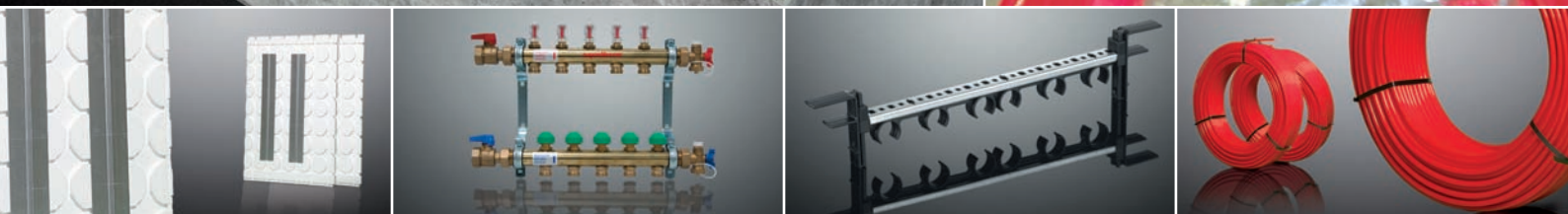
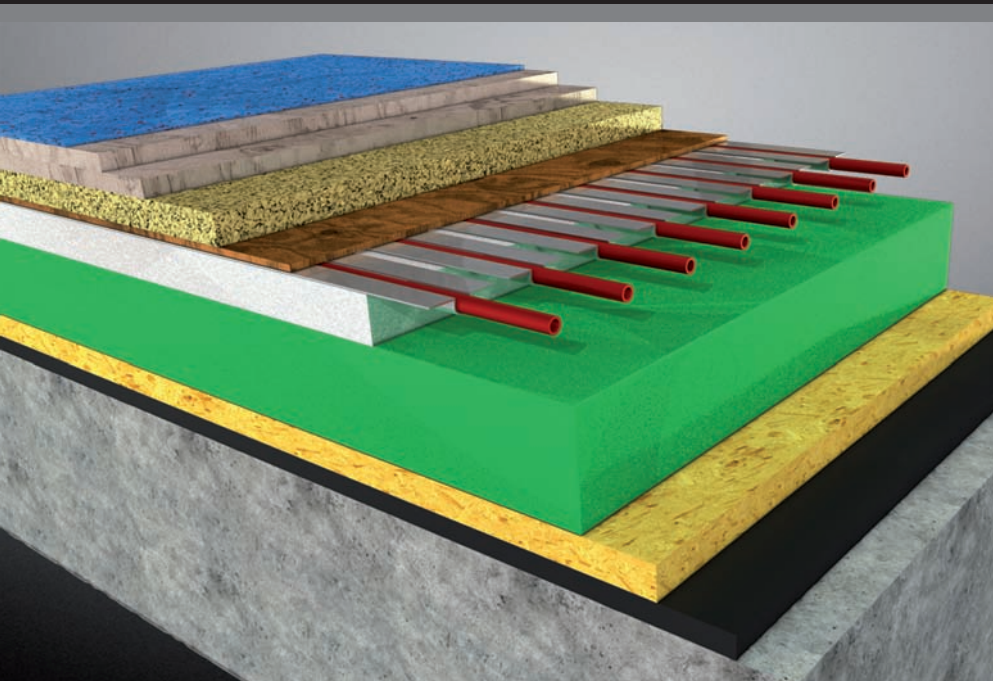


Technical information

Sports floor heating system

Technical information aquatherm® sports floor heating system



aquatherm® Surface heating systems for sports facilities - technology, construction and application



aquatherm

Preface



Dear customers and partners...

...since ancient times, mankind has been thinking of effective ways of transporting and using „aqua“ (lat. for water) and „therm“ (lat. for warmth). Applied technologies have been developed and changed considerably over the ages, but the motivation has remained the same: Hygiene, health and well-being.

aquatherm has participated in this development over the past almost 40 years and in some areas has been able to make decisive contributions.

By constantly adapting its products to the needs of the market and developing the relevant know-how, aquatherm has achieved worldwide success and prestige within the last almost 40 years; a fact we are proud of, but at the same time giving us the motivation to continue to make constant improvements.

For any further questions and of course suggestions as well, please do not hesitate to contact us!

The aquatherm GmbH management

Gerhard Rosenberg

President of the Advisory Board

Dirk Rosenberg

Managing Director

Maik Rosenberg

Managing Director

Christof Rosenberg

Managing Director

1973

Foundation of aquatherm by Gerhard Rosenberg

1978

Transfer to the first factory in Biggen/Attendorn

1985

Completion of factory 1 in Biggen/Attendorn

1992

Foundation of a branch in Radeberg near Dresden

1996

Foundation of the metal processing company aquatherm metall, Attendorn

1998

Foundation of a subsidiary in Carrara/Italy

1999

Completion of the main site in Attendorn as one complex (factories 1+2, production and store, laboratory and training centre)

2001

Completion of the extension - plant 2 in Attendorn

2001

Opening of the new training centre in Radeberg

2002

Logistics centre in Attendorn

2003

Rebuilding and finishing of the training centre in Attendorn

2003

30 years of aquatherm

2005

Extension of main office building – plant 1

2005/06

Completion of the 4-storey hall on the premises in Attendorn

Basement: store

First floor: assembly/packaging

1st upper floor: laboratory and research/development

2nd floor: special manifold construction

2008

Take-over of former warehouses of the forwarding agent Kost which accommodate the new rooms for plant maintenance, too.

