# Climate Recovery Duct System
# Technical Specifications

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# Welcome to Climate Recovery



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# Climate Recovery (CR) Duct System

## Overview

The CR Duct System offers a complete, pre-insulated ductwork system for heating, ventilation and air-conditioning.

CR Ducts and CR Bends consist mainly of glass, sand, and soda. CR Ducts and CR Bends both possess patented aluminum CR Foil on inner and outer surfaces, which provides a condensation barrier.

CR Ducts are standardly mounted round but, through use of the CR Transformer, can be made rectangular when necessary.

## Applications

The CR Duct System can only be used for indoor installations.

CR products are not to be used for kitchen exhaust.

Local rules and regulations are to be recognized when installing any CR products.

| ENJOY WORK | Lightweight | Adaptability | Round/ rectangular | Pre-insulation | Noise reduction |
|---|---|---|---|---|---|
| CREATE BUSINESS | | | | | |
| Labor savings | ✓ | ✓ | ✓ | ✓ | ✓ |
| Material savings | | ✓ | ✓ | | ✓ |
| Product offering expansion | ✓ | | | ✓ | |
| Installation quality | | | | ✓ | |
| Better brand image | | | | | |
| Planning facilitation | | | ✓ | | ✓ |
| Lifecycle costs | | | ✓ | | |

# Climate Recovery (CR) Duct System

| CE-test certifications & working conditions | | | |
|---|---|---|---|
| **Tightness** | Class D | | EN 1507:2006 |
| **Fire Classification** | A2-s1,d0<br>Unburnable | | EN 13501-1:2007+A1:2009 |
| **Pressure** | | | EN 13403:2003 |
| Max Under | -400 Pa | Shock waves | -1000 Pa |
| Max Over | +1000 Pa | Shock waves | +2500 Pa |
| **Heat Transfer (λ)** | ≈ 0.035W/mK | | |
| **Temperature** | | | |
| Minimum | -40° C | Maximum | +60° C |

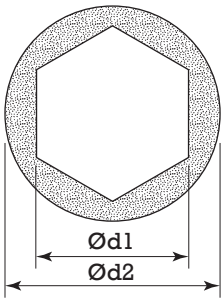
## Certifications

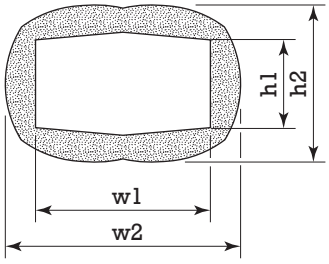
The CR Duct System has been certified through RISE, the Swedish governing body for CE certification and accreditation.

European Technical Assessment (ETA) 17/1007 was issued on the basis of EAD 360001-00-0803.

| Sustainable materials | $CO_2$ reduction | Self-supporting | No vibrations | No heat transfer | Reopening | Standard dimensions |
|---|---|---|---|---|---|---|
| | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | | ✓ | ✓ | ✓ | |
| ✓ | | | | | ✓ | ✓ |
| | | ✓ | | | | ✓ |
| ✓ | ✓ | | | ✓ | | |
| ✓ | | | ✓ | ✓ | ✓ | ✓ |
| | | ✓ | | | ✓ | |

# CR Duct




CR Ducts are made of compressed glass wool with inner & outer surfaces covered by a layer of CR Foil.

All CR Ducts are shipped 235 cm long.

All CR Ducts are shipped vacuum packed.

Average insulation thickness ≈ 30mm.

Water vapor resistance > 140m²h Pa/mg

## Round

| Ød1* mm | l mm | Ød2 mm | kg/ m |
|---|---|---|---|
| 125 | 2.35 | 195 | 0,98 |
| 160 | 2.35 | 230 | 1,19 |
| 200 | 2.35 | 270 | 1,49 |
| 250 | 2.35 | 320 | 1,83 |
| 315 | 2.35 | 385 | 2,21 |

## Rectangular

| Ød1 mm | w1 mm | h1 mm | w2 mm | h2 mm |
|---|---|---|---|---|
| 125 | 140 | 75 | 200 | 135 |
| 160 | 188 | 94 | 258 | 166 |
| 200 | 220 | 115 | 280 | 175 |
| 250 | 283 | 141 | 358 | 221 |
| 315 | 340 | 175 | 400 | 225 |

