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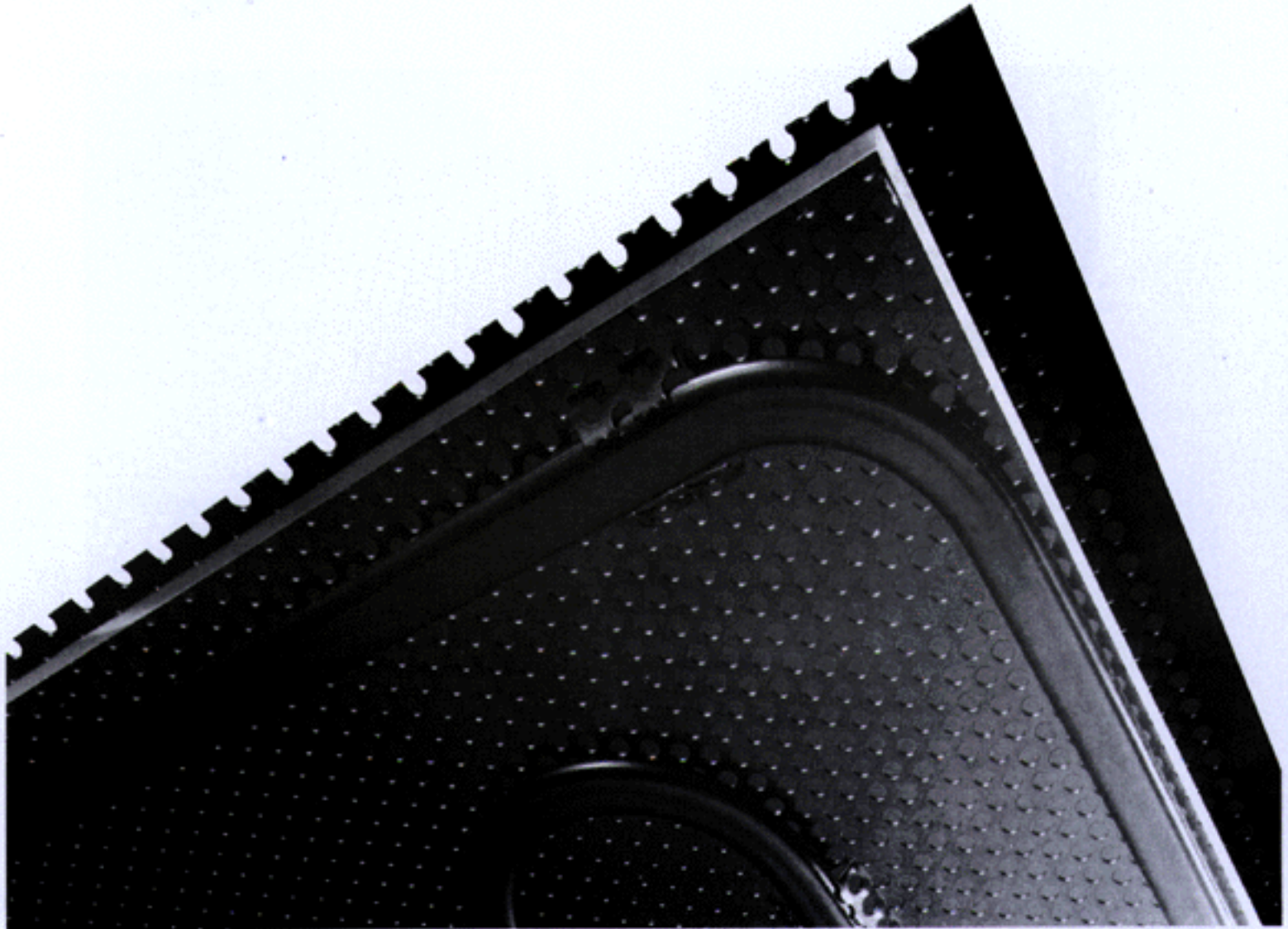
TROX[®] TECHNIK

