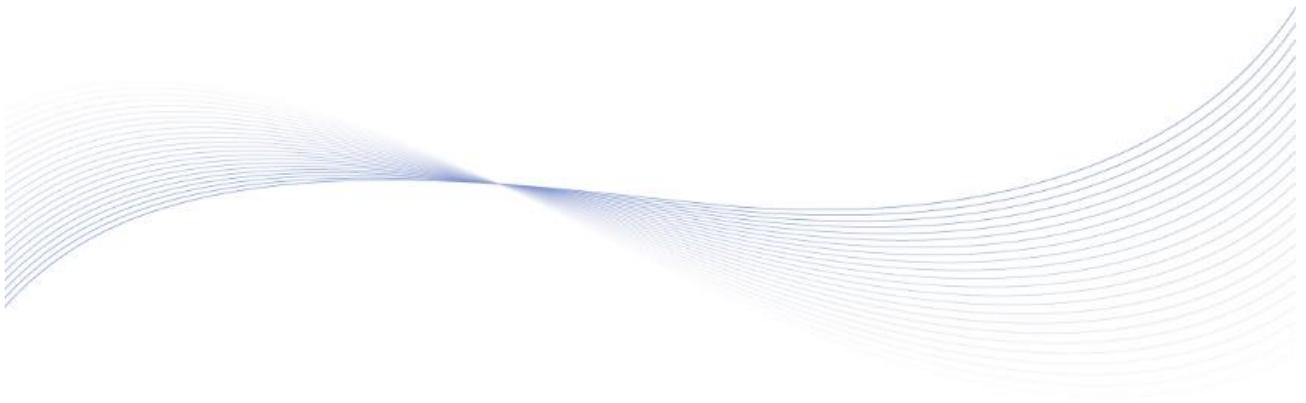

SmartGen

MAKING CONTROL SMARTER

**HGM6100N/HGM6100CAN
GENSET CONTROLLER
COMMUNICATION PROTOCOL**



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Table 1 Software Version

Date	Version	Content
2013-01-05	1.0	Original release.
2014-01-20	1.1	Added coil and maintenance countdown according to HGM6100E HMI V2.5.
2015-08-11	1.2	Added HGM6100N protocol.
2018-10-26	1.3	Added HGM6100LT.
2022-05-12	1.4	1. Modified it according to new protocol format; 2. Modified it according to the latest program (HGM6100N, HGM6100CAN).
2023-04-20	1.5	Modify it with the latest template.
2024-12-26	1.6	1. Remove the model of HGM6100LT; 2. Update the contents of function code 01 and 03 (to distinguish between HGM6100N and HGM6100CAN); 3. Add the instruction and example of accumulated data.
2025-07-01	1.7	1. Update function code 01 (aftertreatment alarm); 2. Update the contents of function code 03; 3. Add description of neutral gear status indicator and low DEF level indication.

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1. DESCRIPTION

This protocol describes read and write command format of RS485 half-duplex serial port communication and definition of internal information data for the third-party to develop and use.

The HGM6100N/HGM6100CAN controller has 1 RS485 port, which can be used as the slave, using Modbus-RTU protocol, and does not support other protocols such as Modbus-ASCII.

Data format:

Communication address: 1~254 (default: 1)

Baud rate: 2400/4800/9600/19200/115200bps (default: 9600bps)

Start bit: 1-bit

Data bit: 8-bit

Parity bit: None, odd parity, even parity (default: none)

Stop bit: 1-bit

Supported function code: 01H, 03H, 05H and 06H. Function code 01H is used for reading various coils inside the device (such as breaker close, open, fault, auto or manual status, etc.); 03H is used for reading value register inside the device (value register saves measured set value of various analog and parameters); 05H is used for sending remote command. 05H is used for saving the single-point data into the device's internal memory.

Data calibration method: CRC16.

Internal registers of controller are in the unit of "byte (double bytes)".

Communication timeout period: over 200ms.

Communication distance: 9600 baud rate, the longest distance can reach 1,000m when using 120 Ω shielding twisted pair line.

Once maximum 120 data of byte register can be read.

Up to 32 controllers can be deployed for network communication.

When RS485 is connected, 120 Ω twisted pair line with shielding layer shall be used, and the shielding layer shall be grounded at one end.

2. WIRING DIAGRAM

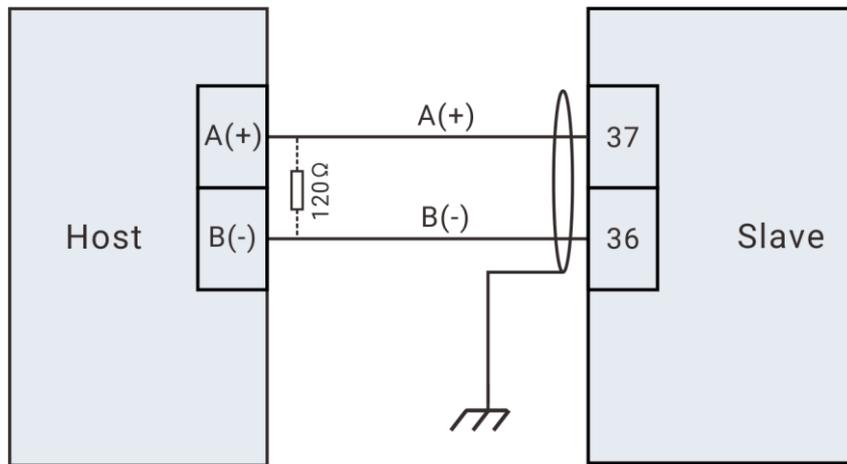


Fig.1 Single Unit Communication Wiring Diagram

NOTE 1: 120Ω resistor at controller side is controlled by setting match resistor enable item. When it is enabled, controller internal 120Ω resistor is connected to controller's RS485A, RS485. (configuration item is defaulted as enable)

