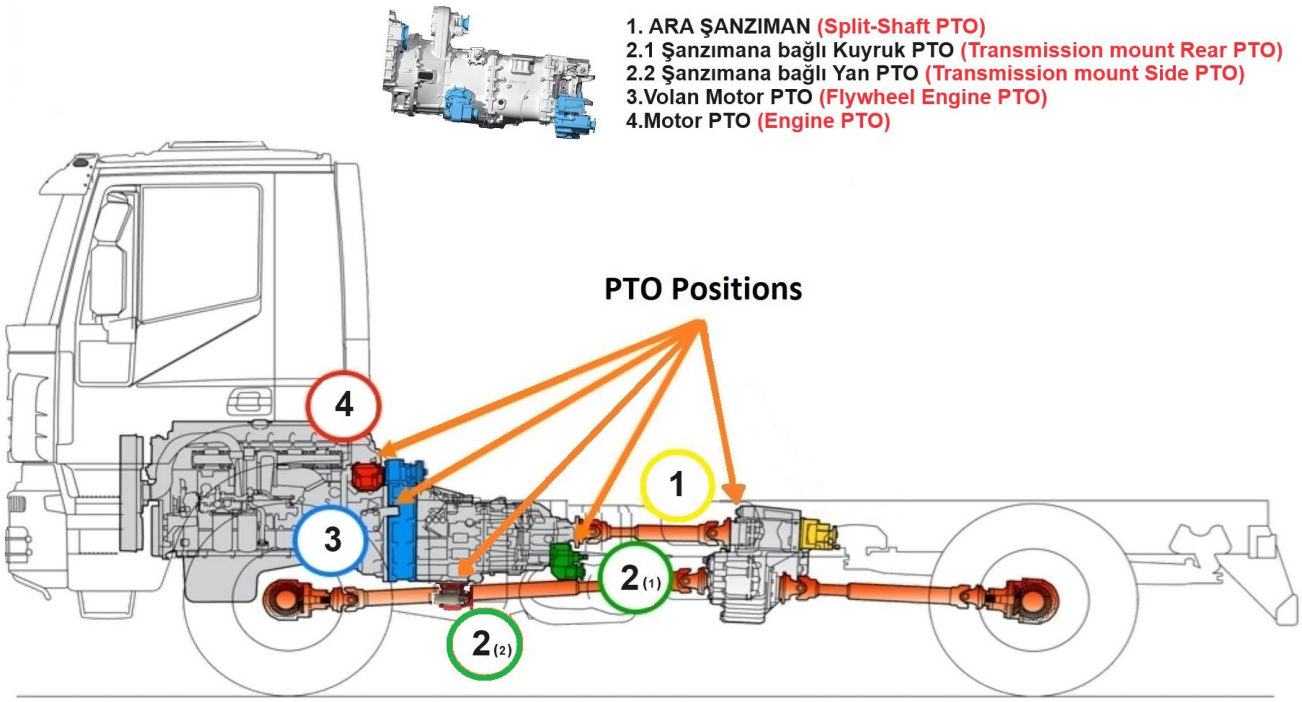
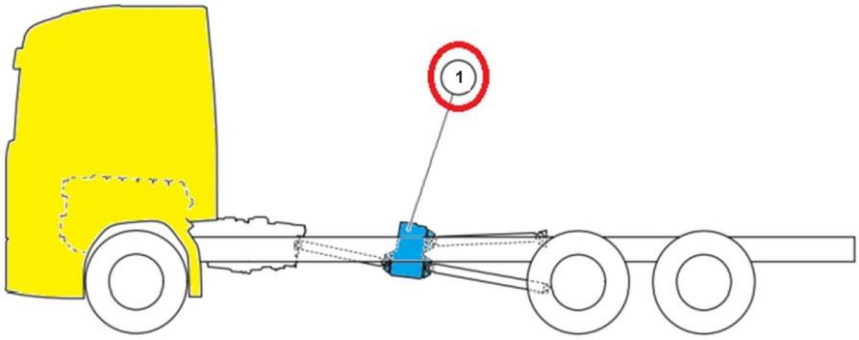
PARAMETERS CORRECTLY CHARACTERISING PTOs:

- Splift Shaft Gearbox-PTO, Transmission PTO, Flywheel and Engine PTO, Sandwich PTO, Off-Road Gearboxes, Control and Engagement Methods and Output Properties;

There are considerations to take into account to determine what type of PTO (Light duty-Heavy duty) or an Split Shaft (SS) PTO (Horizontal-Vertical) or a Reducer (RPM Increaser-Decreaser) or an Engine connected Flywheel PTO you need for your many superstructure applications such as Dump Trucks, Garbage Vehicles, Basket Platforms, Vacuum Trucks, Sewage Cleaning Trucks, Tow Trucks, Fire Trucks, Water Tankers, Road Sweepers, Concrete Pumps etc.

Knowing the PTO options for different types of vehicles, understanding their connection types, control types, engagement methods and output types will bring you one step closer to choosing the right product.

