Edition: 03.2014

# aquatherm blue pipe

**Pipe system made of polypropylene**
for chilled, hot fluid and various industrial applications

aquatherm
state of the pipe

Our sales and delivery conditions (January 2014) and the contacts of our technical sales and distribution see on our homepage www.aquatherm.de.

Dear customers and partners,

thank you for your interest in our family enterprise. For a long time the classification of enterprises as a family has rather been hidden than actively marketed. Only in recent years family enterprises experience a comeback. From employee perspective, they are generally a flat hierarchy, provide independent and responsible work under a cooperative management style, but above all they are considered safe employers who commit permanently to their employees.

By definition, family enterprises are distinguished primarily by the unity of ownership and management in the hands of a family; this criterion the aquatherm group still meets after the transition from the first to the second generation (pictured above).

Our self-image of a family enterprise, however, clearly exceeds this description. Our claim describes a proactive organization that bases in the responsible contact in everyday life, that challenges encouraging, thereby accompanies developments in a promoting way and sets on a personal influenced by nearby corporate culture. If these business properties meet determined people that daily inspire through initiative, diligence and passion, until we speak of a living family enterprise, until we speak with pride of the aquatherm family.

We look forward to presenting you on the following pages some insight into our colorful, slightly green-tinted aquatherm world.

**Christof Rosenberg**
Managing Director

**Dirk Rosenberg**
Managing Director

**Maik Rosenberg**
Managing Director

**Gerhard Rosenberg**
President of the Advisory Board

**1973**
Founding of aquatherm by Gerhard Rosenberg
**1978**
Transfer to the first factory in Biggen / D-Attendorn
**1985**
Completion of factory 1 in Biggen / D-Attendorn
**1992**
Founding of the branch in Radeberg near D-Dresden
**1996**
Founding of the metal processing company aquatherm metal, D-Attendorn
**1998**
Founding of a subsidiary in Carrara / Italy
**1999**
Completion of the main site in D-Attendorn as one complex (Factories 1+2, Production and Store, Laboratory and Training Centre)
**2001**
Completion of the extension Factory 2 in D-Attendorn
**2001**
Opening of the new training centre in D-Radeberg
**2002**
Completion of the logistics centre in D-Attendorn
**2003**
Completion of rebuilding and finishing of the training centre in D-Attendorn
**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 Attendorn

| | |
|---|---|
| Basement: | Store |
| Ground floor: | Assembly / Packing |
| 1st Floor: | Laboratory and Technical department |
| 2 nd Floor: | Special manifold construction |

**2008**
Aquisition of the former storehouse of the forwarding agent Kost, which also accomodates the room of the plant maintenace.
**2009**
Opening of the new expertise centre for technical application.
**2013**
40 year celebration of the company aquatherm

# SERVICE

## TECHNICAL HOTLINE*
## +49 (0)2722 950 200

* free call

info@aquatherm.de www.aquatherm.de


### Parent plant Attendorn

**aquatherm GmbH**
Biggen 5
D-57439 Attendorn
Phone: +49 (0)2722 950 0
Fax: +49 (0)2722 950 100

### Subsidiary Radeberg

**aquatherm GmbH**
Wilhelm-Rönsch-Str. 4
D-01454 Radeberg
Phone: +49 (0) 3528 4362-0
Fax: +49 (0) 3528 4362-30


**Field staff**

In addition to the regular training service at Attendorn and Radeberg aquatherm field staff are available to assist customers, on site, throughout Germany.

**Training service**

In addition to training service through the merchant network aquatherm offers its customers training, free of charge, at its training centres at Attendorn and Radeberg.

**Fair**

aquatherm is represented on all important fairs relevant for the sanitary and heating sector in Germany or abroad with its own exhibition booth. For more information regarding fairs near to you, please visit internet page: www.aquatherm.de.

## CERTIFICATIONS IN ACCORDANCE WITH ISO 9001, 14001 & 50001

Since 1996 aquatherm has been meeting the requirements of the certifiable quality management system according to DIN ISO 9001. The 2012 TÜV certificate was extended by the environmental management system according to ISO 14001 and currently by the energy management system according to ISO 50001.

This success is a great contribution and represents a further step to strengthen our competitive position and to meet the high requirements and the responsiblity for our customers, partners and the environment.


Certificate

ISO 9001:2008

aquatherm

TÜVRheinland®


Certificate

ISO 14001:2004

aquatherm

TÜVRheinland®


Certificate

ISO 50001:2011

aquatherm

TÜVRheinland®

### Laboratory

The aquatherm laboratory: from the testing of granulate through to the finished product the customer can be assured of only the highest quality products.

### Software-Service

The aquatherm-software service provides Datanorm-files, an independent graphical program (liNear), and the appropriate training.

### Miscellaneous

Different aquatherm-CD`s, prospects, catalogues, poster, leaflets, mailings,calen-dars, a.s.m. are investigated and produced from the internal advertising department. All information regarding the company, the technology, the products, the various trainings and fairs as well as all catalogues in pdf-form can be called and downloaded from the aquatherm-website: www.aquatherm.de.

SERVICE

# REBRANDING

The desire to avoid stagnation and continuously improve our products, as well as to find new fields of application and create solutions quickly, has resulted in some of the well-known aquatherm product groups. This often led to systems being named as they emerged and has resulted in naming conventions that no longer accurately convey the suitable applications for the pipe.

Another issue is that many of our pipes and systems have names that do not relate to each other, and in turn do not relate those products to their parent company, aquatherm.
Furthermore, other companies from different industries around the globe use similar names, creating confusion between aquatherm products and their products. The desired uniqueness of our system identification is lost.
Thus, the next logical step for us is to introduce a naming system that matches and unifies our products.

| | new branding structure | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | brand name | | appendix | | | | | |
| no.: | company | system | Standard Dimension Ratio | structure of pipe | special feature of pipe | Material / Glas fibre content GF[%]/ fire class. Acc. ISO 11925 | old brand name | article-no. |
| 1 | aquatherm | green pipe | SDR11 | S | | PP-R/GF0/E | fusiotherm SDR11 | 10208 . . . 10248 |
| 2 | aquatherm | green pipe | SDR7,4 | S | | PP-R/GF0/E | fusiotherm SDR7,4 | 10806 . . . 10826 |
| 3 | aquatherm | green pipe | SDR6 | S | | PP-R/GF0/E | fusiotherm SDR6 | 10006 . . . 10024 |
| 4 | aquatherm | green pipe | SDR7,4 | MS | | | fusiotherm stabi-composite pipe | 70806 . . . 70824 |
| 5 | aquatherm | green pipe | SDR7,4 | MF | | PP-R/GF7/E | fusiotherm faser composite pipe | 70708 . . . 70747 |
| 6 | aquatherm | green pipe | SDR7,4 | MF | UV | inliner like 5 with black PE-coating | fusiotherm faser composite pipe UV | 70758 . . . 70788 |
| 7 | aquatherm | green pipe | SDR7,4 | MF | TI | inliner like 5 with PU-Insulation and black PE-casing | fusiotherm faser composite pipe ISO | 1270711 . . . 1270737 |
| 8 | aquatherm | green pipe | SDR9 | MF | RP | PP-RP/GF7/E | aquatherm green pipe faser composite pipe | 370712 . . . 0370744 |
| 9 | aquatherm | green pipe | SDR9 | MF | RP UV | inliner like 8 with black PE-coating | aquatherm green pipe faser composite pipe UV | 370762 … 370794 |
| 10 | aquatherm | blue pipe | SDR11 | S | | PP-R/GF0/E | Climatherm SDR11 | 2010208 . . . 2010238 |
| 11 | aquatherm | blue pipe | SDR7,4/ SDR11 | MF | | PP-R/GF7/E | Climatherm faser composite pipe SDR7,4/SDR11 | 2070112 . . . 2070726 |
| 12 | aquatherm | blue pipe | SDR7,4/ SDR11 | MF | UV | inliner like 11 with black PE-coating | Climatherm faser composite pipe SDR7,4/SDR11 UV | 2070162 . . . 2070762 |
| 13 | aquatherm | blue pipe | SDR7,4/ SDR11 | MF | OT | inliner like 11 with EVOH O2-barrier | Climatherm faser composite pipe SDR7,4/SDR11 OT | 2170114 . . . 2170712 |
| 14 | aquatherm | blue pipe | SDR17,6 | MF | | PP-R/GF7/E | Climatherm faser composite pipe SDR17,6 | 2570134 . . . 2570154 |
| 15 | aquatherm | blue pipe | SDR7,4/ SDR11 | MF | TI | inliner like 11 with PU-Insulation and black PE-casing | Climatherm faser composite pipe SDR7,4/SDR11 ISO | 2270111 . . . 2270142 |
| 16 | aquatherm | blue pipe | SDR7,4/ SDR11 | MF | OT-TI | inliner like 13 with PU-insulation and black PE-casing | Climatherm faser composite pipe SDR7,4/SDR11 OT ISO | 2470711 . . . 2470126 |
| 17 | aquatherm | red pipe | SDR7,4 | MF | HI | PP-R/GF7/B-s1,d0 | aquatherm firestop | 4170707 . . . 4170730 |
| 18 | aquatherm | lilac pipe | SDR7,4/ SDR11 | S | | PP-R/GF0/E | aquatherm lilac | 9010212 . . . 9010238 |
| 19 | aquatherm | black system | | | OT | | climasystem | |
| 20 | aquatherm | orange system | | S | OT | | aquatherm floor heating | |
| 21 | aquatherm | grey pipe | | | | | aquatherm SHT | |

During the transition period, the products will have the old and the new system name. This will help to facilitate familiarization and orientation in the market.

| LEGEND: | | | |
|---|---|---|---|
| **S** | single layer | **UV** | ultraviolet protected |
| **MS** | multilayer stabi | **TI** | isolated with PUR and external PE pipe |
| **MF** | multilayer faser | **RP** | raised pressure (resistance) |
| **OT** | oxygen tight | **HI** | hardly inflammable |

| potable water | HVACR | swimming pool | chemical fluids | recycled & reclaimed water | fire protection | compressed air | district heating | geothermal | shipbuilding sector |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| ● | ❍ | ● | ● | ❍ | | ❍ | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | ● | ● | ● | ❍ | | ● | ● | ● | ● |
| | | | | | ● | | | | |
| | | | | ● | | | | | |
| | ● | | | | | | | | |
| | ● | | | | | | | | |
| ● | ❍ | | | | | | | | |

System recommended due to its technical advantages: ●
Application of the system is suitable: ❍

## SHORT CUTS & SYMBOLS

| short cuts **structure of pipe** | |
|---|---|
| S | single |
| M | multilayer |
| MF | multilayer faser |
| OT | oxygen tight |
| UV | UV resistant |
| TI | thermal insulation |

| short cuts **material** | |
|---|---|
| PP | polypropylene |
| PP-R | polypropylene random |
| PE | polyethylene |

### FIELDS OF APPLICATION


potable water application


heating system construction


connection heating and cooling


underfloor heating


wall heating


ceiling heating and cooling


industrial floor cooling


industrial floor heating


chilled water technology


agriculture


sports floor heating and cooling


swimming-pool technology


chemical transport


rainwater application


irrigation


fire protection sprinkler-systems


application in the field of ship building


district heating pipeline systems


geothermal

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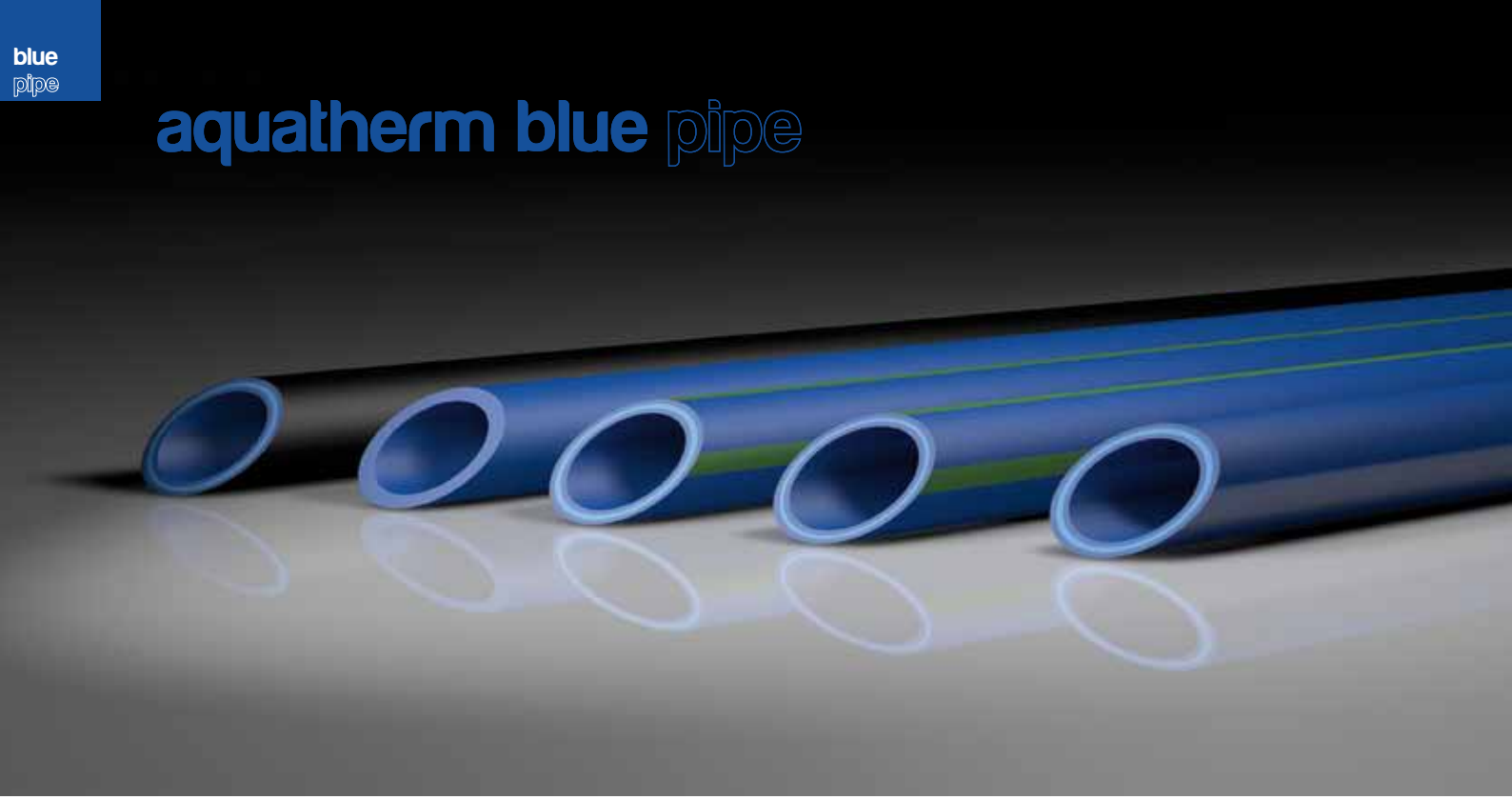
Fittings
Weld-in saddle
Threaded connections and accessoires
Transition piece
Screwed connections and counter parts
Distributors
Valves and accessoires
Cutting tools, welding devices
Welding machines and welding jig
But welding machines & electrofusion device
Peeling tools
Saddle welding tools
Drills & saddle peeling tool

# aquatherm blue pipe



## AQUATHERM PP-R PIPE SYSTEMS

aquatherm offers pipe systems with many applications due to their special characteristics and versatility.

The aquatherm pipe systems are applied in all fields of

**NEW INSTALLATION**

**REPAIR** and

**RENOVATION.**

## AQUATHERM BLUE PIPE

climatherm our specialty for distributing cooling and heating in closed systems as well as in several industrial applications, will become

aquatherm blue pipe

This system was developed 10 years ago in order to prevent corrosion in air conditioning pipes and quickly expanded its range of application, with many positive features for other fields of piping installation. It has gone on to find success around the world in hotels, stadiums, schools, offices, and industrial applications.

The aquatherm blue pipe system has been developed especially for applications outside the potable water installation.

In addition to the general advantages of the PP-R pipesystem (see page 13) aquatherm blue pipe in comparison with the aquatherm green pipe system offers higher volumetric current values due to smaller wall thickness.

### System components

The system has to be installed in combination with the aquatherm green pipe-fittings - and includes all elements for the pipe system installation for chilled, hot fluid and various industrial applications.

- pipes in straight lengths and / or coils
- fittings
- flanged joints
- water point connections and accessories
- welding devices and machines
- weld-in saddles
- manifolds
- shut-off devices
- cutting and peeling tools
- installation guide and fastenings
- transition joints from PP-R to metal or from metal to PP-R

**aquatherm blue pipe stopps corrosion damages!**

Air conditioning systems (problems with dew-point) installed with steel pipes especially are affected by corrosion at the outer surface of the pipes.

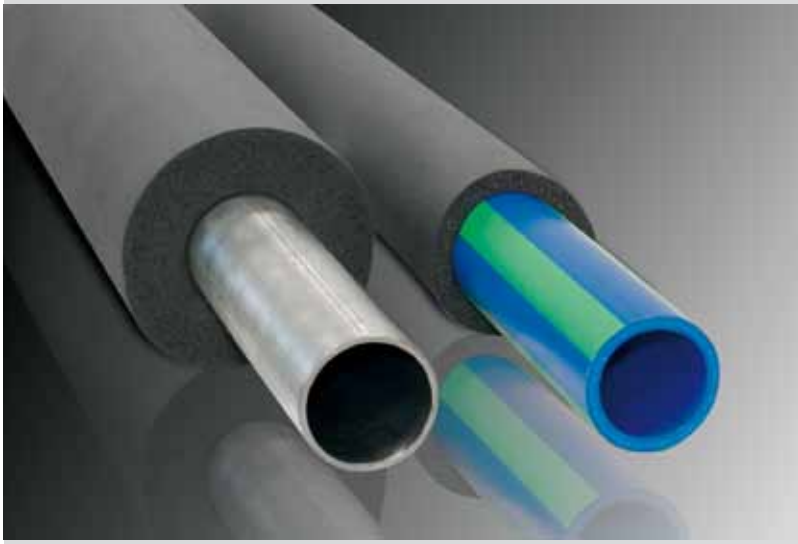
aquatherm blue pipe is manufactured from 100% corrosion resistant materials which increase the life-time of air-conditioning pipe systems considerably.

corroding steel pipes

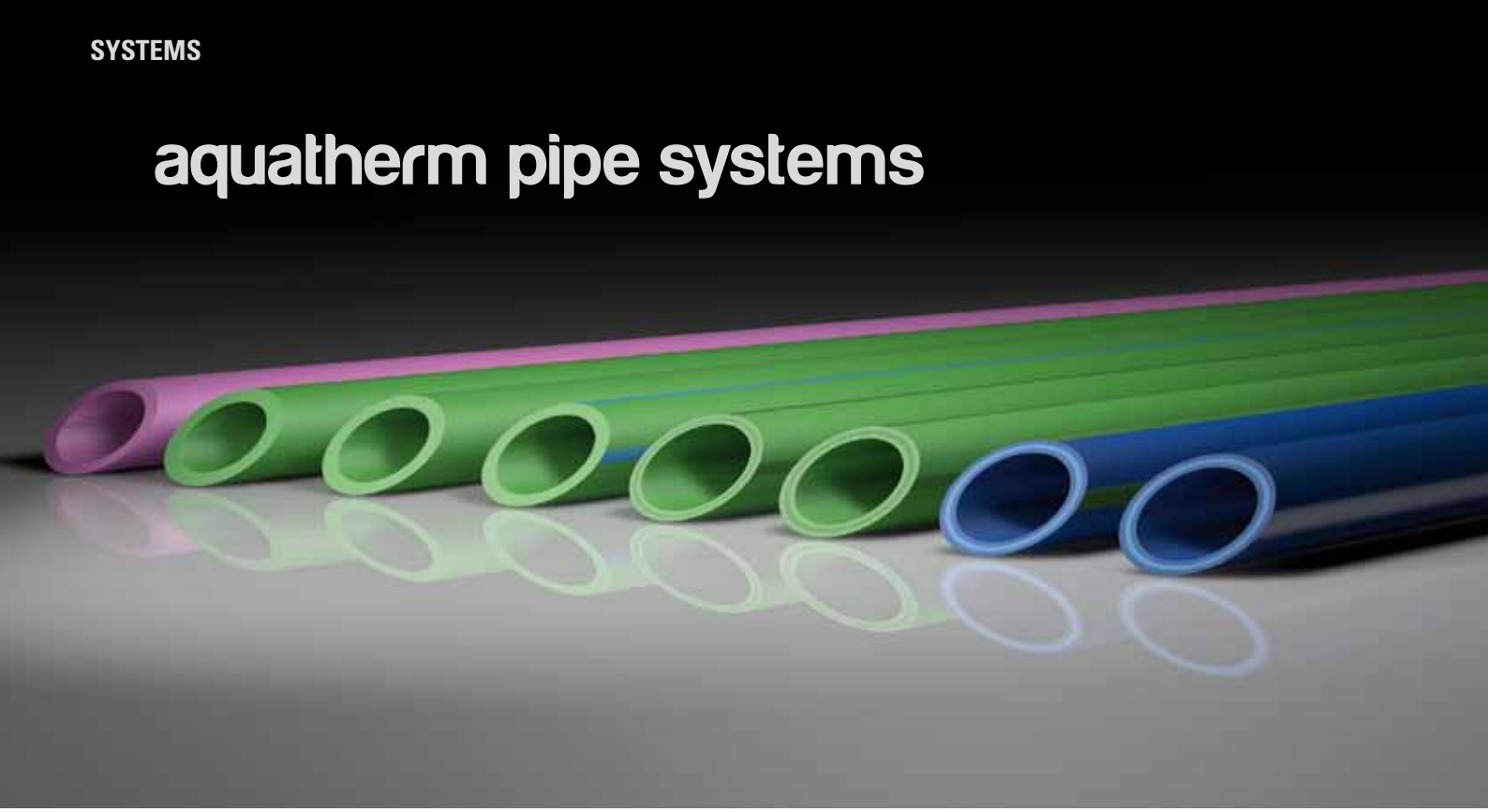
**Insulation against energy loss**

Due to its excellent thermal insulation properties aquatherm blue pipes compared to metal pipes require a considerably thinner insulation.

For detailed information see table on page 81.



# aquatherm pipe systems



## FIELDS OF APPLICATION

- **Heating pipes for residential houses**
  heat generator connections
  heating manifolds
  risers
  high rise
  manifold connections
  radiator connections

- **Pipe networks**
  for climate technology
  for Chilled water technology
  for Swimming-pool technology
  for Chemical transport
  for Rainwater application
  for Compressed air systems
  for Under-floor-heating-systems
  in ship building
  for District heating
  for Geothermal

## AQUATHERM PIPE SYSTEMS

**Characteristic**

aquatherm PP-R pipe systems stopping corrosion damages. All materials are corrosion resistant and - compared to metallic pipes - have less noise flow rate. aquatherm PP-R pipes are opaque - no danger of algae development.

**Installation**

aquatherm offers an unique and unrivalled connection process: material union by fusion. Shortest connection times are convincing:

e.g. outside diameter 20 mm = 5 sec.

aquatherm pipe connections can be hydraulic pressure tested or put into operation directly after their fusion. There are no extended waiting times.

**Quality**

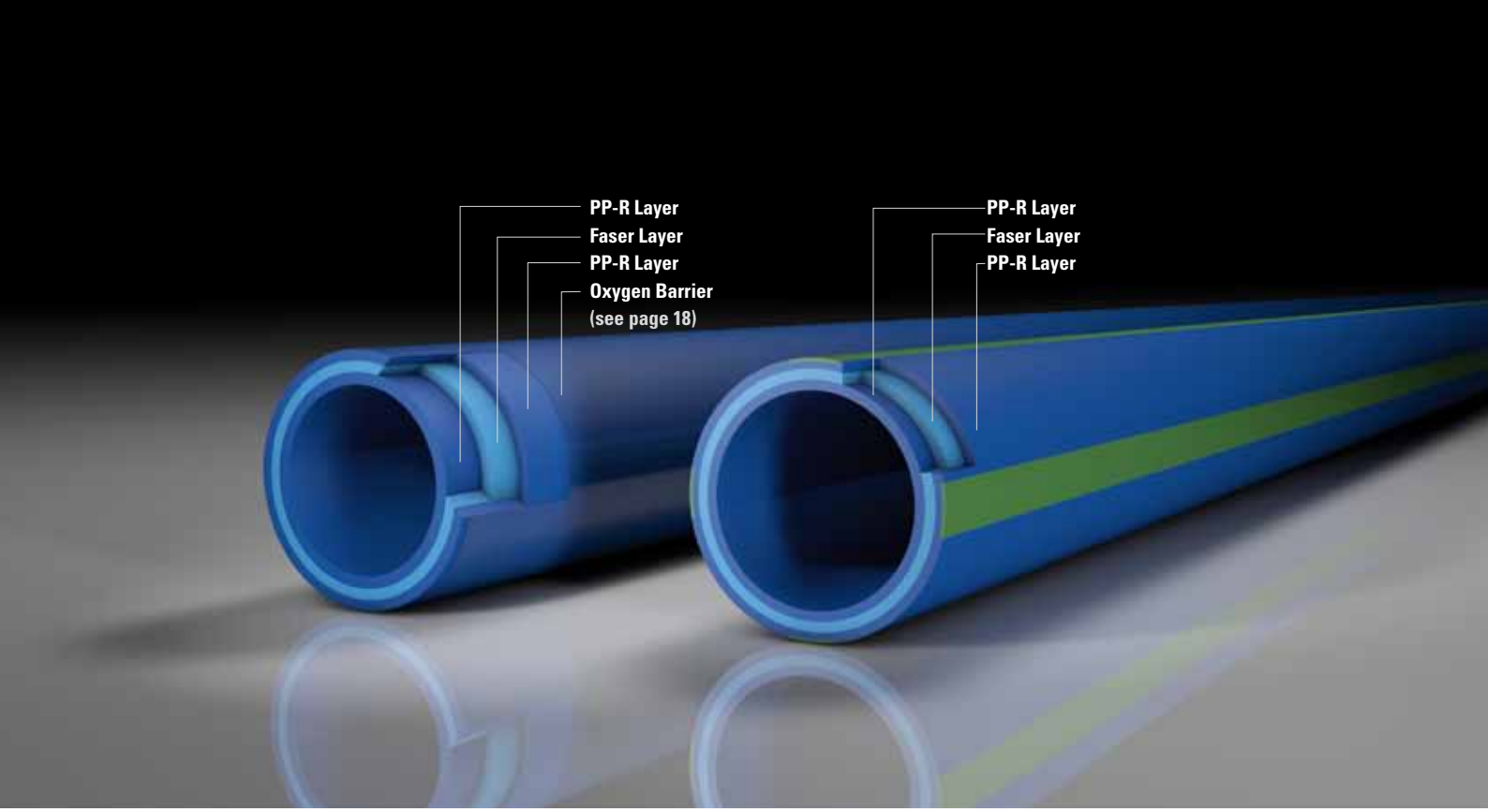
This is reflected in national and international certificates, but above all in the satisfaction of aquatherm-clients, installers and planners. For more details regarding quality and certificates see page 30.

**Guarantee**

As a statement to aquatherm quality standards the aquatherm PP-R pipe systems carries a 10 year guarantee for pipe and fittings with a product liability of 15 Mio. EUR per damage event.

**Price**

aquatherm PP-R pipe systems are perfected pipe systems of high quality material with an optimum cost-performance ratio.




## FASER COMPOSITE TECHNOLOGY

The composite pipes made in the multi-layer extrusion process produce a higher stability due to the fibre filling in the middle layer. Compared to customary PP-pipes there are further advantages.

aquatherm developed a manufacturing method, realizing the integration of a special faser mixture within the material polypropylene.

The result of this innovative technology is the singular compound of the different materials.

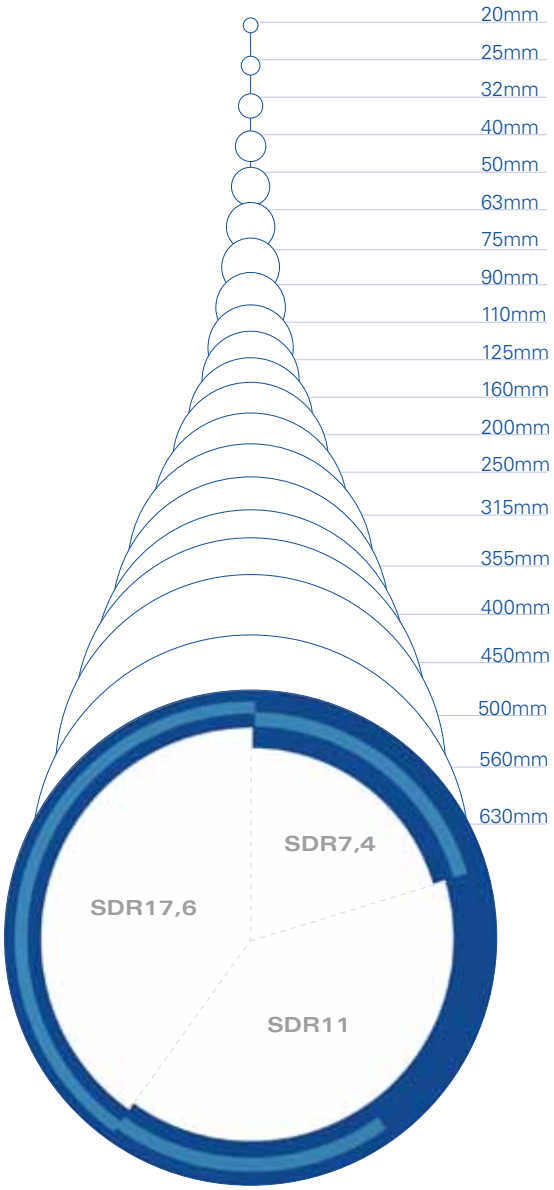
- The linear expansion is reduced by at least 75 % compared with standard PP- pipes
- The flow rate is increased by 20 % due to smaller wall thickness.
- High stability
- The coefficient of linear expansion is nearly identical to that of metal pipes, so that compared with usual plastic pipes the support intervals can be enlarged and the number of clamps can be reduced.
- Optimum cost-performance ratio
- Lower weight
- High impact rate
- Simply cut and weld

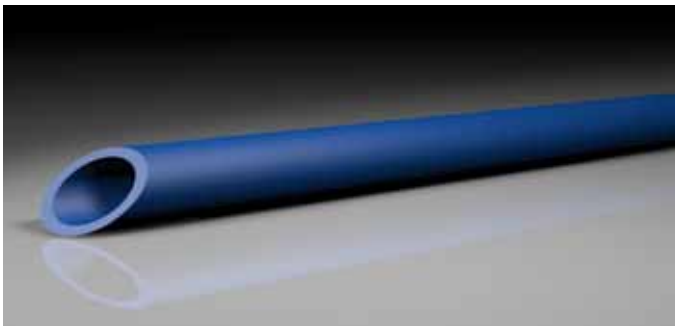
**A diagram for the simple and rapid determination of the length expansion and expansion compensation is on page 72.**

# aquatherm blue pipe
## OVERVIEW

## COMPARISION OF THE WATER CONTENT PER METER

| ø Dimension mm | aquatherm blue pipe<br><br>SDR 7,4 MF<br>SDR 7,4 MF OT | aquatherm blue pipe<br><br>SDR 11 MF<br>SDR 11 MF OT<br>SDR 11 S | aquatherm blue pipe<br><br>SDR 17,6 MF |
|---|---|---|---|
| ø 20 | 0,163 | 0,206 | - |
| ø 25 | 0,254 | 0,327 | - |
| ø 32 | 0,423 | 0,539 | - |
| ø 40 | - | 0,834 | - |
| ø 50 | - | 1,307 | - |
| ø 63 | - | 2,074 | - |
| ø 75 | - | 2,959 | - |
| ø 90 | - | 4,252 | - |
| ø 110 | - | 6,359 | - |
| ø 125 | - | 8,199 | 9,637 |
| ø 160 | - | 13,430 | 15,792 |
| ø 200 | - | 21,010 | 24,661 |
| ø 250 | - | 32,861 | 38,568 |
| ø 315 | - | 52,172 | 61,223 |
| ø 355 | - | 66,325 | 77,832 |
| ø 400 | - | 84,290 | 98,756 |
| ø 450 | - | 106,477 | 125,036 |
| ø 500 | - | - | 154,272 |
| ø 560 | - | - | 193,688 |
| ø 630 | - | - | 245,070 |

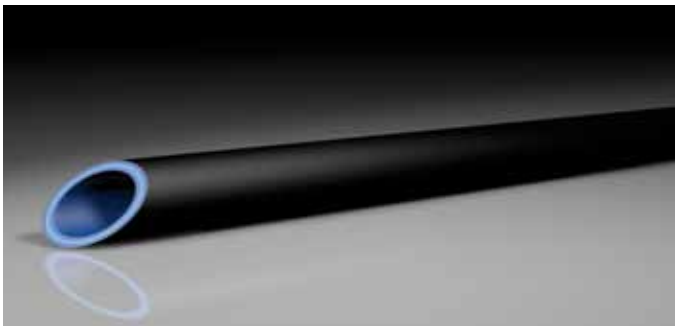




**SDR:** 11
**ø:** 20-32mm

**Type of pipe:**

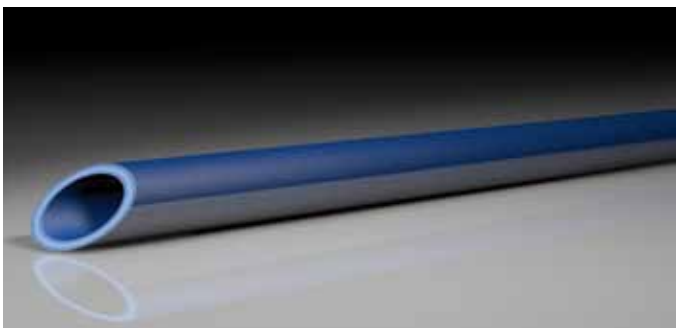
**Old (before March 2013):** climatherm pipe
**New (since March 2013):** aquatherm blue pipe S



**SDR:** 7,4 **ø:** 20-32 mm
**SDR:** 11 **ø:** 32-450 mm
**SDR:** 17,6 **ø:** 160-630 mm

**Type of pipe:**

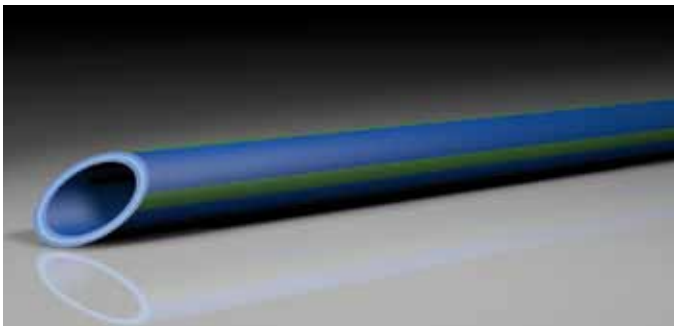
**Old (before March 2013):** climatherm Faser composite pipe UV
**New (since March 2013):** aquatherm blue pipe MF UV



**SDR:** 7,4 **ø:** 20-32 mm
**SDR:** 11 **ø:** 40-250 mm

**Type of pipe:**

**Old (before March 2013):** climatherm Faser composite pipe OT
**New (since March 2013):** aquatherm blue pipe MF OT



**SDR:** 7,4 **ø:** 20-32 mm
**SDR:** 11 **ø:** 32-450 mm
**SDR:** 17,6 **ø:** 125-630 mm

**Type of pipe:**

**Old (before March 2013):** climatherm Faser composite pipe
**New (since March 2013):** aquatherm blue pipe MF

**SDR:** 11 **ø:** 32-450 mm
**SDR:** 17,6 **ø:** 160-450 mm

**Type of pipe:**

**Old (before March 2013):** climatherm ISO Faser composite pipe
**New (since March 2013):** aquatherm blue pipe MF TI

# The advantages

of aquatherm pipes and fusiolen® PP-R

**absolutely corrosion resistant**
**resistant against chemicals**
**high environmental compatibility**
**high impact rate**
**less pipe roughness**
**heat and soundinsulating characteristics**
**very good welding properties**
**high heat-stabilized**
**noticeable less insulation - recommended are**
**10 mm of insulation for all pipe dimensions**
**high stability**
**lighter in weight**
**easy processing**
**well-priced**
**installation aids and fixings**

fusiolen®

## OUR MATERIAL FUSIOLEN PP-R

Decades of experience in the production and the application of PP-R pipe systems and the current ambition of continuous development led to numerous improvements of the aquatherm-system technology.

Newly opened markets set a high standard of quality to make even larger demands against the pipe material. Various fields of application require the greatest possible independence of the material to be processed. Raw materials with new properties are required.

aquatherm has developed and produced their own, innovative PP-R materials which meet the requirement of a global market in the potable water and heating technology, in the airconditioning and chilling engineering, in the industrial and agriculture economy, in shipbuilding as well as in fire protection. Successful results of this research are fusiolen® PP- R, fusiolen® PP-R C or fusiolen® PP-R FS.

All aquatherm PP-R pipes and fittings are made of fusiolen® PP-R.

Special heat and extraction stability are only two of the features of this material. Its physical and chemical properties are well-suited to the transfer of potable water and to the heating field. Above all, the good welding properties and fusion, resulting in a permanent connection, have made the aquatherm systems and the raw material fusiolen® PP-R well known worldwide.

### Environment

The environmentally friendly material polypropylen fusiolen® PP-R is recyclable and can be ground, melted and reutilised for various applications e.g. motor-protections, wheel linings, laundry baskets and other kinds of transport boxes. There are no polluting substances with PP-R either in its processing or in its disposal.

**fusiolen® PP-R – for the benefit of our environment!**

### Use of metal deactivators

By adding suitable food-approved additives the risk of amaterial damage caused by metal under extreme conditions of application is substantially reduced.

### Higher long-term heat stabilization

The long-term heat stabilization has been increased to resist to the potential effects of peak temperatures within higher safety parameters.

## MATERIAL PROPERTIES

The extrapolated service life of aquatherm PP-R- pipes is more than 50 years. Peak temperatures of 100° C arising from short disruptions are unproblematic.

Permanent temperatures from 70°C up to 90° C reduce the service life of the pipe (see table “Permissible Working Pressure”, page 34).

Using aquatherm PP-R pipes for heating or air conditioningapplications the pressure- and temperature conditions according to table “Permissible Working Pressure” are valid.

The following table shows the operating conditions related to pressure and temperature as a basis for pipe and pipe connections.

These figures refer to potable water installations based on a theoretical service life of 50 years.

# Certificates

Numerous international certificates testify to the high quality standard of the aquatherm pipes.

**DVGW, SKZ (Germany)**
**AENOR (Spain)**
**ÖVGW (Austria)**
**WRAS (UK)**
**SVGW (Switzerland)**
**KIWA (Netherlands)**
**SAI-Global (Australia)**
**CRECEP (France)**
**SII (Israel)**
**SIRIM (Malaysia)**
**TIN (Poland)**
**LNEC (Portugal)**
**SITAC (Sweden)**
**NSF, ICC (USA)**
**a.m.m.**

* Reference temperature for the creep rupture strength: 20°C (68°F)

| | Working pressure | Temperature | Annual working hours |
|---|---|---|---|
| | bar (psi) | °C (°F) | h/a |
| **Cold water** | 0 upto 10 (145) transient | to 25 (77)* | 8760 |
| **Hot water** | 0 upto 10 (145) transient | to 60 (140) to 85 (185) | 8710 50 |

## AQUATHERM & ECOLOGY

Environmental protection is taken very seriously by aquatherm!

Products such as the aquatherm PP-R pipe systems feature not only a long service life, but also excellent environmental and social compatibility.

From the origin of the company aquatherm placed emphasis on the fact that its products and manufacturing processes should not pollute our sensitive eco-systems, and ensured development of fully recyclable materials which can thus be added, problem-free, to new production.

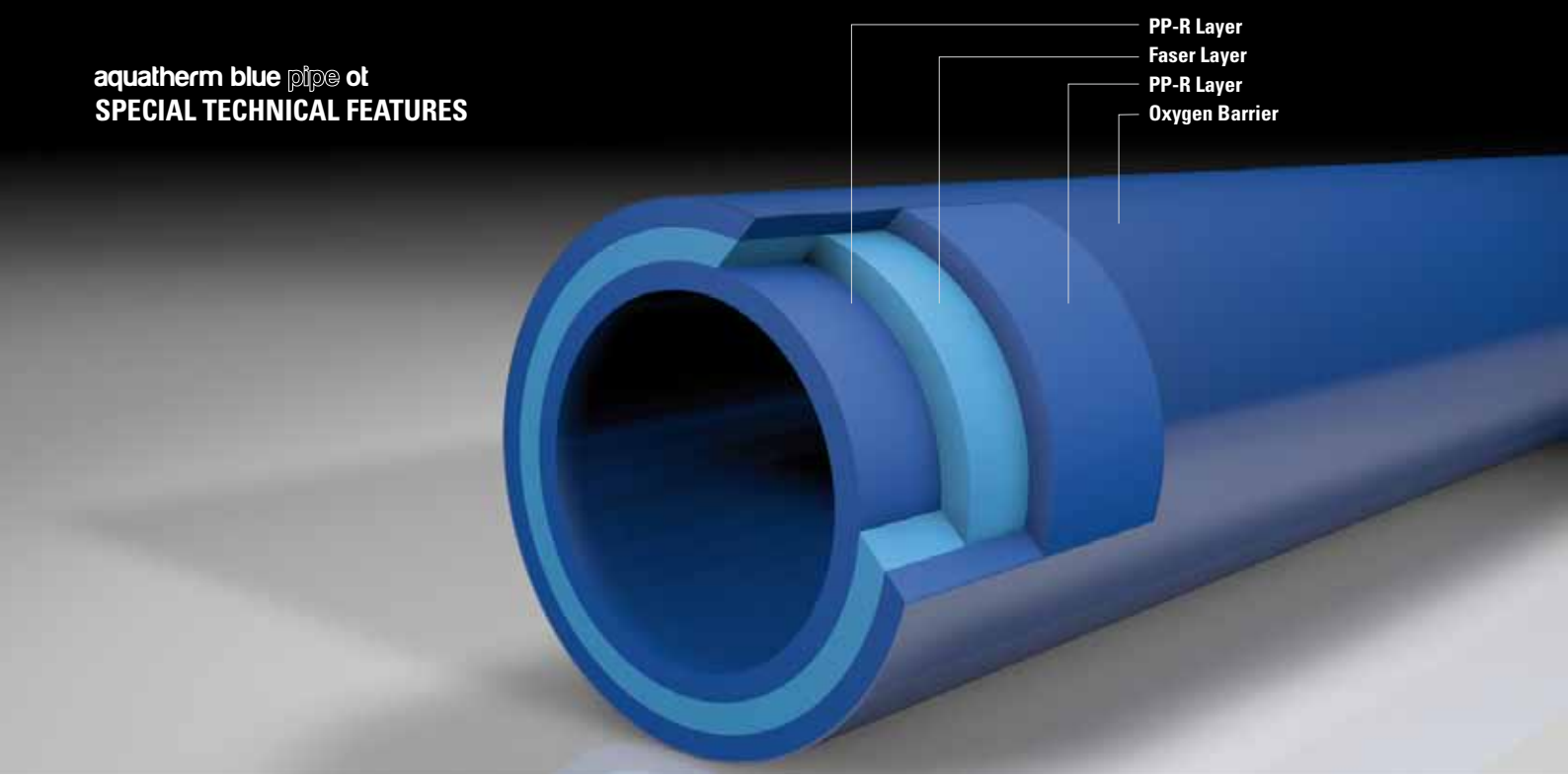
Long before environmental protection was recognised as a global issue aquatherm fulfilled ecological standards which are demanded today.

For now 40 years aquatherm has underlined its philosophy that ecological and economic interests should not be contradictory, neither during production and sales, nor in the product application.

The environmentally friendly raw material fusiolen® its used for the manufacture of the aquatherm pipe systems. To ensure its environmental compatibility the basic material polypropylene, as well as all contained additives (colour pigments and stabilizers) were extensively tested, not only by aquatherm's own laboratory, but also by independent laboratories.

Their results show that the material fusiolen® and the pipe systems from which it is manufactured, comply with the highest ecological standards and are thus future-oriented.

aquatherm blue pipe ot
SPECIAL TECHNICAL FEATURES




# aquatherm blue pipe ot

## WITH OXYGEN BARRIER

With the redeveloped aquatherm blue pipe faser composite pipe OT, aquatherm launches an oxygen tight pipe, which is equipped with an oxygen barrier and thus corresponds to the requirements of DIN 4726.

The aquatherm blue pipe faser composite pipe OT in combination with the aquatherm blue pipe system includes all elements for the pipe installation of chilled, hot fluid and various industrial applications.

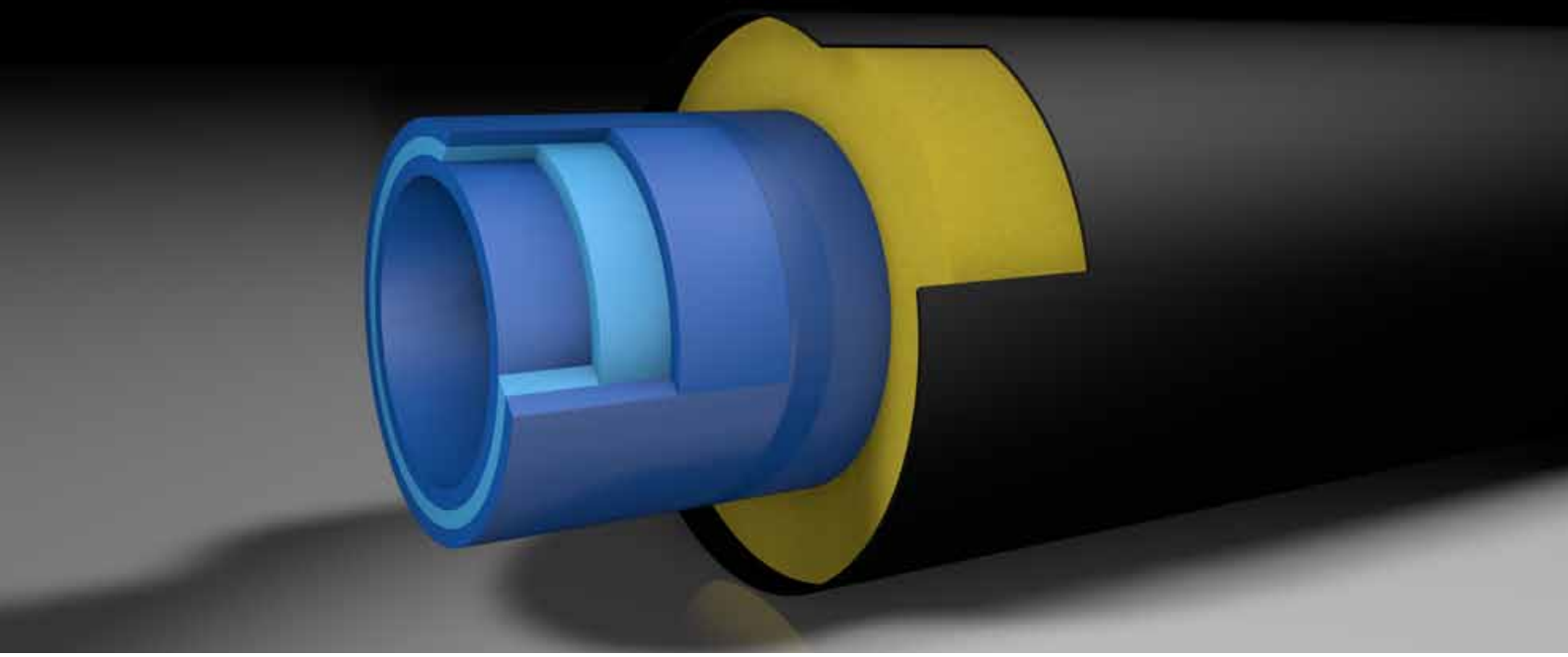
**The advantages of aquatherm blue pipe ot:**

- oxygen tight by diffusion barrier
- certified according to DIN 4726
- absolutely corrosion resistant
- less pipe friction
- high stability
- high heat-stability
- high environmental compatibility
- high impact rate
- resistant against chemicals
- heat- and sound insulating characteristics
- very good welding properties
- considerably thinner insulation

**Easy and quick installation technology**

aquatherm blue pipe faser composite pipe OT also convinces by easy but effective installation- and connection technology. By heating of pipe end and fitting the plastic melts after joining of the elements into a permanent connection. aquatherm blue pipe faser composite pipes OT have to be peeled with peeling tools Art.-No. 50506-50526 before processing.

aquatherm blue pipe ti
SPECIAL TECHNICAL FEATURES



# aquatherm blue pipe ti

## PRE INSULATED PIPE SYSTEMS FOR DISTRICT HEATING

For the transport of district heating energy over long distances a complex, mostly underground pipe system is required.
High demands are made on both, the medium pipe and the pipe insulation.

aquatherm offers with the factory insulated aquatherm blue pipe ti-fiber composite pipes the ideal district heating pipes for heating systems, which are operated with working pressures up to 20 bar and working temperatures up to 90° C.

