



Modbus Protocol for eYc FCM06

APPENDIX C

Modbus register map version 2.xx

Modbus register map version V2.17

Interface mode	RS-485, asynchronous, half-duplex
Baud rate	1200, 2400, 4800, 9600 bit/s
Data format	1 start bit, 8 data bits, No parity bit and 1 or 2 stop bits (or 1 Odd Parity or Even Parity, and 1 stop bit). Can be set in the Menu items 30, 31. Default data format is 9600-8-N-1
Maximum length of data frame	1 byte address + 253 byte data + 2byte CRC = 256 Bytes

Frame structure:

Function 01: Read Coil Status

Query:

Slave address	Function	Starting address		Coils quantity		CRC	
	01H	00H	08H	00H	08H		

Response:

Slave address	Function	Byte count	Coil status	CRC	
	01H	01H			

Error:

Slave address	Function	Error code	CRC	
	81H	01H		

Exception code:

01H : Function is not supported

02H : Incorrect Starting address or Coils quantity

03H : Coils quantity is out of range of 1 – 200

04H : Failed to read coil

Function 04: Read Input Registers

Query:

Slave address	Function	Starting address		Registers quantity		CRC	
	04H						

Response:

Slave address	Function	Byte count	Data value	CRC	
	04H				

Error:

Slave address	Function	Error code	CRC	
	84H	01H		

Exception code:

01H : Function is not supported

02H : Incorrect Starting address or Registers quantity

03H : Registers quantity is out of range of 0 – 125

04H : Failed to read registers

Function 05: Write Single Coil

Query:

Slave address	Function	Coil address		Data value		CRC	
	05H						

Response:

Slave address	Function	Coil address		Data value		CRC	
	05H						

Error:

Slave address	Function	Error code	CRC	
	85H	01H		

Exception code:

01H : Function is not supported

02H : Incorrect Coil address

03H : Data value is out of range of 0x0000 – 0xFF00

04H : Failed to write single coil

Function 06: Write Single Register

Query:

Slave address	Function	Register address		Data value		CRC	
	06H						

Response:

Slave address	Function	Register address		Data value		CRC	
	06H						

Error:

Slave address	Function	Error code	CRC	
	86H	01H		

Exception code:

01H : Function is not supported

02H : Incorrect Register address

03H : Data value is out of range of 0 – 65535

04H : Failed to write single register

Function 08: Diagnostics (supports only subfunction code 00)

Query:

Slave address	Function	Subfunction		Data value		CRC	
	08H	00H	00H	xxH	xxH		

Response:

Slave address	Function	Subfunction		Data value		CRC	
	08H	00H	00H	xxH	xxH		

Error:

Slave address	Function	Error code	CRC	

	88H	01H		
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Exception code:

01H : Function or subfunction is not supported

03H : Incorrect Data value

04H : Failed to diagnose

Function 16: Write Multiple Registers

Query:

Slave address	Function	Starting address	Registers quantity	Byte count	Data value	CRC
	10H		00H 02H	04H		

Response:

Slave address	Function	Starting address	Registers quantity	CRC
	10H		00H 02H	

Error:

Slave address	Function	Error code	CRC
	90H	01H	

Exception code:

01H : Function is not supported

02H : Incorrect Starting address or Registers quantity

03H : Registers quantity (N) is out of range of 1 – 123 or Byte count is not equal to N * 2

04H : Failed to write multiple registers

Function 17: Report Slave ID

Query:

Slave address	Function	CRC
	11H	

Response:

Slave address	Function	Byte count	Slave ID	Run indicator status	Software version	CRC
	11H	06H	AOH	FFH		

Error:

Slave address	Function	Error code	CRC
	91H	01H	

Exception code:

01H : Function or subfunction is not supported

04H : Failed to fetch Slave ID

Minimal query period is 32 μ s. Recommended period is 125 μ s.

