



DAE Instrument Corp.

DEM 電表

基本通訊

(Basic Communication)

Modbus 通信協定

Revision 1.3c

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Register Table

Function Code	位置 Address	字元大小 Size	Modscan	說明 Description	數值範圍 Range	單位 Unit
3, 16	0	2 words	03:0001	電度 Total Energy	0~9,999,999	0.01 kWh
3, special*	48	1 word	n.a.	設備通信地址 Device Address	1~254	---
3, special*	55	1 word	n.a.	通信速率 Baud Rate	0 = 9600, 1 = 4800, 2 = 2400, 3 = 1200	---

備註：

- n.a. 表示不支援
- 寫入通信地址與通信速率需依照說明下指令。

一、讀取電度 Read Total Energy

格式 Format

輸入 Input

- 電表地址範圍 DEM Address = 1~254

問 Query

電表地址 DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1~254	3	0	0	0	2	ZL	ZH

回 Reply

DEM Address	Function Code	Byte Count	Read Word 1		Read Word 2		CRC	
			high EP-1	low EP-2	high EP-3	low EP-4	low ZL	high ZH
1~254	3	4	EP-1	EP-2	EP-3	EP-4	ZL	ZH

運算方法 Output

- 總累積電度值 Total Energy = (EP-3 x 16,777,216 + EP-4 x 65,536 + EP-1 x 256 + EP-2) x 0.01 kWh

讀取電度範例範例 Example

輸入 Input

- 電表地址 DEM Address = 1

問 Query

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1	3	0	0	0	2	196	11

回 Reply

DEM Address	Function Code	Byte Count	Read Word 1		Read Word 2		CRC	
			high EP-1	low EP-2	high EP-3	low EP-4	low	high
1	3	4	81	173	0	39	59	52

運算結果 Output

- 總累積電度值 = (0 x 16,777,216 + 39 x 65,536 + 81 x 256 + 173) x 0.01 kWh = 25768.13 度

二、寫入電度 Write Total Energy

格式 Format

輸入 Input

- 電表地址範圍 DEM Address = 1~254
- 可寫入電度範圍 Total Energy = 0.00~99,999.99 kWh

問 Query

- EP-3 = (Total Energy / 0.01 kWh) div 16,777,216
- EP-4 = ((Total Energy / 0.01 kWh) mod 16,777,216) div 65,536
- EP-1 = ((Total Energy / 0.01 kWh) mod 65,536) div 256
- EP-2 = (Total Energy / 0.01 kWh) mod 256

DEM Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		Write Data		CRC	
		high	low	high	low		high	low	high	low	low	high
1~254	16	0	0	0	2	4	EP-1	EP-2	EP-3	EP-4	ZL	ZH

回 Reply

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1~254	16	0	0	0	2	ZL	ZH

寫入電度範例 Example

輸入 Input

- 電表地址 DEM Address = 1
- 欲寫入電度 Total Energy = 37196.23 kWh

問 Query

- EP-3 = (37196.23 kWh / 0.01 kWh) div 16,777,216 = 0
- EP-4 = ((37196.23 kWh / 0.01 kWh) mod 16,777,216) div 65,536 = 56
- EP-1 = ((37196.23 kWh / 0.01 kWh) mod 65,536) div 256 = 193
- EP-2 = (37196.23 kWh / 0.01 kWh) mod 256 = 199

DEM Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		Write Data		CRC	
		high	low	high	low		EP-1	EP-2	EP-3	EP-4	low	high
1	16	0	0	0	2	4	193	199	0	56	126	124

回 Reply

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1	16	0	0	0	2	65	200

三、讀取電表地址 Read Device Address

格式 Format

輸入 Input

- 電表地址範圍 DEM Address = 1~254
- 若電表地址輸入為 255 則為廣播，用於一對一查詢地址
- 一般若非廣播則用於查詢電表群組地址

問 Query

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1~254	3	0	5	0	1	ZL	ZH

回 Reply

DEM Address	Function Code	Byte Count	Read Word		CRC	
			high	low	low	high
1~254	3	2	GRP	ADR	ZL	ZH

電表地址讀回結果 Output

- 電表群組地址範圍 Group (**GRP**) = 1~255 (預留 reserved)
- 電表通信地址範圍 Address (**ADR**) = 1~254

讀取電表地址範例 Example

輸入 Input

- 電表地址 DEM Address = 1

問 Query

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
255	3	0	5	0	1	129	213

回 Reply

DEM Address	Function Code	Byte Count	Read Word		CRC	
			High(GRP)	low (ADR)	low	high
255	3	2	1	78	16	52

電表地址讀回結果 Output

- 電表群組編號範圍 Group (**GRP**) = 1
- 電表通信地址範圍 Address (**ADR**) = 78

四、寫入電表地址 Write Device Address

格式 Format

輸入 Input

- 電表地址範圍 DEM Address = 1~254
- 欲寫入電表地址範圍 New Device Address (**NDA**) = 1~254

第一步：開放寫入地址功能

問 Query / 回 Reply (問與回相同表示已開放)

