# Ducting

Every HVAC system requires many different parts and components for efficiently transporting air.

In its ducting range, BerlinerLuft. offers products and components for designing complete round or rectangular ducting systems.

**Tailor-made solutions**

**Sturdy and safe**

**Compliant with standards**

# Rectangular ducting

# Folded ducting components

## FOLDED DUCTING COMPONENTS – GALVANISED STEEL

Folded sheet metal ducts and fittings with rectangular cross section as per DIN EN 1505, 1507 and DIN 18379

Material: Sendzimir galvanised sheet steel

Grade: DX51D + Z275MA-C (DIN EN 10346 and DIN EN 10143)

Sheet thickness: for pressure rating L, M, HR

Tightness classes: A, B and C as per DIN EN 1507

Turning vanes as per DIN EN 1505

Longitudinal seams folded, end connection with frame or slip joint,

walls reinforced with trapezoidal corrugation

Additional reinforcement for pressure ratings M and HR as per BerlinerLuft. Technik GmbH (BLKS) company standard

Standard duct section length 1500 mm (also with frame)

### Width of frame sections for pressure rating L

| | |
|---|---|
| Frame width 20 mm: | up to edge length 1000 mm |
| Frame width 30 mm: | > edge length 1000 to 2000 |
| Frame width 40 mm: | > edge length 2000 mm |

## FOLDED DUCTING COMPONENTS – STAINLESS STEEL 1.4301
## FOLDED DUCTING COMPONENTS – STAINLESS STEEL 1.4571

Sheet metal ducts and fittings with rectangular cross section similar to EN 1505, 1507 and DIN 18379

Folded sheet metal ducts and fittings made of stainless steel 1.4301 or 1.4571 (surface 2B as per DIN EN 10088)

Sheet thickness 0.8 mm and 1.0 mm. Corners sealed or whole joint sealed (corners, frame and seams)

Longitudinal seams folded, end connection with frame, turning vanes as per DIN EN 1505, walls reinforced with corrugations, additional reinforcement as per BerlinerLuft. company standard. Spot welds treated

Standard duct section length 1500 mm

### Width of frame sections for pressure rating L

| | |
|---|---|
| Frame width 20 mm: | up to edge length 1000 mm |
| Frame width 30 mm: | > edge length 1000 to 2000 mm |

## FOLDED DUCTING COMPONENTS – ALUMINIUM

Sheet metal ducts and fittings with rectangular cross section similar to EN 1505, 1507 and DIN 18379

Folded sheet metal ducts and fittings made of aluminium AlMg3

Sheet thickness 1.0 mm and 1.2 mm. Corners sealed or whole joint sealed (corners, frame and seams)

Longitudinal seams folded, end connection with frame, turning vanes as per DIN EN 1505, walls reinforced with corrugations, additional reinforcement as per BerlinerLuft. company standard. Standard duct section length 1500 mm

### Width of frame sections for pressure rating L

Frame width 20 mm: up to edge length 700 mm

Frame width 30 mm: > edge length 700 to 2000 mm

## FOLDED DUCTING COMPONENTS – GALVANISED STEEL INDUSTRIAL DUCTING

Sheet metal ducts and fittings with rectangular cross section for harsher conditions

Folded sheet metal ducts and fittings made of Sendzimir galvanised sheet steel grade DX51D + Z275MA-C (DIN EN 10346 and DIN EN 10143). Sheet thickness up to 1000 mm, edge length 1.0 mm, from 1001 mm edge length 1.25 mm. Tightness class A or B as per DIN EN 1507. Longitudinal seams folded, end connection with frame

Turning vanes as per DIN EN 1505

Walls corrugated, additional reinforcement with 30 mm standing seam and U-section support 30 x 50 x 30

Suitable for pressure of -1500 Pa to +3000 Pa and high air velocities. Standard duct section length 1000 mm

### Width of frame sections for pressure rating HR

Frame width 30 mm: up to edge length 1000 mm

Frame width 40 mm: > edge length 1000 mm

# Overview of ducting components: folded, welded

## FOLDED DUCTING COMPONENTS – GALVANISED STEEL, INSULATED

Sheet metal ducts and fittings with rectangular cross section, galvanised, folded and insulated

Sheet metal ducts and fittings made of Sendzimir galvanised fine sheet steel grade DX51D + Z275MA-C (DIN EN 10346 and DIN EN 10143)

Sheet thickness depending on pressure rating L or M

Tightness class A or B as per DIN EN 1507

Longitudinal seams folded, end connection with frame

Turning vanes as per DIN EN 1505. Walls reinforced with corrugations, additional reinforcement as per BerlinerLuft. company standard. Standard duct section length 1500 mm

### Width of frame sections for pressure rating L

| | |
|---|---|
| Frame width 20 mm: | up to edge length 1000 mm |
| Frame width 30 mm: | > edge length 1000 to 2000 mm |

## WELDED DUCTING COMPONENTS – SHEET STEEL

Welded sheet metal ducts and fittings with rectangular cross section as per DIN EN 1505, 1507 and VDI 3803

Welded sheet metal ducts and fittings made of Sendzimir galvanised fine sheet steel grade DX51D + Z275MA-C (DIN EN 10346 and DIN EN 10143) and black sheet S 235 JRG2 as per DIN EN 10025

Sheet thickness for pressure rating $H^R$

Tightness class C and D as per DIN EN 1507

End connection with angle frame or formed frame. Perforated as per factory standard (hole spacing 125 mm), turning vanes as per DIN EN 1505. Fixed duct length according to frame connection

| | |
|---|---|
| Fixed duct length with flush angle frame: | 1500 mm |
| Recessed angle frame: | 1480 mm |
| 30 mm formed frame 30/15: | 1350 mm |
| 40 mm formed frame 40/20: | 1350 mm |
| 60 mm formed frame 60/30: | 1300 mm |

Larger formed frames available on request (individual assessment)

## WELDED DUCTING COMPONENTS – MATT OR POLISHED STAINLESS STEEL

Sheet metal ducts and fittings with rectangular cross section similar to DIN EN 1505, 1507 and VDI 3803

Welded sheet metal ducts and fittings made of stainless steel 1.4301 and 1.4571, matt or polished finish

Sheet thickness as required for tightness class C or D as per DIN EN 1507. Stricter requirements such as nekal tightness as per DIN on request

End connection with angle frame or formed frame. Perforated as per factory standard (hole spacing 125 mm), turning vanes as per DIN EN 1505. Fixed duct length according to joint type

Fixed duct length with flush angle frame: 1500 mm

Recessed angle frame: 1480 mm

30 mm formed frame 30/15: 1350 mm

40 mm formed frame 40/20: 1350 mm

60 mm formed frame 60/30: 1300 mm

Larger formed frames available on request (individual assessment)

## WELDED DUCTING COMPONENTS – ALUMINIUM

Sheet metal ducts and fittings with rectangular cross section similar to DIN EN 1505, 1507 and VDI 3803

Welded sheet metal ducts and fittings made of aluminium AL 99.5 hh and AlMg3, sheet thickness 2.0 mm and 3.0 mm

Tightness class C and D as per DIN EN 1507. Stricter requirements such as nekal tightness as per DIN on request

End connection with perforated angle frame as per company standard (hole spacing 125 mm), turning vanes as per DIN EN 1505

Fixed duct length with flush angle frame: 1500 mm

Recessed angle frame: 1480 mm

30 mm formed frame 30/15: 1350 mm

40 mm formed frame 40/20: 1350 mm

60 mm formed frame 60/30: 1300 mm

Larger formed frames available on request (individual assessment)

# Design of ducting components – frames

## PLANNING REQUIREMENTS

Ducting components are part of the ducting system in central ventilation systems. When planning the ducting system, various requirements have to be met:

- Optimised air flow
- Ability to withstand pressure (VDI 3803)
- Tightness class (DIN EN 1507)
- Hygiene requirements (VDI 6022)
- Type specification (folded or welded)
- Selection of material according to the type of air carried, e.g.: normal room air, dusty process air, chemically polluted air

## DESIGN OF RECTANGULAR DUCTING COMPONENTS

### Welded air duct with folded frame (3)

Mandatory for the strictest requirements of tightness class D (e.g. decontaminable design)

### Welded air duct with angle frame (4)

Can be used for special requirements of tightness class D

1 | Folded air duct with formed frame
2 | Folded air duct with attached frame
3 | Welded air duct with folded frame
4 | Welded air duct with angle frame


1

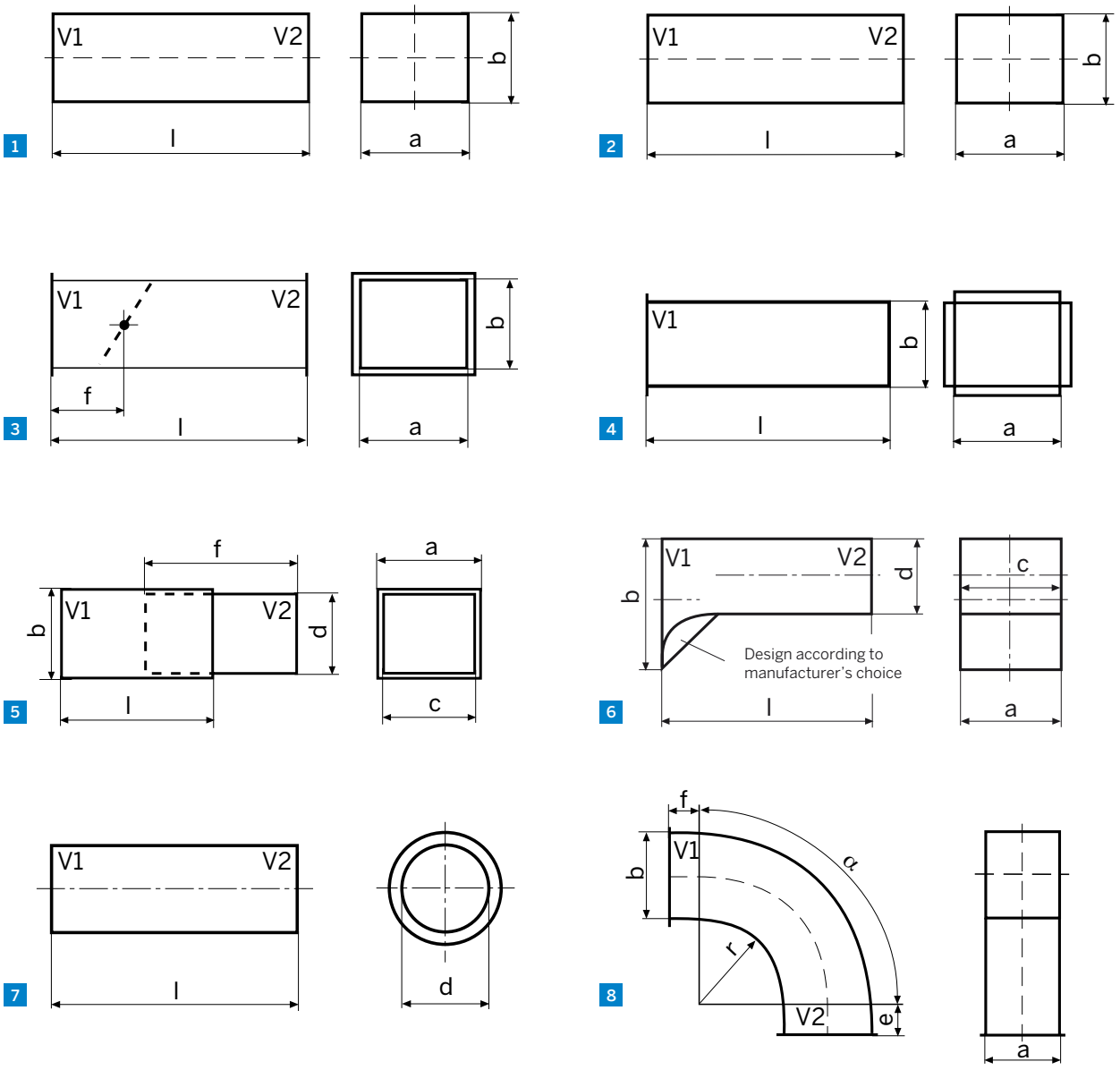

2


3


4

# Sheet metal ducts and fittings

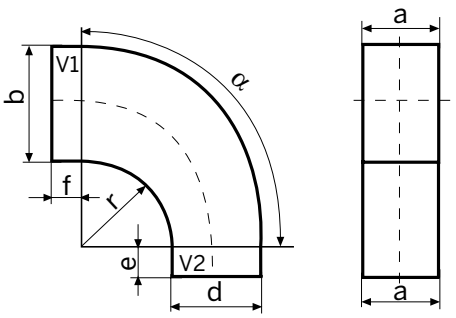
## AS PER DIN EN 1505, 1507 AND DIN 18379




1 | K – Duct l > 900
2 | KT – Duct section l ≤ 900
3 | KD – Duct with damper
4 | KS – Duct connector
5 | SS – Sliding connector
6 | SU – Transition connector
7 | SR – Round connector
8 | BS – Bend

# Sheet metal ducts and fittings

## AS PER DIN EN 1505, 1507 AND DIN 18379

1
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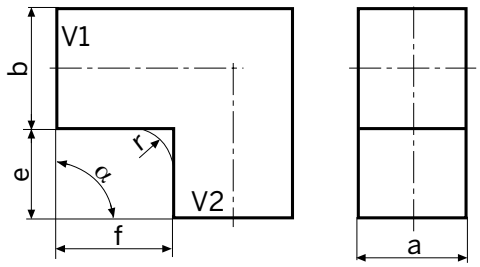


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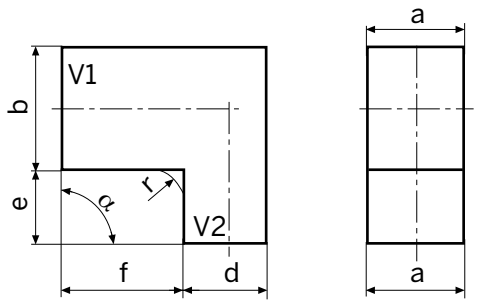


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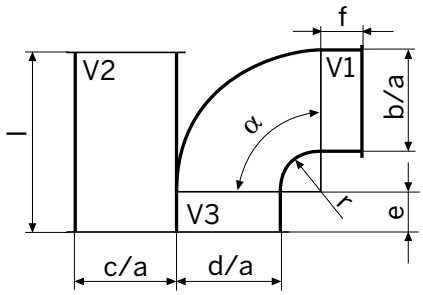


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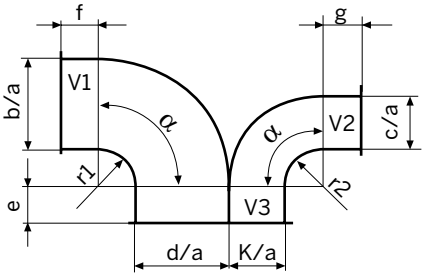


