

Communication interface MODBUS manual for HGMP A60

Revision History

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1 Overview

This document describes the MODBUS ADDRESS MAP used in MODBUS communication of HGMP A60 motor protection relay products sold by Hyundai Electric & Energy System Co., Ltd.

(1) Application

Motor protection relay HGMP A60

(2) Communication specification

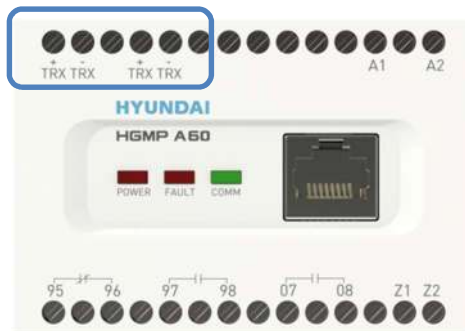
HGMP A60 supports Modbus communication using RS485 interface and functions as a Modbus client (slave).

Connection	2-wire
Speed	9600, 19200, 38400 bps
Protocol	MODBUS-RTU

Table1. Communication specification of HGMP A60

(3) Communication port

The communication port of the HGMP A60 is located at the top of the front of the main body.



Picture1. Communication port location of HGMP A60

(4) Communication environment setting.

Call address, communication speed, and swap status can be set in HGMP A60 product settings.

Setting items	Contents	Range of settings	Initial settings.
Addr	Slave Address	1 ~ 247	1
bPS	Communication speed (0.96:9600, 1.92:19200, 3.84:38400)	9600, 19200, 38400	9600
SAP	Byte order of the float variable	oFF, on	oFF

Table 2. HGMP A60 Communication Settings Items

2 Specification

The communication of the HGMP A60 product acts as a slave during the master/slave configuration of the modbus-rtu protocol. The detailed operation specifications are as follows.

- Protocol: Modbus-RTU
- Start bit: 1 bit
- Data bit: 8 bits
- Parity: none
- Stop bit: 1 bit
- Error Check Field: Cyclical Redundancy Check(CRC)
- Master – Client Method
- Data Link Layer
- The Query-Response Cycle

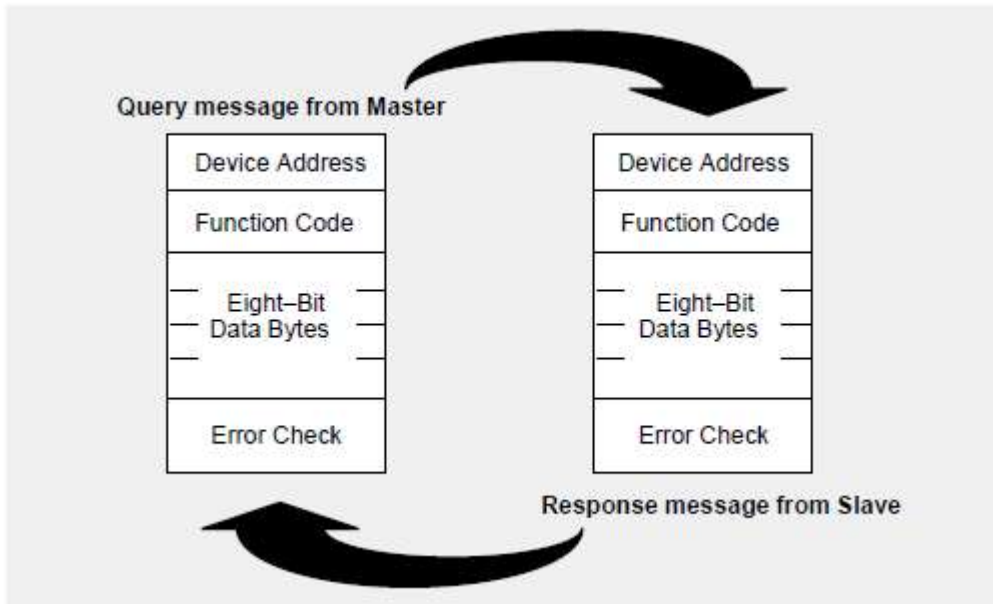


Figure 2. Query response structure.

(Example)

In order to explain the communication operation of the HGMP A60, the process of reading specific data (rating current setting) from the HGMP A60 is described.

(Explaining)

According to the Address Profile in Chapter 3 of the body, the register of the rated current setting is 40001, and the address map's start address for this register data is 0. This is expressed in a specific request/response code as follows.

