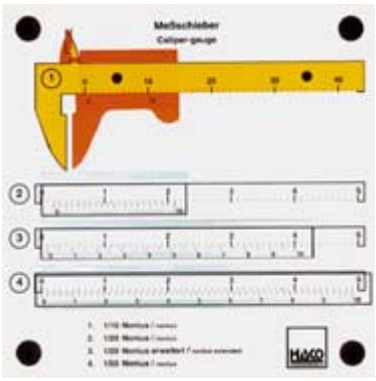
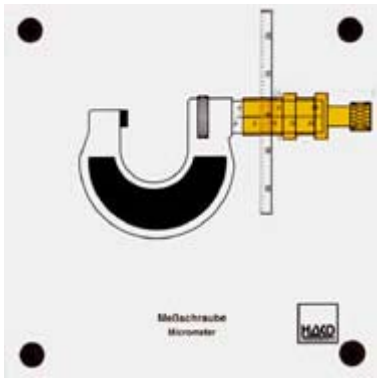
HAKO Overheadmodels - Section 7

Mechanical engineering, pneumatics, hyraulics



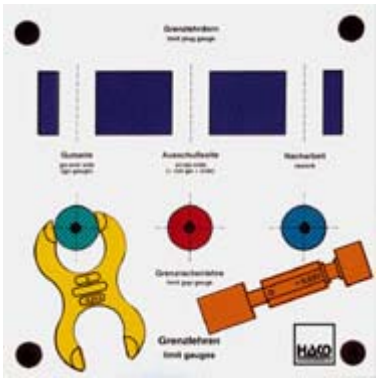
Order no. 216
Caliper gauge

- design of a caliper gauge
- four different vernier scales can be read (1/10mm, 1/20mm extended and 1/50mm)
- all values can be clearly read



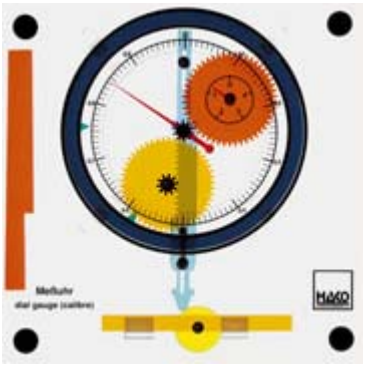
Order no. 218
Micrometer

- full and half millimeters can be read off the scale
- hundredth millimeters can be read off the graduated drum. (developed view of drum)



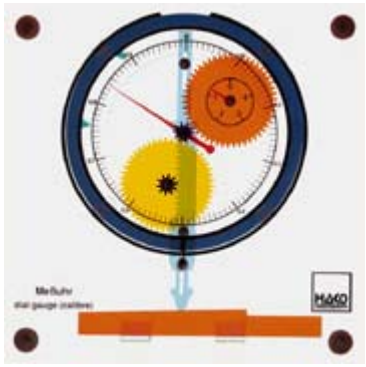
Order no. 231
Limit gauges

- both gauges have a go end and a no-go end and are marked accordingly
- since both gauges fit into several work pieces, it is possible to demonstrate the following: workpieces within tolerance range, scrap and rework

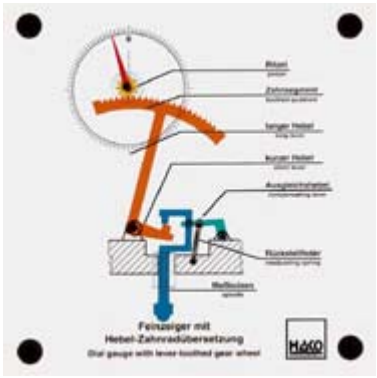


Order no. 228
Dial gauge

- all interactions in a dial gauge can be shown
- indication of full and hundredth millimeters can be seen
- demonstration of the gauge's uses: parallelism of work pieces and concentric running of round pieces

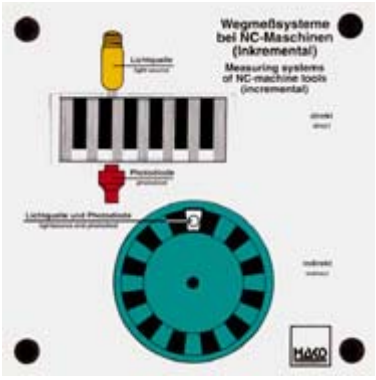


- there is no backlash because a compensating pull spring and a spiral spring are used



Order no. 233
Dial gauge

- function and interaction of the parts in a dial gauge can be shown

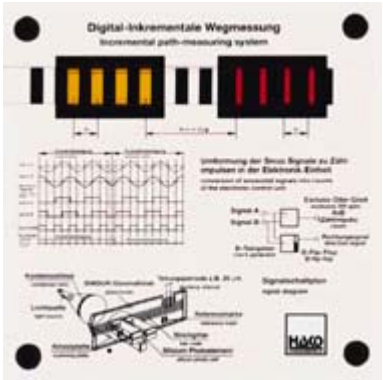


Order no. 237
Path-measuring system

(made-up of two models)
- the four most common path-measuring systems are shown:
incremental: direct and indirect

Order no. 110
Path-measuring system

absolute: direct and indirect
- complex actions made easy
- the principle of digital counting can be deduced



Order no. 263
Incremental path-measuring system:

Functions:
- displacement of the scanning plates by one quart of alpha
- bar code can be moved in both directions
- transformation of the determined signals
- forward and backward motion can be recognized

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Order no. 236
General angle measuring instrument

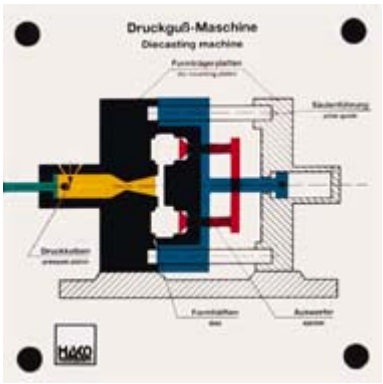
- fine scaling makes easy reading and precise measuring possible
- correct reading can be practised on plexiglass workpieces

Order no. 266
Tool radius offset on a CNC-lathe

Moving along the cutting edge with the tool shows the following:

- no fault of tool lip without tool lip radius

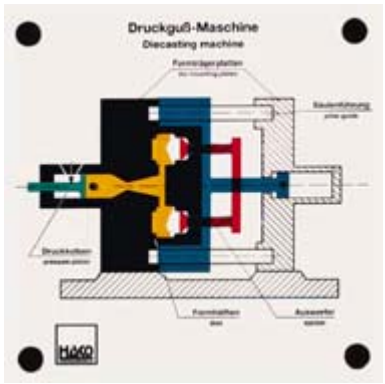
- fault of tool lip if tool lip radius has no path correction
- no fault of tool lip with path correction