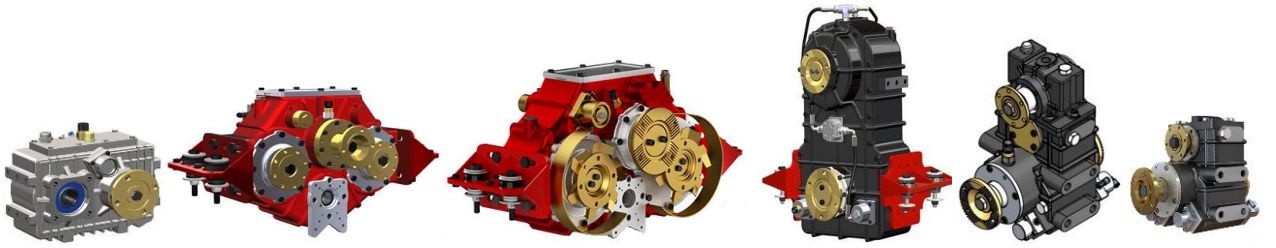




1-) SPLIT-SHAFT PTOs

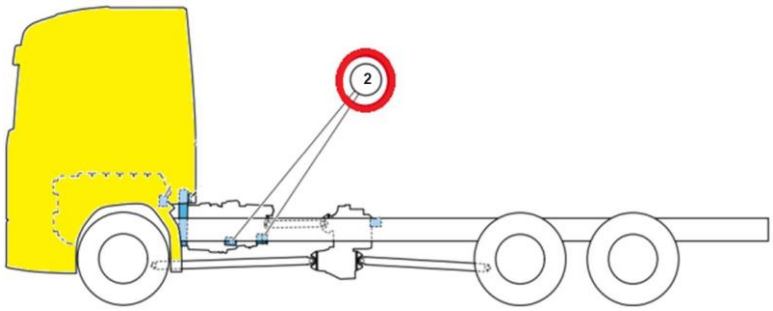
It is a PTO that is used in heavy duty vehicles such as firefighting, sewage cleaning, road sweeper, concrete pumps, water tankers, road line drawing / wiping vehicles, off-road vehicles when higher horsepower and torque are required. The cardan shaft between the transmission and differential of the vehicle is split and the PTO is then mounted between the cardan shafts. In addition to this, in cases where there is no PTO option in light commercial vehicles, it is installed between the transmission and differential of the vehicle and meets the single or double output PTO requirements. Since this type of PTOs take motion from the cardan shaft of the vehicle, it must be properly mounted on the vehicle chassis and the shaft vibrations must be well adjusted. There are various styles and sizes such as horizontal and vertical types according to the capacity of the vehicles and the type of vehicle top equipment to be applied. There is also a hydrostatic application in SS PTO applications. It eliminates the need for a second engine and reduces fuel consumption and noise pollution. It provides a comfortable ride with hydraulic drive reducing maintenance costs. It is designed with 3 and 4 outputs for the installation of heavy-duty hydraulic pumps and variable flow hydraulic pumps to be used. Some applications are road sweeper vehicles, snow ploughing vehicles, salt spreading vehicles, airport service vehicles. It offers superior performance in situations where many jobs can be done at the same time, both driving of the vehicle and the running of the equipment.

HORIZONTAL PTOs **VERTICAL PTOs**



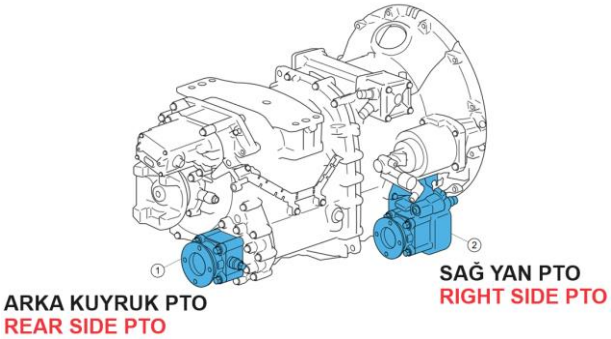
Light-Duty **Midium-Duty** **Heavy-Duty** **Heavy-Duty** **Midium-Duty** **Light-Duty**

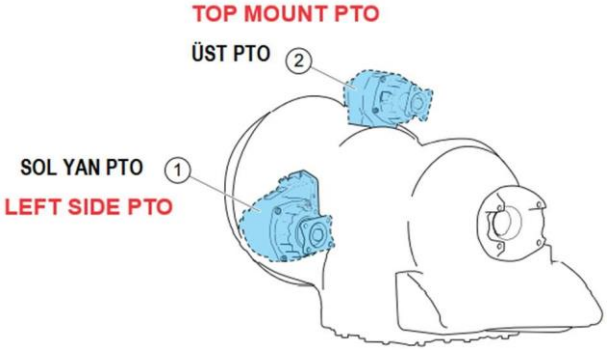
HORIZONTAL PTO APPLICATION **VERTICAL PTO APPLICATION**



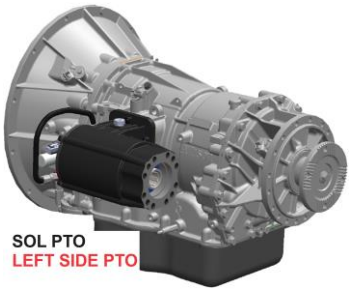
2-) TRANSMISSON MOUNTED PTOs;

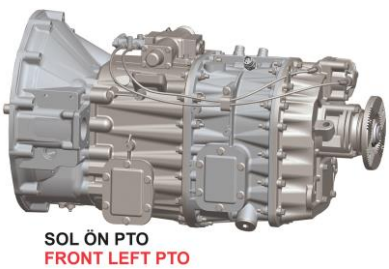
There are covers for PTO mounting on the main transmission of truck brands. These PTO mounting covers are usually available on ZF, EATON, FULLER, CLARK, PACCAR transmissions on the rear side or on both sides- right and left- or at the top and bottom. PTOs are mounted using a series of stud/bolt and gasket kits by removing the cover from the transmission. Afterwards, it is activated by the driver according to the PTO type and the drive force originates from the meshing gear. They are gearboxes that transfer power to components such as a hydraulic pump or a water pump. With the oil flow provided by the hydraulic pump, it provides power transfer to the hydraulic cylinders in the vehicle (such as dump trucks, garbage trucks) or to components such as water pump (such as fire trucks) or high pressure jetting pump or vacuum blowers/vacuum pumps (such as vacuum trucks, sewage cleaning vehicles) or suction pumps.

