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Gascheka duo™ System

Operation - Installation - Servicing

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INTRODUCTION

This manual contains instructions on Installing, Operating and Servicing Pyroban's Gascheka duo product.

Gascheka duo offers real time flammable gas detection with automatic equipment shutdown.

IMPORTANT INFORMATION

Adding Gascheka duo to equipment will not change the hazardous area rating of the equipment on which it is installed. Further modification, testing and certification by a recognized testing laboratory will be required to change the equipment's hazardous area rating.

IMPORTANT INFORMATION

The Pyroban Pellistor Gas Sensing Head has a high level of poison resistance, but it may be irreversibly damaged by certain materials. These materials will increase the replacement frequency of the Gas Sensing Head.

Materials that might damage the Pellistor Gas Sensing Head include:

- Organic silicon containing compounds such as silicone fluids and greases.
- Organic lead containing compounds
- Organic phosphorous containing compounds

The Pyroban Infrared Gas Sensing Head is not affected by these materials.

The Pellistor and Infrared Gas Sensing Head will not detect the above materials.

IMPORTANT INFORMATION

Operation of the Pyroban Pellistor Gas Sensing Head may be temporarily impaired by other materials. Normal operation may be resumed after a period of operation in clean air.

Material that might temporarily impair proper functioning of the Pellistor Gas Sensing Head includes:

- Hydrogen sulphide and organic sulphur containing compounds
- Halogenated hydrocarbons such as refrigerants

The Pyroban Infrared Gas Sensing Head is not affected by these materials

The Pellistor and Infrared Gas Sensing Head will not detect the above materials.

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Contact information

For any questions or concerns about this or any other Pyroban products or services, please do not hesitate to contact us.

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System Overview

Gascheka duo is a ‘flammable-gas detection system’ for use on industrial vehicles. The system will warn the vehicle operator if gas levels rise above 10% LEL* propane and will shut the vehicle down if levels rise above 25% LEL propane.

For assured reliability, Gascheka duo has an automated gas test, which is performed every time the system is activated from sleep mode. This is generally intended to be once a day at the beginning of a shift. The vehicle cannot be used until the test is completed. Gas calibration is performed using 0.5% propane in air contained in a 0.5 litre cylinder, which requires periodic replacement. This gas mixture is non-flammable.

A set of driver and supervisor keys is provided with the system kit. The driver keys enable a choice of power saving modes. The supervisor key will re-activate the vehicle if a gas shut down has occurred and should be appointed to the local facility official responsible for site safety.

The system kit includes pre-made leads for interconnecting the main components to facilitate installation. Infrared or pellistor gas sensing heads can be specified depending on the potential gases that may be present.

** LEL (Lower Explosion Limit); the weakest mixture of gas in air that will support an explosion.*

Components

The Gascheka duo system consists of the following major components.

Relay Unit

The Relay Unit is the wiring interface with the vehicle. Battery power is fed into the Relay Unit to power the Gascheka duo system. A volt free relay contact enables shutdown of the vehicle. A second volt free relay contact facilitates a time delayed shutdown for applications where the vehicle must be brought to a controlled stop before the vehicle is shut down.

Control Unit

The Control Unit receives the gas sensing head signal and controls the shutdown function of the Relay Unit. The Control Unit also displays the various warning and shutdown modes to the operator.

Pellistor gas detection head

Infrared gas detection head

The Gas Detection Head (Infrared or Pellistor) monitors the concentration of flammable gas and signals the Control Unit. Before each use the system performs mandatory start up diagnostic test, during which the Control Unit introduces a sample of calibration and test gas into the Gas Sensing Head. This check process confirms the correct operation of the Gas Sensing Head before each use of the vehicle.

If this test is failed, the equipment will not be able to operate.

Test gas cylinder, regulator and pressure gauge

The Test Gas Cylinder contains a *non-flammable* mixture of propane in air which is used to verify correct operation of the Gas Sensing Head.

Electronic button key

The Electronic Button Keys (Dallas keys) are applied to the Control Unit to control the Gascheka duo system. Colour-coded keys are provided with the Gascheka duo.

Limitations of Use

IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY PYROBAN, THE PROTECTION PROVIDED BY THE GASCHEKA DUO MAY BE IMPAIRED.

IF THE GASCHEKA DUO FAILS TO OPERATE, OR IF IT SHUTS THE VEHICLE DOWN WHILE IN OPERATION, DO NOT ATTEMPT TO RESTART UNTIL PERMISSION HAS BEEN GRANTED BY THE PERSON IN CHARGE OF SITE SAFETY.

The Gascheka duo system automatically checks for the correct operation of the Gas Sensing Head during each start-up. If the gas test consistently fails due to an inhibited or poisoned gas sensing elements, you will be required to replace the Gas Sensing Head (See recommended spares).

