ANG96

Multifunction Power Meter

Modbus-RTU

ANG96 Modbus Communication Protocol

The standard transmission rate is 9600 Bps, 8 bits, no parity, and one stop bit. Other speeds are possible, programming the device, from 1200 to 19200 Bps.

1. Read-write command:

Assume the meter address is 01, start address is 0002 and the three-register's data as bellow

(ANG96 register all as 2-digit unit)

Address	Data
0002	000A
0004	020B
0006	125C

1.1 Function code 03H or 04H (Read register)

Main machine sent	Number of bytes	For example
Identity number	1	01 send to assistant machine 01
Command code	1	03 or 04 read register
Data address	2H.L	00 start address is 0002
		02
Number of registers to be read	2H.L	00 read 3pcs register
		03 (total 6 bytes)
CRC code of main machine	2L.H	A4 CRC code L
		0B CRC code H

Assistant machine's answer	Number of bytes	For example
Identity number	1	01 data send to main machine
Command code	1	03 or 04 read register
Number of bytes sent	1	06 3 register 6 bytes
Variable value	2H.L	00 data of address 0002
		0A
Variable value	2H.L	02 data of address 0004
		0B
Variable value	2H.L	12 data of address 0006
		5C
CRC code of main machine	2L.H	C5 CRC code of assistant machine
		97

Data of assistant machine register can not change.

If check is not right or address invalid, then send wrong answer:

Assistant machine send wrong answer	Number of bytes	For example
Identity number	1	01
Command code	1	83 or 84 function code highest code 1
keep original data	2H.L	00 data part is not changed
		02
	2H.L	00
		03
assistant machine calculate CRC code again	2L.H	A5 CRC code below 8 bits
		D5 CRC code up 8 bits

1.2 Functional code 06H (write single register)

Main machine sent	Number of bytes	For example
Identity number	1	01 send to 01 of assistant machine
Command code	1	06 write single register
start address	2H.L	00 start address is 0002
		02
data save	2H.L	00 data save 0002
		02
CRC code of main machine	2L.H	A9 CRC code below 8 bits
		CB CRC code up 8 bits

Assistant machine send right answer	Number of bytes	For example
Identity number	1	01 send data to main machine
Command code	1	06 write single register
start address	2H.L	00 start address 0002
		02
data save	2H.L	00 save data 0002
		02
CRC code of assistant machine	2L.H	A9 CRC code below 8 bits
		CB CRC code up 8 bits

Assistant machine answers correctly and carries out, and then its register 0002 will save The update information from main machine. Data in 0002 register of assistant machine will be below:

Address	Data
0002	0002
0004	020B
0006	125C

If checks wrong or the address is invalid, then assistant machine will give wrong answer.

Assistant machine send wrong answer	Number of bytes	For example
Identity number	1	01
Command code	1	86 function code highest code 1
	2H.L	00 data part is not changed
		02
	2H.L	00
assistant machine calculate CRC		02
code again	2L.H	A8 CRC code below 8 bits
		15 CRC code up 8 bits

1.3 Function code 10H (write data to continuation register)

Main machine send	Number of bytes	For example	
Identity number	1	01	send to 01 of assistant machine
Command code	1	10	save continuation register
start address	2H.L	00	start address 0002
		02	
Number of registers	2H.L	00	save three registers
		03	
Number of bytes sent	1	06	6 bytes
	2H.L	00	save to data address 0002
data 1		64	
	2H.L	23	save to data address 0004
data 2		04	
	2H.L	55	save to data address 0006
data 3		66	
	2L.H	C3	CRC code L
CRC code of main machine		BD	CRC code H

Assistant machine send right answer	Number of bytes	For example	
Identity number	1	01	send data to main machine
Command code	1	10	save continuation register successful
start address	2H.L	00	start address 0002
		02	
save data	2H.L	00	Save three continuation registers
		03	(6 bytes)
CRC code of assistant	2L.H	21	CRC code below 8 bits
		C8	CRC code up 8 bits

Assistant machine answers command correctly, then data will be changed into below table:

Address	Data
0002	0064
0004	2304
0006	5566

If CRC checks error or the address is invalid, assistant machine gives error answer:

Assistant machine send error answer	Number of bytes	For example	
Identity number	1	01	
Command code	1	90	function code highest position 1
start address	2H.L	00	data part is not change
		02	
Number of registers	2H.L	00	
		03	
number of bytes	1	06	
data 1	2H.L	00	
		64	
data 2	2H.L	23	
		04	
data 3	2H.L	55	
		66	
assistant machine re-calculate CRC code	2L.H	C1	CRC code below 8 bits
		C3	CRC code up 8 bits

2. Data format

2.1 32-bit float format

32-bit float type data follows IEEE-754 format. Byte sequence of data adopts big-end mode which means low byte is after high byte.

Float type data of three phase voltages are shown in the following list.

Address (Dec)	Data (Hex)	Description
0000	435C-8000	V1 = 0x435C8000 = 220.5V
0018	4360-4CCD	V2 = 0x43604CCD = 224.3V
0038	435E-B333	V3 = 0x435EB333 = 222.7V

2.2 16-bit integer format

16-bit integer type data adopts two's complement storage mode. Byte sequence of data adopts big-endian mode which means low byte is after high byte.

Int data of three phase voltages harmonic are shown in the following list.

Address (Dec)	Data (Hex)	Description
0215	00DC	Sec. PT = 0x00DC = 220 V
0218	13EC	TCP_Port= 0x13EC = 5100

2.3 32-bit long integer format

32-bit integer type data adopts binary type storage mode. Byte sequence of data adopts big-end mode which means low byte is after high byte.

Long data of energy accumulation time are shown in the following list.

Address (Dec)	Data (Hex)	Description
0084	0020-152A	Hour meter-EP+ = 32 hours, 21 minutes, 42 seconds.
0086	0000-371F	Hour meter-EP- = 0 Hours, 55 min, 31 s

2.4 32-bit float format in JBUS mode

32-bit float type data follows IEEE-754 format.

The registers are transmitted LSR (Least Significant Register) first.

Float type data of three phase voltages are shown in the following list.

Address (Dec)	Data (Hex)	Description
0000	8000-435C	V1 = 0x435C8000 = 220.5V
0018	4CCD-4360	V2 = 0x43604CCD = 224.3V
0038	B333-435E	V3 = 0x435EB333 = 222.7V

2.5 32-bit long integer in JBUS mode

32-bit integer type data are transmitted with LSR (Least Significant Register) first.

Long data of energy accumulation time are shown in the following list.

Address (Dec)	Data (Hex)	Description
0084	152A-0020	Hour meter-EP+ = 32 hours, 21 minutes, 42 seconds.
0086	371F-0000	Hour meter-EP- = 0 Hours, 55 min, 31 s

