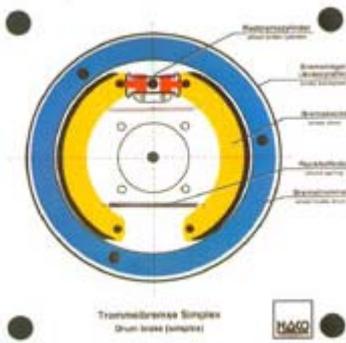
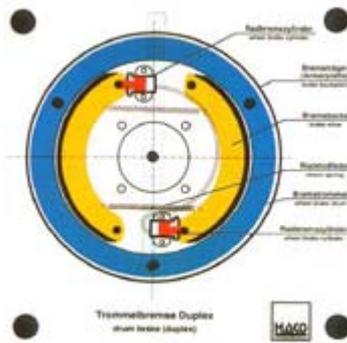


**HAKO Overheadmodels - Section 5**  
 Hydraulic braking, air-braking, air-brake components



**Order no. 118**  
**Drum brake simplex**

- braking
- brake shoes fit tightly
- function of the return spring
- the trailing (secondary) shoe is pushed



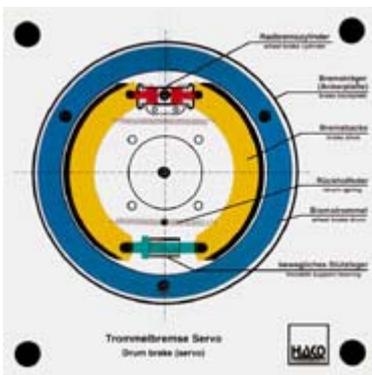
**Order no. 119**  
**Drum brake duplex**  
 (like simplex)

- braking with two leading brake shoes or, when backing-up, with two trailing brake shoes



**Order no. 120**  
**Drum brake duo servo**  
 (like simplex)

- transmission of the frictional forces of one brake shoe to the other
- backing-up the same effect result



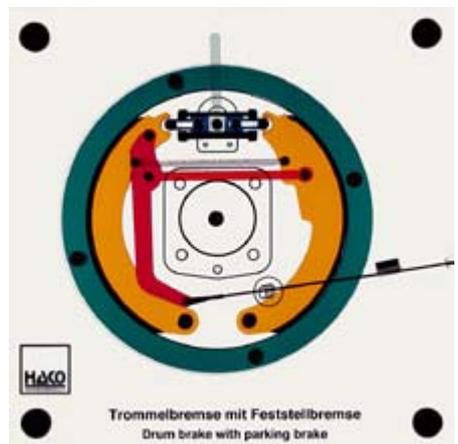
**Order no. 175**  
**Drum brake servo**  
 (like duo servo)

- force transmission only possible in one direction

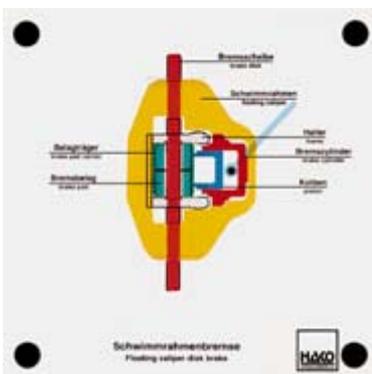


**Order no. 461**  
**Drum brake with parking brake**

- Operation of the brake shoes via the wheel brake cylinder
- Function of leading and trailing shoe (the leading shoe is pulled onto the drum, the trailing shoe is pushed away)

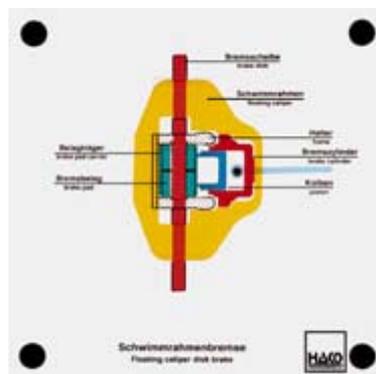


- Operation of the service brake via the pistons in the wheel cylinder
- Operation of the parking brake via a linkage