Request

Byte order	Structure		Example
Function code	1 byte	0x03	03
Start address	2 bytes	0x0000 to 0xFFFF	00 00
The number of registers	2 bytes	1 to 125	00 01

Response

Byte order	Structure		Example
Function code	1 byte	0x03	03
Start address	1 bytes	2 x N*	02
The number of registers	N* x 2 bytes		00 05

* N = The number of registers

에러(Error)

Byte order	Structure	
Error code	1 byte	0x83
Byte count	1 byte	01 or 02 or 03 or 04

Exception code	Code name	Description
01h	Illegal function	Invalid function code is specified
02h	Illegal data address	Invalid register address is specified
03h	Illegal data value	Invalid data value is specified
04h	Slave device failure	Failed to process the transmitted request command

Table 3. Exception code

3 HGMP A60 Address Profile

(1) Metering information

Function Code	R/W	Register	Address	Name	Format	Scale	Unit	Description
0x04	R	30001	0	IR	UINT32		mA	
	R	30003	2	IS	UINT32		mA	
	R	30005	4	IT	UINT32		mA	
	R	30007	6	ZCT Ground current	UINT32		uA	
	R	30009	8	NCT Ground current	UINT32		mA	
	R	30011	10	Maximum phase current	UINT32		mA	
	R	30013	12	Load rate	UINT32		%	
	R	30015	14	Unbalance rate	UINT32		%	
	R	30017	16	Total hours of use (hour)	UINT16		hour	
	R	30018	17	Total hours of use (min)	UINT16		min	
	R	30019	18	Hours of use (hour)	UINT16		hour	
	R	30020	19	Hours of use (min)	UINT16		min	
	R	30021	20	Fault data	UINT16		-	
	R	30022	21	Setting, driving time over	UINT16		-	
	R	30129	128	Real-time current IR #1	INT16	1/40	mA	The number of requests: ≤ 125
	R	30320	319	Real-time current IR #192	INT16	1/40	mA	
	R	30321	320	Real-time current IS #1	INT16	1/40	mA	The number of requests: ≤ 125
	R	30512	511	Real-time current IS #192	INT16	1/40	mA	
	R	30513	512	Real-time current IT #1	INT16	1/40	mA	The number of requests: ≤ 125
R	30704	703	Real-time current IT #192	INT16	1/40	mA		

Note) The real-time current value is captured at the initial request moment to provide a three-phase simultaneous sampling value.

However, the waveform capture condition is limited to the case where the real-time current waveform request address is the R-phase start number 128.

(2) Setting information

Function Code	R/W	Register	Address	Name	Range	Format	Scale	Unit
0x03	R	40001	0	Rated current setting	5~600(1 step)	UINT16	10	A
	R	40002	1	CT	25, 50, 100, 200~20000(100 step)	UINT16	100	-
	R	40003	2	Characteristics of movements	0(dEF), 1(thr), 2(nthr)	UINT16	1	-
	R	40004	3	Operation delay time	OFF, 2, 5, 10~600(10 step)	UINT16	10	sec
	R	40005	4	THERMAL CLASS	OFF, 10~600(10 step)	UINT16	10	class
	R	40006	5	Activation Delay	0~200(1 step)	UINT16	1	sec
	R	40007	6	Lock protection	OFF, 200~1000(100 step)	UINT16	1	%
	R	40008	7	Lock motion delay time	1~100(1 step)	UINT16	10	sec
	R	40009	8	Stall Protection	OFF, 150, 200~700(100 step)	UINT16	1	%
	R	40010	9	Stall delay time	5, 10~100(1 step)	UINT16	10	sec
	R	40011	10	Phase loss	0(OFF), 1(ON)	UINT16	-	-
	R	40012	11	Open phase Activation Delay	5, 10~100(10 step)	UINT16	10	sec
	R	40013	12	Phase Unbalance	OFF, 10~70(10 step)	UINT16	1	%
	R	40014	13	Phase Unbalance Activation Delay	5, 10~100(10 step)	UINT16	10	sec
	R	40015	14	Reverse Phase	OFF, ON	UINT16	-	-
	R	40016	15	Undercurrent	OFF, 30~90(10 step)	UINT16	1	%
	R	40017	16	Undercurrent Activation Delay	5, 10~300(10 step)	UINT16	10	sec
	R	40018	17	Earth Leakage (ZCT)	OFF, 10~250(10 step)	UINT16	100	A
	R	40019	18	Earth Leakage (ZCT) Activation Delay	1~100(10 step)	UINT16	10	sec
	R	40020	19	Earth Leakage(NCT)	OFF, 5~600(1 step)	UINT16	10	A
	R	40021	20	Ground Fault(NCT) Activation Delay	1~100(10 step)	UINT16	10	sec
	R	40022	21	Ground Fault Delay During Startup	OFF, ON	UINT16	-	-
	R	40023	22	Short	OFF, 600~1500(100 step)	UINT16	1	%
	R	40024	23	Short Delay During Startup	OFF, ON	UINT16	-	-
	R	40025	24	Overcurrent Warning	OFF, 60~110(10 step)	UINT16	1	%
	R	40026	25	Electrical Reset	OFF, ON	UINT16	-	-
	R	40027	26	Automatic Reset	OFF, 5, 10~12000(10 step)	UINT16	10	sec
	R	40028	27	Motor Runtime Warning	OFF, 1~9999(1 step)	UINT16	1	hour
	R	40029	28	Communication address	1~247(1 step)	UINT16	1	-
	R	40030	29	Communication speed	0.96, 1.92, 3.84	UINT16	1	-
	R	40031	30	Communication data SWAP	OFF, ON	UINT16	-	-
	R	40032	31	RTC TIME(Year)	2000~2100(1 step)	UINT16	1	-
	R	40033	32	RTC TIME(Month)	1~12(1 step)	UINT16	1	-
	R	40034	33	RTC TIME(Date)	1~31(1 step)	UINT16	1	-
	R	40035	34	RTC TIME(Hour)	0~23(1 step)	UINT16	1	-
	R	40036	35	RTC TIME(Minute)	0~59(1 step)	UINT16	1	-
	R	40037	36	RTC TIME(Second)	0~59(1 step)	UINT16	1	-