3 Address table

3.1 Addresses for instantaneous variables.

Address	Format	Description	Unit	R/W
0000	FLOAT	Voltage (L1-to-Neutral) (U1)	V	R
0002	FLOAT	Voltage (L3-to-L1) (U31)	V	R
0004	FLOAT	Current L1 (I1)	A	R
0006	FLOAT	THD% Current L1 (I1%)	%	R
0008	FLOAT	THD% Voltage (L1-to-Neutral) (U1%)	%	R
0010	FLOAT	Active Power L1 (P1)	KW	R
0012	FLOAT	Power factor (COSΦ) L1 (Pf1)	---	R
0014	FLOAT	Reactive Power L1 (Q1)	Kvar	R
0016	FLOAT	Apparent Power L1 (S1)	KVA	R
0018	FLOAT	Voltage (L2-to-Neutral) (U2)	V	R
0020	FLOAT	Voltage (L1-to-L2) (U12)	V	R
0022	FLOAT	Current L2 (I2)	A	R
0024	FLOAT	THD% Current L2 (I2%)	%	R
0026	FLOAT	THD% Voltage (L2-to-Neutral) (U2%)	%	R
0028	FLOAT	Active Power L2 (P2)	KW	R
0030	FLOAT	Power factor (COSΦ) L2 (Pf2)	---	R
0032	FLOAT	Reactive Power L2 (Q2)	Kvar	R
0034	FLOAT	Apparent Power L2 (S2)	KVA	R
0036	FLOAT	Voltage (L3-to-Neutral) (U3)	V	R
0038	FLOAT	Voltage (L2-to-L3) (U23)	V	R
0040	FLOAT	Current L3 (I3)	A	R
0042	FLOAT	THD% Current L3 (I3%)	%	R
0044	FLOAT	THD% Voltage (L3-to-Neutral) (U3%)	%	R
0046	FLOAT	Active Power L3 (P3)	KW	R
0048	FLOAT	Power factor(COSΦ) L3 (Pf3)	---	R
0050	FLOAT	Reactive Power L3 (Q3)	Kvar	R
0052	FLOAT	Apparent Power L3 (S3)	KVA	R
0054	FLOAT	Neutral current (In)	A	R
0056	FLOAT	Frequency (F)	Hz	R
0058	FLOAT	Power factor (COSΦ) Total (Pft)	----	R
0060	FLOAT	Apparent Power total (St)	KVA	R
0062	FLOAT	Active Power total(Pt)	KW	R
0064	FLOAT	Reactive Power total (Qt)	Kvar	R
0066	FLOAT	Import Active Energy (Consumed)	kWh	R
0068	FLOAT	Export Active Energy (Generated)	kWh	R
0070	FLOAT	Reactive Energy. Inductive (L)	kvarh	R
0072	FLOAT	Reactive Energy. Capacitive (C)	kvarh	R
0074	FLOAT	Generator Mode. Import Active Energy (Consumed)	kWh	R
0076	FLOAT	Generator Mode. Export Active Energy (Generated)	kWh	R

0078	FLOAT	Generator Mode. Reactive Energy. Inductive (L)	kvarh	R
0080	FLOAT	Generator Mode. Reactive Energy. Capacitive (C)	kvarh	R
0082	LONG	Import Active Energy Time Counter. FIRST WORD: HOURS. SECOND WORD: MINUTES + SECONDS		R
0084	LONG	Export Active Energy Time Counter. FIRST WORD: HOURS. SECOND WORD: MINUTES + SECONDS		R
0086	LONG	Generator Mode. Import Active Energy Time Counter. FIRST WORD: HOURS. SECOND WORD: MINUTES + SECONDS		R
0088	LONG	Generator Model. Export Active Energy Time Counter. FIRST WORD: HOURS. SECOND WORD: MINUTES + SECONDS		R

3.2. Addresses for Maximum Demand

Address	Format	Description	Unit	R/W
0100	FLOAT	Current L1. (I1e). Previous period end value.	A	R
0102	FLOAT	Current L1. (I1m). Maximum Value.	A	R
0104	FLOAT	Current L2. (I2e). Previous period end value.	A	R
0106	FLOAT	Current L2. (I2m). Maximum Value.	A	R
0108	FLOAT	Current L3. (I3e). Previous period end value.	A	R
0110	FLOAT	Current L3. (I3m). Maximum Value.	A	R
0112	FLOAT	Pt Previous period Imported (Pe+).	KW	R
0114	FLOAT	Pt Previous period Exported (Pe-).	KW	R
0116	FLOAT	Pt Maximum value Imported (Pm+)	KW	R
0118	FLOAT	Pt Maximum value Exported (Pm-)	KW	R
0120	FLOAT	Qt Previous period Inductive (Qe+).	Kvar	R
0122	FLOAT	Qt Previous period capacitive (Qe-).	Kvar	R
0124	FLOAT	Qt Maximum value Inductive (Qm+).	Kvar	R
0126	FLOAT	Qt Maximum value Capacitive (Qm-).	Kvar	R
0128	FLOAT	St Previous period (Se).	KVA	R
0130	FLOAT	St Maximum value (Sm).	KVA	R