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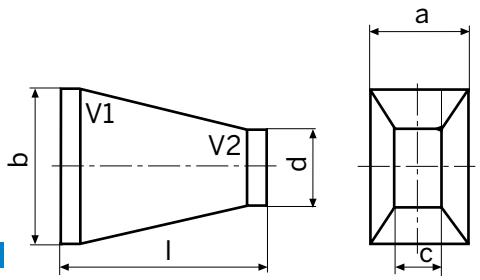


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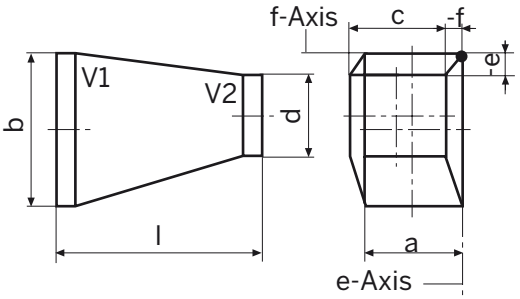


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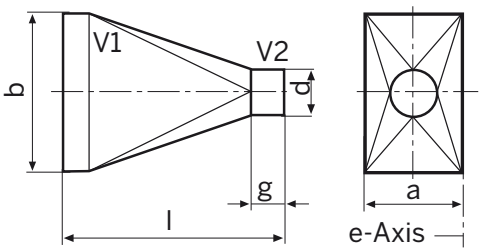
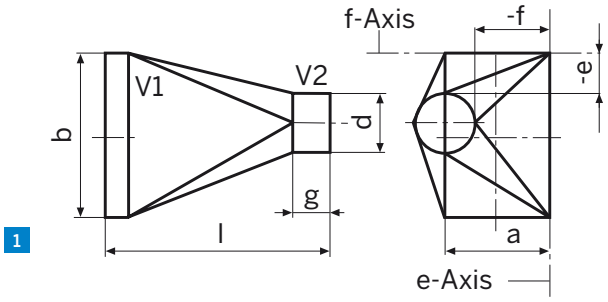
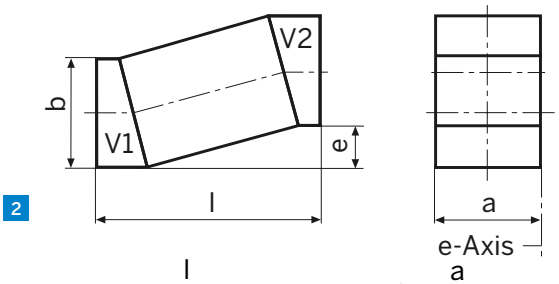



1 | BA – Transition bend
2 | WS – Symmetrical square bend
3 | WA – Square transition bend
4 | KOM Combined bend/duct
5 | KOM 3 combined bend/bend
6 | US – Symmetrical transition
7 | UA – Asymmetrical transition
8 | RS – Symmetrical square to round transition




1

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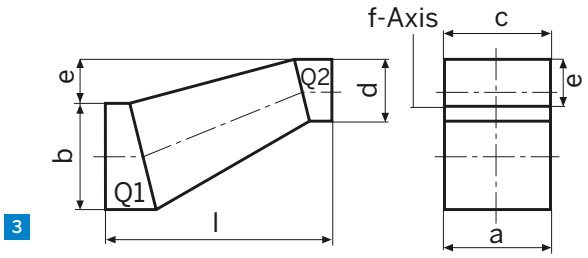


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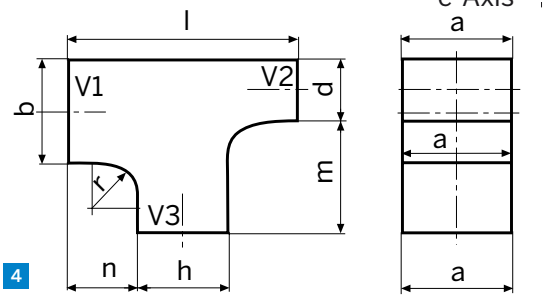


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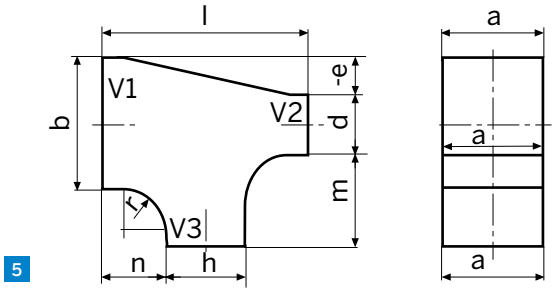


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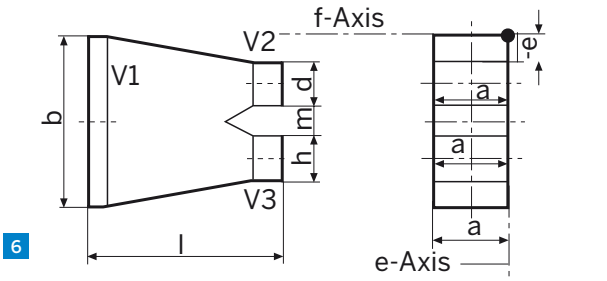


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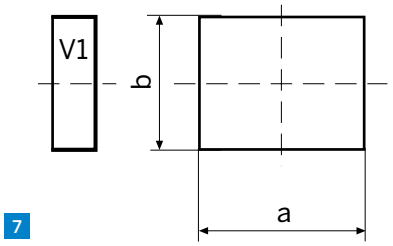


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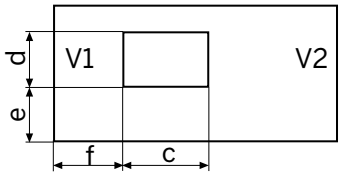
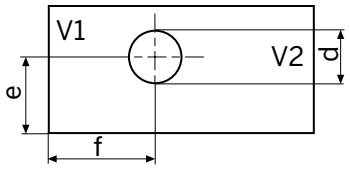



8 Define edge length a or b




9 Define edge length a or b

1 | RA – Asymmetrical square to round transition
2 | ES – Symmetrical offset
3 | EA – Asymmetrical offset
4 | TG – Straight T-piece
5 | TA – Diagonal T-piece
6 | HS – Y-piece
7 | BO – Base
8 | AE – Rectangular cut-out
9 | AR – Round cut-out

# Table of ducting components

| Technical requirement | Material | | | | | |
|---|---|---|---|---|---|---|
| | Galvanised steel | Black steel | Stainless steel | FAL | Aluminium | Platal |
| **Version** | | | | | | |
| Folded | • | | • | | • | • |
| Welded | • | • | • | • | • | |
| **Connection** | | | | | | |
| Frame | • | | • | | • | • |
| Slip joint | • | • | • | • | • | |
| Screw connection | • | • | • | • | • | |
| Welded butt joint | | • | • | • | | |
| **Tightness** | | | | | | |
| Tightness class B | • | | • | | • | |
| Tightness class C | • | | • | | • | |
| Tightness class D | • | • | • | • | • | • |
| Aerosol-tight | • | | • | | • | • |
| **Surface** | | | | | | |
| Hot-dip galvanised | | • | | | | |
| Primed/painted | • | • | | | • | |
| Chlorine-resistant paint | • | • | | | | |
| Fatty acid-resistant paint | • | • | | | | |
| Powder coated | • | • | • | | • | |
| **Insulation** | | | | | | |
| Double wall | • | | • | | • | • |
| Mineral wool/perforated plate, inside | • | | • | | • | |
| Cellular rubber inside/outside | • | • | • | • | • | • |
| Anti-drone coating | • | | • | | • | |

# Standards and guidelines

## STANDARDS AND GUIDELINES

HVAC is undergoing a period of upheaval in terms of standards and regulations. Some of the DIN standards have been withdrawn and replaced by EN standards. Although fundamental contractual freedom exists, withdrawn DIN standards may no longer be used.