*True inner Diameter ≈10–20 mm larger than Ød1



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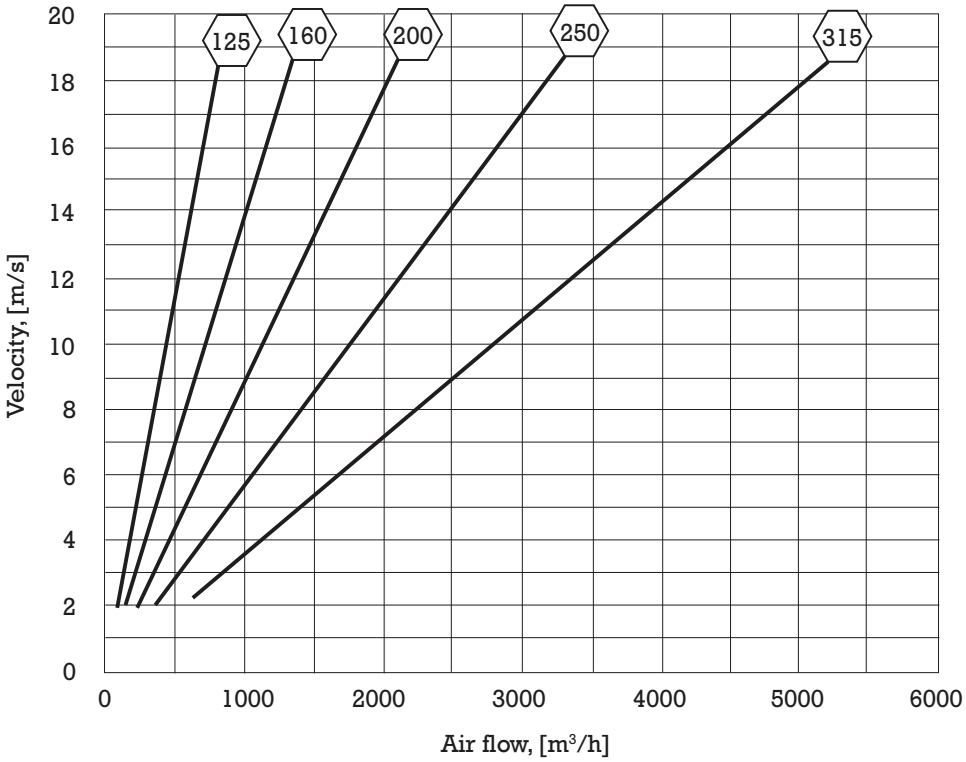
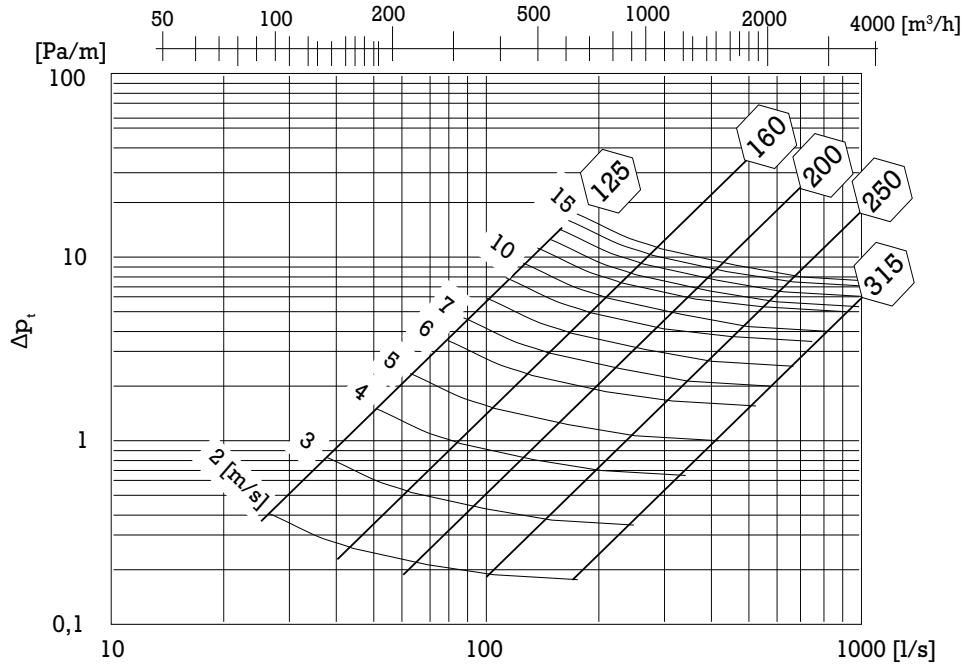
# CR Duct – Pressure loss




Changes may be made without notice

# CR Duct – Sound

| CR Duct Sound Reduction, $L_w$ room – $L_w$ duct | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Octave band, Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| CR 125, 2.35 m | 22 | 30 | 33 | 37 | 40 | 47 | 55 | 60 |
| CR 160, 2.35 m | 21 | 29 | 32 | 36 | 39 | 46 | 54 | 59 |
| CR 200, 2.35 m | 20 | 28 | 31 | 35 | 38 | 45 | 53 | 58 |
| CR 250, 2.35 m | 19 | 27 | 30 | 34 | 37 | 44 | 52 | 57 |
| CR 315, 2.35 m | 18 | 26 | 29 | 33 | 36 | 43 | 51 | 56 |

| Damping in a CR Duct – 2.35 m | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Octave band, Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| CR 125, 2.35 m | 5 | 4 | 6 | 20 | 43 | 31 | 16 | 8 |
| CR 160, 2.35 m | 5 | 5 | 8 | 36 | 48 | 25 | 15 | 8 |
| CR 200, 2.35 m | 4 | 3 | 8 | 36 | 41 | 20 | 10 | 7 |
| CR 250, 2.35 m | 3 | 4 | 10 | 28 | 39 | 20 | 12 | 7 |
| CR 315, 2.35 m | 2 | 9 | 15 | 29 | 35 | 19 | 11 | 6 |