2009

Opening of the new „specialist center for building services engineering“

General description (System element)

Heating pipes: General description

The operation of a floor heating system is decisively determined by the quality of the heating pipe used.

Typical for the aquatherm® surface heating pipes are the following features:

- excellent creep strength also at higher temperatures
- smooth pipe inner surface
- low friction loss
- high heat-stabilized corrosion resistance
- outstanding resistance against chemicals
- high flexibility
- high impact rate
- less sound of flow
- oxygen-tight according to DIN 4726 due to EVOH coating

Processing

aquatherm® heating pipes can be laid without preliminary tempering cold from the roll. For practical reasons, the heating pipes should generally be laid with the aquatherm® pipe hasp.

Connection technique

Only those pipe joints indicated by the manufacturer should be used for the respective type of pipe. The aquatherm® connectors and screw connections for manifolds conform to DIN 8076 part 1, requested in DIN 4726.

Linear expansion

aquatherm® surface heating pipes for wet construction systems are directly embedded into the heating screed. A change in length resulting from a temperature difference is prevented by embedding into the heating screed or concrete. The material absorbs tensions so that they are not critical.

Oxygen-tightness

Manufacturing of the aquatherm® surface heating pipes with an oxygen barrier is achieved according to a specially developed extrusion procedure. Due to the EVOH coating (ethylene vinyl alcohol) deposited on the basic pipe as an all-over compound, the pipe reaches an optimum tightness. The adhesive layer between basic pipe and barrier layer results in an adhesion resisting against hardest site conditions. The oxygen-tight aquatherm® surface heating pipes correspond to DIN 4726. A system separation by means of a heat exchanger is not necessary as per DIN 4726 when using these pipes.

Heating water additions

In principle, only heating water additions with controlled harmlessness regarding the material used by aquatherm can be used. Heating water additions must expressly be released by aquatherm. The application of corrosion inhibitors is not necessary when using aquatherm® surface heating pipes.

Packing

The aquatherm® surface heating pipes are packed in site-adapted cardboard impervious to light for protection against mechanical damage or effects from UV rays. The pipe bundles have to be stored in the packing until installation. The pipes are supplied as a ring bundle. Remaining bundles have to be restored in the cardboard.

External supervision

The supervision contracts necessary in the scope of DIN-Certco have been concluded with SKZ (South German Plastic Centre Würzburg).

Internal supervision

aquatherm® surface heating pipes are self-supervised according to the requirements of the manufacturing works.

Heating pipes made of polyethylene (PE-RT)

Characteristics

aquatherm® surface heating pipes made of polyethylene (PE-RT) in combination with outside EVOH barrier layer according to DIN 4726 / 16833 / ISO 22391-1,2,5 have an unique molecular structure with controlled side chain distribution, ensuring an excellent stress cracking resistance and a very good long term internal pressure behavior at high flexibility.

Designation

AQUATHERM FLOOR HEATING PIPE -- ART.NO. 90026 --
- 16 X 2.0 MM - OXYGEN-TIGHT -- DIN 4726 -- DIN
16833 -- DATE OF MANUFACTURING/ TIME --
MACHINE NUMBER -- MTR. MARKING -- MADE IN
GERMANY

Moreover, every coil is printed continuously with the length in meters. An instruction leaflet containing the identification data is added to every coil.

Surplus material

Surplus pipes can be applied with the tested and certified aquatherm® SHT connection technique for radiator connection.



Heating pipe made of PE-RT

aquatherm® surface heating pipes made of polyethylene (PE-RT)		
Art.no.	Nominal size	Length of coil
90024	14 x 2,0 mm	250 m
90034	14 x 2,0 mm	500 m
90026	16 x 2,0 mm	250 m
90036	16 x 2,0 mm	500 m
90027	17 x 2,0 mm	250 m
90037	17 x 2,0 mm	500 m
90028	20 x 2,0 mm	250 m
90038	20 x 2,0 mm	500 m

Heating pipes made of polyethylene (PE-RT)

