

# ATEK ALFA

## BFT 220 SERIES MODBUS COMMUNICATION PROTOCOL

### 1、communicational parameter

| order number | parameter     | scope                                  | explain             |
|--------------|---------------|----------------------------------------|---------------------|
| 1            | Slave Address | 1~247                                  | Initial value: 1    |
| 2            | Baud rate     | 1200/4800/9600/19200/38400/57600/11520 | Initial value: 9600 |
| 3            | data bit      | 8bit                                   | fixed               |
| 4            | stop bit      | 1bit                                   | fixed               |
| 5            | check bit     | NONE,ODD,EVEN                          | initial valueNONE   |

### 2. Communication Command

**Example:** (Slave bus address: 01H)

#### 1. Read sensor data (Function Code 03H)

The pressure unit can be configured; for the corresponding unit codes, please refer to Table 3; the temperature unit is fixed as °C.

##### (1) Read single-precision floating-point number

**Host transmission: 01 03 00 00 00 04 44 09**

| order | definition          | Byte count | explain                                          |
|-------|---------------------|------------|--------------------------------------------------|
| 0     | Slave Address       | 1          | 01 Slave address: 1                              |
| 1     | FC                  | 1          | 03 Read Sensor Data                              |
| 2~3   | start address       | 2          | 00 00 Data Address                               |
| 4~5   | Number of addresses | 2          | 00~04: The number of memory addresses read is 4. |
| 6~7   | check code          | 2          | CRCLCRCH                                         |

**Slave device correct response: 01 03 08 41 45 70 A4 41 CC 00 00EA 05**

| order | definition    | Byte count | explain                                                                                                     |
|-------|---------------|------------|-------------------------------------------------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                                                         |
| 1     | FC            | 1          | 03 Read Sensor Data                                                                                         |
| 2     | Byte count    | 1          | 08 indicates that 8 bytes of data have been received.                                                       |
| 3~6   | pressure      | 4          | 41 45 70 A4 denotes a single-precision floating-point number with a decimal value of 12.34.                 |
| 7~10  | temperature   | 4          | 41 CC 00 00 represents a single-precision floating-point number, equivalent to 25.5 °C in decimal notation. |
| 11~12 | check code    | 2          | CRCLCRCH                                                                                                    |

To read floating-point pressure or temperature data individually, you can modify the starting address and the number of addresses; the starting address for pressure values is 00 00, and the starting address for temperature values is 00 02; both the number of addresses is 02.

**Example: Querying pressure value: Host sends: 01 03 00 00 00 02 C4 0B; Slave responds: 01 03 04 41 45 70 A4 DB A1**

**Query temperature value: Host sends: 01 03 00 02 00 02 65 CB; Slave responds: 01 03 04 41 CC 00 00 2E 30**  
**Complete data addresses are provided in Table 1.**

## **2. Write slave device address, baud rate, pressure unit, or reset (Function Code 06H)**

### **(1) Write slave address (register address 0x012A):**

**Host transmitter: 01 06 01 2A 00 02 28 3F**

| order | definition    | Byte count | explain                              |
|-------|---------------|------------|--------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                  |
| 1     | FC            | 1          | 06 Pre-configure single register     |
| 2~3   | start address | 2          | 012A Slave Address – Storage Address |
| 4~5   | Data Content  | 2          | 00 02 – Write to address 012A        |
| 6~7   | check code    | 2          | CRCLCRCH                             |

**Slave device correct response: 01 06 01 2A 00 02 28 3F**

| order | definition    | Byte count | explain                                                                  |
|-------|---------------|------------|--------------------------------------------------------------------------|
| 0     | Slave Address | 1          | Upon completion of this command, the slave address will be set to 2.     |
| 1     | FC            | 1          | 06 Pre-configure single register                                         |
| 2~3   | start address | 2          | 012A Slave Address – Storage Address                                     |
| 4~5   | Data Content  | 4          | 00 02 – Address written successfully; the slave device address is now 2. |
| 6~7   | check code    | 2          | CRCLCRCH                                                                 |

**Slave device error response: 01 86 02 A2 61**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 86 indicates an error for a command with function code 06. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

Address range: 1~247

Set slave device baud rate (register address 0x012B):

**Host transmission: 01 06 01 2B 00 02 79 FF**

| order | definition    | Byte count | explain                          |
|-------|---------------|------------|----------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1              |
| 1     | FC            | 1          | 06 Pre-configure single register |
| 2~3   | start address | 2          | 01 2B baud rate storage address  |
| 4~5   | Data Content  | 2          | 00 02 – Write to address 01 2B   |
| 6~7   | check code    | 2          | CRCLCRCH                         |

