

A4VSO泵及其变量机构概述

Rexroth
Bosch Group

Axialkolbenmaschinen

*Brueninghaus
Hydromatik*



A4VSO泵及其变量机构概述

A4VSO...的技术参数:

- ▶ 适用的粘度及温度: $v_{opt.}=16-36 \text{ mm}^2/\text{S}$ (厘斯: cent-stock)
(油箱温度) $v_{min}=10 \text{ mm}^2/\text{S}$ $v_{max}=1000 \text{ mm}^2/\text{S}$
 $t_{max}=+90^{\circ}\text{C}$ $t_{min}=-25^{\circ}\text{C}$

▶ 泵只允许短时处于温度及粘度的极限值状态, 否则对产品寿命不利, 任何部位 (包括局部) 的温度都不能超过 t_{max} 。

▶ 粘度值尽量选高值; 泄漏油的温度在系统中受压力及转速的影响较高, 但系统任何部位绝对不能超过 t_{max} , 否则请向我公司咨询。过滤精度:

最低精度等级: NAS1638: 9 级

SAE: 6级

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▶ ISO/DIS : 18/15

10 μ

过滤比: $\beta_{20} \geq 100$

- 安装位置: 任意, 但工作过程中及停车时泵壳内应充满油液。

- 吸油压力S口 (绝对压力):

不带辅助吸油泵时:

$$\blacklozenge P_{\text{abs min}} \geq 0.8 \text{ bar}$$

$$\blacklozenge P_{\text{abs max}} = 30 \text{ bar}$$

带辅助吸油泵时:

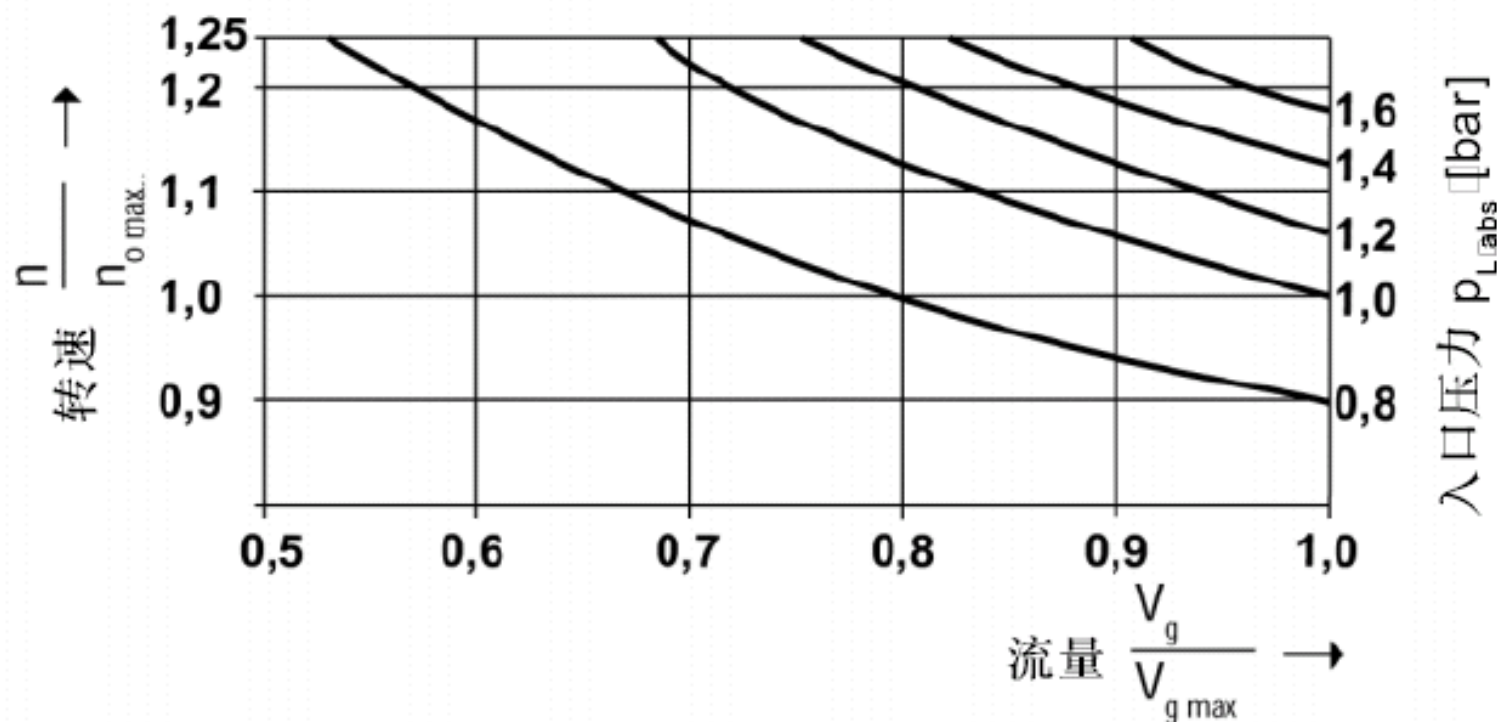
- 工作口压力:

额定压力: p_N 350 bar

峰值压力: p_{max} 450 bar

A4VSO泵及其变量机构概述

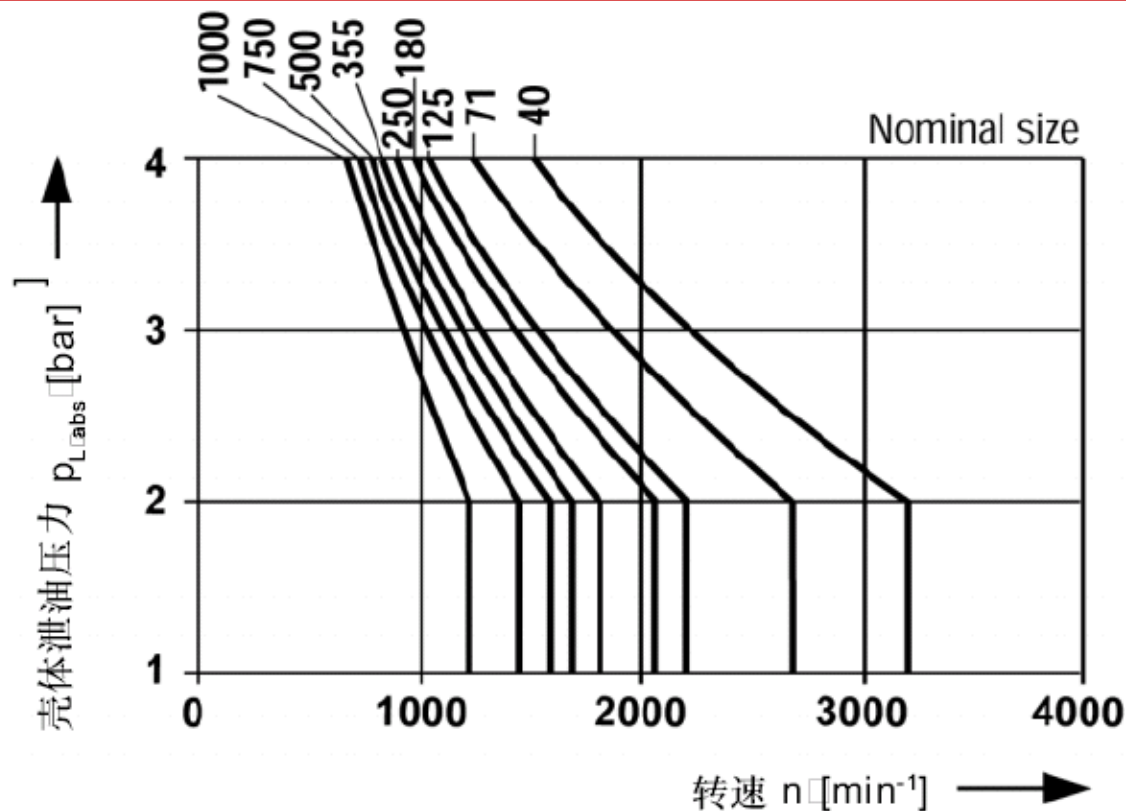
在吸入口 **S** 处进口压力 **P_{abs}** 的决定，或当转速增加时排量的减少。



最低吸油压力: **> 0.8 bar** (绝对压力)

A4VSO泵及其变量机构概述

壳体压力与转速的关系：



最高允许壳体
压力：

最大壳体泄油压力 (泵体压力)

p_{Lmax} _____ 4 bar

这是近似值。在某些工况下此值需减小。

A4VSO泵及其变量机构概述

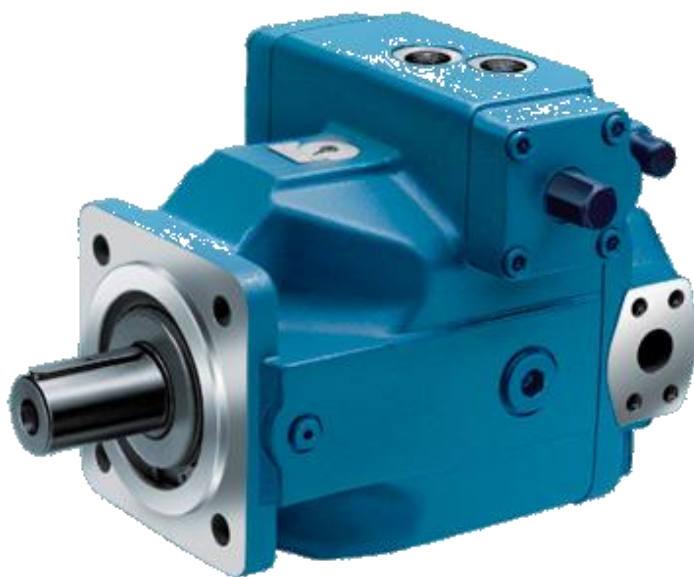
- 泵轴承的冲洗：
 - 非矿物油液压液（润滑性能较差）
 - 工作温度和粘度处于接近极限 范围。
 - 传动轴垂直朝上安装

各种规格泵所需的冲洗油液流量为：

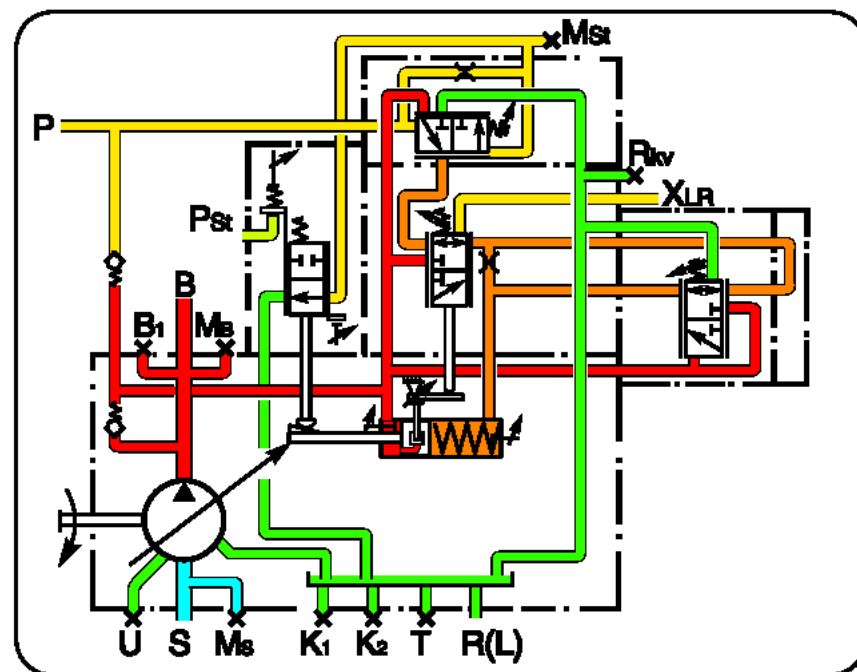
规格	40	71	125	180	250	355	500	750	1000
Q _{Sp} L/min	3	4	5	7	10	15	20	30	40

