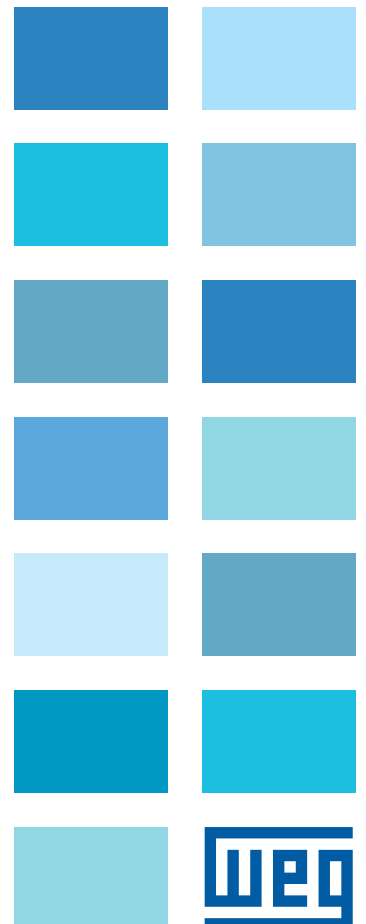


Protocolo Modbus Modbus Protocol Protocolo Modbus

Manual do Usuário
User's Manual
Manual del Usuario



1. INTRODUÇÃO

Protocolo Modbus ABW.

2. CAMADA FÍSICA

- Porta de comunicação: RS485
- Formato assíncrono: um carácter consiste de 10 bit. (1 bit de início + 8 bits de dados + 1 bit de parada).
- Taxa de transmissão: 9.600, 19.200, 38.400 bps (Ajustável pelo OCR).
- Bits de dados: 8 bits.
- Paridade: sem paridade.
- Bista de parada: 1 bit.
- Tem o método de comunicação de mestre-escravo: mestre só pode realizar um pedido de ação e o Escravo envia os dados solicitados recebidos do Mestre ou respostas ao desempenho solicitado.

3. CAMADA DE LINK DE INFORMAÇÕES

- Se o mestre envia o telegrama solicitado ao escravo, o escravo envia de volta o quadro de resposta. Cada moldura é separada por seu tempo de espera.

O modo geral para enviar / receber estrutura é a seguinte:

| Descrição | Tamanho |
|------------------|--------------------------------|
| Endereço escravo | 1 byte |
| Código função | 1 byte |
| Dado | N byte |
| CRC | 2 byte |
| Tempo de espera | 3,5 bytes tempo de transmissão |

| Mestre | Solicitação |
|---|----------------------|
| Endereço escravo | Endereço dispositivo |
| Definição de ação do escravo | Código de função |
| Informação adicional para executar ações solicitadas do Escravo | Dados |
| CRC | Checagem de Erro |

| Resposta | Escravo |
|-------------------------|--|
| Endereço do dispositivo | Endereço escravo |
| Código função | ECHO ou MSB = 1 |
| Dado | Informação solicitada Ou código exclusão |
| Checagem de erro | CRC |

3.1. ENDEREÇO ESCRAVO

- Faixa de endereço válida para os dispositivos escravos.
- Faixa de endereço efetivamente utilizada do dispositivo escravo.
- No caso o dispositivo escravo endereça onde o mestre solicita para o escravo na faixa zero, isso significa que o dispositivo mestre está transmitindo para todos os escravos.
- Quando o mestre solicita ao escravo, transmite o campo de endereço depois arquiva isso no endereço correspondente.
- Quando o escravo responde ao mestre, transmite campo de endereço arquivando com endereço escravo.

3.2. CÓDIGO DE FUNÇÃO

- Variação de faixa válida.
- Normal: 1~127, error: 129 ~ 255 (normal + 0x80).
 - Isso define a ação que o mestre pode solicitar ao escravo.
 - Escravo entra com a seguinte informação.
 - No caso de resposta normal: repercuto código de função válido da solicitação desta forma.
 - No caso de resposta por exceção: completa o código de função válido da solicitação após ajustar MSB como 1.

3.3. DADOS

- Endereço do registrador.
- Total do item a controlar.
- Quantidade Byte da informação atual.

3.4. CRC

- É utilizado para método de checagem de erro.

CRC-16

Função Geral

```

unsigned short CRC16(puchMsg, usDataLen)
unsigned char *puchMsg ; /* message to calculate CRC upon */
unsigned short usDataLen ; /* quantity of bytes in message */
{
unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */
unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
unsigned ulIndex ; /* will index into CRC lookup table */
while (usDataLen??) /* pass through message buffer */
{
ulIndex = uchCRCHi ^ *puchMsgg++ ; /* calculate the CRC */
uchCRCHi = uchCRCLo ^ auchCRCHi[ulIndex] ;
uchCRCLo = auchCRCLo[ulIndex] ;
}

```

3.5. TEMPO DE ESPERA

O Sistema é finalizado quando tem um intervalo sem resposta maior do que 3.5 ciclo de scan após receber o caracter final.

4. MODBUS CÓDIGOS DAS EXCEÇÕES

| Código | Nome |
|--------|---|
| 0x01 | Função ilegal |
| 0x02 | Endereço de dados ilegal |
| 0x03 | Valor de dados ilegal |
| 0x04 | Falha no dispositivo escravo |
| 0x10 | Sem evento de dados/Falha de gravação |
| 0x11 | Tempo remoto (tempo remoto ajustado em torno de 5 segundos) |
| 0x12 | Comprimento ADU ilegal |
| 0x13 | Modo local |

| Função | Registro | Endereço | Nome do Registro | Faixa | Etapa | Etapa | Formato | |
|--------|----------|----------------------------|----------------------------------|-------|-------|-------|---------|-----|
| | | | | | | | T | • € |
| 0x03 | 40001 | 0 | Alarme de temperatura | - | - | - | F001 | R |
| | | | Ajustar valor | | | | | |
| | | | Velocidade de comunicação | | | | | |
| 0x04 | 31031 | 1030 | Informação do TRIO | - | - | - | F112 | R |
| | | | Informação de temperatura máxima | | | | | |
| | 31032 | 1031 | Temperatura ponto 1 | - | - | - | F038 | R |
| | | | Temperatura ponto 2 | | | | | |
| | | | Temperatura ponto 3 | | | | | |
| 0x05 | 31033 | 1032 | Temperatura ponto 4 | - | - | - | F038 | R |
| | | | Seleção disjuntor ligado | | | | | |
| | 32 | 31 | op disjuntor ligado | - | - | - | F002 | W |
| | 33 | 32 | Seleção disjuntor desligado | - | - | - | F002 | W |
| | 34 | 33 | op disjuntor desligado | - | - | - | F002 | W |
| | 35 | 34 | Seleção saída digital ligada | - | - | - | F002 | W |
| | 36 | 35 | op saída digital ligada | - | - | - | F002 | W |
| | 37 | 36 | Seleção saída digital desligada | - | - | - | F002 | W |
| 51 | 50 | reset saída digital alerta | - | - | - | F002 | W | |
| | | reset erro do disjuntor | | | | | | |