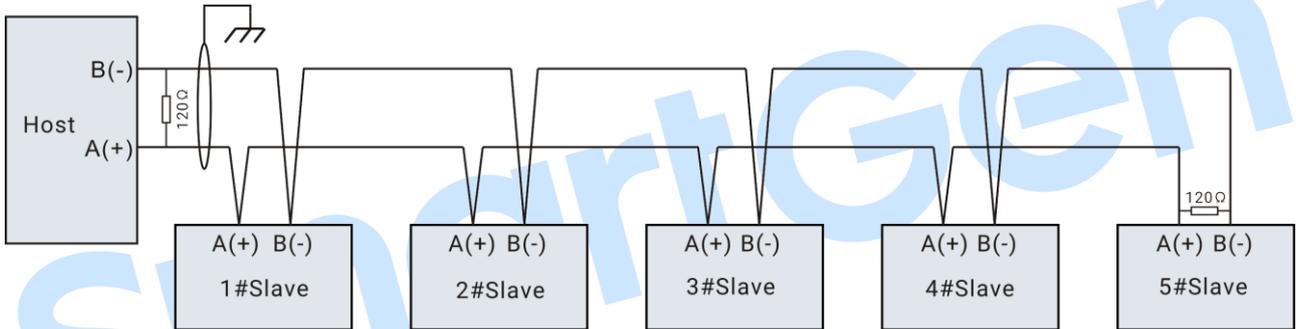


Fig.2 Multi-unit Communication Wiring Diagram

NOTE 1: Please set each controller's communication module address before networking. Same module address is inhibited in the same network.

NOTE 2: The shielding layer of communication line is single-end grounded on the host side.

3. CONTROLLER INTERNAL REGISTER ADDRESS AND DATA

3.1 FUNCTION CODE 01H MAPPLING COIL FIELD

Table 2 Alarm, Status Coil Data Field

Modbus Address	PLC Address	Item	Description
0000	0001	Common Alarm	0 represents there is no common alarm; 1 represents there is common alarm, and so on.
0001	0002	Common Warning Alarm	1 for active
0002	0003	Common Shutdown Alarm	1 for active
0003	0004	Remote Mode	1 for active
0004	0005	Remote Lock	1 for active
0005	0006	Reserved	1 for active
0006	0007	Mains On-load	1 for active
0007	0008	Gen On-load	1 for active
0008	0009	Emergency Stop	1 for active
0009	0010	Overspeed Alarm Shutdown	1 for active
0010	0011	Underspeed Alarm Shutdown	1 for active
0011	0012	Speed Signal Loss Shutdown	1 for active
0012	0013	Overfrequency Alarm Shutdown	1 for active
0013	0014	Underfrequency Alarm Shutdown	1 for active
0014	0015	Overvoltage Alarm Shutdown	1 for active
0015	0016	Undervoltage Alarm Shutdown	1 for active
0016	0017	Gen Overcurrent Shutdown	1 for active
0017	0018	Crank Failure	1 for active
0018	0019	High Water Temp. Alarm Shutdown	1 for active
0019	0020	Low Oil Pressure Alarm Shutdown	1 for active
0020	0021	Frequency Loss Alarm	1 for active
0021	0022	Input Shutdown Alarm	1 for active
0022	0023	Low Fuel Level Shutdown Alarm	1 for active
0023	0024	Low Coolant Level Shutdown Alarm	1 for active
0024	0025	High Water Temp. Warning Alarm	1 for active
0025	0026	Low Oil Pressure Warning Alarm	1 for active
0026	0027	Gen Overcurrent Warning Alarm	1 for active
0027	0028	Stop Failure Warning Alarm	1 for active
0028	0029	Low Fuel Level Warning	1 for active
0029	0030	Charging Failure Warning	1 for active
0030	0031	Battery Undervoltage Warning Alarm	1 for active
0031	0032	Battery Overvoltage Warning Alarm	1 for active
0032	0033	Input Warning Alarm	1 for active
0033	0034	Speed Signal Loss Warning	1 for active
0034	0035	Low Coolant Level Warning	1 for active
0035	0036	Temp. Sensor Open Warning	1 for active