The Pyroban standard limited product warranty for Gascheka duo does not cover the Gas Sensing Head in environments where the materials that might damage the sensing head are present.

The Gas Sensing Head(s) must be protected when the vehicle is cleaned or when silicone is being used to spray lift chains or other parts.

The Gas Sensing Head(s) must be protected in cases where a component of anti-seize sprays used on the equipment contain silicone.

Gascheka duo does NOT offer any user adjustable settings or controls. The shutdown alarm is locked in at 25% LEL propane. The response to other gases is listed in Appendix 3.

Gascheka duo should not be used in oxygen enriched or oxygen deficient atmospheres.

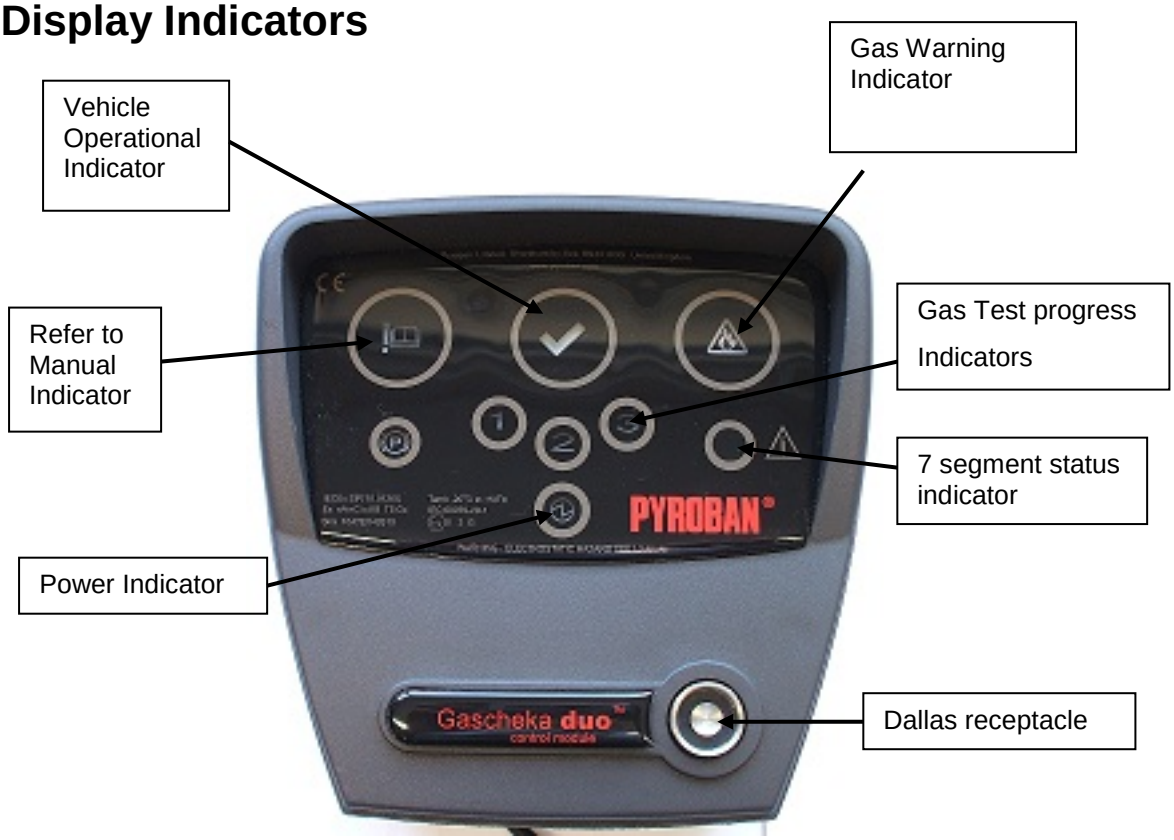
Gascheka duo must receive its electrical supply from lead acid batteries or an equivalent low impedance DC voltage source.

Warnings related to operational use

- Relay unit connections – each terminal shall carry only one conductor between 0.5mm^2 and 2.5mm^2 or 1.5mm by 2.4mm.
- The infrared gas sensing head, pellistor gas sensing head and Control units are not user serviceable. The Relay unit is not serviceable except for the fuses which may be replaced as follows.
- Fuse F1 – Fuse element T3.15A 5x20mm.
- Fuse F3, F4 – Fuse element T2.0A 5x20mm.
- The current rating of the relays is 2A maximum.
- Install gas sensing heads between 20° and 60° to the horizontal.
- Warning – The voltage selection link in the Relay unit must be correctly set to ‘12V’ or ‘24V to 96V’ prior to operation.
- Warning – Extended operation of the system below normal battery voltages could impair the operational function of Gascheka duo.
- Warning – the Control unit and Relay unit must be mounted in a location with a low risk of mechanical impact.
- Warning – the Control unit and Relay unit must only be cleaned with a damp cloth.
- The Relay unit cable gland diameter accommodation is 5.0mm to 8.0mm.