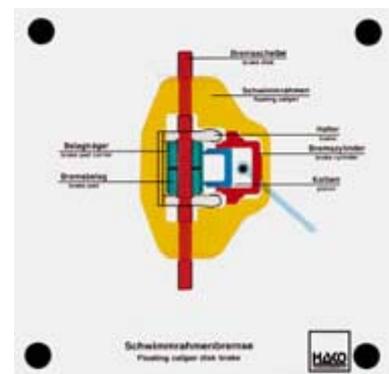


**Order no. 171**  
**Sliding brake caliper**

- first, a transparent cam pushes the brake pad against the brake disk



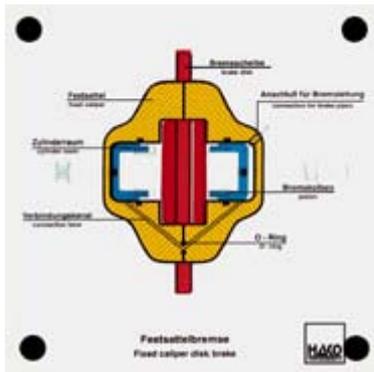
- The caliper absorbs the counterforce and is moved by it



- automatic resetting

## HAKO Overheadmodels - Section 5

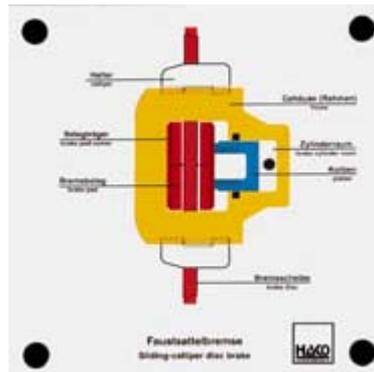
### Hydraulic braking, air-braking, air-brake components



**Order no. 169**

### Fixed-caliper disk brake

- actuating the brake pistons
- the principle of independent readjustment
- deformation of the sealing ring while braking
- clearance re-established after braking (sealing ring gets back into original shape)



**Order no. 170**

### Floating-caliper disk brake

- a small, transparent cam first pushed the piston with brake pad against the brake disk and then the caliper into the opposite direction
- small, transparent springs move them back after braking



**Order no. 446**

### Automatic adjustment and lift clearance

- Deformation of the gasket ring
- Return to shape of the gasket ring



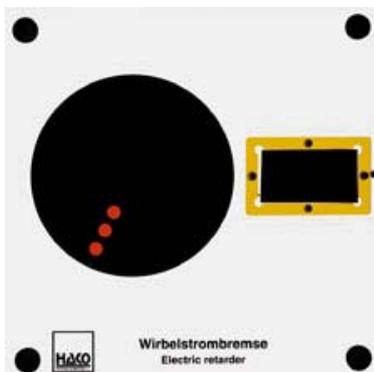
- Production of the clearance
- Adjustment with wear of the lining



**Order no. 393**

### Parking brake

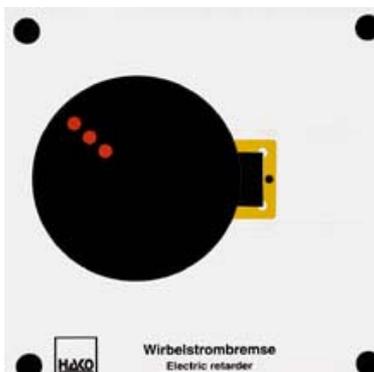
- Pulling the parking-brake lever
- Function of the ratchet
- Braking action of the drum brake
- Release of the drum brake
- Actuation of the ratchet push-button



**Order no. 449**

### Electric retarder

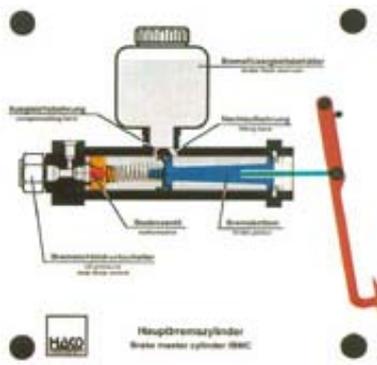
- Turning the aluminium plate (ball-bearing)
- Movement of the pair of permanent magnets
- Slight to strong braking of the disk,



- depending upon the position of the magnets
- Moving the plate with the help of the magnets

## HAKO Overheadmodels - Section 5

### Hydraulic braking, air-braking, air-brake components



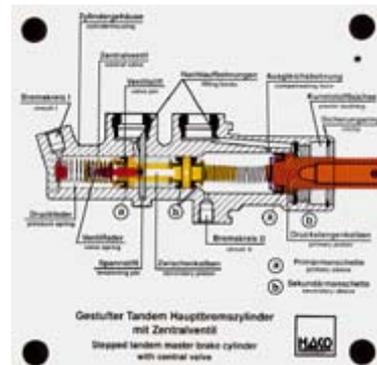
**Order no. 122**  
**Single-chamber brake master cylinder**

