

# NOISE ATTENUATING DIFFUSERS

## Introduction

Pressure reduction in gas or steam networks is often achieved by control valves, frequently accompanied by high levels of noise generation. Pressure reduction over several stages also reduces the generated noise. Q.E. has an excellent solution for this in the form of noise attenuating diffusers located immediately downstream from the control valve. This method of noise attenuation is compact, efficient and demands no maintenance.

## Generated noise

Choking flow in a gas stream leads to high internal velocities. The sudden speed and pressure changes excite acoustic waves. These may have very high sound power levels, 160 decibel is not uncommon, that propagate through the walls of the valve and of the downstream piping. The system pressure, pressure-drop and the gas velocity among other things influence the excited noise level. Fitting a downstream diffuser reduces the pressure drop across the valve with a commensurate reduction in generated noise.

## Noise attenuation in the diffuser

The attenuation in the diffuser is achieved in the following steps:

- Noise entering the diffuser is partially reflected. The proportions of the diffuser determine this effect.
- The openings in the diffuser force the production of small gas jets which mutually interfere so attenuating noise further
- The noise spectrum is altered. Low frequency noise being transformed to the higher frequencies that are more efficiently impeded by the pipe wall.

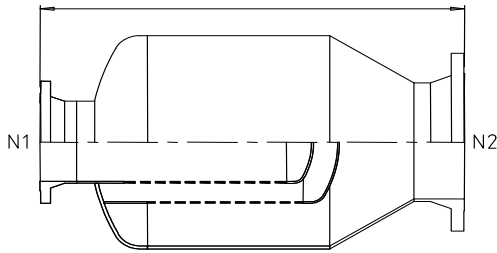


## Construction

The gas or vapour leaving the control valve enters the diffuser and flows through a special pattern of openings towards the downstream piping. When higher pressures are present several stages of orifices are built into the diffuser. To aid fitting into the piping system a selection may be made out of many different geometries. Flanged connections to any normal specification, weld-prepared ends for field butt-welding are amongst the options.

The degree of noise attenuation rests upon the number, dimensions and arrangement of the internal orifices in each stage. Since these also affect the overall pressure drop a precise balance is made between pressure drop and noise generation. Q.E. has developed its own calculation methods to determine this balance.

The pressure containing envelope will fall under local Pressure Vessel ordinances compliance. Q.E. design engineers are versed with these regulations so that the completed diffuser will meet the international requirements of either PED 97/23/EC or ASME VIII Division 1.



Typical cross-section of a Q.E.I. two stage controlled pressure diffuser

### Valve life

An added advantage of the diffuser is its effect upon increasing the useful life of the valve by reducing the internal vibrations so reducing the loading on the valve internals. In those situations where valves are located close to the plant boundary, or are in a zone having stringent noise limitations, additional external acoustic insulation is fitted.

### Summary

A diffuser changes the distribution of pressure drop between the valve and the downstream system. The orifices (openings) in the diffuser determine the pressure drop across each diffuser element and the frequency of the residual noise. The final design of a diffuser depends upon the number of stages it comprises the design pressure, the design temperature and the type of gas or vapour being transmitted. Q.E. diffusers have been used, for many years, by a number of valve manufacturers throughout the world. Q.E. expertise in this field is at your disposal. We will be pleased to advise your staff of the best proposal for your application. To make a firm offer the following data is needed:

- Gas or vapour type
- Pressure upstream of the control valve
- Pressure downstream from the valve/diffuser system
- Temperature of the flowing medium
- Unsilenced noise level inside the valve
- Connection sizes



View into the interior of a Q.E.I. controlled-pressure diffuser from the downstream connection.

### Q.E. International B.V., your partner in Industrial noise abatement

In short, with more than 40 years experience Q.E. International has demonstrated to its loyal and satisfied clients that it is the partner in solving industrial noise problems and we can perform the same services for your organisation. Our advisors will be pleased to confer with you in order to find the most effective and economical approach to your problem.

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