



## Secondary air charger

### Compact – light-weight – powerful

**Exhaust gas emissions in the FTP-75 cycle are recorded from engine start-up onwards, that is, in the cold start phase, before the catalyst has reached its operating temperature. Due to stricter legislation regarding exhaust gases in petrol engines, specific measures have to be taken to reduce emissions during the cold start.**

MANN+HUMMEL develops and produces air intake components and complete air intake systems – from the dirty air inlet, via the air filters, to the clean air side – as well as peripheral equipment for these systems.

Emissions in the cold start phase can be drastically reduced by feeding fresh air into the exhaust system. Electrically-driven secondary air pumps have been used for many years for this purpose. However, MANN+HUMMEL has developed a new system for secondary air injection, the secondary air charger. This compact unit is driven by the pressure difference at the throttle body, is light-weight, and highly efficient.

## Secondary air charger with plastic wheels

Petrol engines require a relatively rich mixture for a smooth cycle on cold start. If the catalyst and the lambda probe have not yet reached their operating temperatures, the exhaust gases contain high levels of CO and hydrocarbons.

By feeding air into the exhaust manifold (secondary air), CO and hydrocarbons are oxidised through afterburning at temperatures of over 600 °C to form H<sub>2</sub>O and CO<sub>2</sub>. This exothermal reaction increases the exhaust gas temperature and thus warms the catalyst more quickly. The quantity of unburned material in the exhaust is also reduced.

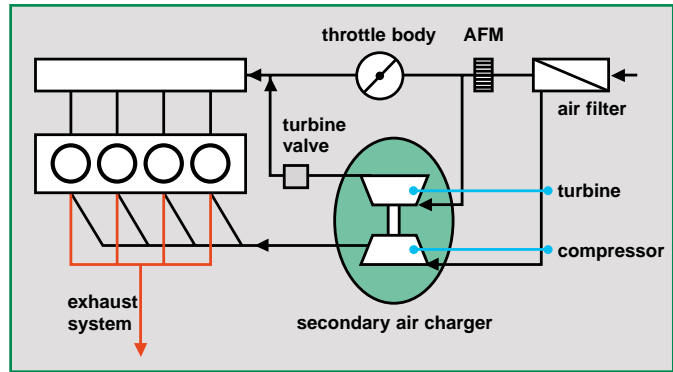
For short warm-up time, a high secondary air flow rate must be achieved within the first few seconds of start-up. It is therefore essential to have good response behaviour. The air flow is maintained until the lambda control is in operation. Once the probe and catalyst have reached their operating temperature, a valve cuts off the secondary air flow.

The secondary air charger offers an economical and effective alternative to the electrically-driven secondary air pump. It consists of a turbine and a compressor. The turbine is driven by the pressure drop at the throttle body. The bypass air flow and the flow at the throttle body feed the engine with fresh intake air during the cold start. At the same time, the compressor feeds secondary air into the exhaust system through a valve assembly. The turbine performance – and thus the compressor mass flow rate - is controlled by a valve fitted between the turbine outlet and the intake manifold.

Application of the secondary air charger is extremely flexible. It can be connected to the air filter directly with the compressor inlet, so that no compressor inlet duct is required. When combined with the turbine valve, it can also be integrated into the intake manifold. If the secondary air charger is used as a stand-alone unit, it no longer needs to be connected to the air filter, as there can be a separate air filter at the compressor inlet.

### Advantages

- Less weight, compared with secondary air pumps
- Requires less space than secondary air pumps
- Faster response time
- Versatile integration into the air intake system
- Does not require an electric power supply

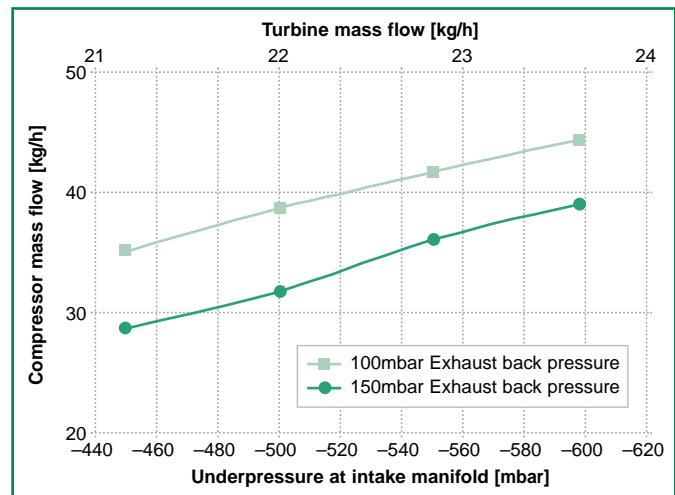


Functional principle of the secondary air charger



The size of the secondary air charger, compared with the secondary air pump

Friction and inertia are reduced by using injection-moulded glass-fibre reinforced plastic wheels, and performance is therefore significantly improved.



Performance data at different back pressures

