

HAKO cut-away models

10: Clutches, Transmission, Automatic Transmission, Rear-wheel Drive, Front-wheel Drive, Steering, Chassis, Damping, Suspension



Order No. 1211
Clutch functional model

A diaphragm spring clutch is mounted so that it can be turned on a stable tubular steel frame. When engaged, power is able to flow between the disk flywheel and the clutch lining. By pressing the lever it can be seen how the release bearing tilts the outer edge of the diaphragm spring around the tilted rings, thus releasing the clutch disk. The power flow is interrupted.



Order No. 1265
Cutaway model: Clutch with adjustment for wear

As a result of the wear and tear on the driving disk, the position of the diaphragm spring alters, which means that the pressure from the diaphragm spring on the ramp shaped setting rings drops. The locking bolt has the effect that the setting rings turn as a result of the tension of the springs. In this way, the clearance between the diaphragm spring and the pressure plate is compensated.

HAKO cut-away models



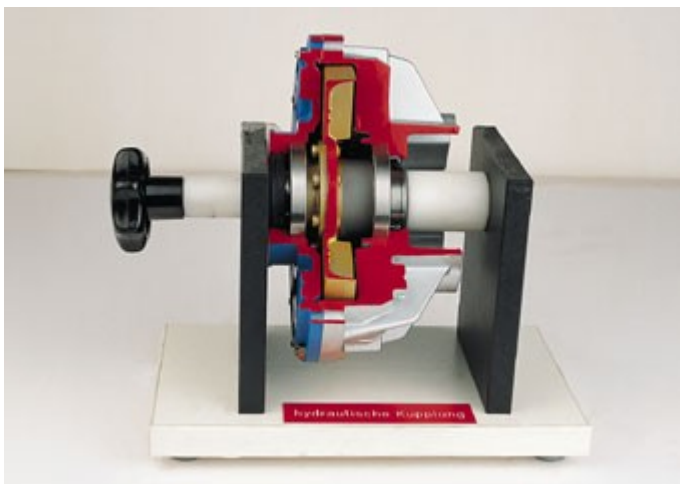
Order No. 1266
Cutaway model: Multi-disk clutch

Design of a multi-disk clutch (without disengaging gear). This clutch has a number of internal and external disks in its basket, which means that a large torque can be transmitted despite a small diameter.
The pressing force of the disks results from a number of helical springs.



Order No. 1139
Viscous clutch

- all externally toothed discs are fixed to the housing
- all internally toothed discs are fixed to the driving shaft
- power transmission is attained via the shearing effect of the silicone fluid between the slots and the holes in the discs (in the cutaway model there is no silicone fluid)



Order No. 1160
Hydraulic coupling

- Also called fluid clutch
- function of the pump wheel
 - function of the turbine wheel
 - mounting of the turbine wheel



Order No. 1155
Multi-disk clutch for mopeds

- Interaction of piston, connecting rod, crankshaft and clutch.
No power flow at low revs.
Power flow at high revs by means of flyweights.
Power flow on pressing the starting lever.

HAKO cut-away models



Order No. 1157
LUK dual-mass flywheel

Structure of a dual-mass flywheel:

- function of the pressure springs when subject to torsional vibrations
- function of the torsional-vibration damper between primary and secondary flyweights; the primary flyweight on the model can be turned against the force of the springs



Order No. 1226
Clutch model case

- hydraulic clutch control mechanism
- a pressure plate with coil springs and release levers
- a complete diaphragm spring clutch with flywheel
- two flexible clutch disks with torsional-vibration damping linings:
 - synthetic fibres and sintered metal
- a clutch disk prepared for the demonstration of the torsional-vibration damping; clutch release bearing and release lever



Order No. 1293
Planetary dual-mass flywheel

- Rotation of the secondary fly wheel mass against the primary flywheel
- Pressing the springs together in their guide shoes to absorb vibrations by ignition induced rotary unevenness of the motor
- Acceleration of the planetary wheels, which attenuate the vibrations of the springs thanks to their friction

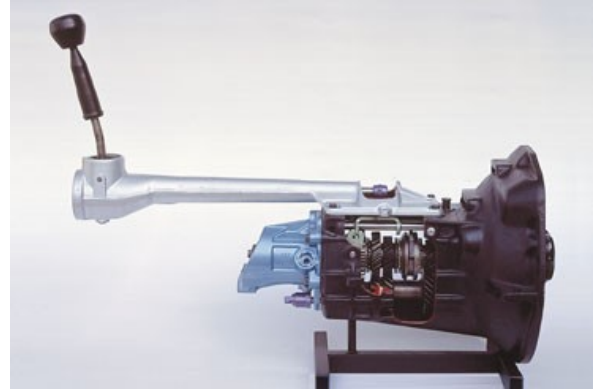
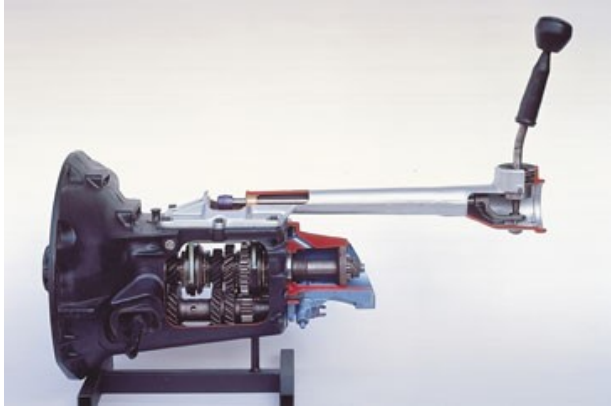


Order No. 1166
Clutch master cylinder and slave cylinder

Function and interaction of the master cylinder and slave cylinder of a hydraulically-operated clutch.

- function of the bleeding of the unit

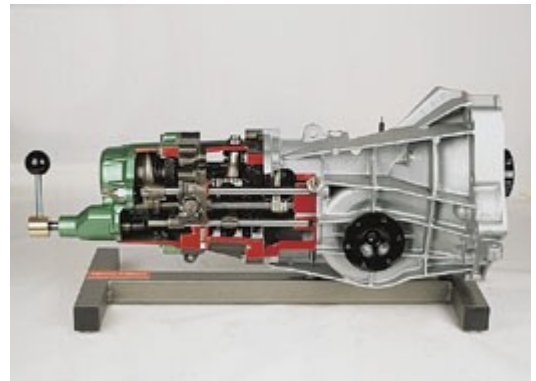
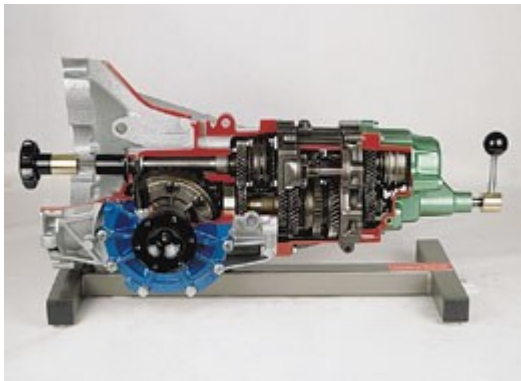
HAKO cut-away models



Order No. 1002

Four-speed transmission with locking synchronization

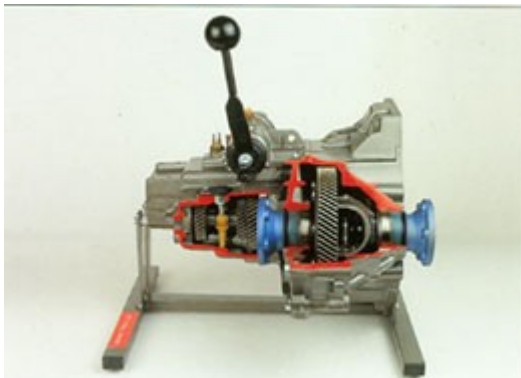
- the transmission is cut wide open at the front and back
- all gears can be shifted



Order No. 1089

Five-speed transmission with differential

- Demonstration:
- shifting all gears
 - Synchromesh
 - Function of differential

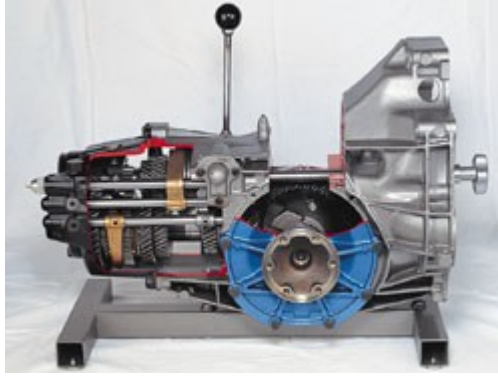


Order No. 1132

Four-speed-transmission (VW Golf)

- Demonstration:
- shifting of all gears
 - synchromesh
- function of differential gear front and rear parts widely cut open

HAKO cut-away models



Order No. 1054
Four-speed transmission with differential

- Possible demonstrations:
- shifting all gears
 - function of a differential gear
 - synchronization



Order No. 1121
Transfer case

- power flow and power distribution in the transfer case
- shifting of the off-road gear and road gear
- function of the differential in the transfer case
- differential lockup



Order No. 1133
Five-speed front transmission (VW Golf)

- layout of the entire transmission front, upper part and rear widely cut open
- smooth shifting of all gears



- function of the spur-gear differential
- function of the synchromesh



Order No. 1199
Modern five-speed front transmission with differential

- (Daimler Benz A Class)
- Flow of power from the drive shaft to the output shaft and differential.
- Very smooth shifting of all gears.