In a legal dispute, only the EN standards apply.

This means that there always an obligation to check that the standards are up to date.

Here is a list of standards which must always be observed for ducting:

| | |
|---|---|
| **DIN EN 1505** | Sheet metal air ducts and fittings with rectangular cross section - Dimensions |
| **DIN EN 1507** | Sheet metal air ducts with rectangular section - Requirements for strength and leakage |
| **DIN EN 12097** | Requirements for ducting components to facilitate maintenance of ducting systems |
| **DIN EN 12236** | Ductwork hangers and supports |
| **DIN EN 12599** | Test procedures and measurement methods to hand over air conditioning and ventilation systems |
| **DIN EN 13779** | Ventilation of non-residential buildings |
| **DIN 18379** | VOB Part C - General technical specifications in construction contracts |
| **DIN 18869-4** | Equipment for commercial kitchens - Components for ventilation |
| **DIN 24193-1*** | Ducting for ventilation equipment; flanges; series 1 angle flanges |
| **DIN 24193-2*** | Ducting for ventilation equipment; flanges; series 2 angle flanges |
| **DIN 1946-4** | Ventilation systems in hospitals |
| **VDI 2052** | Air-conditioning - Kitchens (VDI Ventilation Code of Practice) |
| **VDI 2087** | Air ducts - Operating and construction fundamentals |
| **VDI 2089** | Building services in swimming baths |
| **VDI 3803** | Central air-conditioning systems - Structural and technical principles |
| **VDI 6022** | Hygiene requirements for ventilation and air-conditioning systems and units |

* DIN 24193 Parts 1 and 2 have been withdrawn. However, their use can be agreed upon, as no equivalent EN standard exists.

## CERTIFICATE OF CONFORMITY WITH VDI 6022

The sheet metal ductwork made by BerlinerLuft. Technik GmbH (BLKS) is certified as compliant with VDI 6022 and is listed by the Institut für Lufthygiene Berlin with the registration number: **HKP 09/13 -10**.

# Materials

## METALLIC MATERIALS

Depending on the application, ducting can be manufactured from different metallic materials

### FOLDED AND WELDED VERSION

| Material type | Grade | Standard | tmax (°C) |
|---|---|---|---|
| Galvanised steel<br>(Sendzimir galvanised fine sheet steel) | DX51D + Z275 MA-C | DIN EN 10346<br>DIN EN 10143 | + 250 °C |
| Stainless sheet steel (surface 2 B) | 1.4301 (V2A)<br>1.4571 (V4A) | DIN EN 10088 | + 500 °C |
| Aluminium | ALMg3 | DIN EN 485<br>DIN EN 573-3 | + 350 °C |
| FAL (hot-dip aluminised sheet steel) | | DIN EN 1396 | + 700 °C |
| Platal (folded ducting only) | DX51D + ZA255<br>OS: 200 µm PVC st.no....<br>US: 5 µm + K- | DIN EN 10346<br>DIN EN 143 | - 20 °C/+ 80 °C |
| Black sheet steel<br>(welded ducting only) | S 235 JRG 2 | DIN 10130 | + 250 °C |
| **Sealants** [1] [2]<br>Single-component sealant<br>Basis: | <br>Silicone-free<br>Butyl rubber<br>Acrylic<br>Silyl modified polymer (SMP)<br>Resistant to fatty acids<br>Permanently elastic and UV-resistant | VDI 6022 | <br>+ 80 °C<br>Certified |

[1] For all seals, only silicon-free materials are used
[2] Special seals for specific applications are available on request

## SURFACE FINISH

Ducting can be made from different metallic materials, depending on the application. The surface finish and corrosion protection depend on the requirements.

The necessary coating thicknesses depend on the application, and must be specified by the user in line with the relevant corrosion protection guidelines. With sheet steel, the surface is either black or galvanised.

### Black and galvanised sheet steel

- Surface preparation / washing and passivation
- Undercoat or primer
- Painting
- Powder coating
- KTL coating

### Stainless steel

- Pickling and neutralisation
- Blasting
- Grinding
- Brushing

# Sheet thicknesses and pressure ratings as per VDI 3803

<table>
<tr><th rowspan="5">Nominal dimensions (edge lengths) [1] [2] as per EN 1505</th><th colspan="10">Wall thickness s [mm] [3]</th></tr>
<tr><th colspan="8">Folded ducting</th><th colspan="2">Welded ducting</th></tr>
<tr><th colspan="2">Low pressure<br>L</th><th colspan="2">Medium pressure<br>M</th><th colspan="2">High pressure<br>H[R]</th><th colspan="2">High pressure<br>H</th></tr>
<tr><th colspan="8">Max. pressure</th><th colspan="2">Max. pressure</th></tr>
<tr><th>a</th><th>b</th><th>Pa<br>+1000</th><th>Pa<br>-500</th><th>Pa<br>+2000</th><th>Pa<br>-750</th><th>Pa<br>+3000</th><th>Pa<br>-1500</th><th>Pa<br>+6000</th><th>Pa<br>-2500</th></tr>
<tr><td>100</td><td>100</td><td colspan="2" rowspan="6">0.6</td><td colspan="2" rowspan="6">0.7</td><td colspan="2" rowspan="9">1.0</td><td colspan="2" rowspan="3">1.5</td></tr>
<tr><td>150</td><td>150</td></tr>
<tr><td>200</td><td>200</td></tr>
<tr><td>250</td><td>250</td><td colspan="2" rowspan="6">2.0</td></tr>
<tr><td>300</td><td>300</td></tr>
<tr><td>400</td><td>400</td></tr>
<tr><td>500</td><td>500</td><td colspan="2" rowspan="3">0.8</td><td colspan="2" rowspan="3">0.9</td></tr>
<tr><td>600</td><td>600</td></tr>
<tr><td>800</td><td>800</td></tr>
<tr><td>1000</td><td>1000</td><td colspan="2" rowspan="5">1.0</td><td colspan="2" rowspan="5">1.1</td><td colspan="2" rowspan="5">1.2</td><td colspan="2" rowspan="5">3.0</td></tr>
<tr><td>1200</td><td>1200</td></tr>
<tr><td>1400</td><td>1400</td></tr>
<tr><td>1600</td><td>1600</td></tr>
<tr><td>1800</td><td>1800</td></tr>
<tr><td>2000</td><td>2000</td></tr>
<tr><td colspan="2">Nominal dimensions outside DIN EN 1505<br>> 2000 to 3000</td><td colspan="10">Special non-standard components are manufactured on request.<br>For the tender specification, the customer must state specific requirements for the sheet thickness and frame connection.<br>They are charged for as special components.</td></tr>
</table>

[1] Edge lengths a and b can be combined in any way

[2] For intermediate sizes, the sheet thickness is the one stated for the next higher edge length

[3] The wall thicknesses are nominal thicknesses as per DIN 10143

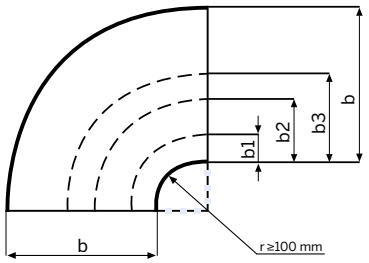
H[R] Folded industrial ducting for restricted high pressure with increased sheet thickness and additional reinforcement (available in tightness class B), max. duct length 1000 mm

# Turning vanes

## ARRANGEMENT OF TURNING VANES IN 90° BENDS AS PER DIN EN 1505 [1]

| Width of ducting [mm] | Number of turning vanes | Space between turning vanes (approximate) [mm] | | |
|---|---|---|---|---|
| | | b1 | b2 | b3 |
| 400 < b ≤ 800 | 1 | b/3 | - | - |
| 800 < b ≤ 1600 | 2 | b/4 | b/2 | - |
| 1600 < b ≤ 2000 | 3 | b/8 | b/3 | b/2 |

Note: Bends up to 45° do not contain turning vanes




As standard, the turning vanes are fastened with sealed studs.