F001

- 8 bit tipo inteiro sem sinal

F002

- F038 Type
- 0xFF00: ON, OFF

F003

- F001 Type
- 00: 9.600 bps
- 01: 19.200 bps
- 02: 38.400 bps

F038

- 16bit tipo inteiro sem sinal

F112

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|----------------|------------------|------------------|---|------------------------|---|---|-----------|
| Erro disjuntor | Disjuntor ligado | Disjuntor ligado | Saída digital estado 1: fechado 0: aberto | Aviso de temperatura 1 | Entrada digital estado 1 1: fechado 0: aberto | Entrada digital estado 0 1: fechado 0: aberto | Reservado |

5. MAPA DE ENDEREÇAMENTO OCR

| Registro | Endereço | Nome de Registro | Faixa | Unidade | Etapa | Formato | Propriedade |
|----------|----------|---------------------------------------|-------|---------|-------|---------|-------------|
| 1 | 0 | DO1 ON select | - | - | - | F001 | W |
| 2 | 1 | DO1 ON op | - | - | - | F001 | W |
| 3 | 2 | DO1 OFF select | - | - | - | F001 | W |
| 4 | 3 | DO1 OFF op | - | - | - | F001 | W |
| 5 | 4 | DO2 ON select | - | - | - | F001 | W |
| 6 | 5 | DO2 ON op | - | - | - | F001 | W |
| 7 | 6 | DO2 OFF select | - | - | - | F001 | W |
| 8 | 7 | DO2 OFF op | - | - | - | F001 | W |
| 9 | 8 | DO3 ON select | - | - | - | F001 | W |
| 10 | 9 | DO3 ON op | - | - | - | F001 | W |
| 11 | 10 | DO3 OFF select | - | - | - | F001 | W |
| 12 | 11 | DO3 OFF op | - | - | - | F001 | W |
| 101 | 100 | FAULT RESET | - | - | - | F001 | W |
| 102 | 101 | EVENT CLEAR | - | - | - | F001 | W |
| 103 | 102 | TRIP EVENT CLEAR | - | - | - | F001 | W |
| 104 | 103 | Reserved | - | - | - | F001 | W |
| 105 | 104 | DEMAND RESET | - | - | - | F001 | W |
| 106 | 105 | MAX W RESET | - | - | - | F001 | W |
| 107 | 106 | ENERGY RESET(WH, VARH, rWH, rVARH) | - | - | - | F001 | W |
| 108 | 107 | Operation Time RESET | - | - | - | F001 | W |
| 109 | 108 | Circuit Breaker Conducting Time RESET | - | - | - | F001 | W |
| 110 | 109 | Number of times CB Operating RESET | - | - | - | F001 | W |
| 30001 | 0 | Mechanical State Information #1 | | | | F112 | R |
| 30003 | 2 | Mechanical State Information #2 | | | | F212 | R |
| 30005 | 4 | R-Phase Current | | | | F004 | R |
| 30007 | 6 | S-Phase Current | | | | F004 | R |
| 30009 | 8 | T-Phase Current | | | | F004 | R |
| 30011 | 10 | N-Phase Current | | | | F004 | R |
| 30013 | 12 | R-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30015 | 14 | S-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30017 | 16 | T-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30019 | 18 | Zero-Phase Voltage | | | | F004 | R |
| 30021 | 20 | RS-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30023 | 22 | ST-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30025 | 24 | TR-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30027 | 26 | Power-factor | | | | F004 | R |
| 30029 | 28 | TOTAL Power | | | | F004 | R |
| 30031 | 30 | TOTAL Reactive Power | | | | F004 | R |
| 30033 | 32 | TOTAL ApparentPower | | | | F004 | R |
| 30035 | 34 | Frequency | | | | F004 | R |
| 30037 | 36 | Active Power Energy | | | | F004 | R |
| 30039 | 38 | Reactive Power Energy | | | | F004 | R |
| 30041 | 40 | Reverse Active Power Energy | | | | F004 | R |
| 30043 | 42 | Reverse Reactive Power Energy | | | | F004 | R |
| 30045 | 44 | Reserve | | | | F004 | R |
| 30047 | 46 | Normal Phase Voltage | | | | F004 | R |
| 30049 | 48 | Reverse Phase Voltage | | | | F004 | R |
| 30051 | 50 | Voltage Unbalance Factor | | | | F004 | R |
| 30053 | 52 | Normal Phase Current | | | | F004 | R |
| 30055 | 54 | Reverse Phase Current | | | | F004 | R |
| 30057 | 56 | Current Unbalance Factor | | | | F004 | R |
| 30059 | 58 | Reserved | | | | F004 | R |
| 30061 | 60 | R-Phase Voltage Phase | | | | F004 | R |
| 30063 | 62 | S-Phase Voltage Phase | | | | F004 | R |
| 30065 | 64 | T-Phase Voltage Phase | | | | F004 | R |
| 30067 | 66 | RS-Phase Voltage Phase | | | | F004 | R |
| 30069 | 68 | ST-Phase Voltage Phase | | | | F004 | R |
| 30071 | 70 | TR-Phase Voltage Phase | | | | F004 | R |
| 30073 | 72 | R-Phase Current Phase | | | | F004 | R |
| 30075 | 74 | S-Phase Current Phase | | | | F004 | R |
| 30077 | 76 | T-Phase Current Phase | | | | F004 | R |
| 30079 | 78 | R-Phase Current Power-factor | | | | F004 | R |