- Locking device to prevent the selection of reverse gear from fifth gear.
- Control of the hydraulic clutch mechanism.

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Order No. 1055

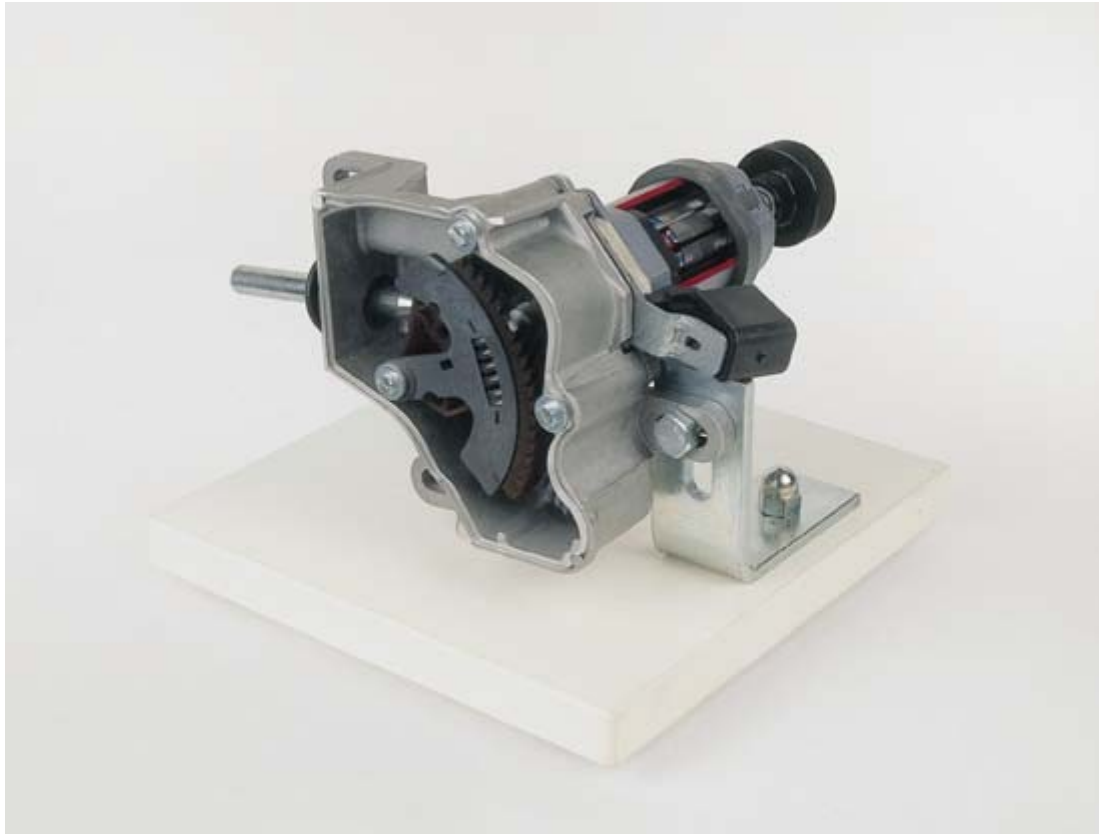
Four-speed transmission, suited for the technology lab.

Functions:

- shifting all gears
- synchronization



- measuring the torque in all the gears
- measuring and calculation of the gear-ratios in all gears using a graded scale



Order No. 1285 Clutch actuator

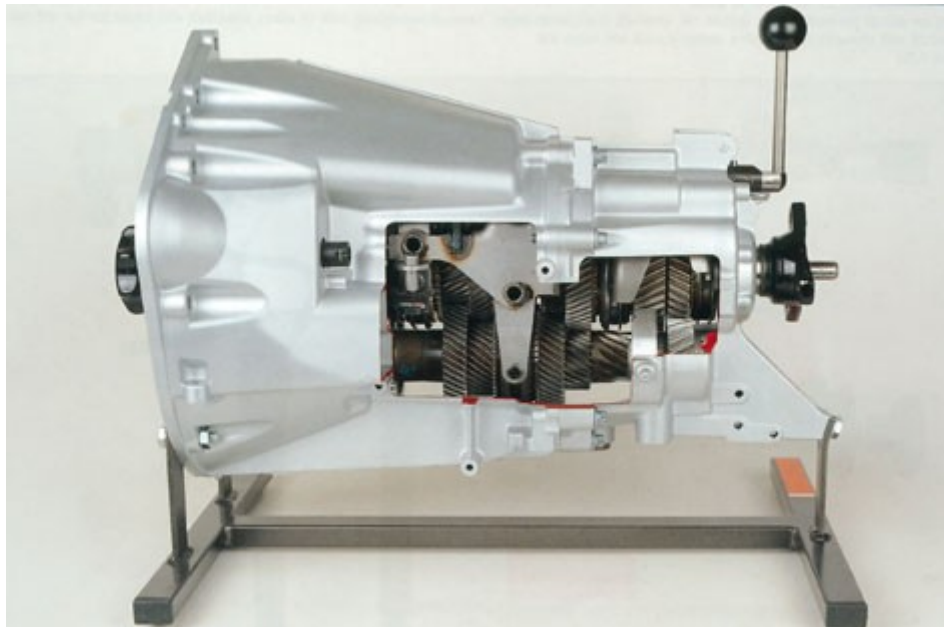
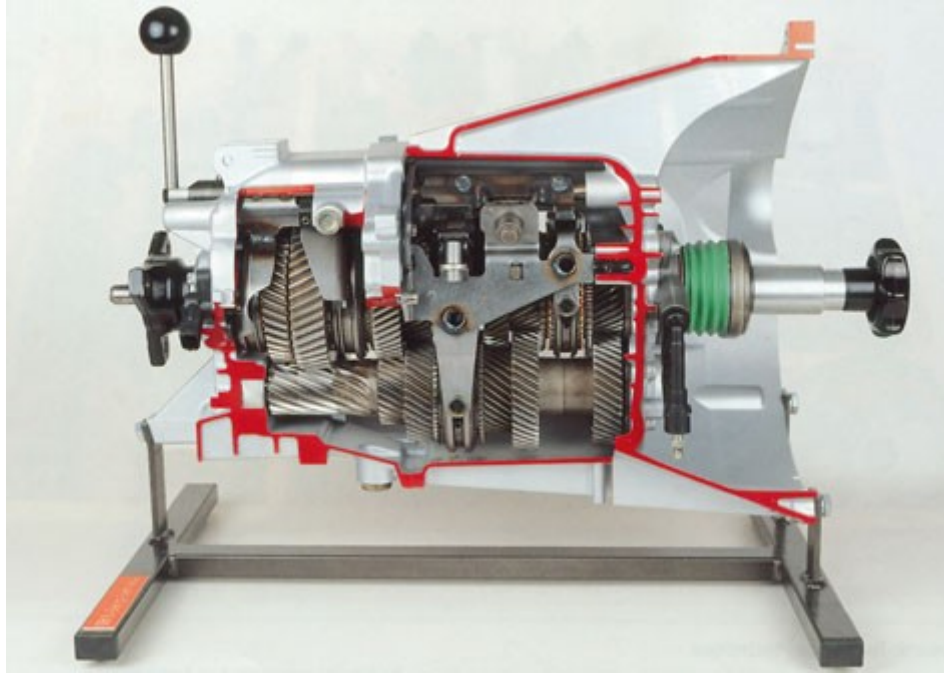
An electric motor drives a segment of a worm wheel via a worm. The worm wheel presses the release pin forwards, thus separating the flow of power in the clutch. The large tensioning forces to separate the clutch are taken over by a fine

spring, which means that the electric motor only supplies the torque to overcome the friction.