[1] Turning vanes as per DIN EN 1505
Edge length b as per DIN 18379 (VOB Part C)

# Tightness

## TIGHTNESS

To ensure that the air conditioning system operates reliably and energy-efficiently, the ducting must meet specific leak-tightness requirements. DIN EN 1507 defines the permissible leakage rate per $m^2$ of ducting surface, depending on the static internal pressure.

Diagram 1 can be used to estimate the expected leak loss for a ducting system or a section of it. To do this, starting with the average internal pressure[1], the leakage rate is read off of the diagram and multiplied by the duct surface area. The table below shows the tightness requirements in DIN EN 1507 and the recommendations for use in DIN 13779 and VDI 3803.

[1] Static pressure difference between the internal duct pressure and the ambient pressure (both positive and negative pressure)

| Airtightness class as per DIN EN 1507 | Maximum air leakage $m^3 \times s^{-1} \times m^{-2}$ | Use recommendation as per VDI 3803 |
|---|---|---|
| A | $0.027 \times p^{0.65} \times 10^{-3}$ | Not recommended |
| B | $0.009 \times p^{0.65} \times 10^{-3}$ | Minimum requirement |
| C | $0.003 \times p^{0.65} \times 10^{-3}$ | Standard requirement |
| D | $0.001 \times p^{0.65} \times 10^{-3}$ | Maximum requirement |

p = static interior pressure

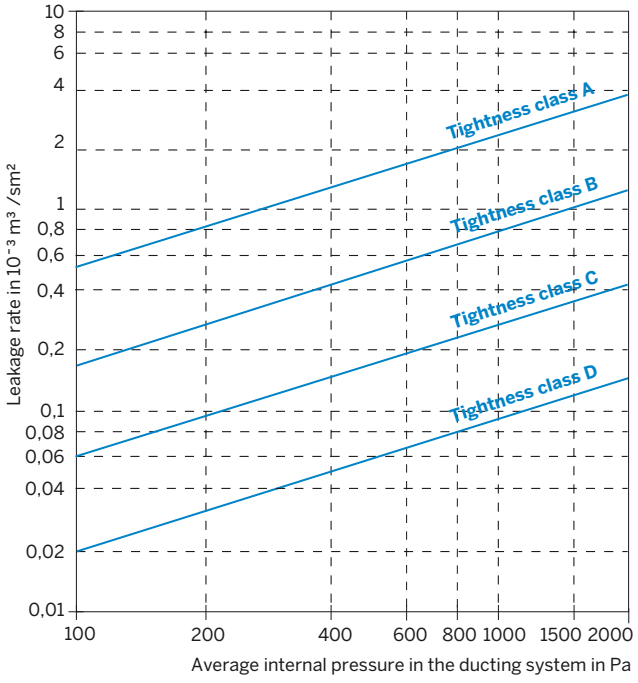


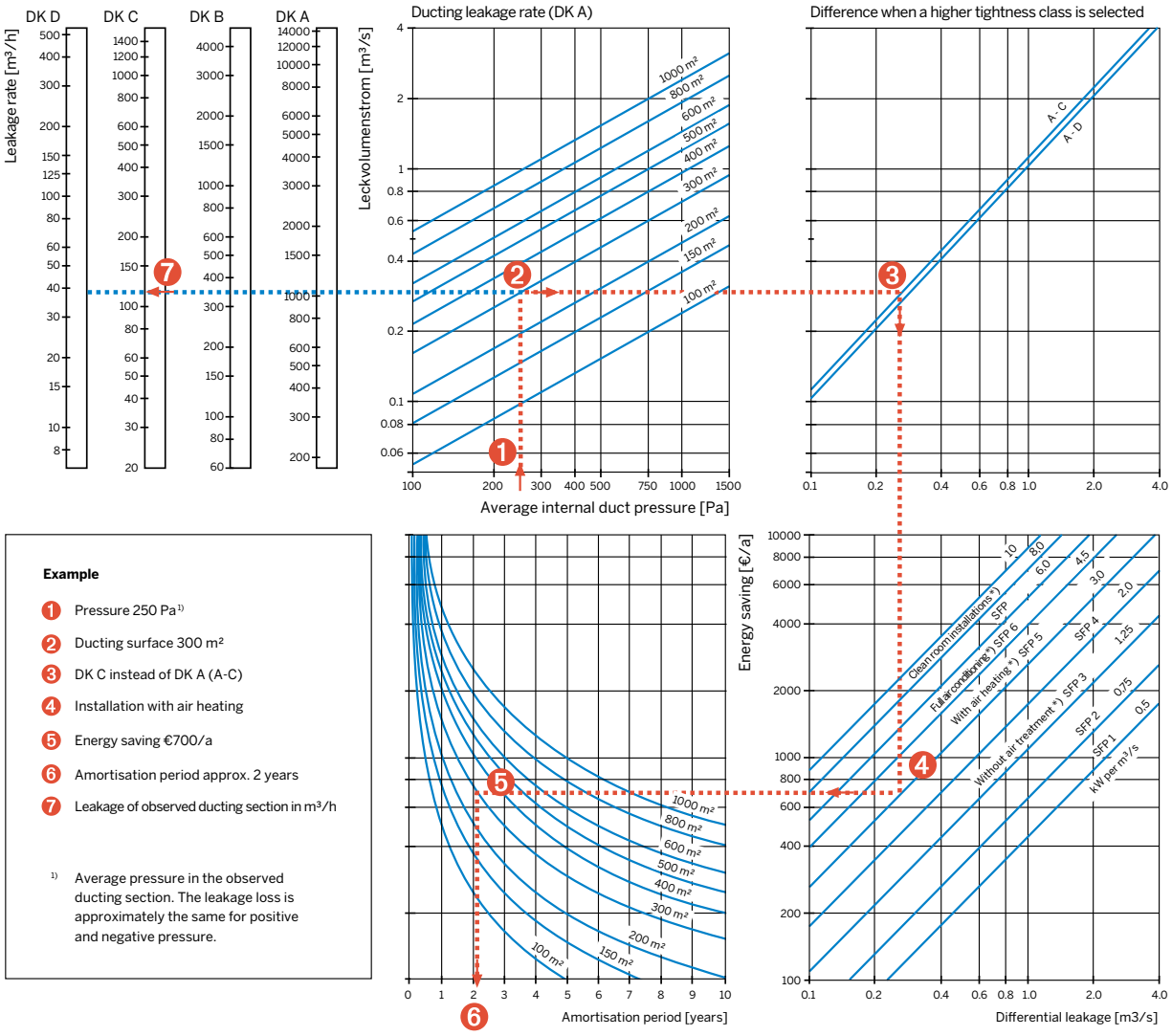

Diagram 1

## PROOF OF TIGHTNESS

The tightness class must be certified on an installed section of the ductwork containing a representative number of ducts and fittings and a surface area of at least 10 $m^2$ (see DIN EN 1507, measuring procedure in DIN EN 12599).

The quality of installation has a significant effect on the leak-tightness of the ducting. In order to achieve a particular tightness class, all the components must have been designed for the respective class at the least, and must be correctly installed. To monitor the quality of installation, it is advisable to carry out a sample test of the leak rate in accordance with DIN EN 15599 during the assembly phase.