The insulated aquatherm blue pipe fiber composite pipes are also used as cooling- and refrigerant agent pipes. The pipe insulation is factory-made with PUR rigid foam that surrounds the medium pipe all over. To protect the insulation layer outward against mechanical or weather-related influences, the outside coating consists of a PEHD-protection pipe.

Fittings such as elbows, bends or tees are insulated at the factory in the same design. The joints between pipe and fitting are manufactured locally at the site in the pipe dimension 32 up to 125 mm by socket welding and in the dimension 160 up to 315 mm by butt-welding process.

The insulation of these joints is done by insulation sockets that enable a continuous insulation of the district heating pipeline.

aquatherm district heating pipes are available in length of 5.8 m and 11.6 m. We offer fittings with leg lengths of 0.5 m and 1.0.

Special designs on request.

### Medium pipes

- **aquatherm blue pipe ti** -
  faser composite pipe system SDR 11/17,6
  pipe system for heating, cooling and waste water
  in dimensions DN25 – DN300

- **aquatherm blue pipe ot ti** -
  faser composite pipe system SDR 11
  oxygen-tight pipe system for heating- and industrial
  in dimensions DN25 – DN100

### Fields of application

System recommended due to its technical advantages: ●

| | aquatherm blue pipe ti | aquatherm blue pipe ot ti |
|---|---|---|
| **Climate technology** | ● | ● |
| **Chilled water technology** | ● | ● |
| **Swimming pool technology** | ● | |
| **Rainwater application** | ● | |
| **Irrigation** | ● | |
| **District heating pipeline systems** | ● | ● |
| **Application in the field of Shipbuilding** | ● | ● |
| **Industrial liquids** considering the material resistance | ● | ● |

## aquatherm ti SYSTEM ADVANTAGES

System recommended due to its technical advantages: ●
Application of the system is suitable: ❍

| | aquatherm blue pipe ti | aquatherm blue pipe ot ti |
|---|---|---|
| **Low expansion** | ● | ● |
| **Corrosionresistant** | ● | ● |
| **Very good welding properties** | ● | ● |
| **Less pipe friction** | ● | ● |
| **High impact resistance** | ● | ● |
| **Heat-stability** | ● | ● |
| **Metal deactivation** | ● | ● |
| **Recyclable** | ● | ❍ |
| **Sound- and heat insulation** | ● | ● |
| **Low weight** | ● | ● |
| **Self-compensating** | ● | ● |

## DIMENSIONS

| medium pipe | aquatherm blue pipe ti<br>faser composite pipe<br>SDR 11 | aquatherm blue pipe ot ti<br>faser composite pipe<br>SDR 11 | aquatherm blue pipe ti<br>faser composite pipe<br>SDR 17,6 | casing pipe |
|---|---|---|---|---|
| external diameter | dimension | dimension | dimension | external diameter |
| 32 mm | DN 25 | DN 25 | - | 90 mm |
| 40 mm | DN 32 | DN 32 | - | 110 mm |
| 50 mm | DN 40 | DN 40 | - | 110 mm |
| 63 mm | DN 50 | DN 50 | - | 125 mm |
| 75 mm | DN 65 | DN 65 | - | 140 mm |
| 90 mm | DN 80 | DN 80 | - | 160 mm |
| 110 mm | DN 80/100 | DN 80/100 | - | 200 mm |
| 125 mm | DN 100 | DN 100 | DN 100 | 225 mm |
| 160 mm | DN 125 | DN 125 | DN 150 | 250 mm |
| 200 mm | DN 150 | DN 150 | DN 200 | 315 mm |
| 250 mm | DN 200 | DN 200 | DN 250 | 400 mm |
| 315 mm | DN 250 | - | DN 300 | 450 mm |

* larger dimensions on request

## aquatherm ti INSULATION

### Material

The aquatherm ti pipe systems are insulated with PUR-rigid foam. This polyurethane foam is made of Polyol and Isocyanate and meets the functional requirements of the EN 253. The foam is homogene with an average cell size of max. 0,5 mm.

For the professional insulation of the pipe and fitting connections, insulation jackets made of PUR-rigid foam are available for the aquatherm ti pipe system, coated with shrink sockets resulting in a permanent connection with the casing pipes.

### Material parameters

| Technical data | PUR |
|---|---|
| Cell gas Cyclopentane | > 8 % |
| Core density | > 60 kg/m$^3$ |
| Closed cell | > 88 % |
| Water absorption | < 10 % (Vol) |
| Compression strength 10 % deformation | > 0.3 N/mm$^2$ |
| Shearing resistance | > 0.12 N/mm$^2$ |
| Tangent shearing resistance | > 0.20 N/mm$^2$ |
| Thermal conductivity at 50° C | < 0.03 W/mK |

## aquatherm ti LOSS OF HEAT AND COOLING ENGERGY

| Type of pipe | Heat loss at average temperature 40°C in W/m | Heat loss at average temperature 50°C in W/m | Heat loss at average temperature 65°C in W/m |
|---|---|---|---|
| aquatherm blue pipe & aquatherm blue pipe ot SDR 11 | | | |
| 32 mm | 6,86 | 8,57 | 11,14 |
| 40 mm | 6,92 | 8,65 | 11,24 |
| 50 mm | 8,87 | 11,08 | 14,41 |
| 63 mm | 10,10 | 12,62 | 16,41 |
| 75 mm | 10,99 | 13,74 | 17,86 |
| 90 mm | 11,80 | 14,75 | 19,17 |
| 110 mm | 11,27 | 14,08 | 13,81 |
| 125 mm | 11,43 | 14,29 | 18,57 |
| 160 mm | 14,83 | 18,54 | 24,10 |
| 200 mm | 14,60 | 15,25 | 23,73 |
| 250 mm | 14,15 | 17,69 | 23,00 |
| 315 mm | 18,30 | 22,88 | 29,74 |

| Type of pipe | Cooling engergy loss at average temperature 8°C in W/m | Cooling engergy loss at average temperature 15°C in W/m | Cooling engergy loss at average temperature 21°C in W/m |
|---|---|---|---|
| aquatherm blue pipe und blue pipe ot SDR 11 | | | |
| 32 mm | 1,29 | 2,57 | 3,60 |
| 40 mm | 1,30 | 2,59 | 3,63 |
| 50 mm | 1,66 | 3,33 | 4,66 |
| 63 mm | 1,89 | 3,79 | 5,30 |
| 75 mm | 20,60 | 4,12 | 5,77 |
| 90 mm | 2,21 | 4,42 | 6,19 |
| 110 mm | 2,11 | 4,13 | 5,92 |
| 125 mm | 2,14 | 4,29 | 6,00 |
| 160 mm | 2,78 | 5,56 | 7,79 |
| 200 mm | 2,74 | 5,48 | 7,67 |
| 250 mm | 2,65 | 5,31 | 7,43 |
| 315 mm | 3,43 | 6,86 | 9,61 |
| aquatherm blue pipe SDR 17,6 | | | |
| 125 mm | | | |
| 160 mm | 2,78 | 5,74 | 8,04 |
| 200 mm | 2,82 | 5,65 | 7,91 |
| 250 mm | 2,74 | 5,47 | 7,66 |
| 315 mm | 3,57 | 7,14 | 10,0 |

## aquatherm ti CASING PIPES - MATERIAL

The casing pipes of the aquatherm ti pipe system are made of the material PE according to DIN EN 8075. Like insulated steel pipes correspond to the EN 253, aquatherm applies casing pipes, which correspond to the technical requirements of this standard.

The material is characterized by the following mechanical and thermal features.

### Material parameters

| Technical data | PE 80 |
|---|---|
| Density, g/cm$^3$, ISO 1183 | 0.950 |
| Yield stress, MPa, DIN EN ISO 527 | 22 |
| Elongation at yield stress, %, DIN EN ISO 527 | 9 |
| Elongation at break, %, DIN EN ISO 527 | 300 |
| Tension-E-module, MPa, DIN EN ISO 527 | 800 |
| Impact strength, kJ/m$^2$, DIN EN ISO 179 | without break |
| Impact strength, kJ/m$^2$, DIN EN ISO 179 | 12 |
| Ball impression hardness, MPa, DIN EN ISO 2039-1 | 40 |
| Shore hardness, D, ISO 868 | 63 |
| Medium thermal expansion coeff., K-1, DIN 53752 | $1.8 \cdot 10^{-4}$ |
| Thermal conductivity, W/m · K, DIN 52612 | 0.38 |
| Electric strength, kV/mm, VDE 0303-21 | 47 |
| Surface resistance, Ohm, DIN IEC 167 | $10^{14}$ |
| Inflammability, DIN 4102 | B2 |
| Physiological harmlessness acc. to BgVV | yes |
| Chemical resistance acc. to DIN 8075 supplement | complied with |
| Thermal operating conditions | °C -40 to +80 |

## RING STIFFNESS OF aquatherm blue pipe

The aquatherm blue pipes SDR 11 MF (90-400 mm) and SDR 17.6 MF (160-630 mm) have been tested according to DIN EN ISO 9969 with 3% pipe deformation and have a ring stiffness of ≥ 16 KN/m². Thus, they are classified in the ring stiffness class SN16, which corresponds to the highest standard category.

**Underground installation:** The depth of the trench adds up from the depth of the frost line, the outer diameter of the pipe and the height of the bedding (**A**+Da+**B**). The frost line must be observed: 0.5 m – 9.0 m above the pipe peak (E). If the pipes are installed outside the specified laying depth, a load distribution by steel or concrete slabs must be installed.

**Traffic load:** SLW 60, heavy forklift (60 tons maximum load).

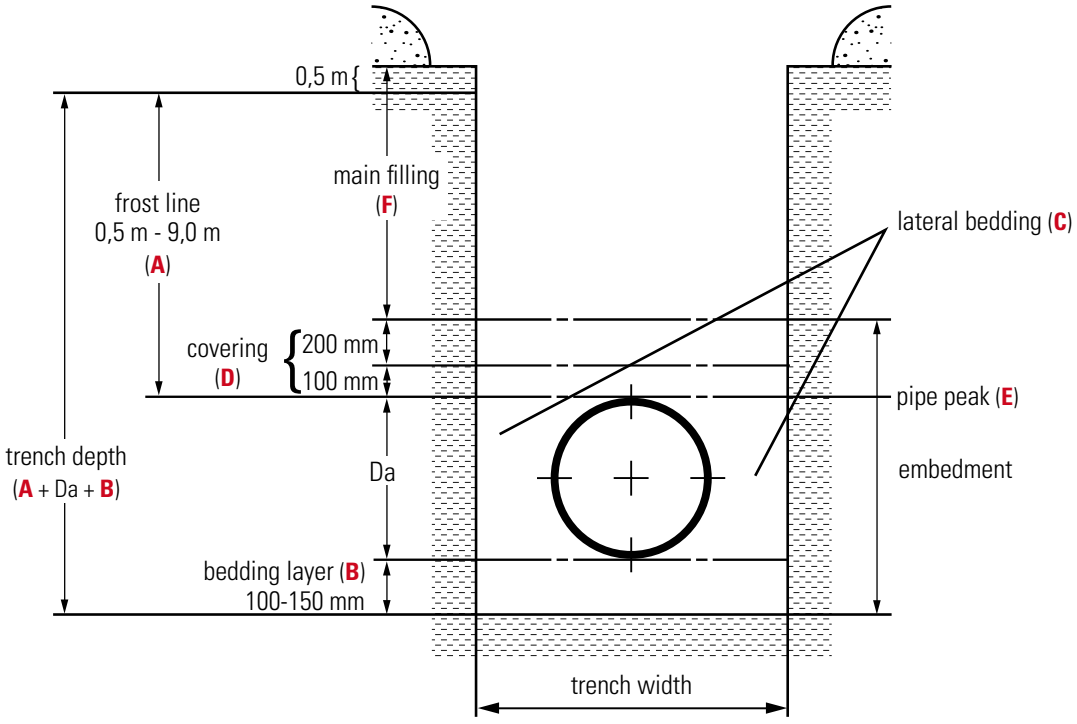
**Trench design:** Recommended calculation according to ATV A 127 (basis for calculation).

**Laying conditions:** We recommend laying the pipes in a narrow trench in which nevertheless sufficient space for working is available.

**Bedding layer (B):** In normal soil 100 mm sand with round graining size 0-8 mm.
When rock or rocky soils 150 mm sand with round graining size 0-8 mm.
This layer is equally compressed (≥ 97% Proctor) with gaps in the socket area. Non sustainable soils are made stable by the choice of the bedding layer. Note planning requirements.

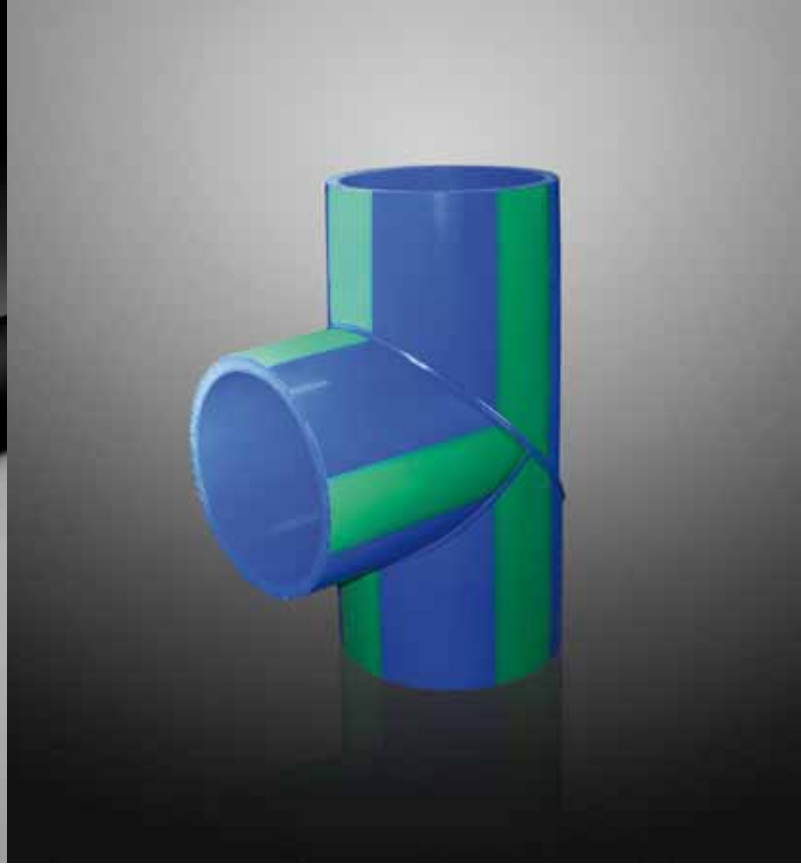
**Backfilling:** The building material 4/8 mm graining is filled in layers in order to construct the lateral bedding (**C**) and the covering (**D**). Thereby the peak of the pipe (**E**) is covered with minimum 100 mm. Then the main filling (**F**) with the excavation can be carried out. Note that the grain size does not exceed 300 mm respectively sharp and rough stones are removed. Planning requirements of the filling levels are always to be considered.
Each filling is compressed separately.

**Compaction:** The compression (≥ 97% Proctor) of the lateral bedding (**C**) and the covering (**D**) is done by hand or with light equipment. If the main filling is made with minimum 20 cm, the trench can be compressed 95 % Proctor upwards from this layer with heavy equipment. The last 50 cm of the trench are compressed with 97 – 100 % Proctor.




## aquatherm ti MORE INFORMATION

For more information on the aquatherm ti-system, please see our aquatherm ti-catalogue with the order-no. **E30000**. You can request at our Info-Service on telephone-no. **+49 2722 950-0** or download in the download area of our website **www.aquatherm.de**.



## UV-RESISTANCE

Pipes made from fusiolen® PP-R and fusiolen® PP-R C are normally not installed where subject to UV-radiation.

All aquatherm PP-R pipes and -fittings have UV- stabilizer to bridge transport and installation times. Maximum storage time in the open air is 6 months.

For the application in open air aquatherm offers composite pipes with UV- protective layer made from polyethylene, which excludes damages caused by sunlight.

aquatherm PP-R pipes with UV-protection are always available in stock.

Available types of pipe: aquatherm blue pipe MF und aquatherm blue pipe MF ot.

## UV ADHESIVE TAPE

As an alternative to our pipes, factory-equipped with UV protective layer, the wrapping with UV tape is possible, e.g. when fittings or short pieces of pipe must be protected.

Therefore an elastic tape with good resistance to abrasion, moisture, oils, mild acids and alkalis and outdoor weather influences should be selected. The tape should always be applied to a dry, clean and grease-free surface. The winding should be performed with slight pulling and at least 50 % overlap.

Further information on page 117.

## SYSTEM EXTENSION UP TO DIMENSION 630 MM

Responding to the requirements for pipe systems with bigger flow volume in industrial plants, factories, gigantic construction projects in hotel building, universities and stadiums aquatherm now offers the extension of aquatherm blue pipe in the dimensions 400 mm, 450 mm, 500 mm, 560 mm and 630 mm.

Considering the following well-established advantages of the pipes and fittings made from fusiolen PP-R and connected by butt-welding, aquatherm succeeded, as the first pipe system manufacturer worldwide, in the production of fiber composite pipes, connecting pieces and joints in these big dimensions.

**Pipe system for heating and climate technology**

For the application in heating and climate technology, wether in manifold construction as risers or distribution pipes or for the transport of various media on longer distances, e.g. for district heating, the aquatherm blue pipe system now provides a wider field of applications.

## FIRE PROTECTION

The aquatherm PP-R pipe systems comply with the requirements of the fire classification B2 DIN 4102 (normal inflammable). Compared to natural products like wood, cork or wool, aquatherm PP-R - pipes do not produce any gas toxicity. In case of fire, there is no risk of dioxin emissions. To avoid fire and smoke transmission aquatherm advises the use of fire retardant seals. The fire resistance period is the minimum period in minutes.

The extent of the preventive measures depends on the type of installation. The determining of fire areas and fire classification has to be made in acc. with the law of the country. Information is given by the Planning Department and Building Control Office or the Fire Protection Representative.

Basically fire walls and ceilings with pipe passages have to be installed to the same fire resistance classification. All fire protection systems with a corresponding classification are suitable for aquatherm pp-r- pipes.

aquatherm recommends the Rockwool®- Conlit fire retardant seals as ideal solution for both systems. Detailled information about the draft-guidelines 2000 will be given by our technical hotline +49 (0) 2722 950-200 or directly by Rockwool GmbH.

**Recommended suppliers**

- Deutsche Rockwool Mineralwoll
  GmbH & Co. OHG
  Postfach 207
  45952 Gladbeck
  Phone: 02043 408-0 · Fax: 02043 408-444
  Website: www.rockwool.de

- Doyma GmbH u. Co
  Industriestr. 43-57
  28876 Oyten
  Phone: 04207 9166-0 · Fax: 04207 9166-199
  Website: www.doyma.de

Doyma GmbH u. Co

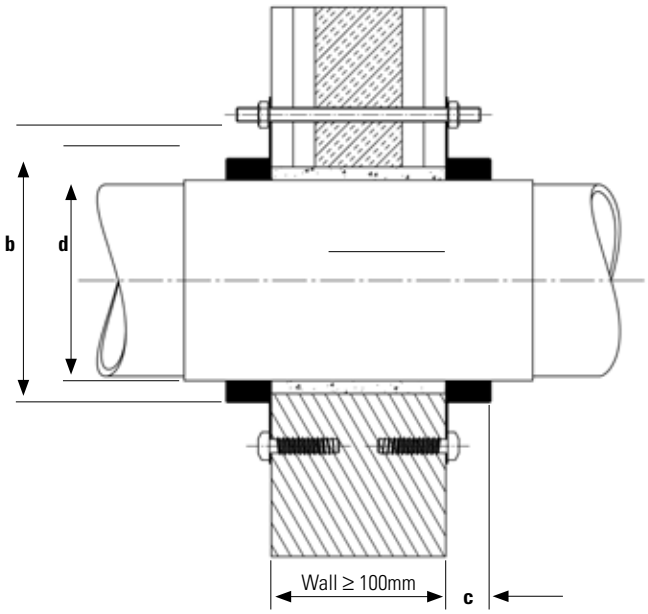
# APPLICATION OF THE DOYMA CURAFLAM® SLEEVE XSPRO FIRE PROTECTION SLEEVE WITH AQUATHERM-PIPE SYSTEMS

| | |
|---|---|
| **Pipe material** | Polypropylene |
| **Type of pipe** | flammable |
| **Pipe outer diameter** | OD ≤ 315mm |
| **Insulation** | Sound protection possible; PE-film 3-5 mm, caoutchouc insulation 10-50 mm; with pre-insulated pipes (ti), the insulation on both sides of the component (wall/ceiling) hat to be removed and can be replaced by synthetic caoutchouc in the insulation thickness of 10 – 50 mm. |
| **Fire resistance class** | R 90, EI 90 |
| **Approval** | Z-19.17-1983, ETA-11/0498 |

**APPLICATION OF AQUATHERM-PIPES TESTED POSITIVE, APPROVAL ADD-ON REQUESTED**

**Dimensions**

| Pipe OD d (mm) | OD ca. b (mm) | Depth ca. c (mm) | xxx for article number* |
|---|---|---|---|
| 1 - 34 | 43 | 30 | 032 |
| 35 - 42 | 56 | | 040 |
| 43 - 52 | 70 | | 050 |
| 53 - 65 | 85 | | 063 |
| 66 - 77 | 99 | | 075 |
| 78 - 92 | 117 | | 090 |
| 93 - 112 | 141 | | 110 |
| 113 - 125 | 154 | 50 | 125 |
| 126 - 140 | 178 | | 140 |
| 141 - 160 | 200 | | 160 |
| 161 - 180 | 228 | | 180 |
| 181 - 200 | 253 | | 200 |
| 201 - 225 | 307 | 100 | 225 |
| 226 - 250 | 336 | | 250 |
| 251 - 280 | 370 | | 280 |
| 231 - 315 | 410 | | 315 |

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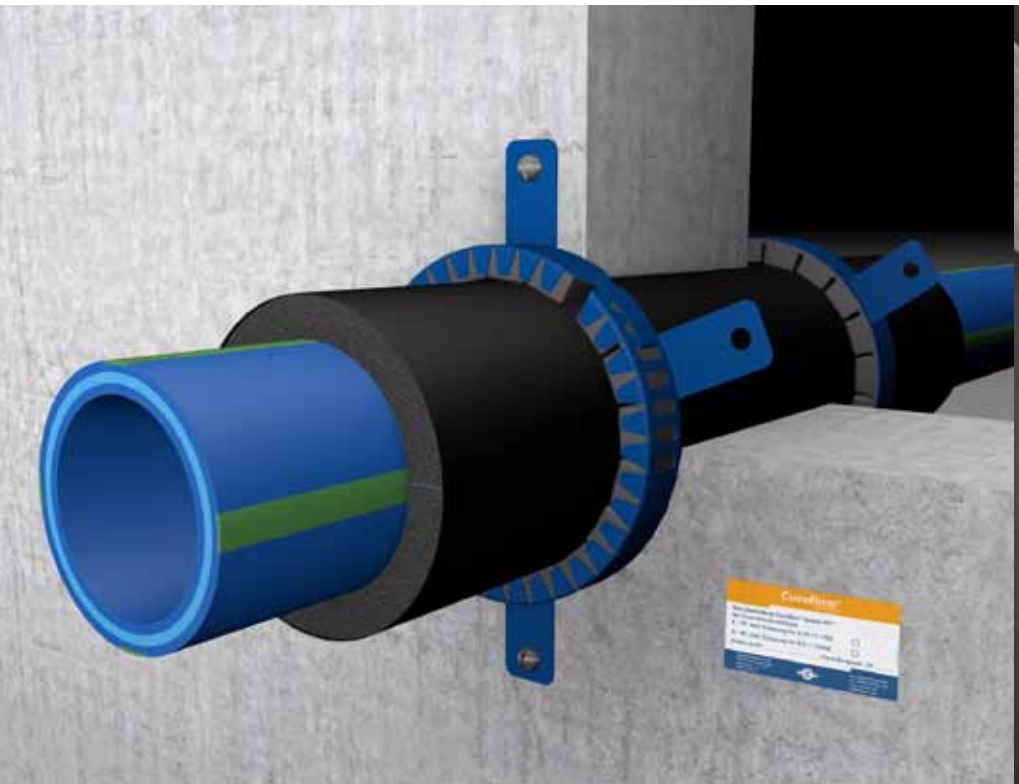
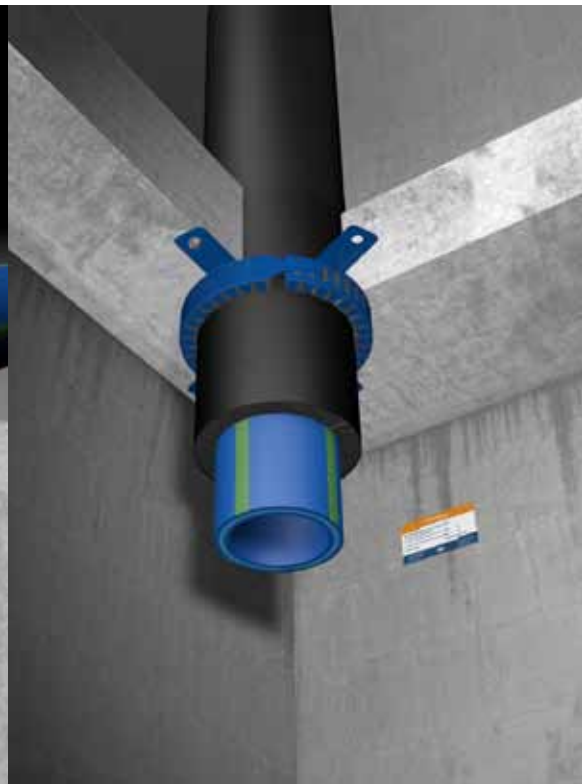
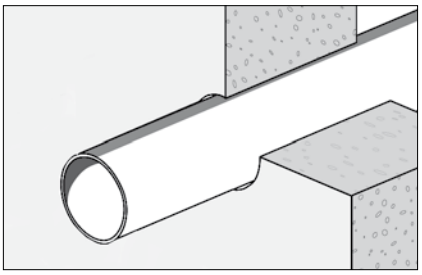




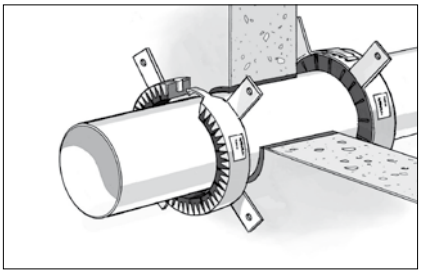
Doyma GmbH u. Co

# CURAFLAM® SLEEVE XS$^{PRO}$ INSTALLATION EXAMPLES

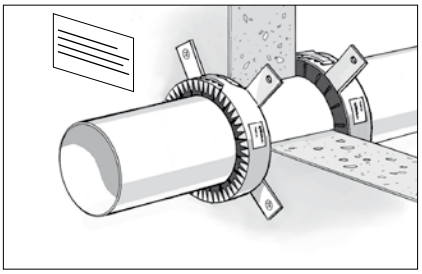
## Solid wall



If necessary, wrap the media pipe with a commercial available sound protection film up to 5 mm. Close the remaining opening.

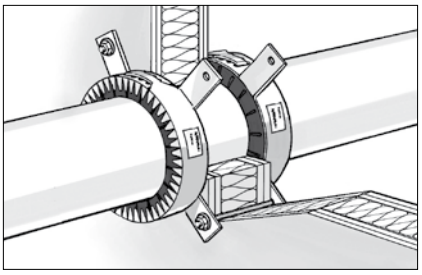


Insert the sleeve around the pipe and seal by closing bracket. Place drillings and plugs suitable to the fixing straps.



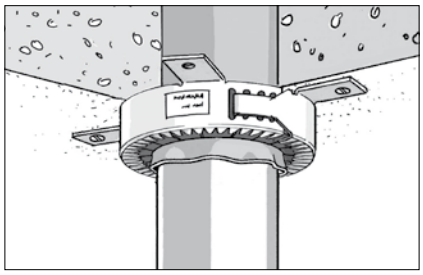
Screw the sleeve with the included fixing set with the ceiling/wall. Label the sign and attach permanently next to the sleeve.

## Light partition wall

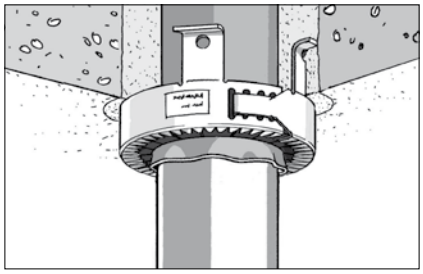


In light partition walls (LPW) the sleeves must be attached opposite with continuous solid threaded rods (M 8).

## Ceiling

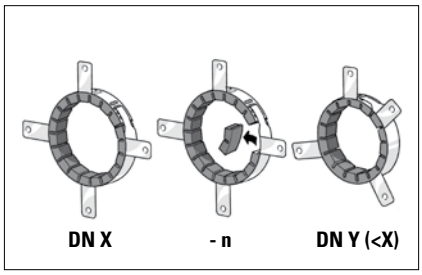


A commercial sound protection film (material PE, up to 5 mm) may be pulled under the sleeve.



The straps of the sleeve, depending on the pipe type, may be fully grouted in solid ceilings. Then they have to be folded over outwards (see approval).

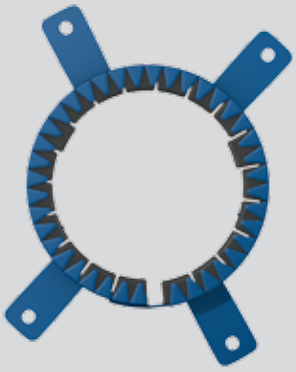
## Special ways




The sleeve-diameter can be reduced by one DN-step. The corresponding number of segments (see table) is to break out at the side of the closing bracket.

Then hook the closing bracket in a tighter interlock opening.

| **DN X** (starting-Ø) | **n** number of the segments to break out | **DN Y** (smaller Ø) |
|---|---|---|
| DN 32 | --- | --- |
| DN 40 | 4 | DN 32 |
| DN 50 | 3 | DN 40 |
| DN 63 | 4 | DN 50 |
| DN 75 | 3 | DN 63 |
| DN 90 | 3 | DN 75 |
| DN 110 | 3 | DN 90 |
| DN 125 | 2 | DN 110 |
| DN 140 | 4 | DN 125 |
| DN 160 | 3 | DN 140 |
| DN 180 | 3 | DN 160 |
| DN 200 | 4 | DN 180 |



**Packing unit**
1 Curaflam® sleeve XS$^{Pro}$
1 Fire protection sign
1 Attachment Set
1 Sound protection film
Installation instructions

**Article number: 3 22 1 xxx 000 00**
xxx see table on the left.

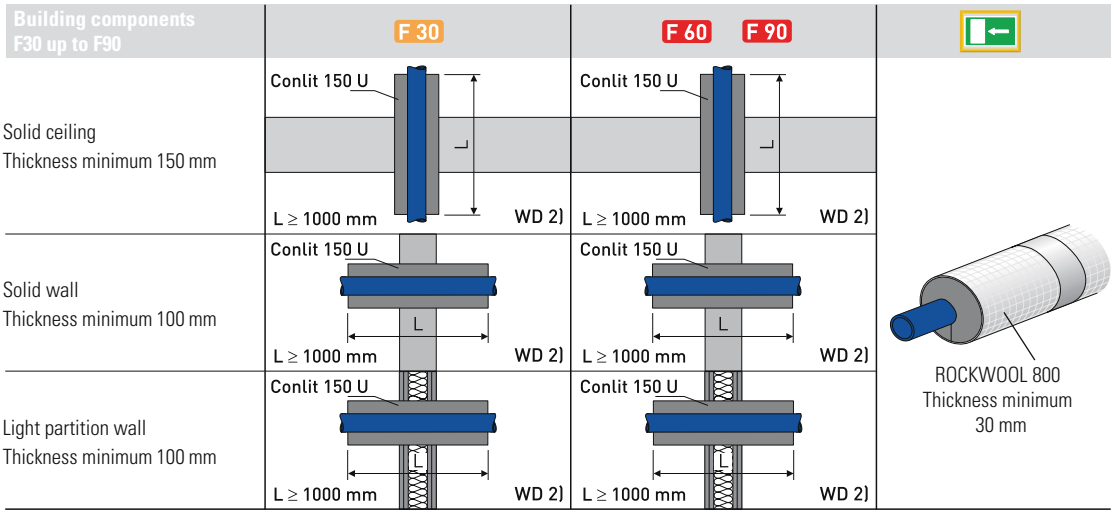
**Detailed information regarding the fields of application and regulations of execution, please take from the general building approval (abZ) or the ETA.**

Deutsche Rockwool Mineralwoll GmbH & Co. OHG

## R30 UP TO R 90 PIPE PENETRATIONS FOR THE aquatherm blue pipe INSTALLATION SYSTEM WITH NON-FLAMMABLE MEDIA, SUCH AS HEATING AND COOLING

**Material:** PP-R
**Product name:**

aquatherm blue pipe
SDR 7,4 MF
SDR 11MF
SDR 7,4 MF UV
SDR 11 MF UV
SDR 7,4 MF OT
SDR 11 MF OT
SDR 11 S




**Embodiment according to ROCKWOOL from PP-3726/4140-MPA BS**

| aquatherm blue pipe | Pipe dimension | Conlit 150 U | | | ROCKWOOL 800 1) 2) 3) | | |
|---|---|---|---|---|---|---|---|
| | Dimension | Type 3) | Insulation thickness 4) s (mm) | Core drilling Dk (mm) | EnEV 100 % Warm, Type | EnEV 50% Warm, Type | DIN 1988 Cold Type 3) |
| | 20 | 20/20 | 20,0 | 60 | 22/20 | 22/20 | 22/20 |
| | 25 | 25/17,5 | 17,5 | 60 | 28/20 | 28/20 | 28/20 |
| | 32 | 32/24 | 24,0 | 80 | 35/30 | 35/20 | 35/20 |
| | 40 | 40/20 | 20,0 | 80 | 42/40 | 42/20 | 42/20 |
| | 50 | 50/25 | 25,0 | 100 | 54/40 | 54/30 | 54/30 |
| | 63 | 63/33,5 | 33,5 | 130 | 64/50 | 64/30 | 64/30 |
| | 75 | 75/52,5 | 52,5 | 180 | 76/70 | 76/40 | 76/30 |
| | 90 | 90/65 | 65,0 | 220 | 102/80 | 102/40 | 102/30 |
| | 110 | 110/70 | 70,0 | 250 | 114/100 | 114/50 | 114/30 |

**Notes / Special installation conditions**

1) In some cases, the available minimum insulation thickness is specified
2) The insulation jacket ROCKWOOL 800 can be used as further insulation
3) According to DIN 1988-200 there must be a vapor barrier, so only use fire protection jacket Conlit 150U/ insulation jacket ROCKWOOL 800
4) Insulation thickness according to EnEV 50 % and DIN 1988-200 fitting to the core hole diameter Dk

All constraints of the specific general building inspection certificates (abP) must be considered.

## FIRE LOAD

The values required for determining the fire load within a fire section are calculated from the total of all flammable materials located within this area.

The calculation for establishing the combustion heat V [kWh / m] for a fire section in the event of an outbreak is dependent on dimensions and materials.

The basis used for the calculation of pipes made of PP-R is the lower calorific value $H_u$ = 12.2 kWh/kg (as per DIN V 18230 T1) in conjunction with the mass of material $m_{pipe}$ [kg / m].

The integrated layers of faser-composite pipes also are considered.

Depending on the calculation procedure, the fire load is worked out with reference to the burn-up factor. This value is designated as mfactor and is taken as 0.8 for polypropylene.

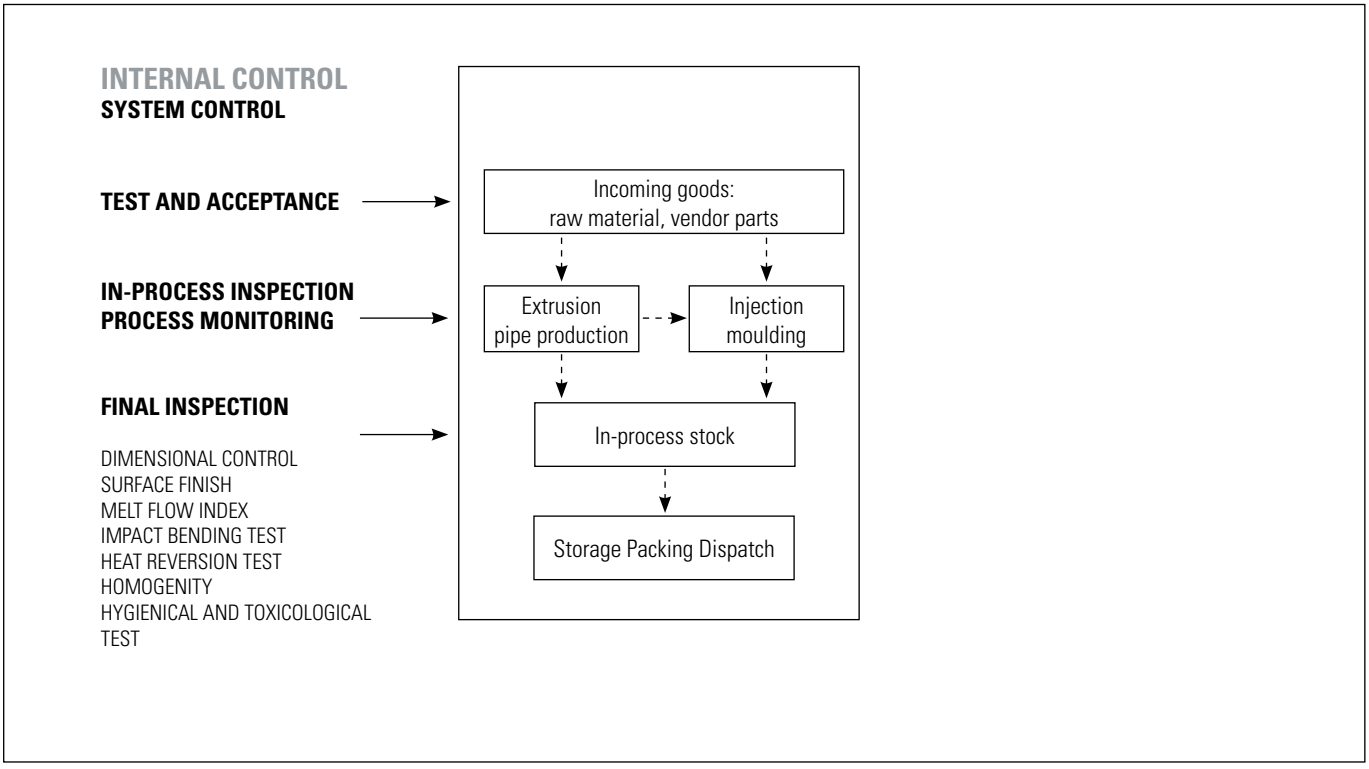
**Combustion values V [kWh/m] for aquatherm blue pipe**

| Dimension mm | aquatherm blue pipe SDR 7,4 MF/OT | aquatherm blue pipe SDR 11 MF/OT | aquatherm blue pipe SDR 17,6 MF |
|---|---|---|---|
| **20** | 1,76 | - | - |
| **25** | 2,74 | - | - |
| **32** | 4,39 | 3,14 | - |
| **40** | - | 4,83 | - |
| **50** | - | 7,48 | - |
| **63** | - | 11,82 | - |
| **75** | - | 16,48 | - |
| **90** | - | 23,86 | - |
| **110** | - | 35,33 | - |
| **125** | - | 45,83 | 30,03 |
| **160** | - | 74,88 | 48,53 |
| **200** | - | 116,64 | 75,68 |
| **250** | - | 181,42 | 117,64 |
| **315** | - | 285,82 | 186,32 |
| **355** | - | 362,93 | 236,07 |
| **400** | - | 460,78 | 299,73 |
| **450** | - | 583,21 | 378,64 |
| **500** | - | - | 468,24 |
| **560** | - | - | 584,88 |
| **630** | - | - | 740,59 |

## COMPLIANCE WITH THE SYSTEM STANDARD

**Various national and international independent authorities and institutions confirm aquatherm's quality standard**

## AQUATHERM QUALITY MANAGEMENT SYSTEM




In addition to the permanent internal quality control, an external control is made by i.e. SKZ, SAI, TGM, Hygieneinstitut.

## SYSTEM CONTROL

The production of a quality controlled pipe system demands the supervision, regulation and control of all work operations. All results and processes have to be documented.

This requires

**test and acceptance of incoming goods**
**process control**
**in-process inspection and test**
**final inspection and test**

Relevant regulations for the quality control of potable water pipe systems are:

DIN-guidelines
DVGW-working sheets
Supervisory Regulations of the SKZ
(Süddeutsches Kunststoff-Zentrum)

These standards and guidelines detail the minimum requirements for internal control.

Conformance to the standards is verified by independent institutes in form of internal audits and laboratory tests.

aquatherm has many years of experience in extrusion and injection moulding and is the market leader and pioneer in the manufacture of polypropylene pipe systems.

This experience is reflected in internal quality standards and laid down procedures, which are taken strongest note of and are documented by the constant quality of our products.

### INTERNAL CONTROL

Trained and qualified employees and a modern equipped laboratory ensure that all tests are carried out and regulations are complied with in accordance with the quality control policy, which includes

**control of inspection, measuring and test equipment process and production control**
**receiving inspection test**
**in-process inspection**
**final inspection**

All internal quality controls are documented and recorded in acc. with the quality control policy.

## QUALITY ASSURANCE

**Test and acceptance of incoming goods**

All incoming goods are subject to a test. This ensures that incoming products conform to specified requirements. Goods, which have not been tested are not released for production.

**In-process inspection and test**

The quality plan requires that tests and inspections are carried out before and during production. At the start of production all quality relevant data are checked by the quality assurance department. Preproduction samples are tested by the laboratory technicians for

- surface finish
- dimensional accuracy of the test samples
- data from extrusion and injection moulding machines

The goods will be released for production only if optimal test results are achieved. These tests are carried out at the beginning of each production series to ensure perfect system quality.

**Process control**

Ultrasonic measurement and process data recording in the field of extrusion are only one example of the extensive quality control process.

This equipment enables constant observation and control of production.

Ultrasonics automatically measure and report any deviations in tolerance to the cutting device on the extrusion machine so that the sizing plant automatically isolates a substandard product. This ensures that only perfect quality products are packed and stored.

All data received during production is analyzed in detail.

**Final inspection and test**

The quality plan requires that inspections and tests are carried out on all finished products. The results are documented in test reports. Finished products are only released to stock when all tests and inspections conform to the prescribed procedures and specifications.

The final inspection and test includes time lapse test procedures. This enables statements regarding the usability of the products in their later field of application.

These tests are the method for quality assurance during production and for design tests. This is to discover and remove production weaknesses. The results document the system quality and optimize the manufacturing processes. The final inspection and test covers the following test procedures:

- Dimensional control
- Surface finish
- Measurement of the melt flow index
- Impact bending test
- Heat reversion test
- Homogeneity of the material
- Internal pressure test

In addition to the tests mentioned above, daily hygiene tests in accordance with KTW / DVGW Guidelines arecarried out regularly in the company's own sensoryanalysis laboratory.


## EXTERNAL CONTROL

External supervision consists of tests of a defined scope and in defined intervals. The respective supervising institutions appoint authorized test organizations to carry out these tests.

The external supervision includes external tests of the products and

a) internal audit of aquatherm's quality assurance system and test procedures,

b) calibration of the test equipment and

c) hygienic and toxicity tests.

The results of the supervisory visits as well as external tests made on pipe and fitting samples are confirmed to aquatherm in test certificates.

In Germany, the external supervision of the aquatherm pipe system is carried out by the

- SKZ (Süddeutsches Kunststoffzentrum Würzburg)
- Institute for Hygiene, Gelsenkirchen (Hygieneinstitut Gelsenkirchen)

who are authorized by the DVGW (German Institute for Gas and Water) as controlling organization. The external supervision for certificates from abroad is carried out in a similar way.

**Storage / packing / dispatch**

Upon successful release the products are stored in suitable warehouses.

Internal instructions control the method of packing, storage and dispatch of the products. The warehouse staff is responsible for control of the stored product.