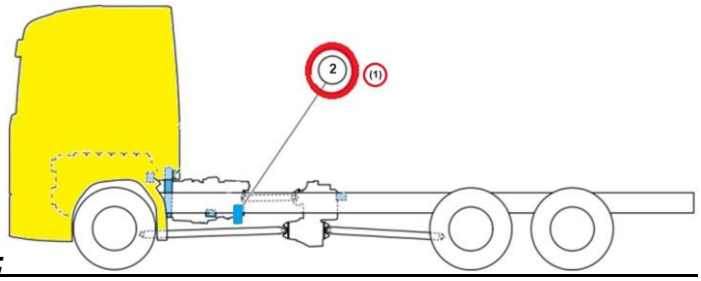




Some transmissions have these covers on the top and bottom (ALLISON or EATON-FULLER brand transmissions). PTOs are mounted by removing the cover from these transmissions in the same way and using a series of stud / bolt and gasket kits. Afterwards, it is activated by the driver according to the PTO type and the drive force originates from the meshing gear. They are gearboxes that transfer power to components such as a hydraulic pump or a water pump. With the oil flow provided by the hydraulic pump, it provides power transfer to the hydraulic cylinders in the vehicle (such as dump trucks, garbage trucks) or to components such as water pump (such as fire trucks) or high pressure jetting pump or vacuum blowers/vacuum pumps (such as vacuum trucks, sewage cleaning vehicles) or suction pumps.

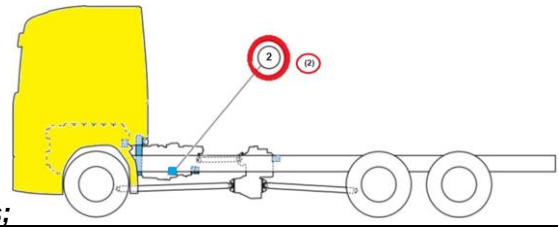






2.1 REAR SIDE PTOs;

It is the most widely used PTO type in light and heavy duty commercial vehicles, mostly in the European market. They are powered by the output from the 4-bolt cover (5 o'clock position) behind all manual, semi-automatic and fully automatic transmissions. Depending on the transmission types, they are sometimes powered by a drive shaft. They are also stronger and longer lasting due to easier installation and higher torque limits. They are more compatible with all hydraulic pumps in DIN standard. Depending on the type of equipment to be installed on the vehicle, it can have a single output and double output, i.e. it can activate either a single pump or a double pump at the same time. (hydraulic pump, water pump or blower pump etc.)



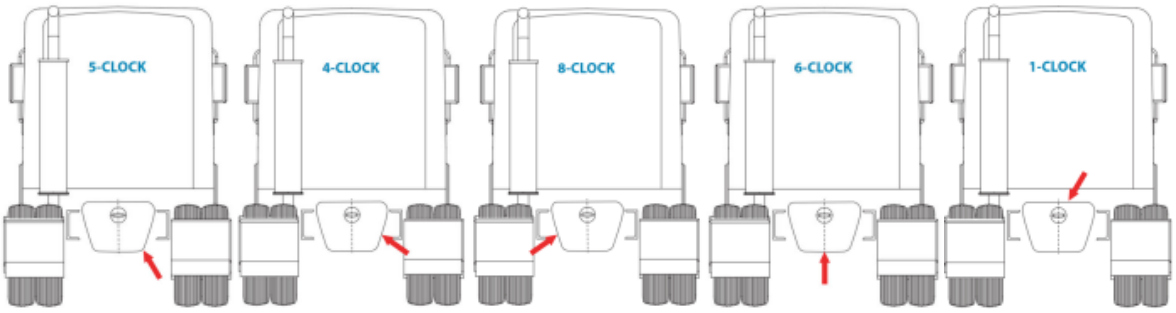
2.2 RIGHT-LEFT SIDE / TOP-BOTTOM MOUNT PTOs;

PTOs mounted on the right side (4 o'clock) or left side (8 o'clock) are the most commonly used PTO type in manual, semi-automatic or fully automatic transmission types available in light and heavy duty commercial vehicles in the Asian, American and partly European markets. Due to its position on the transmission, some different model transmissions have bottom (6 o'clock) or top (1 o'clock) mounting. In this type of gearboxes, the motion originates directly from the transmission gear. Side mounted right/left or top/bottom PTOs usually mounted on the 6-bolt, 8-bolt and 10-bolt cover of the transmissions.

(6 bolt PTO)

(8 bolt PTO)

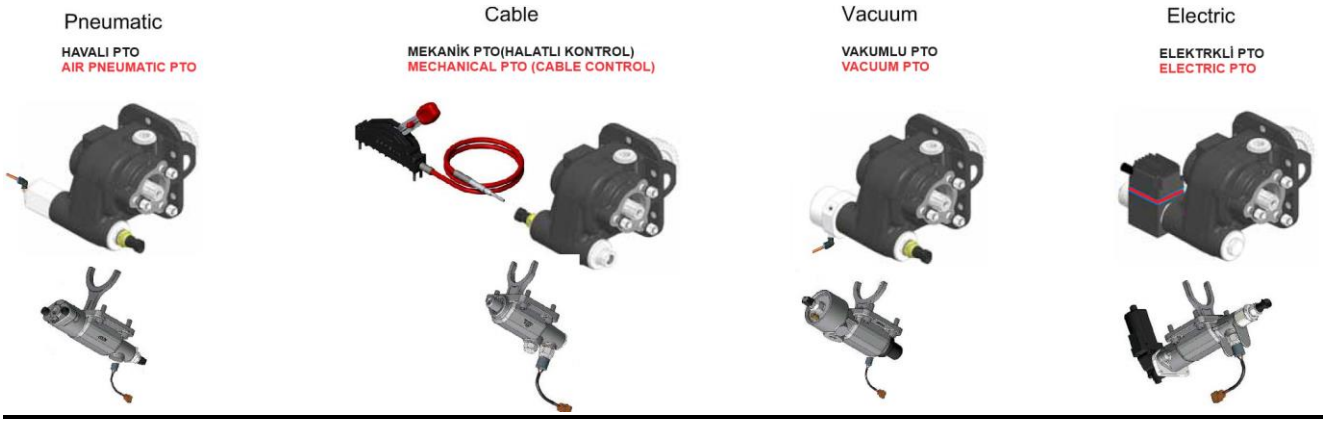
(10 bolt PTO)



