

Voith Turbo H + L Hydraulic HBL System Training

Präsentation

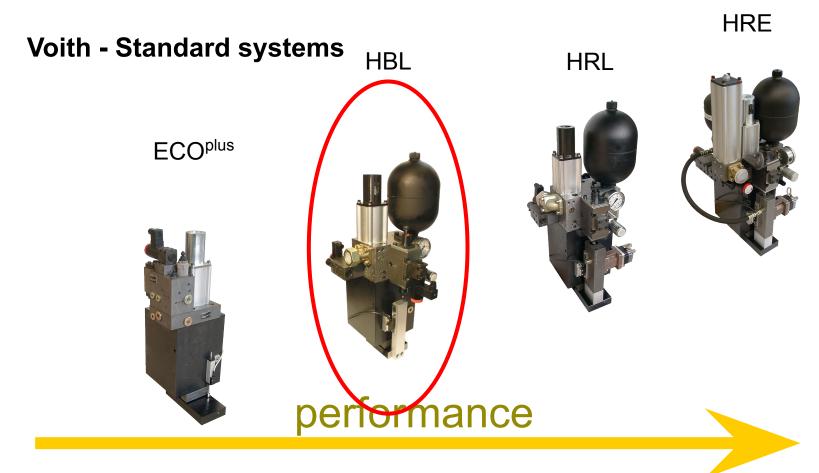
HBL System Training

Punching system HBL general

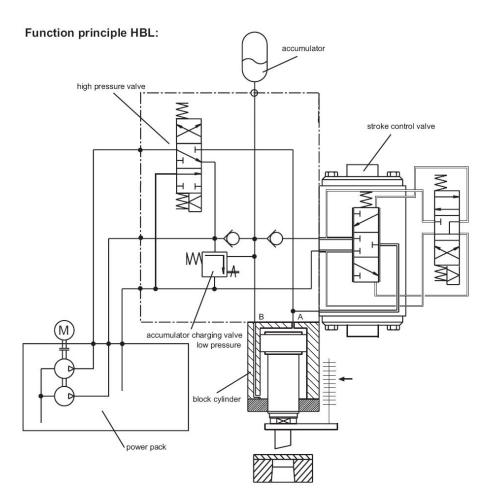
Tutor:

Wang Aimin

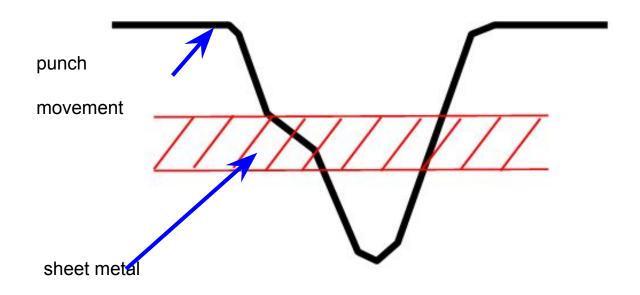
- Punch press hydraulics general overview
- HBL functional principle and part search guide
- Service guide & trouble shooting



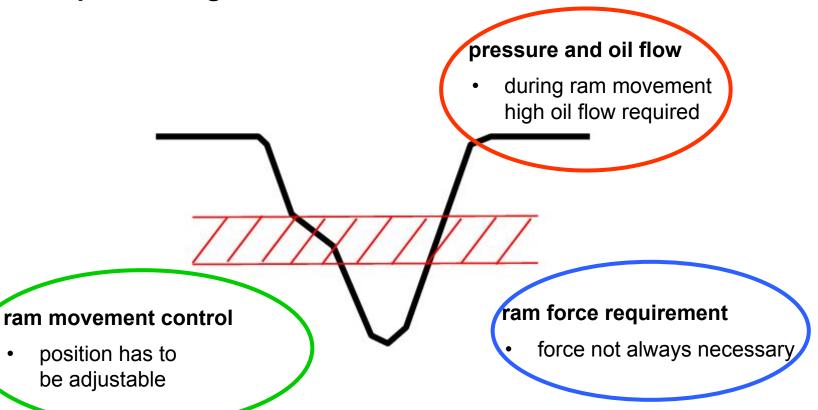




Punch operation - general reflection



Punch operation - general reflection



Basis functions

pressure and flow conditioning

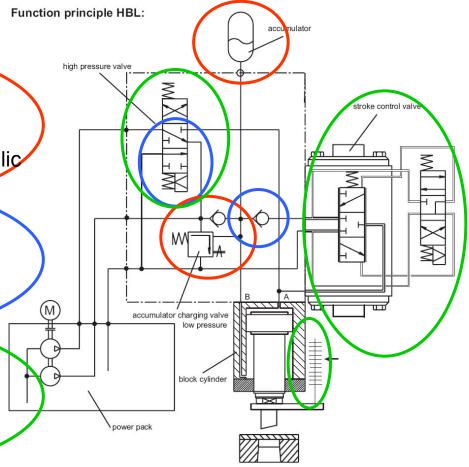
- accumulator charging control
- consumption optimized hydraulic

