# Road safety factsheet:

# Tyre safety

July 2023

In Great Britain in 2021, 12 people were killed and 111 people were seriously injured in collisions where illegal, defective or under-inflated tyres were deemed to be a contributory factor to the collision[1]. 491 people were injured in total.

Tyres are the vehicle's only point of contact with the road. The actual area of contact between the car and the road through the tyres is small, roughly equivalent to four size eight men's shoes. Bald tyres - 'slicks' - may be fine for a race car on a dry track but are no good at all for road vehicles on a wet road surface. Tyres treads are designed to pump water from the road surface and provide maximum grip. By the time the tread is worn down to the legal limit they will be unable to perform this task efficiently and must be replaced. Currently, the penalty for illegal tyres is a fine of up to £2,500 and three penalty points for each illegal tyre.

RoSPA recommends that worn tyres are replaced with an equivalent new unit well before the legal minimum tread limit of 1.6mm is reached - ideally as soon as they reach 3mm.

### The right tyres for the vehicle

Motor vehicle manufacturers choose the type, make, size, profile, load carrying capacities and speed ratings to match their vehicles, adjusting the tyre pressures to give the optimum grip, ride and handling characteristics. You should only change the type of tyres on your vehicle based on expert advice from the vehicle manufacturer, or tyre manufacturer.

## What is the law?

### Tyre pressures

Tyre pressures must be maintained at or within a very close tolerance of the recommended pressures. The vehicle's handbook contains information about vehicle loading and the required adjustments to tyre pressures which should be followed for safety. Tyre pressures should always be checked and corrected (if necessary) when they are cold. Correct pressures will ensure maximum tyre life, safety, the best ride and handling characteristics.

Over or under-inflating tyres is likely to seriously impair tyre performance and adversely affect tyre life. Over-inflation increases overall tyre diameter, decreasing the amount of tread in contact with the road, sidewall

[1] GOV UK (2021) 'Table RAS0701: Factors contributing to collisions and casualties: collisions, casualties and road user type, 2021; https://www.gov.uk/government/statistical-data-sets/reported-road-accidents-vehicles-and-casualties-tables-for-great-britain#vehicles-and-drivers-ras05 – accessed July 2023

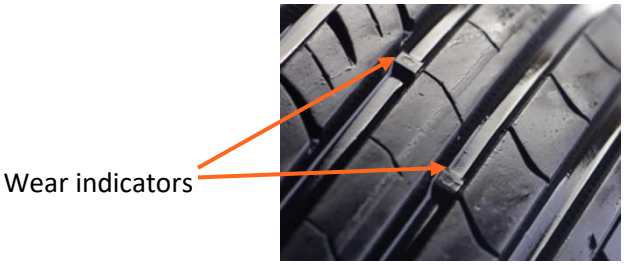
flexibility and affects road-adhesion. Under-inflation decreases overall tyre diameter, increases sidewall flexion, generates higher tyre operating temperatures and leads to difficult vehicle handling characteristics. Running an under-inflated tyre may cause premature tyre failure.

## Tyre tread depth and damage

Pay special attention to the amount of tread remaining on your tyres and measure the tread depth regularly. When tyres become worn or damaged they must be replaced. There must, by law, be at least 1.6mm of tread depth across the centre 3/4 of the width of the tread throughout the entire circumference of the tyre. There must be no damage to the tyre body - sidewalls or tread and no bulges or cuts.

You can check your tyre tread depth in three ways:

1. Tread wear indicators – indicators are raised bumps of rubber at the bottom of the grooves. When the surface is level with these then the tyre tread depth is approaching the legal limit of 1.6mm and must be replaced.




2. 20p test – take a 20 pence coin and insert it into the tread grooves of the tyre. If you can see the outer band on the coin, your tyres are likely to be above the legal limit. However, if the outer band is visible, your tyre could be below the legal limit If this is the case, take your vehicle to a professional for checks, as the tyre could need to be replaced [2].