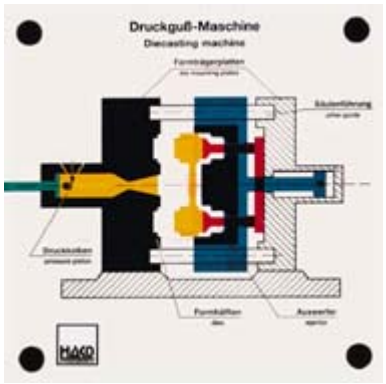
Order no. 277
Diecasting machine

The following functions can be shown:

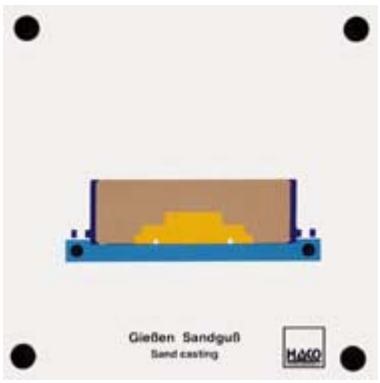
- filling the dies by displacing the pressure piston (Demonstrated a plexiglass / an acrylic glass yellow plate.)



- dies can be opened by means of a second working piston
- the work piece is ejected by means of an ejector

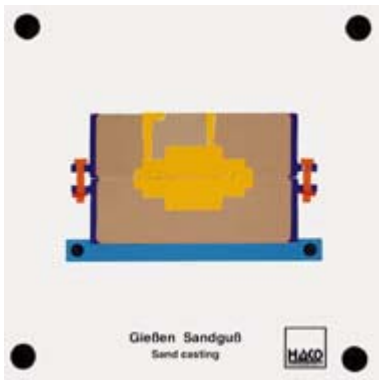


- the dies are closed for the next cast

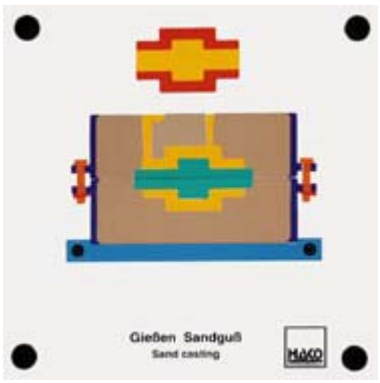


Order no. 413
Sand casting

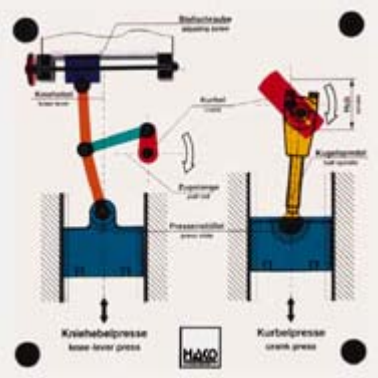
- placing a pattern half on the base plate
- positioning the bottom box
- filling with sand
- turning the bottom box
- positioning and wedging the top box
- inserting the second half of the plattern, the rising gate and the runner gate



- filling with sand
- removal of the model halves, the rising gate and the runner gate
- insertion of the core and positioning of the top box
- casting



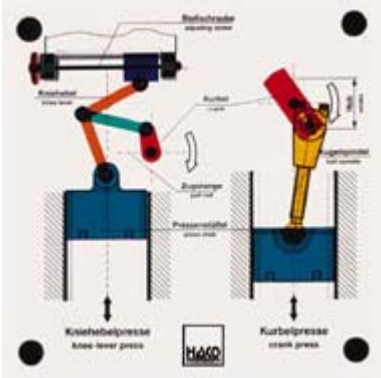
- appearance of the finished workpiece with runner and riser
- removal of the core
- appearance of the finished workpiece



Order no. 264
Presses
Knee-lever press:

- function of crank and pull rod
- stroke of the press slide
- changing length of stroke by means of the flexible adjusting screw (fine adjustment)

"Short stroke"



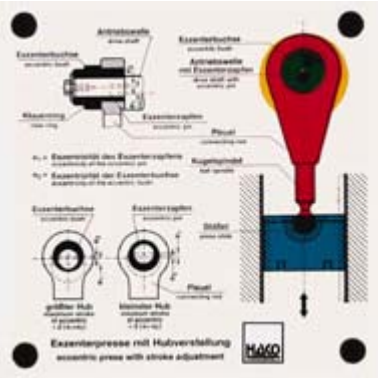
Crank press

- function of crank and ball spindle
- stroke of press slide
- change of stroke length possible

"Long stroke"

Order no. 192
Schmidt coupling

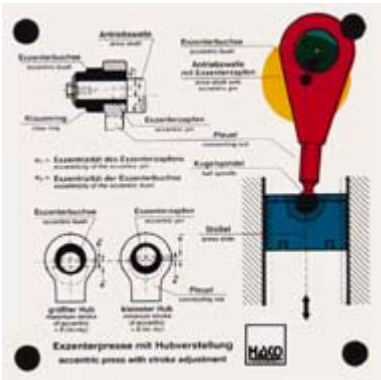
- the Schmidt coupling is used to drive shafts with large axial offset
- distance and sense of rotation of input and output shafts are variable
- the output shaft can be moved in all directions



Order no. 265
Eccentric press
with stroke adjustment

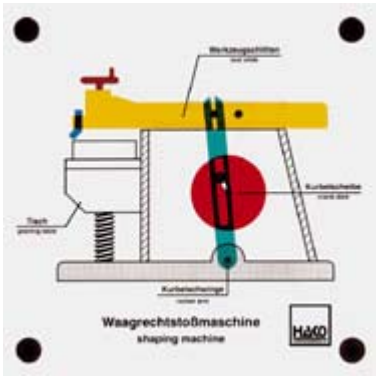
Functions:
- stroke of press slide
- adjusting the stroke by means of the eccentric pin and the eccentric bush

"Short stroke"



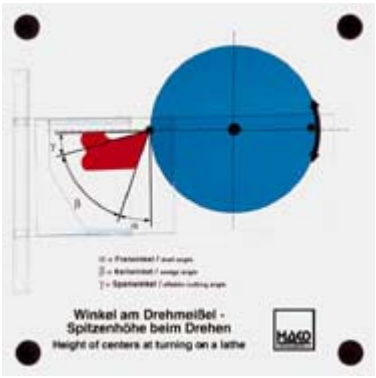
- minimum and maximum stroke of eccentric.