OPERATING INSTRUCTIONS

Display Indicators



Note: Not all indicators on the Control Unit are relevant to Gascheka duo.

The Operator's responsibilities are restricted to the actions described in this section of the manual. The Operator should not perform any servicing or maintenance, remove any covers or replace fuses. Fuse replacement should be carried out by a suitably qualified/experienced service engineer.

Pre-start Checks

1. Carry out any pre-start checks recommended by the vehicle manufacturer.
2. Check the general condition of the vehicle and Pyroban equipment as defined in the Routine Servicing section of this manual.
3. Ensure the valve on the Pyroban test gas cylinder is turned to the ON position and that the cylinder is not empty.

   If there is any doubt as to the satisfactory condition of the vehicle or Pyroban equipment, the Person in Authority must be consulted and any faults rectified before the vehicle may be used.

4. Switch on the Gascheka duo isolator. Confirm that the green power indicator on the Control module is lit.

Starting Gascheka duo

Before the vehicle can be operated, the Gascheka duo flammable-gas detection system must go through a self-test gas response and calibration check.

1. Place the blue (or green) Dallas Key onto the receptacle on the Control Unit. A tone will be heard and all indicators on the Control Unit will be illuminated momentarily to confirm correct operation of the sounder and lamps.

2. The gas test progress indicators (green 1, 2 and 3) will illuminate in sequence as Gascheka duo carries out an automatic gas test and calibration. This start-up sequence takes approximately 90seconds for the pellistor head or 30 seconds for the infrared head.

3. The type of head fitted is displayed in the 7 segment display during the gas test, once the head type has been determined (during a 20S learning period after power-on). “I” for infrared and “P” for pellistor

4. Start-up is complete when you see a green tick  on the Control module.

If the gas test is failed refer to the ‘Trouble Shooting’ section.

Use of Dallas keys

The green or blue keys are used to activate the system by initiating a start-up gas test. These same keys may also be used to return the system into the Sleep mode (vehicle disabled). The system can be set up to enter the sleep mode automatically if the vehicle is not used for a period of time (this is detected via a motion sensor). The standard "sleep" period is six hours if the green key is used and one hour if the blue key is used. The blue key is intended for use on powered vehicles with 12V (or automotive) batteries, where battery drain is an issue. To recover from sleep mode, apply either key and the system will be taken through the warm up and calibration tests.

If a shutdown alarm occurs due to flammable gas readings the red key must be used to reset the system after which the green or blue key must be used to re-activate the system.

The red key should not be kept with the equipment, but be held by the person responsible for site safety.

Operating the Vehicle

Once Gascheka duo is in the Drive mode  , the vehicle can be operated as normal but the operator must be made aware of the potential for the vehicle to stop automatically (with or without a delay).

Gascheka duo will activate vehicle shutdown if the flammable gas threshold is reached or a system fault is detected.

Depending on the vehicle characteristics the shutdown may inhibit all vehicle functions immediately or in some cases critical functions (e.g. power steering) may be preserved for a period of time so that the vehicle may be brought to a controlled stop. A time delay of up to 25 seconds may be set via DIP switches in the Relay unit.

If such a delay is implemented, the vehicle will be labelled accordingly. In the event of a shutdown the vehicle should be brought to a controlled stop BEFORE automatic shutdown occurs. A shutdown or imminent delayed shutdown is identified by operation of the sounder and a red triangle (on solid).

Refer to the original vehicle operator manual for further guidance on operating the vehicle.

De-activating the System

During normal daily operations it is not necessary to de-activate the Gascheka duo system until the end of a shift.

The procedure for deactivating the system is as follows. Ensure the vehicle is stationary and properly secured according to the vehicle hand book. From Drive mode (✔ illuminated), place the green or blue electronic button key onto the receptor on the Control module. The Drive mode indicator ✔ will be extinguished and the vehicle will be disabled

When the system is not being used it is recommended practice to switch off the Gascheka duo isolator to preserve battery charge. This is especially important on vehicles with 12V electrical systems

Turn off the test gas bottle valve.

Explanation of Vehicle Shutdown and Control Unit Warnings

Key: Alarm sounder activated Flashing Display

1. **Low level of gas or vapour detected.** Gas detection of 10% LEL will cause an audible and visible warning to activate. Vehicle is still operational.

Vehicle should be driven safely from the gas contaminated area.
Inform the Person in Authority.

