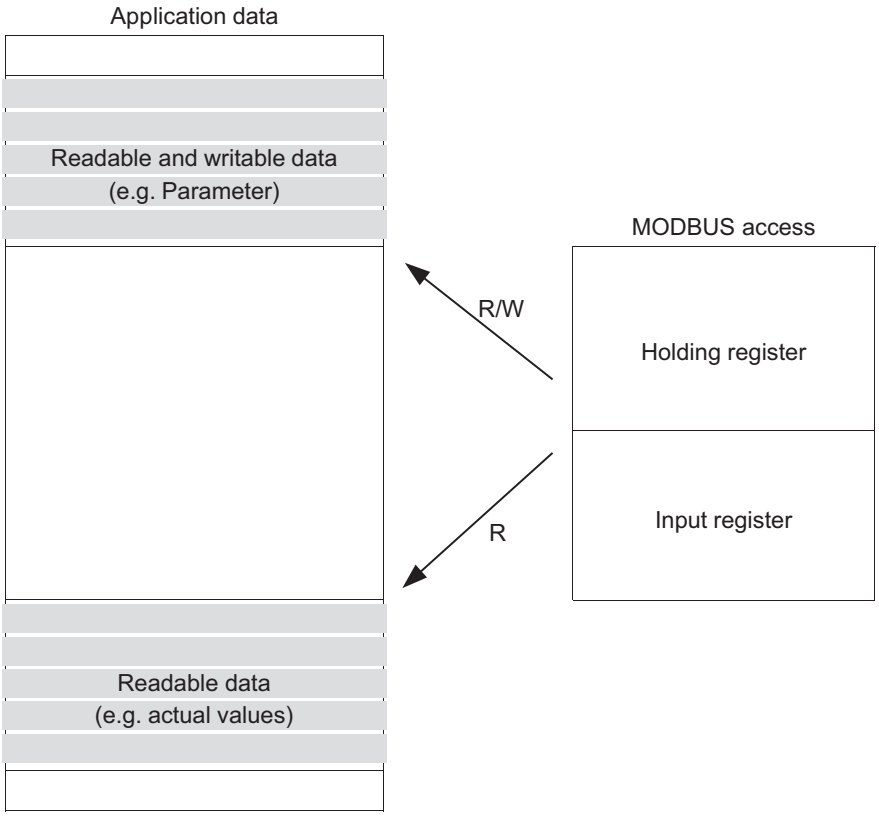
Necessary PIN protection level for acces to register for ECblue or devices with AM-MODBUS (Icontrol Basic, Fcontrol Basic, ..)

0	Not protected, in each PIN protection level recordably
1	Starting from adjustet PIN protection level 1 or higher recordably. For adjusted PIN protection level 0 PIN: 1234 necessary.
2	Starting from adjustet PIN protection level 2 or higher recordably. For adjusted PIN protection level 0 and 1 PIN: 0010 necessary.
3	Only with administrator password recordably.

3.2 Data model and access options

The MODBUS access to the application data is gained with the following MODBUS functions for registers:

- Read Input register (function code 4)
- Read Holding register (function code 3)
- Write Single register (function code 6)
- Write Multiple registers (function code 16)
- Read Coil register (function code 1)
- Write Single Coil Register (function code 5)
- Write MultipleCoil registers (function code 15)



The application data are arranged completely in the Holding Register and the Input Register section respectively beginning at MODBUS register address **0**.
An exception message is output on exceeding the register range.
It is urgently recommended to observe the further informations and examples in the corresponding Operating Instructions.

3.3 Control

3.3.1 MB Holding Register1, Address: h0 = PIN input

MB Holding Register1, Address: h0	PIN input
Code input to execute special functions e.g. default setting	
Access / necessary PIN protection level	RW / [0]
minimal value	0
maximum value	65535
Default	0
Bit [15:0]	Decimal value 0 - 65535

PIN Code	Function
3698	Communications parameters take-over
2143	Reset motor controller (approx. 3.2 sec delay)
1234	Release of the PIN protection level [1], at programmed PIN protection level [0] (☞ MB Holding Register 17 address h16: bit [9:8])
0010	Release of the PIN protection level [2], at programmed PIN protection level [0] and [1] (☞ MB Holding Register 17 address h16: bit [9:8])
7401	Reset current maximum value memory
7500 - 7509	Selection events memory 0 up to 9 (content of events memory place is copied in query i30, i31 register). 7500 is the most current fault
xxxx	Administrator password (factory configuration)
xxxx	Delete error memory
xxxx	Loading the factory settings:
xxxx	COM Watchdog Reset
xxxx ☞ Code on request from Ziehl-Abegg	

Information

- Without any further action a released PIN protection level is reset automatically to the programmed PIN protection leval after approximately 15 minutes!
- Reset to factory setting is possible only by parameter set download. Each fan has a set of parameters. This is loaded by the factory and can be loaded any time with Ziehl-Abegg tools again.