- 为保证上述冲洗流量，需在U口和壳体之间有约2巴（1，2系列）或约3巴（3系列）的压差。
- 注意：U口的节流螺丝须拧到底！

A4VSO泵的变量机构概述



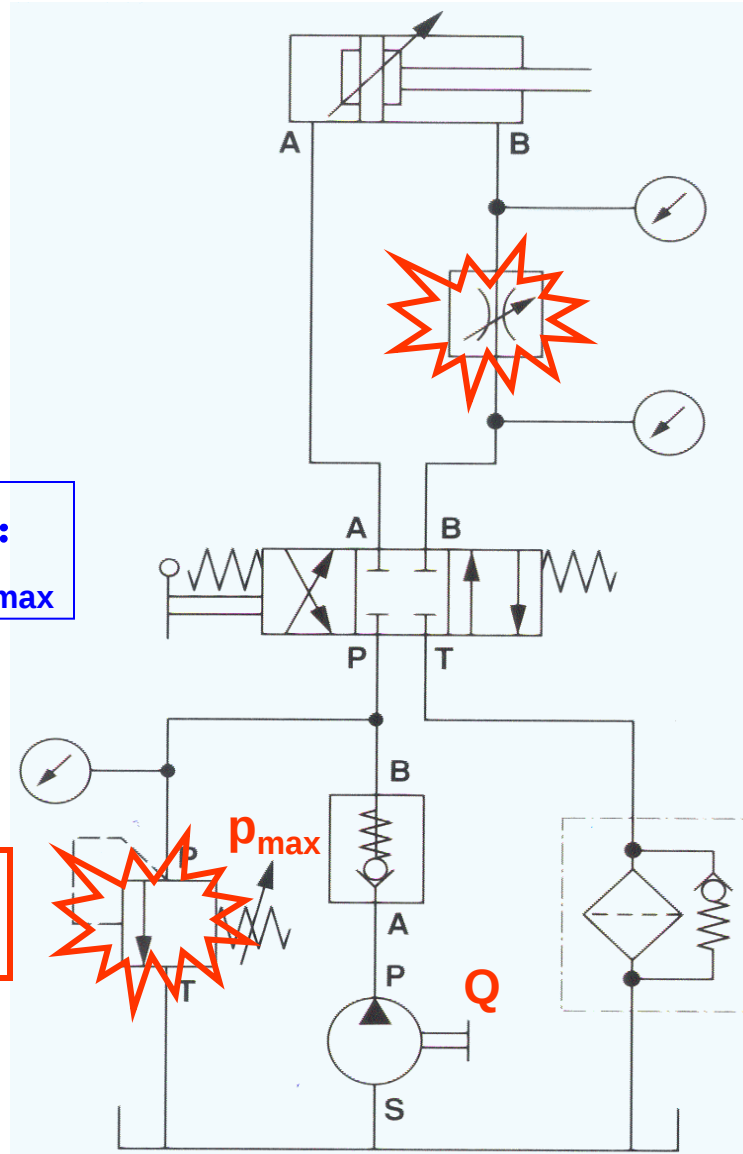
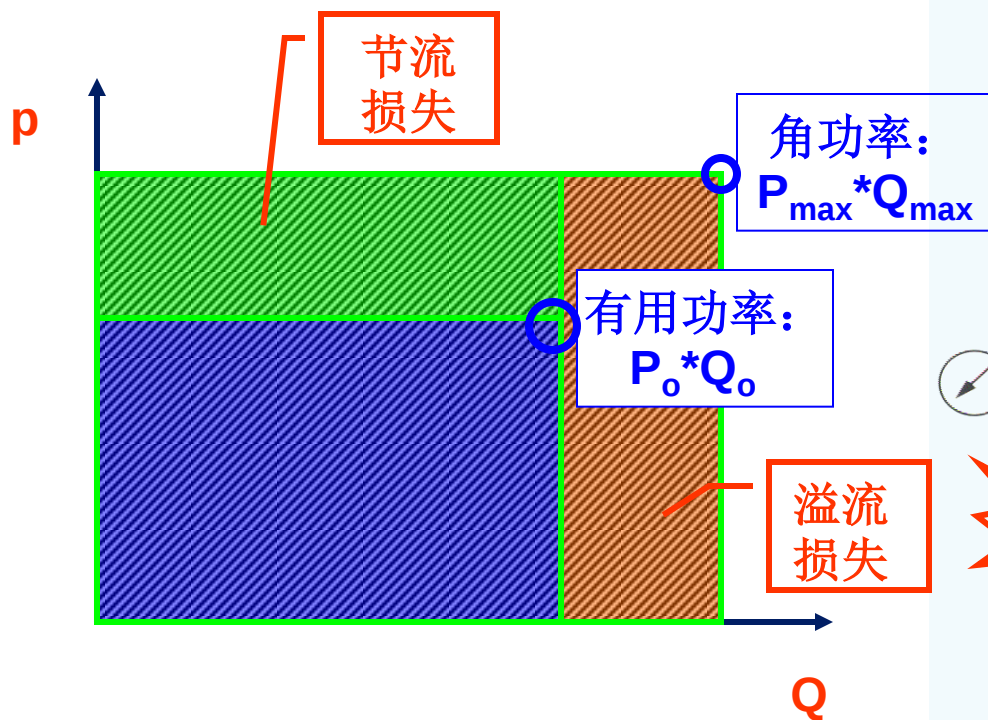
不就变量机构而谈变量机构，
而就液压系统所存在的缺陷
而谈如何改善这些缺陷！如何
使液压系统达到一个理想的
境界！



恒压变量控制机构DR

▶ 定量泵系统:

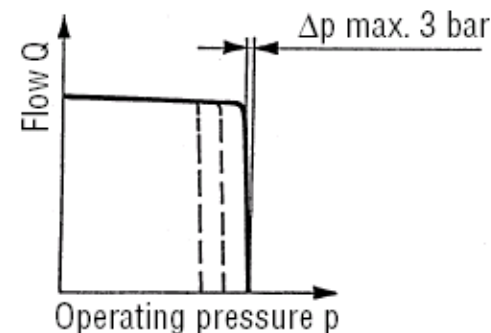
- ▶ 系统的压力: $p = P_{\max}$
- ▶ 系统的流量: $Q = V_g * n$
- ▶ 系统的功率利用率: $< 50\%$



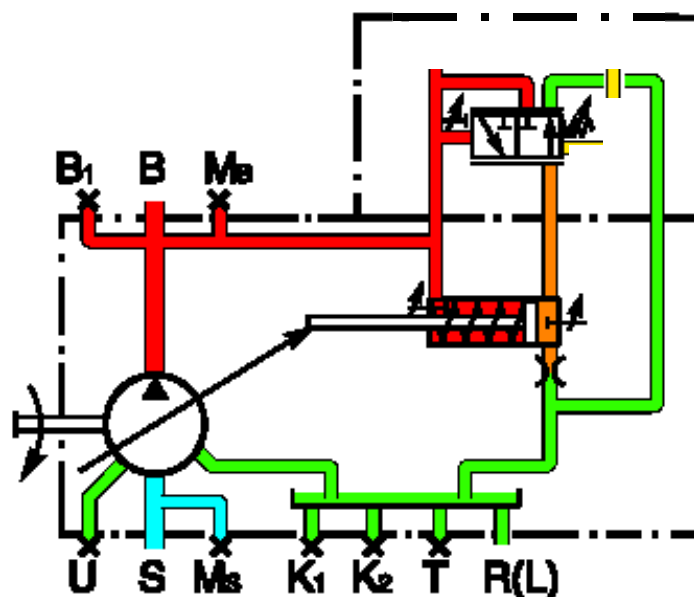
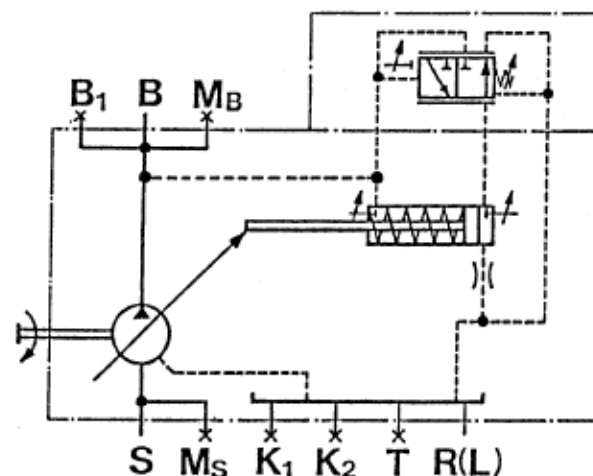
恒压变量控制机构DR

- ▶ 恒压源
- ▶ 只提供系统所需要的流量，理论上无能量损失；所以加上恒压变量机构后，系统可以节能，避免系统过热。
- ▶ 其作用与溢流阀截然不同！
- ▶ 可实现遥控（**DRG**）。
- ▶ 考虑到总的装机功率，多用于蓄能器回路。