Modbus Address	PLC Address	Item	Description	
0036	0037	Oil Pressure Sensor Open Warning	1 for active	
0037	0038	Maintenance Time Due Warning	1 for active	
0038	0039	Charger Fail to Charge Warning	1 for active	
0039	0040	Overpower Warning	1 for active	
0040	0041	Test Mode	1 for active	
0041	0042	Auto Mode	1 for active	
0042	0043	Manual Mode	1 for active	
0043	0044	Stop Mode	1 for active	
0044	0045	Temp. Sensor Open Shutdown	1 for active	
0045	0046	Oil Pressure Sensor Open Shutdown	1 for active	
0046	0047	Maintenance Time Due Shutdown Alarm	1 for active	
0047	0048	Overpower Shutdown Alarm	1 for active	
0048	0049	Emergency Stop Input	1 for active	
0049	0050	Aux. Input 1	1 for active	
0050	0051	Aux. Input 2	1 for active	
0051	0052	Aux. Input 3	1 for active	
0052	0053	Aux. Input 4	1 for active	
0053	0054	Aux. Input 5	1 for active	
0054	0055	Reserved	1 for active	HGM6100CAN
		Liquid Leakage Shutdown	1 for active	HGM6100N
0055	0056	Reserved	1 for active	
0056	0057	Crank Relay Output	1 for active	
0057	0058	Fuel Relay Output	1 for active	
0058	0059	Aux. Output 1	1 for active	
0059	0060	Aux. Output 2	1 for active	
0060	0061	Aux. Output 3	1 for active	
0061	0062	Aux. Output 4	1 for active	
0062	0063	Fuel 1 Output Control	1 for active	HGM6100CAN
		Overcurrent Shutdown Input	1 for active	HGM6100N
0063	0064	Liquid Leakage Warning	1 for active	HGM6100CAN
		Overspeed Shutdown Input	1 for active	HGM6100N
0064	0065	Mains Fault	1 for active	
0065	0066	Mains Normal	1 for active	
0066	0067	Mains Overvoltage	1 for active	
0067	0068	Mains Undervoltage	1 for active	
0068	0069	Mains Loss Phase	1 for active	
0069	0070	Mains Blackout	1 for active	
0070	0071	Reserved	1 for active	HGM6100CAN
		High Temp. Shutdown	1 for active It links to the analog temp. sensor.	HGM6100N
0071	0072	Reserved	1 for active	HGM6100CAN

Modbus Address	PLC Address	Item	Description	
		Low Oil Pressure Shutdown	1 for active It links to the analog oil pressure sensor.	HGM6100N
0072	0073	Gen Normal	1 for active	
0073	0074	Gen Overvoltage	1 for active	
0074	0075	Gen Undervoltage	1 for active	
0075	0076	Gen Overfrequency	1 for active	
0076	0077	Gen Underfrequency	1 for active	
0077	0078	Gen Overcurrent	1 for active	
0078	0079	Scheduled Not Run Time Indication	1 for active	
0079	0080	ECU Warning	1 for active	HGM6100CAN
		Liquid Leakage Warning	1 for active	HGM6100N
The following items are only supported by HGM6100CAN				
0080	0081	ECU Shutdown Alarm	1 for active	
0081	0082	ECU Comm. Failure Alarm	1 for active	
0082	0083	High Temp. Shutdown	1 for active It links to the analog temp. sensor.	
0083	0084	Low Oil Pressure Shutdown	1 for active It links to the analog oil pressure sensor.	
0084	0085	Liquid Leakage Shutdown	1 for active	
0085	0086	Reserved	1 for active	
0086	0087	Reserved	1 for active	
0087	0088	Reserved	1 for active	
0088	0089	Regeneration in process	1 for active	
0089	0090	Severe limit will be activated soon	1 for active	
0090	0091	Service Regeneration is required due to DPF overload	1 for active	
0091	0092	Parked regeneration is required due to DPF full load	1 for active	
0092	0093	DPF is regenerating, DO NOT shut down	1 for active	
0093	0094	DPF regeneration is inhibited	1 for active	
0094	0095	DPF regeneration is required, DO NOT shut down	1 for active	
0095	0096	Engine Warning Fault	1 for active	
0096	0097	On-road Regeneration	1 for active	
0097	0098	Parked regeneration is required	1 for active	
0098	0099	Regeneration at the service station is required	1 for active	
0099	0100	Parked regeneration is required	1 for active	
0100	0101	High Aftertreatment Exhaust Temp.	1 for active	
0101	0102	Do not close the switch with load during regeneration	1 for active	

Modbus Address	PLC Address	Item	Description
0102	0103	Please regenerate when water temp. is above 50°C	1 for active
0103	0104	Active regeneration is required	1 for active
0104	0105	HEST Indication	1 for active
0105	0106	DPF Inhibit Indication	1 for active
0106	0107	NCD Alarm	1 for active
0107	0108	NCD limit will be activated soon	1 for active
0108	0109	NCD Primary Limit	1 for active
0109	0110	NCD Severe Limit	1 for active
0110	0111	Service Regeneration is required	1 for active
0111	0112	Parked regeneration in process	1 for active
0112	0113	MIL	1 for active
0113	0114	SVS	1 for active
0114	0115	Cruise Control Indication	1 for active
0115	0116	Water in Fuel	1 for active
0116	0117	Exhaust Brake	1 for active
0117	0118	Low Urea Level	1 for active
0118	0119	Driver Alarm	1 for active
0119	0120	DPF	1 for active
0120	0121	Engine Shutdown Fault	1 for active
0121	0122	Reserved	1 for active
0122	0123	Reserved	1 for active
0123	0124	Reserved	1 for active
0124	0125	Reserved	1 for active
0125	0126	Reserved	1 for active
0126	0127	Reserved	1 for active
0127	0128	Reserved	1 for active

Example:

If the status of “Emergency Stop” and “Input Warning Alarm” needs to be read, firstly get their corresponding addresses are 0008 and 0032 by checking the table above, then it is known that 40 coils need to be read.

Assume the slave (controller) address is 01, the master (can be computer) request command is as following:

Table 3 Master (Computer) Request Command

Slave Address	Function Code	Starting Address (0000)		Request Data Qty. (40)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	01	00	00	00	28	3C	14

The slave response command is as following:

Table 4 Slave (Controller) Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data					CRC 16 Calibration	
			Content of Address 07-00	Content of Address 15-08	Content of Address 23-16	Content of Address 31-24	Content of Address 39-32	LSB	MSB
01	01	05	07	01	00	00	01	E4	AE

Table 5 Data Analysis

Address	Received Data (Hex)	Binary	Data Signification
Data of Address 15-08	01H	0000 0000 0000 0001	Data of bit 08 is 1, represents emergency stop alarm is active.
Data of Address 39-32	01H	0000 0000 0000 0001	Data of bit 32 is 1, represents input warning alarm is active.



