

## Two shift operation power plants

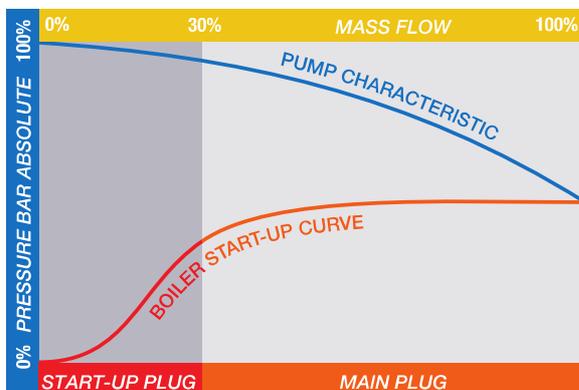
Power stations that were originally designed for base load applications are now increasingly being asked to operate on a two shift, stop start regime; this is more commonly known in the industry as dual shifting. The multiple start/stops that these stations are now experiencing is in some instances causing an increase of operational issues due to the constantly changing process parameters. For example dual shift stations will experience additional thermal stress in the headers, drums, high temperature piping, valves plus the auxiliary equipment leading to additional wear and tear of their systems and component parts. This is due to the more frequent use of the plant at severe service conditions. The consequences of the change in plant operation cannot be ignored. If the plant is not operated correctly or more importantly modified properly to handle these changes the lifetime of the components within the plant will decrease enormously.

The changing operational requirements of the plant require that the steam coolers, de-superheater valves, drains, feed water control valves, main steam isolation valves and the turbine quick closing valves are reviewed. These critical pieces of equipment have to be specifically designed to take the new dual shifting process requirements into consideration, once this has been done the operational performance of the plant can be improved and wear and tear of systems and components can be controlled and significantly reduced. Consequently as these pieces of equipment have been specifically designed for the new operating conditions of the station they are no longer a limiting factor to the start up time of the plant.

The following paper highlights some of the more common issues found in dual shifting power stations with special regards to steam control.

### Feed water control valves

Feed water control valves are important components of a steam installation, as they control the supply of feed water to the boiler. The physical demands on this valve are high so that, with a carefully selected feed water pump with minimal pressure drop at full load, no energy is wasted.

