



Transmission Systems

# Dual Mass Flywheel



Product focus **valeoscope**



## Valeo clutches, expertise & innovation dedicated to customer satisfaction

### **D.M.F./KIT4P** Adapted to your needs!

#### **D.M.F.**

- Designed for lasting performance
- Improved driving comfort

#### **KIT4P**

- Economical & reliable
- Alternative solution to D.M.F.

#### **Hydraulics**

- All-in-one solution
- Quick & easy to install

#### **Traditional Kits**

- One of the market's best coverage rates
- Best-in-class Valeo friction material

### **Aftermarket self-adjusting solutions**

#### **2 offers:**

- S.A.T. (O.E. solution for I.A.M.)
- H.E.C. (I.A.M. solution)

#### **3 main benefits:**

- Easy to fit! No need for specialist tool
- Economical solution
- Constant pedal effort = optimal driver's comfort

**Valeo**

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## MORE ABOUT VALEO D.M.F.?



[qr.valeodrive.com/998120/003098](http://qr.valeodrive.com/998120/003098)

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# Foreword

## Our Multi-specialist expertise is rooted in our genes.

As one of the leading automotive system designers and manufacturers, nothing is more natural for Valeo than to deliver 14 product lines for passenger cars and 8 products lines for heavy-duty vehicles, serving all distribution channels from car makers' networks to independent aftermarket and modern distribution, in more than 120 countries all over the world.

Valeo Transmission Systems' mission is to be the supplier of choice for all powertrain architectures with innovative technologies developed for efficient and comfortable power transfer from the engine to the transmission, whilst reducing fuel consumption.

All Valeo clutches are manufactured to Valeo's highest quality standards, making Valeo products efficient and reliable and ensuring full customer satisfaction.

Efficient because Valeo's expertise in research and development allows the reduction of clutch noise and vibrations along with enhanced driver comfort through better gear changes, giving consumers a smoother and more comfortable ride.

Reliable because Valeo clutches are able to perform in the most hostile operating environments. Valeo aftermarket customers benefit from this Original Equipment (O.E.) expertise, rigor and quality.

The worldwide vehicle car parc consists of 69% passenger cars and is growing by 3.9% per year. Every second passenger car or light commercial vehicle which rolls off the assembly line is equipped with a D.M.F., and that share is still increasing. Consequently, the share of vehicles in Europe equipped with a D.M.F. is estimated to increase to 39% by 2018.

As technologies evolve, Valeo Service introduced Dual Mass Flywheel to its range. This technical handbook is the opportunity to explain you D.M.F. design, composition, related advantages. You will find as well a diagnosis and a guide to explain common breakdown causes for your daily support. Last but not least, the most frequently asked questions will be addressed.

**Valeo - from original equipment leadership to aftermarket excellence**



# Disclaimer

Whilst we endeavour to ensure that the information included in this training documentation is correct, we do not warrant its completeness or accuracy; nor do we commit to ensuring that the material in the documentation is kept up to date.

To the maximum extent permitted by applicable law, we exclude all representations, warranties and conditions relating to this documentation and the use of this documentation (including, without limitation, any warranties implied by law in respect to satisfactory quality, fitness for purpose and/or the use of reasonable care and skill).

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To the extent that this documentation and this training documentation are provided free of charge, we will not be liable for any loss or damage of whatsoever nature.





## Valeo, your Transmission Systems Multi-Specialist

Valeo is an automotive supplier, partner to all automakers worldwide. As a technology company, Valeo proposes innovative products and systems that contribute to the reduction of CO<sub>2</sub> emissions and to the development of intuitive driving.

In 2013, the Group generated sales of €12.1 billion euros and invested over 10% of its original equipment sales in research and development. Valeo has 124 production sites, 16 Research centers, 35 Development centers and 12 distribution platforms, and employs 74,800 people in 29 countries throughout the world.

Valeo consists of 4 Business Groups: Powertrain Systems, Thermal Systems, Comfort and Driving, Assistance Systems and Visibility Systems.

Together, these 4 Business Groups comprise 16 Product Groups and supply both the Original Equipment (O.E.) market and the aftermarket. The Transmission Systems product portfolio is part of Valeo's Powertrain Systems Business Group.

# Valeoscope library

## Technical handbooks



**Air Conditioning**  
Ref: 998321



**Lighting Systems**  
Ref: 998542

## Product focus



**Transmission Systems Clutch HEC-SAT**  
Ref: 998121



**Transmission Systems Clutch Hydraulics**  
Ref: 998123



**Transmission Systems Clutch KIT4P**  
Ref: 998102



**Transmission Systems Dual-Mass Flywheel DMF**  
Ref: 998120

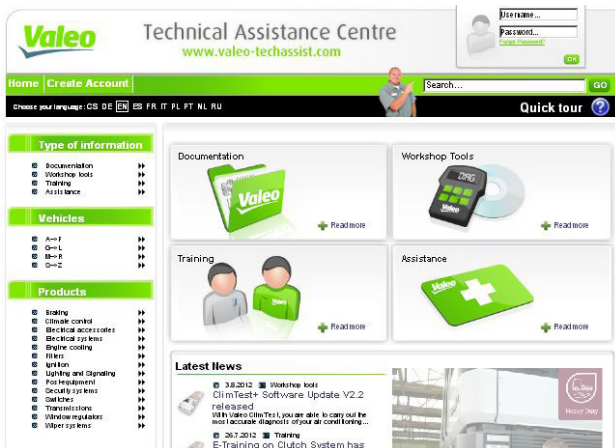
## Diag & Fit



**Truck Brake Pad**  
Ref: 957100



# valeo-techassist.com



Valeo TechAssist is a web-based application, specifically developed for repair workshops, automotive spare parts distributors and technical trainers.

Valeo TechAssist is available at any time, and 10 languages are implemented to date. Just connect to the website [www.valeo-techassist.com](http://www.valeo-techassist.com).

Valeo TechAssist is not only a technical database, but also a learning platform and a forum for information exchange. It covers passenger cars and all Valeo product lines.

The information in Valeo TechAssist is structured in four comprehensive domains:



## 1. Product documentation

## 2. Technical assistance

## 3. Workshop tools

## 4. Technical training

You will benefit from Valeo TechAssist all through the workshop service process:

- Get product information: product data sheets provide details in addition to the catalogue information.
- Find common failures: step-by-step failure diagnosis guides about typical faults.
- Keep you updated about Valeo Service products: full access to all Technical Service Bulletins.
- Find help when it is needed: answers to frequently asked questions and contact with the Valeo Service technical hotline
- Use Valeo workshop tools efficiently: retrieve user manuals, service manuals and software updates on Valeo Service tools.
- Learn about new technologies: online training modules (e-learning) and self-study documents about most modern product technologies. In addition, you have access to some advanced features:
  - Add comments to any document: give personal feedback to Valeo Service and contribute to a continuous service improvement.
  - Fill in your evaluation: provide feedback on your satisfaction.
  - Write a fitting testimony: share your experience with other users.