ram force supply

- load sensing control
- high pressure on demand

ram movement control

- position control
- short cycle times



Basis functions

pressure and flow conditioning

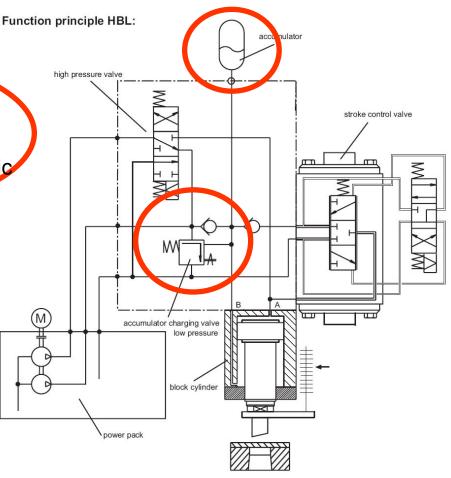
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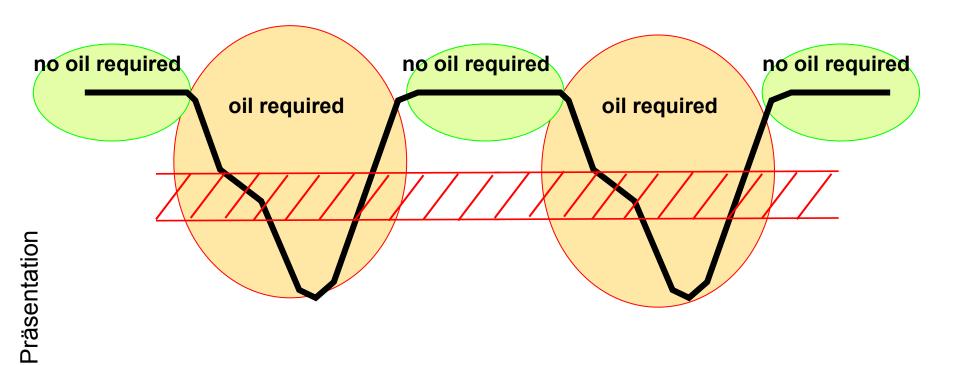
- load sensing control
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ram movement control

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- short cycle times



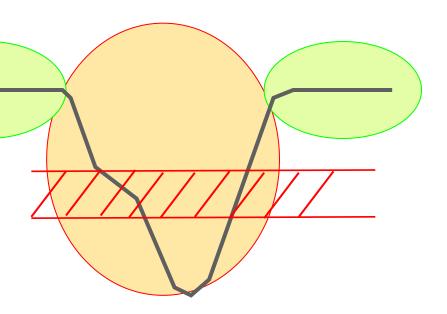
General reflection – oil requirement



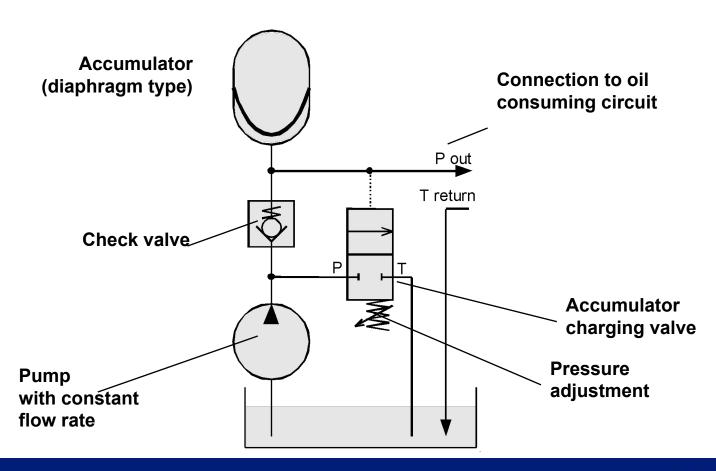
General reflection – oil requirement

accumulator operation idea

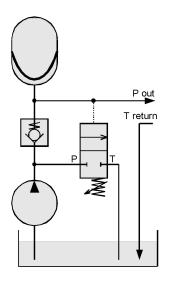
- during punch operation ram has high oil consumption.
 accumulator and pump provide together the required very high oil flow.
- during X/Y axis movement no oil consumption of the ram. during that time pump refills the accumulator for the next punch cycle.



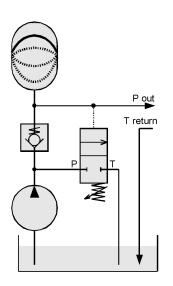
Oil requirement – accumulator charging



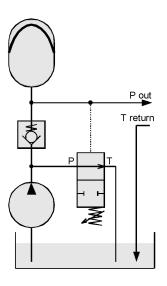
Oil requirement – accumulator charging sequence



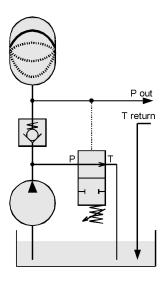
Empty: Accu empty, valve charging



Filling: Accu filling, valve charging

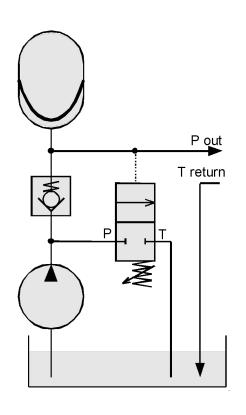


Full: Accu full, valve = bypass



Delivering: Accu dropping, valve = bypass

Accumulator charging



Key Features:

- Efficient: low bypass pressure saves energy

- Reliable: pure mechanical steering constant flow rate pump

- Setup: no complex adjustments

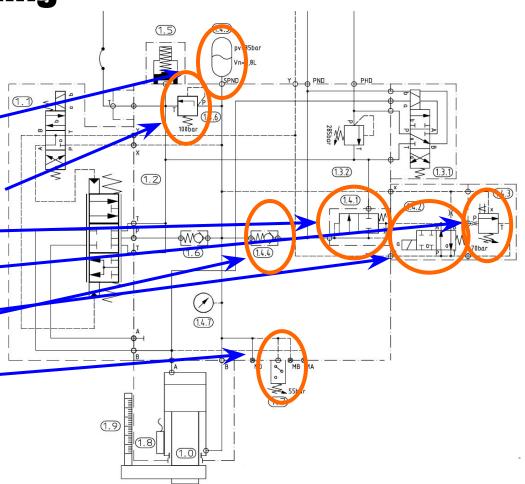
- Dynamics: good response to load changes

- Low noise: soft switching valve

Accumulator charging

devices

- accumulator
- safety valve (pressure relief)
- charging valve main stage
- charging valve pilot stage
- electr. discharging valve
- check valve
- pressure switch



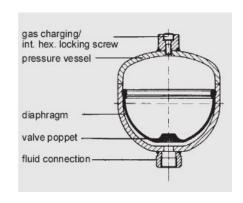
Accumulator charging - device guide

accumulator

- type of construction diaphragm
- precharge pressure (nitrogen) according to hydraulic circuit

quick check for precharge pressure:

- start up hydraulic, let it pressurize
- stop pump, deenergize electr. discharge valve.
- monitor pressure gauge
- pressure must drop slowly until precharge level is reached, then will drop abruptly to zero.





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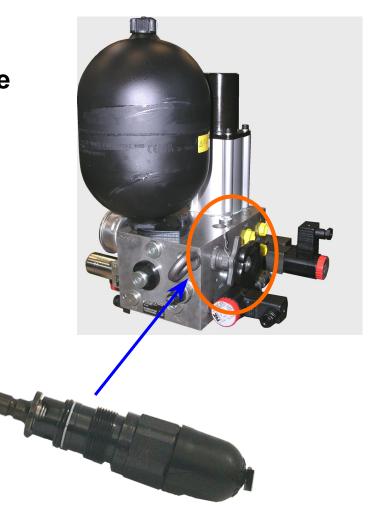
Accumulator charging - device guide

safety valve (pressure relief)

type of construction – poppet seat valve

remark:

- for security issues only
- do not brake seals
- do not make any adjustments
- do not lose certificates





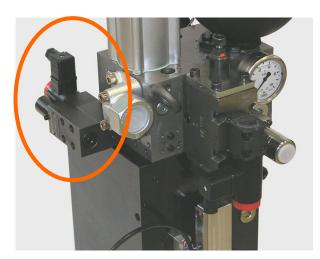
Accumulator charging - device guide

accumulator charging valve consisting of:

- main stage -> chartridge valve (in manifold)
- pilot stage -> for pressure adjustment
- electrical discharging -> 4/2 solenoid valve

remark:

- restrictor in cartridge valve has to be clean!
- if restrictor is blocked -> no pressure

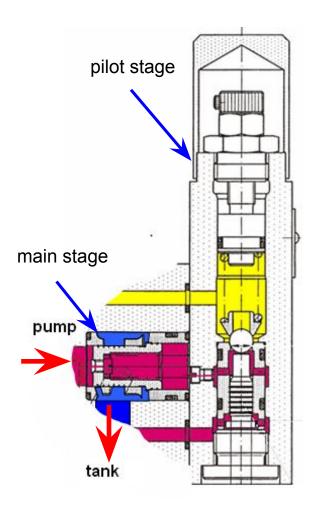




Accumulator charging - device guide



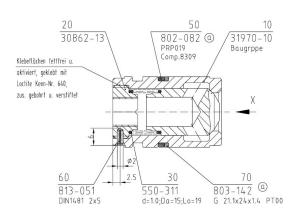




Accumulator charging - device guide

check valve:

- type of construction: cartridge valve
- mounted in manifold





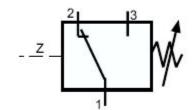
Accumulator charging - device guide

pressure switch

 type of construction – piston valve

remark:

- for monitoring pressure only
- no other functions
- has to be controlled by machine control
- adjustment pressure according to hydraulic circuit





Basis functions

pressure and flow conditioning

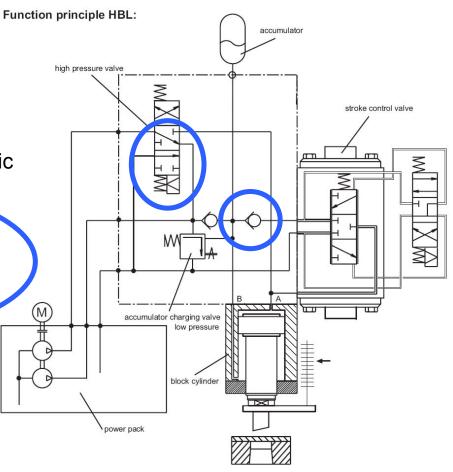
- accumulator charging control
- consumption optimized hydraulic

