Continental
The Future in Motion

WORKBOOK

ContiTech

Contents

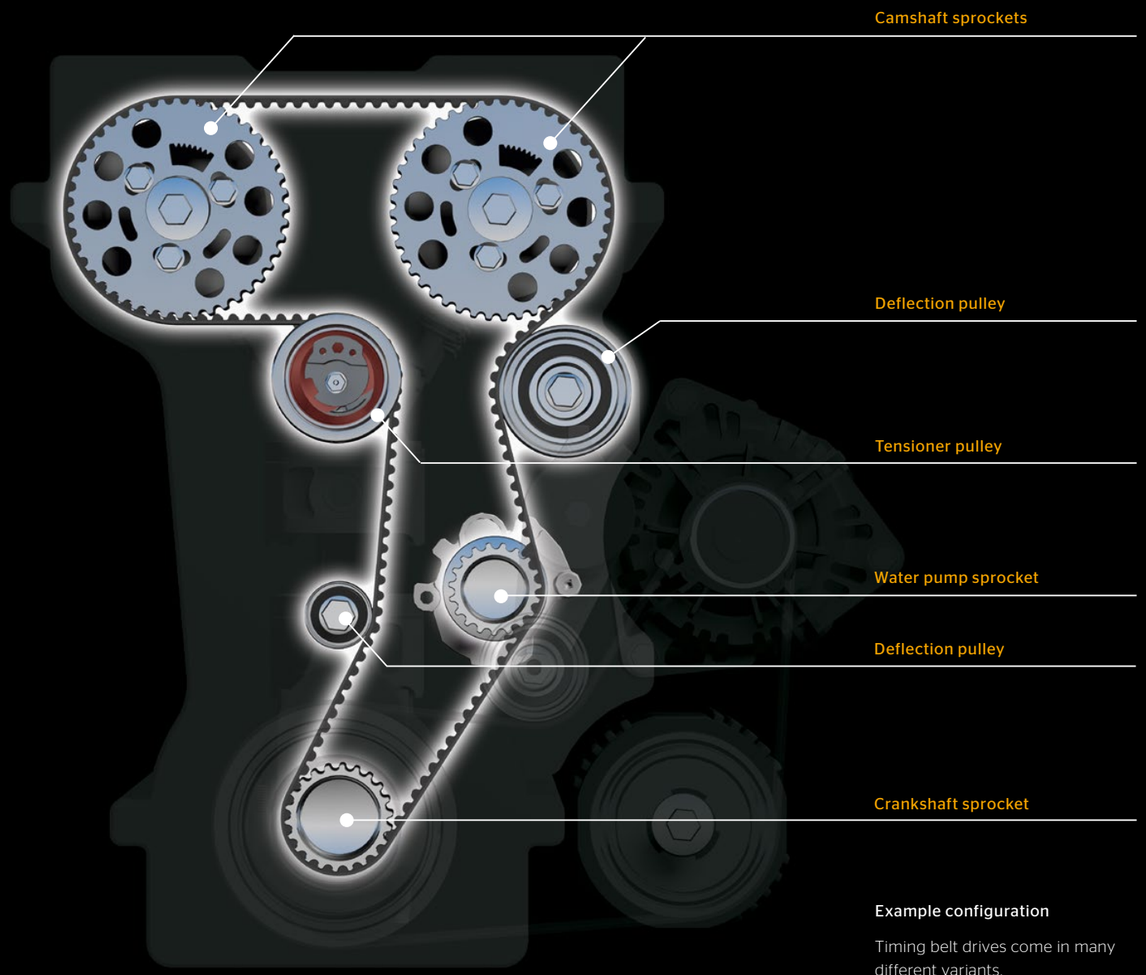
Introduction

Commonly misconceived as being simply black, round and technically quite boring, today's power transmission belts are actually high-tech products. With their ingenious mix of materials and individual technical specifications, they are crucial for the safety, comfort and driving performance of modern cars.

Our aim with this brochure is to provide you, the professionals in the automotive workshop, with specialist technical information and interesting background knowledge about these products. And, in so doing, to help you carry out the main repair jobs on the belt drive safely and efficiently.

Timing belts

Timing belts ensure absolutely synchronous power transmission thanks to the positive-locking connection created between drive sprocket and belt by the belt's teeth. In internal combustion engines they are used to drive camshafts, fuel injection pumps, balancer shafts and water pumps.



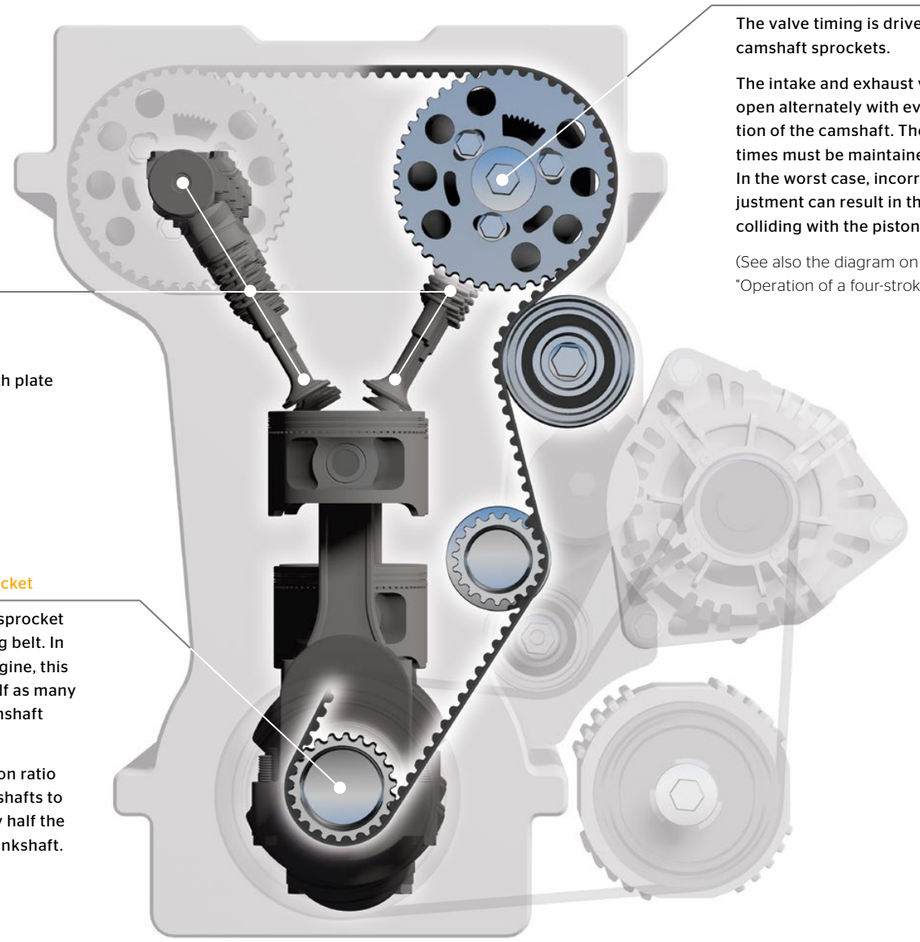
Example configuration

Timing belt drives come in many different variants.

Function

The timing belt transmits the rotary motion of the crankshaft to the camshafts. Their cams operate transmission elements such as tappets, rocker arms or cam followers, which in turn transmit the movement to the valves. Starting from the camshaft, the valves are therefore opened and then closed again by the force of the valve springs. This process enables the exchange of gases in a four-stroke internal combustion engine.

The valves have to be opened and then closed again within a precisely defined timeframe to allow the combustion chamber to be completely filled with gas or the air/fuel mixture and to ensure that the exhaust gases are discharged effectively. If the valve timing is wrong, the engine will not deliver the required power and serious engine damage could be caused if the valves collide with the piston. On a four-stroke engine (intake – compression – power – exhaust), the valves must only open on every second revolution of the crankshaft to produce the four strokes. In this case, therefore, the crankshaft and camshaft have a 2:1 ratio, meaning the camshaft rotates at half the speed of the crankshaft.



Camshaft sprocket

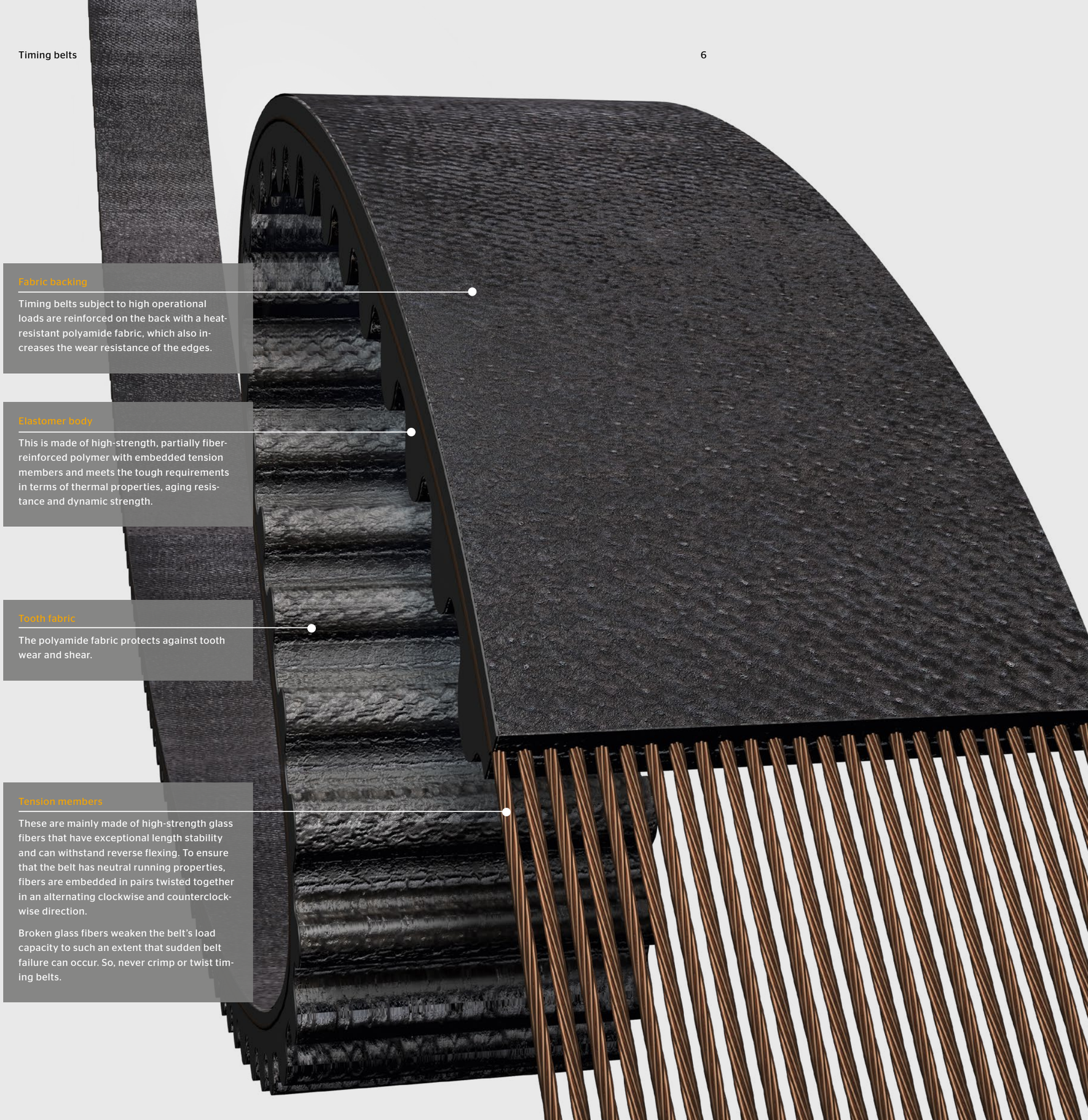
The valve timing is driven by the camshaft sprockets.

The intake and exhaust valves open alternately with every rotation of the camshaft. The opening times must be maintained exactly. In the worst case, incorrect adjustment can result in the valves colliding with the piston.

(See also the diagram on p. 8 "Operation of a four-stroke engine".)

The crankshaft sprocket drives the timing belt. In a four-stroke engine, this sprocket has half as many teeth as the camshaft sprockets.

This 2:1 reduction ratio causes the camshafts to rotate at exactly half the speed of the crankshaft.



Fabric backing

Timing belts subject to high operational loads are reinforced on the back with a heat-resistant polyamide fabric, which also increases the wear resistance of the edges.

Elastomer body

This is made of high-strength, partially fiber-reinforced polymer with embedded tension members and meets the tough requirements in terms of thermal properties, aging resistance and dynamic strength.

Tooth fabric

The polyamide fabric protects against tooth wear and shear.

Tension members

These are mainly made of high-strength glass fibers that have exceptional length stability and can withstand reverse flexing. To ensure that the belt has neutral running properties, fibers are embedded in pairs twisted together in an alternating clockwise and counterclockwise direction.

Broken glass fibers weaken the belt's load capacity to such an extent that sudden belt failure can occur. So, never crimp or twist timing belts.

Timing belt design

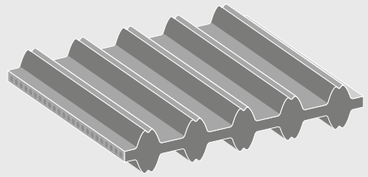
A timing belt is made up of four main components:

> Polyamide fabric
> Elastomer body
> Tension members
> Fabric backing (depending on model)

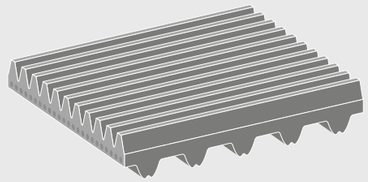
There are also a number of special belt versions, for instance:

> Timing belts running in oil that enable a slimmer engine design. Their components are specially engineered for this operating environment and are resistant to oil and impurities in the oil, such as soot particles, fuel, condensation and glycol.

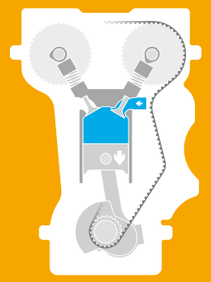
> Double-sided timing belts that allow positive-locking drive on both sides (e.g. for balancer shafts).



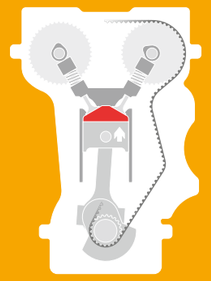
> Timing belts with a ribbed back for driving ancillary components.



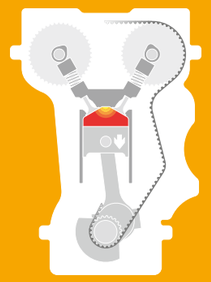
Operation of a four-stroke engine:
The engine is only able to operate if the rotary movements of the crankshaft and camshafts are synchronized.



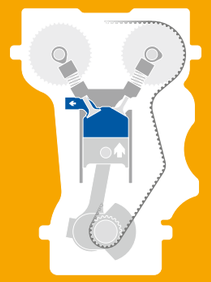
1st stroke (intake)



2nd stroke (compression)



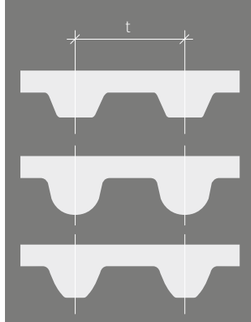
3rd stroke (power)



4th stroke (exhaust)

Profiles

The first timing belts featured a trapezoidal tooth shape, which was already in use in industrial applications (L profile). The increased demands in terms of acoustic properties and load transmission have meant that curved tooth shapes (HTD and STD profiles) have now become the norm. The circular shape allows uniform distribution of the forces acting on the tooth and prevents tension spikes. The pitch (t) is the distance between two teeth and is typically 8 mm or 9.525 mm for camshaft belts.



Scale 2:1

HTD: High Torque Drive; profile optimized for the transmission of high forces, such as those in diesel engines with a high injection pressure.

STD: Super Torque Drive; acoustically optimized, therefore mainly used in gasoline engines.

These tooth shapes come in a large number of variations. For example, a groove on the tooth head can result in better acoustic properties, as this produces just two linear areas of contact between tooth head and belt pulley when meshing with the sprockets rather than full-surface contact.

Play it safe

> Only fit timing belts that have been correctly stored and are not out of date.

> Only use timing belts with the correct profile.

> Never crimp or twist timing belts as this will damage the tension members.

> When fitting the belt, follow the car manufacturer's instructions and the handling tips given above.

> Always use the specified special tools.

Handling

Timing belts are high-performance components that are required to work reliably over a long service life under extreme operating conditions. Correct handling of the belts is very important to avoid damaging them before use.

Storage:
- In a cool (15–25°C), dry place.
- Away from direct heat and sunlight.
- In the original packaging.
- Not near highly flammable, aggressive substances or near lubricants or acids.
- Maximum of 5 years (see storage expiry date on the packaging).

Fitting:
- Follow the car manufacturer's fitting instructions.
- Use the specified special tools. Never pry the belt onto the pulleys by force, e.g. by using a tire lever or similar. This will destroy the glass fiber tension members.
- Do not crimp or twist. Never bend around a smaller diameter than that of the crankshaft belt pulley. This will damage the glass fiber tension members.
- If necessary, set the belt tension specified by the manufacturer using a tension gauge. Twisting the belt through 90 degrees is only permissible for a very small number of vehicles and must not be applied universally.
- Protect belts from exposure to oil (including oil mist) and other service fluids such as coolant, fuel and brake fluid. Do not use any sprays or chemicals to reduce belt noise.