- function of piston, piston valve and primary sealing cup
- when the brake is released, the sealing cup is lifted



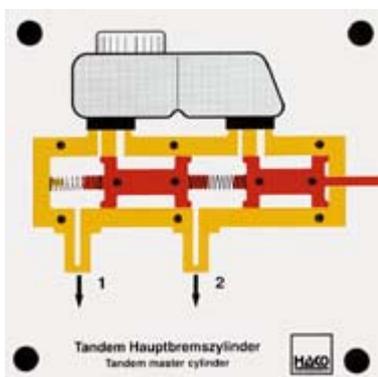
**Order no. 123**  
**Tandem brake master cylinder**

- function of pressure rod piston and intermediate piston
- simulation of a failure of brake circuit I or II
- the pedal travel becomes longer when a brake circuit fails



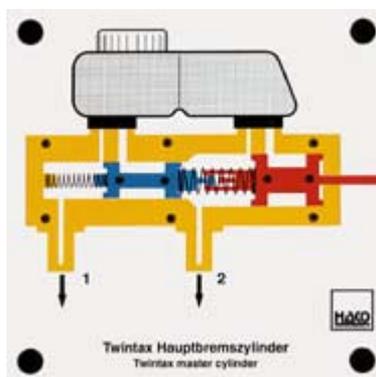
**Order no. 244**  
**Stepped tandem brake master cylinder with central valve**

- Function of a stepped tandem cylinder. Function of the central valve. Function of pistons. Simulation of a failure of brake circuit I or II.



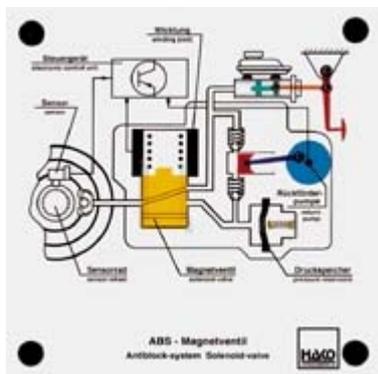
**Order no. 401**  
**Tandem brake master cylinder**

- By pressing the lever the outer valve can be seen to open. The piston rod with diaphragm disk moves forward. The pressure rod moves both the pistons in the brake master cylinder and the braking process is started.
- Function of the pressure rod and the secondary piston
  - Function of the brake master cylinder in the case of failure of brake circuit I or II
  - Function of the pressure springs



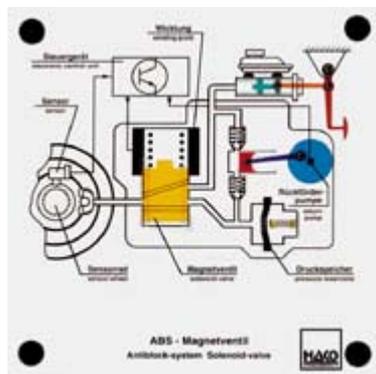
**Order no. 418**  
**Twintax brake master cylinder**

- Function of the pressure rod and the secondary piston. Functions of the brake master cylinder in the case of failure of brake circuit I or II. Increase pressure in the intact brake circuit if one brake circuit fails. Shorter pedal travel in the case of failure of a brake circuit.

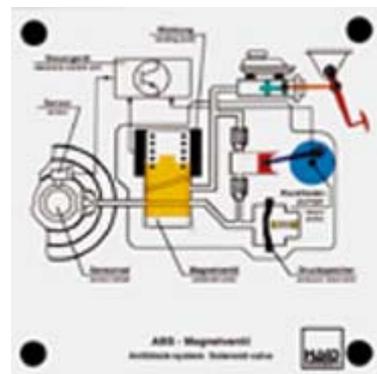


**Order no. 183**  
**Antiblock system ABS solenoid valve**

- brake pedal with piston rod and piston, return pump, solenoid valve and pressure accumulator can be actuated

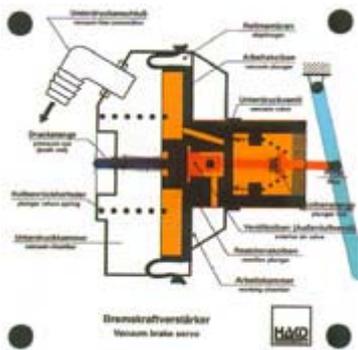


- function of the solenoid valve: pressure build-up, keeping the pressure the same, pressure decrease through forced return flow



