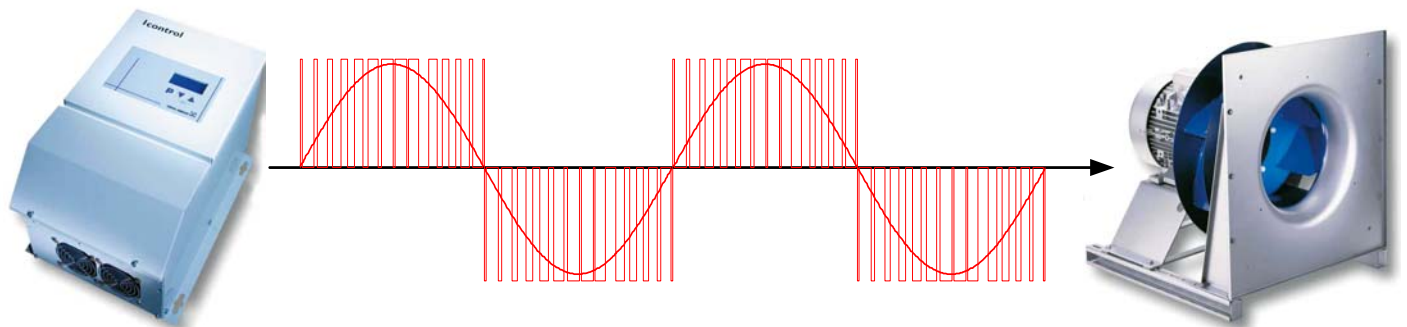
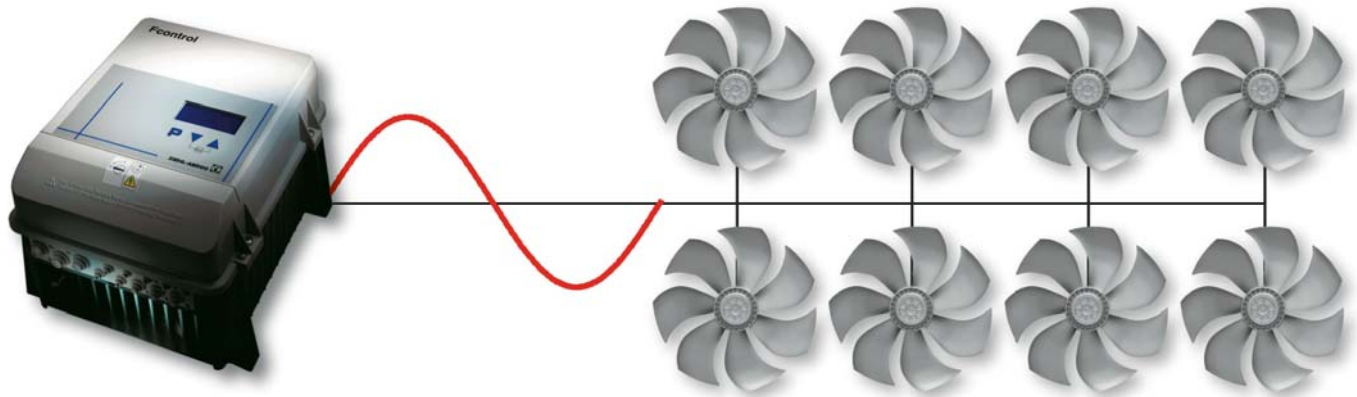


MODBUS-RTU description for Fcontrol and Icontrol from Version 2.12 Version 1.1



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History of change:

Date	abbreviation	description
10.04.04	knj	Revised version for equipment families E/Fcontrol and the like
17.05.05	knj	Revision for I/Fcontrol starting from version 2.12
08.03.12	sd	Actualization
12.03.12	knj	Actualization for Firmware 2.35 up to 2.37