Example of queries:

Read Reverse flow total count mode

Query:

Slave address	Function	Starting address	Coils quantity	CRC
41H	01H	00H 08H	00H 08H	B2H CEH

Response:

Slave address	Function	Byte count	Coil status	CRC	
41H	01H	01H	00H	44H	48H

Error:

Slave address	Function	Error code	CRC	
41H	81H	01H	80H	44H

Result: Reverse flow is subtracted from the totalizer values

Reset totalizer (resettable)

Query:

Slave address	Function	Coil address	Data value	CRC	
41H	05H	00H 02H	FFH 00H	23H	3AH

Response:

Slave address	Function	Coil address	Data value	CRC	
41H	05H	00H 02H	FFH 00H	23H	3AH

Error:

Slave address	Function	Error code	CRC	
41H	85H	01H	82H	84H

Perform zero calibration

Query:

Slave address	Function	Coil address	Data value	CRC	
41H	05H	00H 04H	FFH 00H	C3H	3BH

Response:

Slave address	Function	Coil address	Data value	CRC	
41H	05H	00H 04H	FFH 00H	C3H	3BH

Error:

Slave address	Function	Error code	CRC	
41H	85H	01H	82H	84H

Read mass flow rate

Query:

Slave address	Function	Starting address	Registers quantity	CRC	
41H	04H	00H A7H	00H 02H	CEH	E8H

Response:

Slave address	Function	Byte count	Data value	CRC	
41H	04H	04H	43H B4H	74H	D0H

Error:

Slave address	Function	Error code	CRC	
41H	84H	01H	83H	14H

Result: mass flow rate is 360.9126 kg/s

Write mass unit of kg

Query:

Slave address	Function	Register address		Data value		CRC	
41H	06H	00H	15H	00H	01H	57H	0EH

Response:

Slave address	Function	Register address		Data value		CRC	
41H	06H	00H	15H	00H	01H	57H	0EH

Error:

Slave address	Function	Error code	CRC	
41H	86H	01H	82H	74H

Write calibration coefficient K = 1100 g/s/μs

Query:

Slave address	Function	Starting address		Registers quantity		Byte count	Data value				CRC	
41H	10H	00H	63H	00H	02H	04H	44H	89H	80H	00H	44H	89H

Response:

Slave address	Function	Starting address		Registers quantity		CRC	
41H	10H	00H	63H	00H	02H	BFH	16H

Error:

Slave address	Function	Error code	CRC	
41H	90H	01H	8CH	14H

General information

The addresses in the tables below are decimal; the starting address is 1.

For example, address 127 corresponds to hexadecimal address 0x007EH (126 decimal).

Read/Write mode: WO – write only; RO – read only; RW – read and write

Coils

Functions: Read – 01, Write – 05

Read: 0 – Off ; 1 – On

Write: 0x0000 – Off , 0xFF00 – On

Address	Mode	Description	Menu item *
0001	WO	Output emulation 1 – Start output emulation	12
0003	WO	Reset totalizer (resettable) 1 – Reset totalizer	18
0004	WO	Reset totalizer (inventory) ** 1 – Reset totalizer	–
0005	WO	Zero calibration 1 – Start zero calibration	16
0009	RW	Reverse flow total count mode 0 – Subtract from the totalizer (default) 1 – Add to the totalizer	20
0011	RW	Oil-water analyze (pure oil counting) 0 – Off (default) 1 – On	52
0013	RW	Multipoint correction 0 – Off 1 – On	81
0082	RW	Pressure compensation 0 – Off (default) 1 – On	39

* For Menu items refer to display menu structure in Figure 2.14 and menu items description in Table 2.7.

** To write in registers the switches 2-4-6-8 must be in ON position.

16-bit registers – integer values

2 bytes, high byte first

Functions: Read – 04, Write – 06

Address	Mode	Description	Menu item *
0002	RW	Menu language ** 1 – English (default) 2 – Russian	80
0003	RW	Register map version ** 1 – Gpe (default) 2 – ProLink	–
0012	RW	Current output 0 – Mass flow rate (default) 1 – Volumetric flow rate 2 – Density	27
0013	RW	Modbus Baud rate 0 – 9600 bit/s (default) 1 – 4800 bit/s 2 – 2400 bit/s 3 – 1200 bit/s	29
0014	RW	Pulse output 0 – Mass flow rate (default) 1 – Volumetric flow rate 2 – Density	25
Address	Mode	Description	Menu item *

