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HGM1880

Automatic Control Module

USER MANUAL

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Software Version

Date	Version	Note
2009-11-20	1.0	Original release.
2010-05-31	1.1	Optimize details in Manual.
2010-07-21	1.2	Add alternator poles.
2010-11-05	1.3	Add function of setting parameters via front panel and over current alarm when loading.
2011-06-16	1.4	Add over-current action option.
2016-01-01	1.5	Modify **Typical Application**.

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CONTENT

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1. SUMMARY

HGM1880 is an auto start module. It has 3 working modes which can be select through push button in the panel. It can control the genset to start/stop by manual or remote start signal. When controller detected faults (such as low oil pressure, water/cylinder temperature, emergency stop alarm, and over speed), it can disconnect the fuel relay and stop. LCD in the panel displays faults status and offers real alarm signals.

2. PERFORMANCE AND CHARACTERISTICS

- ♦ Use microprocessor as its core. LCD display with push button operation.
- ♦ Power supply range is (8~35) VDC, suitable for start environment of 12V or 24V.
- ♦ With sensors input ports, to realize digital display of electrical parameters, including,
  - Gens voltage (V)
  - Gens frequency (Hz)
  - Gens current (A)
  - Engine temperature (ºC)
  - Engine oil pressure (kPa)
  - Speed (rpm)
  - Accumulated hours run (h)
  - Battery voltage (V)
  - Engine fuel level (%)
- ◙ Sensors threshold can be set to warn and pre-alarm, including,
  - Low oil pressure
  - High temperature of water/ cylinder
  - Over speed/under speed
  - Emergency stop
  - Fail to start
  - Fail to stop
  - Gens over/under voltage
  - Gens over/under frequency
  - Battery over/under voltage
  - Low fuel level
- ♦ Idle speed control and energized to stop (ETS);
- ♦ 3 working modes: Manual, Automatic, and Stop;
- ♦ Controller can be set as engine controller via software configuration (controller

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does not select voltage input), suitable for pump unit control;

- Red light-emitting diodes (LED) installed in the panel displays working and alarming status;
- Multiple sensors of temperature, pressure, and oil level can be used directly and its parameters can be defined. The sensors of temperature and pressure can be paralleled use with temperature and pressure alarm;
- Multiple crank disconnect conditions are optional (such as magnetic pickup, oil pressure and gens);
- 2 fixed relay outputs (fuel output, start output);
- 1 programmable output which can be set as common alarm output, fail to stop output, preheat output or idle control output;
- User can edit and save the parameters in FLASH memory of controller and not lost even power off. All parameters can be set via front panel or link port via PC testing software (with SG72 adaptor). An USB port is needed only without connecting battery to set parameters;
- Modular design, anti-flaming ABS plastic shell, embedded mounting. Compact structure with small size. Advanced SCM control, stable performance and convenient operation.

3. SPECIFICATION

Item	Content
Working Voltage	DC8. 0V to 35. 0V, Continuous Power Supply
Power Consumption	Standby, 12V-0.3W, 24V-0.4W Working, 12V-1W, 24V-1.1W
Alternator voltage Input	1P2W 15V AC ~ 360 V AC (ph-N)
Alternator Frequency	50/60Hz
Magnetic Pickup Voltage	1V to 24V (active value)
Magnetic Pickup Frequency	Max. 10kHz
Max. accumulative run time	99999.9 hours
Start Relay Output	1Amp DC28V DC B+ power supply
Fuel Relay Output	1Amp DC28V DC B+ power supply
Stop Relay Output	1Amp DC28V DC B+ power supply
Idle Relay Output	1Amp DC28V DC B+ power supply
Programmable Relay Output	1Amp DC28V DC B+ power supply
Digital Input	Active when connected to B-
Case Dimensions	88mm x 76mm x 44mm
Panel Cutout	78mm x 66mm
Working conditions	Temperature: (-25~+70)ºC Humidity: (20~90)% without condensation
Storage Condition	Temperature: (-30~+80)ºC

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Item	Content
Protection Level	IP55: when waterproof rubber gasket added between controller and its panel. IP42: when waterproof rubber gasket not have between controller and its panel.
Insulation Intensity	Object: among input/output/power Quote standard: IEC688-1992 Test way: AC1.5kV/1min 1mA leakage current
Weight	0.15kg

4. OPERATION

4.1. Panel Keys

Key	Definition	Description
	Manual/Decrease	Press this key to enter into Manual Mode. In parameter setting, press this to decrease values.
	Auto/Increase	Press this key to enter into Auto Mode. In parameter setting, press this to increase values.
	Stop	Press this key, genset stops and enters into standby mode; Press this to reset an alarm.
	Turn Page /Confirm	Used for turning pages in LCD; in parameter setting, can shift cursor and confirm setting.
	Alarm Indicator	This indicator will illuminate when an alarm occurs.