Product Information
Type WK-D-UM
PI/2/20/B/2

Chilled Ceilings

Type WK-D-UM

Water Cooling System

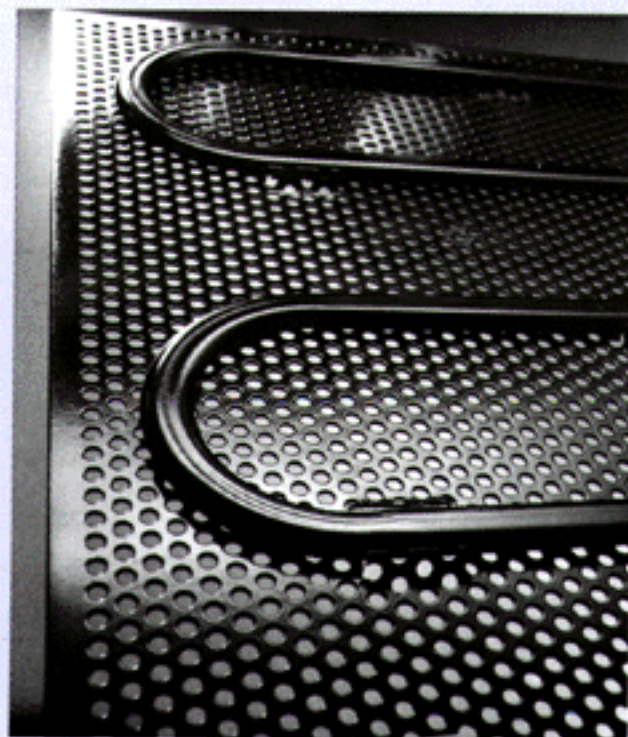
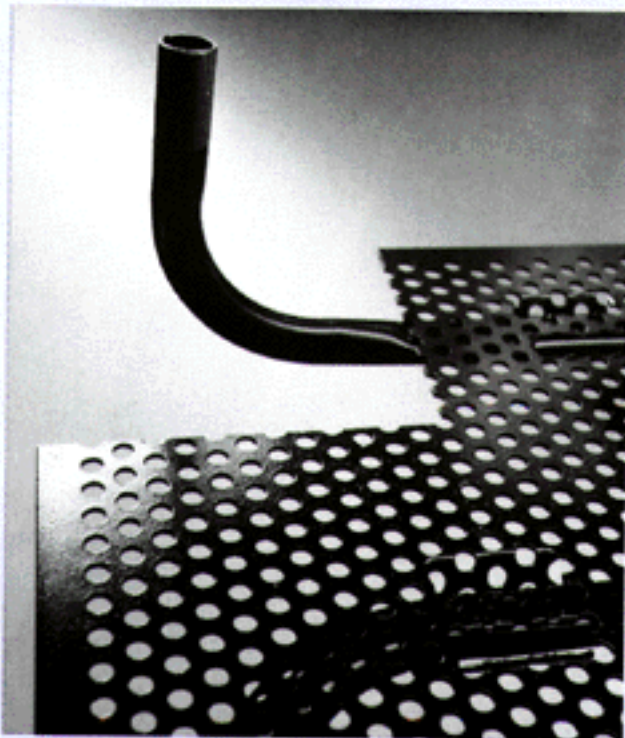


