BIOplantrix IDH 1224: Electronic Induction Heating System for Injection Pipes

Product description

The IDH 1224 was developed to heat alternative fuel (such as vegetable oil) inside the injection pipes of diesel engines directly before injection. The warmed fuel has lower viscosity and can be better nebulized at the injector nozzles. Thus, fuel can be burned completely.

In the high-power electronic module the direct current supplied by the battery is transformed into a high-frequency alternating current. The induction coils applied to the injection pipes generate an alternating magnetic field which induces a high current in the metallic induction pipes. This current causes the warming of the pipes. The temperature of the pipes is controlled by an electronic sensor mounted to one of the pipes. The system is optimized for high injection temperatures with a reasonable electrical power consumption. Since the injectors are not heated directly the loss of energy towards the cylinder head and the coolant is minimized.

The maximum power consumption (at 12V) is about 10 – 15 A which is similar to the consumption of a vehicle's lighting. Depending on conditions of operation as well as on the outside temperature the average power consumption may be reduced by 50 – 70 %.

System features:

- Fuel warming directly before injection into the combustion chamber.
- Compatible with almost all veg-oil conversion technologies for unsupercharged and turbocharged diesel engines with indirect and direct injection.
- Suitable for all injection systems with accessible injection pipes (incl. common-rail).
- Also applicable for facilitation of cold engine start with single tank conversion.
- High injection temperatures especially for low injected fuel quantities.
- Avoids the loss of temperature due to zero-delivery at overrun operation (engine brake).
- Induction wire has no permanent interconnection to positive pole

Note: This system does not replace conventional conversion procedures such as fuel warming at tank, filter or injection pump as well as degasification measures! Such procedures might be necessary to enable fuel delivery and filtering and proper function of the high pressure pump.

Attention: The use of alternative fuels (e.g. vegetable oil) in diesel engines may result in damage of engine or injection system in case of disadvantageous operating conditions or inadequate conversion. Please inform yourself about possible risks and advantageous and disadvantageous operating conditions for your engine. Ask for support at your conversion workshop. The responsibility for the use of alternative fuels is borne by the owner or by the conversion company (where applicable).

Mounting guidelines

Attention: Installation of electrical components in a vehicle requires great care. Inadequate installation may cause damages or fire danger. Assembly and initial operation has to be performed by an authorized workshop or technician.

Finding the correct location for mounting the electronic module

An optimal mounting place for the electronic module is essential for a reliable and safe operation of the system. Mostly the best location for mounting the module is in the engine compartment. The electronic module is equipped with an internal over temperature protection. For disadvantageous mounting places the temperature inside the device might exceed the limit so that the device turns off until cooling down.

Please strictly comply with the following instructions:

- The electronic module has to be protected against direct splash water.
- The module must not be placed near to hot parts of the engine. A minimum distance of 0.5 m between the module and exhaust, manifold and turbo charger is necessary (radiant heat!).
- The heat sink at the rear side of the module needs sufficient ventilation and may not have contact with electric wires, fuel lines or other materials.
- Do not mount the module in the cooler airflow.
- The distance towards the battery as well as towards the injection pipes should be as short as possible but with respect to the points mentioned above.
- The device has to be fixed with suitable mounting angles at the car body or at other stable parts. Do not attach the module to the engine itself.
- The module always has to be mounted with the connectors downwards.
- All wires from/to the electronic module have to be fixed with cable ties assuring that no short circuit may occur in case of a loose connector.

Connecting the electronic module

Attention: The interconnection between the BAT+ contact and the positive pole of the battery has to be established in the last step of assembly!

All wires and leads have to be run in a manner avoiding damage of isolation due to vibration, rubbing or heat. If possible leads and wires have to be protected by isolation tubes and fixed with cable ties. Induction wires and sensor leads have to accept the

movements of the engine compared to the chassis. They must not be stretched or buckled! The induction wires must not be wrapped around metallic parts (except injection pipes) and have to run in parallel from the electronic module to the injection pipes. Avoid direct contact of the induction wires with sensible electronic components such as ABS-controlling unit, electronic injection unit and other sensors on the engine.