A button can be used to turn the electric motor and to demonstrate the release process.

The installed pane of plexiglas means that everything can be seen easily.

HAKO cut-away models

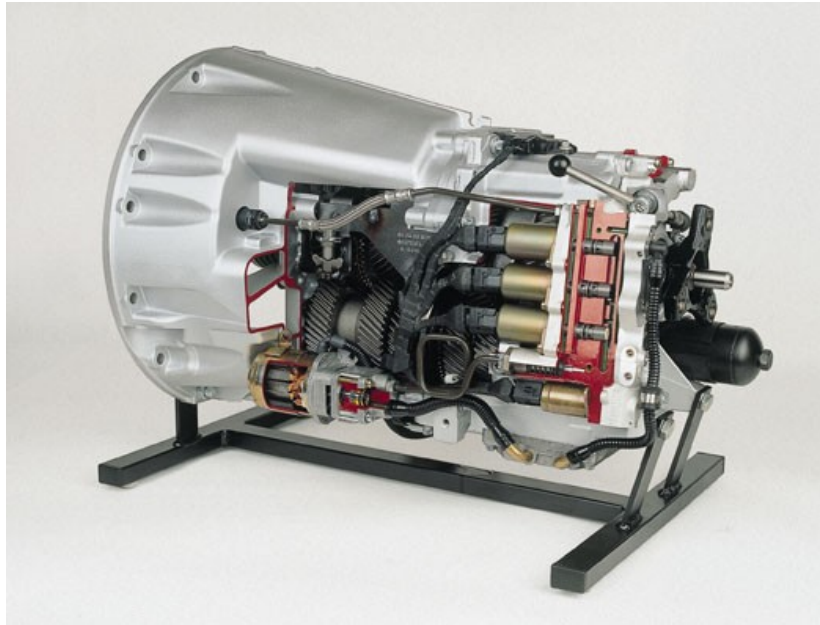
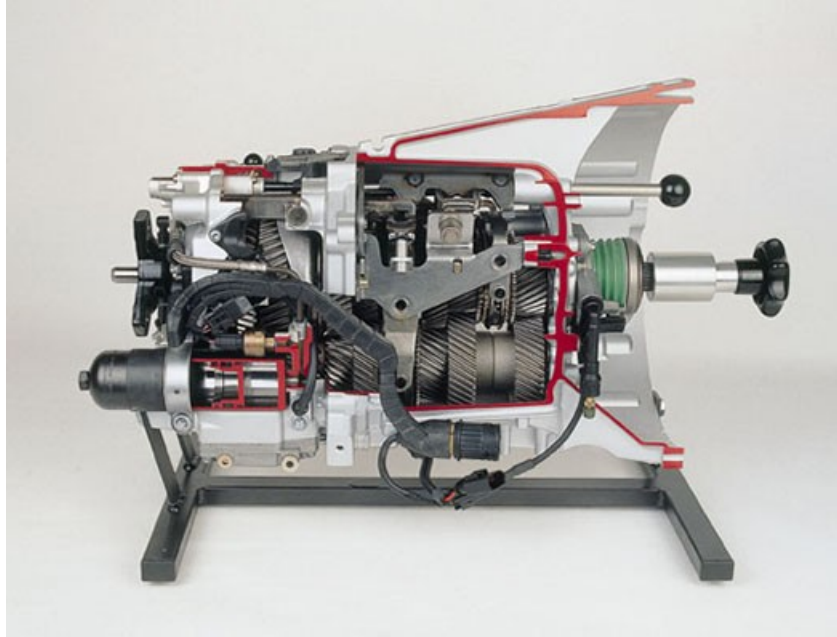


Order No. 1255

Cutaway model: Daimler Benz 6-gear transmission

This new construction is an equal-axe three-shaft transmission with 6 forward and one synchronised reverse gear. The shift elements are distributed on 2 shafts. Operation of the clutch is done automatically via central disengaging gear. The transmission can easily be turned neutral. All the gears can be shifted and the flow of force shown.

HAKO cut-away models



Order No. 1282 **Automatic sequential six-gear transmission (DB)**

The automated, sequential six-gear transmission developed from the classical six-gear manual transmission is controlled by the engine management. With the help of a hydraulic piston, 2 gears can be shifted on each shift level. To change to another shift level, a gate sleeve, which had been able to rotate loosely up to then, is arrested by a second hydraulic piston. In this way, the old gear is firstly removed and then the selector shaft turned onto a different shift level by a pin in the arrested gate sleeve when the inlet selector shaft is displaced by the first hydraulic piston. Now, shifting into the next gear is possible. The installation of a gearshift rod with a button and a mechanical clamping lever means that all the gears can be shifted and the function of the hydraulic controls demonstrated.

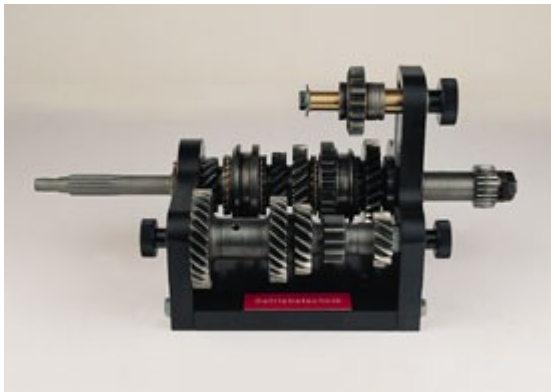
The following are cut away: transmission housing front and back, hydraulic pump with electric engine, hydraulic unit and the hydraulic pressure accumulator.

HAKO cut-away models



**Order No. 1238
SMART gearbox**

The new construction from the firm of GRETAG is a mechanical shift gear with 6 forward and one reverse gear. The shifting of the gearbox is done by an electric motor via a gear wheel transmission onto a gear selector drum. The slide shoes of the gearshift rods engage into the groove tracks of the gear selector drum. For the differential, 2 differing transmission ratios can be shifted, which means that 6 forward gears result from the 3 forward gears of the main shaft. In shifting, an automatic clutch actuator takes over the clutch engagement and de-clutching. The gearbox is supplied as a semi-automatic or fully automatic gearbox. All the gears can be shifted by turning the electric motor. The function of the differential is also easily visible.



**Order No. 1169
Transmission technology**

Function of the drive shaft, main shaft, countershaft and the reverse gear. interaction of the individual shafts.



Shifting of all gears, power distribution.
Calculation of the different transmission ratios.

HAKO cut-away models



Order No. 1248

Transmission technique: 5-gear transmission

Function of the drive shaft, main shaft countershaft and the reverse gear wheel set-up of a 5-gear transmission pushing together of the individual shafts.



Switching of all the gears.

Calculating of the gear ratios in all gears.
Extensive operating instructions with worksheets for pupils and teachers.



Order No. 1273

Functional model: Transmission technology, five-gear front transmission

Design of a two-shaft transmission for vehicles with front-wheel drive. Pushing together of the transmission shafts. Shifting of all gears, observation of flow of force in the individual gears. Reading and calculation of the various transmissions.

HAKO cut-away models



Order No. 1278

Transmission technique: six-gear transmission

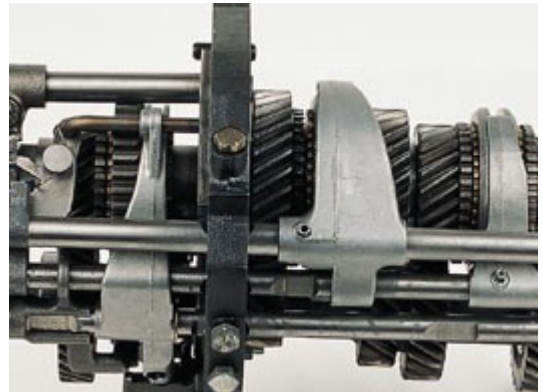
- Set-up of a equal-axle three-shaft transmission
 - Pushing together and separation of the shafts
 - Insertion of the reverse pinion
- Shifting the 6 forward gears and the reverse gear
 - Reading and calculation of the various ratios



Order No. 1212

Five-speed transmission assembly model

This assembly model is well-suited to pupils own use. Without a puller and press the transmission can be taken apart and reassembled. The following can be learnt from it:
Various synchromesh mechanisms, shifting locks and shifting catches.



the shifting of all gears including reverse gear, the function of the gearshift rods and the gearshift forks.