MODBUS-RTU description for Fcontrol / Icontrol

1. Introduction

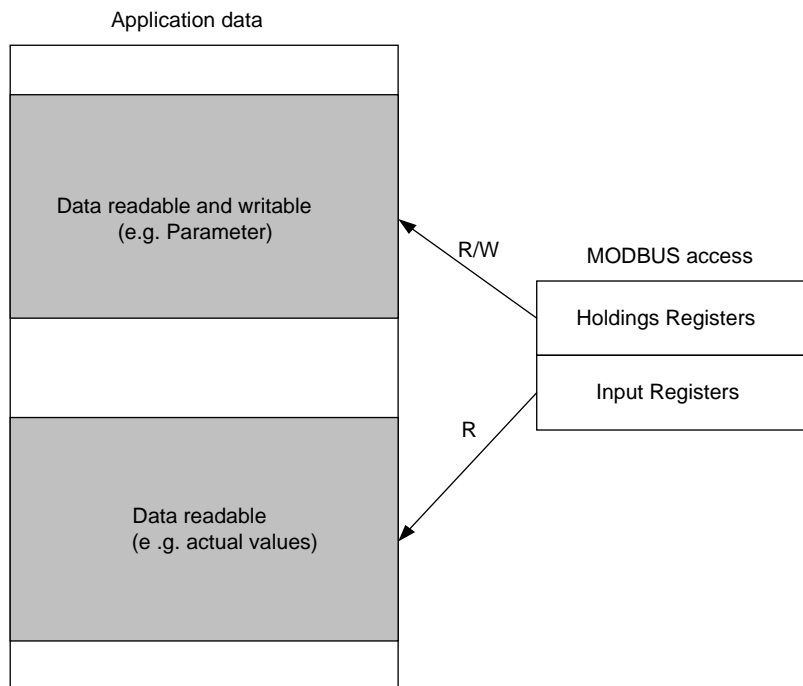
The ZIEHL-ABEGG Icontrol / Fcontrol (FXDM) device family is supplied factory equipped with an RS-485 interface (D+, D-, GND). Using this interface, the device can be controlled and configured via the MODBUS-RTU protocol. The MODBUS-RTU protocol implementation of the device complies with the standards described in the Modbus Application Protocol Specification 1.1. Not all of the function codes included there are implemented in the device. The device supports essentially all functions available for the Holding and Input Register.

2. Data model and access facilities

The device's application data are organized in such a manner that access to it with the MODBUS function for 16-bit registers is possible. Data points that have a smaller word width internally are expanded to 16-bits; data points that have a larger word width are distributed across 2 registers. The device does not support bit-oriented data points. MODBUS access to application data is thus carried out with the MODBUS functions for register:

- Read Input Register (function code 4)
- Read Holding Register (function code 3)
- Write Single Register (function code 6)
- Write Multiple Register (function code 16)

The application data are placed entirely in the Holding Register or Input Register sector, starting with MODBUS register 1. If the register sector is exceeded, an exception message is issued!



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3. Description of the Input Register (actual value)

