



# aquatherm orange system

## Sports floor heating system

**Technical information surface heating system for sports facilities**  
Technology, construction and application



**aquatherm**

state of the pipe



## PREFACE



Dear customers...

...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 40 years and in some areas has been able to make decisive contributions. An example is the aquatherm green pipe-system produced by aquatherm.

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 40 years: a fact which we are proud of, but at the same time giving us the motivation to continue making constant improvements.

This documentation is to give you a first idea of our products and services - and to make you curious to gain more information.

In case of further questions and of course also suggestions, we and our team will be pleased to be at your disposal!

**Christof Rosenberg**  
Managing Director

**Dirk Rosenberg**  
Managing Director

**Maik Rosenberg**  
Managing Director

**Gerhard Rosenberg**  
President of the Advisory Board

Transfer to the first factory in Biggen/D-Attendorf  
1985  
Completion of factory 1 in Biggen/D-Attendorf  
1992  
Founding of the branch in Radeberg near D-Dresden  
1996  
Founding of the metal processing company  
aquatherm metal, D-Attendorf  
1998  
Founding of a subsidiary in Carrara/Italy  
1999  
Completion of the main site in D-Attendorf as one  
complex (Factories 1+2, Production and Store,  
Laboratory and Training Centre)  
2001  
Completion of the extension Factory 2 in D-Attendorf  
2001  
Opening of the new training centre in D-Radeberg  
2002  
Completion of the logistics centre in D-Attendorf  
2003  
Completion of rebuilding and finishing of the training  
centre  
in D-Attendorf  
2003  
30 year celebration of the company aquatherm  
2005  
Adding of 2 storeys on the administration building  
2005/06  
Completion of the 4-storey hall  
on the premises in Attendorf  
Basement: Store  
Ground floor: Assembly/Packing  
1st Floor: Laboratory and Technical depart-  
ment  
2nd Floor: Special manifold construction  
2008  
Aquisition of the former storehouse of the forwarding  
agent Kost, which also accomodates the room of the  
plant maintenance.  
2009  
Opening of the new expertise centre for technical ap-  
plication.

## GENERAL DESCRIPTION

### (SYSTEM ELEMENT)

Heating pipes: General description

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

Typical for the aquatherm orange system-floor heating pipes are the following features:

- › excellent creep strength also at higher temperatures
- › smooth inner pipe surface
- › low friction loss
- › high heat-stabilized
- › corrosion resistance
- › outstanding resistance against chemicals
- › high flexibility
- › high impact rate
- › less sound of flow
- › oxygen-tight due to EVOH-coating acc. to DIN EN 1264

#### Processing

aquatherm orange system-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 orange system-pipe hasp.

#### Connection technique

Only those pipe joints indicated by the manufacturer should be used for the respective type of pipe.

The aquatherm orange system-connectors and screw connections for manifolds conform to DIN 8076 Part 1, requested in DIN EN 1264.

#### Linear expansion

aquatherm orange system-floor heating pipes for wet construction systems are embedded directly into the heating screed.

A change in length resulting from a temperature difference prevented by embedding into the heating screed. The material absorbs tensions so that they are not critical.

#### Oxygen-tightness

Manufacturing of the aquatherm orange system-floor heating pipes with an oxygen barrier layer is achieved according to a specially developed extrusion procedure.

Due to the EVOH-coating deposited on the basic pipe as an all-over compound, the pipe reaches an optimum tightness. The adhesive layer between basis pipe and barrier layer results in an adhesion resisting against hardest site conditions.

The oxygen-tight aquatherm orange system-underfloor heating pipes are in accordance with DIN EN 1264.

A system separation by means of a heat exchanger is not necessary as per DIN EN 1264 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 be expressly released by aquatherm.

The application of corrosion inhibitors is not necessary when using aquatherm orange system-underfloor heating pipes.

#### Packing

aquatherm orange system-underfloor heating pipes are packed in site-adapted cardboards 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 the SKZ (South German Plastic Centre Würzburg).

#### Internal supervision

aquatherm orange system-underfloor heating pipes are self-supervised according to the requirements of the manufacturing works.

