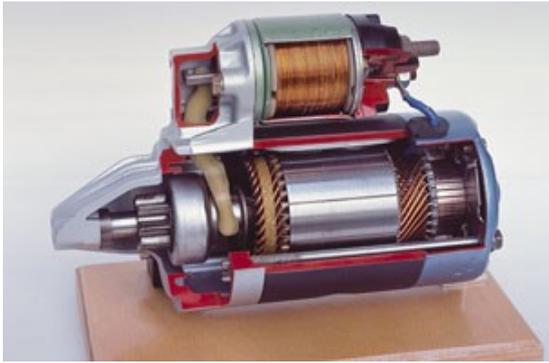


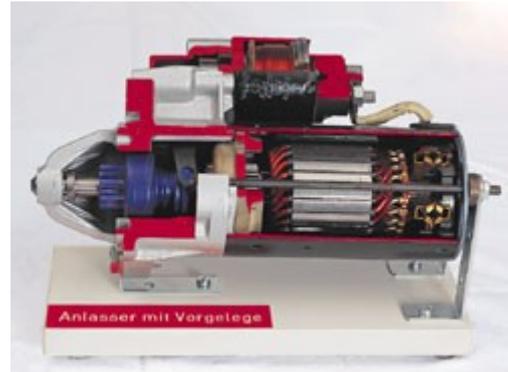
HAKO cut-away models

12: Motor Vehicle Electrics, Pumps, Engine Test Stands, Other Models



**Order No. 1003
Starter**

- parts cut in this model: solenoid switch, housing and windings
- armature can be rotated and solenoids switch actuated
- engaging the starter pinion can be demonstrated



**Order No. 1056
Starter with back gears**

- Demonstration:
- as per order no. 1003
 - plus: the function of the planetary gearing is easy to identify



**Order No. 1191
Sliding gear starter (truck)**

- Demonstration of the following functions:
- multi-disk clutch
 - turning of the rotor and the pinion
 - starter and control solenoid switches
 - moving contact and ratchet
 - meshing, starting and disengaging



**Order No. 1093
Ignition distributor - battery ignition**

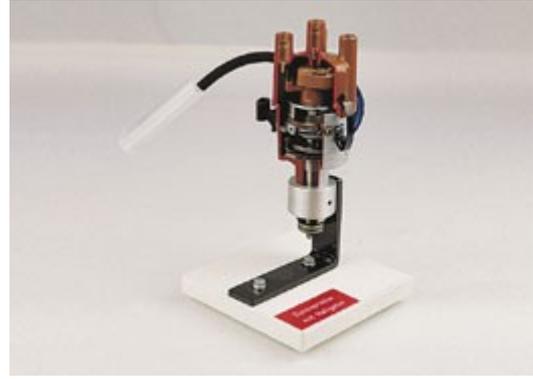
- Function of distributor rotor and contact breaker,
Ignition distribution,
Centrifugal advance,
Vacuum advance (is demonstrated with the aid of a vacuum syringe).

HAKO cut-away models



Order No. 1094
Ignition distributor with induction

Function as order no. 1093
In addition: Function of induction sensor.



Order No. 1095
Ignition distributor with hall sensor

Function as order no. 1093
In addition: Function of hall sensor.



Order No. 1125
Magneto ignition

Base plate layout:
Lighting armature, ignition armature, condenser, contact breaker,
pole wheel with permanent magnets and contact- breaker cams.



Order No. 1215
Ignition model case

3 cutaway distributors (induction, Hall, contact breaker),
magneto ignition
2 cutaway ignition coils, one uncut
1 cutaway vacuum cell, 2 distributor rotors (one with
speed limiting device)
Ignition cable with connector plug and 4 different spark
plugs
One cutaway ignition control unit

HAKO cut-away models



**Order No. 1085
Generator**

- visible parts:
- rotor with coil and slip ring
- regulator with carbon brushes
- power and exciter diodes
- stator with stator winding



**Order No. 1192
Internally-ventilated generator**

The new generation of generators has the following characteristics:

- rotor with windings and commutator rings
- regulator with power and exiting diodes
- stator with stator winding
- ventilation by internal blower wheels