Register	Name	description
1	Frequency (output)	500 corresponds 50.0 Hz
2	Controlling actual value	2740 corresponds 0, decimal place depending on measuring range
3	Controlling setpoint	2740 corresponds 0, decimal place depending on measuring range
4	Measuring value Sensor1	depending on measuring range
5	Measuring value Sensor2	depending on measuring range
6	Setpoint 1	
7	Setpoint 2	
8	Default relativ	100 corresponds 100%
9	modulation relativ	0...100 corresponds 0...100%
10	Manual operation	0 = OFF, 1 = ON
11	Min speed cut off	0 = OFF, 1 = ON
12	Error code	See following error code list
13	Version of program	110 entspricht 1.10
14	E1 (Temperature sensor)	2740 corresponds 0.0 °C , 2940 corresponds 20.0 °C
15	E2 Temperature sensor)	2740 entspricht 0.0 °C , 2940 corresponds 20.0 °C
16	E1 (current input)	0- 2000, 2000 corresponds 20.00mA
17	E2 (current input)	0- 2000, 2000 corresponds 20.00mA
18	E1 (voltage input)	0-1000, 1000 corresponds 10.00 V
19	E2 (voltage input)	0-1000, 1000 corresponds 10.00 V
20	E3 (voltage input)	0-1000, 1000 corresponds 10.00 V (ZModulB)
21	D1 status	0 = closed 1 = open
22	D2 status	0 = closed 1 = open
23	D3 status	0 = closed 1 = open (ZModulB)
24	D4 status	0 = closed 1 = open (ZModulB)
25	D5 status	0 = closed 1 = open (ZModulB)
26	K1 status	0 = OFF 1 = ON
27	K2 status	0 = OFF 1 = ON
28	K3 status	0 = OFF 1 = ON (ZModulB)
29	K4 status	0 = OFF 1 = ON (ZModulB)
30	Temp. heatsink	2740 corresponds 0.0 °C , 2940 corresponds 20.0 °C
31	Temp. DC-choke	For internal use
32	Temp. ELKO	For internal use
33	DC voltage	For internal use
34	Motorcurrent	For internal use
35	And following	For internal use

MODBUS-RTU description for Fcontrol / Icontrol

Error codes

Code	description
128	No error
129	General error
131	Motor fault (TK)
132	Motor blocked
133	Heat sink overtemperature
134	Ground fault
135	HALL-IC fault
136	Over current
137	Line fault
138	Line interruption heat-sink sensor
139	DC- reservoir voltage to high
140	Wrong direction of rotation
141	Temperature lowering
142	Wrong connection
143	External fault (digital error input)
144	Factory setting was loaded
145	EEP error
146	RTC fault general
147	RTC voltage fault
148	Filter alarm (contamination)
149	
150	Transfer error / Bus fault general
151	Data connection line fault
152	Data connection check sum fault
160	Sensor fault input 1
161	Sensor fault input 2
162	Sensor fault input 3

MODBUS-RTU description for Fcontrol / Icontrol

4. Description of Holding Register (Parameter)

Register	Name	description
1		Do not use
2		Do not use
3		Do not use
4		Do not use
5	Menu language	0=D, 1=GB, 2=F, 3 = SE, 4= I
6	Reset instruction	1= controller reset!
7	Setpoint 1.1	2740 corresponds 0, range depending on resolution (Modus)
8	Setpoint 1.2	2740 corresponds 0, range depending on resolution (Modus)
9	Control range 1	2740 corresponds 0, range depending on resolution (Modus)
10	Setpoint 2.1	2740 corresponds 0, range depending on resolution (Modus)
11	Setpoint 2.2	2740 corresponds 0, range depending on resolution (Modus)
12	Control range 2	2740 corresponds 0, range depending on resolution (Modus)
13	Setting internal 1	speed
14	Setting internal 2	speed
15	Minimum 1	speed
16	Maximum 1	speed
17	Minimum 2	speed
18	Maximum 2	speed
19	Manual setting	0-100%
20	Manual setting mode	0/1 = ON / OFF
21	Setting external mode	0/1 = ON / OFF
22	Mode	0 = 1.01, following depending on table see manual
23	Controller type	0 = P, 1 = PID
24	Reverse control function 1	0/1 = ON / OFF
25	Reverse control function 2	0/1 = ON / OFF
26	Minimum speed cut off	0/1 = ON / OFF
27	Function Ext- Setpoint	Do not use
28	Value limitaion	0-100%
29	Motor cosphi	Only Ucontrol, 100 = 1.00
30	Pin protection	0/1 = ON / OFF
31	Setting protection	0/1 = ON / OFF
32	Dummy	Do not use
33	Dummy	Do not use
34	KP	0-200%
35	KI	0-200%
36	KD	0-200%
37	TI	0-200%
38	Sensoralarm	0/1 = ON / OFF
39	SA Temperatur band	2740 corresponds 0, 0,1K
40	SA Start temperature	2740 corresponds 0, 0,1°C
41	SA Minimal pressure	2740 corresponds 0, range depending on resolution (Mode)
42	Sensor unit 1	Do not use, setting at the controller

