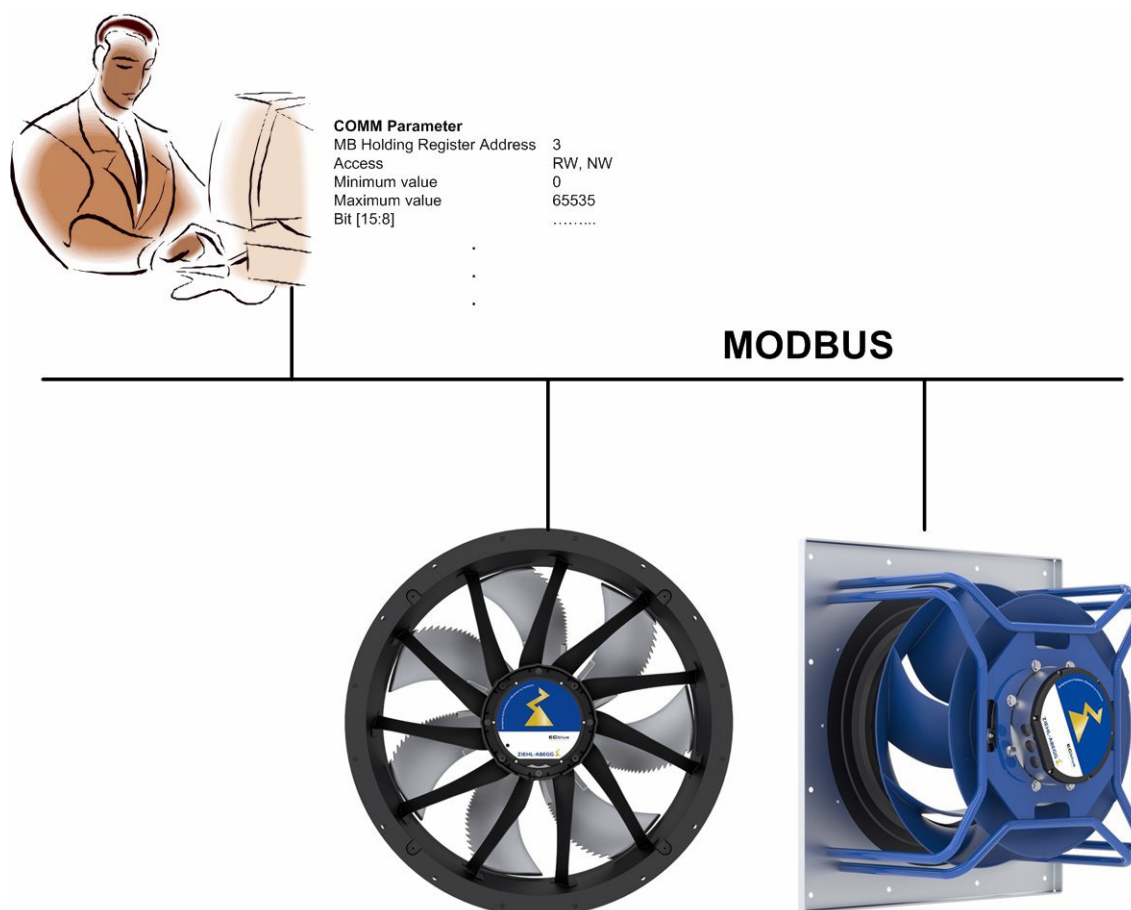


Description MODBUS Communication

ECblue BASIC-MODBUS



Preliminary edition!