HAKO cut-away models



Order No. 1101 Assembly of a Borg-Warner synchronesh

Main shaft stub, mounted on stands, for dismantling and assembly of two gears, including tool. A synchronising unit was prepared so that it can be assembled without puller and press. Particularly suitable for producing a work schedule.



The gears can be shifted easily.



Order No. 1102 Assembly of a Porsche synchronesh

Main shaft stub, mounted on stands, for dismantling and assembly of two gears, including tool. A synchronising unit was prepared so that it can be assembled without puller and press. Particularly suitable for producing a work schedule.



The gears can be shifted easily.

HAKO cut-away models



Order No. 1100 **Assembly of a complete main shaft**

A complete main shaft with drive shaft has been prepared so that it can be dismantled and assembled without press and puller.



The tool is supplied. The correct assembly can be checked with the aid of the countershaft. The gears can be shifted easily.



Order No. 1147 **Students assembly set, main shafts**

includes the following:
5 main shafts - different makes (Daimler Benz, Opel, Ford, VW). Functions as described above.



Order No. 1148 **Students assembly set, Borg Warner synchromesh**

includes the following:
5 different main shaft stubs, i.e. main transmission shafts of vehicles with front wheel drive. (Opel, VW, Ford) Functions as described above.

HAKO cut-away models



Order No. 1218
Variable- speed transmission model case

Four-speed transmission with drive shaft, main shaft and countershaft for rear-wheel drive (equal-axle transmission)
All components are clearly visible and arranged in the correct order:

shafts, gear wheels, synchronizer body, sliding sleeves, synchronizer rings, sliding blocks, springs and bearings. Everything has been prepared so that the shafts can easily be put together.



Order No. 1219
Variable- speed transmission model case II

Four-speed transmission with drive shaft and output shaft for front-wheel drive (unequal-axle transmission)

All components are clearly visible and arranged in the correct order:

shafts, gear wheels, synchronizer body, sliding sleeves, synchronizer rings, sliding blocks, springs and bearings. Everything has been prepared so that the shafts can easily be put together.

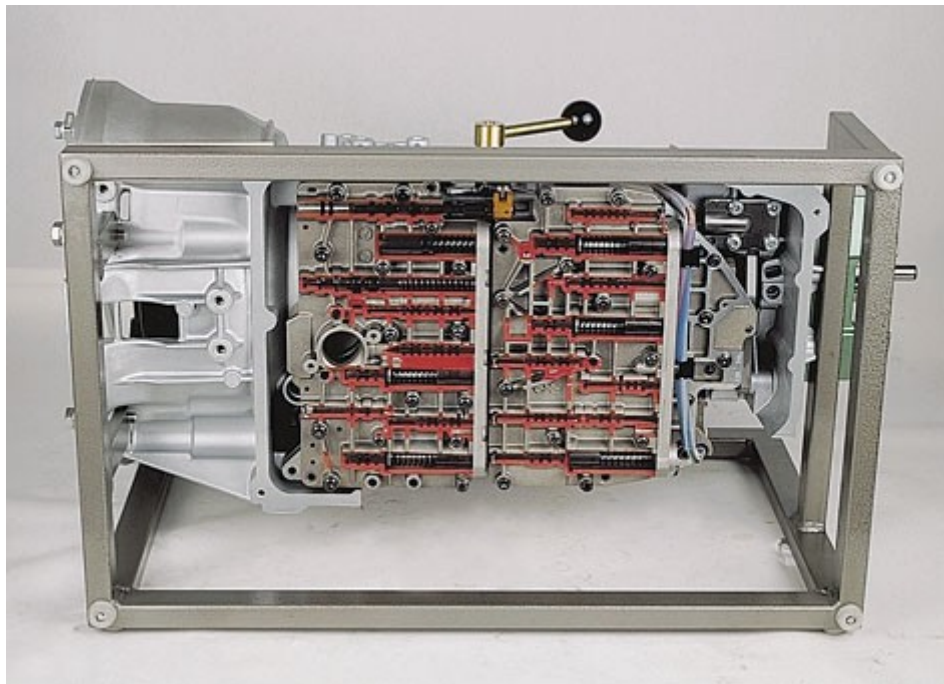
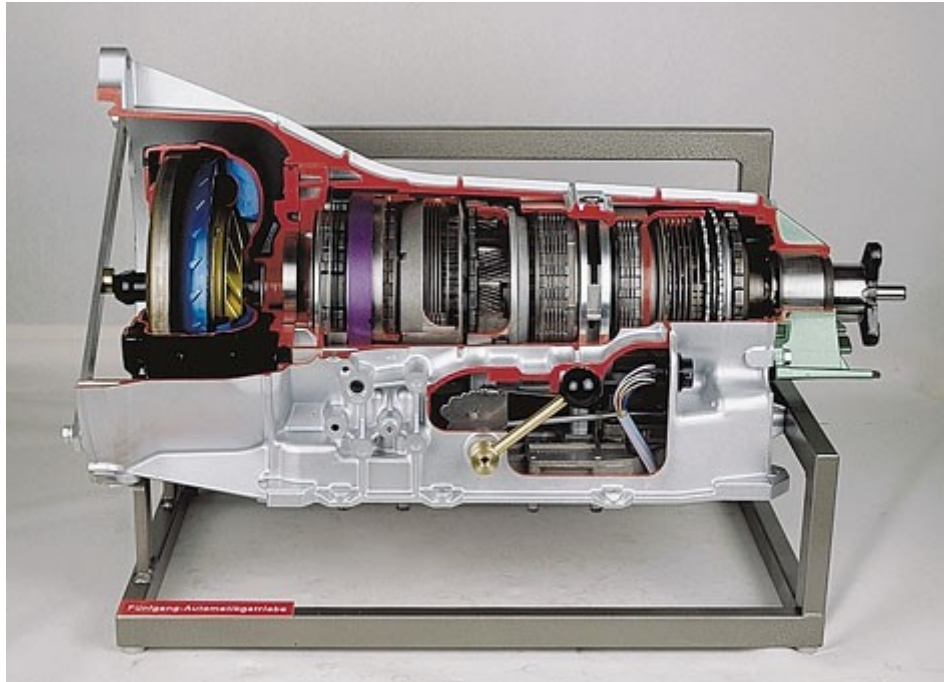


Order No. 1220
Variable- speed transmission model case III

Four-speed transmission with drive shaft and output shaft for front-wheel drive (unequal-axle transmission)
All components are clearly visible and arranged in the correct order:

shafts, gear wheels, synchronizer body, sliding sleeves, synchronizer rings, sliding blocks, springs and bearings. Everything has been prepared so that the shafts can easily be put together.

HAKO cut-away models



Order No. 1090

**Five-speed automatic transmission, electronically controlled,
with torque converter and torque converter lock-up clutch (ZF)**

Parts cut in this model:

- front and rear housing
- torque converter with lock-up clutch
 - all couplings
- internally-gear wheels for planetary gear sets
 - crescent-type pump and brake band
- shift valve housing with all valves and pistons
 - actuating piston for brake band

HAKO cut-away models



Order No. 1127

Electronically controlled five-speed transmission (Daimler Benz)

A newly developed automatic transmission from Daimler Benz.