3.2 FUNCTION CODE 03H MAPPING DATA FIELD

Table 6 Value Data Field

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0000	40001	Mains UA	0~65535	1	V	Unsigned	2Bytes
0001	40002	Mains UB	0~65535	1	V	Unsigned	2Bytes
0002	40003	Mains UC	0~65535	1	V	Unsigned	2Bytes
0003	40004	Mains UAB	0~65535	1	V	Unsigned	2Bytes
0004	40005	Mains UBC	0~65535	1	V	Unsigned	2Bytes
0005	40006	Mains UCA	0~65535	1	V	Unsigned	2Bytes
0006	40007	Mains Freq.	0~100.0	0.1	Hz	Unsigned	2Bytes
0007	40008	Gen UA	0~65535	1	V	Unsigned	2Bytes
0008	40009	Gen UB	0~65535	1	V	Unsigned	2Bytes
0009	40010	Gen UC	0~65535	1	V	Unsigned	2Bytes
0010	40011	Gen UAB	0~65535	1	V	Unsigned	2Bytes
0011	40012	Gen UBC	0~65535	1	V	Unsigned	2Bytes
0012	40013	Gen UCA	0~65535	1	V	Unsigned	2Bytes
0013	40014	Gen Freq.	0~100.0	0.1	Hz	Unsigned	2Bytes
0014	40015	A Phase Current	0~65535	0.1	A	Unsigned	2Bytes
0015	40016	B Phase Current	0~65535	0.1	A	Unsigned	2Bytes
0016	40017	C Phase Current	0~65535	0.1	A	Unsigned	2Bytes
0017	40018	Water Temp. Value		1	°C	Unsigned	2Bytes
0018	40019	Water Temp. Resist. Value		0.1	Ω	Unsigned	2Bytes
0019	40020	OP Value		1	kPa	Unsigned	2Bytes
0020	40021	OP Resist. Value		0.1	Ω	Unsigned	2Bytes
0021	40022	Level Value		1	%	Unsigned	2Bytes
0022	40023	Level Resist. Value		0.1	Ω	Unsigned	2Bytes
0023	40024	Speed	0~65535	1	RPM	Unsigned	2Bytes
0024	40025	Battery Voltage	0~65535	0.1	V	Unsigned	2Bytes
0025	40026	D+ Voltage	0~65535	0.1	V	Unsigned	2Bytes
0026	40027	Active Power		1	kW	Signed	2Bytes
0027	40028	Reactive Power		1	kvar	Signed	2Bytes
0028	40029	Apparent Power		1	kVA	Signed	2Bytes
0029	40030	Power Factor		0.01		Signed	2Bytes
0030	40031	Maintenance Countdown h		1	h	Unsigned	2Bytes
0031	40032	Maintenance Countdown min	0~59	1	min	Unsigned	2Bytes
0032	40033	Ignition Advance Angle		1	deg	51: KINGBAND 73: KINGBAND-1	Only support HGM6100CAN ECU genset;
				0.1	CA	Other ECU	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
						gensets	For HGM6100N, it is reserved.
0033	40034	Gas Valve Position		0.01	%	Signed	
0034	40035	Controller Running Status		No.		Genset Status	2Bytes
0035	40036	Delay			s	Unsigned	2Bytes
0036	40037	Auto Running Status				Remote Start Status	2Bytes
0037	40038	Delay			s	Unsigned	2Bytes
0038	40039	ATS Running Status				Unsigned	2Bytes
0039	40040	Delay			s	Unsigned	2Bytes
0040	40041	Mains Status 0 Normal 1 Abnormal 2 No Delay				Unsigned	2Bytes
0041	40042	Delay			s	Unsigned	2Bytes
0042	40043	Accum. Oil Engine Running Time (h) MSB	0~9000	1	h	Unsigned	2Bytes
0043	40044	Accum. Oil Engine Running Time (h) LSB	0~9999	1	h	Unsigned	2Bytes
0044	40045	Accum. Oil Engine Running Time (min)	0~59	1	min	Unsigned	2Bytes
0045	40046	Accum. Oil Engine Running Time (s)	0~59	1	s	Unsigned	2Bytes
0046	40047	Accum. Start Times MSB	0~9000			Unsigned	2Bytes
0047	40048	Accum. Start Times LSB	0~9999			Unsigned	2Bytes
0048	40049	Accum. Energy MSB	0~9000	1	kWh	Unsigned	2Bytes
0049	40050	Accum. Energy LSB	0~9999	1	kWh	Unsigned	2Bytes
0050	40051	SW		0.1		Unsigned	2Bytes
0051	40052	HW		0.1		Unsigned	2Bytes
0052	40053	A Phase Active Power		1	kW	Signed	2Bytes
0053	40054	B Phase Active Power		1	kW	Signed	2Bytes