"Long stroke"



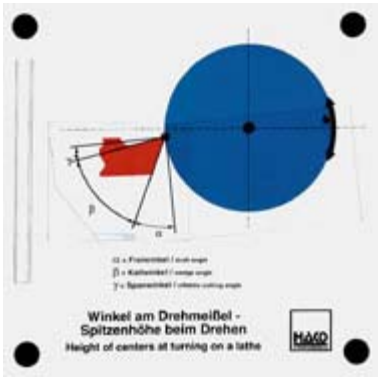
Order no. 159
Slodding machine

- function of the crank mechanism
- return stroke shorter than cutting stroke
- adjustable stroke length

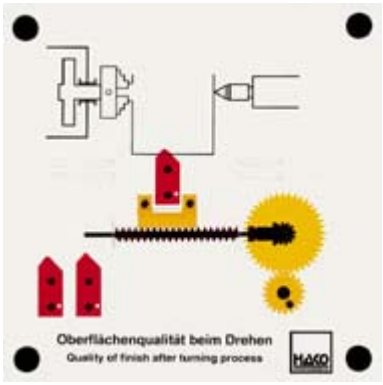


Order no. 158
Turning

- the lathe chisel can be positioned on, above or below the center

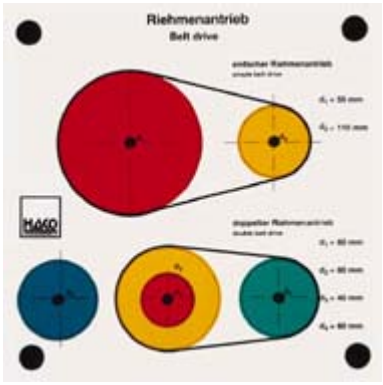


- a change of draft and effective cutting angle can be read immediately



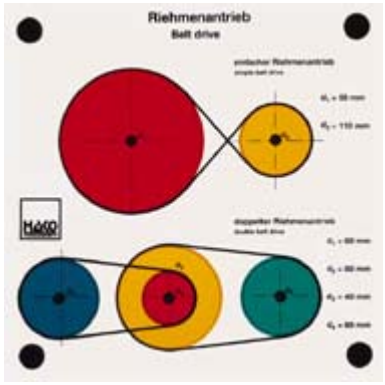
Order no. 364
Quality of finish after turning process

A water-soluble marker can be used to show the contours of the cutting tool on the surface of the work piece at each revolution. Different cutting tools can be inserted. Shows the effects of various feed rates.

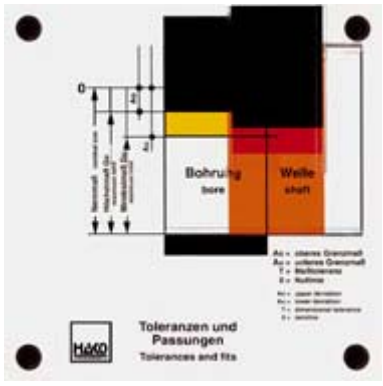


Order no. 253
Belt drive

Functions:
- simple and double belt drive
- reversing the direction of rotation when belts are crossed
- transmission changes with pulleys of different diameters

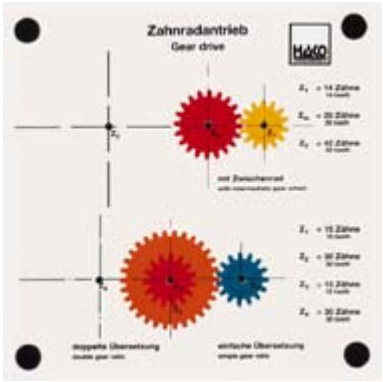


- angle of arc of belt contact
- well suited for mathematics



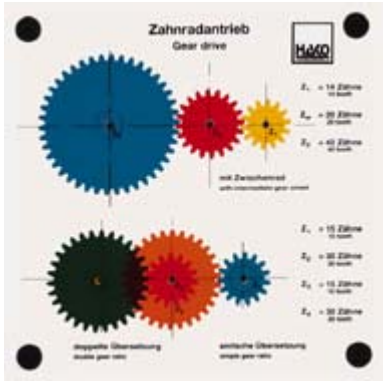
Order no. 168
Tolerance

- variable location and size of the allowances
- all fits can be shown
- limit size and minimum or maximum are shown directly
- shaft can slide into the hole

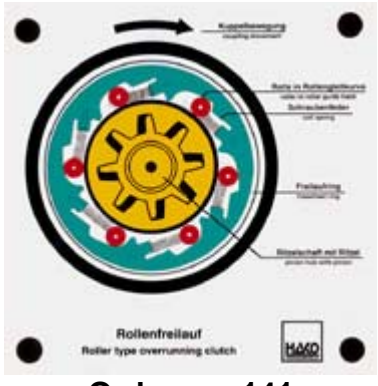


Order no. 252
Gear drive

Functions:
- transmission to faster motion
- transmission to slower motion
- simple and double transmision



- function of an intermediate gear wheel
- all wheels can be taken out of the model
- well suited for mathematics



Order no. 141
Roller-type free wheel

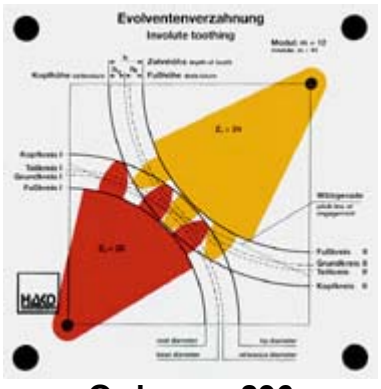
Function of the rollers rotating counter-clockwise and clockwise. Jaming and free-wheeling

Order no. 369
Cycloid toothing

The epicycloid is obtained by rolling a pitch circle on a pitched line of engagement.
It can be clearly seen how the addendum flank of the tooth of gear wheel 1 rolls off the dedendum flank of the tooth of gear wheel 2.

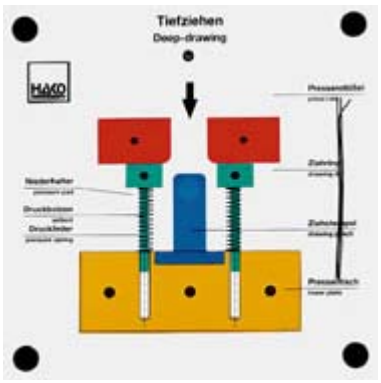
Order no. 370
Toothing with re-entrant angle

When a gear wheel is being manufactured, if the number of teeth is below the lower limit (e.g. 12 teeth), then the tooth faces must be made with a re-entrant angle.
This process weakens the tooth faces.