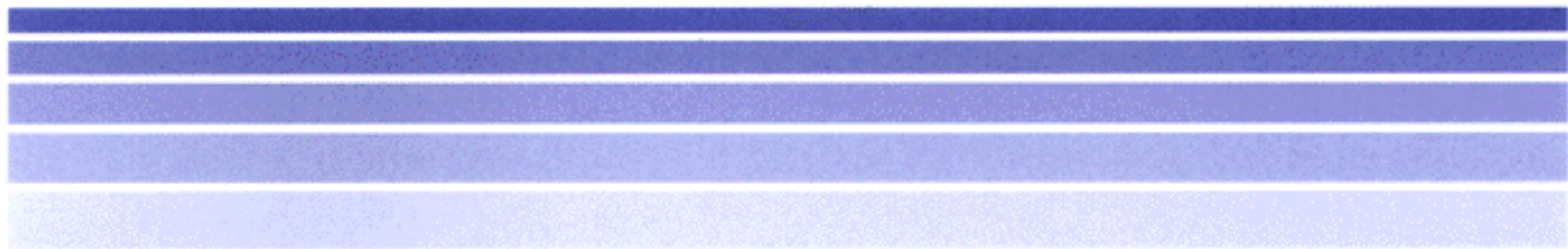
Description

The new cooling elements in the type WK-D-UM are designed for quick, cost-effective assembly and dismantling. This results from the simple lay-in principle enabling the use of standard commercially available ceiling tiles. Additionally, on site installation time is reduced by the use of push fit flexible couplings.

The cooling elements are available for any ceiling tile dimensions.

A carrier plate located above the copper pipes enables a very good radiation exchange to be achieved and therefore a high level of efficiency.



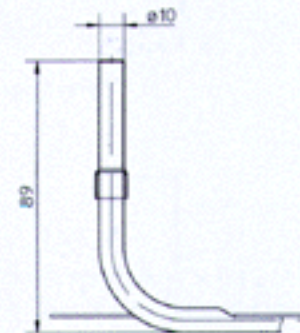
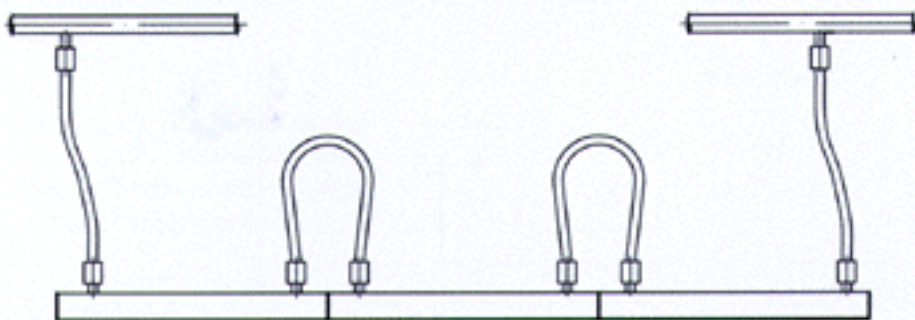


Construction · Dimensions

Typical ceiling tile dimensions

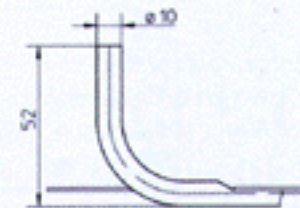
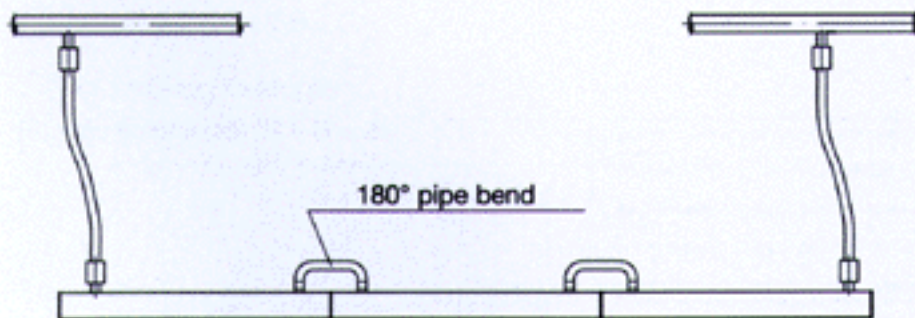
Square	Rectangular		Remarks
500 x 500 mm 600 x 600 mm 625 x 625 mm	Length L 800 ... 1800 mm	Width B 200 ... 649 mm	All intermediate dimensions available; other dimensions on request.

