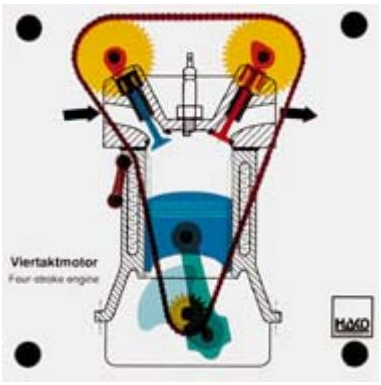
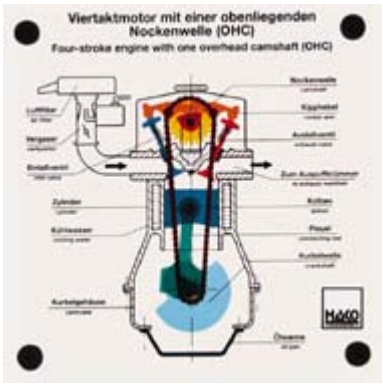
HAKO Overheadmodels - Section 1

Combustion engines, Steam engines, Stirling engines, engine management, other models, model stand and model cabinet for OHP models



Order no. 101
Four stroke engine

- drive of the double overhead camshaft
- sequence of the four strokes
- valve opening overlap
- function of a chain tensioner



Order no. 255
Four stroke engine with one overhead camshaft (OHC)

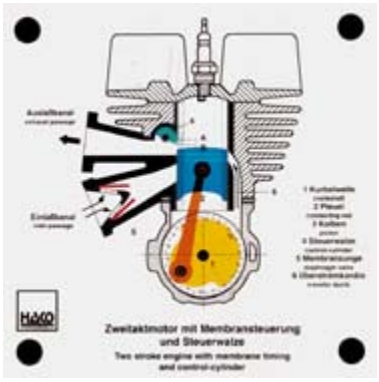
- crankshaft drive, stroke of a piston
- camshaft timing (ratio of 1:2)
- function of the rocker arm
- opening and closing the valves
- valve overlap

Order no. 417
Petrol direct injection engine

- all the functions of a four-stroke engine can be shown with valve overlap
- direct injection of the petrol into the combustion chamber (bow- in piston)

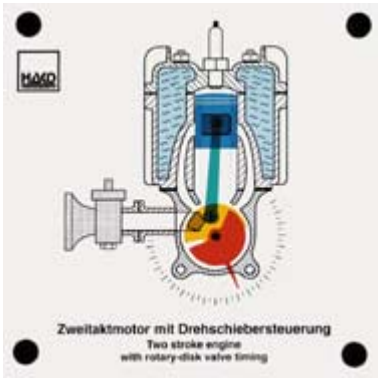
Order no. 102
Two stroke engine

- function of combustion chamber and crankcase
- sequence of the strokes in both chambers
- function of the transfer duct



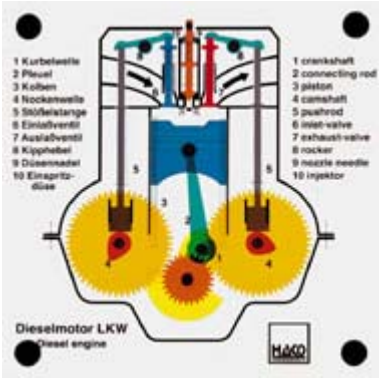
Order no. 193
Two stroke engine with diaphragm timing and control cylinder

- principle of a modern two stroke engine
- function of a diaphragm timing
- actuating the control cylinder in the exhaust passage
- the control timing is changed by the control cylinder
- the control timing can be directly read



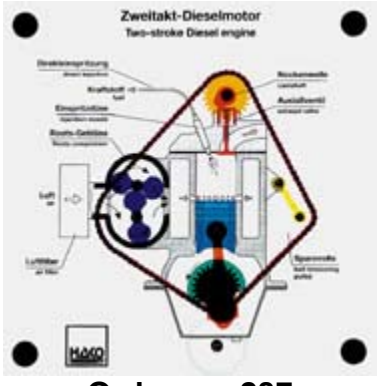
Order no. 398
Two stroke engine with rotary-disk valve control

- gas control in a two-stroke engine with rotary-disk valve
- reading of the angle for the induction, precompressing, overflow, exhaus, compression and working



