DRC61_ModbusProtocol

Insulation monitoring device for ungrounded DC circuits in EV charging stations

Modbus protocol

Modbus measured values registers (read only)

Register	Function	Channel description (last two bytes)
1000-1003	Insulation measurement	71 = no fault 1 = alarm or fault 102 = PE disconnection
1004-1007	Reserved	
1008-1011	Under / over voltage	76 = no fault 77 = undervoltage 78 = overvoltage
1012-1015	Not implemented	
1016-1019	Voltage PE to L+	76 = no fault
1020-1023	Voltage PE to L-	76 = no fault
1024-1027	Not implemented	
1028-1031	Not implemented	
1032-1035	Device status	1022 = Measured value update counter 115 = Device error

Measured values register configuration

The measured values registers are configured as shown below (register 1000-1003 is shown as an example).

1000		**1001**		**1002**		**1003**	
High byte	**Low byte**	**High byte**	**Low byte**	**High byte**	**Low byte**	**High byte**	**Low byte**
Measured value				Alarm type and test (AT&T)	Range and unit (R&U)	Channel description	

Measured value (4 bytes)

Values are in floating point format according to IEEE 754 (S = sign, E = exponent, M = mantissa):

WORD	**0x0000**															
BYTE	**High byte**								**Low byte**							
BIT	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	S	E	E	E	E	E	E	E	E	M	M	M	M	M	M	M

WORD	**0x0001**															
BYTE	**High byte**								**Low byte**							
BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

Alarm type and test (AT&T) byte

Bit	Description	7	6	5	4	3	2	1	0
Alarm type	No fault	X	X	X	X	X	0	0	0
	Alarm	X	X	X	X	X	0	0	1
	Device error	0	0	X	X	X	0	1	0
	Reserved	X	X	X	X	X	0	1	1
	Warning	X	X	X	X	X	1	0	0
	Fault	X	X	X	X	X	1	0	1
	Reserved	X	X	X	X	X	1	1	0
	Reserved	X	X	X	X	X	1	1	1
Test	No test	0	0	X	X	X	X	X	X
	Internal test	0	1	X	X	X	X	X	X
	External test	1	0	X	X	X	X	X	X

Range and Unit (R&U) byte

Bit	Description	7	6	5	4	3	2	1	0
Unit	Invalid	-	-	-	0	0	0	0	0
	No unit	-	-	-	0	0	0	0	1
	Ω	-	-	-	0	0	0	1	0
	A	-	-	-	0	0	0	1	1
	V	-	-	-	0	0	1	0	0
	%	-	-	-	0	0	1	0	1
	Hz	-	-	-	0	0	1	1	0
	Baud	-	-	-	0	0	1	1	1
	F	-	-	-	0	1	0	0	0
	H	-	-	-	0	1	0	0	1
	°C	-	-	-	0	1	0	1	0
	°F	-	-	-	0	0	0	1	1
	Second	-	-	-	0	1	1	0	0
	Minute	-	-	-	0	1	1	0	1
	Hour	-	-	-	0	1	1	1	0
	Day	-	-	-	0	1	1	1	1
	Month	-	-	-	1	0	0	0	0

Bit	Description	7	6	5	4	3	2	1	0
Range of validity	Actual value			X	X	X	X	X	X
	Value is lower			X	X	X	X	X	X
	Value is higher			X	X	X	X	X	X
	Invalid value			X	X	X	X	X	X

Channel description (2 bytes)

Value (dec)	Measured value description	Comments
0		
1	Insulation fault	
71	Insulation fault	Insulation resistance R_F in Ω
76	Voltage	Measured value in V
77	Undervoltage	
78	Overvoltage	
101	System connection	
012	PE disconnection	
115	Device error	
129	Device error	
145	Own address	

Modbus parameter registers

RO = read only, WO = write only, RW = read / write

Register	R/W	Description	Format	Unit	Value range
999	RO	Number of Modbus measured value registers with alarm or fault	UINT16	---	0..3
3000	RO	Test status	UINT16	---	0 = None 1 = Self Test 2 = Relay
3001-3004	RW	Reserved	---	---	---
3005	RW	Insulation resistance pre-alarm value (R_{an2})	UINT16	kΩ	R_{an1}…500
3006	RW	Reserved	---	---	---
3007	RW	Insulation resistance Alarm value (R_{an1})	UINT16	kΩ	1…R_{an2}
3008	RW	Undervoltage detection enabled / disabled	UINT16	---	0=disabled 1=enabled Default = 0
3009	RW	Undervoltage detection level “U<”	UINT16	V	30…U>

