# REPORT

Issued by an Accredited Testing Laboratory


| Contact person | Date | Reference | Page |
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LINDAB s.r.o.
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# Air tightness test of a circular duct system according to standard EN 12237:2003

(2 appendices)

## Assignment

An air tightness test on a DIRECT VENT circular ventilation duct system was carried out by request of Lindab s.r.o.

## Test object

A DIRECT VENT circular duct system consisting of:

1 pc. duct 3.0 meter, Ø 1250 mm (0.9*)
2 pcs. duct 1.5 meter, Ø 1250 mm (0.9*)
2 pcs. duct 1.5 meter, Ø 630 mm (0.7*)
1 pc. duct 3.0 meter, Ø 500 mm (0.7*)
2 pcs. duct 1.5 meter, Ø 500 mm (0.7*)
2 pcs. duct 3.0 meter, Ø 250 mm (0.5*)
2 pcs. duct 1.5 meter, Ø 160 mm (0.5*)
1 pc. duct 3.0 meter, Ø 80 mm (0.45*)
1 pc. reduction Ø 1250 mm → Ø 630 mm (0.9*)
1 pc. reduction Ø 630 mm → Ø 500 mm (0.7*)
1 pc. reduction Ø 630 mm → Ø 250 mm (0.7*)
1 pc. reduction Ø 250 mm → Ø 160 mm (0.5*)
1 pc. reduction Ø 160 mm → Ø 80 mm (0.7*)
1 pc. reduction Ø 100 mm → Ø 80 mm (0.5*)
1 pc. T-piece, Ø 630 mm → Ø 630 mm (0.7*)
1 pc. bend 90° Ø 250 mm (0.5*)
1 pc. silencer, connection Ø 250 mm
1 pc. damper, connection Ø 160 mm (0.5*)
1 pc. plug end Ø 1250 mm (0.9*)
1 pc. plug end Ø 500 mm (0.6*)
1 pc. female coupling Ø 1250 mm (1.25*)
3 pcs. male coupling Ø 1250 mm (0.9*)
1 pc. male coupling Ø 630 mm (0.7*)
2 pcs. male coupling Ø 500 mm (0.6*)

* sheet thickness in [mm] according to manufacturer's material specification

Ducts and fittings were made of galvanized steel. Sheet thickness was checked on randomly selected ducts and fittings and corresponded with values stated in the manufacturer's material

specification. Measured values were within tolerance levels according to EN 10143:2006. For photos of the duct system, see appendix 1.

## Place and date of test

The test was performed by RISE on February 01, 2023, on a duct system assembled at the company's premises in Grevie, Sweden.

## Test procedure

The test was carried out according to standard EN 12237:2003 ”Ventilation for buildings – Ductwork – Strength and leakage of circular sheet metal ducts”. The duct system was connected to a speed-controlled fan and an air flow meter to measure the air leakage.

## Results

The reported values have been corrected to an air density of 1.2 kg/m³. The test was conducted at an atmospheric pressure of 987 hPa and an ambient temperature of 19°C. The system was pressurized about 5 minutes at every measurement point before the air leakage was measured.

The tested circular system had a total surface area (A) of 57.36 m² and a total joint length (L) of 59.16 m. This resulted in a ratio L/A = 1.03 $m^{-1}$.

The results only applies for the tested system.

*Air leakage test*

The measured and calculated values for pressure and air leakage factors are presented in tables 1-2 and in the diagram in appendix 2.

**Table 1. Results for circular duct system at static positive pressure.**

| Static positive pressure Pa | Measured leakage factor l/s/m² | Demand acc. to class B l/s/m² | Demand acc. to class C l/s/m² | Demand acc. to class D l/s/m² |
|---|---|---|---|---|
| **118** | **0.002** | 0.20 | 0.067 | 0.022 |
| **421** | **0.005** | 0.457 | 0.152 | 0.051 |
| **759** | **0.008** | 0.671 | 0.224 | 0.075 |
| **1045** | **0.010** | 0.826 | 0.275 | 0.092 |
| **1512** | **0.013** | 1.049 | 0.350 | 0.117 |
| **2013** | **0.016** | 1.264 | 0.421 | 0.140 |