## HEATING PIPES MADE OF POLYETHYLENE (PE-RT)

### Characteristics

aquatherm orange system-underfloor heating pipes made of polyethylene (PE-RT) combined with outside EVOH-barrier acc. to DIN EN 1264/16833/ISO 22391-1,2,5 have a unique molecular structure with controlled side chain distribution, ensuring an excellent environment stress cracking resistance, and a very good long term internal pressure behaviour at high flexibility.

### Designation

AQUATHERM FLOOR HEATING PIPE – ART.-NO. 90026 – 16 X 2.0 MM – OXYGEN-TIGHT – DIN EN 1264 – DIN 16833 – DATE OF MANUFACTURING / TIME – MACHINE-NO – 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 grey pipe-connection technique for radiator connection.



Heating pipes made from PE-RT

#### aquatherm orange system-Heating pipes made of Polyethylene (PE-RT)

Art.-No.	Diameter	Length of coil
90020	10 x 1,25 mm	250 m
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
90030	25 x 2,3 mm	250 m
90038	20 x 2,0 mm	500 m

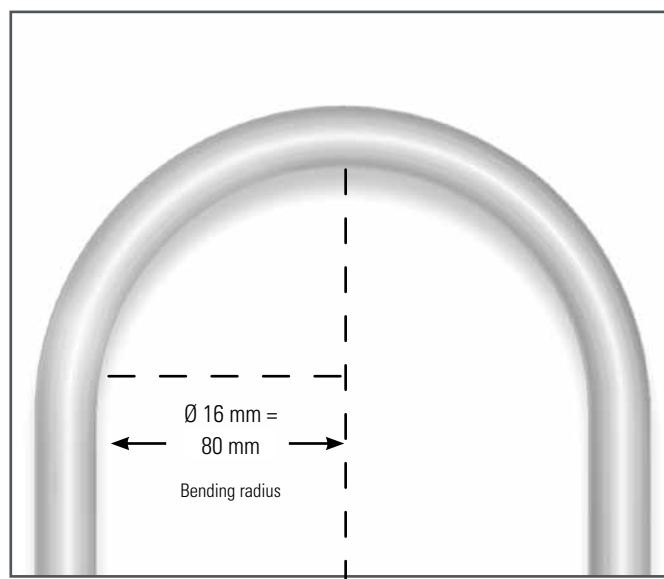
### Elastic modulus

The modulus of elasticity as an important parameter of the bending resistance of the pipes is for Polyethylene (PE-RT) at 20° C about 580 N/mm<sup>2</sup>.