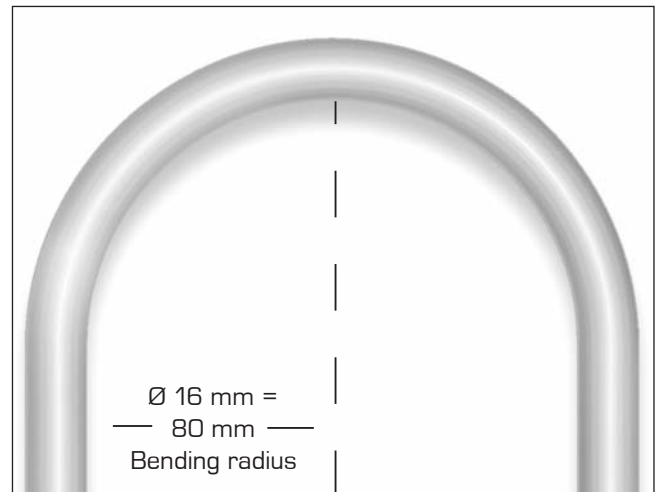
Elastic modulus

The modulus of elasticity as an important parameter of the bending resistance of the pipes is for polyethylene (PE-RT) at 20 °C approx. 580 N/mm².

Consequently, the smallest admissible

bending radius is 5 x d,

in which d has been determined as mean outside diameter. For pipes with a dimension of 16 x 2 mm the bending radius will be $r = 5 \times 16 \text{ mm} = 80 \text{ mm}$.



Physical properties PE-RT pipe material

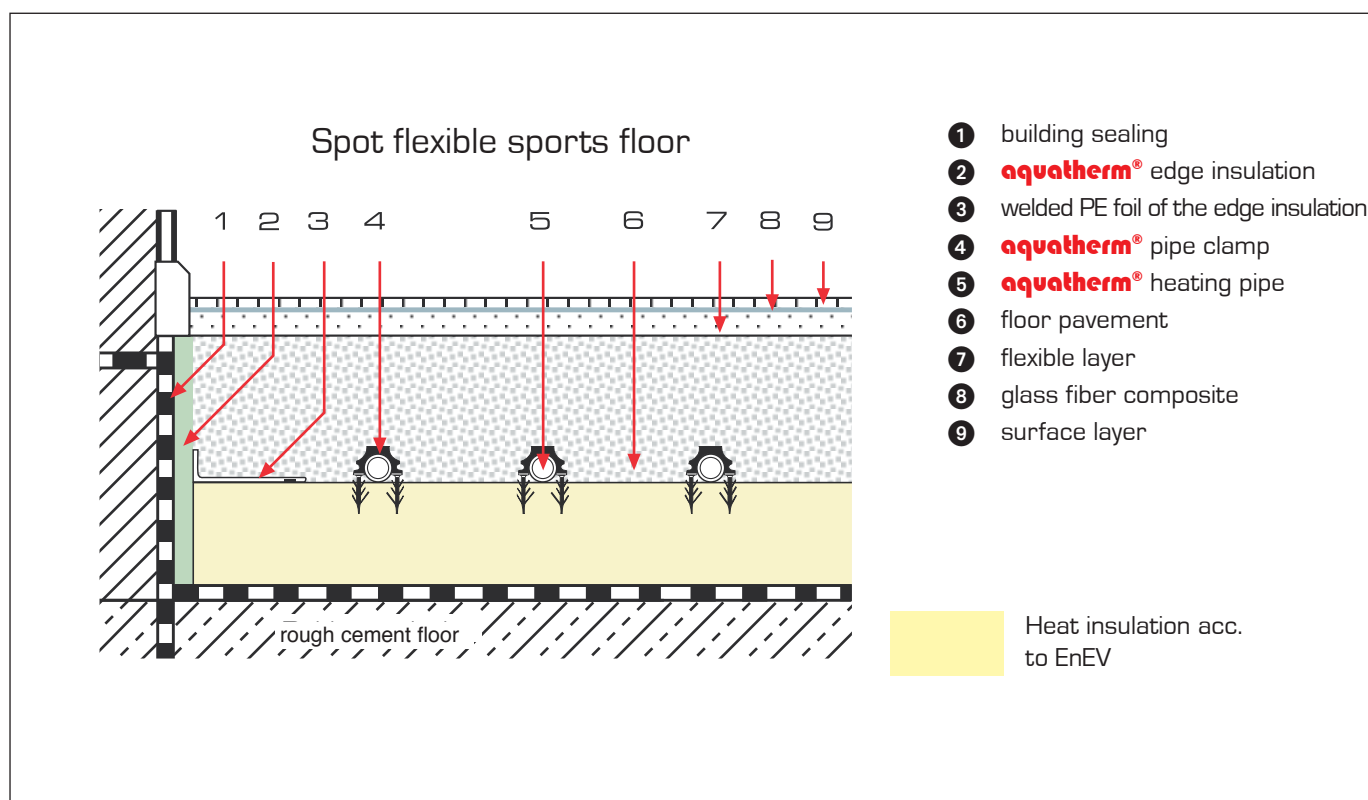
Physical properties	Unit	Test method	Value
Melt flow index, 190 °C/2,16 kg	g/10 min	ISO 1133	0,7
Melt flow index, 190 °C/5,16 kg	g/10 min	ISO 1133	2,2
Density	g/cm ³	ISO 1183	0,933
Vicat softening point	°C	ISO 306 (method A)	122
Thermal conductivity	W/(mk)	DIN 52612-1	0,35
Linear thermal expansion coefficient	10 ⁻⁴ /K	DIN 53752 A (20 °C-70 °C)	1,95
Mechanical properties	Unit	Test method	Value
Shore hardness D	%	ISO 868	53
Yield stress	MPa	ISO 527	16,5
Yield tensile elongation	%	ISO 527	13
Tensile strength	MPa	ISO 527	34
Elongation at tear	%	ISO 527	>800
Flexural modulus	MPa	ISO 178	550
Elastic modulus	MPa	ISO 527	580
Izod impact strength	KJ/m ² at 23 °C KJ/m ² at -40 °C	ISO 180 ISO 180	no break 8
ESCR Environment Stress Cracking Resistance	h h h	ASTM D 1693-B 10% 50% antifreezer (PEG) 10% corrosion inhibitor	>8760 (0 Error) >8760 (0 Error) >8760 (0 Error)