0015	RW	Zero correction	67
0016	RW	Reserved ***	
0017	RW	Flow direction 0 – Single direction (default) 1 – Bidirectional	19
0018	RW	Mass flow rate unit 0 – g/s 1 – kg/s 2 – kg/min 3 – t/day 4 – kg/h (default) 5 – t/h	33
0019	RW	Density unit 0 – g/cm ³ (default) 1 – kg/L 2 – kg/m ³	36
0020	RW	Temperature unit 0 – °C (default) 0 – F	37
0021	RW	Volumetric flow rate unit 0 – mL/s 1 – L/s 2 – L/min 3 – m ³ /day 4 – L/h 5 – m ³ /h (default)	35
0022	RW	Mass total unit 0 – g 1 – kg 2 – t (default)	32
0023	RW	Volume total unit 0 – mL 1 – L 2 – m ³ (default)	34
0024	RW	Modbus slave address	28
0257	RO	Calculated pressure from external pressure sensor (Bar)	–
0267	RW	Coefficient of pressure compensation for flow (% / PSI)	40
0269	RW	Coefficient of pressure compensation for density (% / PSI) ***	–
0271	RW	Flow calibration pressure (Bar)	–
0273	RW	Pressure relating to 4 mA (Bar) ***	–
0275	RW	Pressure relating to 20 mA (Bar) ***	–
0451	RW	Input external pressure (Bar)	41
0521	RW	Bytes sequence in floating point 32-bit registers 0 – 0-1-2-3 (default) 1 – 2-3-0-1 2 – 1-0-3-2 3 – 3-2-1-0	75

* For Menu items refer to display menu structure in Figure 2.14 and menu items description in Table 2.7.

** To write in registers the switches 2-4-6-8 must be in ON position.

*** Reserved for future modifications.

32-bit registers – single precision floating point values complied with IEEE 754 format

4 bytes, high bytes first

Functions: Read – 04, Write – 16

For example, value “-1.5” corresponds to “0xBF 0xC0 0x00 0x00” in the order from low to high address in memory.

Address	Mode	Description	Menu item *
0100 0101	RW	Calibration coefficient (g/s/μs)	60
0102 0103	RW	Temperature correction coefficient for flow (% / 100°C)	61
0104 0105	RW	High density for density calibration (g/cm ³)	62
0106 0107	RW	Period for high density (μs)	63
0108 0109	RW	Low density for density calibration (g/cm ³)	64
0110 0111	RW	Period for low density (μs)	65
0112 0113	RW	Temperature correction coefficient for density (% / 100°C)	66
0114 0115	RW	Pulse weight	24
0116 0117	RW	Value relating to 20 mA	26
0118 0119	RW	Low flow cutoff (kg/h)	17
0120 0121	RW	Zero point (μs)	16
0122 0123	RW	Density of pure oil under standard conditions (g/cm ³)	53
0124 0125	RW	Density of pure water under standard conditions (g/cm ³)	54
0126 0127	RW	Flow compensation by percentage of gas in the oil-water	55
0128 0129	RW	Flow compensation by percentage of pure water in the oil-water	56 ***
0130 0131	RW	Correction coefficient of the temperature (for simulation mode)	76
0132 0133	RW	Zero temperature (for simulation mode)	77
0134 0135	RW	Correction coefficient of the density (for simulation mode)	78
0136 0137	RW	Zero density (for simulation mode)	79
0138 0139	RW	Time delay for point 0, D0 (μs)	84
0140 0141	RW	Time delay for point 1, D1 (μs)	
0142 0143	RW	Time delay for point 2, D2 (μs)	
0144 0145	RW	Time delay for point 3, D3 (μs)	
0146 0147	RW	Time delay for point 4, D4 (μs)	
0148 0149	RW	Time delay for point 5, D5 (μs)	
0150 0151	RW	Time delay for point 6, D6 (μs)	
0152 0153	RW	Time delay for point 7, D7 (μs)	
0154 0155	RW	Correction coefficient for point 0, K0	85
0156 0157	RW	Correction coefficient for point 1, K1	
0158 0159	RW	Correction coefficient for point 2, K2	
0160 0161	RW	Correction coefficient for point 3, K3	
0162 0163	RW	Correction coefficient for point 4, K4	
0164 0165	RW	Correction coefficient for point 5, K5	
0166 0167	RW	Correction coefficient for point 6, K6	
Address	Mode	Description	Menu item *
0168 0169	RO	Mass flow rate (kg/h)	1
0170 0171	RO	Density (g/cm ³)	3
0172 0173	RO	Temperature (°C)	3
0174 0175	RO	Volumetric flow rate (L/s)	2

