Kemper KHS Flow Splitter

Estimation of flow through the loop during peak flow appearance in supply pipe of a cold water installation

Date:

23rd March 2017

Author:

Frank Schmidt

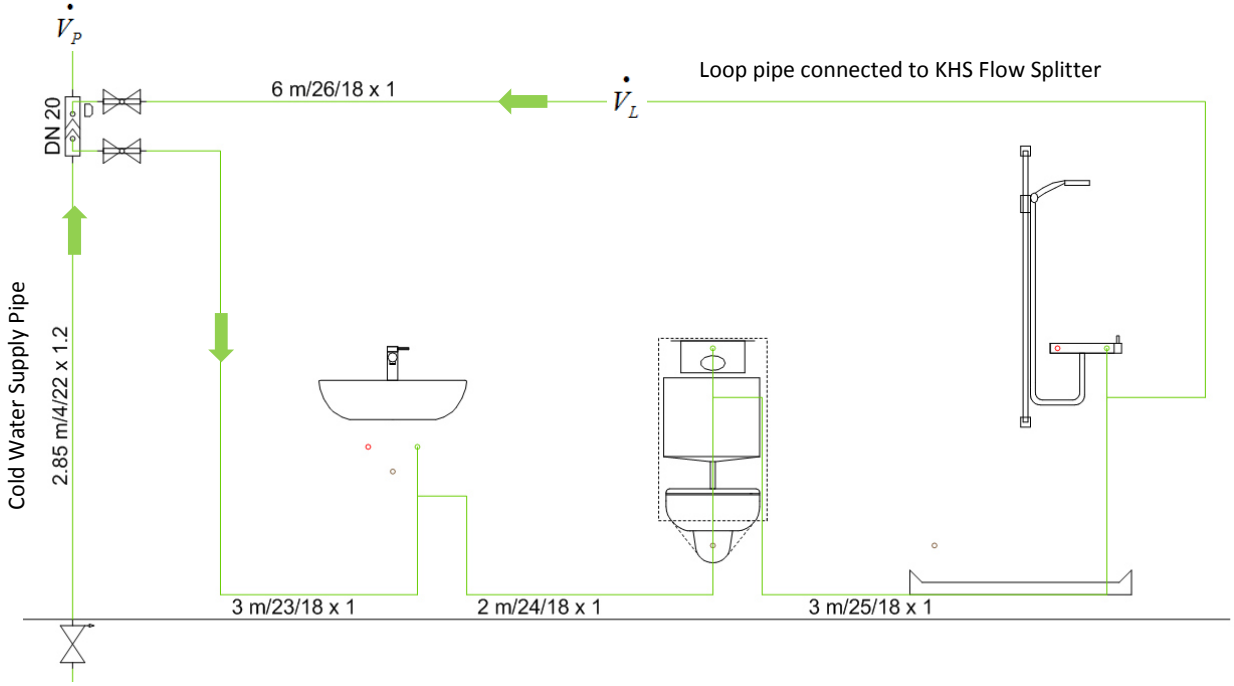
Gebr. Kemper GmbH + Co. KG

Index

1 General

This document explains how you can estimate if and how good is a water exchange in the loop of a KHS Flow Splitter during the appearance of a defined flow rate in the cold water supply pipe. There is no water consumption at an outlet connected to the loop!

2 Example Installation



$\dot{V}_P$ = Peak Flow – this value is given by the pipe sizing calculations (l/s)

$\dot{V}_L$ = Flow Rate in the loop during Peak Flow in supply pipe (l/s)

3 Estimation of effectivity of the Flow Splitter

The given Peak Flow ($\dot{V}_P$) in the DN 20 Flow Splitter is in this example assumed to be 0,5 l/s.