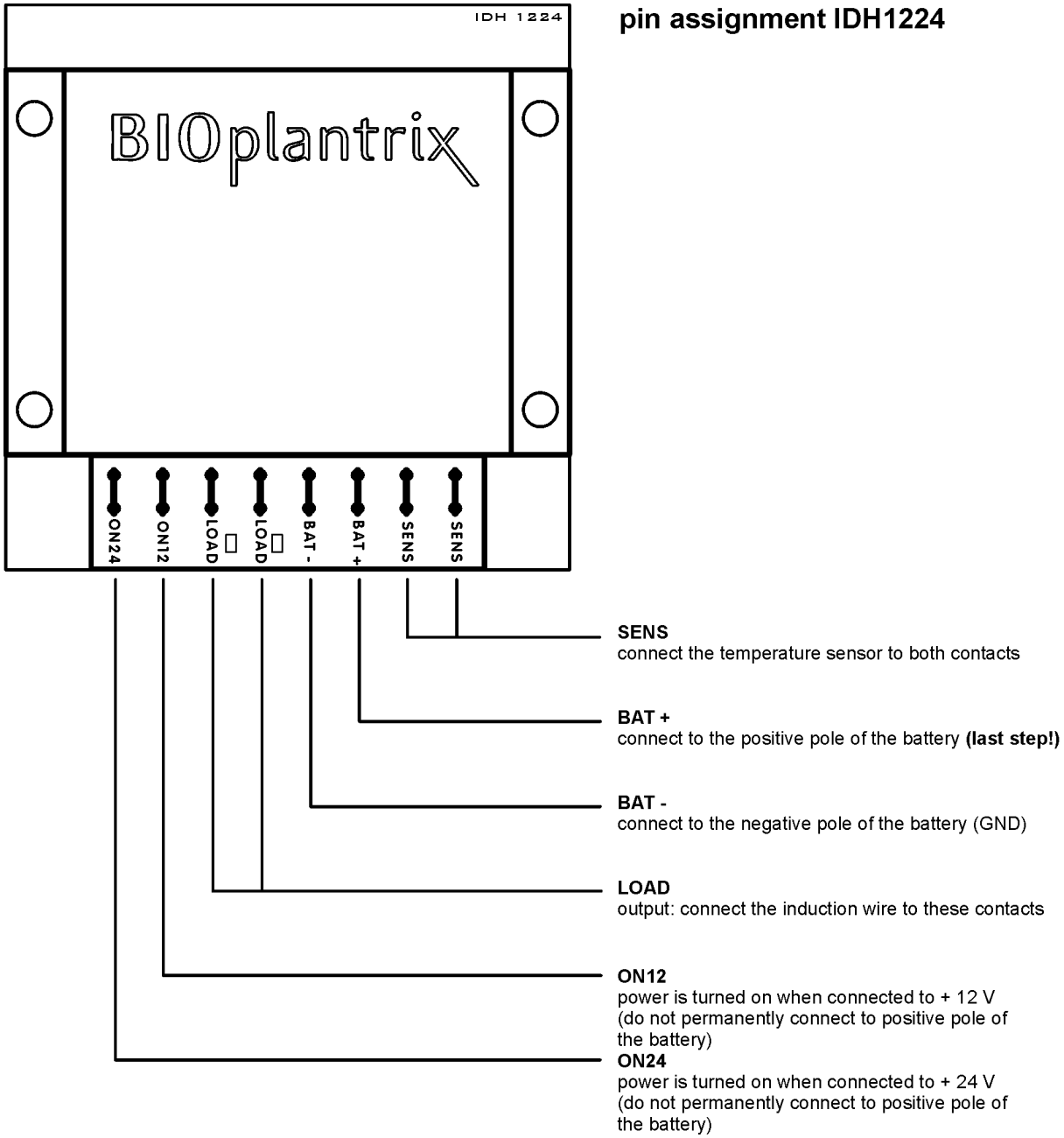

Fig.1: pin assignment of the electronic module

Attaching the induction wire

12 V supply:

The electronic module is pre-adjusted to provide the nominal power with a total of 60 to 64 turns of the induction wire around 6-mm injection pipes. In this configuration the power consumption during the heating periods is 10 – 12 A (max. 13 – 15 A with engine running). Thus, the following numbers of turns (at each pipe) are given:

2- cylinder engine: 30 to 32 turns per injection pipe
3- cylinder engine: 20 to 21 turns per injection pipe
4- cylinder engine: 15 to 16 turns per injection pipe
5- cylinder engine: 12 to 13 turns per injection pipe
6- cylinder engine: 10 to 11 turns per injection pipe (the use of 2 separate systems is recommended, see 3-cyl. engine)

24V supply:

For a 24-V supply the total number of turns has to be increased by 1.5 to 2.5 times. If necessary the coil can be wound in two layers but the direction of rotation must not be changed within one coil. Depending on the diameter and the wall thickness of the pipes the nominal current must be measured and the electronic module has to be adjusted (if necessary). During heating the current consumption must not exceed 8 A (10 A with engine running). For testing the current consumption an ampere meter with a range of 30 A minimum has to be used! For adjusting the module please contact your local dealer or ask for support at BIOplantrix engineering Austria.

For larger engines (above 3.000 cc) and 6-cylinder engines the use of 2 separate systems is recommended. For 8-, 10- and 12-cylinder engines 2 or more systems are required.

When the number of turns per pipe is limited due to the construction of the engine the system can be adjusted for less turns. For adjusting the module please contact your local dealer or ask for support at BIOplantrix engineering Austria.

The induction wire has to be coiled close to the pipe, turn by turn and side by side (see fig. 2). The injection pipes must not be disassembled for this reason. Start at the pipe closest to the electronic module. Place a silicone sleeve approx. 1 – 2 cm from the nut and fix the wire with a heat-resistant cable tie (included in the kit). Coil the wire with the indicated number of turns around the pipe and place a second sleeve and cable tie at the end. Keep the wire stretched during coiling so that it is fastened closely to the pipe. Take care of the isolation of the wire when threading. Lead the wire with a slight sag to the next pipe and repeat the procedure. Assure that a possible replacement of an injector is not impeded by the wires. For injectors with integrated nozzle sensor (e.g. at some VW-TDI engines) assure a minimum distance of 2.5 cm to the nut and do not put the induction wire together with the sensor cable. At the last coil the temperature sensor has to be attached at the last 3 to 4 turns between the wire and the pipe (towards the high pressure pump !, see fig. 2 and fig. 3). Fix the sensor cable and the induction wire together with a heat resistant cable tie. Additionally the sensor can be fixed with a small amount of silicone or engine gasket paste. Be careful with the sensor and avoid any buckling of the last centimeter (blue isolator).