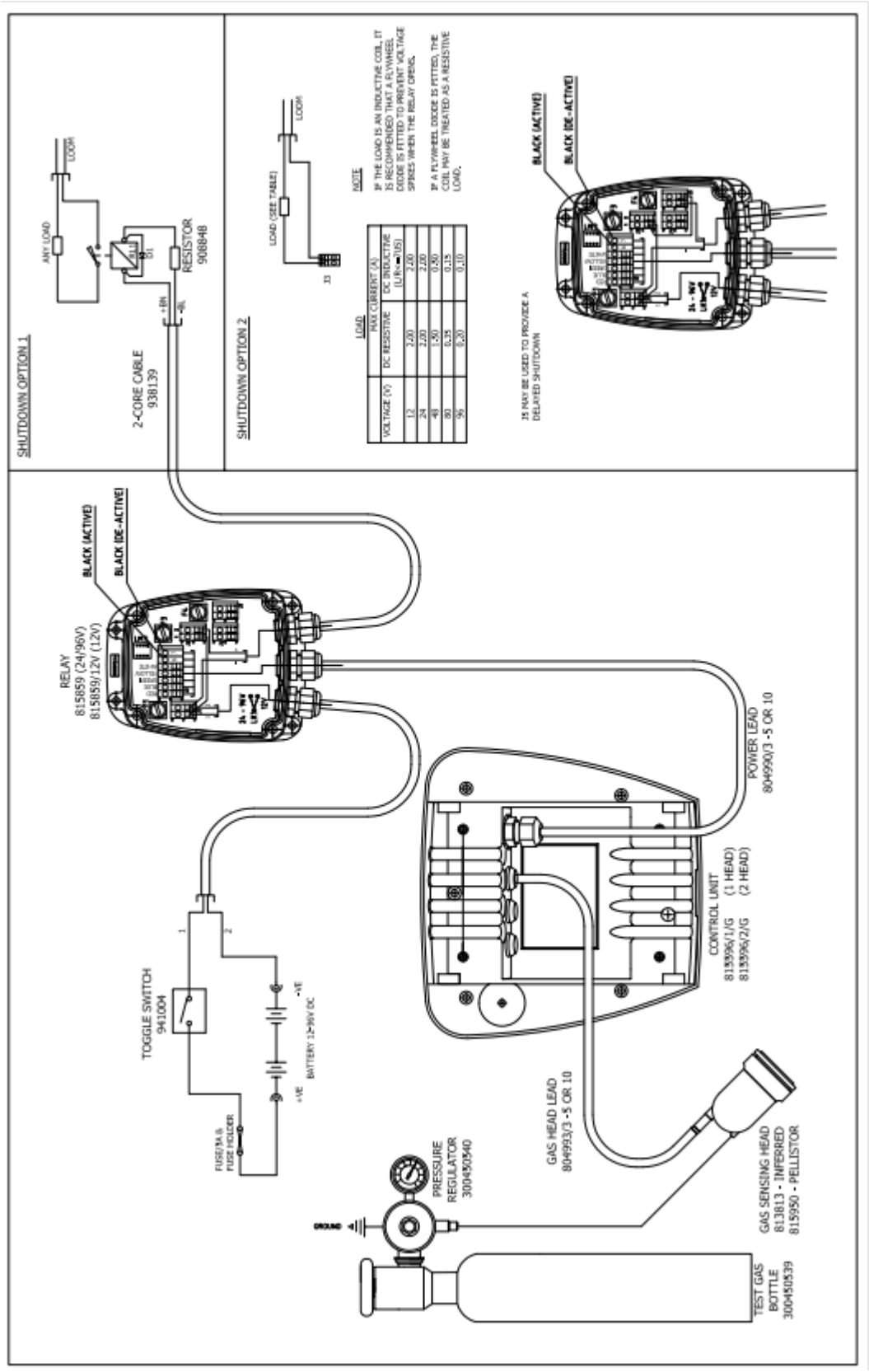
DO NOT re-enter the gas contaminated area until authorized to do so.

2. **High level of gas or vapour detected.** Gas detection of 25% LEL will cause an audible and visible warning to activate and the vehicle will be shutdown, either immediately or after a short delay.
BRING THE VEHICLE TO A CONTROLLED STOP.

Inform the Person in Authority.

INSTALLATION

Installation Diagram



Preparation

Check the kit of parts supplied against the packing list in kit list:

Study the installation diagram with a view to siting the new Gascheka duo components and cable runs on the vehicle.

The following cables carry incendive voltages and currents and **MUST** be routed within the confines of the vehicle or mechanically protected from impact to prevent an ignition hazard.

- Power supply cable
- Cable from Relay Unit to Control Unit

The remaining of the cable is non-incendive but should be routed within the confines of the vehicle or mechanically protected to give reliable long term operation.

- Control Unit to Gas Sensing Head

Battery

Disconnect battery in accordance with vehicle manufacturer's instructions prior to any installation work taking place.