**Order No. 1279
Generator, water-cooled**

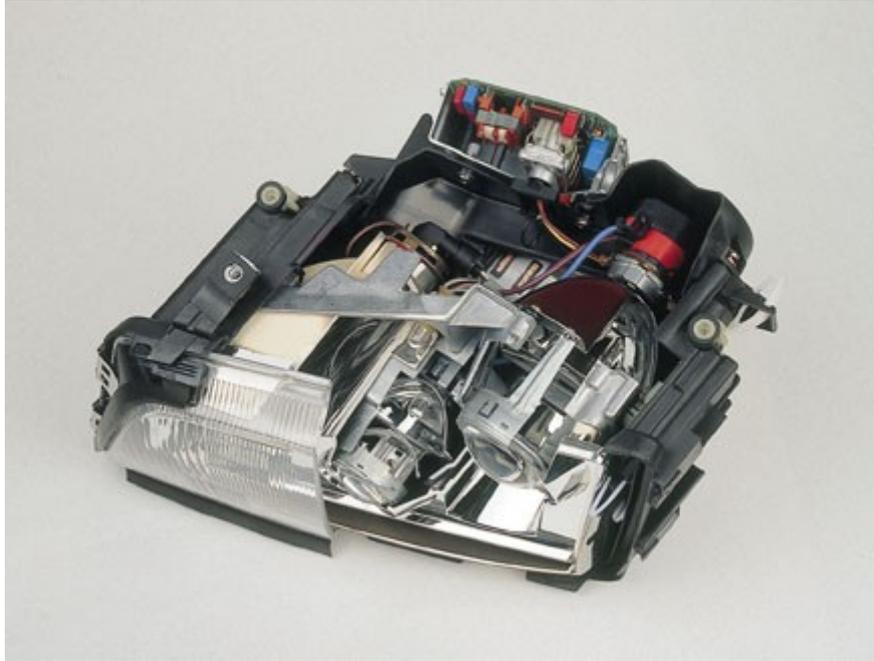
For large outputs (above 2 kW), water-cooled generators are used nowadays.

The following components are easy to recognise:

- water jacket in the outer part of the housing
- field and anchor coiling
- output and exciter diodes
- stand and anchor

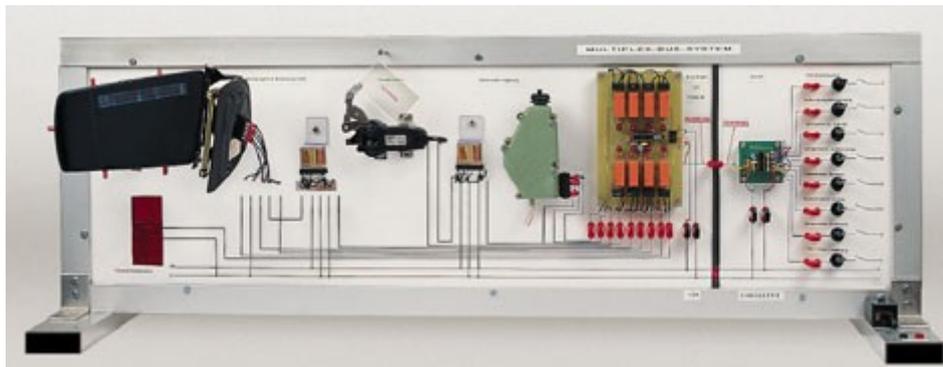
The moving parts of the generator are easy to turn.