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Register	Name	description
43	Fixed point1	Do not use, setting at the controller
44	Sensormin 1	Do not use, setting at the controller
45	Sensormax 1	Do not use, setting at the controller
46	Sensoroffset 1	Do not use, setting at the controller
47	K Factor 1	Do not use, setting at the controller
48	refrigerantl 1	Do not use, setting at the controller
49	Setpoint min.1	Do not use, setting at the controller
50	Setpoint max. 1	Do not use, setting at the controller
51	Sensor unit 2	Do not use, setting at the controller
52	Fixed point 2	Do not use, setting at the controller
53	Sensor min 2	Do not use, setting at the controller
54	Sensor max 2	Do not use, setting at the controller
55	Sensor offset 2	Do not use, setting at the controller
56	K Factor 2	Do not use, setting at the controller
57	refrigerant 2	Do not use, setting at the controller
58	setpoint min.2	Do not use, setting at the controller
59	setpoint max. 2	Do not use, setting at the controller
60	Assignment A1	Do not use, setting at the controller
61	Assignment A2	Do not use, setting at the controller
62	Assignment K1	Do not use, setting at the controller
63	Assignment K2	Do not use, setting at the controller
64	Assignment K3	Do not use, setting at the controller
65	Assignment K4	Do not use, setting at the controller
66	Assignment D1	Do not use, setting at the controller
67	Assignment D2	Do not use, setting at the controller
68	Assignment D3	Do not use, setting at the controller
69	Assignment D4	Do not use, setting at the controller
70	Assignment D5	Do not use, setting at the controller
71	Assignment E2	Do not use, setting at the controller
72	Assignment E3	Do not use, setting at the controller
73	Zuordnung M	Do not use, setting at the controller
74	E1 Mode	Do not use, setting at the controller
75	E2 Mode	Do not use, setting at the controller
76	A1 Min	0,1V, 0-100
77	A1 Max.	0,1V, 0-100
78	A2 Min	0,1V, 0-100
79	A2 Max.	0,1V, 0-100
80	Limit modulation function	0 = OFF, 1=Message only, 2=activate Alarm
81	Limit modulation Minimum	0-100 = 0-100%
82	Limit modulation Maximum	0-100 = 0-100%
83	Limit modulation delay	2 corresponds 2 sec
84	Limit E1 function	0 = OFF, 1=Message only, 2=activate Alarm
85	limit E1 Min	Depending on sensor setting 1

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Register	Name	description
86	limit E1 Max	Depending on sensor setting 1
87	Limit E1 Hyst.	Depending on sensor setting 1
88	limit E1 delay	2 corresponds 2 sec
89	limit E2 Function	0 = OFF, 1=Message only, 2= activate Alarm
90	limit E2 Min	Depending on sensor setting 2
91	limit E2 Max	Depending on sensor setting 2
92	limit E2 Hyst.	Depending on sensor setting 2
93	limit E2 delay	2 corresponds 2 sec
94	limit Offset Function	0 = OFF, 1=Message only, 2= activate Alarm
95	limit Offset 1	Do not use, setting at the controller
96	limit Offset 2	Do not use, setting at the controller
97	limit Offset Hyst	Do not use, setting at the controller
98	limit Offset Verzögerung	Do not use, setting at the controller
99	Suppression Mode 1	1 = ON
100	Suppression Start 1	0-100%
101	Suppression End 1	0-100%
102	Suppression Mode 2	1 = ON
103	Suppression Start 2	0-100%
104	Suppression End2	0-100%
105	Suppression Mode 3	1 = ON
106	Suppression Start 3	0-100%
107	Suppression End 3	0-100%
108	Dummy	Do not use
109	Alarmmask	For internal use
110	Inverting K1	1 = inverse
111	Inverting K2	1 = inverse
112	Inverting D1	1 = inverse
113	Inverting D2	1 = inverse
114	Inverting E1	1 = inverse
115	Inverting E2	1 = inverse
116	Inverting A1	1 = inverse
117	InvertingK3	1 = inverse
118	Inverting K4	1 = inverse
119	InvertingD3	1 = inverse
120	Inverting D4	1 = inverse
121	Inverting D5	1 = inverse
122	InvertingE3	1 = inverse
123	Inverting A2	1 = inverse
124	Group 2 value ON	0-100%
125	Group 2 Minimum	0-100%
126	Do not use	
127	Bus address	1-247, factory setting 247
128	Ambient pressure	For future use