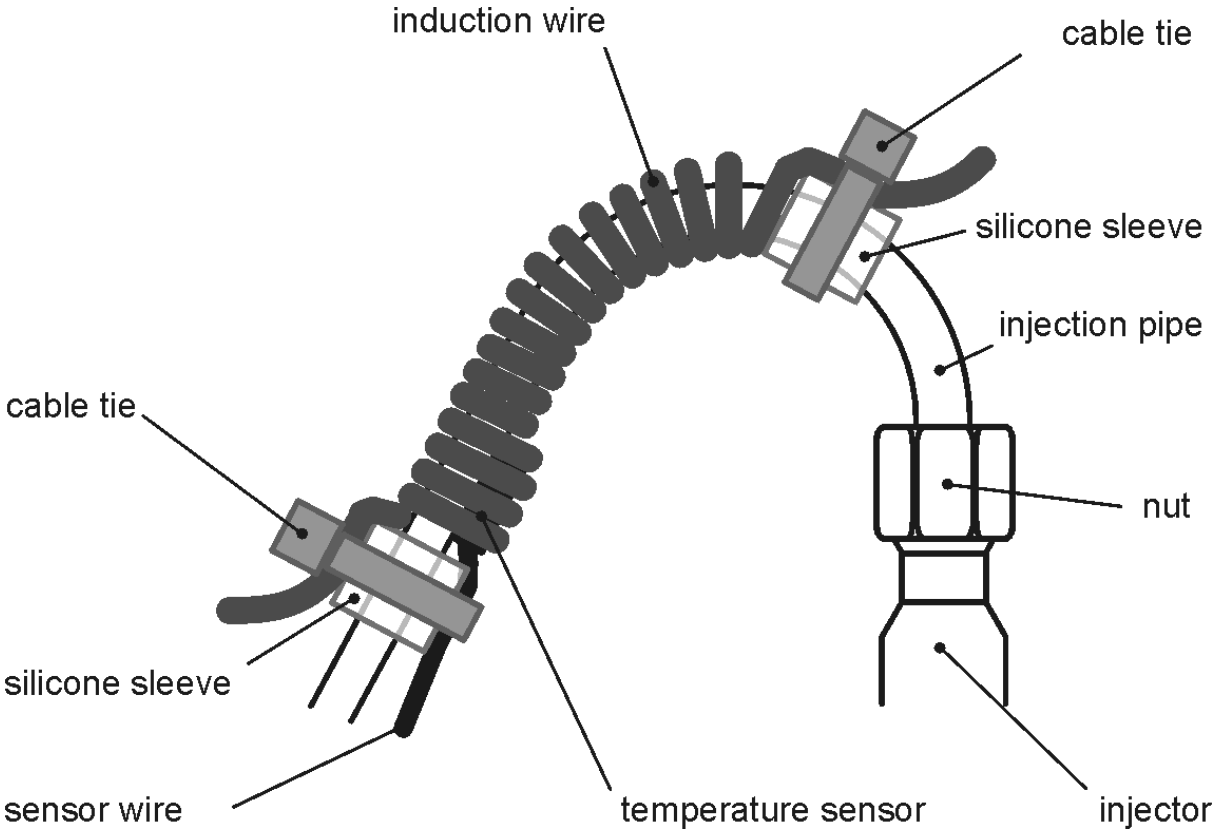

Fig. 2: attachment of the induction wire to the injection pipe

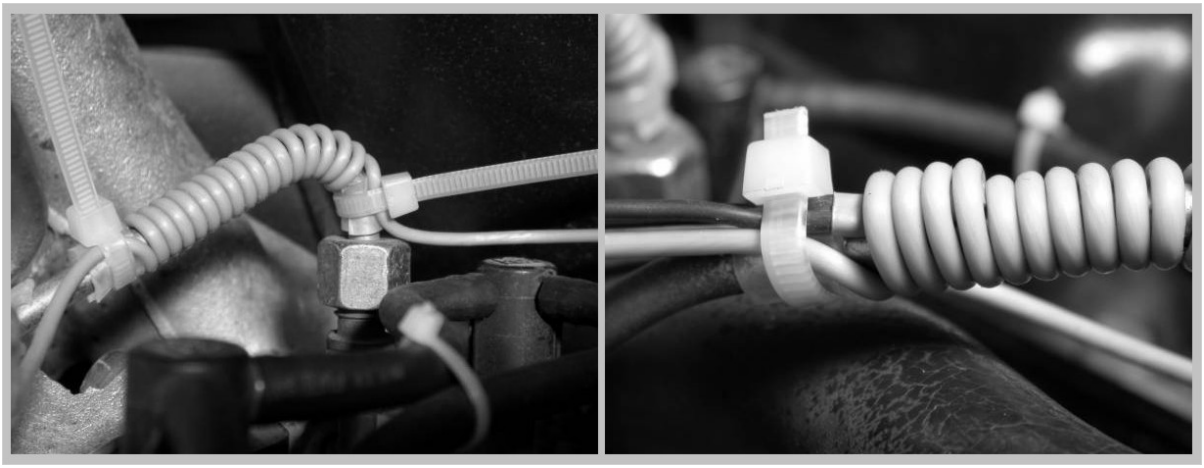

Fig. 3: attachment of the induction wire (left panel), placement of the temperature sensor (right panel)

The sensor cable can run together with the induction wire inside of an isolation tube to the electronic module. Take care of an appropriate strain relief and sag. Please note that only the special induction wire included in the kit may be used for the coils (heat resistance). Do not use any other types of wires for this purpose!

Attention: There is high current flow at BAT+, BAT- and at the LOAD contacts. Make sure that there is a reliable interconnection of the crimp contacts with the wires. Additional soldering of the contacts may be useful.

Connecting the control wire

The system is active when the ON12 (ON24) contact is connected to +12V (+24V). There are several options for controlling the system:

The most simple case is a switch inside the cockpit to turn the system on and off. Always use the “ignition on” wire (and not the permanent positive pole) to control the unit (this assures that the system is always turned off when the ignition is off). The current needed for a control of the IDH1224 is below 100 mA. Thus, there is no need for additional fuses or relays in the ignition circuit for the system.