Sports floor heating system

Spot flexible sports floor

The heating pipes of the spot flexible heating systems for sports floors are laid in a cement or anhydrite floor.

The covering existing of a flexible layer, glass fiber composite and surface floor is glued on the floor pavement.



Reg.-Nr.: 7F 296-F

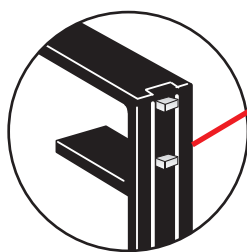
Sports floor heating system

Surface flexible sports floor with flexible construction

Fixing of the heating pipes with the aquatherm® pipe guiding rail.

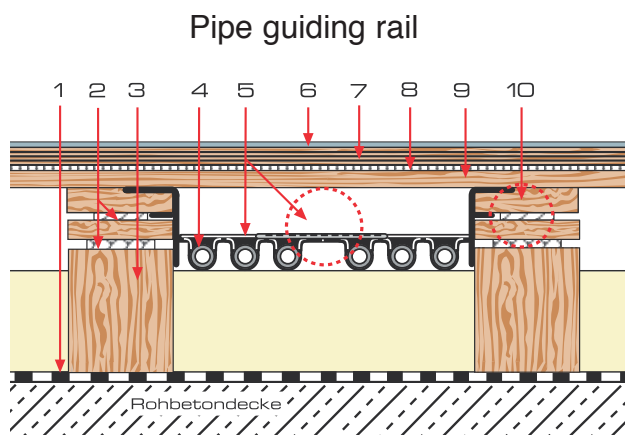
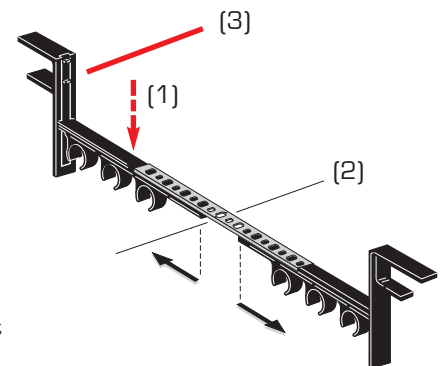
The aquatherm® heating pipes are kept on the construction with the aquatherm® pipe guiding rail lying on the heat insulation. The pipe guiding rail is hung up securely and firmly in the double swing bearer. The rail is lengthwise adjustable (2) and therefore suitable for all centre dimensions and model constructions. All kinds of heat insulation material as boards or rolls can be selected.

Due to the infinitely variable height adjustment (1) the heating pipe always lies on the already installed insulation. That way an exact pipe guiding and therefore an optimal heat distribution is secured. The 20 mm safe distance between the blind floor and heating pipe, required by the FSB, Berlin, is guaranteed by the safety stop (3).

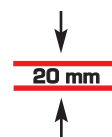


Safety stop guaranteeing the safe distance of 20 mm

Pipe guiding rail lengthwise adjustable, with infinitely variable height adjustment and safety stop



Pipe guiding rail



Safe distance from the heating pipe up to lower surface of the blind floor (acc. to code of practice of FSB).

- 1 building sealing
- 2 permanently elastic spring pads
- 3 lining blocks
- 4 **aquatherm®** heating pipe
- 5 **aquatherm®** pipe guiding rail
- 6 surface layer: parquet, linoleum, PUR
- 7 load distribution board
- 8 PE foil
- 9 blind floor
- 10 double swing bearer