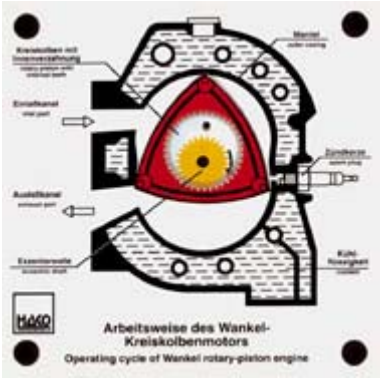
Order no. 191
Diesel engine of a truck

- the OHV-engine is driven by means of a crankshaft, tappet and rocker arm
- valve overlapping
- sequence of the four strokes
- injection needle in motion



Order no. 287
Two stroke diesel engine

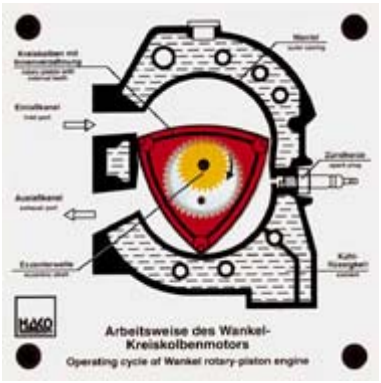
- function of crankshaft drive
- regulation of camshaft and exhaust valve
- principle of a roots compressor for uniflow scavenging
- regulation of charge cycle

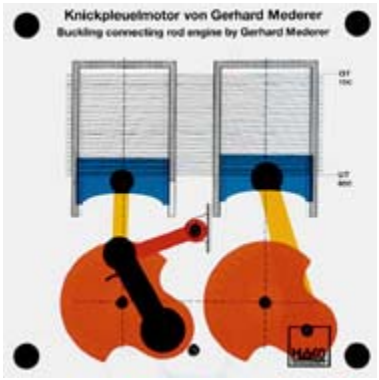


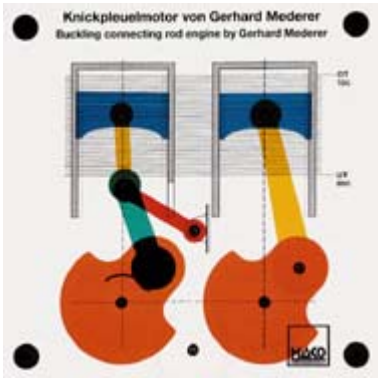
Order no. 238
Wankel engine

- the bid and solid overhead model shows how a wankel engine works, especially the function of an eccentric shaft and gearing

TECHNOLAB SA, Rotherdweg 16, Postfach, CH-5022 Rombach - Switzerland
Tel: +41 62 827 11 11 - Fax: +41 62 827 11 70 - e-mail: info@technolab.org - www.technolab.org

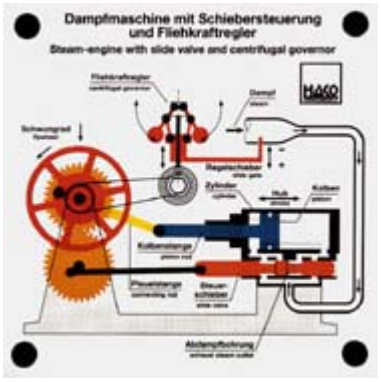






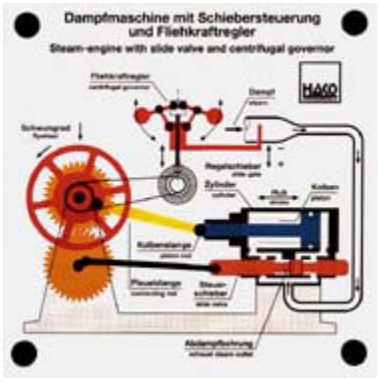
Order no. 301
Buckling connecting rod engine by Gerhard Mederer

The two engines are connected by gear wheels and are turning simultaneously
It is clear that the buckling connecting rod engine has a significantly linkage towards the crankshaft and a greatly reduced piston side pressure

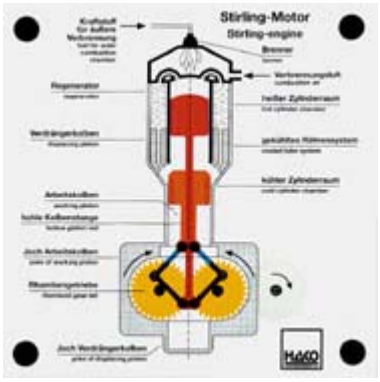


Order no. 283
Steam engine with slide valve and centrifugal governor

- function of the piston and flywheel
- function of the slide valve



- function of the centrifugal governor
- regulation the steam inlet for constant speed