Consequently is the smallest admissible

#### bending radius 5 x d

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



### Physical properties of the material PE-RT

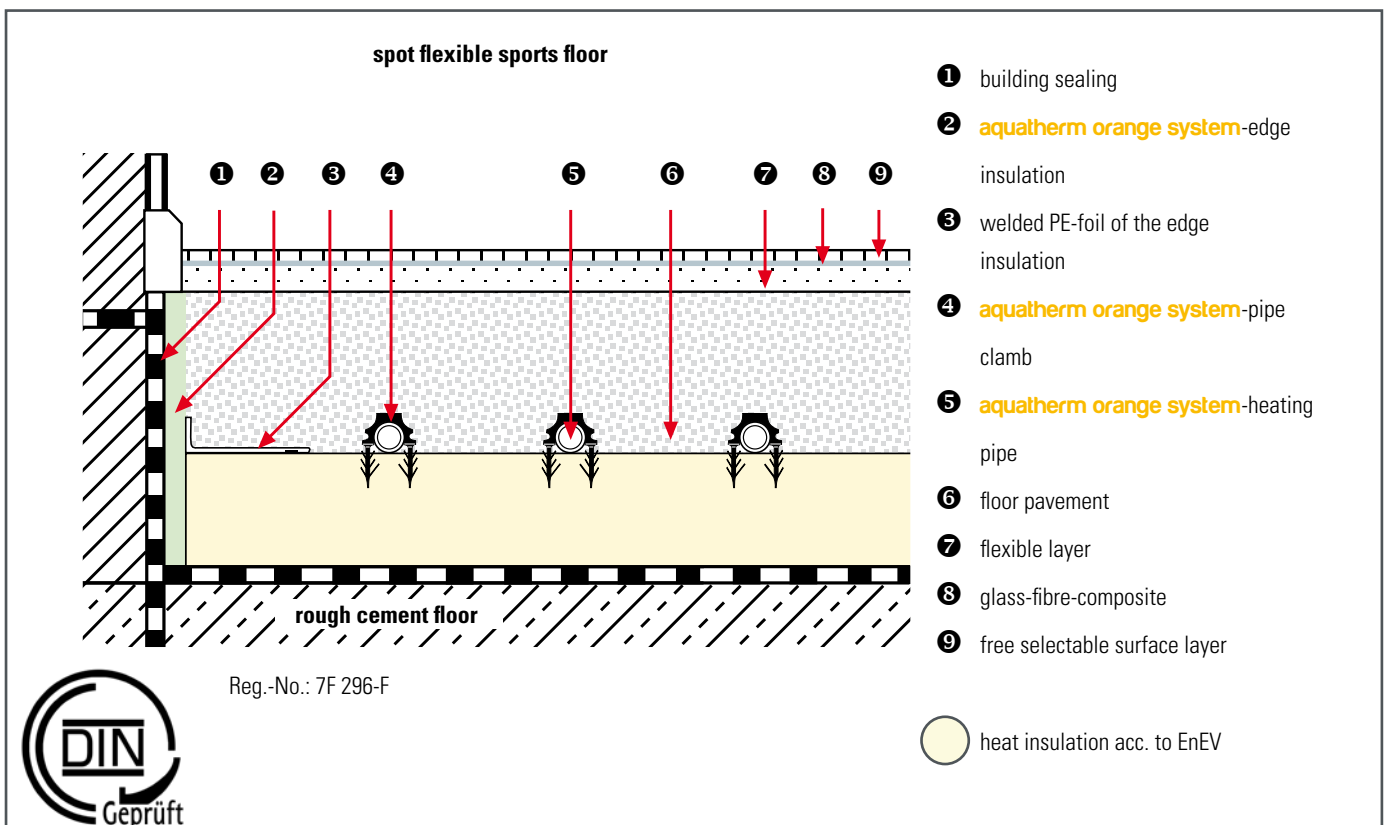
Physical properties	Unit	Test method	Value
Melt-flow index, 190°C / 2.16 kg	g/10 min	ISO 1133	0.7
Melt-flow index, 190°C / 5.16 kg	g/10 min	ISO 1133	2.2
Density	g/cm <sup>3</sup>	ISO 1183	0.933
Vicat softening point	°C	ISO 306 (Method A)	122
Thermal conductivity	W/(mk)	DIN 52612-1	0.4
Linear thermal expansion coefficient	10 <sup>-4</sup> /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 <sup>2</sup> at 23°C	ISO 180	no break
	KJ/m <sup>2</sup> at - 40°C	ISO 180	8
ESCR Environment Stress Cracking Resistance	h	ASTM D 1693-B 10 %	>8760 (0 Error)
	h	50 % anti-freezer (PEG)	>8760 (0 Error)
	h	10 % corrosion inhibitor	>8760 (0 Error)

## FLOOR CONSTRUCTION SPORTS FLOOR

### 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 fibre composite and surface floor is glued on the floor pavement.



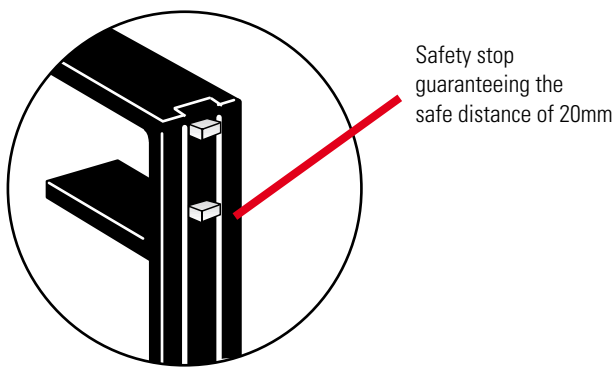
**Fixing of the heating pipes with the aquatherm orange system-pipe guiding rail.**

The aquatherm orange system-heating pipes are kept on the construction with the aquatherm orange system-pipe guiding rail lying on the heat insulation.