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks	
0054	40055	C Phase Active Power		1	kW	Signed	2Bytes	
0055	40056	Load Output Percentage			%	Unsigned	2Bytes	
0056	40057	Air-fuel Ratio		0.01		Signed	Only support HGM6100CAN ECU genset; For HGM6100N, it is reserved.	
0057	40058	Throttle Percentage		0.1	%	Signed		
0058	40059	Coolant Level		1	%	Signed		
0059	40060	Oil Temp.		1	°C	Signed		
0060	40061	Coolant Pressure		1	kPa	Signed		
0061	40062	Fuel Pressure		1	kPa	Signed		
0062	40063	Fuel Temp.		1	°C	Signed		
0063	40064	Air Inlet Temp.		1	°C	Signed		
0064	40065	Exhaust Outlet Temp.		1	°C	Signed		
0065	40066	Turbo Pressure		1	kPa	Signed		
0066	40067	Fuel Consump.		0.1	L/h	Signed		
0067	40068	Intake Pressure		1	kPa	Signed		
0068	40069	Accum. Fuel		1	L	Signed		
0069	40070	Consump.						
0070	40071	Reserved				Unsigned		2Bytes
0071	40072	Controller Model				Unsigned		2Bytes
0072	40073	Controller Time: Year	0~99	1		Unsigned	2Bytes	
0073	40074	Controller Time: Month	1~12	1		Unsigned	2Bytes	
0074	40075	Controller Time: Day	1~31	1		Unsigned	2Bytes	
0075	40076	Controller Time: Week	0~6	1		Unsigned	2Bytes	
0076	40077	Controller Time: h	0~23	1		Unsigned	2Bytes	
0077	40078	Controller Time: min	0~59	1		Unsigned	2Bytes	
0078	40079	Controller Time: s	0~59	1		Unsigned	2Bytes	
0079	40080	Release Year	0~99	1		Unsigned	2Bytes	
0080	40081	Release Month	1~12	1		Unsigned	2Bytes	
0081	40082	Release Day	1~31	1		Unsigned	2Bytes	
0082	40083	Ignition Speed		1	RPM	Unsigned	Only support HGM6100CAN ECU genset; For HGM6100N, it is reserved.	
0083	40084	Urea Level			%	Unsigned		
0084	40085	ECU Temp.			°C	Signed		
0085	40086	Ambient Pressure			kPa	Signed		
0086	40087	ECU Running			h	Signed		
0087	40088	Time						