Reg.-Nr.: 7F 291-F
7F 292-F
7F 293-F
7F 295-F

Heat insulation acc.to EnEV, insulation materials as rolls or boards

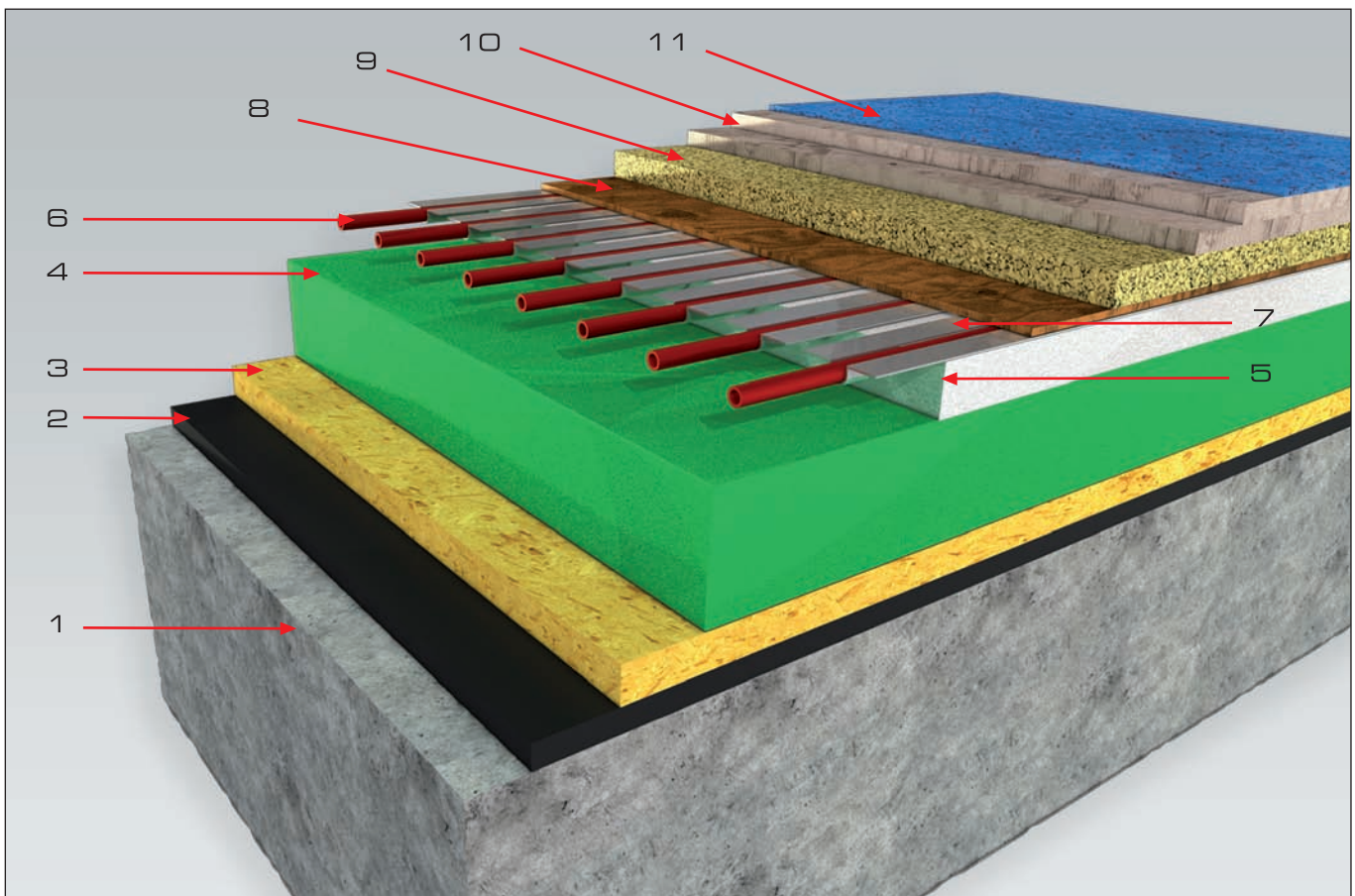
Surface flexible sports floor with flexible layer (assembled construction)

Surface flexible sports floor with flexible layer (assembled construction)

The surface flexible sports floor in assembled construction is composed of a flexible layer, a load distribution layer resistant to bending and the surface layer.

The aquatherm® floor heating is laid down dry below the construction. The heating pipes are laid in a polystyrol system component with heat conducting lamellas.

The combination of the aquatherm® floor heating with a surface flexible sports floor in assembled construction offers a maximum of heating comfort. The protective and sport functional characteristics are met in any situation.



- ① rough cement floor
- ② building sealing
- ③ levelling layer
- ④ heat insulation
- ⑤ **aquatherm®** system component TS
- ⑥ **aquatherm®** heating pipe

- ⑦ **aquatherm®** heat conducting lamellas
- ⑧ hardboard; alternatively steel plate
- ⑨ flexible layer
- ⑩ load distribution board
- ⑪ surface layer



Reg.-Nr.: 7F 294-F
7F 298-F

aquatherm® reverse return (Tichelmann principle) for sports floor heating systems