Maintenance and replacement

Timing belts are maintenance-free, meaning they do not require re-tensioning. They endure high levels of strain as a result of the high temperatures in the engine compartment and the constant reverse flexing, and are subject to aging and continuous wear. Their condition should be inspected as a precautionary measure during servicing in accordance with the vehicle manufacturer's specifications. This allows any irregularities to be detected in good time. If the timing belt snaps while the engine is running, the valves and pistons inside the engine could collide with force. In many cases this will result in severe engine damage. To prevent this from happening, the belt should be replaced under the following circumstances:

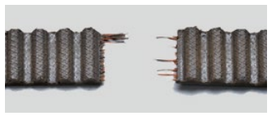
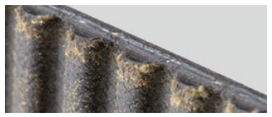
1 > The maximum mileage has been reached

A timing belt's inspection and change intervals are specified by the vehicle manufacturer. It should be replaced after running for between 40,000 and 240,000 km. The intervals depend on the combination of belt type, engine variant and vehicle model. The same belts fitted in the same engines can therefore have varying change intervals in different vehicle models. This can be due to, for example, different installation positions, transmission ratios or engine encapsulation. Unless otherwise stipulated by the vehicle manufacturer, we recommend changing the belt after a maximum life of seven years. An old belt can no longer be guaranteed to function correctly as a result of the material's aging process.

2 > The belt is damaged/worn

Damaged and/or worn belts must be replaced. First, however, you must find the cause and remedy it. The adjacent table will help you diagnose the problem.

Timing belts damaged by incorrect handling must, of course, never be fitted or put into use (please refer to the relevant instructions on p. 9).

Problem	Typical fault pattern	Cause	Solution
Timing belt snapped		① Foreign objects in drive ② Exposure to foreign substances ③ Pretension too high ④ Belt crimped before or during fitting	① Remove foreign objects, check components for damage and replace if necessary, change belt ② Eliminate any leaks, clean belt pulleys, change belt ③ Change belt, set correct tension ④ Change belt, fitting the new belt correctly
Edge wear		① Pulleys not parallel: belt running against flange ② Axial displacement of pulleys: timing belt cannot run flush to them ③ Defect in a pulley flange ④ Play in component bearings	①② Check drive, align misaligned pulleys and replace if necessary, change belt ③④ Replace deflection/tensioner pulley, change belt
Fabric wear in tooth root		① Tension set too high ② Worn timing belt pulley	① Change belt, set correct tension ② Replace belt pulley
Tooth flank wear, root cracks and sheared-off teeth		① Tension too high/low ② Foreign objects in drive ③ Seized timing belt pulley or tensioner pulley	① Change belt, set correct tension ② Remove foreign objects, check components for damage and replace if necessary, change belt ③ Determine cause (e.g. defective bearing), take remedial action, change belt
Teeth and fabric detach from belt body		① Swelling of elastomer compound and disintegration of vulcanized bond resulting from chemical action of service fluids	① Eliminate leaks from engine or in engine compartment (e.g. escaping oil, fuel, coolant, etc.), clean belt pulleys, change belt
Running marks on tooth side		① Foreign objects in drive ② Defects on teeth of timing belt pulley caused by foreign objects or tools during fitting ③ Timing belt damaged before/during fitting	① Remove foreign objects, check components for damage and replace if necessary, change belt ② Replace timing belt pulley, change belt, fitting the new belt correctly ③ Change belt, fitting the new belt correctly
Intermittent undulating sheared teeth		① Tooth pitches of belt and sprocket do not match	① Check all sprockets match tooth pitch of belt
Cracks on back		① Ambient temperature too high/low ② Exposure to foreign substances ③ Overheating of belt back due to seized/stiff backside pulley ④ Lifetime exceeded	① Remedy cause, change belt ② Eliminate any leaks, clean belt pulley, change belt ③ Change pulley and belt, check pulley can move freely ④ Change belt
Damage to back		① Backside pulleys seized, plastic outer ring melted ② Contact between timing belt and foreign objects, e.g. timing belt guard, screws, edges, etc.	① Change pulley and belt, check pulley can move freely (e.g. by ensuring timing belt guard is correctly seated) ② Change belt, ensuring there are no foreign objects touching the timing belt
Noise when running		① Tension too high: belt squealing or whistling ② Tension too low: belt knocks against guard ③ Noise caused by worn/defective pulleys or water pump ④ Belt pulleys not aligned	①② Set correct tension ③ Replace defective components, change belt ④ Align sprockets and pulleys and replace if necessary, change belt

Changing the timing belt

When changing the belt, all the steps specified in the vehicle manufacturer's instructions must be carried out. It is essential to use any special tools stipulated. This ensures that the positions of the crankshaft, camshafts and, if applicable, injection pump relative to each other remain unchanged. Under no circumstances should a timing belt be fitted on the sprockets by force or using lever tools. The running direction is irrelevant unless it is indicated by an arrow.

Timing belts with markings

Some timing belts have ignition timing marks on the back of the belt as an aid for fitting. The printed arrows indicate the belt's running direction. The lines marked on the belt must align with the markings on the belt pulleys during fitting.

Checking and setting the timing

The timing of valve opening and closing, i.e. the engine timing, only has to be reset if the crankshaft is no longer in the correct position relative to the camshafts (following complete disassembly of the engine, for example, or if the timing belt snaps). The precise figures are defined by the vehicle manufacturer and indicated in degrees (° crank angle) relative to top dead center (e.g. intake valve opens at 10° before TDC).

The timing of valve opening and closing can be checked using reference marks. To do this, the piston of one cylinder is positioned at top dead center (TDC). The vehicle manufacturer specifies which cylinder has to be positioned at TDC (often cylinder no. 1). The timing can be checked and adjusted as necessary using various markings on the engine block, the cylinder head, the timing belt guard, the belt itself and the belt pulleys. In addition to the camshafts, the position of mechanical distributors, balancer shafts and injection pumps must also be taken into account.

Without additional markings, TDC can only be set by unscrewing a spark plug, glow plug or fuel injector or with the cylinder head removed. A dial gauge is then used to find the corresponding cylinder's highest point of travel by carefully turning the crankshaft a little at a time.

To prevent the pistons from colliding with open valves and causing damage, the engine may only be turned over with the timing belt fitted. This can only be done, however, if the timing is approximately correct. If this is not the case, all the valves must be closed and valve control components such as tappets removed before turning the engine over. When the first cylinder on a four-cylinder four-stroke engine is set to TDC, the valves of the fourth cylinder must also be slightly open (overlap, gas exchange). The first cylinder will have just completed its compression stroke and can be ignited (valves closed). The position of the valves can only be checked with the cylinder head cover removed or by inserting an endoscope through the spark plug hole.

Play it safe

> Never change the position of the crankshaft relative to the camshafts when changing the timing belt.

> Always observe the car manufacturer's fitting instructions and stipulated change intervals. Risk of engine damage.

> Only turn the engine over with the timing belt fitted.

> Always use the specified special tools.

Belt-in-oil technology

The technology

With belt-in-oil technology, the timing belt for driving the timing gear runs in its own oil bath. The key benefit here is the reduction in frictional losses, which is also reflected in the vehicle's fuel consumption and CO_2 emissions. Belts in oil also run much more quietly than a chain drive, for example. Besides increasing driving comfort, the belt's smooth operation also has a positive effect on the oil's useful life in the vehicle.

Special belts required

We initially developed our timing belts for belt-in-oil technology for the Ford 1.0l Eco Boost engine and the 1.2l units from PSA and Opel manufactured from late 2012. They have been specially geared to the specific demands of operation in oil. Another application is the Ford 2.0l EcoBlue unit, while Volkswagen 1.6 and 2.0 TDI engines also use a timing belt in oil for driving the oil pump.

There is a risk of soot building up in modern direct injection engines with high compression ratios. These soot particles can become lodged in the oil bath between the sprocket and the belt, damaging the belt and thereby ultimately causing damage to the engine. Other crystalline compounds or fuel in the oil (dilution of the oil) also pose a challenge for the belt. Our timing belts are able to withstand these strains thanks to their special material composition **(Fig. 1)**.

Using the right oil is crucial

Oil is one of the most important operating fluids in a car. It is therefore crucial to follow each manufacturer's exact specifications and only use approved oils when changing the oil. Here, mechanics need to check the oil's technical properties as well as its grade. This is particularly true of vehicles with belt-in-oil technology. These require special oils whose chemical composition has been tailored specifically to the particular engine application. Additives can also be used to reduce the formation of soot referred to above. These include dispersing agents, friction modifiers, corrosion inhibitors, antioxidants and cleaning agents.

Dilution of oil and loss of function

Over time, the aforementioned additives become less effective at preventing soot formation. The reason for this is the oil in the engine becoming diluted over the course of operation. This is a normal phenomenon (within certain limits) that occurs less in vehicles used for long journeys and more in vehicles that either drive short distances in urban traffic or operate as taxis/delivery vehicles with frequent engine starts and stationary periods. On short journeys, a particularly high quantity of fuel accumulates in the engine oil, where it then impairs the belt. Leaving a vehicle that is only used for short journeys parked up for a prolonged period can therefore do far more harm to the belt than driving it daily. The duration of contact with the diluted oil is largely responsible for the damage caused to the

Fig. 1

belt. Driving with a full load, towing a trailer or frequently driving uphill can also speed up dilution of the engine oil.

Other factors that can lead to faster engine oil dilution include

- Use of an oil that does not match the specifications of the oil recommended by the manufacturer
- Failing to follow maintenance intervals
- Use of additional additives that harm the composition of the engine oil
- Not maintaining the engine oil at the correct level.

When the engine is used under aggravated operating conditions, servicing work such as oil changes and vehicle inspections need to be carried out sooner. And because diluted or fuel-contaminated oil also has an abrasive effect on timing belts in belt-in-oil engines, the timing belt may also need to be replaced more frequently if necessary. As a general rule, oil changes for belt-in-oil engines should be carried out every 20,000 kilometers and at least once a year. Ultimately, though, the manufacturer's specifications should always be followed here.

Detecting timing belt damage caused by the wrong oil

Timing belt damage is a continuous process that begins slowly. First, the back of the belt starts to crack **(Fig. 2)**, as can be observed on PSA and Opel engines by simply looking through the oil cap **(Figs. 6, 7)**.

As wear increases, individual fibers or teeth break away from the belt and are deposited in the strainer upstream from the oil pump **(Fig. 3)**.

In the case of 1.2l PureTech engines from PSA and Opel, the strainers for the variable camshaft timing's two solenoid valves can also become clogged with belt particles, as can the vacuum pump's oil strainer **(Figs. 8–12)**. This can also lead to faults in the oil pressure system (oil pressure warning lamp).

The timing belt on 1.2l PureTech engines from PSA and Opel must be checked annually during every oil service using a control gauge. The control gauge must fit over the back of the belt. If the timing belt is damaged, it will swell and become larger, meaning that it needs to be replaced **(Figs. 4, 5)**.

Fig. 2

Fig. 6

Fig. 7

Fig. 3

If the timing belt has to be replaced due to the belt disintegrating, it is advisable to carry out additional servicing work:

- Check and clean the two solenoid valves for the camshaft timing, replace if necessary
- Check and clean the vacuum pump's oil strainer, replace if necessary
- Check and clean the oil pump's strainer
- Replace the banjo bolt for the turbocharger's oil feed
- Change oil and replace oil filters
- Check and clean the oil pressure control valve, replace if necessary

If the oil is heavily contaminated, impurities may accumulate in the oil strainers again after traveling a short distance **(Figs. 8-12)**, whereupon the additional work must be repeated until all impurities have been removed. This does not necessarily mean the timing belt will have to be replaced again, however.

What to do if the wrong engine oil is used

If a non-approved oil is ever added to the engine by mistake, the wrong oil should be drained immediately and replaced with an engine oil that has been approved by the vehicle manufacturer. If the customer has driven the vehicle with the wrong engine oil for some time, the timing belt may have already suffered damage (see section on detecting damage). Draining the wrong oil and topping up the engine with an engine oil that has been approved by the vehicle manufacturer might still be sufficient. It is advisable, however, to carry out another oil change after a short period of operation. If the timing belt has already been damaged, particles would once again be deposited in the oil strainers leading to the fault messages described above. In addition to this, the timing belt width should also be checked with the control gauge on PSA and Opel engines **(Figs. 4, 5)**.

Fig. 4

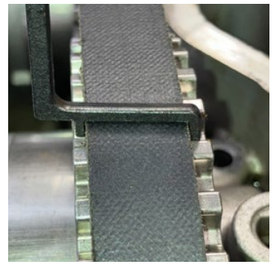


Fig. 5

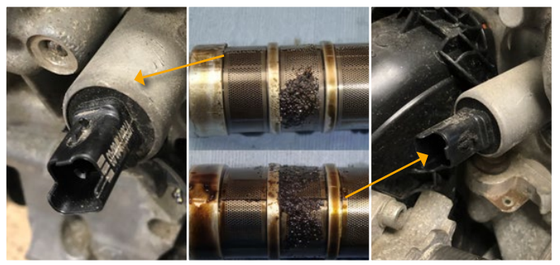


Fig. 8 **Fig. 9** **Fig. 10**

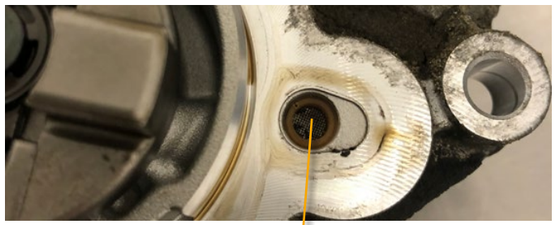


Fig. 11

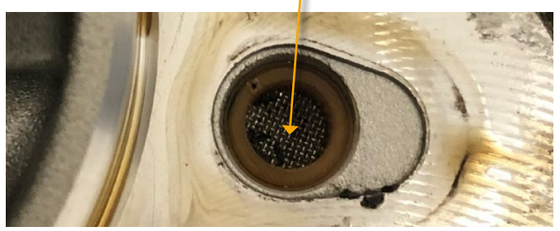


Fig. 12

For VW, Audi, Seat and Škoda engines with timing belt: TOOL BOX V01

Contents

- Locking tools and pins for crankshaft and camshafts
- Counterhold tool for tensioner pulleys
- Multilingual manual with tool names, original part numbers and vehicle applications

Benefits

- The most common tools for Volkswagen engines always ready to hand
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

For Renault: TOOL BOX V02

Contents

- Locking tools and pins for crankshaft and camshafts
- Counterhold tool for camshafts
- Multilingual manual with tool names, original part numbers and vehicle applications

Benefits

- Complete set of tools for all common Renault engines always ready to hand
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

For Citroën and Peugeot: TOOL BOX V03

Contents

- Locking tools and pins for crankshaft and camshafts
- Counterhold tool for camshafts
- Multilingual manual with tool names, original part numbers and vehicle applications
- Puller for crankshaft sprocket

Benefits

- Complete set of tools for all common Citroën and Peugeot engines always ready to hand
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

For Ford and Opel: TOOL BOX V04

Contents

- Locking tools and pins for crankshaft and camshafts
- Counterhold tool for camshafts
- Multilingual manual with tool names, original part numbers and vehicle applications
- Puller for camshaft sprocket

Benefits

- Complete set of tools for all common Ford and Opel engines always ready to hand
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

For Fiat: TOOL BOX V06

Contents

- Various retaining and locking tools (e.g. for flywheel, camshaft)
- Various setting and alignment tools (e.g. for crankshaft, tensioner pulley, cylinder head bolt)
- Dial gauge adapter
- Various locking pins, fastening bolts, washers

Benefits

- High-quality tools for professional use
- Made of robust, high-grade steel
- The most common tools for Fiat engines always ready to hand
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

The universal set: TOOL BOX V07

Contents

- Various locking tools
- Sprocket locking tool
- Belt pulley puller
- Various adapter and locking pins
- Fastening elements
- Various flywheels

Benefits

- High-quality tools for professional use
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

For VW: TOOL BOX V08

Contents

- Adjustment tools and counterhold tool
- Locking and release tools
- Retaining tools and various locking pins
- Camshaft timing tools
- Oil seal installation tools
- And much more

Benefits

- High-quality tools for professional use
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

For belt-in-oil engines: TOOL BOX V09

Contents

- Locking, adjustment and alignment tools (camshaft), locking tool (camshaft timing)
- Adjustment, locking and holding tools (crankshaft); locating pin and locking tool (flywheel), mounting device for timing belt, timing belt tensioner and set of sealing plugs
- Locking pins 0.8–2.6 mm
- Installation tool for front cover seal

Benefits

- High-quality tools made of robust, high-grade steel
- The most common tools for belt-in-oil engines from Stellantis always ready to hand
- Clearly organized storage in a sturdy case
- Tools available to order individually in the case of damage or loss

A perfect fit: the BIO TOOL

It's not easy to tell whether the timing belt in belt-in-oil engines is worn or not. The BIO TOOL from Continental provides the answer. It offers an easy way of checking the belt width on PSA and Opel models as well as Toyota engines with exceptional precision. This enables mechanics to detect any structural changes resulting from the permanent contact with oil at an early stage.

For working on Ford engines: TOOL BOX V10

Contents

- Torque multiplier
- Retaining plate
- Supporting arm
- Fastening bolts
- Reinforced sockets
- Spacer plate

Benefits

- High-quality tools for professional use
- Made of robust, high-grade steel
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case
- Tools available to order individually in the case of damage or loss

For cooling system diagnostics: TOOL BOX W01

Contents

- Cooling system tester with quick connector
- Hand pump for building up pressure in the cooling system
- CO_2 leak tester
- Adapters in all standard sizes
- Environmentally neutral leak tester fluid
- User guide

Benefits

- High-quality tools for professional use
- Exclusive set of tools only available from Continental
- Clearly organized storage in a sturdy case

Cooling system vacuum filling device: TOOL BOX W02

Contents

- Cooling system vacuum filling device
- User guide

Benefits

- High-quality tools for professional use
- Clearly organized storage in a sturdy case

Refractometer: TOOL BOX W03

Contents

- Refractometer
- Pipette
- User guide

Benefits

- High-quality tools for professional use
- Clearly organized storage in a sturdy case

Flushing made easy: TOOL BOX W04

Contents

- Complete flushing and vacuum unit
- Battery and hose clamps
- All the necessary hoses and couplings
- Venturi nozzle
- Screw caps for containers
- Clearly explained user guide

Benefits

- Simple, safe flushing in accordance with the manufacturer's specifications, even for very intricate cooling systems
- Perfect match for the adapters and connectors contained in TOOL BOX W01
- Smart solution in two handy cases
- Universally suitable for all vehicles

Video on flushing with TOOL BOX W04

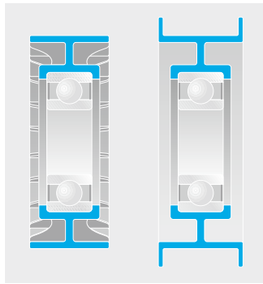
Timing belt drive components

The timing belt precisely controls the combustion process in the engine. To allow the timing belt to operate safely and reliably, various components are required to guide it and ensure the correct pretension. All the belt drive components are subjected to extreme stresses in modern engines, such as vibrations or large fluctuations in speed and temperature. They affect the entire timing gear and must meet the highest standards of quality.