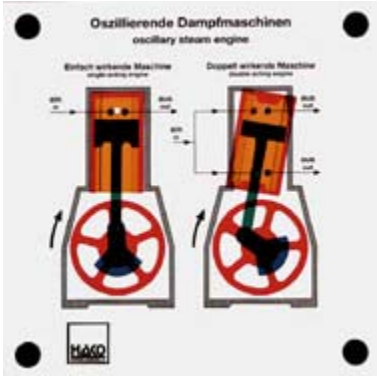


Order no. 289
Stirling engine

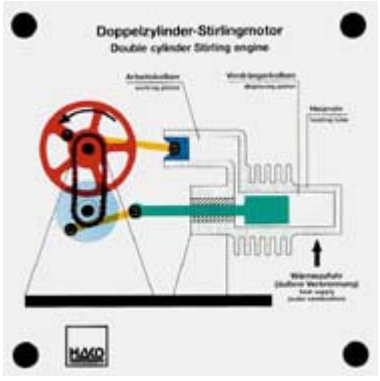
- function of a rhomboid gear-set
- functioning of displacing piston and working piston
- effect of regenerator in the closed system

Order no. 319
Oscillary steam engine

the simlest form of a reciprocating engine is a steam engine with oscillating cylinders. The model shows both the single-acting and the double-acting engine. The mode of operation of the engine and the control of steam inlet and outlet, through a cylinder bore in each case, can be demonstrated particulary well.



- function: control of steam by moving the cylinder
- single-acting: one working chamber above
- double-acting: two working chambers above and below



Order no. 304
Double-cylinder Stirling engine

- function of a double-cylinder Stirling engine
- actuating the crankshaft drive
- interaction of working and displacing piston

Order no. 104
Flat engine

- characteristics of a flat engine in motion
- function of the oposed pistons

Order no. 105
V-engine

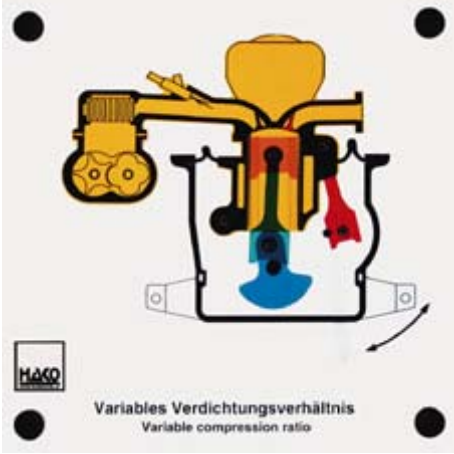
- arrangement of the cylinders
- characteristics of the two pistons in motion

Order no. 103
Radial cylinder engine

- function of a the master connecting rod
- coordinated displacement of all pistons in one level

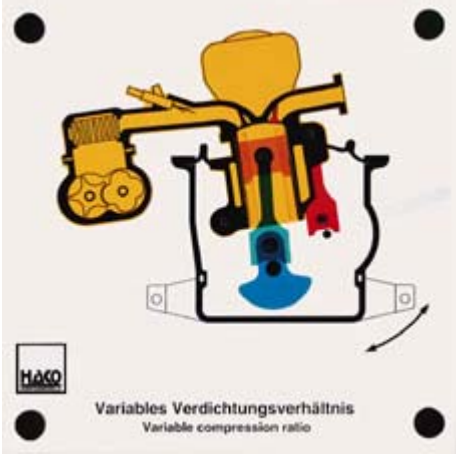
Order no. 420
7-cylinder radial engine

- function of a radial engine according to the four-stroke principle
- function of the master connecting rod
- combined effect of the 7 pistons on one lever
- driven by one external lever



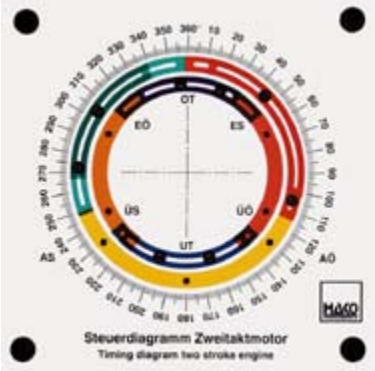
Order no. 457
Variable compression ratio (SVC engine)

By pivoting the cylinder block plus added parts around a pivoting axis, the compression ratio can be
altered infinitely from 8:1 (full load with full loading pressure) to 14:1 (part load with low loading pressure)
Maximisation of the compression ratio from idling to
full load with minimisation of the furel consumption and pollutant discharge.