MODBUS-RTU description for Fcontrol / Icontrol

Register	Name	description
129	Derating Alarm Level	0-100%
130	COM Baud rate	0=4800, 1=9600, 2=19200, 3=38400
131	COM Mode	0=8N1, 1=8E1, 2=8O1
132	Write protection Bus address	1 = OFF, 0 = ON
133	D1 Busmode	0/1 OFF / ON
134	D2 Busmode	0/1 OFF / ON
135	Rampup time	Value in seconds 40 = 40sec
136	Rampdown time	Value in seconds 40 = 40sec
137	Edge frequency	0.1 Hz Steps 500 = 50.0 Hz
138	Maximal frequency	Speed. Attention change affects on other parameters
139	Start voltage	1% Steps 100 = 100 %
140	Maximal voltgae	1% Steps 100 = 100 %
141	U/F type	0 = linear, 1 = quadratic
142	Switching frequency	0.1 kHz seps 160 = 16.0 kHz
143	Do not use	
144	Constant frequency (special mode)	0.1 Hz Steps 500 = 50.0 Hz
145	Sync. Frequency (internal)	0.1 Hz Steps 500 = 50.0 Hz
145	Sync. frequency	0.1 Hz Steps 500 = 50.0 Hz
146	Switch off frequency	0.1 Hz Steps 500 = 50.0 Hz
147	Motor rated voltage	1V Steps 400 = 400 V (for Icontrol)
148	Motor rated current	0.1 A Steps 60 = 6.0 A (for Icontrol)
149	Direction of rotation	0= left on rotor, 1 = right on rotor (for Icontrol)
150	DC brake mode	0 = OFF, 1 = brake before motor start (for Icontrol)
151	DC brake time	1 sec Steps 10 = 10 seconds (for Icontrol)
152	DC brake level	1% Steps, 5 = 5% (for Icontrol)
153	Current limit	1% Steps, 120 = 120 % (e.g. for Icontrol)
154 (Ver 2.35)	Boost value	1% Steps, 0-250%, 150 = 150% (-> Motor Setup)
155 (Ver 2.35)	Quench mode	0/1 OFF/ON -> Motor Setup)
156 (Ver 2.35)	Motor On/Off	0/1 OFF/ON (-> Start)
157 (Ver 2.35)	Disable Discharge	0/1 OFF/ON -> Motor Setup)
158 (Ver 2.36)	Overmodulation	0/1 OFF/ON (-> Motor Setup)
159 (Ver 2.37)	Number of Steps	0-5 (-> Mode 1.02 Base Setup)
160 (Ver 2.37)	Selection Step Mode 1.02	0 up to number of steps (-> Mode 1.02 Settings)
161 (Ver 2.37)	Step value 1 Mode 1.02	0.1 Hz Steps 500 = 50.0 Hz (-> Mode 1.02 Base Setup)
162 (Ver 2.37)	Step value 2 Mode 1.02	0.1 Hz Steps 500 = 50.0 Hz (-> Mode 1.02 Base Setup)
163 (Ver 2.37)	Step value 3 Mode 1.02	0.1 Hz Steps 500 = 50.0 Hz (-> Mode 1.02 Base Setup)
164 (Ver 2.37)	Step value 4 Mode 1.02	0.1 Hz Steps 500 = 50.0 Hz (-> Mode 1.02 Base Setup)
165 (Ver 2.37)	Step value 5 Mode 1.02	0.1 Hz Steps 500 = 50.0 Hz (-> Mode 1.02 Base Setup)
166 (Ver 2.37)	Group 2: Switch off value	1% Steps , 50 = 50% (-> Controller Setup)
167 (Ver 2.37)	Group 3: Switch on value	1% Steps , 50 = 50% (-> Controller Setup)
168 (Ver 2.37)	Group 3: Switch off value	1% Steps , 50 = 50% (-> Controller Setup)
169 (Ver 2.37)	Group 4: Switch on value	1% Steps , 50 = 50% (-> Controller Setup)
170 (Ver 2.37)	Group 4: Switch off value	1% Steps , 50 = 50% (-> Controller Setup)