**Slave device correct response: 01 06 01 2B 00 02 79 FF**

| order | definition    | Byte count | explain                                                                                           |
|-------|---------------|------------|---------------------------------------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                                               |
| 1     | FC            | 1          | 06 Pre-configure single register                                                                  |
| 2~3   | start address | 2          | 01 2B baud rate storage address                                                                   |
| 4~5   | Data Content  | 4          | 00 02 – The baud rate setting was successful; at this point, the slave machine's baud rate is 960 |
| 6~7   | check code    | 2          | CRCLCRCH                                                                                          |

**Slave device error response: 01 86 02 A2 61**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 86 indicates an error for a command with function code 06. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**(2) Write the slave check bit (register address 0x012C):**

**Host transmission: 01 06 01 2C 00 02 C8 3E**

| order | definition    | Byte count | explain                          |
|-------|---------------|------------|----------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1              |
| 1     | FC            | 1          | 06 Pre-configure single register |
| 2~3   | start address | 2          | 01 2C Check Bit Storage Address  |
| 4~5   | Data Content  | 2          | 00 02 – Write to address 01 2C   |
| 6~7   | check code    | 2          | CRCLCRCH                         |

**Slave device correct response: 01 06 01 2C 00 02 79 FF**

| order | definition    | Byte count | explain                                                                                           |
|-------|---------------|------------|---------------------------------------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                                               |
| 1     | FC            | 1          | 06 Pre-configure single register                                                                  |
| 2~3   | start address | 2          | 01 2C Check Bit Storage Address                                                                   |
| 4~5   | Data Content  | 4          | 00 02: Writing the check bit was successful; at this point, the slave device's check bit is EVEN. |
| 6~7   | check code    | 2          | CRCLCRCH                                                                                          |

**Slave device error response: 01 86 02 A2 61**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 86 indicates an error for a command with function code 06. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**(3) Pressure unit:**

**Host transmission: 01 06 00 17 00 0C 39 CB**

| order | definition    | Byte count | explain                             |
|-------|---------------|------------|-------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                 |
| 1     | FC            | 1          | 06 Pre-configure single register    |
| 2~3   | start address | 2          | 00 17 Pressure Unit Storage Address |
| 4~5   | Data Content  | 2          | Write 00 0C to address 00 17        |
| 6~7   | check code    | 2          | CRCLCRCH                            |

**Slave device correct response: 01 06 00 17 00 05 09 CD**

| order | definition    | Byte count | explain                                                                |
|-------|---------------|------------|------------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                    |
| 1     | FC            | 1          | 06 Pre-configure single register                                       |
| 2~3   | start address | 2          | 00 17 Pressure Unit Storage Address                                    |
| 4~5   | Data Content  | 4          | 00 0C – Writing pressure unit succeeded; the pressure unit is now KPa. |
| 6~7   | check code    | 2          | CRCLCRCH                                                               |

**Slave device error response: 01 86 02 A2 61**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 86 indicates an error for a command with function code 06. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**Note:** When the function code is 06, the device can respond to the Address 0 command issued by the host computer.

#### (4) Clear Stress:

**Host sends: 01 06 00 10 00 00 88 0F**

| order | definition    | Byte count | explain                                     |
|-------|---------------|------------|---------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                         |
| 1     | FC            | 1          | 06 Pre-configure single register            |
| 2~3   | start address | 2          | 00 10 Pressure Offset Value Storage Address |
| 4~5   | Data Content  | 2          | 00 00 indicates a reset operation.          |
| 6~7   | check code    | 2          | CRCLCRCH                                    |

**Slave device correct response: 01 06 00 10 00 00 88 0F**

| order | definition    | Byte count | explain                                                  |
|-------|---------------|------------|----------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                      |
| 1     | FC            | 1          | 06 Pre-configure single register                         |
| 2~3   | start address | 2          | 00 10 Pressure Offset Value Storage Address              |
| 4~5   | Data Content  | 2          | 00 00 indicates that the reset operation was successful. |
| 6~7   | check code    | 2          | CRCLCRCH                                                 |

**Slave device error response: 01 86 02 A2 61**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 86 indicates an error for a command with function code 06. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

Note: When the function code is 06, the device can respond to the Address 0 command issued by the host computer.