# HAKO Overheadmodels - Section 5

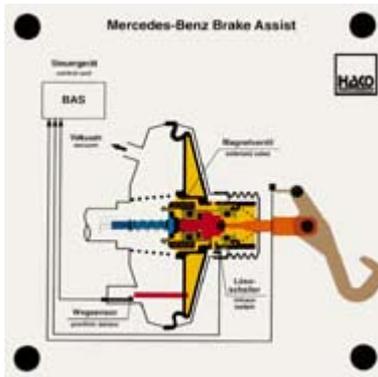
## Hydraulic braking, air-braking, air-brake components



Order no. 121

### Pneumatic brake booster

- brakes released (vacuum valve open)
- brakes activated (vacuum valve closed, exterior air valve opened and working piston moved)

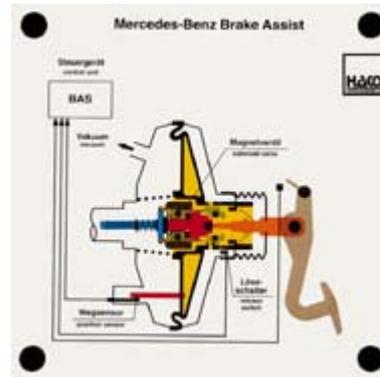


Order no. 388

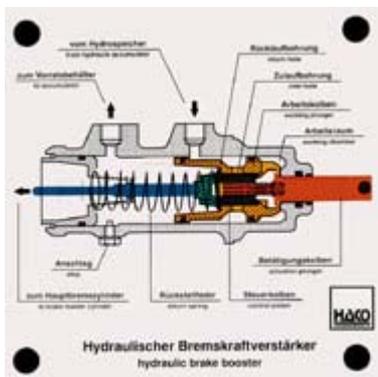
### Daimler Benz Brake Assist

The Brake Assist system was developed in order to achieve a fast brake response and a maximum braking deceleration in the case of an emergency stop.

The control unit measures the speed at which the pedal is depressed and initiates full braking by means of the solenoid valve.



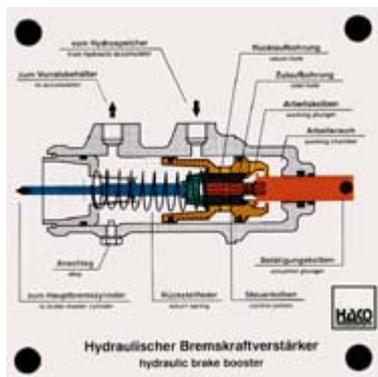
The functions of a standard brake power assist unit can also be demonstrated.



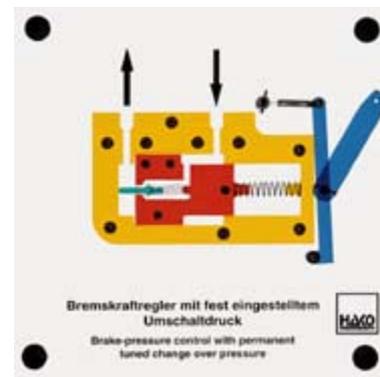
Order no. 327

### Hydraulic brake booster

- Functions:
- release position
- partial braking
- full braking



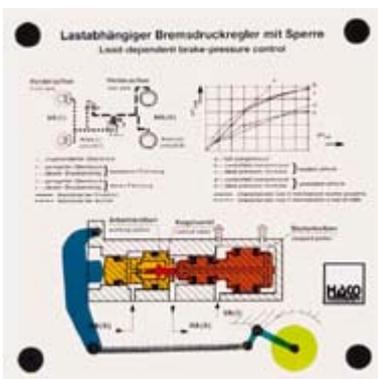
- pressure build-up
- pressure reduction



Order no. 402

### Brake-power regulator with fixed change-over pressure

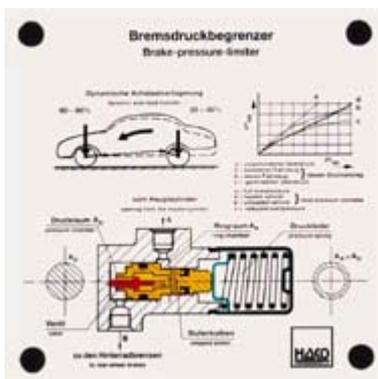
- Function of a pressure-controlled brake-power regulator
- Function of a load-dependent brake-power regulator using the blue additional linkage