## PERMISSIBLE WORKING PRESSURE

**For heating systems or closed systems considering the seasonal periods of operation - non potable water application**

| Heating period | Temperature | Service life | aquatherm blue pipe SDR 11 MF, OT & S | | aquatherm blue pipe SDR 17,6 MF | |
|---|---|---|---|---|---|---|
| | | | Permissible working pressure in bar and (psi) | | | |
| | | | bar | (psi) | bar | (psi) |
| constant operating temperature 70 °C / 158 °F incl. 30 days per year at | 75 °C | 5 | 9,38 | (136) | 5,38 | (78) |
| | | 10 | 9,08 | (132) | 5,21 | (76) |
| | | 25 | 7,82 | (113) | 4,48 | (65) |
| | | 45 | 6,77 | (98) | 3,89 | (56) |
| | 80 °C | 5 | 8,88 | (129) | 5,09 | (74) |
| | | 10 | 8,46 | (123) | 4,86 | (70) |
| | | 25 | 7,38 | (107) | 4,24 | (61) |
| | | 42,5 | 6,49 | (94) | 3,72 | (54) |
| | 85 °C | 5 | 8,17 | (118) | 4,69 | (68) |
| | | 10 | 7,82 | (113) | 4,49 | (65) |
| | | 25 | 6,70 | (97) | 3,85 | (56) |
| | | 37,5 | 6,07 | (88) | 3,49 | (51) |
| | 90 °C | 5 | 7,50 | (109) | 4,30 | (62) |
| | | 10 | 7,19 | (104) | 4,13 | (60) |
| | | 25 | 5,85 | (85) | 3,36 | (49) |
| | | 35 | 5,39 | (78) | 3,09 | (45) |
| constant operating temperature 70 °C / 158 °F incl. 60 days per year at | 75 °C | 5 | 9,26 | (134) | 5,31 | (77) |
| | | 10 | 8,90 | (129) | 5,11 | (74) |
| | | 25 | 7,62 | (111) | 4,37 | (63) |
| | | 45 | 6,60 | (96) | 3,79 | (55) |
| | 80 °C | 5 | 8,61 | (125) | 4,94 | (72) |
| | | 10 | 8,24 | (120) | 4,73 | (69) |
| | | 25 | 6,93 | (101) | 3,98 | (58) |
| | | 40 | 6,18 | (90) | 3,55 | (51) |
| | 85 °C | 5 | 7,91 | (115) | 4,54 | (66) |
| | | 10 | 7,56 | (110) | 4,34 | (63) |
| | | 25 | 6,05 | (88) | 3,47 | (50) |
| | | 35 | 5,57 | (81) | 3,20 | (46) |
| | 90 °C | 5 | 7,25 | (105) | 4,16 | (60) |
| | | 10 | 6,40 | (93) | 3,67 | (53) |
| | | 25 | 5,12 | (74) | 2,94 | (43) |
| | | 30 | 4,90 | (71) | 2,81 | (41) |
| constant operating temperature 70 °C / 158 °F incl. 90 days per year at | 75 °C | 5 | 9,17 | (133) | 5,26 | (76) |
| | | 10 | 8,79 | (127) | 5,04 | (73) |
| | | 25 | 7,45 | (108) | 4,27 | (62) |
| | | 45 | 6,45 | (94) | 3,70 | (54) |
| | 80 °C | 5 | 8,46 | (123) | 4,85 | (70) |
| | | 10 | 8,11 | (118) | 4,65 | (67) |
| | | 25 | 6,60 | (96) | 3,78 | (55) |
| | | 37,5 | 5,98 | (87) | 3,43 | (50) |
| | 85 °C | 5 | 7,76 | (113) | 4,45 | (65) |
| | | 10 | 7,03 | (102) | 4,04 | (59) |
| | | 25 | 5,63 | (82) | 3,23 | (47) |
| | | 32,5 | 5,28 | (77) | 3,03 | (44) |
| | 90 °C | 5 | 6,96 | (101) | 3,99 | (58) |
| | | 10 | 5,88 | (85) | 3,37 | (49) |
| | | 25 | 4,70 | (68) | 2,70 | (39) |

*** SDR = Standard Dimension Ratio** (diameter /wall thickness ratio)
**SDR = 2 x S + 1 ≈ d/s** (S = Pipe series index from ISO 4065)

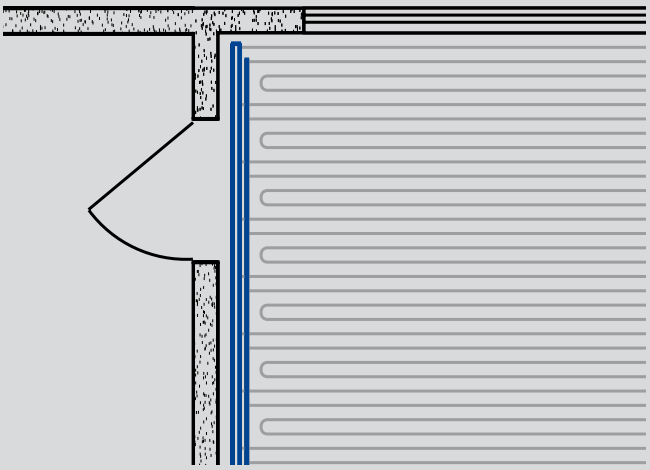
## PERMISSIBLE WORKING PRESSURE

**for general pressure pipe applications in permanent operation charted application ranges on the left**

| Temperature | Service life | aquatherm blue pipe SDR 17,6 MF | | aquatherm blue pipe SDR 11 MF & MF OT | |
|---|---|---|---|---|---|
| | | Permissible working pressure in bar and (psi) | | | |
| | | bar | (psi) | bar | (psi) |
| 10 °C | 1 | 12,8 | (186) | 27,8 | (403) |
| | 5 | 12,0 | (174) | 26,2 | (380) |
| | 10 | 11,7 | (170) | 25,6 | (371) |
| | 25 | 11,4 | (165) | 24,7 | (358) |
| | 50 | 11,1 | (161) | 24,1 | (350) |
| | 100 | 10,8 | (157) | 23,5 | (341) |
| 15 °C | 1 | 11,8 | (171) | 25,7 | (373) |
| | 5 | 11,1 | (161) | 24,2 | (351) |
| | 10 | 10,8 | (157) | 23,6 | (342) |
| | 25 | 10,5 | (152) | 22,8 | (331) |
| | 50 | 10,2 | (148) | 22,2 | (322) |
| | 100 | 9,9 | (144) | 21,6 | (313) |
| 20 °C | 1 | 10,9 | (158) | 23,8 | (345) |
| | 5 | 10,3 | (149) | 22,3 | (323) |
| | 10 | 10,0 | (145) | 21,7 | (315) |
| | 25 | 9,6 | (139) | 21,0 | (305) |
| | 50 | 9,4 | (136) | 20,4 | (296) |
| | 100 | 9,1 | (132) | 19,9 | (289) |
| 30 °C | 1 | 9,3 | (135) | 20,2 | (293) |
| | 5 | 8,7 | (126) | 18,9 | (274) |
| | 10 | 8,5 | (123) | 18,4 | (267) |
| | 25 | 8,2 | (119) | 17,8 | (258) |
| | 50 | 7,9 | (115) | 17,3 | (251) |
| | 100 | 7,7 | (112) | 16,8 | (244) |
| 40 °C | 1 | 7,9 | (115) | 17,1 | (248) |
| | 5 | 7,4 | (107) | 16,0 | (232) |
| | 10 | 7,2 | (104) | 15,6 | (226) |
| | 25 | 6,9 | (100) | 15,0 | (218) |
| | 50 | 6,7 | (97) | 14,6 | (212) |
| | 100 | 6,5 | (94) | 14,1 | (205) |
| 50 °C | 1 | 6,7 | (97) | 14,5 | (210) |
| | 5 | 6,2 | (90) | 13,5 | (196) |
| | 10 | 6,0 | (87) | 13,1 | (190) |
| | 25 | 5,8 | (84) | 12,6 | (183) |
| | 50 | 5,6 | (81) | 12,2 | (177) |
| | 100 | 5,5 | (80) | 11,9 | (173) |
| 60 °C | 1 | 5,6 | (81) | 12,2 | (177) |
| | 5 | 5,2 | (75) | 11,4 | (165) |
| | 10 | 5,1 | (74) | 11,0 | (160) |
| | 25 | 4,9 | (71) | 10,6 | (154) |
| | 50 | 4,7 | (68) | 10,3 | (149) |
| 70 °C | 1 | 4,7 | (68) | 10,3 | (149) |
| | 5 | 4,4 | (64) | 9,6 | (139) |
| | 10 | 4,2 | (61) | 9,2 | (133) |
| | 25 | 3,7 | (54) | 8,0 | (116) |
| | 50 | 3,1 | (45) | 6,8 | (99) |
| 75 °C | 1 | 4,3 | (62) | 9,4 | (136) |
| | 5 | 4,0 | (58) | 8,7 | (126) |
| | 10 | 3,7 | (54) | 8,0 | (116) |
| | 25 | 3,0 | (44) | 6,4 | (93) |
| | 50 | 2,5 | (36) | 5,4 | (78) |
| 80 °C | 1 | 4,0 | (58) | 8,6 | (125) |
| | 5 | 3,5 | (51) | 7,7 | (112) |
| | 10 | 3,0 | (44) | 6,5 | (94) |
| | 25 | 2,4 | (35) | 5,2 | (75) |
| 90 °C | 1 | 3,3 | (48) | 7,2 | (104) |
| | 5 | 2,3 | (33) | 5,1 | (74) |
| | 10 | 2,0 | (29) | 4,3 | (62) |

**SDR =** Standard Dimension Ratio (diameter/wall thickness ratio)
**MF =** multilayer faser

For fittings of butt-welded pipe segments a reduction factor of 0.75 (reduction of the table values by 25%) is effective.



Pipe lay out with weld-in saddle

CONNECTION

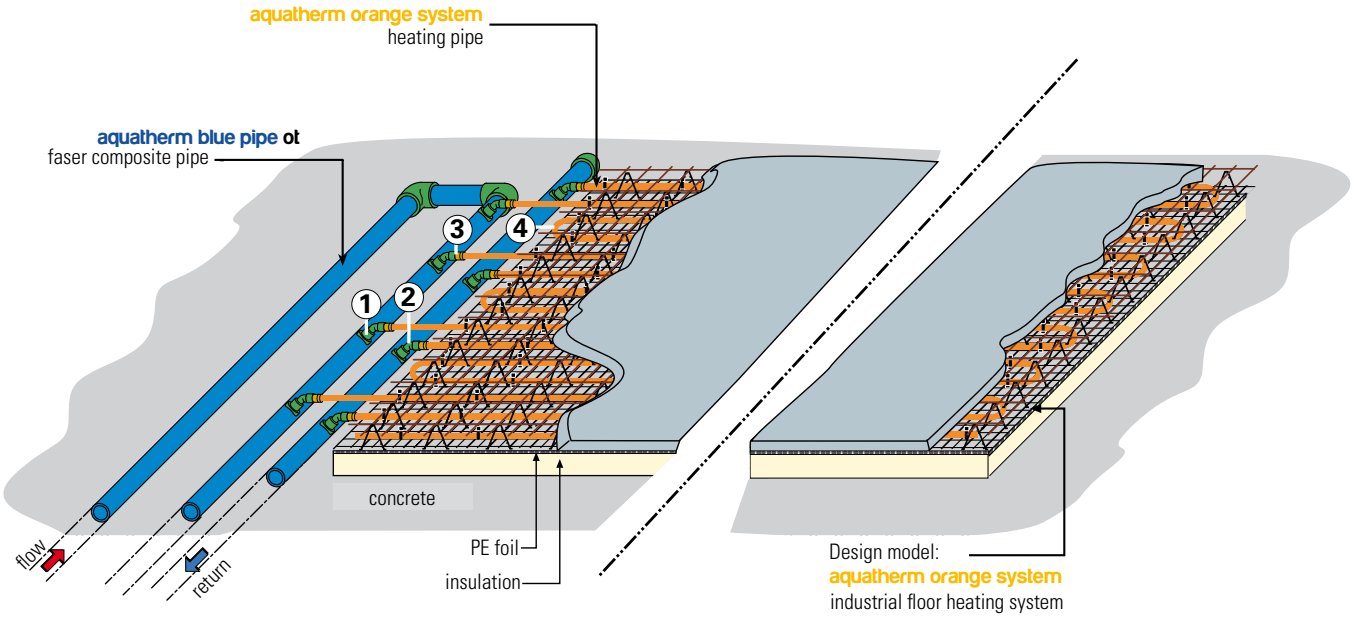
## REVERSE RETURN TECHNIQUE (Tichelmann-principle)

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 and industrial floor heating.

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 ot 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 providean optimum connection between the aquatherm blue pipe ot faser composite pipes and the aquatherm orange system.




1. aquatherm green pipe-weld-in saddle
2. aquatherm green pipe-elbow 45°
3. aquatherm grey pipe-transition adapter
4. heating pipe

## UNDER SOIL HEATING

To keep a pitch with natural or artificial turf or any other open area free from ice and snow aquatherm offers a system to provide an under soil heating efficiently and in consideration of environmental aspects.

The ideal combination of aquatherm blue pipe and aquatherm green pipe compounds creates this condition.


## ICE SURFACE COOLING

The ice surface cooling system is made of an ideal combination of aquatherm blue pipe and and aquatherm green pipe-components. For the construction of mobile ice rink surfaces the pipework is completed with aquatherm blue pipe components.

The distribution pipes as well as the manifold connecting pipes are made from aquatherm blue pipes and connected by reverse return (Tichelmann-principle). The weld-in saddle technique, developed by aquatherm, is applied for the production of manifold branches.

## INDUSTRIAL FLOOR HEATING

**Fields of application**
- Production halls
- Workshops
- Warehouses
- Logistics centers
- Maintenance hangars
- Exhibition halls
- Market halls
- Salesrooms
- Cold storage warehouses with sub-freezing protection heater

Industrial buildings are planned by builders and architects in a way that preferably the entire volume of space is utilized.

TGA-installation must not impede the working processes. With component integrated surface heating systems the entire surface area is available to the user. That creates absolute space freedom and optimal utilization of the halls. An industrial surface heating provides a uniform temperature profile, low air speeds, has no maintenance costs, works with lowest temperatures and has a fast pay back.

The lifetime of the pipes corresponds to the life of the building!

**Energy efficiency**
Systems near to room temperature have the highest energy efficiency. Large transfer surfaces are required for the operation of heat pumps and the use of waste heat. Only industrial surface heating is suitable for these requirements.

**Thermal insulation**
Thermal insulation in industrial surface heating is usually placed under the concrete slab as perimeter insulation (adjacent to ground).

Depending on the static load it is chosen between extruder foam and foam glass plates. The insulation material for the perimeter insulation must be impervious to moisture and suitable for the loads occurring.

In calculating the U-value, according to DIN 4108, only layers up to the building sealing have to be included. Only when presenting a building approval for the selected building material the insulation value of the perimeter insulation can be included in the calculation of the U-value for the entire construction.

**Construction types of floor slabs**
Heating pipes can be integrated in the following types of concrete:

- Reinforced concrete with bottom reinforcement
- Reinforced concrete with bottom and top reinforcement
- Steel fiber concrete without reinforcement mats

Surface treatments (such as in vacuum concrete) are easily possible.

**Construction types of industrial surface heating according to pipe fixing**

Option A: Matt reinforced concrete, fixing of heating pipes by spring rails on the bottom reinforcement
Option B: Matt reinforced concrete, fixing of heating pipes by cable ties at the bottom reinforcement
Option C: steel fiber concrete, fixing of heating pipes by spring rail on the film

Also, industrial surface heating must be subjected to a leak test. The pressure test is performed immediately prior to the concreting process. The test pressure of the water pressure test is at least 4 bar and not more than 6 bar. This pressure is to be kept during the concreting process.

The leak test must be documented. The test record is used as a confirmation for the architect and the constructor.

**Concreting**
The concrete is placed in a ready-mixed consistency with the transport hose, distributed, levelled and compacted.

**Functional heating**
Also industrial surface heating has to be heated up after the placement of the concrete and top layer (functional heating). The earliest possible start of heating is dependent on the quality and thickness of the concrete and must be agreed with the concrete layer/structural engineer. The wait time is usually 28 days. The functional heating is simply a function test according to VOB DIN 18380.

## HEATING AND AIR-CONDITIONING

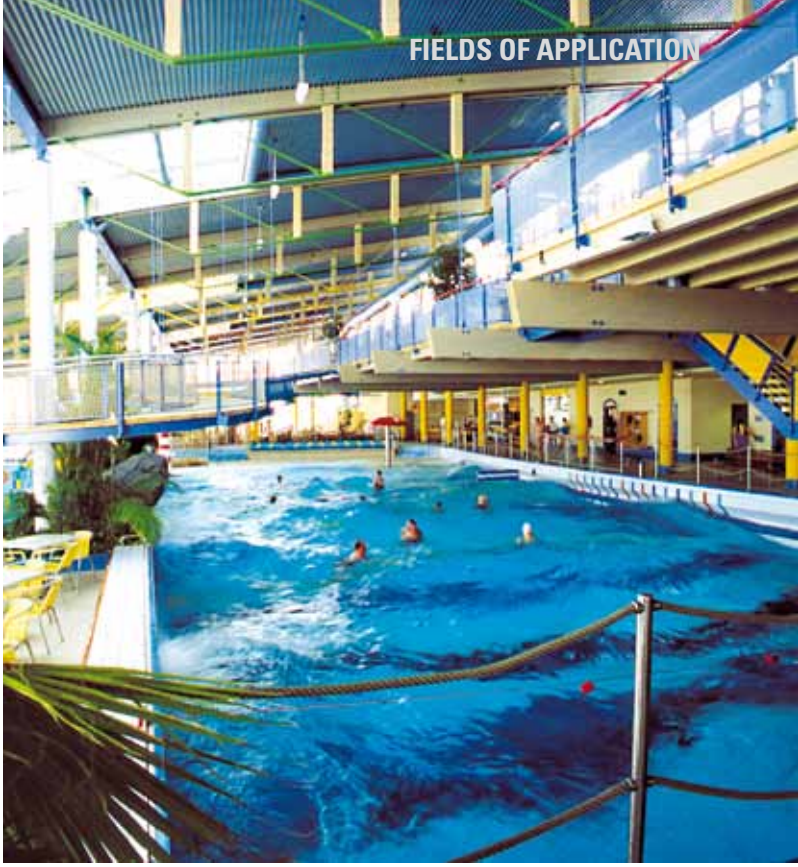
aquatherm blue pipe includes all pipe installation components for chilled water, hot and various industrial applications. Reduced wall thickness offers higher flow rates and the products are stabilised under heat.


## SHIPBUILDING

Corrosion resistance against aggressive media and sea water with low ph-values makes aquatherm blue pipe the ideal pipe system in shipbuilding.

A major advantage of the saltwater resistant pipe systems is the fast processing and repair works easy to be carried out, even on sea.

ABS EUROPE LTD.
Germanischer Lloyd
BUREAU VERITAS Marine Division
Lloyd's Register TYPE APPROVED



## COMPRESSED AIR

The aquatherm blue pipe system is also suitable for the use of industrial compressed air systems. Whether indoor, outdoor or even in the underground area, our blue pipes are suitable for pressure air everywhere. The lower weight, compared to metal pipes is an advantage in e.g. compressed air pipe systems mounted under hall roofs with high altitudes. Additionally, the material PP-R is also resistant to non-treated oil-contaminated compressed air.

## SWIMMING POOL

For the pool operator only pure water guarantees the safety to offer its guests unlimited swimming pleasure. Only a working heating gives him the assurance of a smooth, low-loss operation, preferably for 52 weeks of the year.

The pipe systems made by aquatherm offer both, in the field of water management as well as in the associated heating technology, a complete and reliable all-round supply on the foundation of a more than 40-year experience.

## AGRICULTURE

In the agricultural sector, the possible applications of the aquatherm blue pipe system are manifold. The system can be used not only for the climatisation of cattle sheds, but also for the transport of disinfectants in the professional shed cleaning, to improve the hygiene and health of the animals and thus, e.g. milk quality.

Furthermore, the system is suitable for the field and green area irrigation or transportation of fertilizers in gardening and landscaping.

## SPECIAL APPLICATIONS
### EXAMPLE: SKI JUMPS

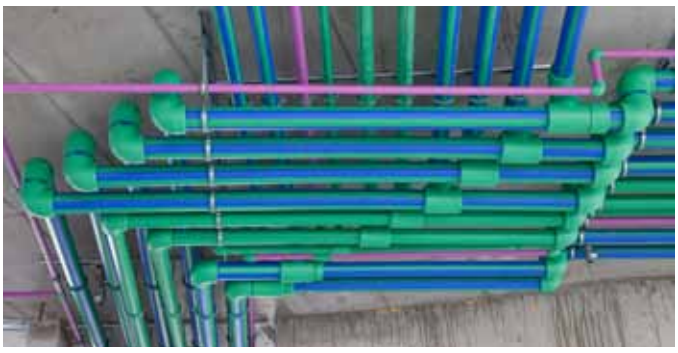
To save the state of the track on the so-called ski jump start of a ski-jump even in changing weather conditions, and thus secure equality of opportunity in the start-up speed, aquatherm-cooling grids are installed immediately below the in-run. These are fed by a glycol-water mixture running through the aquatherm blue pipes and thus the trace is cooled evenly and consistently.

The ski jump is just one example of the many special applications of the aquatherm blue pipe system.

# aquatherm blue pipe

Flange connections and transition joints enable the connection of all components to the central heating system and on the floor.

Risers and distribution piping for heating supply should be planned and installed with aquatherm blue pipe - faser composite pipes.



The connection of floor heating systems or the installation of radiator pipes up to the manifold can also be carried out with aquatherm blue pipe.

## PART A: ASSEMBLY OF WELDING TOOLS

The professional processing of aquatherm PP-R - medium pipes is made by the following tools for the connection of insulated pipes and fittings by socket welding or by butt-welding.

## IMPORTANT!

Only use the original aquatherm welding devices and aquatherm welding tools, except devices and tools which are especially approved by aquatherm.

1. **aquatherm** - manual welding device (800 W) without welding tools (Art.-No. 50337) for medium pipes of dimension 16 – 63 mm

2. **aquatherm** - manual welding device (1400W) without welding tools (Art.-No. 50341) for medium pipes of dimension 50 – 125 mm

3. **aquatherm** - welding tools for manual welding devices

| | |
|---|---|
| Art.-No. 50208 | 20 mm |
| Art.-No. 50210 | 25 mm |
| Art.-No. 50212 | 32 mm |
| Art.-No. 50214 | 40 mm |
| Art.-No. 50216 | 50 mm |
| Art.-No. 50218 | 63 mm |
| Art.-No. 50220 | 75 mm |
| Art.-No. 50222 | 90 mm |
| Art.-No. 50224 | 110 mm |
| Art.-No. 50226 | 125 mm |

4. **aquatherm** welding machine (1400W) incl. welding tools 50 – 125 mm (Art.-No. 50148) for medium pipes of dimension 50 – 125 mm

5. **aquatherm** - butt-welding-machines for medium pipes of dimension 160 – 630 mm

6. **aquatherm** - electrical welding jig Art.-No. 50159 for medium pipes of dimension 63 -125 mm

Manual welding device 800W with welding tools 16 – 63 mm

Manual welding device 1400W with welding tools 50 – 125 mm

Welding machine

Butt-welding machine type Light and accessories

Electrical welding jig

## MOUNTING OF THE TOOLS

1. aquatherm green, blue and lilac pipe system are processed identically.

Assemble and tighten the cold welding tools manually.

3. Before fusing the distribution block, in which two connections are fused simultaneously, the welding tools have to be placed into the respective holes as described in the adjoing table A and drawing B.

4. All welding tools must be free from impurities. Check if they are clean before assembling. If necessary clean the welding tools with a non fibrous, coarse tissue and with methylated spirit.

5. Place the welding tools on the welding device so that there is full surface contact between the welding tool and the heating plate. Welding tools over Ø 40 mm must always be fitted to the rear position of the heating plate.

Electric supply:

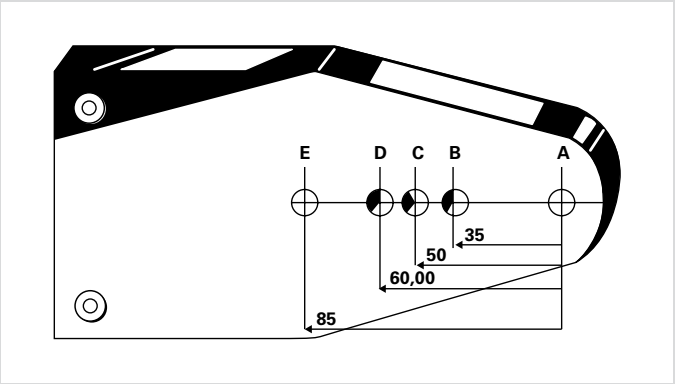
The power supply must coincide with the data on the type plate of the welding device and must be protected according to the local regulations. To avoide high power loss, the conductor cross-section of the used extension cables must be selected according to the power input of the welding devices.

6. Plug in the welding device. Depending on the ambient temperature it takes 10 - 30 minutes to heat up the heating plate.

## A

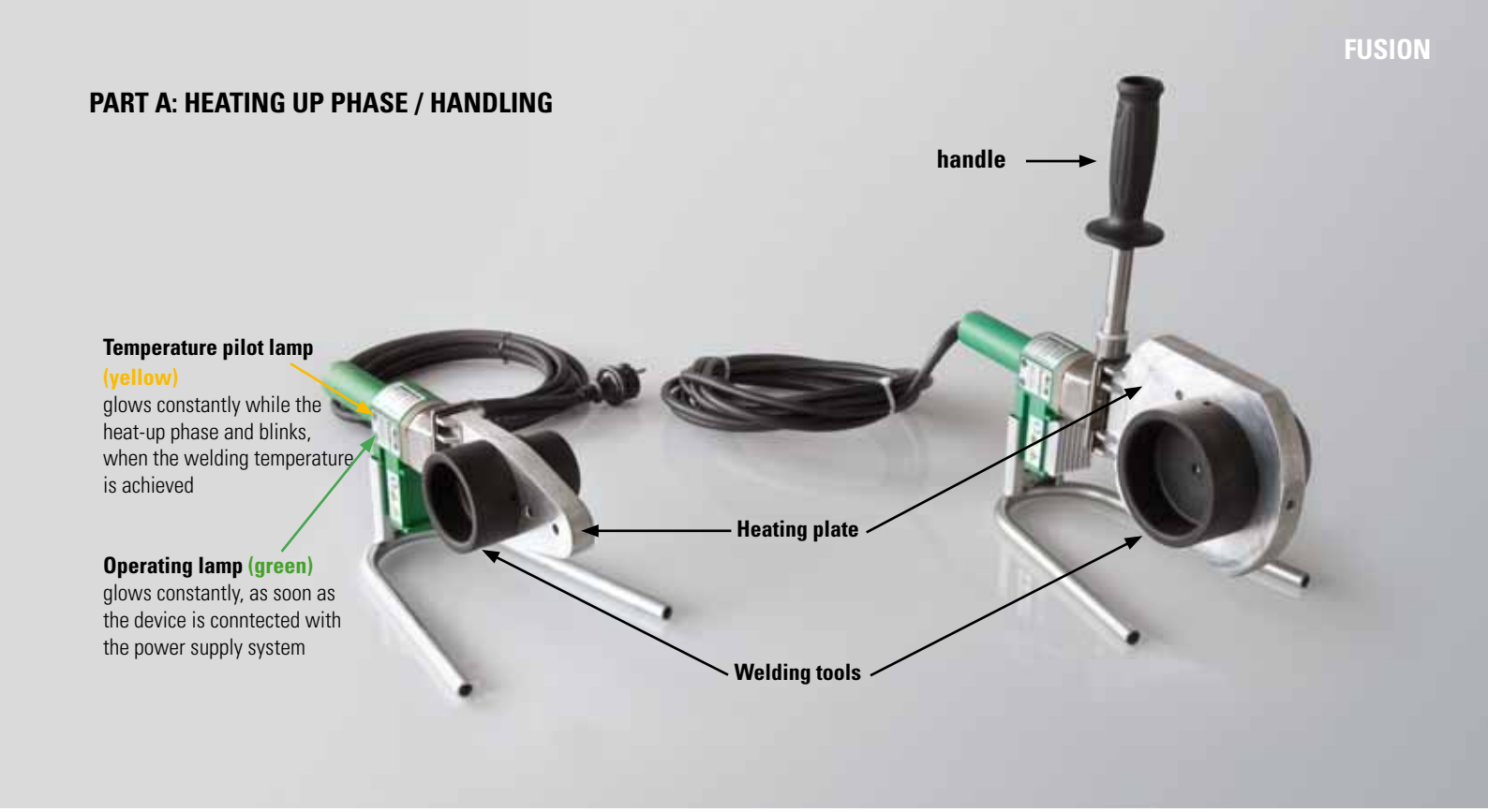
| Art.-No. | Passage | Hole | Branch | Hole |
|---|---|---|---|---|
| 30115 | Ø 25 mm | A + E | Ø 20 mm | A + C |
| 85123 | Ø 20 mm | A + B | Ø 16 mm | A + C |
| 85124 | Ø 20 mm | A + B | Ø 16 mm | A + C |

## B





## PART A: HEATING UP PHASE / HANDLING




**Part A: Heating up phase**

7. During the heating up phase tighten the welding tools carefully with the Allan key.

   Take care that the tools completely contact the heating plate. Never use pliers or any other unsuitable tools, as this will damage the coating of the welding tools.

8. The temperature of 260° C is required for the welding of aquatherm PP-R pipes.

   Acc. to DVS-Welding Guidelines the temperature of the welding device has to be checked at its tool before starting the welding process.

   This can be done with a fast indicating surface thermometer.

**ATTENTION:**

First welding - soonest 5 minutes after reaching of the welding temperature. DVS 2207, Part 11.

**Part A: Handling**

9. A tool change on a heated device requires another check of the welding temperature at the new tool (after its heating up).

10. If the device has been unplugged, e.g. during longer breaks, the heating up process, has to be restarted (see item 6).

11. After use unplug the welding device and let it cool down. Water must never be used to cool the welding device, as this would destroy the heating resistances.

12. Protect aquatherm-welding devices and tools against impurities. Burnt particles may lead to an incorrect fusion. The tools may be cleaned with aquatherm-cleaning cloths, Art.-No.50193.

Always keep the welding tools dry.

13. After welding, do not lay the the device on the Teflon coated tool, but put it down in the provided supporting stand.

14. For a perfect fusion, damaged or dirty welding tools must be replaced, as only impeccable tools guarantee a perfect connection.

15. Never attempt to open or repair a defective device. Return the defective device for repair.

16. Check the operating temperature of aquatherm-welding devices regularly by means of suitable measuring instruments.

## PART A: GUIDELINES
## PART B: CHECKING OF DEVICES AND TOOLS

**Part A: Guidelines**

17. For the correct handling of welding machines the following must be observed:

General Regulations for Protection of Labour and Prevention of Accidents and particularly the Regulations of the Employers' Liability Insurance Association of the Chemical Industry regarding Machines for the Processing of Plastics, chapter: „Welding Machines and Welding Equipment".

18. For the handling of aquatherm-welding machines, devices and tools please observe General Regulations DVS 2208 Part 1 of the German Association forWelding Engineering, Registered Society (DeutscherVerband für Schweißtechnik e. V.).

**Part B: Checking of devices and tools**

1. Check, if the aquatherm-welding devices and tools comply with to the guidelines "Fusion Part A".

2. All used devices and tools must have reached the necessary operating temperature of 260 °C. This requires acc. to "Fusion Part A, item 8" a separate test, which is indispensable (DVS-Welding Guidelines):

Suitable measuring instruments have to measure a temperature of up to 350° C with a high accuracy.

**NOTE**:
aquatherm recommends the original aquatherm temperature measuring device art.-no. 50188

Measurement of temperature at the aquatherm manual welding device (800W )

Measurement of temperature at the aquatherm welding machine

Measurement of temperature at the aquatherm butt-welding machine

## PART B: PREPARATION FOR THE FUSION

3. Cut the pipe at right angles to the pipe axis. Only use aquatherm pipe cutters or other suitable cutting pliers. Take care that the pipe axis is free from burrs or cutting debris and remove where necessary.

4. Mark the welding depth at the end of the pipe with the enclosed pencil and template.

5. Mark the desired position of the fitting on the pipe and / or fitting. The markings on the fitting and the uninterrupted line on the pipe may be used as a guide.


Cutting of the pipe


Marking of the welding depth

## AQUATHERM UNIVERSAL PEELING TOOLS

By using the aquatherm universal peeling tools the end pieces of the aquatherm blue pipe OT and UV can be peeled. By the uniform removal of the outer layer of the pipe any extension of the pipe system by electrofusion socket or fitting is possible. The universal peeling tools are available in the sizes Ø 20- Ø 125 mm (Art.-No. 50479 – 50488). The peeling process is done either mechanically or manually. For the mechanical processing two attachment plates for pipe sizes Ø20- Ø63 mm (Art.-No. 50499) and Ø75- Ø125 (Art.-No. 50500) mm are available. For the mechanically processing of the electrofusion sockets the peeler is extended by an attachment (Art.-No. 50489 – 50498). The power drill should have a high torque.

### 1. INSTRUCTIONS FOR THE MECHANICAL PEELING PROCESS

**1.1.** The attachment plate is clamped with the hexagon bolt in the power drill.

**1.2.** The peeler is fixed with its screws in the slot matching the diameter of the attachment plate and rotated clockwise so that the peeler adheres to the attachment plate.

**1.3.** The peeling tool clamped on the chuck is set by the lead to the end of the pipe.

**1.4.** The peeling process starts with rotation of the peeling tool upon slight force in axial direction. The peeling operation is completed when the attachment plate strikes against the pipe end.

**1.5.** The pipe now can be welded by socket welding method.

### 2. INSTRUCTIONS FOR THE MECHANICAL PEELING PROCESS FOR ELECTROFUSION SOCKETS

**2.1.** The extension is centered with the peeler through the superimposed chamfer fit and fastened with three Allen screws.

**2.2.** The attachment plate is clamped with the hexagon bolt in the power drill and connected with the peeling tool (see photo **1.2.**).

**2.3.** The peeling process starts with rotation of the peeling tool upon slight force in axial direction. The peeling operation is completed when the carrier plate strikes against the pipe end.

**2.4.** The peeling tool is withdrawn from the pipe and the E-socket welding process can start.

### 3. PEELING INSTRUCTIONS FOR MANUAL PEELING

**3.1.** For the manual peeling two handles are mounted at the peeling tool.

**3.2.** The peeling tool is pushed onto the untreated pipe up to the stop.

**3.3.** The peeling tool is turned clockwise as long as the marked peeling depth (see table) is reached.

**3.4.** If the specified/marked peeling depth (see table) is reached, the peeling tool is removed and the socket welding process can start. If the electric socket can be used as a sliding sleeve, the peeling depth for the electric socket welding (see table) must be doubled.





2.1


2.2

2.3

2.4

3.1

3.2

3.3

3.4

**TABLE OF PEELING DEPTH:**
**SOCKET AND ELECTRIC SOCKET WELDING**

| Diameter | Peeling depth Socket welding | Peeling depth Electric socket welding |
|---|---|---|
| ø 20 | 16 mm | 39 mm |
| ø 25 | 20 mm | 43 mm |
| ø 32 | 22 mm | 45 mm |
| ø 40 | 25 mm | 50 mm |
| ø 50 | 28 mm | 56 mm |

| Diameter | Peeling depth Socket welding | Peeling depth Electric socket welding |
|---|---|---|
| ø 63 | 32 mm | 65 mm |
| ø 75 | 34 mm | 69 mm |
| ø 90 | 37 mm | 77 mm |
| ø 110 | 42 mm | 85 mm |
| ø 125 | 44 mm | 90 mm |

## PART B: HEATING OF PIPE AND FITTING

**Heating of pipe and fitting**

6. Push the end of the pipe, without turning, up to the marked welding depth into the welding tool.

   It is essential to observe the above mentioned heating times.

   Pipes and fittings of the dimensions Ø 75 to 125 mm can only be welded with welding device Art.-No. 50341 (or with machine Art.-No. 50148). On using the aquatherm-welding machine Art.-No. 50148 a separate operating instruction has to be observed.

**ATTENTION**:

The heating time starts, when pipe and fitting have been pushed to the correct welding depth on the welding tool. Not before!

## PART B: SETTING AND ALIGNMENT

7. After the required heating time quickly remove pipe and fitting from the welding tools. Joint them immediately, and without turning, until the marked welding depth is covered by the PP-bead from the fitting.

**ATTENTION**:

Do not push the pipe too far into the fitting, as this would reduce the bore and in an extreme case will close the pipe.

8. The joint elements have to be fixed during the specified assembly time. Use this time to correct the connection. Correction is restricted to the alignment of pipe and fitting. Never turn the elements or align the connection after the processing time.

9. After the required cooling time the fused joint is ready for use.

   The result of the fusion of pipe and fitting is a permanent material joining of the system elements. Connection technique with security for a life-time.

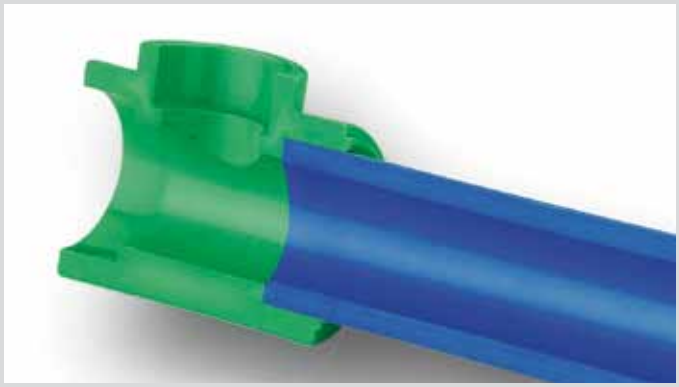
**The fusion is subject to the following data**

| Pipe external-Ø | Welding depth | Heating time | | Welding time | Cooling time |
|---|---|---|---|---|---|
| mm | mm | sec. DVS | sec. AQE* | sec. | min. |
| 20 | 14,0 | 5 | 8 | 4 | 2 |
| 25 | 15,0 | 7 | 11 | 4 | 2 |
| 32 | 16,5 | 8 | 12 | 6 | 4 |
| 40 | 18,0 | 12 | 18 | 6 | 4 |
| 50 | 20,0 | 18 | 27 | 6 | 4 |
| 63 | 24,0 | 24 | 36 | 8 | 6 |
| 75 | 26,0 | 30 | 45 | 8 | 8 |
| 90 | 29,0 | 40 | 60 | 8 | 8 |
| 110 | 32,5 | 50 | 75 | 10 | 8 |
| 125 | 40,0 | 60 | 90 | 10 | 8 |

Heating-up of pipe and fitting

Joining, fixing and…

…aligning



The result: a permanent connection!

*heating times recommended by aquatherm at ambient temperatures below + 5 °C

**Dimension 160 - 630 mm:**

The dimension 160 - 630 mm are joined by butt-welding.

Detailed information page 64 + 65.

**The General Guidelines for Heated Tool Socket Welding acc. to DVS 2207 Part 11 are applied hereupon.**

## PART C: WELD-IN SADDLES

**aquatherm**-weld-in saddles are available for pipe outer diameter of 40 - 630 mm.

Weld in saddles are used for

- branch connections in existing installations
- the substitution of a reduction-tee
- branch connections in risers
- sensor wells, etc.

The maximum sensor well diameter is specified in the table on page 53.

1. Before starting the welding process, check whether the aquatherm-welding devices and tools comply with the requirements of "Fusion Part A".

2. The first step is to drill through the pipe wall at the intended outlet point by using the aquatherm-drill (Art.-No. 50940-50958).

**3. IMPORTANT!**

Only the oxgen barrier layer of the aquatherm blue pipe ot Art.-No. 2170708-2170138 must be removed with the mentioned aquatherm special peeling drills mentioned in the table beside.

For this the special peeling drill is inserted into the bore hole and swaied 2-3 times with light pressure and low rotating speed between the pipe walls until the oxygen barrier layer is completely peeled off.

Remove burrs, debris and other dirts with a chamfering tool or the aquatherm cleaning wipes. Do not touch the peeled surface any more and protect it from new pollution.

4. The welding device / saddle welding tool must have reached the required operating temperature of 260 °C (check with reference to "Fusion Part B, item 2").

5. The welding surfaces have to be clean and dry.

6. Insert the heating tool on the concave side of the weld in saddle tool into the hole drilled in the pipe wall until the tool is completely in contact with the outer wall of the pipe. Next the weld-in saddle tool is inserted into the heating sleeve until the saddle surface is up against the convex side of the welding tool. The heating time of the elements is generally 30 seconds.

7. After the welding tool has been removed, the weld-in saddle tool is immediately inserted into the heated, drilled hole. Then the weld-in saddle should be pressed on the pipe for about 15 seconds. After being allowed to cool for 10 minutes the connection can be exposed to its full loading. The appropriate branch pipe is fitted into the sleeve on the aquatherm-weld-in saddle using conventional fusion technology.

**By fusing the weld-in saddle with the pipe outer surface and the pipe inner wall the connection reaches highest stability.**

Drilling through the pipe wall

Removal of the oxgen barrier layer from the aquatherm blue pipe ot

**aquatherm** saddle peeling tools for **aquatherm blue pipe ot** pipes ø 50-125 mm

| Art.-No. | Dimension |
|---|---|
| 50921 | for weld-in saddles ø 20 & 25 mm |
| 50922 | for weld-in saddles ø 32 mm |
| 50924 | for weld-in saddles ø 40 mm |
| 50926 | for weld-in saddles ø 50 mm |
| 50928 | for weld-in saddles ø 63 mm |

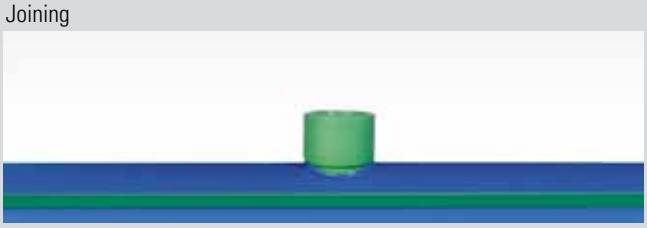
**aquatherm** saddle peeling tools for **aquatherm blue pipe ot** pipes Ø 160-250 mm

| Art.-No. | Dimension |
|---|---|
| 50421 | for weld-in saddles ø 20 & 25 mm |
| 50422 | for weld-in saddles ø 32 mm |
| 50424 | for weld-in saddles ø 40 mm |
| 50426 | for weld-in saddles ø 50 mm |
| 50428 | for weld-in saddles ø 63 mm |

The welding tool is inserted into the pipe wall …

…heating-up of the elements

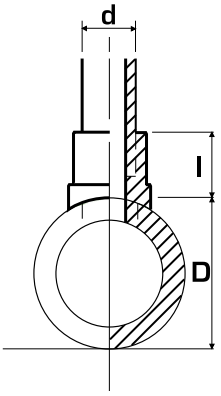
Joining



Ready!

## PART C: WELD-IN SADDLES

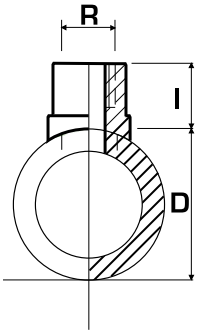
| Art.-No. | Dimension | D | d | l | Drill | Special peeling drill* | Tool |
|---|---|---|---|---|---|---|---|
| | | mm | mm | mm | Art.-No. | Art.-No. | Art.-No. |
| 15156 | 40/20 mm | 40 | 25 | 27.0 | 50940 | 50920 | 50614 |
| 15158 | 40/25 mm | 40 | 25 | 28.0 | 50940 | 50920 | 50614 |
| 15160 | 50/20 mm | 50 | 20 | 27.0 | 50940 | 50921 | 50616 |
| 15162 | 50/25 mm | 50 | 25 | 28.0 | 50940 | 50921 | 50616 |
| 15164 | 63/20 mm | 63 | 20 | 27.0 | 50940/15941 | 50921 | 50619 |
| 15166 | 63/25 mm | 63 | 25 | 28.0 | 50940/15941 | 50921 | 50619 |
| 15168 | 63/32 mm | 63 | 32 | 30.0 | 50942 | 50922 | 50620 |
| 15170 | 75/20 mm | 75 | 20 | 27.0 | 50940/15941 | 50921 | 50623 |
| 15172 | 75/25 mm | 75 | 25 | 28.0 | 50940/15941 | 50921 | 50623 |
| 15174 | 75/32 mm | 75 | 32 | 30.0 | 50942 | 50922 | 50624 |
| 15175 | 75/40 mm | 75 | 40 | 34.0 | 50944 | 50924 | 50625 |
| 15176 | 90/20 mm | 90 | 20 | 27.0 | 50940/15941 | 50921 | 50627 |
| 15178 | 90/25 mm | 90 | 25 | 28.0 | 50940/15941 | 50921 | 50627 |
| 15180 | 90/32 mm | 90 | 32 | 30.0 | 50942 | 50922 | 50628 |
| 15181 | 90/40 mm | 90 | 40 | 34.0 | 50944 | 50924 | 50629 |
| 15182 | 110/20 mm | 110 | 20 | 27.0 | 50940/15941 | 50921 | 50631 |
| 15184 | 110/25 mm | 110 | 25 | 28.0 | 50940/15941 | 50921 | 50631 |
| 15186 | 110/32 mm | 110 | 32 | 30.0 | 50942 | 50922 | 50632 |
| 15188 | 110/40 mm | 110 | 40 | 34.0 | 50944 | 50924 | 50634 |
| 15189 | 110/50 mm | 110 | 50 | 34.0 | 50946 | 50926 | 50635 |
| 15190 | 125/20 mm | 125 | 20 | 27.0 | 50940/15941 | 50921 | 50636 |
| 15192 | 125/25 mm | 125 | 25 | 28.0 | 50940/15941 | 50921 | 50636 |
| 15194 | 125/32 mm | 125 | 32 | 30.0 | 50942 | 50922 | 50638 |
| 15196 | 125/40 mm | 125 | 40 | 34.0 | 50944 | 50924 | 50640 |
| 15197 | 125/50 mm | 125 | 50 | 34.0 | 50946 | 50926 | 50642 |
| 15198 | 125/63 mm | 125 | 63 | 38.0 | 50948 | 50928 | 50644 |
| 15206 | 160/20 mm | 160 | 20 | 27.5 | 50940/15941 | - | 50648 |
| 15208 | 160/25 mm | 160 | 25 | 28.5 | 50940/15941 | - | 50648 |
| 15210 | 160/32 mm | 160 | 32 | 30.0 | 50942 | 50421 | 50650 |
| 15212 | 160/40 mm | 160 | 40 | 34.0 | 50944 | 50421 | 50652 |
| 15214 | 160/50 mm | 160 | 50 | 34.0 | 50946 | 50422 | 50654 |
| 15216 | 160/63 mm | 160 | 63 | 38.0 | 50948 | 50424 | 50656 |
| 15218 | 160/75 mm | 160 | 75 | 42.0 | 59050 | 50426 | 50657 |
| 15220 | 160/90 mm | 160 | 90 | 45.0 | 50952 | 50428 | 50658 |
| 15228 | 200-250/20 mm | 200-250 | 20 | 27.5 | 50941 | - | 50660 / 50672 |
| 15229 | 200-250/25 mm | 200-250 | 25 | 28.5 | 50941 | - | 50660 / 50672 |
| 15230 | 200-250/32 mm | 200-250 | 32 | 30 | 50942 | - | 50662 / 50674 |
| 15231 | 200/40 mm | 200 | 40 | 34 | 50944 | - | 50664 |
| 15232 | 200/50 mm | 200 | 50 | 34 | 50946 | 50424 | 50666 |
| 15233 | 200/63 mm | 200 | 63 | 37.5 | 50948 | 50426 | 50668 |
| 15234 | 200/75 mm | 200 | 75 | 42.0 | 50950 | 50428 | 50667 |
| 15235 | 200/90 mm | 200 | 90 | 42.0 | 50952 | - | 50669 |
| 15236 | 200/110 mm | 200 | 110 | 49.0 | 50954** | - | 50670 |
| 15237 | 200/125 mm | 200 | 125 | 55.0 | 50956** | - | 50671 |
| 15251 | 250/40 mm | 250 | 40 | 34 | 50944 | - | 50676 |
| 15252 | 250/50 mm | 250 | 50 | 34 | 50946 | - | 50678 |
| 15253 | 250/63 mm | 250 | 63 | 37.5 | 50948 | - | 50680 |
| 15254 | 250/75 mm | 250 | 75 | 42.0 | 50950 | - | 50682 |
| 15255 | 250/90 mm | 250 | 90 | 45.0 | 50952 | - | 50684 |
| 15256 | 250/110 mm | 250 | 110 | 49.0 | 50954** | - | 50686 |
| 15257 | 250/125 mm | 250 | 125 | 55.0 | 50956** | - | 50688 |
| 15260 | 315/63 mm | 315 | 63 | 37,5 | 50948 | - | 50690 |
| 15261 | 315/75 mm | 315 | 75 | 42,0 | 50950 | - | 50692 |
| 15262 | 315/90 mm | 315 | 90 | 45,0 | 50952 | - | 50694 |
| 15263 | 315/110 mm | 315 | 110 | 49,0 | 50954** | - | 50696 |
| 15264 | 315/125 mm | 315 | 125 | 55,0 | 50956** | - | 50698 |
| 15268 | 355/90 mm | 355 | 90 | 45,0 | 50952 | - | 50716 |
| 15269 | 355/110 mm | 355 | 110 | 49,0 | 50954** | - | 50718 |
| 15270 | 355/125 mm | 355 | 125 | 55,0 | 50956** | - | 50720 |
| 15271 | 355/160 mm | 355 | 160 | - | 50958 | - | 50722 |
| 15275 | 400-500/75 mm | 400-500 | 75 | - | 50950 | - | 50728 |
| 15277 | 400-450/110 mm | 400-500 | 110 | - | 50954 | - | 50736 |
| 15278 | 400/125 mm | 400 | 125 | - | 50956 | - | 50742 |
| 15288 | 400-500/90 m | 400-500 | 90 | - | 50952 | - | 50732 |
| 15290 | 450-500/125 m | 400-500 | 125 | - | 50956 | - | 50744 |
| 15300 | 400-630/63 mm | 400 | 63 | - | 50948 | - | 50726 |
| 15303 | 500-560/110 mm | 500-560 | 110 | - | 50954 | - | 50738 |
| 15315 | 560-630/75 mm | 560-630 | 75 | - | 50950 | - | 50730 |
| 15316 | 560-630/90 mm | 560-630 | 90 | - | 50952 | - | 50734 |
| 15318 | 560-630/125 mm | 560-630 | 125 | - | 50956 | - | 50746 |
| 15331 | 630/110 mm | 630 | 110 | - | 50954 | - | 50740 |



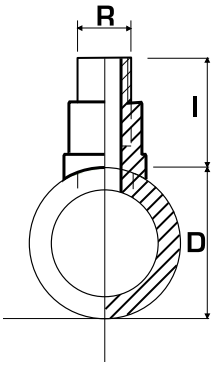

* only for aquatherm blue pipe OT faser composite pipes, Art.-No. 2170708 - 2170138
** tool holder MK4

## PART C: WELD-IN SADDLES

| Art.-No. | Dimension | D | d | l | Sensor-wels | Drill | Special peeling drill* | Tool |
|---|---|---|---|---|---|---|---|---|
| | | mm | mm | mm | Art.-No. | Art.-No. | Art.-No. | Art.-No. |
| 28214 | 40/25 x 1/2" IG. | 40 | 1/2" | 39,0 | 14 | 50940 | 50920 | 50614 |
| 28216 | 50/25 x 1/2" IG. | 50 | 1/2" | 39,0 | 14 | 50940 | 50921 | 50616 |
| 28218 | 63/25 x 1/2" IG. | 63 | 1/2" | 39,0 | 14 | 50940/15941 | 50921 | 50619 |
| 28220 | 75/25 x 1/2" IG. | 75 | 1/2" | 39,0 | 14 | 50940/15941 | 50921 | 50623 |
| 28222 | 90/25 x 1/2" IG. | 90 | 1/2" | 39,0 | 14 | 50940/15941 | 50921 | 50627 |
| 28224 | 110/25 x 1/2" IG. | 110 | 1/2" | 39,0 | 14 | 50940/15941 | 50921 | 50631 |
| 28226 | 125/25 x 1/2" IG. | 125 | 1/2" | 39,0 | 14 | 50940/15941 | 50921 | 50636 |
| 28230 | 160/25 x 1/2" IG. | 160 | 1/2" | 39,0 | 14 | 50940/15941 | 50921 | 50648 |
| 28232 | 200-250/25 mm x 1/2" IG. | 200-250 | 1/2" | 39,0 | 14 | 50941 | 50921 | 50660 / 50672 |
| 28234 | 40/25 x 3/4" IG. | 40 | 3/4" | 39,0 | 16 | 50940 | 50920 | 50614 |
| 28236 | 50/25 x 3/4" IG. | 50 | 3/4" | 39,0 | 16 | 50940 | 50921 | 50616 |
| 28238 | 63/25 x 3/4" IG. | 63 | 3/4" | 39,0 | 16 | 50940/15941 | 50921 | 50619 |
| 28240 | 75/25 x 3/4" IG. | 75 | 3/4" | 39,0 | 16 | 50940/15941 | 50921 | 50623 |
| 28242 | 90/25 x 3/4" IG. | 90 | 3/4" | 39,0 | 16 | 50940/15941 | 50921 | 50627 |
| 28244 | 110/25 x 3/4" IG. | 110 | 3/4" | 39,0 | 16 | 50940/15941 | 50921 | 50631 |
| 28246 | 125/25 x 3/4" IG. | 125 | 3/4" | 39,0 | 16 | 50940/15941 | 50921 | 50636 |
| 28250 | 160/25 x 3/4" IG. | 160 | 3/4" | 39,0 | 16 | 50940/15941 | 50921 | 50648 |
| 28254 | 200-250/25 mm x 3/4" IG. | 200-250 | 3/4" | 39,0 | 16 | 50941 | 50921 | 50660 / 50672 |
| 28260 | 75/32 x 1" IG. | 75 | 1" | 43,0 | 20 | 50942 | 50922 | 50624 |
| 28262 | 90/32 x 1" IG. | 90 | 1" | 43,0 | 20 | 50942 | 50922 | 50628 |
| 28264 | 110/32 x 1" IG. | 110 | 1" | 43,0 | 20 | 50942 | 50922 | 50632 |
| 28266 | 125/32 x 1" IG. | 125 | 1" | 43,0 | 20 | 50942 | 50922 | 50638 |
| 28270 | 160/32 x 1" IG. | 160 | 1" | 43,0 | 20 | 50942 | 50922 | 50650 |
| 28274 | 200-250/32 mm x 1" IG. | 200-250 | 1" | 43,0 | 20 | 50942 | 50922 | 50662 / 50674 |




| Art.-No. | Dimension | D | d | l | Drill | Special peeling drill* | Tool |
|---|---|---|---|---|---|---|---|
| | | mm | mm | mm | Art.-No. | Art.-No. | Art.-No. |
| 28314 | 40/25 x 1/2" AG. | 40 | 1/2" | 55,0 | 15940 | 50920 | 50614 |
| 28316 | 50/25 x 1/2" AG. | 50 | 1/2" | 55,0 | 15940 | 50921 | 50616 |
| 28318 | 63/25 x 1/2" AG. | 63 | 1/2" | 55,0 | 15940/15941 | 50921 | 50619 |
| 28320 | 75/25 x 1/2" AG. | 75 | 1/2" | 55,0 | 15940/15941 | 50921 | 50623 |
| 28322 | 90/25 x 1/2" AG. | 90 | 1/2" | 55,0 | 15940/15941 | 50921 | 50627 |
| 28324 | 110/25 x 1/2" AG. | 110 | 1/2" | 55,0 | 15940/15941 | 50921 | 50631 |
| 28326 | 125/25 x 1/2" AG. | 125 | 1/2" | 55,0 | 15940/15941 | 50921 | 50636 |
| 28330 | 160/25 x 1/2" AG. | 160 | 1/2" | 55,0 | 15940/15941 | 50921 | 50648 |
| 28334 | 40/25 x 3/4" AG. | 40 | 3/4" | 56,0 | 15940 | 50921 | 50614 |
| 28336 | 50/25 x 3/4" AG. | 50 | 3/4" | 56,0 | 15940 | 50921 | 50616 |
| 28338 | 63/25 x 3/4" AG. | 63 | 3/4" | 56,0 | 15940/15941 | 50921 | 50619 |
| 28340 | 75/25 x 3/4" AG. | 75 | 3/4" | 56,0 | 15940/15941 | 50921 | 50623 |
| 28342 | 90/25 x 3/4" AG. | 90 | 3/4" | 56,0 | 15940/15941 | 50921 | 50627 |
| 28344 | 110/25 x 3/4" AG. | 110 | 3/4" | 56,0 | 15940/15941 | 50921 | 50631 |
| 28346 | 125/25 x 3/4" AG. | 125 | 3/4" | 56,0 | 15940/15941 | 50921 | 50636 |
| 28350 | 160/25 x 3/4" AG. | 160 | 3/4" | 56,0 | 15940/15941 | 50921 | 50648 |




* only for aquatherm blue pipe OT faser composite pipes, Art.-No. 2170708-2170130

## PART D: PULLING JIG (HITCH)

### Notice

The following description of the electric pulling jig applies to the type of the year 2013.