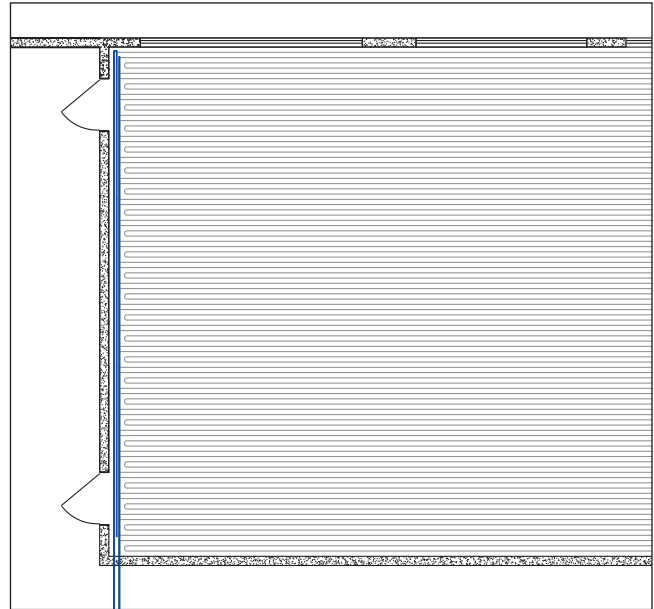
Pipe guiding plan according to Tichelmann principle

The weld-in saddle technique developed by aquatherm facilitates to connect the heating pipes to a passing distribution pipe according to the Tichelmann principle. This technique is used for sports floors with a flexible construction (single resp. double wooden sports floor).

In case of the Tichelmann principle, all heating circuits have the same length of heating pipes. The pipe guiding ensures the same pressure loss in case of all heating circuits. Thus, a hydraulic adjustment of the heating circuits is not necessary.

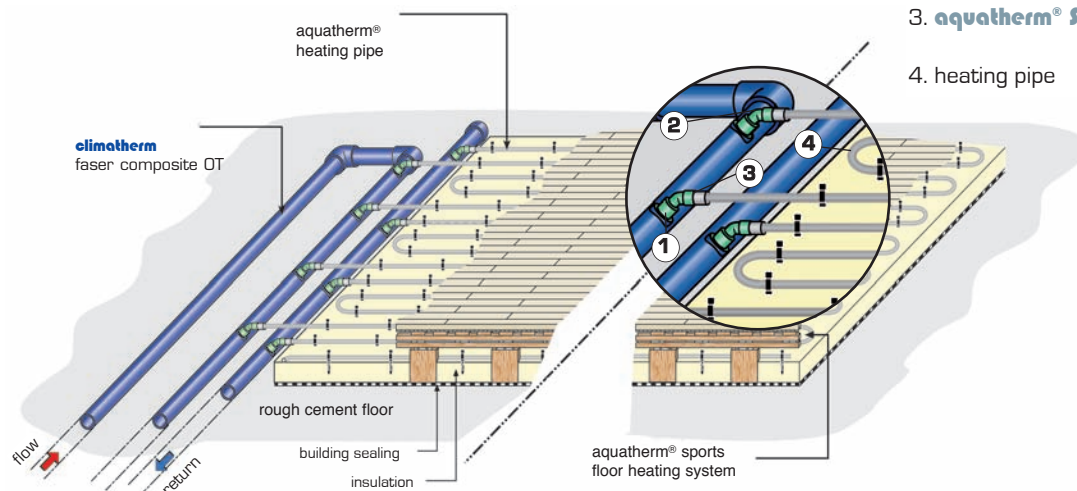
Execution

In case of the connection technique, the manifold pipes are realized with an oxygen-tight climatherm faser composite pipe OT and weld-in saddles. The distance of saddles is determined by the laid distance of the heating pipes. aquatherm® SHT transition adapters are used for connecting the diffusion-tight heating pipes. They ensure an optimal connection of the climatherm faser composite pipes OT with the aquatherm heating pipes.



Pipe guiding plan with weld-in saddles

Pipe connection climatherm faser composite pipe OT



1. **fuviotherm®** weld-in saddle
2. **fuviotherm®** elbow 45°
3. **aquatherm® SHT** transition adapter
4. heating pipe

aquatherm® pipe guiding with heating circuit manifold

Pipe guiding plan with heating circuit manifold

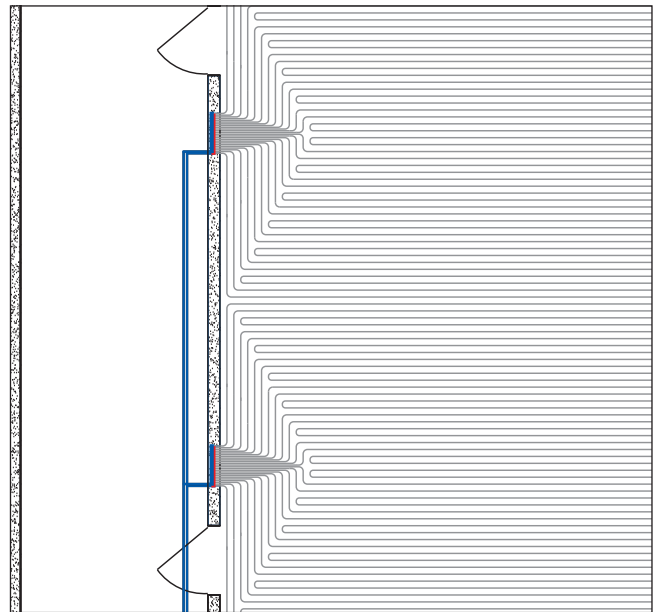
The heating pipes of the aquatherm® sports floor heating system are laid in crosswise or lengthwise direction between the lower construction of the sports floor or in the polystyrol system components with heat conducting lamellas.