Order no. 395
Valve overlap

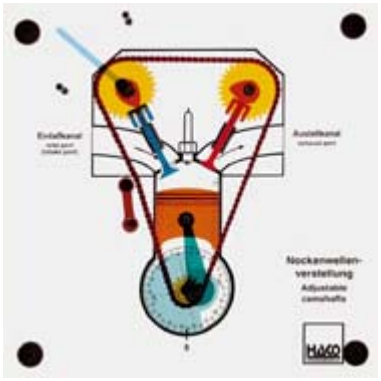
- the opening and closing angle of the discharge and inlet valves can be adjusted as required
- the various overlap angles can be read off



Order no. 399
Two stroke engine timing diagram

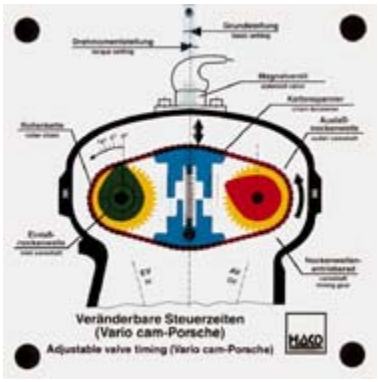
Setting the various angles for:
- pre-induction, induction, precompression, overflow, exhaust, compression and working

- setting of symmetrical and asymmetrical timing diagrams
- reading pff the various angles



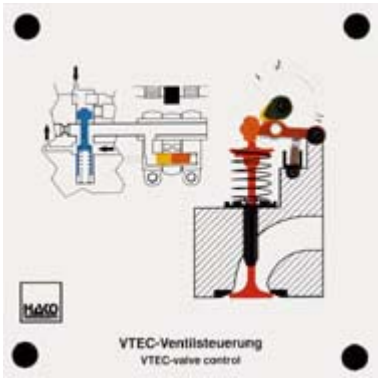
Order no. 187
Adjustable camshafts

all functions of a four stroke engine can be shown, incl. chain tensioning. Inlet valve and exhaust valve openings can be read in degrees. Valve opening and closing as well as valve overlapping can be shown. The inlet cam can be advanced by means of a lifting cam and power screw.



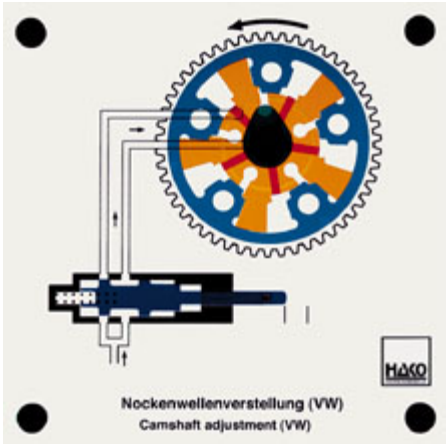
Order no. 235
Variable valve timing system Porsche (VARIO CAM)

Advancing the inlet camshaft by means of two sliding chain tensioners, which can be moved to and from via magnetohydraulic actuation. The exhaust camshaft is driven by the crankshaft. The inlet camshaft is driven by the outlet camshaft via a chain



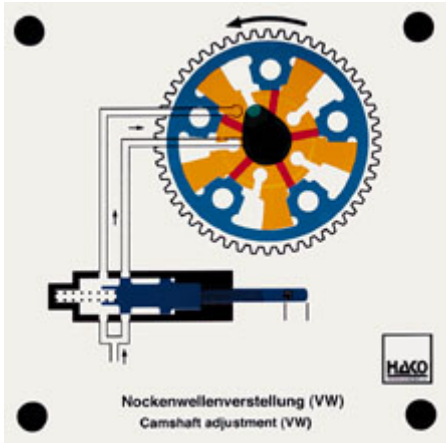
Order no. 419
VTEC valve control

- valve control in the lowest speed range with drag levers released
- locking of the drag lever in the upper speed range, valve control by means of the sharp cam
- entering thecontrol angle

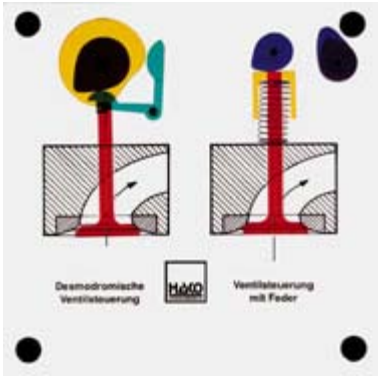


Order no. 463
Camshaft adjustment (VW)

In this, the adjustment of the inlet and the outlet camshaft is done with the help of hydraulically operated vane adjuster. In an outer rotor, an inner rotor is rotated hydraulically clockwise or anti-clockwise and adjusts the camshaft in



The maximum adjustment angle is 52° crank angle with the inlet camshaft and 22° with the outlet camshaft.
the direction of early or late.