(3) Fault event

Function Code	R/W	Register	Address	Name	Range	Format	Scale	Unit
0x03	R	40129	128	Breakdown event 1		F115	-	-
	R	40144	143	Breakdown event 2		F115	-	-
	R	40159	158	Breakdown event 3		F115	-	-
	R	40174	173	Breakdown event 4		F115	-	-
	R	40189	188	Breakdown event 5		F115	-	-
	R	40204	203	Breakdown event 6		F115	-	-
	R	40219	218	Breakdown event 7		F115	-	-
	R	40234	233	Breakdown event 8		F115	-	-
	R	40249	248	Breakdown event 9		F115	-	-
	R	40264	263	Breakdown event 10		F115	-	-

(4) System event

Function Code	R/W	Register	Address	Name	Range	Format	Scale	Unit
0x03	R	40385	384	System event 1		F116		
	R	40389	388	System event 2		F116		
	R	40393	392	System event 3		F116		
	R	40397	396	System event 4		F116		
	R	40401	400	System event 5		F116		
	R	40405	404	System event 6		F116		
	R	40409	408	System event 7		F116		
	R	40413	412	System event 8		F116		
	R	40417	416	System event 9		F116		
	R	40421	420	System event 10		F116		
	R	40425	424	System event 11		F116		
	R	40429	428	System event 12		F116		
	R	40433	432	System event 13		F116		
	R	40437	436	System event 14		F116		
	R	40441	440	System event 15		F116		
	R	40445	444	System event 16		F116		
	R	40449	448	System event 17		F116		
	R	40453	452	System event 18		F116		
	R	40457	456	System event 19		F116		
	R	40461	460	System event 20		F116		
	R	40465	464	System event 21		F116		
	R	40469	468	System event 22		F116		
	R	40473	472	System event 23		F116		
	R	40477	476	System event 24		F116		
	R	40481	480	System event 25		F116		
	R	40485	484	System event 26		F116		

R	40489	488	System event 27		F116		
R	40493	492	System event 28		F116		
R	40497	496	System event 29		F116		
R	40501	500	System event 30		F116		
R	40505	504	System event 31		F116		
R	40509	508	System event 32		F116		
R	40513	512	System event 33		F116		
R	40517	516	System event 34		F116		
R	40521	520	System event 35		F116		
R	40525	524	System event 36		F116		
R	40529	528	System event 37		F116		
R	40533	532	System event 38		F116		
R	40537	536	System event 39		F116		
R	40541	540	System event 40		F116		
R	40545	544	System event 51		F116		
R	40549	548	System event 52		F116		
R	40553	552	System event 53		F116		
R	40557	556	System event 54		F116		
R	40561	560	System event 55		F116		
R	40565	564	System event 56		F116		
R	40569	568	System event 57		F116		
R	40573	572	System event 58		F116		
R	40577	576	System event 59		F116		
R	40581	580	System event 60		F116		

