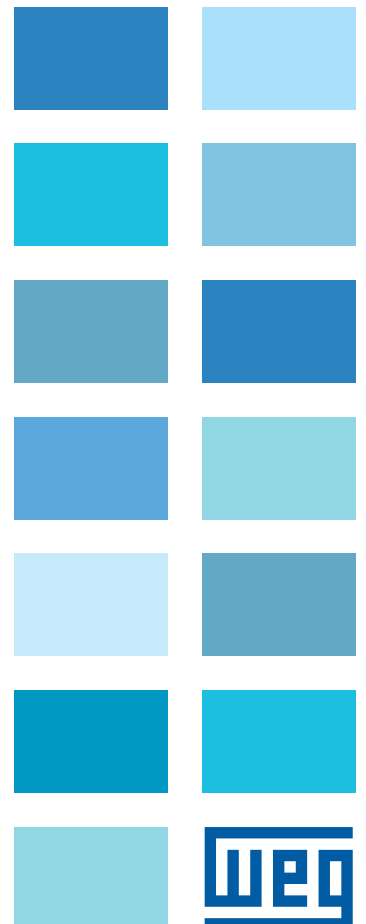


# Protocolo Modbus Modbus Protocol Protocolo Modbus

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	Chechagem de Erro

Resposta	Escravo
Endereço do dispositivo	Endereço escravo
Código função	ECHO ou MSB = 1
Dado	Informação solicitada Ou código exclusão
Chechagem 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						-	-	-	F002	W
			op disjuntor ligado										
			Seleção disjuntor desligado										
			op disjuntor desligado										
			Seleção saída digital ligada										
			op saída digital ligada										
			Seleção saída digital desligada										
op saída digital desligada													
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	Etapa	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 <sub>g</sub> , I <sub>p</sub> ) [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 <sub>g</sub> , T <sub>p</sub> )[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	-	-	-	F002	W
	33	32	Circuit breaker OFF selection	-	-	-	F002	W
	34	33	Circuit breaker OFF op	-	-	-	F002	W
	35	34	Digital output ON selection	-	-	-	F002	W
	36	35	Digital output ON op	-	-	-	F002	W
	37	36	Digital output OFF selection	-	-	-	F002	W
	38	37	Digital output OFF op	-	-	-	F002	W
51	50	Alert digital output reset	-	-	-	F002	W	
		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	
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 <sub>g</sub> , I <sub>p</sub> ) [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 <sub>g</sub> , T <sub>p</sub> )[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 <sub>g</sub> , I <sub>p</sub> ) [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 <sub>g</sub> , T <sub>p</sub> )[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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