### Operation and fusion

With the help of the electric pulling jig, all aquatherm PP-R pipes and fittings in dimensions from 63 to 125 mm are in a very simple manner without any effort welded together.

Also the pulling jig simplifies the welding of pipes and fittings under ceilings,  in narrow shafts and other hard-to-reach places.

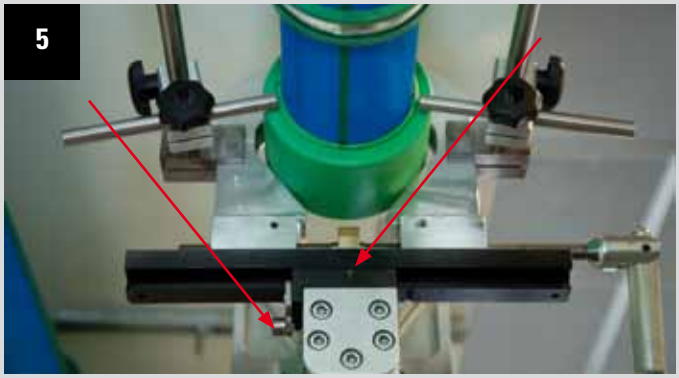
### 1. Preparation for the fusion

Mark the welding depth with the included green marking template on the pipe end. (Fig. 1). In addition, the clamping depth is measured 2 cm from the welding depth marking  and marked again. (Fig. 2 +3)

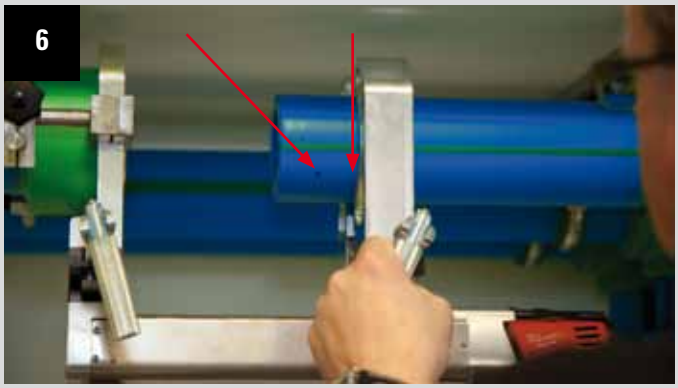


The pulling jig is now placed on the fitting or pipe to be welded with the clamping jaws. (Fig. 4)


The two arrows of the jaws and the machine must be flush with each other. The jaws are to be fixed with the help of the clamping device (Fig. 5).




Align the pipe so that the rear marking is flush with the inner edge of the clamping jaw. The front marking identifies the welding depth (Fig. 6).




Lock pipe and fitting by using the front adjusting screws. (Fig. 7)


Never clamp so tight that deformations appear. Additionally, with the fitting support, all fittings are supported. The support is mounted on the clamping jaw for fittings. (Fig.8)

## PART D: PULLING JIG (HITCH)

**2. Fusion**

Hold the welding device between pipe and fitting and ride machine carriage in batches together (pay attention to the welding depth).

Basically the jaws must be released after the insertion of pipe and fitting in the welding tool by a short return of the machine (3-7 mm)! The jaws must always be parallel to each other. (Fig. 9 +10)

After finishing of the warm-up drive the machine carriage apart and remove the welding device. (Fig. 11)

Ride the jaws together again and release the clamping jaws again by a short return of the machine (3-7 mm). (Fig. 12)

## CAUTION:

Jaws may be released only after the expiry of the cooling time!

Pipe and fitting are now joined by fusion to a material unit. (Fig. 13)

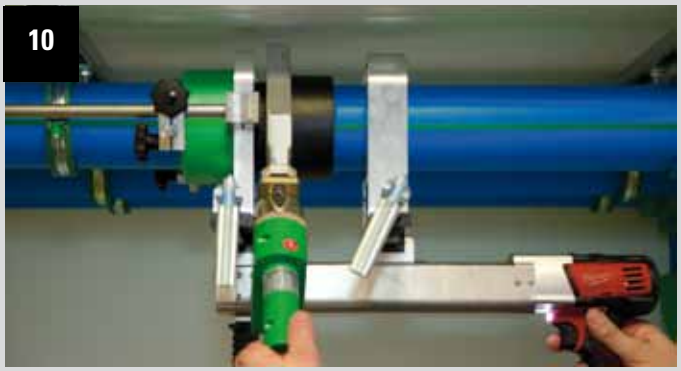
| Pipe external | Welding depth | Heating time | | Welding time | Cooling time |
|---|---|---|---|---|---|
| mm | mm | sec. DVS | sec. AQE* | sec. | min. |
| 63 | 24,0 | 24 | 36 | 8 | 6 |
| 75 | 26,0 | 30 | 45 | 8 | 8 |
| 90 | 29,0 | 40 | 60 | 8 | 8 |
| 110 | 32,5 | 50 | 75 | 10 | 8 |
| 125 | 40,0 | 60 | 90 | 10 | 8 |

*heating times recommended by aquatherm at ambient temperatures below +5 °C.

**The General Guidelines for Heated Socket Welding acc. to DVS 2207, Part 11 are applied hereupon.**

9

10



11

12

13

## PART E: AQUATHERM- WELDING MACHINE

for stationary processing 50 – 125 mm

precise pre-assembly and facilitation by hand creek

clamping jaws 50 – 125 mm, tools 50 – 125 mm,

Scope of supply:
wooden transport box, slide with sub construction, clamping jaws 50 - 125 mm, welding tools 50 - 125 mm, stay with rolls

For welding of aquatherm blue pipe a welding temperature of 260 °C at the welding tools is necessary (see page 47).

Instructions for use can be taken from the attached operation manual.

**The fusion is subject to the following data**

| Pipe external- Ø | Welding depth | Heating time | | Welding time | Cooling time |
|---|---|---|---|---|---|
| mm | mm | sec. DVS | sec. AQE* | sec. | min. |
| 50 | 20,0 | 18 | 27 | 6 | 4 |
| 63 | 24,0 | 24 | 36 | 8 | 6 |
| 75 | 26,0 | 30 | 45 | 8 | 8 |
| 90 | 29,0 | 40 | 60 | 8 | 8 |
| 110 | 32,5 | 50 | 75 | 10 | 8 |
| 125 | 40,0 | 60 | 90 | 10 | 8 |

**The general guidelines for heated tool socket welding acc. to DVS 2207 part 11 are applied hereupon.**

*heating times recommended by aquatherm at ambient temperatures below + 5 °C

**Dimension 160-630 mm:**

The dimension 160-630 mm are joined by butt- welding.

Detailed information on page 64 + 65.

## PART E: WELDING MACHINE PRISMA-LIGHT

welding machine prisma-light with heating plate without tools

clamping fixture for fixing the prisma-light e. g. at the work bench

1. Check machine: temperature lamp blinks after reaching the welding temperature (260° C), adjust clamping jaws 63 – 125 mm coarsely. Mark welding depth with the template at the pipe.

2. Fix the fitting against the clamping jaws.

3. Place the pipe loose in the opposite clamping jaws.

4. Position the welding device centrically to the pipe-fitting axis and remove it.

5. Lock the front calibration knob and drive up the slide as far as it will go.

6. In this position push the pipe against the fitting and fix it with the clamping jaws.

7. Regulate the welding time according to the table on page 57, place the welding device and push the fitting and pipe slowly as far as it will go up to the marking.

8. The heating time starts when pipe and fitting are completely pushed on the tool. When heating time is complete slide return the slide, remove the heating device quickly and join the pipe and fitting.

9. Consider cooling times from the table on page 57.

More detailed information can be taken from the enclosed operating manuals.

## PART F: ELECTROFUSION DEVICE

### Fusion

The aquatherm-electrofusion device was specially developed for electrofusion sockets from Ø 20 - 250 mm.

The fusion of 160-250 mm aquatherm blue -faser composite pipes UV-resistant with the electrofusion socket Art.-No. 17230 is not possible.

### Technical information:

supply voltage: 230 V (nominal voltage)
nominal capacity: 2.800 VA, 80 % ED
rated frequency: 50 Hz - 60 Hz
protection class: IP 54

### 1. General and inspection

Cleanliness is - besides correct workmanship - the most important precondition for a correct fusion. For keeping the sockets clean do not unwrap them before processing.

The pipe surface must also be clean and undamaged. Deformed pipe ends must be cut off.

All parts of the system to be fused as well the temperature sensors shall have the same temperature (e.g. sun radiation or unadapted storing may cause differences in temperature!) within the acceptable range of temperature (e.g. +5 °C to 40 °C according to DVS 2207).

### 2. Preparation

Follow carefully the order of working steps!

Preparation is one of the most important steps of the electrofusion process!

a. Cut the ends of the pipes rectangularly and deburr them thoroughly

b. Clean and dry the ends of the pipes at the necessary length

c. Mark the depth of aquatherm-electro-fusion-socket on the end of the pipe

aquatherm electrofusion device Ø 20-250 mm

aquatherm electrofusion socket

aquatherm peeling tool (Art.-No. 50558-70, up to 75 mm) (from 90-160 mm: Art.-No. 50572-50592 (without picture))

| Welding depth up to 250 mm | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ø | 20 | 25 | 32 | 40 | 50 | 63 | 75 | 90 | 110 | 125 | 160 | 200 | 250 |
| ET | 35,0 | 39,0 | 40,0 | 46,0 | 51,0 | 59,0 | 65,0 | 72,5 | 80,0 | 86,0 | 93,0 | 105,0 | 125,0 |

## TEIL F: ELECTROFUSION DEVICE

**Fusion**

d. Peel the surface of both pipes up to the marks thoroughly with a peeling tool (use the aquatherm-peeling tool with the respective pipe diameter)

**IMPORTANT!**

Before the fusion peel off the oxygen barrier layer of the aquatherm blue pipe OT and the UV-layer of the faser-composite-pipe-UV completely to the stop by using the double peeling tools (Art.-No. 50507, 50511, 50516, 50519, 50525) considering the pipe diameter.

By turning the adjusting screw clockwise to the stop, the peeling tools can be adjusted into small depths (sockets), by turning them counter clockwise up to the stop they can be adjusted into big peeling depth (electrofusion sockets).

**e. Clean again thoroughly**

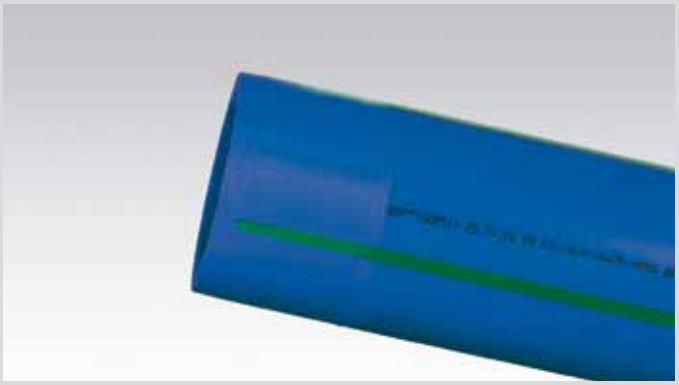
Without complete peeling of the fusion surface a homogeneous and tight welding connection is not assured. Damages of the surface like axial grooves and scratches are not accepted in the fusion zone. Never touch peeled surfaces and protect them against dirt and grease. Start the fusion process within 30 mins after peeling.

**3. Assembling the electrofusion sockets**

Avoid soiling and fix all parts securely!

1. Open the protective wrapping of the aquatherm-electrofusion sockets (cut with knife along the edge of the bore), leaving the rest of the foil intact. Clean the inside of the fitting carefully with aquatherm-cleaning wipes. Assemble the fitting within 30 mins after opening of the protective foil.

2. Push the aquatherm-electrofusion sockets on the clean and dry end of the pipe (up to the marked depth). Use pressing clamps if necessary.



Cut, peel and clean the pipes to be welded carefully

Clean the inner surface of the electrofusion socket

Push the electrofusion socket onto the pipe end

## PART F: ELECTROFUSION DEVICE

Remove the protective foil completely and push the other prepared pipe end into the aquatherm- electro-fusion sockets tighten in the fixation.

Leave the pipes, free from bending stress or own weight, within the aquatherm - electrofusion socket. the socket is movable at both pipe ends after assembling. The air gap has to be even around the circumference. A non stress-free, resp. displaced connection can effect an unacceptable melt-flow and a defective connection while joining. The pipe ends and electrofusion sockets have to be dry when installed.

**4. Fusion process**

1. Position the fitting with even air gap around the circumference.

2. Regulate fusion equipment for the right fusion parameter.

3. Compare the indications of the fusion equipment with the parameters of the label.

4. Start and watch the fusion process.

Do not move or stress pipe and fitting during the whole fusion process and cooling time.

**5. Cooling time and pressure test**

A fused pipe-joint shall not be moved (no release of the fixation) or stressed before complete cooling.

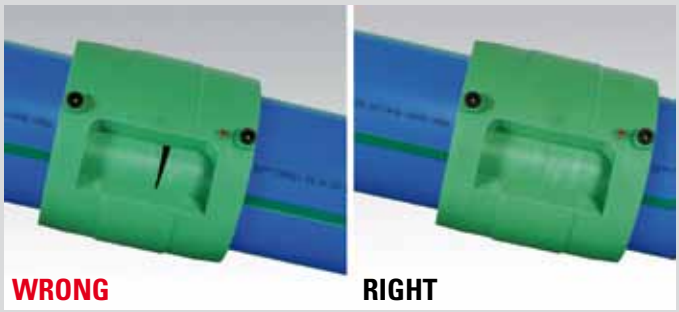
The minimum required cooling time is marked on each aquatherm electrofusion socket. Ambient temperatures of more than 25 °C or strong sun-radiation need longer cooling times.

**Working pressure**

The operation pressure can be taken from the imprint on the electric welding socket. The relation between working temperature, pressure load and service life is given in the tables "Permissible working pressure."

For further information concerning electrofusion socket and details about the aquatherm- electrofusion device read the enclosed operating instructions.

Push the second pipe - also peeled and cleaned - into the socket




For a stable welding result it is important that both pipe ends inside the electrofusion socket are with parallel faces! Follow the minimum welding depth - absolutely!

Adjust the socket diameter on the welding device. Start and control welding process. Keep the cooling time. Finished!

| Kind of stress | Compressive stress | Minimum waiting period |
|---|---|---|
| Tension, bend, torsion of unpressurized pipes | | 20 minutes |
| Test- or working pressure of pipes pressurized | up to 0.1 bar (1.5 psi)<br>0.1 up to 1 bar (1.5-14.5 psi)<br>over 1 bar (14.5 psi) | 20 minutes<br>60 minutes<br>120 minutes |
| Repeating of the welding process | | 60 minutes |

## FLANGE CONNECTIONS

### THE FOLLOWING MUST BE OBSERVED IN THE USE OF FLANGE CONNECTIONS:

Flange adapter respectively the sealing surfaces must always be aligned parallel to each other. A subsequent tightening of the flange connection after the welding process must be avoided. It is important to ensure that the flange faces are clean and undamaged.

The screw length should be selected so that the screw thread is as flush as possible, maximum two threads from the nut. To distribute the force of the screw head and the nut over a larger area, washers are used. Screws, nuts and washers must be clean and undamaged.

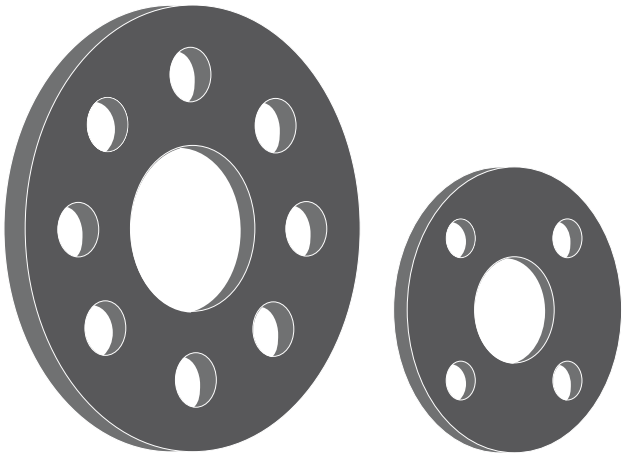
In order to achieve proper force distribution (surface pressure) acting on the seal, note the following:

- Screw joints must be tightened diagonally and evenly
- Torque information on the individual flanges must be observed (see table)

For flange connections, exposed to a mutual load, take care that they are checked as part of the maintenance and retightened, if necessary.

### TORQUE FLANGE according to manufacturere´s instructions

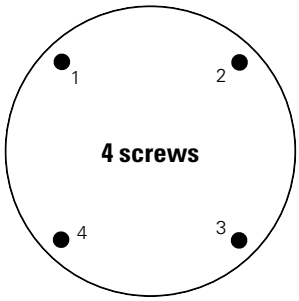
| Art.-No. | Dimension | DN specification | Nm |
|---|---|---|---|
| 15712 | 32mm | 25 | 15 |
| 15714 | 40mm | 32 | 20 |
| 15716 | 50mm | 40 | 30 |
| 15718 | 63mm | 50 | 35 |
| 15720 | 75mm | 65 | 40 |
| 15722 | 90mm | 80 | 40 |
| 15724 | 110mm | ohne | 50 |
| 15726 | 125mm | 100 | 50 |
| 15730 | 160mm | 125 | 60 |
| 15734 | 200mm | 150 | 75 |
| 15738 | 250mm | 200 | 95 |
| 15742 | 315mm | 250 | 100 |
| 15744 | 355mm | 300 | 100 |
| | | | |
| 15746 | 400mm | 350 | 244-366 |
| 15748 | 450mm | 400 | 271-407 |
| 15750 | 500mm | 450 | 271-407 |
| 15752 | 560mm | 500 | 353-529 |
| 15754 | 630mm | 500 | 393-590 |

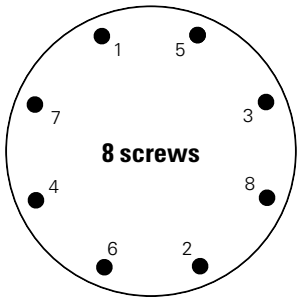


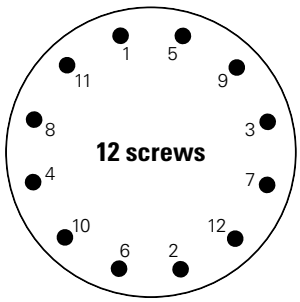
### TIGHTENING SEQUENCE

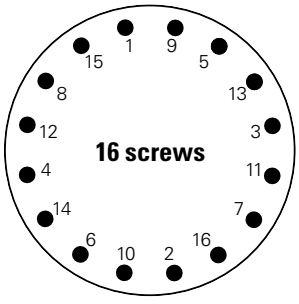
| Number of screws | Criss-Cross Pattern Tightening Sequence |
|---|---|
| 4 | 1 - 2 - 3 - 4 |
| 8 | 1 - 5 - 3 - 7 >> 2 - 6 - 4 - 8 |
| 12 | 1 - 7 - 4 - 10 >> 2 - 8 - 5 - 11 >> 3 - 9 - 6 - 12 |
| 16 | 1 - 9 - 5 - 13 >> 3 - 11 - 7 - 15 >> 2 - 10 - 6 - 14 >> 4 - 12 - 8 - 16 |
| 20 | 1 - 11 - 6 - 16 >> 3 - 13 - 8 - 18 >> 5 - 10 - 15 - 20 >> 2 - 12 - 7 - 17 >> 4 - 14 - 9 - 19 |

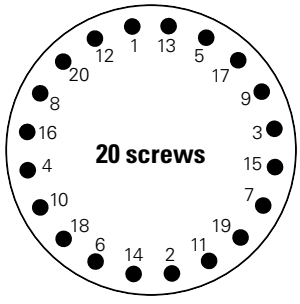
Following the table, tighten the given screw number to the desired torque value for the given round of tightening.



## POSSIBILITIES OF REPAIR

Pipe repairs with the aquatherm green pipe-electrofusion socket

Cut squarely 3 to 4 lengths of a fitting out of the defect pipe, symmetrically to the defect. Fit the new pipe into this gap. Prepare the pipe ends of the existing pipe as in the case ofa new welding.

Peel the new piece of pipe on both sides with the peeling tool on a length of more than the length of one fitting.

Unwrap two fittings and carefully move the fittings over both ends of the new pipe.

Then place the repair-pipe into the gap and move the fittings until they are aligned with the markings on the existing pipes.

Take care, that the fittings are exactly aligned and completely free of stress before welding.

**Additional possibilities of repair**

Damaged pipes may be repaired - as already mentioned - by means of

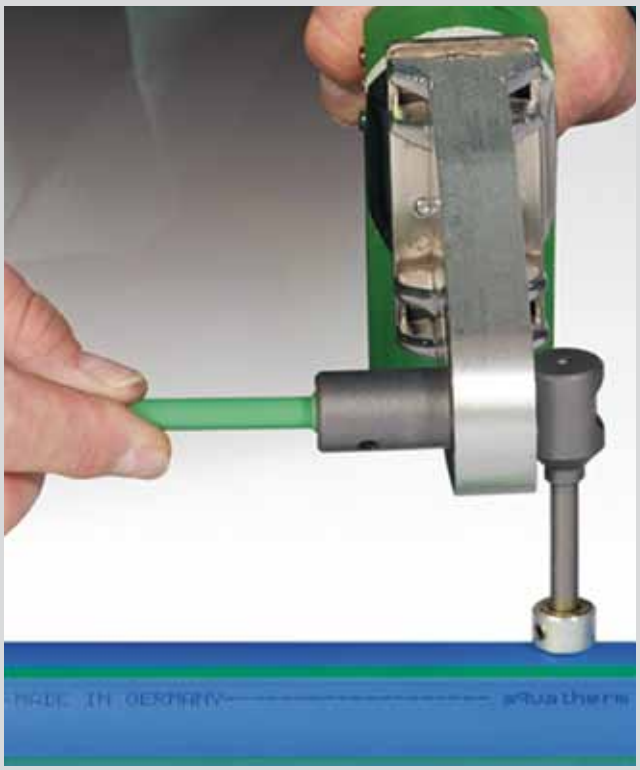
fusion (see Part B)
electrofusion socket (see Part F).

In addition to this the aquatherm PP-R- systems offers the possibility of the

**pipe repair stick.**

The necessary welding tool (Art.-No. 50307 / 11) and repair stick (Art.-No. 60600) are described on page 158.

The installation information is enclosed with the welding tool, but may also be ordered separately (Order-No. D 11450) from aquatherm.



Heat-up

Repair stick

Cutting

## PART H: BUTT-WELDING OF PIPE DIMENSION 160 - 630 MM

The following aquatherm - pipes series are available:

aquatherm blue pipe SDR 11 MF faser-composite pipe

aquatherm blue pipe SDR 11 MF OT faser- composite pipe

aquatherm blue pipe SDR 17,6 MF faser- composite pipe

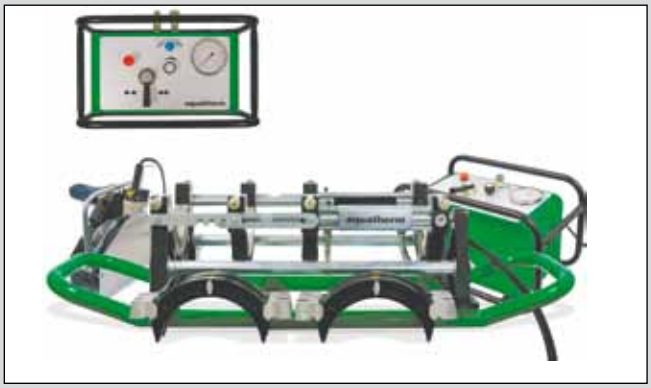
Pipes and fittings are fused, as explained below, by butt welding:

1. Protect your place of work from weather influences
2. Check, if welding machine works properly and heat it up
3. Cut pipes into required length
4. Plastic pipes are aligned and fixed by means of the clamping elements
5. Use the milling machine for planing the pipe end to be plane-parallel
6. Remove the debris and clean the pipe ends with methylated spirit
7. Check if pipes match (tolerance: max. 0.1 x wall thickness)
8. Check width of gap between the two pipes to be welded (tolerance: max. 0.5 mm)
9. Check the temperature of the heating element (210° C +/- 10° C)
10. Clean the heating element

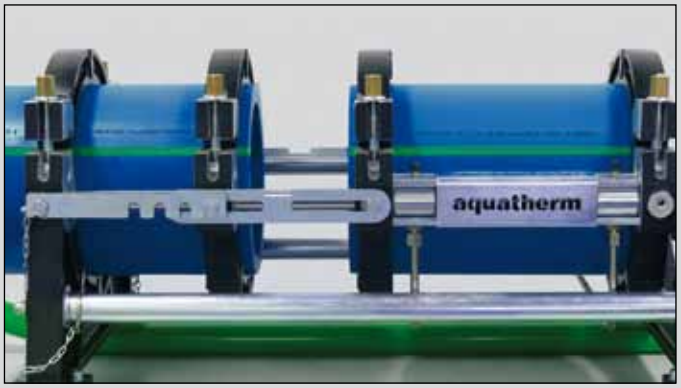
### IMPORTANT:

Before welding, aquatherm blue pipe OT pipes have to be burred at the front. To ensure an optimal weld joint, the heating plates' surfaces have to be cleaned before each welding process and be free of visible and invisible residues.

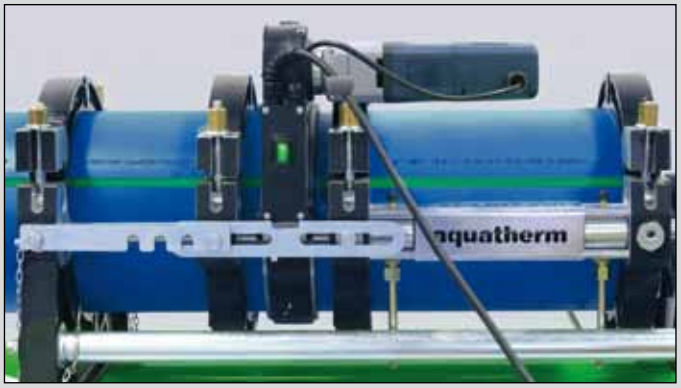
Before welding, pipes are cut into the required lengths



Check performance of the welding machine and heat it up




The parts to be welded are fixed and aligned respectively, the milling machine is used



## PART H: BUTT-WELDING OF PIPE DIMENSION 160 - 630 MM

11. After the heating element has been positioned, the pipes are pushed onto the heating plate with a defined adjusting pressure.

12. After reaching the specified bead height (see tablet) the pressure is reduced. This process marks the beginning of the heating time. This time is for heating up the pipe ends up to the right welding temperature.

Specified bead height in mm:

| | SDR 11 | SDR 17,6 |
|---|---|---|
| 160 mm | 1,0 | 1,0 |
| 200 mm | 1,0 | 1,0 |
| 250 mm | 1,5 | 1,0 |
| 315 mm | 2,0 | 1,0 |
| 355 mm | 2,0 | 1,5 |
| 400 mm | 2,0 | 1,5 |
| 450 mm | 2,5 | 1,5 |
| 500 mm | | 2,0 |
| 560 mm | | 2,0 |
| 630 mm | | 2,0 |

13. When heating time has expired, divide the machine slide, remove heating element quickly and join the pipes (by putting both parts of the slide together).

14. The pipes are fused with the required welding pressure and cooled down under pressure.

15. The welded connection can be unclamped - the welding process is finished.

Additionally please follow the instructions given in the operating manual of the welding machine and observe guideline DVS 2207, part 11.

**Important Note**

1. The welding machines have to be suitable for the welding of pipes with a diameter/wall thickness ratio of up to SDR 7.4

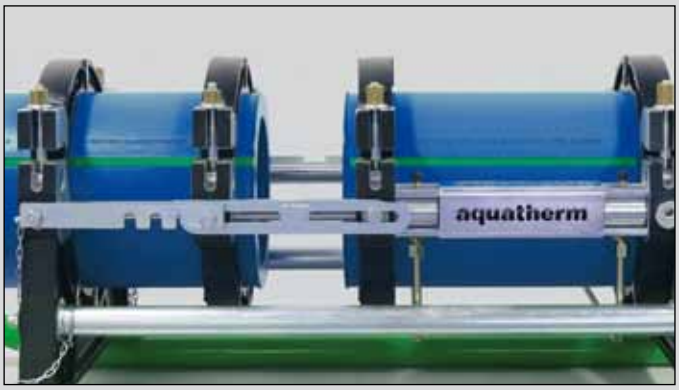
aquatherm recommends the following manufacturers of welding machines for butt welding:

Company Ritmo
Company Rothenberger
Company Widos

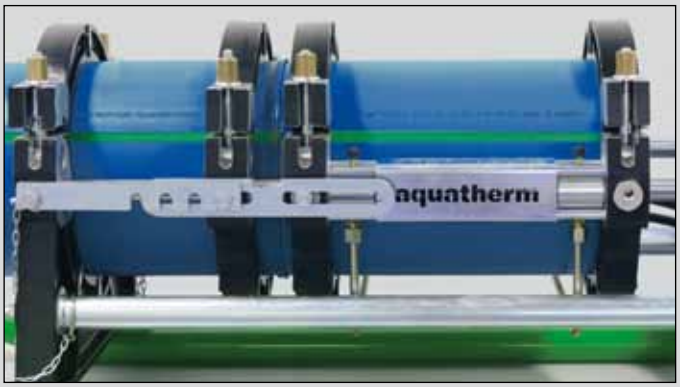
2. For hydraulically operated welding machines, the real manometer pressure has to be calculated in consideration of the hydraulic piston area.

This value can be taken from the respective operating manuals.

Positioning of heating element

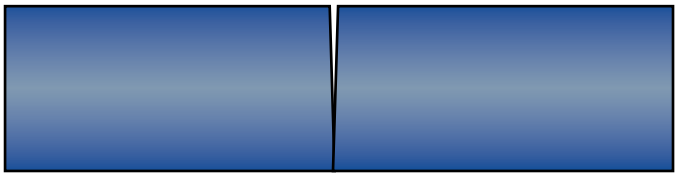


Divide the machine slide, remove heating element

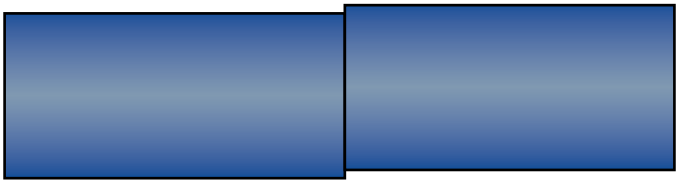



Unclamp and work on...

## Visual inspection of fusion seam - Misalignment and gap width for butt welding



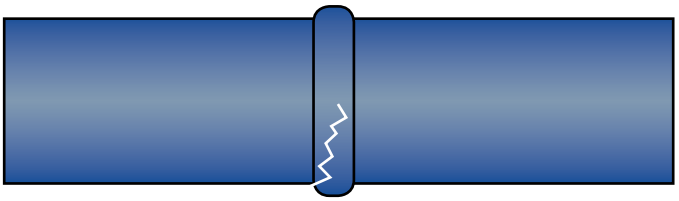
Gap width up to 355 mm outer diameter = 0.5 mm
Gap width from 400 mm to 630 mm outer diameter = 1 mm



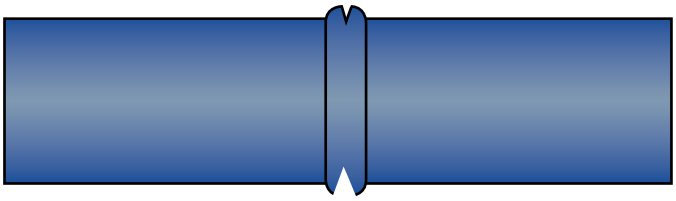
The misalignment cannot be more than 10 % of the wall thickness or max. 2 mm

## Welding defects during butt-welding

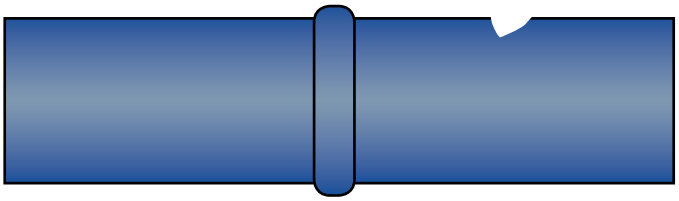
Normally a bead around the entire circumference is formed at the edge of the socket during the welding process. This bead indicates the proper welding.
It is important to assure that the following welding defects are avoided:



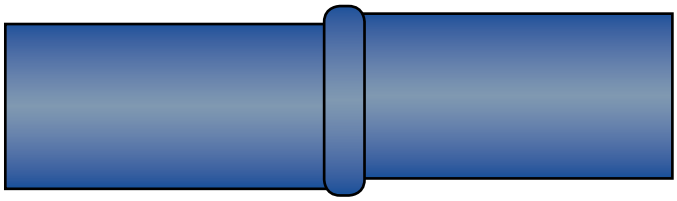
Cracks



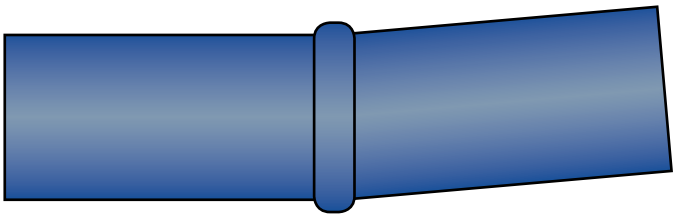
Grooves in the bead



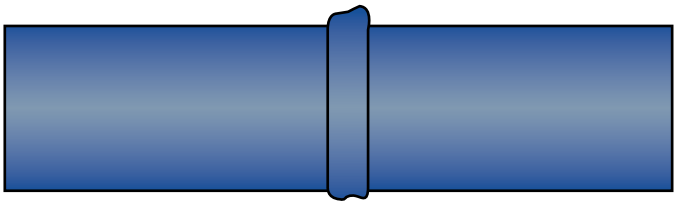
Grooves and scratches



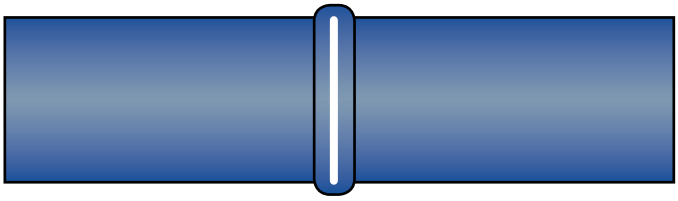
Misalignment of the joining area



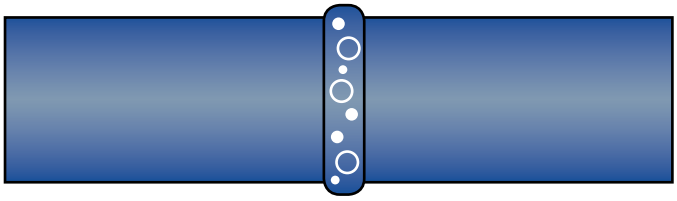
Tilting of the joining area



Uneven welding bead



Lack of fusion at the joining area



Pores, voids and inclusion of impurities

## Correct butt welded seam


**The visual inspection may be only a first indication of the welding seam quality.**
**But it is not a replacement for the leak test, which has to be carried out after the completion of the installation.**

### Requirements for welding

The immediate welding area is to be protected against bad climatic conditions (e.g. wind, moisture and low temperatures).

If the pipes are heated unevenly as a result of sun exposure, temperature compensation by timely covering of the welding area is to be created. Cooling down by draft during the welding process should be avoided.

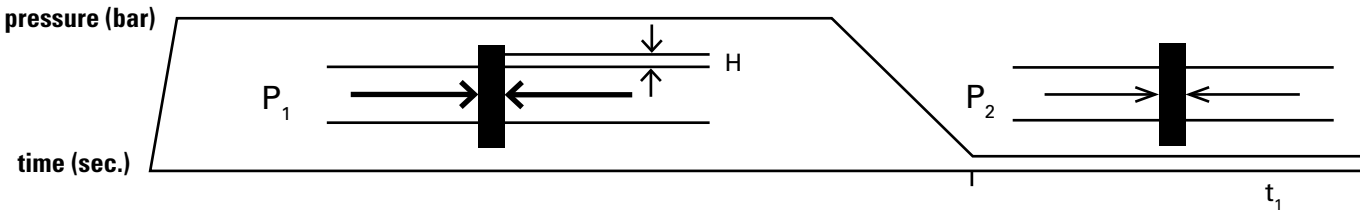

For perfect welding joints, both the welding areas and tools must be clean and free of grease.

## AQUATHERM WELDING PARAMETERS
## WELDING TEMPERATURE: 210° C +/- 10° C

**The calculated drag pressure is added to the adjustment and welding pressure (see description)**

**ATTENTION**: When using other welding machines, the pressures P1, P2 and P3 must be adjusted.

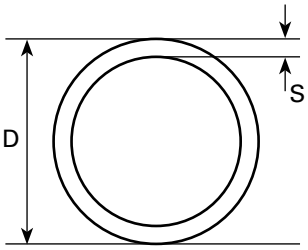
### Excerpt from the DVS 2207 part 11



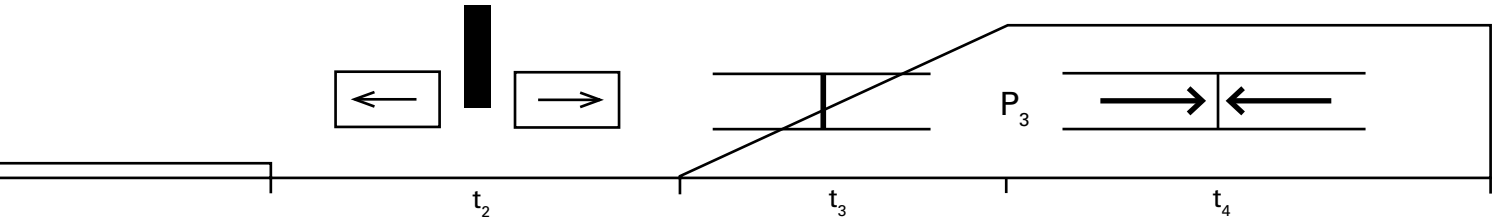

| | | P1 Adjustment pressure (bar) | | | | | | P2 Heating pressure (bar) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dimension (mm) | Pipe series SDR | Rothenberger Art.-No. 50163, 50167 + 50178 | Ritmo Art.-No. 50165 | Ritmo Art.-No. 50166 | Ritmo Art.-No. 50177 | Ritmo Art.-No. 50169 | Height of bead (mm) | Rothenberger Art.-No. 50163, 50167 + 50178 | Ritmo Art.-No. 50165 | Ritmo Art.-No. 50166 |
| | | | | | | | H | | | |
| 160x 9,1 | 17,6 | 7 | 7 | 6 | 3 | | 1 | 1 | 1 | 1 |
| 160x14,6 | 11 | 11 | 11 | 10 | 5 | | 1 | 1 | 1 | 1 |
| 160x17,9 | 9 | 13 | 13 | 12 | 6 | | 1 | 1 | 1 | 1 |
| 160x21,9 | 7,4 | 15 | 16 | 14 | 7 | | 1,5 | 2 | 2 | 2 |
| 200x11,4 | 17,6 | 11 | 11 | 10 | 5 | | 1 | 1 | 1 | 1 |
| 200x18,2 | 11 | 17 | 18 | 16 | 7 | | 1 | 2 | 2 | 2 |
| 200x22,4 | 9 | 20 | 21 | 19 | 9 | | 1,5 | 2 | 2 | 2 |
| 200x27,4 | 7,4 | 24 | 25 | 22 | 11 | | 2 | 2 | 3 | 2 |
| 250x14,2 | 17,6 | 17 | 18 | 16 | 7 | | 1 | 2 | 2 | 2 |
| 250x22,7 | 11 | 26 | 28 | 24 | 11 | | 1,5 | 3 | 3 | 2 |
| 250x27,9 | 9 | 31 | 33 | 29 | 14 | | 2 | 3 | 3 | 3 |
| 250x34,2 | 7,4 | 37 | 39 | 35 | 16 | | 2 | 4 | 4 | 3 |
| 315x17,9 | 17,6 | 27 | | 25 | 12 | 8 | 1 | 3 | | 3 |
| 315x28,6 | 11 | 41 | | 38 | 18 | 13 | 2 | 4 | | 4 |
| 315x35,2 | 9 | 49 | | 46 | 22 | 15 | 2 | 5 | | 5 |
| 315x42,6 | 7,4 | 59 | | 56 | 26 | 18 | 2,5 | 6 | | 6 |
| 355x20,1 | 17,6 | 34 | | | 15 | 10 | 1,5 | 3 | | |
| 355x32,2 | 11 | 52 | | | 23 | 16 | 2 | 5 | | |
| 355x39,5 | 9 | 63 | | | 28 | 19 | 2,5 | 6 | | |
| 355x49,0 | 7,4 | 77 | | | 33 | 23 | 2,5 | 7 | | |
| 400x22,7 | 17,6 | | | | | 13 | 1,5 | | | |
| 400x36,3 | 11 | | | | | 20 | 2 | | | |
| 400x44,5 | 9 | | | | | 24 | 2,5 | | | |
| 450x25,5 | 17,6 | | | | | 17 | 1,5 | | | |
| 450x40,9 | 11 | | | | | 26 | 2,5 | | | |
| 500x28,4 | 17,6 | | | | | 21 | 2 | | | |
| 500x45,5 | 11 | | | | | 32 | 2,5 | | | |
| 560x31,7 | 17,6 | | | | | 26 | 2 | | | |
| 630x35,7 | 17,6 | | | | | 33 | 2 | | | |

**Note:** A reduction of the cooling time up to 50%, i.e. release of the jointing pressure and removal of the welded part from the welding machine is allowed under the following conditions:

- the join connection is manufactured under factory conditions and
- the removal from the welding machine and the temporary storage cause only a slight load to the join connection and
- the joining parts have a wall thickness ≥ 15 mm




Further processing with full mechanical load on the joining connection may be effected only after complete cooling down according to the table.




| | | | | | P3 Adjustment pressure (bar) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ritmo Art.-No. 50177 | Ritmo Art.-No. 50169 | Heating time DVS 2207 (sec.) | Max. changeover time (sec.) | Max. pressurization time (sec.) | Rothenberger Art.-No. 50163, 50167 + 50178 | Ritmo Art.-No. 50165 | Ritmo Art.-No. 50166 | Ritmo Art.-No. 50177 | Ritmo Art.-No. 50169 | Cooling time (min.) |
| | | t1 | t2 | t3 | | | | | | t4 |
| 0 | | 204 | 6 | 9 | 7 | 7 | 6 | 3 | | 15 |
| 0 | | 277 | 8 | 13 | 11 | 11 | 10 | 5 | | 24 |
| 1 | | 315 | 9 | 16 | 13 | 13 | 12 | 6 | | 28 |
| 1 | | 359 | 10 | 19 | 15 | 16 | 14 | 7 | | 34 |
| 0 | | 237 | 7 | 11 | 11 | 11 | 10 | 5 | | 19 |
| 1 | | 320 | 9 | 16 | 17 | 18 | 16 | 7 | | 29 |
| 1 | | 364 | 10 | 19 | 20 | 21 | 19 | 9 | | 35 |
| 1 | | 411 | 11 | 23 | 24 | 25 | 22 | 11 | | 42 |
| 1 | | 272 | 8 | 13 | 17 | 18 | 16 | 7 | | 23 |
| 1 | | 367 | 10 | 20 | 26 | 28 | 24 | 11 | | 35 |
| 1 | | 415 | 12 | 24 | 31 | 33 | 29 | 14 | | 43 |
| 2 | | 463 | 13 | 29 | 37 | 39 | 35 | 16 | | 51 |
| 1 | 1 | 317 | 9 | 16 | 27 | | 25 | 12 | 8 | 28 |
| 2 | 1 | 412 | 12 | 24 | 41 | | 38 | 18 | 13 | 44 |
| 2 | 2 | 471 | 14 | 30 | 49 | | 46 | 22 | 15 | 53 |
| 3 | 2 | 520 | 15 | 37 | 59 | | 56 | 26 | 18 | 62 |
| 1 | 1 | 341 | 9 | 18 | 34 | | | 15 | 10 | 32 |
| 2 | 2 | 448 | 13 | 28 | 52 | | | 23 | 16 | 48 |
| 3 | 2 | 501 | 15 | 34 | 63 | | | 28 | 19 | 58 |
| 3 | 2 | 551 | 17 | 42 | 77 | | | 33 | 23 | 68 |
| | 1 | 367 | 10 | 20 | | | | | 13 | 35 |
| | 2 | 480 | 14 | 31 | | | | | 20 | 54 |
| | 2 | 528 | 16 | 39 | | | | | 24 | 63 |
| | 2 | 395 | 11 | 22 | | | | | 17 | 39 |
| | 3 | 508 | 15 | 35 | | | | | 26 | 59 |
| | 2 | 419 | 12 | 24 | | | | | 21 | 43 |
| | 3 | 534 | 16 | 39 | | | | | 32 | 65 |
| | 3 | 444 | 12 | 27 | | | | | 26 | 48 |
| | 3 | 475 | 14 | 31 | | | | | 33 | 53 |

## FASTENING TECHNIQUE / FIXED POINTS / SLIDING POINTS

### Fastening technique

Pipe clamps for aqautherm PP-R - pipes must be dimensioned for the external diameter of the plastic pipe.

