

LIQUEFIED PETROLEUM GAS

This leaflet is prepared by The Caravan Club as part of its service to members. The contents are believed to be correct at the time of publication, but the current position may be checked with The Club's Technical Advice & Information Department. The Club does not endorse the listed products and you should satisfy yourself as to their suitability. As always check that the installation of an after-market accessory does not invalidate your warranty.

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Gas Characteristics

Liquefied petroleum gases are products of the refining of crude oil, and are therefore closely related to petrol, diesel etc. They consist of hydrocarbons, which are compounds containing only carbon and hydrogen.

The simplest form of LPG is methane (CH_4) but as this can only be liquefied at low temperatures and is therefore difficult to handle commercially, the most commonly used varieties of LPG are propane (C_3H_8) and butane (C_4H_{10}). These are gases at normal temperatures and pressures, but can be liquefied by the application of a relatively low pressure. Because a small volume of liquid equals a very large volume of gas (1 to 274 for propane, 1 to 233 for butane) a small pressurised cylinder can contain a significant amount of 'energy' for your caravan appliances.

Butane and propane have slightly different properties, the most important to the caravanner being the boiling point at atmospheric pressure. In other words, the temperature at which it changes from being a liquid to a gas. Butane will only readily change to a gas above 0°C , so is generally suitable for the spring to autumn caravanner. Propane, on the other hand, will become a gas down to -40°C and therefore can be used in winter, or all year round if desired. Propane is often sold in red cylinders, butane in blue, but some suppliers use alternative colours – always check which gas you are buying.



Propane might be a good idea

Gas installations

Until September 2003, different regulators were required, depending on which gas was being used - butane being regulated to 28mbar and propane to 37mbar. Regulators were attached to the gas cylinder itself, with the low-pressure gas from the regulator then being taken into the caravan through a thin, low-pressure hose. These hoses were vulnerable to damage and age-related deterioration, and needed regular replacement (typically every three years).

Sample 'old style' regulators:



28mbar 4.5kg butane



28mbar 7kg/15kg butane



37mbar 3.9kg/6kg propane

The introduction of the EN1949 European Standard for 2004 model-year caravans (from September 2003 in the UK) then harmonised pressure for both gases as 30mbar, meaning a single regulator now suits both propane and butane.

EN1949 allows for either bulkhead or cylinder-mounted regulators. Convention within the UK caravan industry is to use a bulkhead-mounted regulator. Some continental-built caravans and motor caravans, however, may be imported with cylinder-mounted ones. Such regulators may not be compatible with UK gas cylinders without the use of adapters, or may need to be replaced with a bulkhead-mounted one instead. With a bulkhead-mounted regulator, gas is taken from the cylinder at high pressure via a heavy-duty supply hose, which is much more robust than the formerly-used low pressure hoses.



Typical 30mbar bulkhead-mounted regulator



30mbar cylinder-top regulator

High pressure hoses supplied with the caravan or motor caravan when new should conform to the length requirements of EN1949. The initial issue of EN1949 specifies a maximum length of 400mm, but this is widely considered too short, and most hoses are actually 450mm. Where there is a slide-out gas cylinder holder (even slightly slide-out) the length can be up to 750mm. Hoses bought as aftermarket accessories can be any length, but the use of longer hoses should be considered carefully, so as to avoid loops of hose running down towards the regulator (see section on regulator failures below).

Caravans manufactured before September 2003 should not be retrofitted with a bulkhead-mounted regulator, since the appliances fitted in the caravan may not be suited to use at the 30mbar pressure this would involve, especially if propane is used. Older style regulators should continue to be available for the foreseeable future, however, meaning older caravans can continue to be used perfectly well.