3.3.2 MB Holding Register 2, Address: h1 = Control

MB Holding Register 2, Address: h1	Control
Digital control is used for digital control of the device. The register bits controls digital functions. The digital control has to be enabled for each bit ☞ control mode register h4.	
Access / necessary PIN protection level	RW / 0
minimal value	0
maximum value	65535
Default	0
Bit [15]	1: K1 Control system
Bit [14]	1: Min. speed "OFF" (by ECblue only in combination with Premium Modul, from FW10)
Bit [13:6]	no function, reads 0
Bit [5]	1: Fire alarm (from Firmware 9.00)
Bit [4]	1: Reverse
Bit [3]	1: Limit (h18)
Bit [2]	1: Set Intern3 (h9) for control mode 0...4 (h4, Bit [3:0.])
Bit [1]	1: Set Intern2 (h6) for control mode 0...4 (h4, Bit [2:0.])
Bit [0]	1: Enable

3.3.3 MB Holding Register 3, Address: h2 = Speed control

MB Holding Register 3, Address: h2	Speed control
Used for speed control of the device. The interpretation of the value depends on control mode register (h4) Bit [3:0].	
Access / necessary PIN protection level	RW / 0
minimal value	0
maximum value	65535
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.4 Controller Setup

3.4.1 MB Holding Register 4, Address: h3 = COM Parameter

MB Holding Register 4, Address: h3	COM Parameter
Communication parameters for serial MODBUS communication. Settings made in this register will be made active after a device reset or by entering a PIN code, ☞ h0.	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	65535
Bit [15:8]	Bus Address: 1 - 247, Default 247
Bit [7:4]	COM Baudrate: 19200Bd (default) 0 = 4800 1 = 9600 2 = 19200 * 3 = 38400 (only AM-MODBUS) 4 = 115200 (only AM-MODBUS from Firmware 04)
Bit [3:0]	COM Mode: 8E1 (default) 0 = 8N1 1 = 8O1 2 = 8E1 * 3 = 8N2 (from AM-MODBUS version 9.00)

*

First-generation fans of the series **ECblue lite IP54** and **ECblue motor size B IP54** operate at a fixed baud rate of “19,200” and parity “8E1”. It is possible to set and save other values but these are not executed. With second-generation fans, these parameters are no longer fixed. This can be recognised by the fact that a successful connection is possible with the provided setting options for baud rate and parity.

Information

If communication is no longer possible due to incorrect setting of the communication parameters ☞ section "Emergency scenario (error handling)".

3.4.2 MB Holding Register 5, Address: h4 = Controlmode

MB Holding Register 5, Address: h4	Controlmode
Control mode defines how the device is controlled by the user.	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	65535
Bit [15:14]	no function, reads 0
Bit [13]	Buscon firealarm (by ECblue firealarm from Firmware 9.00)[1] 0: h1 Bit 5 deactivated 1: h1 Bit 5 active
Bit [12]	Buscon reverse (Rolling direct., Default = 0) 0: h1 Bit 4 deactivated 1: h1 Bit 4 active (OR'ed with digital input)
Bit [11]	Buscon Limit (speed limitation, Default = 0) 0: h1 Bit 3 deactivated 1: h1 Bit 3 active (OR'ed with digital input)
Bit [10]	Buscon Set intern 3 (Set Intern3, Default = 0) 0: h1 Bit 2 deactivated 1: h1Bit 2 active (OR'ed with digital input)
Bit [9]	Buscon Set intern 2 (Set Intern2, Default = 0) 0: h1 Bit 1 deactivated 1: h1 Bit 1 active (OR'ed with digital input)

Bit [8]	Buscon enable (Enable, Default = 0) 0: h1 Bit 0 deactivated 1: h1 Bit 0 active (OR'ed with digital input)
Bit [7:4]	Automatic reset after error (from version 13.30) 0: No automatic reset 1: Automatic reset after 1 minute 2: Automatic reset after 15 minutes 3: Automatic reset after 60 minutes
Bit [3:0]	Speed control mode (Default = 0) 0: Control by E1 (0 - 10 V / PWM) * 1: Speed control register h2 (ECblue: absolute speed, F-, Icontrol: frequency 1/10 Hz) * 2: Speed control register h2 (fractional 0 - 32767 = 0 - 100 %) * 3: Speed control register h2 (fractional 0 - 100 = 0 - 100 %) * 4: Set Intern1 * 5: Set Intern2 6: Set Intern2 * with possibility for switch over to Set Intern 2,3
[1] **Attention!** To achieve as long a life as possible, the devices have active temperature management. The modulation is reduced when internal temperature limits are exceeded. In venting systems in which the fan must run at max. speed in the event of a fire, the temperature management / temperature monitoring can be switched off by a digital input. At the same time, the fan is operated independently of the speed setting for regular operation at maximum speed. **Attention! The device and its internal components are no longer protected against overtemperature when this function is activated (this affects the life ☞ installation instructions or operating instructions of the device).** The function is activated at the digital input with the contact open (at factory setting D1/E1 Inverting = OFF") so that the maximum speed of the fan is also possible with the line to the digital input interrupted in case of fire.	