0176 0177	RO	Mass total (kg)	1
0178 0179	RO	Volume total (L)	2
0180 0181	RO	Current value on the current output (mA)	71
0182 0183	RO	Frequency of the signal on the pulse output (Hz)	71
0184 0185	RO	Measuring tubes oscillation frequency (Hz)	68
0186 0187	RO	Left coil voltage (mV)	69
0188 0189	RO	Right coil voltage (mV)	69
0190 0191	RO	Drive coil load (%)	69
0202 0203	RO	Internal temperature	70

* For Menu items refer to display menu structure in Figure 2.14 and menu items description in Table 2.7.

*** Reserved for future modifications.

APPENDIX D

Modbus register map version 3.xx (ProLink)

Modbus register map version V3.02

General information

The addresses in the tables below are decimal; the starting address is 1.

For example, address 127 corresponds to hexadecimal address 0x007EH (126 decimal).

Read/Write mode: WO – write only; RO – read only; RW – read and write

Coils

Functions: Read – 01, Write – 05

Read: 0 – Off ; 1 – On

Write: 0x0000 – Off , 0xFF00 – On

Address	Mode	Description	Menu item *
0002	RW	Start / Stop totalizers 0 – Stop totalizers 1 – Start totalizers	–
0003	RW	Reset totalizers (resettable) 0 – Abort 1 – Reset totalizers	18
0004	RW	Reset totalizers (inventory) ** 0 – Abort 1 – Reset totalizers	–
0005	RW	Zero calibration 0 – Abort 1 – Start zero calibration	16
0056	RW	Reset mass totalizer (resettable) 0 – Abort 1 – Reset mass totalizer	–
0057	RW	Reset volume totalizer (resettable) 0 – Abort 1 – Reset volume totalizer	–
0082	RW	Pressure compensation 0 – Off (default) 1 – On	39

* For Menu items refer to display menu structure in Figure 2.14 and menu items description in Table 2.7.

** To write in registers the switches 2-4-6-8 must be in ON position.

16-bit registers – integer values

2 bytes, high byte first

Functions: Read – 04, Write – 06

Address	Mode	Description	Menu item *
0003	WO	Register map version ** 1 – GPE (default) 2 – ProLink	74
0016	RO	Transmitter software version - Format XXX.X	–
0039	RW	Mass flow rate unit 70 – g/s 73 – kg/s 74 – kg/min 77 – t/day 75 – kg/h (default) 78 – t/h	33
Address	Mode	Description	Menu item *

0040	RW	Density unit 91 – g/cm ³ (default) 96 – kg/L 92 – kg/m ³	36
0041	RW	Temperature unit 32 – °C (default) 33 – F	37
0042	RW	Volumetric flow rate unit 0 – mL/s 24 – L/s 17 – L/min 29 – m ³ /day 138 – L/h (default) 19 – m ³ /h	35
0044	RO	Pressure unit 0 – MPa 7 – Bar (default) 12 – kPa	–
0045	RW	Mass total unit 60 – g 61 – kg (default) 62 – t	32
0046	RW	Volume total unit 0 – mL 41 – L (default) 43 – m ³	34
0120	RO	Device type code 40 – Core Processor 21/41/42 – RFT9739/1700A/2700A	–
0125	RO	Alarms code	–
0126	RO	Alarms code	–
0136	RO	Zero calibration time (s)	–
0313	RW	Modbus slave address	28
0419	RO	Alarms code	–
0420	RO	Alarms code	–
0421	RO	Alarms code	–
0422	RO	Alarms code	–
0423	RO	Alarms code	–
0424	RO	Alarms code	–
0521	RW	Bytes sequence in floating point 32-bit registers 0 – 0-1-2-3 (default) 1 – 2-3-0-1 2 – 1-0-3-2 3 – 3-2-1-0	75
1138	RO	Output signals 0 – None 1 – Current + Pulse + RS485 (default) 2 – Fieldbus (H1) or Profibus-PA	–
1166	RO	Output channel A type 0 – Current (primary) (default) 1 – Pulse 2 – Digital 3 – Current (secondary) 4 – Discrete output 5 – Discrete input	–
Address	Mode	Description	Menu item *
1167	RO	Output channel B type 0 – Current (primary) (default) 1 – Pulse 2 – Digital 3 – Current (secondary)	–