Order no. 130
Valve timing

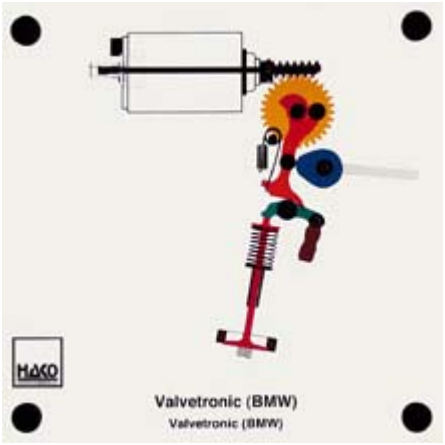
- function of the desmotronic valve actuation (with cams to open and close the valve)
- different cam shapes cause different cylinder fillings

Order no. 435
Valve operation, valve play

Functions:
- Differing valve stroke with differing heights oc cams
- Reading off the angle of opening with differing shapes of cams

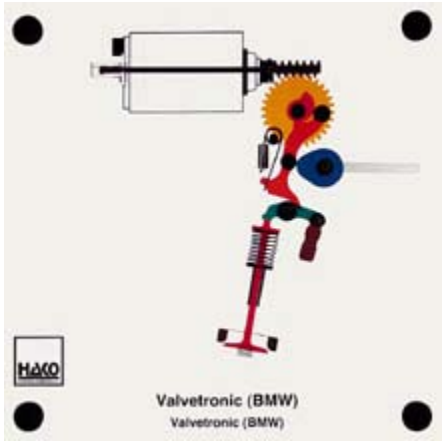
- Correct setting of the valve play with the help of a thickness gauge
- Heat expansion of the valve and the effects if the valve play is too low

- Effects on the engine if the valve play is too large

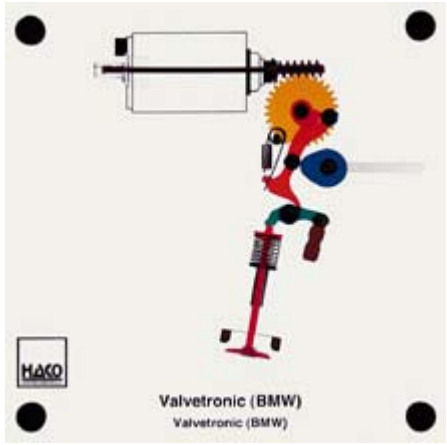


Order no. 460
Valvetronic (BMW)

Instead of a throttle valve, the differing valve stroke is used in the Valvetronic to control the fresh gas. An eccentric shaft is operated by the engine managementvia an electric motor, a worm and a work wheel.



The eccentric shaft controls an oscillating lever between the cam shaft and the rocker arm, with the result that the cam of the inlet camshaft opens the valve to differing extents (from zero strokeup to maximum stroke).

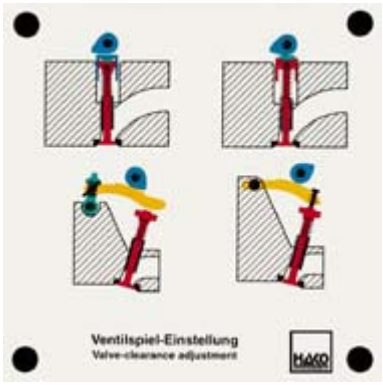


The worm can be operated manually with the help of a small wheel!

Fig. 1: Zero stroke (valve remains closed)
Fig. 2: Half stroke
Fig. 3: Maximum stroke

Order no. 390
Valve-clearance adjustment I

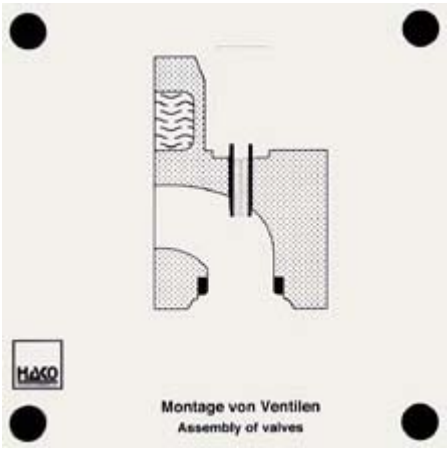
It is possible to demonstrate 4 different ways of setting the valve clearance, by rotating the adjusting screws on the rocker arm or rocker lever, by inserting discs of varying thicknesses or by means of an eccentric on the rocker arm