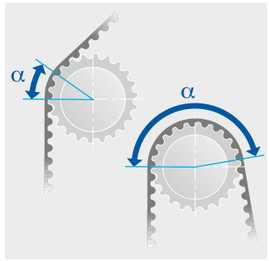
Deflection and guide pulleys

The position of the driven belt pulleys normally requires the timing belt to be routed using deflection and/or guide pulleys.

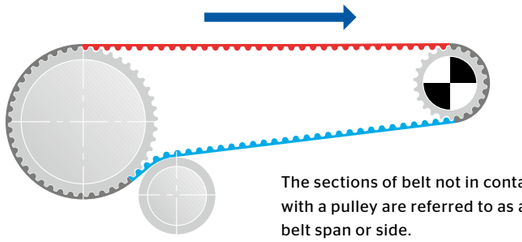
They are also used for the following reasons:
- To increase the wrap angle so that as many teeth as possible are in mesh if high power outputs need to be transmitted,
- To steady sections of belt in the drive that are prone to undesirable vibrations (e.g. for long belt spans).



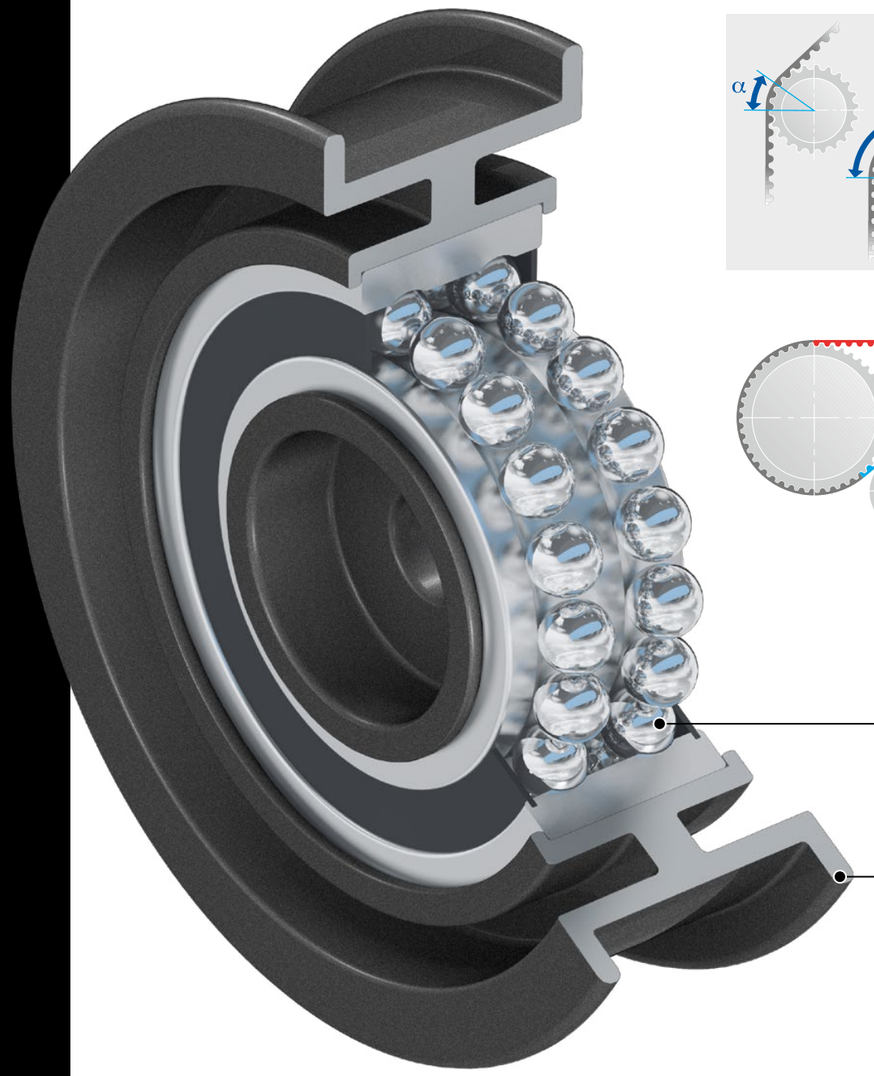
Deflection pulleys with flanges are termed guide pulleys. They keep the timing belt moving along the desired path. If a flanged tensioner pulley is used, no additional guide pulley is required.
Left: deflection pulley
Right: guide pulley



The larger the wrap angle, the more teeth mesh with the sprocket and the greater the force that can be transmitted. In the case of multi V-belts, the contact surface area with the belt pulley increases in a similar way.



The sections of belt not in contact with a pulley are referred to as a belt span or side.
Red: loaded or tight span/side
Blue: return or slack span/side



Deep-groove ball bearings

Single- or double-row; with enlarged grease reservoir.

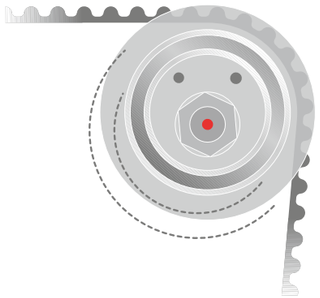
Outer ring

Made of steel or plastic (polyamide), smooth or toothed.

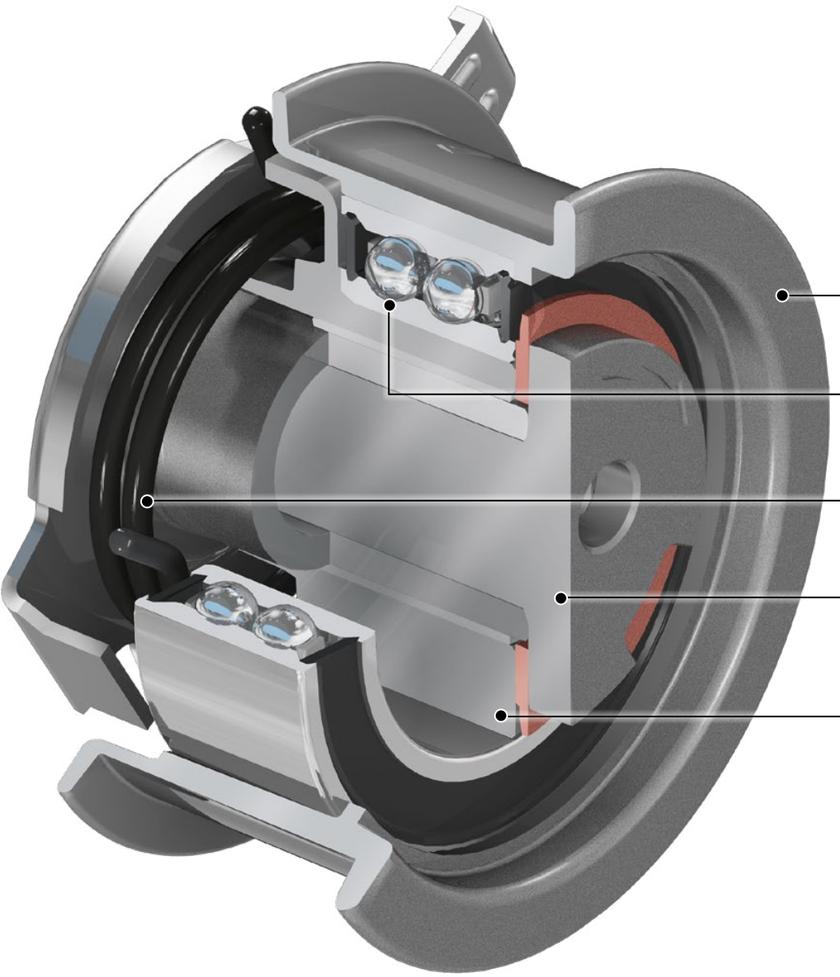
Tensioners

Various tensioning systems are used to tension the belt in the timing belt drive and keep the tension as constant as possible. They are fitted on the slack side.

- Short-term changes in tension are caused, for example, by differences in temperature and load.
- Prolonged changes in tension are caused by wear and elongation of the timing belt.



Manual tensioner pulley
The entire pulley is turned by means of its eccentric hole until the required belt pretension is achieved and then secured in that position. This simple system cannot compensate for variable factors (heat, wear) and does not include a damping function. Other types of tensioner have therefore gained in popularity since the 1990s.



Semi-automatic tensioner pulley with double eccentric

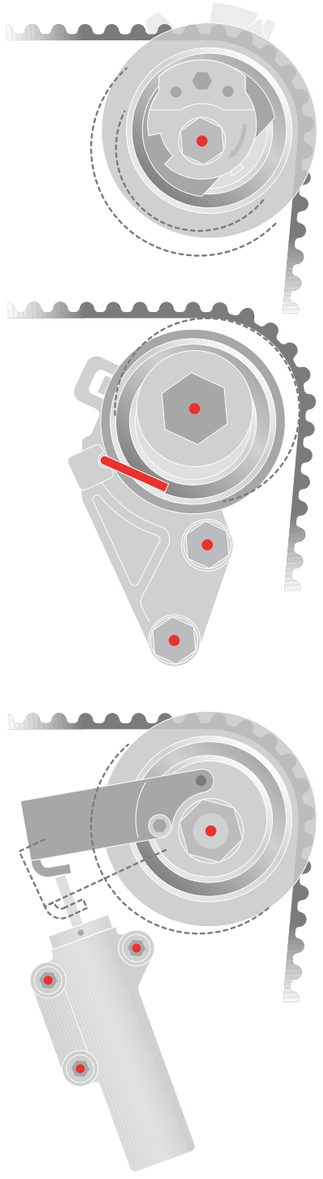
Tensioner pulley
With steel outer ring.

Ball bearings
Shown here in a double-row version.

Torsion spring
Creates the pretension.

Eccentric adjuster with adjustment shim
Inner eccentric, compensates for tolerances during fitting.

Working eccentric
Outer eccentric, ensures dynamic tensioning function.



The various tensioning systems' pivot and attachment points are marked in red.

Semi-automatic tensioner pulley
The semi-automatic tensioner pulley compensates for both elongation of the timing belt and temperature- and load-dependent changes in tension by means of a spring assembly. As a result, the timing belt tension remains more or less constant throughout the belt's lifetime. A mechanical damper unit minimizes spring and belt vibrations, which therefore extends the drive's lifetime and improves its acoustic properties. The semi-automatic tensioner pulley has to be manually tensioned during fitting.

Two designs:
With the single eccentric design, the dynamic tensioning function and tolerance compensation are combined. With a double eccentric (pictured here), the two functions are separate and can each be matched exactly to the specific drive. The double eccentric may only be tensioned in the specified direction of rotation, as the pulley's operation would otherwise be severely restricted or it could fail completely despite appearing to be correctly adjusted (nominal position, pointer on notch).

Automatic tensioner pulley
This works like a semi-automatic tensioner pulley with a single eccentric, but is already pretensioned and secured with a device such as a cotter pin (marked red in the drawing). Once all the components have been fitted, the securing device (cotter pin) is removed and the pulley automatically sets the correct tension.

Tensioning damper system
Hydraulic tensioning systems are also used for very high dynamic forces. Here, the tensioner pulley is mounted on a lever arm whose movement is damped by a hydraulic cylinder. A compression spring in the hydraulic cylinder creates the necessary pretension. Such systems offer excellent damping properties even at low pretension forces thanks to their asymmetric damping.

Play it safe

> Only tension timing belt drives when the engine has cooled to approx. 20°C.

> In addition to the belt, the remaining components in a drive system are also subjected to high loads and need to be replaced. Wear is not necessarily visible.

> Extreme precision is required when fitting all the timing belt drive components:
- No misalignment
- No axial displacement
- No skewed mountings
- Observe the specified tightening torques
- On models with variable camshaft timing, first detach the camshafts (CT1139)

> Always use any special tools that are specified.

Water pump and cooling system

Greater efficiency, lower consumption – and therefore lower emissions. This is the effect of thermal management in modern engines. Auxiliary water pumps are crucial components of these systems, whether it's for wide-ranging comfort applications in combustion-engined vehicles or for cooling the battery in BEVs or PHEVs.

Thermal management systems are basically becoming increasingly complex and, because water pump operation is dependent on engine speed, these systems therefore require pumps that have been purpose developed and built for the specific task. But these components have a complex design and are increasingly patent protected, meaning there are hardly any products available on the independent aftermarket that meet the manufacturers' specifications. Continental was quick to pick up on this and has developed a wide range of thermal management products for the independent aftermarket.

Water pumps available to order individually

The range now includes many more models of water pump that can be ordered individually. These are primarily used in the auxiliary drive of modern vehicles, where the water pump is driven via the multi V-belt. The water pumps are dynamically adjustable, meaning they are capable of carrying out important thermal management functions in the vehicle.

Multi V-belt kits with water pump

The auxiliary drive in modern vehicles is also becoming more and more complex – not least because of the additional thermal management functions. Repairs involve more work as a result. This means that, here too, the water pump should also be replaced as standard practice whenever the belt is changed. Thanks to the multi V-belt kits with water pump, mechanics always have everything required instantly to hand.

PRO kits with water pump

Besides the water pump, the PRO kit also includes all drive belts for engines that use a second belt for driving the balancer shaft or oil pump, for example, in addition to the timing belt for driving the timing gear. PRO kit variants are available for many different vehicle models in Europe. They include the PRO kits CT1167WP1 PRO and CT1167WP2 PRO, which have been specially developed for the EA211 family of engines from the Volkswagen Group.

Electric primary and auxiliary water pumps

Continental offers workshops a large selection of adjustable auxiliary water pumps for a wide variety of vehicle applications. The advantage of this is that the mounting and heat shield are also included where required by the particular model of engine. This allows mechanics to replace pumps safely with less effort. All water pumps offer the customary proven Continental quality.

Individual water pumps

Multi V-belt kits with water pump

PRO kits with water pump

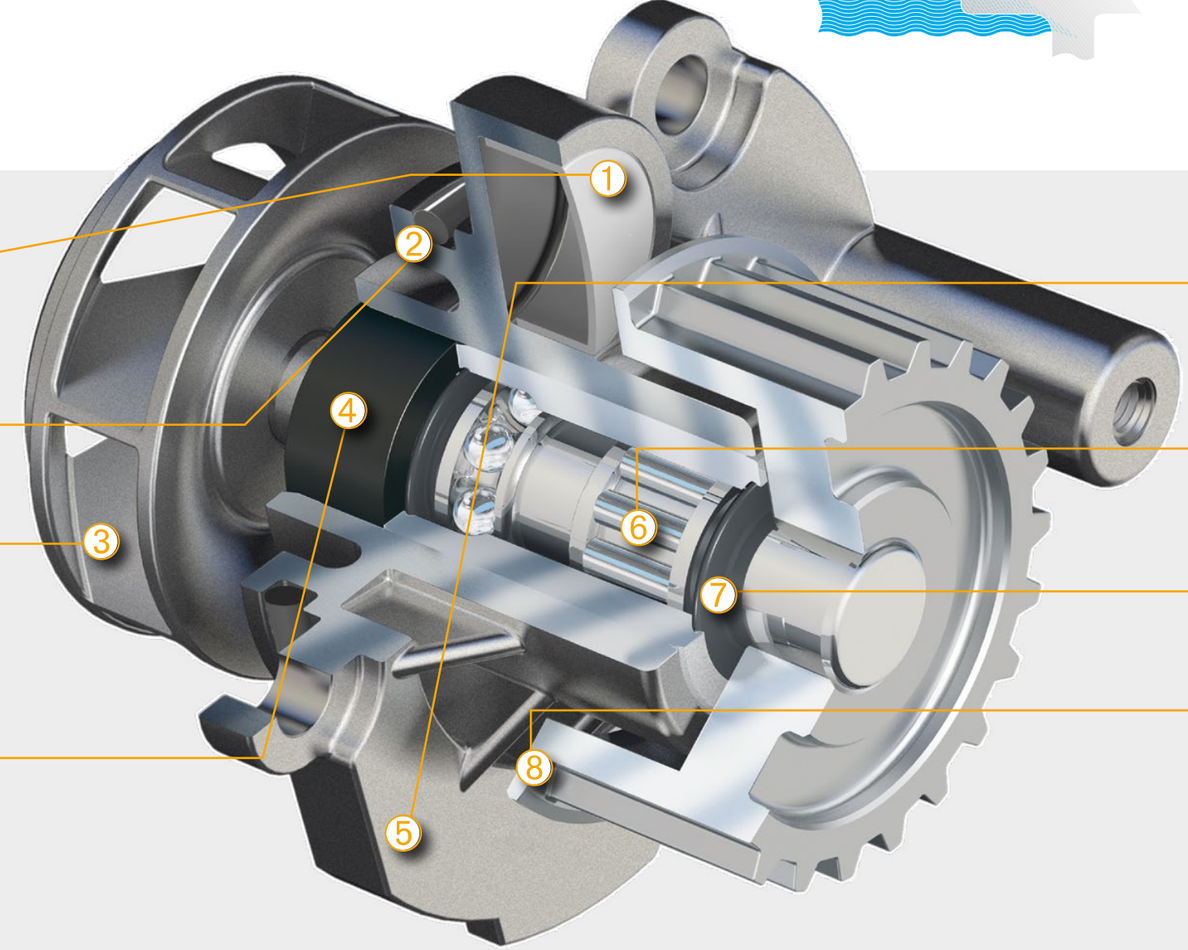
Water pumps

The high temperatures generated in an internal combustion engine have to be dissipated to prevent damage due to overheating (defective cylinder head gasket, cracks in the cylinder head). Liquid cooling is the method of choice here in automotive engineering. The thermally stressed areas of the engine block and cylinder head contain channels known as a cooling jacket, through which the coolant flows. This transports the generated heat to the radiator, where it is released into the surrounding air. The water pump conveys the coolant in a circuit that ensures the continuous removal of excess heat.