| Registro | Endereço | Nome de Registro | Faixa | Unidade | Etapas | Formato | Propriedade |
|----------|----------|---|-------|---------|--------|-------------|-------------|
| 30081 | 80 | S-Phase Current Power-factor | | | | F004 | R |
| 30083 | 82 | T-Phase Current Power-factor | | | | F004 | R |
| 30085 | 84 | R-Phase Active Power(Reverse Active Power) | | | | F004 | R |
| 30087 | 86 | S-Phase Power(Reverse Active Power) | | | | F004 | R |
| 30089 | 88 | T-Phase Power(Reverse Active Power) | | | | F004 | R |
| 30091 | 90 | R-Phase Reactive Power | | | | F004 | R |
| 30093 | 92 | S-Phase Reactive Power | | | | F004 | R |
| 30095 | 94 | T-Phase Reactive Power | | | | F004 | R |
| 30097 | 96 | R-Phase ApparentPower | | | | F004 | R |
| 30099 | 98 | S-Phase ApparentPower | | | | F004 | R |
| 30101 | 100 | T-Phase ApparentPower | | | | F004 | R |
| 30103 | 102 | R-Phase Active Power Energy | | | | F004 | R |
| 30105 | 104 | S-Phase Active Power Energy | | | | F004 | R |
| 30107 | 106 | T-Phase Active Power Energy | | | | F004 | R |
| 30109 | 108 | R-Phase Reactive Power Energy | | | | F004 | R |
| 30111 | 110 | S-Phase Reactive Power Energy | | | | F004 | R |
| 30113 | 112 | T-Phase Reactive Power Energy | | | | F004 | R |
| 30115 | 114 | R-Phase Reverse Active Power Energy | | | | F004 | R |
| 30117 | 116 | S-Phase Reverse Active Power Energy | | | | F004 | R |
| 30119 | 118 | T-Phase Reverse Active Power Energy | | | | F004 | R |
| 30121 | 120 | R-Phase Reverse Reactive Power Energy | | | | F004 | |
| 30123 | 122 | S-Phase Reverse Reactive Power Energy | | | | F004 | |
| 30125 | 124 | T-Phase Reverse Reactive Power Energy | | | | F004 | |
| 30127 | 126 | DEMAND Ia | | | | F004 | R |
| 30129 | 128 | DEMAND Ib | | | | F004 | R |
| 30131 | 130 | DEMAND Ic | | | | F004 | R |
| 30133 | 132 | Max DEMAND W | | | | F004 | R |
| 30135 | 134 | Max W | | | | F004 | R |
| 30137 | 136 | R-Phase(3P4W) / RS-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30139 | 138 | S-Phase(3P4W) / ST-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30141 | 140 | T-Phase(3P4W) / TR-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30143 | 142 | R-Phase Current THD | | | | F004 | R |
| 30145 | 144 | S-Phase Current THD | | | | F004 | R |
| 30147 | 146 | T-Phase Current THD | | | | F004 | R |
| 30149 | 148 | R-Phase Voltage Fundamental Harmonic | | | | F004 | R |
| 30917 | 916 | OCR Current R-Phase | | | | F004 | R |
| 30919 | 918 | OCR Current S-Phase | | | | F004 | R |
| 30921 | 920 | OCR Current T-Phase | | | | F004 | R |
| 30923 | 922 | OCR Current N-Phase | | | | F004 | R |
| 30925 | 924 | OCGR Current | | | | F004 | R |
| 30926 | 925 | OCGR Current | | | | F005 | R |
| 31001 | 1000 | MAX DEMAND W time | | - | - | F113 | R |
| 31004 | 1003 | Reserved | | - | - | F113 | R |
| 31007 | 1006 | MAX W Time | | - | - | F113 | R |
| 40002 | 1 | OCR H/W Setting Information (DIP SW Information) | | | | F038(F117) | R |
| 40003 | 2 | Connection Method, Frequency, Demand, OCR FineSet, OCGR... | | | | F038(F118) | R |
| 40011 | 10 | Long-time delay Reference Current(Ir) [A] | | A | | F038 | R |
| 40012 | 11 | Long-time delay Operation Time(Tr) [0.1 sec] | | 0.1sec | | F038 | R |
| 40013 | 12 | Short-time delay Operation Current(Is) [A] | | A | | F038 | R |
| 40014 | 13 | Short-time delay Operation Time(Ts) [ms] | | ms | | F038 | R |
| 40015 | 14 | Instantaneous delay Operation Current(Ii) [A] | | A | | F022 | R |
| 40021 | 20 | Ground-fault(Leakage, PTA) Operation Current (I _g , I _p) [A] ※ Outer CTGround-fault, Leakage Function, Indicates ×10 value in a Setting ×10(means 50→5A, 5→0.5A) ※ Function as PTA, Indicates Setting PTAOperation Current [A] | | A/×10A | | F038 | R |
| 40022 | 21 | Ground-fault(Leakage, PTA) Operation Time(T _g , T _p)[ms] ※ Function as PTA, Setting PTATime unit is [sec] | | ms/sec | | F038 | R |
| 40031 | 30 | OVR/UVR Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |

| Registro | Endereço | Nome de Registro | Faixa | Unidade | Etapa | Formato | Propriedade |
|----------|----------|--|----------|---------|-------|----------------|-------------|
| 40032 | 31 | V/I Unbalance Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40033 | 32 | rPower/rRot Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40034 | 33 | OFR/UFR Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40035 | 34 | OVR Operation Reference [V] | | V | | F038 | R |
| 40036 | 35 | UVR Operation Reference | | V | | F038 | R |
| 40037 | 36 | V unbalance Operation Reference [%] | | % | | F038 | R |
| 40038 | 37 | I Unbalance Operation Reference | | % | | F038 | R |
| 40039 | 38 | Reverse Power Operation Reference [kW] | | kW | | F038 | R |
| 40040 | 39 | Reserve | | - | | F038 | R |
| 40041 | 40 | OFR Operation Reference [Hz] | | Hz | | F038 | R |
| 40042 | 41 | UFR Operation Reference | | Hz | | F038 | R |
| 40043 | 42 | OVR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40044 | 43 | UVR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40045 | 44 | V unbalance Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40046 | 45 | I Unbalance Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40047 | 46 | Reverse Power Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40048 | 47 | OFR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40049 | 48 | UFR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40050 | 49 | Reserve | | - | | F038 | R |
| 41001 | 1000 | Operation Time | 0~232 -1 | Sec | 1 | F006 | R |
| 41003 | 1002 | Circuit Breaker Conducting Time | 0~232 -1 | Sec | 1 | F006 | R |
| 41005 | 1004 | CBOperation number of times | 0~65535 | Times | 1 | F038 | R |
| 42101 | 2100 | Event Record | - | - | - | F114 | R |
| 42201 | 2200 | Trip Event Record | - | - | - | F115 | R |

1. INTRODUCTION

ABW Modbus Protocol.

2. PHYSICAL LAYER

- Communication port: RS485.
- Asynchronous format: one character consists of 10 bit. (1 start bit + 8 data bits + 1 stop bit).
- Baud rate: 9,600, 19,200, 38,400 bps (Adjustable by the OCR).
- Data bits: 8 bits.
- Parity: No parity.
- Stop bits: 1 bit.
- It has the master-slave communication method: the Master can only make one action request and the Slave sends the requested data received from the Master or responses to the requested performance.

3. INFORMATION LINK LAYER

- If the master sends the telegram requested by the slave, the slave sends back the response table. Each frame is separated by its waiting time.

The general mode to send/receive structure is the following:

| Description | Size |
|---------------|-----------------------------|
| Slave address | 1 byte |
| Function code | 1 byte |
| Data | N byte |
| CRC | 2 byte |
| Waiting time | 3.5 bytes transmission time |

| Master | Request |
|--|----------------|
| Slave address | Device address |
| Slave action definition | Function code |
| Additional information to execute the actions requested by the slave | Data |
| CRC | Error Check |

| Response | Slave |
|---------------|---|
| Slave address | Slave address |
| Function code | ECHO or MSB = 1 |
| Data | Information requested Or exclusion code |
| Error check | CRC |

3.1. SLAVE ADDRESS

- Valid address range for slave devices.
- Address range effectively used of the slave device.
- When the slave device addresses where the master requests the slave in the zero range, that means the master device is transmitting to all the slaves.
- When the master requests the slave, it transmits the address field and then files that in the corresponding address.
- When the slave responds the master, it transmits the address field filing with slave address.