Order no. 391
Valve-clearance adjustment II

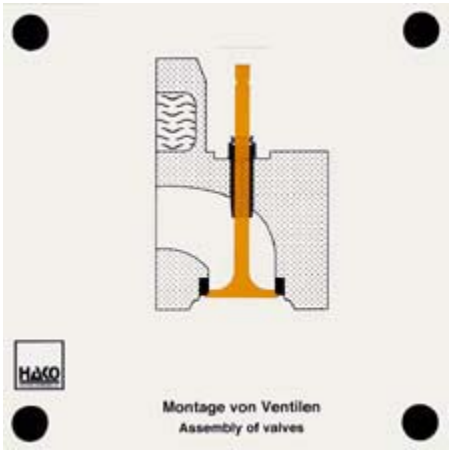
It is possible to demonstrate 4 different ways of setting the valve clearance. By inserting discs of varying thicknesses in or under the bucket tappet. By rotating the adjusting srews on the rocker arm and rocker lever

All cams can be turned, so that the opening stroke at various valve clearances can be demonstrated

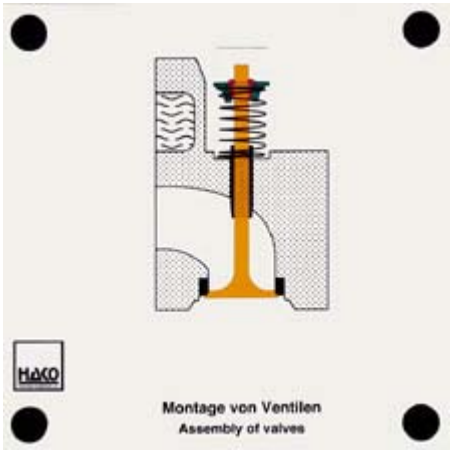


Order no. 464
Assembly of valves

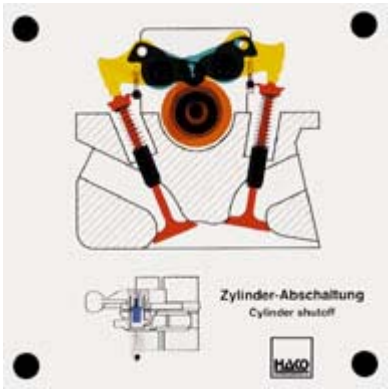
The assembly of a valve into the cylinder head can be demonstrated clearly:



Insertion of the valve shaft into the sleeve on the cylinder head Pushing the valve shaft sealing on

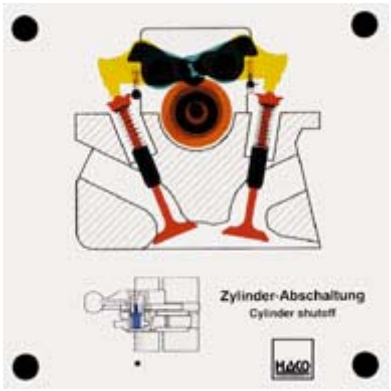


Pushing the spring valve and the spring cap on Pushing the spring valve over the spring cap Pushing the valve key into the groove of the spring cap.

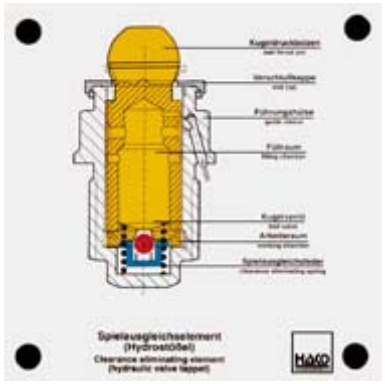


Order no. 434
Cylinder shutoff

The cylinder shutoff, a new development for the new Daimler Benz S class, is switched on and off electro-hydraulically by the control unit. In the lower load area, 4 cylinders are switched off, in the upper load area there is a switch-over to 8 cylinders. The valves are operated in a locked state. If the coupling pins

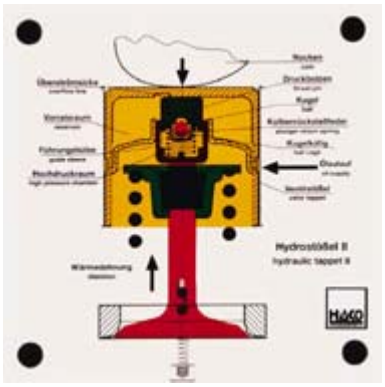


are removed, the valves remain closed. The driving levers are pressed onto the camshaft by springs in an unlocked state.