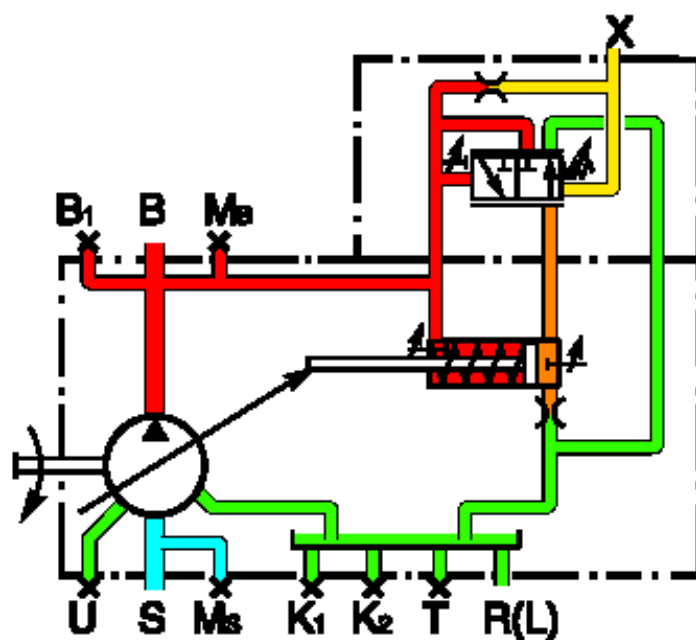
Operating
Curve



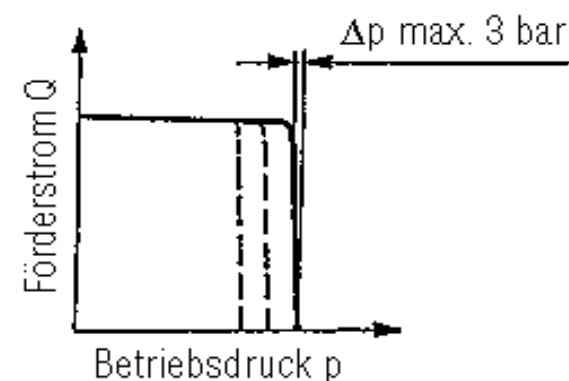
Circuit



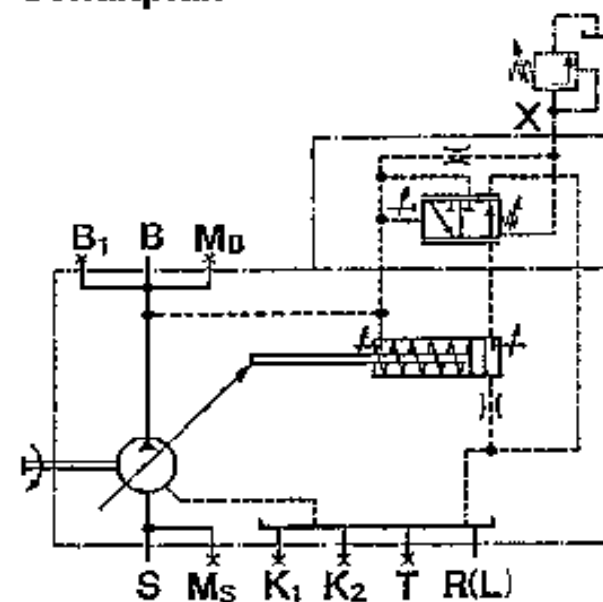
遥控恒压变量控制机构DRG



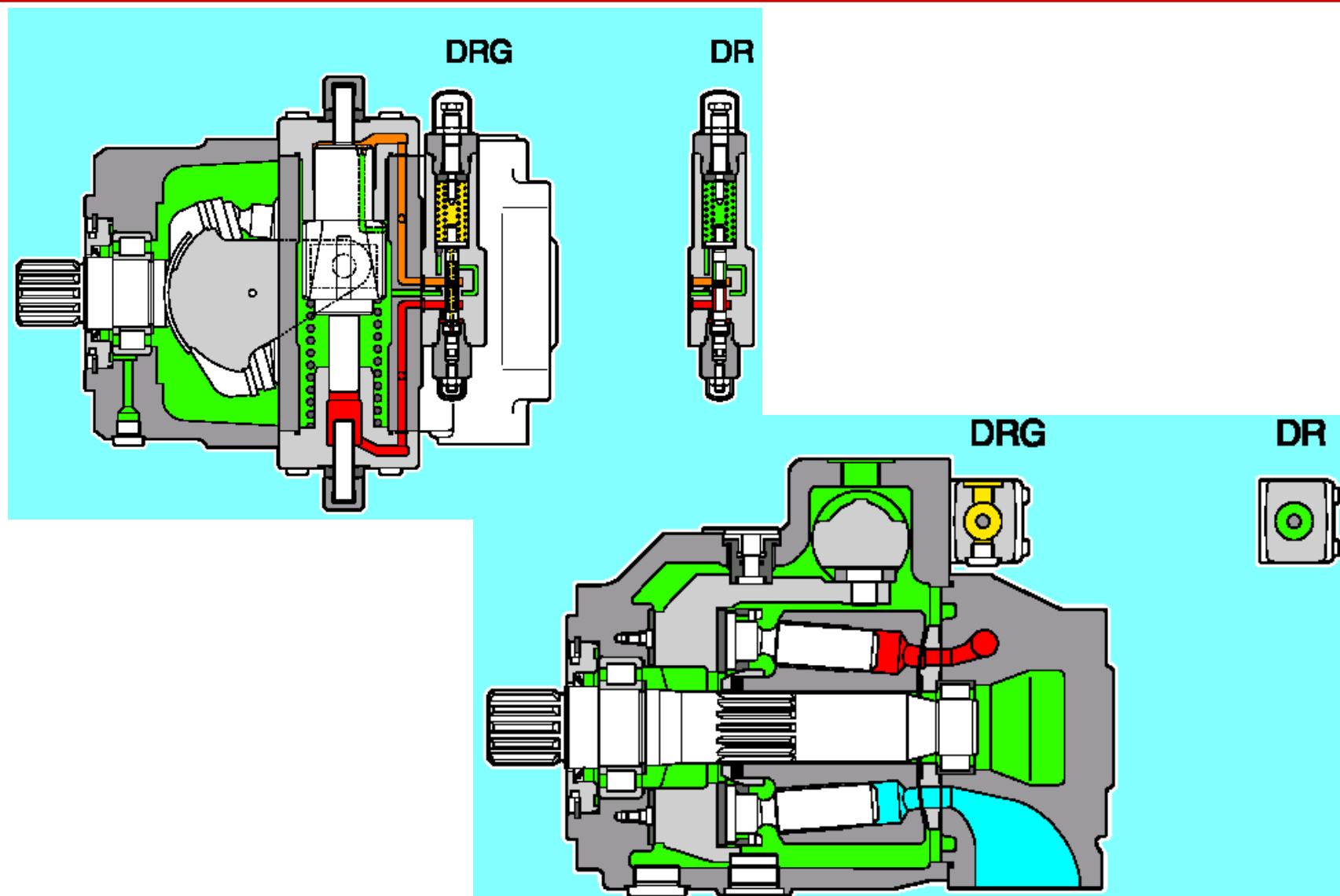
Kennlinie



Schaltplan



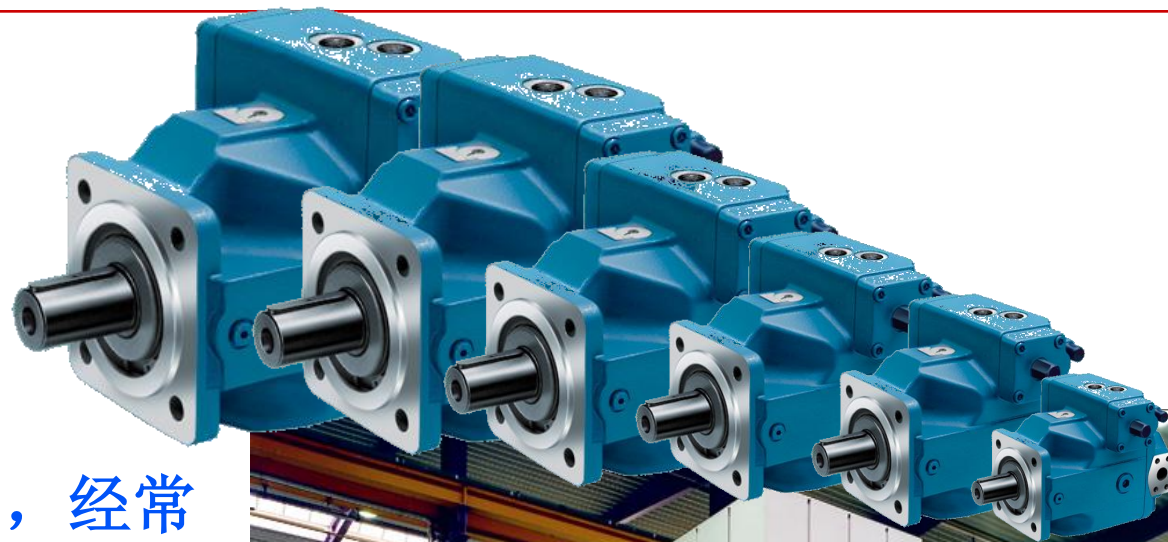
DR(DRG)泵的结构



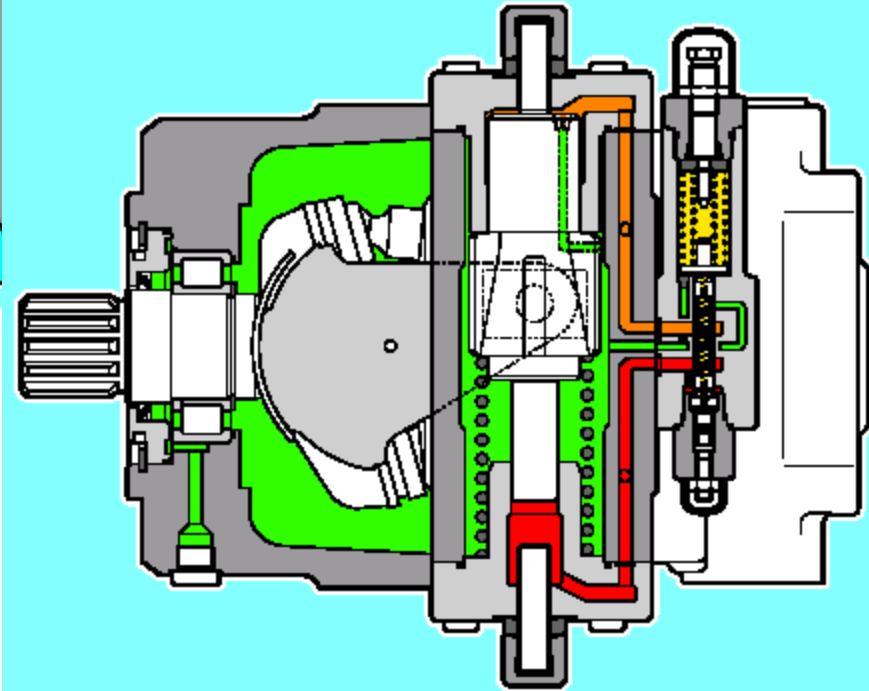
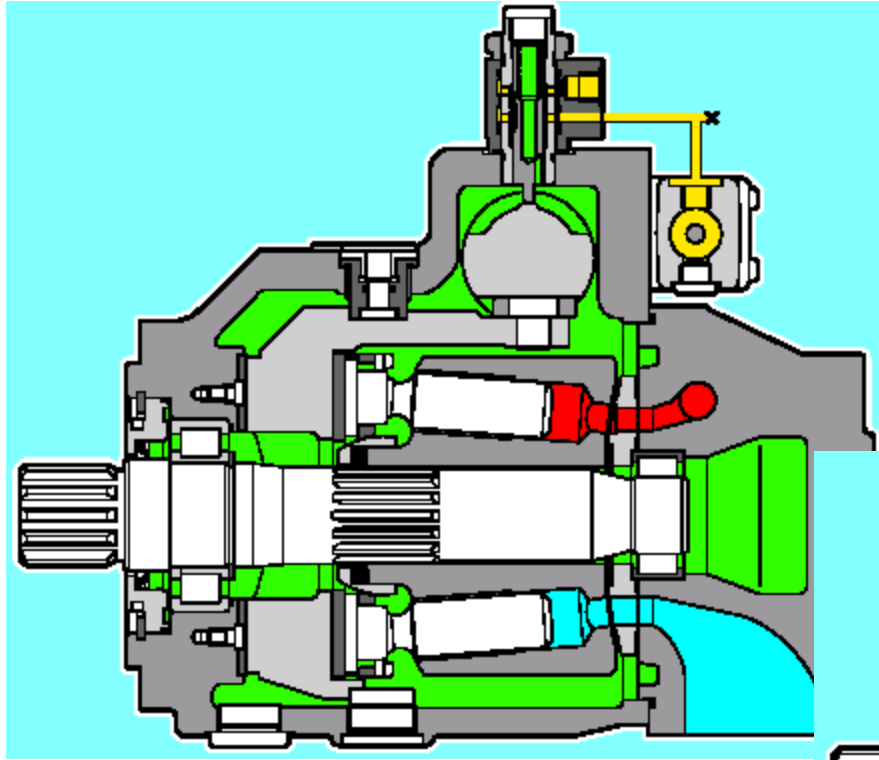
同步控制变量机构DP

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- ▶ 大型系统中，经常使用很多泵，为了保证所有液压泵的同步工作，防止出现“特殊化”的倾向，必须采用同步控制变量机构的液压泵！

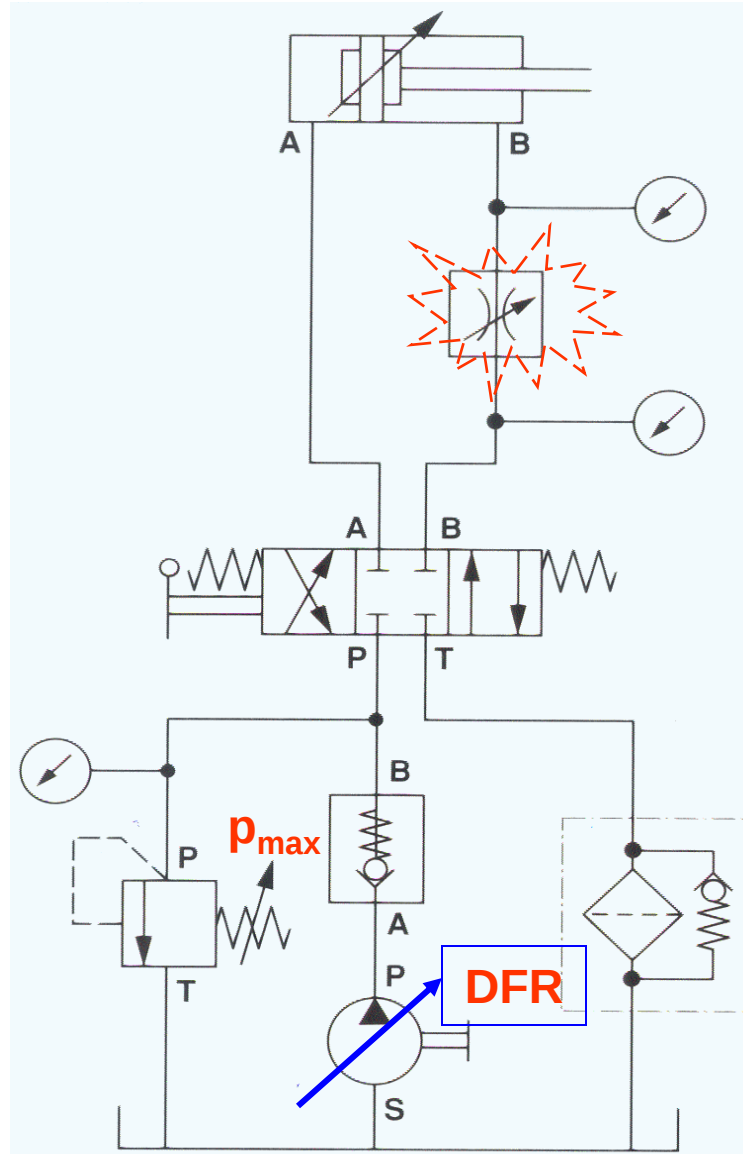
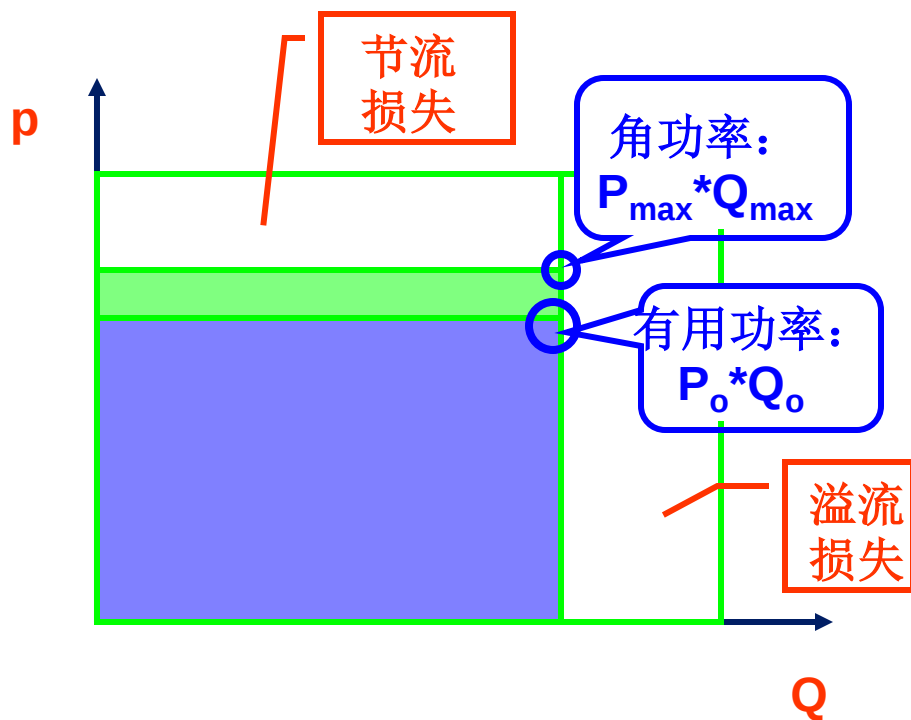


同步控制变量机构DP



恒压DR与负荷敏感(恒流量)DFR

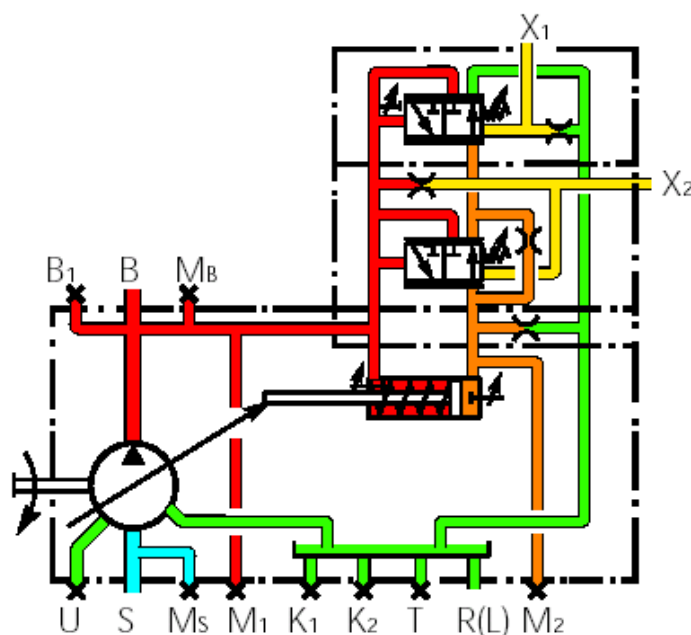
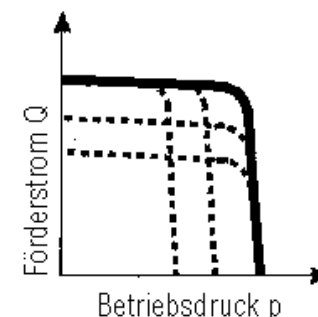
- ▶ 系统的压力: $p =$ 系统所需
- ▶ 系统的流量: $Q =$ 系统所需
- ▶ 系统的功率利用率: $> 50\%$