(5) The last fault wave record

- Record of fault wave for last 100ms

Function Code	R/W	Register	Address	Name	Format	Scale	Unit	Description
0x03	R	41313	1312	LAST TRIP WAVE – IR #1	INT16	1/40	mA	The number of requests: ≤ 125
	R	41504	1503	LAST TRIP WAVE – IR #192				
	R	41505	1504	LAST TRIP WAVE – IS #1	INT16	1/40	mA	The number of requests: ≤ 125
	R	41696	1695	LAST TRIP WAVE – IS #192				
	R	41697	1696	LAST TRIP WAVE – IT #1	INT16	1/40	mA	The number of requests: ≤ 125 The number of requests: ≤ 125
	R	41888	1887	LAST TRIP WAVE – IT #192				

(6) Write command

Function Code	R/W	Address	Name	Range	Format	Scale	Unit
0x06	W	0	Rated Current	5~600(1 step)	UINT16	10	A
	W	1	CT Ratios	25, 50, 100, 200~20000(100 step)	UINT16	100	-
	W	2	Operating Time Characteristics	0(DEF), 1(thr), 2(nthr)	UINT16	1	-
	W	3	Activation Delay	OFF, 2, 5, 10~600(10 step)	UINT16	10	sec
	W	4	THERMAL CLASS	OFF, 10~600(10 step)	UINT16	10	class
	W	5	Startup Delay	0~200(1 step)	UINT16	1	sec
	W	6	Lock Protection	OFF, 200~1000(100 step)	UINT16	1	%
	W	7	Lock Activation Delay	1~100(1 step)	UINT16	10	sec
	W	8	Stall Protection	OFF, 150, 200~700(100 step)	UINT16	1	%
	W	9	Stall Activation Delay	5, 10~100(1 step)	UINT16	10	sec
	W	10	Phase Failure	OFF, ON	UINT16	-	-
	W	11	Phase Failure Activation Delay	5, 10~100(10 step)	UINT16	10	sec
	W	12	Phase Unbalance	OFF, 10~70(10 step)	UINT16	1	%
	W	13	Phase Unbalance Activation Delay	5, 10~100(10 step)	UINT16	10	sec
	W	14	Reverse Phase	OFF, ON	UINT16	-	-
	W	15	Undercurrent	OFF, 30~90(10 step)	UINT16	1	%
	W	16	Undercurrent Activation Delay	5, 10~300(10 step)	UINT16	10	sec
	W	17	Earth Leakage (ZCT)	OFF, 10~250(10 step)	UINT16	100	A
	W	18	Earth Leakage (ZCT) Activation Delay	1~100(1 step)	UINT16	10	sec
	W	19	Ground Fault (NCT)	OFF, 5~600(1 step)	UINT16	10	A
	W	20	Ground Fault (NCT) Activation Delay	1~100(1 step)	UINT16	10	sec
	W	21	Ground Fault Delay During Startup	OFF, ON	UINT16	-	-
	W	22	Instantaneous	OFF, 600~1500(100 step)	UINT16	1	%
	W	23	Instantaneous Fault Delay During Startup	OFF, ON	UINT16	-	-
	W	24	Overcurrent Warning	OFF, 60~110(10 step)	UINT16	1	%
	W	25	Electrical Reset	OFF, ON	UINT16	-	-
	W	26	Automatic Reset	OFF, 5, 10~12000(10 step)	UINT16	10	sec
	W	27	Motor Runtime Warning	OFF, 1~9999(1 step)	UINT16	1	hour
	W	28	Comm. Address	1~247(1 step)	UINT16	1	-
	W	29	Comm. Speed	0.96, 1.92, 3.84	UINT16	1	-
	W	30	Comm. Data SWAP	OFF, ON	UINT16	-	-
	W	31	RTC TIME(Year)	2000~2099 (1 step)	UINT16	1	-
	W	32	RTC TIME(Month)	1~12(1 step)	UINT16	1	-
	W	33	RTC TIME(Date)	1~31(1 step)	UINT16	1	-
	W	34	RTC TIME(Hour)	0~23(1 step)	UINT16	1	-
	W	35	RTC TIME(Minute)	0~59(1 step)	UINT16	1	-
W	36	RTC TIME(Second)	0~59(1 step)	UINT16	1	-	