Content

1	General notes	4
1.1	Target group	4
1.2	Exclusion of liability	4
1.3	Copyright	4
2	Safety instructions	4
3	MODBUS Register Description	5
3.1	Explanations	5
3.2	Data model and access options	6
3.3	Control	7
3.3.1	MB Holding Register 1, Address: h0 = PIN input	7
3.3.2	MB Holding Register 2, Address: h1 = Control	8
3.3.3	MB Holding Register 3, Address: h2 = Speed control	8
3.4	Controller Setup	9
3.4.1	MB Holding Register 4, Address: h3 = COM Parameter	9
3.4.2	MB Holding Register 5, Address: h4 = Controlmode	9
3.4.3	MB Holding Register 6, Address: h5 = Set Intern1: 1/min	10
3.4.4	MB Holding Register 7, Address: h6 = Set Intern2: 1/min	11
3.4.5	MB Holding Register 8, Address: h7 = Min. Speed: 1/min ³⁾	11
3.4.6	MB Holding Register 9, Address: h8 = Max. Speed: 1/min	11
3.4.7	MB Holding Register 10, Address: h9 = Set Intern3: 1/min	11
3.5	IO Setup	12
3.5.1	MB Holding Register 11, Address: h10 = Inverting	12
3.5.2	MB Holding Register 12, Address: h11 = E11 Min	12
3.5.3	MB Holding Register 13, Address: h12 = E12 Max	12
3.5.4	MB Holding Register 14, Address: h13 = E1 Function	12
3.5.5	MB Holding Register 15, Address: h14 = D1 Function	13
3.5.6	MB Holding Register 16, Address: h15 = K1 Function	13
3.5.7	MB Holding Register 17, Address: h16 = Controller Setup Flags	13
3.5.8	MB Holding Register 18, Address: h17 = communication / control signal watchdog	14
3.5.9	MB Holding Register 19, Address: h18 = Limit	14
3.5.10	MB Holding Register 20, Address: h19 = Radio network code	15
3.6	Motor Setup	15
3.6.1	MB Holding Register 26, Address: h25 = Ramp timing	15
3.7	Speed range suppression	15
3.7.1	MB Holding Register 31, Address: h30 = Suppression	15
3.7.2	MB Holding Register 32, Address: h31 = Range1 Min.: 1/min	15
3.7.3	MB Holding Register 33, Address: h32 = Range1 Max.: 1/min	16
3.7.4	MB Holding Register 34, Address: h33 = Range2 Min.: 1/min	16
3.7.5	MB Holding Register 35, Address: h34 = Range2 Max.: 1/min	16
3.7.6	MB Holding Register 36, Address: h35 = Range3 Min.: 1/min	16
3.7.7	MB Holding Register 37, Address: h36 = Range3 Max.: 1/min	16
3.7.8	MB Holding Register 38, Address: h37 = Fan Bad	17
3.8	Internal PI controller settings	17
3.9	Antiblock protection	17
3.9.1	MB Holding Register 51, Address: h50 = repeat tries	17
3.9.2	MB Holding Register 52, Address: h51 = running time and mode	17
3.9.3	MB Holding Register 53, Address: h52 = Activation temperature (IGBT)	17
3.9.4	MB Holding Register 54, Address: h53 = Deactivation temperature (IGBT)	18
3.9.5	MB Holding Register 55, Address: h54 = Activation temperature (inside temperature)	18
3.9.6	MB Holding Register 56, Address: h55 = deactivation temperature (inside temperature)	18
3.10	Vibration velocity	19
3.10.1	MB Holding Register 61, Address: h60 = warning limit x-axis	19
3.10.2	MB Holding Register 62, Address: h61 = warning limit Y-axis	19
3.10.3	MB Holding Register 63, Address: h62 = warning limit Z-axis	19

3.10.4	MB Holding Register 64, Address: h63 = delay time warning X-axis	19
3.10.5	MB Holding Register 65, Address: h64 = delay time warning Y-axis	20
3.10.6	MB Holding Register 66, Address: h65 = delay time warning Z-axis	20
3.10.7	MB Holding Register 67, Address: h66 = failure limit X-axis	20
3.10.8	MB Holding Register 68, Address: h67 = failure limit Y-axis	20
3.10.9	MB Holding Register 69, Address: h68 = failure limit Z-axis	20
3.10.10	MB Holding Register 70, Address: h69 = delay time failure X-axis	21
3.10.11	MB Holding Register 71, Address: h70 = delay time failure Y-axis	21
3.10.12	MB Holding Register 72, Address: h71 = delay time failure Z-axis	21
3.11	Air flow	22
3.11.1	MB Holding Register 81, Address: h80 = maximum volume flow	22
3.11.2	MB Holding Register 85, Address: h84 = volume flow adjustment	22
3.12	Lifetime	23
3.12.1	MB Holding Register 82, Address: h81 = warning limit lifetime	23
3.12.2	MB Holding Register 83, Address: h82 = failure limit lifetime	23
3.13	Info, monitoring and diagnostic	23
3.13.1	MB Input Register 1, Address: i0 = Firmware	23
3.13.2	MB Input Register 2, Address: i1 = Product code 1	23
3.13.3	MB Input Register 3, Address: i2 = Parameterset ID	24
3.13.4	MB Input Register 4-9, Address: i3 - i8 = Unique Device Signature 0 - 5	24
3.13.5	MB Input Register 10, Address: i9 = Parameterset index	24
3.13.6	MB Input Register 11, Address: i10 = Operation condition 1	24
3.13.7	MB Input Register 12, Address: i11 = Operation condition 2	25
3.13.8	MB Input Register 13, address: i12 = error status	26
3.13.9	MB Input register 14, address: i13: failure status 2	27
3.13.10	MB Input Register 15, Address: i14 = Speed	29
3.13.11	MB Input Register 16, Address: i15 = Motorcurrent	29
3.13.12	MB Input Register 21, Address: i20 = DC voltage	29
3.13.13	MB Input Register 22, Adresse: i21 = Line voltage	29
3.13.14	MB Input Register 23, Address: i22 = IGBT-temperature	29
3.13.15	MB Input Register 24, Adresse: i23 = inside temperature	30
3.13.16	MB Input Register 25, Address: i24 = MCU temperature	30
3.13.17	MB Input Register 27, Address: i26 = E1 input	30
3.13.18	MB Input Register 28, Address: i27 = Modulation	30
3.13.19	MB Input register 30, address: i29 = MSW Event	31
3.13.20	MB Input register 31, address: i30 = LSW Event	31
3.13.21	MB Input Register 32, Address: i31 = Event number	31
3.13.22	MB Input Register 33, Address: i32 = power factor	31
3.13.23	MB Input Register 34, Address: i33 = Motor input power	31
3.13.24	MB Input register 39, address: i38 = LSW operation time	32
3.13.25	MB Input register 40, address: i39 = MSW operation time	32
3.13.26	MB Input Register 41, Address: i40 = reactor temperature	32
3.13.27	MB Input Register 43, Address: i42 = LSW air flow	32
3.13.28	MB Input Register 44, Address: i43 = MSW air flow	32
3.13.29	MB Input Register 46, Address: i45 = Motor voltage	33
3.13.30	MB Input Register 48, Address: i47 = Motorcurrent phase U	33
3.13.31	MB Input Register 49, Address: i48 = Motorcurrent phase V	33
3.13.32	MB Input Register 50, Address: i49 = Inquiry PIN protect level	33
3.13.33	MB Input Register 51, Address: i50 = Remaining lifetime	33
3.13.34	MB Input Register 56, Address: i55 = Motor installation position	34
3.13.35	MB Input Register 60, Address: i59 = vibration velocity X-axis [1st order]	34
3.13.36	MB Input Register 61, Address: i60 = vibration velocity Y-axis [1st order]	34
3.13.37	MB Input Register 62, Address: i61 = vibration velocity Z-axis [1st order]	34
4	Emergency scenario (error handling)	35
5	Enclosure	37
5.1	Manufacturer reference	37