**3. Read slave device address, baud rate, pressure unit, and pressure offset value (Function Code 04H)****(1) Read slave address (register address 0x012A):****Host transmitter: 01 04 01 2A 00 01 11 FE**

| order | definition    | Byte count | explain                              |
|-------|---------------|------------|--------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                  |
| 1     | FC            | 1          | 04 Read Register                     |
| 2~3   | start address | 2          | 012A Slave Address – Storage Address |
| 4~5   | quantity      | 1          | 00 01                                |
| 6~7   | check code    | 2          | CRCLCRCH                             |

Slave device correct response: 01 04 02 00 01 78 F0 (This sequence consists of 7 bytes; however, the sequence in the following table is missing 6~7 bytes).

| order | definition    | Byte count | explain                              |
|-------|---------------|------------|--------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                  |
| 1     | FC            | 1          | 04 Read Register                     |
| 2     | quantity      | 1          | The byte sequence after 02 is 00 01. |
| 3~4   | quantity      | 2          | 00 01 Slave Address Bit 1            |
| 5~6   | check code    | 2          | CRCLCRCH                             |

**Slave error response: 01 84 02 C2 C1**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 84 indicates an error for a command with function code 04. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

Address range: 1~247

**(2) Read slave baud rate (register address 0x012B):**

**Host transmission: 01 04 01 2B 00 01 40 3E**

| order | definition    | Byte count | explain                                      |
|-------|---------------|------------|----------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                          |
| 1     | FC            | 1          | 04 Read Register                             |
| 2~3   | start address | 2          | 01 2B Slave Device Baud Rate Storage Address |
| 4~5   | quantity      | 1          | 00 01                                        |
| 6~7   | check code    | 2          | CRCLCRCH                                     |

**Slave device correct response: 01 04 02 00 02 38 F1**

| order | definition    | Byte count | explain                                           |
|-------|---------------|------------|---------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                               |
| 1     | FC            | 1          | 04 Read Register                                  |
| 2~3   | quantity      | 2          | 00 02 indicates a slave device baud rate of 9600. |
| 4~5   | check code    | 2          | CRCLCRCH                                          |

**Slave error response: 01 84 02 C2 C1**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 84 indicates an error for a command with function code 04. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**(2) Read the slave check bit (register address 0x012C):**

**Host sends: 01 04 01 2C 00 01 F1 FF**

| order | definition    | Byte count | explain                                     |
|-------|---------------|------------|---------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                         |
| 1     | FC            | 1          | 04 Read Register                            |
| 2~3   | start address | 2          | 01 2C Slave Device Checksum Storage Address |
| 4~5   | quantity      | 1          | 00 01                                       |
| 6~7   | check code    | 2          | CRCLCRCH                                    |

**Slave device correct response: 01 04 02 00 02 38 F1**

| order | definition    | Byte count | explain                                                     |
|-------|---------------|------------|-------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                         |
| 1     | FC            | 1          | 04 Read Register                                            |
| 2~3   | quantity      | 2          | 00 02 indicates that the slave device's parity bit is EVEN. |
| 4~5   | check code    | 2          | CRCLCRCH                                                    |

**Slave error response: 01 84 02 C2 C1**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 84 indicates an error for a command with function code 04. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**(3) Read pressure unit (register address 0x012B):**

**Host sends: 01 04 00 17 00 01 81 CE**

| order | definition    | Byte count | explain                             |
|-------|---------------|------------|-------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                 |
| 1     | FC            | 1          | 04 Read Register                    |
| 2~3   | start address | 2          | 00 17 Pressure Unit Storage Address |
| 4~5   | quantity      | 1          | 00 01                               |
| 6~7   | check code    | 2          | CRCLCRCH                            |

**Slave device correct response: 01 04 02 00 0C B9 35**

| order | definition    | Byte count | explain                                        |
|-------|---------------|------------|------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                            |
| 1     | FC            | 1          | 04 Read Register                               |
| 2~3   | quantity      | 2          | 00 0C indicates that the pressure unit is kPa. |
| 4~5   | check code    | 2          | CRCLCRCH                                       |

**Slave error response: 01 84 02 C2 C1**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 84 indicates an error for a command with function code 04. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**(4) Read the pressure offset value (register address 0x0010):****Host transmitter: 01 04 00 10 00 02 70 0E**

| order | definition    | Byte count | explain                                     |
|-------|---------------|------------|---------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                         |
| 1     | FC            | 1          | 04 Read Register                            |
| 2~3   | start address | 2          | 00 10 Pressure Offset Value Storage Address |
| 4~5   | quantity      | 1          | 00 02                                       |
| 6~7   | check code    | 2          | CRCLCRCH                                    |