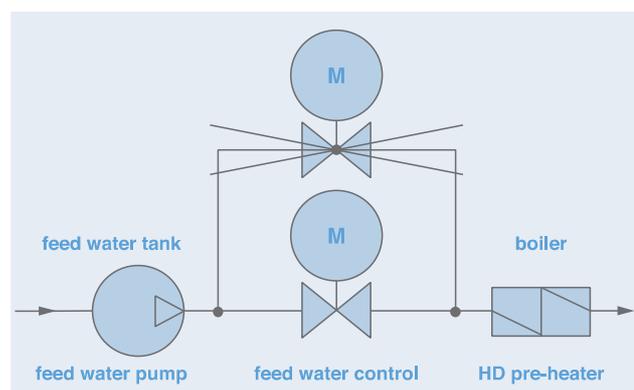


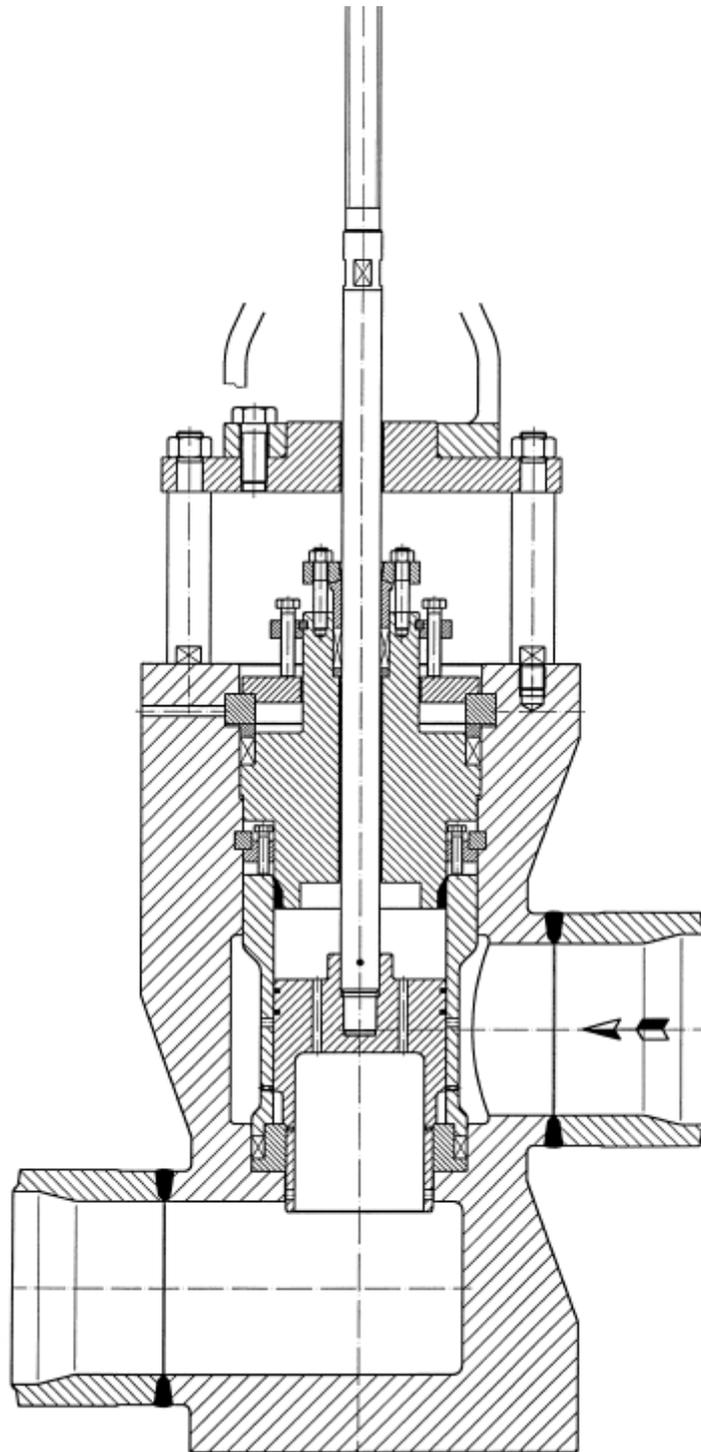
However, when the boiler is starting from cold the requirements from the valve are totally different. As the valve is required to control a small mass flow with a high delta P, the required rangeability can no longer be realised by one valve alone. Potential cavitation will easily damage the valve.

Generally the solution is found in the installation of a second control valve, the startup or the so called 30% valve. Installed parallel with the main feed water control valve, this valve can handle

small mass flows at high pressure drops, and therefore the change from the start up valve to the main valve is not an easy transition, but can only be achieved with good craftsmanship.

The feed water control set is based on a main feed water control valve and a 30% bypass start up valve. The set will also include stop valves and a lot of high pressure piping. The regular wear and tear on the 30% valve can be severe.





**Above:**  
*Typical base load feed water control valve, two staged controlled, forged body (WB 36), pressure seal.*

In this chapter we introduce as well the “Combi feed water control valve”, a single control



valve which is capable of controlling both the startup conditions and the maximum case loads.

## HORA combi feed water control valve

The **HORA** combi feed water control valve combines the different functions of the feed water set into one single valve. With only one control signal both start up as well as main feed control can be handled. The valve is designed to withstand all conditions. The multi stage start up plug will prevent the water from flashing. The main plug will control the normal function that is needed with a very small pressure drop.