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

These operating instructions contain copyright protected information. The operating instructions may be neither completely nor partially photocopied, reproduced, translated or put on data medium without previous explicit consent from ZIEHL-ABEGG SE. Infringements are liable for damages. All rights reserved, including those that arise through patent issue or registration on a utility model.

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 automatically. For this purpose a suitable PC software (ZAsen) 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.
- Negative values are displayed in two's complement.

Kind of register

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

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

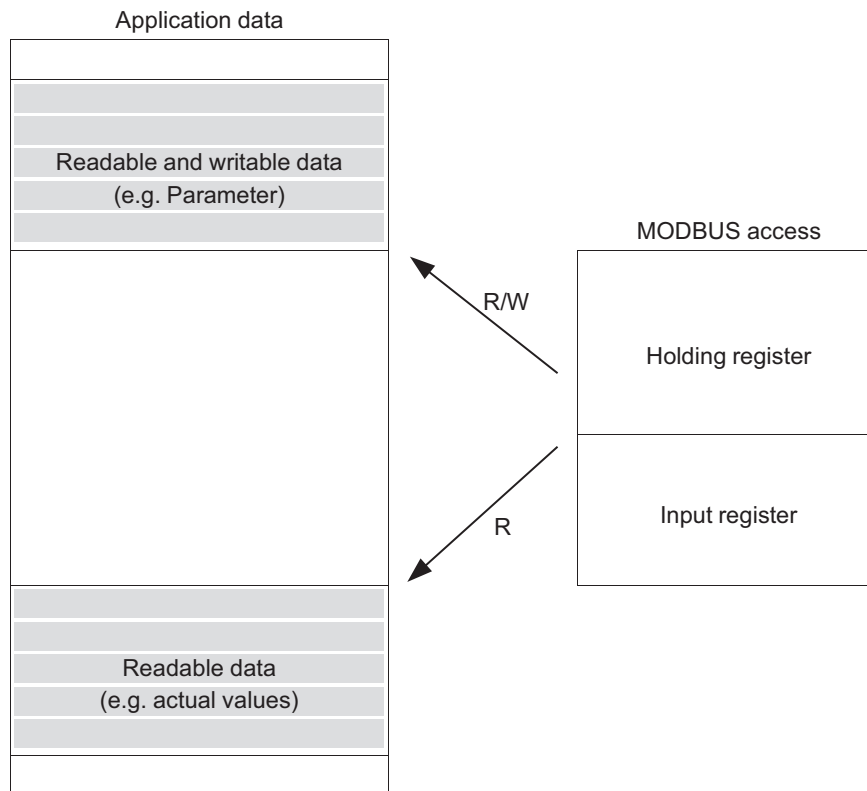
Necessary PIN protection level for access to register for ECblue or devices with AM-MODBUS (Icontrol Basic, Fcontrol Basic, ..)