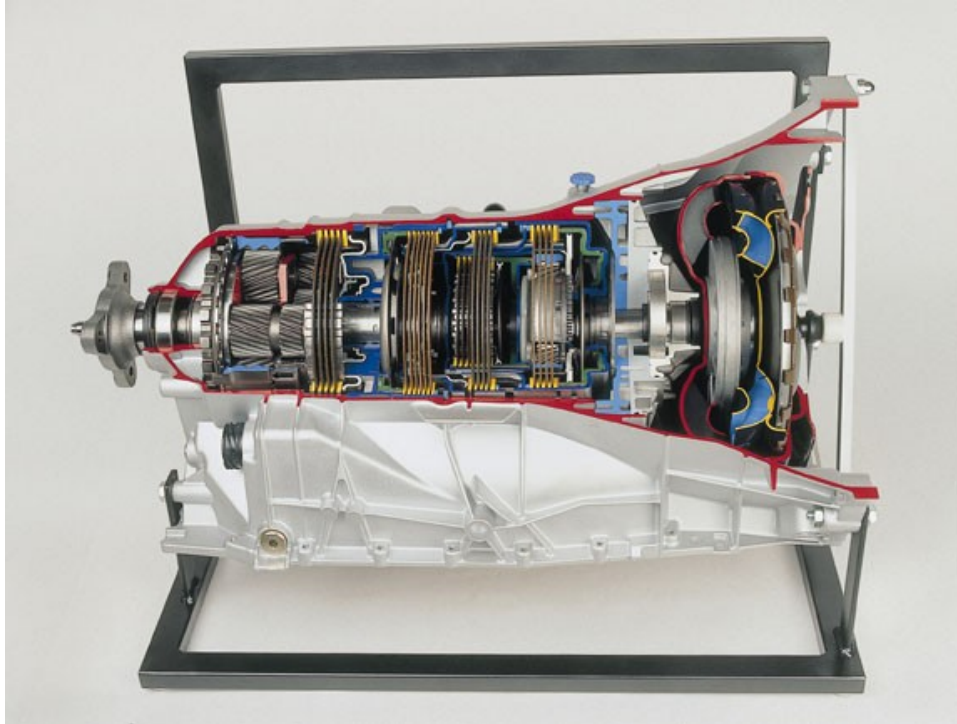
Parts cut in this model:

housing, converter, converter lock-up clutch, oil pump, all clutches, all 3 planetary gear trains, hydraulic unit.

The model allows for demonstration of the following:

- function of the converter - function of the converter lock-up clutch
- function of the freewheels - function of the oil pump
- function of the parking interlock - function of the clutches and planetary gear trains
- function of the solenoid valves and hydraulic unit - switching of the main control piston via the selector lever

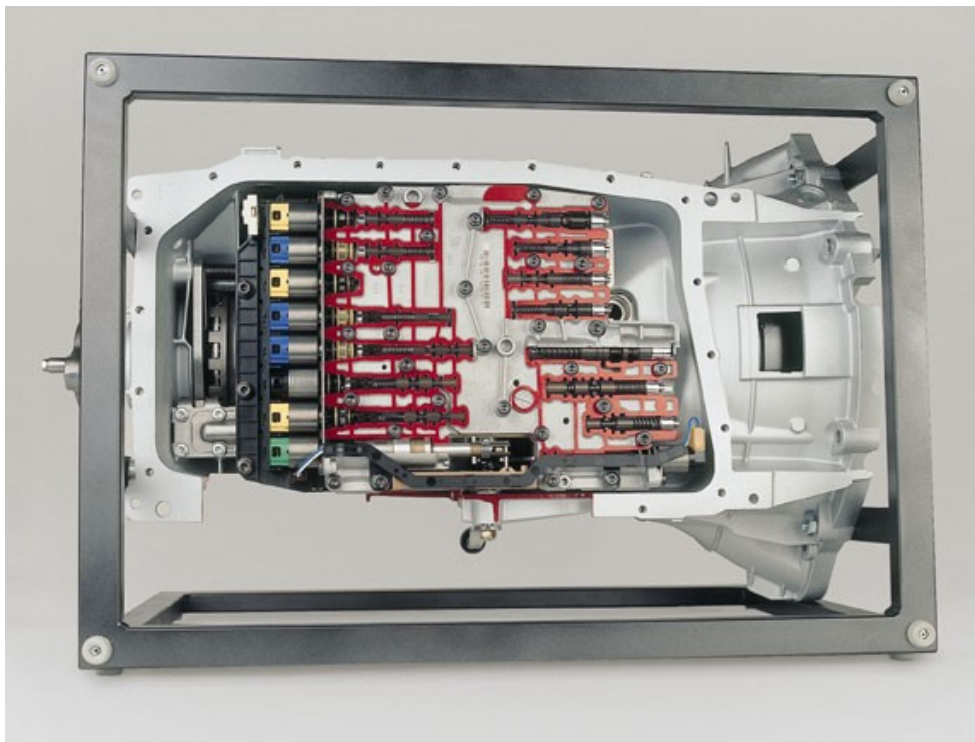
HAKO cut-away models



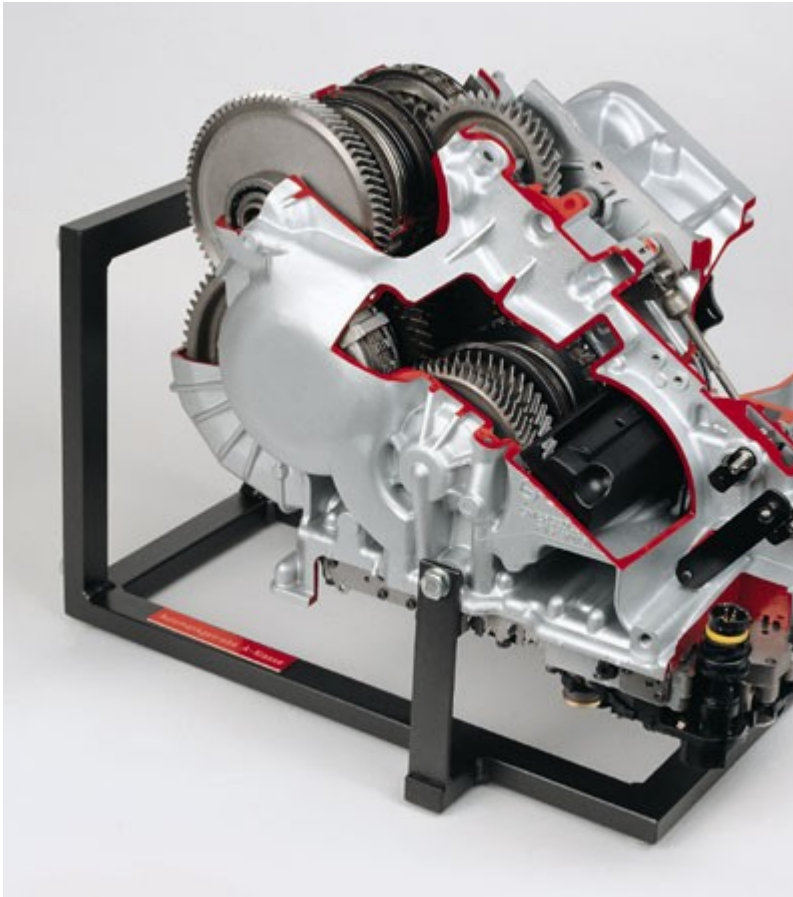
Order No. 1283
Six-gear automatic transmission and converter with shorting (ZF)

A transmission with superlatives, a latest-generation transmission. The housing has been cut away to a large extent. In addition, all the clutches with hydraulic pistons, the planetary gear trains, the crescent pump, the converter with shorting and the hydraulic control device with the solenoid valves.

The transmission can be cranked easily.



HAKO cut-away models



Order No. 1260

Cutaway model: Five-gear front automatic transmission

DB A Class without torque converter

The transmissions in the individual gear steps are not implemented with planetary gear trains, but with spur gears. The shifting processes are initiated electronically, with the gears being shifted by hydraulic clutches via the electro-hydraulic control unit.

A very extensive description of the function is supplied.