Register	R/W	Description	Format	Unit	Value range
3010	RW	Overvoltage detection enabled / disabled	UINT16	---	0=disabled 1=enabled Default = 0
3011	RW	Overvoltage detection level “U>”	UINT16	V	U< … 1150
3012	RW	Unit latches on fault condition	UINT16	---	0=disabled 1=enabled Default = 0
3013	RW	Operating mode of RLY1	UINT16	---	0=N.O 1=N.C (default = 1)
3014	RW	Operating mode of RLY2	UINT16	---	0=N.O 1=N.C (default = 1)
3015	RW	Bus address	UINT16	---	0..247 (0=Broa-adcast) Default = 3
3016	RW	Baud rate	UINT16	---	1=1.2k 2=2.4k 3=4.8k 4=9.6k (default) 5=19.2k 6=38.4k 7=57.6k 8=115.2k
3017	RW	Parity	UINT16	---	0=8N1 (default) 1=8O1 2=8E1 3=8N2
3018	RW	Startup delay “t” during service start	UINT16	S	0..10 (default = 0)
3019	RW	Response delay “ton” for relays 1 & 2	UINT16	S	0..99 (default = 0)
3020	RW	Delay on release “toff” for relays 1 & 2	UINT16	S	0..99 (default = 0)
3021	RW	Repetition period for automatic self-test	UINT16	S	0=OFF (default) 1=1h 2=24h

Register	R/W	Description	Format	Unit	Value range
3022	RW	Reserved	---	---	---
3023	RW	Monitoring mode	UINT16	---	0=CCS/DC 1=CHAdeMO 1 2= CHAdeMO 2
3026	RW	Request stop mode	UINT16	---	0=Stop 1=Enable
3027	RW	Function assignment for RLY1	UINT16	---	Bit 15...Bit 0 (default = 0x0004)
3028	RW		UINT16	---	Bit 15...Bit 0 (default = 0x0010)
8003	WO	Factory setting for all parameters, including Modbus communication parameter	UINT16	---	0x6661 “fa”
8004	WO	Factory setting for user parameters only (no communication parameter change)	UINT16	---	0x4653 “FS”
8005	WO	Start device test	UINT16	---	0x5445 “TE”
8006	WO	Clear all alarm and fault indications	UINT16	---	0x434C “CL”
8010	RW	Lock / unlock			Set anti-tamper lock. 0xAA55 = lock Writing to following 3 registers sets passcode 0x1122 = unlock request Following 3 registers must form correct passcode to unlock settings.
8011	WO	Passcode digit 1	UINT16		0-9
8012	WO	Passcode digit 2	UINT16		0-9

Register	R/W	Description	Format	Unit	Value range
8013	WO	Passcode digit 3	UINT16		Writing this register will activate the lock if locking requested in register 10000. If unlocking requested, and passcode is correct then device will be unlocked.
9800-9809	RO	Device name:	UINT16 - ASCII		
9820	RO	Software ID number	UINT16	---	
9821	RO	Software version #	UINT16	---	
9822	RO	Software version: year	UINT16	---	
9823	RO	Software version: month	UINT16	---	
9824	RO	Software version: day	UINT16	---	
9825	RO	Modbus driver version	UINT16	---	

Relay function assignments

Bit	Indication	Description
0	Reserved	0 when read
1	All LEDs flashing	Device error / PE connection failure
2	Yellow and green LEDs ON	PE/L+ insulation resistance < R_{an2}
3	Yellow and green LEDs ON	PE/L- Insulation resistance < R_{an2}
4	All LEDs ON	PE/L+ insulation resistance < R_{an1}
5	All LEDs ON	PE/L- insulation resistance < R_{an1}
6	Green LED ON, yellow LED flashing	Undervoltage warning
7	Green LED ON, red LED flashing	Overvoltage warning
8	All LEDs ON	Manually started self-test
9	-	-
10	Reserved	0 when read
11	Reserved	0 when read
12	Reserved	0 when read
13	Reserved	0 when read
14	Reserved	0 when read
15	Reserved	0 when read