HAKO cut-away models



Order No. 1284 Xenon headlights

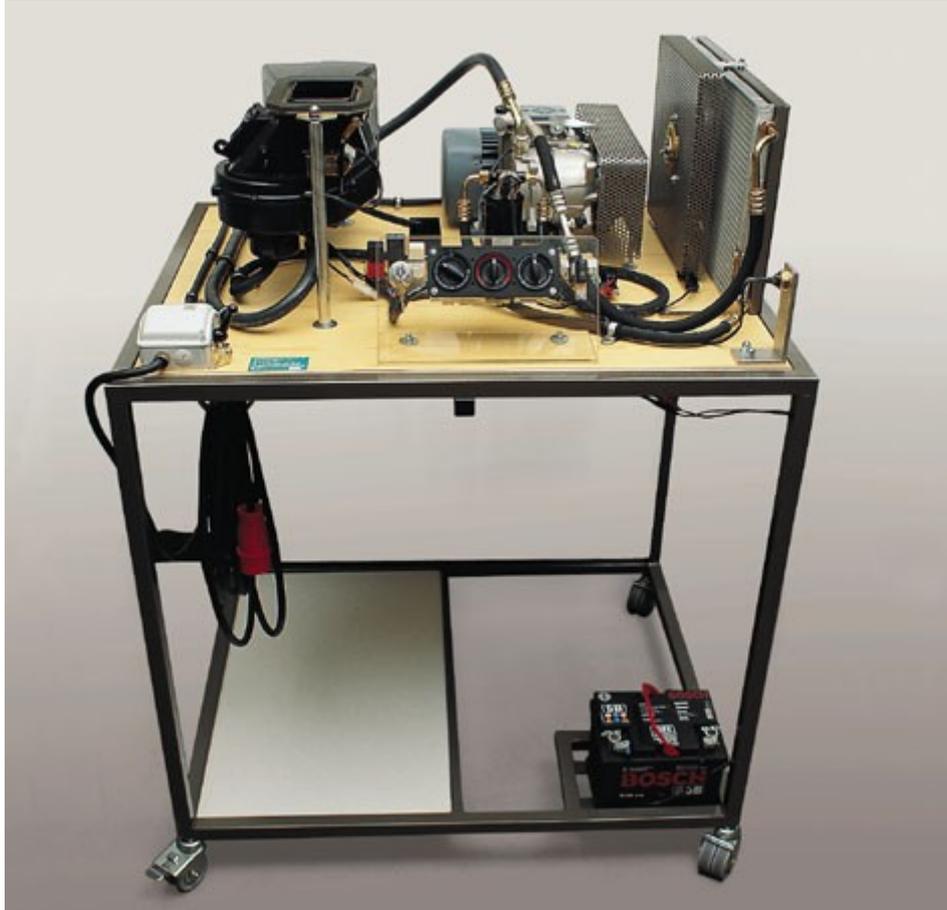
The cutaway model shows a section through a modern xenon headlight. The control device and the ignition coil needed for a gas-discharge lamp have been cut away. In addition, the headlight, with the result that the lens, the reflector, the beam orifice and the gas-discharge lamp can easily be seen. The device for the dynamic headlight range adjustment and the setting device can easily be operated by hand.



Order No. 1243 Data bus

In the Daimler Benz "Actros", a data bus is used instead of the harnesses used up to now. Signals are sent via 3 lines for each consumer and the corresponding consumers actuated via a decoder and encoder (transmitter and receiver). In our model, the consumers of a door are actuated (mirror adjustment in 2 directions, mirror heating, central locking, window winders and one light). The actuation of the consumers can be measured via measurement bushes. The data signals can be portrayed with any customary oscilloscope. The Multiplex data bus replaces an entire cable tree with one data line.

HAKO cut-away models



Order No. 1237
Air- conditioning

The air-conditioning is based on a supplementary equipment kit for the Audi A4. It is driven by a 3.8kW electric motor (400V, 3-phase). The painted stator is equipped with steering brake rollers and has a 12V battery under the air-condition unit and a storage compartment for measuring equipment. The unit is already filled with coolant and can be operated without additional equipment. All the test connections for measurements exists. The 12V and 400V switch can be locked, two keys are supplied.



Order No. 1216
Silencer

This cutaway silencer enables the inner workings of a silencer to be studied.
Front silencer.



Order No. 1217
Main silencer

HAKO cut-away models



Order No. 1208
Swivel-vane vacuum pump for diesel engine

Swivel-vane vacuum pumps are currently the state of the art for creating the vacuum required for brake power assist units for diesel engines. Negative pressures of up to 0.98 bar are possible. By turning the eccentrically-positioned rotor it can be seen how the swivel vanes lie against the casting. The negative pressure is created by increasing and reducing the space.



Order No. 1207
Pumps model case

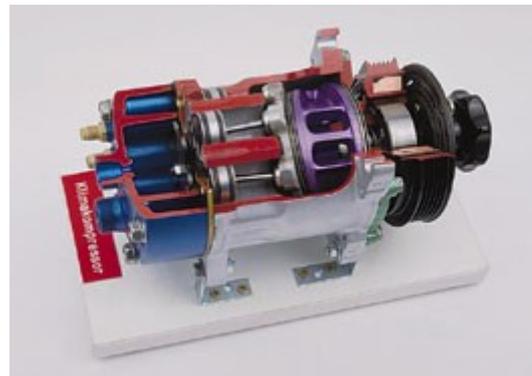
A collection of 8 different pumps for various applications and showing various pumping principles:

- fuel pumps: diaphragm and roller-cell pumps
- oil pumps: external and internal gear pumps, rotor pump
- vacuum pumps: vane-type pump, piston pump
- water pumps: rotary pump