		4 – Discrete output 5 – Discrete input	
1168	RO	Output channel C type 0 – Current (primary) (default) 1 – Pulse 2 – Digital 3 – Current (secondary) 4 – Discrete output 5 – Discrete input	–

* For Menu items refer to display menu structure in Figure 2.14 and menu items description in Table 2.7.

** To write in registers the switches 2-4-6-8 must be in ON position.

32-bit registers – single precision floating point values complied with IEEE 754 format

4 bytes, high bytes first

Functions: Read – 04, Write – 16

For example, value “-1.5” corresponds to “0xBF 0xC0 0x00 0x00” in the order from low to high address in memory.

Address	Mode	Description	Menu item *
0149 0150	RW	Low density cutoff (g/cm ³)	–
0155 0156	RW	Low density for density calibration (g/cm ³)	64
0157 0158	RW	High density for density calibration (g/cm ³)	62
0159 0160	RW	Period for low density (μs)	65
0161 0162	RW	Period for high density (μs)	63
0163 0164	RW	Temperature correction coefficient for density (% / 100°C)	66
0189 0190	RW	Flow rate averaging time from 0.5 to 10 s in steps of 0.05 s	49
0191 0192	RW	Temperature averaging time (s) ***	–
0193 0194	RW	Density averaging time from 0.5 to 30 s in steps of 0.05 s	50
0195 0196	RW	Low mass flow cutoff (kg/h)	17
0197 0198	RW	Low volume flow cutoff (L/h)	75
0199 0200	RW	Upper limit of density range (g/cm ³)	58
0201 0203	RW	Lower limit of density range (g/cm ³)	59
0231 0232	RO	Zero point standard deviation (μs)	–
0233 0234	RO	Zero point (μs)	16
0247 0248	RO	Mass flow rate	1
0249 0250	RO	Density	3
0251 0252	RO	Temperature	3
0253 0254	RO	Volumetric flow rate	2
0257 0258	RO	Calculated pressure from external pressure sensor (kgf/cm ²) ***	73
Address	Mode	Description	Menu item *
0259 0260	RO	Mass totalizer (resettable)	1
0261 0262	RO	Volume totalizer (resettable)	2
0263 0264	RO	Mass totalizer (inventory)	21
0265 0266	RO	Volume totalizer (inventory)	22
0267 0268	RW	Coefficient of pressure compensation for flow (% / PSI)	40

0269 0270	RW	Coefficient of pressure compensation for density (% / PSI) ***	–
0271 0272	RW	Flow calibration pressure (kgf/cm ²)	73
0273 0274	RW	Pressure relating to 4 mA (kgf/cm ²) ***	42
0275 0276	RW	Pressure relating to 20 mA (kgf/cm ²) ***	43
0285 0286	RO	Measuring tubes oscillation frequency (Hz)	68
0287 0288	RO	Left coil voltage (mV)	69
0289 0290	RO	Right coil voltage (mV)	69
0291 0292	RO	Drive coil load (%)	69
0293 0294	RO	Live mass flow rate (zero point not counted) (kg/h)	–
0451 0452	RW	Input external pressure (kgf/cm ²)	41
		ASCII registers	
0072, 0073, 0074	RW	Calibration coefficient (g/s/μs) Format: XXXXXX Example: "23.350", K=23.35 g/s/μs	40
0075, 0076	RW	Temperature correction coefficient for flow Kt (%/100°C) Format: XXXX Example: "5.00", Kt=5.0 %/100°C	61

* For Menu items refer to display menu structure in Figure 2.14 and menu items description in Table 2.7.

*** Reserved for future modifications.