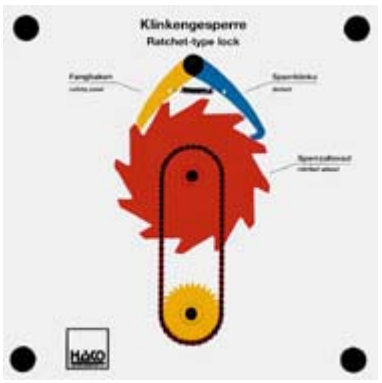
Order no. 296
Involute toothing

- meshing
- turning the tooth segments
- moving the involute on the pitch line of engagement
- displacing the pitch point of engagement
- marks on toothing



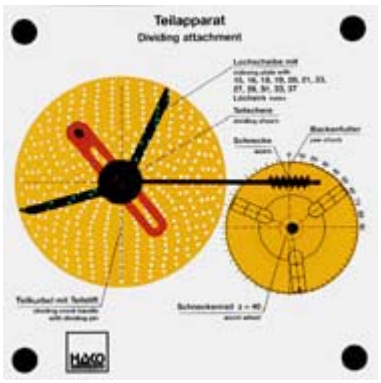
Order no. 290
Deep-drawing

- design of a deep-drawing tool
- production of a deep-drawn tin wire part
- influence of pressure pad force and pad pressure



Order no. 309
Ratched-type lock

- cycle of movement in lock and release directions
- how detents work



Order no. 292
Dividing attachment

- function of a dividing attachment
- adjusting the dividing crank according to diameter of pitch circle - adjusting the dividing shears
- turning the dividing shears
- automatic turning of the jaw-chuck (1:40)
- calculations on a dividing attachment

Order no. 346
Climb Milling

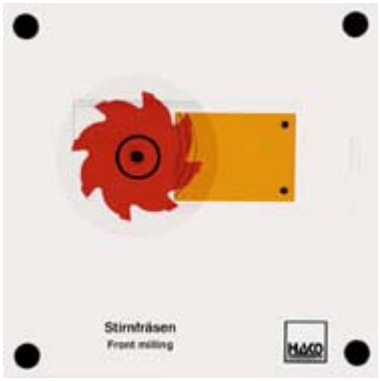
Turning of the miller with simultaneous table feed in the same direction.
Under the miller there is a transparent 2 mm Plexiglas plate. The plate has boreholes at the ends of the miller teeth. With the aid of a fibre-tip pen, one

can see the development of a turning comma during the rotation of the miller

Order no. 347
Opposed Milling

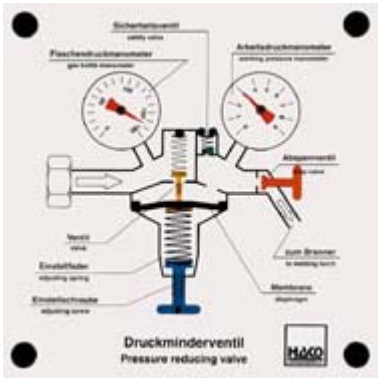
Turning of the miller with simultaneous table feed in the opposite direction.
Under the miller there is a transparent 2 mm Plexiglas plate.

The plate has boreholes at the ends of the miller teeth. With the aid of a fibre-tip pen, one can see the development of a turning comma during the rotation of the miller.



Order no. 348
Front Milling

Turning of the miller with simultaneous table feed. With the aid of a fibre- tip pen, one can see the development of a turning comma during the rotation of the miller.



Order no. 331
Pressure reducing valve

- function of the safety valve
- function of the shut-off valve
- function of the adjusting screw and governing spring for pressure regulation
- function of the diaphragm and the valve
- movement of the needle according to the level of pressure

Order no. 366
Bending test

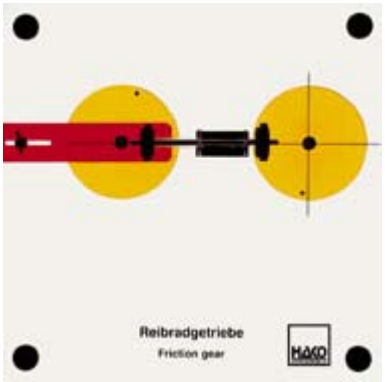
The properties of various materials and cross-sections when subjected to bending.
The properties of the materials at different sweeps.

Order no. 367
Hardness test

3 different penetrators enable the demonstration of the Brinell-Rockwell and Vickers processes. Before the penetration of a second test piece teh surface is automatically smoothed.

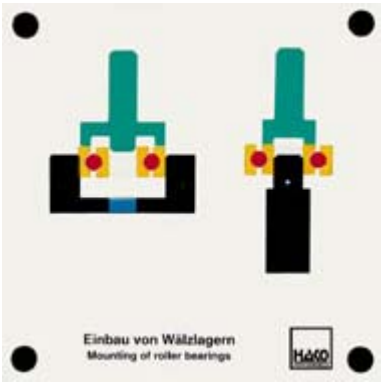
Order no. 362
Wringing fit and centring seat

Demonstration: The difference between the wringing fit and centring seat.
The wringing fit with a taper of 1 : 50 centres and has good adhesion qualities.
The centring seat with a taper of 1 : 10 centres well, but is self-releasing.



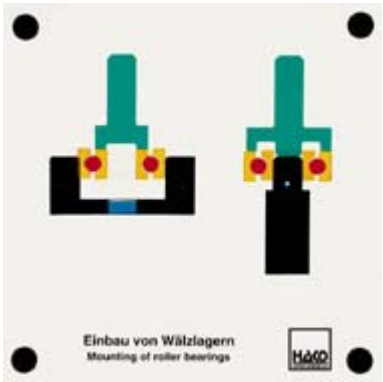
Order no. 368
Friction gear

Application for e.g. screw presses.
By sliding the drive shaft an infinitely-variable alteration of the gear ratio is possible. The power flow is obtained by friction.



Order no. 383
Mounting of roller bearings

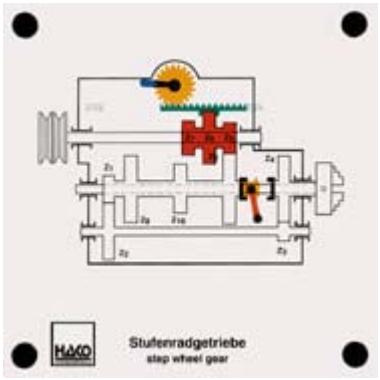
Left diagram: Correct mounting of roller bearings. The force for pressing together the outer ring (left) and the inner ring (right) is applied directly to the ring which is firmly fixed.



Right diagram: incorrect mounting of roller bearings. The joining force os transferred to the roller. This can be well demonstrated by the backlash of the balls.
This damages the rings.

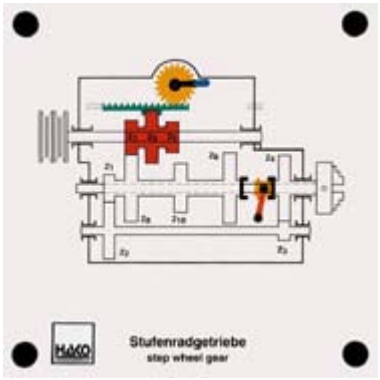
Order no. 363
Relieve

Used for the manufacture of profile cutters.
A water-soluble marker is used to show the path of the cutting tool on the blank.