For conventional 2-tank conversion systems the control wire (ON12 or ON24) can be connected directly to the positive pole of the magnetic valve switching over from diesel to vegoil. In this case the induction heating system is only active when the engine runs with alternative fuel.

For single-tank converted engines and for micro-computer controlled systems the control of the IDH1224 system depends on the properties of the conversion technique. A manual turning-off should always be possible (e.g. for use of pure diesel fuel).

If the IDH 1224 is controlled by a microcomputer the control output needs a capacity of at least 500 mA switching current.

Initial operation

Before the initial operation the wire from the BAT+ contact is connected to the positive pole of the battery. As long as the ON12 (ON24) contact is not connected to +12V (+24V) the device is not active. The two LED indicators at the LOAD contacts on the module are off. Now the ON-wire is connected to the positive pole (e.g. by switching on the device by pressing the button in the cockpit). Both LED indicators should be on now displaying that the system heats up the pipes. After half a minute the injection pipes should be warmed so that you can easily feel it with your fingers. The heat sink should only be slightly warmed. If the pipes remain cold or the heat sink gets warmer than the pipes there is a failure. In that case disconnect immediately the device from the battery and check up on the reason.

Within a period of approx. 1 – 3 minutes (time depending on many factors) the set temperature (120 – 140°C) has to be reached and the device automatically turns off. An easy test is to put a drop of water between the last turns of the injection wire (towards the injector). When the temperature goes above 100°C the water immediately starts to boil. After an automatic turn-off it should take about 20 to 60 seconds (depending on the outside temperature, with engine off) until the system starts heating again. Please note that for a longer testing of the system the electronic module may need a cooling (which is normally given by the air stream when driving). If a critical temperature of 70 – 85°C is exceeded inside the module it turns off automatically (over-heat protection) and will remain off for several minutes. At the initial operation the temperature of the pipes should be measured and be around 120 – 140 °C with engine off (or running at idle). A maximum temperature of 150°C should never be exceeded.

Attention: If the system does not turn on or does not turn off after reaching the set temperature, the temperature sensor might be damaged or not connected properly. The sensor can easily be tested with a standard multimetre. The resistance of the sensor has to be around 100 kOhm (at 20° C) with decreasing values for higher temperatures. The system must not be used in case of a broken sensor.

Note: The on- and off-times of the system strongly depend on the thermic conditions at the temperature sensor. If the sensor is directly hit by the cold airstream or the fuel is coming with low temperature from the high pressure pump it may happen that the system is on most of the time or does not turn off at all. It may be wise to isolate the injection pipes especially at the area of the induction coils.

The green LED indicators on the electronic module are on when the system is heating the injection pipes. At the same time the function of the high-power electronic circuit is monitored. If one of the LEDs is on and the other one is off there is a failure with the system and it needs repair.

To monitor the function of the system from the cockpit a control lamp can be connected between the two LOAD contacts in parallel to the induction coil. In this case there must not be a connection from the lamp to the negative or positive pole! Alternatively a lamp or LED with an adequate resistor can be connected between one of the LOAD contacts and earth (negative pole).

Special note for use of the system

The IDH1224 system in it's current version was developed for experimental use and has been tested successfully in a number of vehicles successfully. Please refer to the local law when using the system in vehicles for public transport.

The installation of the IDH1224 system does neither modify the engine or the fuel- and injection system itself nor require any changes at the injection system.

Specifications

Supply voltage (12 V DC)	min. 11.0 V, typ. 12.0 to 13.8 V, max. 14.4 V
Supply voltage (24 V DC)	min. 22.0 V, typ. 24.0 to 26.6 V, max. 28.4 V
Current consumption (12 V)	during heating 10 – 15 A, max. 16 A
Current consumption (24 V)	during heating 6 – 8 A, max. 9 A
Conductor cross-section (supply, load)	2.5 mm^2 min.
Conductor cross-section (control wires)	0.5 mm^2 min.
Turn-off temp. (internal protection)	70° - 85° C
Turn-off temp. (sensor at injection pipe)	pre-adjusted: approx. 110 - 120 °C
Resistance of sensor (at injection pipe)	approx. 100 kOhm (at 20 ° C)
Switching hysteresis	approx. 10 °C
Internal fuse	automotive fuse 20 A (for 24 V: 15 A)