3.4.3 MB Holding Register 6, Address: h5 = Set Intern1

MB Holding Register 6, Address: h5	**Set Intern1: 1/min ☞[2)]**
Set Intern1 for control mode Bit [3-0] = 4	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	6000
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.4.4 MB Holding Register 7, Address: h6 = Set Intern2: 1/min

MB Holding Register 7, Address: h6	**Set Intern2: 2/min ☞[2)]**
Set Intern2 for control mode Bit [3-0] = 5 In control mode Bit [3-0] = 0 up to 4 if digital control (h1) - Bit 1 = 1 or D1 = 1 if D1 function = 5 (h14)	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	6000
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.4.5 MB Holding Register 8, Address: h7 = Min. Speed: 1/min[3)]

MB Holding Register 8, Address: h7	Min. Speed: 1/min ☞[2)]
Minimal Speed	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	6000
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.4.6 MB Holding Register 9, Address: h8 = Max. Speed: 1/min

MB Holding Register 9, Address: h8	Max. Speed: 1/min ☞[2)]
Maximal Speed	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	6000
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.4.7 MB Holding Register 10, Address: h9 = Set Intern3: 1/min

MB Holding Register 10, Address: h9	Set Intern3: 3/min ☞[2)]
Speed preset in control mode Bit [3-0] = 6 By control mode Bit [3-0] = 0 up to 4 if digital control (h1) - Bit2 = 1 or D1 = 1 if D1 function = 6 (h14)	
Access / necessary PIN protection level	RW, NV / 1
minimal value	0
maximum value	6000
Default	0
Bit [15:0]	Decimal value 0 - 65535

2)

n > “Max. Speed” (h8), is limited for operation to “Max. Speed”.

3)

If in Speed control mode “2” or “3” (☞ MB Holding Register 5, Address 4) the “Min. Speed” is set > 0, so the actual speed in the relationship is increased accordingly. I.e. this is then higher than the adjusted desired value of speed.

In Speed control mode “1” the adjusted speed (h2) maintains independently from the “Min. Speed”.

3.5 IO Setup

3.5.1 MB Holding Register 11, Address: h10 = Inverting

MB Holding Register 11, Address: h10	Inverting
Inverting E1, D1, K1	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Bit [15:3]	no function, reads 0
Bit [2]	1: K1 Inverting (NO = normally open contact), Default: 0
Bit [1]	1: D1 inverting Default: 0
Bit [0]	1: E1 inverting (10 V - 0 V) Default: 0

3.5.2 MB Holding Register 12, Address: h11 = E11 Min

MB Holding Register 12, Address: h11	E1 Min: %
Start value for the analog input E1. Example: 20 % means a useful range of 2 V - E1 Max. ≙ 0 - 100 % speed. (E1 Watchdog Mode ☞ MB Holding Register 18, Address: h17)	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	100
Default	5 %
Bit [15:0]	Decimal value 0 - 65535

3.5.3 MB Holding Register 13, Address: h12 = E12 Max

MB Holding Register 13, Address: h12	E1 Max: %
End value for the analog input E1. Example: 80 % means a useful range of E1 Min. - 8 V ≙ 0 - 100 % speed.	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	100
Default	100
Bit [15:0]	Decimal value 0 - 65535

3.5.4 MB Holding Register 14, Address: h13 = E1 Function

MB Holding Register 14, Address: h13	E1 Function (analog input)
Function for E1 0: 0 - 10 V / PWM (Default) For settings higher "0" “E1” is working like “D1” as digital input. 1 = Enable, 3 = Limit, 5 = Set Intern2, 6 = Set Intern3, 13 = change direction of rotation, 15 = Firealarm (by ECblue from Firmware 9.00)	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.5.5 MB Holding Register 15, Address: h14 = D1 Function

MB Holding Register 15, Address: h14	D1 (digital input) Function
Function for D1 0 = OFF, 1 = Enable (Default), 3 = Limit, 5 = Set Intern2, 6 = Set Intern3, 13 = change direction of rotation, 15 = Firealarm (by ECblue from Firmware 9.00)	
Access / necessary PIN protection level	RW, NV / [2]
minimal value	0
maximum value	65535
Default	1
Bit [15:0]	Decimal value 0 - 65535

3.5.6 MB Holding Register 16, Address: h15 = K1 Function

MB Holding Register 16, Address: h15	K1 (Relays) function
Function for K1 0: OFF, 1: Operation, 2: Fault (Default), 4: Speed limit ON = (Speed > Set Intern3 & Operation) Hyst = 50 rpm, 17: Control - Bit 15 (h1), 20: fault indication or indication for active temperature management (from Firmware 13.31)	
Access / necessary PIN protection level	RW, NV / [2]
minimal value	0
maximum value	65535
Default	2
Bit [15:0]	Decimal value 0 - 65535