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0088	40089	MTU FC			RPM	Unsigned	
0089	40090	MTU Droop			%	Unsigned	
0090	40091	MTU Demand Source				Unsigned	
0091	40092	MTU SSD				Unsigned	
0092	40093	Gen UA Phase		1	°	Signed	2Bytes
0093	40094	Gen UB Phase	0~360	1	°	Signed	2Bytes
0094	40095	Gen UC Phase	0~360	1	°	Signed	2Bytes
0095	40096	Mains UA Phase	0~360	1	°	Signed	2Bytes
0096	40097	Mains UB Phase	0~360	1	°	Signed	2Bytes
0097	40098	Mains UC Phase	0~360	1	°	Signed	2Bytes
The following items are only supported by HGM6100N							
98	40099	Fuel Level Variation (Displayed in Event Log)			%	Signed	The value increase or decrease in fuel level.
99	40100	Initial value of fuel level			%	Unsigned	2Bytes
100	40101	Fuel level variation above 5% sign				Unsigned	2Bytes
101-110	40102-40111	Cyclic record for fuel level (10 records)				Unsigned	2Bytes
111	40112	Reserved				Unsigned	2Bytes
112	40113	Sum of fuel level array				Unsigned	2Bytes
113	40114	PC Version High 16-bit				Unsigned	2Bytes
114	40115	PC Version Low 16-bit				Unsigned	2Bytes
The following items are only supported by HGM6100CAN							
0098	40099	DM1 Alarm 1				SPN Low 16-bit	Only support HGM6100CAN ECU genset.
0099	40100					SPN High 16-bit	
0100	40101					High 8-bit: OC Low 8-bit: FMI	
0101	40102	DM1 Alarm 2				SPN Low 16-bit	
0102	40103					SPN High 16-bit	
0103	40104					High 8-bit: OC Low 8-bit: FMI	
0104	40105	DM1 Alarm 3				SPN Low 16-bit	
0105	40106					SPN High 16-bit	
0106	40107					High 8-bit: OC	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
						Low 8-bit: FMI	
0107	40108	DM1 Alarm 4				SPN Low 16-bit	
0108	40109					SPN High 16-bit	
0109	40110					High 8-bit: OC Low 8-bit: FMI	
0110	40111	DM1 Alarm 5				SPN Low 16-bit	
0111	40112					SPN High 16-bit	
0112	40113					High 8-bit: OC Low 8-bit: FMI	
0113	40114	DM1 Alarm 6				SPN Low 16-bit	
0114	40115					SPN High 16-bit	
0115	40116					High 8-bit: OC Low 8-bit: FMI	
0116	40117	DM1 Alarm 7				SPN Low 16-bit	
0117	40118					SPN High 16-bit	
0118	40119					High 8-bit: OC Low 8-bit: FMI	
0119	40120	DM1 Alarm 8				SPN Low 16-bit	
0120	40121					SPN High 16-bit	
0121	40122					High 8-bit: OC Low 8-bit: FMI	
0122	40123	DM1 Alarm 9				SPN Low 16-bit	
0123	40124					SPN High 16-bit	
0124	40125					High 8-bit: OC Low 8-bit: FMI	
0125	40126	DM1 Alarm 10				SPN Low 16-bit	
0126	40127					SPN High 16-bit	
0127	40128					High 8-bit: OC Low 8-bit: FMI	
0128	40129	DM2 Alarm 1				SPN Low 16-bit	
0129	40130					SPN High 16-bit	
0130	40131					High 8-bit: OC Low 8-bit: FMI	
0131	40132	DM2 Alarm 2				SPN Low 16-bit	
0132	40133					SPN High 16-bit	
0133	40134					High 8-bit: OC Low 8-bit: FMI	
0134	40135	DM2 Alarm 3				SPN Low 16-bit	
0135	40136					SPN High 16-bit	
0136	40137					High 8-bit: OC Low 8-bit: FMI	
0137	40138	DM2 Alarm 4				SPN Low 16-bit	
0138	40139					SPN High 16-bit	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0139	40140					High 8-bit: OC Low 8-bit: FMI	
0140	40141	DM2 Alarm 5				SPN Low 16-bit	
0141	40142					SPN High 16-bit	
0142	40143					High 8-bit: OC Low 8-bit: FMI	
0143	40144	DM2 Alarm 6				SPN Low 16-bit	
0144	40145					SPN High 16-bit	
0145	40146					High 8-bit: OC Low 8-bit: FMI	
0146	40147	DM2 Alarm 7				SPN Low 16-bit	
0147	40148					SPN High 16-bit	
0148	40149					High 8-bit: OC Low 8-bit: FMI	
0149	40150	DM2 Alarm 8				SPN Low 16-bit	
0150	40151					SPN High 16-bit	
0151	40152					High 8-bit: OC Low 8-bit: FMI	
0152	40153	DM2 Alarm 9				SPN Low 16-bit	
0153	40154					SPN High 16-bit	
0154	40155					High 8-bit: OC Low 8-bit: FMI	
0155	40156	DM2 Alarm 10				SPN Low 16-bit	
0156	40157					SPN High 16-bit	
0157	40158					High 8-bit: OC Low 8-bit: FMI	
0158	40159	ECU Shutdown No.				Unsigned	
0159	40160	ECU Warning No.				Unsigned	
0160	40161	Instant Fuel Consumption		0.1	Km/L	Unsigned	
0161	40162	Gas Pressure		0.01	kPa	Genset 46: EAPP-EXON	
				1		Other ECU gensets	
0162	40163	Exhaust Oxygen Content		0.01	%	Unsigned	
0163	40164	Turbo Inlet Temp.		1	°C	Signed	
0164	40165	Fuel Valve Position		0.1	%	Unsigned	
0165	40166	Urea Temp.		1	°C	Signed	
0166	40167	Urea Temp. 2		1	°C	Signed	
0167	40168	Urea		0.1	%	Unsigned	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
		Concentration					
0168	40169	Urea Consumption		0.1	L/h	Unsigned	
0169	40170	Gas Temp.		1	°C	Signed	
0170	40171	SCR Temp.		1	°C	Signed	
0171	40172	Throttle Valve Position 2		0.1	%	Signed	
0172	40173	DPF Soot Content		1	%	Signed	
0173	40174	DPF Ash Content		1	%	Signed	
0174	40175	SCR Outlet Temp.		1	°C	Signed	
0175	40176	DPF Carbon Deposit				DPF Carbon Deposit	
0176	40177	Torque		1	%	Signed	
0177	40178	DPF Regen. Reminder				DPF Regen. Reminder	
0178	40179	DPF Regen. Inhibit				Regen. Inhibit	
0179	40180	DPF Regen. Status				Regen. Status Indication	
0180	40181	DPF Status Indication				DPF Status Indication	
0181	40182	Driver Alarm				Driver Alarm	
0182	40183	Fuel Valve Position 2		1	%	Unsigned	
0183	40184	Crankcase Pressure		1	kPa	Signed	
0184	40185	Intercooler Temp.		1	°C	Signed	
0185	40186	Exhaust Outlet Temp. 1		1	°C	Signed	
0186	40187	Exhaust Outlet Temp. 2		1	°C	Signed	
0187	40188	Exhaust Outlet Temp. 3		1	°C	Signed	
0188	40189	Exhaust Outlet Temp. 4		1	°C	Signed	
0189	40190	Exhaust Outlet Temp. 5		1	°C	Signed	
0190	40191	Exhaust Outlet Temp. 6		1	°C	Signed	
0191	40192	Exhaust Outlet Temp. 7		1	°C	Signed	
0192	40193	Exhaust Outlet Temp. 8		1	°C	Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks	
0193	40194	Exhaust Outlet Temp. 9		1	°C	Signed		
0194	40195	Exhaust Outlet Temp. 10		1	°C	Signed		
0195	40196	Exhaust Outlet Temp. 11		1	°C	Signed		
0196	40197	Exhaust Outlet Temp. 12		1	°C	Signed		
0197	40198	Exhaust Outlet Temp. 13		1	°C	Signed		
0198	40199	Exhaust Outlet Temp. 14		1	°C	Signed		
0199	40200	Exhaust Outlet Temp. 15		1	°C	Signed		
0200	40201	Exhaust Outlet Temp. 16		1	°C	Signed		
0201	40202	Gas Pressure 2		0.1	kPa			
0202	40203	SCR Indication				SCR Indication		
0203	40204	PC Version High 16-bit				Unsigned		2Bytes
0204	40205	PC Version Low 16-bit				Unsigned		2Bytes
0205	40206	Reserved				Unsigned	2Bytes	
0206	40207	Phase A Current		0.1	A	Unsigned	4Bytes	
0207	40208							
0208	40209	Phase B Current		0.1	A	Unsigned	4Bytes	
0209	40210							
0210	40211	Phase C Current		0.1	A	Unsigned	4Bytes	
0211	40212							
0212	40213	Active Power		0.1	kW	Signed	4Bytes	
0213	40214							
0214	40215	Reactive Power		0.1	kvar	Signed	4Bytes	
0215	40216							
0216	40217	Apparent Power		0.1	kVA	Signed	4Bytes	
0217	40218							
0218	40219	Neutral Gear Status				Neutral Gear Status	Only support HGM6100CAN ECU genset.	
0219	40220	Low DEF Level Alarm Indicator				Low DEF Level Indication		
The following items are supported by HGM6100N and HGM6100CAN								
2500	42501	Phase A Current		0.1	A	Unsigned	4Bytes	
2501	42502							
2502	42503	Phase B Current		0.1	A	Unsigned	4Bytes	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
2503	42504						
2504	42505	Phase C Current		0.1	A	Unsigned	4Bytes
2505	42506						
2506	42507	Active Power		0.1	kW	Signed	4Bytes
2507	42508						
2508	42509	Reactive Power		0.1	kvar	Signed	4Bytes
2509	42510						
2510	42511	Apparent Power		0.1	kVA	Signed	4Bytes
2511	42512						