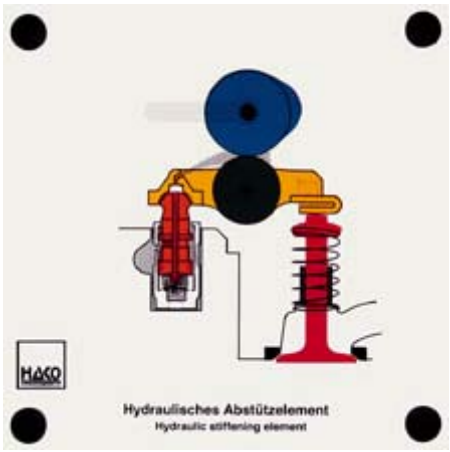
Order no. 131
Hydraulic valve tappet I

- how the hydraulic valve tappet works under pressure and release
- function of piston, spring and ball



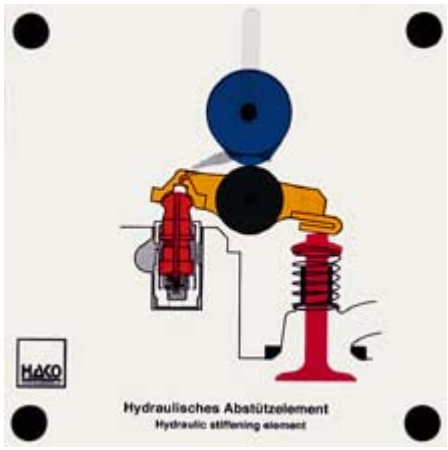
Order no. 268
Hydraulic tappet II

This hydraulic tappet is designed as a bucket tappet and makes a valve adjustment without clearance possible. Function of high pressure chamber, ball valve, clearance-eliminating spring and valve tappet can be shown.

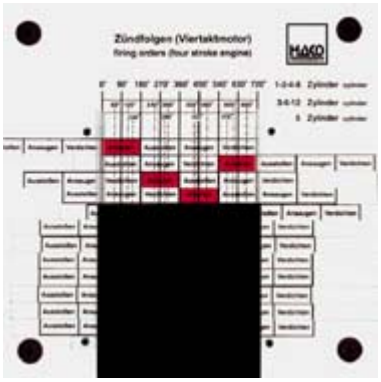


Order no. 459
Hydraulic stiffening element

The following can be shown:
- Valve clearance compensation by the hydraulic stiffening element
- Function of the piston in load and relief

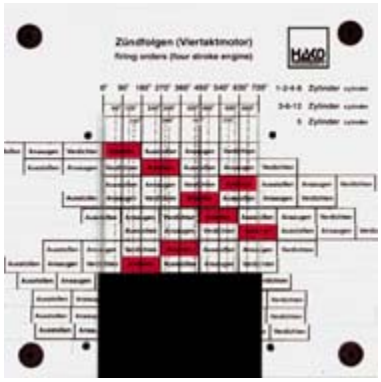


- Function of the spherical valve
- Opening of the valve by the rocker arm
- Closing the valve by the valve spring



Order no. 145
Valve timing diagram

- firing order of one- to twelve-cylinder engines
- any firing order can be set
- especially suited to understand different firing order schemes

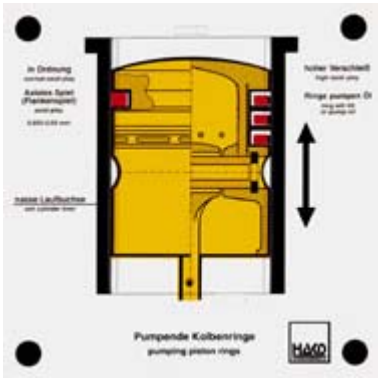


Order no. 145 E

Order no. 250
Installation of a piston ring

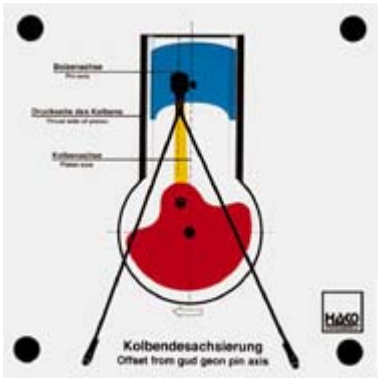
- inserting three different piston rings shows an incorrect and correct ring gap
- different cylinder diameters cause a piston ring gap that is normal, too wide or too narrow