Order no. 329
Step wheel gear

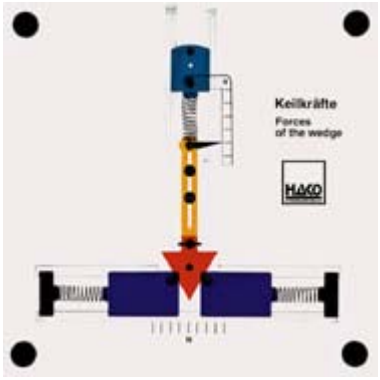
- layout of a step wheel gear
- shifting of the countershaft to positions 1 and 2
- shifting of the main shaft to position 1 and 2
- demonstration of power flow with the 6 different rotational speeds



- calculation of rotational speeds and torques with help of the operating instructions

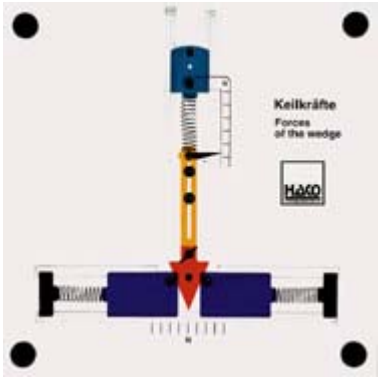
Order no. 328
Tumbler gear

- modifying the sense of rotation by means of the tumbler gear
- power flow with clockwise and counter clockwise rotation
- no power flow in idling position



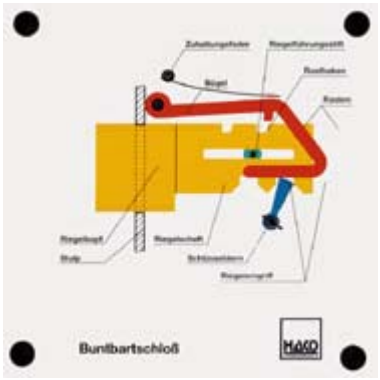
Order no. 335
Forces on the wedge

With the help of 3 wedges (30, 45 and 60 degrees) it is possible to observe the wedge force dependent on the different pressure forces



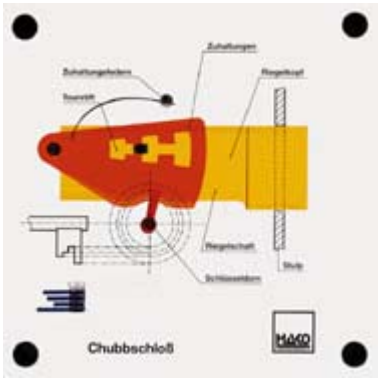
Order no. 365
Spindle drive free from backlash

Without initial tension of the threaded nut the threaded spindle is seen to have a lot of backlash.
With initial tension of the threaded nut the threaded spindle is free from backlash.



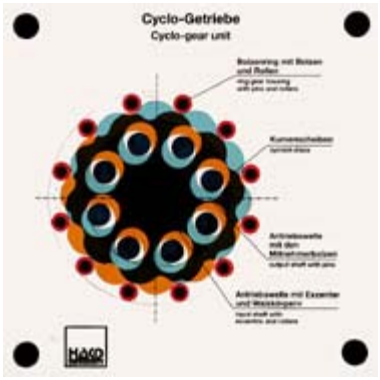
Order no. 407
Buntbart lock

- function of the locking and unlocking action of a Buntart lock
- stoppage of the lock when using various incorrect keys
- security of the lock



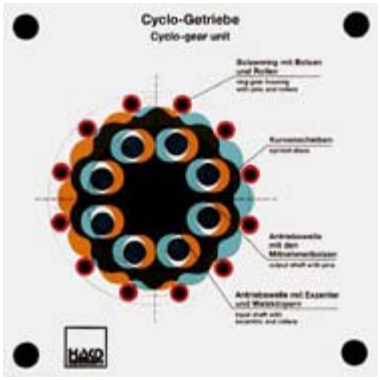
Order no. 406
Chubb lock

- function of the locking and unlocking action of a Chubb lock
- stoppage of the lock when using an incorrect key
- security of the lock



Order no. 294
Cyclo-gear unit

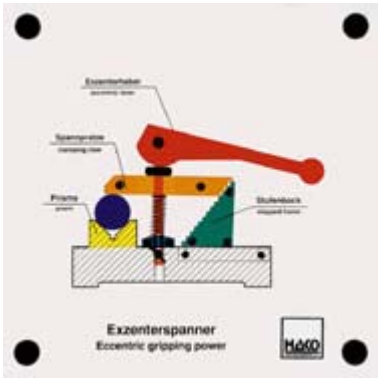
- function of a cyclo-gear unit
- power transmission by rolling motion
- the advantages of a cyclo-gear unit:



compact design, high transmission ratio, no sliding friction, high dynamics, low moment of inertia, silent run, high efficiency, three-stage transmission up to 428285:1

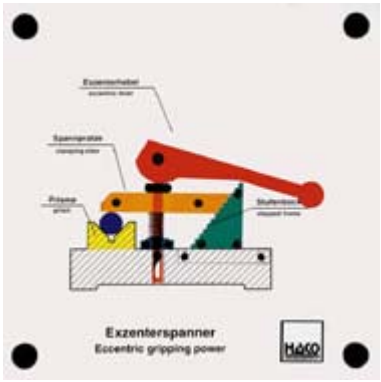
Order no. 359
Maltese Cross

Maltese cross-type transmission is used for the control of rotary indexing tables.
Each turn of the curved wheel rotates the Maltese wheel through 90°, and it remains it this position until the next time the curved wheel is turned.