3.5.7 MB Holding Register 17, Address: h16 = Controller Setup Flags

MB Holding Register 17, Address: h16	Controller Setup Flags	
Access / necessary PIN protection level	RW, NV / [2]	
minimal value	0	
maximum value	65535	
Default	513	
Bit [15]	Blocking protection repeat tries: 0 = 5 tries (default), 1 = no repeat tries (from version 13.30)	
Bit [14]	Blocking protection change direction of rotation: 0 (default), 1 = change direction at each repeat try (from version 13.30)	
Bit [13]	0 = motor heating normal (default), 1 = motor heating suppressed (from version 13.30).	
Bit [12:11]	0 = 16 kHz FIX (default) 1 = 8 kHz FIX 2 = 8 kHz auto switching by temperature 3 = 8 kHz auto switching by setting	
Bit [10]	Tacho out (from firmware 8.02) 0: OFF (default, LED output) 1: ON (display frequenzy, n = 60 x f)	
Bit [9:8] **Information** Settings are not saved until after a Reset (h0 = PIN 2143) or switching ON/OFF. For register with necessary PIN protection level [3] administrator PIN necessary.	Default PIN Protectlevel	
	[0]	For register with necessary PIN Protect level [1] or [2] PIN input for write access necessary.
	[1]	For register with necessary PIN protection level [2] and higher PIN input for wirte access necessary.
	[2]	Write access for register with necessary PIN protection level [1] and [2] (Default).
Bit [7:4]	Setting wirless channel (in combination with communication module type AM-MODBUS-W) Default: 0	

Bit [3:1] **Information** Only for control mode 1, 2, 3 valid	The selected value is copied after a Reset depending on the kind of speed control into the holding register h2 (control). 0: Write 0 (Default) 1: Write Holding Register 5 (NV, Speed1) 2: Write Holding Register 6 (NV, Speed2) 3: Write Holding Register 9 (NV, Speed3) 4: Write Holding Register 8 (NV, Max. Speed) 5: Write last speed (h2, saved at a power failure) Function from firmware 11.00 and higher available!
Bit [0]	LED Mode 0: OFF 1: Run / Fault indication by blink codes (Default)

3.5.8 MB Holding Register 18, Address: h17 = communication / control signal watchdog

MB Holding Register 18, Address: h17	**Communication Watchdog**
Communication watchdog defines a behavior in case of a communication failure / control signal failure. If the device receives no message or if the control signal is disturbed in a time window, the device will execute the selected function.	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	0
Bit [15:8]	Watchdog time in seconds (Default 0 = off)
Bit [7:0]	Watchdog Mode: 0: No function (default) = OFF from FW 13 1: Fault (K1 function, h15) in case of communication fault (WDT) 2: Constant speed 1 * in case of communication fault (WDT) 3: Fault + constant speed 1 * in case of communication fault (WDT) 4: Fault by E1 Fault ** (only ECblue) 5: Constant speed 1 by E1 Fault (only ECblue) 6: Fault constant speed 1 in case of E1 fault (only ECblue) 7: Switch over to E1 * in case of a communication fault (WDT) from FW 13.30 8: Failure + switch over to E1 * in case of a communication fault (WDT) from FW 13.30
* in this condition it is possible by digital input function 5, 6 or digital control function to change between the constant speeds (Holding register h4). ** E1 fault is triggered when E1 falls below E1 Min x 0.5. E1 fault is cancelled when E1 rises above E1 Min x 0.9.	

3.5.9 MB Holding Register 19, Address: h18 = Limit

MB Holding Register 19, Address: h18	**Limit: %**
Speed limit when activated by a digital control function.	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	100
Default	75
Bit [15:0]	Decimal value 0 - 65535

3.5.10 MB Holding Register 20, Address: h19 = Radio network code

MB Holding Register 20, Address: h19	Radio network code
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	9999
Default	9999
Bit [15:0]	Decimal value 0 - 65535

3.6 Motor Setup

3.6.1 MB Holding Register 26, Address: h25 = Ramp timing

MB Holding Register 26, Address: h25	Ramp timing
factory settings configuration	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Bit [15:8]	Rampdown time / s, e. g. ECblue 116 = 20 *
Bit [7:0]	Rampup time / s, e. g. ECblue 152 = 20 *

* depending on device type

Register 20 - 24 and 26 - 29 holds factory settings that should not be changed!