NOTE 1: Actual value=received data*ratio. Take the frequency as the example, if the received data is 5000 (1388H), ratio is 0.01Hz, then the actual frequency value is 50.00Hz (5000*0.01Hz);

NOTE 2: For 4-byte data, actual value=received data MSB*65536+received data LSB;

NOTE 3: Instruction for accumulated data (accumulated running time/start times/energy)

Take the Accumulated Running Time (Hour) as the example: if the high order bits of data received are 0x01, the low high order bits are 0x04, so the actual Accumulated Running Time is 10004h (1*10000+4=10004).

NOTE 4: When received data is 32766, it represents no normal data, "###" will display;

NOTE 5: If the high 16 bits of the PC Version are 0x0601 and the low 16 bits are 0x0407, so the compatible PC Version number is 6.1.4.7.

NOTE 6: Definition of signed number. Take received data 8000H as the example, transfer it to binary 1000 0000 0000 0000b, the MSB is 1, which is a negative number. One's complement is obtained by subtracting 1 from it, which is inverted to obtain the absolute value of the negative number. Then transfer it to -32768 in decimal.

Example:

If need to read battery voltage, D+ voltage data, firstly get its address is 0024 and 0025 by checking the table, then it is known that you need to read 2 bytes' data.

Assume the slave (controller) address is 01, the master (can be computer) request command is as following:

Table 7 Master (Computer) Request Command

Slave Address	Function Code	Starting Address (0024)		Request Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	03	00	18	00	02	44	0C

The slave response command is as following:

Table 8 Slave (Controller) Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 0024	Data LSB of Address 0024	Data MSB of Address 0025	Data LSB of Address 0025	LSB	MSB
01	03	04	01	12	00	00	5B	CA

Fill the received data into the corresponding address, as shown in the table below:

Table 9 Data Analysis

Address	Received Data (Hex)	Decimal	Data Signification
0024	0112H	274	Ratio is 0.1, battery voltage is 27.4V.
0025	0000H	0	Ratio is 0.1, D+ voltage is 0V.

3.3 FUNCTION CODE 05H MAPPING COIL FIELD

Table 10 Remote Coil Field

Modbus Address	PLC Address	Item	Description
0000	0001	Remote Oil Engine in Start Status	Only send 00FFH for active
0001	0002	Remote Oil Engine in Stop Status	Only send 00FFH for active
0002	0003	Remote Oil Engine in Test Status	Only send 00FFH for active
0003	0004	Remote Oil Engine in Auto Status	Only send 00FFH for active
0004	0005	Remote Oil Engine in Manual Status	Only send 00FFH for active
0005	0006	Remote Gen Close/Open	Only send 00FFH for active
0006	0007	Remote Mains Close/Open	Only send 00FFH for active
0005	0006	Remote Gen Open	Only send 00FFH for active
0006	0007	Remote Gen Close	Only send 00FFH for active

NOTE: The above remote command only can be sent once only.

Example:

Remote control controller to work in auto mode, firstly get its remote address is 0003.
Assume the slave address is 01, the master request command is as following:

Table 11 Master Request Command

Slave Address	Function Code	Remote Address (0003)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	05	00	03	FF	00	7C	3A

The slave response command is as following:

Table 12 Slave Response Command

Slave Address	Function Code	Remote Address (0003)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	05	00	03	FF	00	7C	3A

3.4 GENSET STATUS

Table 13 Genset Status

No.	Item	Description
-----	------	-------------

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0	Standby	No delay value for this status
1	Preheat	
2	Fuel Output	No delay value for this status
3	Crank	
4	Crank Rest	
5	Safety Run	
6	Start Idle	
7	High Speed Warming Up	
8	Wait for Load	No delay value for this status
9	Normal Running	No delay value for this status
10	High Speed Cooling	
11	Stop Idle	
12	ETS	
13	Wait for Stop	
14	Stop Failure	No delay value for this status
15	After Stop	

SmartGen

3.5 REMOTE START STATUS

Table 14 Remote Start Status

Value (No.)	Item	Description
0	No Delay	No delay value for this status
1	Start Delay	
2	Stop Delay	