# 4

## Why Dual Mass Flywheel (D.M.F.)?

The flywheel is a rotating mechanical device with a significant moment of inertia used as a storage device for rotational energy. Flywheels are available on vehicles with internal combustion engines to provide a significant inertia for a regular regime in rotation.

Rigid flywheels are most common on gasoline vehicle applications. It is a single mass made of cast iron and bolted over the crankshaft. One surface is machined to form the friction face. A rigid flywheel is always fitted with a clutch and a dampened type disc to perform the necessary clutch function:

- Allow the engagement and disengagement between engine and gearbox
- **Transmit full engine torque through the transmission**
- Dissipate the heat generated between friction surfaces
- **Filter out dynamic vibrations between the engine and the gearbox**
- **Enable flawless engine starting**
- Provide engagement comfort & driver control
- Enable smooth gear changes

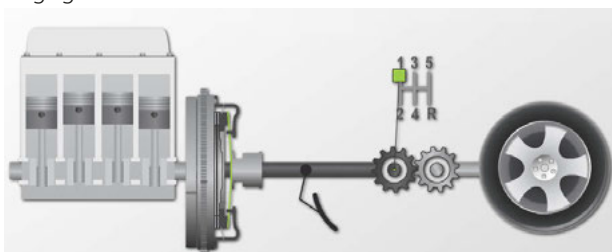
Today's modern engines produce higher torques that can be driven at low engine speeds. As a result, the maximum engine torque to be transmitted increases thus resulting in an increase of noise and vibration.

Moving the damper springs from the conventional clutch plate to inside the flywheel allows the D.M.F to filter the torsional engine vibrations away from the gearbox and reduces the load on the transmission line. The larger damper in the D.M.F is better suited for filtering the engine vibrations (especially needed for turbo diesel engines). Gear shifting comfort is also improved with a low-inertia disc.

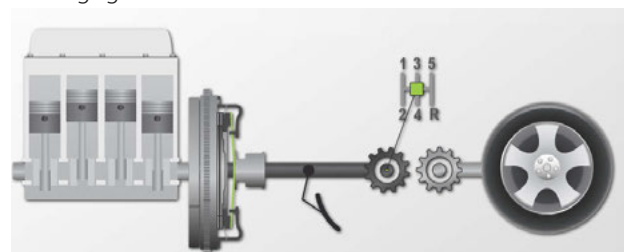
The D.M.F. allows driving at lower engine speeds increasing engine efficiency, thereby saving fuel and reducing CO<sub>2</sub> emissions as well as any vibration that can cause "gear rattling" & "body booms".

D.M.F. production started in the 80s. Since then, Valeo has continued to strengthen its presence among different car manufacturers, making Valeo a key solution provider for designing and producing suitable D.M.F. for the improved driveline technologies.

Engaged



Disengaged

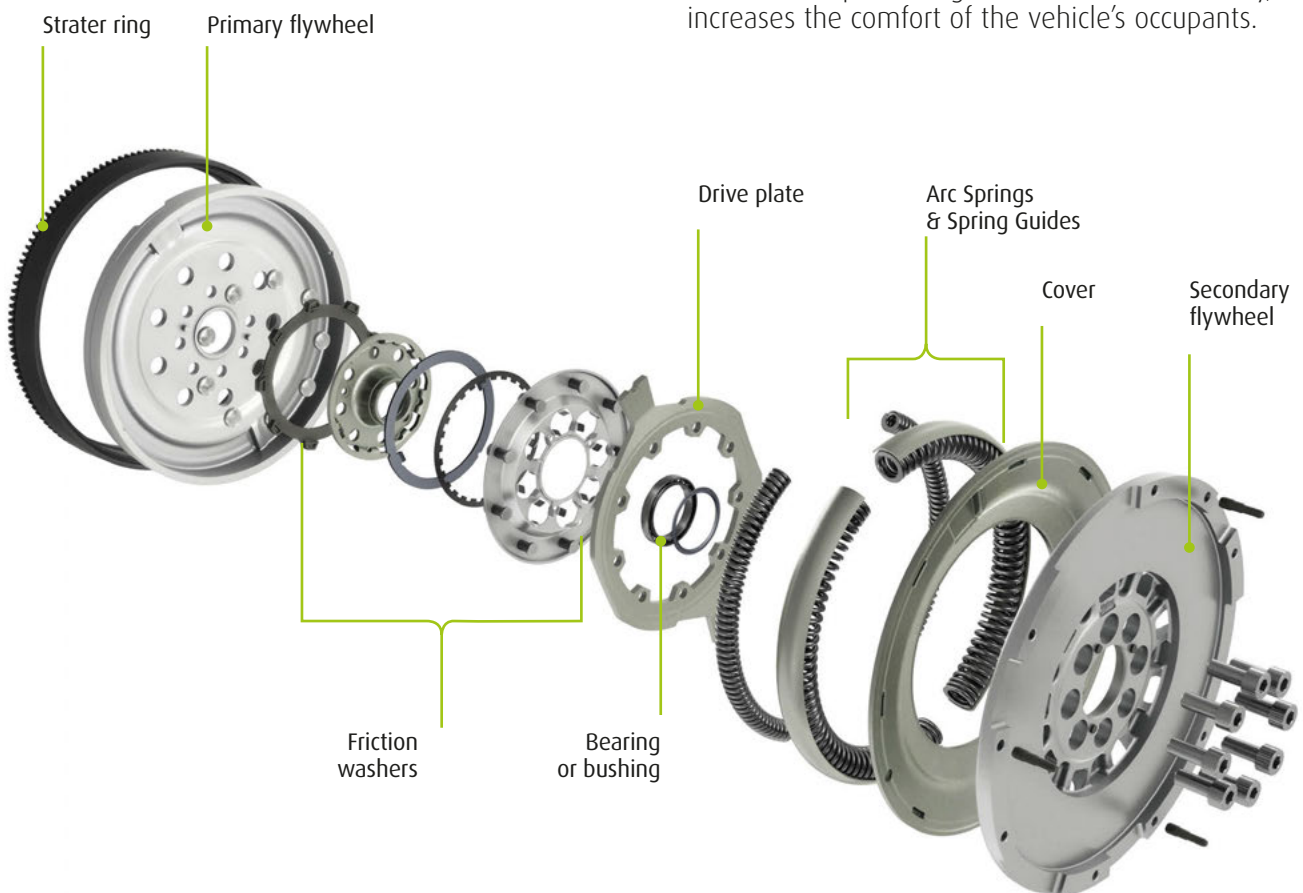


*Flywheels resist changes in their rotational speed, which helps steady the rotation of the shaft.*

# Dual Mass Flywheel composition

The D.M.F. is made up of two independent inertias/flywheels. The design splits the inertia between the engine and the transmission to keep the power train resonance below the engine idle speed.

As a result, there is no transmission gear rattle in the normal speed range of the vehicle. Thereby, it increases the comfort of the vehicle's occupants.