Take care, that the fastening material does not mechanically damage the surface of the pipe (aquatherm- pipe clamps Art.-No.: 60516 - 60660).

All pipes should be fastened with only aquatherm's green rubber compound fasteners, with expansion spacers, or other as deemed equal or approved by aquatherm and /or the project's Hydraulic Consultant.

Basically it must be distinguished on pipe assembly, whether the fastening material is used as

a fixed point or
a sliding point.

### Fixed points

On locating fixed points the pipelines are divided into individual sections. This avoids uncontrolled movements of the pipe.

In principle fixed points have to be measured and installed in a way, that the forces of expansion of aquatherm PP-R- pipes as well as probable additional loads are accommodated.

On using threaded rods or threaded screws the drop from the ceiling should be as short as possible. Swinging clamps should not be used as fixed points.

Basically vertical distributions can be installed. Risers do not require expansion loops, provided that fixed points are located immediately before or after a branch.

To compensate the forces arising from the linear expansion of the pipe there must be sufficient and stable clamps and mountings.

aquatherm- pipe clamps meet all mentioned requirements and - when considering the following installation instructions - are perfect for fixed point installations.

### Sliding points

Sliding clamps have to allow axial pipe movements without damaging the pipe.

On locating a sliding clamp it has to be ensured that movements of the pipelines are not hindered by fittings or armatures installed next to the clamps.

aquatherm- pipe clamps have an extra even and sliding surface of the sound insulation insert.

## INSTALLATION ADVICE / LINEAR EXPANSION / CONCEALED INSTALLATION

### Installation advices

aquatherm- pipe clamps are perfectly suited for fixed point and sliding point installations.

The application of distance rings depends on the type of pipe.

| Fastening | MF Pipes (faser composite pipe) & S Pipes (single layer) |
|---|---|
| Sliding Point | 1 distance ring |
| Fixed point | no distance ring |

### Linear expansion

The linear expansion of pipes depends on the difference of operating temperature to installation temperatur:

$\Delta T = T_{\text{operating temperature}} - T_{\text{installation temperature}}$

Therefore cold water pipes have practically no linear expansion.

Because of the heat dependent expansion of the material, the linear expansion must especially be considered in case of hot and heating installations. This requires a distinction of the types of installation, e.g.

- **concealed installation**
- **installation in ducts**
- **open installation.**

### Concealed installation

Concealed installations generally do not require a consideration of the expansion of aquatherm PP-R - pipes.

The insulation acc. to DIN 1988 or the EnEV (Energie-einsparverordnung) provides enough expansion space for the pipe. In the case where the expansion is greater than the room to move in the insulation, the material absorbs any stress arising from a residual expansion.

The same applies to pipes, which do not have to be insulated acc. to current regulations.

A temperature induced linear expansion is prevented by the embedding in the floor, concrete or plaster. The compressive strain and tensile stress arising from this are not critical as they are absorbed by the material itself.

## INSTALLATION IN DUCTS

**Installation in ducts**

Due to the different linear expansion of the aquatherm PP-R-pipes with or without stabilization, the installation of pipe branches in risers has to be made according to the selected type of pipe.

**aquatherm blue pipe MF**

The linear expansion of aquatherm-faser composite pipes in vertical risers can be ignored.

The positioning of a fixed point directly before each branch-off point is sufficient. All clamps in the riser must be installed as fixed points (see 1).

In general it is possible to install risers rigidly, that means without expansion joints. This directs the expansion on the distance between the fixed points, where it is ineffective.

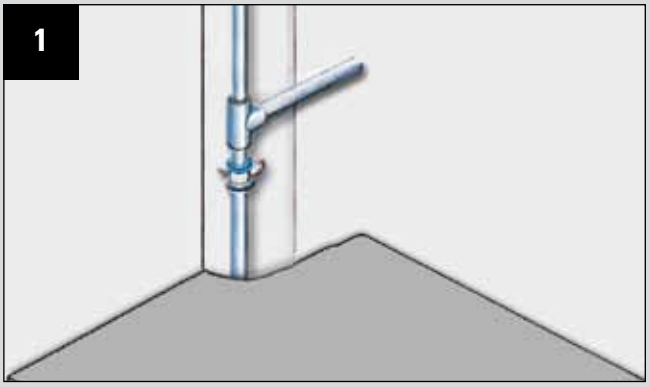
For a maximum distance between two fixed points please refer pages 76/77.

The installation of risers of aquatherm-pipes without stabilizing components (faser) requires a branch pipe, which is elastic enough to take the linear expansion of the riser.

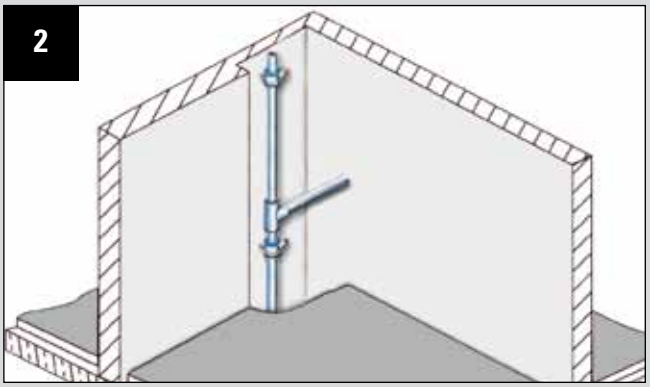
This can be ensured by a favourable fixing of the riser in the duct (see 2).

An adequate large pipe liner also gives sufficient elasticity to the branch-off pipe (see 3).

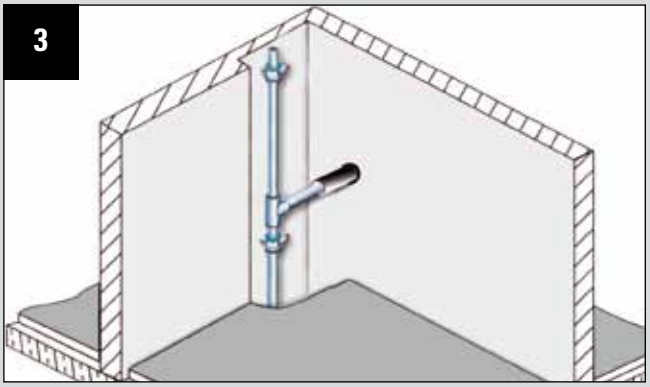
Furthermore the installation of a spring leg gives the appropriate elasticity (see 4).



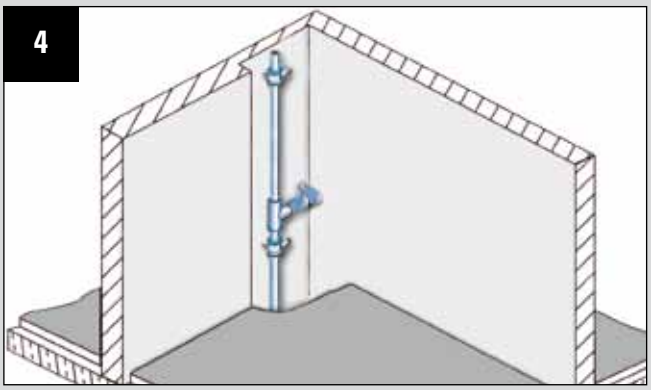
Positioning of the fixed point clamp



Favourable fixing



Large diameter pipe liner



Installation of a spring leg

# OPEN INSTALLATION / CALCULATION OF THE LINEAR EXPANSION

### Open installation

In case of open installed pipes (e.g. in the basement), excellent optical characteristics and form stability are important. aquatherm-pipes for cold water and aquatherm faser composite pipes for hot water and heating plants make this possible. The coefficient (a) of linear expansion of aquatherm-composite pipes is only

$\alpha_{\text{green/blue pipe MF}} = 0{,}035$ mm / mK

and therefore nearly identical with the linear expansion of metal pipes.

The coefficient of linear expansion of aquatherm-pipes without stabilizing components is

$\alpha_{\text{green/blue pipe}} = 0{,}150$ mm/mK

aquatherm faser composite pipes must have enough space to expand (see page 68 u. 69). An expansion control must is required for long and straight faser composite pipes (over 40 m).

aquatherm-pipes without the stabilizing compound should have the expansion control after 10 m straight pipelines. Risers of composite pipes may be installed rigidly without expansion compensation. The following formula, calculation examples, data-tables and diagrams help to determine the linear expansion. The difference between working temperature and maximum or minimum installation temperature is essential for the calculation of linear expansion.

### Calculation of the linear expansion

Given and required values

| Symbol | Meaning | Value | Measuring unit |
|---|---|---|---|
| $\Delta L$ | Linear expansion | ? | [mm] |
| $\alpha_2$ | Coefficient of linear expansion aquatherm-faser composite pipe | 0,035 | mm/mK |
| $\alpha_3$ | Linear expansion coefficient | 0,15 | mm/mK |
| L | Pipe length | 25,0 | [m] |
| $T_B$ | Working temperature | 60 | °C |
| $T_M$ | Installation temperature | 20 | °C |
| $\Delta T$ | Temperature difference between working and installation temperature ($\Delta T = T_W - T_M$) | 40 | K |

The linear expansion $\Delta L$ is calculated according to the following formula:

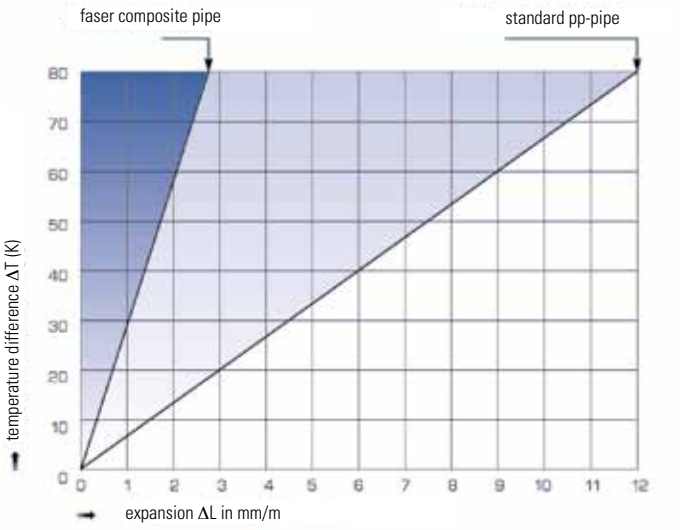
$\Delta L = \alpha \times L \times \Delta T$

**Material:**
aquatherm MF-faser composite pipe (a = 0.03 mm/mK)

$\Delta L$ = 0,035 mm/mK x 25,0 m x 40 K

$\Delta L$ = 35,0 mm

**Linear expansion comparison: faser composite to standard PP-pipe**



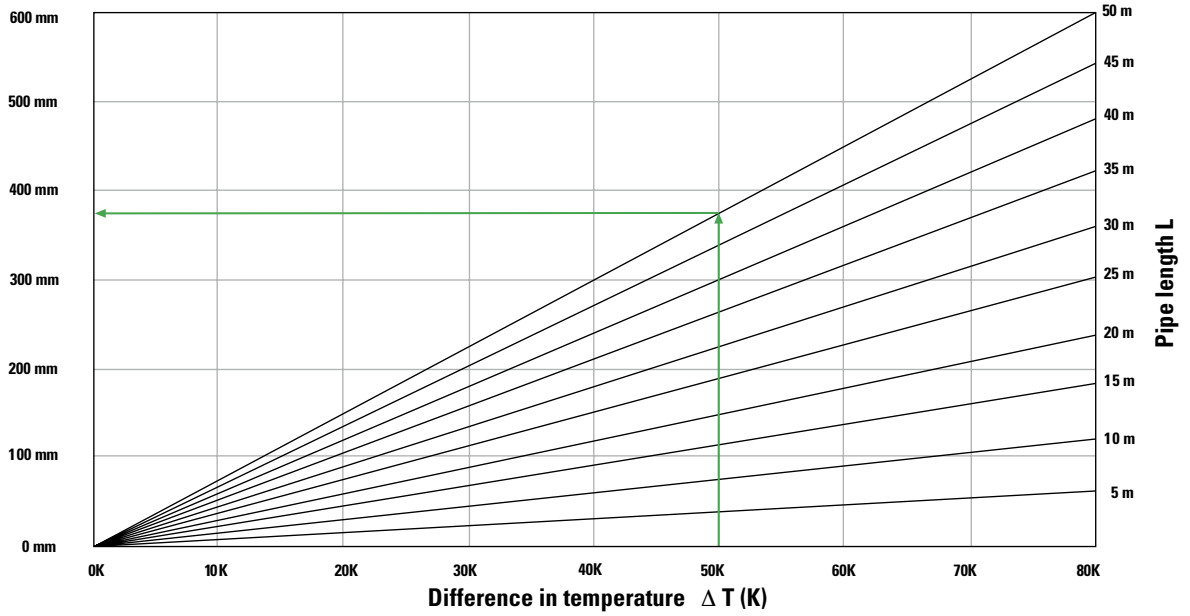
# aquatherm blue pipe

**(without faser)**

The linear expansion, described on the preceding pages, can be taken from the following tables and graphs.

**Linear expansion** $\Delta L$ in [mm]: aquatherm blue pipe - $\alpha$ = 0,150 mm/mK

| Pipe length | Difference in temperature $\Delta T = T_{operating\ temperature} - T_{installation\ temperature}$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **10 K** | **20 K** | **30 K** | **40 K** | **50 K** | **60 K** | **70 K** | **80 K** |
| | **Linear expansion $\Delta L$ (mm)** | | | | | | | |
| 5 m | 8 | 15 | 23 | 30 | 38 | 45 | 53 | 60 |
| 10 m | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 |
| 15 m | 23 | 45 | 68 | 90 | 113 | 135 | 158 | 180 |
| 20 m | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 |
| 25 m | 38 | 75 | 113 | 150 | 188 | 225 | 263 | 300 |
| 30 m | 45 | 90 | 135 | 180 | 225 | 270 | 315 | 360 |
| 35 m | 53 | 105 | 158 | 210 | 263 | 315 | 368 | 420 |
| 40 m | 60 | 120 | 180 | 240 | 300 | 360 | 420 | 480 |
| 45 m | 68 | 135 | 203 | 270 | 338 | 405 | 473 | 540 |
| 50 m | 75 | 150 | 225 | 300 | 375 | 450 | 525 | 600 |

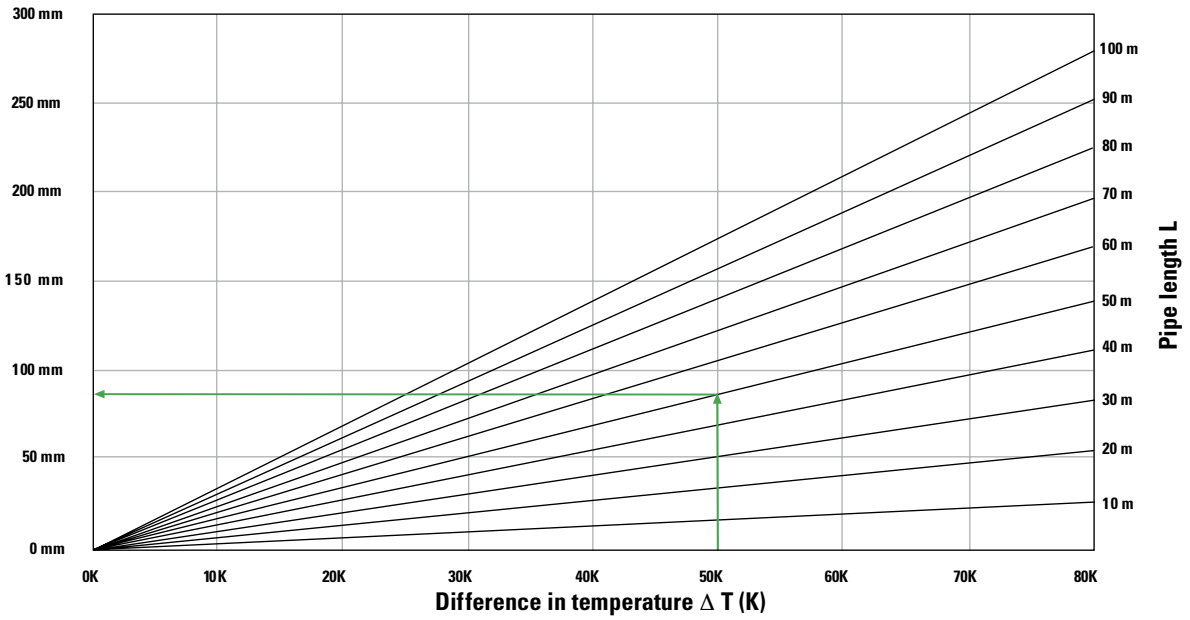


# aquatherm blue pipe MF (faser composite pipe)

Due to the integration and positive bond of the different materials, the aquatherm-faser composite pipes offers much higher stability.
The linear expansion reduces its value to $^1/_5$ of the mere PP-pipes.

Linear expansion ΔL in [mm]: aquatherm-faser composite pipes - a = 0.035 mm / mK

| Pipe length | Difference in temperature $\Delta T = T_{operating\ temperature} - T_{installation\ temperature}$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10 K | 20 K | 30 K | 40 K | 50 K | 60 K | 70 K | 80 K |
| | Linear expansion ΔL (mm) | | | | | | | |
| 10 m | 4 | 7 | 11 | 14 | 18 | 21 | 25 | 28 |
| 20 m | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 |
| 30 m | 11 | 21 | 32 | 42 | 53 | 63 | 74 | 84 |
| 40 m | 14 | 28 | 42 | 56 | 70 | 84 | 98 | 112 |
| 50 m | 18 | 35 | 53 | 70 | 88 | 105 | 123 | 140 |
| 60 m | 21 | 42 | 63 | 84 | 105 | 126 | 147 | 168 |
| 70 m | 25 | 49 | 74 | 98 | 123 | 147 | 172 | 196 |
| 80 m | 28 | 56 | 84 | 112 | 140 | 168 | 196 | 224 |
| 90 m | 32 | 63 | 95 | 126 | 158 | 189 | 221 | 252 |
| 100 m | 35 | 70 | 105 | 140 | 175 | 210 | 245 | 280 |



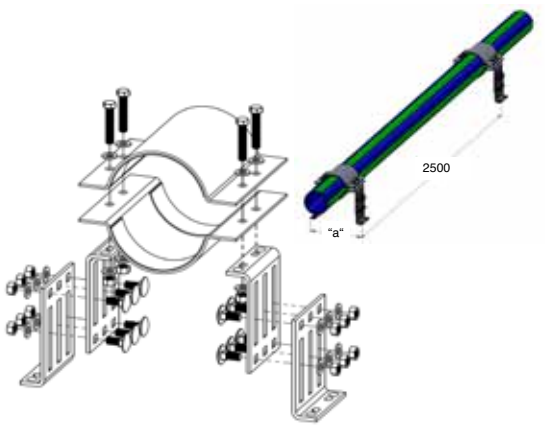
## **PIPE CLAMPS** suitable as fixing point

From now on aquatherm offers fixed-point fastenings for pipes from 160 mm - 630 mm (art.-No. 60768 - 60790). Packing unit is each with 1 piece.

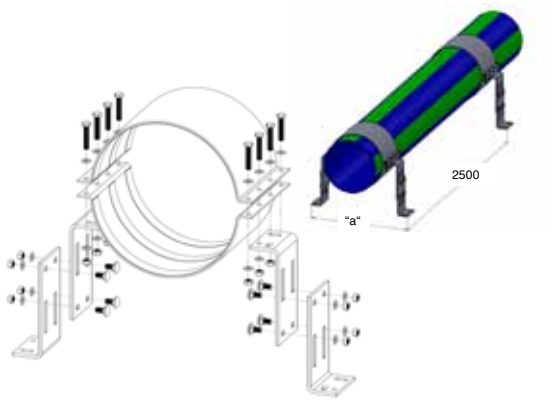
**Advantages:**

- reliable and permanent protection against perforation corrosion and breakdown of the static load capacity
- 1000 hours salt spray test without ferric oxide (rust)
- suitable for installation in corrosive inner and outside areas
- considerably higher corrosion protection than with electrogalvanized and hot-dip galvanized products (after spread test acc. to DIN EN ISO 9227)

| art.-no. | diameter | min. torque clamp locking | min. torque height adjustment | height adjustment | fixig on building | measure „a“ | weight per set |
|---|---|---|---|---|---|---|---|
| [-] | [mm] | [Nm] | [Nm] | [mm] | [-] | [mm] | [kg] |
| 0060768 | 160 | 25 | 75 | 192,5 - 283,5 | M 12 | 354,1 | 8,55 |
| 0060770 | 200 | 25 | 75 | 192,5 - 283,5 | M 12 | 394,5 | 9,45 |
| 0060774 | 250 | 50 | 75 | 192,5 - 283,5 | M 12 | 444,8 | 19,37 |
| 0060778 | 315 | 50 | 75 | 192,5 - 283,5 | M 12 | 510 | 22,75 |
| 0060780 | 355 | 50 | 75 | 192,5 - 283,5 | M 12 | 550,1 | 24,84 |




| art.-no. | diameter | min. torque clamp locking | min. torque height adjustment | height adjustment | fixig on building | measure „a“ | weight per set |
|---|---|---|---|---|---|---|---|
| [-] | [mm] | [Nm] | [Nm] | [mm] | [-] | [mm] | [kg] |
| 0060782 | 400 | 50 | 120 | 404,5 - 497,5 | M16 | 823,2 | 43,64 |
| 0060784 | 450 | 50 | 120 | 404,5 - 497,5 | M16 | 873,3 | 46,25 |
| 0060786 | 500 | 50 | 120 | 404,5 - 497,5 | M16 | 923,4 | 48,87 |
| 0060788 | 560 | 50 | 120 | 404,5 - 497,5 | M16 | 983,4 | 52,00 |
| 0060790 | 630 | 50 | 120 | 404,5 - 497,5 | M16 | 1053,5 | 55,66 |





Example

## BENDING SIDE

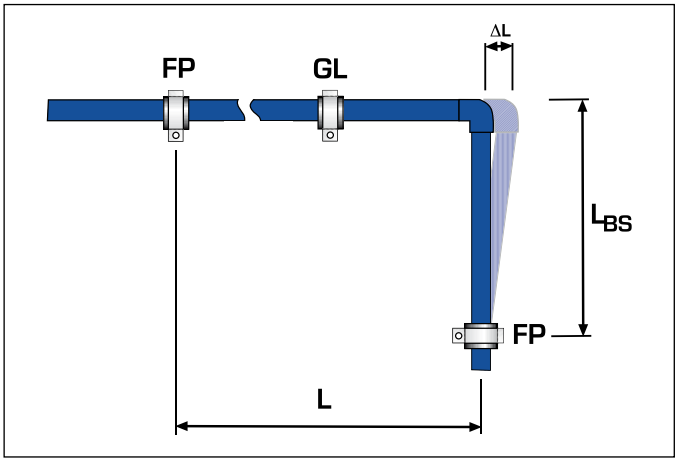
Linear expansion due to temperature difference between operating temperature and installation temperature can be compensated by different installation techniques.

### Bending side

In most cases direction changes can be used to compensate for linear expansion in pipes.

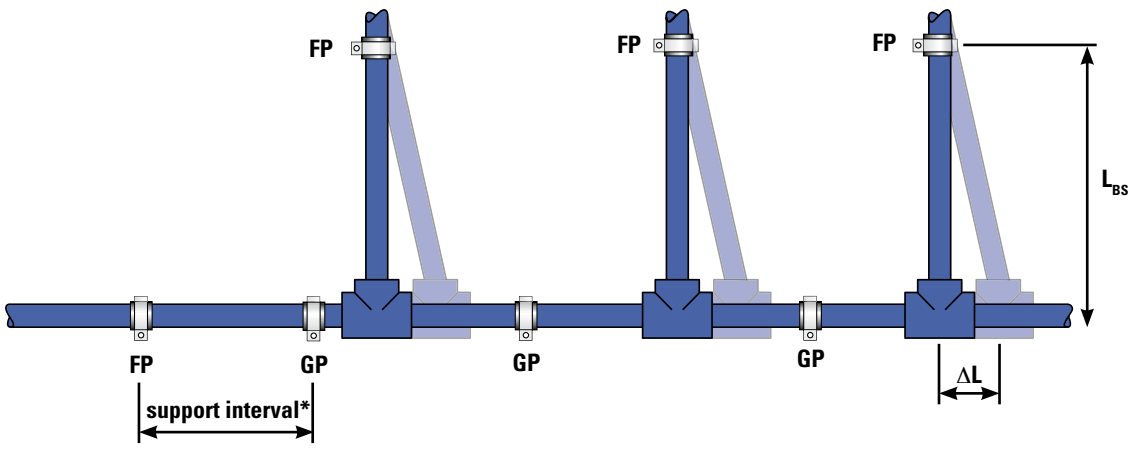
The values of the bending side can be taken directly from the tables and graphs on the following pages.

| Symbol | Meaning | |
|---|---|---|
| $L_{BS}$ | Length of the bending side | [mm] |
| K | Material specific constant | 15,0 |
| d | Outside diameter | [mm] |
| $\Delta L$ | Linear expansion | [mm] |
| L | Pipe Length | [m] |
| FP | Fixed point | |
| GL | Sliding point | |




Calculational determination of the bending side length

$$L_{BS} = K \times \sqrt{d \times \Delta L}$$




* support intervals on page 80

# PRE-STRESS / BELLOW EXPANSION JOINT

### Expansion loop

If the linear expansion cannot be compensated by a change in direction, it will be necessary to install an expansion loop with long and straight pipelines.

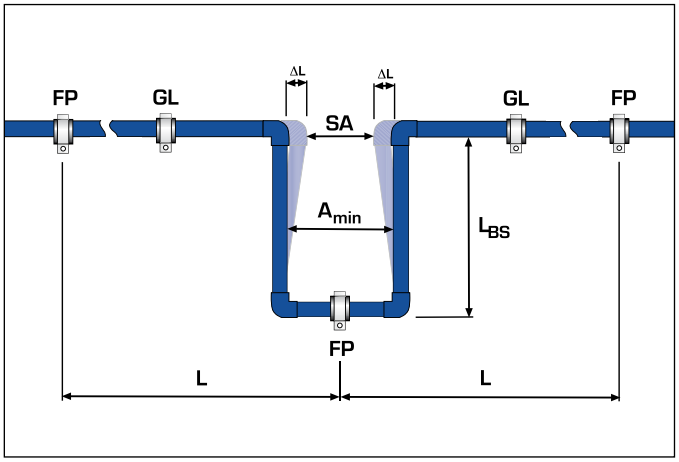
In addition to the length of the bending side LBS the width of the pipe bend Amin must be considered.

| Symbol | Meaning | |
|---|---|---|
| $A_{min}$ | Width of the expansion loop | [mm] |
| SA | Safety distance | 150 mm |

The pipe bend Amin is calculated acc. to the followingformula:

$$A_{min} = 2 \times \Delta L + SA$$

The width of the expansion loop Amin should be at least 210 mm.




### Pre-stress

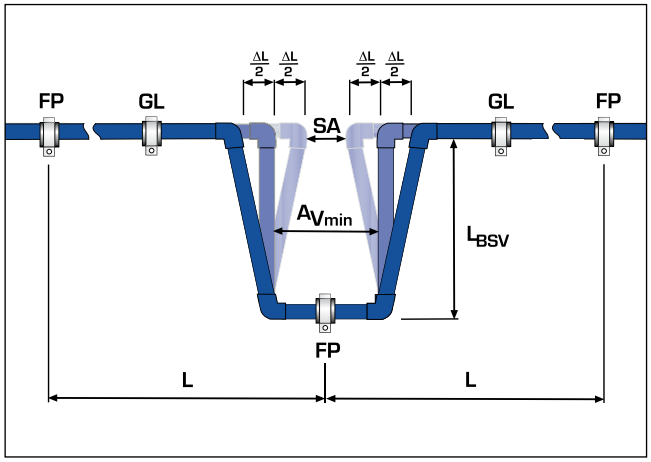
Where space is limited, it is possible to shorten the total width Amin as well as the length of the bending side LBSV by pre-stressing.

Pre-stress installations, if planned and carried out carefully, offer an optically perfect installation, as the linear expansion is hardly visible.

| Symbol | Meaning | |
|---|---|---|
| $L_{BSV}$ | Length of pre-stress | [mm] |

The side length of expansion loops wih pre-stress is calculated acc. to the following example:

$$L_{BSV} = K \times \sqrt{d \times \frac{\Delta L}{2}}$$




### Bellow expansion joint

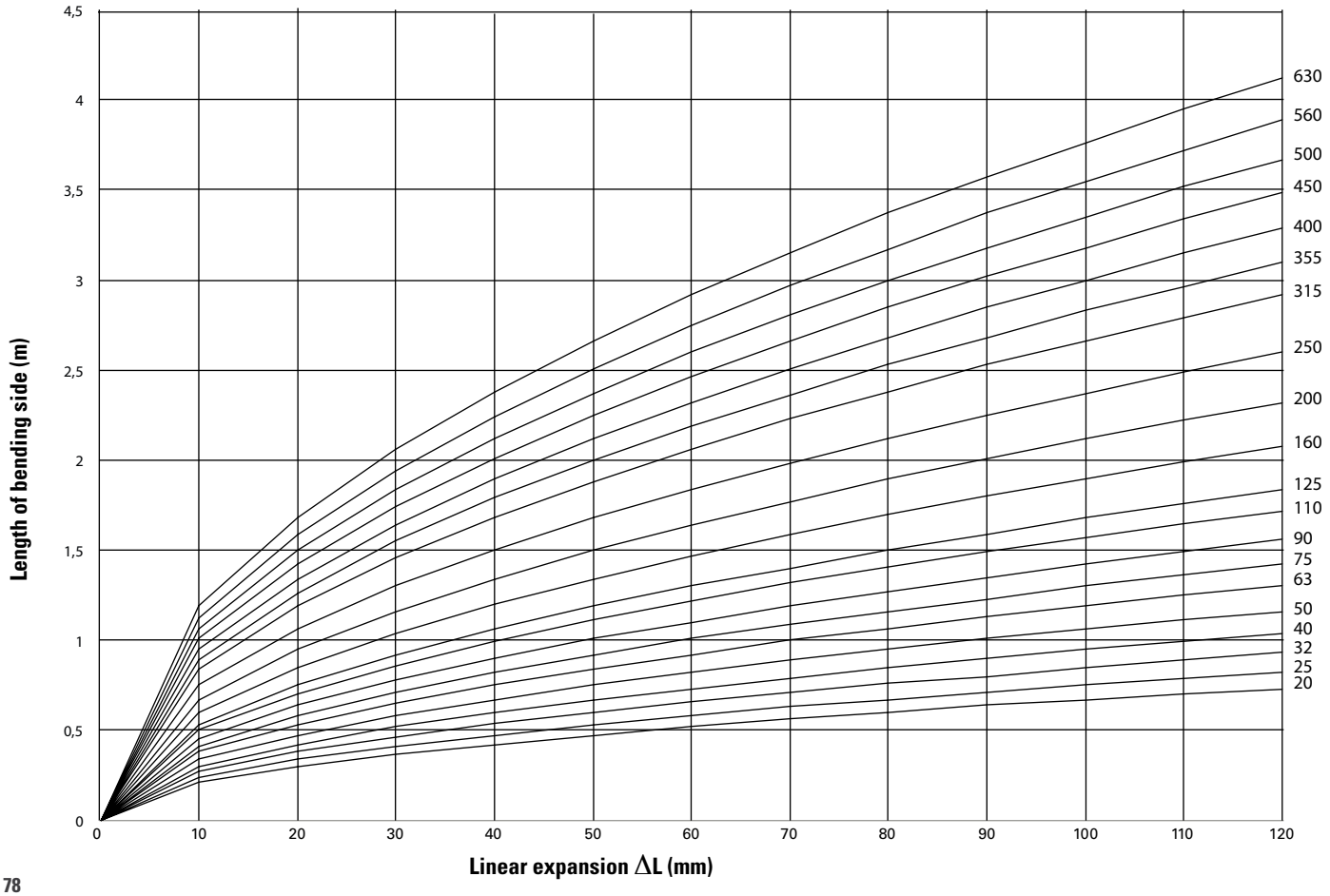
All bellow expansion joints for corrugated pipes designed for metal materials are unsuitable for aquatherm PP-R- pipes.

When using axial expansion joints observe the manufacturers instructions.

## LENGTH OF BENDING SIDE

for aquatherm PP-R pipes The length of the bending side with pre-stress $L_{BSV}$ can be taken from the tables and graphs in consideration of the applied pipe dimensions and determined linear expansion.

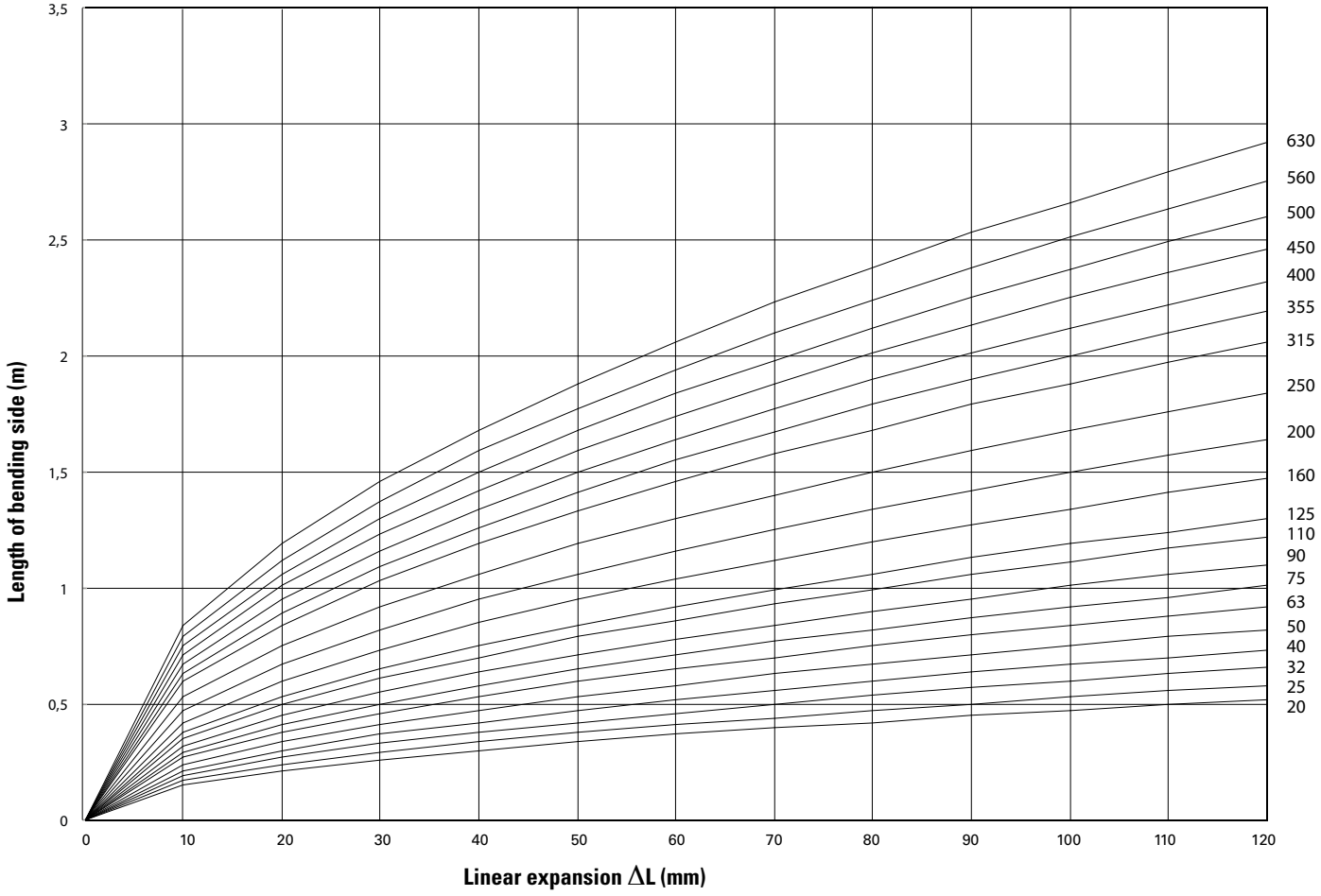
| Pipe Dimension | Linear expansion (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
| | Length of bendig side (mm) | | | | | | | | | | | |
| 20 mm | 0,21 | 0,30 | 0,37 | 0,42 | 0,47 | 0,52 | 0,56 | 0,60 | 0,64 | 0,67 | 0,70 | 0,73 |
| 25 mm | 0,24 | 0,34 | 0,41 | 0,47 | 0,53 | 0,58 | 0,63 | 0,67 | 0,71 | 0,75 | 0,79 | 0,82 |
| 32 mm | 0,27 | 0,38 | 0,46 | 0,54 | 0,60 | 0,66 | 0,71 | 0,76 | 0,80 | 0,85 | 0,89 | 0,93 |
| 40 mm | 0,30 | 0,42 | 0,52 | 0,60 | 0,67 | 0,73 | 0,79 | 0,85 | 0,90 | 0,95 | 0,99 | 1,04 |
| 50 mm | 0,34 | 0,47 | 0,58 | 0,67 | 0,75 | 0,82 | 0,89 | 0,95 | 1,01 | 1,06 | 1,11 | 1,16 |
| 63 mm | 0,38 | 0,53 | 0,65 | 0,75 | 0,84 | 0,92 | 1,00 | 1,06 | 1,13 | 1,19 | 1,25 | 1,30 |
| 75 mm | 0,41 | 0,58 | 0,71 | 0,82 | 0,92 | 1,01 | 1,09 | 1,16 | 1,23 | 1,30 | 1,36 | 1,42 |
| 90 mm | 0,45 | 0,64 | 0,78 | 0,90 | 1,01 | 1,10 | 1,19 | 1,27 | 1,35 | 1,42 | 1,49 | 1,56 |
| 110 mm | 0,50 | 0,70 | 0,86 | 0,99 | 1,11 | 1,22 | 1,32 | 1,41 | 1,49 | 1,57 | 1,65 | 1,72 |
| 125 mm | 0,53 | 0,75 | 0,92 | 1,06 | 1,19 | 1,30 | 1,40 | 1,50 | 1,59 | 1,68 | 1,76 | 1,84 |
| 160 mm | 0,60 | 0,85 | 1,04 | 1,20 | 1,34 | 1,47 | 1,59 | 1,70 | 1,80 | 1,90 | 1,99 | 2,08 |
| 200 mm | 0,67 | 0,95 | 1,16 | 1,34 | 1,50 | 1,64 | 1,77 | 1,90 | 2,01 | 2,12 | 2,22 | 2,32 |
| 250 mm | 0,75 | 1,06 | 1,30 | 1,50 | 1,68 | 1,84 | 1,98 | 2,12 | 2,25 | 2,37 | 2,49 | 2,60 |
| 315 mm | 0,84 | 1,19 | 1,46 | 1,68 | 1,88 | 2,06 | 2,23 | 2,38 | 2,53 | 2,66 | 2,79 | 2,92 |
| 355 mm | 0,89 | 1,26 | 1,55 | 1,79 | 2,00 | 2,19 | 2,36 | 2,53 | 2,68 | 2,83 | 2,96 | 3,10 |
| 400 mm | 0,95 | 1,34 | 1,64 | 1,90 | 2,12 | 2,32 | 2,51 | 2,68 | 2,85 | 3,00 | 3,15 | 3,29 |
| 450 mm | 1,01 | 1,42 | 1,74 | 2,01 | 2,25 | 2,46 | 2,66 | 2,85 | 3,02 | 3,18 | 3,34 | 3,49 |
| 500 mm | 1,06 | 1,50 | 1,84 | 2,12 | 2,37 | 2,60 | 2,81 | 3,00 | 3,18 | 3,35 | 3,52 | 3,67 |
| 560 mm | 1,12 | 1,59 | 1,94 | 2,24 | 2,51 | 2,75 | 2,97 | 3,17 | 3,37 | 3,55 | 3,72 | 3,89 |
| 630 mm | 1,19 | 1,68 | 2,06 | 2,38 | 2,66 | 2,92 | 3,15 | 3,37 | 3,57 | 3,76 | 3,95 | 4,12 |



## LENGTH OF BENDING SIDE WITH PRE-STRESS

for aquatherm PP-R pipes The length of the bending side with pre-stress $L_{BSV}$ can be taken from the tables and graphs in consideration of the applied pipe dimensions and determined linear expansion.

| Pipe Dimension | Linear expansion (mm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
| | Length of bendig side (mm) | | | | | | | | | | | |
| 20 mm | 0,15 | 0,21 | 0,26 | 0,30 | 0,34 | 0,37 | 0,40 | 0,42 | 0,45 | 0,47 | 0,50 | 0,52 |
| 25 mm | 0,17 | 0,24 | 0,29 | 0,34 | 0,38 | 0,41 | 0,44 | 0,47 | 0,50 | 0,53 | 0,56 | 0,58 |
| 32 mm | 0,19 | 0,27 | 0,33 | 0,38 | 0,42 | 0,46 | 0,50 | 0,54 | 0,57 | 0,60 | 0,63 | 0,66 |
| 40 mm | 0,21 | 0,30 | 0,37 | 0,42 | 0,47 | 0,52 | 0,56 | 0,60 | 0,64 | 0,67 | 0,70 | 0,73 |
| 50 mm | 0,24 | 0,34 | 0,41 | 0,47 | 0,53 | 0,58 | 0,63 | 0,67 | 0,71 | 0,75 | 0,79 | 0,82 |
| 63 mm | 0,27 | 038 | 0,46 | 0,53 | 0,60 | 0,65 | 0,70 | 0,75 | 0,80 | 0,84 | 0,88 | 0,92 |
| 75 mm | 0,29 | 0,41 | 0,50 | 0,58 | 0,65 | 0,71 | 0,77 | 0,82 | 0,87 | 0,92 | 0,96 | 1,01 |
| 90 mm | 0,32 | 0,45 | 0,55 | 0,64 | 0,71 | 0,78 | 0,84 | 0,90 | 0,95 | 1,01 | 1,06 | 1,10 |
| 110 mm | 0,35 | 0,50 | 0,61 | 0,70 | 0,79 | 0,86 | 0,93 | 0,99 | 1,06 | 1,11 | 1,17 | 1,22 |
| 125 mm | 0,38 | 0,53 | 0,65 | 0,75 | 0,84 | 0,92 | 0,99 | 1,06 | 1,13 | 1,19 | 1,24 | 1,30 |
| 160 mm | 0,42 | 0,60 | 0,73 | 0,85 | 0,95 | 1,04 | 1,12 | 1,20 | 1,27 | 1,34 | 1,41 | 1,47 |
| 200 mm | 0,47 | 0,67 | 0,82 | 0,95 | 1,06 | 1,16 | 1,25 | 1,34 | 1,42 | 1,50 | 1,57 | 1,64 |
| 250 mm | 0,53 | 0,75 | 0,92 | 1,06 | 1,19 | 1,30 | 1,40 | 1,50 | 1,59 | 1,68 | 1,76 | 1,84 |
| 315 mm | 0,60 | 0,84 | 1,03 | 1,19 | 1,33 | 1,46 | 1,58 | 1,68 | 1,79 | 1,88 | 1,97 | 2,06 |
| 355 mm | 0,63 | 0,89 | 1,09 | 1,26 | 1,41 | 1,55 | 1,67 | 1,79 | 1,90 | 2,00 | 2,10 | 2,19 |
| 400 mm | 0,67 | 0,95 | 1,16 | 1,34 | 1,50 | 1,64 | 1,77 | 1,90 | 2,01 | 2,12 | 2,22 | 2,32 |
| 450 mm | 0,71 | 1,01 | 1,23 | 1,42 | 1,59 | 1,74 | 1,88 | 2,01 | 2,13 | 2,25 | 2,36 | 2,46 |
| 500 mm | 0,75 | 1,06 | 1,30 | 1,50 | 1,68 | 1,84 | 1,98 | 2,12 | 2,25 | 2,37 | 2,49 | 2,60 |
| 560 mm | 0,79 | 1,12 | 1,37 | 1,59 | 1,77 | 1,94 | 2,10 | 2,24 | 2,38 | 2,51 | 2,63 | 2,75 |
| 630 mm | 0,84 | 1,19 | 1,46 | 1,68 | 1,88 | 2,06 | 2,23 | 2,38 | 2,53 | 2,66 | 2,79 | 2,92 |



## SUPPORT INTERVALS

### aquatherm blue pipe SDR 11 S

Table to determine support intervals in conjunction with temperature and outside diameter.

| Pipe diameter d (mm) | | |
|---|---|---|
| 20 | 25 | 32 |
| Support intervals in cm | | |
| 60 | 75 | 90 |

### aquatherm blue pipe SDR 17,6 MF

Table to determine support intervals in conjunction with temperature and outside diameter.

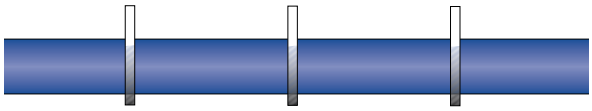
| Difference in temperature ΔT [K] | Pipe diameter d (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 125 | 160 | 200 | 250 | 315 | 355 | 400 | 450 | 500 | 560 | 630 |
| | Support intervals in cm | | | | | | | | | | |
| 0 | 255 | 260 | 265 | 275 | 280 | 285 | 295 | 305 | 315 | 325 | 330 |
| 20 | 185 | 190 | 200 | 205 | 210 | 215 | 230 | 240 | 255 | 270 | 280 |
| 30 | 175 | 180 | 190 | 195 | 200 | 205 | 220 | 230 | 245 | 260 | 275 |
| 40 | 170 | 175 | 180 | 190 | 190 | 195 | 210 | 225 | 235 | 250 | 265 |
| 50 | 160 | 165 | 175 | 180 | 185 | 190 | 200 | 215 | 230 | 240 | 255 |
| 60 | 150 | 155 | 165 | 170 | 175 | 180 | 185 | 200 | 215 | 230 | 240 |
| 70 | 140 | 145 | 155 | 160 | 170 | 175 | 180 | 190 | 205 | 220 | 230 |

### aquatherm blue pipe SDR 7,4 MF (faser composite pipe)

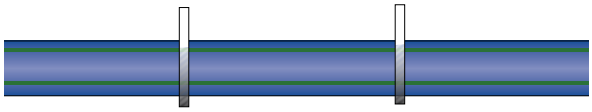
Table to determine support intervals in conjunction with temperature and outside diameter.

| Difference in temperature ΔT [K] | Pipe diameter d (mm) | | |
|---|---|---|---|
| | 20 | 25 | 32 |
| | Support intervals in cm | | |
| 0 | 120 | 140 | 160 |
| 20 | 90 | 105 | 120 |
| 30 | 90 | 105 | 120 |
| 40 | 85 | 95 | 110 |
| 50 | 85 | 95 | 110 |
| 60 | 80 | 90 | 105 |
| 70 | 70 | 80 | 95 |

### SUPPORT SPACINGS PP-PIPE AND FASER COMPOSITE PIPE



PP-pipe



Faser composite pipe approx. 30% more fixing distance

### aquatherm blue pipe SDR 11 MF (faser composite pipe)

Table to determine support intervals in conjunction with temperature and outside diameter.

| Difference in temperature ΔT [K] | Pipe diameter d (mm) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | 25 | 32 | 40 | 50 | 63 | 75 | 90 | 110 | 125 | 160 | 200 | 250 | 315 | 355 | 400 | 450 |
| | Support intervals in cm | | | | | | | | | | | | | | | | |
| 0 | 110 | 130 | 150 | 170 | 195 | 220 | 235 | 250 | 275 | 280 | 285 | 290 | 300 | 310 | 315 | 325 | 325 |
| 20 | 80 | 95 | 110 | 125 | 145 | 165 | 175 | 185 | 200 | 205 | 210 | 220 | 225 | 230 | 235 | 250 | 265 |
| 30 | 80 | 95 | 110 | 125 | 145 | 165 | 175 | 185 | 190 | 195 | 200 | 210 | 215 | 220 | 225 | 240 | 255 |
| 40 | 75 | 85 | 100 | 115 | 135 | 155 | 165 | 175 | 180 | 185 | 190 | 200 | 210 | 210 | 215 | 230 | 245 |
| 50 | 75 | 85 | 100 | 115 | 135 | 155 | 160 | 170 | 170 | 175 | 180 | 190 | 200 | 205 | 205 | 220 | 235 |
| 60 | 70 | 80 | 95 | 110 | 125 | 145 | 150 | 160 | 160 | 165 | 170 | 180 | 185 | 190 | 195 | 205 | 220 |
| 70 | 60 | 70 | 85 | 100 | 120 | 135 | 140 | 145 | 150 | 155 | 160 | 170 | 175 | 185 | 190 | 195 | 210 |

Pipe clamp distances of vertically installed pipes can be increased by 20 % of the tabular values, e.g. to multiply the tabular value by 1.2.