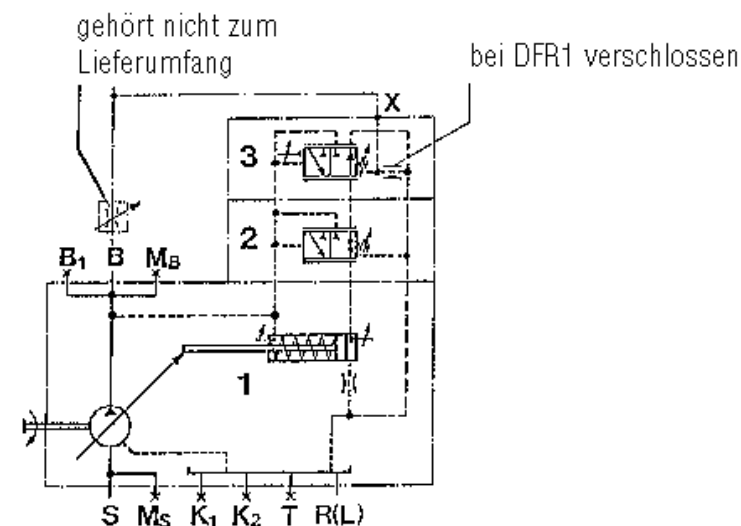
DFR泵的结构

❖ **X₁**: 负荷敏感口; **X₂**: 恒压遥控口

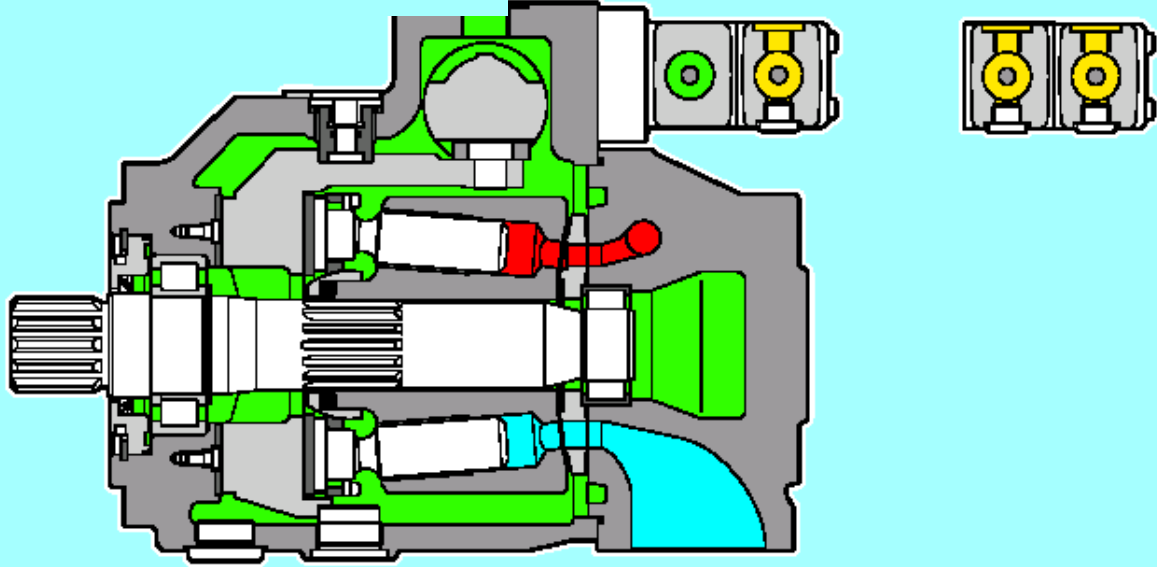
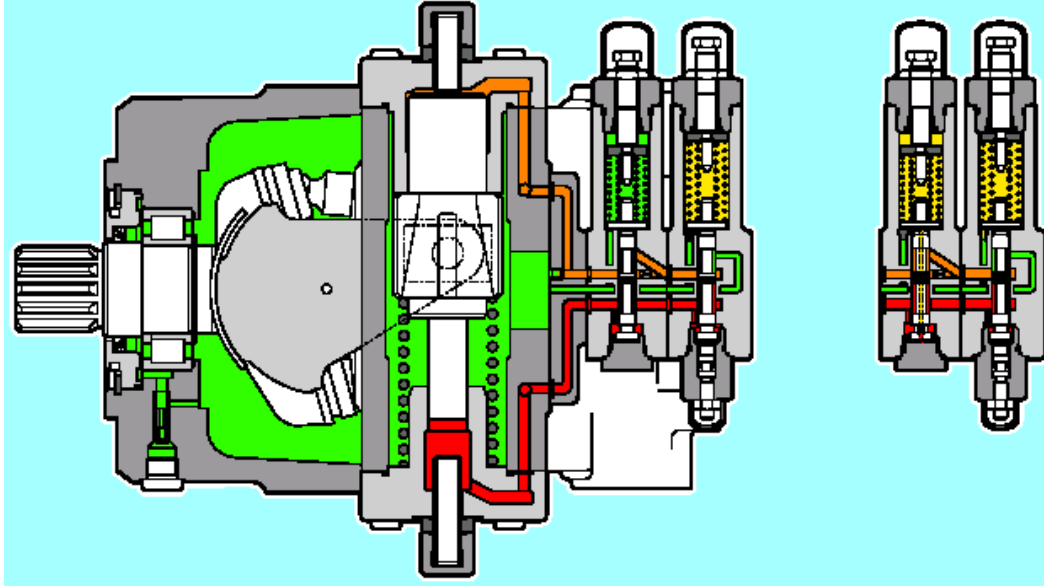
❖ 作用: 恒压+与负载无关的负荷敏感



Schaltplan

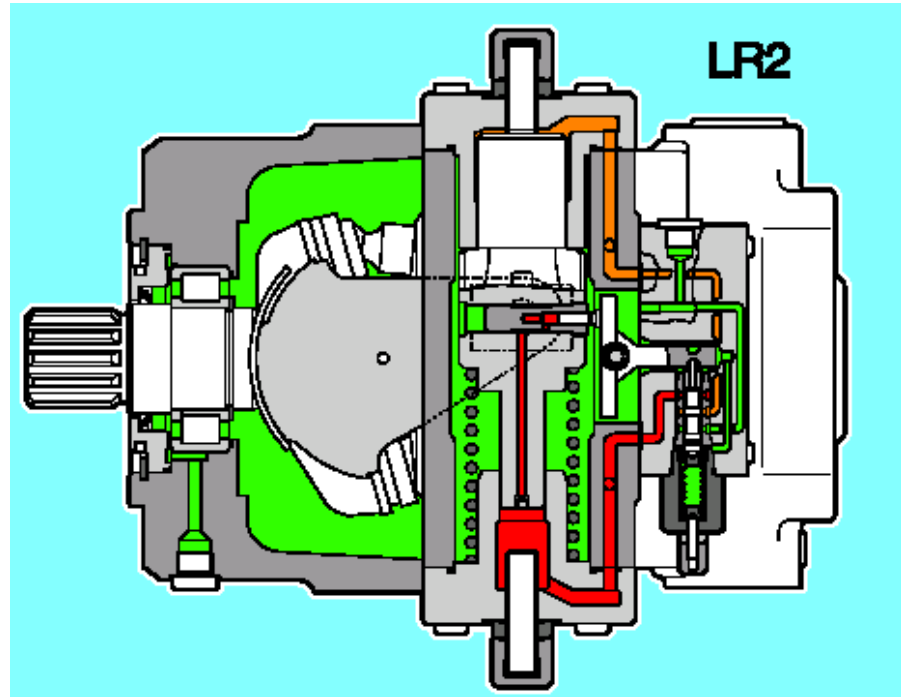


DFR泵的结构

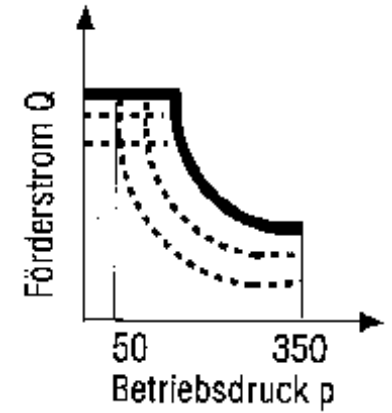
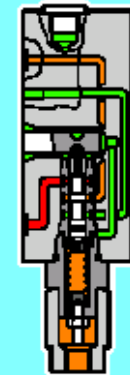


恒功率泵

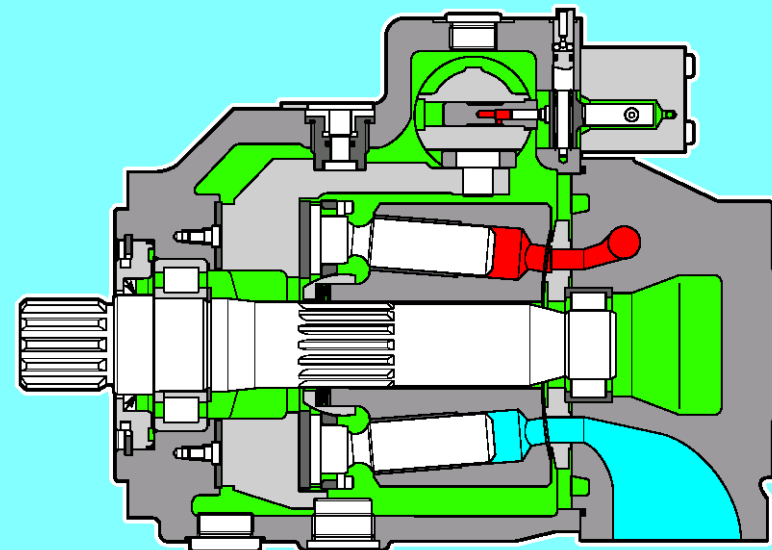
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LR3