Order No. 1261

Cutaway model: Five-gear front automatic transmission

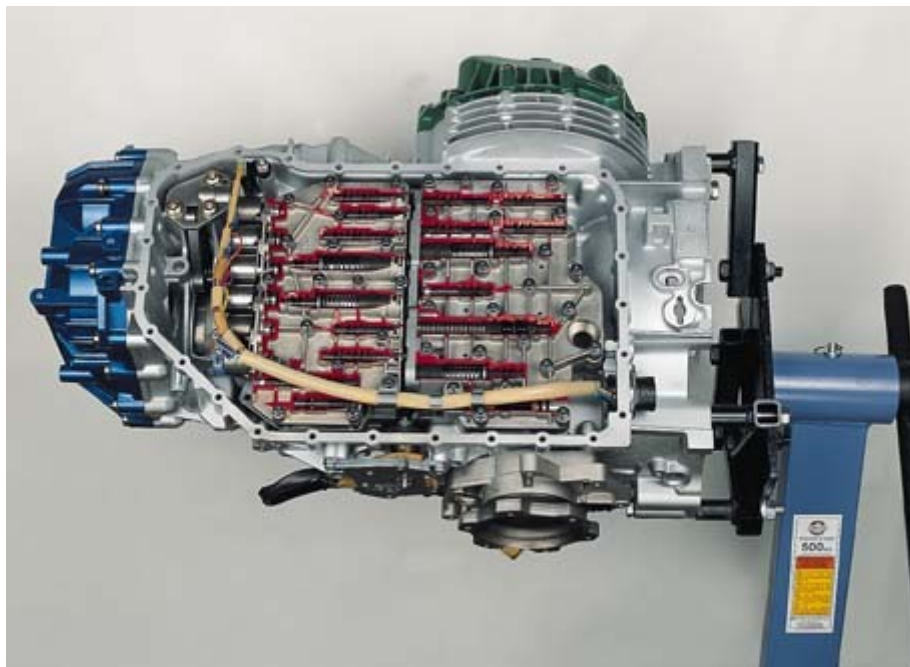
DB A Class with torque converter

The transmissions in the individual gear steps are not implemented with planetary gear trains, but with spur gears. The shifting processes are initiated electronically, with the gears being shifted by hydraulic clutches via the electro-hydraulic control unit.

In the cutaway torque converter, one sees the pump and turbine wheel, the freewheel and the converter lockup clutch.

A very extensive description of the function is supplied.

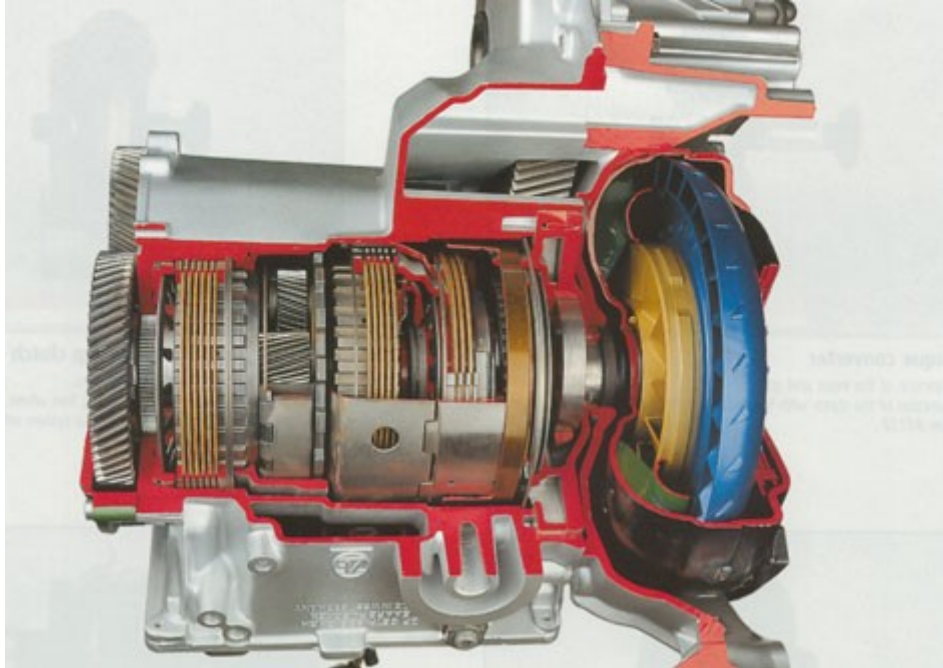
HAKO cut-away models



Order No. 1223
Five-speed automatic transmission for front- wheel drive (ZF)
electronically controlled

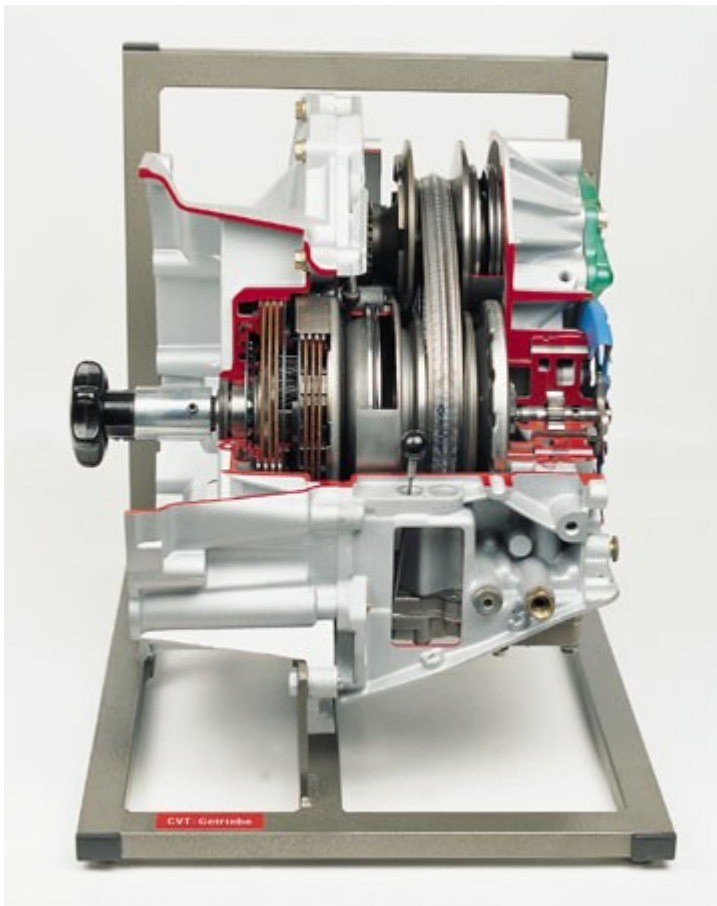
This transmission designed for high performance has the following parts cut away:
Torque converter with lock-up clutch, all hydraulic couplings, planetary gear trains, transmission wheels and
intermediate gear
drive shaft with pinion, differential and hydraulic control. The transmission can easily be turned.

HAKO cut-away models



Order No. 1222
Four-speed automatic transmission for front- wheel drive (ZF)
electronically controlled

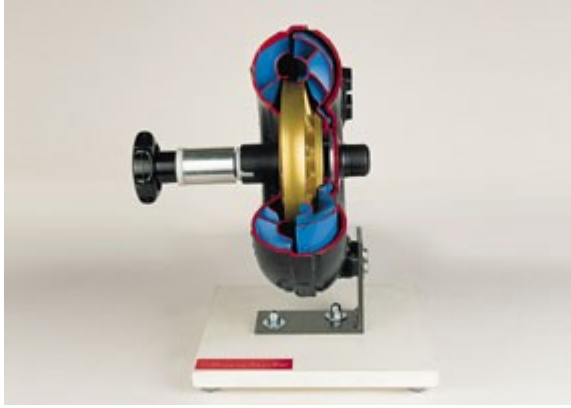
The cut away parts are:
Torque converter with lock-up clutch, all hydraulic couplings, planetary gear trains, differential and hydraulic control. The transmission can easily be turned.



Order No. 1198
CVT automatic transmission with
sliding articulated band

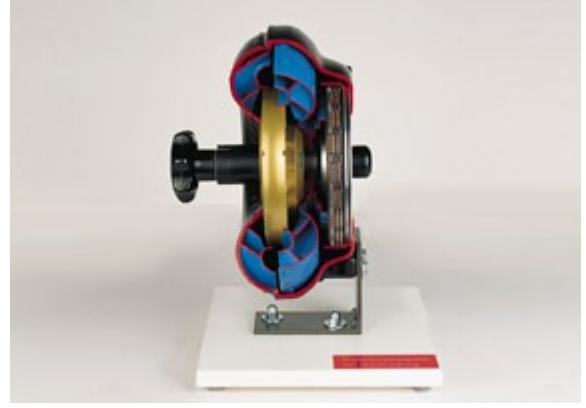
The complete power flow within the CVT automatic transmission can be observed:
Input shaft, planetary gear with hydraulic clutch mechanism, primary and secondary conical disk with hydraulic piston, idler gear and differential.
Speed change by movement of the conical disks.
Hydraulic control of the CVT automatic transmission.