3.2. FUNCTION CODE

- Valid range variation.
- Normal: 1~127, error: 129 ~ 255 (normal + 0x80).
 - That defines the action the master can request the slave.
 - Slave enters the following information.
 - In case of normal response: it completes the valid function code of the request this way.
 - In case of response by exception: it completes the valid function code of the request after setting MSB as 1.

3.3. DATA

- Recorder address.
- Total of the item to be controlled.
- Byte Quantity of the current information.

3.4. CRC

- It is used for check method.

CRC-16

```

General function
    unsigned short CRC16 (puchMsg, usDataLen)
    unsigned char *puchMsg ; /* message to calculate CRC upon */
    unsigned short usDataLen ; /* quantity of bytes in message */
    {
    unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */ unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
    unsigned ulndex ; /* will index into CRC lookup table */
    while (usDataLen??) /* pass through message buffer */
    {
    ulndex = uchCRCHi ^ *puchMsgg++ ; /* calculate the CRC */ uchCRCHi = uchCRCLo ^ auchCRCHi[ulndex] ; uchCRCLo =
    auchCRCLo[ulndex] ;
    }
    }
    
```

3.5. WAITING TIME

The System is finished in case an interval without response longer than 3.5 scan cycle occurs after receiving the final character.

4. MODBUS EXCEPTION CODES

| Code | Name |
|------|--|
| 0x01 | Illegal Function |
| 0x02 | Illegal data address |
| 0x03 | Illegal data value |
| 0x04 | Fault on the slave device |
| 0x10 | No data event/Recording fault |
| 0x11 | Remote time (remote time set around 5 seconds) |
| 0x12 | Illegal ADU length |
| 0x13 | Local mode |

| Function | Record | Address | Name of the Record | Range | Step | Step | Format | |
|----------|--------|-----------------------------|---------------------------------|-------|------|------|--------|-----|
| | | | | | | | T | • € |
| 0x03 | 40001 | 0 | Temperature alarm | - | - | - | F001 | R |
| | | | Set value | | | | | |
| | | | Communication speed | | | | | |
| | | | Set value | | | | | |
| 0x04 | 31031 | 1030 | TRIO information | - | - | - | F112 | R |
| | | | Maximum temperature information | | | | | |
| | 31032 | 1031 | Temperature point 1 | - | - | - | F038 | R |
| | | | Temperature point 2 | | | | | |
| | 31033 | 1032 | Temperature point 3 | - | - | - | F038 | R |
| | | | Temperature point 4 | | | | | |
| 0x05 | 31 | 30 | Circuit breaker ON selection | - | - | - | F002 | W |
| | 32 | 31 | Circuit breaker ON op | | | | | |
| | 33 | 32 | Circuit breaker OFF selection | | | | | |
| | 34 | 33 | Circuit breaker OFF op | | | | | |
| | 35 | 34 | Digital output ON selection | | | | | |
| | 36 | 35 | Digital output ON op | | | | | |
| | 37 | 36 | Digital output OFF selection | | | | | |
| | 38 | 37 | Digital output OFF op | | | | | |
| | 51 | 50 | Alert digital output reset | | | | | |
| | | Circuit breaker error reset | | | | | | |

F001

- 8 bit integer type without signal

F002

- F038 Type
- 0xFF00: ON, OFF

F003

- F001 Type
- 00: 9600 bps
- 01: 19,200 bps
- 02: 38,400 bps

F038

- 16bit integer type without signal

F112

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----------------------|--------------------|--------------------|---|--------------------------|--|--|----------|
| Circuit breaker error | Circuit breaker ON | Circuit breaker ON | Digital output status 1: closed 0: open | Temperature warning 1 | Digital input status 1 1: closed 0: open | Digital input status 0 1: closed 0: open | Reserved |

5. OCR ADDRESSING MAP

| Record | Address | Name of the Record | Range | Unit | Step | Format | Property |
|--------|---------|---------------------------------------|-------|------|------|--------|----------|
| 1 | 0 | DO1 ON select | - | - | - | F001 | W |
| 2 | 1 | DO1 ON op | - | - | - | F001 | W |
| 3 | 2 | DO1 OFF select | - | - | - | F001 | W |
| 4 | 3 | DO1 OFF op | - | - | - | F001 | W |
| 5 | 4 | DO2 ON select | - | - | - | F001 | W |
| 6 | 5 | DO2 ON op | - | - | - | F001 | W |
| 7 | 6 | DO2 OFF select | - | - | - | F001 | W |
| 8 | 7 | DO2 OFF op | - | - | - | F001 | W |
| 9 | 8 | DO3 ON select | - | - | - | F001 | W |
| 10 | 9 | DO3 ON op | - | - | - | F001 | W |
| 11 | 10 | DO3 OFF select | - | - | - | F001 | W |
| 12 | 11 | DO3 OFF op | - | - | - | F001 | W |
| 101 | 100 | FAULT RESET | - | - | - | F001 | W |
| 102 | 101 | EVENT CLEAR | - | - | - | F001 | W |
| 103 | 102 | TRIP EVENT CLEAR | - | - | - | F001 | W |
| 104 | 103 | Reserved | - | - | - | F001 | W |
| 105 | 104 | DEMAND RESET | - | - | - | F001 | W |
| 106 | 105 | MAX W RESET | - | - | - | F001 | W |
| 107 | 106 | ENERGY RESET(WH, VARH, rWH, rVARH) | - | - | - | F001 | W |
| 108 | 107 | Operation Time RESET | - | - | - | F001 | W |
| 109 | 108 | Circuit Breaker Conducting Time RESET | - | - | - | F001 | W |
| 110 | 109 | Number of times CB Operating RESET | - | - | - | F001 | W |
| 30001 | 0 | Mechanical State Information #1 | | | | F112 | R |
| 30003 | 2 | Mechanical State Information #2 | | | | F212 | R |
| 30005 | 4 | R-Phase Current | | | | F004 | R |
| 30007 | 6 | S-Phase Current | | | | F004 | R |
| 30009 | 8 | T-Phase Current | | | | F004 | R |
| 30011 | 10 | N-Phase Current | | | | F004 | R |
| 30013 | 12 | R-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30015 | 14 | S-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30017 | 16 | T-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30019 | 18 | Zero-Phase Voltage | | | | F004 | R |
| 30021 | 20 | RS-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30023 | 22 | ST-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30025 | 24 | TR-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30027 | 26 | Power-factor | | | | F004 | R |
| 30029 | 28 | TOTAL Power | | | | F004 | R |
| 30031 | 30 | TOTAL Reactive Power | | | | F004 | R |
| 30033 | 32 | TOTAL ApparentPower | | | | F004 | R |
| 30035 | 34 | Frequency | | | | F004 | R |
| 30037 | 36 | Active Power Energy | | | | F004 | R |
| 30039 | 38 | Reactive Power Energy | | | | F004 | R |
| 30041 | 40 | Reverse Active Power Energy | | | | F004 | R |
| 30043 | 42 | Reverse Reactive Power Energy | | | | F004 | R |
| 30045 | 44 | Reserve | | | | F004 | R |
| 30047 | 46 | Normal Phase Voltage | | | | F004 | R |
| 30049 | 48 | Reverse Phase Voltage | | | | F004 | R |
| 30051 | 50 | Voltage Unbalance Factor | | | | F004 | R |
| 30053 | 52 | Normal Phase Current | | | | F004 | R |
| 30055 | 54 | Reverse Phase Current | | | | F004 | R |
| 30057 | 56 | Current Unbalance Factor | | | | F004 | R |
| 30059 | 58 | Reserved | | | | F004 | R |
| 30061 | 60 | R-Phase Voltage Phase | | | | F004 | R |
| 30063 | 62 | S-Phase Voltage Phase | | | | F004 | R |
| 30065 | 64 | T-Phase Voltage Phase | | | | F004 | R |
| 30067 | 66 | RS-Phase Voltage Phase | | | | F004 | R |
| 30069 | 68 | ST-Phase Voltage Phase | | | | F004 | R |
| 30071 | 70 | TR-Phase Voltage Phase | | | | F004 | R |
| 30073 | 72 | R-Phase Current Phase | | | | F004 | R |
| 30075 | 74 | S-Phase Current Phase | | | | F004 | R |
| 30077 | 76 | T-Phase Current Phase | | | | F004 | R |
| 30079 | 78 | R-Phase Current Power-factor | | | | F004 | R |