0	Not protected, in each PIN protection level recordably
1	Starting from adjusted PIN protection level 1 or higher recordably. For adjusted PIN protection level 0 PIN: 1234 necessary.
2	Starting from adjusted 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 Register 1, 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 / ☐
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 ☐ , at programmed PIN protection level ☐ (↪ MB Holding Register 17 address h16: bit [9:8])
0010	Release of the PIN protection level ☐ , at programmed PIN protection level ☐ and ☐ (↪ 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
9095	Restore to factory setting = delivery status
xxxx	Administrator password (factory configuration)
xxxx	Delete error memory
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 level 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 / 
minimal value	0
maximum value	65535
Default	0
Bit [15]	1: K1 Control system
Bit [14]	1: Min. Speed "OFF"
Bit [13:7]	no function, reads 0
Bit [6]	1: Fire alarm 2
Bit [5]	1: Fire alarm 1
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 / 
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 4 = 115200
Bit [3:0]	COM Mode: 8E1 (default) 0 = 8N1 1 = 8O1 2 = 8E1 3 = 8N2



Information

If communication is no longer possible due to incorrect setting of the communication parameters, see 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 [14]	Buscon Firealarm 2 ¹ 0: h1 Bit 6 deactivated 1: h1 Bit 6 active
Bit [13]	Buscon Firealarm 1 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: h1 Bit 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 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 (absolute) 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 7: Control by E1 (quadratic characteristics) 8: Control by E1 (custom characteristics) 9: Control by E1 (air flow control) 10: Speed control register h2 (fractional; air flow control) 11: Speed control register h2 (quadratic characteristics) 12: Speed control register h2 (fractional; custom characteristics) 13: Control by E1 (0...24 mA) 14: Control by E1 (constant moment) 15: Speed control register h2 (fractional; constant moment) * 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: 1/min

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	h7
maximum value	h8
Default	1/3*h8
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	h7
maximum value	h8
Default	2/3*h8
Bit [15:0]	Decimal value 0 - 65535

3.4.5 MB Holding Register 8, Address: h7 = Min. Speed: 1/min³⁾

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	h20
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	h7
maximum value	h20
Default	h20
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	h7
maximum value	h8
Default	3/3*h8
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 = E1 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. $\triangleq$ 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	h12
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 $\triangleq$ 0 - 100 % speed.	
Access / necessary PIN protection level	RW, NV / [2]
minimal value	h11
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 1, 19 = Firealarm 2	
Access / necessary PIN protection level	RW, NV / [2]
minimal value	0
maximum value	19
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 1, 19 = Firealarm 2	
Access / necessary PIN protection level	RW, NV / <u>2</u>
minimal value	0
maximum value	19
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	
Access / necessary PIN protection level	RW, NV / <u>2</u>
minimal value	0
maximum value	20
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 / <u>2</u>
minimal value	0
maximum value	65535
Default	513
Bit [15]	Blocking protection repeat tries: 0 = 5 tries (default), 1 = no repeat tries
Bit [14]	Blocking protection change direction of rotation: 0 (default), 1 = change direction of rotation by each repeat try
Bit [13]	0 = Motorheating normal (Default), 1 = Motorheating suppressed
Bit [12:11]	Switching frequency of the output stage 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 0: OFF (default, LED output) 1: ON (display frequency, n = 60 x f)
Bit [9:8]	Default PIN Protectlevel
Information Settings are not saved until after a Reset (h0 = PIN 2143) or switching ON/OFF. For register with necessary PIN protection level <u>3</u> administrator PIN necessary.	<u>0</u> For register with necessary PIN Protect level <u>1</u> or <u>2</u> PIN input for write access necessary.
	<u>1</u> For register with necessary PIN protection level <u>2</u> and higher PIN input for write access necessary.
	<u>2</u> Write access for register with necessary PIN protection level <u>1</u> and <u>2</u> (Default).
Bit [7:4]	Setting wireless 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)
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 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 E1 Fault** 5: Constant speed 1 by E1 failure 6: Failure constant speed 1 by E1 failure 7: Switch over to E1 * at communication failure (WDT) 8: Failure + Switch over to E1* at communication failure (WDT)
* 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 0: Speed suppression range 3 deactivated
Bit [1]	2: Speed suppression range 2 active 0: Speed suppression range 2 deactivated
Bit [0]	1: Speed suppression range 1 active 0: Speed suppression range 1 deactivated

3.7.2 MB Holding Register 32, Address: h31 = Range1 Min.: 1/min

MB Holding Register 32, Address: h31	Range1 min.: 1/min
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	20000
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.7.3 MB Holding Register 33, Address: h32 = Range1 Max.: 1/min

MB Holding Register 33, Address: h32	Range1 Max.: 1/min
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	20000
Default	100
Bit [15:0]	Decimal value 0 - 65535

3.7.4 MB Holding Register 34, Address: h33 = Range2 Min.: 1/min

MB Holding Register 34, Address: h33	Range2 Min.: 1/min
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	20000
Default	200
Bit [15:0]	Decimal value 0 - 65535

3.7.5 MB Holding Register 35, Address: h34 = Range2 Max.: 1/min

MB Holding Register 35, Address: h34	Range2 Max.: 1/min
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	20000
Default	300
Bit [15:0]	Decimal value 0 - 65535