Flexible Connections



Construction with sleeve for flexible connectors

Rigid Connections



Construction with rigid connection

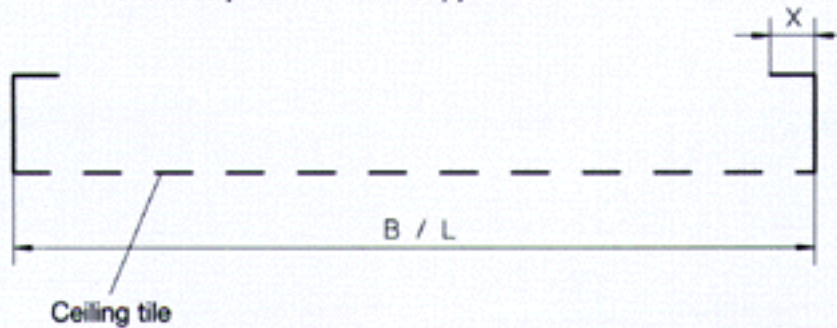
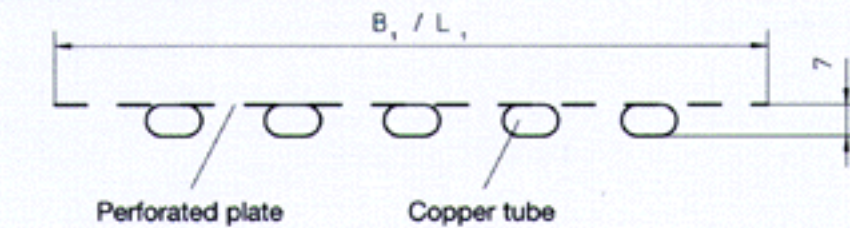
In the event that the area above the cooling elements has to remain accessible for maintenance work (e. g. on control equipment installed within the false ceiling), the

cooling elements can be interconnected by means of a flexible hose, so that they can be individually dismantled. If this is not the case, the rigid connection may be used.



Dimensions · Assembly Example

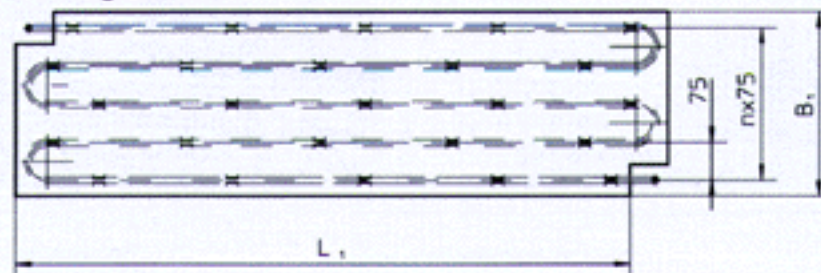
Optionally fitted with thermal insulation (acoustic)



Length dimension $X_{max} = 9$
 Width dimension $X_{max} = 13$
 or with external return to rest on the ceiling support grid.



Cooling Element



$B_1 = B - 20$ (depending upon B)
 $L_1 = L - 15$

Assembly Example

The assembly process involves laying the cooling element in the ceiling panel. Following this, the insulation material is placed on top of the cooling element. The cooling element and insulation material are secured into the

ceiling panel with the clamping device. Assembly without insulation material possible, for example ceiling panel with acoustic fleece.

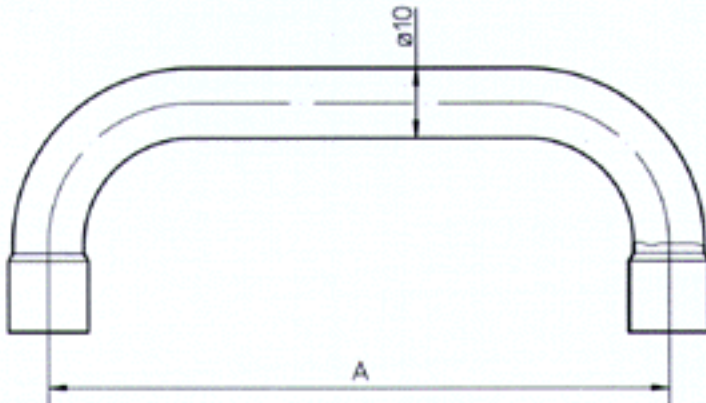
Accessories

- 1) Flexible hose with push fit couplings FS



300 mm or 500 mm long
(standard construction)