ram force supply

- load sensing control
- high pressure on demand

ram movement control

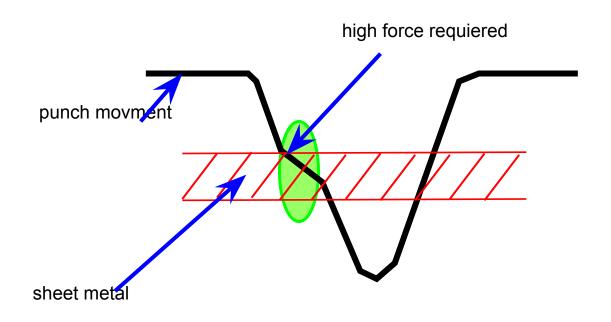
- position control
- short cycle times



Präsentation

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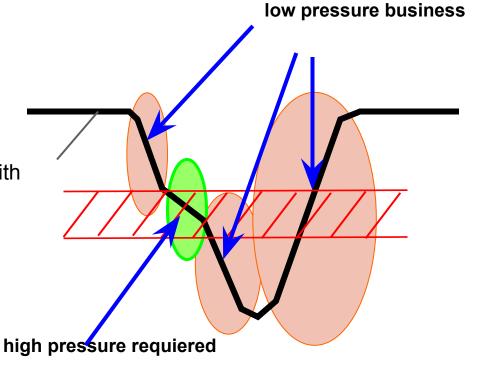
Ram force supply



Ram force supply - low/high pressure operation

consumption optimised punching

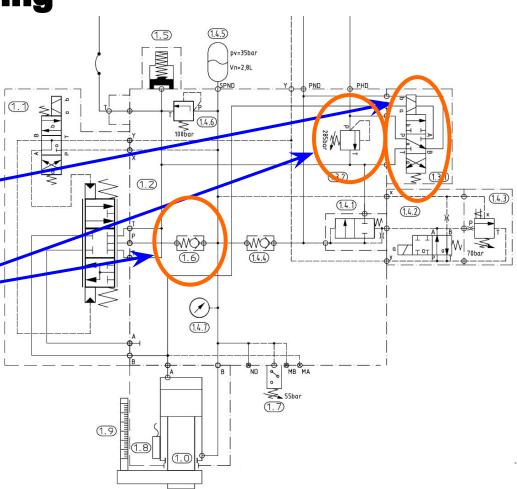
- two pressure solution with high and low pressure
- nibbling and punch processes with low force demand under low pressure
- only on high force demand high pressure generation



Ram force supply

device guide

- slow move valve (high pressure switch on)
- high pressure relief valve .
- check valve

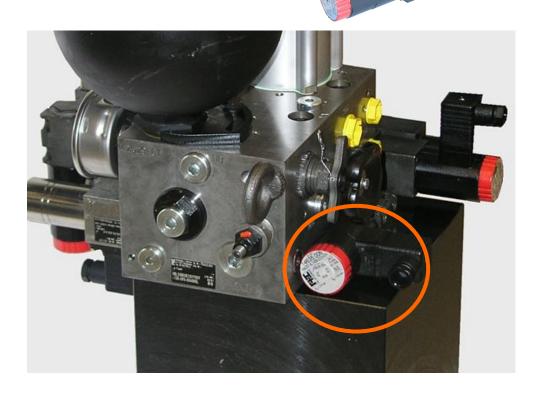


Ram force supply - device guide

slow move valve

- high pressure switch on!
- directly controlled
- fast switching
- solenoid valve





Präsentation

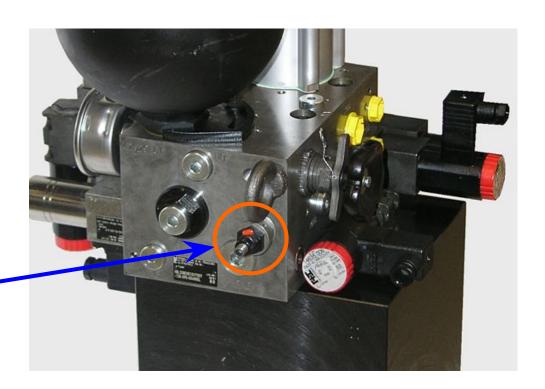
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Ram force supply - device guide

high pressure relief valve

 directly controlled pressure relief valve



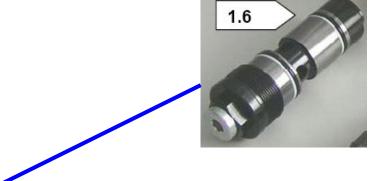


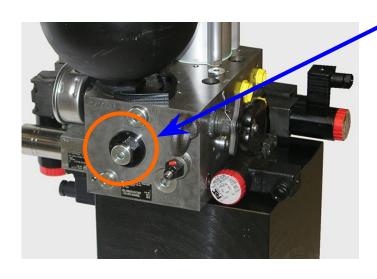
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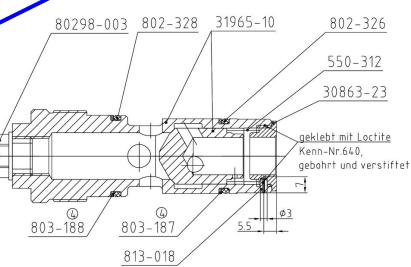
Ram force supply - device guide

check valve

poppet seat valve







Basis functions

pressure and flow conditioning

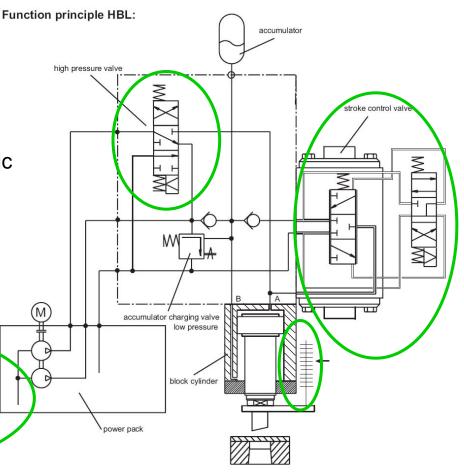
- accumulator charging control
- consumption optimized hydraulic