4.2. LCD Icons

Icon	Definition	Icon	Definition
	High Temp. Alarm		Auto Mode
	Low Oil Pressure		Stop Mode
	Over Speed Alarm		Manual Mode
	Under Speed Alarm	AC	Gens Volts Indication
	Emergency Stop	DC	Battery Volts Indication
Vt	High Voltage	rpm	Speed Unit (Per Minute)
V	Low Voltage	kPa	Oil Pressure Unit
	Fail to start	V	Voltage Unit
	Fail to stop	%	Fuel Level Unit (%)
	Voltage Abnormal	℃	Temperature Unit
	Auxiliary Alarm	Hz	Frequency Unit
	Normal Run	H	Hours Count
	Fuel Level Low	A	Load Current

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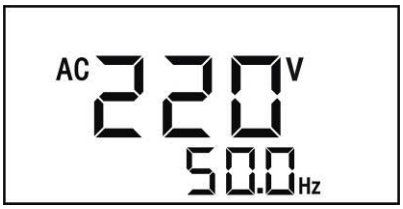
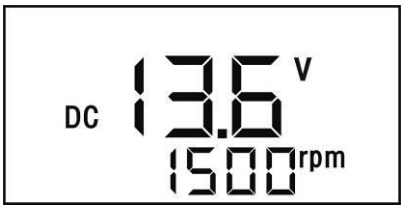
4.3. Display Description

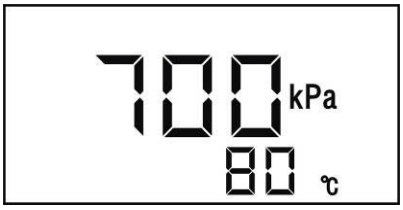
Gens, phase voltage Ua, frequency F



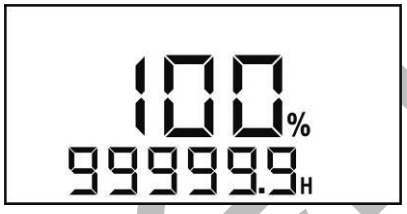
Battery voltage, engine speed



Oil pressure, water temperature



Liquid level %, accumulated run time



Parameters setting

Loading, current Ia, engine speed

4.4. Operation Instruction

Controller has 3 working modes, Stop ( ), Manual start ( ), Automatic ( ).

➢ **Manual Start** ( )

◆ This mode is activated by pressing the ( ) (hold 1 second), LED indicator beside the button illuminates and confirms this action. Preheat is outputting firstly and preheat delay begins. Fuel output 1 second before preheat delay is over, and then preheat output opens, starter is energized to output and engine cranks. When gens frequency is over the preset, starter is power off, genset starts successfully and enters into safety on delay. When the delay is over, idle delay begins. When the delay is over, idle delay closes and genset runs in high speed.

➢ **Automatic** ( )

◆ This mode is activated by pressing the ( ) (hold 1 second), LED indicator beside the button illuminates and confirms this action. When remote start signal is active (remote start input connected to B-), genset will start automatically after start delay. Preheat is outputting firstly and preheat delay begins. Fuel output 1 second

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before preheat delay is over, and then preheat output opens, starter is energized to output (If crank disconnect within specified times, module is started; if fail to disconnect every time, common alarm annunciator illuminates) and enters into safety on delay. When delay is over, enters into idle delay. After it is over, idle delay closes and genset runs in high speed.

Note: In the interval of start attempts, fuel output opens. After 3 seconds of start interval delay, pre-heating and ETS is outputting. After start interval delay is over, ETS output is disconnecting and fuel output. The pre-heating output is disconnected before starting.

♦ When remote start signal input is inactive, genset enters into idle after stop delay. Idle relay disconnects and fuel relay is also disconnects after idle delay is over. ETS is outputting and genset will stop automatically. When genset is steadily stopped, ETS is disconnected.

➢ **Stop** (),

♦ During genset in normal running (Manual or Auto mode), this mode is activated by pressing the () (hold 1 second). LED indicator beside the button confirms this action and is illuminating and genset enters into idle delay process. Idle delay opens. After idle delay is over, fuel output opens ETS output and genset stops. When genset is steadily stopped, ETS is disconnected.