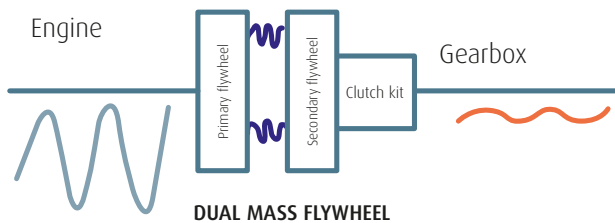


*The Dual Mass Flywheel is attached to the engine crankshaft and is connected to the clutch and transmission.*

The primary flywheel is bolted directly to the crankshaft and contains the damping springs. The secondary flywheel is fitted with a conventional clutch cover and solid disc with a lower inertia, improving the gear shifting.

There are two long curved springs between the flywheels that absorb the engine vibrations. The main advantage is a greater angular damping which allows the maximum filtration.

A cover plate is welded to the primary flywheel to form a chamber filled with low-friction grease to help the springs move freely. The secondary flywheel is made of special cast iron that can resist the high thermal loads of the clutch.



## 5.1 Primary Inertia (mass)

### Primary Flywheel

The primary flywheel is bolted to the engine crankshaft. It is a steel stamped component with a sufficient mass moment of inertia. In certain cases, it could be made of cast iron. The ring gear is press fitted on the flywheel to interface with the engine starter.

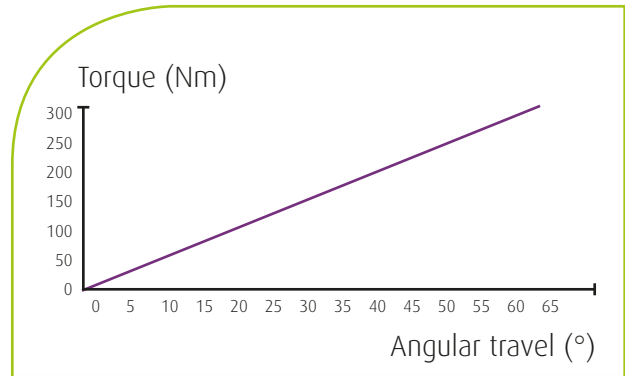
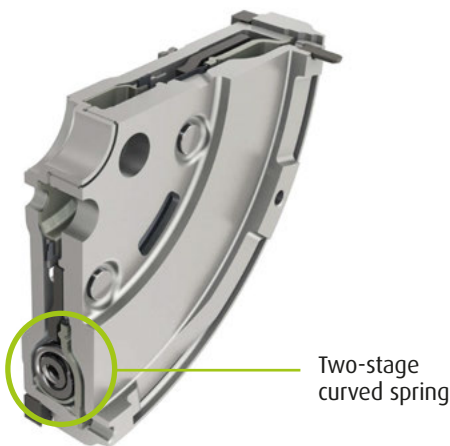


# 5. Dual Mass Flywheel composition

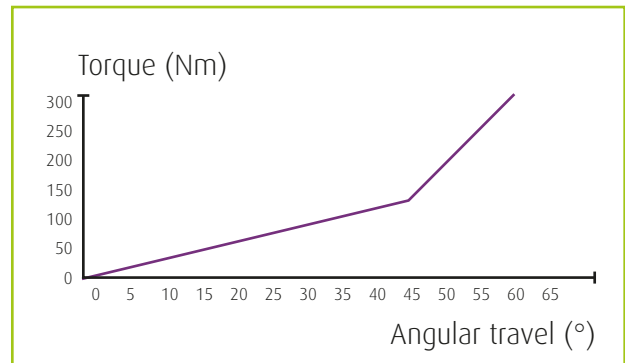
## Springs and spring guides

The curved springs are valve steel quality so that they can resist very high stress during wide angle compression when filtering. The high curved spring load is supported by two hardened spring guides located inside the primary flywheel. A specific grease sustaining high operating temperature is added to lower friction between the springs and the spring guides.

A curved D.M.F. contains two sets of curved springs. Each set includes external and internal spring. The D.M.F. could have one stage or two stages of springs (equal length or different length for internal and external springs). The two-stage spring enables two slopes with different stiffness & angular travel of the secondary flywheel, improving the engine startability.



Torque transfer of D.M.F. with one-stage curved spring



Torque transfer of D.M.F. with two-stage curved spring

## Drive plate

The drive plate is fitted on the secondary flywheel and transmits the spring's torque to the secondary flywheel. It is steel stamped, hardened for high mechanical resistance.

On the D.M.F. with inner damper, the drive plate contains straight springs to improve the filtering capacity.



### Cover

The cover is welded to the primary flywheel to form a sealed chamber containing the curved springs, spring guides and the grease.



### Bearing or bushing

The bearing or bushing is an interface between the two inertias during angular displacement. The first design contains only a bearing. The bushing has only recently been introduced into production.



### Friction washers

During engine start-up, a high angular deflection occurs between the two inertias. To limit this deflection and help improve engine start-up, friction washers are added on certain applications. They do not operate in drive mode.



## 5.2. Secondary Inertia (mass)

The secondary flywheel is a cast iron component. One side is machined to form the friction surface of the disc. The secondary flywheel transmits the engine torque to the clutch, the gearbox and the wheels.



# 6

## Dual Mass Flywheel design



The engine speed fluctuates during operating phases, which causes vibrations. If these vibrations enter the gearbox, they cause the gearbox pinions to collide, which creates gearbox noise that is unpleasant for the driver. A conventional damper-type disc filters these vibrations.

Modern engines run with lower idle speeds and higher torques, generating more vibrations. Therefore, it is necessary to improve the filtering capacity or to lower the point at which filtration begins without compromising the torque capacity. As vehicles are becoming more silent and the chassis is becoming lighter and more rigid, the level of vibration is becoming more apparent.

The design of the D.M.F. and the distribution of the masses of inertia make it possible to shift the resonance frequency under engine idle speed.

Mechanical resonance is the tendency of a mechanical system to respond at greater amplitude when the frequency of its oscillations matches the system's natural frequency of vibration (its resonance frequency or resonant frequency):

The resonance frequency is a function of stiffness and the reverse function of the inertia:

$$f \sim \sqrt{[\text{Stiffness}/\text{Inertia}]}$$

Stiffness is the resistance of an elastic body to deformation by an applied force.

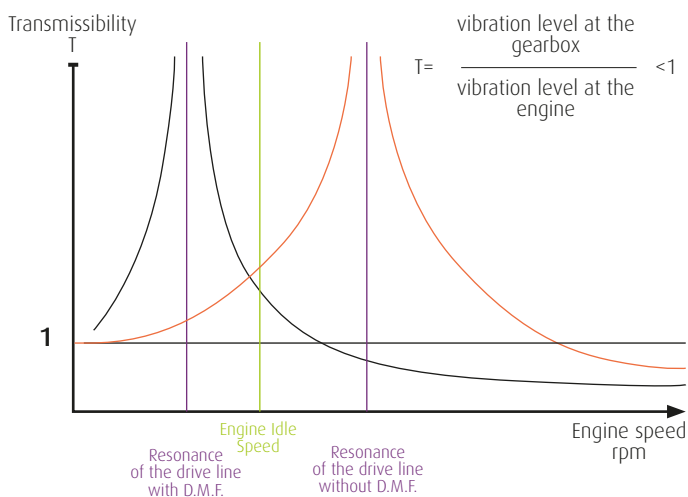
As a spring stretches or compresses, there is a force striving to restore the equilibrium condition.