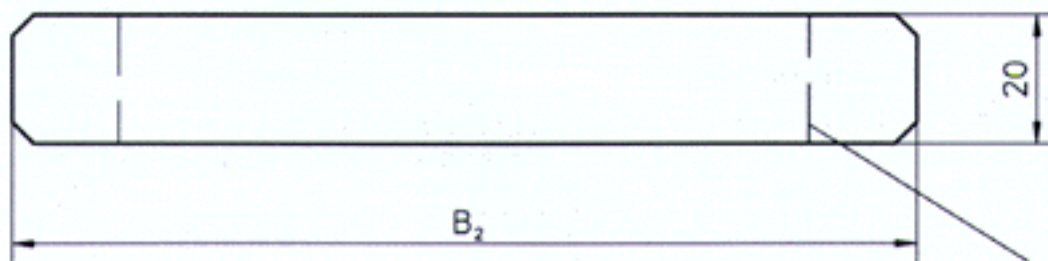
- 2) Rigid "U" pipe RB...



Dimension A = 50 ... 124,
subject to requirement!

- 3) Clamping device SB

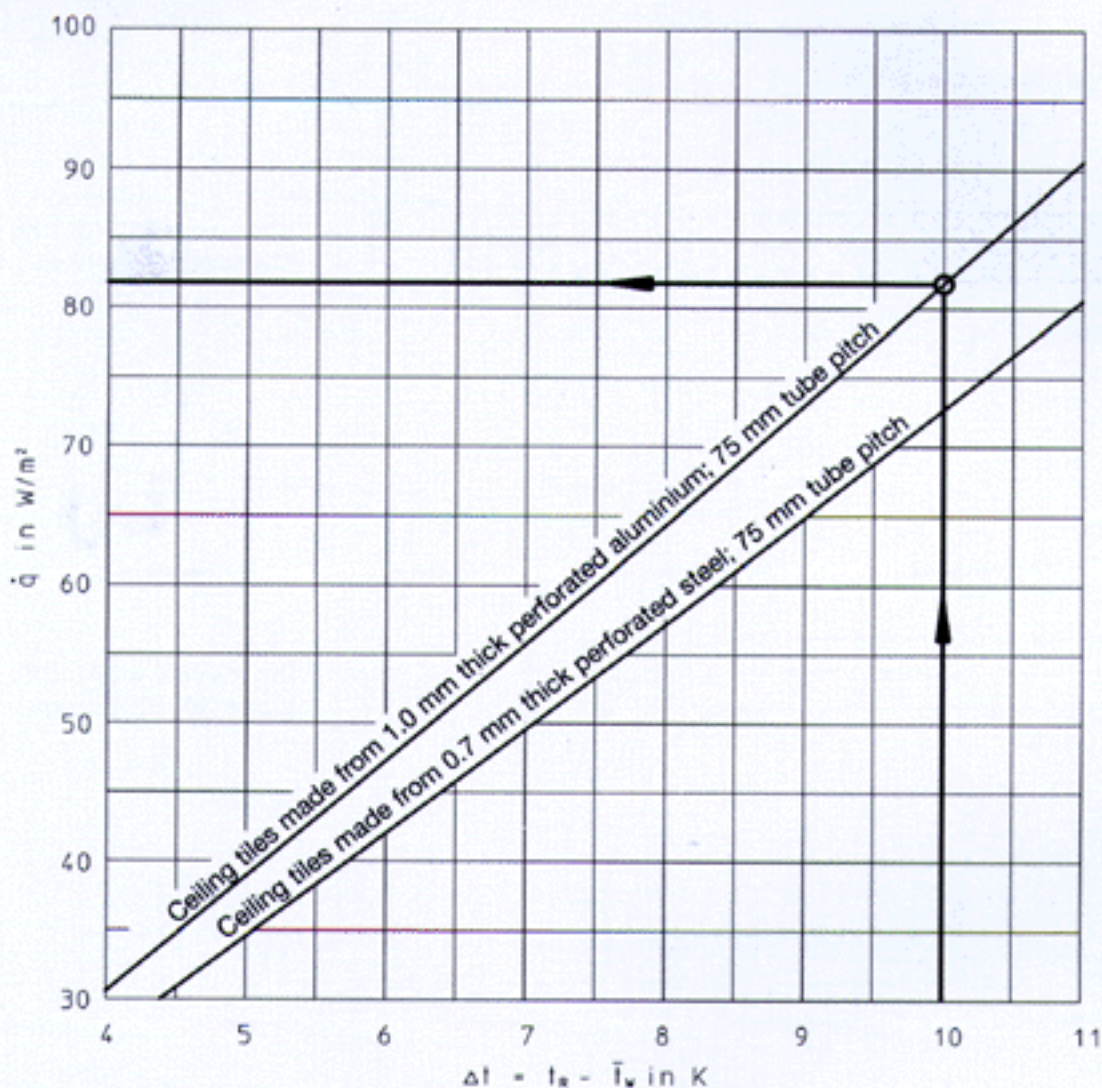
Construction Example



The construction of the clamping device including the dimension B₂ is dependant on the ceiling panel width, depth and construction

Clamping device to be bent to suit ceiling panel depth

1 Cooling Capacity (Chilled Element with Perforated Steel Carrier Plate)



Example

Ceiling tiles made from 1.0 mm thick perforated aluminium; 75 mm tube pitch. Carrier plate perforated steel.

Data given:

Water flow temperature $t_{wV} = 16\text{ }^\circ\text{C}$
 Water return temperature $t_{wR} = 18\text{ }^\circ\text{C}$
 Mean water temperature $\bar{t}_w = 17\text{ }^\circ\text{C}$
 Temperature difference ($t_{wR} - t_{wV}$) $\Delta t_w = 2\text{ K}$
 Room temperature $t_R = 27\text{ }^\circ\text{C}$
 Temperature difference ($t_R - \bar{t}_w$) $\Delta t = 10\text{ K}$

Note: The following approximate changes can be considered when an aluminium perforated carrier plate is used.