| Record | Address | Name of the Record | Range | Unit | Step | Format | Property |
|--------|---------|---|-------|--------|------|-------------|----------|
| 30081 | 80 | S-Phase Current Power-factor | | | | F004 | R |
| 30083 | 82 | T-Phase Current Power-factor | | | | F004 | R |
| 30085 | 84 | R-Phase Active Power(Reverse Active Power) | | | | F004 | R |
| 30087 | 86 | S-Phase Power(Reverse Active Power) | | | | F004 | R |
| 30089 | 88 | T-Phase Power(Reverse Active Power) | | | | F004 | R |
| 30091 | 90 | R-Phase Reactive Power | | | | F004 | R |
| 30093 | 92 | S-Phase Reactive Power | | | | F004 | R |
| 30095 | 94 | T-Phase Reactive Power | | | | F004 | R |
| 30097 | 96 | R-Phase ApparentPower | | | | F004 | R |
| 30099 | 98 | S-Phase ApparentPower | | | | F004 | R |
| 30101 | 100 | T-Phase ApparentPower | | | | F004 | R |
| 30103 | 102 | R-Phase Active Power Energy | | | | F004 | R |
| 30105 | 104 | S-Phase Active Power Energy | | | | F004 | R |
| 30107 | 106 | T-Phase Active Power Energy | | | | F004 | R |
| 30109 | 108 | R-Phase Reactive Power Energy | | | | F004 | R |
| 30111 | 110 | S-Phase Reactive Power Energy | | | | F004 | R |
| 30113 | 112 | T-Phase Reactive Power Energy | | | | F004 | R |
| 30115 | 114 | R-Phase Reverse Active Power Energy | | | | F004 | R |
| 30117 | 116 | S-Phase Reverse Active Power Energy | | | | F004 | R |
| 30119 | 118 | T-Phase Reverse Active Power Energy | | | | F004 | R |
| 30121 | 120 | R-Phase Reverse Reactive Power Energy | | | | F004 | R |
| 30123 | 122 | S-Phase Reverse Reactive Power Energy | | | | F004 | R |
| 30125 | 124 | T-Phase Reverse Reactive Power Energy | | | | F004 | R |
| 30127 | 126 | DEMAND Ia | | | | F004 | R |
| 30129 | 128 | DEMAND Ib | | | | F004 | R |
| 30131 | 130 | DEMAND Ic | | | | F004 | R |
| 30133 | 132 | Max DEMAND W | | | | F004 | R |
| 30135 | 134 | Max W | | | | F004 | R |
| 30137 | 136 | R-Phase(3P4W) / RS-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30139 | 138 | S-Phase(3P4W) / ST-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30141 | 140 | T-Phase(3P4W) / TR-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30143 | 142 | R-Phase Current THD | | | | F004 | R |
| 30145 | 144 | S-Phase Current THD | | | | F004 | R |
| 30147 | 146 | T-Phase Current THD | | | | F004 | R |
| 30149 | 148 | R-Phase Voltage Fundamental Harmonic | | | | F004 | R |
| 30917 | 916 | OCR Current R-Phase | | | | F004 | R |
| 30919 | 918 | OCR Current S-Phase | | | | F004 | R |
| 30921 | 920 | OCR Current T-Phase | | | | F004 | R |
| 30923 | 922 | OCR Current N-Phase | | | | F004 | R |
| 30925 | 924 | OCGR Current | | | | F004 | R |
| 30926 | 925 | OCGR Current | | | | F005 | R |
| 31001 | 1000 | MAX DEMAND W time | | - | - | F113 | R |
| 31004 | 1003 | Reserved | | - | - | F113 | R |
| 31007 | 1006 | MAX W Time | | - | - | F113 | R |
| 40002 | 1 | OCR H/W Setting Information (DIP SW Information) | | | | F038(F117) | R |
| 40003 | 2 | Connection Method, Frequency, Demand, OCR FineSet, OCGR... | | | | F038(F118) | R |
| 40011 | 10 | Long-time delay Reference Current(Ir) [A] | | A | | F038 | R |
| 40012 | 11 | Long-time delay Operation Time(Tr) [0.1 sec] | | 0.1sec | | F038 | R |
| 40013 | 12 | Short-time delay Operation Current(Is) [A] | | A | | F038 | R |
| 40014 | 13 | Short-time delay Operation Time(Ts) [ms] | | ms | | F038 | R |
| 40015 | 14 | Instantaneous delay Operation Current(Ii) [A] | | A | | F022 | R |
| 40021 | 20 | Ground-fault(Leakage, PTA) Operation Current (I _g , I _p) [A] ※ Outer CTGround-fault, Leakage Function, Indicates ×10 value in a Setting ×10(means 50→5A, 5→0.5A) ※ Function as PTA, Indicates Setting PTAOperation Current [A] | | A×10A | | F038 | R |
| 40022 | 21 | Ground-fault(Leakage, PTA) Operation Time(T _g , T _p)[ms] ※ Function as PTA, Setting PTATime unit is [sec] | | ms/sec | | F038 | R |
| 40031 | 30 | OVR/UVR Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |

| Record | Address | Name of the Record | Range | Unit | Step | Format | Property |
|--------|---------|--|----------|--------|------|----------------|----------|
| 40032 | 31 | V/I Unbalance Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40033 | 32 | rPower/rRot Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40034 | 33 | OFR/UFR Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40035 | 34 | OVR Operation Reference [V] | | V | | F038 | R |
| 40036 | 35 | UVR Operation Reference | | V | | F038 | R |
| 40037 | 36 | V unbalance Operation Reference [%] | | % | | F038 | R |
| 40038 | 37 | I Unbalance Operation Reference | | % | | F038 | R |
| 40039 | 38 | Reverse Power Operation Reference [kW] | | kW | | F038 | R |
| 40040 | 39 | Reserve | | - | | F038 | R |
| 40041 | 40 | OFR Operation Reference [Hz] | | Hz | | F038 | R |
| 40042 | 41 | UFR Operation Reference | | Hz | | F038 | R |
| 40043 | 42 | OVR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40044 | 43 | UVR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40045 | 44 | V unbalance Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40046 | 45 | I Unbalance Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40047 | 46 | Reverse Power Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40048 | 47 | OFR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40049 | 48 | UFR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40050 | 49 | Reserve | | - | | F038 | R |
| 41001 | 1000 | Operation Time | 0~232 -1 | Sec | 1 | F006 | R |
| 41003 | 1002 | Circuit Breaker Conducting Time | 0~232 -1 | Sec | 1 | F006 | R |
| 41005 | 1004 | CBOperation number of times | 0~65535 | Times | 1 | F038 | R |
| 42101 | 2100 | Event Record | - | - | - | F114 | R |
| 42201 | 2200 | Trip Event Record | - | - | - | F115 | R |

1. INTRODUCCION

Protocolo Modbus ABW.

2. CAMADA FISICA

- Puerta de comunicación: RS485.
- Formato asíncrono: un carácter consiste en 10 bit. (1 bit de inicio + 8 bits de datos + 1 bit de parada).
- Tasa de transmisión: 9.600, 19.200, 38.400 bps (Ajustable por el OCR).
- Bits de datos: 8 bits.
- Paridad: sin paridad.
- Bits de parada: 1 bit.
- Tiene el método de comunicación de maestro-esclavo: el maestro sólo puede realizar un pedido de acción y el Esclavo envía los datos solicitados recibidos desde el Maestro o respuestas al desempeño solicitado.

3. CAMADA DE LINK DE INFORMACIONES

- Si el maestro envía el telegrama solicitado al esclavo, el esclavo envía devuelta el cuadro de respuesta. Cada marco es separado por su tiempo de espera.

El modo general para enviar / recibir la estructura es el siguiente:

| Descripción | Tamaño |
|-------------------|---------------------------------|
| Dirección esclavo | 1 byte |
| Código función | 1 byte |
| Dato | N byte |
| CRC | 2 byte |
| Tiempo de espera | 3,5 bytes tiempo de transmisión |

| Maestro | Solicitud |
|--|-----------------------|
| Dirección esclavo | Dirección dispositivo |
| Definición de acción del esclavo | Código de función |
| Información adicional para ejecutar acciones solicitadas del Esclavo | Datos |
| CRC | Verificación de Error |

| Respuesta | Esclavo |
|---------------------------|---|
| Dirección del dispositivo | Dirección esclavo |
| Código función | ECHO o MSB = 1 |
| Dato | Información solicitada o código exclusión |
| Verificación de error | CRC |

3.1. DIRECION ESCLAVA

- Rango de dirección válida para los dispositivos esclavos.
- Rango de dirección efectivamente utilizada del dispositivo esclavo.
- En el caso del dispositivo esclavo, direcciona donde el maestro solicita al esclavo en el rango cero, eso significa que el dispositivo maestro está transmitiendo para todos los esclavos.
- Cuando el maestro solicita al esclavo, transmite el campo de dirección, luego archiva eso en la dirección correspondiente.
- Cuando el esclavo responde al maestro, transmite el campo de dirección archivando con dirección esclavo.

3.2. CODIGO DE FUNCION

- Variación de rango válido.
- Normal: 1~127, error: 129 ~ 255 (normal + 0x80):
 - Eso define la acción que el maestro puede solicitar al esclavo.
 - El esclavo entra con la siguiente información.
 - En caso de respuesta normal: repercutió el código de función válido de la solicitud de esta forma.
 - En caso de respuesta por excepción: completa el código de función válido de la solicitud tras ajustar MSB.

3.3. DATOS

- Dirección del registrador.
- Total del ítem a controlar.
- Cantidad de Bytes de la información actual.

3.4. CRC

- Es utilizado para método de verificación de error.

CRC-16

```

Función General
unsigned short CRC16(puchMsg, usDataLen)
unsigned char *puchMsg ; /* message to calculate CRC upon */
unsigned short usDataLen ; /* quantity of bytes in message */
{
unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */ unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
unsigned ulndex ; /* will index into CRC lookup table */
while (usDataLen??) /* pass through message buffer */
{
ulndex = uchCRCHi ^ *puchMsgg++ ; /* calculate the CRC */ uchCRCHi = uchCRCLo ^ auchCRCHi[ulndex] ; uchCRCLo =
auchCRCLo[ulndex] ;
}
}
    
```

3.5. TIEMPO DE ESPERA

El Sistema es finalizado cuando tiene un intervalo sin respuesta mayor que 3.5 ciclos de scan, tras recibir elcarácter final.

4. MODBUS CODIGOS DE LAS EXCEPCIONES

| Código | Nombre |
|--------|--|
| 0x01 | Función ilegal |
| 0x02 | Dirección de datos ilegal |
| 0x03 | Valor de datos ilegal |
| 0x04 | Falla en el dispositivo esclavo |
| 0x10 | Sin evento de datos/Falla de grabación |
| 0x11 | Tiempo remoto (tiempo remoto ajustado alrededor de 5 segundos) |
| 0x12 | Longitud ADU ilegal |
| 0x13 | Modo local |