3.7.6 MB Holding Register 36, Address: h35 = Range3 Min.: 1/min

MB Holding Register 36, Address: h35	Range3 Min.: 1/min
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	20000
Default	500
Bit [15:0]	Decimal value 0 - 65535

3.7.7 MB Holding Register 37, Address: h36 = Range3 Max.: 1/min

MB Holding Register 37, Address: h36	Range3 Max.: 1/min
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	20000
Default	600
Bit [15:0]	Decimal value 0 - 65535

3.7.8 MB Holding Register 38, Address: 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 Antiblock protection**3.9.1 MB Holding Register 51, Address: h50 = repeat tries**

MB Holding Register 51, Address: h50	Repeat tries
Number of retries with blocked motor. Register value is only used if h16 Bit 15=0	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	5
Bit [15:0]	Decimal value 0 - 65535

3.9.2 MB Holding Register 52, Address: h51 = running time and mode

MB Holding Register 52, Address: h51	Running time and mode
Bit [15:8] antiblock protection minimum running time [h]; Bit [7:0] antiblock protection mode	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	1537
Bit [7:0]	Antiblock protection mode 0: Monitoring via IGBT temperature OFF 1: Monitoring via IGBT temperature ON
Bit [15:8]	Antiblock running time [h] Decimal value 0 - 65535

3.9.3 MB Holding Register 53, Address: h52 = Activation temperature (IGBT)

MB Holding Register 53, Address: h52	Activation temperature (IGBT)
When the temperature falls below this value, the antiblock protection (motor heating with slowly rotating motor) is activated. 200 = 20.0 °C	
Access / necessary PIN protection level	RW, NV / 2
minimal value	-20
maximum value	120
Default	30
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.9.4 MB Holding Register 54, Address: h53 = Deactivation temperature (IGBT)

MB Holding Register 54, Address: h53	Deactivation temperature (IGBT)
If this temperature is exceeded, the antiblock protection (motor heating with slowly rotating motor) is deactivated when the minimum runtime h51 Bit [15:8] has elapsed. 200 = 20.0 °C	
Access / necessary PIN protection level	RW, NV / 2
minimal value	-20
maximum value	120
Default	50
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.9.5 MB Holding Register 55, Address: h54 = Activation temperature (inside temperature)

MB Holding Register 55, Address: h54	Activation temperature (inside temperature)
When the temperature falls below this value, the antiblock protection (motor heating with slowly rotating motor) is activated. 200 = 20.0 °C	
Access / necessary PIN protection level	RW, NV / 2
minimal value	-40
maximum value	120
Default	65346
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.9.6 MB Holding Register 56, Address: h55 = deactivation temperature (inside temperature)

MB Holding Register 56, Address: h55	Deactivation temperature (inside temperature)
If this temperature is exceeded, the antiblock protection (motor heating with slowly rotating motor) is deactivated when the minimum runtime h51 Bit [15:8] has elapsed. 200 = 20.0 °C	
Access / necessary PIN protection level	RW, NV / 2
minimal value	-40
maximum value	120
Default	65386
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.10 Vibration velocity

3.10.1 MB Holding Register 61, Address: h60 = warning limit x-axis

MB Holding Register 61, Address: h60	Warning limit X-axis: mm/s
Value of the 1st order. 2 decimal places 500 = 5.00 mm/s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0.00
maximum value	655.35
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.10.2 MB Holding Register 62, Address: h61 = warning limit Y-axis

MB Holding Register 62, Address: h61	Warning limit Y-axis: mm/s
Value of the 1st order. 2 decimal places 500 = 5.00 mm/s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0.00
maximum value	655.35
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.10.3 MB Holding Register 63, Address: h62 = warning limit Z-axis

MB Holding Register 63, Address: h62	Warning limit Z-axis: mm/s
Value of the 1st order. 2 decimal places 500 = 5.00 mm/s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0.00
maximum value	655.35
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.10.4 MB Holding Register 64, Address: h63 = delay time warning X-axis

MB Holding Register 64, Address: h63	Delay time warning X-axis
Delay time until a warning is issued if the vibration velocity is too high. Time in s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	15
Bit [15:0]	Decimal value 0 - 65535

3.10.5 MB Holding Register 65, Address: h64 = delay time warning Y-axis

MB Holding Register 65, Address: h64	Delay time warning Y-axis
Delay time until a warning is issued if the vibration velocity is too high. Time in s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	15
Bit [15:0]	Decimal value 0 - 65535

3.10.6 MB Holding Register 66, Address: h65 = delay time warning Z-axis

MB Holding Register 66, Address: h65	Delay time warning Z-axis
Delay time until a warning is issued if the vibration velocity is too high. Time in s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	15
Bit [15:0]	Decimal value 0 - 65535