The total pipe length of the loop (l_l) is:

l_l = 3 m + 2 m + 3 m + 6 m

l_l = 14m

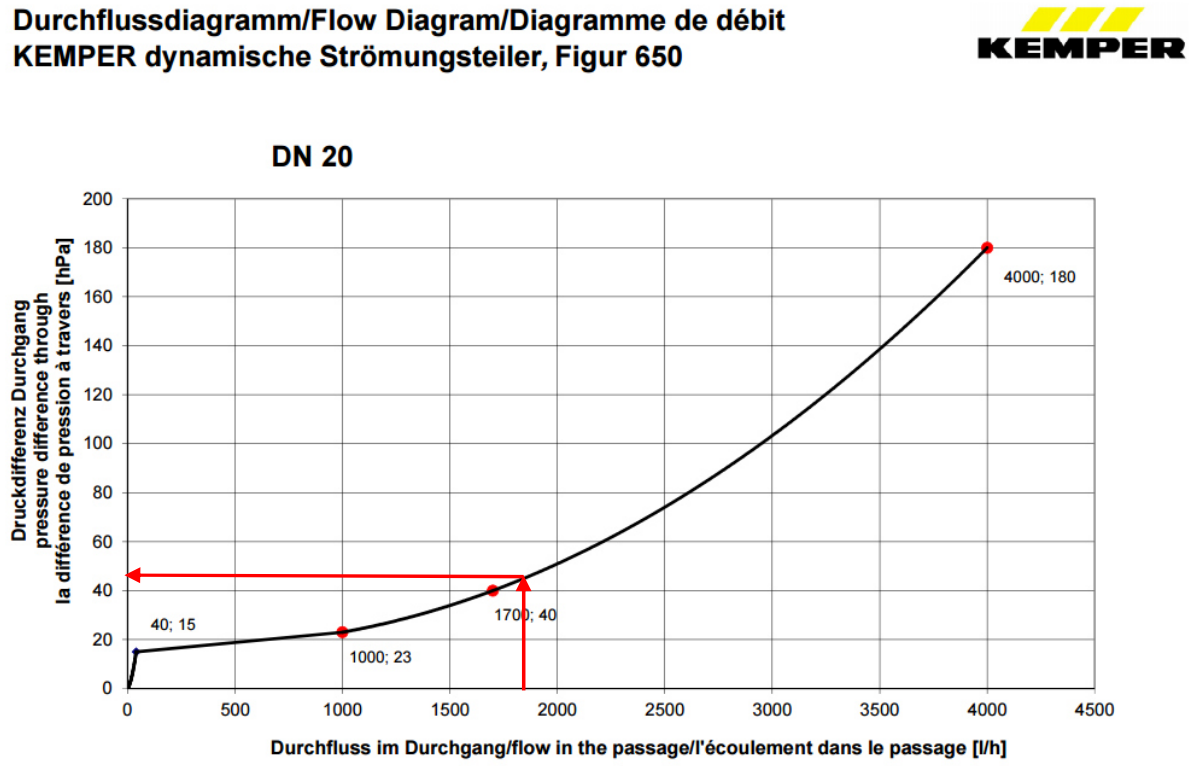
To estimate the flow rate through the loop pipe, this steps need to be processed:

1. Determine the pressure drop of the KHS Flow Splitter @ given peak flow by using the flow chart of the KHS Flow Splitter.

2. Determine the available, specific pressure drop per meter of the loop pipe.
3. Determine the flow rate in the loop @ calculated spec. pressure drop by using the flow chart of the pipe material.
4. Determine if the flow rate in the loop is sufficient or not.
5. Reduce the peak flow by the flow rate of the loop and reiterate the calculation till the result does not change anymore.

3.1 Pressure drop of KHS Flow Splitter

The given Peak Flow ($\dot{V}_P$) in the DN 20 Flow Splitter is 0,5 l/s (1800 l/h). The pressure drop of the KHS Flow Splitter (Δp_{FS}) is appx. 45 mbar.



3.2 Specific pressure drop in loop

The pressure drop that occurs for the main direction of the KHS Flow Splitter is the same as the pressure drop that occurs for the loop, as both flow paths are parallel. The specific pressure drop in the loop (Δp_{SP}) is:

$$\Delta p_{SP} = \frac{\Delta p_{FS}}{l_l} = \frac{45 mbar}{14 m} = 3{,}2 \frac{mbar}{m}$$

This calculation does not respect the pressure drop caused by fittings or fixtures. It only considers pressure drop due to pipework.