An advantage of the bulkhead-mounted regulator system is that when changing to alternative cylinder suppliers (including when abroad), it is only necessary to purchase a suitable connecting hose or simple adapter, rather than a substitute regulator, as is often the case with older caravans. Cylinders use a variety of screw on (usually with a left-hand thread) or clip on attachments, and thus a range of connecting hoses and adapters may be required. Check with the cylinder supplier before buying, or consult an accessory stockist for which is required. Adapters to suit Continental cylinders are usually available from UK accessory stockists prior to travelling, such as those below used to connect a standard butane hose to a Campingaz or Norwegian, Spanish, Portuguese and Southern Irish cylinders.



Campingaz adapter



'Jumbo' Adapter for Norway, Spain, Portugal and Ireland

Most caravan appliances operate happily on either butane or propane. A propane cylinder has a higher offtake rate than butane, though, which means it can run more appliances, or is better suited to those appliances that demand a lot of gas, such as central heating units. Some older Continental caravans may require re-jetting of appliances to use UK LPG cylinders and regulators (especially older German ones designed for a 50mbar gas system) - consult your dealer for further information.



The most common brand of LPG in the UK is Calor, with a broad range of 4.5kg, 7kg and 15kg butane cylinders. Propane users have the choice of Calor's 3.9kg, 6kg and 13kg cylinders. Not all Calor stockists will have the 6kg Propane, so check first by calling free on 0800 626 626. Calor also offer "Calor Lite" 6kg propane cylinders, with the same screw connections as standard propane cylinders, but a reduced cylinder weight. Calor cylinders are stocked on most Club sites.

Several other brands are available too – one of the most popular is the "Gas Light" lightweight plastic cylinder from BP, available in 5kg and 10kg propane capacities. Some cylinder compartments have mouldings or brackets on the floor that are designed to hold only steel cylinders. You can buy a plastic bracket to fit in your cylinder compartment which will hold both BP Gas Light and steel cylinders safely and securely. Contact Truma for stockist details for these brackets. You may also find that you need a longer material strap to hold the slightly wider BP Gas Light cylinder in place. Gas Light uses a 27mm clip on connection, as is used for patio gas cylinders.



These cylinders (and all those mentioned in Table 4 towards the end of this leaflet) are 'exchangeable', i.e. when empty, you return the cylinder to a stockist, who exchanges it for a full one, with you paying just for the new gas. The empty cylinder is then taken to a refilling plant. Cylinders remain in use for many years. Calor, for instance, says all its cylinders are subject to a periodic statutory examination and requalification every 15 years to ensure that they are 'fit for purpose'. At the time of this examination, cylinder valves are replaced. Calor advises that, as LPG is non-corrosive, the steel cylinders suffer no internal corrosion, and are coated with a protective coating. Cylinders with poor appearance are segregated at their filling plants and re-painted with a decorative paint coating prior to filling. The age of the cylinder is, therefore, irrelevant and the external decorative appearance should not be taken as a sign of the cylinder's physical condition or fitness for use.

An alternative to exchangeable cylinders are 'user-refillable' cylinders or tanks. These are sometimes found on motor caravans, and less commonly on caravans. In principal, these appear to be a good idea, as they can be refilled at petrol stations selling 'Autogas' for LPG-powered cars, which is cheaper than 'cylinder' gas.



This refillable cylinder fits in a normal locker, and comes with an external filler neck



This tank is similar to those used for vehicle propulsion, and is usually fixed under the vehicle

However, there are a number of factors to consider before opting for these systems:

- The equipment is often quite expensive to buy. It really only suits those who will use quite a lot of gas during a season.
- There are no specific standards or regulations for fitting such equipment to caravans and motor caravans for supplying the habitation appliances (unlike for equipment used for vehicle propulsion). Both the quality of equipment and installation may vary, therefore, and should be considered carefully before purchase.
- Some filling stations are reluctant to allow user-refilling, especially of cylinders which cannot be refilled in situ by means of an external filler.
- The cost of Autogas is heavily dependant on the level of taxation the Government chooses to apply to it.

Some guidance on this issue has been provided by the LPG industry trade association, UKLPG.

It is our advice that user owned, portable LPG cylinders should not be refilled at Autogas refuelling sites.