HAKO cut-away models



Order No. 1158
Torque Converter

- function of the input and output rotors
- function of the stator with functioning free wheel



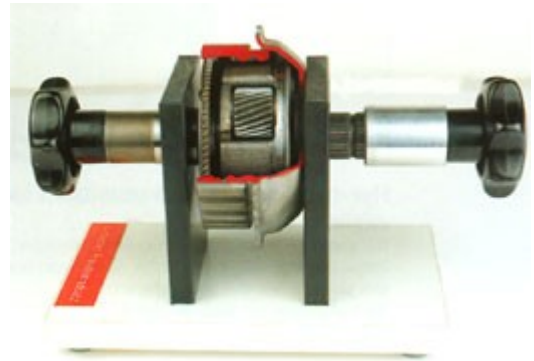
Order No. 1159
Torque Converter with lock-up clutch

- function of the input and output rotors
- function of the stator with functioning free wheel
- function of the lockup clutch by a disk system and a hydraulic piston



Order No. 1193
Torque Converter with lock-up clutch (ZF)

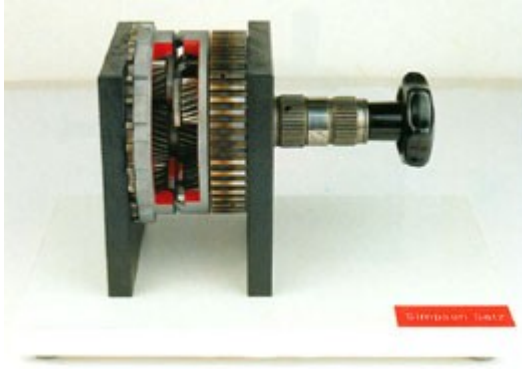
- function of the impeller and turbine
- function of the stator with functioning free wheeling
- function of the lockup clutch, consisting of a steel clutch disc with friction lining, which is hydraulically pressed on the impeller



Order No. 1164
Simple planetary gear train

Function of a simple planetary gear train with ring gear, sun wheel, planet carrier with planetary wheels.

HAKO cut-away models



Order No. 1163
Planetary gear train - Simpson gear set

interaction of the components of the planetary gear train.
- function of the two simple planetary gear trains with coupled sun wheels



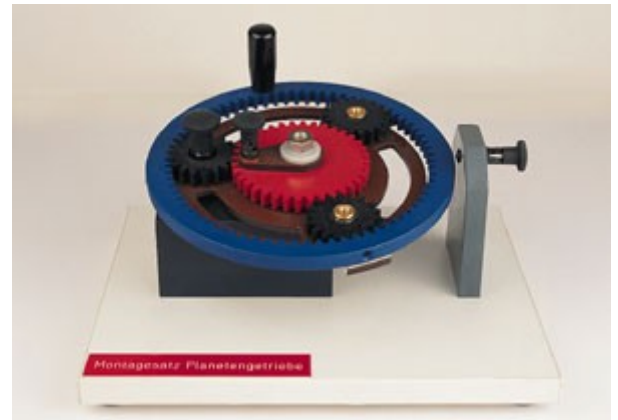
Order No. 1162
Planetary gear train - Ravigneaux gear set

Interaction of the components of the planetary gear train.
Ring gear, 2 sun wheels and planet carrier with 3 narrow and 3 wide planetary wheels are easily recognised through the Plexiglas screen.



Order No. 1161
Automatic transmission components model case

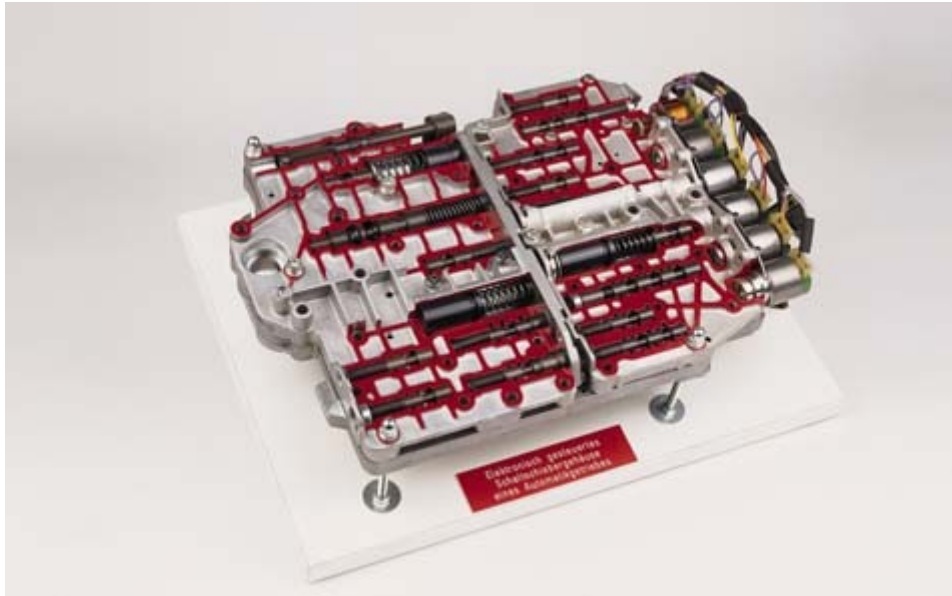
Contains the most important automatic transmission components (some parts cut open). Hydraulic control with shift valve, centrifugal governor, freewheel, internal gear pump, complete planetary gear train (easily dismantled), brake band 2 hydraulic couplings, park position with ratchet, disk set.



Order No. 1156
Planetary gear train assembly set

-Dismantling of the planetary gear train
- Assembly of the Planetary gear train
- Assembly diagram supplied
- Shifting of the different gears
- Calculation of the transmission ratios

HAKO cut-away models



Order No. 1294

Electronically controlled shift-valve body of an automatic transmission

This model gives an insight into the complicated interior of a modern shift valve body. In the cutaway housing, one sees the control plunger and control springs. An electro-solenoid valve has also been cutaway so that its interior can be studied.



Order No. 1049

Differential gear with hypoid gearing

Possible demonstrations:

- function of the final drive (bevel pinion and crown wheel)
- function of the differential bevel gears when driving in a straight line and when cornering
- functions of the differential bevel gears when one wheel spins while the other stands still



Order No. 1092

Differential with lock (ASR, ASD)

Demonstrations:

- function of axle drive (pinion, crown wheel)
- function of differential spider gears
- locking by hydraulic piston and multiple-disk

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Order No. 1201
Rear-wheel drive with disk locking system

Demonstrations:

- function of the axle drive (bevel gear - differential ring gear)
 - function of the differential when cornering
- function of the locking mechanism in the case of wheel spin
 - function of the thrust rings and friction disks



Order No. 1129
Differential with mechanical lock

- function of the wheel-drive assembly (bevel gear, differential ring gear)
 - function of the differential gear
 - compensation of differential travels without locking
- differential lock by shifting a claw-coupling over the locking lever



Order No. 1046
Limited-slip differential with multi-disk clutches (ZF)

Possible demonstrations:

- different speeds of axle shafts when cornering
 - function of the friction plates
 - function of the thrust rings
 - locking



Order No. 1136
Model case, differential

All components of the differential are closely visible, they are mounted on a board and are easy to remove.

HAKO cut-away models



Order No. 1043
TORSEN differential gear

Possible demonstrations:

- function of the worm gears and spur gears
- different speeds of axle shafts when cornering
- locking



Order No. 1272
Cutaway model: Torsen intermediate axle differential

Intermediate axle differentials are fitted in vehicles with four-wheel drive. They permit a balance between the front and the rear axle and automatically block if the wheels of one axle spin. They can be installed directly on the transmission outlet for the rear axle.



Order No. 1286
Measurement device to measure the locking figure of differentials

The differential used is a Torsen centre differential from an Audi Quattro. Drive shafts have been installed in both outlets of the differential and provided with lever arms at their ends. The levers are held by an infinitely adjustable balance. If the differential housing is turned with the help of a rotary lever, the levers of the axle shafts contact the lever arms of the balance. Depending on the setting of the lever arms on the balance, the differential blocks until the balance has been adjusted in such a way that the differential slips lever arms. The locking figure of the differential can be determined immediately by reading off the lever arms (law of levers!).

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Order No. 1146 **Students assembly set, differential**

includes the following:

- 2 differential gears with ring gear
- 3 differential gears with spur pinion
- Extremely easy to put together and take apart (no pushing or pulling)



Order No. 1105 **Assembly of differential gear with crown wheel**

The housing has been prepared so that simple assembly and dismantling is assured.