### The function

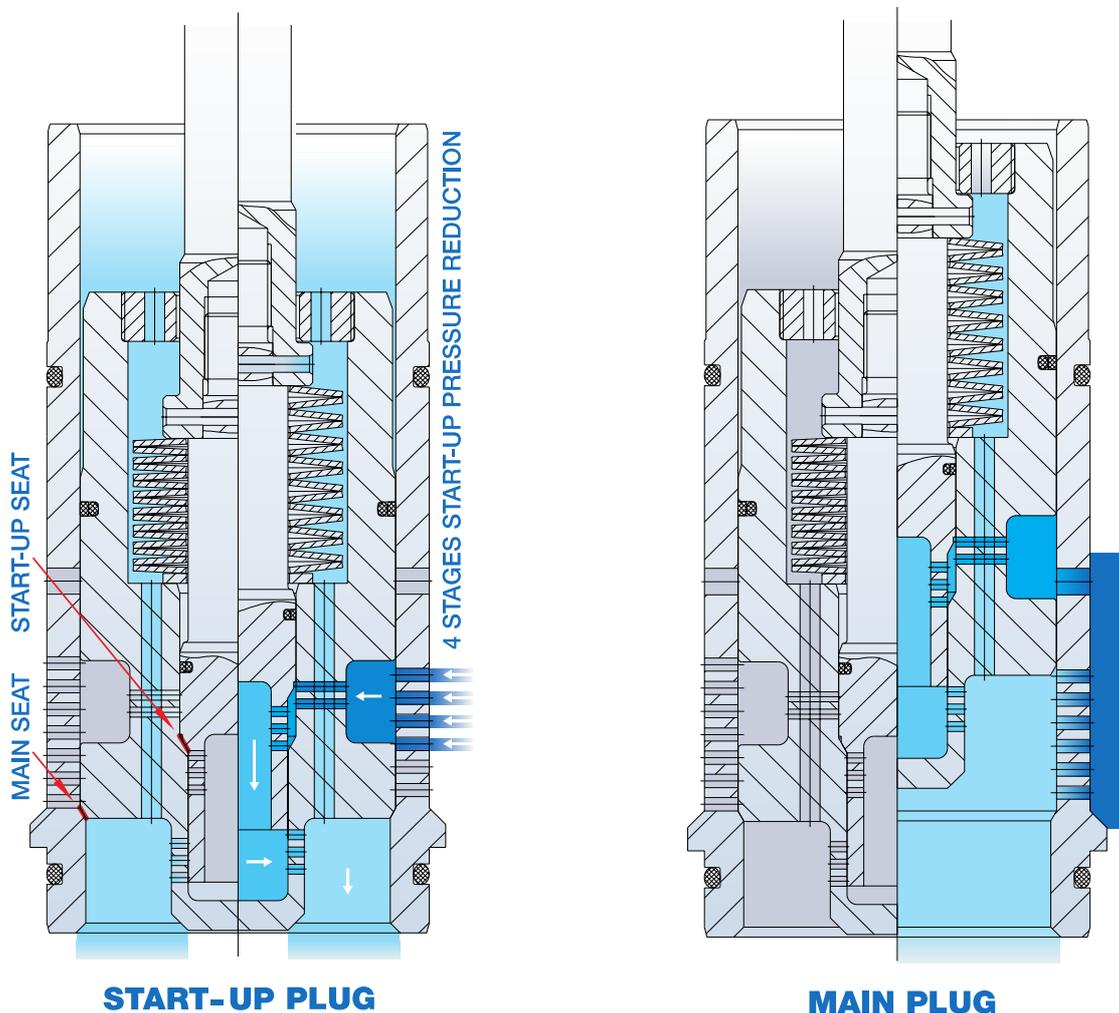
The drawings below illustrate the trim functions.

