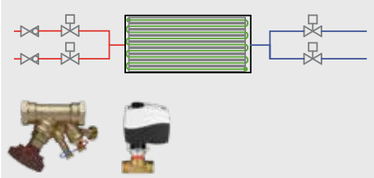
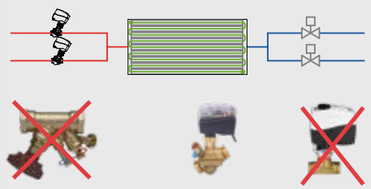
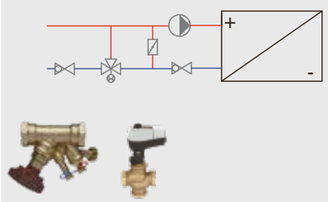
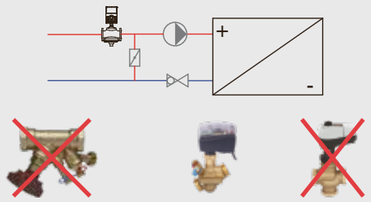
Chapter 2

Modern hydronic systems

2.1 Heating and cooling systems

Traditional hydronics From the past, still used today.	**Modern hydronics** Used sometimes, recommended for the future.
Comparison of hydronic systems with heating/cooling ceilings	
	
Description of the system 3 or 4 line system with changeover function. This system requires 2 on-off valves in the flow (or 1 x 3-way ball valve) and two control valves in the return flow, i.e. 4 (3) fittings all together. The changeover can also be achieved with a 6-way ball valve. The hydronic balancing needs one manual balancing valve per flow pipe. As a result, hydronic balancing is very complex and only applies to this specific application.	**Description of the system** The same system works with two pressure-independent control valves (e.g. Danfoss AB-QM or Siemens VPI) in the flow pipe and two on-off valves or one 3-way ball valve in the return pipe. It is also possible to use a 6-way ball valve. However, with this variant the ball valve should only be used for the changeover. The control should be taken over by the pressure-independent valve. Hydronic balancing is ensured by setting the water flow rate when installing the pressure-independent control valves.
Traditional hydronics Of the past, still used today.	**Modern hydronics** Used sometimes, recommended for the future.
Comparison of hydronic systems with air heating – air cooling circuits	
	
Description of the system With the standard solution the temperature of the incoming air is set by a conventional 3-way valve (or straight-way valve). Hydronic balancing is achieved by a manual balancing valve in the primary circuit and a valve in the secondary circuit. As a result, hydronic balancing is very complex and only applies to this specific application.	**Description of the system** Injection-type system with pressure-independent valve (e.g. Danfoss AB-QM or Siemens VPI). This solution does not require a standard control valve and a manual balancing valve in the primary circuit. If the volume flow in the secondary circuit remains constant, it is sufficient to use manual balancing valves (e.g. Danfoss MSV series).

Comparison of traditional and modern hydronics	**Traditional**	**Modern**
Partial-load operation allows correct mass flows.		✔
Partial-load operation allows correct temperature differences in flow and return.		✔
Partial load operation allows low return flow temperatures.		✔
Valve authority close to 1.		✔
Correct determination of the K_{VS} value for the control fittings required.	✔	
Time consuming planning and adaptation of load characteristic and control valve characteristic to flow characteristic.	✔	
Minimum loss of operating pressure of the pressure-independent control valve must be observed.		✔
In case of correct selection (valve setting) the pressure loss of the system is identical.	✔	✔
Calculation of pressure loss required for entire system incl. calculation of settings for hydronic balancing.	✔	
Calculation and settings for hydronic balancing not carried out.	✔	
Pressure loss of control circuit must be calculated for pump design. No hydronic balancing required for pressure loss calculation.		✔
Hydronic balancing through setting of water flow rate at fittings.		✔
Overflow and underflow of hydronic volume flow rate must not be balanced.		✔
Required heating and cooling is provided by system. No overheating or underheating and no overcooling or undercooling of room.		✔
The energy-saving potential of the speed-controlled pump is used by the correct volume flows.		✔
In terms of energy, heating and cooling generators as well as boilers are operated efficiently.		✔
Cost-effective planning of system.		✔
Higher fittings investment.	(✔)	✔
Lower total investment.		✔
(✔): depending on system.		

Good hydronics save between 5 % and 15 % of energy demand.

See pages 68, 86, 94, 126, 184, 200, 202, 212, 222, 320