## THERMAL INSULATION OF HOT WATER PIPES

**minimum insulation thickness in [mm] against condensation**

| MEDIUM TEMPERATURE 5°C - THERMAL CONDUCTIVITY VALUE OF INSULATION 0,040W/MK | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | **humidity** | **ambient temperature** | | | | | | | | | | |
| | | **20°C** | **22°C** | **24°C** | **26°C** | **28°C** | **30°C** | **32°C** | **34°C** | **36°C** | **38°C** | **40°C** |
| **75mm** | 50% | | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 |
| | 60% | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 7 | 8 | 8 |
| | 70% | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 13 | 13 |
| | 80% | 9 | 11 | 12 | 14 | 15 | 17 | 18 | 19 | 20 | 21 | 22 |
| **110mm** | 50% | | | | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 4 |
| | 60% | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 7 | 8 |
| | 70% | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 11 | 12 | 13 |
| | 80% | 9 | 11 | 12 | 14 | 15 | 17 | 18 | 19 | 20 | 21 | 22 |
| **160mm** | 50% | | | | | | 1 | 1 | 2 | 2 | 3 | 3 |
| | 60% | | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 5 | 6 | 7 |
| | 70% | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 9 | 11 | 11 | 12 |
| | 80% | 8 | 10 | 11 | 13 | 14 | 16 | 17 | 19 | 20 | 21 | 22 |

The decree for energy saving thermal protection and energy saving technique for buildings Decree for Energy Saving (EnEV) regulates the thermal insulation of hot water supplies and fittings in Germany.

Central heating pipes, line 1 - 4 installed in heated rooms or building parts between heated rooms of the one user, where heat output can be controlled by open stop valves do not require a minimum thickness of the insulation.

This even applies to hot water pipes up to an inner diameter of 22 mm in flats, which are neither in the circulation nor have an additional electric heating.

Applying material with thermal conductivities different to 0.035 W/(mK) the minimum thickness of the insulation has to be converted correspondingly.

For the conversion and the thermal conductivity of the insulation the ways and values of calculation described in the technical regulations must be applied.

The minimum insulation acc. to the table for heating distributions and heating pipes can be reduced as far as the same limit of heat output even for further insulation requirements in consideration of the insulating effect of the pipe walls are guaranteed.

## EnEV 2009, § 14, addendum 5, chart 1

| Line | Type of pipe/fitting | minimum thickness of insulation referred to thermal conductivity of 0.035 W/(mK) |
|---|---|---|
| 1 | inner diameter up to 22 mm | 20 mm |
| 2 | inner diameter more than 22 mm up to 35 mm | 30 mm |
| 3 | inner diameter more than 35 mm up to 100 mm | same as inner diameter |
| 4 | inner diameter more than 100 mm | 100 mm |
| 5 | pipes and fittings after line 1 - 4 in wall- and ceiling openings, in crossing area of pipes, at pipe connections, at distributors | ½ of the requirements of line 1 to 4 |
| 6 | pipes of central heating after line 1 - 4, which have been installed after introduction of this decree between heated rooms of various users | ½ of the requirements of line 1 to 4 |
| 7 | pipes after line 6 in floor construction | 6 mm |
| 8 | Cooling distribution and cold water pipes and fittings of air handling and air conditioning systems | 6 mm |

## INSULATION THICKNESS ACC. TO DECREE FOR ENERGY SAVING

Acc. to this decree aquatherm PP-R-pipes and fittings have to be insulated against loss of heat. The insulation thickness depends on the respective installation.

The heat conductivity figure of fusiolen® PP-R is 0.15 W/(mK) aquatherm PP-R-pipes and fittings offer a significantly higher degree of insulation compared to metal pipes.

Due to the high insulation values of the pipe-material PP-R the insulation thickness - compared to metallic pipe systems - can be reduced.

Undermentioned are the recommendation based on EnEV 2009. Regional standards might vary and are to be considered.

**Thermal insulation from heat distribution and hot water pipes, cooling distribution and cold water pipes acc. EnEV 2009**
Minimum thickness of insulation referred to thermal conductivity of 0.035 W/(mK)

| pipe diameter | 50% | 100% |
|---|---|---|
| 16 mm | 10 mm | 20 mm |
| 20 mm | 10 mm | 20 mm |
| 25 mm | 10 mm | 20 mm |
| 32 mm | 15 mm | 30 mm |
| 40 mm | 15 mm | 30 mm |
| 50 mm | 18 mm | 35 mm |
| 63 mm | 23 mm | 45 mm |
| 75 mm | 28 mm | 55 mm |
| 90 mm | 33 mm | 65 mm |
| 110 mm | 40 mm | 80 mm |
| 125 mm | 45 mm | 90 mm |
| 160 mm | 50 mm | 100 mm |
| 200 mm | 50 mm | 100 mm |
| 250 mm | 50 mm | 100 mm |
| 315 mm | 50 mm | 100 mm |
| 355 mm | 50 mm | 100 mm |
| 400 mm | 50 mm | 100 mm |
| 450 mm | 50 mm | 100 mm |
| 500 mm | 50 mm | 100 mm |
| 560 mm | 50 mm | 100 mm |
| 630 mm | 50 mm | 100 mm |

* The insulation thickness has to be calculated due to the thermal conductivity of polyproplene pipes acc. to test report no.: G.2 - 136/97 of FIW-Munich

# PRESSURE TEST / TEST CONTROL/ MEASURING OF THE TEST PRESSURES / TEST RECORD

### Pressure test / Test control

All aquatherm pipe systems shall be subjected to a hydraulical pressure test with a test-pressure of 10 bar.

The material properties of the aquatherm pipe systems result in an expansion of the pipes during the pressure test. This affects the test result. Due to the thermal expansion coefficients of the aquatherm pipe systems the results are influenced additionally. The temperature differences between the pipe and the test medium lead to changes in pressure. Hereby a temperature change of 10 K corresponds to a pressure difference of 0,5 up to 1 bar.

Therefore pressure testing of the aquatherm pipe systems should be made with a constant temperature of the test medium. The hydraulic pressure test requires a preliminary, principal and final test.

In the preliminary test a pressure of 18 bar is applied 3 x 5 minutes for the expansion/release of the pipes. Between the cycles the pipe system must be depressurized.

Immediately after the preliminary test the principal test should be performed. The test duration is 15 min. Here, the test pressure (10 bar) may not fall more than 0,5 bar.

After completion of the preliminary and principle test finally the final test must be performed.

The test duration is 60 minutes. Here, the test pressure - read after the principle test - may not fall more than 0,5 bar.

### Measuring of the test pressures

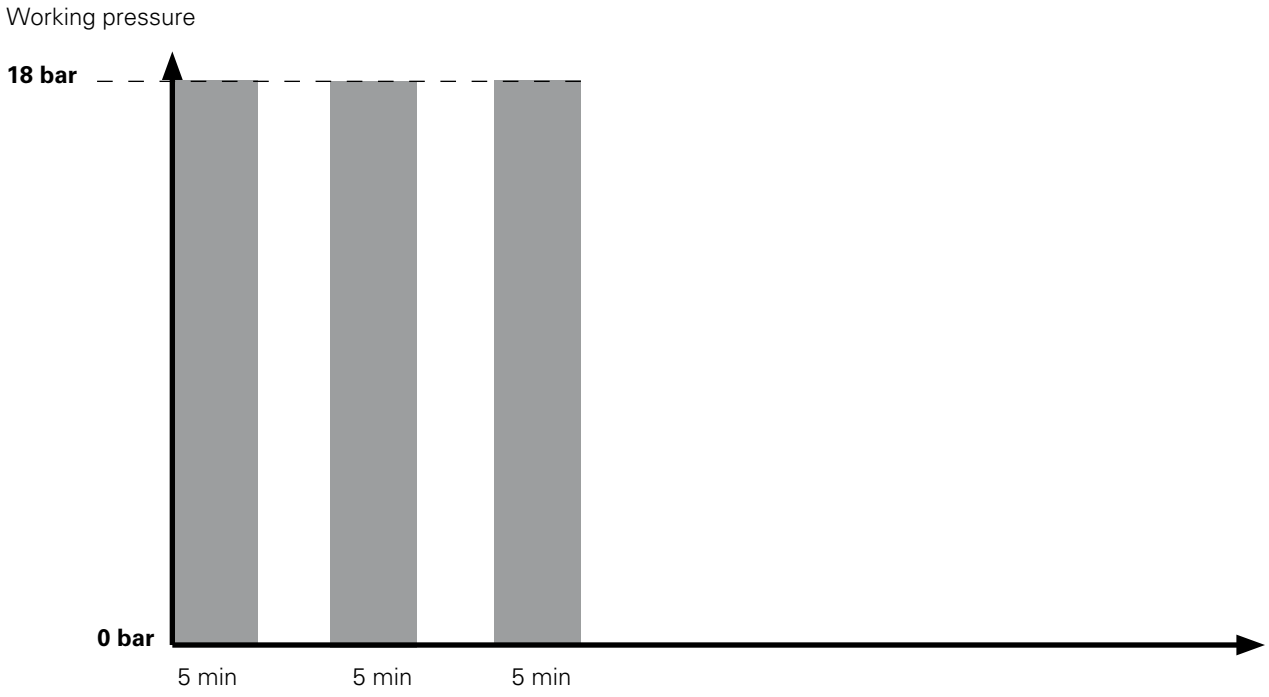
Measuring has to be done with a manometer allowing a perfect reading of a pressure change of 0.1 bar. The manometer has to be placed at the deepest point of the installation.

### Test record

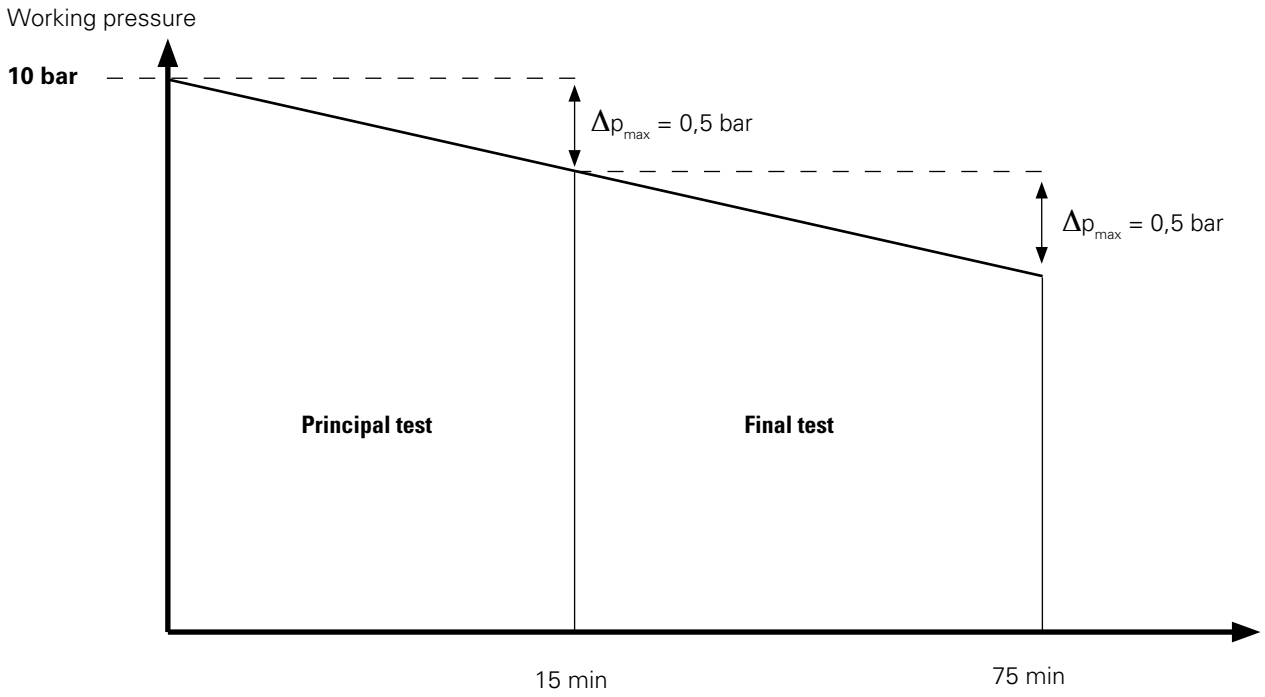
A record of the hydraulic pressure test has to be prepared and signed by the client and contractor stating place and date (see page 85).

## LEAKAGE TEST / PRESSURE DIAGRAM

### PRELIMINARY TEST




### PRINCIPAL- AND FINAL TEST



# TEST RECORD AQUATHERM SYSTEM INSTALLATION

Place: _____

Object: _____

**Note before the test:**
3 x 5 minutes system pressure of 18 bar for expansion/release of the pipes are required.

**Preliminary test**
The pipe system must be unpressurized between each cycle.

| | | | | |
|---|---|---|---|---|
| 18 bar | 5 min | realized: | yes | no |
| 18 bar | 5 min | realized: | yes | no |
| 18 bar | 5 min | realized: | yes | no |

**Principal test**

Test pressure: _____ 10 bar

Pressure decline after 15 min: _____ bar **max. 0,5 bar**

**Final test**
(directly after the principal test, without changing the pressure)

Result principal test: _____ bar

Pressure decline after 60 min: _____ bar **max. 0,5 bar**

**Notes:** _____

Place: _____

Date: _____

_____

**Stamp / Signature**

**Description of installation**

Place: _____

Object: _____

**Pipe length:**

| | | | | | |
|---|---|---|---|---|---|
| Ø 20 mm | _____ | m | Ø 160 mm | _____ | m |
| Ø 25 mm | _____ | m | Ø 200 mm | _____ | m |
| Ø 32 mm | _____ | m | Ø 250 mm | _____ | m |
| Ø 40 mm | _____ | m | Ø 315 mm | _____ | m |
| Ø 50 mm | _____ | m | Ø 355 mm | _____ | m |
| Ø 63 mm | _____ | m | Ø 400 mm | _____ | m |
| Ø 75 mm | _____ | m | Ø 450 mm | _____ | m |
| Ø 90 mm | _____ | m | Ø 500 mm | _____ | m |
| Ø 125 mm | _____ | m | Ø 560 mm | _____ | m |
| | | | Ø 630 mm | _____ | m |

Start of test: _____

End of test: _____

Testperiod: _____

Test medium: ☐ water ☐ water/glycol

Client: _____

_____

_____

Contractor: _____

_____

_____

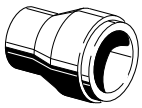
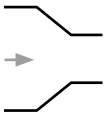
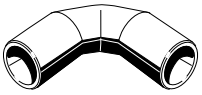
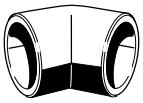
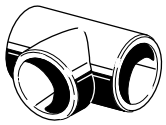
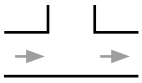
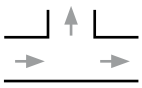
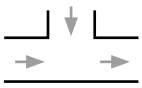
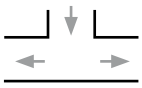
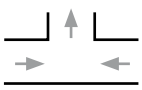
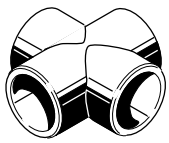
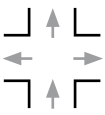
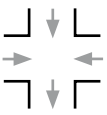
Place: _____

Date: _____

_____

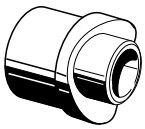
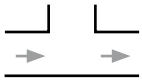
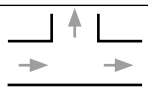
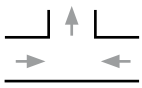
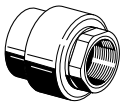
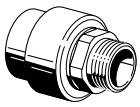
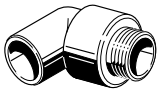
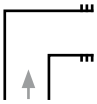
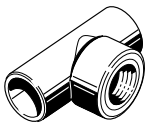
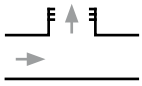
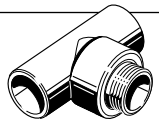
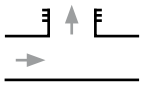
**Stamp / Signature**

## Coefficient of loss ζ aquatherm green pipe- & aquatherm blue pipe-fittings

| Fitting | Picture | Symbol | Comment | ζ-Value |
|---|---|---|---|---|
| Socket |  |  | | 0.25 |
| Reducer |  |  | Reduction… | |
| | | | …by 1 dimension | 0.40 |
| | | | …by 2 dimension | 0.50 |
| | | | …by 3 dimension | 0.60 |
| | | | …by 4 dimension | 0.70 |
| | | | …by 5 dimension | 0.80 |
| | | | …by 6 dimension | 0.90 |
| Elbow 90° |  |  | | 1.20 |
| Segment elbow 90° ( 200 - 630 mm) |  |  | | 0,80 |
| Elbow 90° male/female |  |  | | 1.20 |
| Elbow 45° |  |  | | 0.50 |
| Elbow 45° male/female |  |  | | 0.50 |
| Tee |  |  | | 0.25 |
| | |  | Separation of flow | 1.20 |
| | |  | Conjunction of flow | 0.80 |
| | |  | Counter current in case of separation of flow | 1.80 |
| | |  | Counter current in case of conjunction of flow | 3.00 |
| Reducing tee | The ζ-value results from the addition of tee and reducer | | | |
| Cross |  |  | Separation of flow | 2.10 |
| | |  | Conjunction of flow | 3.70 |

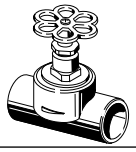
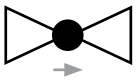
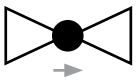
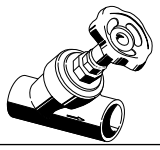
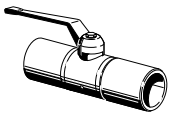
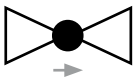
( → = flow direction)

## Coefficient of loss ζ aquatherm green pipe- & aquatherm blue pipe-fittings

| Fitting | Picture | Symbol | Comment | ζ-Value |
|---|---|---|---|---|
| Weld-in saddle |  |  | | 0.25 |
| | |  | Separation of flow | 0.5 |
| | |  | Counter current in case of conjunction of flow | 1.00 |
| Reducing tee | The ζ-value results from the addition of the weld in saddle and tee | | | |
| Transition piece with female thread |  |  | | 0.50 |
| Transition piece with male thread |  |  | | 0.70 |
| Elbow with female thread |  |  | | 1.40 |
| Elbow with male thread |  |  | | 1.60 |
| Transition tee with female thread |  |  | Separation of flow | |
| | | | - 16 x ½" x 16<br>- 20 x ¾" x 20 | 1.40 |
| | | | - 20 x ½" x 20<br>- 25 x ¾" x 25<br>- 32 x 1" x 32 | 1.60 |
| | | | - 25 x ½" x 25<br>- 32 x ¾" x 32 | 1.80 |
| Threaded branch tee with male thread |  |  | Separation of flow<br>- 20 x ½" x 20 | 1.80 |

(► = flow direction)

## Coefficient of loss ζ aquatherm green pipe- & aquatherm blue pipe-fittings

| Fitting | Picture | Symbol | Comment | $K_v$ |
|---|---|---|---|---|
| Screw-down stop globe valve |  |  | - 20 mm | |
| | | | - 25 mm | |
| | | | - 32 mm | |
| | | | - 40 mm | |
| Inclined valve |  |  | - 20 mm | |
| | | | - 25 mm | |
| | | | - 32 mm | |
| | | | - 40 mm | |
| Non-return valve |  |  | - 20 mm | |
| | | | - 25 mm | |
| | | | - 32 mm | |
| | | | - 40 mm | |
| Ball valve |  |  | - 20 mm | |
| | | | - 25 mm | |
| | | | - 32 mm | |
| | | | - 40 mm | |
| | | | - 50 mm | |
| | | | - 63 mm | |
| Draining branch |  |  | | |

(→ = flow direction)

Source: DIN 1988 Part 3

$$Z = \frac{\zeta \; v^2 \; \delta}{2}$$

Z = Pressure lost in [Pa]

ζ = Coefficient of loss of fitting

v = Flow rate [m/s]

δ = Density of medium [kg/m³]

($K_v$= Cold Water Volume Rate circulatory [m³/h] of water [5 °C - 30 °C] at a pressure difference of 1 bar)

**Note:**

For the determination of pressure loss in (mbar) the result has to be divided by the factor 100 (100Pa = 1 mbar).

1bar = $10^5$ Pa = 14,5 psi = 10 N/cm²)

# CHEMICAL RESISTANCE OF PIPES AND FITTINGS

The following chemical resistance document can be used as a general guideline, but should not be considered a formal recommendation or approval by aquatherm. The actual behavior of the piping system when exposed to a specific chemical is very dependent on the exposure conditions (temperature, pressure, flow, duration, etc.), the stresses on the piping material and system (mechanical, thermal, cyclic, etc.), and the ancillary materials in the system (o-rings, seals, gaskets, metal components, etc). Due to the comprehensive warranty provided by aquatherm, specific applications must be submitted to aquatherm for review and evaluation using the form in the technical catalog or the online submittal form. A written response will be provided once the review is completed. The attached guidance document should NOT be used as a definitive reference for determining the chemical compatibility of aquatherm piping in a specific application. This can only be determined by submitting the information to aquatherm for review.

**Polypropylene (PP) pipes; chemical resistance of pipes and pipe fittings.**

The behavior of pipes and pipe fittings towards flow substances depends on the one hand on the particular nature and type of plastic, the design of the pipe fitting and the manufacturing conditions, and, on the other hand, on the nature of the flow substance. In particular, the duration of the action, temperatures and mechanical stresses acting at the same time and other types of influences which additionally have an effect also determine the behavior. The effects of these influences, which frequently are not clearly foreseeable at the outset, are decisive for the suitability for an application. Furthermore, special requirements on the pipe or pipe fitting (e.g. dimensional stability or mechanical strength) shall be taken into consideration, depending on the application.

For these reasons, the suitability of pipes and pipe fittings for a flow substance can be evaluated only from case to case.

The chemical resistance indicates the gradual behavior of the material of the pipe wall towards the action of the flow substance. It depends in each case on the type of interacting substances, their composition, the temperature and the duration of the action.

In an application, the chemical resistance can be influenced by further stresses (e.g. of a mechanical nature).

Note: The chemical resistance does not correspond to the term "chemical stability" hitherto used in everyday language, because this contains an evaluation for the particular application.

**Data on chemical resistance**

Various processes may occur when the flow substances come into contact with the material of the pipe wall, such as absorption of the liquid (swelling), extraction of soluble constituents of the material (shrinkage) and chemical reactions (hydrolysis, oxidation and the like), which in certain circumstances may cause changes in the properties of the pipes and pipe fittings.

The behavior of the pipes and pipe fittings towards the flow substances is classified into the following groups:

●: **resistant**
The material of the pipe wall is generally evaluated as suitable.

◐: **conditionally resistant**
The suitability of the material of the pipe wall for the particular application shall be investigated; if necessary, further experiments shall be carried out.

○: **not resistant**
The material of the pipe wall is generally evaluated as unsuitable.

–: No data on the chemical resistance is available

**Information on resistance can also be obtained from the aqualab:**

**Hotline +49 2722- 950-0**

**For inquiries on resistance, medium and operating conditions (operating pressure and temperature) needs to be specified.**

[1] Table taken from the English translation of DIN 8078 Supplement 1, Feb. 1982, Chemical resistance of (PP-) pipes and pipe fittings.
Reproduction with the permission of DIN Deutsches Institut für Normung e. V.. Important: When applying said standard the edition with the most recent release date should be used (can be purchased at Beuth Verlag GmbH, Burggrafenstrasse 6, 10787 Berlin, Germany).

[1] The following designations are used for the composition of the flow substances:

a) If the content data is not followed by "(Vol.)", the data is the weight in % (previously % by weight) .
VL: aqueous solution, the weight content of which is ≤ 10%.
L: aqueous solution, the weight content of which is greater than 10%.
GL: saturated (at 20 °C) aqueous solution.
TR: flow substance is as least technically pure.
H: commercially available composition.

b) Volume content in % (previously % by volume): this is characterized specially by "(Vol)".
The chemical resistance of pipes and pipe fittings is generally not reduced for weight or volume con- tents and temperatures lower than those given in the table.

[2] These flow substances and/or chemical resistance data are not contained in ISO/TR 7471.

[3] The chemical resistance is evaluated as one group lower in ISO/TR 7471.

[4] The chemical resistance is evaluated as one group higher in ISO/TR 7471.

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Waste gases [2] or air/gas mixtures | | | | |
| - containing hydrogen fluoride | traces | ● | ● | – |
| - containing carbon dioxide | any | ● | ● | – |
| - containing carbon monoxide | any | ● | ● | – |
| - containing nitroses (nitrogen oxide) | traces | ● | ● | – |
| - containing hydrochloric acid | any | ● | ● | – |
| - containing sulphur dioxide | any | ● | ● | – |
| - containing sulphuric acid | any | ● | ● | – |
| - containing sulphur: trioxide (oleum) | traces | ○ | ○ | ○ |
| Acetaldehyde [2] | TR | ◐ | – | – |
| Acetaldehyde, aqueous [2] | 40% | ● | ● | – |
| Acetic anhydric (acetic acid anhydride) | TR | ● | – | – |
| Acetone | TR | ● | ● | – |
| Acetophenone | TR | ● | ◐ | – |
| Acrylonitrile | TR | ● | ● [2] | – |
| Adipic acid [2] | GL | ● | ● | – |
| Malic acid | L | ● | ● | – |
| | | | | |
| Caustic soda see sodium hydroxide solution | up to 60% | ● | ● | ● |
| Battery acid [2] | H | ● | ● | – |
| Alums (Me(I)-Me(III)-sulphates) [2] | GL | ● | ● | – |
| Allyl alcohol (prop-2-en-1-0l), aqueous [2] | 96% | ● | ● | – |
| Aluminium chloride [2] | GL | ● | ● | – |
| Aluminium sulphate [2] | GL | ● | ● | – |
| Formic acid, aqueous | 10% | ● | ● | ◐ |
| Formic acid, aqueous | 85% | ● | ◐ [3] | ○ |
| 2 - Aminoethanol (ethanolamine) | TR | ● | – | – |
| Ammonia, liquid | TR | ● | – | – |
| Ammonia, gaseous | TR | ● | ● [2] | – |
| Aqueous ammonia (ammonia solution) | GL | ● | ● [2] | – |
| Ammonium acetate | GL | ● | ● | – |
| Ammonium carbonate [2] and bicarbonate | GL | ● | ● | – |
| Ammonium chloride | GL | ● | ● [2] | – |
| Ammonium fluoride | L | ● | ● | – |
| Ammonium nitrate | GL | ● | ● | ● |
| Ammonium phosphate [2] | GL | ● | ● | ● |
| Ammonium sulphate | GL | ● | ● | ● |
| Ammonium sulphide [2] | GL | ● | ● | – |
| Amyl acetate (acetate (acetic acid isoamyl ester) | TR | ◐ | – | – |
| Amyl alcohol (fermentation amyl alcohol) | TR | ● | ● | ● |
| Aniline | TR | ◐ [4] | ◐ [4] | – |
| Anilium chloride (aniline hydrochloride) | GL | ● | ● | – |
| Anisole [2] | TR | ◐ | ◐ | – |
| Anone see cyclohexanone | TR | ◐ | ○ | ○ |
| Antimony(III) chloride, aqueous [2] | 90% | ● | ● | – |
| Apple juice | H | ● | ● [2] | ● [2] |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Malic acid | L | ● | ● | – |
| | | | | |
| Apple wine [2] | H | ● | ● | – |
| Arsenic acid, ortho, aqueous [2] | 10% | ● | ● | – |
| Arsenic acid, ortho, aqueous [2] | 80% | ● | ● | ◐ |
| | | | | |
| Barium hydroxide | GL | ● | ● | ● |
| Barium salts [2] | GL | ● | ● | ● |
| Cottonseed oil | TR | ● | ● | – |
| Benzaldehyde [2] | GL | ● | ● | – |
| Benzaldehyde [2] | L | ● | – | – |
| Benzine (aliphatic hydrocarbons) | H | ◐ [3] | ○ | ○ |
| Benzine/benzene mixture [2] | 80%/20% (Vol.) | ◐ | ○ | ○ |
| Benzoic acid | GL | ● | ● [2] | – |
| Benzene | TR | ◐ | ○ | ○ |
| Benzoyl chloride [2] | TR | ◐ | – | – |
| Benzyl alcohol | TR | ● | ◐ | – |
| Succini acid | GL | ● | ● | – |
| Beeswax [2] | H | ● | ◐ | – |
| Beer [2] | H | ● | ● | ● |
| Caramel [2] | VL | ● | ● | – |
| Hydrocyanic acid [2] (hydrogen cyanide) | TR | ● | ● | – |
| Lead acetate [2] | GL | ● | ● | ◐ |
| Bleaching liquor (sodium hypochlorite) | 20% | ◐ [4] | ◐ | ○ [2] |
| Lead tetraethyl (tetraethyl-lead) [2] | TR | ● | – | – |
| Borax (sodium tetraborate) | L | ● | ● | – |
| Boric acid | GL | ● | ● [2] | ● [2] |
| All types of spirits [2] | H | ● | ● | – |
| Bromine (bromine water) [2] | GL | ◐ | ○ | ○ |
| Bromine, gaseous | any | ◐ | ○ | ○ |
| Bromine, liquid | TR | ○ | ○ | ○ |
| Bromomethyl see methyl bromide | TR | ○ | ○ | ○ |
| Hydrobromic acid, aqueous | 48% | ● | ◐ | ○ |
| Butane, gaseous | TR | ● | ● [2] | – |
| Butadiene, gaseous [2] | TR | ◐ | ○ | ○ |
| Butanols (butyl alcohols) | TR | ● | ◐ | ◐ |
| Butane-1,2,4-triol [2] | TR | ● | ● | – |
| But-2-ene-1,4-diol [2] | TR | ● | ● | – |
| But-2-ine-1,4-diol [2] | TR | ● | – | – |
| Butyric acids, aqueous | 20% | ● | – | – |
| Butyl acetates(acetic acid butyl esters) | TR | ◐ | ○ | ○ |
| Butylenes, liquid [2] (butenes) | TR | ◐ | – | – |
| Butylene glycols (butanediols) aqueous [2] | 10%(Vol.) | ● | ◐ | – |
| Butylene glycols (butanediols) [2] | TR | ● | ● | – |
| Butylglycol (ethylene glycol monobutyl ether) | TR | ● | – | – |
| Butylphenols | GL | ● | – | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Butylphenone [2] | TR | ○ | – | – |
| Butyl phthalate (dibutyl phthalate) | TR | ● | ◐ | ◐ |
| | | | | |
| Calcium carbonate | GL | ● | ● | ● |
| Calcium chloride | GL | ● | ● | ● |
| Calcium hydroxide | GL | ● | ● | – |
| Calcium hypochlorite | L | ● | – | – |
| Calcium nitrate | GL | ● | ● | – |
| Camphor oil | TR | ○ | ○ | ○ |
| Carbolineum [2] | H | ● | – | – |
| Chlorine, gaseous, dry | TR | ○ | ○ | ○ |
| Chlorine, gaseous, moist [2] | 0.50% | ◐ | – | – |
| Chlorine, gaseous, moist [2] | 1% | ○ | ○ | ○ |
| Chlorine, liquid | TR | ○ | ○ | ○ |
| Chlorine (chlorine water) | GL | ◐ [4] | ○ | ○ |
| Chloral [2] (trichloroacetaldehyde) | TR | ● | ● | – |
| Chloral hydrate [2] | TR | ◐ | ○ | ○ |
| Chloramine [2] | L | ● | – | – |
| Chlorobenzene [2] | TR | ◐ | – | – |
| Chloroacetic acid, mono, aqueous | L | ● | ● [2] | – |
| Chloroacetic, mono, aqueous | 85% 2) | ● | ● | – |
| Chloroethane (ethyl chloride) | TR | ○ | ○ | ○ |
| 2-Chloroethanol (ethylene chlorohydrin) | TR | ● | ● [2] | – |
| Bleaching powder suspension in water [2] | any | ● | ● | – |
| Chloroform (trichloromethane) | TR | ◐ | ○ | ○ |
| Chloric acid, aqueous [2] | 1% | ● | ◐ | ○ |
| Chloric acid, aqueous [2] | 10% | ● | ◐ | ○ |
| Chloric acid, aqueous | 20% | ● | ○ | ○ |
| Chlorosulphonic acid (chlorosulphuric acid) | TR | ○ | ○ | ○ |
| Chlorine water (chlorine) | GL | ◐ [4] | ○ | ○ |
| Hydrogen chloride, dry gas | TR | ● | ● | – |
| Hydrogen chloride, moist gas [2] (hydrochloric acid) | TR | ● | ● | – |
| Chrome alum (alums) | GL | ● | ● | – |
| Chromic acid, aqueous | 40% | ◐ [4] | ◐ | ○ |
| Chromic acid/sulphuric acid/water [2] (chromic/sulphuric acid) | 15/35/50% | ○ | ○ | ○ |
| Citric acid | VL | ● | ● | ● |
| Crotonaldehyde [2] (2-butenal) | TR | ● | – | – |
| Potassium cyanide | L | ● | ● [2] | – |
| Cyclohexane | TR | ● | – | – |
| Cyclohexanol | TR | ● | ◐ | – |
| Cyclohexanone | TR | ◐ | ○ | ○ |
| | | | | |
| Dekalin (decahydronaphthalene) | TR | ◐ [3] | ○ | ○ |
| Dextrin (starch gum) | L | ● | ● | – |
| Dextrose (glucose) | 20% | ● | ● | ● |
| 1,2-Diaminoethane (ethylenediamine) [2] | TR | ● | ● | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Di-n-butyl ether [2] | TR | ◐ | ○ | ○ |
| Dibutyl phthalate (phehalic acid dibutyl ester) | TR | ● | ◐ | ○ |
| Dichloroethylene (1,1- and 1, 2-) | TR | ◐ | – | – |
| Dichlorobenzenes [2] | TR | ◐ | – | – |
| Dichloroacetic acid | TR | ◐ | – | – |
| Dichloroacetic acid, aqueous [2] | 50% | ● | ● | – |
| Dichloroacetic acid methyl ester [2] | TR | ● | ● | – |
| Diesel fuel [2] | H | ● | ◐ | – |
| Diethanolamine | TR | ● | – | – |
| Diethyl ether (ether) | TR | ● | ◐ | – |
| Diglycollic acid | GL | ● | ● [2] | – |
| Dihexyl phthalate [2] | TR | ● | ◐ | – |
| Diisobutyl ketone [2] (2,6-dimethylheptan-4-one) | TR | ● | ○ | ○ |
| Diisopropyl ether | TR | ◐ | ○ [2] | – |
| Diisooctyl phthalate | TR | ● | ◐ | – |
| Dimethylamine, gaseous | 100% | ● | – | – |
| N, N-Dimethylformamide | TR | ● | ● | – |
| Dinonyl phthalate [2] (DNP) | TR | ● | ◐ | – |
| Dioctyl phthalate (DOP) | TR | ● [3] | ◐ | – |
| 1,4-dioxane (diethylene dioxide) | TR | ◐ | ◐ | – |
| Fertilizer salts [2] | GL | ● | ● | – |
| | | | | |
| Iron (II) and (III) chloride [2] | GL | ● | ● | – |
| Natural gas | TR | ● | – | – |
| Peanut oil | TR | ● | ● | – |
| Vinegar (wine vinegar) | H | ● | ● | ● |
| Acetic acid, aqueous (glacial acetic acid) | TR | ● | ◐ | ○ |
| Acetic acid, aqueous and vinegar essence | 50% | ● | ● | ◐ |
| Acetic acid, aqueous | up to 40% | ● | ● | – |
| Acetic acid anhydride | TR | ● | – | – |
| Acetic acid ethyl ester (ethyl acetate) | TR | ● [3] | ◐ [3] | ○ |
| Acetic acid methyl ester (methyl acetate) | TR | ● | ● | – |
| Ethanol (ethyl alcohol) | TR | ● | ● | ● |
| Ethanol, denatured with 2% of toluene [2] | 96%(Vol.) | ● | – | – |
| Ethylbenzene [2] | TR | ◐ | ○ | ○ |
| Ethyl chloride, gaseous (chloroethane) | TR | ○ | ○ | ○ |
| Ethylene chlorohydrin (chloroethanol) | TR | ● | ● [2] | – |
| Ethylenediamine (1,2-diaminoethane) | TR | ● | ● | – |
| Ethylene glycol | TR | ● | ● | ● |
| Ethylene oxide, liquid [2] (oxirane) | TR | ○ | – | – |
| | | | | |
| Fatty acids (from $C_4$) [2] | TR | ● | ◐ | – |
| Pine-needle oil [2] | H | ● | ◐ | – |
| Fluorine, dry [2] | TR | ◐ | – | – |
| Fluorosilicic acid [2], aqueous | 32% | ● | ● | – |
| Hydrofluoric acid, aqueous [2] | 40% | ● | ● | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
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| Hydrofluoric acid, aqueous [2] | 70% | ● | ◐ | – |
| Formaldehyde, aqueous | 40% | ● | ● [2] | – |
| Photo emulsions [2] | H | ● | ● | – |
| Photo developer baths [2] | H | ● | ● | – |
| Photo fixing baths [2] | H | ● | ● | – |
| Antifreeze (automobiles) [2] | H | ● | ● | ● |
| Fruit drinks and fruit juices | H | ● | ● | ● |
| Fructose (fruit sugar) | L | ● | ● | ● |
| Furfuryl alcohol [2] | TR | ● | ◐ | – |
| | | | | |
| Fermentation mash [2] | H | ● | ● | – |
| Gelatine | L | ● | ● | ● [2] |
| Tannin extract, vegetable [2] | H | ● | ○ | – |
| Tannic acid (tannin), aqueous [2] | 10% | ● | ○ | – |
| Glucose, aqueous | 20% | ● | ● | ● |
| Glycerol | TR | ● | ● | ● |
| Glycollic acid, aqueous | 30% | ● | ◐ [2] | – |
| | | | | |
| Urea | GL | ● | ● [2] | – |
| Yeast [2] | any | ● | – | – |
| Heating Oil [2] | H | ● | ◐ | – |
| Heptanes | TR | ● [3] | ◐ [3] | ○ |
| Hexanes | TR | ● | ◐ | – |
| Hexane-1,2,6-triol [2] | TR | ● | ● | – |
| Hydrazine hydrate [2] | TR | ● | – | – |
| Hydroquinone [2] | L | ● | – | – |
| Hydroxylammonium sulphate [2] | 12% | ● | ● | – |
| | | | | |
| Isooctane | TR | ● [3] | ◐ [3] | ○ |
| Isopropanol (propan-2-01) | TR | ● | ● | ● |
| Tincture of iodine | H | ● | ◐ [2] | – |
| | | | | |
| Potassium hydroxide solution, aqueous | 50% | ● | ● | ● |
| Potassium bromate, aqueous | 10% | ● | ● | – |
| Potassium bromide | GL | ● | ● | – |
| Potassium carbonate (potash) | GL | ● | ● [2] | – |
| Potassium chlorate | GL | ● | ● | – |
| Potassium chloride | GL | ● | ● [2] | – |
| Potassium chromate | GL | ● | ● | – |
| Potassium cyanide | L | ● | ● [2] | – |
| Potassium dichromate [2] | GL | ● | ● | – |
| Potassium fluoride | GL | ● | ● | – |
| Potassium hexacyanoferrate-(II) and -(III) [2] (yellow and red potassium ferro- and ferricyanide) | GL | ● | ● | – |
| Potassium bicarbonate | GL | ● | ● | – |
| Potassium iodide | GL | ● | ● [2] | – |
| Potassium nitrate | GL | ● | ● | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Potassium perchlorate, aqueous | 10% | ● | ● | – |
| Potassium permanganate | GL | ● | ○ [2] | – |
| Potassium peroxodisulphate (potassium persulphate) | GL | ● | ● [2] | – |
| Potassium sulphate | GL | ● | ● [2] | – |
| Fluoro silicic acid | 32% | ● | ● | – |
| Silicic acid, aqueous [2] | any | ● | ● | – |
| Common salt (sodium chloride) | VL | ● | ● | ● |
| Aqua regia ($HCl/HNO_3$) | 75%/25% | ○ | ○ | ○ |
| Carbon dioxide, gaseous | any | ● | ● | – |
| Carbon dioxide (carbonic acid), aqueous [2] | any | ● | ● | – |
| Coconut fat alcohol [2] | TR | ● | ◐ | – |
| Coconut oil (coconut fat, copra) | TR | ● | – | – |
| Cresols | 90%2 | ● | ● | – |
| Cresols | >90% | ● | – | – |
| Copper(II) chloride | GL | ● | ● | – |
| Copper(I) cyanide [2] | GL | ● | ● | – |
| Copper(II) nitrate, aqueous | 30% | ● | ● | ● |
| Copper(II) sulphate | GL | ● | ● | – |
| | | | | |
| Lanolin (wool fat) | H | ● | ◐ | – |
| Linseed oil | H | ● | ● | ● |
| Illuminating gas [2] | H | ● | – | – |
| Air | TR | ● | ● | ● |
| | | | | |
| Magnesium chloride | GL | ● | ● | ● [2] |
| Magnesium hydroxide carbonate | GL | ● | ● | ● |
| Magnesium salts [2] | GL | ● | ● | – |
| Magnesium sulphate | GL | ● | ● | ● [2] |
| Maize germ oil | TR | ● | ◐ | – |
| Machine oil [2] | TR | ● | ◐ | ○ |
| Sea-water | H | ● | ● | ● |
| Molasses [2] | H | ● | ● | ● |
| Menthol [2] | TR | ● | ◐ | – |
| Methanol (methyl alcohol) | TR | ● | ● | – |
| Methanol (methyl alcohol) | 5% | ● | ● [3] | ◐ |
| Methanesulphonic acid, aqueous [2] (methylsulphuric acid) | 50% | ◐ | ◐ | ○ |
| Methanesulphonic acid, aqueous [2] (methylsulphuric acid) | 50 bis 100% | ◐ | ○ | ○ |
| Methoxybutanol [2] | TR | ● | ◐ | – |
| Methyl acetate see (acetic acid methyl ester) | TR | ● | ● | – |
| Methylamine, aqueous | 32% | ● | – | – |
| Methyl bromide (bromomethyl) | TR | ○ | ○ | ○ |
| Methyl chloride, gaseous [2] (chloromethyl) | TR | ○ | ○ | ○ |
| Methylene chloride (dichloromethane) | TR | ◐ | ○ | ○ |
| Methyl ethyl ketone [2] | TR | ● | ◐ | – |
| Milk | H | ● | ● | ● |
| Lactic acid | 90% | ● | ● | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Mineral water | H | ● | ● | ● |
| Engine lubrication oils [2] | TR | ● | ◐ | – |
| | | | | |
| Naphtha | H | ● | ○ | ○ |
| Sodium acetate | GL | ● | ● | ● |
| Sodium benzoate, aqueous | 35% | ● | ● [2] | – |
| Sodium borate-hydrogen peroxide (sodium perbarate) | GL | ● | – | – |
| sodium carbonate, aqueous | 50% | ● | ● | ◐ |
| Sodium chlorate | GL | ● | ● [2] | – |
| Sodium chloride | VL | ● | ● | ● |
| Sodium chlorite, aqueous | 2 to 20% | ● | ◐ | ○ |
| Sodium dichromate | GL | ● | ● | ● |
| Sodium hexametaphosphate | L | ● | ● [2] | – |
| Sodium bicarbonate | GL | ● | ● | ● |
| Sodium bisulphate | GL | ● | ● | – |
| Sodium bisulphite | L | ● | – | – |
| Sodium hypochlorite, aqueous | 10% | ● | – | – |
| Sodium hypochlorite, aqueous | 20% | ◐ [4] | ◐ | ○ [2] |
| Sodium nitrate | GL | ● | ● | – |
| Sodium nitrite [2] | G | ● | ● | – |
| Sodium phosphate, tri | GL | ● | ● | ● |
| Sodium silicate, (water-glass) | L | ● | ● | – |
| Sodium sulphate | GL | ● | ● | – |
| Sodium sulphide | GL | ● | ● [2] | – |
| Sodium sulphite, aqueous | 40% | ● | ● | ● |
| Sodium tetraborate | L | ● | ● | – |
| Sodium thiosulphate | GL | ● | ● [2] | – |
| Sodium hydroxide solution, aqueous | up to 60% | ● | ● | ● |
| Nickel salts [2] | GL | ● | ● | – |
| Nitrobenzene | TR | ● | ◐ | – |
| 2-Nitrotoluene [2] | TR | ● | ◐ | ○ |
| | | | | |
| Fruit pulps [2] | H | ● | – | – |
| Octylcresol [2] | TR | ◐ | ○ | ○ |
| Oils and fats (animal and vegetable) | TR | ● | ◐ | – |
| Oleic acid | TR | ● | ◐ | – |
| Oleum ($H_2SO_4 + SO_3$) | TR | ○ | ○ | ○ |
| Olive oil | TR | ● | ● | ◐ |
| Oxalic acid | GL | ● | ● [3] | ○ |
| Ozone [2] | 0.5ppm | ● | ◐ | – |
| | | | | |
| Paraffin emulsions [2] | H | ● | ● | – |
| Paraffin oil | TR | ● | ◐ | ○ |
| Perchloroethylene (tetrachloroethylene) [2] | TR | ◐ | ◐ | – |
| Perchloric acid, aqueous | 20% | ● | ● [2] | – |
| Petroleum ether | TR | ● [3] | ◐ | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Petroleum | TR | ● | ◐ | – |
| Peppermint oil | TR | ● | – | – |
| Phenol, aqueous | 5% | ● | ● | – |
| Phenol, aqueous | 90% | ● | – | – |
| Phenylhydrazine [2] | TR | ◐ | ◐ | – |
| Phenylhydrazinium chloride [2] | TR | ● | ◐ | – |
| Phosgene, gaseous [2] (carbonyl chloride) | TR | ◐ | ◐ | – |
| Phosphates [2] (inorganic) | GL | ● | ● | – |
| Phosphorus(III) chloride [2] | TR | ◐ | – | – |
| Phosphorus oxychloride | TR | ◐ | – | – |
| Phosphoric acid, ortho | 85% | ● | ● | ● |
| Phthalic acid [2] | GL | ● | ● | – |
| Picric acid (2, 4, 6 - trinitrophenol) | GL | ● | – | – |
| Propane, gaseous | TR | ● | – | – |
| Propan-I-ol [2] (propyl alcohol) | TR | ● | ● | – |
| Propargyl alcohol, aqueous [2] | 7% | ● | ● | – |
| Propionic acid, aqueous | >50% | ● | ● [2] | – |
| Propylene glycols [2] | TR | ● | ● | – |
| Pyridine | TR | ◐ | ◐ [2] | – |
| | | | | |
| Mercury | TR | ● | ● | – |
| Mercury salts [2] | GL | ● | ● | – |
| | | | | |
| Castor oil | TR | ● | ● | – |
| | | | | |
| Aqueous ammonia (ammonia water) | GL | ● | ● [2] | – |
| Nitric acid, aqueous | 10% | ● | ◐ [3] | ○ |
| Nitric acid, aqueous | 10-50% | ◐ | ○ [2] | ○ [2] |
| Nitric acid, aqueous | >50% | ○ | ○ | ○ |
| Hydrochloric acid, aqueous | up to 20% | ● | ● | – |
| Hydrochloric acid, aqueous | >20 to 36% | ● | ◐ [2] | ◐ [2] |
| Oxygen | TR | ● | – | – |
| Lubricating oils [2] | H | ◐ | – | – |
| Sulphur dioxide, gaseous | TR | ● | ● [2] | – |
| Sulphur dioxide, gaseous (sulphurous acid) | any | ● | ● [2] | – |
| Carbon disulphide | TR | ○ | ○ | ○ |
| Sulphuric acid, aqueous | 10% | ● | ● | ● |
| Sulphuric acid, aqueous | >10 to 80% | ● | ● | – |
| Sulphuric acid, aqueous | >80 to TR | ◐ | ○ | – |
| Sulphuric acid, fuming (oleum) | | ○ | ○ | ○ |
| Hydrogen sulphide, gaseous | TR | ● | ● | – |
| Sea-water | H | ● | ● | ● |
| Silver nitrate | GL | ● | ● | ◐ |
| Silver salts [2] | GL | ● | ● | – |
| Silicone oil | TR | ● | ● | ● |
| Silicone emulsion [2] | H | ● | ● | – |

| Flow Substance | Content [1] % | Behavior at | | |
|---|---|---|---|---|
| | | 20°C / 68 °F | 60°C / 140 °F | 100°C / 212 °F |
| Soda (sodium carbonate) | 50% | ● | ● | ◐ |
| Soybean oil | TR | ● | ◐ | – |
| Spindle oil [2] | TR | ● | ◐ | ○ |
| Starch | any | ● | ● | – |
| Starch gum (dextrin) | L | ● | ● | – |
| Startch syrup [2] | any | ● | ● | – |
| Sulphuryl chloride [2] | TR | ○ | ○ | ○ |
| | | | | |
| Terpentine oil | TR | ○ | ○ | ○ |
| White spirit [2] | TR | ● | ◐ | ○ |
| Tetrachloroethane [2] | TR | ◐ | ○ | ○ |
| Tetrachloroethylene (perchloroethylene) | TR | ◐ | ◐ | – |
| Carbon tetrachloride (tetrachloromethane) | TR | ○ | ○ | ○ |
| Tetrahydrofuran | TR | ◐ | ○ | ○ |
| Tetrahydronaphthalene (tetralin) | TR | ○ | ○ | ○ |
| Thionyl chloride [2] | TR | ◐ | ○ | ○ |
| Thiophene | TR | ● | ◐ | – |
| Toluene | TR | ◐ | ○ | ○ |
| Transformer oil (insulating oil) [2] | TR | ◐ | ○ | – |
| Grape sugar (glucose) | 20% | ● | ● | ● |
| Triethanolamine | L | ● | – | – |
| Trichloroethylene | TR | ○ | ○ | ○ |
| Trichloroacetic acid, aqueous | 50% | ● | ● | – |
| Tricresyl phosphate [2] (phosphoric acid tritolyl ester) | TR | ● | ◐ | – |
| Drinking water, chlorinated [2] | TR | ● | ● | ● |
| Triocyl phosphate [2] | TR | ● | – | – |
| | | | | |
| Vaseline oil [2] | TR | ● | ◐ | – |
| Vinyl acetate [2] | TR | ● | ◐ | – |
| Vinylidene chloride (1,1-dichloroethylene) | TR | ◐ | – | – |
| | | | | |
| Detergents [2] | VL | ● | ● | – |
| Water, pure | H | ● | ● | ● |
| Hydrogen | TR | ● | ● [2] | – |
| Hydrogen peroxide, aqueous | 30% | ● | ◐ | – |
| Wines | H | ● | ● [2] | – |
| Wine vinegar, table vinegar | H | ● | ● | ● |
| Tartaric acid, aqueous | 10% | ● | ● | – |
| Xdylene (all isomers) | TR | ◐ [3] | ○ | ○ |
| | | | | |
| Zinc salts [2] | GL | ● | ● | – |
| Tin(II) chloride | GL | ● | ● | – |
| Tin(IV) chloride | GL | ● | ● | – |
| Citric acid | VL | ● | ● | ● |
| Sugar syrup [2] | H | ● | ● | – |

Barleans Organic Oils, USA

# REFERENCES

Blythewood, USA

CSU Data, USA

# REFERENCES

Daikin AC, USA

Epic Brewery, USA


Hancock Medical, USA

# REFERENCES

Lifeline Data, USA

LLNL, USA

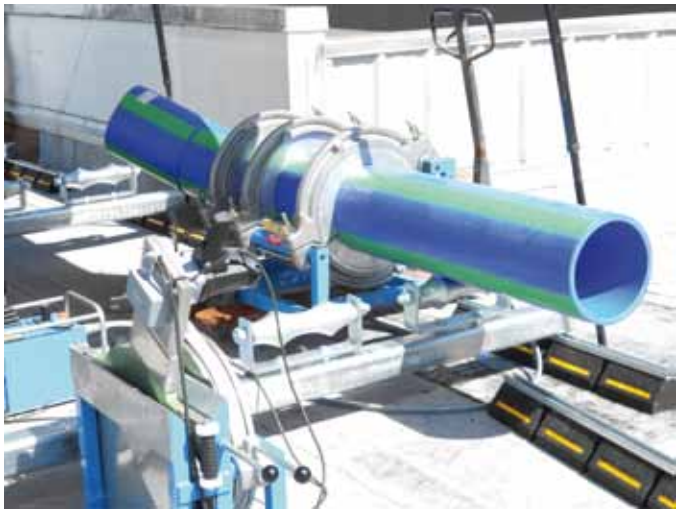
Neenah Paper, USA

# REFERENCES

Park Orchard Elementary School, USA



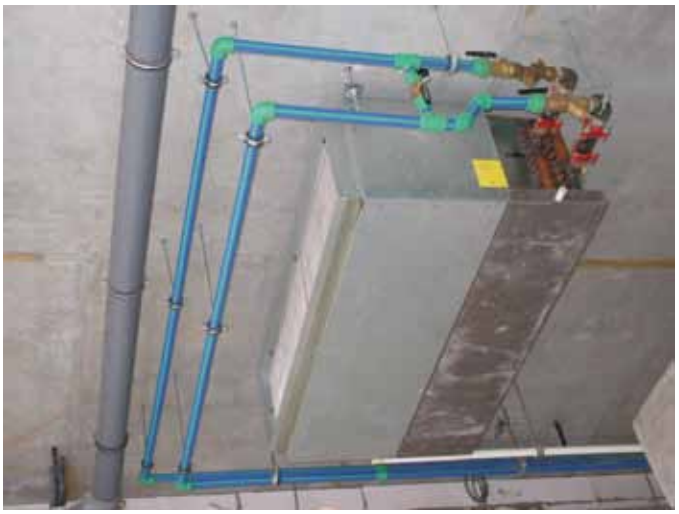
IP Casino, USA



Starbucks, USA

# REFERENZEN

Flex Tower, RAK, UAE



Millerntor stadium, FC St. Pauli 1910 e.V.