- the piston rings have a spring effect
- all piston rings can be taken out of the model



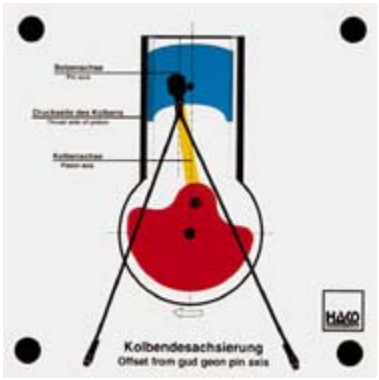
Order no. 211
Pumping action of piston rings

- when moving the pistons to and from, you can see how the piston rings slide up and down in the grooves if there is too much clearance: Oil is pumped into the combustion chamber
- less clearance and thus a smaller pumping effect is shown on the left side



Order no. 146
Piston-pin offset

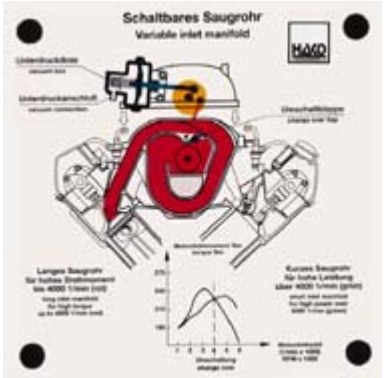
- without offset: piston changes bearing surface after TDC
(under full combustion pressure)



- with offset: piston changes bearing surface already before TDC

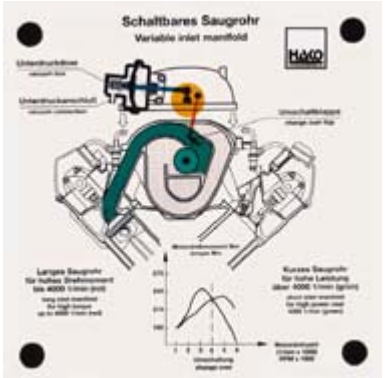
Order no. 189
Balance shafts

- the two balace shafts of a four-cylinder inline engine turn towards each other with double crankshaft RPM

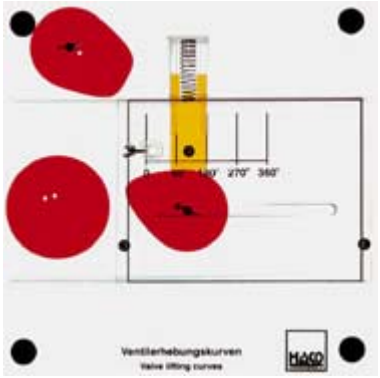


Order no. 276
Variable inlet manifold

Functions:
- change-over flap is controlled by a vacuum box
- intake gas flow varies depending on different RPM's

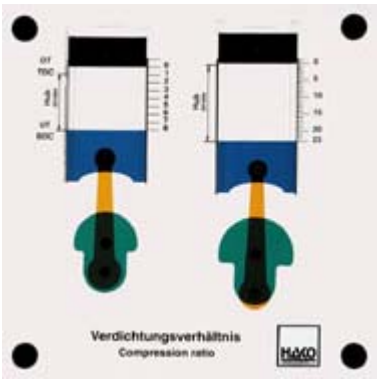


- background knowledge can be explained with the diagram



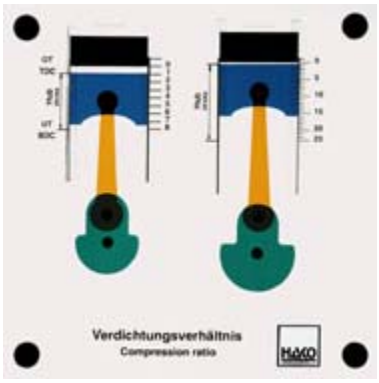
Order no. 196
Valve lifting curves

The filling curves of three different cam shapes can be drawn directly on a mobile slide by means of the three enclosed felt pens (red, blue and green)



Order no. 337
Compression ratio

working out of the different capacities: piston capacity, compression space and combustion chamber



calculation of the compression ratios of Petrol and Diesel engines. Possible Ways of modifying compression:
introduction of a higher or flatter seal or head surfacing; this is demonstrated by means of a slide.

Introduction of a longer or shorter connecting rod, piston and two different crankshafts, calculation of the modified compression ratio

Order no. 1015
Model cabinet

for storing approx. 50 to 60 OH models (depending on height), made of synthetic laminated chipboard, lockable

Order no. 1014
Model stand

for storing 10 OH models made of veneered plywood