3.7 Speed range suppression

3.7.1 MB Holding Register 31, Address: h30 = Suppression

MB Holding Register 31, Address: h30	Suppression
Activation of max. 3 speed suppression ranges	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	0
Bit [15:3]	no function, reads 0
Bit [2]	1: Speed suppression range 3 active
Bit [1]	2: Speed suppression range 2 active
Bit [0]	1: Speed suppression range 1 active

3.7.2 MB Holding Register 32, Address: h31 = Range1 Min

MB Holding Register 32, Address: h31	Range1 min.
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	6000
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.7.3 MB Holding Register 33, Address: h32 = Bereich1 Max

MB Holding Register 33, Address: h32	Range1 max.
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	6000
Default	100
Bit [15:0]	Decimal value 0 - 65535

3.7.4 MB Holding Register 34, Address: h33 = Range2 Min.

MB Holding Register 34, Address: h33	Range2 min.
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	6000
Default	200
Bit [15:0]	Decimal value 0 - 65535

3.7.5 MB Holding Register 35, Address: h34 = Rereich2 Max.

MB Holding Register 35, Address: h34	Range2 max.
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	6000
Default	300
Bit [15:0]	Decimal value 0 - 65535

3.7.6 MB Holding Register 36, Address: h35 = Range3 Min.

MB Holding Register 36, Address: h35	Range3 min.
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	6000
Default	500
Bit [15:0]	Decimal value 0 - 65535

3.7.7 MB Holding Register 37, Address: h36 = Rereich3 Max.

MB Holding Register 37, Address: h36	Range3 max.
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	6000
Default	600
Bit [15:0]	Decimal value 0 - 65535

3.7.8 MB Holding Register 38, Adress: h37 = Fan Bad

MB Holding Register 38, Address: h37	Fan Bad
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Bit [15:8]	Time delay / s *
Bit [7:0]	Speed deviation 1 / min *

* *The function is switched off if one of these two values is "0". "0" is the factory setting in the standard versions.*

The factory settings of the Holding Register h38 - h39 should not be changed!

3.8 Internal PI controller settings

The factory settings of the Holding Register h40 - h49 may not be changed!

3.9 Info, monitoring and diagnostic

3.9.1 MB Input Register 1, Address: i0 = Firmware

MB Input Register 1, Address: i0	Firmware
Firmware version number xx.xx (index version)	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.9.2 MB Input Register 2, Address: i1 = Product code 1

MB Input Register 2, Address: i1	Product code 1 (Controller Code)
Access	R
minimal value	0
maximum value	65535
Bit [15:8]	Product family ID e.g 01h = ECblue
Bit [7:0]	Product variants ID e.g. 00h = Basic

Device	Product Code (Hex) MSB Family, LSB Variante
ECblue Basic Standard (old)	0x0032
ECblue Basic Standard (new)	0x0100
ECblue MODBUS 02 (clean room EC116)	0x0101
ECblue Lite (Standard EC116)	0x0102
ECblue (Standard EC90)	0x0103
FU Basic Standard Icontrol (old)	0x0232
FU Basic Standard Icontrol (from V1.03)	0x0200
FU Basic Standard Fcontrol (from V1.03)	0x0201
PMcontrol Basic	0x0300
AM-MODULE	0x04xx
AM-MODBUS	0x0401
AM-MODBUS-W	0x0402
AM-PREMIUM	0x0403
AM-PREMIUM-W	0x0404
AM-CONFIG	0x0405
AM-UNICON-IO01	0x0407
UNIcon control module (MCRE17)	0x0500
A-G-247NW AZUN27 (2nd edition)	0x0600
A-G-247NW AZUN30 (3nd edition)	0x0601
MODBUS IO MODULE	0x07xx
B-G-028NE	0x0701

3.9.3 MB Input Register 3, Address: i2 = Parameterset ID (from FW 13)

MB Input Register 3, Address: i2	Parameterset ID
Display der Parameterset ID (from FW13)	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.9.4 MB Input Register 4-9, Address: i3 - i8 = Unique Device Signature 0 - 5

MB Input Register 4-9, Address: i3 - i8	Unique Device Signature 0 - 5
6 16-Bit Register to read unique device signature. LSW = 0	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.9.5 MB Input Register 10, Address: i9 = Parameterset Index (from FW 13)

MB Input Register 10, Address: i9	Parameterset Index
Display of Parameterset ID (from FW13)	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.9.6 MB Input Register 11, Address: i10 = Operation condition 1

MB Input Register 11, Address: i10	Operation condition 1
Display operating conditions	
Access	R
minimal value	0
maximum value	65535
Bit [15]	1: Fan Bad (from FW 13)
Bit [14]	1: Reverse active (from FW 12)
Bit [13]	1: Temp. Alarm Inside (from FW 12)
Bit [12]	1: Temp. Alarm IGBT (from FW 12)
Bit [11]	1: DC-link overvoltage (from FW10)
Bit [10]	1: K state (from 1.03 available)
Bit [9]	1: E1 digital State (D2 State)
Bit [8]	1: D1 state
Bit [7]	1: Current limit (from FW10)
Bit [6]	1: Field weakening (from FW10)
Bit [5]	1: Fire alarm (from FW10)
Bit [4]	1: Wrong direction of rotation (from FW10)
Bit [3]	1: Internal system fault (from FW10)
Bit [2]	1: IGBT FAULT CHECK
Bit [1]	1: Temperature management
Bit [0]	1: STOP