The heating pipes are connected by means of heating circuit manifolds equipped with flow and return valves. Thus, an individual adjustment of performance of each heating circuit will be possible. In case of hydraulically same heating circuits the control of all connected heating circuits will be given via one central zone control.

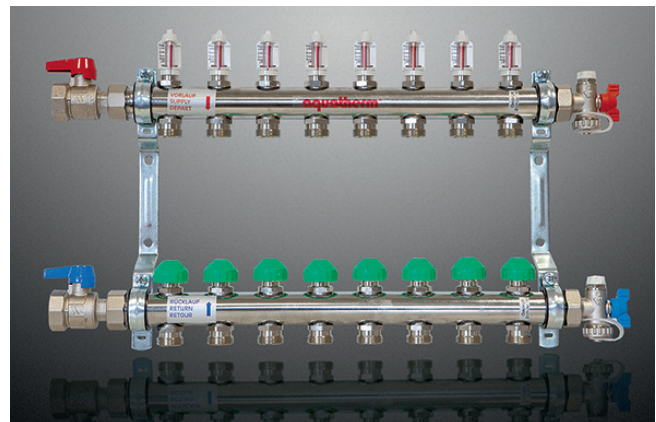
Installation

Heating circuit manifolds are used for the connection in the field of floor heating installations. The maximum of 12 heating circuits can be connected to one manifold.

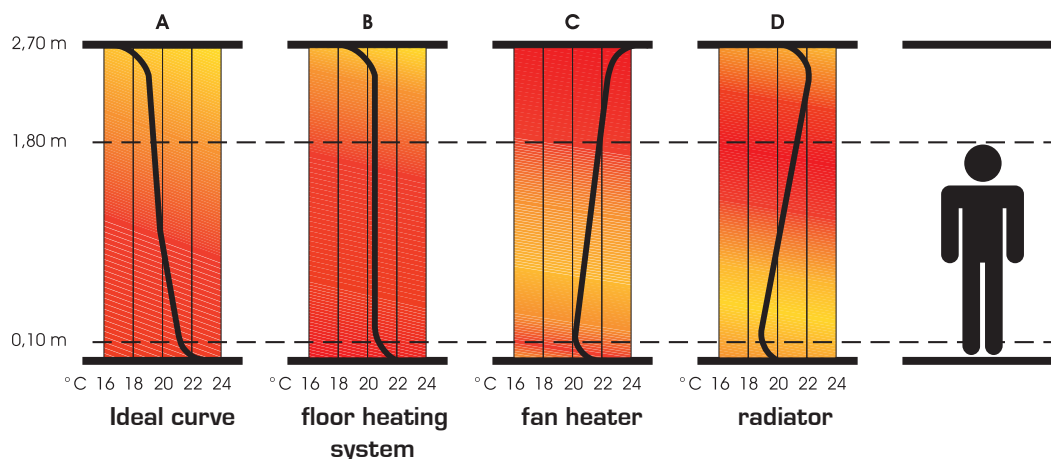
The advantage of a sports floor heating system is the constant temperature distribution over the total area. The course of temperature of the floor heating is closest to the ideal curve of all heating systems.



Pipe guiding plan with heating circuit manifold



March of temperature of various heating systems



Sports floor heating system



Finished sports hall with aquatherm® sports floor heating system with linoleum covering.



Finished sports hall with aquatherm® sports floor heating system with parquet.



Installation technique with pipe guiding rail.



aquatherm® sports floor heating system.