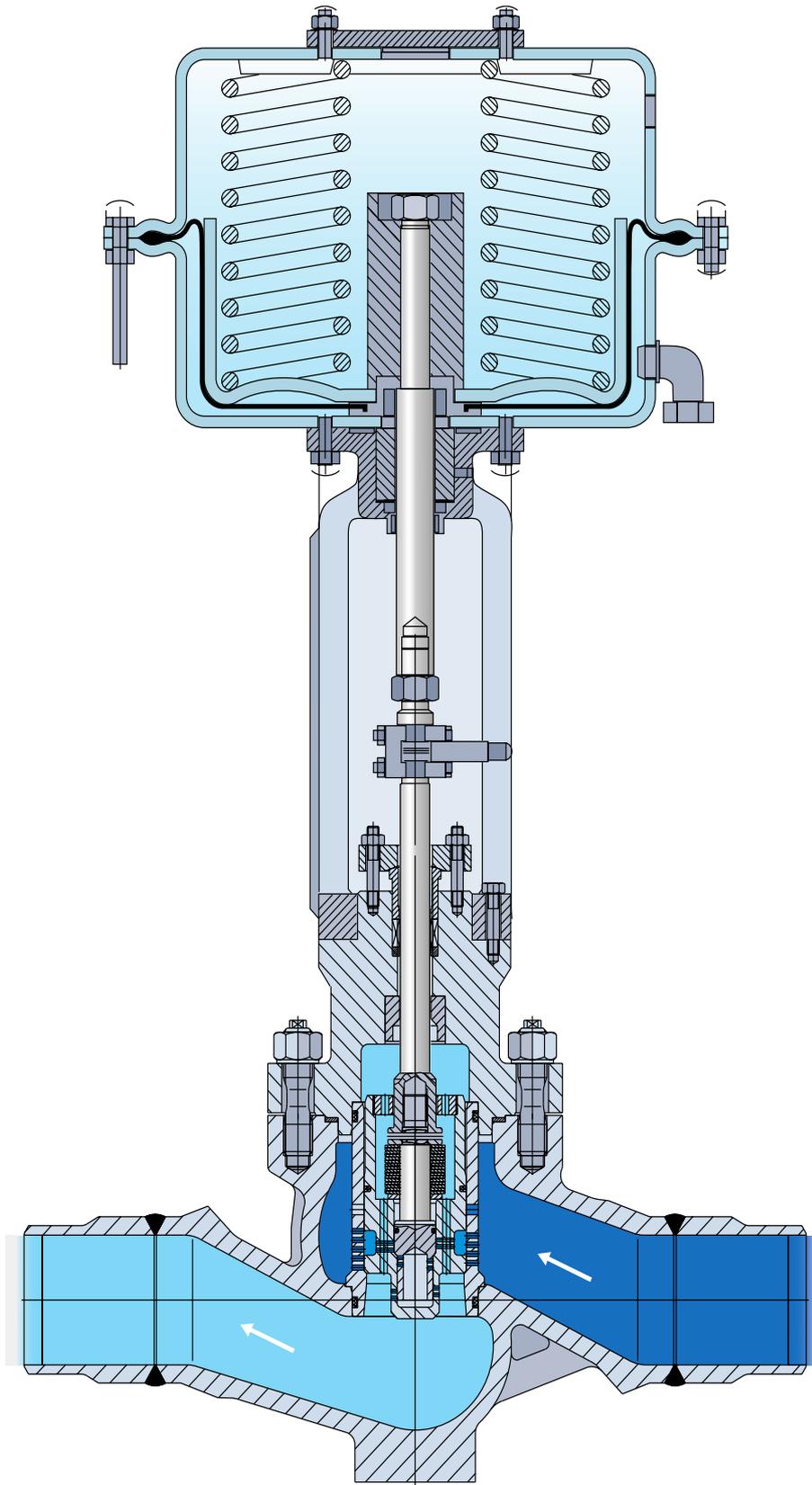
The single stage main plug controlling the main feed water flow is determined by the perforated cage and main plug as the control is gained the moment the main plug is lifted from its seat. On start up, inside the main plug there is a secondary startup plug with 3 stages and so, on initial operation of the valve, the startup plug is lifted from its small seat with the bellville washers holding the main plug firmly closed.

When the startup plug is reaching its maximum stroke, the main plug is lifted and the main control system takes over.