Order no. 256

### Load-dependent brake-pressure control

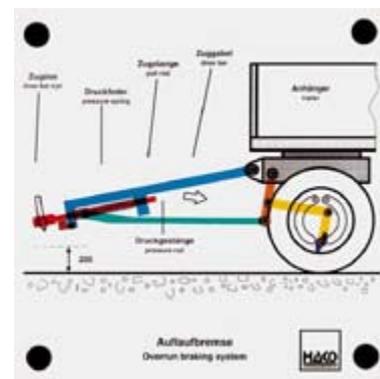
- Functions:
- brake pressure changes automatically depending on the load
- locking effect when front-axle brake unit fails
- displacement of both stepped pistons and function of the conical valve



Order no. 258

### Brake-power limit

Displacing the stepped piston shows that starting from a certain brake pressure of the brake master cylinder the pressure to the rear-wheel brakes can not increase (because it is limited)



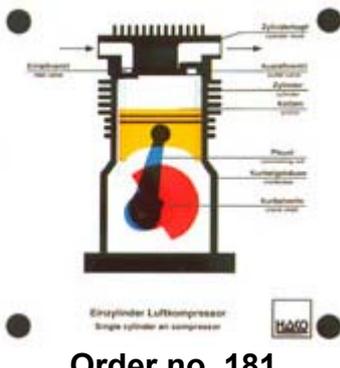
Order no. 209

### Overrun brake

The complete drawbar can be moved, braking while lowering the drawbar, braking while the trailer overruns, actuating the brake cams, function of the reserve blocking (made possible in the model by switching the lever). The reverse blocking is automatically released when driving forward.

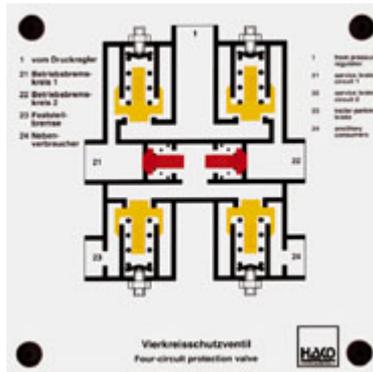
# HAKO Overheadmodels - Section 5

## Hydraulic braking, air-braking, air-brake components



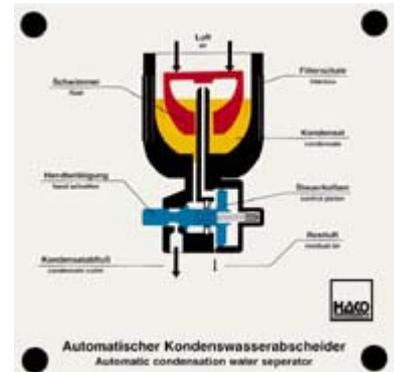
**Order no. 181**  
**Single-cylinder air compressor**

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



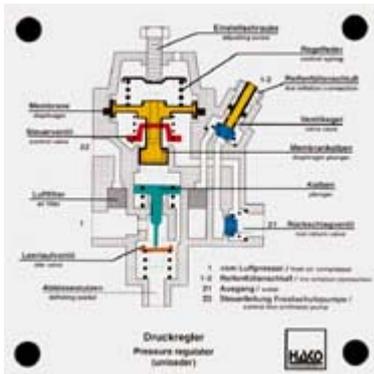
**Order no. 374**  
**Reciprocating compressor**

- Used for the supply of larger quantities of compressed air.
- By opening the relevant inlet and outlet valves it delivers on both the forward and return stroke.



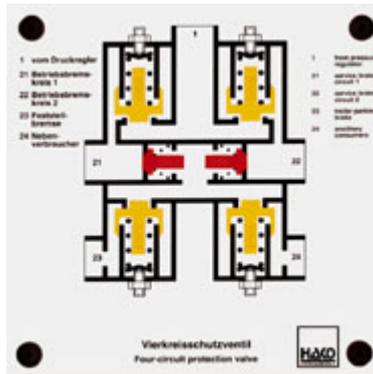
**Order no. 376**  
**Automatic condensation water separator**

- As the condensate level rises the float is released from the air duct. The control piston is moved to the left and allows the condensate to flow out. The control piston can also be operated manually.