*Vessels which are attached to a vehicle for heating or cooking (on camper vans or similar) present similar risks on filling to those for propulsion purposes and may be permitted to be re-filled at Autogas refuelling sites **provided** they:*

- *remain in-situ for refilling*
- *are fitted with a device to physically prevent filling beyond 80%*
- *are connected to a fixed filling connector which is not part of the vessel.*

In other words, cylinders which need to be removed from the caravan/motor caravan for refilling, and which are refilled directly from the nozzle of the LPG pump are still not recommended. However, cylinders which are in effect installed in the vehicle as a fixed tank, which are refilled via an external filler connection, and which include an 80% stop valve to prevent over-filling are acceptable.



The practice of using a large propane cylinder standing outside the caravan is not recommended for several reasons. To transport the cylinder usually requires it to be carried on its side in the car boot, which is strongly advised against. This is because if any liquid LPG seeps up through the cylinder valve, it could gasify in the car boot with potentially dangerous results. Also, unless the cylinder is properly secured, the consequences of even a minor accident could be serious. Once on site, the cylinder is then vulnerable to tampering and, unless properly secured, could be knocked over. There is also a risk of damage to the connecting hose where it passes through the gas locker door, and a likelihood of accelerated aging of the rubber hose due to exposure to sunlight.

Consumption

Knowing the LPG consumption of your appliances, you can work out (*approximately*) how long your cylinders will last. Table 1 gives average consumption figures:

TABLE 1

APPLIANCE	BUTANE <i>Kg/hr</i>	PROPANE <i>kg/hr</i>
Cooker	0.60	0.55
Hotplate/grill	0.52	0.50
Space heater	0.13	0.13
Refrigerator	0.02	0.02
Storage water heater (firing)	0.09	0.09

To use several devices, you need to know offtake rates to select the correct cylinder:

TABLE 2

BUTANE			PROPANE		
CYLINDER	KG/HR	USE/HRS	CYLINDER	KG/HR	USE/HRS
4.5kg	0.4	11	3.9	0.5	8.0
7.0kg	0.5	14	6.0	0.8	7.5
15.0kg	0.7	21	13.0	1.0	13.0

From Tables 1 and 2, it is clear a combination of appliances can have a consumption rate more than some cylinders can deliver. If demand exceeds offtake rate, appliances will not work at full effectiveness. This is most significant for cooking appliances, where cooking times increase if the cylinder cannot supply as much gas as the appliance can use. If an appliance is starved of gas due to too great a demand being made on the cylinder, it is possible that the gas flame will go out. In this circumstance, flame failure devices built into the appliance will prevent any subsequent gas leakage, as they do when the cylinder becomes empty.

TABLE 3

APPLIANCE	HOURS IN USE	OFF TAKE <i>kg/hr</i>	TOTAL USED <i>Kg</i>
Refrigerator	24	0.02	0.48
Hotplate/grill	1.0	0.50	0.50
Space heater	3.0	0.13	0.39
Water heater	1.5	0.09	0.14
TOTALS		0.74	1.51

Table 3 considers propane consumption in an average day (24 hours). At this usage, a 3.9kg cylinder lasts just 2½ days, a 6kg cylinder 4 days. Note with a combined offtake rate of 0.75kg/hr, a 6kg or larger propane cylinder would be required to use all these appliances at the same time.

Safety

Because of its highly flammable nature when mixed with air, certain basic safety guidelines should be followed whenever dealing with LPG.