Recommended Tools Required for Installation:

Digital Voltmeter

Tap wrench

Taps 4mm, 5mm & 8mm

Drill to suit

Battery Powered Drill

Spanners - 8,10,13,17 & 19mm

Gas bottle regulator spanner

Hole cutter for Isolator Switch

Metric Allen Keys (2.5mm & 3mm)

Wire strippers

Wire Cutters

Crimp tool (Press Master RS 533-279)

Terminal screwdriver

Location of Components

Select positions for Gascheka duo components with a low risk of mechanical impact and where the operation of the vehicle, driver's view, access to doors or covers etc. is not compromised.

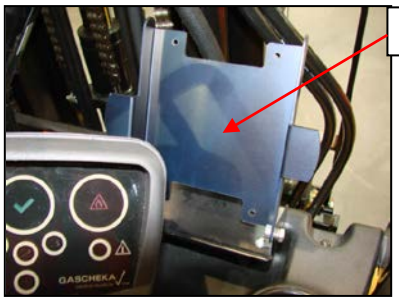
Control Unit

(a) Remove the bracket from the Control Unit and choose a position that is visible and within easy reach of the driver. Consider also, easy cable access to the rear of the unit.

(b) Mark hole positions using bracket as template; drill holes. Fit the bracket to the vehicle and secure with four M4 screws, spring washers, plain washers and nuts supplied.

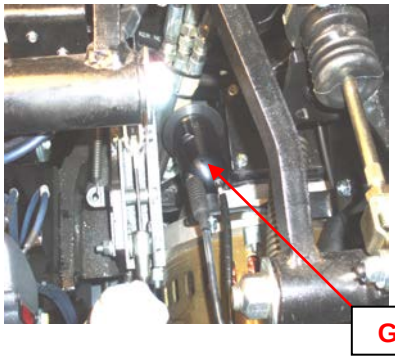
(c) Loosely mount the Control Unit & support bracket; install the Gas Head Lead to the Control Unit and secure Lead to the bracket.

(d) Fit the Control Unit Support Bracket 300814200



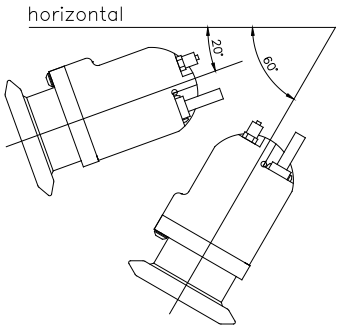
Gas Sensing Head

(a) Gas sensing heads contain sensitive electronic components and may break if subjected to impact or dropped.



(b) Mount Gas Sensing Heads on the vehicle so as to be readily exposed to any flammable atmosphere but protected from mechanical damage and environmental contamination (dirt, water spray etc.). For solvent applications the head should be mounted close to the ground (max 0.6m).

(c) Mount the Gas Sensing Head between 20º and 60º to the horizontal using the two brackets and two M8 bolts supplied. Failure to do this may cause the system to fail the automated gas response test and compromise response time.



(d) NOTE: Erroneous flammable indications and shutdowns may be seen if the gas head is located next to axle vents or screen wash containers.

(e) Gas Sensing Heads must be protected when cleaning the vehicle or using silicone based lubricants or sealants (A plastic bag sealed with tape is sufficient). Where such materials are present in the environment the Pellistor Gas Sensing Head will not be covered by Pyroban warranty protection.

Test Gas Cylinder

1. Position the gas bottle where the pressure gauge is visible and where the vehicle provides mechanical protection.

2. Position the Gas Bottle Mounting Clamps onto the Bracket. Secure the bracket with two M8 screws, spring washers, plain washers and nuts supplied. Alternatively drill and tap mounting holes in suitable location using bracket as template.

3. Fit the regulator to the cylinder.

4. Fit the test gas cylinder assembly to the bracket and secure with clamps provided.

Relay Unit

5. Mount the Relay Unit Bracket to suitable location. The Relay Unit should be fixed to the bracket by its four mounting holes in the plastic moulding using M5 Cap Head screws with spring washers.

6. Allow reasonable access to remove the cover for fuse replacement.

7. The enclosure may be mounted on a horizontal or vertical surface, but the cable glands should not be facing upwards in order to prevent the ingress of water.

System Connection

8. Refer to the installation diagram for connections and best practice.

9. The Relay unit is supplied in two voltage versions

   - 815859/12V for use with 12V vehicles
   - 815859 for use with 24V to 80V vehicles

   Warning - Use of 815859/12V on voltages above 12V will result in permanent damage to the Relay unit.

   Note: The 12V version brings in a voltage boost circuit to compensate for voltage drop caused by engine cranking. Use of 815859 on a 12V system may result in system reset when the engine is cranked.