DEM Address	Function	Register Address		Write Data		CRC	
	Code	high	low	high	low	low	high
1~254	5	0	48	0	0	ZL	ZH

第二步：寫入地址

問 Query (Device Address)

DEM Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high	low	high	low		high	low	low	high
1~254	16	0	48	0	1	2	NDA	0	ZL	ZH

回 Reply (Device Address)

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1~254	16	0	48	0	1	ZL	ZH

第三步：關閉寫入地址功能

問 Query / 回 Reply (問與回相同表示已關閉)

DEM Address	Function	Register Address		Write Data		CRC	
	Code	high	low	high	low	low	high
1~254	5	0	48	255	0	ZL	ZH

寫入電表地址範例 Example

輸入 Input

- 電表通信地址 DEM Address = 1
- 欲寫入電表通信地址 New Device Address (NDA) = **95**

第一步：開放寫入地址功能

問 Query / 回 Reply (問與回相同表示已開放)

DEM Address	Function	Register Address		Write Data		CRC	
	Code	high	low	high	low	low	high
1	5	0	48	0	0	205	197

第二步：寫入地址

問 Query (Device Address)

DEM Address	Function	Register Address		Number of Registers		Byte Count	Write Data		CRC	
	Code	high	low	high	low		high (NDA)	low	low	high
1	16	0	48	0	1	2	95	0	154	80

回 Reply (Device Address)

DEM Address	Function	Register Address		Number of Registers		CRC	
	Code	high	low	high	low	low	high
1	16	0	48	0	1	1	198

第三步：關閉寫入地址功能

問 Query / 回 Reply (問與回相同表示已關閉)

DEM Address	Function	Register Address		Write Data		CRC	
	Code	high	low	high	low	low	high
1	5	0	48	255	0	140	53

五、修改通信速率 Write Baud Rate

格式 Format

Input 輸入

- 電表地址範圍 DEM Address = 1~254
- 通信速率 Baud Rate = 9600/4800/2400/1200
- 通信速率代碼 Baud Rate Index (**BRI**) = {9600 => 0, 4800 => 1, 2400 => 2, 1200 => 3}

第一步：開放寫入通信速率功能

問 Query / 回 Reply (問與回相同表示已開放)

DEM Address	Function	Register Address		Write Data		CRC	
	Code	high	low	high	low	low	high
1~254	5	0	55	0	0	ZL	ZH

第二步：寫入通信速率

問 Query (Baud Rate)

DEM Address	Function	Register Address		Number of Registers		Byte Count	Write Data		CRC	
	Code	high	low	high	low		high	low	low	high
1~254	16	0	55	0	1	2	BRI	0	ZL	ZH

回 Reply (Baud Rate)

DEM Address	Function	Register Address		Number of Registers		CRC	
	Code	high	low	high	low	low	high
1~254	16	0	55	0	1	ZL	ZH

第三步：關閉寫入通信速率

問 Query / 回 Reply (問與回相同表示已關閉)

DEM Address	Function	Register Address		Write Data		CRC	
	Code	high	low	high	low	low	high
1~254	5	0	55	255	0	ZL	ZH

修改通信速率範例 Example

- 電表地址 DEM Address = 1
- 欲寫入通信速率 Baud Rate = 1200
- 欲寫入通信速率代碼 Baud Rate Index (**BRI**) = 3

第一步：開放寫入通信速率功能

問 Query / 回 Reply (問與回相同表示已開放)

DEM Address	Function Code	Register Address		Write Data		CRC	
		high	low	high	low	low	high
1	5	0	55	0	0	124	4

第二步：寫入通信速率

問 Query (Baud Rate)

DEM Address	Function Code	Register Address		Number of Registers		Byte Count	Write Data		CRC	
		high	low	high	low		high (BRI)	low	low	high
1	16	0	55	0	1	2	3	0	162	231

回 Reply (Baud Rate)

DEM Address	Function Code	Register Address		Number of Registers		CRC	
		high	low	high	low	low	high
1	16	0	55	0	1	176	7

第三步：關閉寫入通信速率功能

問 Query / 回 Reply (問與回相同表示已關閉)

DEM Address	Function Code	Register Address		Write Data		CRC	
		high	low	high	low	low	high
1	5	0	55	255	0	61	244

CRC 計算 (CRC Computation)

定義 Defination

```
def get_crc (*byte_array)
  sum = 0xFFFF
  byte_array.each do |byte|
    sum ^= byte
    8.times do
      carry = (1 == sum & 1)
      sum = 0x7FFF & (sum >> 1)
      sum ^= 0xA001 if carry
    end
  end
  return [sum & 0xFF, sum >> 8]
end
```

使用方法 Usage

```
>> crc = get_crc(1,3,0,141,0,5)
=> [21, 226] <---- [CRC low byte, CRC high byte]
```