# CR Duct - Insulation

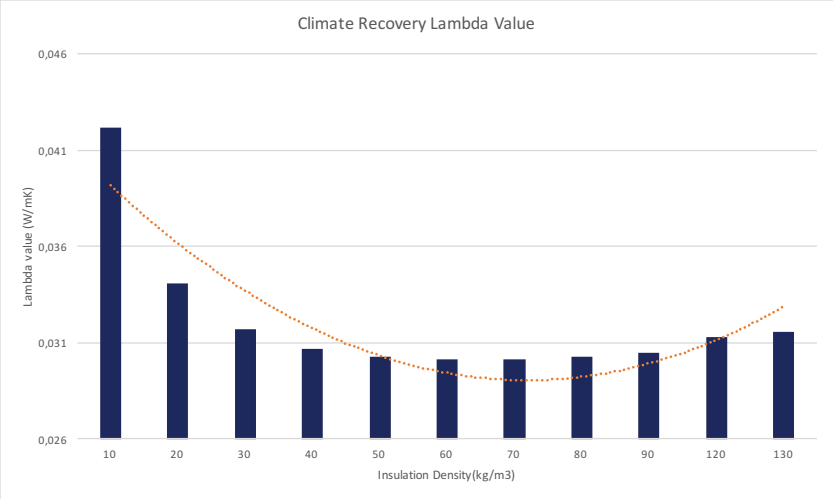
## How CR's increased density affects minimum requirements

The goal is to clarify the CR Duct insulation value against an insulated steel duct.

Steel possesses a high thermal conductivity and releases all heat, so the temperature drop across the duct walls is minimal. Heat transfer on the inside of the duct, either of steel or aluminum, similar to CR, minimally affects the total heat transfer. The heat transfer on the outside of the insulation is even less affected; roughly 80% of the value is impacted by insulation quality, its density and how it is applied.

**The real difference is that CR offers a truly high quality insulation with no cold bridging and an effective vapor barrier (>140m³h Pa/mg) on both inside and outside of the duct. The insulation itself should not come in contact with air on the inside or outside of the duct, otherwise there is the potential for condensation.**

Climate Recovery allowed an outside institute to research the connection between insulation values and density utilized in CR Products.




Results show that the λ-value at 10kg/m³ ≈ 0,040W/mK and drops to slightly below 0,030 at 70kg/m³. After this, the l-value increases as density increases. In CR Products, density ranges from 60 to 80 kg/m³, thus in the most favorable insulation conditions.
The density of insulation that is placed on ventilation ducts today is much lower. It would be extremely difficult to handle an insulation blanket of a comparable density to CR.



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# CR Duct - Insulation - 0,045 W/mK

DIN 1946 part 6 stipulates the minimal insulation thickness that is accepted in comparison to the difference in temperature between air inside and outside the duct.

This norm writes that the recommended insulation thickness is based on λ-value = 0,045 W/mK.

| Type and temperature of air inside ductwork | | Ambient air temperature and insulation thickness λ = 0,045 W/mK | | | | | |
|---|---|---|---|---|---|---|---|
| | | Outside thermal shell, inside building | | | | inside thermal shell | |
| | | < 10°C (inner roof) | | < 18°C (cellar) | | ≥ 18°C | |
| | | minimum mm | improved mm | minimum mm | improved mm | minimum mm | improved mm |
| Fresh Air T | | 25 | 25 | 40 | 40 | 60 | 60 |
| Supply T | without heat recovery | 25 | 25 | 40 | 40 | 60 | 60 |
| Supply T ≤ 20°C | with heat recovery | 25 | 40 | 10 | 25 | 0 | 0 |
| Supply T ≥ 20°C | with return heat pump | 40 | 80 | 25 | 40 | 10 | 25 |
| Supply T ≥ 40°C | heating | 60 | 80 | 40 | 60 | 25 | 40 |
| Return / Exhaust | without heat recovery | 40 | 40 | 25 | 25 | 0 | 0 |
| Exhaust | with heat recovery a/o return heat pump | 20 | 20 | 30 | 30 | 25 | 40 |

To be on the safe side, CR has calculated a λ-value at 0,03235 W/mK.