Coolant circuit
The coolant circuit comprises the coolant channels in the engine block and cylinder head, at least one radiator with a fan/blower, the water pump, the thermostat, the expansion tank, the connecting hoses, plus any secondary circuits, e.g. for the passenger compartment heat exchanger or for cooling a turbocharger.

The water pump is usually driven mechanically by means of the timing belt, V-belt or multi V-belt. The engine's mechanical energy is transferred to the coolant as hydraulic power.

An engine's power output improves as its operating temperature increases. For this reason the coolant circuit is operated at a pressure of up to 3 bar. This means the coolant can be heated to a temperature of over 100°C without boiling, enabling engines to run at higher temperatures and therefore more efficiently.



① Collection chamber with cap
The nature of the design means that minute quantities of coolant can escape. Many water pumps therefore include a collection chamber or a discharge hose.

② O-ring
For sealing the pump housing to the engine. Apart from O-rings, flat gaskets made of various materials are also used.

③ Impeller
Performs the water pump's hydraulic function. There are closed (as pictured) and open impellers, whose design determines their hydraulic properties. They are made from various metallic materials or heat-resistant plastics.

④ Mechanical seal
Creates a hydraulic seal between the water pump housing and pump shaft (integral bearing). This type of seal has low permeability. Lip seals are also occasionally used instead of mechanical seals (see figure at top right).

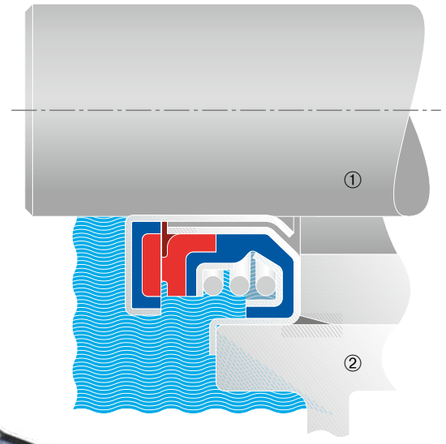
⑤ Housing
Hermetically sealed body in which the bearing and mechanical seal are mounted. It absorbs the resulting forces and must be perfectly sealed to the engine. Housings are made of die-cast aluminum or, less commonly, cast iron or polymers.

⑥ Integral bearing
Consists of the pump shaft and two bearings: either two ball bearings or, as pictured, one roller bearing and one ball bearing. The bearing absorbs the forces resulting from the belt tension.

⑦ Shaft seals
Protect the rolling bearings against the ingress of dirt and moisture and prevent the bearing lubricant from escaping.

⑧ Belt pulley
For driving the pump. Smooth or toothed for timing belts, ribbed for multi V-belts. They are made of sintered metal or plastic.

Mechanical seal



The gap between the two parts of the seal (red) is just a few micrometers wide and the seal can be destroyed by dirt particles in the coolant. The two parts of the seal are embedded in a secondary seal (blue) and pressed together by a coil spring.

① Shaft ② Housing

Coolant

A mixture of water (distilled or demineralized) and ethylene glycol forms the basis of the coolant. Ethylene glycol lowers the freezing point while at the same time raising the boiling point of the mixture to allow more heat to be dissipated. With a mixing ratio of 1:1, the freezing point at atmospheric pressure is approx. –35°C and the boiling point is approx. 108°C.

Many different materials are used within the cooling circuit, which can cause corrosion if they come into contact with each other. In addition to its function as a "heat dissipator", the coolant is also intended to protect against this electrochemical effect and be compatible with different materials. This protective function is achieved by the addition of antioxidant substances known as inhibitors, which also reduce deposits and foaming.

Organic, inorganic and mixed inhibitors can be used, though these are often incompatible with each other. Therefore, different coolants must not be mixed with each other under any circumstances. Colorings used by the manufacturers indicate the presence of different inhibitors. The vehicle manufacturers stipulate the coolant quality to be used.

Play it safe

> If the water pump is driven by the timing belt, we recommend replacing the water pump together with the tensioner and deflection pulleys as a precaution every time the timing belt is changed.

> Drain the cooling circuit completely and flush it thoroughly with water (use a system cleaner if hazing is visible).

> Do not reuse drained coolant; instead, dispose of it properly.

> Clean the sealing surfaces carefully and gently (use sealant remover spray if necessary).

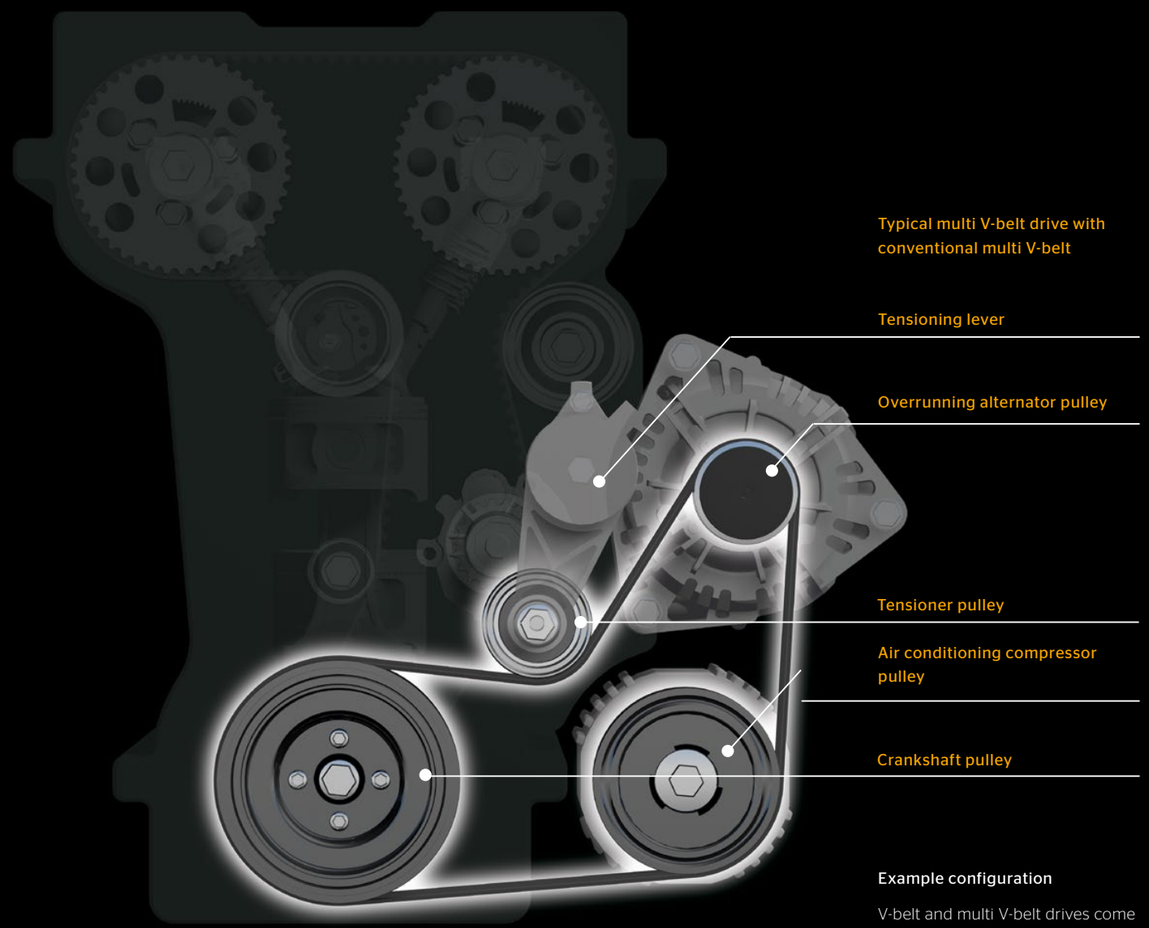
> Only use a sealant if no seal or gasket is provided. Use the sealant sparingly. Observe the curing time, if applicable, before filling the cooling system. Moisten the O-ring with silicone oil before fitting.

> Bleed the cooling system according to the manufacturer's instructions.

Typical fault pattern	Problem and cause	Solution
 	**Leaks from pump bearing** ① Slight trace of condensation on housing (hole) or collection chamber ② Water used instead of coolant ③ Impurities or foreign objects in coolant circuit ④ Application of excessive sealant has destroyed the mechanical seal, sealant adhering to mechanical seal ⑤ Seal and sealant used	① Nature of design means that minute quantities of coolant escape at the mechanical seal. This does not constitute a leak ② Use coolant specified by vehicle manufacturer, change water pump ③ Thoroughly flush cooling system with system cleaner and refill, removing foreign objects if applicable. Change water pump ④ Thoroughly flush cooling system with system cleaner and refill. Change water pump. Only use a sealant if no seal or gasket is provided ⑤ Under no circumstances should additional sealant be applied to existing seals. Change water pump
	**Leaks on the sealing surfaces** ① Water pump or seal not correctly seated ② Sealing surfaces not sufficiently cleaned ③ Unevenly applied sealant	① Check pump for correct design, thoroughly clean the seating surfaces, temporarily secure paper seals to housing ② Clean sealing surfaces thoroughly and gently, using sealant remover if necessary ③ Apply sealant thinly and evenly
	**Corrosion** ① Wrong coolant used ② Water used instead of coolant or incorrect mixing ratio	①② Change water pump, flush cooling system thoroughly with system cleaner and refill using coolant specified by manufacturer
	**Bearing and bearing shaft are badly worn** ① Bearing overloaded as a result of faulty fan clutch ② Bearing overloaded as a result of incorrect timing belt tension ③ Ingress of coolant into bearing due to leak in mechanical seal	① Replace water pump and fan clutch ② Always set belt tension correctly ③ Remedy cause of coolant ingress (see: Leaks from pump bearing), change water pump
	**Impeller blades distorted or broken off** ① Foreign objects in cooling circuit ② Bearing damage at pump shaft causes imbalance and contact with the motor housing	①② Remove foreign objects (blade fragments) from circuit, flush circuit carefully, replace water pump correctly, refill system with coolant specified by manufacturer
	**Damaged drive pulley** ① Flanges damaged or broken off due to misalignment. Belt is not running centrally on pulley and constantly presses against flanges	① Check and correct alignment of belt drive, make sure water pump is correctly seated on engine
	Noises ① Air bubbles remain in the cooling circuit	① Bleed cooling system correctly
	Overheating ① Inadequate circulation of coolant due to air trapped in pump chamber	① Bleed cooling system correctly

V-belts and multi V-belts

V-belts and multi V-belts transmit the rotary motion of the crankshaft to ancillary components via belt pulleys. They are used for ancillaries where synchronous rotary motion is either not needed or not desired, e.g. for the alternator, the water pump, the hydraulic pump, the power steering, the air conditioning compressor or the fan.



Example configuration

V-belt and multi V-belt drives come in many different variants.

Function

V-belts and multi V-belts work as friction-locked drive elements, using the static friction between the belt and the belt pulley to transmit power.

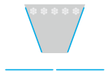
V-belts have a trapezoidal cross-section and run in a wedge-shaped groove in the pulley. They enable one or two components to be driven. They can transmit much larger torques than flat belts without taking up any more space. Because of the friction produced at the (friction-locked) belt flanks, the forces acting on the bearings are lower. If multiple components have to be driven simultaneously, a belt drive using several V-belts will be required.

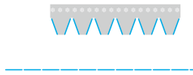
Multi V-belts are a further development of the V-belt with multiple longitudinal ribs. Power is transmitted by means of the static friction between the flanks of the individual belt ribs and the grooved belt pulley. Multi V-belts therefore have a larger friction surface area than V-belts and make it possible to transmit higher torques. Thanks to their more flexible construction, they are also suitable for drives with reverse flexing and small deflection diameters. One belt can drive multiple components at the same time, making this type of belt ideal for the requirements of a compact engine design.

Elastic multi V-belts are pretensioned when fitted and do not require a tensioner.

Comparison of belt types

	V-belts	Multi V-belts	Elastic multi V-belts
Deflection with reverse flexing	–	++	++
Small deflection diameters	o	++	++
Double-sided component drive	–	++	++
Efficiency	+	++	+
Installed size	o	++	++
Method of pretensioning	Adjustment of component position	Tensioner	Belt
Fitting	Without special tools	Without special tools	Only with special tools
Contact area in relation to cross-section	Relatively small	Relatively large	Relatively large



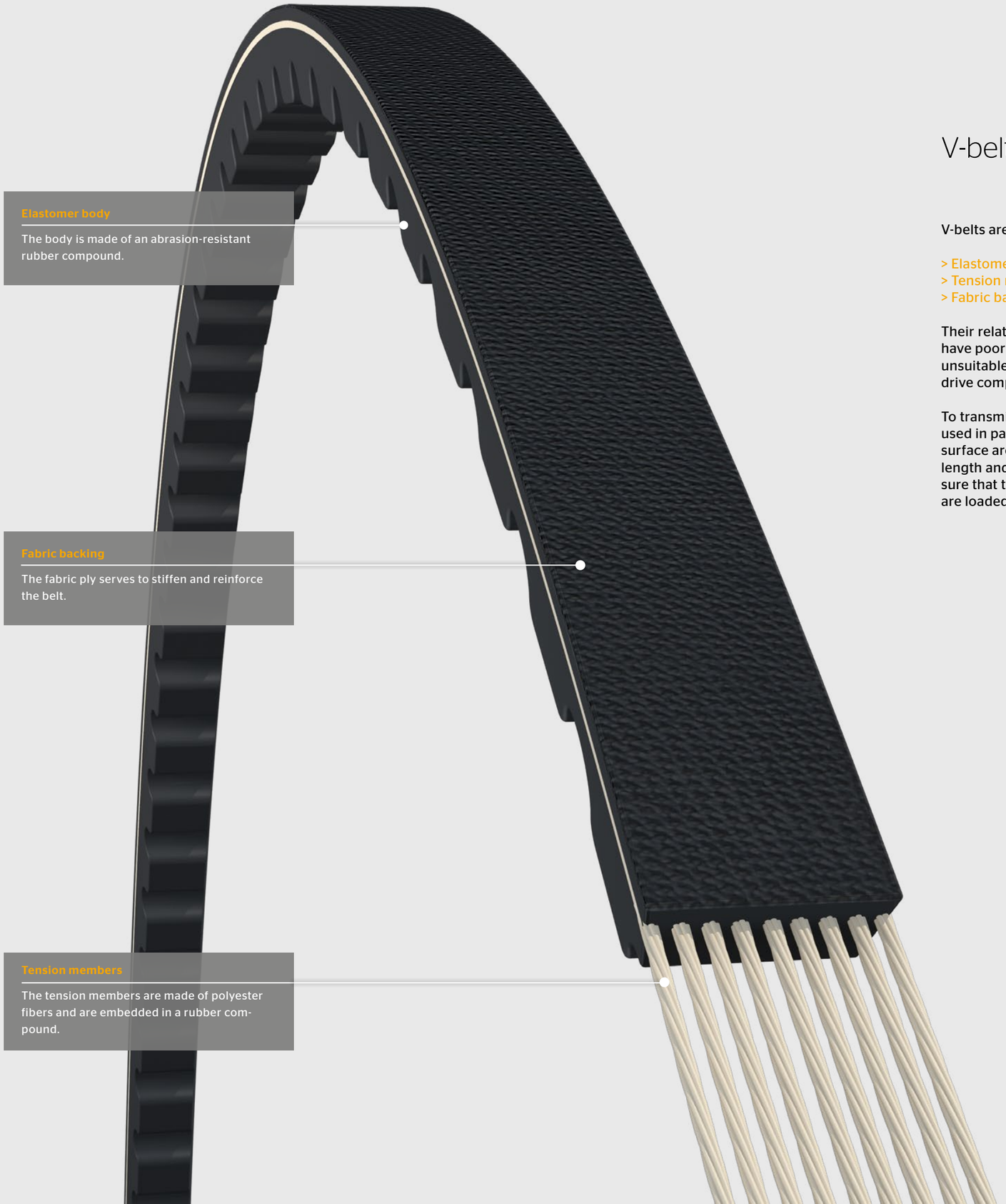


Handling

V-belts and multi V-belts are high-performance components that are required to work reliably over a long service life under extreme operating conditions. Correct handling of the belts is very important to avoid damaging them before use.

Storage:
- In a cool (15–25°C), dry place.
- Away from direct heat and sunlight.
- Not near highly flammable, aggressive substances or near lubricants or acids.
- Maximum of 5 years.

Fitting:
- Follow the car manufacturer's fitting instructions.
- Use the specified special tools. Never pry the belt onto the pulleys by force, e.g. by using a tire lever or similar.
- If necessary, set the belt tension specified by the manufacturer using a tension gauge.
- Protect belts from exposure to oil (including oil mist) and other service fluids such as coolant, fuel and brake fluid. Do not use any sprays or chemicals to reduce belt noise.



V-belts

V-belts are made up of three main components:

> Elastomer body
> Tension members
> Fabric backing

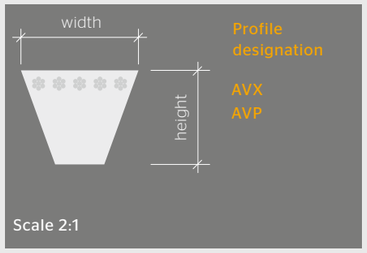
Their relatively thick construction means they have poor reverse flexibility. They are therefore unsuitable for direction changes and can only drive components with their inside face.