3.9.7 MB Input Register 12, Address: i11 = Operation condition 2 (from FW 13)

MB Input Register 12, Address: i11 (from FW 14)	Operation condition 2
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Bit [15..8] is set if a warning in the corresponding warning group occurs (collective error). A warning group is, for example, User Application System Warning. The reason for a group warning message is displayed via bit [7..0]. The prioritisation rules for displaying the warning reasons are as follows: (If several warning bits are set at the same time, the warning reason with the lowest number is displayed) 1. [i11.Bit15] Functional Safety - Fail Safe Mode 2. [i11.Bit14] Motorcontrol System Failure 3. [i11.Bit13] User Application System Failure 5. [i11.Bit9] Direction 4. [i11.Bit8] Limit
Bit [15]	**Functional Safety - Warning** Reason 0: unkown / invalid Reason 1: test statemachine failure Reason 2: variable test failure Reason 3: test control flow failure Reason 4: safety parameter settings failure Reason 5: current sensor plausibitity test (sum) failure Reason 6: division by 0 failure Reason 7: voltage sensor plausibility test failure Reason 8: dc link voltage test failure Reason 9: motorcurrent test failure Reason 10: temperature sensor plausibility failure Reason 11: temperature tests failure Reason 12: configuration register test failure
Bit [14]	**Motorcontrol System Warning** Reason 0: unknown Reason 1: current sensor adjustment Reason 2: parameterisation error Reason 3: motor blocked (Blocking protection - breakaway procedure active)
Bit [13]	**User Application System Warning** Reason 0: unknown Reason 1: motorcontrol selection failure Reason 2: parameter set CRC failure
Bit [12]	Reserved
Bit [11]	Reserved
Bit [10]	Reserved
Bit [9]	**Direction** Reason 0: unknown Reason 1: wrong direction
Bit [8]	**Limit** Reason 0: unknown Reason 1: current limitation Reason 2: voltage limitation Reason 3: power limitation Reason 4: temperature limitation Reason 5: overload limitation

Bit [7:0]	**Warning Reason Code** A code that indicates the reason for a warning message in operating state 2 (i11) bit [15..8]. In the event of several errors, the code of the highest-priority error is displayed.

3.9.8 MB Input Register 13, address: i12 = error status

MB Input Register 13, Address: i12	**Error status**
Display Error status	
Access	R
minimal value	0
maximum value	65535
Bit [15]	1: COM error (Watchdog) Reason = 0
Bit [14]	1: Motor Start Reason 1: braking not possible (break current to high) Reason 2: rotation speed to high
Bit [13]	1: Temperature error (☞ R12.12, R12.13) Reason 1: IGBT Reason 2: ELKO Reason 3: MCU Reason 4: Motor Reason 5: Sinefilter Reason 6: Choke Reason 7: T7 Reason 8: T8
Bit [12]	1: Safety Shutdown (max. elektronic current, from FW13) Reason = 0
Bit [11]	1: Sinefilter (only Fcontrol) Reason = 0 ☞ temperature fault
Bit [10]	1: PEAK CURRENT (from FW10) Reason 1: Max. Peak Reason 2: I^2t
Bit [9]	1: MOTOR BLOCKED Reason 1: Motor blocked
Bit [8]	1: HALLSENSOR Reason 1: Angle error
Bit [7]	1: TB (reserved for PMblue etc.) Reason 1: Thermostats
Bit [6]	1: LINE FAULT Reason 1: Phase failure Reason 2: Line failure
Bit [5]	1: UIN LO (from FW10) Reason 1: Uin too low
Bit [4]	1: UIN HI (from FW10) Reason 1: Uin too high
Bit [3]	1: UZK LO Reason 1: Uzk to low
Bit [2]	1: UZK HI Reason 1: Uzk to high Reason 2: Uzk buffer too high
Bit [1]	1: EARTH TO GROUND FAULT Reason 1: IGBT Fault Signal Reason 2: Current sum
Bit [0]	1: IGBT FAULT Reason 1: IGBT Fault Signal Reason 2: IGBT Driver Ready