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# CR Duct - Insulation - 0,03235 W/mK

The suggested minimum insulation thickness should therefore be:

| Type and temperature of air inside ductwork | | Ambient air temperature and insulation thickness λ = 0,045 W/mK | | | | | |
|---|---|---|---|---|---|---|---|
| | | Outside thermal shell, inside building | | | | inside thermal shell | |
| | | < 10°C (inner roof) | | < 18°C (cellar) | | ≥ 18°C | |
| | | minimum mm | improved mm | minimum mm | improved mm | minimum mm | improved mm |
| Fresh Air T | | **18,1** | **18,1** | **28,9** | **28,9** | 43,3 | 43,3 |
| Supply T | without heat recovery | **18,1** | **18,1** | **28,9** | **28,9** | 43,3 | 43,3 |
| Supply T ≤ 20°C | with heat recovery | **18,1** | **28,9** | **7,2** | **18,1** | **0,0** | **0,0** |
| Supply T ≥ 20°C | with return heat pump | **28,9** | 57,8 | **18,1** | **28,9** | **7,2** | **18,1** |
| Supply T ≥ 40°C | heating | 43,3 | 57,8 | **28,9** | 43,3 | **18,1** | **28,9** |
| Return / Exhaust | without heat recovery | **28,9** | **28,9** | **18,1** | **18,1** | **0,0** | **0,0** |
| Exhaust | with heat recovery a/o return heat pump | **14,4** | **14,4** | **21,7** | **21,7** | **18,1** | **28,9** |

For example, the minimum requirement is achieved in all cases, save for when outside air is introduced directly to room temperature areas and with supply air temperatures above 40°C. In order to achieve the higher demands, only 30 mm of normal insulation is required.

**The end result is that the CR Duct System significantly simplifies and secures the necessary insulation quality.**



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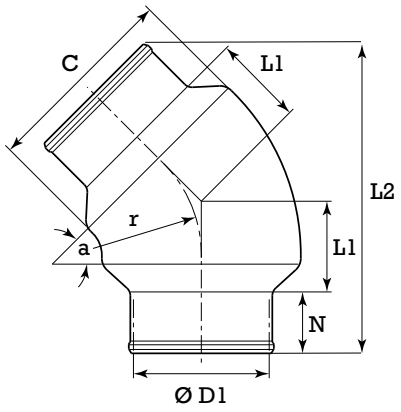
# CR Bend 45°




r ≈ ØD1

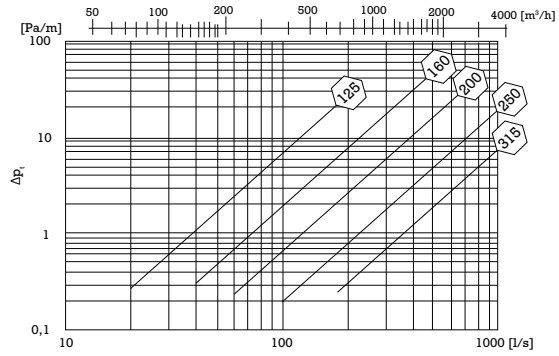
CR Bends are made of compressed glass wool with inner & outer surfaces covered by a layer of CR Foil.

Average insulation thickness ≈ 30mm.

Standard circular sheet metal nipples fit inside neck of CR Bends.

Water vapor resistance > 140m²h Pa/mg

CR 45° bend




| ØD1 mm | C mm | L1 mm |
|---|---|---|
| 125 | 192 | 84 |
| 160 | 233 | 98 |
| 200 | 267 | 115 |
| 250 | 317 | 136 |
| 315 | 382 | 163 |

| ØD1 mm | L2 mm | N mm | kg/ piece |
|---|---|---|---|
| 125 | 298 | 63 | 0.43 |
| 160 | 353 | 73 | 0.60 |
| 200 | 412 | 83 | 0.90 |
| 250 | 482 | 93 | 1.10 |
| 315 | 568 | 103 | 1.32 |

| Damping in a CR 45° Bend | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Octave band, Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| CR 125, Bend 45° | 0 | 2 | 1 | 1 | 2 | 4 | 4 | 3 |
| CR 160, Bend 45° | 1 | 1 | 0 | 0 | 1 | 3 | 3 | 3 |
| CR 200, Bend 45° | 1 | 2 | 2 | 2 | 3 | 5 | 5 | 2 |
| CR 250, Bend 45° | 0 | 1 | 1 | 1 | 4 | 5 | 4 | 2 |
| CR 315, Bend 45° | 1 | 1 | 2 | 4 | 6 | 6 | 3 | 2 |

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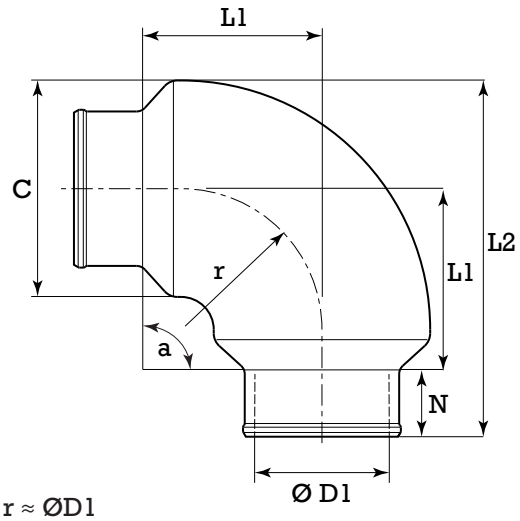
# CR Bend

# 90°



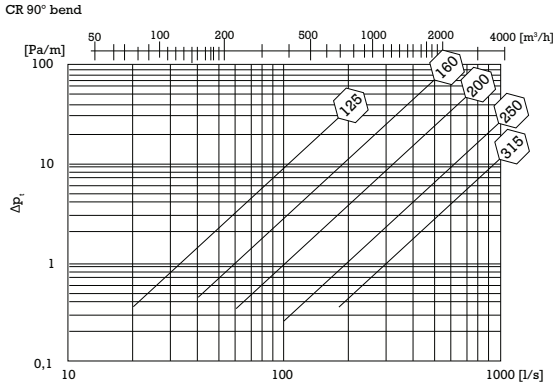

r ≈ ØD1

CR Bends are made of compressed glass wool with inner & outer surfaces covered by a layer of CR Foil.