*Source RAC*

3. A tyre depth gauge – these are small tools that can accurately check the depth of your tyre.

[2] RAC drive (2020) Tyre tread depth and tyre safety checks, https://www.rac.co.uk/drive/advice/tyres/checking-tyre-tread/#:~:text=its%20complete%20circumference.-,What%20is%20the%20minimum%20tyre%20tread%20depth%3F,3mm%2C%20stopping%20distances%20increase%20dramatically. – accessed July 2023

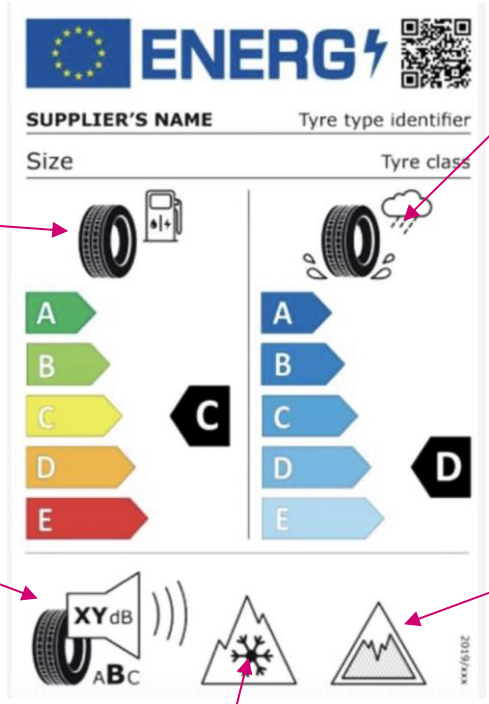
# Tyre Labelling

From 1st May 2021, a new tyre labelling system was introduced. The new system is drawn from a European database, which is accessible to the public and all retailers are obliged to provide the information to their customers. The new 2021 tyre rating label is shown below (source: Tyre safe):

### Fuel efficiency

The energy lost when a tyre is moving is known as 'rolling resistance'. A lower rolling resistance reduces fuel consumption and CO2 emissions.

Fuel efficiency is rated from category A to E. Category A is the most fuel efficient, meaning you will use the least amount of fuel for your journey.




### Wet braking performance/grip in the wet

Wet braking performance is also categorised in 7 classes. An A rated tyre provides the shortest braking distances on wet roads and an E-rated tyre has longer braking distances.

### Exterior noise emission

This is the amount of noise made by a tyre when it rolls along the road surface.

### Nordic tyre

Will be displayed if classified as a 'Nordic' tyre. Winter tyres designed for low temperatures, ice and snow.

Will be displayed if classified as a tyre suitable for use on the snow

# What do tyre Markings mean?[3]


**A** shows the **tyre size**. The code shows the tyre's width (205mm), height (45% of the width) and rim diameter (17 inches). Radial tyres are marked with R. Almost every new tyre manufactured now is a radial tyre.


**B** shows the **load index.** The code indicates the maximum weight your tyres can carry (88=560kg).


**C** shows the **speed symbol**. The letter shows your tyre's maximum speed. (V=149mph).

**D** shows the **production date** of the tyre. (1915= week 19 of 2015).


[3] Merityre specialists (undated) Tyre markings explained, https://www.merityre.co.uk/tyres/introduction-to-tyre-markings - accessed July 2023

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# What are the different tyre types?

There are several different types of tyre tread patterns as well as tyres for different road conditions and types of vehicles. A good rule to follow is to never mix tyres that are from different brands, have different tread patterns, or are different types with different features.

If you are getting a new pair of tyres instead of a full set, always make sure the new pair is fitted to the rear axle rather than the front. This is because your new tyres will have a deeper tread than the rest of the tyres, meaning that in wet weather they are better at displacing the water on the road, providing better grip for the vehicle. If these tyres were fitted to the front of the vehicle and grip was lost due to the wet surface, oversteer would occur which is much harder to deal with than understeer[4].