3.9.9 MB Input Register 14, Address: i13 = error status 2 (from FW 14)

MB Input Register 14, Address: i13	Error status 2
Access	R
minimal value	0
maximum value	65535
Bit [15:8]	Bit [15..8] is set if an error in the corresponding error group occurs (collective error). An error group is, for example, User Application System Failure. The reason for a group error message is displayed via bit [7..0]. Bit [7..0] also gives the reasons for errors that are reported with error state 1 (i12). The prioritisation rules for displaying the error reasons are as follows: (If several error bits are set at the same time, the warning reason with the lowest number is displayed) 1. [i13.Bit 15] Functional Safety - Fail Safe Mode 2. [i13.Bit14] Motorcontrol System Failure 3. [i13.Bit13] User Application System Failure 4. [i12.Bit7] TB 5. [i12.Bit0] IGBT FAULT 6. [i12.Bit1] SHORTCUT EARTH 7. [i12.Bit13] Temperature Error 8. [i12.Bit9] MOTOR BLOCKIERT 9. [i12.Bit6] HALLSENSOR 10. [i12.Bit8] PHASENAUSFALL (LINE) 11. [i12.Bit8] HALLSENSOR 12. [i12.Bit10] PEAK CURRENT 13. [i12.Bit2] UZK HI 14. [i12.Bit3] UZK LO 15. [i12.Bit4] UIN Hi 16. [i12.Bit5] UIN LO 17. [i13.Bit8] Limit 18. [i13.Bit9] Direction 19. [i12.Bit14] Motor Start 20. [i12.Bit15] COM error (Watchdog) 21. [i12.Bit11] Sinefilter 22. [i12.Bit12] Safety Shutdown
Bit [15]	**Functional Safety - Fail Safe Mode** Reason 0: unkown / invalid Reason 1: test statemachine failure Reason 2: variable test failure Reason 3: test control flow failure Reason 4: safety parameter settings failure Reason 5: current sensor plausibitity test (sum) failure Reason 6: division by 0 failure Reason 7: voltage sensor plausibility test failure Reason 8: dc link voltage test failure Reason 9: motorcurrent test failure Reason 10: temperature sensor plausibility failure Reason 11: temperature tests failure Reason 12: configuration register test failure
Bit [14]	**Motorcontrol System Warning** Reason 0: unknown Reason 1: current sensor adjustment Reason 2: Parameterisation error Reason 3: Motor blocked (Blocking protection - breakaway procedure failed)

Bit [13]	**User Application System Failure** Reason 0: unknown Reason 1: Motorcontrol selection failure Reason 2: Parametersatz CRC failure
Bit [12]	Reserved
Bit [11]	Reserved
Bit [10]	Reserved
Bit [9]	**Direction** Reason 0: unknown Reason 1: wrong direction
Bit [8]	**Limit** Reason 0: unknown Reason 1: current limitation Reason 2: voltage limitation Reason 3: power limitation Reason 4: temperature limitation Reason 5: overload limitaion
Bit [7:0]	**Failure Reason Code** A code that indicates the reason for an error message in error state 1 (i12) and error state 2 (i13) bit [15..8]. In the event of several errors, the code of the highest-priority error is displayed.

3.9.10 MB Input Register 15, Address: i14 = Speed

MB Input Register 15, Address: i14	**Speed: 1/min**
Display actual speed	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.9.11 MB Input Register 16, Address: i15 = Motorcurrent

MB Input Register 16, Address: i15	**Motorcurrent: A**
Display motor current	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535 (in 0.01 A steps)

3.9.12 MB Input Register 21, Address: i20 = DC voltage

MB Input Register 21, Address: i20	DC Voltage: V
Display DC LINK voltage	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535 (in 1 V steps)

3.9.13 MB Input Register 22, Addresse: i21 = Line voltage

MB Input Register 22, Address: i21	Line voltage: V
Display supply voltage (peak value)	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535 (in 1 V steps)

3.9.14 MB Input Register 23, Address: i22 = IGBT-temperature

MB Input Register 23, Address: i22	IGBT-Temperature: °C
Display IGBT temperature 200 = 20.0 °C	
Access	R
minimal value	-32768
maximum value	32767
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.9.15 MB Input Register 24, Addresse: i23 = inside temperature

MB Input Register 24, Address: i23	inside Temperature: °C
Display ambient temperature of electronics insde housing 200 = 20.0°C	
Access	R
minimal value	-32768
maximum value	32767
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.9.16 MB Input Register 25, Address: i24 = MCU temperature

MB Input Register 25, Address: i24	MCU Temperature: °C
Display Chip temperature 200 = 20.0 °C	
Access	R
minimal value	-32768
maximum value	32767
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.9.17 MB Input Register 27, Address: i26 = E1 input

MB Input Register 27, Address: i26	E1 Input
Display of connected voltage at anlalog input E1 (0 - 10 V or PWM) as raw value. 0 to 32767 = 0 - 10 V or/and 0 - 100 % PWM	
Access	R
minimal value	0
maximum value	32767
Bit [15:0]	Decimal 0 - 32767 (Fractional)

3.9.18 MB Input Register 28, Address: i27 = Modulation

MB Input Register 28, Address: i27	Modulation
Display fan level of speed controller 0 to 32767 = 0 - 100 %	
Access	R
minimal value	0
maximum value	32767
Bit [15:0]	Decimal 0 - 32767 (Fractional)

3.9.19 MB Input Register 31, Address: i30 = Event

MB Input Register 31, Address: i30	Event
Event log entry according to Register error status (i12). Selection of entry 1 - 10 by entering command code 7500 - 7509.	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Error status

3.9.20 MB Input Register 32, Address: i31 = Event number

MB Input Register 32, Address: i31	Event number
Item of selected event log entry.	
Access	R
minimal value	0
maximum value	1000
Bit [15:0]	Decimal