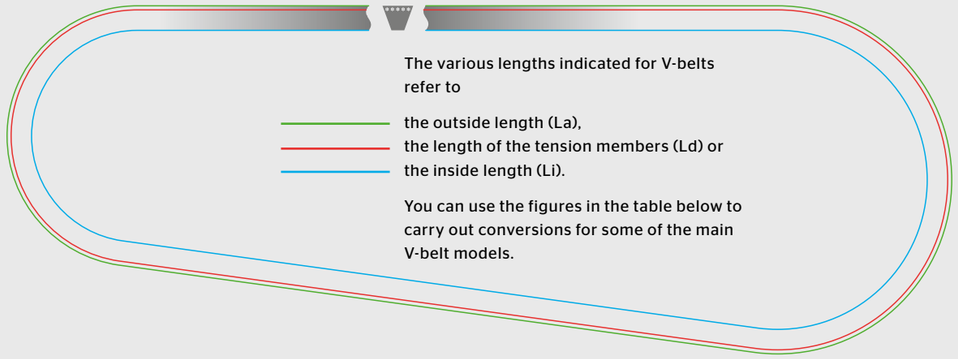
To transmit large torques, several V-belts can be used in parallel (as a set) to enlarge the friction surface area. They have to be exactly the same length and must always be changed as a set to ensure that the pretension is identical and the belts are loaded evenly.

Profiles

V-belts have a trapezoidal cross-section. Depending on the application, they differ in terms of their length, the exact dimensions of the cross-section and their design. Narrow-section V-belts are wrapped with a fabric ply, while raw-edge V-belts dispense with this.

If V-belts are compressed as a result of pulley diameters that are too small or deflection, it will lead to increased heat build-up and premature wear. In the case of raw-edge V-belts, the inside can therefore be toothed to enable smaller deflection diameters to be achieved. Asymmetric toothing reduces the noise generated by the belt.





The various lengths indicated for V-belts refer to

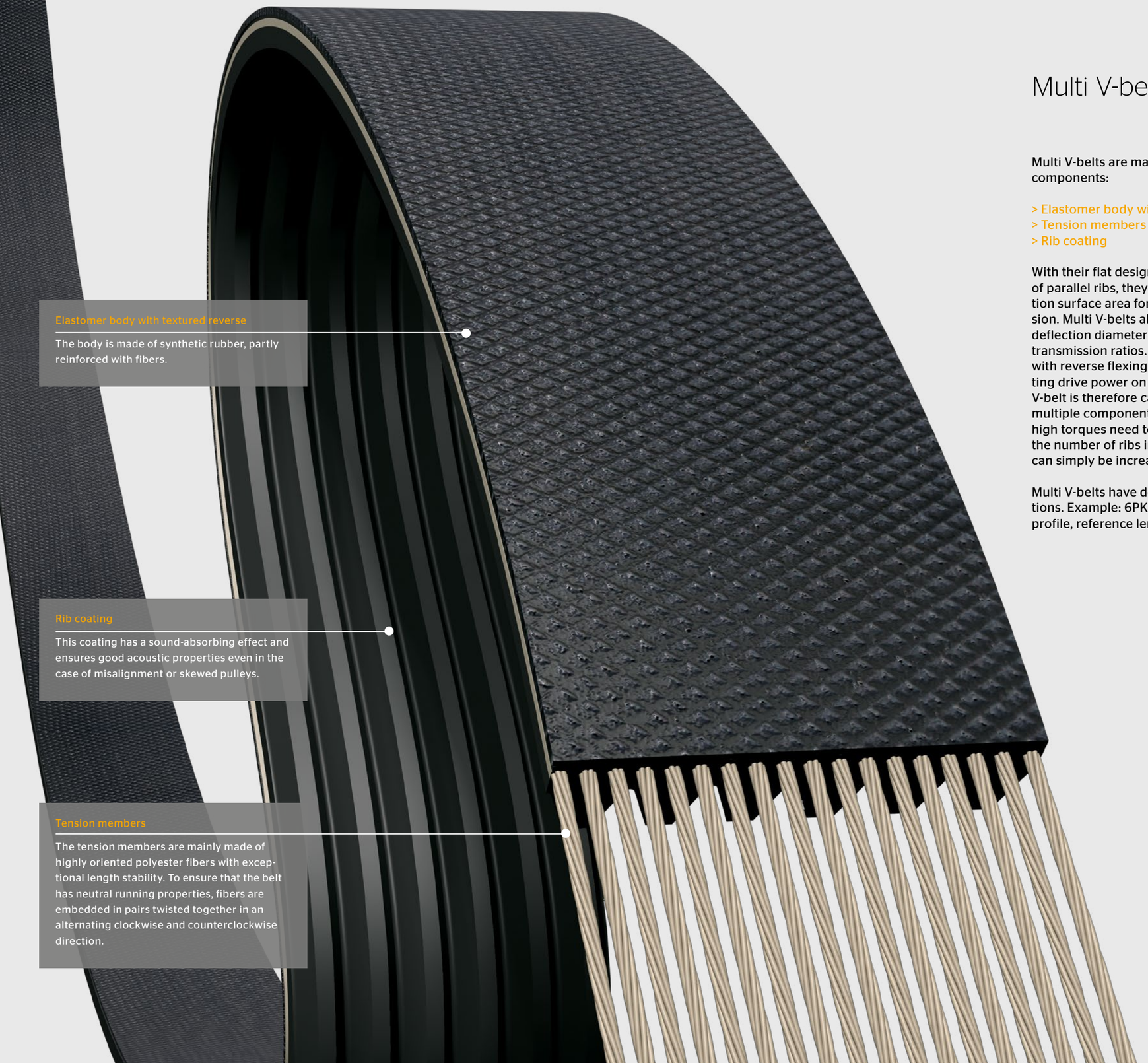
the outside length (La),
the length of the tension members (Ld) or
the inside length (Li).

You can use the figures in the table below to carry out conversions for some of the main V-belt models.

Profile designation
Upper belt width (b = nominal width)
Effective width
Lower belt width
Belt height (h)

AVX10	10	8.5	4.5	8	La = Ld + 13	La = Li + 51	Li = Ld – 38	Li = La – 51
AVX13	13	11.0	6.8	9	La = Ld + 18	La = Li + 57	Li = Ld – 39	Li = La – 57
AVX17	17	14.0	7.3	13	La = Ld + 22	La = Li + 82	Li = Ld – 60	Li = La – 82

All dimensions in mm.



Multi V-belts

Multi V-belts are made up of three main components:

> Elastomer body with textured reverse
> Tension members
> Rib coating

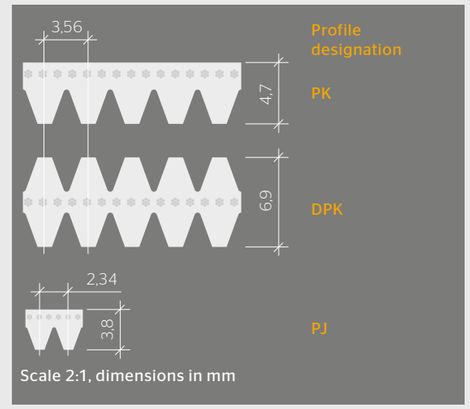
With their flat design featuring a series of parallel ribs, they offer a large friction surface area for power transmission. Multi V-belts allow relatively small deflection diameters, resulting in high transmission ratios. They can be used with reverse flexing and for transmitting drive power on both sides. A multi V-belt is therefore capable of driving multiple components simultaneously. If high torques need to be transmitted, the number of ribs in the multi V-belt can simply be increased.

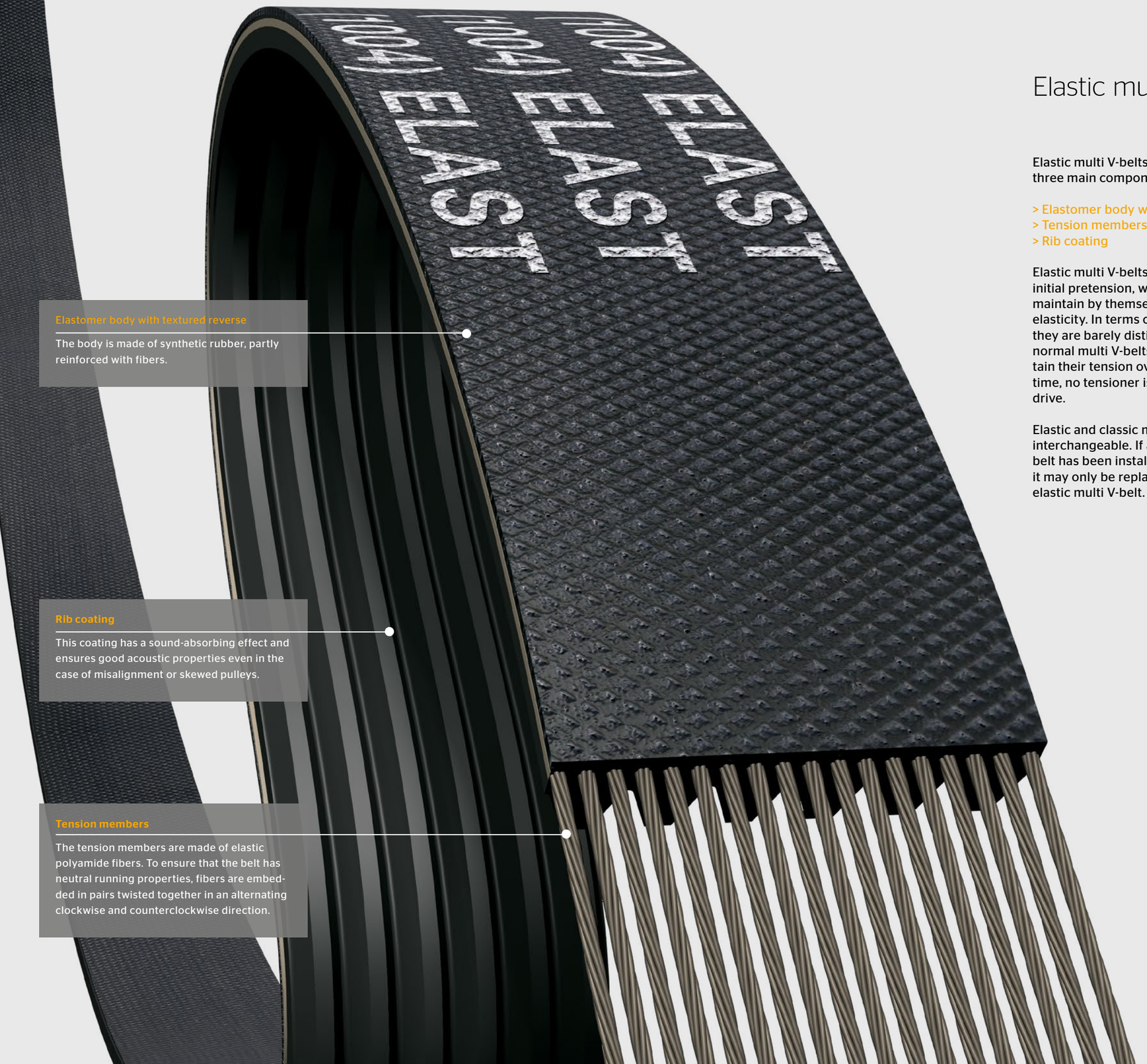
Multi V-belts have descriptive designations. Example: 6PK1080 (6 ribs, PK profile, reference length 1080 mm)

Even when they have reached an advance degree of wear, high-quality EPDM multi V-belts often show hardly any of the telltale signs of wear. The degree of wear on this type of belt must therefore be checked using a profile gauge (e.g. Continental Belt Wear Tester).

Profiles

Only a small number of different profiles are used with multi V-belts. The length and number of ribs (i.e. the width) vary, depending on the application.





Elastomer body with textured reverse

The body is made of synthetic rubber, partly reinforced with fibers.

Rib coating

This coating has a sound-absorbing effect and ensures good acoustic properties even in the case of misalignment or skewed pulleys.

Tension members

The tension members are made of elastic polyamide fibers. To ensure that the belt has neutral running properties, fibers are embedded in pairs twisted together in an alternating clockwise and counterclockwise direction.

Elastic multi V-belts

Elastic multi V-belts are made up of three main components:

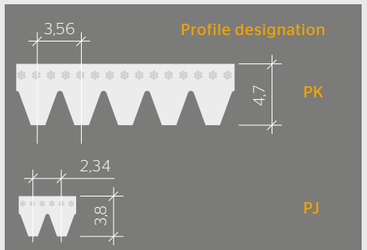
> Elastomer body with textured reverse
> Tension members
> Rib coating

Elastic multi V-belts are fitted with an initial pretension, which they largely maintain by themselves due to their elasticity. In terms of their appearance, they are barely distinguishable from normal multi V-belts. Since they maintain their tension over their entire lifetime, no tensioner is needed in the drive.

Elastic and classic multi V-belts are not interchangeable. If an elastic multi V-belt has been installed at the factory, it may only be replaced with another elastic multi V-belt.

Profiles

Elastic multi V-belts are used in PK and PJ profiles.

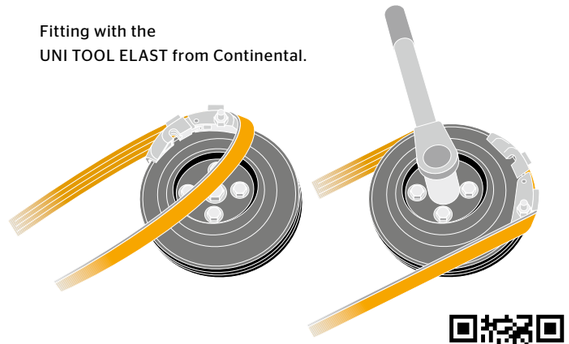


Scale 2:1, dimensions in mm

Elastic multi V-belts can be labeled with two lengths:
1. The production length and
2. The (larger) operational length of the tensioned belt when fitted. The nomenclature of elastic belts varies from manufacturer to manufacturer. Continental belts are labeled on the back with the operational length, followed by the production length in brackets. Example: 6PK1019 (1004) ELAST

Special tools are generally required to ensure no damage is caused during fitting. A distinction is made between reusable tools and disposable solutions (often supplied with the belt).

Fitting with the UNI TOOL ELAST from Continental.



A video on fitting and removing elastic multi V-belts using the UNI TOOL ELAST can be found on our website and our YouTube channel.

DPK belts

DPK belts are often used in vehicles with a particularly complex and tightly routed belt drive. These have longitudinal grooves on both faces, allowing them to transmit power to both sides in the auxiliary drive. This ensures optimum power transmission between crankshaft and alternator.

Why the abbreviation DPK?
Strictly speaking, these belts should be called double-sided multi V-belts because they have the characteristic grooves of a multi V-belt on both sides. They have, however, come to be known by the abbreviation DPK. This stands for Double PK profile – in other words, a belt with two PK profiles.

Even seasoned automotive professionals constantly find themselves wondering which way to actually fit the DPK belts. There is, however, a simple aid for remembering:

The two sides of the belt have different coatings as a result of the production process. One side has a smooth rubberized finish and the other a fabric coating that feels a little rougher to the touch. The rougher side must be on the bottom so that it is in contact with the overrunning alternator pulley.

Everything in the palm of your hand:
the new ContiDrive app

From searching for product articles to checking vehicle applications, the popular ContiDrive app is a valuable aid for automotive mechanics in their daily work.

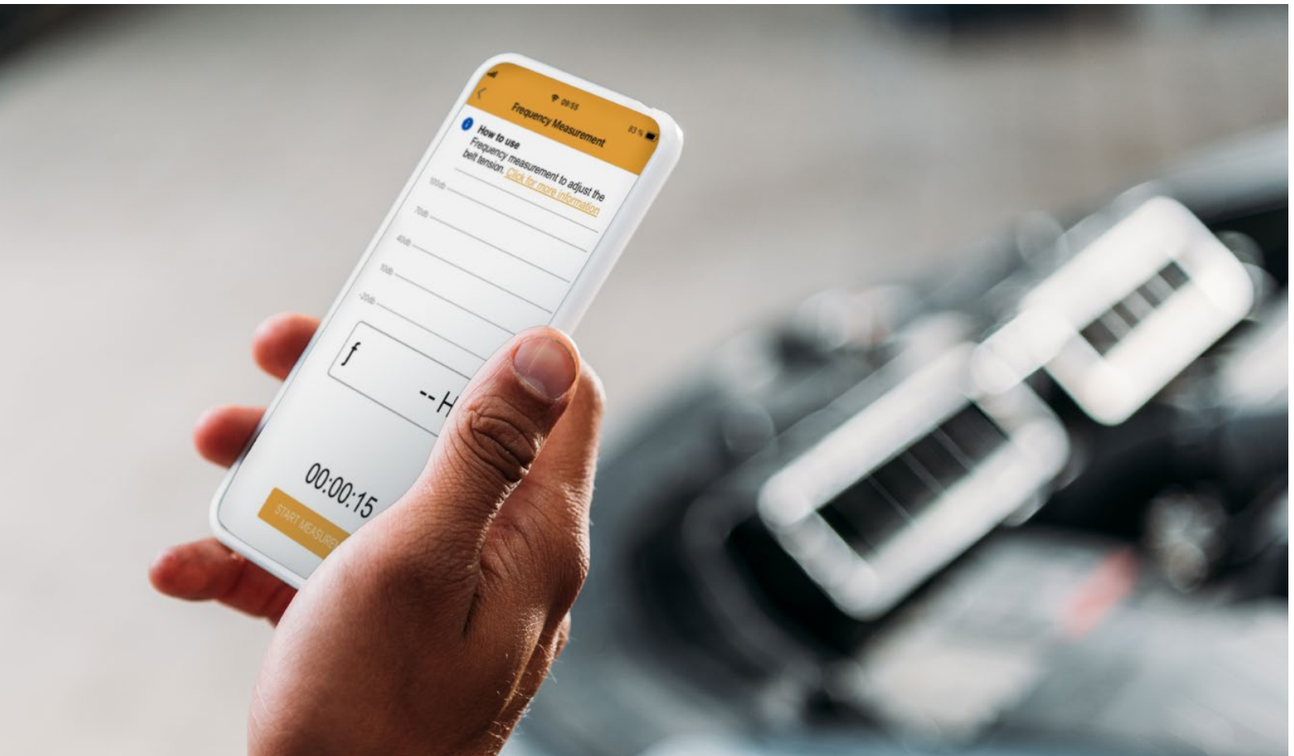
The acoustic frequency measurement function for setting belt tension is a brand new feature. This is how it works: the belt is made to vibrate at a specified, freely oscillating point. The higher the tension, the higher the frequency or the tone will be. This frequency is now measured acoustically using your smartphone's microphone.