Inertia or moment of inertia is an object's resistance to changes in its rotating state.

The flywheel and the clutch kit are made up of rotating elements. The inertia of each component conditions its facility to accelerate and decelerate and, as a consequence, its capacity to respond quickly to the operation of the clutch pedal.

If stiffness is low and inertia is high, then the frequency is low like in the D.M.F.

If stiffness is high and inertia is low, then the frequency is high like in a dampened type disc



Transmissibility (T) is the ratio of output (gearbox) vibration / input (engine) vibration. When gearbox vibrations are greater than engine vibrations (Transmissibility > 1), amplification occurs, creating the gearbox noise. The target with the D.M.F. is to shift resonance frequency of the driveline under engine idle speed in order to keep T below 1 in the driving range.



# Dual Mass Flywheel main advantages

The Dual Mass Flywheel takes advantage of its dual masses and long springs to lower the natural frequency of the vehicle's driveline to less than 400 RPM. This is a big advantage in comparison with conventional clutch systems where the natural frequency of the vehicle's driveline is usually in the driving range of 1500-2000 RPM.

Therefore, with a D.M.F., the filtering of the engine vibrations is insured at all driving speeds. The low stiffness of the dual mass flywheel is made possible by moving the damper from the clutch disc assembly to inside the flywheel where there is much more space. The lighter clutch disc assembly also makes it easier to change gears.

Valeo Dual Mass Flywheels significantly reduce perceived vibrations and gearbox noise. This represents a major step forward in power train filtration technologies. This advance is especially important because the fuel-saving engines now being developed have higher torque and, consequently, generate greater vibrations, especially at low speeds.

## 7.1 Specifically designed for each vehicle application:

- Tuned with low stiffness for maximum noise reduction
- Optimized filtering performance for "rattling" & "booming" issues
- Applications from 200Nm up to 500Nm torque engines

## 7.2 Improved driving comfort:

- Improved gear shift comfort and gearbox synchronizer durability by reduction of clutch disc inertia
- Fuel consumption reduction is achieved by driving at lower speeds due to excellent noise reduction

## 7.3 Designed for long lasting performance:

- High grade "best in class" spring wire used
- Long-life ball bearings and bushings (no maintenance needed)
- Added friction damping system design is stable for life



# 8

## Dual Mass Flywheel technology evolutions

Modern engines deliver higher torque at lower speeds for fuel economy. These engines therefore generate increased vibration. Furthermore, the car manufacturers demand evermore silent vehicles for driving comfort. Thus, improved vibration filtering is mandatory, especially in case of Rear Wheel Drive (R.W.D.) transmission with engine torques above 400Nm.

Valeo's technology roadmap addresses innovative solutions

- D.M.F. with Inner Damper
- Long Travel Damper D.M.F.
- Flexible D.M.F.

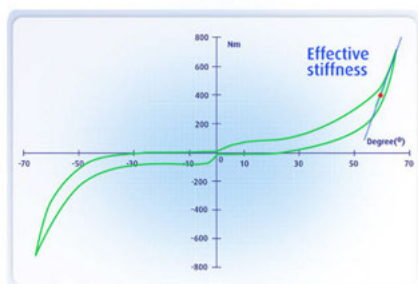
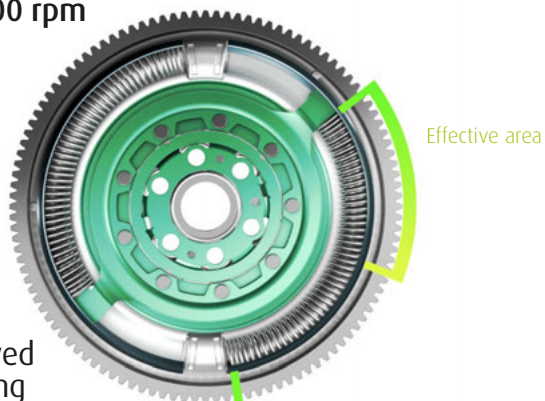


### 8.1 D.M.F. with inner damper

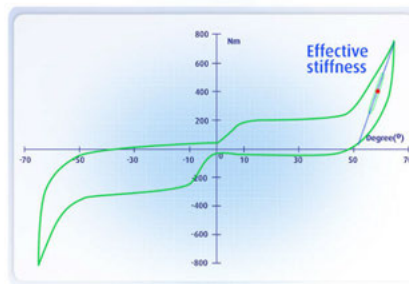
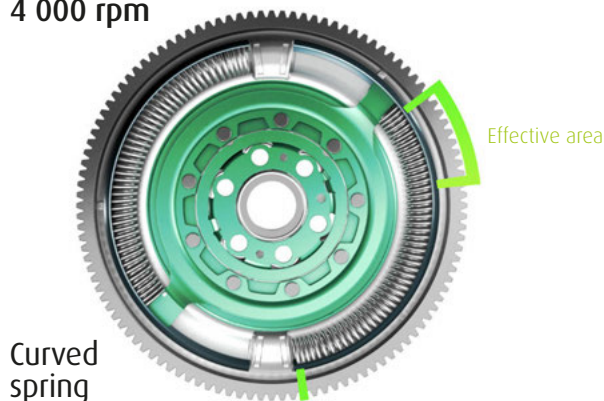
At high engine speeds, the centrifugal load pushes the springs against the spring guides and creates friction. Due to this friction between the springs and the spring guides, the active number of coil springs is reduced; therefore, the effective spring stiffness is increased and filtering capacity is reduced.

## 8. Dual Mass Flywheel technology evolutions

2 000 rpm



4 000 rpm



In the D.M.F. with inner springs, small straight springs are integrated in the drive plate. Less sensitive to the centrifugal load, they are able to filter the vibrations.

For some extremely demanding applications and especially on Rear Wheel Drive (R.W.D.) vehicles, it is necessary to obtain an extremely low level of vibration at gearbox entry level.

Valeo Long Travel Damper (L.T.D.) technology, developed for automatic transmission damping, is integrated in the D.M.F. to reach this target.

