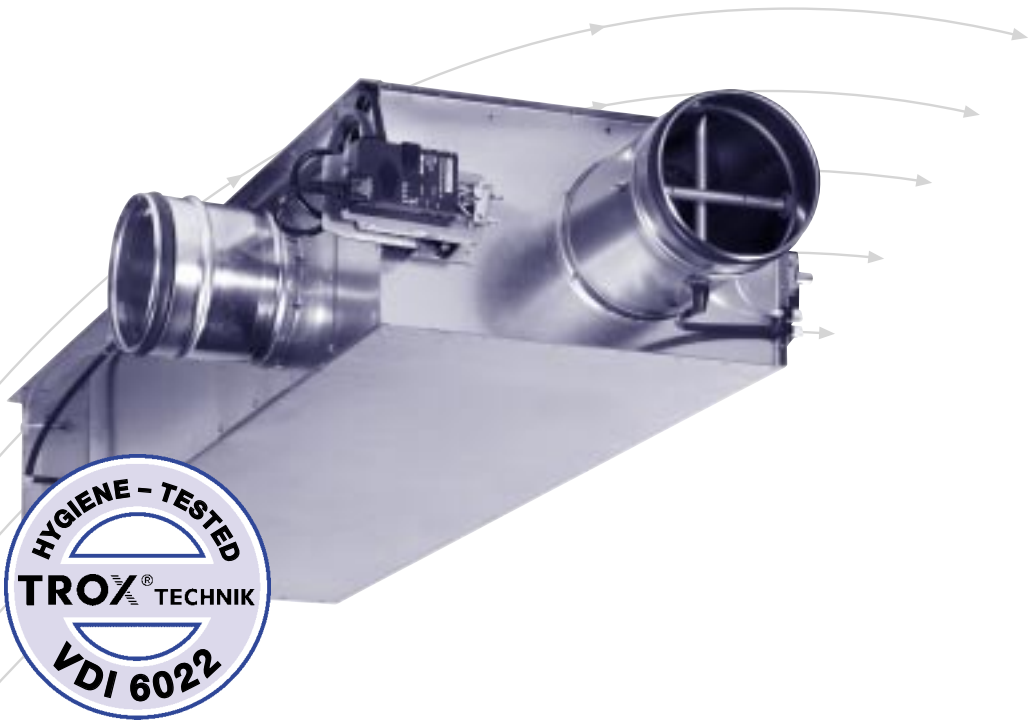
VARYCONTROL®
VAV Dual Duct Terminal Units

for variable volume flow systems
Type TVM



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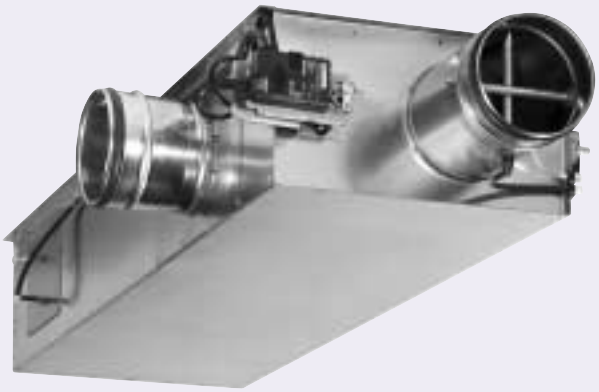
Contents · Description

Type TVM VAV dual duct terminal box



TROX VARYCONTROL® VAV dual duct terminal boxes types TVM and TVMD have been developed for the control of air flows, especially in dual duct variable volume systems.

A special feature of these types is the outstanding acoustic qualities that show themselves to the best advantage in buildings with critical comfort criteria. The boxes meet the hygiene requirements of VDI 6022.

TVM: VAV dual duct terminal box
TVMD: dual duct terminal box with additional acoustic cladding

The mechanical components and electronic components, which are factory fitted, form the controls package. Each box is set up to the required flow rates and is subjected to an aerodynamic function test.

The boxes contain an averaging differential pressure sensor in both the cold spigot and the attenuator section for air flow measurement, control dampers and an integral sound attenuator for reducing the air-regenerated noise. The control damper blades with plastic seal when closed complies with the air tightness requirements of DIN EN 1751.

There are circular spigot connections on the fan (high pressure) end with a rectangular flange connection on the room (low pressure) end.