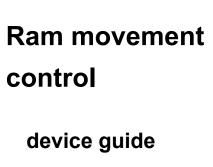
ram force supply

- · load sensing control
- high pressure on demand

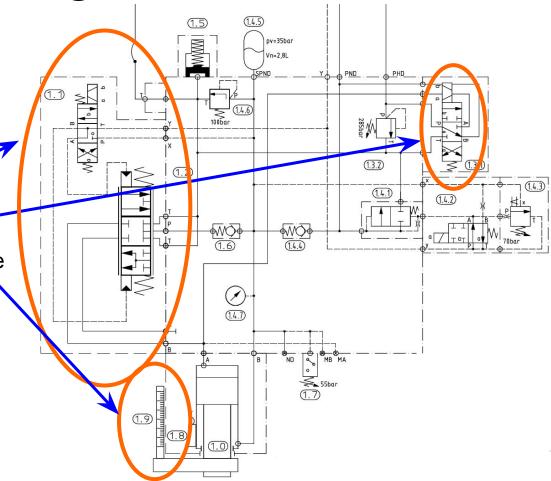
ram movement control

- position control
- short cycle times





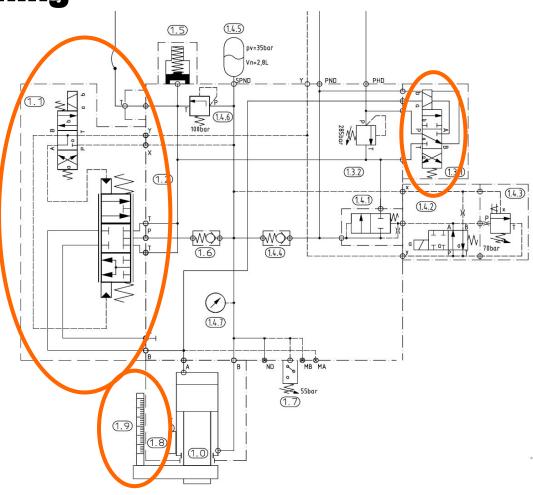
- main valve
- slow move valve
- linear measuring device



Ram movement control

description of function

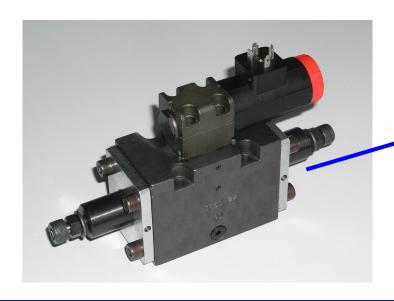
- main & slow move valve-> working in parallel
- both valves together
 - -> fast movement
 - -> full force
- only slow move valve
 - -> slow movement
 - -> high presicion
- only main valvereduced punch force(only about 15%)

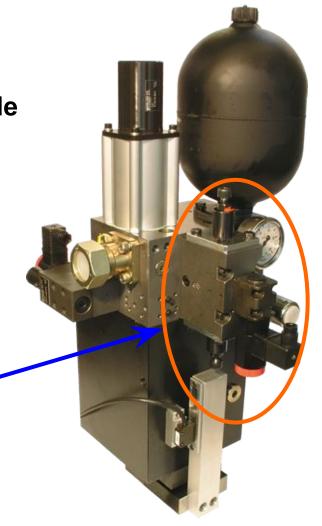


Ram movement control - device guide

main valve

 type of construction pilot operatet spool valve





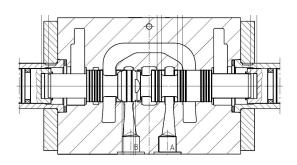
Präsentation

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Ram movement control - device guide

main valve

- pilot operated
- fast switching
- rugged design
- easy to handle





Präsentation

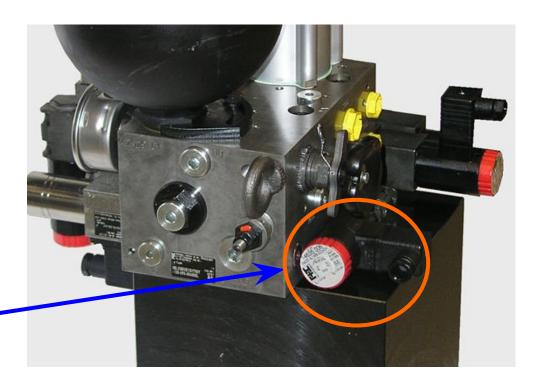
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Ram movement control - device guide

slow move valve

- directly controlled
- fast switching
- solenoid valve
- high pressure switch on!





Ram movement control - device guide

Linear measuring system (LMS)

- feedback sensor for ram position
- incremental signals, magnetic system
- gap adjustment 0.8 mm!