Average insulation thickness ≈ 30mm.

Standard circular sheet metal nipples fit inside neck of CR Bends.

Water vapor resistance > 140m²h Pa/mg




| ØD1 mm | C mm | L1 mm |
|---|---|---|
| 125 | 192 | 157 |
| 160 | 233 | 192 |
| 200 | 267 | 232 |
| 250 | 317 | 282 |
| 315 | 382 | 347 |

| ØD1 mm | L2 mm | N mm | kg/ piece |
|---|---|---|---|
| 125 | 306 | 63 | 0.54 |
| 160 | 381 | 73 | 0.90 |
| 200 | 449 | 83 | 1.50 |
| 250 | 534 | 93 | 1.90 |
| 315 | 641 | 103 | 2.20 |

| Damping in a CR 90° Bend | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Octavband, Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| CR 125, Bend 90° | 1 | 1 | 1 | 2 | 3 | 9 | 7 | 3 |
| CR 160, Bend 90° | 1 | 1 | 1 | 1 | 3 | 7 | 7 | 3 |
| CR 200, Bend 90° | 1 | 0 | 1 | 2 | 5 | 7 | 7 | 3 |
| CR 250, Bend 90° | 1 | 0 | 2 | 5 | 9 | 9 | 5 | 2 |
| CR 315, Bend 90° | 0 | 0 | 2 | 5 | 10 | 11 | 5 | 2 |

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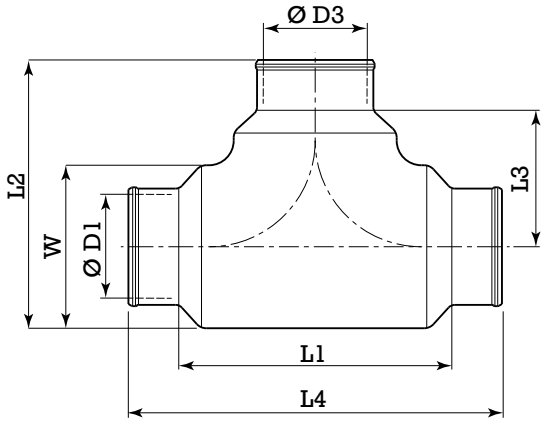
Changes may be made without notice

# CR T-piece




CR T-pieces are made of compressed glass wool with inner & outer surfaces covered by a layer of CR Foil.

Average insulation thickness ≈ 30mm.

The standard circular nipple fits inside the neck of the CR T-piece.

Water vapor resistance > 140m²h Pa/mg

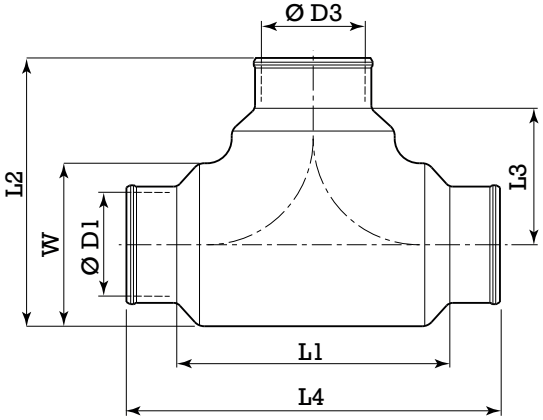
| Damping in CR T-Piece – Straight flow | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Octave band, Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| CR 125/125 T | 1 | 0 | 1 | 0 | 1 | 2 | 4 | 4 |
| CR 160/160 T | 0 | 2 | 2 | 2 | 3 | 5 | 6 | 4 |
| CR 200/200 T | -1 | 1 | 2 | 1 | 2 | 7 | 5 | 6 |
| CR 250/250 T | 0 | 2 | 2 | 1 | 3 | 6 | 6 | 3 |
| CR 315/315 T | 0 | 1 | 1 | 2 | 4 | 9 | 7 | 3 |

| Damping in CR T-Piece – Branch flow | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Octave band, Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| CR 125/125 T | 3 | 3 | 2 | 1 | 1 | 7 | 8 | 6 |
| CR 160/160 T | 2 | 2 | 2 | 2 | 4 | 6 | 10 | 6 |
| CR 200/200 T | 1 | 2 | 2 | 1 | 6 | 8 | 9 | 5 |
| CR 250/250 T | 0 | 2 | 1 | 1 | 4 | 8 | 8 | 5 |
| CR 315/315 T | -1 | 1 | 1 | 3 | 5 | 9 | 8 | 4 |