## Tyre tread types

Tyre tread patterns come in three different types; symmetrical, asymmetrical and directional. Each has their own benefits[5].

1. **Symmetrical** – most common tyre type as they are cost-effective, long lasting and fuel efficient
2. **Directional** – a good all-season tyre or winter tyre is likely to have a directional tread pattern, as they have good handling in snow and mud. They can be a more expensive than other types
3. **Asymmetrical** – these tyres have different tread patterns on the inside and outside of the tyre so need to be mounted in a certain way to the vehicle. They are generally more expensive tyres and are often fitted to high-performance cars.

## Seasonal tyres

Tyres can also be made for a specific season and are generally labelled as summer tyres, winter tyres or all-season tyres.

1. **Summer tyres**[5] – are designed to be used in warmer and dryer conditions. They are not designed to be used in very wet conditions or when the temperature drops below seven degrees celsius
2. **Winter tyres**[5] – designed to be used in colder and wetter environments, on road surfaces that are covered in snow, ice and water. They shouldn't be used in the summer
3. **All-season tyres** – hybrid solution with benefits of both winter and summer tyres. Designed for regions with less extreme climates, characteristically with milder winters and cooler summers, such as the UK[6]. They will not match the performance of the specialist tyres, but provide a good all-round mix.

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[4] TyreSafe (2020) 'Frequently Asked Questions' URL: https://www.tyresafe.org/tyre-faqs/ Date Accessed: 21/09/2020.
[5] Continental tyres (undated) Tyre Basics. Tyre tread patterns and their many uses, https://www.continental-tyres.co.uk/b2c/tyre-knowledge/tyre-tread.html - accessed July 2023
[6] Kick fit (undated) All season tyres, https://www.kwik-fit.com/tyres/types-of-tyre/all-season-tyres - accessed July 2023

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# What are run-flat tyres?

Run-flat tyres are becoming a common accessory on new vehicles. In conventional tyres, the pressurised air contained within the tyre supports the weight of the car. However, run-flat tyres are able to support the weight of the car by themselves, for a short period of time. They have been developed to minimise the risks associated with a tyre puncture, which can cause a driver to lose control of the vehicle due to the deflated tyre's loss of shape and structure.

In everyday operating conditions, run-flat tyres work like conventional tyres. They still contain air; to reduce the load that the run-flat system has to bear, to spread the weight of the vehicle evenly on the road surface, and to maximise the contact patch between the car and the road. The advantage is that they can operate without air in them, for a relatively short distance at low speeds, as their basic shape is kept by rigid components. This rigidity helps a driver maintain control of the vehicle if the tyre loses pressure and removes the need to change a tyre immediately.

There are two different types of run-flat tyre:

1. **Reinforced sidewall –** One way that a tyre can be adapted to support the weight of the vehicle is to increase the thickness and strength of the sidewall. Although the tyre will bulge outwards without pressurised air inside, it will not completely collapse and become unseated from the rim, as a conventional tyre can.
2. **Internal support ring –** The internal support ring is a less common design of run-flat tyre. When the tyre becomes deflated, it rests upon the internal ring, which supports the vehicle and maintains both the tyre's shape, and its contact with the road.

## Run-flat tyres and your vehicle

Run-flat tyres offer a better level of safety than conventional tyres if they have a puncture but need to be treated with care so as not to lose this benefit. Drivers should not travel long distances or at high speeds, on a punctured run-flat tyre, and should ensure they know the maximum speed and distance for their tyres, which can be found on the sidewall of the tyre or by contacting the tyre manufacturer. If a run-flat tyre suffers a puncture, it should be replaced as soon as possible, as damage can occur to the tyre, which may not always visible. Run-flat tyres that have been used whilst deflated should always be replaced, rather than repaired, if they have suffered damage.