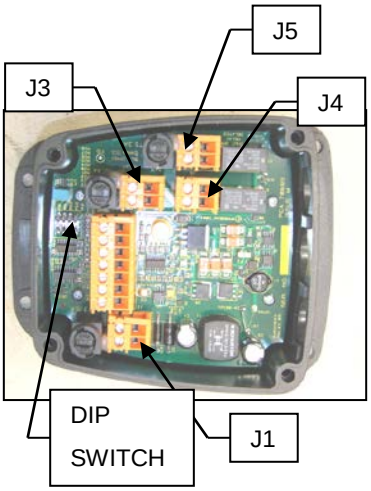
   Supply should be taken from a suitable point closest to the battery using the supplied fuse holder and 5amp fuse.

   The Isolator Switch should be installed in a suitable accessible position.

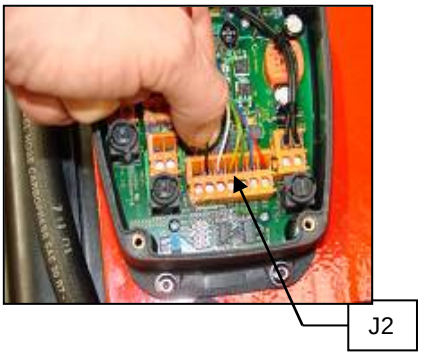
10. A 2-core x 1.5mm^2 cable is supplied for the power and shutdown relay wiring.

    If a replacement cable is used, this must be rated for the maximum system voltage with a minimum 8A current rating taking into account the ambient temperature.

11. Gascheka duo disables the vehicle by interrupting the power supply to a component such as a contactor or fuel relay. See wiring diagram for detail. This component used to facilitate shutdown is to be selected by the installer, however **the switching capacity of the Relay Unit is limited to the values on the table on the installation diagram.** If the load is greater than allowed by the table then a slave relay must be used. Wire via the cable glands provided. **The ignition line is a popular line to interrupt with the Gascheka duo Relay, however note some components such as lights may not be isolated.**



12. **Delayed Shutdown** may be chosen in addition to, or instead of normal shutdown. Delayed shutdown is typically chosen for safety control related items such as steering or brakes. Wire to terminal J5 and follow the guidelines on the connection diagram. The period of delay on this shutdown is installer settable, to a maximum value of 25 seconds, using the DIP switch on the PCB. Refer to the connection diagram for settings. If the load is greater than allowed by the table then a slave relay must be used.



13. Connect the power lead (7-core) to the Control Unit and route into the Relay Unit via the cable gland provided. Trim and terminate to connector J2.

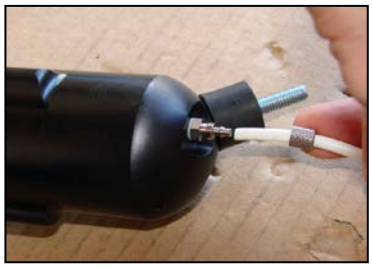
    The system incorporates a motion sensor to facilitate an optional timeout back to Sleep mode if the vehicle is not used for a period of time. Decide whether the automatic timeout facility is required (1hr for blue key, 6hrs for green key).

    - To activate timeout, the black wire of the Power lead should be connected to terminal J2/6 6
    - To deactivate timeout, the black wire of the Power lead should be connected to terminal J2/6 7

    If timeout is not selected, Gascheka duo will remain in Drive mode indefinitely. The ability to shut the vehicle down will not be affected by either mode.

14. The Gas Sensing Head cable is of fixed length and must not be cut. Any excess must be coiled and tied to the vehicle away from any moving parts within the confines of the vehicle.

15. Connect the test gas pipe from the regulator on the test gas cylinder to the Gas Sensing Head using the tube provided. Cut to the length required and secure to the vehicle; cover with the spiral wrap if added protection is required.



16. Check for leaks by opening then closing the bottle valve, taking note of the reading on the gauge. Wait 10 minutes then check that the pressure has not decreased.

17. Reconnect the battery to the vehicle in accordance with the manufacturer's instructions.

18. Place the blue or green operator's key on the Dallas Key receptacle on the Control Unit. Check that Gascheka duo starts up satisfactorily (Refer to Operating Instructions earlier in this manual). Close the valve on the bottle. Disconnect the test gas pipe from the Gas Sensing Head.

19. Place plastic bag (bag that contains labels can be used) over the Gas Sensing Head.

20. Insert the test gas pipe into the plastic bag. Secure/seal the plastic bag and test gas pipe with electricians tape. Fill the plastic bag with test gas from the test gas cylinder. Confirm that shutdown occurs.