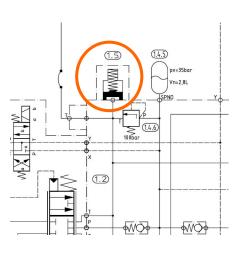




Other ram devices

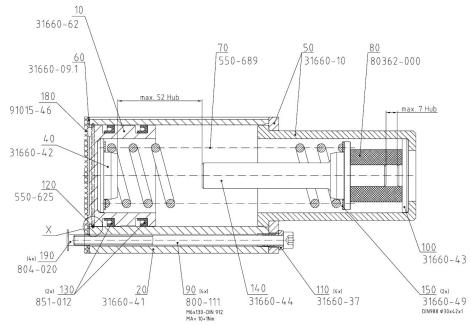
Tank line shock absorber

- piston accumulator
- damping pressure peaks in tank line









Präsentation

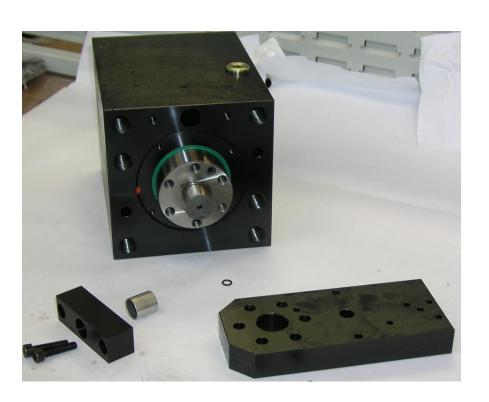
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Other ram devices

mechanical feedback parts

- guiding bar
- mechanics

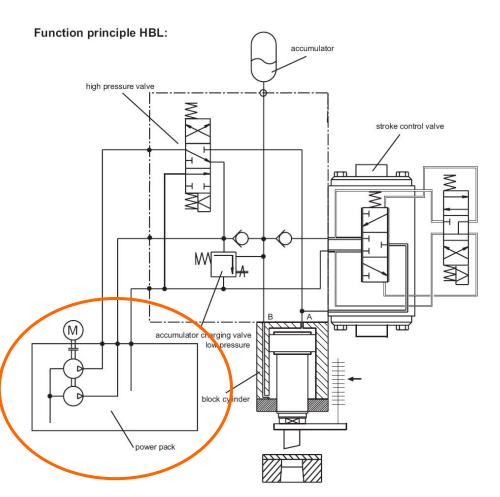


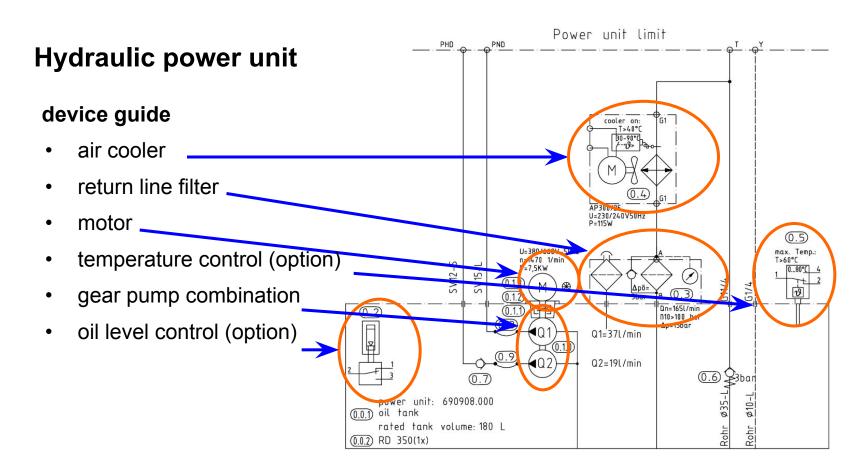


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Hydraulic power unit



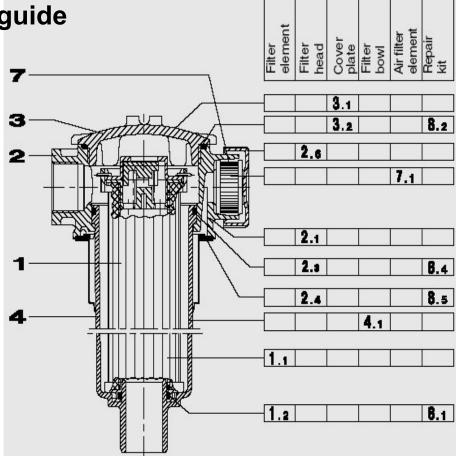




Hydraulic power unit - device guide

return line filter

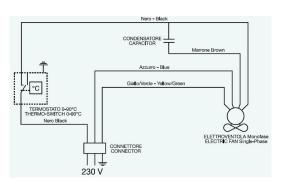
- contamination indicator has to be checked regularly
- filter elements are not reusable do not try to clean used elements
- contaminated filterelements have to be replaced by organial HYDAC spare sparts
- do never run the hydraulics without filter elements

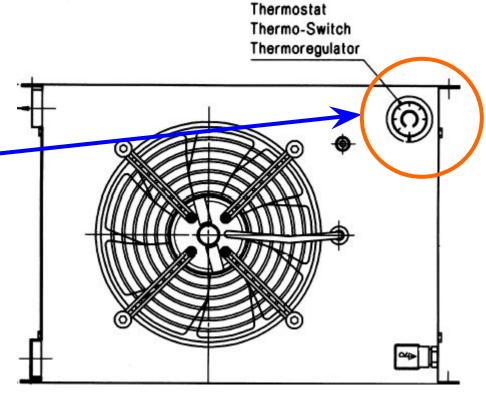


Hydraulic power unit - device guide

heat exchanger

- type of construction oil air cooler
- integrated thermo switch
- switch on temperarure 40 °C