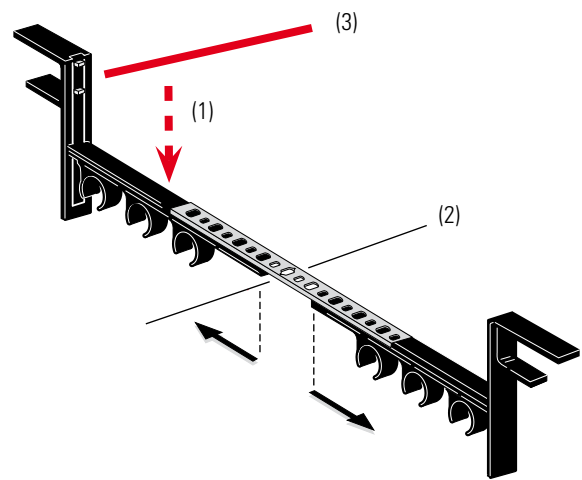
The pipe guiding rail is hung up securely and firmly in the double swing bearer.

The rail is lengthwise adjustable (2) and therefore suitable for all centre dimensions and model constructions.

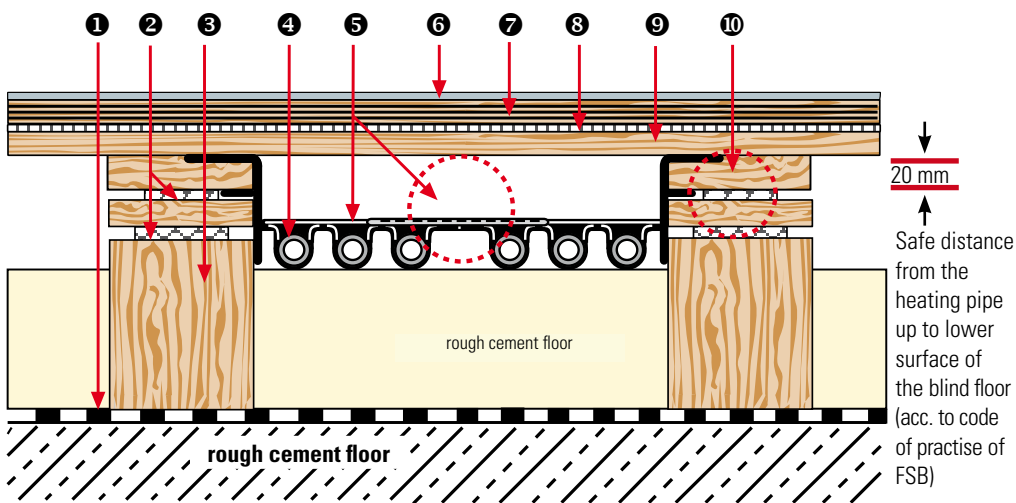
All kinds of heat insulation material as boards or rolls can be selected. Due to infinitely height adjustment (1), the heating pipe always lies on the already installed insulation. That way an exact pipe guiding and therefore an optimum heat distribution is secured. The 20 mm safe distance between the blind floor and heating pipe, required by the FSB, Berlin, is guaranteed by the safety stop (3).