3.10.7 MB Holding Register 67, Address: h66 = failure limit X-axis

MB Holding Register 67, Address: h66	Error limit X-axis: mm/s
Value of the 1st order. 2 decimal places 500 = 5.00 mm/s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0.00
maximum value	655.35
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.10.8 MB Holding Register 68, Address: h67 = failure limit Y-axis

MB Holding Register 68, Address: h67	Error limit Y-axis: mm/s
Value of the 1st order. 2 decimal places 500 = 5.00 mm/s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0.00
maximum value	655.35
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.10.9 MB Holding Register 69, Address: h68 = failure limit Z-axis

MB Holding Register 69, Address: h68	Error limit Z-axis: mm/s
Value of the 1st order. 2 decimal places 500 = 5.00 mm/s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0.00
maximum value	655.35
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.10.10 MB Holding Register 70, Address: h69 = delay time failure X-axis

MB Holding Register 70, Address: h69	Delay time warning X-axis
Delay time until a failure indication is issued if the vibration velocity is too high. Time in s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	15
Bit [15:0]	Decimal value 0 - 65535

3.10.11 MB Holding Register 71, Address: h70 = delay time failure Y-axis

MB Holding Register 71, Address: h70	Delay time failure Y-axis
Delay time until a failure indication is issued if the vibration velocity is too high. Time in s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	15
Bit [15:0]	Decimal value 0 - 65535

3.10.12 MB Holding Register 72, Address: h71 = delay time failure Z-axis

MB Holding Register 72, Address: h71	Delay time failure Z-axis
Delay time until a failure indication is issued if the vibration velocity is too high. Time in s	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	15
Bit [15:0]	Decimal value 0 - 65535

3.11 Air flow

3.11.1 MB Holding Register 81, Address: h80 = maximum volume flow

MB Holding Register 81, Address: h80	maximum volume flow
This value is 100 % default	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.11.2 MB Holding Register 85, Address: h84 = volume flow adjustment

MB Holding Register 85, Address: h84	maximum volume flow
Adjustment of the measured sensor value	
Access / necessary PIN protection level	RW, NV / 2
minimal value	-32767
maximum value	32767
Default	0
Bit [15:0]	Decimal value 0 - 65535

3.12 Lifetime

3.12.1 MB Holding Register 82, Address: h81 = warning limit lifetime

MB Holding Register 82, Address: h81	Warning limit
If the service life falls below the limit value, an error message is output. Unit hours [h] h81 = 0: Warning deactivated; h81 > 0: Warning activated	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	0
Bit [15:0]	0: deactivated

3.12.2 MB Holding Register 83, Address: h82 = failure limit lifetime

MB Holding Register 83, Address: h82	Failure limit
If the service life falls below the limit value, an failure message is output. Unit hours [h] h82 = 0: Warning deactivated; h82 > 0: Warning activated	
Access / necessary PIN protection level	RW, NV / 2
minimal value	0
maximum value	65535
Default	0
Bit [15:0]	0: deactivated

3.13 Info, monitoring and diagnostic

3.13.1 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	0.00
maximum value	655.35
Bit [15:0]	Decimal value 0 - 65535

3.13.2 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 [15:0]	Product Code of the device (Hex) MSB Family, LSB Variante ECblue 116/152 2nd generation = 0x0101

3.13.3 MB Input Register 3, Address: i2 = Parameterset ID

MB Input Register 3, Address: i2	Parameterset ID
Display of parameterset ID	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.13.4 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

3.13.5 MB Input Register 10, Address: i9 = Parameterset index

MB Input Register 10, Address: i9	Parameterset Index
Display of parameterset index	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.13.6 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
Bit [14]	1: Reverse active
Bit [13]	1: Temp. alarm inside
Bit [12]	1: Temp. alarm IGBT
Bit [11]	1: DC-link overvoltage
Bit [10]	1: K1 status
Bit [9]	1: E1 digital status
Bit [8]	1: D1 state
Bit [7]	1: DC Current limit
Bit [6]	1: Field weakening
Bit [5]	1: Fire alarm
Bit [4]	1: Wrong direction of rotation
Bit [3]	1: Internal system error
Bit [2]	1: IGBT FAULT CHECK
Bit [1]	1: Temperature management
Bit [0]	1: STOP

3.13.7 MB Input Register 12, Address: i11 = Operation condition 2

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.Bit13] User Application System Failure 3. [i11.Bit12] Warnung Schwingungswerte 4. [i11.Bit14] Motorcontrol System Failure 5. [i11.Bit8] Limit 6. [i11.Bit9] Direction 7. [i11.Bit11] Lifetime
Bit [15]	Functional Safety - Warning Reason 0: unknown / 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 plausibility 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 Reason 3: parameter set lifetime failure
Bit [12]	Warning vibration values Reason 0: unknown Reason 1: X-axis Reason 2: Y-axis Reason 3: X-axis + Y-axis Reason 4: Z-axis Reason 5: X-axis + Z-axis Reason 6: Y-axis + Z-axis Reason 7: X-axis + Y-axis + Z-axis
Bit [11]	Warning Lifetime
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.

