Comm.: Ecomotive Solutions S.r.l.

D-GID EVO / EVO-PLUS

ECU Dual-Fuel

TECHNICAL SPECIFICATIONS

Date: 12.04.22

Made by: Marco Musso

Revision: 0.1

Cod. PCB:

Cod. Mago: F01DGD14-02 e F01DGD24-02

Approved by: Paolo Mastella

Date: 12.04.22

Revision	Date	Pages Modified	Description	Made by
Rev 0.1	12.04.22	-	Preliminar version	Marco Musso

GENERAL DESCRIPTION

D-GID EVO and EVO-PLUS (Diesel-Gas Dynamic Injection) are the electronic platform developed by Ecomotive Solutions for the dual-fuel calibration of the engine. It is a specific engine control unit for the electronic management of the Dual-Fuel injection of diesel + gas dynamically combined.

This system controls and reduces the quantity of diesel fuel injected (where it is necessary), and then introduces an amount of gas suitable to leave the vehicle/genset performance unvaried.

The ECU communicate also with a PC through serial communication. It is possible to carry out its setup using a dedicated software always developed by Ecomotive Solutions.

PIN CONNECTION

DDF 48PIN			
PIN NUMBER	**SIGNAL**	**PIN NUMBER**	**SIGNAL**
A1	CAN H	A3	ANALOG IN
B1	ANALOG OUT	B3	DIGITAL IN
C1	ANALOG IN	C3	ANALOG IN
D1	5V EXT	D3	BOOT
E1	5V EXT	E3	ANALOG IN
F1	ANALOG OUT	F3	KEY TENSION (+15)
G1	5V EXT	G3	DIGITAL IN
H1	5V EXT	H3	ANALOG OUT
J1	TXD - PC	J3	DIGITAL OUT
K1	12V EXT	K3	ANALOG IN
L1	12V EXT	L3	GROUND
M1	12V EXT	M3	LOW-SIDE OUT

A2	CAN L	A4	RPM NEGATIVE
B2	ANALOG IN	B4	RPM POSITIVE
C2	GROUND	C4	ANALOG IN
D2	ANALOG IN	D4	GROUND
E2	ANALOG IN	E4	ANALOG IN
F2	LEVEL SWITCH COMM.	F4	LOW-SIDE OUT
G2	SWITCH BUTTON COMM.	G4	LOW-SIDE OUT
H2	RXD - PC	H4	LOW-SIDE OUT
J2	GROUND	J4	LOW-SIDE OUT
K2	DIGITAL OUT	K4	ANALOG OUT
L2	GROUND	L4	GROUND
M2	GROUND	M4	BATTERY 12V (+30)

FEATURES

- VKEY operational power supply voltage between 10 and 30 V-DC.
- VBAT operating supply voltage between 10 and 16 V-DC.
- Protection against supply voltages polarity inversion.
- Protection of power supplies against transient over-voltages.
- Protection of all inputs from battery or mass short circuit interruptions.
- Monitoring output currents check and circuit overture in case of shorts circuits to ground.
- Circuit over-temperature protection.
- Transient overvoltage resistance (ESD), immunity against electromagnetic interference (EMC), reduced electromagnetic emissions (EMI).
- Integrated Watchdog system which restores device operation within a few milliseconds if the microcontroller fails.
- The microcontroller registers transients and permanent anomalies giving the manufacturer the possibility to detect the stored diagnostic (through a special interface that can be connected to a computer and with dedicated software).
- New generation ST microcontroller with a frequency clock of 170MHz.
- Serial communication with a PC. The data will be stored in the microcontroller's memory.

- 10 analog input 0-5V.
- 4 analog output 0-5V.
- 2 digital inputs.
- 2 digital outputs.
- 2 inputs dedicated for crankshaft signals.
- 2 12V outputs up to 6A.
- 1 12V output up to 15A (typically used like high-side of gas injectors).
- 2 5V outputs up to 500mA.
- 1 5V output up to 220mA.
- 1 5V output up to 25mA.
- 5 Low-Side outputs up to 12A (4 typically used for peak-hold piloting of gas injectors and 1 typically used to pull to ground for ON/OFF relays).
- 1 CAN Bus up to 1Mbit/sec (it is also possible to work with CAN FD, supported by the microcontroller, by change the transceiver component).
- Usable in injection and fumigation systems.
- IP level: IP 65 (mounting with the connector facing down).

FUNCTIONING

D-GID EVO and EVO-PLUS are a microcontroller device, which allows the management of the DUAL-FUEL system by mixing gas (methane or LPG) with diesel.

Fulcrum of the system, DDF ECU communicates with the original ECU of the vehicle and controls diesel flow reduction. At the same time, it controls and manages the electromechanical system and the injectors or gas valve for the gas injection or fumigation.

Gas is managed entirely by the ECU. The device can manage and monitor the entire gas system. It controls different types of mechanical parts and in injection system can operate on 4 gas injectors. It is also able to monitor temperatures (example gas, water and exhaust), pressures and level.

D-GID EVO and EVO-PLUS can read RMP sensor of the system. In this way, it is possible to read RPM and have a good reference in the map calibration.

To obtain more information, the ECU can read the CAN BUS line. So, it is possible to communicate with the original system and read more information useful for a better working. The DDF ECU is also able to write on CAN line in accord to the original CAN protocol of the original ECU.

On ECU board, there is a diagnosis that stores all the possible errors. In order to visualize them, it is possible to connect by using a dedicated software.

Added to this, there is also a serial communication, full-duplex, used to communicate with the PC by a specific adapter and to regulate D-GID EVO and EVO-PLUS maps. The maps are stored in the flash of the microcontroller.

D-GID EVO and EVO-PLUS has a double power supply: one fixed at 12V (VBAT) that supplies the high-power section and one sub-key (VKEY) that supplies internal voltage regulator.

Protections:
- VBAT power supplies are protected against temporary over-voltage higher than 16V by transil;
- VKEY power supplies are protected against temporary over-voltage higher than 30V by transil;
- Low Side drivers have an active clamp circuit that keeps the tension under 45V, in order to avoid over-voltage created by the inductive injector’s pilotage. They are also protected against over-voltage by an internal limitation.

- Every High Side driver has an independent circuit that controls the voltage supplied and blocks temporarily that driver in case of too high voltage.
- The analogical inputs operate for voltages from 0 to 5V and can support up to -1V.

TYPICAL WIRING HARNESS