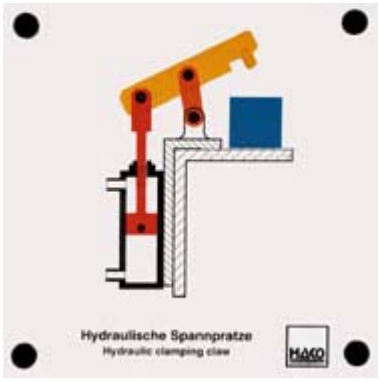


Order no. 339
Eccentric gripping power

- excentric function during clamping
- clamping of different diameter workpieces



- displacement of stand and clamping claw to ensure adaptation to the respective workpiece diameter



Order no. 351
Quick clamping device, hydraulic

- opening and closing of the clamping device by means of the plunger stroke and the hydraulic cylinder

Order no. 349
Quick clamping device, vertical

- opening and closing of the clamping device
- large lever arm on handle and smaller lever arm on clamping claw provide intensive clamping forces

- function of the knee lever

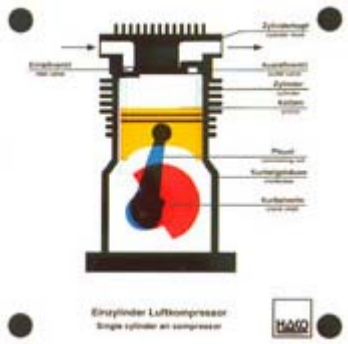
Order no. 352
Quick clamping device, horizontal

- opening and closing of the clamping device
- large lever arm on handle and smaller lever arm on clamping claw provide intensive clamping forces
- function of the knee lever

Order no. 350
Quick clamping device, pneumatic

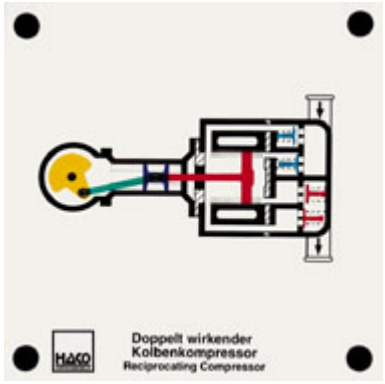
- opening and closing of the clamping device
- large plunger stroke and smaller closing stroke via force deflection in knee lever

- cylinder movement during stroke



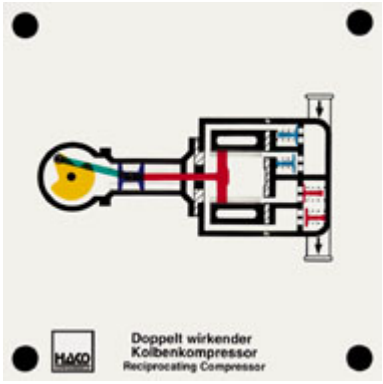
Order no. 181
Single-cylinder air compressor

- function of suction and delivery valve
- function of the piston when turning the cranshaft



Order no. 374
Reciprocating compressor

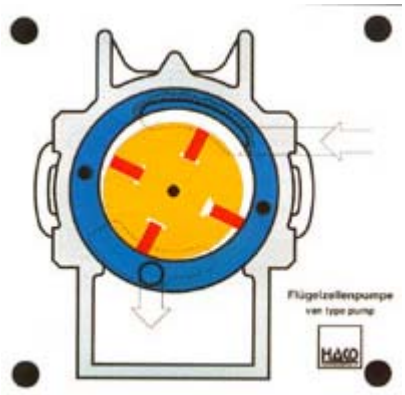
Used for the supply of larger quantities of compressd air.



By opening the relevant inlet and outlet valves it delivers on both the forward and return stroke.

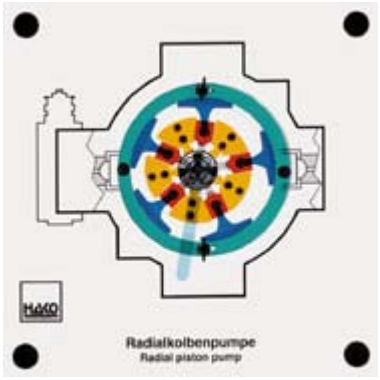
Order no. 375
Diaphragm-type compressor

Used when the compressed air has to be free from lubricant residues.
The membrane is fixed at the top of the piston and follows it in the course of the strokes.



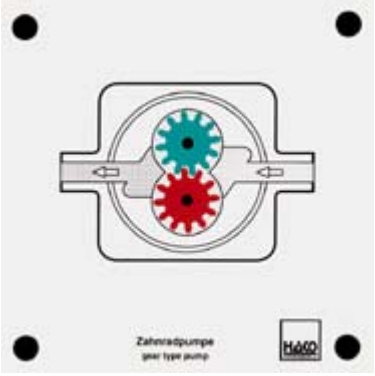
Order no. 124
Vane-pumpe

- function of the pump
- centrifugal force causes apex seal to fit
- apex seals do not fit at slow rotation



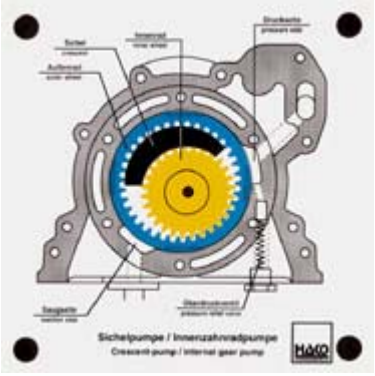
Order no. 421
Radial-piston pump

- The regulation of the delivery rate is performed hydraulically by moving the piston ring.
- The piston ring on the model can be moved from zero to maximum delivery



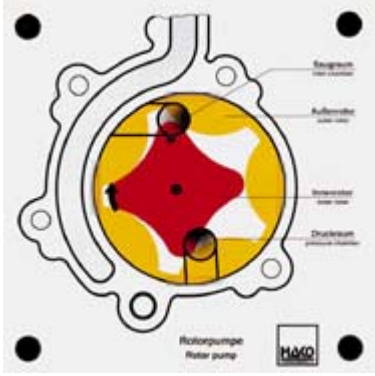
Order no. 128
External gear pump

- oil flow through the pump
- function of the pump



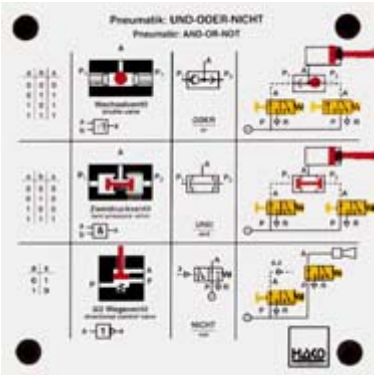
Order no. 206
Internal gear pump

- function of an internal gear pump: increasing and decreasing the volume of suction and pressure chamber
- internal gear pumps are used as engine-oil pumps and oil pumps in automatic transmissions



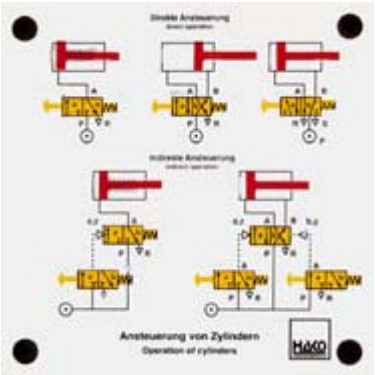
Order no. 129
Rotor pump

- an increase or decrease in volume of the chambers between inner and outer rotor causes suction or pressure