As many run-flat tyres offer good ride comfort whist deflated, it is often hard for the driver to feel that a tyre is deflated, so they should only be used on vehicles that have a Tyre Pressure Monitoring System (TPMS), which can warn the driver if the tyre is deflated. Drivers should seek advice from their vehicle manufacturer or tyre manufacturer before retrofitting a run-flat tyre.

# Is there an expiry date on tyres?

Rubber compounds used in tyres contain anti-oxidising chemicals that help to slow down the natural ageing process of untreated rubber.

There is no law governing the maximum age at which tyres may be used on the roads for cars. You can check how old your tyres are by checking the sidewall markings. Whilst tyre manufacturers do not seem to have a consistent recommendation, tyres do deteriorate with age, which increases the risk of tyre failure. It is always recommended to check tyre condition regularly because the roadworthiness of a tyre depends on many factors, including the condition in which they are stored, the use to which they are put, road conditions, how well they are maintained and the driver's driving style.

RoSPA's recommendation to motorists is to ask their tyre manufacturer for the age at which they recommend tyres should be changed, and to regularly check their tyres for age-related defects, such as

1. Cracking/crazing on the side wall of the tyre, caused by its flexing
2. Distortion of tyre tread
3. Deformation of the carcass of the tyre.

Tyres that display these signs of ageing should be removed and not put to further use. If you are unsure about the safety of your tyres,have them checked by a professional.

Vehicles which are stored for significant periods (motorhomes, caravans, ice cream vans, classic cars, etc) should be inspected before each journey. They can need their tyres replaced at a younger age even though the tread may have hardly been touched. This includes spare wheels.

The caravan industry recommends that caravan tyres should ideally be replaced at five years old and should never be used beyond seven years old. Tyres with higher inflation pressures (50psi and above) may deteriorate faster – check them closely, looking for any bulges or signs of cracking[7].

Tyres used predominantly in coastal areas may age at a greater rate due to the saline conditions, and several cleaning products may also harm the chemicals in the rubber.

[7] Caravan and Motorhome Club (undated) Caravan tyres and wheels, https://www.caravanclub.co.uk/advice-and-training/taking-care-of-your-outfit/caravan-tyres-and-wheels/ - accessed July 2023

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# What are tyre pressure monitoring systems?

Tyre Pressure Monitoring Systems (TPMS) are a way of warning a driver that a tyre is incorrectly inflated. From 1st November 2012, all types of new motor vehicles and mobile homes sold in the EU must be equipped with a TPMS. On January 1st 2015, new legislation was also introduced stating that an inoperative or faulty TPMS sensor would result in MOT failure[8].

It is difficult to spot an under inflated tyre visually, especially without a fully inflated tyre as a comparison. Due to the rigidity of current tyre walls, a drop in pressure will only lead to slight increased flexing of the wall when the tyre is viewed at rest. This is why TPMS can be advantageous, it can warn drivers that their vehicle has an under inflated tyre despite the tyre looking normal.

There are many dangers of having under inflated tyres because they are designed for use at their recommended pressure. Under inflation can lead to increased deformation in the tyre wall as it concentrates the load upon the tread shoulders, and this reduces the amount of surface contact the tyre has with the road. This can have many consequences:

1. Increased wear of the tyre treads, which will lead to a higher chance of aquaplaning in the wet
2. Reduced handling characteristics and a reduced control of the vehicle
3. Longer stopping distances
4. Higher chance of the tyre delaminating, which could lead to a sudden tyre failure.

There are three types of Tyre Pressure Monitoring Systems.

## Direct tyre pressure monitoring systems

The most accurate and reliable form of TPMS is the direct system; this uses sensors to monitor the tyres' pressure and has the advantage that it can take into account factors, such as the tyres temperature, when calculating the pressure.

