

VACUUM PUMPS

The braking system is one of the most important systems in any vehicle. To ensure that a constant and effect brake power is accessible at all times, the use of a vacuum pump is often necessary. Most vehicle brake boosters use a vacuum that is generated by the naturally aspirated engine. Current engine development projects mainly aim to increase the efficiency of drive concepts and further conserve resources. Substantially lower fuel consumption can be achieved by e.g. running the engine as unthrottled as possible, which under certain operating conditions, may result in an insufficient vacuum supply from the combustion engine for brake boost.

Some even more advanced drive concepts, such as hybrids are not even capable of generating a vacuum. In order to meet current safety standards and maintain convenient operation of cost effective, conventional brake systems with pneumatic brake servo boost an alternative or additional vacuum generation is required.

Special features:

- Reduction of energy consumption
- Supporting the reduction of carbon emissions
- Engine independent vacuum servo
- Flexible installation location
- Non-lubrication system (no lubrication circuit connection required)
- Continued utilization of cost effective, conventional brake systems for alternative drive concepts.

UP28 VACUUM PUMP

The UP28 vacuum pump can be triggered on demand to support the brake booster. If the combustion engine does not supply sufficient vacuum under certain operating conditions, i.e. cold start/warming up phase, the UP28 supplies the vacuum to ensure brake booster operation.

The UP28 is installed parallel to the main combustion engine. The UP28 sucks in filtered air via the brake booster and flexible pipes. To enable accurate pressure measurement by the control unit, non-return pressure valves are installed (see diagram). The electric contact between the UP28 and the control unit is established via a cable equipped with an engine compartment plug attached to the vacuum pump.

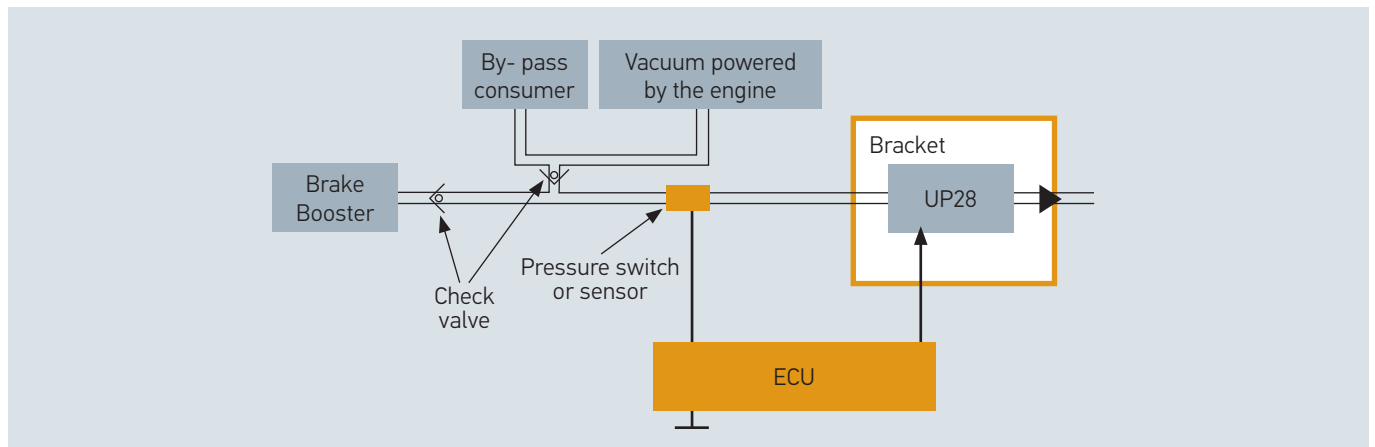
UP30 VACUUM PUMP



The cost advantage of conventional brake systems with a pneumatic brake servo boost can be used in future hybrid / fuel cell vehicle by incorporating a vacuum pump. These pumps supply the necessary vacuum independent from the drive concept. The UP30 supplies a vacuum to the brake booster and, if necessary to the accessories. As with the UP28 the UP30 is installed in the pneumatic section of the brake system. The difference is that the UP30 provides a stand-alone vacuum supply to the brake booster.

UP28 TECHNICAL DATA

	UP28
Operating temperature range	-40 °C ... +100 °C (< 20 min. up to +120 °C)
Voltage range	10,5 V ... 16 V
Maximum vacuum level	≥ 86 % (below ambient pressure level)
Pressure build-up time at 100 hPa ambient pressure, 12 V	$p_{abs} = 500 \text{ mbar}$ in $t \leq 6 \text{ sec}$ $p_{abs} = 300 \text{ mbar}$ in $t \leq 12 \text{ sec}$
Test volume	Approx. 3.2 l
Pump operating time	> 600 hours
Switching operations	> 450,000
Weight	< 1 kg



UP30/32 TECHNICAL DATA

	UP30	UP32
Operating temperature range	-40 °C to 120 °C	-40 °C to 120 °C
Voltage range	10 V ... 16 V	10 V ... 16 V
Maximum vacuum level	≥ 86 % (below ambient pressure level)	≥ 86 % (below ambient pressure level)
Pressure build-up time at 100 hPa ambient pressure, 12 V	$p_{abs} = 500 \text{ mbar}$ in $t \leq 4 \text{ sec}$ $p_{abs} = 300 \text{ mbar}$ in $t \leq 8 \text{ sec}$	$p_{abs} = 500 \text{ mbar}$ in $t \leq 3.4 \text{ sec}$ $p_{abs} = 300 \text{ mbar}$ in $t \leq 6.6 \text{ sec}$
Test volume	Approx. 4 l	Approx. 5 l
Pump operating time	≥ 1200 hours	≥ 1200 hours
Switching operations	> 1,200,000	> 1,200,000
Weight	< 1.7 kg	< 1.7 kg