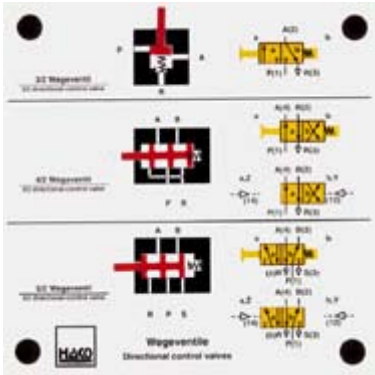
Order no. 219
Pneumatics: decision elements AND-OR-NOT

- a cylinder is triggered from two sides
- only one cylinder should be actuated when two signals are given
- one protecting guard is not closed, an acoustic warning sounds



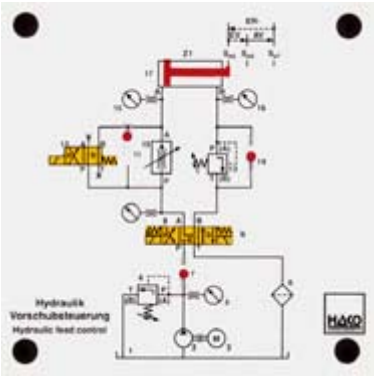
Order no. 220
Pneumatics: triggering a cylinder directly and indirectly

- all pistons and valves can be actuated
- differences between direct and indirect triggering of cylinders
- different methods of actuating: spring reset
- ideal model to simulate movement patters



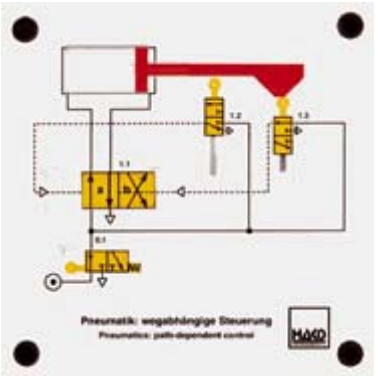
Order no. 217
Pneumatics: 3/2-, 4/2- and 5/2-port directional control valves

- all directional control valves and graphical symbols can be moved
- function and description of the different valves
- the model facilitates the understanding of symbols by comparison with real valves



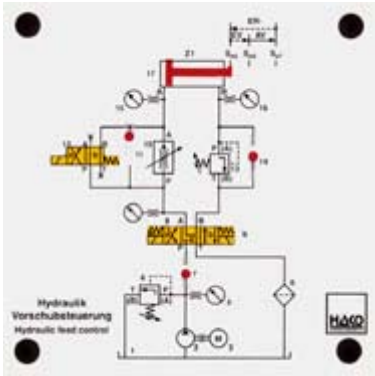
Order no. 221
Pneumatics: decision elements

- all pistons and valves can be actuated
- cooperation of valves and pistons
- ideal model to simulate movement patterns (back and forth)



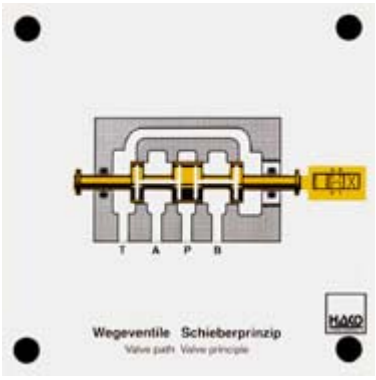
Order no. 234
Pneumatics: Path-dependent control

- in this model, the extending piston directly moves the directional control valves, which are reset by real steel springs
- the model is especially suited to introduce teh functions of model #221



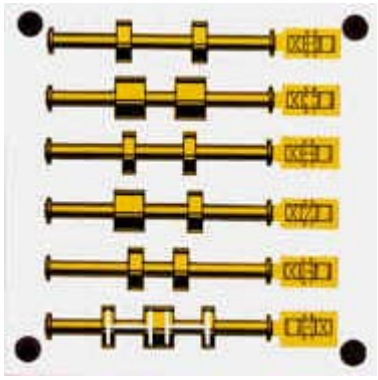
Order no. 222
Hydraulics: connection diagram of a feed control

- directional control valves, pistons and check valve can be moved
- simulation of all movement patterns

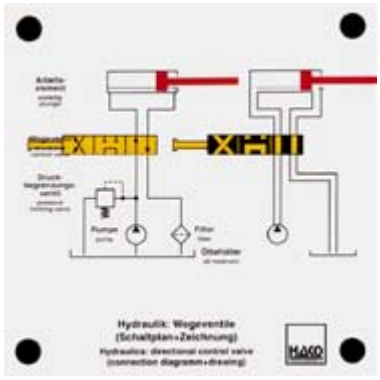


Order no. 223
Hydraulics: directional control valves with six different pistons

- different directional control valves
- possible flow paths through the different original pistons, six different pistons can be applied

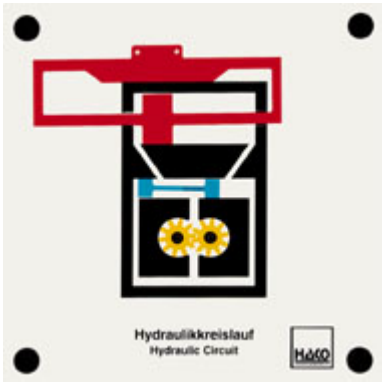


- assigning piston shapes tgo graphical symbols



Order no. 224
Hydraulics: directional control valve (connection diagram and drawing)

- the two valves are connected in a way they can move together
- combining the two pistons
- how graphical symbols of directional control valves come about
- three different shift positions can be set



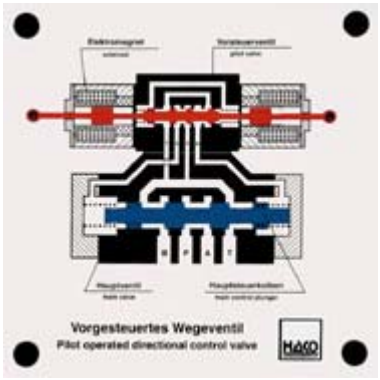
Order no. 361
Hydraulic circuit

The most important components of a hydraulic system are presented clearly and simply:
Function of the gear pump, a directional-control valve and the control piston.