- LPG is non-toxic and has no smell - the characteristic gas smell is added to help detect any leaks.
- Leakages are most likely to occur at connection points such as the regulator, valve or flexible hose.
- Hoses will inevitably deteriorate with age, so they should be inspected for wear and damage and replaced from time to time. Low pressure hoses are most vulnerable, and should be changed every three years.
- If a leak is suspected, **never** look for it with a naked flame. The best method is to brush a solution of washing up liquid over the suspect area or use a gas leak detector spray; any leak should show by bubbles or foam appearing in the liquid or spray at the source.
- Your caravan or motor caravan should have ample ventilation holes through the floor -

Calor has given the following advice regarding leaks:

Leaks from cylinders, hoses or cylinder valves: The advice we give in the event of a leak occurring without igniting is:

1. Open all door and windows
2. Do not use naked flame or smoke
3. Do not turn electrical equipment on or off
4. Attempt to stop the leak by closing the valve and replacing the bung or cap
5. If the leak cannot be stopped, the cylinder should be carefully removed to a well ventilated open space, clear of drains, buildings, sources of ignition and other LPG cylinders
6. The cylinder should, if possible, be marked 'faulty' and left with the leak (usually at the valve) uppermost
7. Contact your local supplier to arrange collection of the cylinder

NO ATTEMPT SHALL BE MADE TO DISMANTLE OR REPAIR THE DEFECTIVE CYLINDER VALVE.'

Regulator Failures

Regulators would normally be expected to give many years service, but if exposed to extreme conditions (for example if water condenses inside then freezes) they can fail. Most are not too expensive, so replace if in any doubt over its condition. If travelling overseas for long periods and reliant on gas, it may be prudent to carry a spare regulator, as it may not be possible to get a UK-specification replacement quickly.

In recent years, however, many Club members have reported failures of bulkhead-mounted regulators, due to blockage by a yellow, oily fluid. While this issue has been very thoroughly investigated by industry experts, it has to date proven impossible to definitively identify the cause, nor to find an absolutely effective cure.

The facts around this issue are:

- If this fluid comes into contact with the rubber seat of the regulator, the seat will swell, blocking the inlet. This appears to be a 'safe' failure, but it will stop the gas system working
- Once contaminated, the regular must be replaced
- The most commonly-used regulator makes and most commonly-used gas brands have been most affected (Truma and Calor). However, similar reports have been made with other equipment and gas, and also in other countries. Systems using butane and propane have both been affected
- The oily fluid contains plasticisers – chemicals used in rubber and plastic manufacturer, which are not usual constituents of LPG.

Many theories have been examined to explain the problem, but tests under controlled conditions have failed to simulate it. The most likely explanation appears to be that a combination of issues may result in chemicals being extracted from the high pressure connecting hose, which can then end up in the regulator. Changes to the system can be made to minimise the risk of this happening:

- Make sure that the final part of the connecting hose runs upwards towards the regulator, not downwards. This requires the regulator to be mounted relatively high in the gas locker compared to the top of the cylinder, preferably with its inlet pointing down or sideways.
- Using short connecting hoses can help by avoiding loops of hose, and regulators with an upward pointing inlet can possibly be fitted with a right angle adapter to give a horizontal hose path
- Choose a size of gas cylinder which ensures the cylinder valve is below the height of the regulator
- Check the hose periodically for signs of oily deposit. If evidence is found, replace the hose.
- One supplier (Gaslow) offers a range of stainless steel hoses which do not contain rubber tubing, and thus should eliminate the risk of chemical extraction.

Changeover valves



Changeover valves allow two cylinders to be connected to the gas system at once. Some systems allow manual changeover from one cylinder to the other, but most change automatically as the first cylinder becomes empty. This reduces the risk of running out of gas on a cold, wet night. Make sure any chosen valve is compatible with your regulator before buying.

Patio Gas

Patio gas is simply LPG (propane) sold for use with barbeques and patio heaters etc. Most cylinders use a 27mm clip-on connection. If the size and availability of these cylinders suits your usage, then there is no technical reason why patio gas cannot be used with a caravan or motor caravan. You will need a suitable regulator or connecting hose/adaptor, and should check the cylinder dimensions are suitable for your gas locker.



Leak detectors and alarms

LPG leaks are usually self-apparent due to the pungent odorant added to the gas. Various electronic devices are also available to warn of leaks. Similar devices are also available to detect carbon monoxide (CO). While dangerous levels of CO are very rare in caravans and motor caravans, this is a risk if an appliance is malfunctioning.