♦ When genset has fault alarm, pressing this key (hold 1 second) can remove it. Press over 1 second, all LED indicators in the panel will illuminate (lamp test).

♦ Under stop mode, press this key at least 1 second, ETS is outputting and all lamps in the panel are illuminating (lamp test). After releasing the Stop button, ETS output opens immediately and the lamp test is over.

♦ When genset in stop mode, controller only responds to emergency stop signal.

Note: the programmable output ports can be set as “ETS output”, “idle output” or “Preheat output” via PC. Therefore, those 3 functions couldn’t activate simultaneously. All above description just means the procedure of controller’s logic action and supposes that the 3 functions were active.

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5. PROTECTION

1) **LOW OIL PRESSURE**, controller will start to detect after safety delay is over and alarm shutdown before 2 seconds.
2) **HIGH ENGINE TEMPERATURE**, controller will start to detect after safety delay is over and alarm to shutdown before 3 seconds.
3) **LOW FUEL LEVEL WARNING**, when the fuel level is lower than the setting value and lasts for 10 seconds, controller will send signal of low fuel level. Only warning and not shutdown.
4) **OVERSPEED**, detecting from cranking, alarm to shutdown before 2 seconds.
5) **UNDERSPEED**, detecting after idle delay is over. Alarm of under speed is sent to shutdown before 15 seconds.
6) **FAIL TO START**, if failed to start within the set start times, alarm to shutdown.
7) **FAIL TO STOP**, when stop delay is over, genset cannot stop, a warning will be sent, but this value not lock and save.
8) **HIGH BATTERY VOLTAGE**, when battery voltage is higher than the preset for 20 seconds, high battery voltage warning signal will be sent but not shutdown.
9) **LOW BATTERY VOLTAGE**, when battery voltage is lower than the preset for 20 seconds, low battery voltage warning signal will be sent but not shutdown.
10) **EMERGENCY STOP**, when emergency stop input is active, ETS immediately output, cut off signals of oil, pre-heating and start. Emergency stop alarm signal will be sent.
11) **GENS OVER VOLTAGE**, when the sample voltage is continuously higher than the preset 5 seconds, gens voltage over signal will be sent, alarm to shutdown in the meantime.
12) **GENS UNDER VOLTAGE**, when the sample voltage is continuously lower than the preset 5 seconds, gens voltage low signal will be sent, alarm to shutdown in the meantime.
13) **LOAD OVER CURRENT**, when loading current is over the preset and continues to the specified delay, over current alarm signal will be sent, “A” is flashing.
14) **COMMON ALARM**, when there is over/under speed, high engine temperature, low oil pressure，emergency stop, fail to start, fail to stop, battery voltage high/low, common alarm led is flashing and common alarm output.

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6. PARAMETER RANGE AND DEFINITION

6.1 Parameters Configuration (Table 1)

No	Items	Range	Default	Description
P00	Start Delay	(0-3600)s	1	Delay from mains abnormal or remote start active to start engine.
P01	Stop Delay	(0-3600)s	1	Delay from mains abnormal or remote start inactive to stop engine.
P02	Start Times	(1-9)times	3	Maximum start times. If failed to start within start attempts, controller will send an alarm signal.
P03	Preheat Time	(0-300)s	0	Time used for powering pre-heat plug before energizing starter.
P04	Crank Time	(3-60)s	8	Time for energizing starter.
P05	Crank Rest Time	(3-60)s	10	Time for waiting another cranking if failed to start at the first time.
P06	Safety Run Time	(1-60)s	10	Alarms of low oil pressure, high temperature, under speed, under frequency, under voltage, charge failure, are disabled.
P07	Start Idle	(0-3600)s	0	Idle running time when started.
P08	Warm Up	(3-3600)s	10	Time for warming up before close breaker.
P09	Cooling Time	(3-3600)s	10	Time for cooling before stopping.
P10	Stop Idle	(0-3600)s	0	Idle run time during stopping.
P11	ETS Delay	(0-120)s	20	Delay for energizing to stop.
P12	Genset At Rest	(0-120)s	0	If “ETS solenoid hold” set as 0, it is the time from end of idle delay to gen-set at rest; if not 0, it is from end of ETS solenoid delay to genset at rest.
P13	Flywheel Teeth	(10-300)	118	Number of flywheel teeth, can detect disconnection conditions and engine speed.
P14	Power Mode	(0-2)	0	Default: Stop Mode
P15	Gens Abnormal Delay	(0-20.0)s	10.0	Delay of over voltage or under voltage alarm.
P16	Gens Over Voltage	(30-360)V	264	When the voltage is over the point, a shutdown alarm will be sent. When the point is 360V, Gens Over Voltage is disabled.