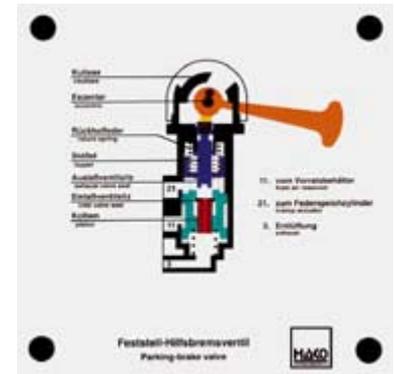
**Order no. 150**  
**Pressure regulator**

- inflating position
- idling
- high-pressure air supply



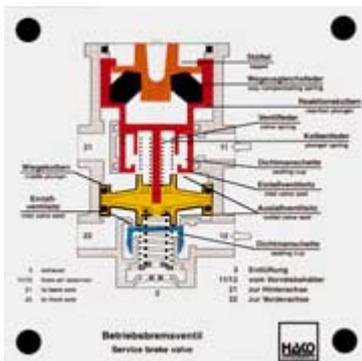
**Order no. 153**  
**Four-circuit protection valve**

- function of the valve when one or several circuits break down



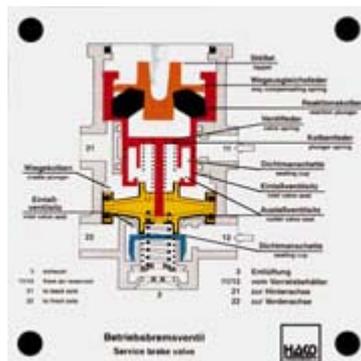
**Order no. 152**  
**Parking-brake valve**

- release position
- actuating the auxiliary brake
- actuating the parking brake

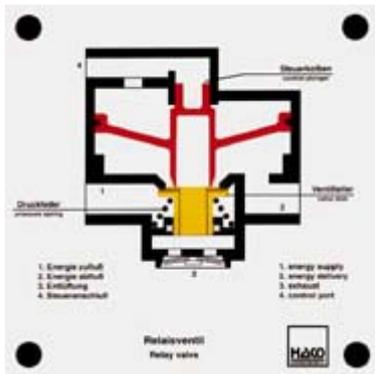


**Order no. 151**  
**Dual-circuit service-brake valve**

- driving position
- partial-braking position
- full braking

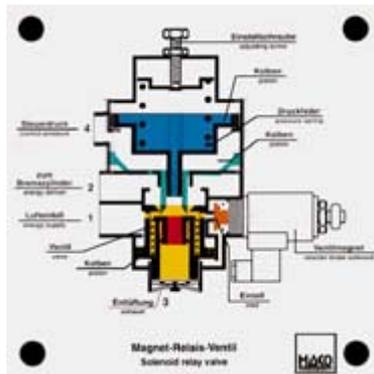


**HAKO Overheadmodels - Section 5**  
 Hydraulic braking, air-braking, air-brake components



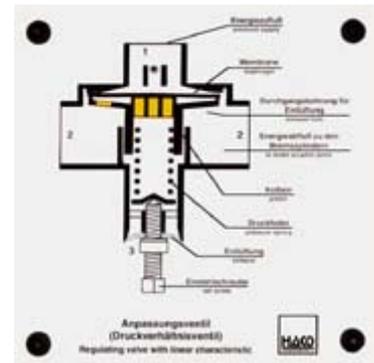
**Order no. 154**  
**Relay valve**

- The relay valve makes a fast filling and bleeding of the brake cylinder possible
  - driving position
  - braking position
- (control plunger and valve disk can be moved)



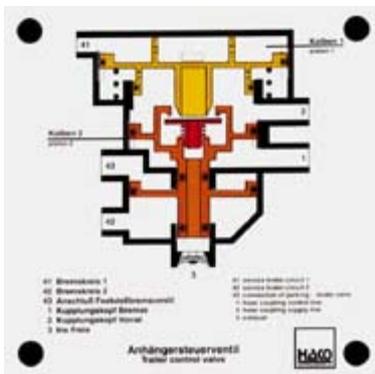
**Order no. 225**  
**Solenoid relay valve of an air brake system**

- function: actuating the permanent brake in the trailer; fast filling and bleeding of brake cylinders decreases reaction delay and response time
- all the valve's piston and the solenoid can be moved



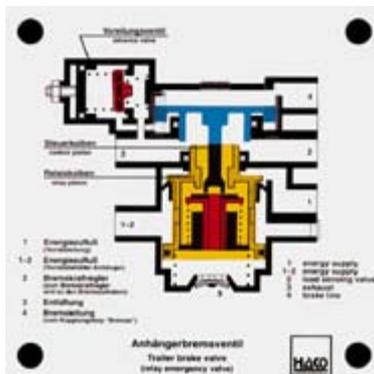
**Order no. 176**  
**Regulating valve with linear characteristic**