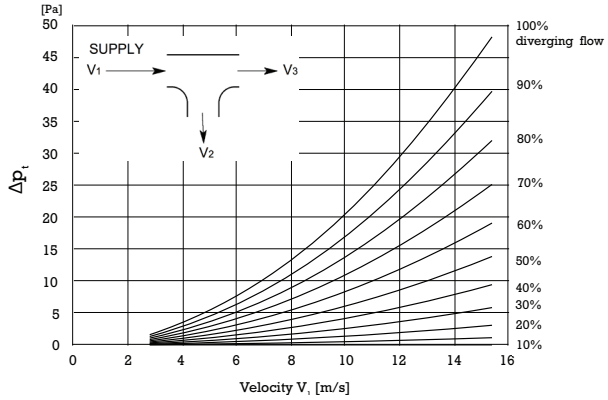
| ØD1 | ØD3 | L1 | L3 | L2 |
|---|---|---|---|---|
| mm | m | mm | mm | mm |
| 125 | 125 | 314 | 157 | 318 |
| 160 | 160 | 384 | 192 | 380 |
| 200 | 125 | 464 | 184 | 381 |
| 200 | 200 | 464 | 232 | 449 |
| 250 | 250 | 564 | 282 | 536 |
| 315 | 125 | 694 | 242 | 496 |
| 315 | 200 | 694 | 280 | 554 |
| 315 | 315 | 694 | 347 | 641 |

| ØD1 | ØD3 | L4 | W | kg/ |
|---|---|---|---|---|
| mm | m | mm | mm | piece |
| 125 | 125 | 440 | 192 | 0.80 |
| 160 | 160 | 530 | 233 | 1.20 |
| 200 | 125 | 630 | 267 | 1.64 |
| 200 | 200 | 630 | 267 | 1.80 |
| 250 | 250 | 750 | 317 | 2.40 |
| 315 | 125 | 900 | 382 | 3.67 |
| 315 | 200 | 900 | 382 | 3.83 |
| 315 | 315 | 900 | 382 | 4.10 |

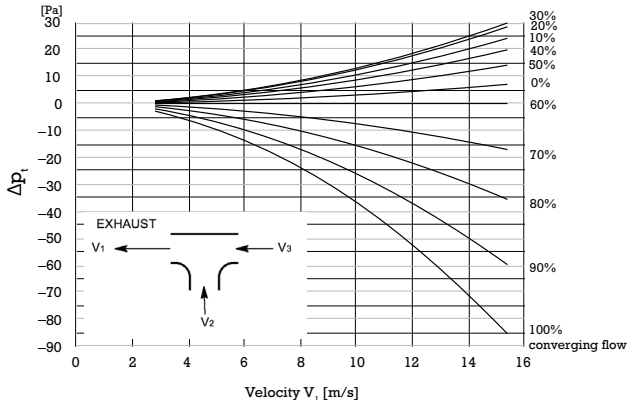
# CR T-piece – pressure loss



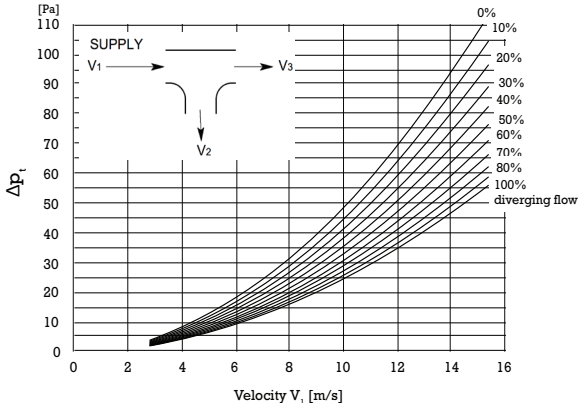

Diverging flow, $V_1$-$V_3$



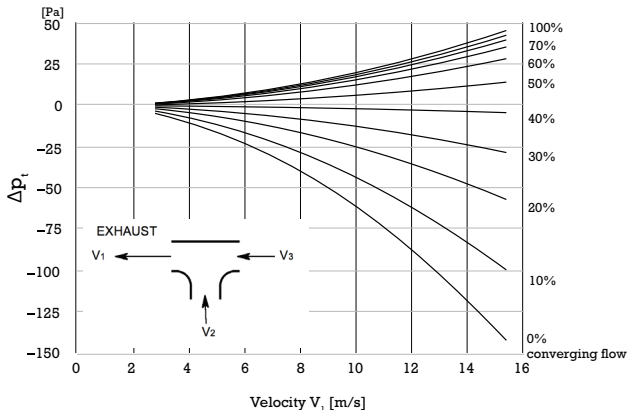

Converging flow, $V_3$-$V_1$




Diverging flow, $V_1$-$V_2$




Converging flow, $V_2$-$V_1$

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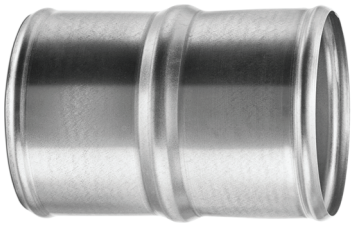
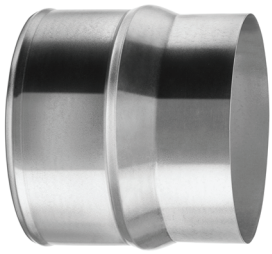
# CR Nipple



CR Nipples connect two CR Ducts together.