21. Remove the plastic bag; reinstall the test gas pipe to the Gas Sensing Head.

22. Check the operation of the red 'supervisors' key following gas shut down. (Refer to the Operating Instructions).

23. The Gascheka duo system is now ready for operation.

24. Peel the protective backing off the two Pyroban Gascheka duo labels and stick one to each side of the vehicle.

25. Peel the protective backing off the Gascheka duo Instruction label and stick within the confines of the vehicle and within the driver's sight. Add Job Identification number to label if required

26. Peel the protective backing off the Isolator Switch Sticker and position it adjacent to switch on the equipment.

    Where delayed shutdown is connected, fit additional warning label so that it is readily visible to the driver – E.G. on Control Panel

27. Distribute blue/green operator's key(s) and red supervisor's key as appropriate.

SERVICING

Routine Servicing

Every 50 Hours (Weekly)

A cloth dampened with water should be used to clean components as necessary.

Every 500 Hours (3 Months)

Item	Maintenance
Cables	Check all cables are in good condition and securely fixed in the correct position.

Every 1000 Hours (6 Months)

Item	Maintenance
Installation of Gascheka duo System	Check the complete installation is in good working order and that all fixings are secure.

Replacement of Fuses

Fuses must only be replaced with the correct type as specified below

Fuse	Location	Type
F1	Main power fuse located in Relay Unit	T3.15A 5*20 mm HBC
F3	Shutdown Relay in Relay Unit	T2.0A 5*20 mm HBC
F4	Delayed shutdown Relay in Relay Unit	T2.0A 5*20 mm HBC
Main Power Fuse	Fuse holder between power supply and Relay Unit.	Fuse 5A bladed

Annual Safety Audit

Pyroban recommend an annual safety audit (ASA) by a Pyroban engineer to confirm the Gascheka duo System is functioning correctly and to advise on any matters arising from the audit. Contact Pyroban Service department on +44 (0) 1273 456800 for further details

TROUBLE SHOOTING GUIDE

If the Control unit power indicator is not illuminated check

- power Isolator Switch is in the correct position
- supply fuse has not blown

The software performs on-going system integrity checks. If a fault is detected the system goes to a safe shutdown mode with a solid book symbol and a code indicating the type of failure on the 7 segment status indicator.


The table below shows the types of failure and possible corrective actions.

7 segment status indicator	**Type of fault**	**Corrective action – in each case power the system down and re-apply power to attempt to clear the fault. If the fault persists take corrective action as below in the order shown**
1	• Head input not present	• Check gas detection head lead is correctly connected. • Replace gas detection head. • Replace Control Unit.
2	• Not applicable	• Not applicable
3	• RAM failure	• Replace Control Unit.
4	• EPROM failure	• Replace Control Unit.
5	• EEPROM failure	• Replace Control Unit.

Denotes that indicator is flashing.

OK.

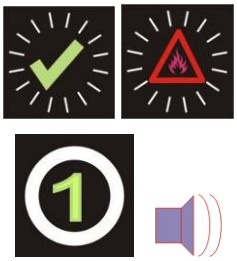
Fault – refer to manual.

Gas test phase (1,2 or 3)

Flammable material in atmosphere

7 segment status indicator

Sounder is active

Control Module	Explanation
	**Flammable warning - Low concentration of gas or vapour detected (>10% LEL).** The vehicle must be removed from the gas contaminated area immediately and the Person in Authority informed. Gascheka duo™ will automatically reset if the concentration of flammable gas or vapour detected returns to a safe level. Gascheka duo™ will automatically shut down if the concentration of flammable gas or vapour increases above the trip threshold
	**Flammable shutdown - High concentration of flammable gas/vapour detected (>25% LEL).** Vehicle shuts down automatically, either immediately or after a short time delay. The Person in Authority must be informed. Do not restart Gascheka duo™ until this procedure has been completed and permission to restart has been granted by the Person in Authority. Gascheka duo™ may then be reset by placing the red supervisor Dallas key on to the key receptor on the Control module. Restart Gascheka duo™ in the normal way, using either the green or blue key.
  	**Automated gas test failure. Investigation required.** Pyroban equipment and vehicle disabled. The Person in Authority must be informed. The green Test indicators (1, 2, 3) will show the test at which the automated gas test failed. **Test 1** Warm up period. No checks or failures during this period. **Test 2** Gas response check and calibration Potential reasons for failure on Test 2. • Test gas cylinder empty. • Test gas regulator output pressure adjusted incorrectly. • Test gas tube disconnected or kinked. • Faulty gas sensing head • Faulty Control module. • Gas sensing head lead disconnected or faulty. **Test 3** Gas diffusion rate check (sinter blockage check) If the detection head output does not fall sufficiently fast this is an indication that the sinter may be blocked. Potential reasons for failure on Test 3. • Blocked sinter This test may also be failed if insufficient gas was available during Test 2. Check the following • Test gas cylinder empty. • Test gas regulator output pressure adjusted incorrectly.