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



**surface flexible sports floor**



- ① building sealing
- ② permanent elastic spring pads
- ③ lining blocks
- ④ aquatherm orange system-heating pipes
- ⑤ aquatherm orange system-pipe clamp
- ⑥ surface layer: parquet, linoleum, PUR, PVC
- ⑦ PE-foil
- ⑧ subfloor
- ⑨ blind floor
- ⑩ double swing bearer
- heat insulation acc. EnEV

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



Reg.-No.: 7F 291-F  
7F 292-F  
7F 293-F  
7F 295-F



## FLOOR CONSTRUCTION SPORTS FLOOR

### Surface flexible sports floor (assembled flooring)

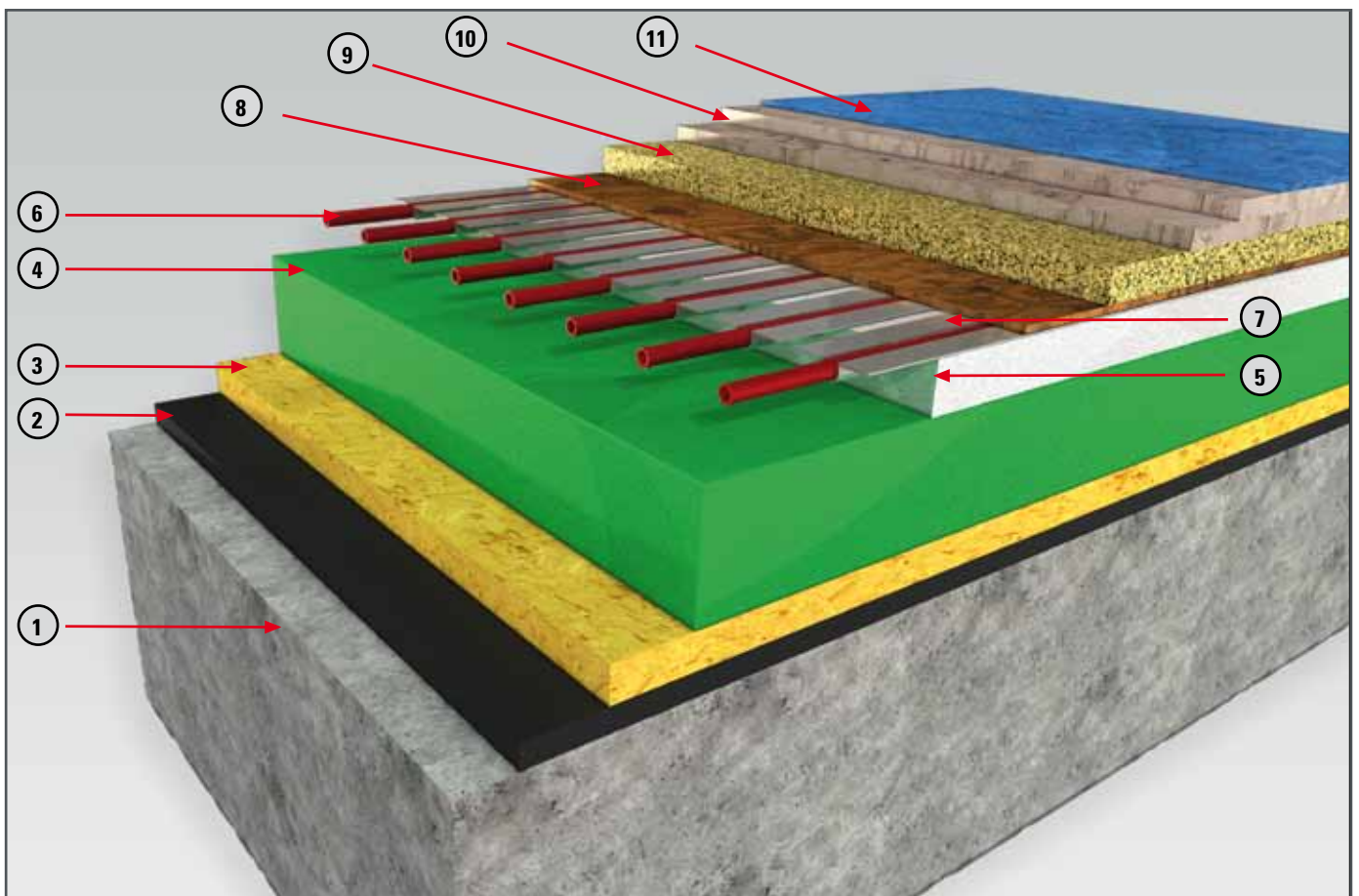
The surface flexible sports floor is composed of a flexible layer, a load distribution layer resistant to bending and the surface layer.