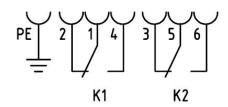


Hydraulic power unit - device guide

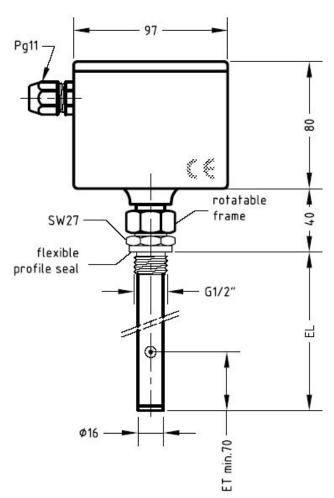
temperature control

monitoring oil temperature

Terminal diagram



Function under switching temperature



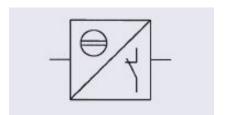
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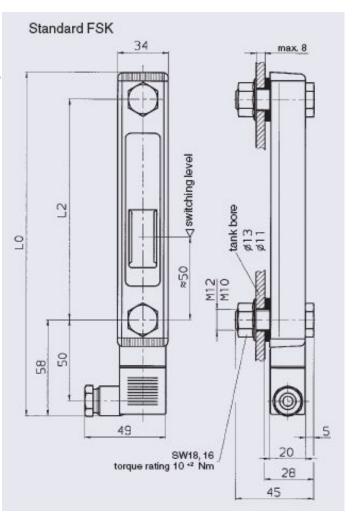
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Hydraulic power unit - device guide

oil level control

monitoring oil level





Service guide - first meeting with the machine

Service guide - first meeting with the machine

- pressure adjustments (low pressure)
- accumulator charging frequency
- accumulator precharge pressure
- · high pressure switch on
- pressure adjustments (high pressure, pressure switch)
- other controls:
 - general punching behavior
 - noise (machine, pump, pipes and hoses)
 - LMS adjustment
 - external leakage

Service guide- first meeting with the machine



Pressure adjustments (low pressure)

- hydraulic pressurized, machine not running look at gauges
- low pressure 70bar (see hydraulic circuit), hysteresis 10% (7 bar).
 pressure drops down very slowly to about 63 bar. Fast reloading back to 70 bar.
- pressure adjustment only at accumulator charging valve (pilot stage).
- upper switching point is defined as working pressure. For correct working pressure see hydraulic circuit.
- monitor pressure during punching. low pressure should be in a range between 70 to 50 bar and not drop below 40 bar.

Service guide- first meeting with the machine

Accumulator charging frequency – low pressure

- hydraulic pressureized, machine not running, ram has to stay somewhere in mid-oil position - look at gauges
- low pressure charging frequency in a brandnew machine about 1-3 times a minute.
- high low pressure charging frequency can be caused by
 - to low accumulator precharge pressure
 - internal leakage caused by wear or cavitation in main valve
 - internal leakage through check valve (1.4.7)

Service guide- first meeting with the machine

Accumulator precharge pressure - fast check

- stop pump, deenergize electrical discharge valve, monitor pressure gauges
- pressure must drop slowly until precharge level is reached, then will drop abruptly to zero.
- required precharge pressure see hydraulic circuit (about 35 bar)
- precharge pressure has to be measured under working temperature (45°C)
- Remark: this procedure only useable for fast check, for detailed measureing appropriate measuring equipment required.

Service guide- first meeting with the machine

Pressure adjustment (high pressure)

- put a pressure gauge in measuring port "MA"
- hydraulic pressurized, machine not running look at gauges (you see about half the low pressure value at "MA")
- move the ram down to the cylinder lower hard stop by switching "on" the "slow move valve" (Pos. 1.3.1) __manually" with external 24 volt.
- look at gauges, you see high pressure value (285 bar) at "MA"
- high pressure adjustment only at high pressure relief valve



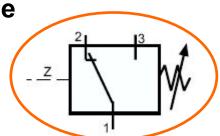


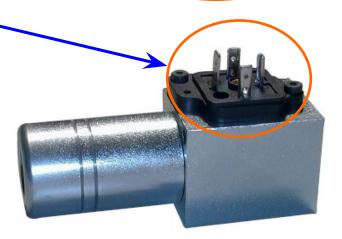


Service guide- first meeting with the machine

Pressure adjustment (pressure switch)

- measure electrical resistance at pressure switch pin1 -> pin 3
- at working pressure pin1 -> pin3 connected
- deenergize electrical discharge valve, pressure drops slowly
- monitor pressure gauge, connection 1-3 opens at adjusted pressure value
- required switching point see hydraulic circuit



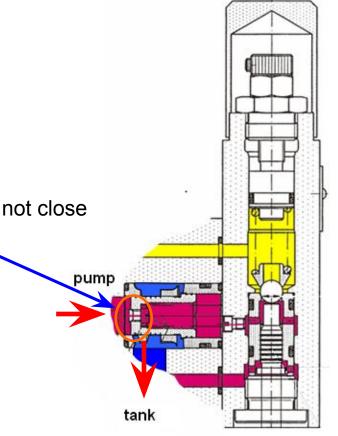


Service guide – trouble shooting

Service guide - trouble shooting

No system pressure on pressure gauge

- electrical discharging valve not switched on
 - -> lose connector plug
 - -> jammed solenoid valve
- accumulator charging valve (main stage) does not close
 - -> blocked restrictor in main stage piston
- extrem external leakage
 - -> broken hose inside the powerpack



Service guide - trouble shooting

System pressure problems (machine stand by)

- system pressure does not reach required level
 - -> wrong pressure adjustment (accumulator charging valve)
 - -> external leakage in powerpack hose or flange connection
 - -> broken pump (internal leakage)
 - -> very high internal leakage in ram (search for source of heating!)
- to high accumulator charging frequency
 - -> to low accumulator precharge pressure
 - -> internal leakage ram (search for source of heating!)

