Volume Flow Limiters
Type VFL

Volume flow limiter for insertion into ducting
Circular, mechanical self-powered controllers for insertion into ducting, for the quick and easy balancing of constant volume flow rates in ventilation and air conditioning systems

- Unique damper blade edge for acoustic optimization
- Simple and quick commissioning on site
- Range of volume flow rate setpoints for each nominal size
- Precise and simple setting of volume flow rates using a scale
- Best accuracy among controllers for insertion
- Suitable for low airflow velocities from 2.6 ft/s
- Any installation orientation; maintenance-free

Volume flow limiter accessories for square or rectangular ducting
Accessories to the VFL now include

- Square or rectangular duct adaptor for exhaust or supply orientation (p. 8)
- Exhaust register for in-wall installation (p. 9)
- Exhaust register with fire damper for in-wall installation (p. 10)
General information

Type

- General Information: Page 2.1 - 3-4
- Installation Notes: Page 2.1 - 5
- Quick Sizing: Page 2.1 - 6
- Dimensions and weight: Page 2.1 - 7
- Accessories (square/rectangular duct adaptor, exhaust register, exhaust register with fire damper): Page 2.1 - 8-10
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Set

1

Insert

2

Done

3
Application
- Circular volume flow limiters of Type VFL for the simple balancing of volume flow rates in air conditioning systems
- Mechanical self-powered volume flow limiter without external power supply
- Simplified project handling with orders based on nominal size
- Set the required volume flow rate using a scale

Nominal sizes
- 4", 5", 6", 8", 10"

Special features
- Mechanical self-powered
- Low-friction bellows
- For circular ducts
- Lip seal for tight and secure fit
- Aerodynamically tested and factory set to a reference volume flow rate
- Sticker showing volume flow rates (in l/s, m³/h and cfm) that can be set for each limiter

Parts and characteristics
- Ready-to-commission limiter
- Damper blade with low-friction bearings
- Bellows that acts as an oscillation damper
- Leaf spring
- Lip seal
- Multi-level volume flow rate setpoint values

Construction features
- Circular casing
- Lip seal for tight and secure fit
- Acoustically optimized damper blade with low-friction bearings and special bellows
- Different damper blade construction and volume flow rate sticker for nominal size 150

Materials and surfaces
- Casing and damper blade made of high-quality plastic, to UL 94, V1; to DIN 4102, material classification B2
- Leaf spring made of stainless steel
- Polyurethane bellows

Installation and commissioning
- Any installation orientation
- Set the required volume flow rate using a scale
- Insert the unit into the duct
- Mark the installation location

Standards and guidelines
- Hygiene conforms to VDI 6022

Maintenance
- Maintenance-free as construction and materials are not subject to wear

Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal sizes</td>
<td>4 - 10 inches</td>
</tr>
<tr>
<td>Volume flow rate range</td>
<td>11 - 450 CFM</td>
</tr>
<tr>
<td>Volume flow rate setting range</td>
<td>&lt;20 - 100% of the nominal volume flow rate</td>
</tr>
<tr>
<td>Volume flow rate accuracy</td>
<td>approx. ± 10 % of the nominal volume flow rate</td>
</tr>
<tr>
<td>Minimum differential pressure</td>
<td>0.12 in w.g.</td>
</tr>
<tr>
<td>Maximum acceptable differential pressure</td>
<td>1.2 in w.g.</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>50 – 120 °F</td>
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Functional description
The volume flow limiter is a mechanical self-powered unit and works without external power supply. A damper blade with low-friction bearings is adjusted by aerodynamic forces such that the set volume flow rate is limited as a consequence. The aerodynamic forces of the airflow create a closing torque on the damper blade. The bellows extends and increases this force while at the same time acting as an oscillation damper. The closing force is countered by a leaf spring. As the differential pressure changes, the leaf spring adjusts the position of the damper blade such that the volume flow rate is limited.

Efficient commissioning
The volume flow limiter performs the previously tedious and expensive balancing of volume flow rates in ventilation and air conditioning systems. Simple handling and perfect function help to save valuable working time on site. The required volume flow rate can be set at the point of installation, then the volume flow limiter is inserted into the duct. The set volume flow rate will then be limited and maintained within close tolerances.

Schematic illustration of the VFL

1. Control damper blade
2. Bellows inlet
3. Bellows
4. Crossbar
5. Volume flow rate scale
Installation

The required flow rate is simply set at the point of installation (see page 6 for flow rate set point values). The slot must then be closed with sticker provided to ensure best acoustic performance. The limiter can now be placed into the duct. See Installation, Operation & Maintenance Manual for complete installation instructions.