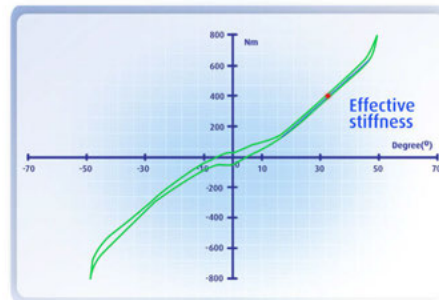
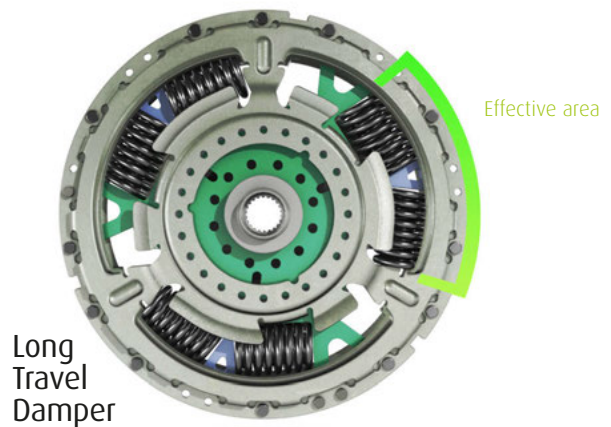


## 8.2 Long travel damper D.M.F.

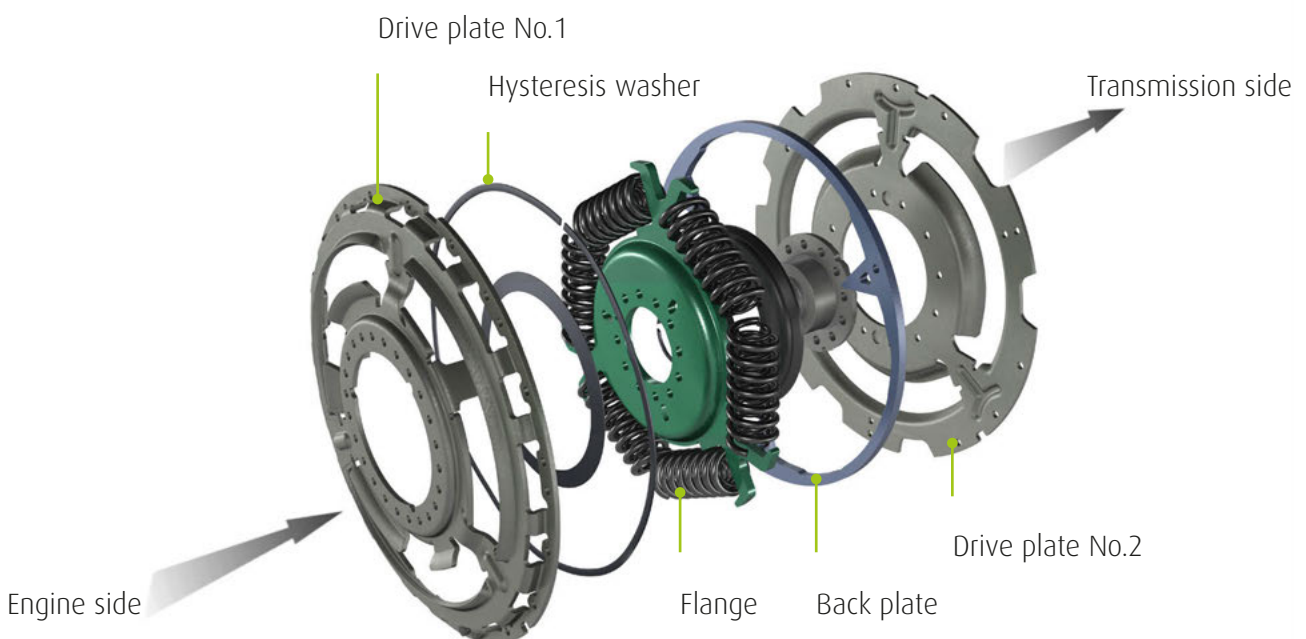
Valeo's Long Travel Damper Dual Mass Flywheel offers improved acoustic comfort and reduces vibrations. The L.T.D. D.M.F. significantly reduces perceived vibrations and engine noise. This represents a major step forward in powertrain filtration technologies. This advance is especially important because the fuel-saving engines now being developed have higher torque and, consequently, generate greater vibrations, especially at low speed. The L.T.D. D.M.F. absorbs torque vibrations generated by the engine to the transmission, thereby increasing the comfort of the vehicle's occupants.

Two compact filtration devices give the L.T.D. D.M.F. the qualities required to become an essential component in tomorrow's conventional high-performance engines as well as for hybrid powertrains, which have the strictest installation constraints.

### Focus on L.T.D. technology



### Long Travel Damper



## 8. Dual Mass Flywheel technology evolutions

The technology L.T.D. is based on two sets of three springs operating in series and synchronised by a back plate. The straight springs are less sensitive to the centrifugal load than the curved springs. This provides less friction, hence the filtering is better than with the curved springs.

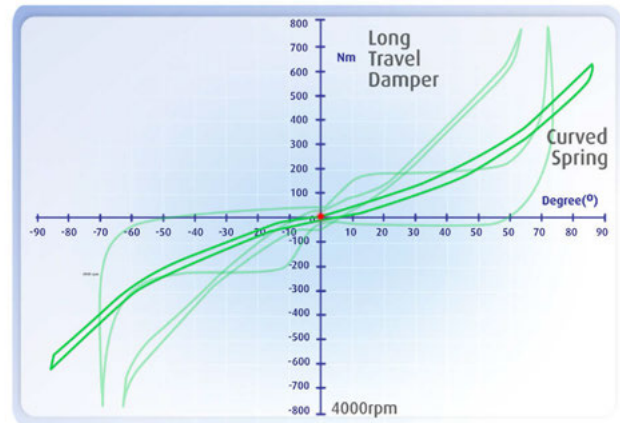
### Integration of L.T.D. to flywheel; Long Travel Damper D.M.F

In addition to the known dual mass flywheel technology, the L.T.D. D.M.F. integrates a long travel damper developed by Valeo for torque converters in automatic transmissions. This combination allows it to provide optimal filtration, especially during start-up, thanks to a maximum angular displacement of 80°, as well as an exceptional performance level in all engine regimes.

Valeo's long travel damper dual mass flywheel offers comfort levels previously unknown on the most fuel-efficient engines. The NVH (Noise-Vibration-Harshness) level and ease of gear changes offer remarkable driving comfort for the most vibration-prone engines.