3.3 Resulting flow in the loop

The specific pressure drop is used to read the occurring flow in the loop pipe from the flow chart of the pipe manufacturer.

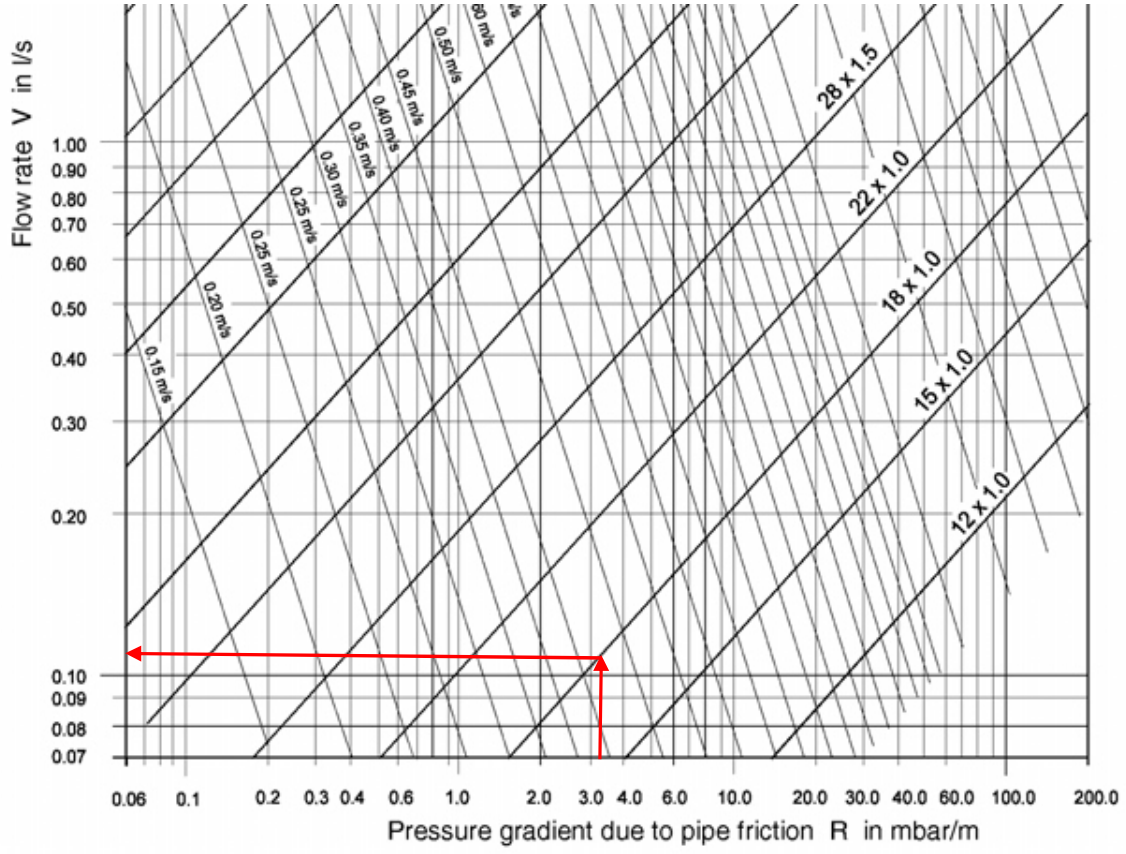


Fig 128 Pressure drop chart for copper pipes at 10 °C

The result shows that there will be a flow in the loop of approximately 0,11 l/s.

At this point the 5th calculation step starts:

- 0,5 l/s – 0,11 l/s = 0,39 l/s (1404 l/h) flow through main direction of KHS Flow Splitter.
- Pressure drop is appx. 35 mbar
- Specific pressure drop is 2,5 mbar
- Flow through loop is 0,095 l/s
- Next reiteration follows…

When the resulting value doesn't change too much anymore you can calculate other facts:

a. How long does it take to exchange the water in the loop when peak flow occurs in the main pipe:
   The volume in the loop pipe with above facts is 28 Liter. With an estimated flow rate of 0,1 l/s, the exchange of the water in the loop takes appx. 4 minutes and 40 seconds.