Order no. 378
Hydraulic system

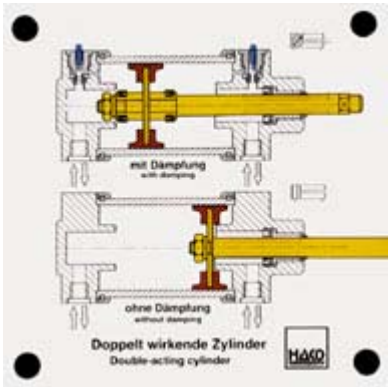
All the important components of a hydraulic system can be demonstrated:
Function of the control piston, pressure relief valve,

throtting valve, working piston and shift valve.
Shows movements of the lifting plattform



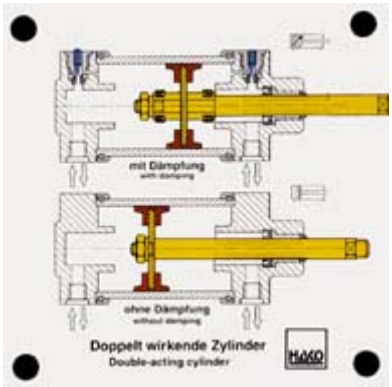
Order no. 338
Pilot operated directional control valve

- actuation of the pilot valve
- primary valve switching
- release of the directional ports via primary vlave

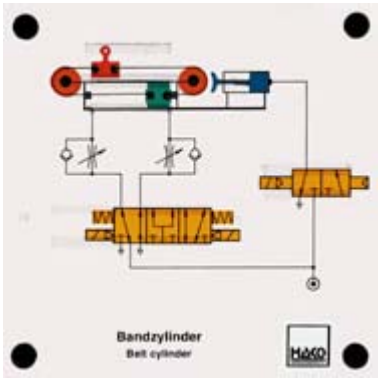


Order no. 431
Double acting cylinder

- Function of a double acting cylinder without damping.
- Function of a double acting cylinder with damping

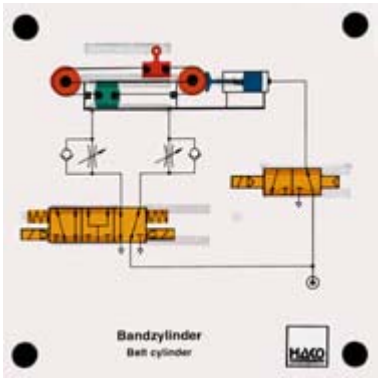


Both throttle valves are mobile, which means that differing damping figures can be set.



Order no. 353
Belt cylinder

- function of the 5/3 port directional control valve
- function of the 3/2 port directional control valve
- throttling function



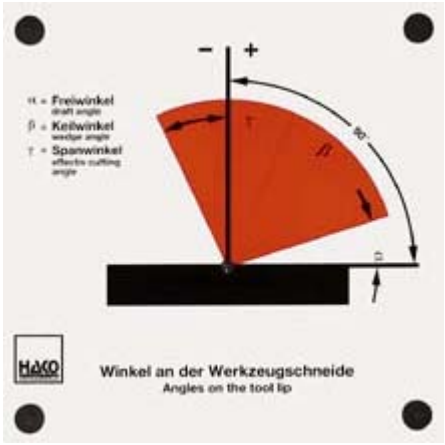
- function of the belt cylinder
- function of the band brake

Order no. 354
Cylinder without piston rods

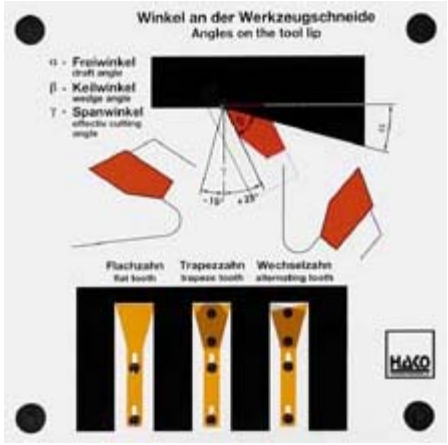
- function of the piston and of the cylinder
- function of the sealing band for sealing of cylinder slot

Order no. 468
Angles on the tool lip

- the size and position of the clearance leading edge and effective cutting angle can be changed

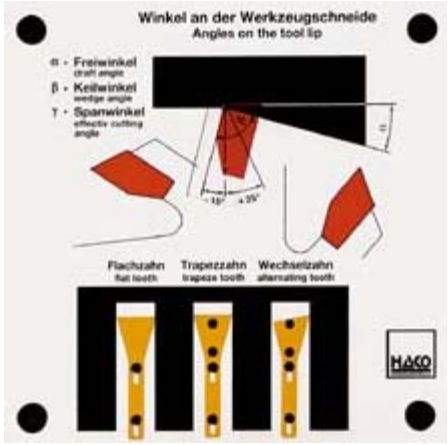


- mutual influence of clearance, leading edge and effective cutting angle can be seen clearly
- results in the negative effective cutting angle

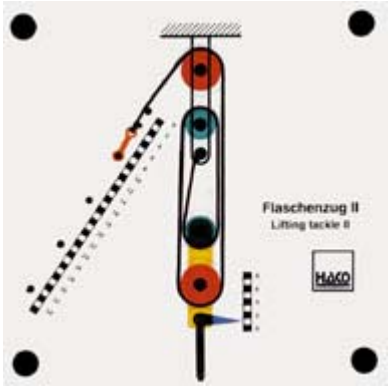


Order no. 472
Angles on the tool lip

- the size and position of the clearance leading edge and effective cutting angle can be changed

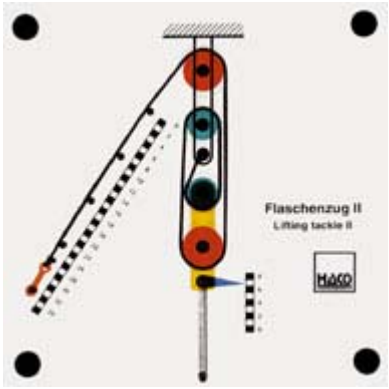


- mutual influence of clearance, leading edge and effective cutting angle can be seen clearly
- results in the negative effective cutting angle
- various shapes of tooth can be shown by adding variously shaped teeth

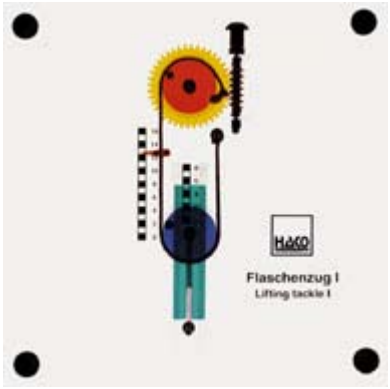


Order no. 436
Lifting tackle II

Functions:
- Principle of a lifting tackle with two loose and two fixed rolls

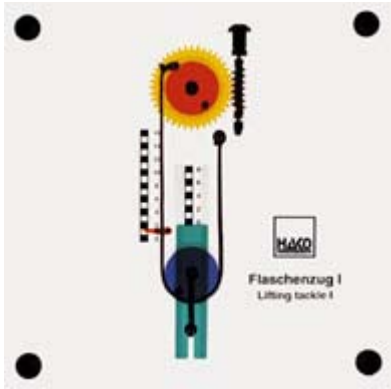


- Reading off the various distances; differing forces result from this



Order no. 426
Lifting tackle I

- Function of a lifting tackle with loose roll-read-off of the various distances
- Function of the worm



drive with a transmission artio of 40 : 1