3.9.21 MB Input Register 34, Address: i33 = Motor input power

MB Input Register 34, Address: i33	Motor input power: W
Display of motor input power in Watt (from FW 12)	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535 (in 1 W steps)

Input Register i34 - i48 are reserved for future use or factory usage

3.9.22 MB Input Register 50, Address: i49 = Inquiry PIN protect level

MB Input Register 50, Address: i49	Inquiry PIN Protectlevel
Access	R
minimal value	0
maximum value	3
Bit [15:0]	Decimal
Setting access authorization ☞h16	

4 Emergency scenario (error handling)

"DEVICE UNDER TEST" hereinafter referred to as "DUT".
If communication with the "DUT" is no longer possible due to incorrect setting of the transfer rate or the slave address, or if the communication parameters or the slave address are not recognised, there is an emergency scenario as a last resort for getting the "DUT" to be recognised again.

The function described below is available depending on the software version, motor size and date of manufacture:	
ECblue Motor size Z (EC 55):	ab Version 14.31 oder höher
ECblue Motor size B (EC90) / ECblue lite Motor size D (EC 116):	from version 4.06 or higher
ECblue Motor size D + G (EC 116 + 152):	with AM-MODBUS from version 9.10 or higher

Emergency scenario:
The "DUT" switches to the default setting with 19,200 bps, parity 8E1 and slave address **255** if 15 consecutive incorrect MODBUS requests are received. An incorrect request has been made if the "CRC" is incorrect or if a request is received by the slave address **255**.
As there can be several "DUTs" on the bus, the "DUT" must not respond in the event of a request to **255**.
The communication parameters with slave address 254 can now be read out and reconfigured accordingly.
If this is not the case, e.g. if there are several "DUTs" on the bus, it is possible to write using a broadcast message at any time.

- ► Registers cannot be read out via slave address **255**
- ► After a further 15 consecutive incorrect MODBUS requests, the "DUT" switches back to normal operation, i.e. the values stored in the holding register address h3 are loaded.
- ► The emergency scenario can only be restarted following a reset (PIN input, power reset).

Recommended procedure:

1. Switch on "DUT".
2. Set MODBUS master to default values 19,200 bps and 8E1 and initiate request to fan with address **255**. Poll interval typically 500 ms.
3. If the "DUT" detects more than 15 incorrect MODBUS requests from the master, it switches to the default settings 19,200 bps and 8E1 until the next reset.
4. Read out and adjust the interface settings of the "DUT" via the MODBUS slave address 254.
5. Perform a reset or switch power supply off and on again.
6. The "DUT" can now be addressed using the previously configured values. Values of the "DUT" can now be read and written directly.

If it is not possible to energise a "DUT" individually, the procedure described below must be followed:

1. Switch on "DUTs".
2. Set MODBUS master to default values 19,200 bps and 8E1 and initiate request to fan with address **255**. Poll interval typically 500 ms.
3. If the "DUTs" detect more than 15 incorrect MODBUS requests from the master, they switch to the default settings 19,200 bps and 8E1 until the next reset.
4. Adjust the interface settings of the "DUT" and the MODBUS slave address via a broadcast command. **-> All "DUTs" have the same address: 247!**
5. The "DUTs" can now be addressed using the previously configured values. After successful auto-installation, values of the "DUTs" can be read and written directly.

5 Document history

Drawing number: L-BAL-E076-GB		
Edition / Index	**Editor**	**Designation**
1007 / 001	sd	Transfer to XML database
1047 / 002	sd	Update for firmware 8.02
1049 / 003	sd	Update for Firmware 9.05
1108 / 004	sd	New title: ECblue MODBUS
1116 / 005	sd	Register numbers inserted
1133 / 006	sd	adaption to internal version
1138 / 007	sd	MB Input Register 1 and 2 for product code
1310 / 008	sd	Extension to Firmware 13
1317 / 009	sd	Corrected data ranges for temperature values
1336 / 010	sd	COM parameter MB Holding Register 4 updated
1443 / 011	sd	Extension: MB Holding Register 18, Address: h17 = Communication Watchdog Extension: MB Holding Register 17, Address: h16 = Controller Setup Flags Extension: MB Holding Register 4, Address: h3 = COM Parameter Extension: MB Holding Register 5, Address: h4 = Controlmode
1505 / 012	sd	Extension: MB Holding Register 16, Address: h15 = K1 function 20
1517 / 013	sd	Extension to Firmware 14 MB Input Register 12, Address: i11 = Operation condition 2 MB Input Register 13, address: i12 error status MB Input Register 14, address: i13: error status 2
1745 / 014	sd	Correction MB Input Register 14, Address: i13: [i12.Bit8] Limit => [i13.Bit8] Limit [i12.Bit9] Direction => [i13.Bit9] Direction
1802 / 015	sd	Change emergency scenario: Information adapted to the time of availability

6 Enclosure

6.1 Manufacturer reference CE

Our products are manufactured in accordance with the relevant international regulations. If you have any questions concerning the use of our products or plan special uses, please contact:

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