Sports floor heating system



MAX-FITNESS-CENTER, Attendorn, Germany



MAX-FITNESS-CENTER,
Installing of sports floor heating system



Sports hall Lichtringhausen, Attendorn, Germany



Sports hall Lichtringhausen, Attendorn, Germany

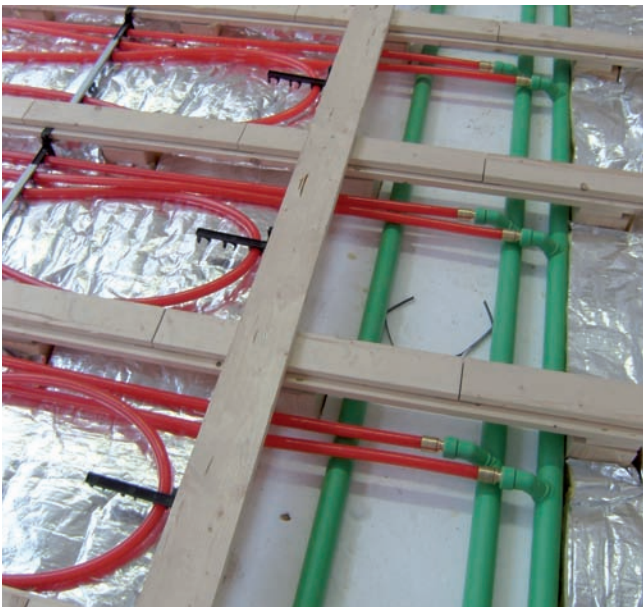
Sports floor heating system



Sports hall, Bergisch Gladbach, Germany



Sports hall, Freital, Germany

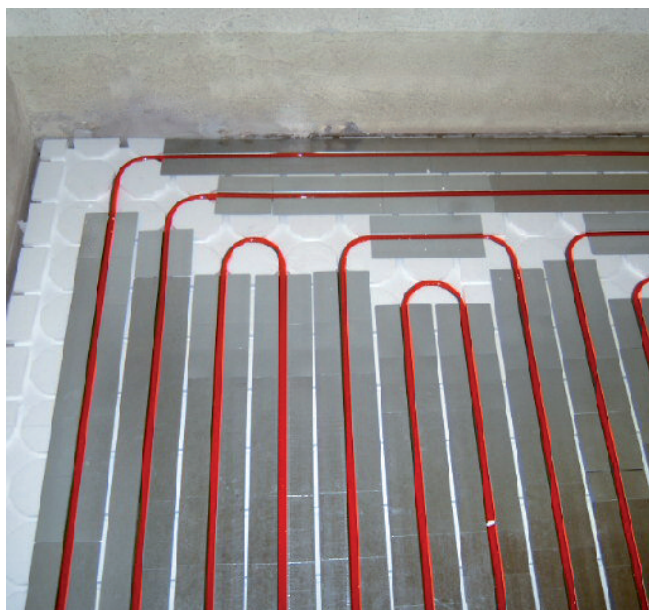
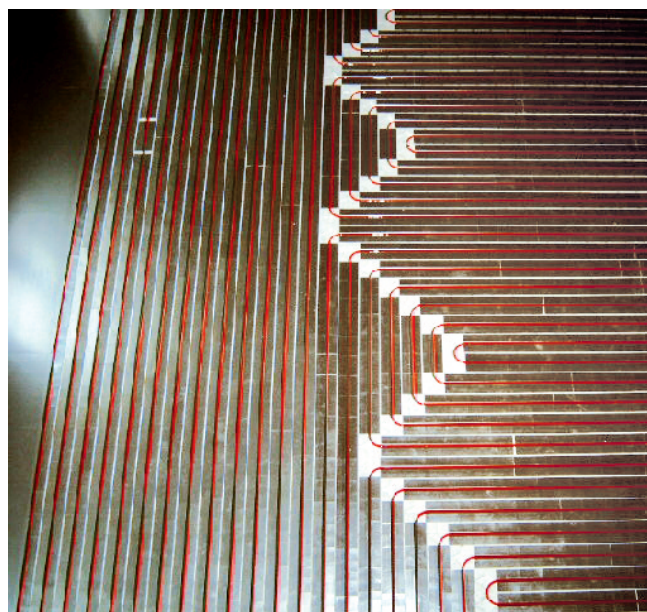


Sorpic school complex, Bautzen, Germany



Vocational school complex, Radeberg, Germany

System component TS 25



Important information on our conditions of sale, guarantee and delivery:

You will find our conditions of sale and delivery (issue: January 2009), as well as the contact details of our technical sales and our representations on the internet at our homepage www.aquatherm.de.

Subject to technical changes!

Pipe systems for every field of application

fusiotherm® | **climatherm** | **aquatherm lilac**

aquatherm® | **aquatherm® SHT** | **climasystem** | **aquatherm ISO**

aquatherm

Innovative Rohrleitungssysteme
innovative pipe systems

Made in Germany

Korrosionsresistente Rohrleitungssysteme	Verteilerbau	Trinkwasser- und Heizkörperanbindungssystem aquatherm® SHT	Deckenkühlung	Nahwärmeleitungen	Rasenheizung	Industrieanwendungen (z.B. Druckluftanlagen)	Industriebodenheizung
corrosion resistant pipes	distribution construction	Potable water and radiator connection system aquatherm® SHT	ceiling cooling	district heating	under-soil heating	industrial applications (e.g. compressed air plants)	industrial floor heating

Estflächenkühlung	Freiflächenheizung	Fußbodenheizung (Alt-/Neubau)	Decken-/Wandheizung Naß- & Trockenbau	Sportbodenheizung	Wasserlöschanlagen	Nutzwasser	Trinkwassernetze
ice surface cooling	open space heating	underfloor heating (old/new buildings)	ceiling/wall heating wet & dry construction	sports floor heating system	fire-extinguishing system	recycled water	potable water pipe systems

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