The boxes with additional acoustic cladding and/or a TS secondary silencer are suitable for very demanding acoustic requirements.

The flow rate controls are closed loop systems with external power supply. The pressure transducers, controllers and actuators are selected to meet the controls requirements and operational conditions. The TROX dual duct boxes can be supplied with control components from any reputable manufacturer to suit the project specification.

Further, current information on application, selection as well as control components available can be found in the “Technical Documentation” download area of our website.

Also available on the internet is the online design programme “Air terminal units” for the design and selection of our units.

Room temperature controller

In VAV systems, the room temperature control takes the form of a cascade control. The primary controlled variable is the room temperature. The output signal of the room temperature controller acts on the cold flow rate control loop in the TVM

TVM control principle

The room temperature controller alters the setpoint for the cold air flow rate between 0 and the maximum flow rate which is set in the factory as a function of the room temperature.

If there is a control variation, the cold air flow rate is kept constant over the full pressure range by adjustment of the control damper blade within tight tolerances. At the same time, a differential pressure sensor determines the total flow rate at the box outlet and passes the value measured to the warm/total controller. This controller is set to the maximum warm air flow rate (e.g. 50 %) and controls the warm damper blade. A corresponding proportion of warm air is added in this way. As the demand for cooling increases, the warm damper blade closes and only cold air flows.

Flow rate measurement

A sensor is necessary for the positive measurement of air flows, this is achieved by pressure measurement at several points distributed over the cross-section and provision of the resulting average value. The TROX differential pressure sensor is an optimum solution in terms of economics and product technology. This sensor delivers exact results for most room air conditioning applications based on normal upstream flow conditions.

Volume flow control

The control of the volume flow rate takes place in a closed control loop, i.e. measurement – comparison – control.

A pressure transducer converts the pressure differential into an electrical signal, which is interpreted as the actual value by the controller. In most applications, the setpoint value comes from a room temperature controller.

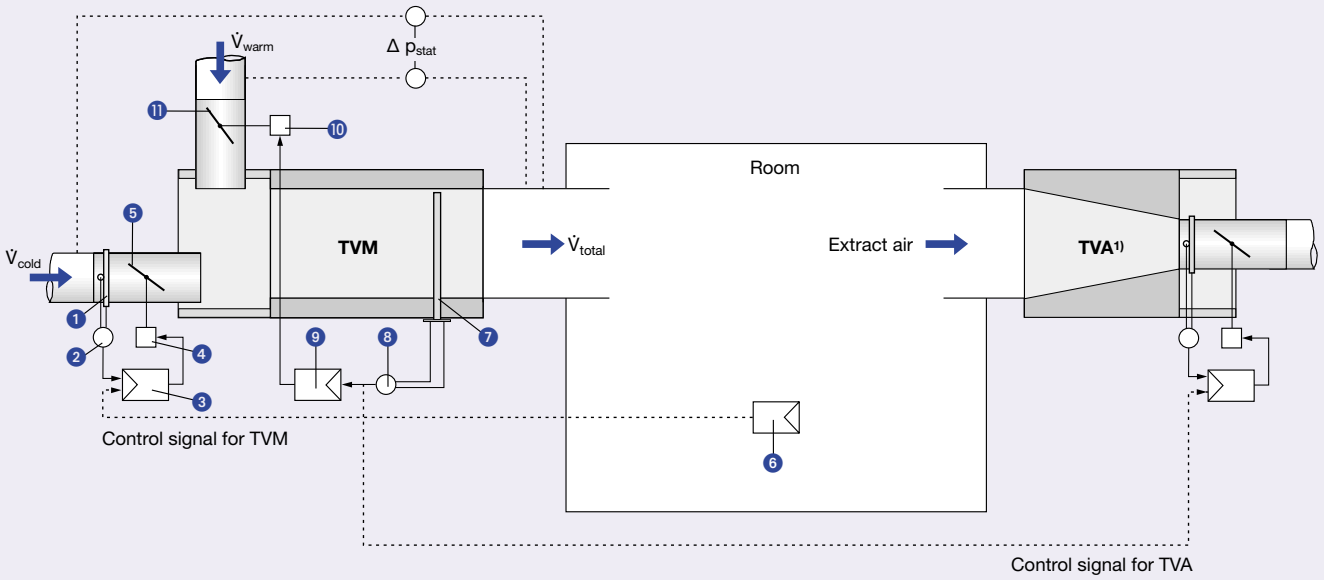
The controller compares the actual value with the setpoint value and from the difference between these two alters the control signal to the damper actuator.