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No	Items	Range	Default	Description
P17	Gens Under Voltage	(30-360)V	196	When the voltage is under the point, a shutdown alarm will be sent. When the point is 30V, Gens Under Voltage is disabled.
P18	Under Speed	(0-6000)RPM	1200	When the engine speed is under the point for 10s, shutdown alarm signal is sent.
P19	Over Speed	(0-6000)RPM	1710	When the engine speed over the point for 2s, shutdown alarm signal is sent.
P20	Under Frequency	(0-75.0)Hz	45.0	When the frequency is under the point for 10s, shutdown alarm signal is sent.
P21	Over Frequency	(0-75.0)Hz	57.0	When the frequency is over the point for 2s, shutdown alarm signal is sent.
P22	High Temperature	(80-140)ºC	98	When the sensor value is over this point for 2s, send out shutdown alarm. When the value is 140, alarm signal won't be sent. (only suited for temperature sensor)
P23	Low Oil Pressure	(0-400)kPa	103	When engine oil pressure sensor value is under this point for 2s, send out shutdown alarm. When the value is 0, send out warning alarm. (only suited for oil pressure sensor)
P24	Fuel Level Low	(0-100)%	10	When fuel level sensor value under this point and remains for 10s, send out warning alarm.
P25	Poles Number	(2-16)	4	Poles number of the generator.
P26	Battery Over Voltage	(12-40)V	33.0	When the battery voltage over the point and holds for 20s, battery over voltage signal is enabled. It's a warning alarm.
P27	Battery Under Voltage	(4-30)V	8.0	When the battery voltage under the point and holds for 20s, battery under voltage signal is enabled. It's a warning alarm.
P28	CT Rate	(5-6000)/5	500	Default: 500:5
P29	Full Load Current	(5-1900)A	500	Rated current of generator used for calculating over current.
P30	Over	(50-130)	120	When load current exceeds this

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No	Items	Range	Default	Description
	Current (%)			preset value, over current delay begins.
P31	Over Current Delay	(0-3600)s	1296	When load current exceeds this preset value for delay timer, then over current occurs.
P32	Digital Output	(0-6)	1	Default: Common Alarm Output
P33	Aux. Input	(0-6)	4	Default: Aux. shutdown Alarm When program the input as 0, fuel level sensor can be set.
P34	Aux. Input Delay	(0-20.0)s	2.0	The delay for input active when aux. input is set as digital input.
P35	Module Address	(1-254)	1	The address of the controller.
P36	Crank Disconnect	(0-5) See Table 5	1	Conditions of disconnecting starter (gens, OP and magnetic pickup)
P37	Engine Speed	(0-3000)RPM	360	When engine speed over this point, starter will disconnect.
P38	Engine Frequency	(10-30)Hz	14	When generator frequency is over this point, starter will disconnect.
P39	Engine Oil Pressure	(0-400)kPa	200	When engine oil pressure over this point, starter will disconnect.
P40	Temp. Sensor	(0-10)	06	SGD (120ºc Resistor type)
P41	OP Sensor	(0-10)	06	SGD (10Bar Resistor type)
P42	Liquid Level Sensor	(0-7)	0	Digital input should be set as Not Used when using the sensor.
P43	Load Over Current	(0-2)	0	0: Warning; 1: Stop; 2: Coolant to stop

6.2 D definition of Programmable Outputs (Table 2)

No	Items	Description
0	Not used	Output port is inactive when select this.
1	Common alarm	All shutdown alarms and warning alarm are included. When warning alarm input is activated only, this alarm is not self-locked; when shutdown alarm is activated, this alarm is self-locked until alarm reset.
2	ETS Control	Suitable for the genset with stop electromagnet. The electromagnet closes when stop idle is over. And opens when EST delay is over.
3	Idle control	Suitable for the genset with idle speed. It closes when starting and opens when entering into high speed warm up. Also closes during stop idle process and opens when genset is steadily stopped.