Identification of the installation location

Stickers are supplied for identifying the volume flow limiter's location once installed. These may be filled in by hand and affixed to the outside of the duct in an easily visible location.
Quick sizing

Volume flow rate ranges

The volume flow limiters are factory set to the reference volume flow rate \( V_{ref} \). Customers can then simply set the required volume flow rate (setting values 1 to 11 with the exception of size 150).

Nomenclature

\( V \) CFM: Flow rate

\( V_{nom} \) CFM: Nominal flow rate

\( \Delta p_g \) in. w.g.: Total pressure differential

Available volume flow rate setpoint values \([m^3/h]\)

<table>
<thead>
<tr>
<th>Size</th>
<th>Pos</th>
<th>Volume flow setpoint values</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>100 (4&quot;)</td>
<td>m³/h</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>l/s</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>cfm</td>
<td>11</td>
</tr>
<tr>
<td>125 (5&quot;)</td>
<td>m³/h</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>l/s</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>cfm</td>
<td>23</td>
</tr>
<tr>
<td>150 (6&quot;)</td>
<td>m³/h</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>l/s</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>cfm</td>
<td>30</td>
</tr>
<tr>
<td>200 (8&quot;)</td>
<td>m³/h</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>l/s</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>cfm</td>
<td>55</td>
</tr>
<tr>
<td>250 (10&quot;)</td>
<td>m³/h</td>
<td>159</td>
</tr>
<tr>
<td></td>
<td>l/s</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>cfm</td>
<td>93</td>
</tr>
</tbody>
</table>

Upstream conditions

The volume flow rate accuracy \( \Delta V \) applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulences that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require straight duct sections upstream. Free air intake only with a straight duct section of 1D upstream.

Bend

A bend with a curvature radius of at least 1D – without an additional straight duct section upstream of the volume flow limiter – has only a negligible effect on the volume flow rate accuracy.

Junction

A junction causes strong turbulences. The stated volume flow rate accuracy \( \Delta V \) can only be achieved with a straight duct section of at least 1.5D upstream. Shorter upstream sections require a perforated plate in the branch and before the volume flow limiter. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.
Dimensions and weight

Dimensions

Volume flow limiter
Type VFL

Dimensions [in] and weight [lb]

<table>
<thead>
<tr>
<th>Nominal size</th>
<th>ØD</th>
<th>L</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>3½</td>
<td>4</td>
<td>0.3</td>
</tr>
<tr>
<td>125</td>
<td>4½</td>
<td>4%</td>
<td>0.6</td>
</tr>
<tr>
<td>150</td>
<td>5½</td>
<td>5%</td>
<td>0.9</td>
</tr>
<tr>
<td>200</td>
<td>7½</td>
<td>6%</td>
<td>1.1</td>
</tr>
<tr>
<td>250</td>
<td>9½</td>
<td>8%</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Dimensional drawing of VFL

Installation example for self-balancing of grilles and diffusers

Flexible Duct

Duct Collar

Diffuser or grille

VFL by TROX
**Accessories**

**Square or rectangular duct adaptor**

**Description**
- Volume flow limiter
  - Type VFL (ED & SD)

**Application**
- The VFL-ED (exhaust orientation) and VFL-SD (supply orientation) are designed for insertion into square or rectangular ducting.

**Nominal VFL sizes**
- 4", 5", 6", 8" and 10"

**Nominal adaptor sizes**
- See table below for sizes
- Other adaptor sleeve heights, widths and depths available upon request

**Special features**
- Exhaust or supply orientation
- VFL secured by brackets and sealed to adaptor

**Materials and surfaces**
- Adaptor made of 20 ga. galvanized steel
- Natural finish

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**Dimensional drawing of VFL - ED and - SD**