Supply/extract air tracking control

The balance between supply and extract air flow rate has to be maintained in individual rooms and closed-off office areas. Otherwise, annoying whistling noises can occur at door gaps, and the doors can be difficult to open. For this reason, the extract air should also have variable control in a VAV system.

The actual value of the supply air is fed as an input signal to the extract air controller (slave controller). In this way, the extract air flow rate automatically follows the supply air flow rate, even in the case where this has not reached its setpoint value.

System diagram

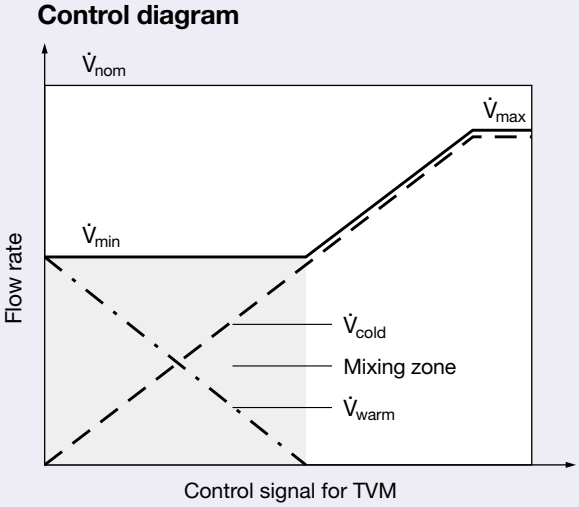


1) See document 5/1/EN/…

Legend

1. Differential pressure sensor for $\dot{V}_{cold}$
2. Pressure transducer for $\dot{V}_{cold}$
3. Flow rate controller for $\dot{V}_{cold}$
4. Actuator for cold duct
5. Control damper blade for cold duct
6. Room temperature controller (supplied by others)
7. Differential pressure sensor for $\dot{V}_{total}$
8. Pressure transducer for $\dot{V}_{total}$
9. Flow rate controller for $\dot{V}_{warm}$ and $\dot{V}_{total}$
10. Actuator for warm duct
11. Control damper blade for warm duct