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No	Items	Description
4	Preheat control	It closes before starting and opens before starter is power on.
5	Switch On Output	Gens output with load.
6	Reserved	

6.3 Definition of Programmable Inputs (Active When Connect To GND (B-)) (Table 3)

No	Description		Notes
0	Digital Inputs	Not Used	
1		High Temp Alarm Input	After genset is started successfully, it will alarm to shut down immediately if this input is active.
2		Low OP Alarm Input	
3		Reserved	Only warning not stops if this input is active.
4		Auxiliary Shutdown Alarm	Genset will alarm to shut down immediately if this input is active.
5		Coolant to Stop	When this input is active and genset in normal running, if the temperature is higher, genset will stop immediately after hi-speed cooling; when this signal is inactive, if the temperature is higher, genset will stop immediately.
6		Reserved	
7		Reserved	
8	Fuel Level Sensor		See Table 4.

6.4 Sensor option (form 4)

Items	Content	Remark
Temperature Sensor	0 Not used 1 activated when digit input low 2 activated when digit input high 3 defined resistance type 4 VDO 5 SGH (yellow river sensor) 6 SGD (Dongkang sensor) 7 CURTIS 8 DATCON 9 VOLVO-EC 10 SGX 120 DEGREE	Defined resistance type input range is 0~999.9Ω, default is SGD type sensor
Oil pressure Sensor	0 Not used 1 activated when digit input low 2 activated when digit input high 3 defined resistance type 4 VDO	Defined resistance type input range is 0~999.9Ω, default is SGD type sensor.

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Items	Content	Remark
	5 SGH (yellow river sensor) 6 SGD(Dongkang sensor) 7 CURTIS 8 DATCON 10Bar 9 VOLVO-EC 10 SGX 10Bar	
Fuel Level Sensor	0 Not used 1 activated when digit input low 2 activated when digit input high 3 defined resistance type 4 SGH (yellow river sensor) 5 SGD (Dongkang sensor) 6 Reserved 1 7 Reserved 2	Defined resistance type input range is 0~999.9Ω, default is SGD type sensor. When defining fuel level sensor, programmable input should be configured as 0 firstly.

6.5 Conditions of Crank Disconnect (Table 5)

No	Content
0	Magnetic Pickup
1	Gens
2	Magnetic Pickup + Gens
3	Magnetic Pickup + Oil pressure
4	Gens+ Oil pressure
5	Gens + Magnetic Pickup+ Oil pressure

1) There are 3 conditions to make starter separate with engine, magnetic pickup, gens can be used separately and engine oil pressure can be used with magnetic pickup, gens together and in order to make the starter motor is separated with engine immediately.
2) Magnetic pickup is the magnetic equipment which be installed in starter and for detecting f flywheel tooth.
3) When magnetic pickup is chosen, ensure that the number of flywheel teeth is as same as the preset, otherwise, “over speed” stop or “under speed” stop maybe caused.
4) If genset has no magnetic pickup, don’t select corresponding items, otherwise, “fail to stop” or “loss of speed signal” maybe be caused.
5) If genset has no oil pressure sensor, don’t select corresponding items
6) If gens has not been chosen, controller will not detect and display the electrical

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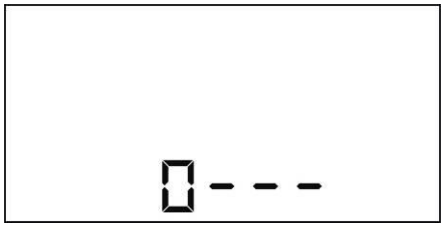
parameters (can be used in pump unit); if magnetic pickup has not been chosen, the rotating speed displayed in controller is calculated on gens signal.

7. PARAMETER SETTING

1) Under standby mode, press and simultaneously to enter into password interface. The first digital begins flashing and then input the password: 0318.
2) Press key to increase value, to decrease value and to shift the bit;
3) Adjust the second to the forth digital according to above setting procedure.
4) If the password is correct, the setting menu will display the item number and the parameter. Press key to scroll items up while press key to scroll down.
5) Press key to set the current item. (Same procedures as password setting)

Input Password:



Parameter Setting:

Notes:

1) Please set the parameters in standby mode only (like sensor selection, programmable inputs and outputs, multiple delays); otherwise, shutdown alarm and other abnormal conditions may appear.
2) Each setting value must within its allowed range, or it cannot be changed.
3) Over voltage threshold must greater than under voltage threshold, otherwise, over voltage and under voltage may appear at the same time.
4) Over speed threshold must greater than under threshold, otherwise, over speed and under speed may appear at the same time.
5) Engine frequency should be set as low as possible when crank disconnect in order to make the starter separate quickly.
6) The series number of setting items is consistent with the series number in Parameter Configuration (Table 1).
7) When defining fuel level sensor, programmable input should be configured as 0 firstly.