# Energy savings from use of tightness class C




* The assignment of SFP classes to the type of system only includes the cost of ducting (as a rough guide)

Comparison: advantages of using tightness class C instead of class A, which has been usual up to now

The diagram is based on the following assumptions:

Energy costs 10 cents/kWh

System operated 24 hours a day

Additional cost of ducting €5.00/m²

The amortisation period is calculated using the following formula, taking account of current cost developments and the operating time:

$$A\ [\text{years}] = \frac{10\ \text{ct.}}{Ek\ [\text{ct.}]} \times \frac{Bd}{[\text{h}]} \times \frac{Mk\ [€]}{€5}$$

A: Amortisation period

Ek: Actual energy costs per kWh

Bd: Average operating time

Mk: Additional cost of the ducting system per m²

# Component joints – maximum and minimum dimensions

| Pressure rating | Profile connection | | | | Folded flange | Angle flange | Straight flange |
|---|---|---|---|---|---|---|---|
| | LP C+ [1] | | LP [2] | | | | |
| | L | M | L | M | H | H | H |
| **Edge length** | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| **00 to 500** | 20 | 20 | 20 | 20 | 40 | 30 x 3 | 30 x 5 |
| **501 to 1000** | | | | | | | 40 x 5 |
| **1001 to 1250** | 30 | 30 | 30 | 30 | 40 | | 60 x 6 |
| **1251 to 2000** | | | | | | 40 x 4 | |
| **> 2000** [3] | | | 40 | 40 | 40 | 50 x 5 | 60 x 10 |

[1] LP C+ formed frame on duct and fitting (except US, UA, HS, BE, BD)

[2] LP Attached frame for the above fittings and special parts

[3] Components with edge lengths greater than 2000 mm are non-standard and are manufactured as special parts. The type of component joint must be specified by the user according to the requirements of use.

## COMPONENT REINFORCEMENTS

The reinforcements on duct walls are based on the component requirements in DIN EN 1507 specifying limits for rigidity and stability of form.

The specific requirements are compiled in an internal company standard.

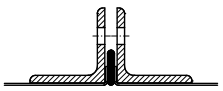
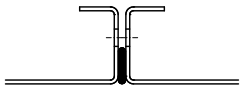
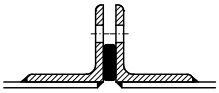
Generally, the following types of reinforcement are used. Walls of duct and fittings up to a sheet thickness of 1.25 mm always have a trapezoidal corrugated profile.

BLKS trapezoidal corrugations have profile depths and flank angles that optimise flow and are classified as smooth-walled as regards VDI 6022.

For certain pressure ratings and component dimensions, additional side wall reinforcements are required. These take the form of

- Internal tubular supports
- Internal or external sheet metal rails
- Internal ribs (only on welded ductwork when necessary)

# Flange connections

| Folded components | | | | | |
|---|---|---|---|---|---|
| | Flange designation | Code | Diagram | Connection [1] with | Standard component length Duct [mm] |
| Folded components | **Profile connection formed** | LP C |  | 4-hole<br>corner joint<br>plus<br>duct clamps | 1500 |
| | **Profile connection attached** | LP |  | 4-hole<br>corner joint<br>plus<br>duct clamps | 1500 |
| | **Angle flange, recessed** | W 1 |  | Bolted joint<br>Hole spacing 125 mm<br>or special hole spacing | 1480 |
| Welded components | **Welded components Folded flange** | WA |  | Bolted joint<br>Hole spacing 125 mm<br>or special hole spacing | 1350<br>at 40/20 mm<br>forward/backward fold |
| | **Angle flange, welded flush** | W 2 |  | Bolted joint<br>Hole spacing 125 mm<br>or special hole spacing | 1500 |

[1] Observe the assembly recommendation

# Assembly recommendation

## FOR JOINTS (FLANGES) OF DUCT COMPONENTS

| Pressure range Pa | Pressure rating | Tightness class | Sealing material for flange | Spacing of duct brackets or bolted joints |
|---|---|---|---|---|
| **+ 1000 / - 500** | L | A | Duct tape 12 x 6 | for a or b > 750 max. 400 mm |
| | | B | Duct tape 12 x 6 | for a or b > 750 max. 400 mm |
| | | C | Duct tape 12 x 6 | for a or b > 400 max. 200 mm |
| **+ 2000 / - 750** | M | B | Duct tape 12 x 6 | for a or b > 750 max. 400 mm |
| | | C | Duct tape 12 x 6 | for a or b > 400 max. 200 mm |
| **+ 3000 / - 1500** (Folded industrial ducting) | HR | B | Duct tape 12 x 6 | for a or b > 550 max. 300 mm |
| **+ 6000 / - 2500** | H | C | Duct tape 12 x 6 | Hole spacing 125 mm |
| | | D | Duct tape 12 x 6 | Hole spacing 125 mm |

$H^R$ Folded industrial ducting for restricted high pressure level with increased sheet thickness and additional reinforcement (available in tightness class B), maximum duct length 1000 mm

## TOLERANCE RANGES

### Sheet metal ducts

| Edge length [mm] | Max. deviation [mm] |
|---|---|
| **a or b** | |
| **100 - 1000** | 0<br>-3 |
| **1001 - 2000** | 0<br>-4 |
| **> 2000** | 0<br>-5 |
| **Component length [mm]** | 0.005 x L |

### Sheet metal fittings

| Component dimensions | Max. deviation [mm] |
|---|---|
| **a, b, c, d, e, f** | 0<br>-4 |
| **l, $l_p$, r** | 0<br>-5 |
| **> 15 / < 100 mm** | |
| **> 100** | 0<br>-4 |
| **> 2000** | 0<br>-10 |
| **Angle tolerance** | +/- 1° |

# Transport and storage

## CLEANLINESS OF DUCTWORK (VDI 6022)

Depending on the hygienic requirements, ducts and fittings may have to be protected from dirt during transport and storage on the site or cleaned before assembly. In accordance with VDI 6022, requirements for the cleanliness of components are divided into three levels.

The standard option offered by the manufacturer is visibly clean, non-packaged components.

Other requirements (such as cleaning, closing ends, complete single or multiple packaging) must be specified at the planning stage.

| Level | Packaging ex works | Protection during transport | Protection during storage | Cleaning on site | Sealing openings on site |
|---|---|---|---|---|---|
| **Basic level** | No | No | No | No | Only rising ducts |
| **Medium level** | No | No | Yes | Yes | Yes |
| **Higher level** | Yes | Yes | Yes | Yes | Yes |

## COST CALCULATION UNITS

The cost of ducts and fittings is standardised and is based on the surface area in $m^2$.

The basis for this is: **DIN 18379**

German construction contract procedures (VOB)

Part C: General technical specifications in construction contracts (ATV)

Installation of air conditioning systems

The price is calculated by $m^2$ of component surface area. The calculation formulae are standardised for each component. The costs are calculated in price groups.

Straight ducts up to a component length of 900 mm are priced as fittings. The minimum size for price calculation is 1 $m^2$ per component.

| Price calculation group | | Maximum edge length [mm] |
|---|---|---|
| Ducts | Fittings | |
| L1 | F1 | up to 500 |
| L2 | F2 | > 500 to 1000 |
| L3 | F3 | >1000 to 1500 |
| L4 | F4 | > 1500 to 2000 |
| L5 | F5 | > 2000 (outside standard) |

# Special ducting

## KITCHEN EXHAUST AIR DUCTING

Ducting for kitchens is subject to special hygiene and safety requirements. The basis for this is DIN 18869 Part 4 and VDI 2052.

Exhaust air ducting in kitchens must be greaseproof and aerosol-proof. The materials used are galvanised sheet steel and stainless steel (V2A 1.4301).