2.3 PTO CONTROL & ENGAGEMENT METHODS;

PTOs, as gearboxes that transfer motion and power, have some activation and deactivation methods in order to activate the pumps to which they will transmit the motion. These are respectively;

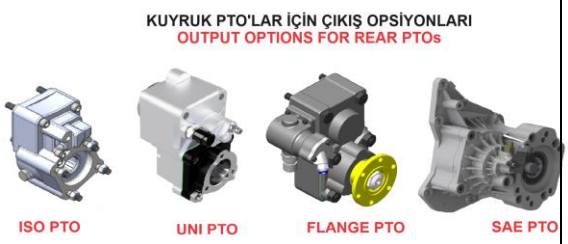
- Pneumatic type PTOs are the most common type in the market. The PTO is activated by the air pressure from the line drawn from the vehicle's air compressor. They work at min. 6 bar, max. 8 bar air pressure.
- b) Mechanical type PTOs, mostly in light duty vehicles without air compressor, are PTOs that can be engaged and disengaged manually by pushing/pulling the PTO shaft (like in handbrake) by means of a cable or steel rope system.
- c) Vacuum type PTOs are the ones that can be controlled by vacuum / suction with a line drawn from the vehicle's own brake vacuum tank according to the model.
- d) Electric PTOs are the ones that can be controlled by means of an electrical control panel specially designed for the PTO at 12 volt in light duty and at 24 volt in heavy duty commercial vehicles.

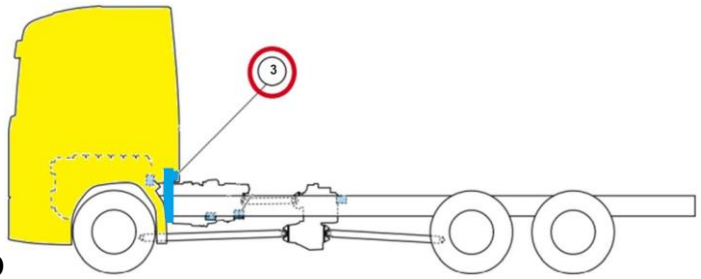


2.4 PTO OUTPUT OPTIONS;

PTOs, as gearboxes that transfer motion and power, must be compatible with the pumps to which they will transmit this power. Some of the common PTO output types are listed below:

a) ISO output (DIN 5462) for pumps connected with 4 bolts.
b) UNI output is for pumps with 3 bolts.
c) Flanged output (DIN 1120, DIN 1300) is a type applied by installing a cardan shaft for significant distance between the PTO and the pump.
d) SAE B 2 and 4 bolted, SAE B-B, SAE C outputs are 2 bolted output types in accordance with American standards used in pumps.
To provide these outputs, adapters are available for fixing on the PTO output afterwards.

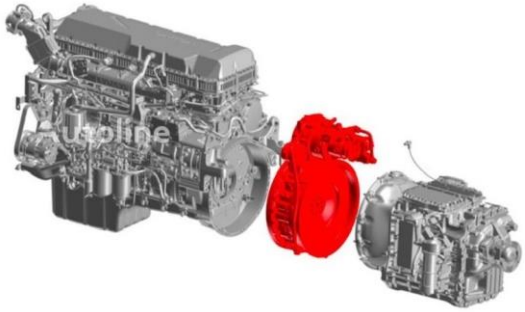




3-) FLYWHEEL ENGINE PTO

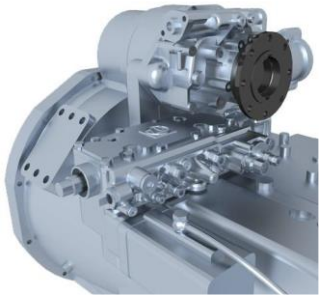
For heavy tonnage vehicles, it is a very powerful PTO mounted between the vehicle's engine flywheel housing cover and the transmission, transferring all engine power and torque. PTO output can be fixed drive or clutch. The ones with fixed drive are for vehicles that need to operate continuously while driving (such as mixer trucks). (such as fire trucks or snow ploughs) The clutch output models have the feature of being activated or deactivated at any time (for applications such as fire trucks or snow ploughs). With its modular design, it provides combination with SAE type automatic and manual transmission and engine systems. It works independently of the clutch and provides the necessary high power transmission for concrete mixing vehicles such as mixer trucks that require high torque and need to operate continuously, or to operate high pressure water pumps in fire trucks, or in vehicles such as drilling machines and snow ploughs. This type of PTOs has extra robustness compared to SS PTOs thanks to its static position as well as not disturbing the aerodynamics of the truck.