*** Remark1:** during setting, press can immediately stop the current setting at any

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time.

***Remark2:** in Manual mode, if select “Magnetic Pickup + Gens” or “Gens+ Magnetic Pickup + Oil Pressure”, and gens frequency and speed is not 0, press and simultaneously (at least 0.5 second), controller will adjust the number of flywheel teeth automatically according to gens frequency and alternator poles.

8. CONNECTIONS

- Terminal1 (B-): Connected to plant battery negative.
- Terminal 2 (B+): Connected to plant battery positive.
- Terminal 3 (Emergency stop input): Output B+. External emergency stop normally close button.
- Terminal 4 (Fuel Output): Output B+. External fuel relay. Contact capacity is 1A.
- Terminal 5 (Start Output): Output B+. External start relay. Contact capacity is 1A.
- Terminal 6 (Remote Start Input): Remote start input port, active when connected to B-.
- Terminal 7 (Configurable Input): Configurable input ports. Digital input signal or fuel level sensor signal can be input through configuration. Active when connected to B-.
- Terminal 8 (Oil Pressure Input): Low oil pressure or sensor signal input, active when connected to B-.
- Terminal 9 (Engine Temp. Input): Water/cylinder high temperature or sensor signal input, active when connected to B-
- Terminal 10 (L), 11 (N): External Alternator voltage signal, for detecting crank disconnect and offering over/under speed protection.
- Terminal 12 (Idle Output): Idle speed control output (output B+), Contact capacity is 1A.
- Terminal 13 (Stop Output): ETS output (output B+), Contact capacity is 1A.
- Terminal 14 (Configurable Output): Configurable output (output B+); the digital output can be set via PC. Contact capacity is 1A.
- Terminal 15 (Magnetic Pickup): Magnetic head signal input, recommended using shielded wire, connecting to GND at one end.
- LINK port: Use SG72 programming cable to connect with the USB for parameter programming.

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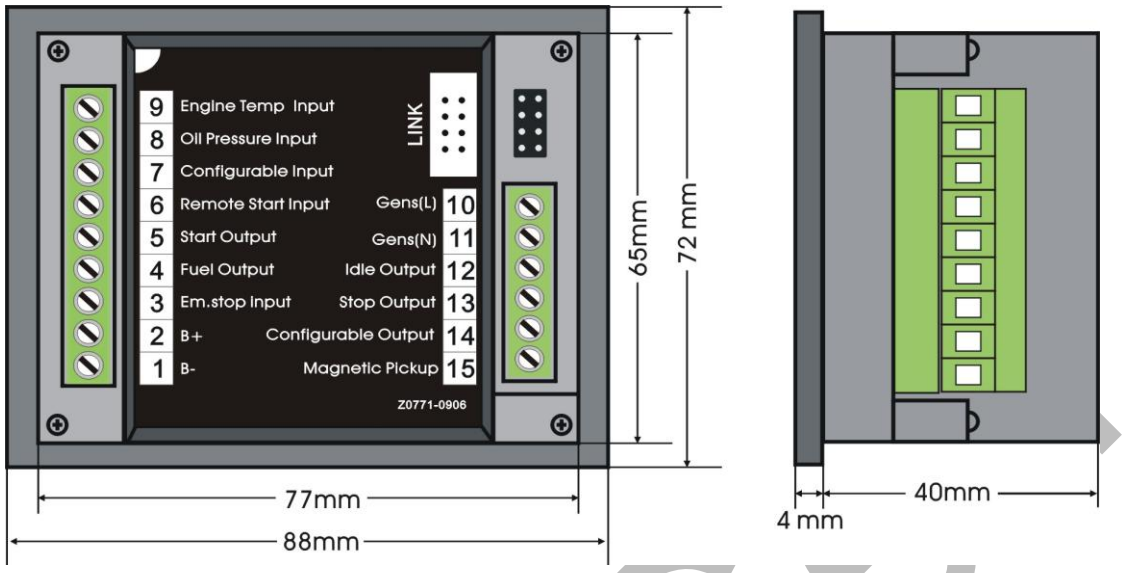
9. OVERALL DIMENSIONS (Panel Cutout 78mmx66mm)



10. TYPICAL APPLICATION