3.6 DPF REGENERATION REMINDER

Table 15 DPF Regeneration Reminder

Value (No.)	Item	Description
0	No icon displayed	Genset 52: WEICHAI-WISE13-T4
1	The icon is always on	
2		
4	The icon flashes	Genset 59: FPT-BOSCH-T4 Genset 64: YUNNEI-DEF20-BOSCH Genset 70: YUNNEI-DEF70-BOSCH
0	No icon displayed	
1	The icon is always on	
4	The icon flashes	Other aftertreatment gensets
0	No icon displayed	
1	The icon is always on	
2	The icon flashes	Genset 58: YUCHAI-T4 Genset 61: YUCHAI-T4-1
4		
0	No icon displayed	
1	The icon is always on	
2	The icon flashes quickly	
3	The icon flashes more quickly (with a shaded background).	
0	No icon displayed	Genset 65: YTO-BOSCH-T4
1	The icon is always on	
2	The icon flashes slowly	
4	The icon flashes quickly	

3.7 REGENERATION INHIBIT

Table 16 Regeneration Inhibit

Value (No.)	Item	Description
0	No icon displayed	
1	The icon is always on	

3.8 DRIVER ALARM

Table 17 Driver Alarm

Value (No.)	Item	Description
0	No icon displayed	
1	The icon is always on	NCD Alarm
2	The icon is always on	NCD limit will be activated soon
3	The icon is always on	NCD Primary Limit
4	The icon is always on	NCD Severe Limit
5	The icon is always on	Driver Alarm
6	The icon flashes	
7	Alarm is triggered, and no icon is displayed	

3.9 REGENERATION STATUS INDICATION

Table 18 Regeneration Status Indication

Value (No.)	Item	Description
0	No icon displayed	Genset 58: YUCHAI-T4
1	The icon is always on	Genset 61: YUCHAI-T4-1
		Genset 59: FPT-BOSCH-T4
		Genset 64: YUNNEI-DEF20-BOSCH
		Genset 65: YTO-BOSCH-T4
		Genset 66: VOLVO-EMS 2.4-T4
		Genset 70: YUNNEI-DEF70-BOSCH
0	No icon displayed	Other aftertreatment gensets
1	The icon is always on	
2	The icon flashes	

3.10 DPF STATUS INDICATION

Table 19 DPF Status Indication

Value (No.)	Item	Description
0	No icon displayed	
1	The icon is always on	
2	The icon flashes slowly	
3	The icon flashes quickly	

3.11 DPF CARBON DEPOSIT

Table 20 DPF Carbon Deposit

Value (No.)	Item	Description
0~8	No icon displayed	
9~10	The icon is always on	Other aftertreatment gensets
11 and above	The icon flashes	
9~10	The icon flashes (Reminder: Parked regeneration is required)	Genset 62: SDEC-H-4-2
11 and above	The icon is always on (Reminder: Regeneration at the service station is required)	Genset 68: SDEC-H/D-T4

3.12 SCR INDICATION

Table 21 SCR Indication

Value (No.)	Item	Description
0	No icon displayed	Genset 66: VOLVO-EMS 2.4-T4
1~2	The icon is always on	
3~4	The icon flashes	
5~6	The icon flashes in reverse display	
7	No icon displayed	

3.13 NEUTRAL GEAR STATUS INDICATION

Table 22 Neutral Gear Status Indication

Value (No.)	Item	Description
0	No icon displayed	Genset 65: YTO-BOSCH-T4
1	The icon is always on	

3.14 LOW DEF LEVEL INDICATION

Table 21 Low DEF Level Indication

Value (No.)	Item	Description
0	No icon displayed	Genset 75: CUMMINS-X12-T4
1	The icon is always on	
4	The icon flashes	

4. COMMUNICATION PARAMETER VIEWING AND CONFIGURATION

- 1) press  key, input correct password (default 0318) can enter the parameter setting menu;
- 2) Select "Module Address" via  key,
- 3) Press  key again, corresponding parameters will be in the selected status;
- 4) Set the current selected content via ,  key, then press  key to confirm, after editing, then the selected status will disappear;
- 5) Press  key to return the main interface.

NOTE: After parameter setting is completed, the configuration takes effect.

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5. FAQ

5.1 COMMUNICATION LINE SHIELDING LAYER GROUNDED

In order to prevent coupled interference signal on communication line, its single end needs to be grounded.

5.2 TERMINAL RESISTOR

At both ends of the linear network (on the two communication ports furthest apart), it is necessary to connect 120Ω terminal resistor in parallel on a pair of communication lines. According to the transmission line theory, the terminal resistor can absorb reflected waves on the network, effectively enhancing the signal strength. The value of two terminal resistors in parallel should be approximately equal to the characteristic impedance of the transmission line at the communication frequency.

A regular RS485 network usually uses terminal resistor. It can also be not used in the case of network connection line is very short, temporary or laboratory test.

5.3 RS485 TO USB COMMUNICATION ADAPTOR

PC can communicate with SG72A module produced by our company.

5.4 EXTENDED COMMUNICATION DISTANCE

Long distance (up to 10km) communication can be realized by a pair of SGCAN300 fiber optical relay modules.



Fig.3 SGCAN300 Application Diagram

5.5 COMMON SOLUTIONS OF COMMUNICATION FAILURE

- 1) Check whether the positive and negative of RS485 is correctly connected;
- 2) Check whether the communication parameter in parameter setting is correct;
- 3) Check whether the RS485 converter (if configured) is normal;
- 4) Check whether the terminal resistor is correctly connected;
- 5) Disconnect the connection line of controller's RS485, measure the voltage difference of RS485's A and B terminal. If the difference is between $\pm 200\text{mV}$, it means communication port has abnormal situation;
- 6) It is recommended to download third-party communication software such as modscan32, modbus poll to check whether communication is normal.