3.1 PTO OUTPUT FIXED DRIVE APPLICATION:



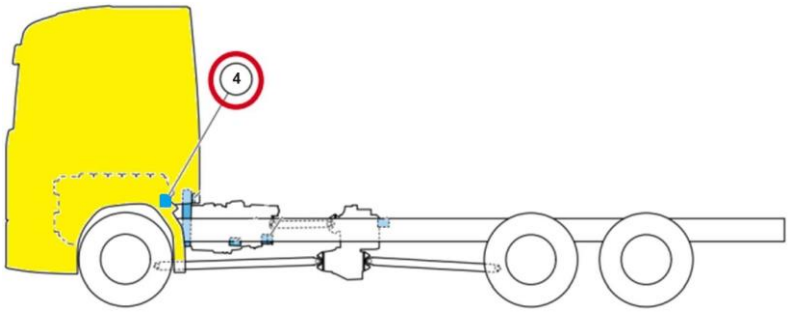
3.2 PTO OUTPUT CLUTCH (NMV) APPLICATION:

VOLVO



MERCEDES-BENZ

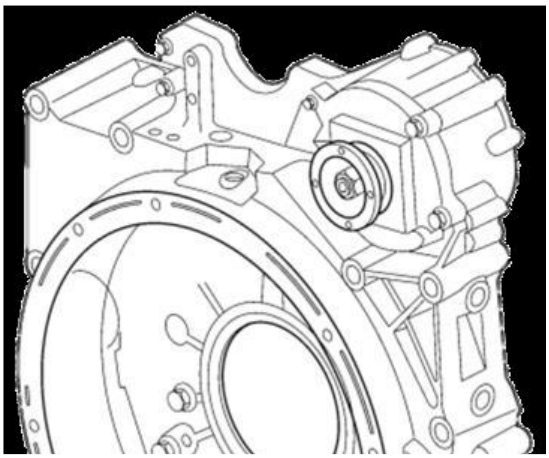
SCANIA

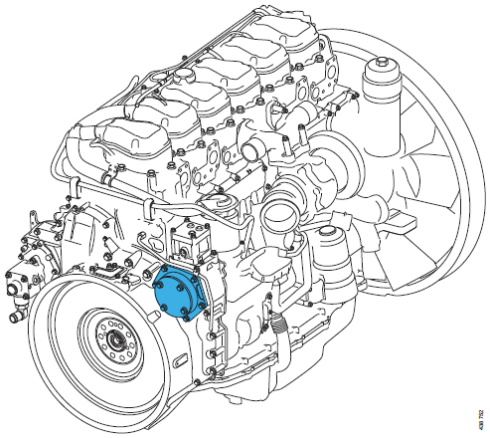


4-) ENGINE PTO:

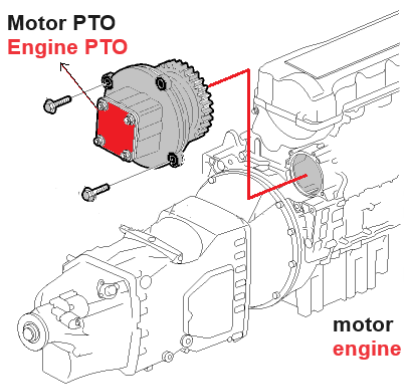
They are mounted on the flywheel cover housing located between the engine and transmission of the vehicle, and in some vehicles, they are mounted on the cover with 2 and 3 bolts (Mercedes trucks), 4 bolts (Renault and Scania trucks), 5 bolts (Man and Scania trucks), 6 and 8 bolts (Man, Mercedes, Ford, Iveco trucks) according to the type of vehicle (2 o'clock). They directly transfer the movement they receive from the engine (concrete mixer mixer trucks, snow ploughs, etc.). These types of PTOs have ISO 4 bolt output with flange output or hydraulic pump suitable connection according to the work to be done. Generally, OEM factory mixer type comes built-in on all vehicles. Flywheel housing cover and PTO are installed later on the vehicles to be equipped with mixer top equipment.

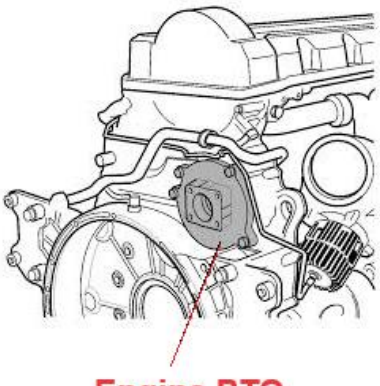
4.1 PTO APPLICATION ON FLYWHEEL ENGINE COVER - 4.2 PTO APPLICATION ON ENGINE :