Service guide - trouble shooting

System pressure problems (machine punching)

- system pressure not high enough, machine stops very often during punching
 - -> external leakage in powerpack hose or flange connection
 - -> wear in pump, does not deliver enough oil (internal leakage)
 - -> internal leakage ram (losing oil)
- system pressure drops down too far during each punch stroke
 - -> to low accumulator precharge pressure
 - -> to long punch strokes
- system pressure seems to be fine, machine stops very often during punching
 - -> check pressure switch adjustment
- Make punch master files!

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Service guide - trouble shooting

No home cycle possible

- low pressure not available -> see "no system pressure"
- "slow move valve" (Pos. 1.3.1) does not switch correctly
 -> check electrical connectors, valve piston blocked due to dirt?
- Make Punch master files!

HBL System Training

Service guide - trouble shooting

Tool change position (Pos1) not reached in time

- "slow move valve" (Pos. 1.3.1) does not switch correctly
 -> check electrical connectors, valve piston blocked due to dirt?
- Make Punch master files!

Service guide - trouble shooting

Punching under high force not possible (more than 15% max. punchforce)

- high pressure valve (Pos 1.3.1) not switching
 - -> check electrical connectors, valve piston blocked due to dirt?
- check valve (1.6) does not close
 - -> does piston of check valve move smooth?
- punching force to high
 - -> punching force and striker force together higher than possible punching force
- wrong punching parameters
 - pos 5 to high or to deep
- Make punch master files!



HBL System Training

Service guide - trouble shooting

Forming mode – machine stops because of overtime

- "slow move valve" (Pos. 1.3.1) does not switch correctly
 -> check electrical connectors, valve piston blocked due to dirt?
- Make punch master files!

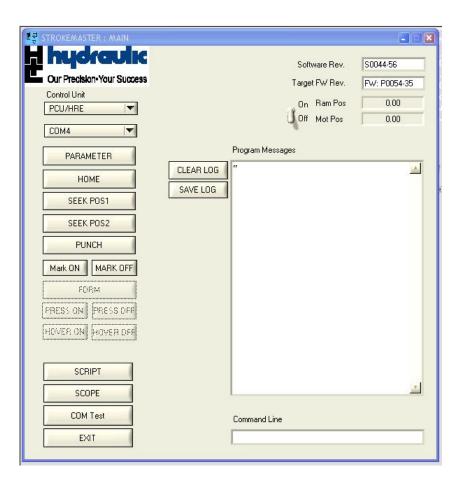
Service guide - trouble shooting

Ram moves down after hydraulic/electronic off

slow creeping movement is normal (mass higher than friction of cylinder seals)

Service guide – software tool strokemaster

- displays soft- and FW-revision
- modify / display parameter
- control RAM
- analyse last RAM movement



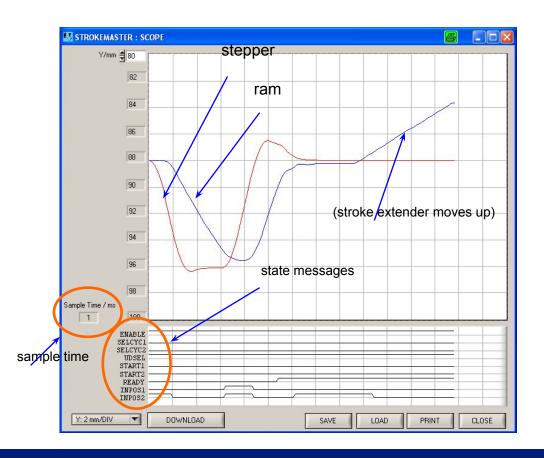
Präsentation

HBL System Training

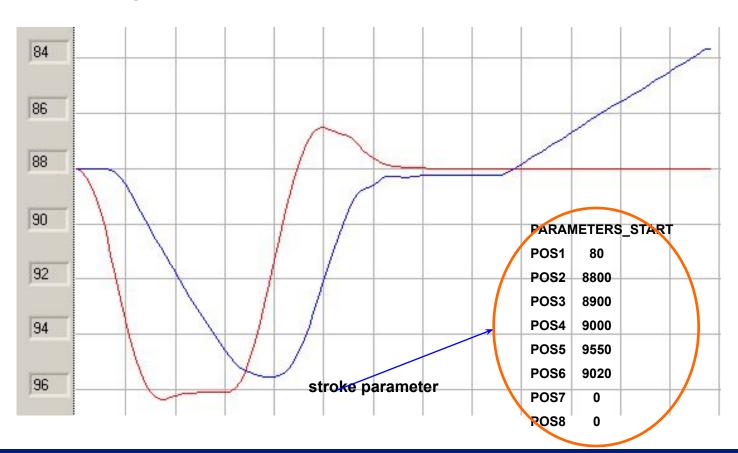
Service guide - stroke master file

Tool to see what happens

- ram movement real
- short punch cycles-> sample time 2 ms
- long form cycles-> sample time 3-5 ms
- make "master-files" to be able to compare



Service guide - stroke master file



Service guide - questions

If you contact H+L for any questions please provide the following information:

- end user company
- ram type (example:HBL20to)
- firmware version
- date of machine installation
- description of failure / machine behavior
- stroke master files
- any remarks:

VOITH

Engineered reliability.