- All phases can be shown:
  - closing position, passage position and exhaust position
- (detailed description enclosed)



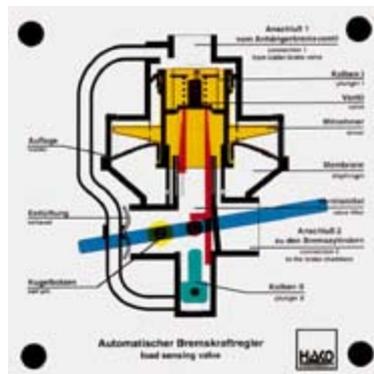
**Order no. 156**  
**Trailer-control valve**

- driving position with an intact unit
- braking with service-brake valve and defect trailer-brake line
- braking with service brake system
- braking with parking brake system



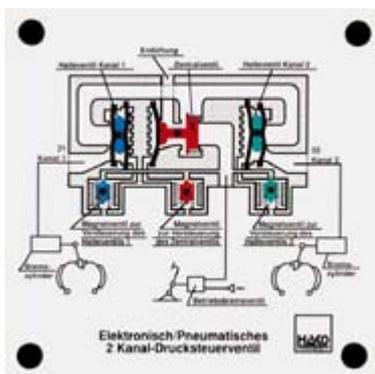
**Order no. 157**  
**Trailer-brake valve with advance valve**

- driving position
- full-braking position
- failure of brake line
- failure of brake and air-reservoir line



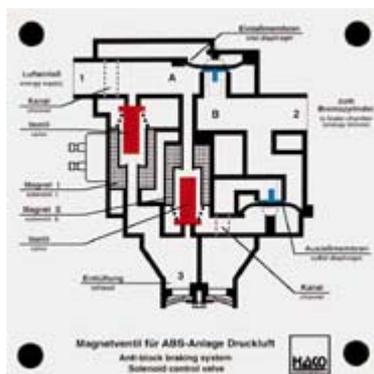
**Order no. 172**  
**Automatic load-dependent brake-power distributor**

- function of the control lever
  - release, partial-load and full-load position
  - actuating the valve
- the diaphragm touches the driver



**Order no. 188**  
**Electronic, pneumatic two-line pressure control valve**

- All six valves can be actuated and fixed in any position:
  - pressure build-up in line 21 and 22
  - keeping the pressure the same in line 21 and pressure decrease in line 22
- pressure build-up in the line 21 and keeping the pressure the same in line 22 (a detailed description is supplied)



**Order no. 190**  
**Antilock system ABS solenoid valve**

- solenoid valve of the antilock system of an air brake
- diaphragm valve and solenoid valve can be moved
- all three phases can be shown: pressure build-up, maintaining and pressure decrease

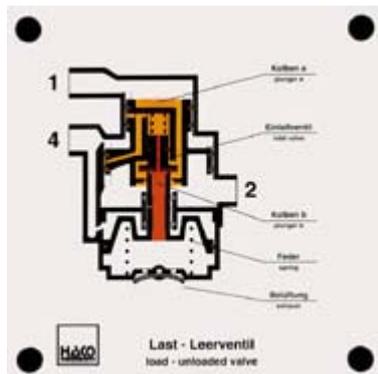


**Order no. 280**  
**Single-chamber air dryer with integrated pressure regulator**

- flow of air in a dryer
  - function of the pressure regulator with drain valve
  - function of the bypass valve
  - function of the check valve

## HAKO Overheadmodels - Section 5

### Hydraulic braking, air-braking, air-brake components

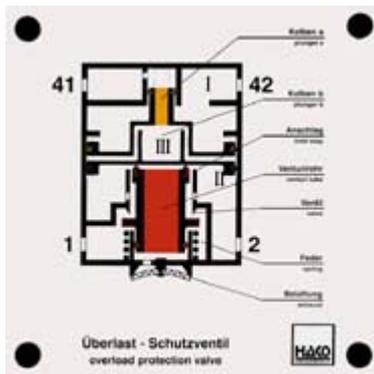


**Order no. 323**  
**Load-unload valve**

Driving position

Actuation:

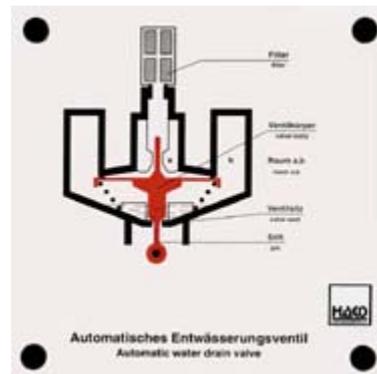
- of the emergency and parking brake system
- of the service brake system
- corresponding activation and deactivation of the emergency and parking brake system



**Order no. 326**  
**Overload protection valve**

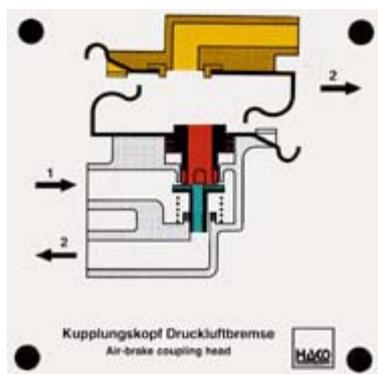
Function of the overload protection valve by means of the following switching processes:

- release position and full braking position
- actuation of the service brake
- actuation of the parking brake
- simultaneous actuation of both braking systems



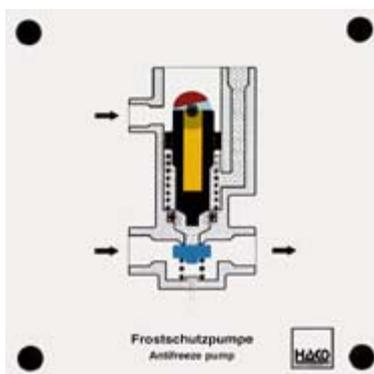
**Order no. 334**  
**Automatic water drain valve**

- lifting of the valve's body
- condensed water collection
- cambering of the valve body's diaphragm
- condensed water drainage



**Order no. 408**  
**Air-brake coupling head**

- sealing of the coupling head of the air supply line of the tractor unit with the trailer line disconnected
- connection of the trailer line
- release of the compressed air to the trailer



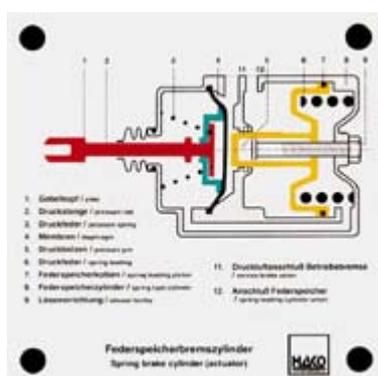
**Order no. 409**  
**Antifreeze pump**

- function of the delivery of antifreeze
- switching off the antifreeze pump
- function of the pump piston, the valve head and the two springs



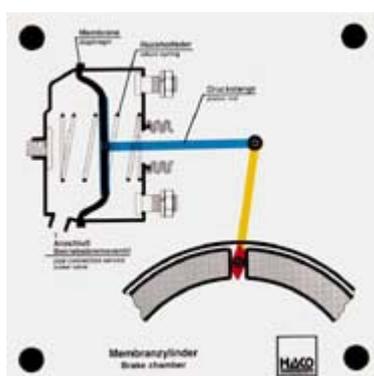
**Order no. 403**  
**Air-operated drum brake system**

- function of the piston cylinder
- transmission of the power from the piston cylinder to the actuating cam
- spreading of the brake shoes, braking effect on the brake drum



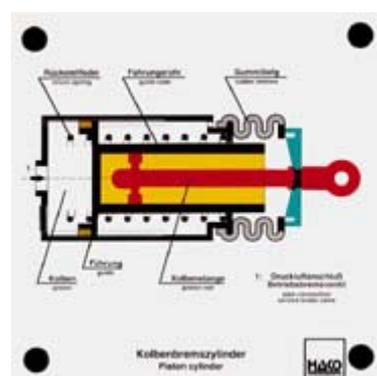
**Order no. 155**  
**Tristop spring-brake actuator**

- release position
- actuating the service brake system
- actuating the auxiliary and parking brake system
- forces are added when a actuating both brake systems
- function of the mechanical release mechanism



**Order no. 197**  
**Diaphragm cylinder**

- function of a diaphragm cylinder, the mobile piston of which actuates the brake cam of the wheel brake via a rod



**Order no. 198**  
**Piston cylinder**

- function of a piston cylinder
- piston cylinders are used in air brake system if large strokes are needed