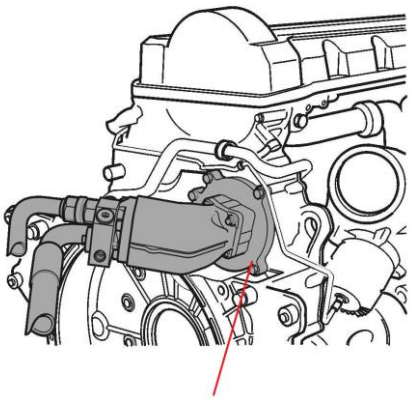


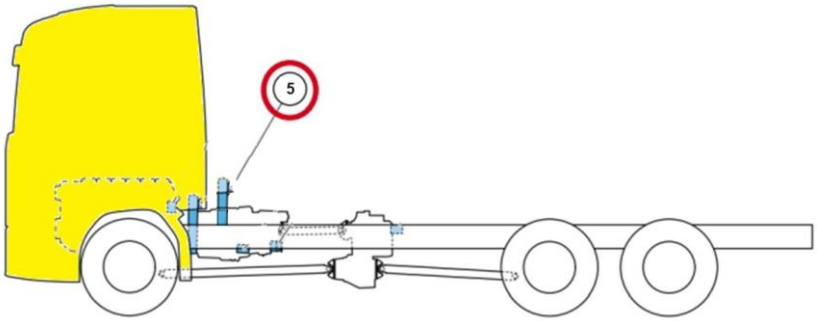


4.2 ENGINE PTO AND HYDRAULIC PUMP MOUNTING APPLICATION:



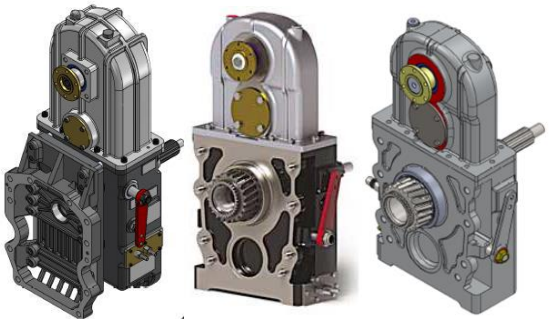


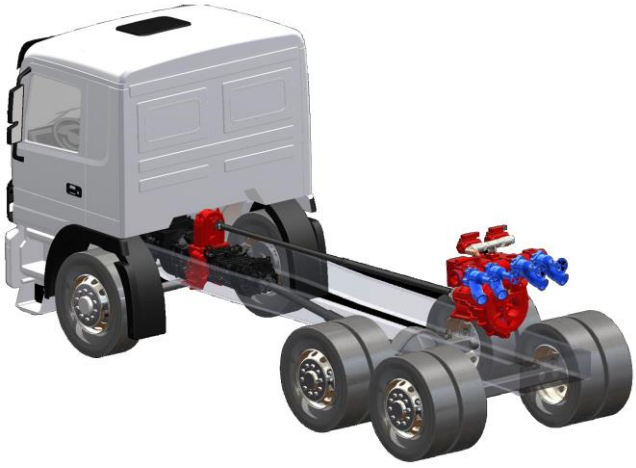


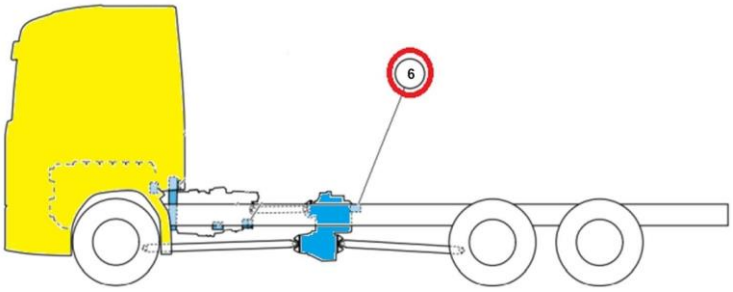


5-) SANDWICH PTO

Sandwich PTOs designed for light tonnage vehicles are used in applications where other PTO types cannot provide the power required for the vehicle's superstructure. Since these PTOs are mounted between the gearbox of the vehicle and the gearbox engine cover, they are called sandwich PTOs. It takes the movement and power directly from the engine. These PTOs do not disturb the aerodynamics of the truck compared to the SS PTOs, as well as having extra robustness thanks to its static position. It is generally preferred in light tonnage fire trucks and can operate continuously for long hours.



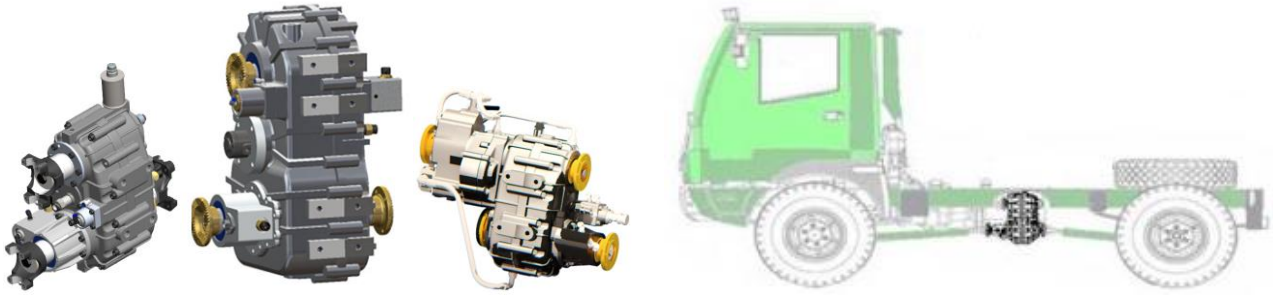




6-) TRANSFER CASE (4X4 – 6X6)

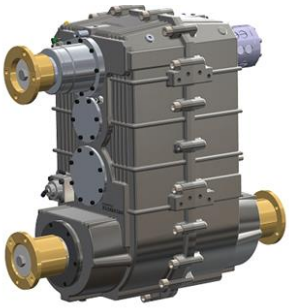
6.1 4X4 TRANSFER CASE

Off-road gearboxes are designed for off-road vehicles and are mounted by splitting the cardan shaft between the vehicle's gearbox and differential, and take motion directly from the shaft at the vehicle's gearbox output. It increases the driving torque of the vehicle and makes it more suitable for use in off-road conditions. The vehicle can be used at heavy and fast speeds according to the terrain condition, as well as doubling the number of available gears. 4x4 Off-road transmissions are a dual-speed transmission with differential locking feature according to their types. Additionally, PTO can be installed in some models for hydraulic pump connection according to the type of upper equipment of the vehicle. In models with differential locking feature, it provides moving without spinning in difficult conditions by equalising the rotation moment of the shafts going to the front and rear differential of the vehicle. In some models, they are mounted on the transmission of the vehicle with cardan shaft, in some models they can be mounted directly on the transmission. Depending on the vehicle model to be used in light / medium / heavy duty vehicles, they can be 2-axis or 3-axis, some models have self-lubricating lubrication system and self-lubricating features. Pneumatic control is provided. They are designed to be used in mountainous and rugged terrains in applications such as civil and military vehicles, ambulances, fire trucks, emergency response vehicles, seismic research vehicles, railway line maintenance vehicles to be used in rugged terrains.