**Slave device correct response: 01 04 04 3F 99 99 9A CD 84**

| order | definition            | Byte count | explain                                        |
|-------|-----------------------|------------|------------------------------------------------|
| 0     | Slave Address         | 1          | 01 Slave address: 1                            |
| 1     | FC                    | 1          | 04 Read Register                               |
| 2     | Byte count            | 1          | 04 indicates the reception of 4 bytes of data. |
| 3~6   | Pressure Offset Value | 4          | 3F 99 99 9A – Floating-point number: 1.2 kPa   |
| 7~8   | check code            | 2          | CRCLCRCH                                       |

**Slave error response: 01 84 02 C2 C1**

| order | definition    | Byte count | explain                                                             |
|-------|---------------|------------|---------------------------------------------------------------------|
| 0     | Slave Address | 1          | 01 Slave address: 1                                                 |
| 1     | FC            | 1          | The code 84 indicates an error for a command with function code 04. |
| 2     | extra-code    | 2          | 02 Fixed                                                            |
| 3~4   | check code    | 2          | CRCLCRCH                                                            |

**Sensor Data Register Address: 40001 (Factory Default)**

| name                                                                                                                                       | address | Read length | Number of bytes returned | form                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|--------------------------|-----------------------------------------------------------------------|
| Pressure or temperature primary variable<br>(floating-point number)                                                                        | 0x0000  | 0x0002      | 4                        | floating number                                                       |
| Reference temperature<br>(floating-point number °C)                                                                                        | 0x0002  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x0004  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x0006  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x0008  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x000A  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x000C  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x000E  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x0010  | 0x0002      | 4                        | floating number                                                       |
| For manufacturer's debugging purposes                                                                                                      | 0x0012  | 0x0002      | 4                        | floating number                                                       |
| Pressure (signed integer)<br>The first and second bytes represent the integer part.<br>The 3rd and 4th bytes represent the divisor factor. | 0x0014  | 0x0002      | 4                        | Signed integer<br>Actual pressure value = Integer part/Divisor factor |
| Pressure (signed integer)                                                                                                                  | 0x0016  | 0x0001      | 2                        | Signed integer<br>Actual pressure value = Signed integer / 100        |

**Table 1**

Note: The "Divisor Factor" in Table 1 can only take one of five possible values: 1, 10,100,1000, or 10000.

**Baud rate range:**

| Baud rate | definition |
|-----------|------------|
| 1200      | 00 00      |
| 4800      | 00 01      |
| 9600      | 00 02      |
| 19200     | 00 03      |
| 38400     | 00 04      |
| 57600     | 00 05      |
| 115200    | 00 06      |

**Table 2**

Checkbit range:

| check bit | definition |
|-----------|------------|
| NONE      | 00 00      |
| ODD       | 00 01      |
| EVEN      | 00 02      |

Table 3

Unit Code:

| unit               | definition(HEX) | explain                                             |
|--------------------|-----------------|-----------------------------------------------------|
| inH <sub>2</sub> O | 00 01           | 0.249082 kPa                                        |
| inHg               | 00 02           | 3.3863787 kPa                                       |
| ftH <sub>2</sub> O | 00 03           | 2.9889841 kPa                                       |
| mmH <sub>2</sub> O | 00 04           | 0.00980665 kPa                                      |
| mmHg               | 00 05           | 0.133322 kPa                                        |
| psi                | 00 06           | 6.8947591 kPa                                       |
| bar                | 00 07           | 100.0 kPa                                           |
| mbar               | 00 08           | 0.1 kPa                                             |
| g_SqCm             | 00 09           | 0.0980665205 kPa                                    |
| kg_SqCm            | 00 0A           | 98.0665205 kPa                                      |
| Pa                 | 00 0B           | 0.01 kPa                                            |
| kPa                | 00 0C           | 1.0 kPa                                             |
| Torr               | 00 0D           | 0.133322 kPa                                        |
| atm                | 00 0E           | 101.325 kPa                                         |
| MPa                | 00 ED           | 1000.0 kPa                                          |
| mH <sub>2</sub> O  | 00 AB           | 9.80665 kPa                                         |
| mHg                | 00 B3           | 133.3220 kPa                                        |
| m                  | 00 2D           | 9.80665 kPa                                         |
| mm                 | 00 31           | 0.00980665 kPa                                      |
| cm                 | 00 30           | 0.0980665 kPa                                       |
| °C                 | 00 32           | Only JT3051TR is used as a temperature transmitter. |

Table 4