| Función | Registro | Dirección | Nombre del Registro | Rango | Etapa | Etapa | Formato | |
|---------|----------|-----------------------------|------------------------------------|-------|-------|-------|---------|-----|
| | | | | | | | T | • € |
| 0x03 | 40001 | 0 | Alarma de temperatura | - | - | - | F001 | R |
| | | | Ajustar valor | | | | | |
| | | | Velocidad de comunicación | | | | | |
| | | | Ajustar valor | | | | | |
| 0x04 | 31031 | 1030 | Información del TRIO | - | - | - | F112 | R |
| | | | Información de temperatura máxima | | | | | |
| | 31032 | 1031 | Temperatura punto 1 | - | - | - | F038 | R |
| | | | Temperatura punto 2 | | | | | |
| | 31033 | 1032 | Temperatura punto 3 | - | - | - | F038 | R |
| | | | Temperatura punto 4 | | | | | |
| 0x05 | 31 | 30 | Selección disyuntor encendido | - | - | - | F002 | W |
| | 32 | 31 | op disyuntor apagado | | | | | |
| | 33 | 32 | Selección disyuntor apagado | | | | | |
| | 34 | 33 | op disyuntor apagado | | | | | |
| | 35 | 34 | Selección salida digital encendida | | | | | |
| | 36 | 35 | op salida digital encendida | | | | | |
| | 37 | 36 | Selección salida digital apagada | | | | | |
| | 38 | 37 | op salida digital apagada | | | | | |
| 51 | 50 | reset salida digital alerta | - | - | - | F002 | W | |
| | | reset error del disyuntor | | | | | | |

F001

- 8 bit tipo entero sin señal

F002

- F038 Type
- 0xFF00: ON, OFF

F003

- F001 Type
- 00: 9.600 bps
- 01: 19.200 bps
- 02: 38.400 bps

F038

- 16bit tipo entero sin señal

F112

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----------------|---------------------|---------------------|---|---------------------------|--|--|-----------|
| Error disyuntor | Disyuntor encendido | Dlsyuntor encendido | Salida digital estado 1: cerrado 0: abierto | Aviso de temperatura 1 | Entrada digital estado 1 1: cerrado 0: abierto | Entrada digital estado 0 1: cerrado 0: abierto | Reservado |

5. MAPA DE ENDEREÇAMENTO OCR

| Registro | Dirección | Nombre de Registro | Rango | Unidad | Etapas | Formato | Propiedad |
|----------|-----------|---------------------------------------|-------|--------|--------|---------|-----------|
| 1 | 0 | DO1 ON select | - | - | - | F001 | W |
| 2 | 1 | DO1 ON op | - | - | - | F001 | W |
| 3 | 2 | DO1 OFF select | - | - | - | F001 | W |
| 4 | 3 | DO1 OFF op | - | - | - | F001 | W |
| 5 | 4 | DO2 ON select | - | - | - | F001 | W |
| 6 | 5 | DO2 ON op | - | - | - | F001 | W |
| 7 | 6 | DO2 OFF select | - | - | - | F001 | W |
| 8 | 7 | DO2 OFF op | - | - | - | F001 | W |
| 9 | 8 | DO3 ON select | - | - | - | F001 | W |
| 10 | 9 | DO3 ON op | - | - | - | F001 | W |
| 11 | 10 | DO3 OFF select | - | - | - | F001 | W |
| 12 | 11 | DO3 OFF op | - | - | - | F001 | W |
| 101 | 100 | FAULT RESET | - | - | - | F001 | W |
| 102 | 101 | EVENT CLEAR | - | - | - | F001 | W |
| 103 | 102 | TRIP EVENT CLEAR | - | - | - | F001 | W |
| 104 | 103 | Reserved | - | - | - | F001 | W |
| 105 | 104 | DEMAND RESET | - | - | - | F001 | W |
| 106 | 105 | MAX W RESET | - | - | - | F001 | W |
| 107 | 106 | ENERGY RESET(WH, VARH, rWH, rVARH) | - | - | - | F001 | W |
| 108 | 107 | Operation Time RESET | - | - | - | F001 | W |
| 109 | 108 | Circuit Breaker Conducting Time RESET | - | - | - | F001 | W |
| 110 | 109 | Number of times CB Operating RESET | - | - | - | F001 | W |
| 30001 | 0 | Mechanical State Information #1 | | | | F112 | R |
| 30003 | 2 | Mechanical State Information #2 | | | | F212 | R |
| 30005 | 4 | R-Phase Current | | | | F004 | R |
| 30007 | 6 | S-Phase Current | | | | F004 | R |
| 30009 | 8 | T-Phase Current | | | | F004 | R |
| 30011 | 10 | N-Phase Current | | | | F004 | R |
| 30013 | 12 | R-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30015 | 14 | S-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30017 | 16 | T-Phase Voltage (Phase Voltage) | | | | F004 | R |
| 30019 | 18 | Zero-Phase Voltage | | | | F004 | R |
| 30021 | 20 | RS-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30023 | 22 | ST-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30025 | 24 | TR-Phase Voltage (Line Voltage) | | | | F004 | R |
| 30027 | 26 | Power-factor | | | | F004 | R |
| 30029 | 28 | TOTAL Power | | | | F004 | R |
| 30031 | 30 | TOTAL Reactive Power | | | | F004 | R |
| 30033 | 32 | TOTAL ApparentPower | | | | F004 | R |
| 30035 | 34 | Frequency | | | | F004 | R |
| 30037 | 36 | Active Power Energy | | | | F004 | R |
| 30039 | 38 | Reactive Power Energy | | | | F004 | R |
| 30041 | 40 | Reverse Active Power Energy | | | | F004 | R |
| 30043 | 42 | Reverse Reactive Power Energy | | | | F004 | R |
| 30045 | 44 | Reserve | | | | F004 | R |
| 30047 | 46 | Normal Phase Voltage | | | | F004 | R |
| 30049 | 48 | Reverse Phase Voltage | | | | F004 | R |
| 30051 | 50 | Voltage Unbalance Factor | | | | F004 | R |
| 30053 | 52 | Normal Phase Current | | | | F004 | R |
| 30055 | 54 | Reverse Phase Current | | | | F004 | R |
| 30057 | 56 | Current Unbalance Factor | | | | F004 | R |
| 30059 | 58 | Reserved | | | | F004 | R |
| 30061 | 60 | R-Phase Voltage Phase | | | | F004 | R |
| 30063 | 62 | S-Phase Voltage Phase | | | | F004 | R |
| 30065 | 64 | T-Phase Voltage Phase | | | | F004 | R |
| 30067 | 66 | RS-Phase Voltage Phase | | | | F004 | R |
| 30069 | 68 | ST-Phase Voltage Phase | | | | F004 | R |
| 30071 | 70 | TR-Phase Voltage Phase | | | | F004 | R |
| 30073 | 72 | R-Phase Current Phase | | | | F004 | R |
| 30075 | 74 | S-Phase Current Phase | | | | F004 | R |
| 30077 | 76 | T-Phase Current Phase | | | | F004 | R |
| 30079 | 78 | R-Phase Current Power-factor | | | | F004 | R |