The aquatherm orange system-underfloor 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 orange system-underfloor 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                               | ⑧ hardboard               |
| ② building sealing                                 | ⑨ flexible layer          |
| ③ levelling layer                                  | ⑩ load distribution board |
| ④ heat insulation                                  | ⑪ surface layer           |
| ⑤ aquatherm orange system-system component TS      |                           |
| ⑥ aquatherm orange system-heating pipe             |                           |
| ⑦ aquatherm orange system-heat conducting lamellas |                           |



Reg.-No.: 7F 294-F  
7F 298-F



## aquatherm orange system-REVERSE RETURN TECHNIQUE FOR SPORTS FLOOR HEATING

### Pipe lay out according to reverse return technique (Tichelmann)

The weld-in saddle technique, developed by aquatherm orange system provides the connection of the heating pipes to a continuous manifold pipe acc. to reverse return. This technique is applied for the double swing floor design a+b.

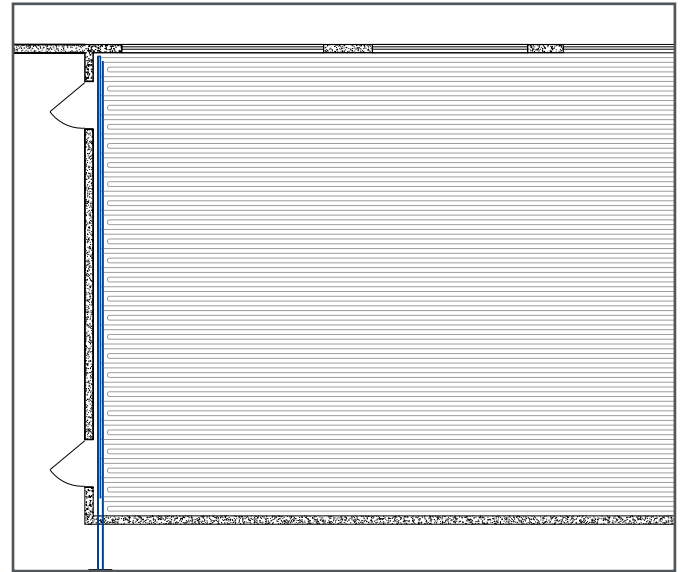
On applying the reverse return technique all heating circuits have the same length.

Thus the pipe lay out ensures the same pressure loss for all heating circuits. A hydraulic balancing of the heating circuits is not required.