## Indirect tyre pressure monitoring systems

Indirect TPMS is an addition to the wheel speed sensors used as a component of the antilock brake system (ABS). A decrease in tyre pressure will lead to a decrease in the wheel's radius; this means it will rotate faster compared to the other tyres and the speed sensors detect this change. This system has the major advantage that it is much cheaper to implement and quicker to introduce onto new vehicles but has major disadvantages due to the fact that it cannot detect a slow and equal decrease in pressure on every tyre. The system also needs to be calibrated more frequently, which could be a difficult for users.

[8] TyreSafe (2017) 'TPMS' http://www.tyresafe.org/tyre-safety/tpms/ - accessed July 2023

## Hybrid tyre pressure monitoring systems

The concept of a Hybrid TPMS is to combine the advantages of both systems – the accuracy of the direct system and some of the cost savings of the indirect system. The pressure sensors are on two of the vehicle's wheels instead of four, and the wheel speed sensors compare the differences in speed to these wheels to detect a dip in pressure.

## Tyre pressure monitoring systems and your vehicle

When driving a car with TPMS, make sure that you know how it will communicate a drop in tyre pressures to you. There may be several different ways, such as a light on the dashboard, an audio signal or a diagram of the car with the tyre suffering the decreased pressure highlighted. If it is by a light on the dashboard then make sure you know what it looks.

Although TPMS is a very useful tool in reminding drivers that tyres of a vehicle need frequent checks, it should not be seen as a replacement. A driver should still perform regular tyre checks on the vehicle, which involve testing the pressure with an accurate gauge, checking the tyre wall for damage, and making sure that the tread is not worn. A tread depth of 1.6mm is the legal minimum, although 3mm and above provides significantly greater safety benefits.

# Should I fill my tyres with nitrogen?

Some tyre specialists now offer to inflate tyres with nitrogen rather than compressed air. It is claimed that there are a number of benefits of this, including:

1. Less corrosion- because unlike air, there is no moisture in nitrogen and;
2. Slower rate of tyre pressure loss – because nitrogen molecules are larger than the oxygen molecules they replace[9].

Although nitrogen leaks through the tyre liner more slowly than compressed air, the tyre pressure must still be checked regularly. Ideally, you should keep your tyres topped up with nitrogen to a minimum of 95 per cent. You are able to top up your tyres with compressed air after having them inflated with nitrogen, but this will dilute the nitrogen content of your tyres[10].

# Part-worn tyres

### What are part-worn tyres?

'Part-worn' tyres are those which have been used previously - in other words they are 'second-hand'. Most part-worn tyres are imported, mainly coming from continental Europe.

### What are the potential problems with part-worn tyres?

Part-worn tyres are usually sold with about 50 per cent or less of their original tread remaining (legal minimum is 2mm) and may have a few thousand miles more motoring in them. However, despite their remaining tread, it must be appreciated part-worn tyres are nevertheless used tyres. As such their purchase and use should be treated with a degree of healthy scepticism. In many cases, such tyres will be perfectly sound. However, it is possible that they have been bumped up and down kerbs and over other obstacles. They may have been run over or under-inflated and may have sustained irreparable and invisible damage to their structure.

The cost of part-worn tyres reflects their second-hand state and this no doubt contributes to their attractiveness to motorists. The purchase and use of part-worn, instead of new tyres may enable some owners to afford to keep their vehicles on the road. The tyre industry continues to express concern about the sale and use of part worn tyres. However, it is important to consider the issue objectively and make a reasoned judgement about the real risks of using such tyres.

[9] AA (2017) 'Filling Tyres with Nitrogen' https://www.theaa.com/driving-advice/safety/filling-tyres-with-nitrogen – accessed July 2023

[10] ATS (2017) 'Nitrogen Inflation' http://www.atseuromaster.co.uk/nitrogen-inflation/ – accessed July 2023

RoSPA's advice, like that of Trading Standards Officers, is 'let the buyer beware'. Whether the purchase of part-worn tyres is a good economic proposition or not, there can be little argument that a tyre which is only half worn but is in all other aspects sound, is likely to be safer than a tyre worn to the legal limit.