3.13.8 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 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 Reason = 0
Bit [11]	1: Sinefilter (only Fcontrol) Reason = 0  temperature fault
Bit [10]	1: PEAK CURRENT Reason 1: Max. Peak Reason 2: I ² t
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 Reason 1: Uin too low
Bit [4]	1: UIN HI 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

3.13.9 MB Input register 14, address: i13: failure status 2

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.Bit13] User Application System Failure 3. [i12.Bit12] Error vibration values 4. [i13.Bit14] Motorcontrol System Failure 5. [i12.Bit7] TB 6. [i12.Bit0] IGBT FAULT 7. [i12.Bit1] SHORTCUT EARTH 8. [i12.Bit13] Temperature Error 9. [i12.Bit9] MOTOR BLOCKIERT 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 23. [i11.Bit11] Error lifetime

Bit [15]	Functional Safety - Fail Safe Mode Reason 0: unknown / 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 plausibility 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 Reason 3: Parametersatz lifetime failure
Bit [12]	Warning vibration values Reason 0: unknown Reason 1: X-axis Reason 2: Y-axis Reason 3: X-axis + Y-axis Reason 4: Z-axis Reason 5: X-axis + Z-axis Reason 6: Y-axis + Z-axis Reason 7: X-axis + Y-axis + Z-axis
Bit [11]	Warning Lifetime
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.

3.13.10 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

3.13.11 MB Input Register 16, Address: i15 = Motorcurrent

MB Input Register 16, Address: i15		Motorcurrent: A
Display motor current		
Access		R
minimal value		0.00
maximum value		655.35
Bit [15:0]		Decimal value 0 - 65535 (in 0.01 A steps)

3.13.12 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)

3.13.13 MB Input Register 22, Adresse: 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)

3.13.14 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		-50
maximum value		150
Bit [15:0]		Decimal value 0 - 65535 (in 0.1 °C steps)

3.13.15 MB Input Register 24, Adresse: i23 = inside temperature

MB Input Register 24, Address: i23	inside Temperature: °C
Display ambient temperature of electronics inside housing 200 = 20.0°C	
Access	R
minimal value	-50
maximum value	150
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.13.16 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	-50
maximum value	150
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

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

MB Input Register 27, Address: i26	E1 Input
Display of connected voltage at analog 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)

3.13.18 MB Input Register 28, Address: i27 = Modulation

MB Input Register 28, Address: i27	Control
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)

3.13.19 MB Input register 30, address: i29 = MSW Event

[MSW = most significant word]

MB Input register 30, address: i29	MSW Event
Event log entry according to Register error status (i13). Selection of entry 1 - 10 by entering command code 7500 - 7509.	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Error status

3.13.20 MB Input register 31, address: i30 = LSW Event

[LSW = least significant word]

MB Input Register 31, Address: i30	LSW 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

3.13.21 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

3.13.22 MB Input Register 33, Address: i32 = power factor

MB Input Register 33, Address: i32	Power factor
Cos(Phi) at inverter output	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	0 - 65535

3.13.23 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 watts	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535 (in 1 W steps)

3.13.24 MB Input register 39, address: i38 = LSW operation time

MB Input Register 39, Address: i38	LSW operation time
LSW of the operating hours counter	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.13.25 MB Input register 40, address: i39 = MSW operation time

MB Input Register 40, Address: i39	MSW operation time
MSW of the operating hours counter	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.13.26 MB Input Register 41, Address: i40 = reactor temperature

MB Input Register 41, Address: i40	Temperature reactor
Temperature at the input reactor (200 = 20.0 °C)	
Access	R
minimal value	-50
maximum value	150
Bit [15:0]	Decimal value 0 - 65535 (in 0.1 °C steps)

3.13.27 MB Input Register 43, Address: i42 = LSW air flow

MB Input Register 43, Address: i42	LSW air flow
LSW of the calculated air flow	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.13.28 MB Input Register 44, Address: i43 = MSW air flow

MB Input Register 44, Address: i43	MSW air flow
MSW of the calculated air flow	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65535

3.13.29 MB Input Register 46, Address: i45 = Motor voltage

MB Input Register 46, Address: i45	Motor voltage
Effective motor voltage 2000 = 200.0 V	
Access	R
minimal value	0.0
maximum value	6553.5
Bit [15:0]	Decimal value 0 - 6553.6

3.13.30 MB Input Register 48, Address: i47 = Motorcurrent phase U

MB Input Register 48, Address: i47	Motor current phase U
Maximum value of the current in phase U 2000 = 2.00 A	
Access	R
minimal value	0.00
maximum value	655.36
Bit [15:0]	Decimal value 0 - 65536