**Nominal duct size** | **Nominal VFL size** | **A** | **B** | **ØD** | **L**
---|---|---|---|---|---
6" x 6" | 100 | 5⅞ | 5⅞ | 3¾ | 4
6" x 6" | 125 | 5⅞ | 5⅞ | 4¾ | 4¾
8" x 8" | 100 | 7⅞ | 7⅞ | 4¾ | 4¾
8" x 8" | 125 | 7⅞ | 7⅞ | 5¾ | 5¾
8" x 8" | 150 | 7⅞ | 7⅞ | 6¾ | 6¾
10" x 10" | 100 | 9⅞ | 9⅞ | 3¾ | 4
10" x 10" | 125 | 9⅞ | 9⅞ | 4¾ | 4¾
10" x 10" | 150 | 9⅞ | 9⅞ | 5¾ | 5¾
10" x 10" | 200 | 9⅞ | 9⅞ | 6¾ | 6¾
12" x 12" | 100 | 11⅞ | 11⅞ | 3¾ | 4
12" x 12" | 125 | 11⅞ | 11⅞ | 4¾ | 4¾
12" x 12" | 150 | 11⅞ | 11⅞ | 5¾ | 5¾
12" x 12" | 200 | 11⅞ | 11⅞ | 6¾ | 6¾
12" x 12" | 250 | 11⅞ | 11⅞ | 7¾ | 7¾

*Standard sizes shown. Other sleeve dimensions available upon request.*
**Application**
- The VFL-ER (exhaust register) and VFL-SR (supply register) are designed for in-wall installation
- Commonly used to eliminate thermal stack effect and regulate high rise building pressure

**Nominal VFL sizes**
- 4", 5", 6", 8" and 10"

**Nominal register sizes**
- See table below for standard sizes
- Other register heights, widths and depths available upon request

**Special features**
- Exhaust or supply orientation
- VFL secured by brackets and sealed to register
- Register can be supplied with aluminum grille (by TROX) or customized for grille by others (see p.10 for details)

**Materials and surfaces**
- Adaptor made of 20 ga. galvanized steel
- Natural finish

**Dimensional drawing of VFL - ER and - SR exhaust register without fire damper**

*Dimension "M" is the minimum clearance required at the VFL maximum airflow rate. Clearance can be reduced for lower flow rates.*

**Dimensions [in] Register Units Type VFL-ER and VFL-SR**

<table>
<thead>
<tr>
<th>Nominal duct size</th>
<th>Nominal VFL size</th>
<th>A</th>
<th>B</th>
<th>ØD</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; x 6&quot;</td>
<td>100</td>
<td>5½</td>
<td>5½</td>
<td>3⅞</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>6&quot; x 6&quot;</td>
<td>125</td>
<td>5½</td>
<td>5½</td>
<td>4⅞</td>
<td>4⅜</td>
<td>1¼</td>
</tr>
<tr>
<td>8&quot; x 8&quot;</td>
<td>100</td>
<td>7½</td>
<td>7½</td>
<td>3⅞</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>8&quot; x 8&quot;</td>
<td>125</td>
<td>7½</td>
<td>7½</td>
<td>4⅞</td>
<td>4⅜</td>
<td>1¼</td>
</tr>
<tr>
<td>8&quot; x 8&quot;</td>
<td>150</td>
<td>7½</td>
<td>7½</td>
<td>5⅞</td>
<td>5⅜</td>
<td>1½</td>
</tr>
<tr>
<td>10&quot; x 10&quot;</td>
<td>100</td>
<td>9½</td>
<td>9½</td>
<td>3⅞</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>10&quot; x 10&quot;</td>
<td>125</td>
<td>9½</td>
<td>9½</td>
<td>4⅞</td>
<td>4⅜</td>
<td>1¼</td>
</tr>
<tr>
<td>10&quot; x 10&quot;</td>
<td>150</td>
<td>9½</td>
<td>9½</td>
<td>5⅞</td>
<td>5⅜</td>
<td>1½</td>
</tr>
<tr>
<td>10&quot; x 10&quot;</td>
<td>200</td>
<td>9½</td>
<td>9½</td>
<td>7½</td>
<td>6⅜</td>
<td>2</td>
</tr>
<tr>
<td>12&quot; x 12&quot;</td>
<td>100</td>
<td>11½</td>
<td>11½</td>
<td>3⅞</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>12&quot; x 12&quot;</td>
<td>125</td>
<td>11½</td>
<td>11½</td>
<td>4⅞</td>
<td>4⅜</td>
<td>1¼</td>
</tr>
<tr>
<td>12&quot; x 12&quot;</td>
<td>150</td>
<td>11½</td>
<td>11½</td>
<td>5⅞</td>
<td>5⅜</td>
<td>1½</td>
</tr>
<tr>
<td>12&quot; x 12&quot;</td>
<td>200</td>
<td>11½</td>
<td>11½</td>
<td>7½</td>
<td>6⅜</td>
<td>2</td>
</tr>
<tr>
<td>12&quot; x 12&quot;</td>
<td>250</td>
<td>11½</td>
<td>11½</td>
<td>9½</td>
<td>8⅜</td>
<td>2⅜</td>
</tr>
</tbody>
</table>