Hellenic Telecoms AG, Athens, Greece

Ecolab, Monheim

Hotel Kalimera, Kreta, Greece

Al Sayegh Tower, Sharjah, UAE

## TRANSPORT UND LAGERUNG

aquatherm PP-R - pipes may be stored outside at any temperature. A solid base for the pipe is very important to avoid a deformation of the pipes while in transport and storage.

At temperatures below 0 °C it is possible to damage the pipes through strong impacts. The material has to be treated with caution at low temperatures.

In spite of its high resistance aquatherm - pipes should be treated with care.

UV-radiation has effects on all high polymer plastics. Do not store permanently outdoor. Maximum storage time (outdoor) is 6 months.

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– aquatherm blue pipe-pipes
– Fastening material
– Fittings
– Weld-in saddle
– Threaded connections and accessories
– Transition pieces
– Screwed connections and counter parts
– Distributors
– Valves and accessories
– Cutting tools, welding devices
– Welding machines and welding jig
– Butt welding machines & electrofusion device
– Peeling tools
– Saddle welding tools
– Drills & saddle peeling tool

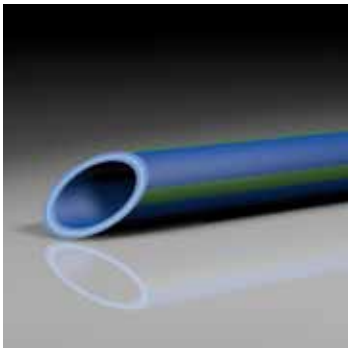
**climatherm** unser Spezialist für  den Transport von kühlenden und heizenden Medien in geschlossenen Systemen, sowie verschiedenen Industrieanwendungen heißt in Zukunft **aquatherm blue pipe**. Vor zehn Jahren entwickelt um Korrosion an Leitungen in Klimaanlagen zu vermeiden, erweiterte sich das Anwendungsspektrum schnell auf zahlreiche weitere Gebiete im Rohrleitungsbau.Mittlerweile findet man es rund um die Welt in Hotels, Sportstadien und industriellen Großprojekten.

# aquatherm blue pipe

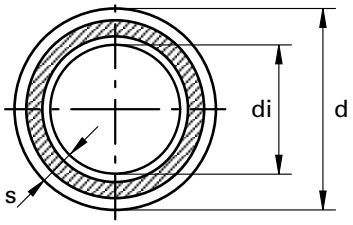
**Rohrleitungssystem aus Polypropylen**
für die Klima-, Heizungs- und Anlagentechnik

| | | Neue Markenstruktur | | | | | |
|---|---|---|---|---|---|---|---|
| Artikel-Nr. | Alter Markenname | Neuer Markenname | | Standard Dimension Ratio | Rohr-aufbau | Beson-derheit | Mate-rial |
| | | Firma | System | | | | |
| 2010208 . . . 2010212 | Climatherm SDR11 | aquatherm | blue pipe | SDR 11 | S | | PP-R |
| 2070112 . . . 2070712 | Climatherm Faserverbundrohr SDR7,4/SDR11 | aquatherm | blue pipe | SDR 7,4/SDR 11 | MF | | PP-R |
| 2070162 . . . 2070762 | Climatherm Faserverbundrohr SDR7,4/SDR11/SDR 17,6 UV | aquatherm | blue pipe | SDR 7,4/SDR 11/SDR 17,6 | MF | UV | PP-R |
| 2170114 . . . 2170712 | Climatherm Faserverbundrohr SDR7,4/SDR11 OT | aquatherm | blue pipe | SDR 7,4/SDR 11 | MF | OT | PP-R |
| 2570130 . . . 2570154 | Climatherm Faserverbundrohr SDR17,6 | aquatherm | blue pipe | SDR 17,6 | MF | | PP-R |
| 2270111 . . . 2270142 | Climatherm Faserverbundrohr SDR7,4/SDR11 ISO | aquatherm | blue pipe | SDR 7,4/SDR 11 | MF | TI | PP-R |
| 2470711 . . . 2470126 | Climatherm Faserverbundrohr SDR7,4/SDR11 OT ISO | aquatherm | blue pipe | SDR 7,4/SDR 11 | MF | OT-TI | PP-R |

## aquatherm blue pipe - SDR 7,4 / 11 / 17,6 MF



| | |
|---|---|
| Rohraufbau: | MF = Faserverbundrohr (mehrschichtig, faserverstärkt) |
| Material: | fusiolen PP-R |
| Rohrreihe: | SDR 7,4/S 3,2 & SDR11 / S 5 & SDR 17,6 / S 8,3 |
| Standards: | SKZ HR 3.28, ASTM F 2389, CSA B 137.11, ISO 21003 |
| Farbe: | blau mit 4 breiten grünen Streifen |
| Lieferform: | ø 20-125mm Stangen zu 4 m<br>ø 160-630mm Stangen zu 5,8 m |
| Liefereinheit: | LE in Meter |
| Einsatzbereich: | |

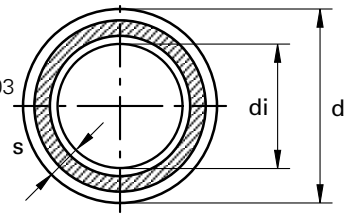


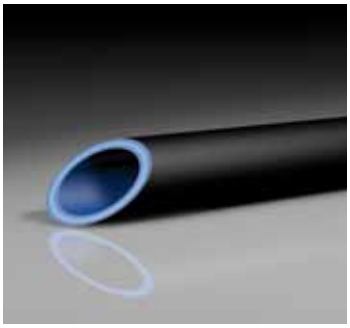

Mechanisch stabilisiert durch Fasergemisch, welches als mittlere Schicht im Werkstoff fusiolen® PP-R eingebracht ist.

| SDR | Art.- Nr. | Durch-messer d [mm] | Wanddicke s [mm] | lichte Weite di [mm] | Wasserinhalt [l/m] | Gewicht [kg] | DN | LE [m] | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 | Muffenschweißverfahren | | | | | | | | | |
| | **2070708** | **20** | 2,8 | 14,4 | 0,163 | 0,159 | 15 | 100 | 11 | |
| | **2070710** | **25** | 3,5 | 18,0 | 0,254 | 0,244 | 20 | 100 | 11 | |
| | **2070712** | **32** | 4,4 | 23,2 | 0,423 | 0,275 | 25 | 40 | 11 | |
| 11 | **2070112** | **32** | 2,9 | 26,2 | 0,539 | 0,285 | 25 | 40 | 11 | |
| | **2070114** | **40** | 3,7 | 32,6 | 0,834 | 0,435 | 32 | 40 | 11 | |
| | **2070116** | **50** | 4,6 | 40,8 | 1,307 | 0,675 | 40 | 20 | 11 | |
| | **2070118** | **63** | 5,8 | 51,4 | 2,074 | 1,065 | 50 | 20 | 11 | |
| | **2070120** | **75** | 6,8 | 61,4 | 2,959 | 1,482 | 65 | 20 | 11 | |
| | **2070122** | **90** | 8,2 | 73,6 | 4,252 | 2,145 | 80 | 12 | 11 | |
| | **2070124** | **110** | 10,0 | 90,0 | 6,359 | 3,175 | - | 8 | 11 | |
| | **2070126** | **125** | 11,4 | 102,2 | 8,199 | 4,118 | 100 | 4 | 11 | |
| | Stumpfschweißverfahren | | | | | | | | | |
| | **2070130** | **160** | 14,6 | 130,8 | 13,430 | 6,728 | 125 | 5,8 | 11 | |
| | **2070134** | **200** | 18,2 | 163,6 | 21,010 | 10,480 | 150 | 5,8 | 11 | |
| | **2070138** | **250** | 22,7 | 204,6 | 32,861 | 16,300 | 200 | 5,8 | 11 | |
| | **2070142** | **315** | 28,6 | 257,8 | 52,172 | 25,700 | 250 | 5,8 | 11 | |
| | **2070144** | **355** | 32,2 | 290,6 | 66,29 | 33,034 | 300 | 5,8 | 11 | |
| | **2070146** | **400** | 36,3 | 327,6 | 84,290 | 41,400 | 300 | 5,8 | 11 | |
| | **2070148** | **450** | 40,9 | 368,2 | 106,477 | 52,400 | 400 | 5,8 | 11 | |
| 17,6 | Muffenschweißverfahren | | | | | | | | | |
| | NEU **2570126** | **125** | 7,1 | 110,8 | 9,637 | 2,698 | 100 | 4 | 11 | |
| | Stumpfschweißverfahren | | | | | | | | | |
| | **2570130** | **160** | 9,1 | 141,8 | 15,792 | 4,360 | 150 | 5,8 | 11 | |
| | **2570134** | **200** | 11,4 | 177,2 | 24,661 | 6,800 | 200 | 5,8 | 11 | |
| | **2570138** | **250** | 14,2 | 221,6 | 38,568 | 10,570 | 250 | 5,8 | 11 | |
| | **2570142** | **315** | 17,9 | 279,2 | 61,223 | 16,740 | 300 | 5,8 | 11 | |
| | **2570144** | **355** | 20,1 | 314,8 | 77,832 | 21,210 | 350 | 5,8 | 11 | |
| | **2570146** | **400** | 22,7 | 354,6 | 98,756 | 26,930 | 350 | 5,8 | 11 | |
| | **2570148** | **450** | 25,5 | 399,0 | 125,036 | 34,020 | 400 | 5,8 | 11 | |
| | **2570150** | **500** | 28,4 | 443,2 | 154,272 | 42,070 | 450 | 5,8 | 11 | |
| | **2570152** | **560** | 31,7 | 496,6 | 193,688 | 52,550 | 500 | 5,8 | 11 | |
| | **2570154** | **630** | 35,7 | 558,6 | 245,070 | 66,540 | 500 | 5,8 | 11 | |

## aquatherm blue pipe - SDR 7,4/11/17,6 MF UV

Rohraufbau: MF = Faserverbundrohr (mehrschichtig, faserverstärkt)
Besonderheit: UV-beständig
Material: fusiolen PP-R
Rohrreihe: SDR 7,4/S 3,2 & SDR 11 & SDR 17,6/ S 8,3
Standards: SKZ HR 3.28, ASTM F 2389, CSA B 137.11, ISO 21003
Farbe: außen schwarz, innen blau
Lieferform: ø 20-125mm Stangen zu 4 m
ø 160-630mm Stangen zu 5,8 m
Liefereinheit: LE in Meter
Einsatzbereich:



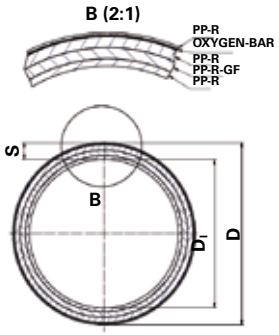



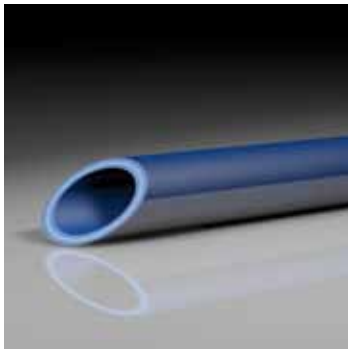
Beständig gegen UV-Strahlen. Mechanisch stabilisiert durch Fasergemisch, welches als mittlere Schicht im Werkstoff fusiolen® PP-R eingebracht ist.

| SDR | Art.- Nr. | Durch-messer d [mm] | Wanddicke s [mm] | lichte Weite di [mm] | Wasserinhalt [l/m] | Gewicht [kg] | DN | LE [m] | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 | Muffenschweißverfahren | | | | | | | | | |
| | **2070758** | **20** | 2,8 | 14,4 | 0,163 | 0,209 | 15 | 100 | 11 | |
| | **2070760** | **25** | 3,5 | 18,0 | 0,254 | 0,313 | 20 | 100 | 11 | |
| | **2070762** | **32** | 4,4 | 23,2 | 0,423 | 0,345 | 20 | 40 | 11 | |
| 11 | **2070162** | **32** | 2,9 | 26,2 | 0,539 | 0,375 | 25 | 40 | 11 | |
| | **2070164** | **40** | 3,7 | 32,6 | 0,834 | 0,554 | 32 | 40 | 11 | |
| | **2070166** | **50** | 4,6 | 40,8 | 1,307 | 0,825 | 40 | 20 | 11 | |
| | **2070168** | **63** | 5,8 | 51,4 | 2,074 | 1,257 | 50 | 20 | 11 | |
| | **2070170** | **75** | 6,8 | 61,4 | 2,959 | 1,707 | 65 | 20 | 11 | |
| | **2070172** | **90** | 8,2 | 73,6 | 4,252 | 2,483 | 80 | 12 | 11 | |
| | **2070174** | **110** | 10,0 | 90,0 | 6,359 | 3,688 | - | 8 | 11 | |
| | **2070176** | **125** | 11,4 | 102,2 | 8,199 | 4,673 | 100 | 4 | 11 | |
| | Stumpfschweißverfahren | | | | | | | | | |
| | **2070180** | **160** | 14,6 | 130,8 | 13,430 | 7,512 | 125 | 5,8 | 11 | |
| | **2070184** | **200** | 18,2 | 163,6 | 21,010 | 11,411 | 150 | 5,8 | 11 | |
| | **2070188** | **250** | 22,7 | 204,6 | 32,861 | 17,754 | 200 | 5,8 | 11 | |
| | **2070192** | **315** | 28,6 | 257,8 | 52,172 | 26,619 | 250 | 5,8 | 11 | |
| | **2070194** | **355** | 32,2 | 290,6 | 66,292 | 33,668 | 300 | 5,8 | 11 | |
| | **2070196** | **400** | 36,3 | 327,4 | 84,145 | 42,566 | 300 | 5,8 | 11 | |
| | **2070198** | **450** | 40,9 | 368,2 | 106,423 | 53,709 | 400 | 5,8 | 11 | |
| 17,6 | **2570180** | **160** | 9,1 | 141,8 | 15,784 | 4,839 | 150 | 5,8 | 11 | |
| | **2570184** | **200** | 11,4 | 177,2 | 24,649 | 7,396 | 200 | 5,8 | 11 | |
| | **2570188** | **250** | 14,2 | 221,6 | 38,549 | 11,321 | 250 | 5,8 | 11 | |
| | **2570192** | **315** | 17,9 | 279,2 | 61,193 | 17,676 | 300 | 5,8 | 11 | |
| | **2570194** | **355** | 20,1 | 314,8 | 77,793 | 22,266 | 350 | 5,8 | 11 | |
| | **2570196** | **400** | 22,7 | 354,6 | 98,707 | 28,124 | 350 | 5,8 | 11 | |
| | **2570198** | **450** | 25,5 | 399 | 124,973 | 35,364 | 400 | 5,8 | 11 | |
| | **2570200** | **500** | 28,4 | 443,2 | 154,195 | 43,563 | 450 | 5,8 | 11 | |
| | **2570202** | **560** | 31,7 | 496,6 | 193,590 | 54,224 | 500 | 5,8 | 11 | |
| | **2570204** | **630** | 35,7 | 558,6 | 244,947 | 68,420 | 500 | 5,8 | 11 | |

## aquatherm blue pipe - SDR 7,4 / 11 MF OT

Rohraufbau: MF = Faserverbundrohr (mehrschichtig, faserverstärkt)
Besonderheit: OT = sauerstoffdicht
Material: fusiolen PP-R
Rohrreihe: SDR 7,4/S 3,2 & SDR11 / S 5
Standards: DIN 8077/78, DIN EN ISO 15874, ASTM F 2389, CSA B 137.11, ISO 21003
Farbe: blau
Lieferform: ø 20-125mm Stangen zu 4 m
ø 160-250mm Stangen zu 5,8 m
Liefereinheit: LE in Meter
Einsatzbereich:



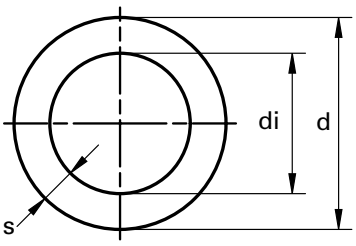



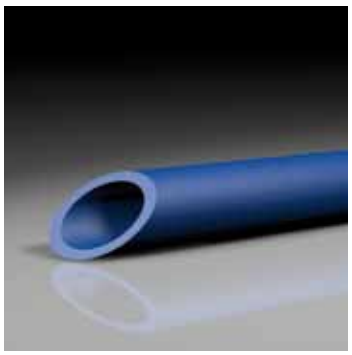
Sauerstoffdicht durch integrierte Sperre. Mechanisch stabilisiert durch Fasergemisch, welches als mittlere Schicht im Werkstoff fusiolen® PP-R eingebracht ist.

| SDR | Art.- Nr. | Durch-messer d [mm] | Wanddicke s [mm] | lichte Weite di [mm] | Wasserinhalt [l/m] | Gewicht [kg] | DN | LE [m] | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | |
| 7,4 | **2170708** | **20** | 2,8 | 14,4 | 0,163 | 0,199 | 15 | 100 | 11 | |
| | **2170710** | **25** | 3,5 | 18,0 | 0,254 | 0,299 | 20 | 100 | 11 | |
| | **2170712** | **32** | 4,4 | 23,2 | 0,423 | 0,466 | 20 | 40 | 11 | |
| 11 | **2170114** | **40** | 3,7 | 32,6 | 0,834 | 0,530 | 32 | 40 | 11 | |
| | **2170116** | **50** | 4,6 | 40,8 | 1,307 | 0,794 | 40 | 20 | 11 | |
| | **2170118** | **63** | 5,8 | 51,4 | 2,074 | 1,218 | 50 | 20 | 11 | |
| | **2170120** | **75** | 6,8 | 61,4 | 2,959 | 1,649 | 65 | 20 | 11 | |
| | **2170122** | **90** | 8,2 | 73,6 | 4,252 | 2,379 | 80 | 12 | 11 | |
| | **2170124** | **110** | 10 | 90,0 | 6,359 | 3,550 | - | 8 | 11 | |
| | **2170126** | **125** | 11,4 | 102,2 | 8,199 | 4,576 | 100 | 4 | 11 | |
| | Stumpfschweißverfahren | | | | | | | | | |
| | **2170130** | **160** | 14,6 | 130,8 | 13,430 | 7,284 | 125 | 5,8 | 11 | |
| | **2170134** | **200** | 18,2 | 163,6 | 21,010 | 11,000 | 150 | 5,8 | 11 | |
| | **2170138** | **250** | 22,7 | 204,6 | 32,861 | 16,700 | 200 | 5,8 | 11 | |

## aquatherm blue pipe - SDR 11 S

Rohraufbau: S (single = einschichtig)
Material: fusiolen PP-R
Rohrreihe: SDR 11/S 5
Standards: DIN 8077/78, DIN EN ISO 15874, ASTM F 2389, CSA B 137.11, NSF 14, ISO 21003
Farbe: blau
Lieferform: Stangen zu 4 m, bzw. *im Ring
Liefereinheit: LE in Meter
Einsatzbereich:



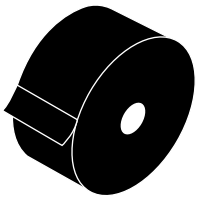



| SDR | Art.- Nr. | Durch-messer d [mm] | Wanddicke s [mm] | lichte Weite di [mm] | Wasserinhalt [l/m] | Gewicht [kg] | DN | LE [m] | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | **2010208** | **20** | 1,9 | 16,2 | 0,206 | 0,110 | 15 | 100 | 11 | |
| | **2010210** | **25** | 2,3 | 20,4 | 0,327 | 0,167 | 20 | 100 | 11 | |
| | **2010212** | **32** | 2,9 | 26,2 | 0,539 | 0,265 | 25 | 40 | 11 | |
| | **2010308*** | **20** | 1,9 | 16,2 | 0,206 | 0,107 | 15 | 100 | 11 | |
| | **2010310*** | **25** | 2,3 | 20,4 | 0,327 | 0,164 | 20 | 100 | 11 | |
| | **2010312*** | **32** | 2,9 | 26,2 | 0,539 | 0,257 | 25 | 40 | 11 | |

## KLEBEBAND ZUM SCHUTZ VOR UV-STRAHLUNG

für aquatherm-Rohre MF UV

| Art.-Nr. | Abmessung (Breite x Länge) | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **10870** | 30mm x 10m | 10m/Pckg | 1 | |
| **10871** | 50mm x 10m | 10m/Pckg | 1 | |

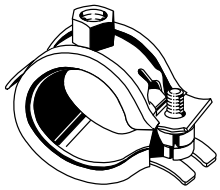


## BEFESTIGUNGSSCHELLEN

geeignet für Gleit- und Festpunktmontage

Gewindeaufnahme: M8 & M10 für 16 - 125 mm | M10 für 160 mm | M16 für 200 - 355 mm

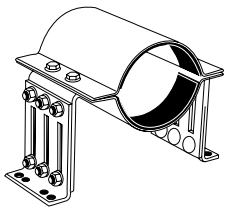
| Art.- Nr. | Für Rohrdimension | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **60520** | **20 mm** | 50 | 1 | |
| **60525** | **25 mm** | 50 | 1 | |
| **60532** | **32 mm** | 50 | 1 | |
| **60540** | **40 mm** | 50 | 1 | |
| **60550** | **50 mm** | 50 | 1 | |
| **60563** | **63 mm** | 25 | 1 | |
| **60575** | **75 mm** | 25 | 1 | |
| **60590** | **90 mm** | 25 | 1 | |
| **60594** | **110 mm** | 25 | 1 | |
| **60595** | **125 mm** | 25 | 1 | |
| **60597** | **160 mm** | 25 | 1 | |
| **60650** | **200 mm** | 1 | 1 | |
| **60654** | **250 mm** | 1 | 1 | |
| **60658** | **315 mm** | 1 | 1 | |
| **60660** | **355 mm** | 1 | 1 | |



## BEFESTIGUNGSSCHELLEN

geeignet für Festpunktmontage

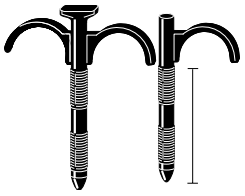
| Art.- Nr. | Für Rohrdimension | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **60768** | **160 mm** | 1 | 1 | |
| **60770** | **200 mm** | 1 | 1 | |
| **60774** | **250 mm** | 1 | 1 | |
| **60778** | **315 mm** | 1 | 1 | |
| **60780** | **355 mm** | 1 | 1 | |
| **60782** | **400 mm** | 1 | 1 | |
| **60784** | **450 mm** | 1 | 1 | |
| **60786** | **500 mm** | 1 | 1 | |
| **60788** | **560 mm** | 1 | 1 | |
| **60790** | **630 mm** | 1 | 1 | |



## ROHRBEFESTIGUNGSBÜGEL

für ø 20 - 32 mm Rohr einsetzbar

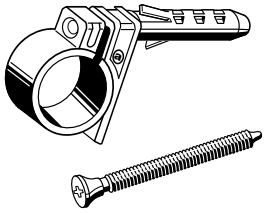
| Art.- Nr. | Für Rohrdimension | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **60604** | **1-fach - Länge = 45 mm** | 50 | 1 | |
| **60606** | **1-fach - Länge = 75 mm** | 50 | 1 | |
| **60608** | **2-fach - Länge = 45 mm** | 50 | 1 | |
| **60610** | **2-fach - Länge = 75 mm** | 50 | 1 | |



## KUNSTSTOFF-BEFESTIGUNGSSCHELLEN

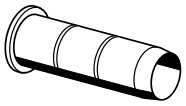
für ø 20 - 40 mm Rohr einsetzbar

| Art.- Nr. | Für Rohrdimension | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **60620** | **20 mm** | 50 | 1 | |
| **60625** | **25 mm** | 30 | 1 | |
| **60632** | **32 mm** | 30 | 1 | |
| **60640** | **40 mm** | 30 | 1 | |



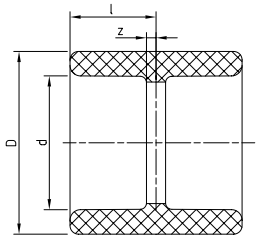
## ROHRSTÜTZHÜLSEN

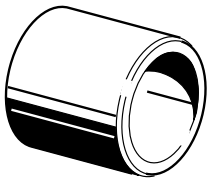
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **85110** | für Rohre ø 16 x 2,2 mm - ø 11,4 mm | 10 | 1 | |
| **10186** | für Rohre ø 16 x 2,7 mm - ø 10,4 mm | 10 | 1 | |



## MUFFEN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

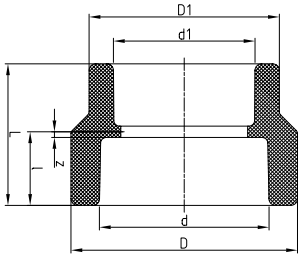


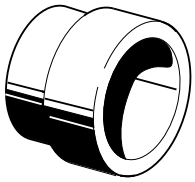



| SDR | Art.- Nr. | Durch-messer d [mm] | l | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 17,6 | **11008** | **20** | 16,00 | 1,50 | 29,50 | 0,011 | 10 | 1 | |
| | **11010** | **25** | 17,50 | 1,50 | 34,00 | 0,014 | 10 | 1 | |
| | **11012** | **32** | 20,25 | 2,25 | 43,00 | 0,026 | 5 | 1 | |
| | **11014** | **40** | 23,75 | 3,25 | 52,00 | 0,044 | 5 | 1 | |
| | **11016** | **50** | 26,50 | 3,00 | 68,00 | 0,084 | 5 | 1 | |
| | **11018** | **63** | 30,25 | 2,75 | 84,00 | 0,139 | 1 | 1 | |
| | **11020** | **75** | 33,25 | 3,25 | 100,00 | 0,226 | 1 | 1 | |
| | **11022** | **90** | 36,25 | 3,25 | 120,00 | 0,343 | 1 | 1 | |
| | **11024** | **110** | 41,00 | 4,00 | 147,00 | 0,583 | 1 | 1 | |
| | **11026** | **125** | 45,00 | 5,00 | 167,00 | 0,844 | 1 | 1 | |

## RED.- MUFFEN INNEN/INNEN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

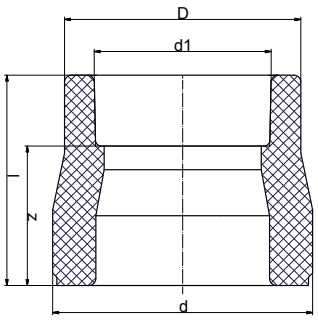


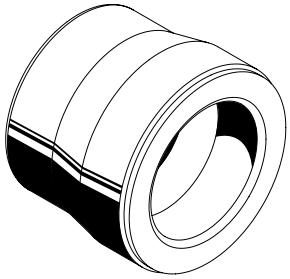



| SDR | Art.- Nr. | Durch-messer d [mm] | Durch-messer d1 [mm] | L | l | z | D | D1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 17,6 | beidseitig Muffenschweißverfahren | | | | | | | | | | | |
| | **11222** | **40** | **32,00** | 44,00 | 24,00 | 3,50 | 52,00 | 43,00 | 0,050 | 1 | 1 | |
| | **11228** | **50** | **32,00** | 47,00 | 26,50 | 3,00 | 68,00 | 43,00 | 0,093 | 1 | 1 | |
| | **11230** | **50** | **40,00** | 50,50 | 26,50 | 3,00 | 68,00 | 52,00 | 0,098 | 1 | 1 | |
| | **11236** | **63** | **40,00** | 54,00 | 30,50 | 3,00 | 84,00 | 52,00 | 0,163 | 1 | 1 | |
| | **11238** | **63** | **50,00** | 56,00 | 30,00 | 2,50 | 84,00 | 68,00 | 0,171 | 1 | 1 | |
| | **11240** | **75** | **50,00** | 60,00 | 33,50 | 3,50 | 100,00 | 68,00 | 0,258 | 1 | 1 | |
| | **11242** | **75** | **63,00** | 62,50 | 32,50 | 2,50 | 100,00 | 84,00 | 0,268 | 1 | 1 | |
| | **11252** | **90** | **63,00** | 66,50 | 36,50 | 3,50 | 120,00 | 84,00 | 0,414 | 1 | 1 | |
| | **11253** | **90** | **75,00** | 69,00 | 36,00 | 3,00 | 120,00 | 100,00 | 0,430 | 1 | 1 | |
| | **11257** | **110** | **75,00** | 74,50 | 41,00 | 4,00 | 147,00 | 100,00 | 0,733 | 1 | 1 | |
| | **11259** | **110** | **90,00** | 77,50 | 41,00 | 4,00 | 147,00 | 120,00 | 0,729 | 1 | 1 | |
| | **11263** | **125** | **90,00** | 83,00 | 46,00 | 6,00 | 167,00 | 120,00 | 1,075 | 1 | 1 | |
| | **11265** | **125** | **110,00** | 87,00 | 46,00 | 6,00 | 167,00 | 147,00 | 1,090 | 1 | 1 | |

## REDUZIERSTÜCKE MUFFENSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

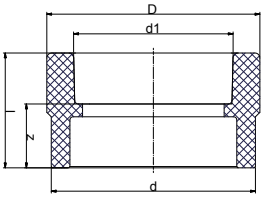


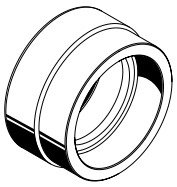



| SDR | Art.- Nr. | Durch-messer d [mm] | Durch-messer d1 [mm] | l | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| | beidseitig Muffenschweißverfahren | | | | | | | | | |
| | **11112** | **25** | **20,00** | 38,50 | 24,00 | 29,50 | 0,012 | 10 | 1 | |
| | **11114** | **32** | **20,00** | 37,50 | 23,00 | 29,50 | 0,015 | 5 | 1 | |
| | **11116** | **32** | **25,00** | 38,00 | 22,00 | 34,00 | 0,016 | 5 | 1 | |
| | **11118** | **40** | **20,00** | 45,00 | 30,50 | 29,50 | 0,025 | 5 | 1 | |
| | **11120** | **40** | **25,00** | 50,00 | 34,00 | 34,00 | 0,028 | 5 | 1 | |
| | **11122** | **40** | **32,00** | 50,00 | 32,00 | 43,00 | 0,032 | 5 | 1 | |
| | **11124** | **50** | **20,00** | 55,00 | 40,50 | 29,50 | 0,045 | 5 | 1 | |
| | **11126** | **50** | **25,00** | 55,00 | 39,00 | 34,00 | 0,044 | 5 | 1 | |
| | **11128** | **50** | **32,00** | 54,00 | 36,00 | 43,00 | 0,048 | 5 | 1 | |
| | **11130** | **50** | **40,00** | 52,50 | 32,00 | 52,00 | 0,053 | 5 | 1 | |
| | **11131** | **63** | **20,00** | 65,00 | 50,50 | 29,50 | 0,073 | 1 | 1 | |
| | **11132** | **63** | **25,00** | 65,00 | 49,00 | 34,00 | 0,071 | 1 | 1 | |
| | **11134** | **63** | **32,00** | 62,00 | 44,00 | 43,00 | 0,076 | 1 | 1 | |
| 6 | **11136** | **63** | **40,00** | 65,00 | 44,50 | 52,00 | 0,089 | 1 | 1 | |
| 7,4 | **11138** | **63** | **50,00** | 63,50 | 40,00 | 68,00 | 0,107 | 1 | 1 | |
| 9 | **11139** | **75** | **40,00** | 69,50 | 49,00 | 52,00 | 0,130 | 1 | 1 | |
| 11 | **11140** | **75** | **50,00** | 63,00 | 39,50 | 68,00 | 0,141 | 1 | 1 | |
| 17,6 | **11142** | **75** | **63,00** | 71,00 | 43,50 | 84,00 | 0,171 | 1 | 1 | |
| | **11143** | **75** | **20,00** | 65,50 | 51,00 | 34,50 | 0,115 | 1 | 1 | |
| | **11144** | **75** | **25,00** | 65,50 | 49,50 | 34,50 | 0,109 | 1 | 1 | |
| | **11145** | **75** | **32,00** | 69,50 | 51,50 | 52,00 | 0,140 | 1 | 1 | |
| | **11151** | **90** | **50,00** | 75,00 | 51,50 | 68,00 | 0,196 | 1 | 1 | |
| | **11152** | **90** | **63,00** | 78,00 | 50,50 | 84,00 | 0,226 | 1 | 1 | |
| | **11153** | **90** | **75,00** | 81,50 | 51,50 | 100,00 | 0,272 | 1 | 1 | |
| | **11155** | **110** | **63,00** | 86,00 | 58,50 | 84,00 | 0,356 | 1 | 1 | |
| | **11157** | **110** | **75,00** | 89,00 | 59,00 | 100,00 | 0,383 | 1 | 1 | |
| | **11159** | **110** | **90,00** | 99,00 | 66,00 | 120,00 | 0,502 | 1 | 1 | |
| | **11161** | **125** | **75,00** | 101,00 | 71,00 | 100,00 | 0,528 | 1 | 1 | |
| | **11163** | **125** | **90,00** | 99,00 | 66,00 | 120,00 | 0,588 | 1 | 1 | |
| | **11165** | **125** | **110,00** | 112,00 | 75,00 | 147,00 | 0,833 | 1 | 1 | |

## REDUZIERSTÜCKE MUFFEN- & STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

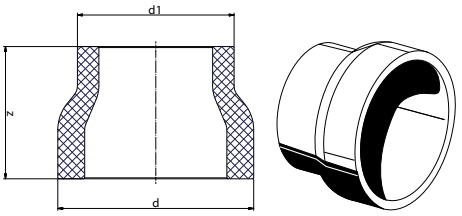


| SDR | Art.- Nr. | Durch-messer d [mm] | Durch-messer d1 [mm] | l | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| | einseitig Muffenschweißverfahren, anderseitig Stumpfschweißverfahren | | | | | | | | | |
| | **11175** | **160** | **110,00** | 90,00 | 53,00 | 147,00 | 0,595 | 1 | 1 | |
| 11 | **11177** | **160** | **125,00** | 90,00 | 50,00 | 167,00 | 0,705 | 1 | 1 | |
| | **11183** | **200** | **125,00** | 135,00 | 95,00 | 167,00 | 1,358 | 1 | 1 | |
| | | | | | | | | | | |
| | **2511174** | **160** | **110,00** | 90,00 | 53,00 | 147,00 | | 1 | 11 | |
| 17,6 | **2511176** | **160** | **125,00** | 90,00 | 50,00 | 167,00 | 0,628 | 1 | 11 | |
| | **2511182** | **200** | **125,00** | 135,00 | 95,00 | 167,00 | 1,055 | 1 | 11 | |

## REDUZIERSTÜCKE STUMPFSCHWEISSVERFAHREN

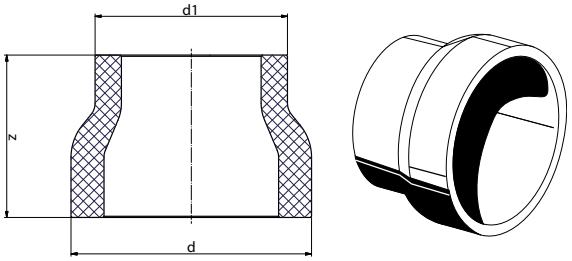
Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün




| SDR | Art.- Nr. | Durch-messer d [mm] | Durch-messer d1 [mm] | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|
| beidseitig Stumpfschweißverfahren | | | | | | | | |
| 11 | **11185** | **200** | **160,00** | 135,00 | 1,163 | 1 | 1 | |
| | **11189** | **250** | **160,00** | 172,50 | 3,472 | 1 | 1 | |
| | **11191** | **250** | **200,00** | 172,50 | 2,341 | 1 | 1 | |
| | **11193** | **315** | **200,00** | 225,00 | 3,412 | 1 | 1 | |
| | **11195** | **315** | **250,00** | 233,00 | 4,650 | 1 | 1 | |
| | **11197** | **355** | **250,00** | 245,00 | 3,940 | 1 | 1 | |
| | **11199** | **355** | **315,00** | 160,00 | 4,344 | 1 | 1 | |
| | **11201** | **400** | **250,00** | 260,00 | | 1 | 1 | |
| | **11203** | **400** | **315,00** | 260,00 | | 1 | 1 | |
| | **11204** | **400** | **355,00** | 260,00 | | 1 | 1 | |
| | **11206** | **450** | **315,00** | 230,00 | | 1 | 1 | |
| | **11207** | **450** | **355,00** | 230,00 | | 1 | 1 | |
| | **11208** | **450** | **400,00** | 230,00 | | 1 | 1 | |

## REDUZIERSTÜCKE STUMPFSCHWEISSVERFAHREN

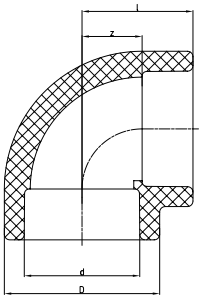
Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

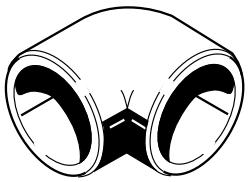



| SDR | Art.- Nr. | Durch-messer d [mm] | Durch-messer d1 [mm] | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|
| beidseitig Stumpfschweißverfahren | | | | | | | | |
| 17,6 | **2511184** | **200** | **160,00** | 135,00 | 0,786 | 1 | 11 | |
| | **2511188** | **250** | **160,00** | 172,50 | 1,500 | 1 | 11 | |
| | **2511190** | **250** | **200,00** | 172,50 | 1,338 | 1 | 11 | |
| | **2511193** | **315** | **200,00** | 225,00 | | 1 | 11 | |
| | **2511195** | **315** | **250,00** | 225,00 | | 1 | 11 | |
| | **2511197** | **355** | **250,00** | 245,00 | 3,099 | 1 | 11 | |
| | **2511199** | **355** | **315,00** | 160,00 | 3,108 | 1 | 11 | |
| | **2511201** | **400** | **250,00** | 260,00 | 4,482 | 1 | 11 | |
| | **2511203** | **400** | **315,00** | 260,00 | 3,366 | 1 | 11 | |
| | **2511204** | **400** | **355,00** | 260,00 | 2,982 | 1 | 11 | |
| | **2511206** | **450** | **315,00** | 230,00 | 4,891 | 1 | 11 | |
| | **2511207** | **450** | **355,00** | 230,00 | 4,688 | 1 | 11 | |
| | **2511208** | **450** | **400,00** | 230,00 | 4,287 | 1 | 11 | |
| | **2511209** | **500** | **315,00** | 230,00 | 8,100 | 1 | 11 | |
| | **2511210** | **500** | **355,00** | 230,00 | 6,500 | 1 | 11 | |
| | **2511211** | **500** | **400,00** | 230,00 | 6,700 | 1 | 11 | |
| | **2511212** | **500** | **450,00** | 230,00 | 5,500 | 1 | 11 | |
| | **2511213** | **560** | **400,00** | 230,00 | 9,000 | 1 | 11 | |
| | **2511214** | **560** | **450,00** | 200,00 | 8,600 | 1 | 11 | |
| | **2511215** | **560** | **500,00** | 200,00 | 7,600 | 1 | 11 | |
| | **2511216** | **630** | **400,00** | 230,00 | 15,100 | 1 | 11 | |
| | **2511217** | **630** | **450,00** | 200,00 | 13,700 | 1 | 11 | |
| | **2511218** | **630** | **500,00** | 200,00 | 11,000 | 1 | 11 | |
| | **2511219** | **630** | **560,00** | 200,00 | 9,000 | 1 | 11 | |

## WINKEL 90° MUFFENSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



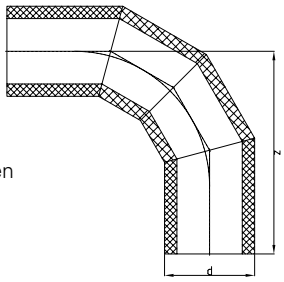



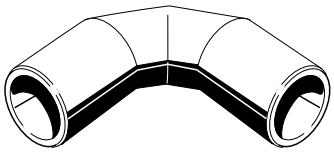
| SDR | Art.- Nr. | Durch-messer d [mm] | z | l | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | |
| | **12108** | **20** | 11,00 | 25,50 | 29,50 | 0,018 | 10 | 1 | |
| | **12110** | **25** | 13,50 | 29,50 | 34,00 | 0,023 | 10 | 1 | |
| | **12112** | **32** | 17,00 | 35,00 | 43,00 | 0,043 | 5 | 1 | |
| 6 | **12114** | **40** | 21,00 | 41,50 | 52,00 | 0,071 | 5 | 1 | |
| 7,4 | **12116** | **50** | 26,00 | 49,50 | 68,00 | 0,163 | 5 | 1 | |
| 9 | **12118** | **63** | 32,50 | 60,00 | 84,00 | 0,290 | 1 | 1 | |
| 11 | **12120** | **75** | 38,50 | 68,50 | 100,00 | 0,446 | 1 | 1 | |
| 17,6 | **12122** | **90** | 46,00 | 79,00 | 120,00 | 0,743 | 1 | 1 | |
| | **12124** | **110** | 56,00 | 93,00 | 147,00 | 1,282 | 1 | 1 | |
| | **12126** | **125** | 76,50 | 116,50 | 167,00 | 2,006 | 1 | 1 | |

## WINKEL 90° STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874

Hinweis: Elektroschweißmuffen nicht bei 160mm-Formteilen einsetzbar

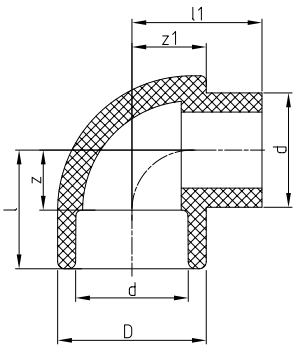


| SDR | Art.- Nr. | Durch-messer d [mm] | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|
| | Stumpfschweißverfahren | | | | | | |
| 11 | **12131** | **160** | 145,00 | 1,912 | 1 | 1 | |
| [1] Mechanisch stabilisiert durch Fasergemisch, welches als mittlere Schicht im Werkstoff fusiolen® PP-R eingebracht ist. | | | | | | | |
| | **2012135** | **200** | 450,00 | 8,014 | 1 | 11 | |
| | **2012139** | **250** | 625,00 | 18,000 | 1 | 11 | |
| | **2012143** | **315** | 773,00 | 37,300 | 1 | 11 | |
| 11 | **2012145** | **355** | 833,00 | 26,650 | 1 | 11 | |
| | **2012147** | **400** | 900,00 | 74,500 | 1 | 11 | |
| | **2012149** | **450** | 975,00 | | 1 | 11 | |
| | | | | | | | |
| | **2512130** | **160** | 390,00 | 3,200 | 1 | 11 | |
| | **2512134** | **200** | 450,00 | | 1 | 11 | |
| | **2512138** | **250** | 625,00 | | 1 | 11 | |
| | **2512142** | **315** | 773,00 | 24,000 | 1 | 11 | |
| | **2512144** | **355** | 833,00 | 32,000 | 1 | 11 | |
| 17,6 | **2512146** | **400** | 900,00 | | 1 | 11 | |
| | **2512148** | **450** | 975,00 | | 1 | 11 | |
| | **2512150** | **500** | 1100,00 | | 1 | 11 | |
| | **2512152** | **560** | 1190,00 | | 1 | 11 | |
| | **2512154** | **630** | 1295,00 | | 1 | 11 | |

## WINKEL 90° INNEN AUSSEN

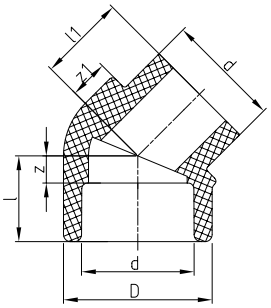
Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

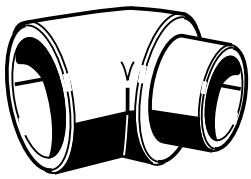



| SDR | Art.- Nr. | Durch-messer d [mm] | z | l | D | l1 | z1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | |
| | **12308** | **20** | 11,00 | 25,50 | 29,50 | 25,50 | 15,00 | 0,017 | 10 | 1 | |
| | **12310** | **25** | 13,50 | 29,50 | 34,00 | 29,50 | 17,00 | 0,023 | 10 | 1 | |
| | **12312** | **32** | 17,00 | 35,00 | 43,00 | 39,00 | 21,50 | 0,047 | 5 | 1 | |
| | **12314** | **40** | 21,00 | 41,50 | 52,00 | 45,50 | 26,00 | 0,080 | 5 | 1 | |