3.13.31 MB Input Register 49, Address: i48 = Motorcurrent phase V

MB Input Register 49, Address: i48	Motor current phase V
Maximum value of the current in phase V 2000 = 2.00 A	
Access	R
minimal value	0.00
maximum value	655.36
Bit [15:0]	Decimal value 0 - 65536

3.13.32 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	

3.13.33 MB Input Register 51, Address: i50 = Remaining lifetime

MB Input Register 51, Address: i50	Remaining lifetime
Remaining lifetime in hours	
Access	R
minimal value	0
maximum value	65535
Bit [15:0]	Decimal value 0 - 65536

3.13.34 MB Input Register 56, Address: i55 = Motor installation position

MB Input Register 56, Address: i55	Motor installation position
Installation position of the motor: 0 = vertical installation (motor shaft horizontal); 1 = horizontal installation (motor shaft vertical)	
Access	R
minimal value	0
maximum value	1
Bit [15:0]	Decimal value 0 - 65536

3.13.35 MB Input Register 60, Address: i59 = vibration velocity X-axis [1st order]

MB Input Register 60, Address: i59	Vibration velocity X-axis [1st order]
Vibration velocity in direction of the X-axis of the motor (1st order): mm/s*100	
Access	R
minimal value	0
maximum value	655.35
Bit [15:0]	Decimal value 0 - 65535

3.13.36 MB Input Register 61, Address: i60 = vibration velocity Y-axis [1.st order]

MB Input Register 61, Address: i60	Vibration velocity Y-axis [1.st order]
Vibration velocity in direction of the Y-axis of the motor (1.st order): mm/s*100	
Access	R
minimal value	0
maximum value	655.35
Bit [15:0]	Decimal value 0 - 65535

3.13.37 MB Input Register 62, Address: i61 = vibration velocity Z-axis [1.st order]

MB Input Register 62, Address: i61	Vibration velocity Z-axis [1.st order]
Vibration velocity in direction of the Z-axis of the motor (1.st order): mm/s*100	
Access	R
minimal value	0
maximum value	655.35
Bit [15:0]	Decimal value 0 - 65535

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 is not recognised, there is an emergency scenario "MODBUS Recovery Function (MRF)".

Emergency scenario (MODBUS Recovery Function):

- If more than 15 faulty messages (e.g. CRC error) or messages with the slave address 255 are received, the DUT automatically switches to the default communication parameter 19200 Bd / 8E1 and slave address 254.
- In the case of an unknown or wrong baud rate, the switchover to default values already takes place after 15 characters.
- Communication with the DUT can now take place via the slave address 254. If there are several DUTs on the bus, only broadcast commands (slave address 0) can be sent.
- The DUT does not respond to the address 255. The emergency scenario can be restarted following a reset (PIN input, power reset).

Recommended sequence for the emergency scenario

(A) Individual devices or devices which can be switched on and off individually:

1. Connect test tool (MODBUS Master), e.g. MODBUS Poll, to the bus.
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. Switch on DUT.
4. If the DUT recognises more than 15 MODBUS requests from the master on address 255, it switches to emergency operation⁽¹⁾ and automatically loads the default settings.
Default settings:
 - Baudrate: 19200⁽²⁾
 - Parity: 8E1
 - Device address: 254 (MODBUS Recovery Function active)
5. If the slave address on MODBUS master is set to 254, all registers can be read out and set in the DUT.
6. In the corresponding Holding Register, set the address / baud rate / parity.
7. Perform a reset, e.g. switch power supply off and on again.
8. DUT can now be re-addressed with the values set under 6), values can be read and written.

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

(B) Several devices in the network which cannot be switched on and off individually:⁽²⁾

1. Connect test tool (MODBUS Master), e.g. MODBUS Poll, to the bus.
2. Switch on DUT.
3. Set MODBUS master to default values 19,200 bps and 8E1 and initiate request to fan with address **255**. Poll interval typically 500 ms.
4. If the DUT recognises more than 15 MODBUS requests from the master on address 255, it switches to the MODBUS Recovery Function and automatically loads the default settings.
Default settings:
 - Baudrate: 19200⁽²⁾
 - Parity: 8E1
 - Device address: 254 (MODBUS Recovery Function active)
5. Adjust the interface settings of the "DUT" and the MODBUS slave address via a broadcast command. **All DUTs have the same address e.g. 247 and the same communication parameters!**
6. Perform a reset, e.g. switch power supply off and on again.
7. Perform auto-addressing. The DUTs can now be addressed using the previously configured values. After successful auto-installation,⁽²⁾ the values of the DUTs can be read and written directly.

(1)

In the case of an unknown or wrong baud rate, the switchover to default values already takes place after 15 characters!

(2)

This scenario is only useful if the devices support the ZIEHL-ABEGG auto-addressing!

5 Enclosure

5.1 Manufacturer reference

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:

ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
phone: +49 (0) 7940 16-0

info@ziehl-abegg.de
<http://www.ziehl-abegg.com>