There is also a handy scanner that can be used to instantly access all relevant product information, such as technical notes, installation tips, videos or free fitting instructions, by simply scanning the QR codes on the packaging.

And a tap of the finger is all it takes to open the app's direct links to the Technical News or our website, where the Watch and Work series of service videos can also be found. And best of all, this service is completely free of charge.

GET IT ON Google Play

Download on the App Store



EXTRA
multi V-belts

Multi V-belts from Continental with the designation EXTRA in the product name boast special technical properties.

These can include strong aramid tension members or a special fabric coating, for example. This allows workshops to quickly and easily find the right specialist belt for specific repair requirements, e.g. for models with a start/stop function and starter-generator or vehicles with a hybrid drive system.

If mechanics use conventional standard belts for such vehicles, there is a risk of increased belt wear and higher noise levels. In the worst case, the belt could snap. Workshops can effectively reduce this risk by using the EXTRA multi V-belts. Our range of these specialist belts is constantly growing and already covers over 90% of the European vehicle fleet.

The right product for each model can be found quickly, easily and reliably in the online catalog at www.continental-engineparts.com.

In a nutshell
- Extra belts with special technical properties
- Identified by the label EXTRA printed on the back of the belt
- OE quality for the aftermarket too
- High-tech synthetic rubber
- High-strength tension members each with their own special properties
- Excellent flexing resistance and high flexibility

Maintenance and replacement

V-belts and multi V-belts are subject to constant reverse flexing and are directly exposed to ambient influences such as dust, dirt and large differences in temperature in the engine compartment. They therefore age and wear and should be replaced after running for 120,000 km.

V-belts are normally tensioned by means of the components' adjustable/movable axes. A tensioner pulley is only used in a few exceptional cases. Multi V-belts, by contrast, usually operate in combination with tensioner and deflection pulleys due to their considerable length and routing around multiple ancillary components. Elastic multi V-belts do not use a tensioner. They generally have to be fitted using special tools.

Play it safe

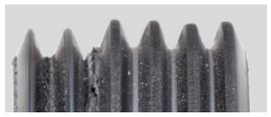
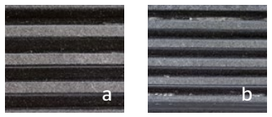
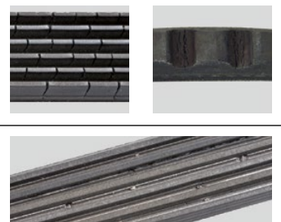
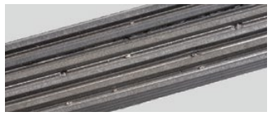
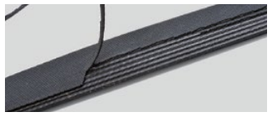
> Only fit belts that have been correctly stored and are not out of date.

> Only use belts with the correct profile and of the right length. Various different lengths are indicated for V-belts (La, Ld or Li).

> Elastic and classic multi V-belts are not interchangeable – an elastic multi V-belt may only be replaced with another elastic multi V-belt!

> When fitting the belt, follow the car manufacturer's instructions and the handling tips on p. 33.

> Always use any special tools that are specified.

Problem	Typical fault pattern	Cause	Solution
Heavy wear on the ribs or flanks		① Belt pulleys, other pulleys or ancillary components defective or stiff ② Belt pulleys not aligned ③ High level of slip ④ Belt pulley profile worn ⑤ Severe belt vibrations	① Replace defective parts, change belt ② Align belt pulleys and other pulleys and replace if necessary, change belt ③ Check belt length, change belt, set correct tension ④ Replace pulleys, change belt ⑤ Check OAP, TVD and tensioner and replace if necessary, change belt
Uneven rib wear		① Belt pulleys not aligned ② Severe belt vibrations	① Align any misaligned belt pulleys/other pulleys or replace if necessary, change belt ② Check OAP, TVD and tensioner and replace if necessary, change belt
Formation of ridges on ribs (a) and wear debris in ribs (b)		① Belt pulleys not aligned ② OAP or TVD defective ③ Belt was offset to one side when placed on ribbed pulleys	① Check drive, align any misaligned belt pulleys/other pulleys or replace if necessary, change belt ② Check operation of OAP, TVD and tensioner and replace if necessary, change belt ③ Change belt, ensure belt is correctly seated
Rib material cracks and breaks off		① Belt tension too low or too high ② Lifetime exceeded ③ Belt gets too hot	① Change belt, set correct tension ② Change belt ③ Remedy cause (e.g. engine temperature too high, check fan operation, stiff ancillary components), change belt
Damage to rib material		① Foreign objects in belt drive	① Check all components for damage and clean or replace if necessary, change belt, remove foreign objects
Detached ribs		① Misalignment due to offset mounting of belt on ribbed pulleys ② Belt pulleys not aligned ③ Severe vibrations cause belt to jump into offset position ④ Foreign objects (small stones) in belt pulley	① Change belt, ensure belt is correctly positioned ② Align any misaligned belt pulleys/other pulleys or replace if necessary, change belt ③ Check operation of OAP, TVD and tensioner and replace if necessary, change belt ④ Remove foreign objects, replace belt pulley if necessary, change belt
Tension member torn out of belt back or flank		① Misalignment due to offset mounting of belt on ribbed pulleys ② Side of belt runs against a fixed edge ③ Pretension too high	① Change belt, ensure belt is correctly positioned ② Check belt can run freely, align any misaligned belt pulleys/other pulleys and replace if necessary, change belt ③ Change belt, set correct tension
Damage to belt back		① Defective or stiff backside pulley ② Pulley outer ring damaged by foreign objects ③ Formation of ridges on pulley outer ring due to wear	① Replace backside pulley, change belt ② Check drive for foreign objects, replace pulley, change belt ③ Replace pulley, change belt
Belt failure due to chemical action of service fluids		① Swelling of elastomer compound and disintegration of vulcanized bond	① Eliminate leaks from engine or in engine compartment (e.g. escaping oil, fuel, coolant, etc.), clean belt pulleys, change belt
Hardened, polished flanks		① Incorrect pretension ② Incorrectly combined set of V-belts ③ Incorrect flank angle with V-belts	① Change belt, set correct tension ② Always replace a complete set of belts ③ Change belt, ensure that correct model of belt is used

ELAST TOOL F01

Difficult, but not impossible: elastic multi V-belts cannot be fitted on some Ford and Volvo engines using a universal tool, as the belt slips off the water pump's flangeless pulley. The ELAST TOOL F01 makes sure workshops have the right special tool for the job.

It can be used to replace the alternator belt on Ford Focus, C-Max and Mondeo 1.4/1.6-liter gasoline engines and Volvo S40, C30 and V50 1.6-liter gasoline engines without difficulty.

The second, shorter belt (for the air conditioning compressor or power steering pump depending on the model) can be replaced using either the fitting tool from the corresponding multi V-belt & tool kit or the UNI TOOL ELAST universal tool.

Contents

> Fitting tool for mounting belt on water pump pulley
> Protective guard for crankshaft pulley
> User guide

Benefits

> Prevents damage to belt or belt pulley
> Installation in accordance with the manufacturer's specifications

UNI TOOL ELAST

Elastic belts have a special tension member and are only used in certain kinds of engine. Consequently, a special tool is required for them, as this is the only way to fit an elastic belt without causing any damage in many vehicles.

The UNI TOOL ELAST is a universal tool for elastic multi V-belts that can be used to fit a wide range of such belts. Continental offers TOOL kits with disposable tools for any vehicles that are not compatible with this tool.

The UNI TOOL ELAST consists of a special tool for pretensioning the belt and fitting it onto the belt pulleys. What's special about it is that its design fits almost any belt pulley – including pulleys without an indentation and some double pulleys.

The bolt that is included prevents the tool from slipping off and moves the UNI TOOL ELAST around with it while fitting the belt. The strap that also comes supplied allows the belt to be removed simply, quickly and, most importantly, without causing any damage.

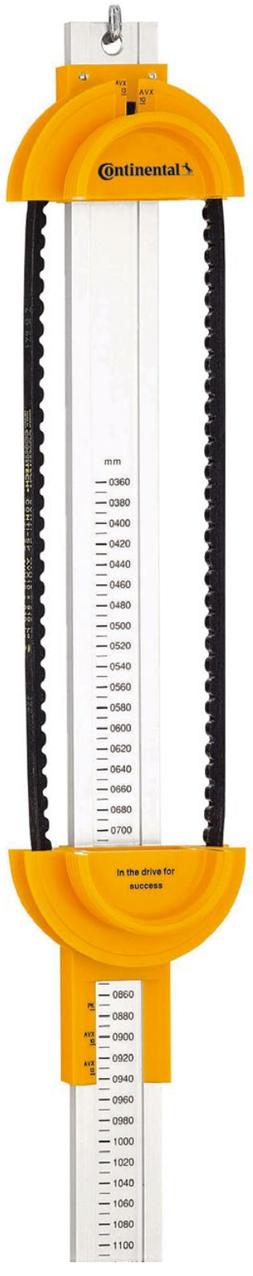
Contents

- Universal fitting tool
- Drive bolt
- Strap for damage-free removal of belt
- User guide

Benefits

- Low-cost alternative to expensive special tools
- Enables elastic belts to be removed without causing any damage
- Very easy to use
- High level of vehicle coverage – can also be used on smooth pulley surfaces without an indentation

Length gauge



Determine belt length quickly and accurately with the length gauge from Continental. No matter whether it's a V-belt or a multi V-belt, a brand new article or recently removed from an engine – the precise length can be calculated in no time using the length gauge, which is suitable for all standard belt profiles.

All you have to do is insert the belt, apply tension and read the exact value shown on the bottom part of the scale.

Suitable for AVP10, AVX10, AVP13 and AVX13 V-belt profiles and multi V-belts with a PK profile.

Measuring range: 360–2520 mm.

Benefits

- Easy to use
- Result can be read quickly and easily
- Reliable measurements
- Can be used for V-belts and multi V-belts

Multi V-belt drive components

As drivers' comfort expectations rise, the power demand of the ancillary components also increases. Absorbing torsional vibrations has therefore taken on great importance in multi V-belt drives. These vibrations are caused by the braking and acceleration of the crankshaft as a result of the engine's strokes and ignition sequence. They are transmitted to all the ancillary components by the belt drive and can result in vibrations, noise and component failure.

Torsional vibration dampers

Belt pulleys often (or generally, in the case of diesel engines) come in the form of torsional vibration dampers (TVD). Their elastomer elements absorb vibrations and help to extend belt and component lifetimes. Torsional vibration damper isolators (TVDi) also eliminate cyclic irregularities in the crankshaft.

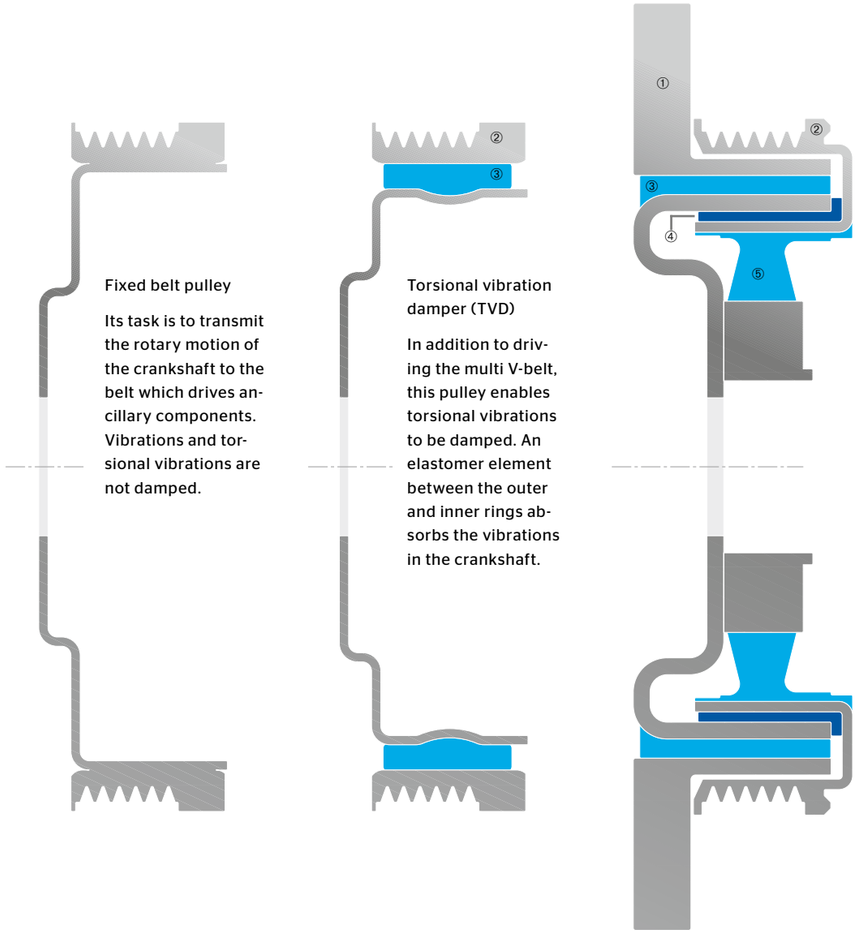
Maintenance and replacement

The elastomer elements of torsional vibration dampers tend to harden as a result of the constant mechanical stresses and ambient conditions in the engine compartment. Pieces tend to crack and break off over time; in extreme cases the outer part separates from the inner ring. They are put under particular stress by engines that are frequently left idling (e.g. taxis) or have been modified by chip tuning.

A defective damper is indicated by a chattering multi V-belt, jerky movement of the tensioner, increased engine noise and vibrations. The belt, tensioner and other components in the drive wear faster as a result. In the worst-case scenario the crankshaft can snap.

The condition of the torsional vibration damper therefore has to be checked at every major service or every 60,000 km. When conducting a visual inspection of the crankshaft pulley (which involves removing it), it is important to check for cracks, detachment, broken-off parts and deformation of the elastomer track. Some pulleys are equipped with indicators in slots which show the degree of wear.

Torsional vibration dampers are matched to the particular engine and therefore cannot be retrofitted.



Fixed belt pulley

Its task is to transmit the rotary motion of the crankshaft to the belt which drives ancillary components. Vibrations and torsional vibrations are not damped.

Torsional vibration damper (TVD)

In addition to driving the multi V-belt, this pulley enables torsional vibrations to be damped. An elastomer element between the outer and inner rings absorbs the vibrations in the crankshaft.

Torsional vibration damper isolator (TVDi)

Designed with the aim of minimizing the vibrations in the belt drive by damping torsional vibrations and also isolating the belt drive from the crankshaft. This is achieved by a second elastic rubber/metal connection ⑤, which absorbs the torsional vibrations and does not transmit them to the outer ring. The torsional vibrations are damped by a sliding bearing ④. A rotating flywheel stabilizes the belt drive.

① Flywheel
② Belt pulley
③ Damping elastomer track
④ Sliding bearing
⑤ Decoupling elastomer track

Deflection and guide pulleys

The position of the driven belt pulleys normally requires the belt to be routed using deflection and/or guide pulleys.

