

Micro-flow control valves explained

Low flow control valves are often required in R&D facilities, technical laboratories, pilot plants and the like. To ensure their proper operation, such valves are purpose engineered and are certainly not just scaled-down versions of larger control valves. For an insider's viewpoint, VVWIME contacted Mr. Raghunath Pawar, a seventy-years-young entrepreneur who has over forty years of experience in all aspects of instrumentation and control valves.

By David Sear

The name Pawar Industries and the company's Micro-flow control valve brand will probably require no introduction to many readers of VVWIME. These field-proven valves and pneumatic actuators are easily specified based on standard data provided by the client, such as the flow rate, the input and output pressure, etc.

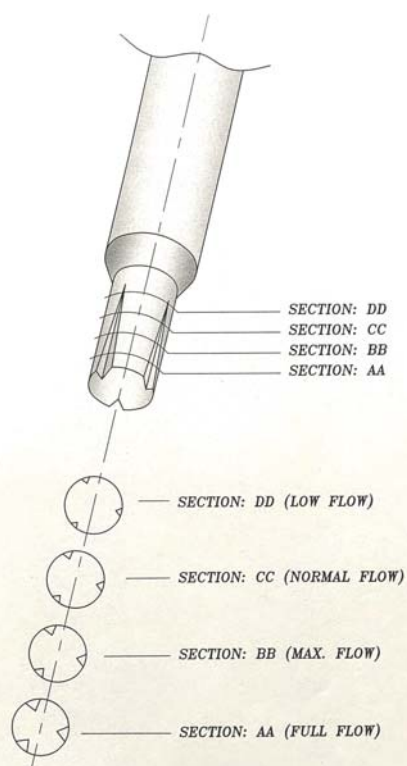


Fig 1: Drawing showing the tapered V-notches on the valve plug



Mr. Raghunath Pawar is an instrumentation and control valve expert.

Asked about some of the internal features that underpin the success of these valves, Mr. Pawar immediately mentions the special needle valve plug design. "First the plug is machined out from a round metallic bar, such as a grade of stainless steel. To give an indication of size, our micro needle type plugs start from 3mm diameter and go upwards in steps to 25mm. Next we machine tapered V-notches onto the periphery of the plug using CNC machines. Once installed, the micro needle is guided with body seat ring port diameter and moves axially up and down in seat ring

port area. Now, thanks to the equispaced V-notches on the needle plug, the fluid being controlled is scattered in different directions during the travel of the plug. This makes the valve the ideal choice for so-called 'equal percentage flow characteristic' performance."

As figure 1 shows, each V-notch is tapered, with the cross-sectional area of the V-notch being larger at the bottom and reducing ultimately to zero towards the upper end of the plug.

To ensure the valves can withstand corrosive and/or erosive conditions, the micro flow control valves are strictly produced from bar stock body material such as 304, 304L, 316 and 316L stainless steels, as well as more exotic materials like Monel-400 or Hastelloy C-276/C-22 grades. The valve seat and valve plug are also produced from base material with hard faced Stellite-6 or stellite-21, as per customers' requirements. "Depending on the choice of material, such valves can be used at temperatures up to 640°C," notes Mr. Pawar

Mr. Pawar further adds that the micro-flow control valves are available in different categories, namely with or without bellows. "For valve without a bellows, the bonnet assembly is provided with a gland packing stuffing box. Our bellows design has a metallic bellows as the primary seal, with a gland packing stuffing box acting as a secondary seal in case of bellows failure."

Bellows options include 316Ti stainless steel or Hastelloy C-276, imported from Witzenmann GmbH, in Germany. The selection is based on the client's indicated application conditions, such as the nature of the fluid, the working temperature and pressure, etc.

Comments Mr. Pawar: "the micro flow control valve with bellows seal gives 100% zero leakage from the stuffing box, namely a sealing performance of less than 10^{-5} mbar/s. This is tested using helium gas on a mass spectrometer leak detector."



Asked about any further features of the micro-flow control valve, Mr. Pawar notes the following: "Pressure ratings extend from 150# to 2500#, with pneumatic actuator options including fail-to-close and fail-to-open. Various end connections are also available, like threaded ends, butt welds or flanges. And finally, the flow direction of the valves can be flow-to-open or flow-to-close."