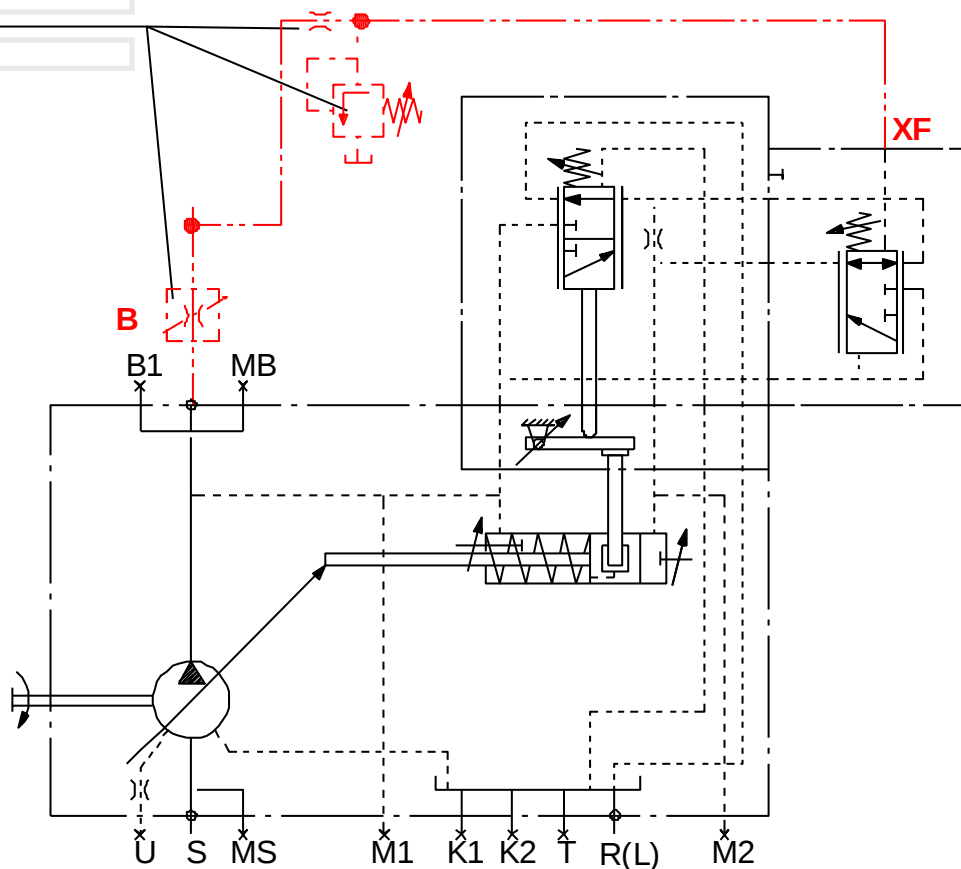


LR2 / LR3

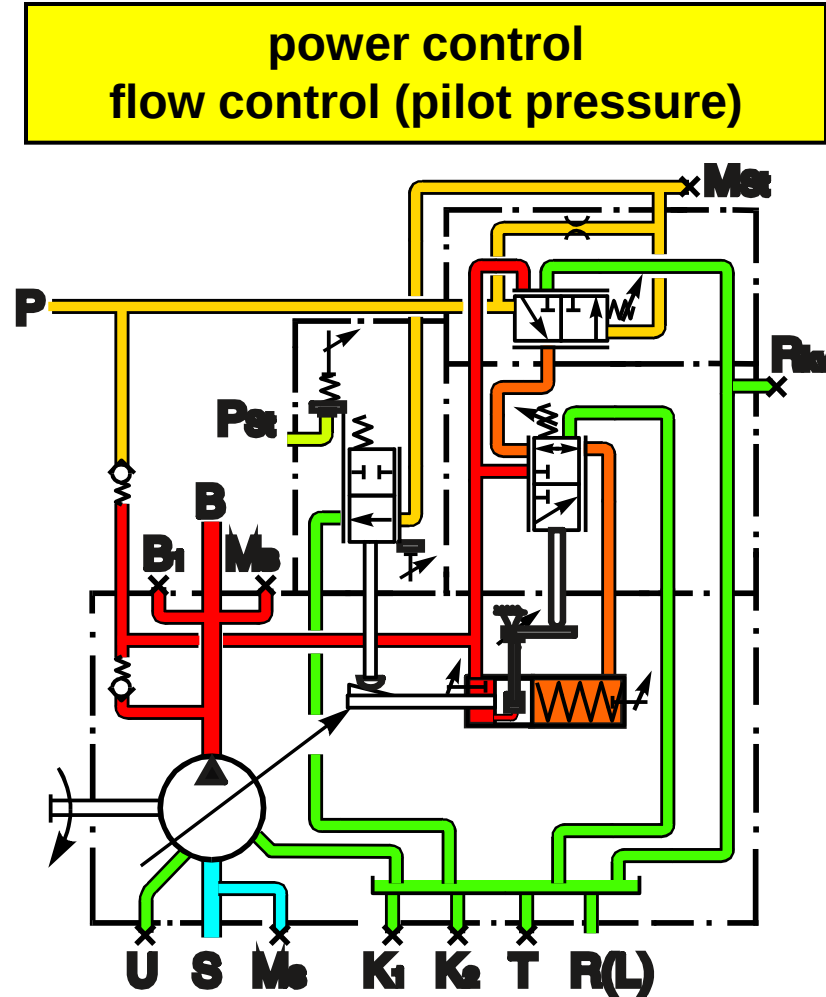
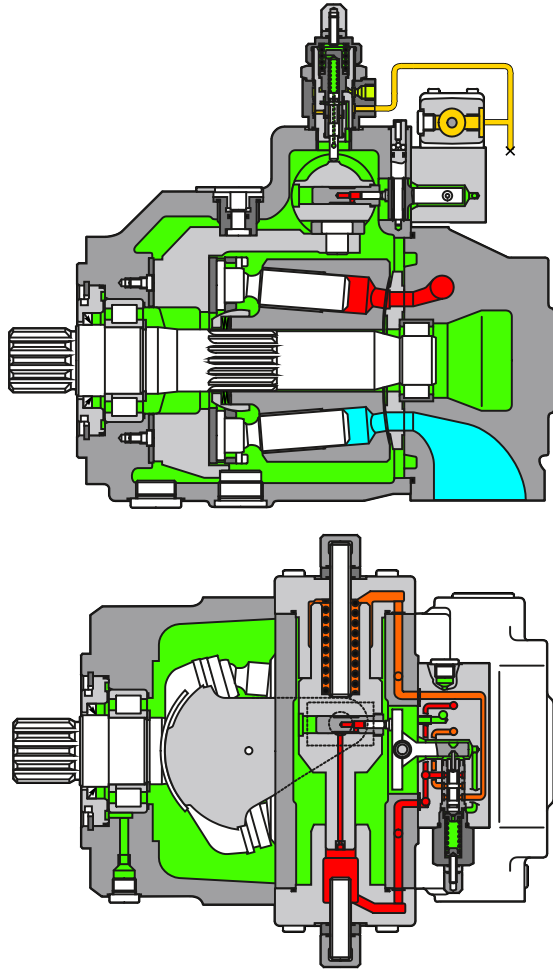


A4VSO...LR2S connection diagram

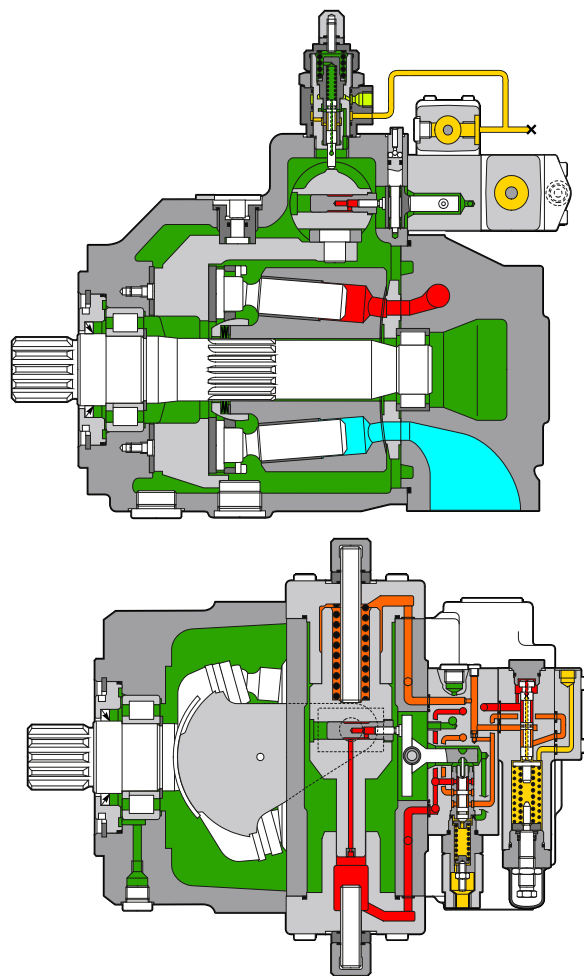
not included in supply



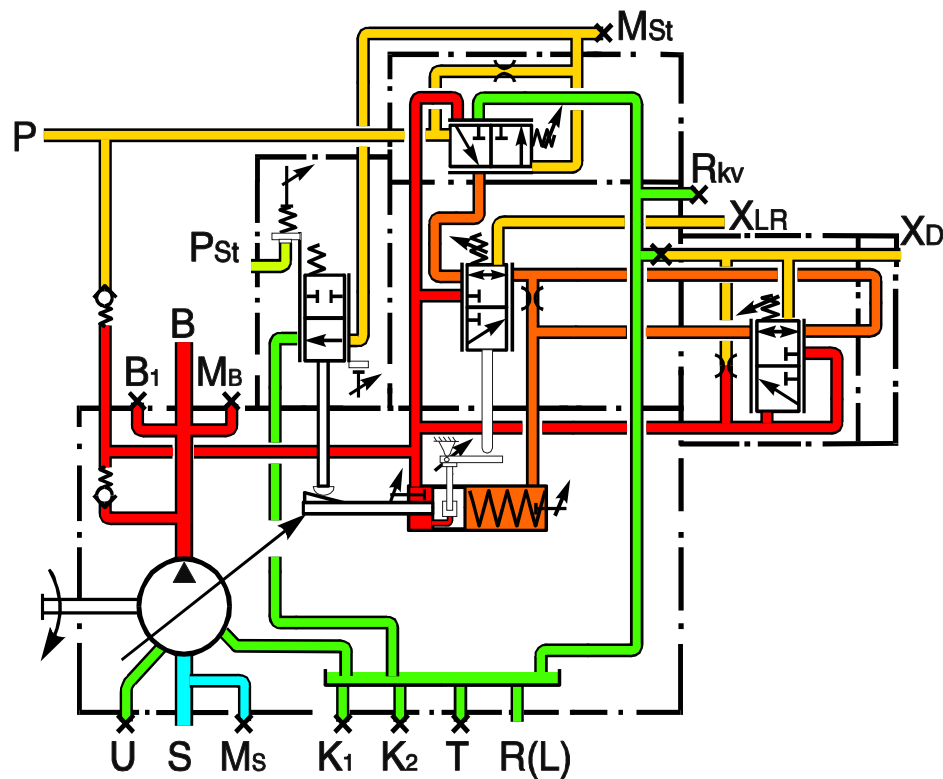
A4VSO...LR2N



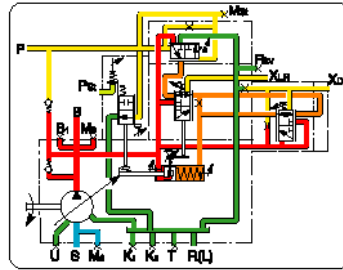
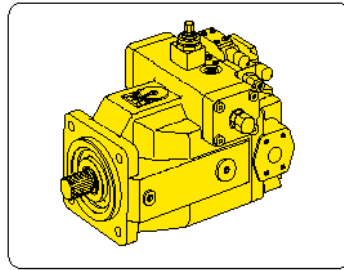
A4VSO...LR3GN



**pressure control (remote controlled)
power control (remote controlled)
flow control (pilot pressure)**



复合变量控制 LR3GN



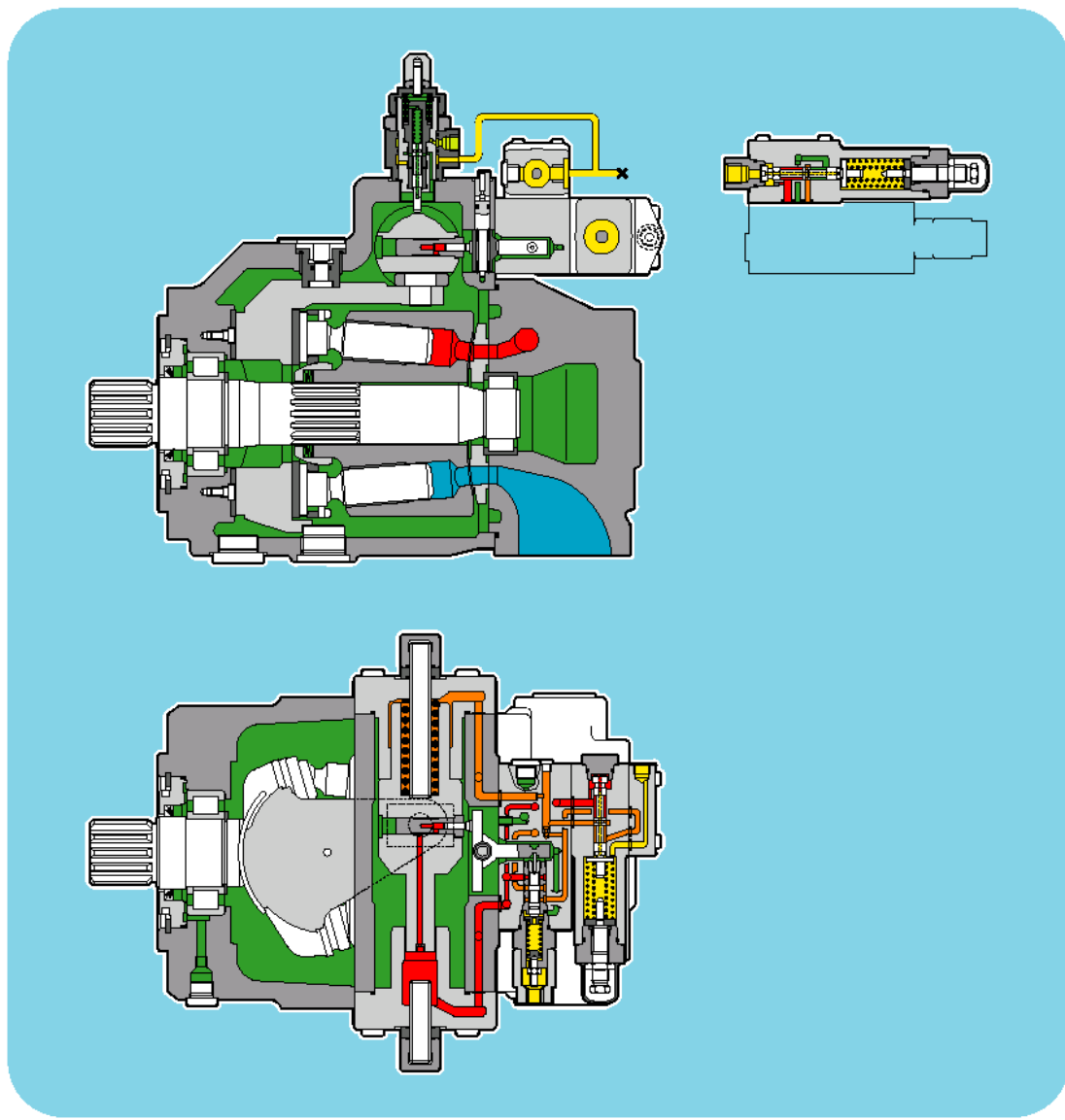
**MANNESMANN
REXROTH**

Brueninghaus Hydromatik

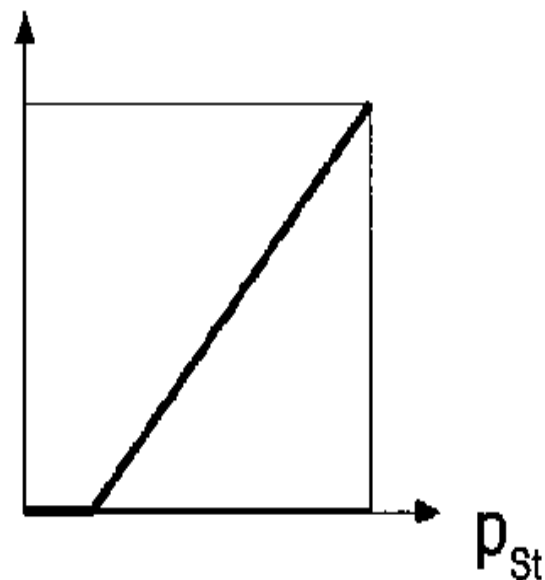
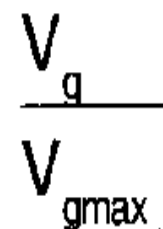
A4VSO ... LR3GN

Index 0
Verstellpumpe
Variable displacement pump

- ▶ LR+恒功率可调+压力切断遥控+液控变量
- ▶ 可装入启动回路:如下图:



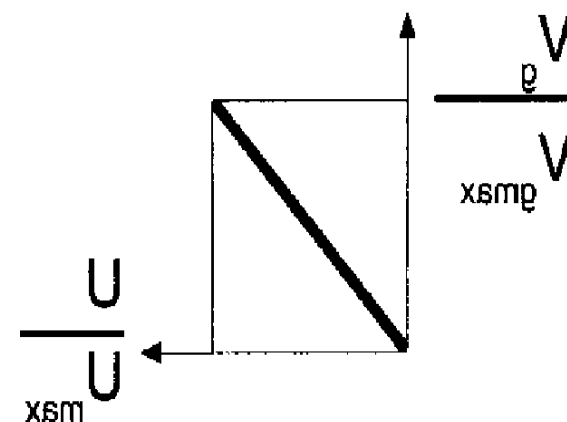
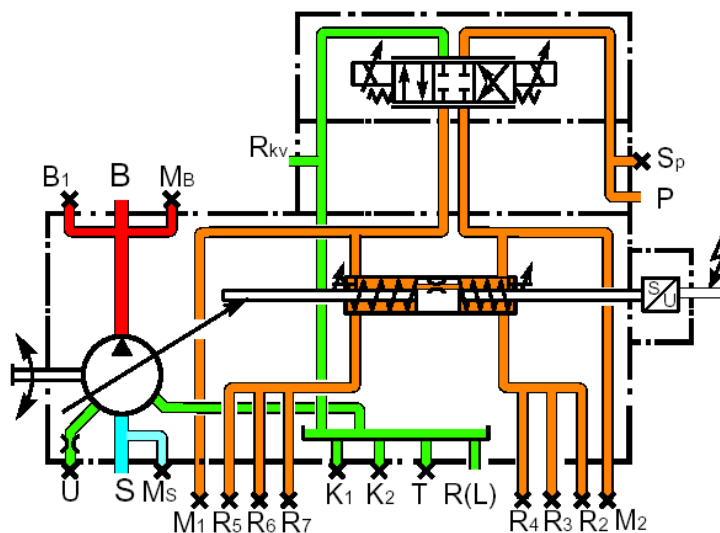
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A4VSO...EO2-电比例控制

Technical data

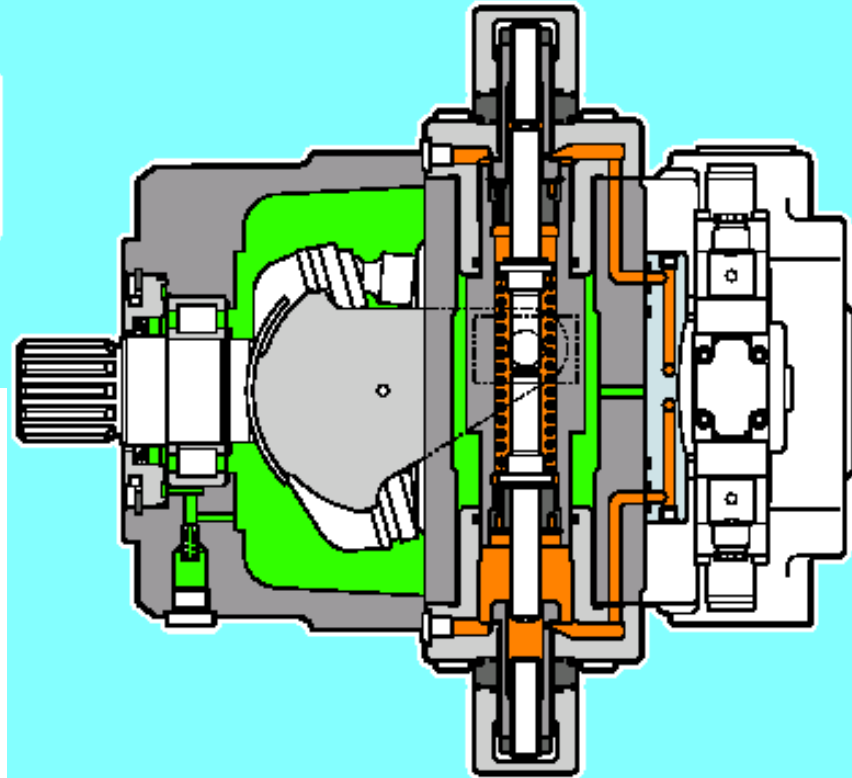
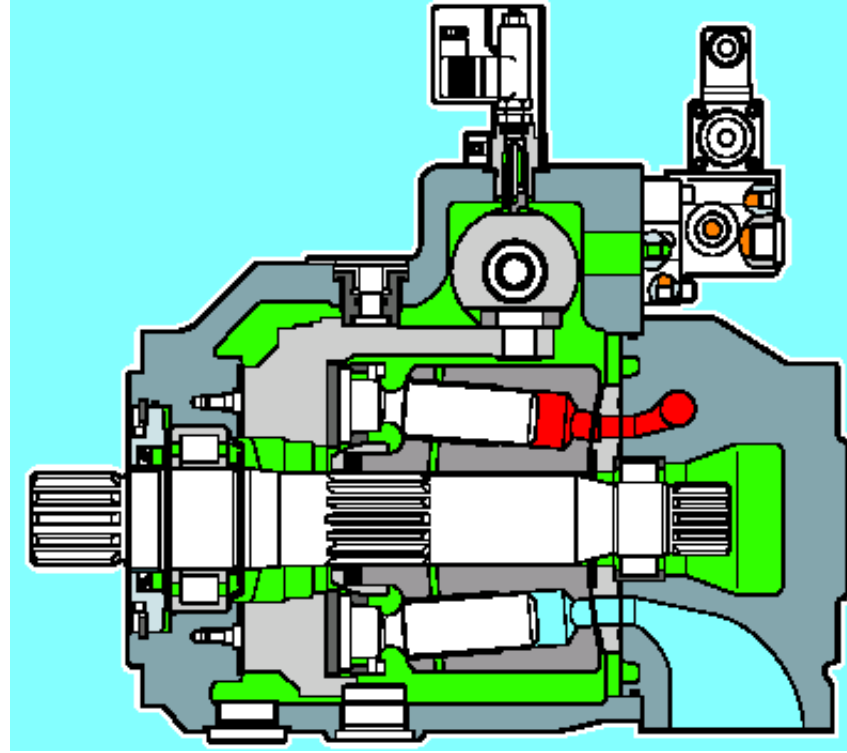
Size		40	71	125	180	250	355	500	750
Control movement $s_{\max}$	mm	14,2	17,1	20,7	20,7	25,9	25,9	32,6	37,0
Control area A	cm ²	8,1	12,6	18,1	18,1	28,3	28,3	38,2	56,8
Control volume $V_{S\max}$	cm ³	11,4	21,5	37,5	37,5	73,2	73,2	124,5	210
Min. control pressure	bar	100	100	100	125	125	125	150	150
$(X_1, X_2) p_{\min}$									
Max. permissible Control pressure $p_{\max}$	bar	315	315	315	315	315	315	315	315
Control time $t_{\min}^*$	s	0,1	0,12	0,2	0,2	0,25	0,25	0,3	0,5



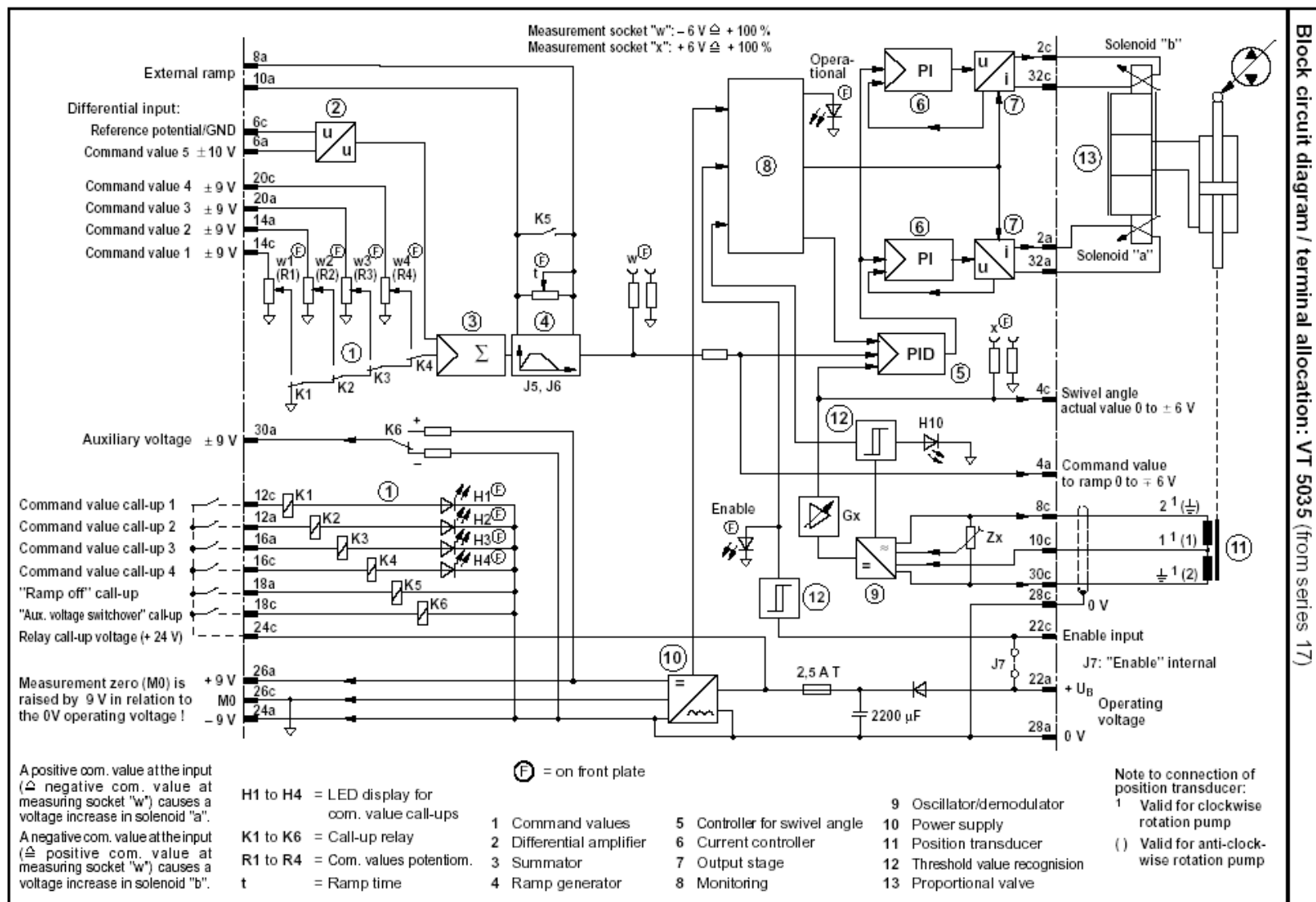
A4VSO...EO2-电比例控制泵的结构图

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Bosch Rexroth Hydraulic Seminar



VT5035



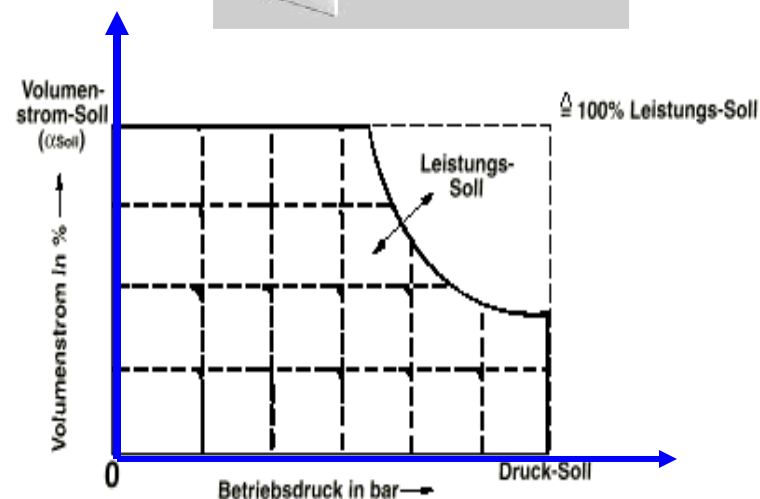
电子泵A4VSO...HS3

The diagram illustrates a hydraulic system for a crane. It features a central pump (circle with a triangle) driven by an electric motor (circle with a lightning bolt). The pump is connected to a main line with several branches. One branch leads to a valve labeled B_1 . Another branch leads to a valve labeled B , which is connected to a valve labeled M_B . A third branch leads to a valve labeled U . The main line also has a valve labeled S and a valve labeled M_s . The system includes several actuators: a cylinder labeled $R_5 R_6 R_7$, a cylinder labeled K_1 , a cylinder labeled K_2 , a cylinder labeled T , and a cylinder labeled $R(L)$. There are also two sets of cylinders labeled $R_4 R_3 R_2$. The system is controlled by a valve labeled S_p and a valve labeled P . A pressure relief valve is shown on the right side. The diagram is color-coded: red lines for the main supply, green lines for the pump and motor, and blue lines for the actuators.