*Standard sizes shown. Other register dimensions available upon request for any damper and grille size.*
Description

Volume flow limiter
Type VFL (ER & SR) with fire damper

Application
- The VFL-ER (exhaust register) and VFL-SR (supply register) are designed for in-wall installation
- Commonly used to eliminate thermal stack effect and regulate high rise building pressure

Nominal sizes
- 4”, 5”, 6”, 8” and 10”

Nominal register sizes
- See table page 10 for standard sizes
- Other register heights, widths and depths available upon request

Special features
- Exhaust or supply orientation
- Fire damper assembly by TROX is UL listed and in accordance with NFPA-90A
- VFL secured by brackets and sealed to register
- Register can be supplied with aluminum grille (by TROX - see details below) or customized for grille by others

Materials and surfaces
- Adaptor made of 20 ga. galvanized steel
- Natural finish

Dimensional drawing of VFL - ER and - SR exhaust register with fire damper

TROX grille dimensions

*N = nominal duct size
Circular volume flow limiters in 5 nominal sizes, made of high-quality plastic, to limit and control volume flows in air conditioning systems. Ready-to-commission unit consists of the casing with volume flow rate setting scale and the control mechanism with leaf spring and low-friction, silicone-free bellows. Easy insertion into circular ducts to EN 1506 or EN 13180; secure fit ensured by a lip seal. Aerodynamically tested and factory set to a reference volume flow rate. Can be subsequently accurately adjusted within a volume flow rate range of at least 5:1.

**Special features**
- Mechanical self-powered
- Low-friction bellows
- For circular ducts
- Lip seal for tight and secure fit
- Aerodynamically tested and factory set to a reference volume flow rate
- Sticker showing volume flow rates (in l/s, m³/h and cfm) on each unit

**Materials and surfaces**
- Casing and damper blade made of high-quality plastic, to UL 94, V1; to DIN 4102, material classification B2
- Leaf spring made of stainless steel
- Polyurethane bellows

**Technical data**
- Nominal sizes: 4 – 10 in
- Volume flow rate range: 11-450 cfm; 5 – 212 l/s or 18 – 764 m³/h
- Volume flow rate control range: < 20 to 100 % of the nominal volume flow rate
- Volume flow rate accuracy: approx. ± 10 % of the nominal volume flow rate
- Minimum differential pressure: 0.12 in. w.g.
- Maximum acceptable differential pressure: 1.2 in. w.g.

**Sizing data**
- \( V \) \[\text{cfm}\]
- \( \Delta p \) \[\text{in. w.g.}\]
- \( L_{DNC} \) air-regenerated noise \[L_{DNC}\]
<table>
<thead>
<tr>
<th>Order code</th>
<th>VFL</th>
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<tbody>
<tr>
<td><strong>1</strong> Type</td>
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<tr>
<td>VFL</td>
<td>Volume flow limiter</td>
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<tr>
<td>VFL-ED</td>
<td>Exhaust, square or rectangular duct</td>
</tr>
<tr>
<td>VFL-SD</td>
<td>Supply, square or rectangular duct</td>
</tr>
<tr>
<td>VFL-ER</td>
<td>Exhaust register</td>
</tr>
<tr>
<td>VFL-SR</td>
<td>Supply register</td>
</tr>
<tr>
<td><strong>2</strong> Size</td>
<td>Nominal Diameter</td>
</tr>
<tr>
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<td>4&quot;</td>
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<tr>
<td>125</td>
<td>5&quot;</td>
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<td>150</td>
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<tr>
<td>200</td>
<td>8&quot;</td>
</tr>
<tr>
<td>250</td>
<td>10&quot;</td>
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<table>
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<tr>
<th><strong>3</strong> Nominal Register/Adaptor size</th>
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<td>See table pages 8-9</td>
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<table>
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<table>
<thead>
<tr>
<th><strong>5</strong> Fire Damper</th>
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<table>
<thead>
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<td>Grille by TROX G</td>
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<table>
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<th><strong>7</strong> Setpoint (p6)</th>
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<tbody>
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<tr>
<td>Optional alternative setpoint 1-11</td>
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</table>

These entries not required for basic VFL

Order example

```
VFL -ER / 150 / 8x8 / 0 / 0 / G - 5
```

VFL size 150 mounted on 8" x 8" exhaust register with grille provided by TROX, adjusted to setpoint 5 (70 cfm).