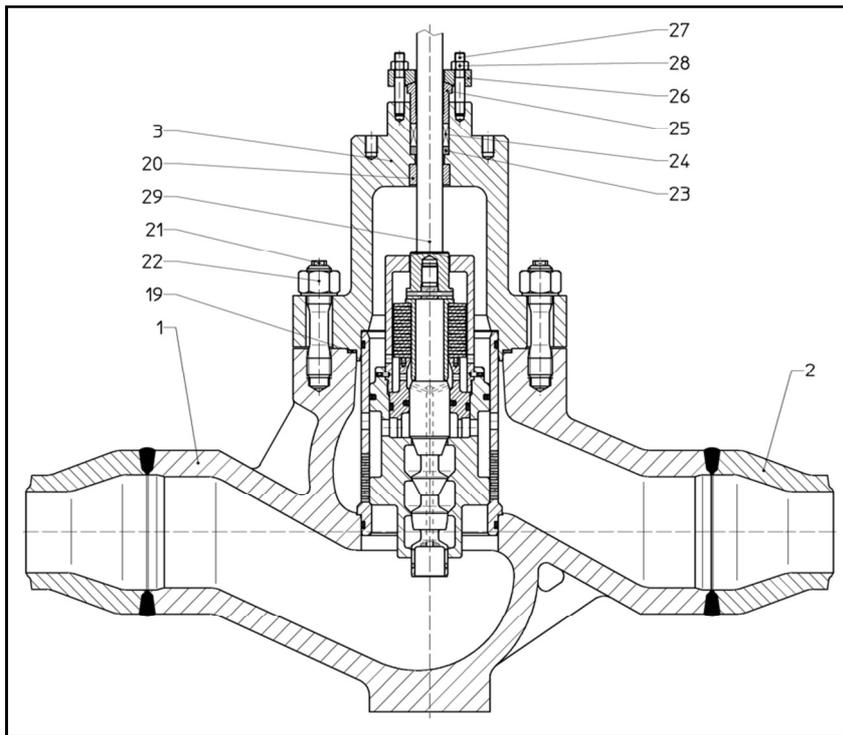
The startup and main control is done by this one valve and one control signal making it easy to use and simple to install.

The combi-feed water control valve is extremely easy to maintain. The complete trim is held within the body as a removable cartridge, and can be readily taken apart.