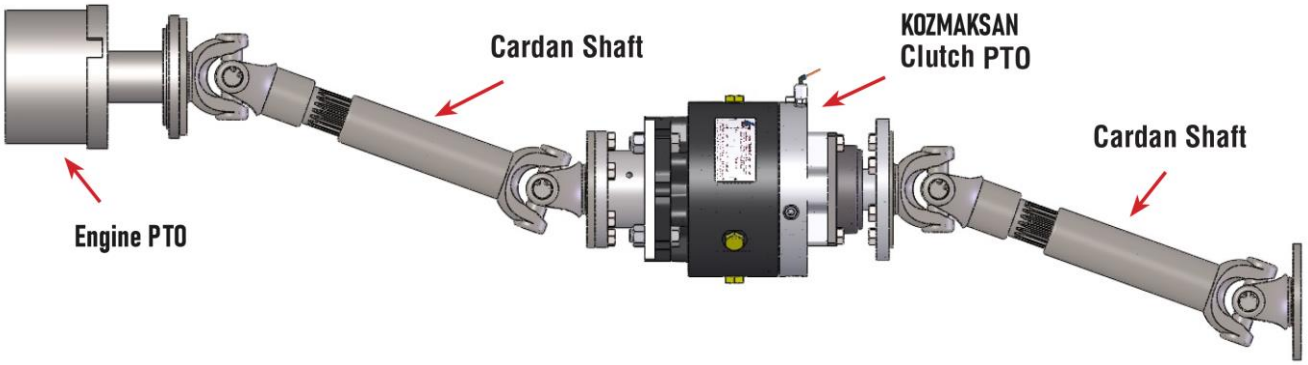
6.2 6X6 TRANSFER CASE

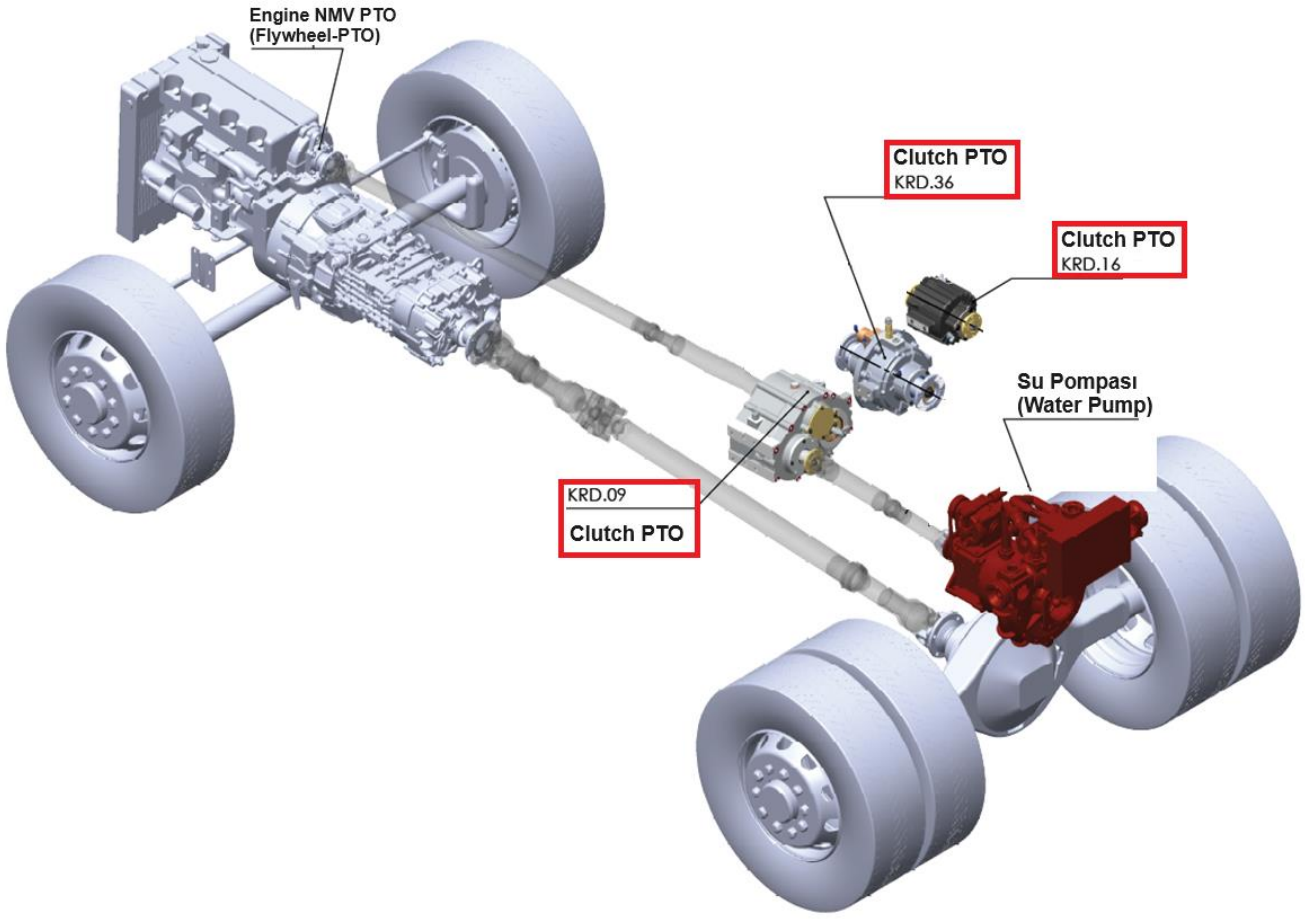
These gearboxes are designed for heavy duty 6x6 off-road vehicles and are mounted by splitting the cardan shaft between the transmission and differential of the vehicle and receive motion directly from this shaft. The gearbox has 2 cycle ratios: fast and slow. Differential system is available in the product. The internal design is made in accordance with all kinds of terrain conditions and heavy working conditions with gears, shafts, rotating parts and sealing equipment. It is used in vehicles such as heavy-duty fire brigade vehicles that will intervene in airport ARFF type fast and serial fires or articulated rock dump trucks that will carry heavy marble, excavated material, stone and rock in mines.