Order No. 1185
Electronic control unit (MOTRONIC)

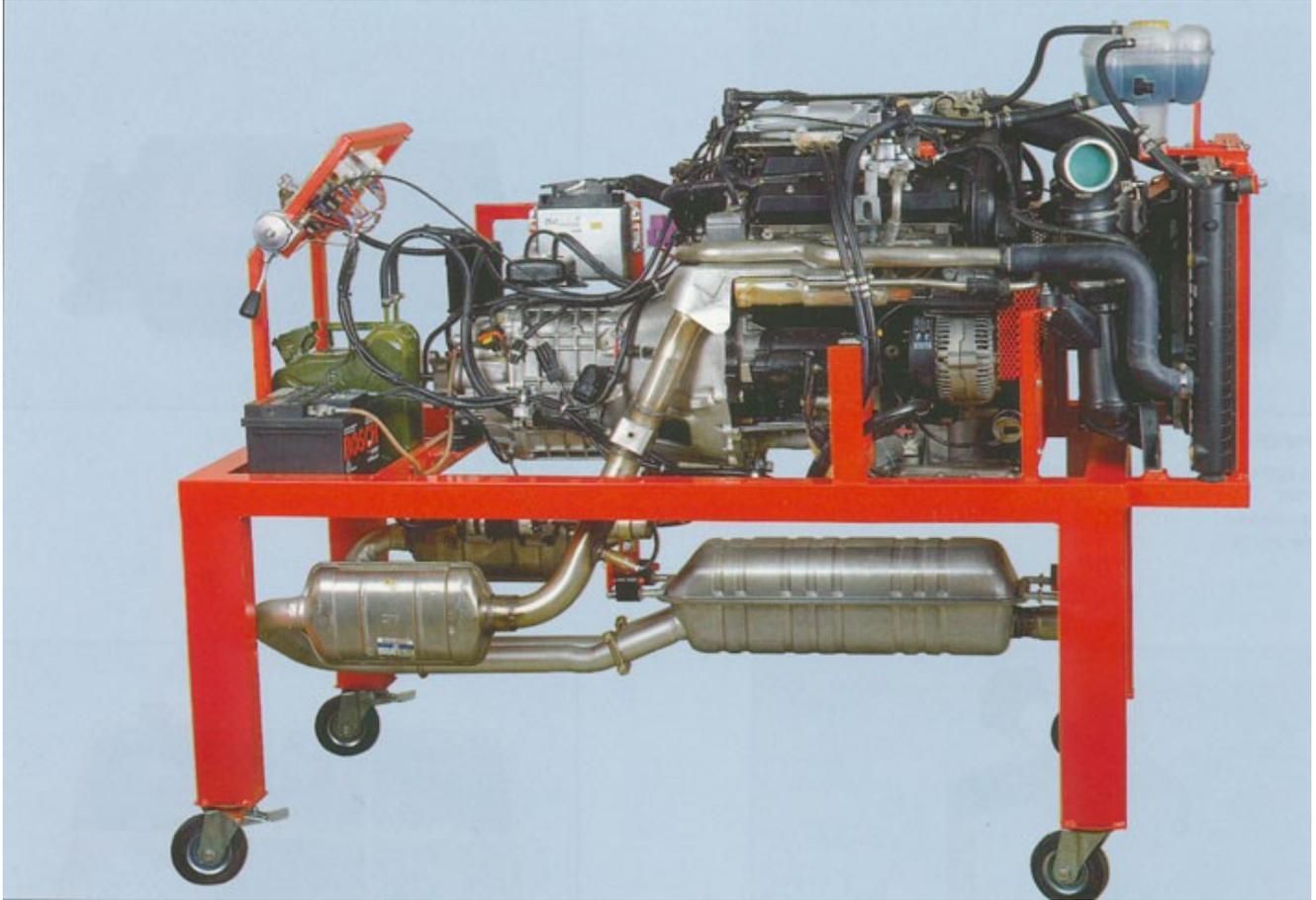
Demonstrates the internal workings of a modern electronic control unit for petrol injection and for electronic ignition.



Order No. 1097
Compressor air-condition

- Function of magnetic clutch
- Function of compressor and valves

HAKO cut-away models



Engines on stands (running)

Reconditioned engines on stand, battery, fuel tank, instruments, throttle cable, cooling and exhaust system. Dynamometers are available also.



Changes reserved!