Made of galvanized sheet metal.

# CR Adapter



CR Adapters connect products with standard circular nipple dimensions to the corresponding CR Duct sizes.

Made of galvanized sheet metal.

# CR Sleeve

CR Sleeves cover the ends of CR Ducts when joints are created.

Made of polyurethane mixture, including flame retardant.

# CR Clamp

CR Clamps tighten CR Ducts around joints created.

Made of stainless steel.

Utilize hex bit, size 8.

Changes may be made without notice

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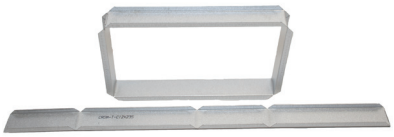
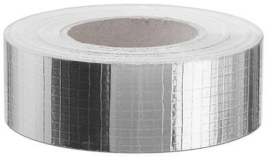
# CR Transformer



CR Transformers are placed around CR Ducts when installations require rectangular dimensions.

Made of .7mm plate steel, coated with aluzinc.

# CR Tape



CR Tape is non-reversible.

Made of aluminum foil with tightening glue.

Width: 50mm
100mm

Changes may be made without notice

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# Proper Hanging

## Attachment to the structure

This should be done in accordance with building specifications per standard EN 12236 protocols. When mounting the CR Duct System to the fixed building structure, M8 steel threaded rod should be used. CR-CM8 has a click function that allow attachment by directly pressing M8 rods into the fixture. CRM8 must be screwed onto the fixture.

## Hanging support

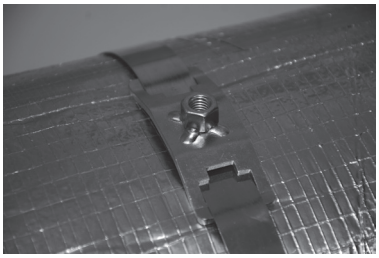
CR Straps should be drawn through the openings of CR-CM8 or CRM8 fixtures. The flat end of the strap is then wrapped around the exterior of the CR Duct, then through the fixed end and secured by the ridged bindings. Leaving a loose binding before hanging will allow easier adjustments made to the placement of M8 fixtures along the duct surface.

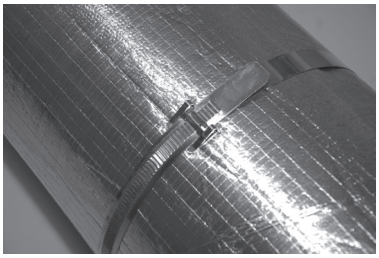
**CR strap**

**CR-CM8**

**CRM8**

**CR Hanger**



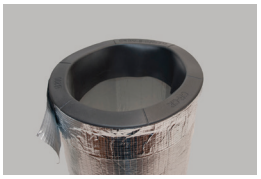


## Hanger spacing

Hanging support of the CR Duct System should be maintained at a minimum of every 2.3 meters of duct length and within 10 cm of any joint.
If CR products are installed vertically, the support must be placed a minimum of 50 cm from joint connections, with further support spaced at a minimum of every 2.5 meters.
When combining the CR Duct System with sheet metal ductwork, support should be placed within 10 cm of joints and every 2 meters.

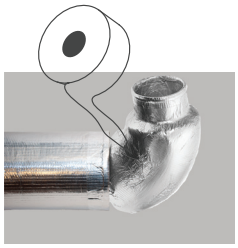
# Installation

CR Sleeve



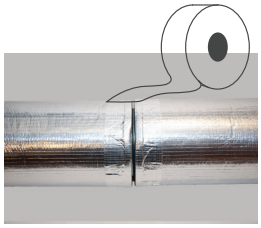
CR Tape

Soap on sleeve and Bend neck

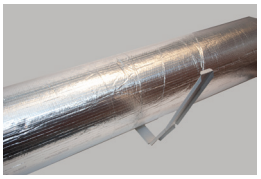


Attach, let dry, tape around

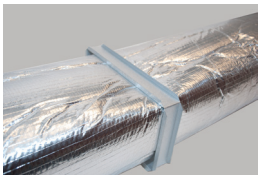
CR Duct-Duct with CR Nipple



CR Tape around



CR Transformer



Rectangular

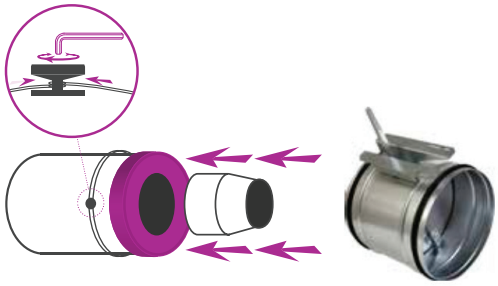
## CR Fittings with standard round duct applications

Standard dimension round nipples fits into the CR Fitting, which allows for connections between normal round sheet metal ducts and the CR Duct System. To secure, place CR Tape around the circumference of the joint, covering the ends of both duct and fitting.