Order No. 1106 **Assembly of differential with spur gear**

The housing has been prepared so that simple assembly and dismantling is assured

HAKO cut-away models



**Order No. 1241
Haldex Clutch**

- 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



HAKO cut-away models



Order No. 1052
Ball-and-nut power steering

All demonstrations same as Order No.1050

Plus:

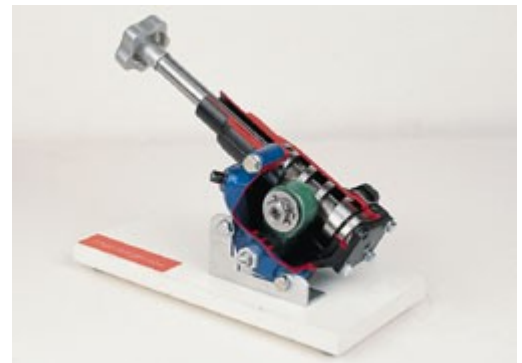
- displacement of the valve pistons
- function of working piston



Order No. 1050
Recirculating-ball steering
(ball-and-nut steering gear)

Possible demonstrations:

- steering gear in motion - transmission ratio of gear set
 - self locking
- the balls roll in opened guide tubes
 - rolling instead of sliding friction
- calculation of transmission ratio and pivoting of the pitman arm



Order No. 1120
Finger steering

- turning of the steering spindle
- Stroke of the finger in the screw
- torsion of the steering column stalk
 - play adjustment

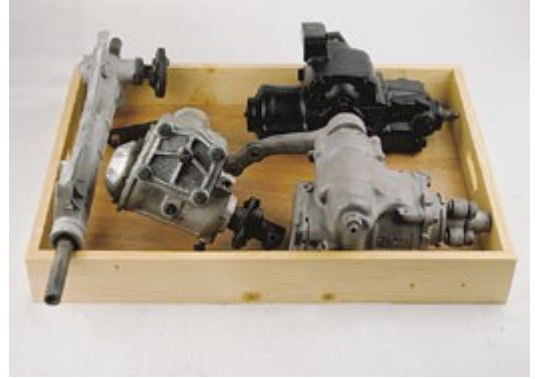
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Order No. 1051
Worm and roller steering gear

possible demonstrations:

- steering gear in motion
- transmission ratio of the gear set
- interaction of roller and worm
- rolling instead of sliding friction
- calculation of transmission ratio and pivoting of pitman arm



Order No. 1098
Steering gear test

4 similar or different steering gears prepared for
dismantling
and assembly
Board-mounted tuition unit



Order No. 1142
Variable rack-and-pinion steering

- movement sequence in steering gear
 - variable transmission ratio via different types of toothing in the gear rack
 - function of the thrust piece with spring:
- The gear rack is pressed against the pinion thus compensating play and different tooth width.



Order No. 1053
Rack and pinion steering gear

- Possible demonstrations:
- Movement cycle of steering gear
 - steering gear ratio
 - function of thrust block with cup springs: The rack constantly pressed against the pinion, Therefore no backlash

HAKO cut-away models



Order No. 1228
Rack-and-pinion power steering II

Sequence of movement in the steering gear. Transmission ratio in the steering system. Function of the thrust piece and the working piston.

Change-over of the working piston by means of valve piston and internal ducts. Lateral drive of the steering tie rods on one side of the steering rack.



Order No. 1229
Rack-and-pinion power steering III

Sequence of movement in the steering gear. Transmission ratio in the steering system. Function of the thrust piece and the working piston.

Change-over of the working piston by means of rotary-disk valve. Lateral drive of the steering tie rods on both sides of the steering rack by means of ball knobs.



Order No. 1202
Complete suspension strut with wishbone, drive shaft, disk brake with brake disk

- Function of the suspension strut with spring and cutaway shock absorber
- Function of the disk brake with cutaway brake caliper
- Function of the wishbone and the drive shaft with cutaway ball-and-socket joint

HAKO cut-away models



Order No. 1246
Spring leg (air suspension)

In the Daimler Benz S class, 4 spring legs are used on the front and rear axle as function elements of the Airmatic. They are connected with one another via a data bus. The following can be clearly seen on the model: Air suspension with inlet valve for level control and lowering of the chassis, damper with bottom valve and gas area, solenoid valves for the regulation of the damping strength.



Order No. 1275
Cutaway model: ABC (active body control) suspension strut

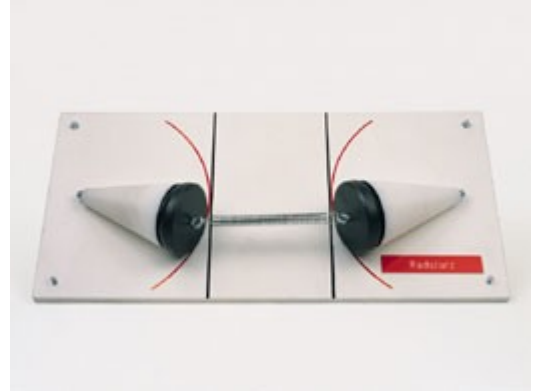
Active suspension and attenuation system with hydraulic cylinder, helical spring and attenuator. Behind the cutaway spring, the hydraulic cylinder (plunger) for level regulation, the attenuator and, in the hollow piston rod, the suspension strut control device are easily visible.

Functions in the vehicle:

The level regulation enables manual and speed-dependent automatic lowering and raising of the level of the vehicle.

In bends and on uneven roads as well as in braking and accelerating, rolling and pitching motions are practically completely suppressed.

HAKO cut-away models



Order No. 1270 **Functional model: Wheel camber**

A wheel at an angle no longer moves on a straight line, but on a circular track. If the wheels are pushed forwards, the wheels make efforts to move apart at the front as a result of the rolling taper.

Thanks to a precisely coordinated selection of the track, the wheel moves straight ahead and the wheel flutter is prevented.



Order No. 1225 **Porsche Weissach axle (928)**

This axle comes complete with:
Axle bracket, double wishbone, axle shafts, internally-ventilated brake disks, four-piston disk brakes, springs and shock absorbers.

The compression of the axle can be clearly demonstrated. On request the axle can be supplied with a cutaway Original Porsche five-speed transmission.



Order No. 1224 **Daimler Benz multi-link suspension**

The construction of the axle with its 5 links is easily distinguished by the use of colour markings. The axle is complete with brake calipers, brake disks, axle shafts, springs and shock absorbers. The compression can be clearly demonstrated. The differential and one brake drum for the parking brake are cut away.

HAKO cut-away models



Order No. 1234
Twin-tube shock absorber

The shock absorber is cut away to such an extent that the inside and outside of the tube with bottom valve and piston can clearly be seen.

The piston and the bottom valve are also cut away, so that the valves can clearly be seen. The piston rods can easily be moved in and out.



Order No. 1235
Single-tube gas-pressure shock absorber

The shock absorber is cut away to such an extent that the separating piston and the working piston can clearly be seen inside the tube.

The working piston is also cut away, so that the valves can clearly be seen. The piston rod can easily be moved in and out.

HAKO cut-away models



Order No. 1213 **Axle shaft model case including joints**

cutaway ball-and-socket joint with wide angle of movement.
cutaway tripod joint with length compensation.
Cardan shaft with 2 universal joints and cutaway sliding section which is easily moved.
Universal joint with polygonal rubber joint.
Hardy disk (disk-type flexible coupling).

HAKO cut-away models



Order No. 1262
Cutaway model: Ball and socket joint

Design of a ball and socket joint (constant-velocity or homo kinetic joint)
Function of the balls and the ball cage. The axle journal can be pivoted, but only be moved up and down minimally.



Order No. 1263
Cutaway model: Tropoid joint

Design of a tropoid joint with tropoid star with pinions and idlers.
Tropoid joints permit diffraction angles of up to 20 degrees and 30mm axial displacement. This can be demonstrated very clearly on the model.

HAKO cut-away models



Order No. 1011
Balancing model for wheels

- the wheel axle, which hangs on two chains, is pulled down by springs
- demonstration of a static unbalance: wheel hops. This can be adjusted by putting on a counterweight
- demonstration of dynamic unbalance: Wheel flutters. This can be adjusted by changing weights to the correct side

Changes reserved!