Before purchasing part-worn tyres always ask to see them inflated before they are fitted to the vehicle and check for any lumps or bulges. Part worn tyres should also be checked for signs of tyre ageing as described elsewhere in this fact sheet. If they show signs of ageing then you should not purchase them.

# Retreaded tyres

### What is a retreaded tyre?

A retreaded tyre – also known as a remould – is made from a used tyre. Old tyres which are not sound should never be used as components for retread tyres. The essential building block for a retreaded tyre is a used tyre whose tread is worn-out but whose carcass (basic structure) is sound. Retreading involves stripping away both the remaining tread and sidewall of the used tyre. The final part of the process moulds new rubber to the old carcass.

### What standards govern the production of retreaded tyres?

On 1st January in 2004, ECE Regulations 108 and 109 came into effect, making it mandatory for retreaded tyres to be subject to a type approval test. This ensures that retread manufacturers must meet a specified basic standard in terms of the tyres' suitability for retreading prior to the process, and their performance after it. It is illegal to sell retreaded tyres that that do not have the "e" mark.

### Are there any problems with retreaded tyres?

In the majority of cases, retreaded tyres perform satisfactorily, provided the manufacturer's guidance about maximum vehicle loadings and maximum speeds is followed. Like all tyres; overloading, sustained high speeds, and under or over-inflation all contribute to increased tyre wear and/or premature failure.

Never buy a retreaded tyre without the "e" mark.

# Winter tyres

### What are winter tyres?

Winter tyres use a type of rubber with high silica content and a tread pattern which is designed to remain flexible when temperatures drop below seven degrees celsius. These tyres provide benefits such as better braking and handling performance on snow and ice and on wet roads in cold conditions. They are different to summer or all-season tyres in several ways:

1. they use a softer rubber compound (usually by including more natural rubber in the mix)
2. the surface of the tread blocks is covered with little jagged slits, called sipes and;
3. they generally have deeper tread grooves than conventional summer tyres.

Winter tyres are not suitable to be used all-year round and therefore if you plan to use winter tyres you will also need all season or summer tyres for when temperatures rise and roads are dry[11].

If you are planning to get winter tyres fitted, make sure that you buy all four, as fitting one pair only will adversely affect the stability of your vehicle. This is because mixing different tyres (particularly if they have different features and tread patterns) can make handling more difficult and slippery conditions more dangerous[12].

For tips on driving safely during winter, read our Winter Driving Tips factsheet.

## Do I need to use winter tyres?

Winter tyres are not mandatory in the UK. However, they can be a useful investment, particularly if you live in a remote location which is at risk of being cut off in periods of bad weather without the use of a functioning vehicle[13].

## Do I need to inform my insurer if I plan to use winter tyres?

Many motor insurers will not charge an additional premium when their insured customers wish to use winter tyres, provided that they meet the vehicle manufacturer's specifications and are in a roadworthy condition. However, some motor insurers may require that you contact them to let them know if you are planning to fit winter tyres.

The Association of British Insurers guide, Motor Insurance Commitment for Winter Tyres, provides information on each insurer and their policy on winter tyres, including a list of insurers who do not charge additional premiums for the use of winter tyres and whether you will need to contact them if you plan to use winter tyres. If your insurer is not included in this list, it is best to contact them directly.

[11] Goodyear (no date) 'What Are Winter Tyres?' https://www.goodyear.eu/en_gb/consumer/learn/winter-tires.html – accessed July 2023

[12] Which (2017) 'Should I buy winter tyres?' http://www.which.co.uk/reviews/cars/article/winter-tyres-and-snow-socks/should-i-buy-winter-tyres – accessed July 2023

[13] AA (2017) 'Winter Tyres in the UK', https://www.theaa.com/driving-advice/safety/winter-tyres-in-the-uk – accessed July 2023