HS3-综合控制：p、Q、N

Bosch Rexroth Hydraulic Seminar

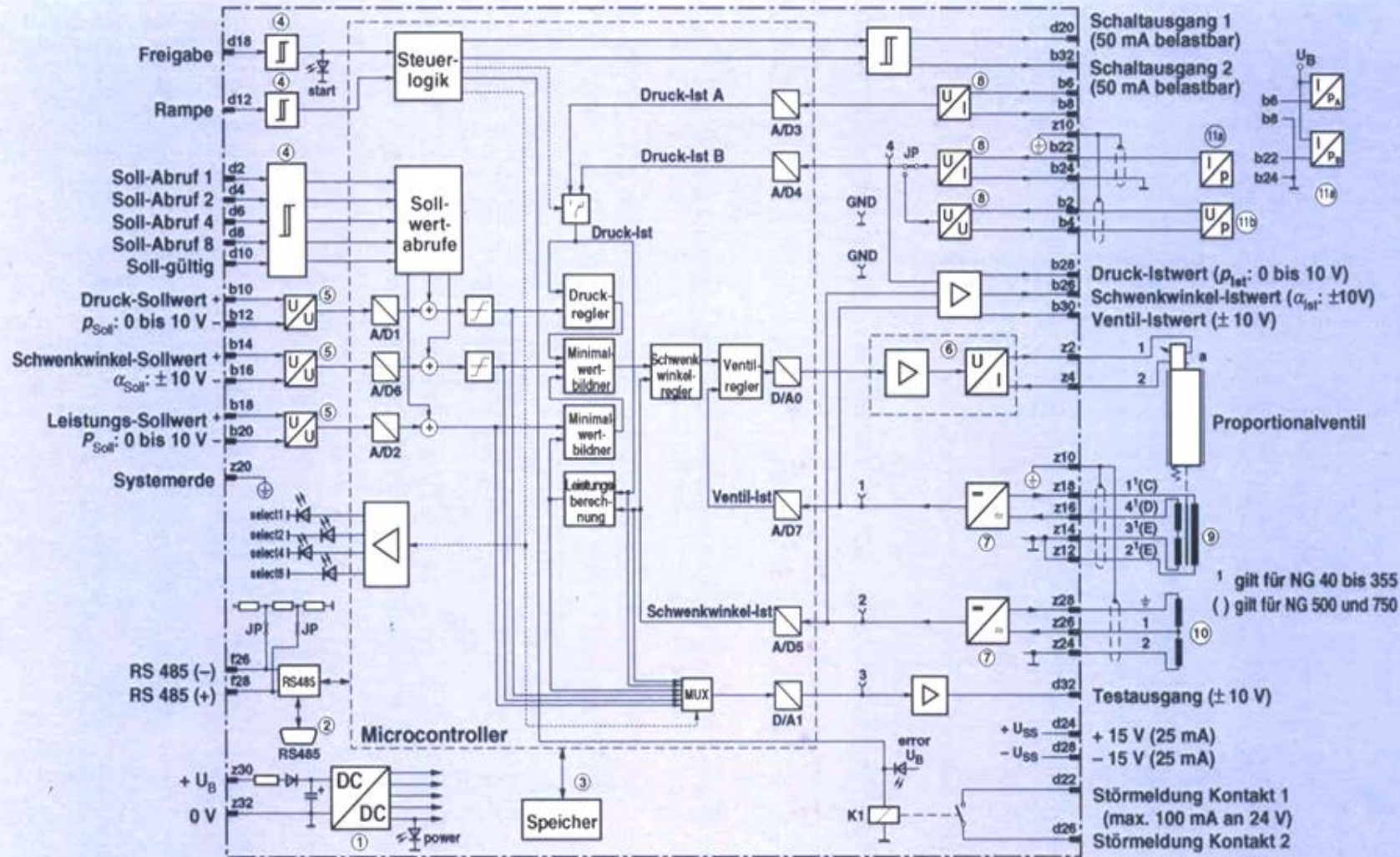
- ▶ 微处理器控制
- ▶ 数字输入方式
- ▶ 模拟量输入和反馈
- ▶ 带使能口，故障显示（二进制代码）
- ▶ 脉宽调制输出
- ▶ **LEDs-显示**
- ▶ 测量口
- ▶ 标准插口
- ▶ 串行接口**RS485**,可使最多**32**块放大板配合工作.
- ▶ 主从控制形式
- ▶ 总线控制形式
- ▶ 压力、流量、功率控制
- ▶ 具有流量补偿功能



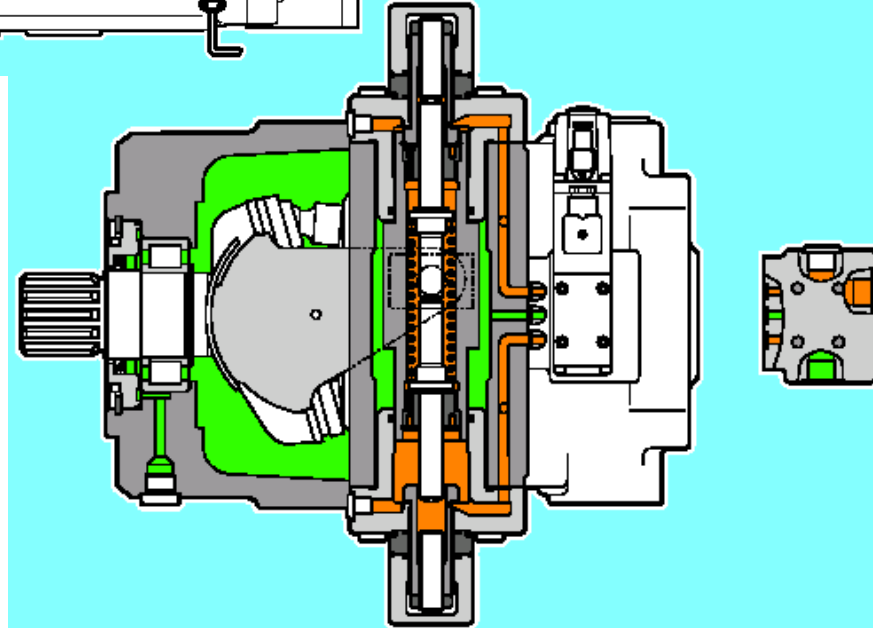
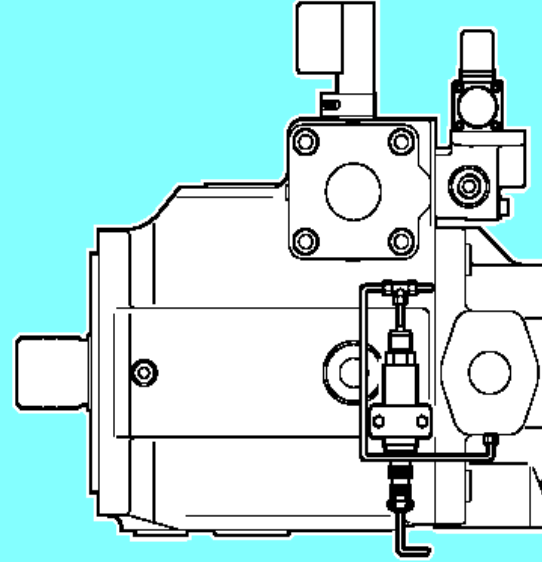
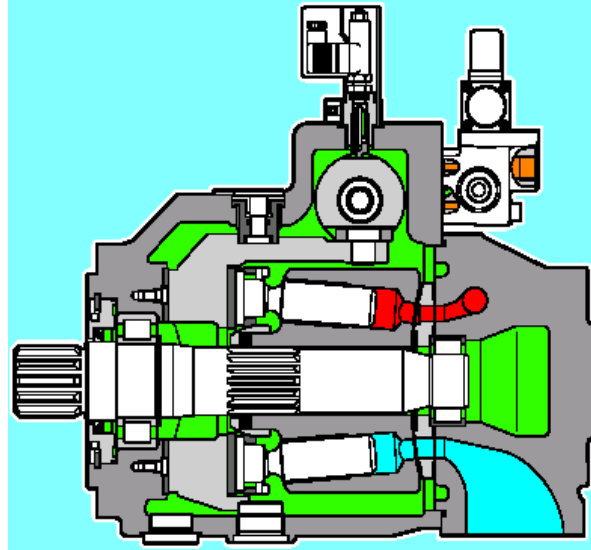
max. Hysterese $\Delta V_g \leq \pm 1 \% \text{ von } V_{g \max}$
 min. Wiederholgenauigkeit $\leq \pm 0,5 \% \text{ von } V_{g \max}$
 Linearitätsabweichung $\leq 2 \% \text{ von } V_{g \max}$

Werte gelten
 für konstante Betriebstemperatur von 50° C.