3.3. Addresses for Maximum & Minimum variables

Address	Format	Description	Unit	R/W
0132	FLOAT	Current L1 MAX (I1max)	A	R
0134	FLOAT	Current L1 MIN (I1min)	A	R
0136	FLOAT	Current L2 MAX (I2max)	A	R
0138	FLOAT	Current L2 MIN (I2min)	A	R
0140	FLOAT	Current L3 MAX (I3max)	A	R
0142	FLOAT	Current L3 MIN (I3min)	A	R
0144	FLOAT	Active Power L1 MAX (P1max)	kW	R
0146	FLOAT	Active Power L1 MIN (P1min)	kW	R
0148	FLOAT	Active Power L2 MAX (P2max)	kW	R
0150	FLOAT	Active Power L2 MIN (P2min)	kW	R
0152	FLOAT	Active Power L3 MAX (P3max)	kW	R
0154	FLOAT	Active Power L3 MIN (P3min)	kW	R
0156	FLOAT	Active Power Total MAX(Ptmax)	kW	R
0158	FLOAT	Active Power Total MIN(Ptmin)	kW	R
0160	FLOAT	Reactive Power Total MAX (Qtmax)	kvar	R
0162	FLOAT	Reactive Power Total MIN (Qtmin)	kvar	R
0164	FLOAT	Apparent Power Total MAX (Stmax)	kVA	R
0166	FLOAT	Apparent Power Total MIN (Stmin)	kVA	R
0168	FLOAT	Power factor (COSΦ) MAX (Pftmax)	-----	R
0170	FLOAT	Power factor (COSΦ) MIN (Pftmin)	-----	R
0172	FLOAT	Frequency MAX (Fmax)	Hz	R
0174	FLOAT	Frequency Min (Fmin)	Hz	R
0176	FLOAT	Voltage(L1-to-Neutral) MAX(U1max)	V	R
0178	FLOAT	Voltage(L1-to-Neutral) MIN(U1min)	V	R
0180	FLOAT	Voltage(L2-to-Neutral) MAX(U2max)	V	R
0182	FLOAT	Voltage(L2-to-Neutral) MIN(U2min)	V	R
0184	FLOAT	Voltage(L3-to-Neutral) MAX(U3max)	V	R
0186	FLOAT	Voltage(L3-to-Neutral) MIN(U3min)	V	R

4.- CONFIGURATION PARAMETERS

Address	Format	Description	Unit	R/W	Default
0201	INTEGER	TYPE_PROT. Format of Floats and Long Integer. JBUS = 0, MODBUS = 1.		R/W	0
0202	INTEGER	Period of Maximum Demand 1 .. 30 minutes	min.	R/W	30
0203	INTEGER	Identity code of the device. 0 .. 247		R/W	0
0204	INTEGER	Baud. 1:1200 2:2400 3:4800 4:9600 5:19200		R/W	4
0205	INTEGER	Relays out mode. 1:pulse out of Ep+/Eq+ 2:operate from PC or Key. 3:Alarms.		R/W	2
0206	INTEGER	Alarm 0 Parameter: 1:U12 2:U23 3:U31 4:I1 5:I2 6:I3 7:P1 8:P2 9:P3 10:Pt 11:Qt 12:pf 13:F.		R/W	1
0207	INTEGER	Alarm 0 Mode: 1 = > (over), 2 = < (low).		R/W	1
0208	INTEGER	The multiple of power in Alarm 0. 0:1,1:K,2:M		R/W	0
0209	INTEGER	Alarm 1 Parameter: 1:U12 2:U23 3:U31 4:I1 5:I2 6:I3 7:P1 8:P2 9:P3 10:Pt 11:Qt 12:pf 13:F		R/W	1
0210	INTEGER	Alarm 1 Mode: 1 = > (over), 2 = < (low)		R/W	1
0211	INTEGER	The multiple of power in Alarm 1. 0:1,1:K,2:M		R/W	0
0212	INTEGER	Control the two relays. ByteH/K1:01(ON)/02(OFF) ByteL/K2:01(ON)/02(OFF)		R/W	0202
0213	INTEGER	Reset Command. 0001: Reset the record of the maximum demand values 0002: Reset the record of the maximum and minimum values 0003: Reset all of the energies		W	
0214	INTEGER	Password. 0~9999		R/W	0000
0215	INTEGER	Secondary value of the PT. (1-999)	V	R/W	220
0216	INTEGER	Secondary value of the CT. (1-9)	A	R/W	5
0217	INTEGER	BackLight time. 0-255 seconds.	s	R/W	30
0218	INTEGER	TCP_Port. 0-65535		R/W	5100
0219	INTEGER	Dynamo state. 0:Normal/1:generator mode		R	
0220	INTEGER	LCD Contrast. 0 .. 9.		R/W	5
0221	LONG	Primary value of the PT. 0-999999. Default 220	V	R/W	220
0223	LONG	Primary value of the CT. 0-999999. Default 5	A	R/W	5
0225	LONG	Value of Alarm 0. 0-999999999 Ratio: Voltage: 0.1 Current: 0.001 Active/Reactive Power: 0.1 Frequency: 0.01 Hz PF: 0.001		R/W	
0227	LONG	Value of Alarm 1. 0-999999999 Voltage: 0.1 Current: 0.001 Active/Reactive Power: 0.1 Frequency: 0.01 Hz PF: 0.001		R/W	
0229	LONG	Weight of the pulses, for RL0 and RL1. 0~99999999Wh/Pulse. Default 1.		R/W	1