Servicing

It is vital to ensure the gas system and appliances are kept in good working order, mainly for safety reasons, but also to make sure it doesn't let you down on holiday. An annual service such as that carried out by an Approved Workshop (see www.approvedworkshops.co.uk) will include a functional and safety check, but will not generally cover detailed appliance servicing (i.e. removal and strip down). Owners should arrange this separately, based on the usage the appliance gets, or according to the manufacturer's recommendations.

If choosing a service workshop or engineer, it should be noted that Gas Safe registration (the body which has replaced CORGI) is not required unless the vehicle is going to be hired out, and such registration does not necessarily indicate competence with caravan LPG installations. CITO (the Caravan Industry Training Organisation) specifies that the minimum competency requirement for work to be carried out on trailer caravans and motor caravans is an ACoPs (Approved Code of Practice) qualification (this is a requirement for membership of the Approved Workshop Scheme). ACoPs is a minimum standard and can be used as a 'stepping stone' to advance to ACS (Accredited Certification Scheme) level. The Club does not recommend DIY servicing and maintenance for gas equipment.

Recommendations for usage of gas barbecues



As a general rule, cooking should not be carried out within a structure (including an awning, tent or garden gazebo) unless that structure has been specifically designed to include a cooking area. This will normally be indicated within the instructions or handbook supplied with the structure. Any safety instructions or prohibitions on use issued by the manufacturer of the structure or the cooking appliance must be followed.

Where gas barbecues are used with their own gas cylinder:

- Take care during transportation (i.e. the cylinder it should be securely restrained in an upright position)
- Position the cylinder and barbecue so neither is likely to topple over
- Minimise risk of contact between the barbecue, its flames or any hot material ejected from it and the structure of the caravan (including the awning). This generally means placing the barbecue well away from the caravan
- Check the gas hose and regulator condition regularly, and replace the hose typically every two to three years, or sooner if deterioration is apparent

Where gas barbecues are supplied from a gas outlet on the side of the caravan or motor caravan:


- Check the location of the gas outlet (right) and the hose length attached to the barbecue are sufficient to allow adequate separation of the barbecue from any flammable structure.
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- A close-up photograph of a gas outlet on a caravan wall, showing a red isolating valve and a gas hose connection. A warning label is visible on the right side of the outlet.
- Ensure the gas hose is in good condition, especially where it attaches to the caravan outlet (see advice about replacement above)
 - Ensure that the gas hose is not an undue tripping hazard
 - Do not fit an extended gas hose longer than that advised by the caravan or appliance manufacturer
 - Do not join lengths of gas hose together
 - The isolating valve for the gas outlet should be automatic so that gas cannot be released when a hose is not connected. However, check the isolating valve is fully off whenever the barbecue is not in use.
 - Caravan manufacturers may state in their handbook that no other gas appliance should be used while the external barbecue outlet is in use

TABLE 4

LPG CYLINDER SIZES BUTANE

BRAND	SIZE	LPG (kg)	LPG+CYLINDER (kg) approximately	DIAMETER (mm)	HEIGHT (mm)	AVAILABILITY *please refer to key below
Campingaz	907	2.75	3.7	202	250	NW / CE
Calor	4.5	4.5	10.2	240	340	NW
Flogas	4.5	4.5	10.7	240	340	R
Calor	7.0	7.0	15.0	256	495	NW
Flogas	7.0	7.0	15.3	256	495	R
Flogas	13.0	13.0	26.2	310	560	R
Calor	15.0	15.0	34.0	318	580	NW

PROPANE

BRAND	SIZE	LPG (kg)	LPG+CYLINDER (kg) approximately	DIAMETER (mm)	HEIGHT (mm)	AVAILABILITY *please refer to key below
Calor	3.9	3.9	9.6	240	340	NW
Flogas	3.9	3.9	10.1	240	340	R
BP Gas Light	5.0	5.0	8.7	305	393	NW
Calor	6.0	6.0	13.0	256	495	NW
Calor Lite	6.0	6.0	8.7	256	495	NW
Flogas	6.0	6.0	14.3	256	495	R
BP Gas Light	10.0	10.0	16.3	305	587	NW / CE
Flogas	11.0	11.0	24.2	310	560	R
Calor	13.0	13.0	between 25 & 32	315	580	NW