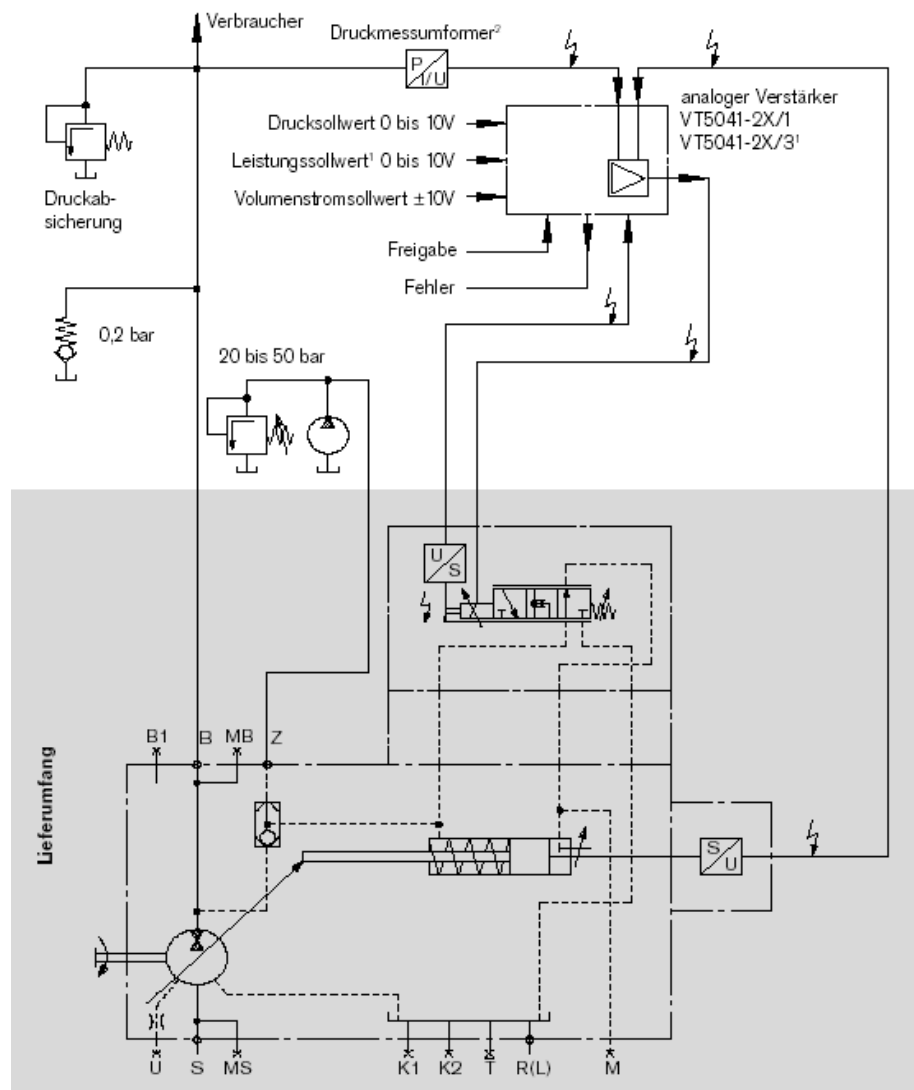
放大器VT12350-原理方框图：



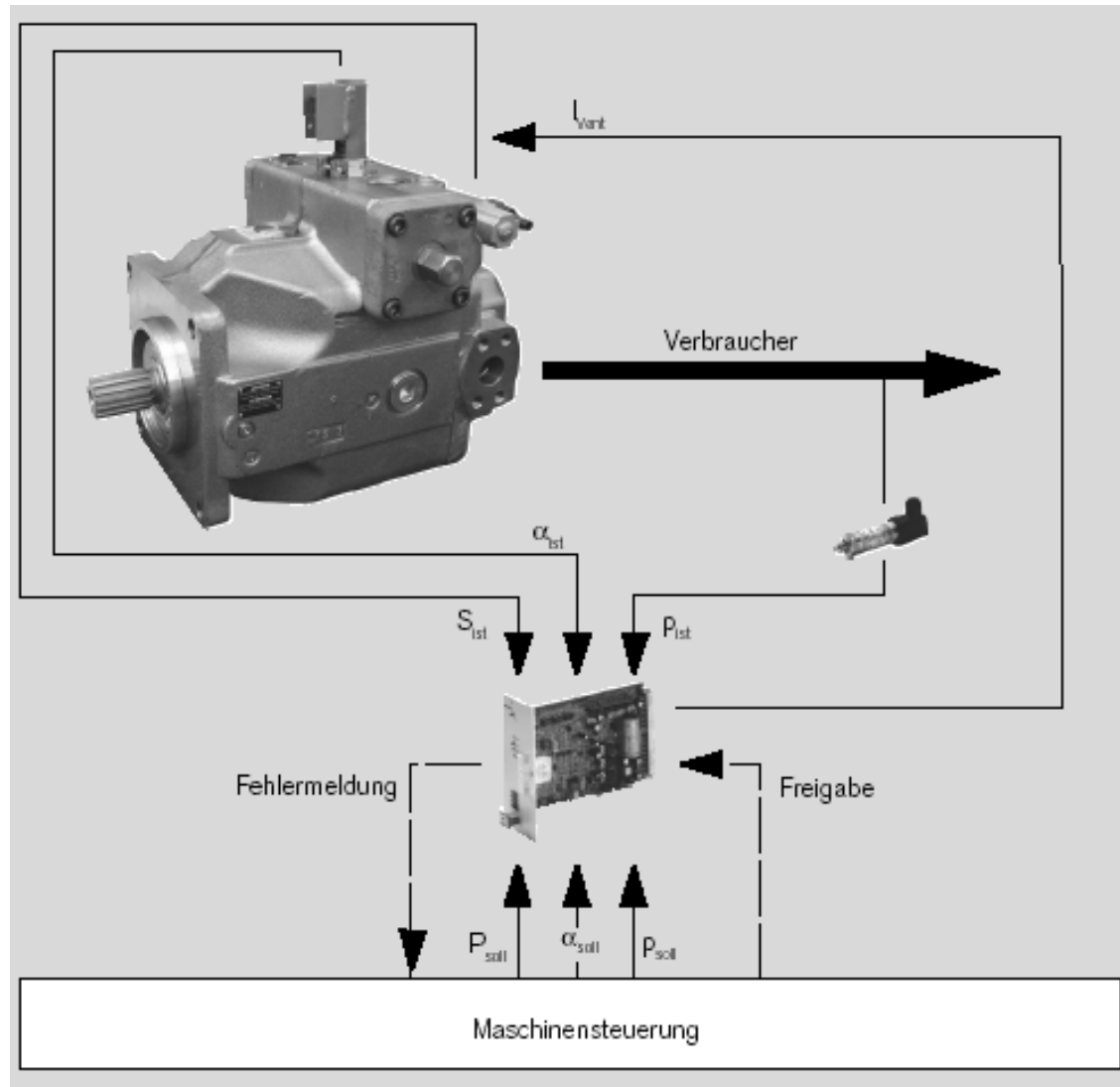
A4VSO...HS3电子泵的结构图



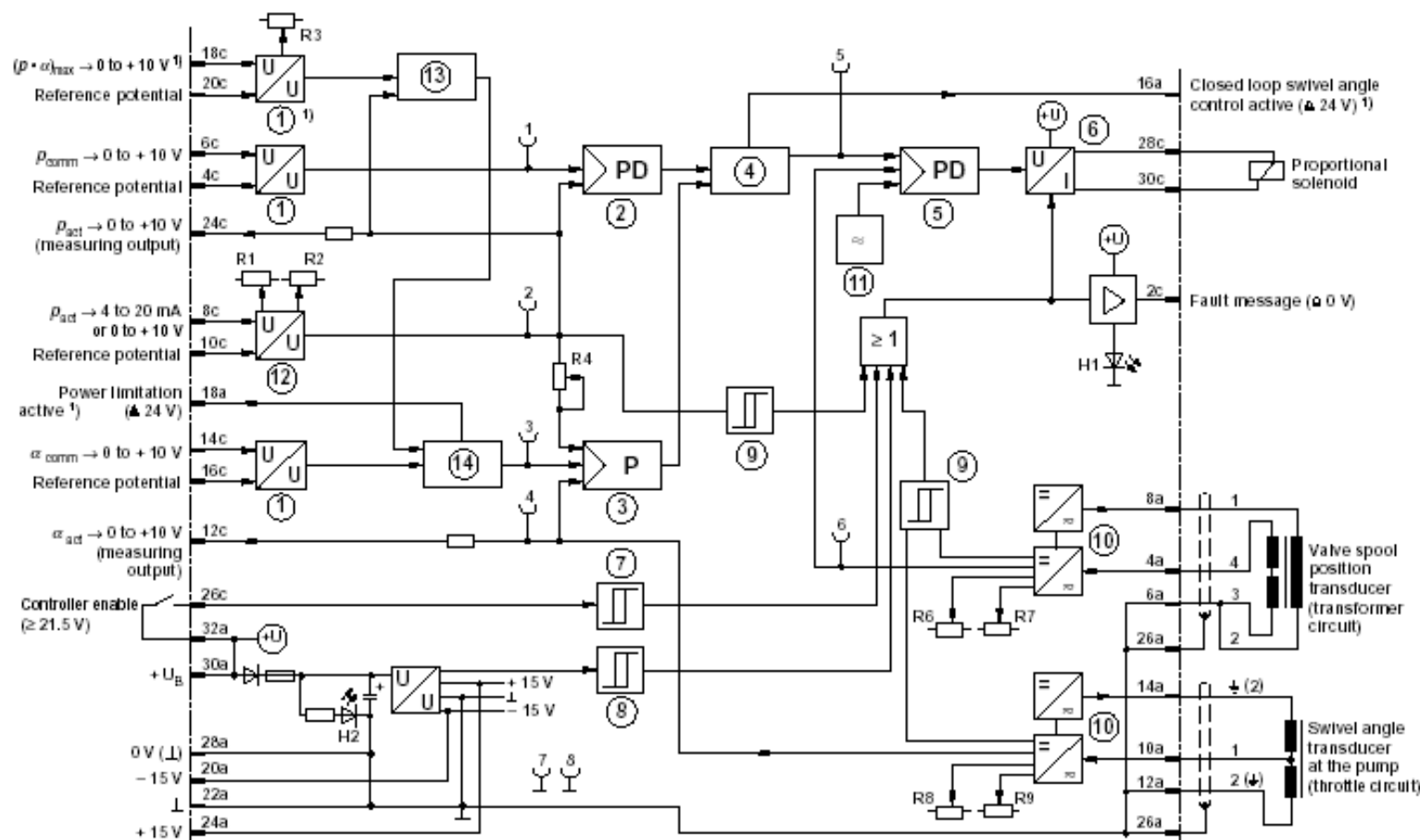
A4VSODFE...



A4VSODFE...



VT5041



- | | |
|--|---|
| 1 Differential amplifier | 6 Current output stage |
| 2 Pressure controller | 7 Output stage enable |
| 3 Swivel angle controller | 8 Monitoring of power supply symmetries |
| 4 Minimum value generator | 9 Cable break detection |
| 5 Valve position controller | 10 Oscillator/demodulator |
| 11 Dither generator | |
| 12 Input amplifier | |
| 13 Divider ¹⁾ | |
| 14 Minimum value generator ¹⁾ | |

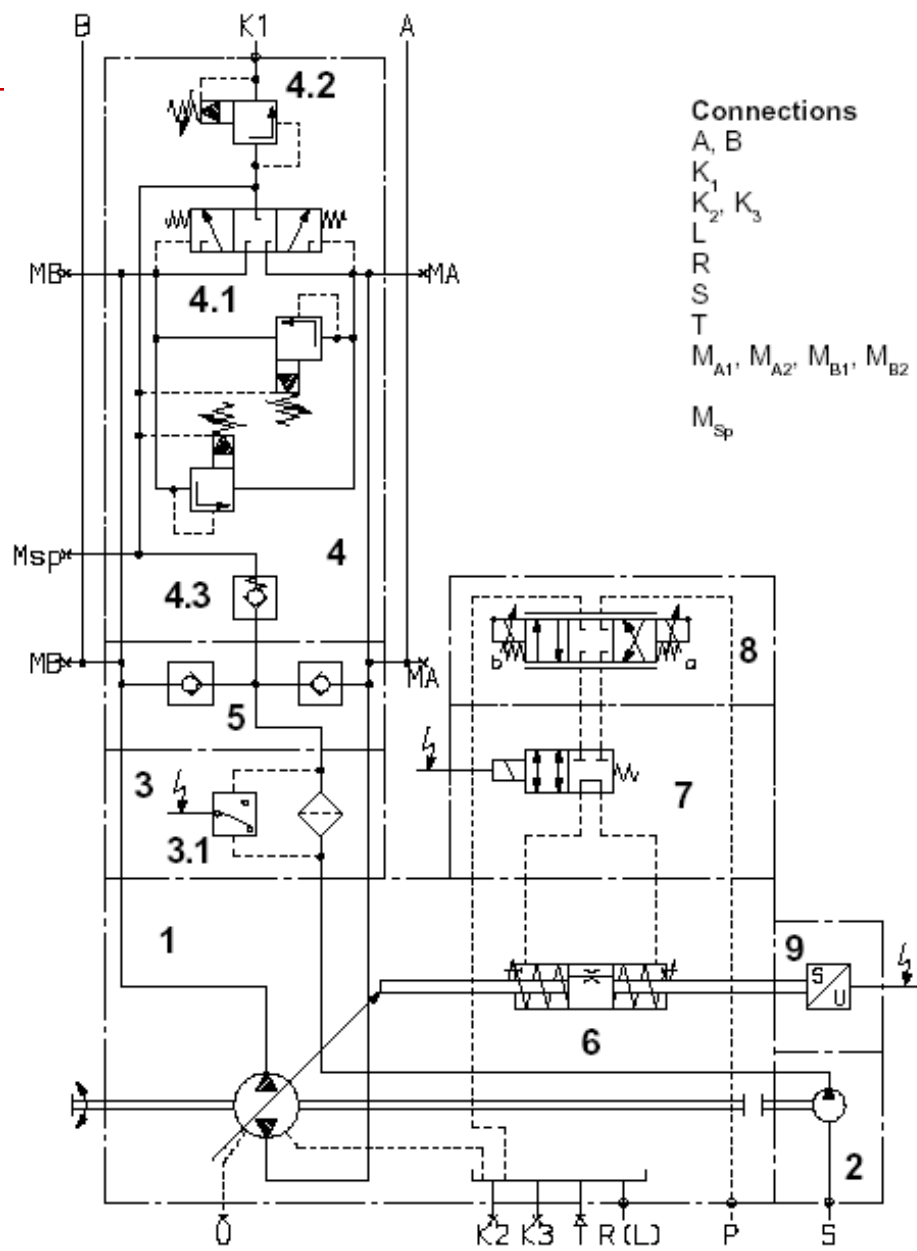
¹⁾ only with VT 5041-2X/3..

- | |
|--|
| H1 Fault display |
| H2 Power |
| R1, R6, R8 Zero point |
| R2, R7, R9 Amplitude |
| R3 Constant maximum power preselection ¹⁾ |
| R4 Leakage compensation |

Note:
The connection of the position transducer in throttle circuit is valid for clockwise rotation of the pump ("(") anti-clockwise rotation of the pump).

A4VSG71E0. . .

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Connections

A, B

Flushing port

K₁

K₂, K₃

L

R

S

T

M_{A1}, M_{A2}, M_{B1}, M_{B2}

M_{sp}

Pressure ports

Flushing port

Housing flushing ports (plugged)

Case drain port

Return line or bleed

Suction port auxiliary pump

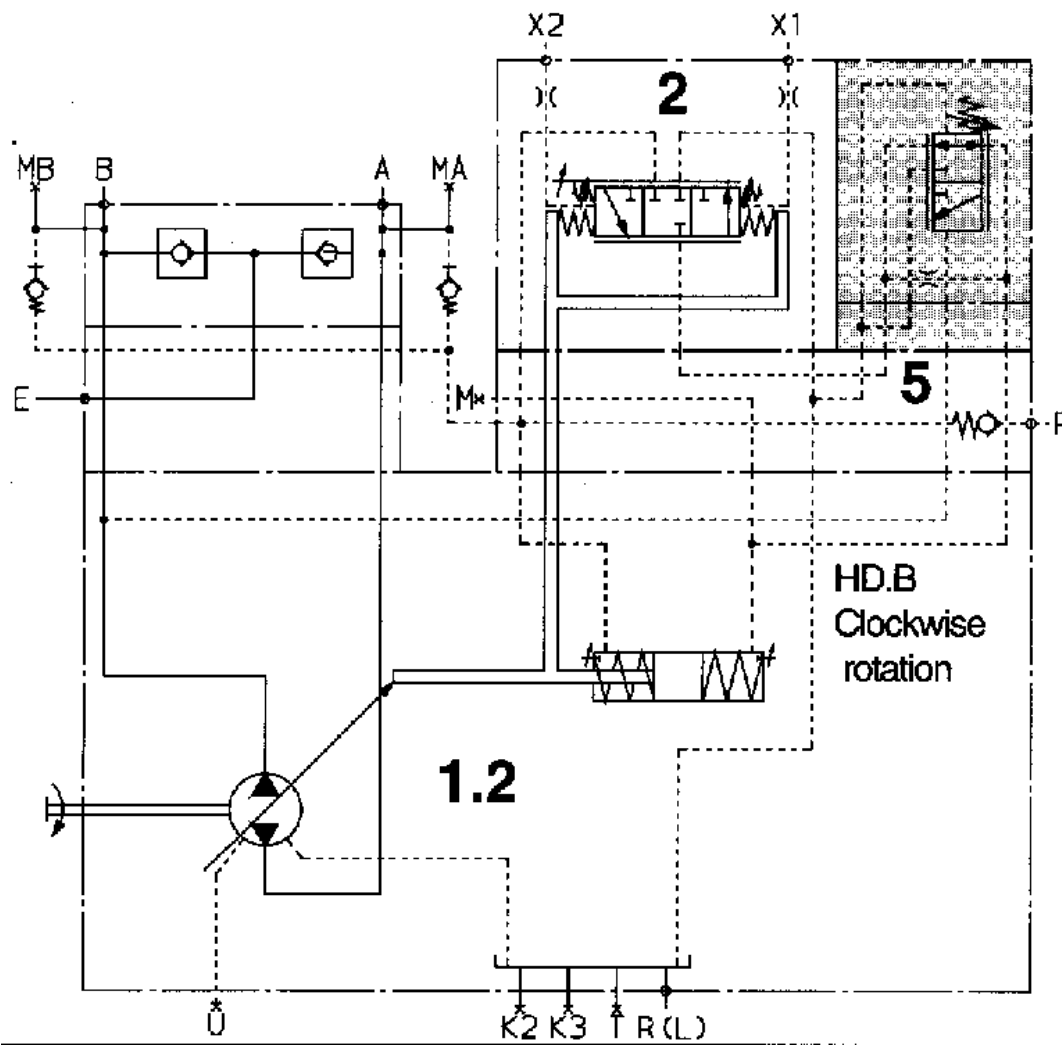
Oil drain (plugged)

Gauge ports for operating pressure (plugged)

Gauge port for flushing pressure (plugged)

A4VSG...HD. B...

Circuit diagram sizes 500 - 750



A4VSG500...集成式结构

Variable displacement pump A4CSG500: integration of the auxiliary pump and valve technology (flushing function)



electro proportional control device
EP

port plate:
integrated design
of all valves and
aux. pump