Function Code	R/W	Address	Name	Range	Format	Scale	Unit
0x05	W	0	Breakdown Reset	0xFF00, 0x0000	UINT16	-	-
	W	1	Thermal Reset	0xFF00, 0x0000	UINT16	-	-

Function Code	R/W	Address	Name	Range	Format	Scale	Unit
0x10	W	0	RTC TIME(Year)	2000~2099(1 step)	UINT16	1	-
	W	1	RTC TIME(Month)	1~12(1 step)	UINT16	1	-
	W	2	RTC TIME(Date)	1~31(1 step)	UINT16	1	-
	W	3	RTC TIME(Hour)	0~23(1 step)	UINT16	1	-
	W	4	RTC TIME(Minute)	0~59(1 step)	UINT16	1	-
	W	5	RTC TIME(Second)	0~59(1 step)	UINT16	1	-

4 Data Format

(1) F115

Index	byte #	description	
Time Stamp : YEAR	1	UINT8	
Time Stamp : MONTH	1	UINT8	
Time Stamp : DATE	1	UINT8	
Time Stamp : HOUR	1	UINT8	
Time Stamp : MINUTE	1	UINT8	
Time Stamp : SECOND	1	UINT8	
고장 내용	2	0x00 :No breakdown	
		0x01 : Definite time	0x09 :Ground fault(NCT)
		0x02 : Inverse time	0x0A : Earth phase(ZCT)
		0x03 : LOCK	0x0B : Undercurrent
		0x04 : STALL	
		0x05 : Phase failure	
		0x06 : Phase unbalance	
		0x07 : Reverse phase	
		0x08 : Instantaneous	
예비	2	0x0	
IR	4	R phase	
IS	4	S phase	
IT	4	T phase	
IZCT	4	ZCT current	
INCT	4	NCT current	
Byte Sum	30		

(2) F116

Index	byte #	description	
Time Stamp : YEAR	1	UINT8	
Time Stamp : MONTH	1	UINT8	
Time Stamp : DATE	1	UINT8	
Time Stamp : HOUR	1	UINT8	
Time Stamp : MINUTE	1	UINT8	
Time Stamp : SECOND	1	UINT8	
Event Data	2	F117	
Byte Sum	8		

(3) F117

Event data	Local	Description	Event data	Remote
0x02	v	Rated Current Change	0x30	v
0x03	v	CT Ratio Change	0x31	v
0x04	v	Operating Time Characteristics Change	0x32	v
0x05	v	Operation delay time Change	0x33	v
0x06	v	Startup Delay Change	0x34	v
0x07	v	THERMAL CLASS Change	0x35	v
0x08	v	LOCK Protection Change	0x36	v
0x09	v	LOCK Activation Delay Change	0x37	v
0x0a	v	STALL Protection Change	0x38	v
0x0b	v	STALL Activation time Change	0x39	v
0x0c	v	Phase Failure Change	0x3a	v
0x0d	v	Phase Failure Activation Delay Change	0x3b	v
0x0e	v	Phase Unbalance Change	0x3c	v
0x0f	v	Phase Unbalance Activation Delay Change	0x3d	v
0x10	v	Reverse Phase Change	0x3e	v
0x11	v	Undercurrent Change	0x3f	v
0x12	v	Undercurrent Activation Delay Change	0x40	v
0x13	v	Earth Leakage (ZCT) Change	0x41	v
0x14	v	Earth Leakage (ZCT) Activation Delay Change	0x42	v
0x15	v	Ground Fault (NCT) Change	0x43	v
0x16	v	Ground Fault (NCT) Activation Delay Change	0x44	v
0x17	v	Ground Fault Delay During Startup Change	0x45	v
0x18	v	Instantaneous Change	0x46	v
0x19	v	Instantaneous Fault Delay During Startup Change	0x47	v
0x1a	v	Overcurrent Warning Change	0x48	v
0x1b	v	Electrical RESET Change	0x49	v
0x1c	v	AUTO RESET Change	0x4a	v
0x1d	v	Motor Runtime Change	0x4b	v
0x1e	v	Comm. Parameter Change	0x4c	v
0x1f	v	RTC Setting Change	0x4d	v
0x20	v	Breakdown reset	0x4e	v
0x21	v	Thermal reset	0x4f	v
0x22	v	Automatic reset		