## RECOMMENDATIONS FOR USE

| Ducting type | Galvanised steel | Stainless steel | Tightness class | Seal | Notes |
|---|---|---|---|---|---|
| **Fresh air** | x | x | C | Grease-resistant Permanently elastic | Folded ducting with additional seal |
| **Exhaust air** | x | x | C | Folded and sealed | Not always suitable, due to complex sealing during production and assembly |
| | x | x | D | Welded | Components are greaseproof and aerosol-proof, high quality of assembly required |

Galvanised ducting through which aerosols might enter food processing areas must be coated with paint.

## DUCTING FOR SWIMMING BATHS

Requirements for building services in swimming baths are specified in VDI 2089.

There are no special requirements for metal ventilation ducting in swimming baths. Some references are made to the requirements for ducting in kitchens.

We also offer sheet steel ducting components with painted surfaces. Depending on the application, the interior or exterior surfaces should be protected.

# Thermal and acoustic insulation

## INSULATION REQUIREMENTS FOR DUCTING

Reduced heat loss

Temperature dropping below dew point

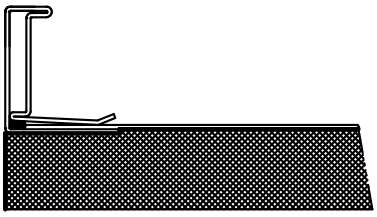
Reduced sound emissions

**Note**

The customer must always check that type and structure of the insulation is suitable for the application.

As well as insulation after complete assembly of the ducting, there is also the option of using ready-insulated components. This option is used indoors when insulation after installation is not possible due to lack of space.

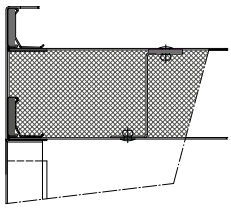
### Interior thermal insulation (self-adhesive cellular rubber)



| Insulation thickness [mm] | Weight kg/m² | U-value W/m²C |
|---|---|---|
| 19 mm | | 1,736 |
| up to EL 1000<br>> EL 1000 | 8.4<br>9.5 | |

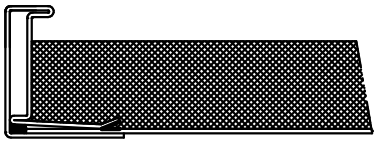
### Double-wall thermal insulation

Mineral wool with sheet metal shell



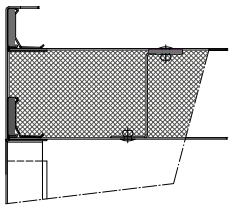
| Insulation thickness [mm] | Weight kg/m² | U-value W/m²C |
|---|---|---|
| 50 | | 0.9 |
| up to EL 1000<br>> EL 1000 | 16<br>19 | |
| 100 | | 0.45 |
| up to EL 1000<br>> EL 1000 | 17.5<br>20.5 | |

### Exterior thermal insulation (self-adhesive cellular rubber)



Insulated components for outdoor assembly, cold insulation or special applications on request

### Acoustic insulation Mineral wool with perforated sheet metal shell



| Insulation thickness [mm] | Weight kg/m² |
|---|---|
| 50 | |
| up to EL 1000<br>> EL 1000 | 12.5<br>14 |
| 100 | |
| up to EL 1000<br>> EL 1000 | 15<br>16.5 |

# Smoke extraction – XDuct® smoke extraction ducting

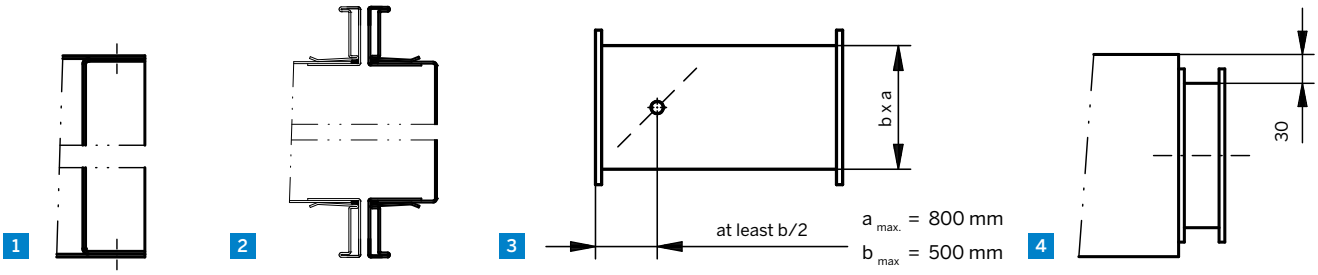
XDuct® is a smoke extraction ducting system made of galvanised sheet steel with the general approval certificate P-TUM-428, tested at the research and test laboratory of the Institute for Air Conditioning and Building Services of the Technical University of Munich. The test took place with 1500 Pa negative pressure at room temperature and 500 Pa negative pressure at 600 °C over a period of 120 minutes as required by DIN 18232-6 and DIN EN 1366-8.

The smoke extraction ducting is a complete system of ducts and fittings made of folded galvanized sheet steel, and complies with Building Code A part 2 no. 2.36. The tested system has a much reduced pressure drop, less risk of transit damage, and is more lightweight and therefore easier to install than other solutions made of calcium silicate plates. The ducts and fittings are made of 1 mm galvanised sheet steel with additional reinforcements and a 30 mm lightweight section frame.

Smoke extraction ducting up to a cross section of W x H = 1250 x 1000 mm is used. The installation material required for the XDuct® system (wall anchors, duct crossbeams, duct tape, putty) is also subject to certification for fire safety and is also supplied on request.

XDuct® smoke extraction ducting with general approval certificate P-TUM-428 with Ü and CE label.

# Duct accessories




1 | Pre-fitted duct base
2 | Separate duct base
3 | Duct with damper
(Damper adjuster with setting mark)
4 | Duct base with rectangular or round connector

## OVAL INSPECTION PANEL WITH 2 STAR KNOBS

| Nominal size | Dimensions | | | | |
|---|---|---|---|---|---|
| **Type** | | **RD** | **RD-SKK** | **RD-HT** | **IRD** |
| Tightness class<br>Range of application | | B<br>-70 °C/+70 °C | C<br>-70 °C/+100 °C | up to 400 °C | up to l thickness 50 mm |
| 21<br>32<br>43<br>54<br>65 | 200 x 100<br>300 x 200<br>400 x 300<br>500 x 400<br>600 x 500 | All listed types and dimensions are available in the following materials:<br>galvanised steel, corrosion-resistant steel (V2A and V4A), aluminium | | | |

RD = Inspection panel
RD-SKK = Inspection panel with self-adhesive edge guard
RD-HT = Inspection panel for high temperatures
IRD = Insulated inspection panel

| | |
|---|---|
| **Drain outlets** | 1/2 "<br>3/4 "<br>1.0 "<br>1 1/2 " |
| **Angle frame for equipment connection**<br>**Hole spacing 125 mm or special hole spacing** | 30 x 30 x 3<br>40 x 40 x 4<br>50 x 50 x 5 |
| **Installation material** | Hex bolts M 8 x 25<br>Hex nuts M 8<br>Washers DN 9<br>Duct clamps<br>C clamp (100 mm long)<br>Self-adhesive installation tape (only for tightness class A)<br>Butyl rubber sealing putty (for tightness class B, C, D) |

Other accessories are available on request.