Make sure to use nipples and adapters with rubber sealing. This creates a tight seal and reduces leakage. Using nipples or adapters without rubber sealing can harm the inner foil of CR Fittings, so we advise not to use these.

## CR Duct to sheet metal ducts and accessories

CR Adapter + metal nipple with gasket + sheet metal duct



CR Clamp outside CR kanal with CR Adapter + sheet metal accessory with gasket, e.g. fire damper

Changes may be made without notice

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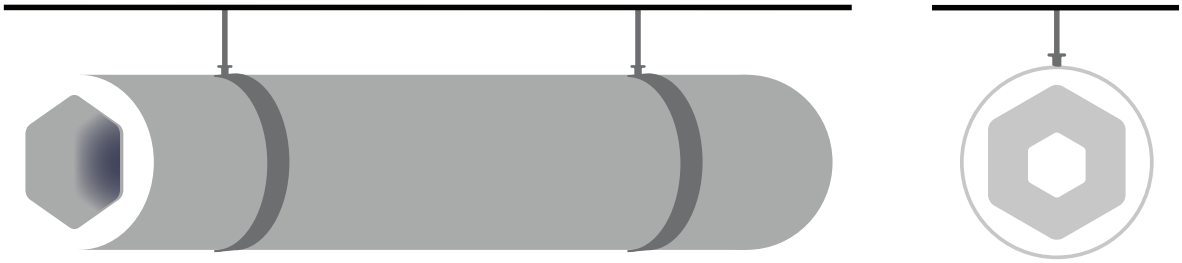
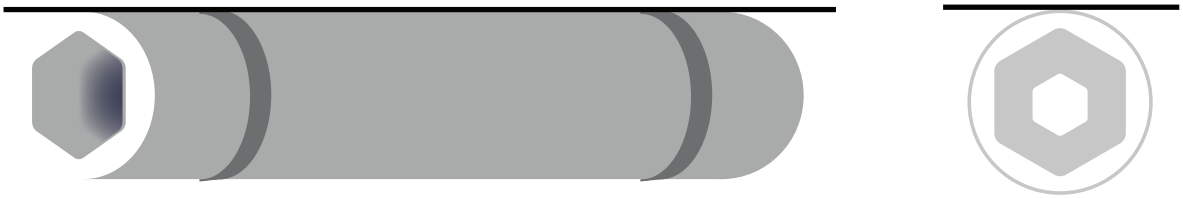
# Build-in Solutions

The fact that CR Ducts can be installed both round and rectangular offers building solutions that have never before been possible at reasonable costs.

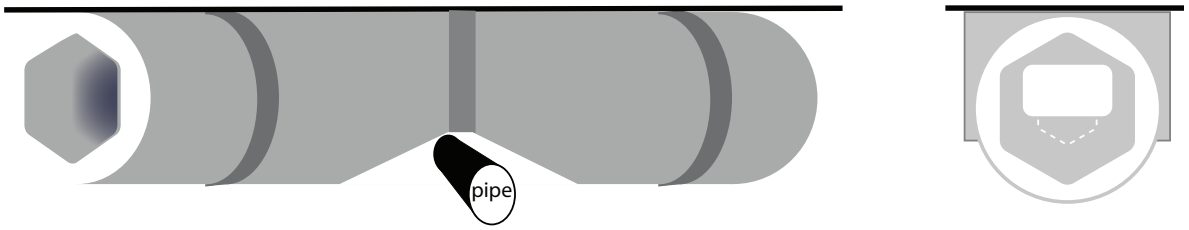
The most natural solution is to mount CR Ducts round and hang them in a standard way.



As CR Ducts don't vibrate or transfer vibrations, it is possible to place directly against the inner ceiling, secured with approved ventilation hanging straps.



Often it is a single obstacle that prevents the opportunity to install larger dimensions of ductwork. CR Ducts can be made rectangular with a CR Transformer to bypass these obstacles and utilize the available space with lower pressure drops and increased air volumes.




This mounting gives a localized pressure drop of 1 Pa.

# Installations

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# Notes

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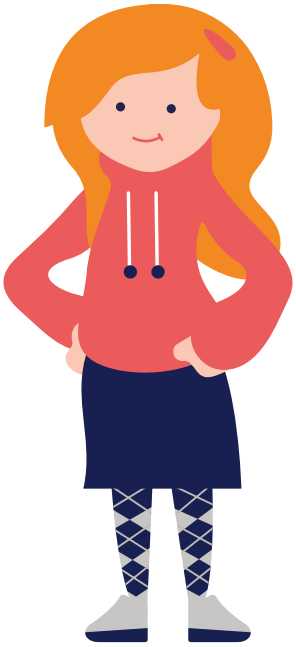

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