### L.T.D. D.M.F.



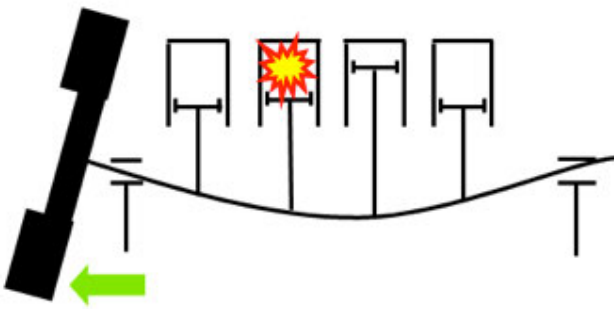
On the graph, you can see the behaviour of L.T.D. D.M.F. and a comparison of L.T.D. with curved spring. The combination of curved spring and long travel damper technologies ensures both start-up (curved springs) and optimum filtration (L.T.D.) of the engine

## 8.3 Flexible flywheel

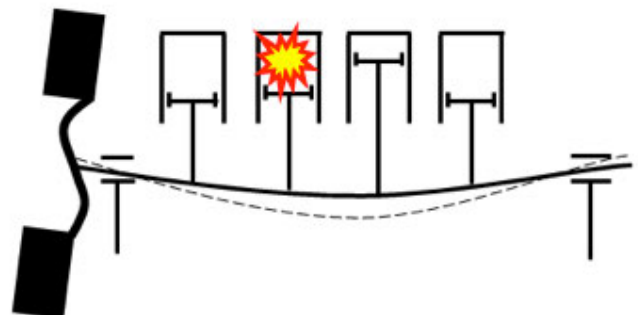
The crankshaft bends under the force of the strong combustions inside the engine cylinders. This generates an axis wobbling on the flywheel, which is bolted to the end of the crankshaft. Stress occurs between the bearings and the crankshaft, generating vibrations. If not filtered, the result is a roaring noise caused by the engine, a flywheel axial vibration and a potential increased vibration on the clutch pedal.

The flexible flywheel filters the axial vibrations transmitted through the engine crankshaft. This is achieved by adding a flexible plate at the engine side of the flywheel mass. Deformation of the crankshaft continues, but is not transmitted to the flywheel thanks to the flexible plate.

- Reduced engine noise at high engine speeds
- Reduced bending stress on crankshaft
- Reduced level of vibration on the clutch pedal



*System without flexible flywheel*



*System with flexible flywheel*



*Flexible flywheel, view from the crankshaft side*

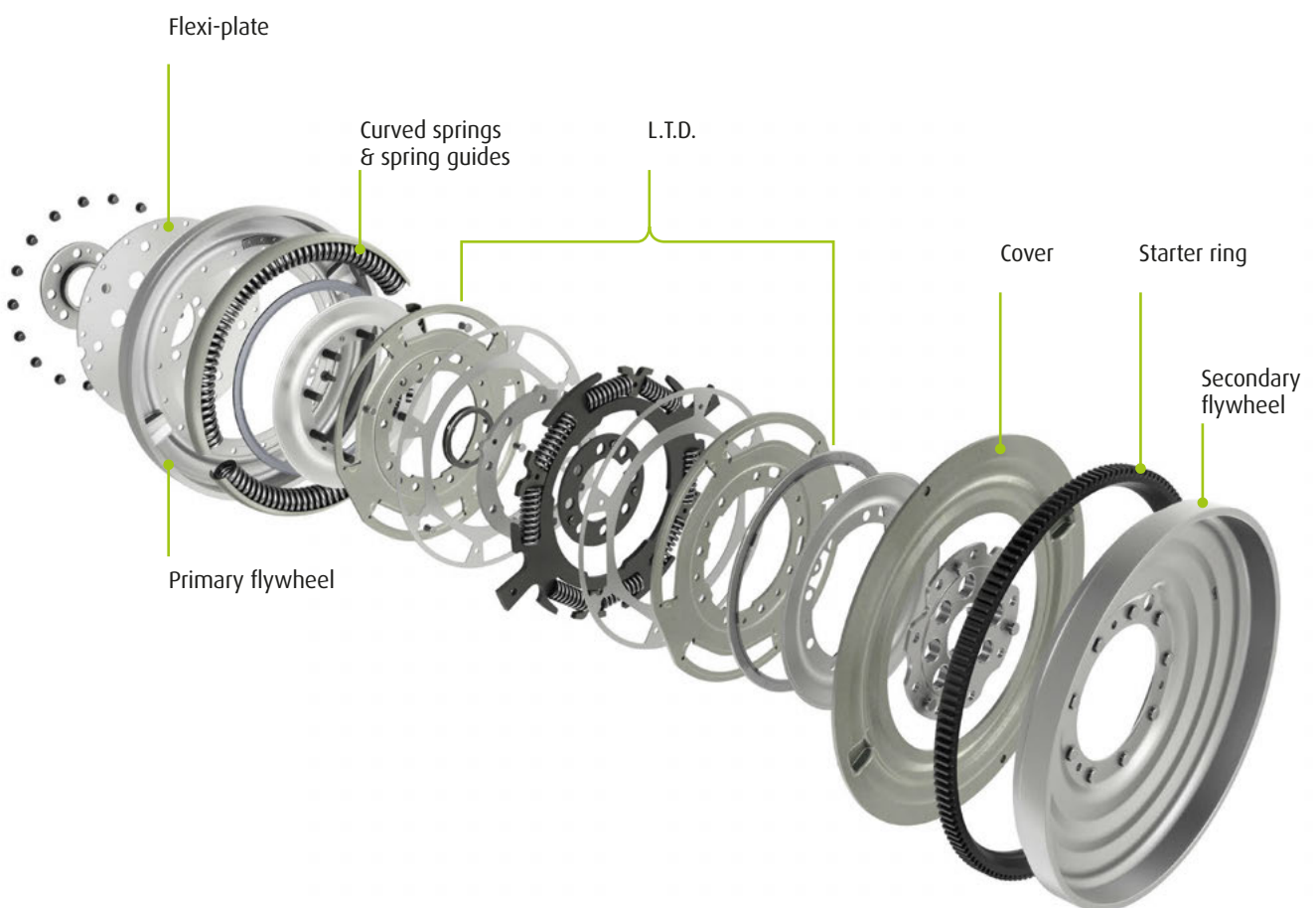


*Flexible flywheel, view from the clutch side*

## 8. Dual Mass Flywheel technology evolutions

The flexible function can be present both on the rigid flywheel and on the Dual Mass Flywheel. On a D.M.F., the flexible plate is attached to the primary flywheel and a multi-stage hub is used to reduce the pressure in the crankshaft fitting bolts.

### Flexible Long Travel Damper Dual Mass Flywheel



*The Dual Mass Flywheel is attached to the engine*

# 9

## Analysis and diagnosis of damage to the Dual Mass Flywheel

Always check the D.M.F. when replacing the clutch and replace when necessary. A worn and defective D.M.F. can damage the newly installed clutch.

A full functional test can only be performed at a properly equipped test facility. This guide to visual inspection and measurements can be used to decide whether the Valeo Dual Mass Flywheel must be replaced or not.

In case of doubt, always replace the D.M.F. together with the clutch. Reworking the secondary flywheel friction surface is not possible. Never install a dropped D.M.F.

### Before installation

- Check the shaft sealing rings for oil leakage and replace if necessary
- Check starter ring for any damage
- Always use new fixing bolts
- Check if the dowel pins are correctly positioned
- Clean the contact surfaces using a damp cloth

For more information on the Dual Mass Flywheel and the common failures, visit:

[www.valeo-techassist.com](http://www.valeo-techassist.com)

## 9. Analysis and diagnosis of damage to the Dual Mass Flywheel

### 9.1 Visual inspection

Visual inspections can also be conducted when the flywheel is installed on the engine.