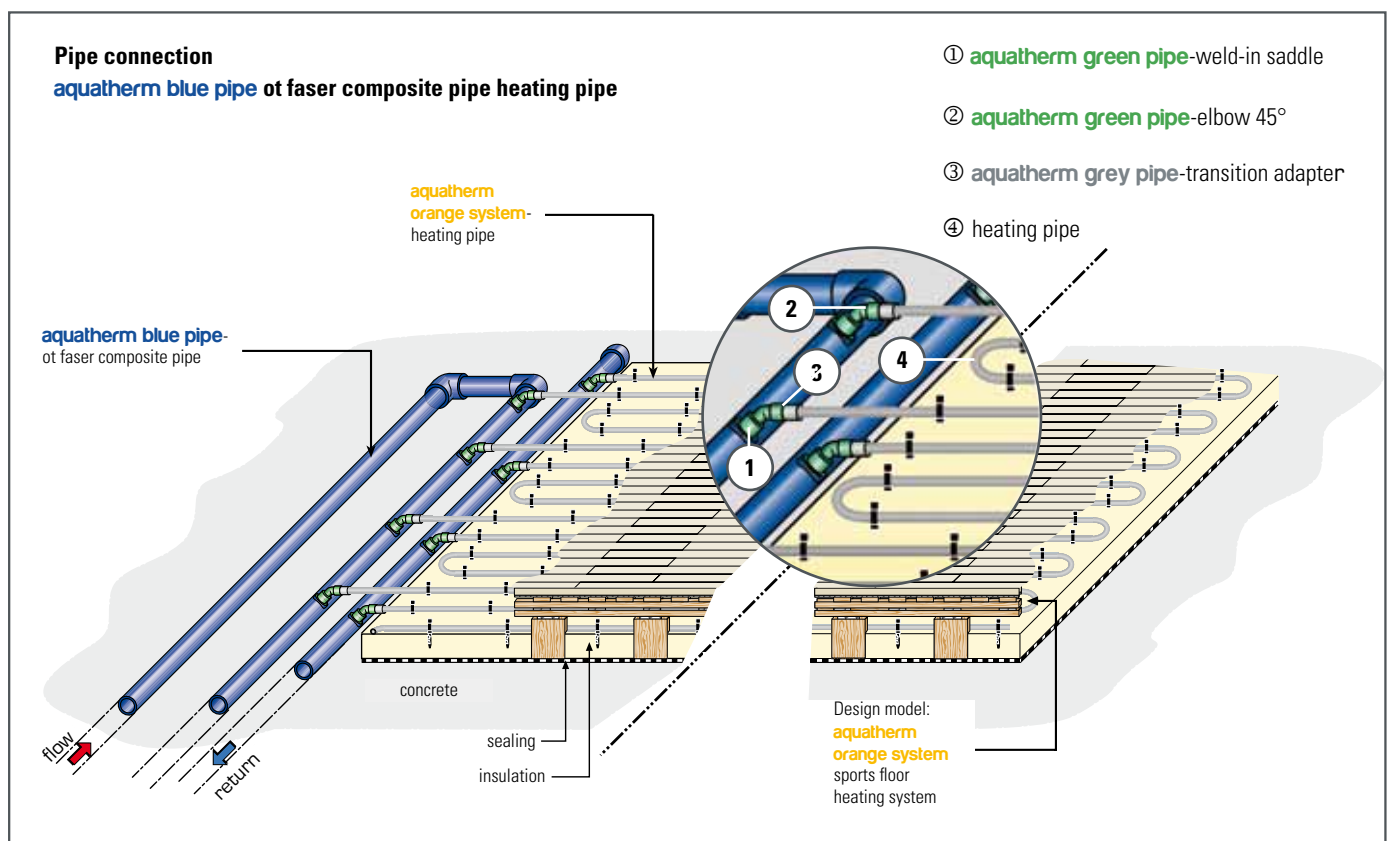
### Installation

For this connection technique the manifold pipes are made from aquatherm blue pipe or faser composite pipes and weld-in saddles.

The spacing of saddles is determined by the pipe spacing of the heating pipes. aquatherm grey pipe transition adapter are applied for the connection of the oxygen-tight heating pipes. They provide an optimum connection between the aquatherm blue pipe or faser composite pipes and the aquatherm grey pipe system. (SHT= sliding sleeve technology)



Pipe lay out with weld-in saddle



**aquatherm orange system PIPE GUIDING WITH HEATING CIRCUIT MANIFOLD**

**Pipe guiding plan with heating circuit manifold**

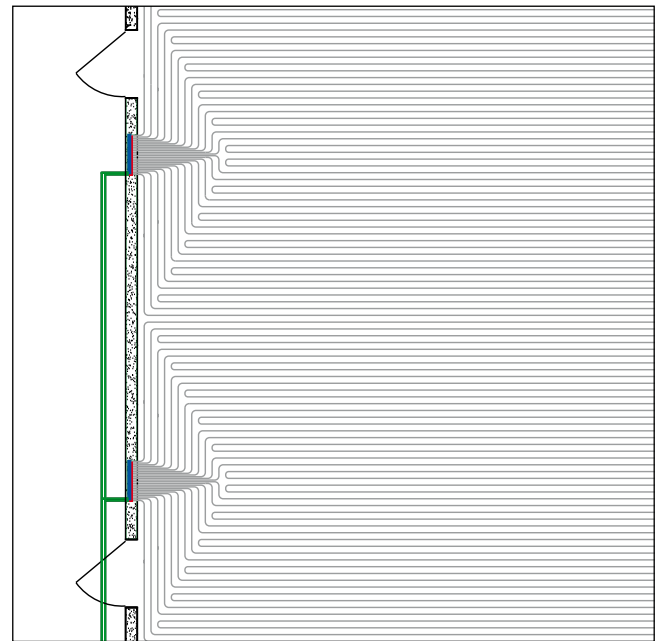
The heating pipes of the aquatherm orange system sports floor heating system are laid in crosswise or lengthwise direction between the lower construction of the sports floor or in the polystyrol system components with heat conducting lamellas.