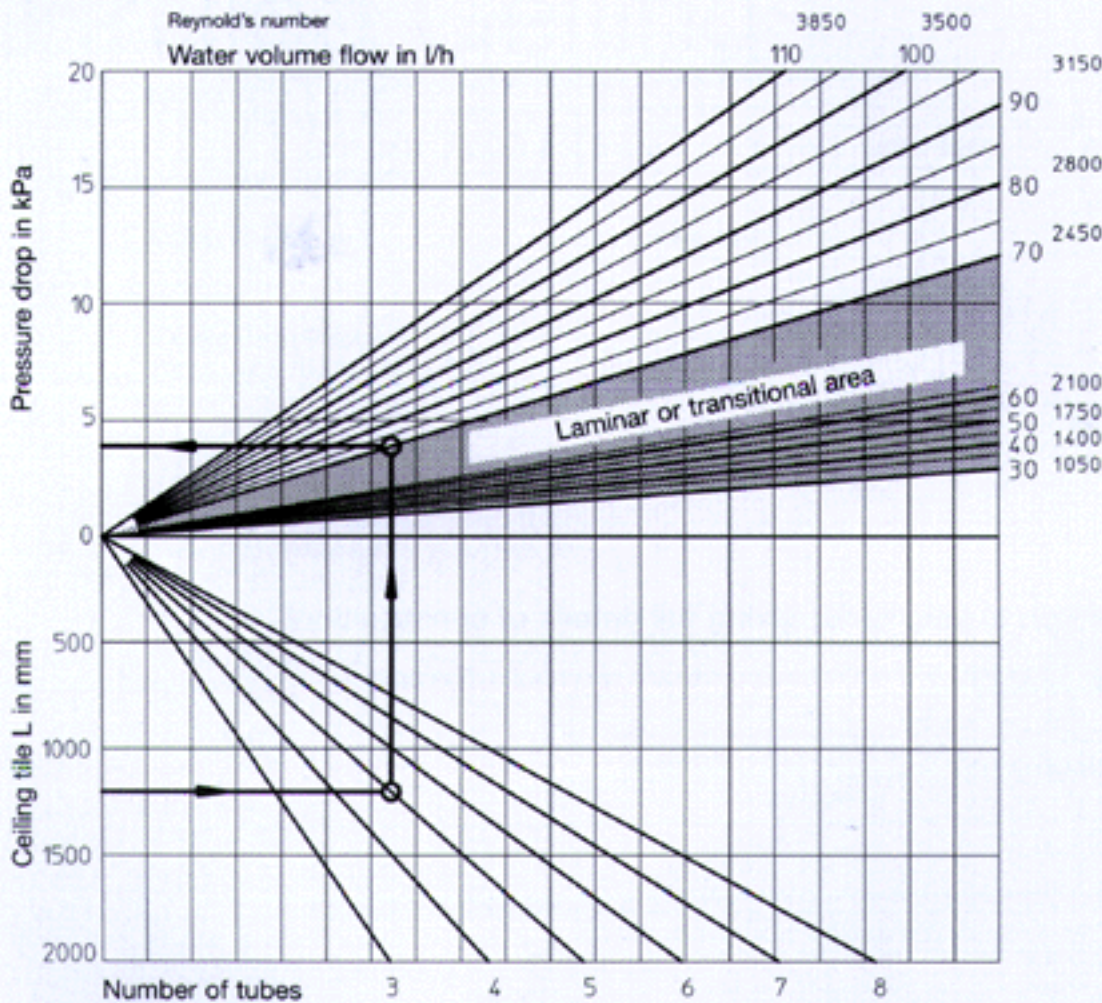
Tile construction	Percentage increase
Steel	10
Aluminium	5

Result:

Cooling capacity $\dot{q} = 81.8\text{ W/m}^2 \times 1.1 \approx 90\text{ W/m}^2$

The factor of 1.1 takes account of additional air movement beneath the ceiling, e. g. due to the introduction of air via ceiling diffusers.

2 Pressure Drop



Ceiling tile width B in mm	Number of tubes
200 ... 274	3
275 ... 349	4
350 ... 424	5
425 ... 499	6
500 ... 574	7
575 ... 649	8

Known variables

Tile width $B = 300 \text{ mm}$ (from table: number of tubes = 4)
 Tile length $L = 1200 \text{ mm}$
 Cooling capacity $\dot{q} = 90 \text{ W/m}^2$ (from diagram 1)
 Min. volume flow \dot{V}_{min} approx. 70 l/h (in order to achieve the turbulent flow)

Calculation

Tile capacity $\dot{Q} = \dot{q} \times L \times B = 90 \text{ W/m}^2 \times 1.2 \text{ m} \times 0.3 \text{ m} = 32.4 \text{ W}$ per tile
 Volume flow per ceiling tile $\dot{V}_p = \dot{Q} / \Delta t_w / 1.163 = 32.4 / 2 / 1.163 \approx 14 \text{ l/h}$ per ceiling tile
 Minimum number of tiles $a_{\text{min}} = \dot{V}_{\text{min}} / \dot{V}_p = 70 / 14 = 5$ ceiling tiles connected in series
 Total volume flow $\dot{V}_{\text{Total}} = 14 \times 5 = 70 \text{ l/h}$