In this case, use a very powerful light to conduct the inspections.



#### 9.1.1 Trace of grease or oil

No trace of grease or oil on the friction surface of the secondary flywheel.

Check grease egress which may require D.M.F. replacement (from primary flywheel...)

*Light traces of grease on the engine side surface of the flywheel do not affect the operation of the flywheel.*



#### 9.1.2 Worn or damaged starter ring gear

Dual-mass flywheels with worn or damaged starter ring gears must be replaced.

*If the starter ring is heavily worn, also check the starter as it may be defective.*





### 9.1.3 High thermal loads

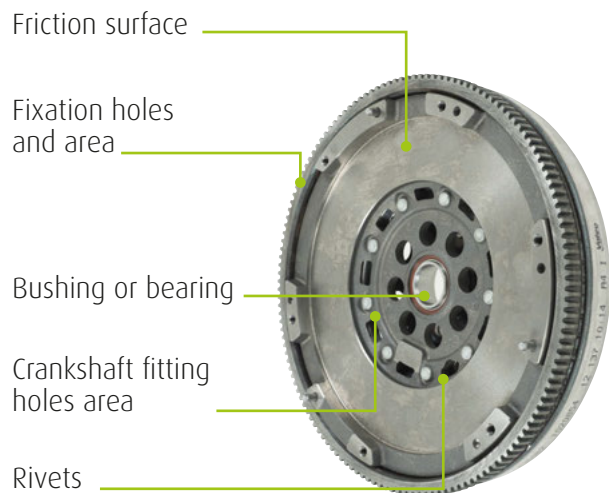
The friction that occurs during the slip time of the clutch disc can result in problems caused by high thermal loads. In particular, this may be dangerous due to the possible centrifuging of the clutch disc lining and the risk of breakage of the secondary flywheel (and the corresponding pressure plate of the mechanism). The signs of high thermal load are:

- blue colour and local hot spots on the friction surface
- blue colour on the cover fixation zone
- blue colour on the rivet zone



In addition to the starter ring and the thermal load inspection, visually inspect the condition of the flywheel and the disassembled kit, as well as the secondary flywheel. The following features indicate that the D.M.F. must be replaced

- Cracks on the friction surface
- Blue-coloured spots and large quantities of grease on the outside surfaces
- Damaged ball bearing
- Broken plastic hysteresis washer (visually inspect the fixing bolts holes)
- Scores on the primary flywheel
- Damaged sensor ring teeth
- Noise



# 9. Analysis and diagnosis of damage to the Dual Mass Flywheel

## 9.2 "Tilt" measurement

This is the clearance between the primary and secondary masses. Excessive free movement of the secondary flywheel of the D.M.F. is a potential sign of a worn bushing.

A simple measurement procedure is described below:

- 1 Place the dual-mass flywheel on the workbench with the secondary flywheel facing upwards
- 2 Place a comparator on the friction surface towards the outer surface (not on the friction surface but on the outer ring)
- 3 Press gently on the opposite side of the secondary flywheel, until it comes into contact with the primary flywheel (3)
- 4 Reset the instrument
- 5 Press the side where the comparator is situated and read the value found (peak to peak) (5)
- 6 Refer to maximum permissible value and replace the D.M.F. if it exceeds the maximum acceptance criteria (2.6mm for D.M.F. with bushing; 1.2mm for D.M.F. with bearing) (6)



## 9.3 Secondary flywheel free-play angle measurement

The angle corresponds to the angular free-play between the secondary flywheel and primary flywheel. Free-play can be checked using the following procedure:

- 1 Place the dual-mass flywheel on the workbench with the secondary flywheel facing upwards
- 2 Apply an angular, clockwise pre-load to the secondary wheel until you feel the elastic reaction of the springs
- 3 Make the corresponding mark in the primary and secondary flywheels
- 4 Rotate the flywheel counter-clockwise until you feel the elastic reaction of the springs. The space between the two marks corresponds to angle J1
- 5 Count the number of teeth of the starting ring gear between the two marks

The maximum acceptable angle is  $15^\circ$ , which represents up to 6 teeth in the starting ring gear (Valeo O.E.).

The operation can also be performed with the dual-mass flywheel mounted on the engine.

- Turn the flywheel counter-clockwise until you feel the elastic reaction of the springs. The space between the two marks corresponds to free play angle.
- Count the number of teeth of the starting ring gear between the two marks.



# 10

## Dual Mass Flywheel breakdown



### Perception

D.M.F. fails, noise

### Problem

Discoloured blue-purple colour on both sides and/or visible damage

### Cause

Very high thermal load



### Perception

Noise or impaired starter motor operation

### Problem

Secondary flywheel scores the primary flywheel

### Cause

D.M.F. bearing/bushing is worn out



### Perception

D.M.F. fails

### Problem

Grease egress, sealing cap missing or discoloured brown due to overload

### Cause

Thermal overload or mechanical damage/overload

### Perception

D.M.F. fails

### Problem

Excessive trace of grease on the back of the primary flywheel

### Cause

Thermal overload or mechanical damage/overload



### Perception

D.M.F. malfunction, noise

### Problem

Burnt residues of abraded lining inside ventilation holes

### Cause

Slippage and high thermal load



### Perception

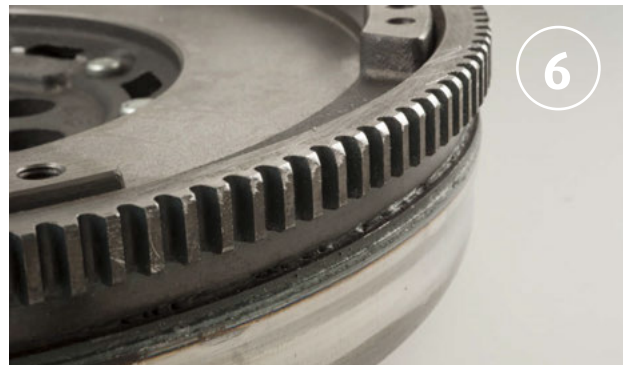
Noise when starting the engine

### Problem

D.M.F. starter ring gears heavily worn or broken

### Cause

Defective starter



### Perception

D.M.F. fails

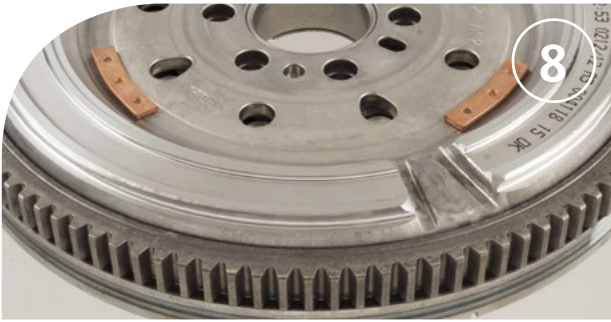
### Problem

D.M.F. bearing is damaged

### Cause

Wear and/or mechanical impact





### Perception

Loud humming, vibration

### Problem

Balance weight missing (possible to see welding spots)

### Cause

Mechanical impact on balance weight



### Perception

D.M.F. fails

### Problem

Strong noise and no torque transmission. Secondary flywheel is blocked or free to rotate at 360°

### Cause

Mechanical damage



### Perception

Noise and vibration

### Problem

Secondary flywheel free to rotate beyond permissible free movement

### Cause

Springs' loss of effectiveness



### Perception

Frequent noise, and difficulty in changing gear

### Problem

Folded or incorrectly fitted dowel pins

### Cause

Mechanical damage



### Perception

D.M.F. malfunction, friction noise

### Problem

Trace of liquid or solid grease from primary flywheel welding

### Cause

Defective primary flywheel

# 1

## F.A.Q. - Everything you want to know about Dual Mass Flywheel

### ***“Can I machine the D.M.F.?”***

DO NOT machine or resurface the Dual Mass Flywheel as it will affect its balance. If the flywheel is damaged, REPLACE it.

