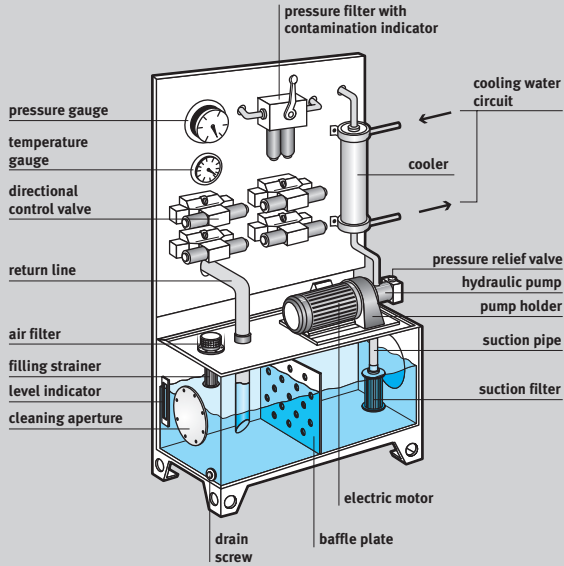


# Hydraulics – Energy supply and cylinders

## Hydraulic power pack

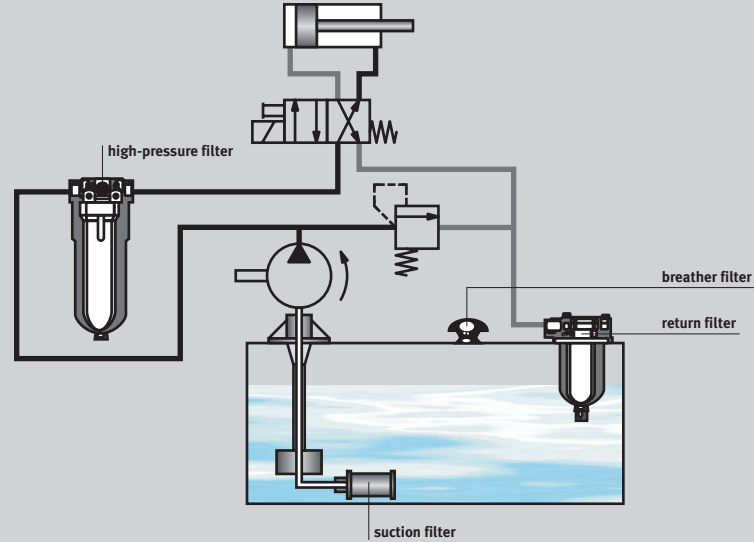


## Filtration

Hydraulic filters are installed in different ways, depending on the application in question.

**Classic filter applications:**  
return-line, intake-line and pressure filtration (also in combination)

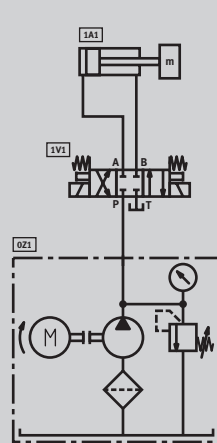
**Further application:**  
bypass filtration



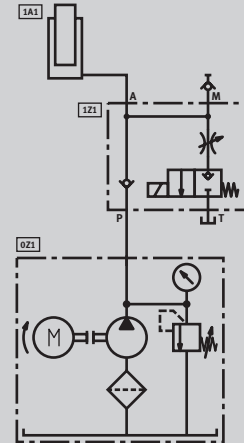
## Pump types

Schematic representation	Designs	Speed range (min <sup>-1</sup> )	Displacement volume (cm <sup>3</sup> )	Nominal pressure (MPa)	Overall efficiency
	gear pump, externally geared	500 – 3500	1.2 – 250	6.3 – 16	0.80 – 0.91
	gear pump, internally geared	500 – 3500	4 – 250	16 – 25	0.80 – 0.91
	Screw pump	500 – 4000	4 – 630	2.5 – 16	0.70 – 0.84
	vane pump	960 – 3000	5 – 160	10 – 16	0.80 – 0.93
	axial piston pump	..... – 3000 750 – 3000 750 – 3000	100 25 – 800 25 – 800	20 16 – 25 16 – 32	0.82 – 0.92 0.82 – 0.92 0.80 – 0.92
	radial piston pump	960 – 3000	5 – 160	16 – 32	0.90

## Double-acting cylinder



## Single-acting cylinder, hydraulic ram



## Designs of cylinders

Designs	Remarks	Schematic representation
differential cylinder	area ratio 2:1 (piston area : piston ring area)	
synchronous cylinder	pressurised areas identical in size; advance and return speed identical	
cylinder with end position cushioning	to reduce the speed of heavy loads and to prevent heavy impact	
telescopic cylinder	increased stroke travel	
pressure intensifier	gives higher pressure	
tandem cylinder	for cases requiring high forces and where the available space is limited	