MODBUS-RTU description for Fcontrol / Icontrol

Register	Name	description
171 (Ver 2.37)	Group 3: Minimum G1	1% Steps , 50 = 50% (-> Controller Setup)
172 (Ver 2.37)	Group 4: Minimum G1	1% Steps , 50 = 50% (-> Controller Setup)
173 (Ver 2.37)	E1minimum	1% Steps , 50 = 50% (-> Controller Setup)
174 (Ver 2.37)	E1 maximum	1% Steps , 50 = 50% (-> Controller Setup)
175 (Ver 2.37)	E2 minimum	1% Steps , 50 = 50% (-> Controller Setup)
176 (Ver 2.37)	E2 maximum	1% Steps , 50 = 50% (-> Controller Setup)
177 (Ver 2.37)	E1 Min.-Max. Mode	0-2 (-> IO Setup)
178 (Ver 2.37)	E2 Min.-Max. Mode	0-2 (-> IO Setup)

MODBUS-RTU description for Fcontrol / Icontrol

4. Setting the bus addresses

The easiest way to modify the bus address is via the menu. There is a menu item in the „IO Setup“ menu group to do this. The address is factory programmed to the highest possible MODBUS address (247).

Holding Register 127 contains the current address. It can also be modified via this register. Afterwards, the master must naturally also modify its target address to be able to continue to communicate with this device.

The write-protect register 132 = 1 and/or J1 must be set to „Unlock“ to be able to modify the address.

5. Modifying the communications parameters

The communications parameters are factory set to 19200 baud, 8 data bits, 1 stop bit, even parity (preferred parameter according to the MODBUS specification). In devices starting from the 1.06 program version, the parameters can be modified under the „Internal“ menu group or via the Hold. Registers 130 and 131. Of course, when modifying the register, temporary communications problems can occur.

The „Internal“ menu group is hidden. Activate by entering PIN code „4653“ in the „Start – PIN“ menu group.

6. Control via a bus system

It is possible to control the device via MODBUS. For this purpose, there are MODBUS variables that take over the function of the analogue inputs. The MODBUS variable more or less replaces the analogue inputs at the lowest level. In order for the function of an analogue input to be taken over by the related MODBUS variable, the input on the device must be configured for this.

Analog Inputs:

Holding Register	Value range	Function like
9001	0-10V, 0-20mA = 0 - 32767	E1 (if E1 input = „Bus“)
9002	0-10V, 0-20mA = 0 - 32767	E2 (if E2 input = „Bus“)

Digitale Inputs:

Coil Register	Value range	Function like
1	0/1 (OFF/ON)	D1 (if D1 Busmodus = ON)
2	0/1 (OFF/ON)	D2 (if D2 Busmodus = ON)

The functions behind E1, E2, D1, D2... correspond to the configuration/selection in the device.

If an input in the bus mode is used, the corresponding analogue input is „switched off“. The programming is not designed to additionally use this input for other purposes. However, the analogue value of the input can be queried via the corresponding Input Register and used for „bus purposes“.