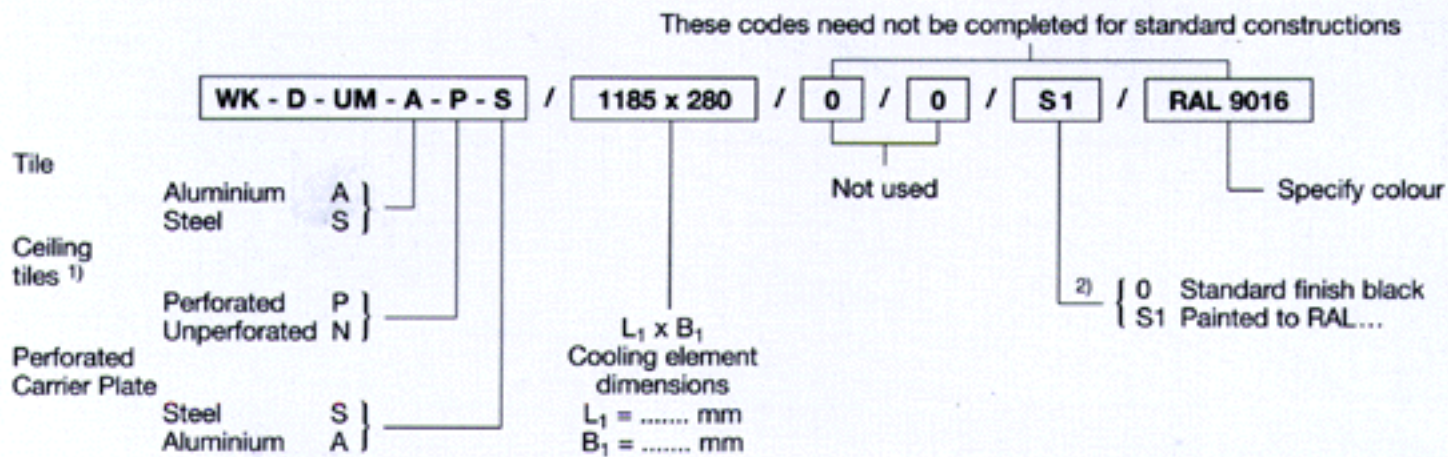
Diagram 2: (for $\dot{V}_{\text{Total}} = 70 \text{ l/h}$)
 Pressure drop

Approx. 3,200 Pa (figure applies to 1 ceiling tile)
 $\diamond 3,200 \text{ Pa} \times 5 = 16,000 \text{ Pa}$ (for 5 ceiling tiles connected in series)

Turbulent pressure drop = Approx. 16,000 Pa



Order Code



Please attach a ceiling panel sketch to your order giving full details of construction!

Important: The ceiling tile dimensions do not correspond to the cooling element dimensions. See page 4.

¹⁾ In case of cooling elements this information influences the performance achieved!
²⁾ Information is only required when ordering in relation to special tile requirements!

Accessories:

- FS** Flexible hose, 300 or 500 mm long, stainless steel braiding and stainless steel push fit couplings at both ends, longer lengths are available on request
- RB, A = ...** "U" pipe, dimensions see page 5
- SB** Clamping device, construction, dimensions see page 5

Specification Text

Cooling element, suitable for installation into standard commercial suspended ceiling systems, consisting of formed tube meander fixed onto a perforated carrier element and pressed flat-oval for better contact with the ceiling tiles. The circular water pipes are bent upwards for quick connection, element to element or element to header.

Materials:

The carrier plate is made from perforated sheet, either steel or aluminium. The water tubes are made from copper. The perforated carrier plate is powder coated black. The whole assembly is then sprayed black (RAL 9005) from the side that comes into contact with the ceiling tile and the assembly is then stoved, thus from the underside of the chilled ceiling element all visible surfaces are finished black.

Order Example

Make: TROX
 Type: WK-D-UM-A-P-S/1185 x 280
 Accessories: FS

Note

Trox can provide ceiling tiles, suspension fittings, copper tubes and assembly work on request. To order complete chilled ceilings, please let us know the required performance specification as additional information!