# Tender specification texts

## FOLDED GALVANISED STEEL DUCTS AND FITTINGS

Folded galvanised steel ducts and fittings as per DIN EN 1505, DIN EN 1507 and VDI 3803

**Pressure rating L (low pressure); +1000/-500 Pa**

Pressure rating M (medium pressure); +2000/-750 Pa

Sheet thickness depending on the above pressure rating

Components suitable for assembly ducting in

tightness class B as per DIN EN 1507
BLKS B-Duct ducting system or
**Tightness class C as per DIN EN 1507**
**BLKS C+Duct ducting system**

Duct flange joint with 4-hole corner fixing, mainly with touching duct profile.

The additional seal on the seams and corners must be permanently elastic, water-insoluble, chemical-resistant and silicon-free.

Duct walls reinforced with BLKS trapezoidal corrugated profile, with optimum pipe friction coefficients.

Additional (internal) reinforcements for optimised acoustic properties depend on the operating pressure, sheet thickness and component dimensions according to the factory standard.

### Additional requirements (as necessary)

To ensure that the ducting is clean as per DIN EN 12097 or VDI 6022

**Basic level:**
**Delivery without packing or transport protection, assembly with only rising ducts sealed**

**Medium level:**
Delivery without packaging or transport protection, protection during storage, cleaning before assembly, openings sealed

**Higher level:**
Delivery with packaging and transport protection (e.g. ends closed), protection during storage, cleaning before assembly, openings sealed

## KITCHEN EXHAUST AIR DUCTING

(Text as above) The additional seal on the seams and corners must be permanently elastic, water-insoluble, chemical-resistant and silicon-free.

All components must be coated on the outside and/or inside with chemically resistant paint,
RAL colour .....

## DUCTING FOR SWIMMING BATHS

(Text as above) The additional seal on the seams and corners must be permanently elastic, water-insoluble, chemical-resistant and silicon-free.

All components must be coated on the outside and/or inside with chemically resistant paint,
RAL colour .....

# Tender specification texts

## FOLDED STAINLESS STEEL DUCTS AND FITTINGS (1.4301 OR 1.4571)

Folded stainless steel ducts and fittings 1.4301 (1.4571)

**Pressure rating L (low pressure); +1000/-500 Pa**

Pressure rating M (medium pressure); +2000/-750 Pa

Sheet thickness min. 0.8 mm; max. 1.0 mm

Components suitable for assembling ducting

In tightness class B according to DIN EN 1507
BLKS BDuct ducting system or

**Tightness class C according to DIN EN 1507**
**BLKS C+Duct ducting system**

Duct flange joint with 4-hole corner fixing, with attached duct profile

The additional seal on the seams and corners must be permanently elastic, water-insoluble, chemical-resistant and silicon-free.

Duct walls reinforced with BLKS trapezoidal corrugated profile, with optimum pipe friction coefficients.

Additional (internal) reinforcements for optimised acoustic properties depend on the operating pressure, sheet thickness and component dimensions according to the factory standard.

### Additional requirements (as necessary)

To ensure that the ducting is clean as per DIN EN 12097 or VDI 6022

**Basic level:**
**Delivery without packaging or transport protection, assembly with only rising ducts sealed**

**Medium level:**
Delivery without packaging or transport protection, protection during storage, cleaning before assembly, openings sealed

**Higher level:**
Delivery with packaging and transport protection
(e.g. ends closed)

Protection during storage, cleaning before assembly, openings sealed

## KITCHEN EXHAUST AIR DUCTING

(Text as above) The additional seal on the seams and corners must be permanently elastic, water-insoluble, fatty-acid-resistant, aerosol-tight and silicon-free.

## INDUSTRIAL FOLDED GALVANISED STEEL DUCTS AND FITTINGS

Folded galvanised steel ducts and fittings

Pressure rating $H^R$ (high pressure restricted); +3000/-1500 Pa

Sheet thickness min. 1.0 mm; max. 1.2 mm

Components suitable for assembling ducting

**In tightness class B according to DIN EN 1507**
**BLKS BDuct ducting system**

Duct flange joint with 4-hole corner fixing, with attached duct profile

The additional seal on the seams and corners must be permanently elastic, water-insoluble, chemical-resistant and silicon-free.

Duct walls reinforced with BLKS trapezoidal corrugated profile, with optimum pipe friction coefficients.

Additional (internal) reinforcements for optimised acoustic properties depend on the operating pressure, sheet thickness and component dimensions according to the factory standard.

### Additional requirements (as necessary)

To ensure that the ducting is clean as per DIN EN 12097 or VDI 6022

**Basic level:**
**Delivery without packing or transport protection, assembly with only rising ducts sealed**

**Medium level:**
Delivery without packaging or transport protection, protection during storage, cleaning before assembly, openings sealed

**Higher level:**
Delivery with packaging and transport protection (e.g. ends closed), protection during storage, cleaning before assembly, openings sealed

# Tender specification texts

## WELDED DUCTS AND FITTINGS

Welded ducts and fittings as per DIN EN 1505, DIN EN 1507 and VDI 3803 made of

galvanised steel with cold galvanised welds

Stainless steel 1.4301 (1.4571), brushed welds

Aluminium AlMg3

Welds may not be ground

**Pressure rating H (high pressure); +6000/-2500 Pa**

Sheet thickness appropriate for the above pressure rating and component cross sections (see BLKS documentation), but at least 1.5 mm

Components suitable for assembly ducting in

**Tightness class D according to DIN EN 1507**
**BLKS DDuct ducting system**

Duct flange connections W1, W2, WA, F2 with 125 mm hole spacing as standard or special hole spacing.

External duct wall reinforcement depending on pressures stated in factory standard

## Additional requirements (as necessary)

All components must be coated on the outside and/or inside with chemically resistant paint, RAL colour ....., coating thickness ..... µm

To ensure that the **ducting is clean** as per DIN EN 12097 or VDI 6022

**Basic level:**
**Delivery without packing or transport protection, assembly with only rising ducts sealed**

**Medium level:**
Delivery without packaging or transport protection, protection during storage, cleaning before assembly, openings sealed

**Higher level:**
Delivery with packaging and transport protection (e.g. ends closed), protection during storage, cleaning before assembly, openings sealed

# Assembly information

## FOR DUCTING REQUIRING TIGHTNESS CLASS C ACCORDING TO DIN EN 1507

Several factors determine whether the tightness class can be ensured. The fundamental requirement is that the components are carefully manufactured. The order must state which tightness class is needed. Assembly on site is equally important in this respect.

As the manufacturer, we would like to provide you with the necessary information.

### Unloading and transporting components

Visually check all components for external damage.

Check that tightness class C is correctly shown on the labels.

Unload the components with care to avoid any damage.

Use suitable equipment to transport the components (do not pull on the frame joint).

Store them in a proper manner on the site.

### Assembly

Visually check the components again for external damage.

Make sure that the frame joint is clean.

Attach the duct tape flush with the inside edge of the duct profile.

Attach the duct tape crosswise in the corner area of the profile.

Make sure the bolt connections on the corners are tight.

Use duct brackets for edge lengths above 400 mm, with a maximum spacing of 200 mm.

About 2 days later, check that the bolt connections on the frame are tight (duct tape has settled).

Only use mating parts with the specially supplied frames (with internal sealant).

Fasten the frame using tightly closing blind rivets, so that it is positively seated on the component (do not use self-tapping screws).

Afterwards, seal the corner area of the profile frame on the inside.

Do not fasten any additional attachments with self-tapping screws (only blind rivets).

Seal attachments afterwards using a suitable sealant (compliant with VDI 6022).

Flexible connectors, louvres, silencers etc. must be shown to meet the requirements of tightness class C.

### Leakage tests

On-site leakage tests in accordance with DIN EN 12599 are offered by external, independent contractors.

The tests should already be defined at the planning stage and carried out during the assembly stage. See the information sheet “Measuring leaktightness on ducting systems” (www.BerlinerLuft.de/de/luftfuehrung)