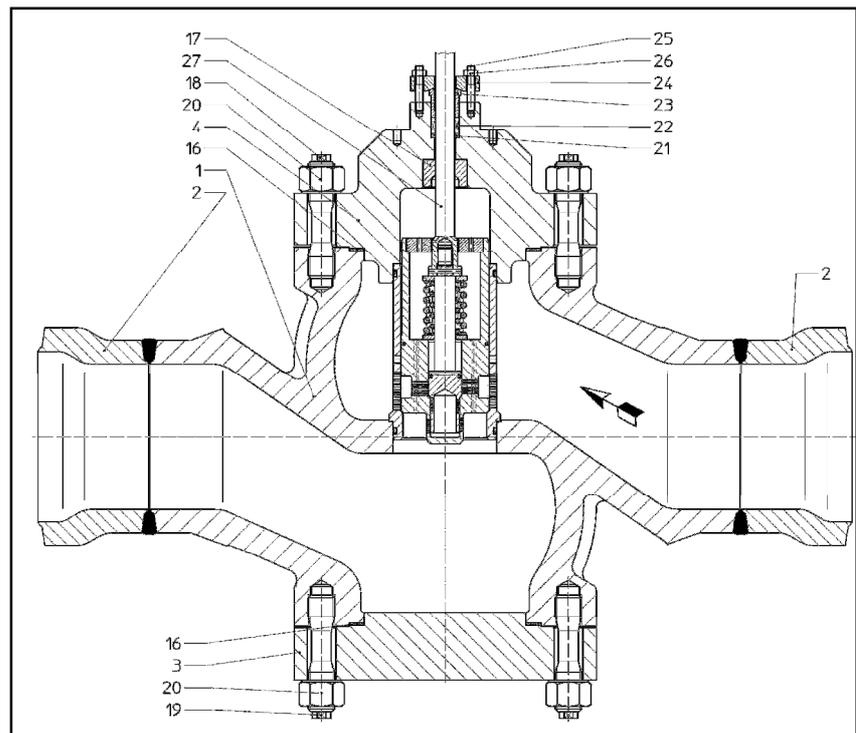


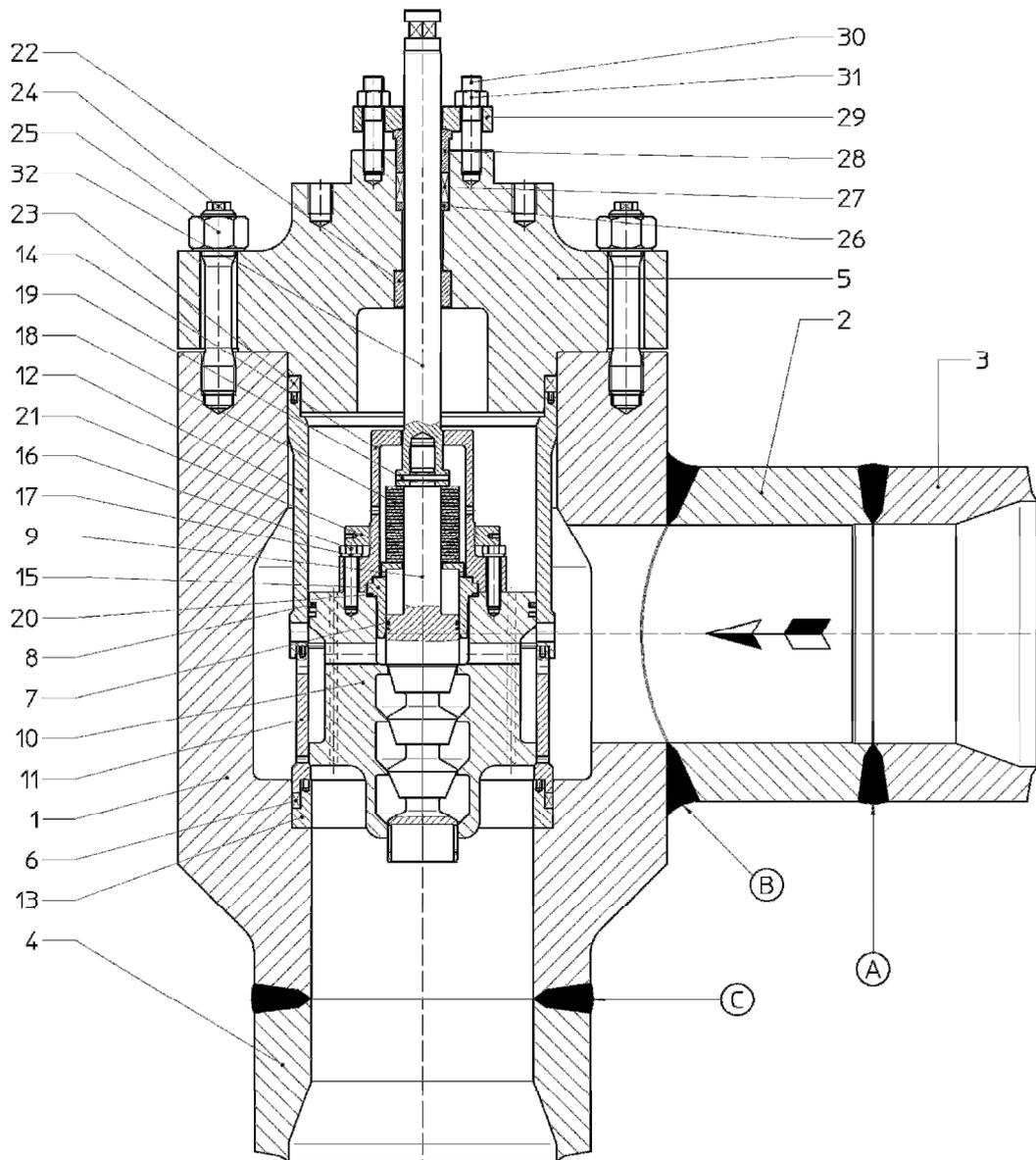
**Above:**  
*Combi-feed water control valve, 3 stage start up trim, single stage main control, BWE.*



**Left:**  
 Combi feed water control valve, 4 stage start up trim, single stage main control, BWE.

**Right:**  
 Combi-feed water control valve, 3 stage start up trim, single stage main control, BWE.





**Above:**

*Combi-feed water control valve, 4 stage start up trim, single stage main control, forged body BWE*

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