**Table 2. Results for circular duct system at static negative pressure.**

| Static negative pressure Pa | Measured leakage factor l/s/m² | Demand acc. to class B l/s/m² | Demand acc. to class C l/s/m² | Demand acc. to class D l/s/m² |
|---|---|---|---|---|
| **126** | **0.002** | 0.208 | 0.069 | 0.023 |
| **206** | **0.003** | 0.287 | 0.096 | 0.032 |
| **313** | **0.004** | 0.377 | 0.126 | 0.042 |
| **397** | **0.005** | 0.440 | 0.147 | 0.049 |
| **607** | **0.007** | 0.580 | 0.193 | 0.064 |
| **752** | **0.008** | 0.667 | 0.222 | 0.074 |

*Strength*

No deformation of the duct system was observed during the test.

At the actual test the system achieved air tightness class D and strength requirements according to standard EN 12237:2003.

When comparing test results with requirements in the standard, the following decision rule has been applied: Measured values are evaluated without regard to measurement uncertainty

## Estimated measurement uncertainty

| | |
|---|---|
| Temperature ± 1°C | Atmospheric pressure ± 1 hPa |
| Air flow ± 4 % of actual flow | Area ± 2 % |
| Static pressure ± 1 % of actual pressure | Leakage factor ± 5 % |

The uncertainty has been calculated according to EA-4/16 with a coverage factor k = 2.

## Measuring equipment

| | |
|---|---|
| Temperature meter, Testo 108 | Inventory number KWP09899-01 |
| Manometer, Testo 510 | Inventory number BX81272 |
| Manometer, Testo 510 | Inventory number BX81273 |
| Barometric Pressure Meter, Testo 511 | Inventory number BX81271 |
| Air flow meter, nozzles 4 to 25 mm | Inventory number BX81487 |
| Digital Caliper Gauge, Mitutoyo 209-918 | Inventory number BX81494 |

**RISE Research Institutes of Sweden AB**
**Department Energy and Resources - Buildings and energy**

Performed by

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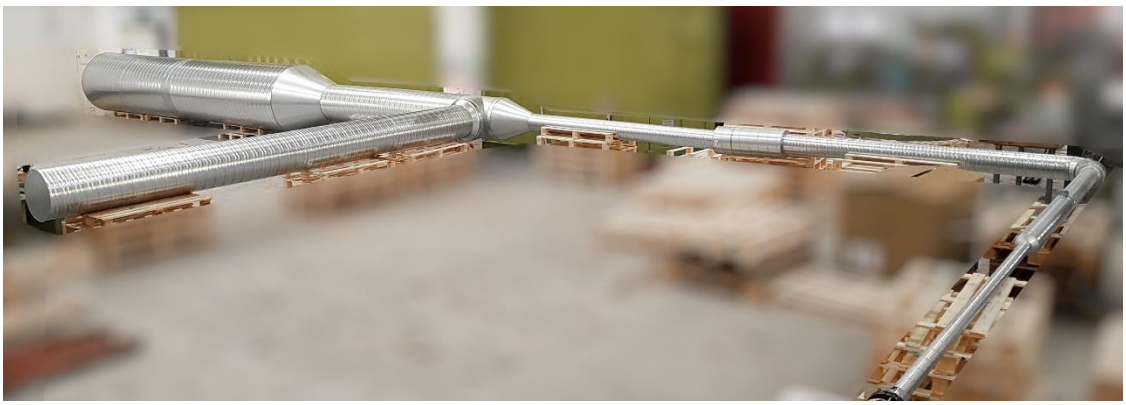
Examined by