### ***“Can I use the bolts on the car to install the new D.M.F.?”***

It is not permissible to use the “old” bolts on the vehicle. Always use new bolts to fit the D.M.F. on the engine crankshaft.

### ***“What is the lifetime of a D.M.F.? Can I just change my kit and keep the old D.M.F.?”***

It is mandatory to verify the condition and the functionality of the D.M.F. and to always replace it if necessary. A simple diagnosis is given in this brochure by Valeo. Some tools manufacturers offer adequate tools for diagnosing the D.M.F. Yet a complete D.M.F. diagnosis can only be done on test benches by professionals. Valeo urges you to always change the D.M.F. during a clutch kit replacement to avoid early service linked to possible D.M.F. failures

### ***“I do not want to buy a D.M.F. Is there any other alternative?”***

Valeo offers the KIT4P range as an alternative to the Dual Mass Flywheel. KIT4P includes a rigid flywheel and a specific dampen type disc to perform necessary clutch function. Please refer to Valeo printed or electronic catalogues for the available Kit 4P product for your vehicle.

### ***“What are the limits of the D.M.F. technology (depending on gearbox type and R.W.D.)?”***

As mentioned in this brochure, as the engine torque to be transmitted increases, a more capable D.M.F. is required. The D.M.F. can be used with an efficiency up to 400 Nm. Above this engine torque, and especially on R.W.D. or 6M applications, a D.M.F. with an inner damper or L.T.D. D.M.F. is needed to perform correct D.M.F. function.

### ***“Can I fit a D.M.F. on a 6-speed gearbox?”***

Yes, but 6M gearboxes are noise sensitive and thus require better filtering. For these applications, a D.M.F. with an inner damper and an L.T.D. D.M.F. are recommended.

### ***“Can I fit a D.M.F. on an R.W.D. application?”***

R.W.D. applications generate higher engine torques and thus require improved torque transfer capacity. For these applications, an L.T.D. D.M.F. is the Valeo solution.

### ***“What is a D.M.F. module?”***

A D.M.F. module is the combination of a D.M.F. and a clutch kit with or without a bearing or C.S.C. The Valeo D.M.F. module enables a complete replacement. Individual pieces are not interchangeable with the competitor version but the combination can easily replace the competitor version without any problem.

### ***“What is a Flexible Flywheel? Is it a D.M.F. or a rigid flywheel?”***

A flexible plate can be present on both a rigid flywheel and a D.M.F.. A flexible plate is attached to the engine side of the flywheel to perform the required filtration. On a D.M.F., the flexible plate is attached to the primary flywheel.

### ***“Can we replace a flexible flywheel with a normal flywheel?”***

If the flexible plate is removed from the design, the strain on the crankshaft will be transferred to the flywheel. This will cause noise and an increased level of vibration. Thus, a flexible flywheel cannot be replaced with a flywheel without this function.

### ***“I hear noise from the D.M.F. when starting or stopping the engine. Is this normal?”***

When starting the engine, we cross the resonance frequency of the D.M.F.; therefore, an increase in noise is normal. However, this level of noise cannot exceed acceptance criteria on a new vehicle. This is ensured by design and an adequate starter. For a used vehicle, there are many factors that may impact noise when starting and stopping, and the D.M.F. may not be the only problem. In such a case, it is necessary to check all elements in the driveline as well as the battery, the engine mounts, exhaust system, heat shields, accessories etc.

Additionally, it is important to isolate any noise caused by front end accessories such as belt tensioning units or A/C compressors. To determine the source of the noise, a stethoscope can be used. A clicking noise when engaging or shifting gears, and during load changes, can originate in the power train, caused by excessive gear clearance in the transmission, play in the propulsion driveshaft or in the differential.

There are various causes of humming noise, for example resonance in the power train or imbalance of the D.M.F. exceeding admissible limits. A D.M.F. can be severely imbalanced, if e.g. the balance weights on the back are missing or the plain bearing is defective.

### ***“Do we need a specific tool to dismount or mount the D.M.F.?”***

No specific tool is required to dismount or mount a D.M.F.. The D.M.F. bolts must be renewed every time and adequate torque and angle must be applied during installation.

### ***“How can I test a D.M.F. to see if it needs replacing?”, “Can I get a tolerance chart for Valeo D.M.F.?”***

It is possible to determine whether the D.M.F. function is correct or not on the D.M.F. diagnosis section. Please refer to step-by-step instructions. There are tools supplied by certain service tools suppliers that can be used to measure D.M.F. tolerances. However, a complete D.M.F. diagnosis can only be performed on test benches by professionals. Valeo urges you to always change the D.M.F. during a clutch kit replacement to avoid early service linked to possible D.M.F. failures. A dropped D.M.F. must not be installed.

### ***“Can we check a D.M.F. without removing it from the vehicle?”***

This check can be performed using specific D.M.F. tools sold on the market. Valeo does not offer such a tool but provides a simple diagnosis method that can be followed with standard garage tools.

### ***“How can I find a cross-reference chart against other suppliers?”***

Valeo provides cross-references to both O.E. and I.A.M. in printed and electronic catalogues. For further information, please contact Valeo.



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Valeo Transmission Systems' mission is to be the supplier of choice for all powertrain architectures with innovative technologies developed for efficient and comfortable power transfer from the engine to the transmission, whilst reducing fuel consumption.

One of the key reasons that diesel cars and light commercial vehicles have become much quieter over recent years and less prone to rattling is the development of the **Dual Mass Flywheel** (D.M.F.) technology.

The D.M.F. allows driving at lower engine speeds increasing **engine efficiency**, thereby **saving fuel** and **reducing CO<sub>2</sub>** emissions as well as any vibration. D.M.F. production started in the 80s. Since then, Valeo has continued to strengthen its presence among different car manufacturers, making Valeo a key solution provider for designing and producing suitable D.M.F. for the improved driveline technologies.

This **technical handbook** is the opportunity to explain you D.M.F. design, composition, related advantages. You will find as well a diagnosis and a guide to explain common breakdown causes for your daily support. Last but not least, the most frequently asked questions will be addressed.

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