0231	LONG	Serial number. 0~99999999		R/W	
0233	LONG	Firmware revision. 4 bytes ASCII:0-FFFFFFFF. 0x56313031 (V101)		R	
0235	LONG	GATEWAY. xxx.xxx.xxx.xxx 192.168.2.1 (0xC0A80201)		R/W	
0237	LONG	SUBNET. xxx.xxx.xxx.xxx 255.255.255.0 (0xFFFFFF00)		R/W	
0239	LONG	IP. xxx.xxx.xxx.xxx 192.168.2.158 (0xC0A8029E)		R/W	

ALARMS CONFIGURATION. EXAMPLES.

VOLTAGE:

SETPOINT FOR ALARM 0 IS 415.3 V : Register 225 = 4153
Register 208 = 0
SETPOINT FOR ALARM 1 IS 423.9 V: Register 226 = 4239
Register 211 = 0

SETPOINT FOR ALARM 0 IS 33.2 kV: Register 225 = 332
Register 208 = 1

SETPOINT FOR ALARM 1 IS 234.7 kV: Register 226 = 2347
Register 211 = 1

CURRENT:

SETPOINT FOR ALARM 0 IS 3.498 A: Register 225 = 3498
Register 208 = 0
SETPOINT FOR ALARM 1 IS 56.29 A: Register 226 = 56290
Register 211 = 0
SETPOINT FOR ALARM 0 IS 578.2 A: Register 225 = 578200
Register 208 = 0
SETPOINT FOR ALARM 1 IS 1580.5 A: Register 226 = 1580500
Register 211 = 0

ACTIVE/REACTIVE POWER:

SETPOINT FOR ALARM 0 IS 4500 W/var: Register 225 = 45000
Register 208 = 0
SETPOINT FOR ALARM 1 IS 39.9 kW/kvar: Register 226 = 399
Register 211 = 1
SETPOINT FOR ALARM 0 IS 99.9 kW/kvar: Register 225 = 999
Register 208 = 1
SETPOINT FOR ALARM 1 IS 999.9 kW/kvar: Register 226 = 9999
Register 211 = 1
SETPOINT FOR ALARM 0 IS 999.9 MW/Mvar: Register 225 = 9999

Register 208 = 2

FREQUENCY:

SETPOINT FOR ALARM 0 IS 49.55 Hz: Register 225 = 4995
Register 208 = 0

POWER FACTOR:

SETPOINT FOR ALARM 1 IS 0.875 : Register 226 = 875
Register 211 = 0