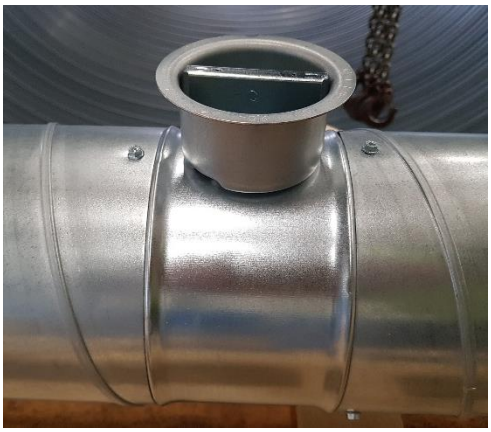
Svein Ruud

**Appendices**

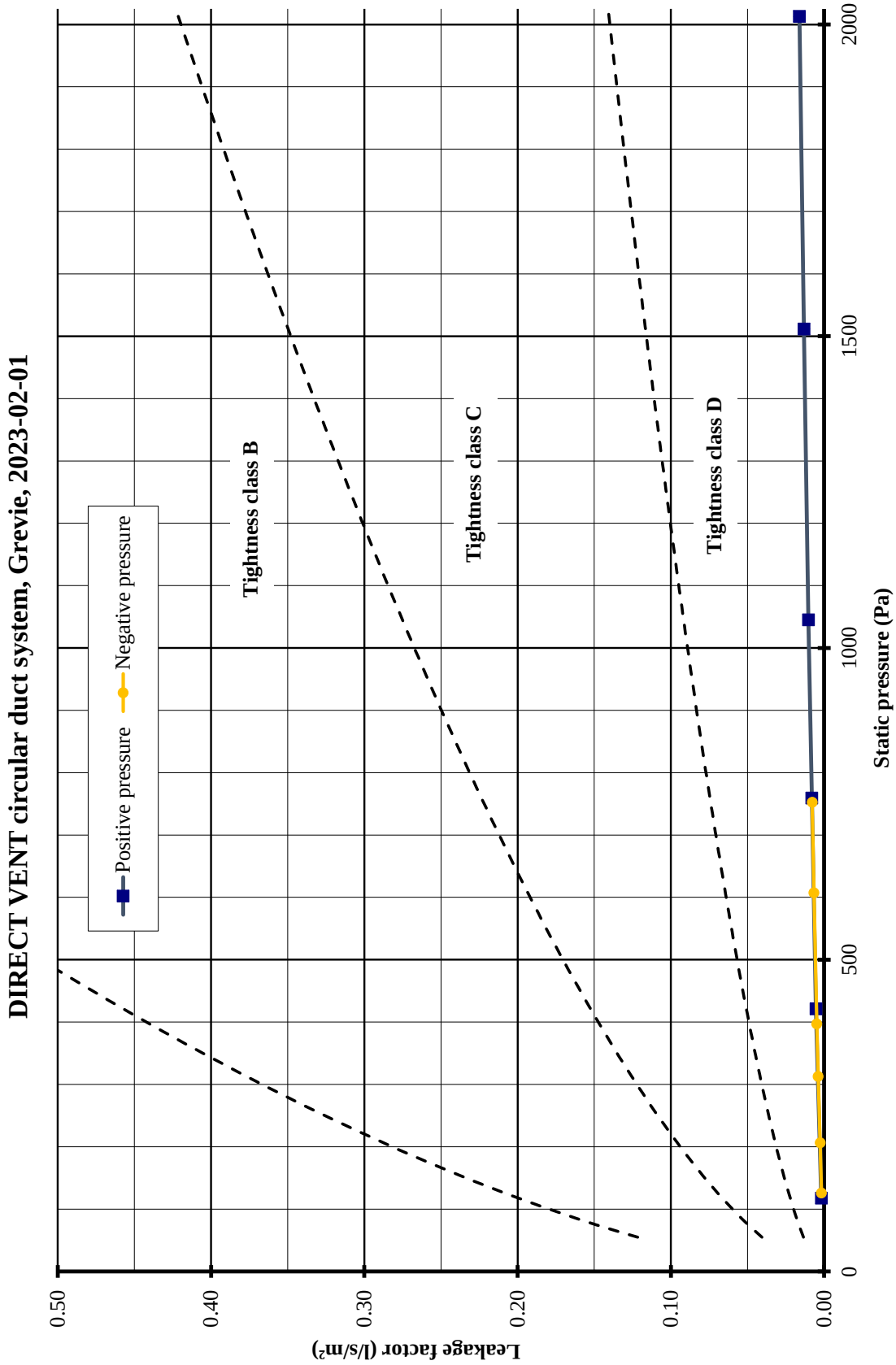
1. Photos of the tested duct system.
2. Diagram: Leakage factor [l/s/m²] as a function of static pressure [Pa].

Appendix 1





Appendix 2



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## Signing parties

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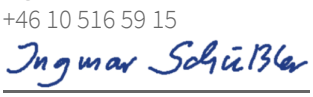

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