| Registro | Dirección | Nombre de Registro | Rango | Unidad | Etapas | Formato | Propiedad |
|----------|-----------|---|-------|--------|--------|-------------|-----------|
| 30081 | 80 | S-Phase Current Power-factor | | | | F004 | R |
| 30083 | 82 | T-Phase Current Power-factor | | | | F004 | R |
| 30085 | 84 | R-Phase Active Power(Reverse Active Power) | | | | F004 | R |
| 30087 | 86 | S-Phase Power(Reverse Active Power) | | | | F004 | R |
| 30089 | 88 | T-Phase Power(Reverse Active Power) | | | | F004 | R |
| 30091 | 90 | R-Phase Reactive Power | | | | F004 | R |
| 30093 | 92 | S-Phase Reactive Power | | | | F004 | R |
| 30095 | 94 | T-Phase Reactive Power | | | | F004 | R |
| 30097 | 96 | R-Phase ApparentPower | | | | F004 | R |
| 30099 | 98 | S-Phase ApparentPower | | | | F004 | R |
| 30101 | 100 | T-Phase ApparentPower | | | | F004 | R |
| 30103 | 102 | R-Phase Active Power Energy | | | | F004 | R |
| 30105 | 104 | S-Phase Active Power Energy | | | | F004 | R |
| 30107 | 106 | T-Phase Active Power Energy | | | | F004 | R |
| 30109 | 108 | R-Phase Reactive Power Energy | | | | F004 | R |
| 30111 | 110 | S-Phase Reactive Power Energy | | | | F004 | R |
| 30113 | 112 | T-Phase Reactive Power Energy | | | | F004 | R |
| 30115 | 114 | R-Phase Reverse Active Power Energy | | | | F004 | R |
| 30117 | 116 | S-Phase Reverse Active Power Energy | | | | F004 | R |
| 30119 | 118 | T-Phase Reverse Active Power Energy | | | | F004 | R |
| 30121 | 120 | R-Phase Reverse Reactive Power Energy | | | | F004 | |
| 30123 | 122 | S-Phase Reverse Reactive Power Energy | | | | F004 | |
| 30125 | 124 | T-Phase Reverse Reactive Power Energy | | | | F004 | |
| 30127 | 126 | DEMAND Ia | | | | F004 | R |
| 30129 | 128 | DEMAND Ib | | | | F004 | R |
| 30131 | 130 | DEMAND Ic | | | | F004 | R |
| 30133 | 132 | Max DEMAND W | | | | F004 | R |
| 30135 | 134 | Max W | | | | F004 | R |
| 30137 | 136 | R-Phase(3P4W) / RS-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30139 | 138 | S-Phase(3P4W) / ST-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30141 | 140 | T-Phase(3P4W) / TR-Phase(3P3W) Voltage THD | | | | F004 | R |
| 30143 | 142 | R-Phase Current THD | | | | F004 | R |
| 30145 | 144 | S-Phase Current THD | | | | F004 | R |
| 30147 | 146 | T-Phase Current THD | | | | F004 | R |
| 30149 | 148 | R-Phase Voltage Fundamental Harmonic | | | | F004 | R |
| 30917 | 916 | OCR Current R-Phase | | | | F004 | R |
| 30919 | 918 | OCR Current S-Phase | | | | F004 | R |
| 30921 | 920 | OCR Current T-Phase | | | | F004 | R |
| 30923 | 922 | OCR Current N-Phase | | | | F004 | R |
| 30925 | 924 | OCGR Current | | | | F004 | R |
| 30926 | 925 | OCGR Current | | | | F005 | R |
| 31001 | 1000 | MAX DEMAND W time | | - | - | F113 | R |
| 31004 | 1003 | Reserved | | - | - | F113 | R |
| 31007 | 1006 | MAX W Time | | - | - | F113 | R |
| 40002 | 1 | OCR H/W Setting Information (DIP SW Information) | | | | F038(F117) | R |
| 40003 | 2 | Connection Method, Frequency, Demand, OCR FineSet, OCGR... | | | | F038(F118) | R |
| 40011 | 10 | Long-time delay Reference Current(Ir) [A] | | A | | F038 | R |
| 40012 | 11 | Long-time delay Operation Time(Tr) [0.1 sec] | | 0.1sec | | F038 | R |
| 40013 | 12 | Short-time delay Operation Current(Is) [A] | | A | | F038 | R |
| 40014 | 13 | Short-time delay Operation Time(Ts) [ms] | | ms | | F038 | R |
| 40015 | 14 | Instantaneous delay Operation Current(Ii) [A] | | A | | F022 | R |
| 40021 | 20 | Ground-fault(Leakage, PTA) Operation Current (I _g , I _p) [A] ※ Outer CTGround-fault, Leakage Function, Indicates ×10 value in a Setting ×10(means 50→5A, 5→0.5A) ※ Function as PTA, Indicates Setting PTAOperation Current [A] | | A×10A | | F038 | R |
| 40022 | 21 | Ground-fault(Leakage, PTA) Operation Time(T _g , T _p)[ms] ※ Function as PTA, Setting PTATime unit is [sec] | | ms/sec | | F038 | R |
| 40031 | 30 | OVR/UVR Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |

| Registro | Dirección | Nombre de Registro | Rango | Unidad | Etapas | Formato | Propiedad |
|----------|-----------|--|----------|--------|--------|----------------|-----------|
| 40032 | 31 | V/I Unbalance Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40033 | 32 | rPower/rRot Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40034 | 33 | OFR/UFR Relay Operation Action [None, Event, DO1, DO2, DO3] | | | | F116 (F038) | R |
| 40035 | 34 | OVR Operation Reference [V] | | V | | F038 | R |
| 40036 | 35 | UVR Operation Reference | | V | | F038 | R |
| 40037 | 36 | V unbalance Operation Reference [%] | | % | | F038 | R |
| 40038 | 37 | I Unbalance Operation Reference | | % | | F038 | R |
| 40039 | 38 | Reverse Power Operation Reference [kW] | | kW | | F038 | R |
| 40040 | 39 | Reserve | | - | | F038 | R |
| 40041 | 40 | OFR Operation Reference [Hz] | | Hz | | F038 | R |
| 40042 | 41 | UFR Operation Reference | | Hz | | F038 | R |
| 40043 | 42 | OVR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40044 | 43 | UVR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40045 | 44 | V unbalance Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40046 | 45 | I Unbalance Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40047 | 46 | Reverse Power Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40048 | 47 | OFR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40049 | 48 | UFR Operation Time [0.1 sec] | | 0.1Sec | | F038 | R |
| 40050 | 49 | Reserve | | - | | F038 | R |
| 41001 | 1000 | Operation Time | 0~232 -1 | Sec | 1 | F006 | R |
| 41003 | 1002 | Circuit Breaker Conducting Time | 0~232 -1 | Sec | 1 | F006 | R |
| 41005 | 1004 | CBOperation number of times | 0~65535 | Times | 1 | F038 | R |
| 42101 | 2100 | Event Record | - | - | - | F114 | R |
| 42201 | 2200 | Trip Event Record | - | - | - | F115 | R |



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