They are also used for the following reasons:
- To increase the wrap angle. This is mainly necessary with small pulley diameters in order to transmit large outputs (e.g. alternator).
- To steady sections of belt in the drive that are prone to undesirable vibrations (e.g. for long belt spans; see graphic on p. 19)

Design
- Outer ring made of steel or plastic (polyamide), smooth or grooved.
- Single- or double-row deep-groove ball bearing with enlarged grease reservoir.
- Fitted with a plastic dust cap to protect against dirt and dust since ancillary drives do not have a cover. A new dust cap must be used following removal

Tensioners

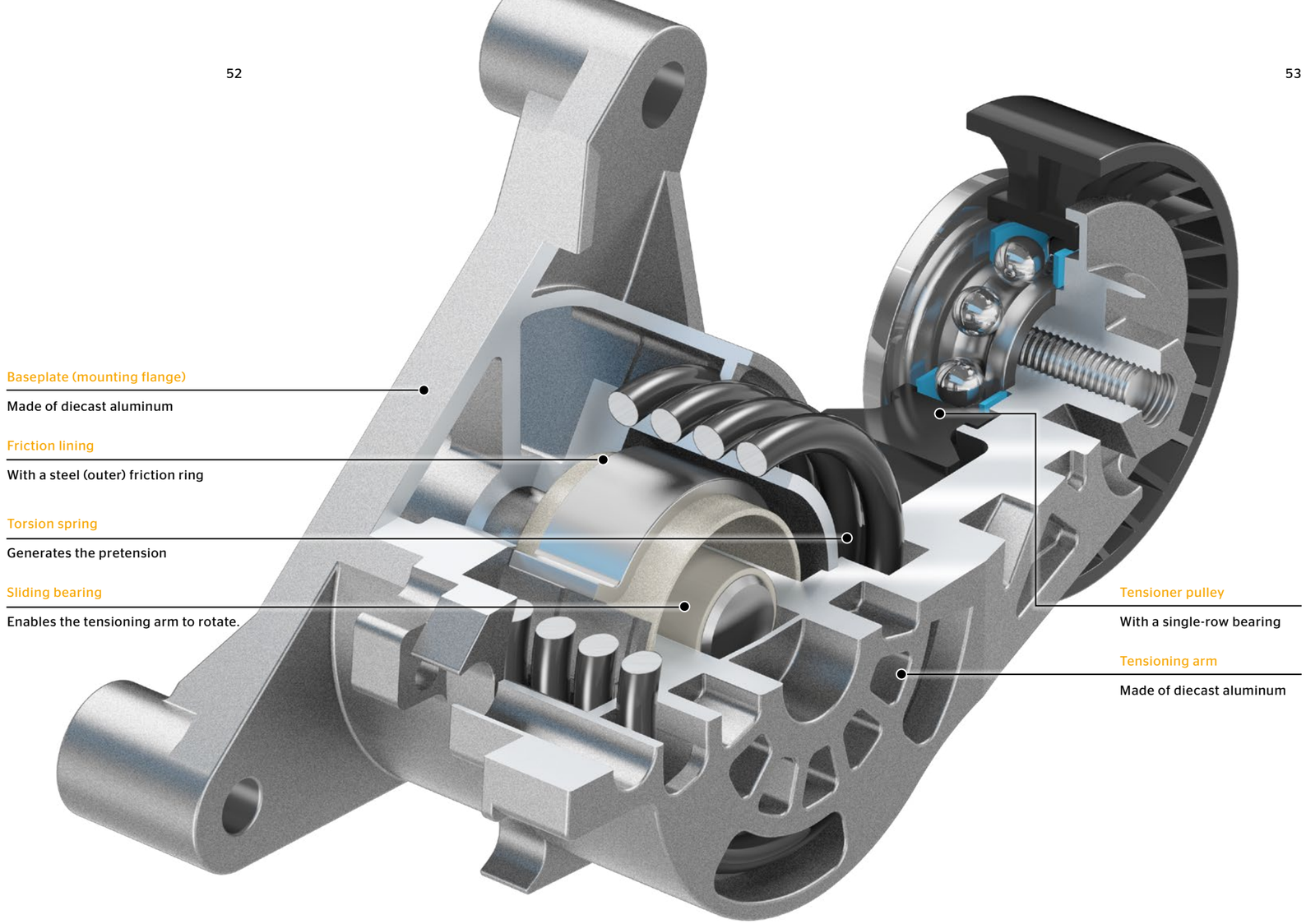
The belt tension in the drive should be high enough to transmit power reliably while subjecting the mechanical components to minimal wear. It is the task of the tensioner to ensure this optimum level.

It compensates for changes caused by
- differences in temperature
- wear
- belt stretch

and minimizes belt slip and vibrations.

Elastic multi V-belts maintain their tension automatically and are operated without a tensioner.

Mechanically damped belt tensioner
Various designs of mechanical, friction-damped tensioners are in widespread use. The tensioner pulley is mounted at the end of a lever arm and deflects the belt by means of an integral torsion spring. The pretension generated in this way can be kept almost constant under various operating conditions.



Play it safe

> Protect belt pulleys, other pulleys and tensioners against service fluids such as oil, brake fluid, coolant, fuel and other chemicals.

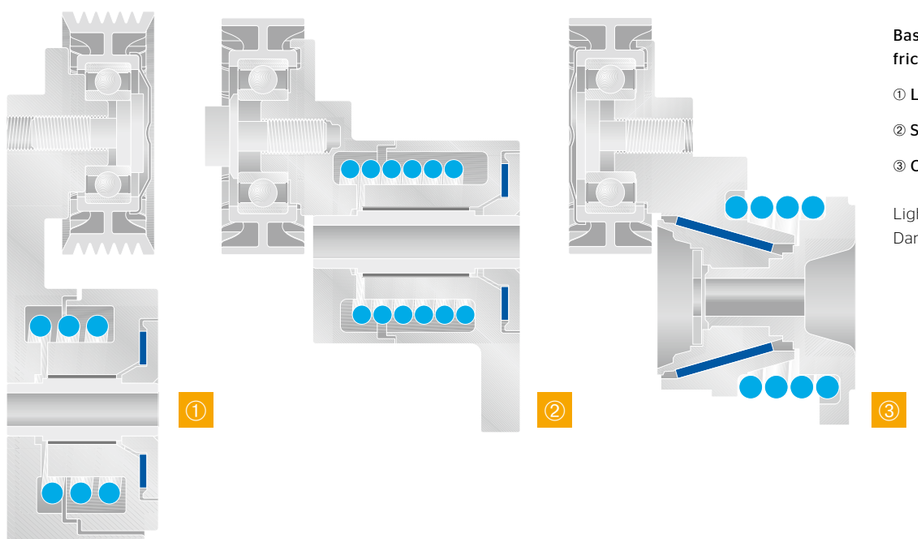
> It is essential to avoid damaging the (ribbed) contact surface.

> When mounting TVD pulleys on the crankshaft, use new expansion bolts and the correct tightening torque.

> Always use the specified special tools.

A friction layer between the baseplate and lever mechanically damps any lever movement, thereby reducing the vibrations in the drive. The pretension and damping are matched independently of each other to the relevant application.

Tensioning damper system
Hydraulic tensioning systems are also used in the event of very high dynamic loads. In these, the tensioner pulley is mounted on a lever arm whose movement is damped by a hydraulic cylinder. A compression spring in the hydraulic cylinder generates the pretension. Thanks to their asymmetric damping, they offer excellent damping properties even at low pretension loads. Their design corresponds to that of the tensioning damper system used for tensioning timing belts, see the graphic on p. 21.



Basic forms of mechanical, friction-damped tensioners:

① **Long-arm tensioner**

② **Short-arm tensioner**

③ **Cone-shaped tensioner**

Light blue: torsion spring
Dark blue: friction layer

Mild hybrids

Stages of electrification

Different degrees of electrification are possible in a hybrid drive system, the electric motor providing varying levels of power boost for the internal combustion engine. But whether the model in question is a micro hybrid, mild hybrid, full hybrid or plug-in hybrid – they all use a combination of fuels and are fitted with a lithium-ion battery to power their electric motor.

If required, the electric motor can also work as a generator to charge the battery. To this end, it converts kinetic energy generated under braking and on downhill sections of a journey into electricity – a process known as recuperation. The internal combustion engine is used to charge the battery at times, too. And another important point here is that hybrid vehicles (like fully electric vehicles) also use a classical 12V starter battery.

Mild-hybrid configurations

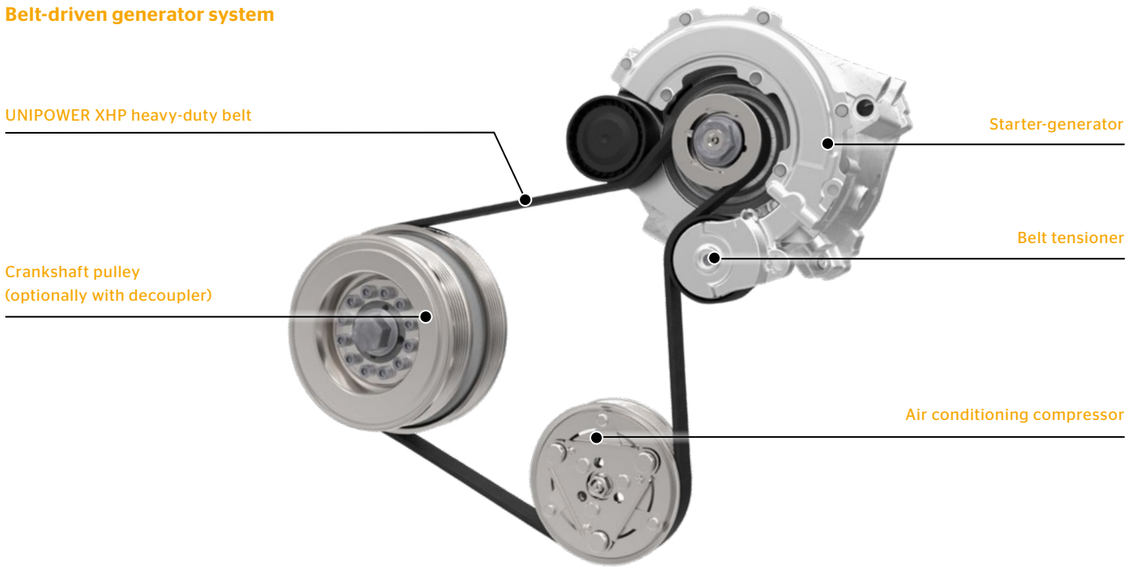
There are various ways of integrating the starter-generator and 48V battery into the car's drive system. Below are the main options:

Connecting with the internal combustion engine
The simplest and by far most widely used solution is to connect the belt-driven starter-generator (BSG) with the internal combustion engine using a multi V-belt. Here, the BSG is fitted in the space otherwise occupied by the alternator.

Connecting with the transmission
The starter-generator is connected with the transmission either directly or by a belt. This is a more complex approach, as it is not fitted as a single item but in the form of individual parts. Air cooling is not possible. All of this increases costs. On the other hand, losses due to engine friction are lower and fuel savings of up to 22 percent are achievable. It is even possible to drive on electric power alone at low speeds, which is useful when parking and in stop-start traffic.

Connecting with the rear axle
The starter-generator is integrated into the rear axle via the differential. This solution produces the lowest drivetrain friction losses and fuel consumption drops by up to 25 percent. Added to which, the combination of starter-generator and internal combustion engine enables significant driving functionality, such as temporary all-wheel drive. However, the work required on the drivetrain is more extensive than with the alternatives, and that makes it expensive.

Belt-driven generator system



How mild hybrids work

The internal combustion engine is always started from cold using the traditional starter motor. If the driver takes their foot off the accelerator during a journey, the engine then switches off automatically with the start/stop function. The car continues to "coast" (i.e. with no drive power) until the driver accelerates again and the BSG restarts the engine with minimal vibration. The engine is switched off and on again without delay or any impact on comfort.

The BSG increases dynamic potency and comfort both when pulling away from a standstill and under mid-range acceleration; the belt drive allows it to transfer its power almost directly to the engine's crankshaft and, in so doing, increase drive torque without hesitation (this is known as the "boost" function).

Mild hybrids need heavy-duty belts

The task of transmitting power between the BSG and internal combustion engine is handled by a multi V-belt, which is subjected to extremely high levels of strain due to constant load peaks and dynamic changes of load direction.

This is why Continental develops heavy-duty belts for OE and replacement use in numerous vehicle models. And it also offers kits containing tensioner pulleys, deflection pulleys and screws to make the belt easy to replace.

Types of tensioner

Decoupling tensioner
(Omega tensioner)

Decoupling tensioner
(V tensioner)

Hydraulic tensioner

Mechanical tensioner

Types of hybrid

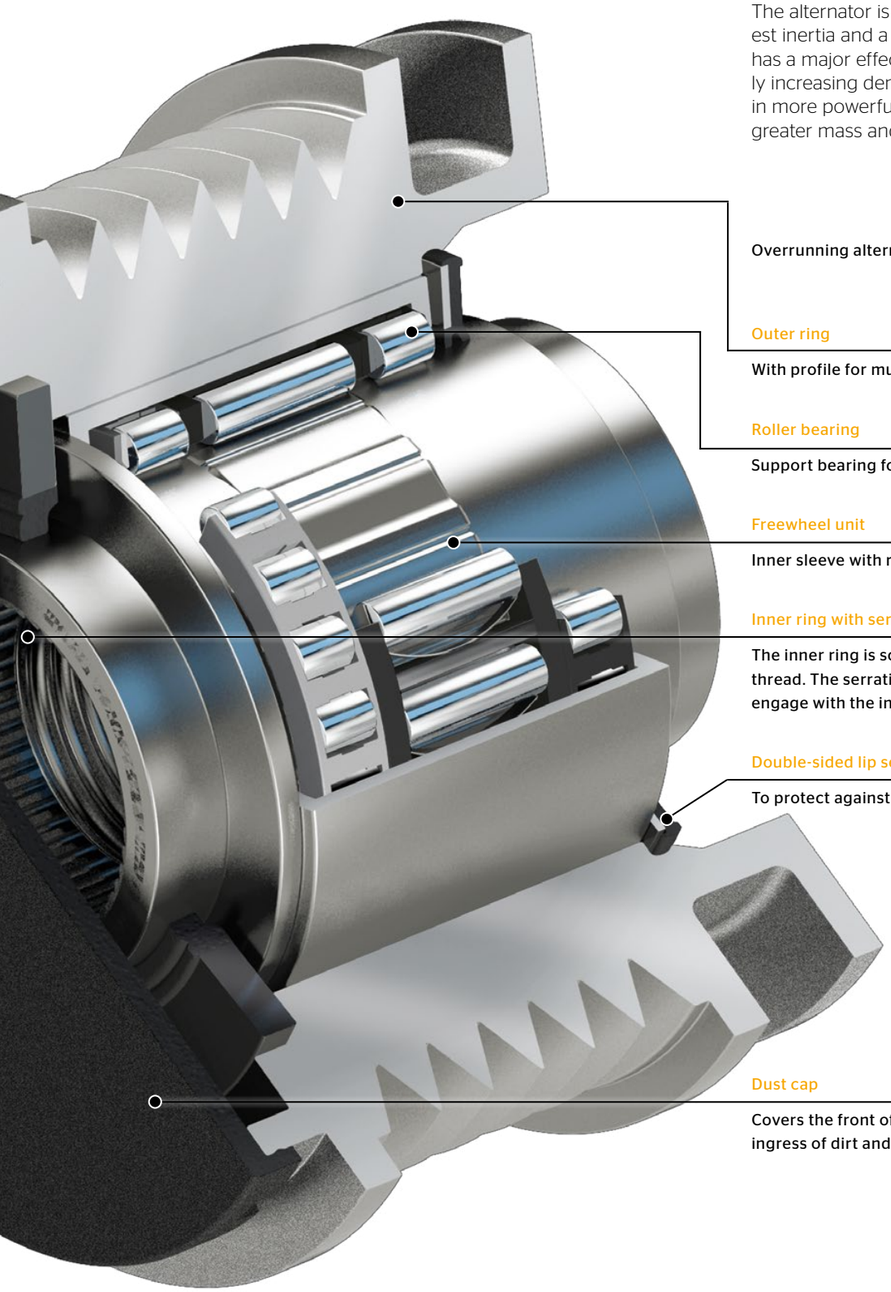
Micro hybrids
Here, the electric motor is mostly used solely as a generator to recover braking energy in the form of electrical energy (brake energy recuperation). It is not intended to boost output from the internal combustion engine. Similarly, the car cannot be driven on electric power alone. The 12V battery serves purely as a power source for the start/stop function. This eases the workload on the alternator, and fuel consumption drops by up to 10 percent.

Mild hybrids
The electric motor in mild-hybrid electric vehicles (MHEV) is usually described as a belt-driven starter-generator (BSG). It assists the internal combustion engine with additional torque when pulling away and accelerating. The BSG sources the energy required from a 48V battery, which it recharges via recuperation. Mild hybridization can reduce the fuel consumption of a passenger car by as much as 15 percent.

Full hybrids and plug-in hybrids
Full-hybrid vehicles or hybrid electric vehicles (HEV) have larger batteries und more powerful electric motors. This makes it possible to drive the car purely on electric power. Plug-in hybrid electric vehicles (PHEV) – which can be charged externally – have an operating range on electric power alone of significantly over 50 km, depending on the size of the vehicle and battery.

Overrunning alternator pulleys

The alternator is the drive component with the greatest inertia and a large transmission ratio. It therefore has a major effect on the whole drive. The continually increasing demand for electrical power is resulting in more powerful alternators which generally have a greater mass and reinforce this effect.



Overrunning alternator pulley OAP

Outer ring

With profile for multi V-belt, corrosion-protected.

Roller bearing

Support bearing for low-wear freewheel function.

Freewheel unit

Inner sleeve with ramp profile, pinch rollers.

Inner ring with serrations

The inner ring is screwed to the alternator shaft via a fine thread. The serrations are provided to enable the tool to engage with the inner ring when fitting/removing.

Double-sided lip seal

To protect against dirt ingress.

Dust cap

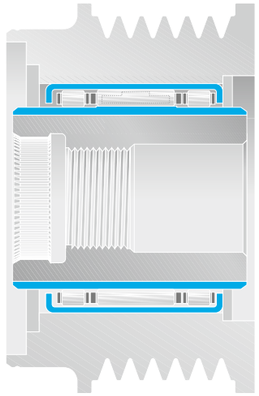
Covers the front of the pulley and protects against the ingress of dirt and spray.

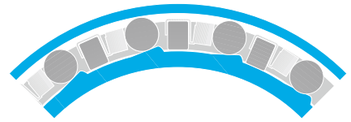
An overrunning pulley is used on the alternator in order to reduce the effect of the alternator mass on the belt drive. It interrupts power transmission as soon as the speed of the secondary side exceeds that of the primary side. The alternator shaft can therefore rotate faster than the belt pulley. This compensates for cyclic irregularities. Furthermore, the alternator can "coast down" if the speed is suddenly reduced (gear change).

This function is easy to check once the component has been removed. The inner ring of the overrunning pulley must turn when rotated in the alternator's running direction and must be locked in the opposite direction. In the case of the OAD, a significantly increasing spring force must be felt in the opposite direction.

Overrunning pulleys
- improve the smoothness and noise properties of the belt drive
- minimize belt vibrations and slip
- extend the lifetime of the belt and tensioner.

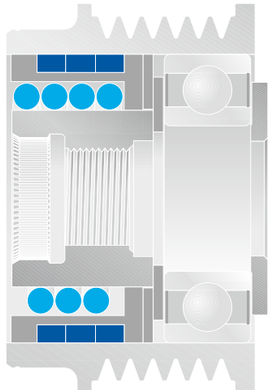
Belt vibrations, belt chatter, premature wear of the belt and tensioner, whistling/squealing noises and severe tensioner wear are signs of a defective overrunning pulley.