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.

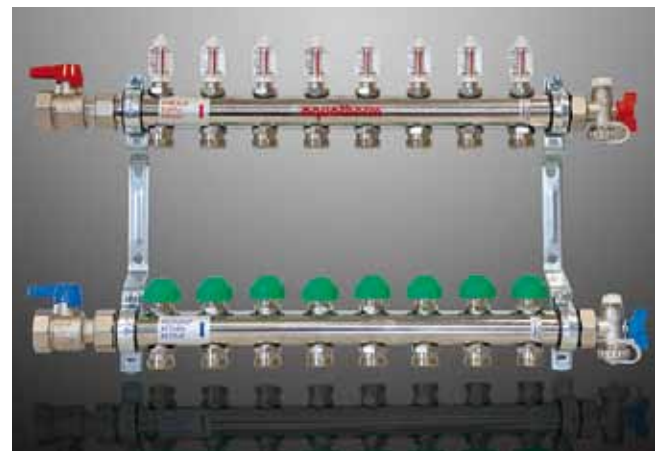
**Installation**

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.

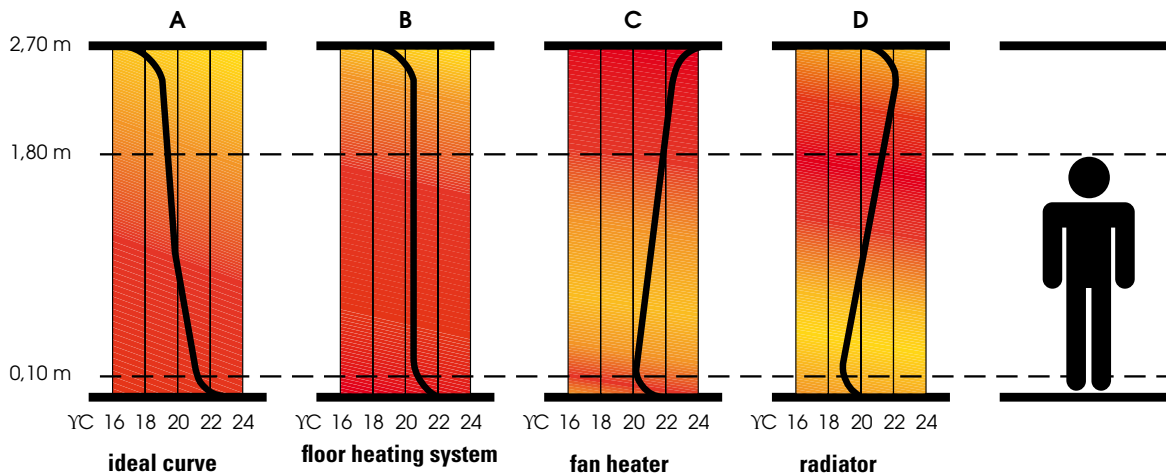
The advantage of a sports floor heating system is the constant temperature distribution over the total area. The course of temperature of the floor heating is closest to the ideal curve of all heating systems.



Pipe guiding plan with heating circuit manifold



**March of temperature of various heating systems**



## SPORTS FLOOR HEATING SYSTEM

Finished sports hall with aquatherm orange system sports floor heating system with linoleum covering



Laying with pipe suspension rail



Finished sports hall with aquatherm orange system sports floor heating system with parquet covering



aquatherm orange system 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 hall, Bergisch Gladbach, Germany



Sports hall, Freital, Germany



Sorpic school complex, Bautzen, Germany



Vocational school complex, Radeberg, Germany





**SYSTEM ELEMENT TS 25**



## **GENERAL TERMS AND CONDITIONS**

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