*KEY:	
Nationwide (UK)	NW
Continental Europe	CE
Regional (UK)	R

Table 4 gives some popular brands and sizes of LPG cylinder available in the UK. If travelling abroad, alternative local suppliers are available, but you will probably need an alternative regulator or connecting hose/adapter. Campingaz are the only UK supplier to also have outlets in Europe selling the same specification of cylinder. You should not attempt to have Calor or other cylinders not designed for user-refilling refilled abroad.

Note that most suppliers operate a hire agreement on cylinders, which remain their property. Keep the original hire agreement safe, because if you want to return the cylinders at any time, you will get a proportion of the hire fee back. The hire form may also be required if you wish to switch cylinder sizes, or from butane to propane. Most dealers will accommodate your requirements to change cylinder size or type if possible, but during the peak season some cylinder sizes are in far greater demand than others and the dealer may not be willing or able to exchange for a different size or type.

USEFUL TELEPHONE NUMBERS:

Calor:	0800 626626	www.calor.co.uk
Coleman UK Plc: Campingaz	01275 845024	www.campingaz.com
Flogas:	0800 262053	www.flogas.co.uk
BP Gas:	0845 6076943	www.bpgaslight.co.uk

USEFUL ADDRESSES

REGULATORS, HOSES, ADAPTERS, CHANGEOVER VALVES etc	
Gaslow International Manor House Stables Main Street Normanton on Soar Leicestershire LE12 5HB Tel: 0845 4000600 www.gaslow.co.uk	Truma (UK) Ltd Park Lane Dove Valley Park South Derbyshire DE65 5BG Tel: 01283 586050 www.trumauk.com
Cavagna Ltd 24 Longmoor Lane Breaston Derbyshire DE72 3BB Tel: 01332 875878 www.cavagna.co.uk	
GAS/CARBON MONOXIDE DETECTORS	
Alde International (UK) Ltd 14 Regent Park Booth Drive Park Farm South Wellingborough Northampton NN8 6GR Tel 01933 677765 www.alde.co.uk (Gas)	Honeywell Analytics Hatch Pond House 4 Stinsford Road Nuffield Industrial Estate Poole Dorset BH17 0RZ Tel 01202 645587 www.honeywellanalytics.com (Carbon Monoxide)
First Alert Gordano Gate Portishead Bristol BS20 7GG Tel 01452 887570 www.brk.co.uk (Carbon Monoxide)	Arctic Products Ltd Baird Road Corby, Northants NN17 5ZA Tel 01536 264000 www.arctic-products.co.uk (‘Sleepsafe’ Carbon Monoxide detector)

USEFUL ADDRESSES contd

GAS/CARBON MONOXIDE DETECTORS Contd	
SAS Security Products Ltd. Chestnut House Chesley Hill Wick Nr Bristol BS30 5NE Tel: 0117 9374494 www.sasproducts.com	
GAS LEVEL INDICATOR	
Truma (UK) Ltd Park Lane Dove Valley Park South Derbyshire DE65 5BG Tel: 01283 586050 www.trumauk.com	
GAS LEAK DETECTOR SPRAY	
Arctic Products Ltd Baird Road Corby Northants NN17 5ZA. Tel: 01536 264000	Calor Gas Contact Customer Services for a local stockist: 0800 626626
GAS DETECTOR PEN	
Omnitron (UK) Ltd Unit 48 Abbey Enterprise Centre Abbey Park Industrial Estate Premier Way Romsey Hampshire SO51 9DF Tel: 0870 626 0410 Email: info@omnitron.co.uk www.omnitron.co.uk (Omnitron DB4000 Gas Detekta Pen)	