Control Module	Explanation
	• Test gas tube disconnected or kinked. • Faulty gas sensing head • Gas sensing head blocked or obstructed. This test may also be failed if there is flammable material present in the atmosphere as the gas detection head output will not fall at a sufficient rate. • Flammable material present in the area of the gas sensing head. **Warning:** If either Test 2 or Test 3 is marginally within the limit then the gas test will be passed and the Green tick illuminated so that the vehicle may be driven, however the corresponding Test indicator will remain flashing. Urgent servicing is required. The Person in Authority must be informed**.**
	If the automatic timeout facility is enabled, Gascheka duo will go to Sleep mode automatically after 6 hours (green key) or one hour (blue key) if no vehicle movement is detected. An audible warning with green tick flashing will also be present for the last 10 minutes prior to shut down. During the 10 minute timeout warning period Gascheka duo™ may be reset by placing the green or blue operator Dallas key on to the key receptor on the Control module or by movement of the vehicle.

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APPENDIX 1 – SPECIFICATION

Power supply

The system, with the appropriate Relay Unit fitted, is designed to operate on vehicles with electrical systems ranging from 12Vdc to 80Vdc.

During cranking of diesel engines the battery voltage may drop. The system will operate with voltage drop down to 6V with the appropriate Relay Unit fitted. (See installation section).

The system is specified up to 96Vdc for a fully charged 80V battery.

The power consumption is 20W max.

Humidity

15 to 90% RH non-condensing

Ambient Temperature

The system is specified from -20°C to +50°C. The System should be protected from high intensity solar radiation at high ambient temperatures.

Flammable atmosphere warning alarm

10% LEL propane

Flammable atmosphere shutdown alarm

25% LEL propane

Accuracy

5% LEL propane

Response

See Appendix 4

Response time

Response time to shutdown alarm with step change from 0 to 100% LEL propane less than 10 seconds.

Barometric pressure range

95kPa to 110kPa

IP rating (Ingress Protection)

Control Unit & Relay Unit IP64.

Gas Sensing Head IP54. The front of the Gas Sensing Head must be protected from road spray and power washing.

Delayed shutdown timing options

10S, 15S, 20S, 25S (± 10%)

APPENDIX 2 – SPARES

Pyroban supplied parts must be used (unless marked *)

Item	Pyroban part number
Control Unit	815596/1/G
Relay Unit 12V	815859/12V
Relay Unit 24-80V	815859
Gas Sensing Head, Pellistor	815950
Gas Sensing Head, Infrared	813813
Gas Bottle 0.5l	450539
Gas tube	500886
Gas Sensing Head lead Part No/Length (m)	804993/3 804993/5 804993/10, (Kit Selected) 804993/1 804993/15 804993/30 (Option)
Power lead Part No/Length (m)	804990/3 (Standard Kit) 804990/5 804990/15 804990/30 (Options)
Fuse Relay Unit F1 T3.15A 5mm x 20mm HBC*	950561
Fuse Relay Unit F3 or F4 T2.0A 5mm x 20mm HBC *	tbd
Fuse 5A Bladed*	950811
Dallas key - Green (Driver - Electric Vehicle)	804987/1
Dallas key - Red (Supervisor)	804987/2
Dallas key - Blue (Driver - Diesel Vehicle)	804987/4

APPENDIX 3 – PELLISTOR HEAD RELATIVE RESPONSE

Material	% LEL shutdown
Acetylene	25.42%
Acetone	36.31%
Butane	31.12%
Cyclohexane	41.22%
Di methyl ethylene	33.89%
DI-Ethyl Ether	39.10%
Ethane	21.79%
Ethanol	28.24%
Ethyl Acetate	41.22%
Ethylene oxide	31.12%
Ethylene	21.79%
Heptane	43.57%
Hexane	39.10%
Isopropanol	38.13%
Methane	15.25%
Methanol	21.18%
Pentane	36.31%
Propanol (propion aldehyde)	41.22%
Propane	25.00%
Toluene	43.57%
Vinyl acetate	39.10%
Xylene	58.65%

APPENDIX 4 – INFRARED HEAD RELATIVE RESPONSE

Material	% LEL shutdown
Cyclohexane	28.4
Ethanol	20.6
Ethyl acetate	58.8
Kerosene	53.4
Methanol	22.7
Isopropanol	40.4
n-Heptane	31.2
n-Propanol	36.4
n-Propyl acetate	41.0
Butane	30.5
Isobutane	20.6
n-Octane	36.0
2,2,4-Trimethyl Pentane	30.8
n-Butyl alcohol	42.5
Propane	25.0
Ethane	29.4