7-) CLUTCH PTOs

This type of PTOs take motion from the Engine PTO of the vehicle and transmits power to any pump (water pump, etc.) by means of the cardan shaft. It is designed for engagement and disengagement for situations where the upper equipment or pump needs to be stopped while the vehicle is in motion.
Clutch PTOs are pneumatically operated and can be used with flanges, adapters and universal shafts in all ISO standards. It can be mounted directly on PTO and SS PTOs with suitable adapters or with cardan shaft. In order not to damage the clutch discs, it must be used according to the instructions. KRD.16 and KRD.36 ad KRD.09 type clutch PTOs are usually used in fire trucks to be used in city and forest fires and have patented design.





8-) RPM INCREASER / DECREASER

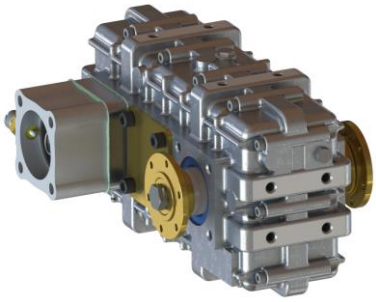
These gearboxes are powered by a PTO source and used to provide required rpm for the equipment such as water pump, vacuum pump or a blower pump by increasing or decreasing the speed. They are designed in two-axis and three-axis variants for light, medium and heavy applications according to the vehicle and superstructure requiring rpm increase/decrease. These gearboxes allow horizontal and vertical mounting. They are suitable for high operating speeds with cooling system. In terms of working efficiency, it should be well adjusted in position and the connection brackets should be properly fixed. Shaft angles should be adjusted very carefully in absence of which noise can appear.

Extra strong; It has a special structure ready to work in all kinds of heavy conditions with gears, shafts, rotating parts and sealing equipment. While robustness is ensured with the special body made of aluminium alloy material, the weight is kept as low as possible. One main input and up to five main outputs can be provided on these gearboxes. Flanges, adapters and cardan shafts in all ISO standards can be fitted on the outputs. If desired, a synchromesh separator can be fitted on the outputs to independently engage and disengage the hydraulic pumps, water pumps or other components to be run.

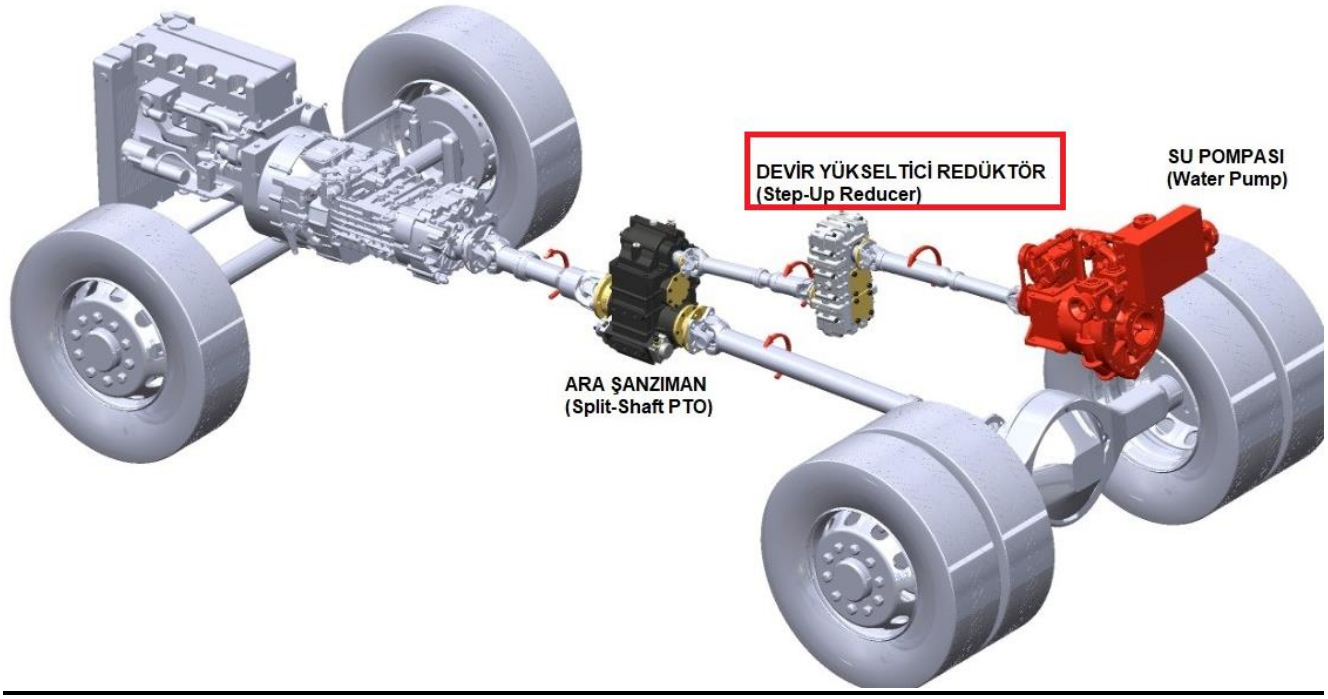
The main outputs can also provide ratios of 1/0.41, 1/0.79, 1/0.89, 1/0.94 (speed reduction) and 1/1.26, 1/1.33, 1/1.51, 1/1.61, 1/1.69, 1/2.02, 1/2.42 (speed increase). Generally, it is frequently used in fire trucks, vacuum trucks, road maintenance and environmental cleaning vehicles such as water tankers to increase or decrease the speed from the PTO source.

A single inlet and outlet (with a flange)

A single inlet and two outlets (with a flange)



A single inlet and two outlets (with a flange and ISO type output)


DEVİR YÜKSELTİCİ REDÜKTÖR
(Step-Up Reducer)
SU POMPASI
(Water Pump)
ARA ŞANZIMAN
(Split-Shaft PTO)