Control diagram



Construction · Dimensions

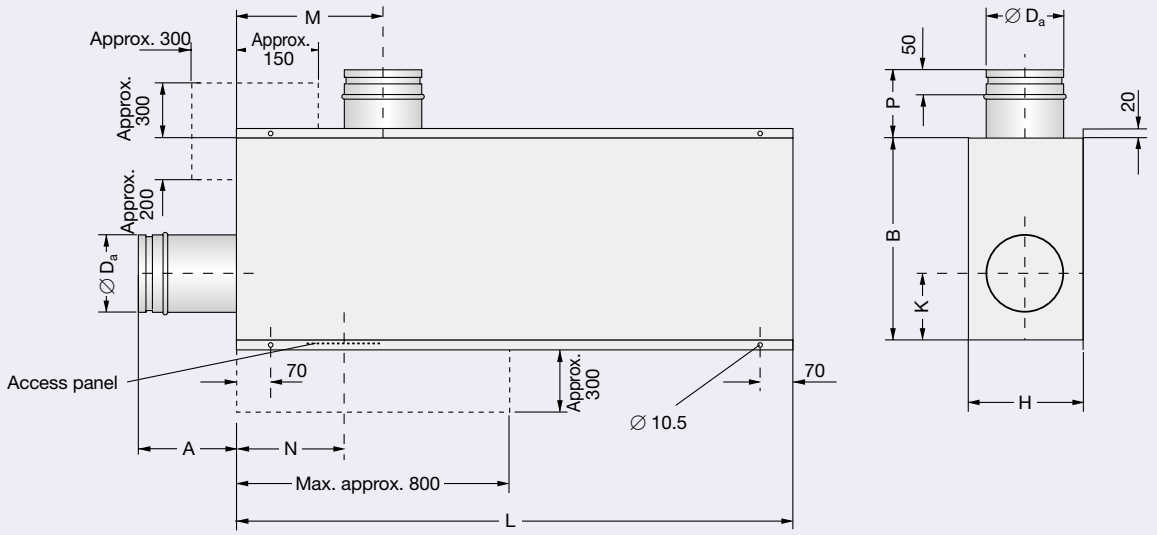
Characteristics

- Electronic flow rate control
- Very close control accuracy for the flow rate settings, even with upstream bend at R = 1 D. Please ensure the most favourable aerodynamic configuration of ductwork is used
- Differential pressure range from 150 to 1500 Pa
- Full shut-off from ductwork system
- Control damper closed blade airtightness to DIN EN 1751, class 4 (exception nominal size 125, class 3)
- Baffle plates are fitted after the control damper for optimum acoustic and aerodynamic performance
- Integral sound attenuator with at least 26 dB insertion loss at 250 Hz
- Independent of orientation
- Factory set up of flow rate. This includes aerodynamic function test of each box using a dedicated test rig. Data covering set up is given on a test label attached to each box
- Flow rate can be measured and subsequently reset on site; an additional adjuster unit may be necessary
- Actual value signal referred to $\dot{V}_{Nom}$
- The boxes are, in terms of their mechanical parts, maintenance-free
- Operating temperature range 10 to 50 °C

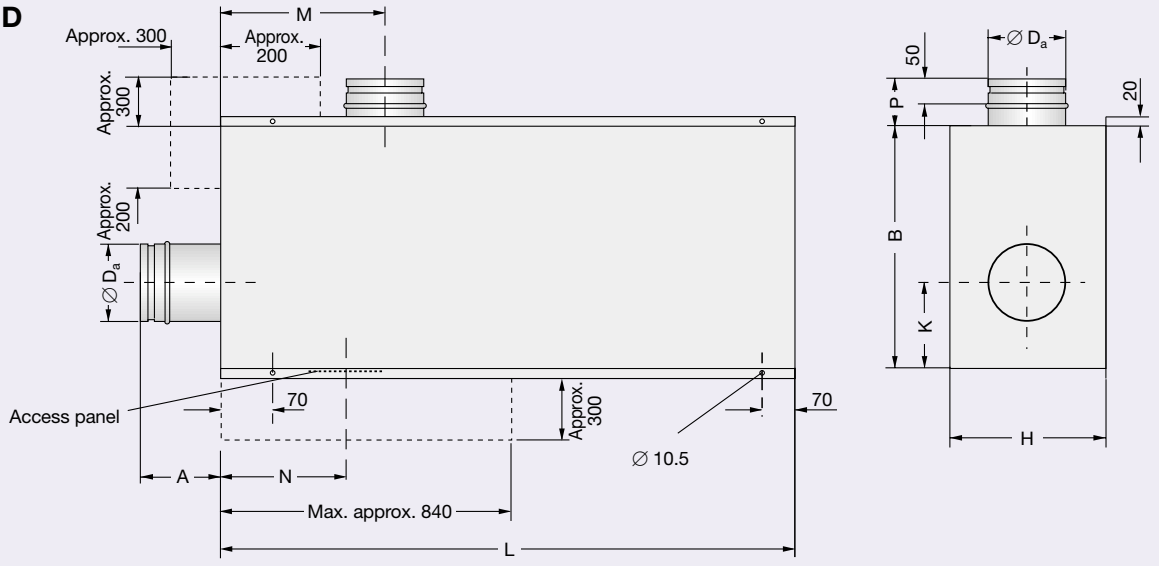
Constructional features

- Circular spigots on the fan (high pressure) side, this includes a groove for the use of a lip seal, suitable for circular connecting ducts to DIN EN 1506 or DIN EN 13180 (if lip seals are required, these will be factory fitted)
- Room (low pressure) side suitable for attachment of connecting flanges
- Holes in the return edges of the casing for support rods
- Casing air leakage complies with DIN EN 1751, class A
- Fulfills VDI 2083, clean room class 3 and US Federal standard 209E, class 100
- Fulfills the hygiene requirements according to VDI 6022, DIN 1946, part 4, DIN EN 13779 and VDI 3803, with access panel for cleaning

TVM



TVMD



--- Keep clear to provide access to control components

Control components are situated on the right hand side when seen from the direction of airflow (with the folded seam upper most)!