Overrunning alternator pulley (OAP)

As a result of the overrunning pulley (pinch-roller freewheel – blue) the inner ring can only be turned in the alternator's running direction. Because of the ramp profile on the inner ring, the middle row of rollers (pinch rollers) locks the opposite direction.



Overrunning alternator decoupler (OAD)

The OAD also decouples the multi V-belt drive from the alternator by means of an integrated spring damper system (blue). This torsion-damped overrunning unit enables better absorption of vibrations. The torsion spring absorbs the cyclic irregularities in the crankshaft and thus ensures a "soft" alternator drive. At the same time, the design takes the form of a wrap spring clutch to generate the freewheel function.

Play it safe

> It is essential to avoid damage to the contact surface.

> Check the pulley function at every belt change.

> Fit a new dust cap every time a pulley is removed (the pulley may only be operated with a dust cap fitted).

> Always use the specified special tools.

> You can find more useful information in our service video:

TOOL BOX OAP

Overrunning alternator pulleys (OAP) reduce vibrations in the auxiliary drive, thus extending the operating life of the belts and ancillary components and minimizing running noise.

For alternators, vehicle manufacturers use overrunning alternator pulleys and overrunning alternator decouplers (OAD), which reduce vibrations even more.

The overrunning alternator pulley is a further development of the rigid belt pulley on the alternator. Thanks to its overrunning clutch it damps the vibrations which are generated in the belt drive by cyclic irregularities in the crankshaft during belt operations. It also enables the engine speed to be reduced rapidly in the event of sudden load changes. An alternative design is the overrunning alternator decoupler, which also offers a damping function.

However, to make sure that these operate correctly they have to be fitted correctly. The TOOL BOX OAP contains two combination wrenches with socket heads as counterholders and cap nuts. These offer excellent leverage with minimal exertion of force for the fitting and dismantling of OAPs and OADs.

Prepared for anything: with TOOL BOX OAP, the ‘One for all’ principle applies. The reason: the socket heads have functional dimensions and are suitable for all standard alternators.

Contents

> 12-part toolset:
  - two combination alternator wrenches
  - six socket heads as counterholders for the belt pulley shaft
  - four cap nuts for releasing and tightening the central nuts

Benefits

> One for all: fits all standard overrunning pulleys
> Parts can be combined in different ways
> Top-quality tools for professional use
> Made of robust, premium-quality steel
> Organized storage in a strong case
> An alternative to original tools

The way it’s done

> Normal belt pulley or overrunning alternator pulley? Overrunning alternator pulleys and overrunning alternator decouplers can be identified by their cover caps. Belt pulleys have no cover caps.

> Overrunning alternator pulleys and overrunning alternator decouplers must only be operated with cover caps.

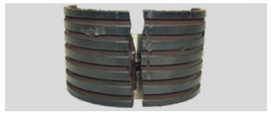
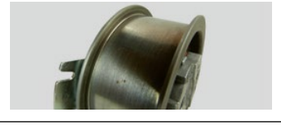
> Tip: Defective OAPs can be identified by the flapping belt or blocked overrunning pulley.

> Tip: OAPs are often fitted very tightly at the factory. Inferior quality tools can easily break during dismantling, which is why premium-quality tools are essential for this purpose.

> Video guide to using TOOL BOX OAP:

Appendix

Fault patterns for tensioners and belt pulleys

Problem	Typical fault patterns	Cause	Solution
End stop worn, stop lug broken		① Tensioner pulley incorrectly adjusted (e.g. tensioned in wrong direction) ② Tension too low or too high ③ Tensioner pulley oily (failure of damping friction element)	① Fit new tensioner pulley and adjust in accordance with manufacturer's specifications. Change belt ② Fit new tensioner pulley and set correct tension ③ Rectify cause of leak, change pulley and belt
Front plate broken		① Wrong tightening torque when securing pulley ② Washer was not used when securing pulley	① Fit new pulley and use correct tightening torque ② Fit new pulley with washer and apply correct tightening torque
Deflector is oily and soiled, spring may be broken	 	① Leaks from engine result in ingress of service fluid into tensioning system. Lubricating effect of fluid means that friction element no longer performs its damping function. End stops of tensioner pulley are damaged	① Rectify cause of leak, change pulley and belt
Outer ring broken		① Foreign objects in belt drive ② Pulley damaged before or during fitting	① Remove foreign objects, check all components for damage and replace if necessary ② Change pulley and fit correctly
Tensioner snapped off		① Multi V-belt vibrating badly ② Lifetime exceeded ③ Damper fastening screw tightened to wrong torque	① Check function of OAP and TVD and replace if necessary ②③ Fit new tensioning damper and apply correct tightening torque
Overheated deflector (color change of bearing metal)		① Pulley overheated as a result of friction caused by belt back slipping ② Pulley has seized mechanically (e.g. as a result of touching the belt cover or protruding edges on the engine)	① Rectify cause of slipping belt (e.g. seized water pump, seized pulley), change pulleys and belt, apply correct tension ② Change pulley and belt, check that pulley can rotate freely (e.g. by positioning timing belt guard correctly), note correct rotational direction when tensioning
Oil leak at seal gaiter of hydraulic tensioner		① Gaiter torn	① Ensure correct fitting without damaging gaiter
Wear marks on flange of pulley		① Pulley not correctly aligned in belt drive ② Increased bearing play in pulley because of wear	① Adjust misaligned pulley or replace if necessary. Ensure correct pulley is used and counterhold is correctly positioned, change belt ② Change pulley and belt
45° cracks in decoupling track of TVDi		① Damage as a result of extreme idling load, e.g. in taxis ② Lifetime exceeded ③ Overload, e.g. as a result of chip tuning	①② Change belt pulley correctly ③ Restore engine power to factory level. Change belt pulley correctly

Practical tips

Changing power transmission belts is an everyday part of workshop operations, but there are a number of things to keep in mind. We've summarized the main points.

Timing drive

- Tensioner and deflection pulleys are also subject to wear and should be replaced when the belt is changed.
- Instructions for installation should always be followed.
- Make sure the right type of profile is used.
- In the case of engines in which the timing belt also drives the water pump, the pump should also be replaced when the timing belt is changed.
- The timing belt should only be changed when the engine has cooled
- Timing belts, tensioner/deflection pulleys and water pumps are sensitive precision parts. Never use force – if it doesn't fit, it doesn't fit.
- Screws should always be tightened with the correct torque.
- Do not use any sprays or chemicals to reduce belt noise.
- Only turn the engine over with the timing belt fitted.
- Never change the relative position of the crankshaft to the camshaft.
- Before switching on the engine check the timing belt drive for:
  – misalignment
  – axial displacement
  – skewed mountings
- Even 'automatic' tensioner pulleys are often only semi-automatic, which means that manual setting of the tension needs to be carried out during installation.

Timing belts should never be crimped. If the sensitive glass-fiber tension member inside the belt breaks, the belt can tear while the engine is running.

Change sticker: 'Smart Sticker'

Showing at a glance when the timing belt was replaced, the change sticker is both practical and important. However, it can get hot in the engine compartment, not to mention damp and dirty. This often affects the lettering, and an unreadable sticker is of very little use.

For this reason, the Continental change sticker is made of premium-quality film, which gives the lettering long-term protection. The improved change sticker is included with all Continental timing belts and timing belt kits.

Replacement intervals

Replacement intervals are stipulated by the vehicle manufacturer and are mandatory. They must not be extended. If no replacement interval has been stipulated by the vehicle manufacturer, Continental recommends changing the belt after no more than 120,000 km or seven years, whichever comes first.

Detailed information on changing belts is available in the "Technical News/Technical Info" newsletter. You can subscribe right now at: www.continental-ep.com/registration

Video tutorials:

Auxiliary drive

- Auxiliary drive belts, overrunning alternator pulleys and torsional vibration dampers are subject to wear and tear. They should be checked with every belt change and replaced if necessary.
- Instructions for fitting should always be followed.
- If the V-belt makes a squealing noise the alignment of the pulleys should be checked and the belt changed if necessary.
- When rotating parts are fitted, the direction and location of all pulleys should be taken into account.
- Do not use any sprays or chemicals to reduce belt noise.
- Never replace a normal multi V-belt with an elastic multi V-belt – or vice versa. To check the belt tension, use the acoustic frequency measurement function on the ContiDrive App.
- Elastic multi V-belts can be re-used if they have been removed without damage.
- Elastic multi V-belts are self-tensioning – no belt tensioner is required.
- Continental offers various solutions for the fitting of elastic multi V-belts:
  – complete package: Multi V-Belt Elast + Tool or
  – various universal and special tools
- Elastic belts are fitted under load.
- Overrunning alternator pulleys and overrunning alternator decouplers must only be operated with cover caps.
- In the event of noises or damage in the belt drive, the overrunning alternator pulley should always be checked.
- If there is visible damage to the rubber track, the torsional vibration damper/ torsional vibration damper isolator must always be replaced at the same time. **Warning**: damage to the torsional vibration damper may only be visible on its reverse side.

Find out more – in one handy and compact bulletin

Our Technical Info updates contain regular fitting tips for specific vehicle applications – in 16 different languages. And mechanics can also find product information and installation instructions in the Product Information Center (PIC) – all they need is the relevant article/ reference number or the vehicle's key number. It's even easier using a smartphone: in most cases, a QR code will be printed on the product packaging that will take the user directly to the correct page in the PIC.

Both services are available free of charge at continental-engineparts.com

NEW
SUSPENSION PARTS WITH 5-YEAR GUARANTEE.

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They were on your wishlist - so we have expanded our portfolio to include suspension parts in exceptional Continental quality. Get the new parts with a 5-year guarantee for even better service.

Find out more

Wheel bearings

Wheel bearings transmit the drive forces to the wheels, meaning they are responsible for both a well-balanced ride and safe handling characteristics. The quality of the bearings has a crucial role to play here. After all, they have the weight of the entire vehicle resting on them.

Continental offers wheel bearings for all the major European vehicle manufacturers. The selection ranges from simple ball bearings to pre-assembled wheel hub bearing units with ABS ring, to wheel bearings for battery-electric vehicles.

Tip: **Scan this code for a video on changing wheel bearings and checking magnetic sensor wheels.**

Suspension components

They absorb vibrations, ensuring a safe and comfortable drive: our suspension components. With our top-quality wishbone bushings, ball joints and stabilizer links, professional mechanics can carry out reliable vehicle repairs across an extremely wide spectrum of models – from young classics to the latest electric cars. Our new range has all the replacement parts required – in premium Continental quality – for the most common repairs to Europe's vehicle fleet.

Steering components

What makes a good steering system? Above all, the mechanical strength of the steering components, and their safe functioning and precision. That's exactly what we offer with our steering components. Our wide range of items gives professional mechanics access to top-quality inner tie rods, track rod ends and steering boots for carrying out the most common repairs on the vehicles traveling European roads – including the latest electric models.

TOOL BOX WBE01

A lot of force is required to remove wheel bearings – but it's much easier with the right tools. TOOL BOX WBE01 contains everything workshop mechanics need to replace bolt-on wheel bearings. This professional tool set is suitable for virtually all models of vehicle and is the perfect complement to the slide hammer puller.

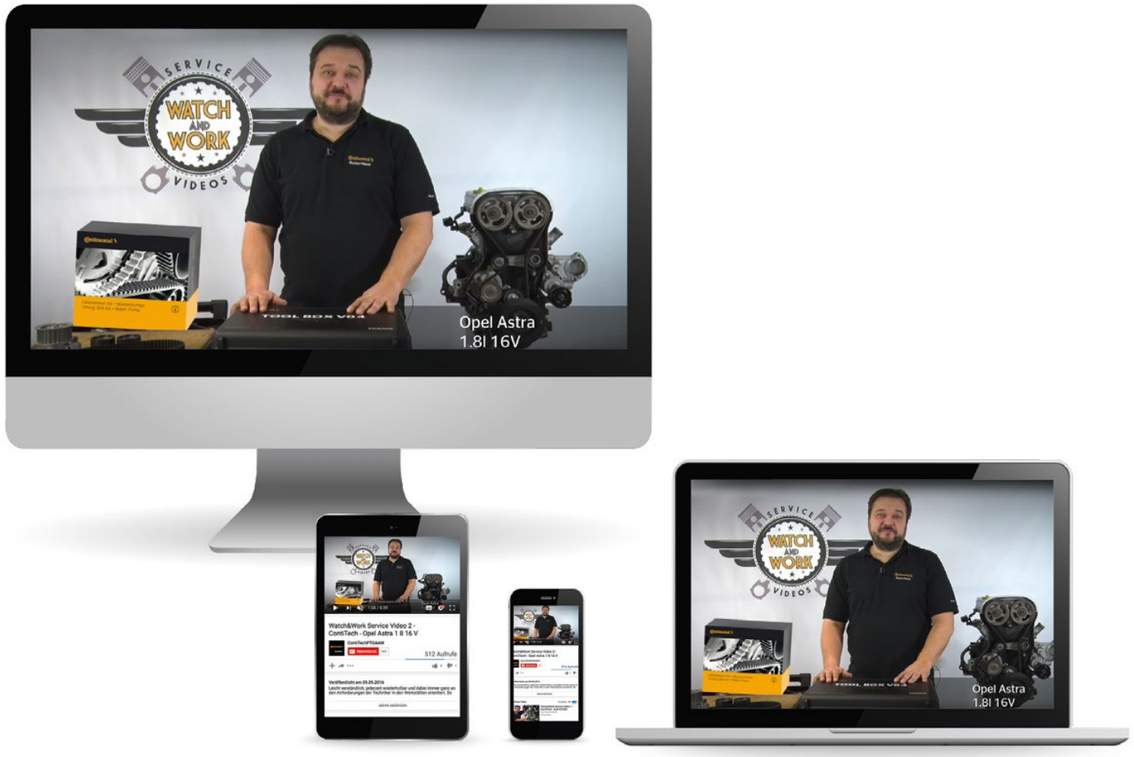
Watch and Work service videos

The Watch and Work service videos produced by Continental are practical and easy to understand. In each episode, lasting just a few minutes, trainer Stefan Meyer presents essential tips and tricks for professionals when installing belts. Each video focuses on a different engine. And Stefan also regularly takes time out for a closer look at the daily life of an a car workshop.

The Watch and Work videos are normally produced in German and English and the content is also translated into other languages. The videos are available at:

YouTube: **www.continental-ep.com/**yt
Facebook: **www.continental-ep.com/**fb
Instagram: **www.instagram.com/**continental.aftermarket
Website: **www.continental-ep.com/**waw
They can also be found in the PIC.

If you have any questions, ideas or topic suggestions, you can e-mail Stefan at aam@continental.com



Free-of-charge fitting information and much more in the PIC

Need data, free-of-charge instructions or other information on a particular article? Use our Product Information Center (PIC). Here you'll find useful supplementary information on all products.

PIC
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Available round the clock, always up-to-date and free of charge:
At www.continental-ep.com/pic you will find technical data such as parts lists, images, fitting advice and detailed fitting instructions. You can simply search by article name or enter the vehicle data and then select an article.

Our PIC is also available for your smartphone or tablet: simply scan the QR code on the product packaging and the relevant page of the PIC will open up.

Technical data/parts list
> Components of the product
> Automotive application

Fitting instructions
> Download fitting instructions
> Technical instructions
> "Watch and Work" videos

Vehicles
> Automotive applications for the specific article

Fitting advice
> Technical information
> FAQs and instructions

General information
> General information on replacement intervals
> Problem and diagnosis cases

Always included.

5-year guarantee for all belt drive components.

Workshop professionals don't need empty promises, they need quality they can rely on. That's why we offer registered workshops a 5-year guarantee on all belt drive components for the automotive aftermarket. **www.continental-ep.com/5**

5-YEAR GUARANTEE

Professional training courses

The wheel of innovation turns extremely quickly, especially in our industry.
And this makes it all the more important for automotive mechanics to keep up to speed with all the latest developments. This can be done very efficiently and effectively with the help of our technical training courses. We offer these both online as webinars and as part of our popular in-person events.Participants can customize training courses by adapting them to their existing level of knowledge and requesting specific content. This allows mechanics to build up knowledge in a targeted way, enabling them to meet the latest challenges in the workshop safely and efficiently.

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You can find detailed information at **www.continental-ep.com** in the section headed **Training Course Overview**.

Product and sales training

> **Continental corporation, facts and figures**
For: partners' internal and field sales staff

Technical training

> **Belt drive systems for ancillary components**
For: senior automotive mechanics – mechanics – apprentices

> **Timing belts**
For: senior automotive mechanics, mechanics, apprentices

> **Timing belts in oil (BIO)**
For: senior automotive mechanics, mechanics, apprentices

> **Water pump and cooling system**
For: senior automotive mechanics, mechanics, apprentices

> **48V mild-hybrid belt drives**
For: senior automotive mechanics, mechanics, apprentices

> **Avoiding installation errors – typical questions and answers**
For: senior automotive mechanics, mechanics, apprentices

> **VAG diesel motors**
For: senior automotive mechanics, mechanics, apprentices

> **Timing belts and drive components in vehicles**
For: senior automotive mechanics, mechanics, apprentices

> **Practical training in belt drive systems**
For: senior automotive mechanics, mechanics, apprentices

Special training

> **Expert training**
For: senior automotive mechanics, mechanics, apprentices, sales and customer service employees, automotive assessors (independent assessors, testing organizations such as TÜV, DEKRA, insurance companies), vocational training centers, vocational colleges, professional organizations

> **Training for schools**
For: senior automotive mechanics, mechanics, apprentices, vocational training centers, vocational colleges, professional organizations

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Power Transmission Group

Market Segment
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Automotive Aftermarket

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aam@continental.com
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www.continental-engineparts.com

PIC
Product Information Center
www.continental-ep.com/pic

Data, instructions and other technical information are available from the PIC at www.continental-ep.com/pic or simply scan the QR code.

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