## WINKEL 45° INNEN AUSSEN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

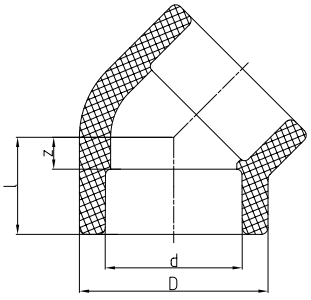


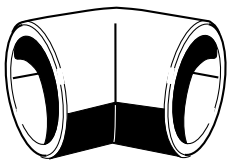



| SDR | Art.- Nr. | Durch-messer d [mm] | z | l | D | l1 | z1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | |
| | **12708** | **20** | 5,00 | 19,50 | 29,50 | 19,50 | 9,00 | 0,013 | 10 | 1 | |
| | **12710** | **25** | 6,00 | 22,00 | 34,00 | 22,00 | 8,50 | 0,017 | 10 | 1 | |
| | **12712** | **32** | 7,50 | 25,50 | 43,00 | 28,50 | 11,50 | 0,036 | 5 | 1 | |
| | **12714** | **40** | 9,50 | 30,00 | 52,00 | 30,50 | 13,50 | 0,057 | 5 | 1 | |

## WINKEL 45° MUFFENSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



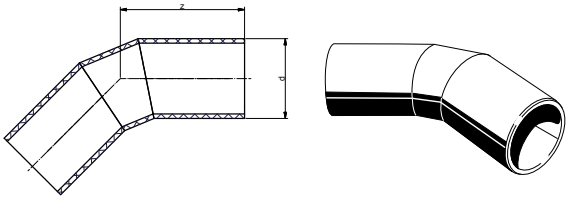
| SDR | Art.- Nr. | Durch-messer d [mm] | z | l | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 17,6 | Muffenschweißverfahren | | | | | | | | |
| | **12508** | **20** | 5,00 | 19,50 | 29,50 | 0,014 | 10 | 1 | |
| | **12510** | **25** | 6,00 | 22,00 | 34,00 | 0,018 | 10 | 1 | |
| | **12512** | **32** | 7,50 | 25,50 | 43,00 | 0,035 | 5 | 1 | |
| | **12514** | **40** | 9,50 | 30,00 | 52,00 | 0,053 | 5 | 1 | |
| | **12516** | **50** | 11,50 | 35,00 | 68,00 | 0,113 | 5 | 1 | |
| | **12518** | **63** | 14,00 | 41,50 | 84,00 | 0,226 | 1 | 1 | |
| | **12520** | **75** | 16,50 | 46,50 | 100,00 | 0,350 | 1 | 1 | |
| | **12522** | **90** | 19,50 | 52,50 | 120,00 | 0,571 | 1 | 1 | |
| | **12524** | **110** | 23,50 | 60,50 | 147,00 | 1,022 | 1 | 1 | |
| | **12526** | **125** | 27,00 | 67,00 | 167,00 | 1,309 | 1 | 1 | |

## WINKEL 45° STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R & PP-RP

Standard: DIN 16962, DIN EN ISO 15874

Hinweis: Elektroschweißmuffen nicht bei 160mm-Formteilen einsetzbar



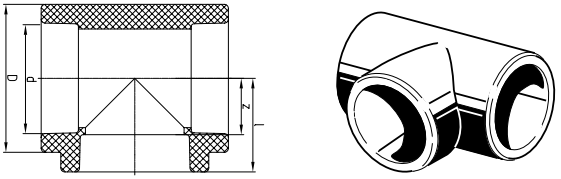

| SDR | Art.- Nr. | Durchmesser d [mm] | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|
| Stumpfschweißverfahren | | | | | | | |
| 11 | **12531** | **160** | 95,00 | 1,380 | 1 | 1 | |
| | | | | | | | |
| 11 | **2012535** | **200** | 274,00 | 6,865 | 1 | 11 | |
| | **2012539** | **250** | 412,00 | 16,000 | 1 | 11 | |
| | **2012543** | **315** | 517,00 | 27,100 | 1 | 11 | |
| | **2012545** | **355** | 520,00 | 42,000 | 1 | 11 | |
| | **2012547** | **400** | 548,00 | | 1 | 11 | |
| | **2012549** | **450** | 580,00 | | 1 | 11 | |
| | | | | | | | |
| 17,6 | **2512530** | **160** | 249,00 | 1,730 | 1 | 11 | |
| | **2512534** | **200** | 274,00 | | 1 | 11 | |
| | **2512538** | **250** | 412,00 | 9,400 | 1 | 11 | |
| | **2512542** | **315** | 498,00 | 18,000 | 1 | 11 | |
| | **2512544** | **355** | 520,00 | | 1 | 11 | |
| | **2512546** | **400** | 548,00 | 30,800 | 1 | 11 | |
| | **2512548** | **450** | 580,00 | | 1 | 11 | |
| | **2512550** | **500** | 665,00 | | 1 | 11 | |
| | **2512552** | **560** | 698,00 | | 1 | 11 | |
| | **2512554** | **630** | 741,00 | | 1 | 11 | |

## T- STÜCKE MUFFENSCHWEISSVERFAHREN

Material: Fusiolen® PP-R

Standard: DIN 16962, DIN EN ISO 15874

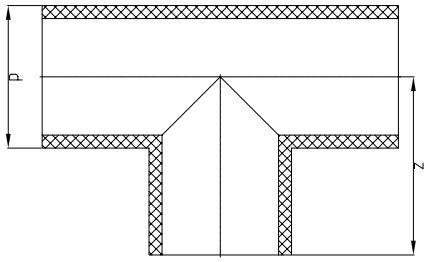
Farbe: grün

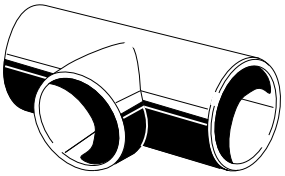



| SDR | Art.- Nr. | Durch-messer d [mm] | z | l | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| 7,4<br>11<br>17,6 | Muffenschweißverfahren | | | | | | | | |
| | **13108** | **20** | 11,00 | 25,50 | 29,50 | 0,022 | 10 | 1 | |
| | **13110** | **25** | 15,00 | 31,00 | 34,00 | 0,033 | 10 | 1 | |
| | **13112** | **32** | 17,00 | 35,00 | 43,00 | 0,054 | 5 | 1 | |
| | **13114** | **40** | 20,00 | 40,50 | 52,00 | 0,099 | 5 | 1 | |
| | **13116** | **50** | 26,00 | 49,50 | 68,00 | 0,175 | 5 | 1 | |
| | **13118** | **63** | 32,50 | 60,00 | 84,00 | 0,371 | 1 | 1 | |
| | **13120** | **75** | 38,50 | 68,50 | 100,00 | 0,540 | 1 | 1 | |
| | **13122** | **90** | 46,00 | 79,00 | 120,00 | 0,924 | 1 | 1 | |
| | **13124** | **110** | 56,00 | 93,00 | 147,00 | 1,611 | 1 | 1 | |
| | **13126** | **125** | 76,50 | 116,50 | 167,00 | 2,655 | 1 | 1 | |

## T- STÜCKE STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874
Hinweis: Elektroschweißmuffen nicht bei 160mm-Formteilen einsetzbar

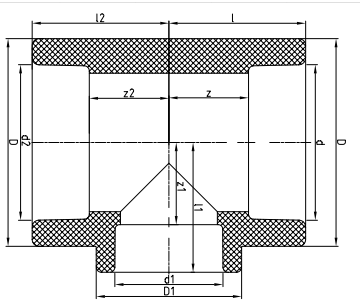


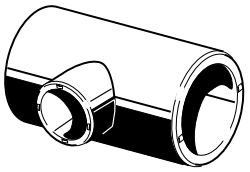



| SDR | Art.- Nr. | Durch-messer d [mm] | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|
| Stumpfschweißverfahren | | | | | | | |
| 11 | **13131** | **160** | 145,00 | 2,791 | 1 | 1 | |
| | | | | | | | |
| 11 | **2013135** | **200** | 250,00 | 6,865 | 1 | 11 | |
| | **2013139** | **250** | 375,00 | 16,000 | 1 | 11 | |
| | **2013143** | **315** | 460,00 | 20,450 | 1 | 11 | |
| | **2013145** | **355** | 480,00 | 42,000 | 1 | 11 | |
| | **2013147** | **400** | 500,00 | | 1 | 11 | |
| | **2013149** | **450** | 525,00 | | 1 | 11 | |
| | | | | | | | |
| 17,6 | **2513130** | **160** | 145,00 | 2,716 | 1 | 11 | |
| | **2513134** | **200** | 250,00 | | 1 | 11 | |
| | **2513138** | **250** | 375,00 | 11,500 | 1 | 11 | |
| | **2513142** | **315** | 460,00 | 22,000 | 1 | 11 | |
| | **2513144** | **355** | 480,00 | 27,500 | 1 | 11 | |
| | **2513146** | **400** | 500,00 | | 1 | 11 | |
| | **2513148** | **450** | 525,00 | | 1 | 11 | |
| | **2513150** | **500** | 600,00 | | 1 | 11 | |
| | **2513152** | **560** | 630,00 | | 1 | 11 | |
| | **2513154** | **630** | 665,00 | | 1 | 11 | |

## RED.- T- STÜCKE MUFFENSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



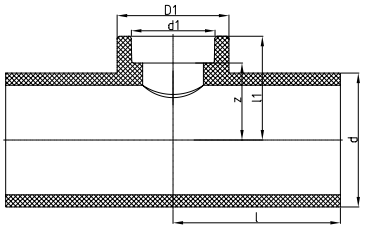



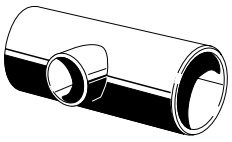
| SDR | Art.- Nr. | d | d1 | d2 | l | l1 | l2 | z | z1 | z2 | D | D1 | Ge-wicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | | | | | | | |
| | **13511** | **20** | **25,00** | **20,00** | 31,00 | 30,50 | 31,00 | 16,50 | 14,50 | 16,50 | 34,00 | 34,00 | 0,040 | 10 | 1 | |
| | **13520** | **25** | **20,00** | **20,00** | 31,00 | 30,50 | 31,00 | 15,00 | 16,00 | 16,50 | 34,00 | 34,00 | 0,039 | 10 | 1 | |
| | **13522** | **25** | **20,00** | **25,00** | 31,00 | 30,50 | 31,00 | 15,00 | 16,00 | 15,00 | 34,00 | 34,00 | 0,036 | 10 | 1 | |
| | **13528** | **32** | **16,00** | **32,00** | 35,00 | 31,00 | 35,00 | 17,00 | 18,00 | 17,00 | 43,00 | 29,50 | 0,053 | 5 | 1 | |
| | **13532** | **32** | **20,00** | **20,00** | 36,50 | 37,00 | 36,50 | 18,75 | 22,50 | 22,25 | 43,00 | 43,00 | 0,075 | 5 | 1 | |
| | **13534** | **32** | **20,00** | **32,00** | 35,00 | 31,00 | 35,00 | 17,00 | 16,50 | 17,00 | 43,00 | 29,50 | 0,049 | 5 | 1 | |
| | **13538** | **32** | **25,00** | **25,00** | 35,00 | 34,50 | 35,00 | 17,00 | 18,50 | 15,00 | 43,00 | 43,00 | 0,069 | 5 | 1 | |
| | **13540** | **32** | **25,00** | **32,00** | 35,00 | 34,50 | 35,00 | 17,00 | 18,50 | 17,00 | 43,00 | 43,00 | 0,050 | 5 | 1 | |
| | **13542** | **40** | **20,00** | **40,00** | 41,50 | 36,00 | 41,50 | 21,00 | 21,50 | 21,00 | 52,00 | 34,00 | 0,091 | 5 | 1 | |
| | **13544** | **40** | **25,00** | **40,00** | 41,50 | 36,00 | 41,50 | 21,00 | 20,00 | 21,00 | 52,00 | 34,00 | 0,090 | 5 | 1 | |
| | **13546** | **40** | **32,00** | **40,00** | 42,00 | 40,50 | 42,00 | 21,50 | 22,50 | 21,50 | 52,00 | 52,00 | 0,092 | 5 | 1 | |
| | **13547** | **50** | **20,00** | **50,00** | 49,50 | 40,50 | 49,50 | 26,00 | 26,00 | 26,00 | 68,00 | 29,50 | 0,161 | 5 | 1 | |
| | **13548** | **50** | **25,00** | **50,00** | 49,50 | 44,50 | 49,50 | 26,00 | 28,50 | 26,00 | 68,00 | 43,00 | 0,158 | 5 | 1 | |
| | **13550** | **50** | **32,00** | **50,00** | 49,50 | 44,50 | 49,50 | 26,00 | 26,50 | 26,00 | 68,00 | 43,00 | 0,159 | 5 | 1 | |
| | **13551** | **50** | **40,00** | **50,00** | 49,50 | 49,50 | 49,50 | 26,00 | 29,00 | 26,00 | 68,00 | 68,00 | 0,161 | 5 | 1 | |
| | **13552** | **63** | **20,00** | **63,00** | 60,00 | 48,50 | 60,00 | 32,50 | 34,00 | 32,50 | 84,00 | 34,00 | 0,334 | 1 | 1 | |
| | **13554** | **63** | **25,00** | **63,00** | 60,00 | 48,50 | 60,00 | 32,50 | 32,50 | 32,50 | 84,00 | 34,00 | 0,329 | 1 | 1 | |
| 7,4<br>11<br>17,6 | **13556** | **63** | **32,00** | **63,00** | 60,00 | 53,50 | 60,00 | 32,50 | 35,50 | 32,50 | 84,00 | 52,00 | 0,342 | 1 | 1 | |
| | **13558** | **63** | **40,00** | **63,00** | 60,00 | 53,50 | 60,00 | 32,50 | 33,00 | 32,50 | 84,00 | 52,00 | 0,333 | 1 | 1 | |
| | **13560** | **63** | **50,00** | **63,00** | 60,00 | 60,00 | 60,00 | 32,50 | 36,50 | 32,50 | 84,00 | 84,00 | 0,402 | 1 | 1 | |
| | **13561** | **75** | **20,00** | **75,00** | 68,50 | 54,50 | 68,50 | 38,50 | 40,00 | 38,50 | 100,00 | 34,00 | 0,501 | 1 | 1 | |
| | **13562** | **75** | **25,00** | **75,00** | 68,50 | 54,50 | 68,50 | 38,50 | 38,50 | 38,50 | 100,00 | 34,00 | 0,497 | 1 | 1 | |
| | **13564** | **75** | **32,00** | **75,00** | 68,50 | 59,00 | 68,50 | 38,50 | 41,00 | 38,50 | 100,00 | 52,00 | 0,506 | 1 | 1 | |
| | **13566** | **75** | **40,00** | **75,00** | 68,50 | 59,00 | 68,50 | 38,50 | 38,50 | 38,50 | 100,00 | 52,00 | 0,496 | 1 | 1 | |
| | **13568** | **75** | **50,00** | **75,00** | 68,50 | 66,00 | 68,50 | 38,50 | 42,50 | 38,50 | 100,00 | 84,00 | 0,553 | 1 | 1 | |
| | **13570** | **75** | **63,00** | **75,00** | 68,50 | 66,00 | 68,50 | 38,50 | 38,50 | 38,50 | 100,00 | 84,00 | 0,518 | 1 | 1 | |
| | **13576** [1)] | **90** | **32,00** | **90,00** | 79,00 | 65,00 | 79,00 | 46,00 | 47,00 | 46,00 | 120,00 | 52,00 | 0,882 | 1 | 1 | |
| | **13578** [1)] | **90** | **40,00** | **90,00** | 79,00 | 65,00 | 79,00 | 46,00 | 44,50 | 46,00 | 120,00 | 52,00 | 0,870 | 1 | 1 | |
| | **13580** [1)] | **90** | **50,00** | **90,00** | 79,00 | 75,00 | 79,00 | 46,00 | 51,50 | 46,00 | 120,00 | 84,00 | 0,908 | 1 | 1 | |
| | **13582** [1)] | **90** | **63,00** | **90,00** | 79,00 | 75,00 | 79,00 | 46,00 | 47,50 | 46,00 | 120,00 | 84,00 | 0,874 | 1 | 1 | |
| | **13584** [1)] | **90** | **75,00** | **90,00** | 79,00 | 81,00 | 79,00 | 46,00 | 51,00 | 46,00 | 120,00 | 120,00 | 0,993 | 1 | 1 | |
| | **13586** [1)] | **110** | **63,00** | **110,00** | 93,00 | 87,50 | 93,00 | 56,00 | 60,00 | 56,00 | 147,00 | 100,00 | 1,567 | 1 | 1 | |
| | **13588** [1)] | **110** | **75,00** | **110,00** | 93,00 | 87,50 | 93,00 | 56,00 | 57,50 | 56,00 | 147,00 | 100,00 | 1,501 | 1 | 1 | |
| | **13590** [1)] | **110** | **90,00** | **110,00** | 93,00 | 89,00 | 93,00 | 56,00 | 56,00 | 56,00 | 147,00 | 120,00 | 1,534 | 1 | 1 | |
| | **13592** [1)] | **125** | **75,00** | **125,00** | 116,50 | 106,50 | 116,50 | 76,50 | 76,50 | 76,50 | 167,00 | 100,00 | 2,421 | 1 | 1 | |
| | **13594** [1)] | **125** | **90,00** | **125,00** | 116,50 | 109,50 | 116,50 | 76,50 | 76,50 | 76,50 | 167,00 | 120,00 | 2,519 | 1 | 1 | |
| | **13596** [1)] | **125** | **110,00** | **125,00** | 116,50 | 113,50 | 116,50 | 76,50 | 76,50 | 76,50 | 167,00 | 147,00 | 2,563 | 1 | 1 | |

[1)] Mechanisch stabilisiert durch Fasergemisch, welches als mittlere Schicht im Werkstoff fusiolen® PP-R eingebracht ist.

## RED.- T- STÜCKE MUFFEN- & STUMPFSCHWEISSVERFAHREN

Standard: DIN 16962, DIN EN ISO 15874
Abgang: Muffenschweißverfahren

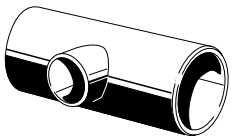


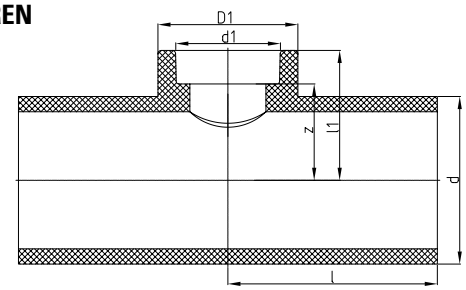



| SDR | Art.- Nr. | d | d1 | l | l1 | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Abgang: Muffenschweißverfahren | | | | | | | | | | |
| 11 | **13601** | **160** | **75,00** | 230,00 | 122,00 | 92,00 | 100,00 | 3,140 | 1 | 1 | |
| | **13603** | **160** | **90,00** | 230,00 | 125,00 | 92,00 | 120,00 | 3,176 | 1 | 1 | |

## aquatherm blue pipe RED.- T- STÜCKE MUFFEN- & STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: blau/grün
Abgang: Muffenschweißverfahren

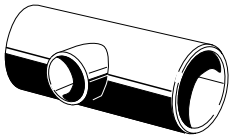


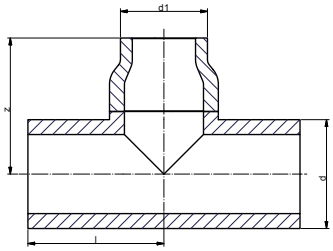



| SDR | Art.- Nr. | d | d1 | l | l1 | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Abgang: Muffenschweißverfahren | | | | | | | | | | |
| | **2013609** | **200** | **75,00** | 250,00 | 142,00 | 112,00 | 100,00 | | 1 | 11 | |
| | **2013611** | **200** | **90,00** | 250,00 | 145,00 | 112,00 | 120,00 | | 1 | 11 | |
| | **2013613** | **200** | **110,00** | 250,00 | 149,00 | 112,00 | 147,00 | | 1 | 11 | |
| | **2013615** | **200** | **125,00** | 250,00 | 155,00 | 115,00 | 167,00 | | 1 | 11 | |
| | **2013625** | **250** | **75,00** | 375,00 | 167,00 | 137,00 | 100,00 | | 1 | 11 | |
| 11 | **2013627** | **250** | **90,00** | 375,00 | 170,00 | 137,00 | 120,00 | | 1 | 11 | |
| | **2013629** | **250** | **110,00** | 375,00 | 174,00 | 137,00 | 147,00 | | 1 | 11 | |
| | **2013631** | **250** | **125,00** | 375,00 | 180,00 | 140,00 | 167,00 | | 1 | 11 | |
| | **2013651** | **315** | **125,00** | 460,00 | 213,00 | 173,00 | 167,00 | 25,000 | 1 | 11 | |
| | **2013663** | **355** | **125,00** | 480,00 | 233,00 | 193,00 | 167,00 | | 1 | 11 | |
| | **2013676** | **400** | **125,00** | 500,00 | 255,00 | 215,00 | 167,00 | | 1 | 11 | |
| | **2013690** | **450** | **125,00** | 525,00 | 280,00 | 240,00 | 167,00 | | 1 | 11 | |

## aquatherm blue pipe RED.- T- STÜCKE STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: blau/grün
Abgang: Stumpfschweißverfahren

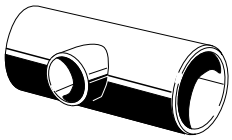


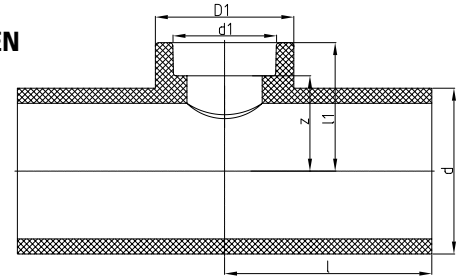



| SDR | Art.- Nr. | d | d1 | l | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| | Abgang: Stumpfschweißverfahren | | | | | | | | |
| | **2013619** | **200** | **160,00** | 250,00 | 250,00 | | 1 | 11 | |
| | **2013635** | **250** | **160,00** | 375,00 | 682,00 | | 1 | 11 | |
| | **2013641** | **250** | **200,00** | 375,00 | 548,00 | | 1 | 11 | |
| | **2013653** | **315** | **160,00** | 460,00 | 238,00 | 25,000 | 1 | 11 | |
| | **2013655** | **315** | **200,00** | 460,00 | 460,00 | | 1 | 11 | |
| | **2013657** | **315** | **250,00** | 460,00 | 460,00 | | 1 | 11 | |
| | **2013665** | **355** | **160,00** | 480,00 | 258,00 | | 1 | 11 | |
| | **2013667** | **355** | **200,00** | 480,00 | 268,00 | 30,200 | 1 | 11 | |
| | **2013669** | **355** | **250,00** | 480,00 | 480,00 | 40,000 | 1 | 11 | |
| 11 | **2013671** | **355** | **315,00** | 480,00 | 480,00 | 40,000 | 1 | 11 | |
| | **2013678** | **400** | **160,00** | 500,00 | 354,00 | | 1 | 11 | |
| | **2013680** | **400** | **200,00** | 500,00 | 318,00 | | 1 | 11 | |
| | **2013682** | **400** | **250,00** | 500,00 | 280,00 | 46,000 | 1 | 11 | |
| | **2013684** | **400** | **315,00** | 500,00 | 500,00 | | 1 | 11 | |
| | **2013685** | **400** | **355,00** | 500,00 | 500,00 | | 1 | 11 | |
| | **2013692** | **450** | **160,00** | 525,00 | 379,00 | | 1 | 11 | |
| | **2013694** | **450** | **200,00** | 525,00 | 343,00 | | 1 | 11 | |
| | **2013696** | **450** | **250,00** | 525,00 | 305,00 | | 1 | 11 | |
| | **2013698** | **450** | **315,00** | 525,00 | 315,00 | | 1 | 11 | |
| | **2013699** | **450** | **355,00** | 525,00 | 525,00 | | 1 | 11 | |
| | **2013700** | **450** | **400,00** | 525,00 | 525,00 | | 1 | 11 | |

## aquatherm blue pipe RED.- T- STÜCKE MUFFEN- & STUMPFSCHWEISSVERFAHREN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: blau
Abgang: Muffenschweißverfahren

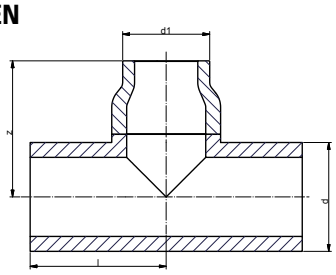


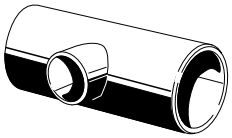



| SDR | Art.- Nr. | d | d1 | l | l1 | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17,6 | Abgang: Muffenschweißverfahren | | | | | | | | | | |
| | **2513600** | **160** | **75,00** | 230,00 | 122,00 | 92,00 | 100,00 | | 1 | 11 | |
| | **2513602** | **160** | **90,00** | 230,00 | 125,00 | 92,00 | 120,00 | | 1 | 11 | |
| | **2513608** | **200** | **75,00** | 250,00 | 142,00 | 112,00 | 100,00 | | 1 | 11 | |
| | **2513610** | **200** | **90,00** | 250,00 | 145,00 | 112,00 | 120,00 | | 1 | 11 | |
| | **2513612** | **200** | **110,00** | 250,00 | 149,00 | 112,00 | 147,00 | | 1 | 11 | |
| | **2513614** | **200** | **125,00** | 250,00 | 155,00 | 115,00 | 167,00 | | 1 | 11 | |
| | **2513624** | **250** | **75,00** | 375,00 | 167,00 | 137,00 | 100,00 | | 1 | 11 | |
| | **2513626** | **250** | **90,00** | 375,00 | 170,00 | 137,00 | 120,00 | | 1 | 11 | |
| | **2513628** | **250** | **110,00** | 375,00 | 174,00 | 137,00 | 147,00 | | 1 | 11 | |
| | **2513630** | **250** | **125,00** | 375,00 | 180,00 | 140,00 | 167,00 | | 1 | 11 | |
| | **2513651** | **315** | **125,00** | 460,00 | 213,00 | 173,00 | 167,00 | | 1 | 11 | |
| | **2513663** | **355** | **125,00** | 480,00 | 233,00 | 193,00 | 167,00 | 21,500 | 1 | 11 | |
| | **2513676** | **400** | **125,00** | 500,00 | 255,00 | 215,00 | 167,00 | | 1 | 11 | |
| | **2513690** | **450** | **125,00** | 525,00 | 280,00 | 240,00 | 167,00 | | 1 | 11 | |
| | **2513804** | **500** | **125,00** | 600,00 | 305,00 | 265,00 | 167,00 | | 1 | 11 | |
| | **2513821** | **560** | **125,00** | 630,00 | 335,00 | 295,00 | 167,00 | | 1 | 11 | |
| | **2513839** | **630** | **125,00** | 665,00 | 370,00 | 330,00 | 167,00 | | 1 | 11 | |

## aquatherm blue pipe RED.- T- STÜCKE STUMPFSCHWEISSVERFAHREN

Systeme: **aquatherm blue pipe**
Standard: DIN 16962, DIN EN ISO 15874
Farbe: blau
Abgang: Stumpfschweißverfahren

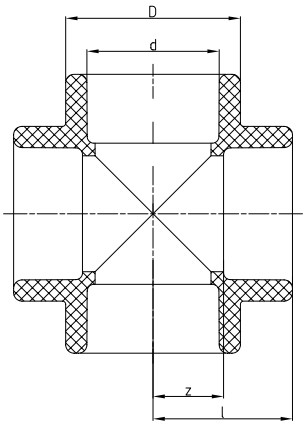


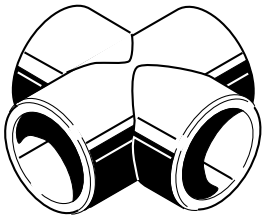



| SDR | Art.- Nr. | d | d1 | l | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| | Stumpfschweißverfahren | | | | | | | | |
| | **2513618** | **200** | **160,00** | 250,00 | 250,00 | | 1 | 11 | |
| | **2513634** | **250** | **160,00** | 375,00 | 375,00 | | 1 | 11 | |
| | **2513640** | **250** | **200,00** | 375,00 | 375,00 | | 1 | 11 | |
| | **2513653** | **315** | **160,00** | 460,00 | 238,00 | | 1 | 11 | |
| | **2513655** | **315** | **200,00** | 460,00 | 460,00 | | 1 | 11 | |
| | **2513657** | **315** | **250,00** | 460,00 | 460,00 | | 1 | 11 | |
| | **2513665** | **355** | **160,00** | 480,00 | 258,00 | 21,500 | 1 | 11 | |
| | **2513667** | **355** | **200,00** | 480,00 | 268,00 | | 1 | 11 | |
| | **2513669** | **355** | **250,00** | 480,00 | 480,00 | | 1 | 11 | |
| | **2513671** | **355** | **315,00** | 480,00 | 480,00 | | 1 | 11 | |
| | **2513678** | **400** | **160,00** | 500,00 | 354,00 | | 1 | 11 | |
| | **2513680** | **400** | **200,00** | 500,00 | 318,00 | | 1 | 11 | |
| | **2513682** | **400** | **250,00** | 500,00 | 280,00 | 29,000 | 1 | 11 | |
| | **2513684** | **400** | **315,00** | 500,00 | 500,00 | 35,800 | 1 | 11 | |
| | **2513685** | **400** | **355,00** | 500,00 | 500,00 | | 1 | 11 | |
| | **2513692** | **450** | **160,00** | 525,00 | 379,00 | | 1 | 11 | |
| | **2513694** | **450** | **200,00** | 525,00 | 343,00 | | 1 | 11 | |
| | **2513696** | **450** | **250,00** | 525,00 | 305,00 | | 1 | 11 | |
| | **2513698** | **450** | **315,00** | 525,00 | 315,00 | | 1 | 11 | |
| | **2513699** | **450** | **355,00** | 525,00 | 525,00 | | 1 | 11 | |
| | **2513700** | **450** | **400,00** | 525,00 | 525,00 | | 1 | 11 | |
| 17,6 | **2513806** | **500** | **160,00** | 600,00 | 404,00 | | 1 | 11 | |
| | **2513808** | **500** | **200,00** | 600,00 | 368,00 | | 1 | 11 | |
| | **2513810** | **500** | **250,00** | 600,00 | 330,00 | | 1 | 11 | |
| | **2513812** | **500** | **315,00** | 600,00 | 340,00 | | 1 | 11 | |
| | **2513813** | **500** | **355,00** | 600,00 | 600,00 | | 1 | 11 | |
| | **2513814** | **500** | **400,00** | 600,00 | 600,00 | | 1 | 11 | |
| | **2513815** | **500** | **450,00** | 600,00 | 600,00 | | 1 | 11 | |
| | **2513823** | **560** | **160,00** | 630,00 | 434,00 | | 1 | 11 | |
| | **2513825** | **560** | **200,00** | 630,00 | 398,00 | | 1 | 11 | |
| | **2513827** | **560** | **250,00** | 630,00 | 360,00 | | 1 | 11 | |
| | **2513829** | **560** | **315,00** | 630,00 | 370,00 | | 1 | 11 | |
| | **2513830** | **560** | **355** | | | | 1 | 11 | |
| | **2513831** | **560** | **400,00** | 630,00 | 630,00 | | 1 | 11 | |
| | **2513832** | **560** | **450,00** | 630,00 | 630,00 | | 1 | 11 | |
| | **2513833** | **560** | **500,00** | 630,00 | 630,00 | | 1 | 11 | |
| | **2513841** | **630** | **160,00** | 665,00 | 474,00 | | 1 | 11 | |
| | **2513843** | **630** | **200,00** | 665,00 | 438,00 | | 1 | 11 | |
| | **2513845** | **630** | **250,00** | 665,00 | 400,00 | | 1 | 11 | |
| | **2513847** | **630** | **315,00** | 665,00 | 405,00 | | 1 | 11 | |
| | **2513848** | **630** | **355** | | | | 1 | 11 | |
| | **2513849** | **630** | **400,00** | 665,00 | 665,00 | | 1 | 11 | |
| | **2513850** | **630** | **450,00** | 665,00 | 665,00 | | 1 | 11 | |
| | **2513851** | **630** | **500,00** | 665,00 | 665,00 | | 1 | 11 | |
| | **2513852** | **630** | **560,00** | 665,00 | 665,00 | | 1 | 11 | |

## KREUZSTÜCKE

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

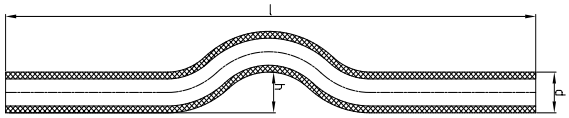


| SDR | Art.- Nr. | Durch-messer d [mm] | z | l | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | |
| | **13708** | **20** | 26,00 | 11,50 | 29,50 | 0,025 | 10 | 1 | |
| | **13710** | **25** | 29,50 | 13,50 | 34,00 | 0,035 | 10 | 1 | |
| | **13712** | **32** | 35,00 | 17,00 | 43,00 | 0,064 | 5 | 1 | |
| | **13714** | **40** | 41,50 | 21,00 | 52,00 | 0,099 | 5 | 1 | |

## ÜBERSPRINGBOGEN

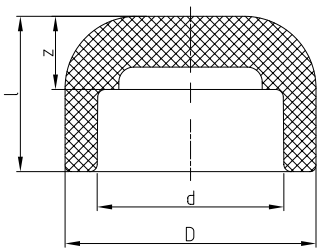
Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

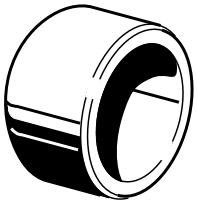


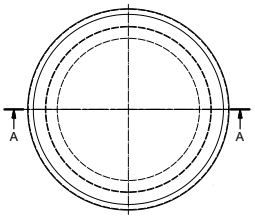
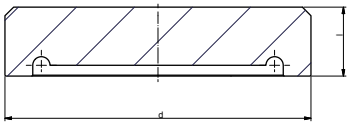
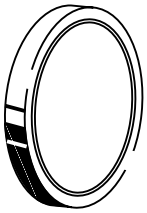

| SDR | Art.- Nr. | Durch-messer d [mm] | h | l | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | |
| | **16108** | **20** | 22,00 | 352,00 | 0,060 | 10 | 1 | |
| | **16110** | **25** | 25,00 | 352,00 | 0,091 | 10 | 1 | |
| | **16112** | **32** | 32,00 | 352,00 | 0,154 | 5 | 1 | |

## ENDKAPPEN

Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

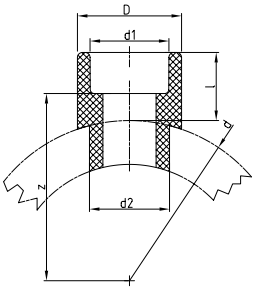


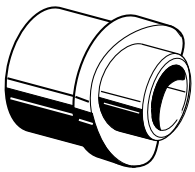



| SDR | Art.- Nr. | Durch-messer d [mm] | l | z | D | Gewicht [kg] | LE | PG | Preis m/St |
|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | |
| 7,4 11 | **14108** | **20** | 24,00 | 9,50 | 29,50 | 0,009 | 10 | 1 | |
| | **14110** | **25** | 24,00 | 8,00 | 34,00 | 0,011 | 10 | 1 | |
| | **14112** | **32** | 31,50 | 13,50 | 43,00 | 0,019 | 5 | 1 | |
| | **14114** | **40** | 38,00 | 17,50 | 52,00 | 0,043 | 5 | 1 | |
| | **14116** | **50** | 44,50 | 21,00 | 68,00 | 0,081 | 5 | 1 | |
| | **14118** | **63** | 52,00 | 24,50 | 84,00 | 0,144 | 1 | 1 | |
| | **14120** | **75** | 58,50 | 28,50 | 100,00 | 0,243 | 1 | 1 | |
| | **14122** | **90** | 57,50 | 34,50 | 120,00 | 0,368 | 1 | 1 | |
| | **14124** | **110** | 65,00 | 28,00 | 147,00 | 0,635 | 1 | 1 | |
| | **14126** | **125** | 70,00 | 30,00 | 167,00 | 0,862 | 1 | 1 | |
| | Stumpfschweißverfahren    | | | | | | | | |
| 11 | **14131** | **160** | 70,00 | | | 0,818 | 1 | 1 | |
| | **14135** | **200** | 80,00 | | | 1,070 | 1 | 1 | |
| | **14139** | **250** | 90,00 | | | 1,989 | 1 | 1 | |
| | **14143** | **315** | 270,00 | | | 6,200 | 1 | 1 | |
| | **14145** | **355** | 65,00 | | | 9,500 | 1 | 1 | |
| | **14147** | **400** | 60,00 | | | | 1 | 1 | |
| | **14149** | **450** | 70,00 | | | | 1 | 1 | |
| | | | | | | | | | |
| 17,6 | **2514130** | **160** | | | | 0,679 | 1 | 11 | |
| | **2514134** | **200** | | | | 0,925 | 1 | 11 | |
| | **2514138** | **250** | | | | 2,109 | 1 | 11 | |
| | **2514142** | **315** | | | | 2,961 | 1 | 11 | |
| | **2514144** | **355** | | | | 3,930 | 1 | 11 | |
| | **2514146** | **400** | 60,00 | | | 5,821 | 1 | 11 | |
| | **2514148** | **450** | 70,00 | | | 8,520 | 1 | 11 | |
| | **2514150** | **500** | 75,00 | | | 12,500 | 1 | 11 | |
| | **2514152** | **560** | 80,00 | | | 16,000 | 1 | 11 | |
| | **2514154** | **630** | 90,00 | | | 23,500 | 1 | 11 | |

## EINSCHWEISSSÄTTEL

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün
Hinweis * nicht für aquatherm blue pipe OT

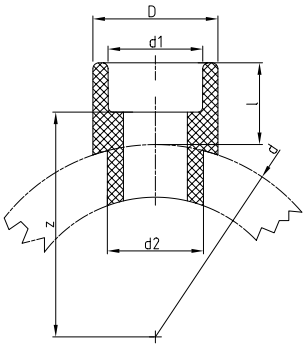


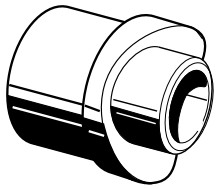



| SDR | Art.- Nr. | d | d1 | d2 | l | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | | |
| | **15156*** | **40** | **20,00** | **25,00** | 25,00 | 27,00 | 32,50 | 0,016 | 5 | 1 | |
| | **15158*** | **40** | **25,00** | **25,00** | 25,00 | 28,50 | 32,50 | 0,017 | 5 | 1 | |
| | **15160** | **50** | **20,00** | **25,00** | 25,00 | 27,50 | 38,00 | 0,018 | 5 | 1 | |
| | **15162** | **50** | **25,00** | **25,00** | 25,00 | 28,50 | 37,50 | 0,019 | 5 | 1 | |
| | **15164** | **63** | **20,00** | **25,00** | 25,00 | 27,50 | 44,50 | 0,017 | 5 | 1 | |
| | **15166** | **63** | **25,00** | **25,00** | 25,00 | 28,50 | 44,00 | 0,019 | 5 | 1 | |
| | **15168** | **63** | **32,00** | **32,00** | 32,00 | 30,00 | 43,50 | 0,028 | 5 | 1 | |
| | **15170** | **75** | **20,00** | **25,00** | 25,00 | 27,50 | 50,50 | 0,018 | 5 | 1 | |
| | **15172** | **75** | **25,00** | **25,00** | 25,00 | 28,50 | 50,00 | 0,019 | 5 | 1 | |
| | **15174** | **75** | **32,00** | **32,00** | 32,00 | 30,00 | 49,50 | 0,028 | 5 | 1 | |
| | **15175** | **75** | **40,00** | **40,00** | 40,00 | 34,00 | 51,00 | 0,049 | 5 | 1 | |
| | **15176** | **90** | **20,00** | **25,00** | 25,00 | 27,50 | 58,00 | 0,018 | 5 | 1 | |
| | **15178** | **90** | **25,00** | **25,00** | 25,00 | 28,50 | 57,50 | 0,019 | 5 | 1 | |
| | **15180** | **90** | **32,00** | **32,00** | 32,00 | 30,00 | 57,00 | 0,029 | 5 | 1 | |
| | **15181** | **90** | **40,00** | **40,00** | 40,00 | 34,00 | 58,50 | 0,048 | 5 | 1 | |
| | **15182** | **110** | **20,00** | **25,00** | 25,00 | 27,50 | 68,00 | 0,019 | 5 | 1 | |
| | **15184** | **110** | **25,00** | **25,00** | 25,00 | 28,50 | 68,50 | 0,020 | 5 | 1 | |
| | **15186** | **110** | **32,00** | **32,00** | 32,00 | 30,00 | 67,00 | 0,030 | 5 | 1 | |
| | **15188** | **110** | **40,00** | **40,00** | 40,00 | 34,00 | 68,50 | 0,050 | 5 | 1 | |
| | **15189** | **110** | **50,00** | **50,00** | 50,00 | 34,00 | 65,50 | 0,091 | 5 | 1 | |
| | **15190** | **125** | **20,00** | **25,00** | 25,00 | 27,50 | 29,50 | 0,019 | 5 | 1 | |
| | **15192** | **125** | **25,00** | **25,00** | 25,00 | 28,50 | 75,00 | 0,020 | 5 | 1 | |
| | **15194** | **125** | **32,00** | **32,00** | 32,00 | 30,00 | 74,50 | 0,029 | 5 | 1 | |
| | **15196** | **125** | **40,00** | **40,00** | 40,00 | 34,00 | 76,00 | 0,050 | 5 | 1 | |
| 7,4<br>11<br>17,6 | **15197** | **125** | **50,00** | **50,00** | 50,00 | 34,00 | 73,00 | 0,091 | 5 | 1 | |
| | **15198** | **125** | **63,00** | **63,00** | 63,00 | 38,00 | 73,00 | 0,150 | 5 | 1 | |
| | **15206** | **160** | **20,00** | **25,00** | 25,00 | 62,00 | 93,00 | 0,021 | 5 | 1 | |
| | **15208** | **160** | **25,00** | **25,00** | 25,00 | 28,50 | 92,50 | 0,023 | 5 | 1 | |
| | **15210** | **160** | **32,00** | **32,00** | 32,00 | 30,00 | 92,00 | 0,034 | 5 | 1 | |
| | **15212** | **160** | **40,00** | **40,00** | 40,00 | 34,00 | 93,50 | 0,054 | 5 | 1 | |
| | **15214** | **160** | **50,00** | **50,00** | 50,00 | 34,00 | 68,00 | 0,093 | 5 | 1 | |
| | **15216** | **160** | **63,00** | **63,00** | 63,00 | 38,00 | 90,50 | 0,155 | 5 | 1 | |
| | **15218** | **160** | **75,00** | **75,00** | 75,00 | 42,00 | 92,00 | 0,227 | 5 | 1 | |
| | **15220** | **160** | **90,00** | **90,00** | 90,00 | 45,00 | 92,00 | 0,364 | 5 | 1 | |
| | **15228** | **200-250** | **20,00** | **25,00** | 25,00 | 27,50 | 113,00 | 0,020 | 5 | 1 | |
| | **15229** | **200-250** | **25,00** | **25,00** | 25,00 | 28,50 | 112,50 | 0,021 | 5 | 1 | |
| | **15230** | **200-250** | **32,00** | **32,00** | 32,00 | 30,00 | 112,00 | 0,031 | 5 | 1 | |
| | **15231** | **200** | **40,00** | **40,00** | 40,00 | 34,00 | 113,50 | 0,049 | 5 | 1 | |
| | **15232** | **200** | **50,00** | **50,00** | 50,00 | 34,00 | 110,50 | 0,087 | 5 | 1 | |
| | **15233** | **200** | **63,00** | **63,00** | 63,00 | 37,50 | 110,00 | 0,147 | 5 | 1 | |
| | **15234** | **200** | **75,00** | **75,00** | 75,00 | 42,00 | 112,00 | 0,220 | 5 | 1 | |
| | **15235** | **200** | **90,00** | **90,00** | 90,00 | 45,00 | 112,00 | 0,342 | 5 | 1 | |
| | **15236** | **200** | **110,00** | **110,00** | 110,00 | 49,00 | 112,00 | 0,577 | 5 | 1 | |
| | **15237** | **200** | **125,00** | **125,00** | 125,00 | 55,00 | 115,00 | 0,869 | 5 | 1 | |
| | **15251** | **250** | **40,00** | **40,00** | 40,00 | 34,00 | 138,50 | 0,053 | 5 | 1 | |
| | **15252** | **250** | **50,00** | **50,00** | 50,00 | 34,00 | 135,50 | 0,090 | 5 | 1 | |
| | **15253** | **250** | **63,00** | **63,00** | 63,00 | 37,50 | 135,00 | 0,152 | 5 | 1 | |
| | **15254** | **250** | **75,00** | **75,00** | 75,00 | 42,00 | 137,00 | 0,222 | 5 | 1 | |
| | **15255** | **250** | **90,00** | **90,00** | 90,00 | 45,00 | 137,00 | 0,348 | 5 | 1 | |
| | **15256** | **250** | **110,00** | **110,00** | 110,00 | 49,00 | 137,00 | 0,054 | 5 | 1 | |
| | **15257** | **250** | **125,00** | **125,00** | 125,00 | 55,00 | 140,00 | 0,820 | 5 | 1 | |

## EINSCHWEISSSÄTTEL

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



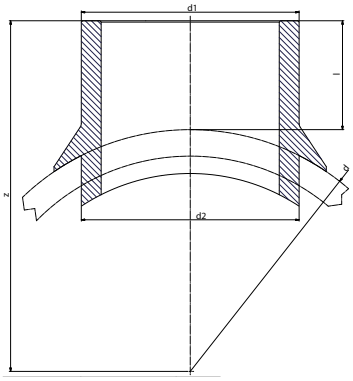



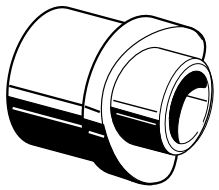
| SDR | Art.- Nr. | d | d1 | d2 | l | z | D | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | | | | | |
| 7,4<br>11<br>17,6 | **15260** | **315-355** | **63,00** | **63,00** | 63,00 | 37,50 | 167,50 | 0,153 | • | • | | 1 | 1 | |
| | **15261** | **315-355** | **75,00** | **75,00** | 75,00 | 42,00 | 169,50 | 0,230 | • | • | | 1 | 1 | |
| | **15262** | **315** | **90,00** | **90,00** | 90,00 | 45,00 | 169,50 | 0,347 | • | • | | 1 | 1 | |
| | **15263** | **315** | **110,00** | **110,00** | 110,00 | 49,00 | 169,50 | 0,567 | • | • | | 1 | 1 | |
| | **15264** | **315** | **125,00** | **125,00** | 125,00 | 55,00 | 172,50 | 0,830 | • | • | | 1 | 1 | |
| | **15268** | **355** | **90,00** | **90,00** | 90,00 | 45,00 | 189,50 | 0,355 | • | • | | 1 | 1 | |
| | **15269** | **355** | **110,00** | **110,00** | 110,00 | 49,00 | 189,50 | 0,586 | • | • | | 1 | 1 | |
| | **15270** | **355** | **125,00** | **125,00** | 125,00 | 55,00 | 192,50 | 0,803 | • | • | | 1 | 1 | |
| | **15275** | **400-500** | **75,00** | **75,00** | 75,00 | 42,00 | 212,00 | 0,209 | • | • | | 1 | 1 | |
| | **15277** | **400-450** | **110,00** | **110,00** | 110,00 | 49,00 | 212,00 | 0,528 | • | • | | 1 | 1 | |
| | **15278** | **400** | **125,00** | **125,00** | 125,00 | 55,00 | 215,00 | 0,769 | • | • | | 1 | 1 | |
| | **15288** | **400-500** | **90,00** | **90,00** | 90,00 | 45,00 | 237,00 | 0,326 | • | • | | 1 | 1 | |
| | **15290** | **450-500** | **125,00** | **125,00** | 125,00 | 55,00 | 240,00 | 0,774 | • | • | | 1 | 1 | |
| | **15300** | **400-630** | **63,00** | **63,00** | 63,00 | 37,50 | 260,00 | 0,148 | • | • | | 1 | 1 | |
| | **15303** | **500-560** | **110,00** | **110,00** | 110,00 | 49,00 | 262,00 | 0,541 | • | • | | 1 | 1 | |
| | **15315** | **560-630** | **75,00** | **75,00** | 75,00 | 42,00 | 292,00 | 0,224 | • | • | | 1 | 1 | |
| | **15316** | **560-630** | **90,00** | **90,00** | 90,00 | 45,00 | 292,00 | 0,340 | • | • | | 1 | 1 | |
| | **15318** | **560-630** | **125,00** | **125,00** | 125,00 | 55,00 | 280,00 | 0,792 | • | • | | 1 | 1 | |
| | **15331** | **630** | **110,00** | **110,00** | 110,00 | 49,00 | 327,00 | 0,563 | • | • | | 1 | 1 | |

Mit Aufschweißfläche und zusätzlichem Einschweißstutzen zur Fusion mit der Rohrwandung.
Die erforderlichen Werkzeuge zur Verarbeitung sind ab Seite 160 aufgeführt.

## EINSCHWEISSSÄTTEL STUMPFSCHWEISSEN

Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

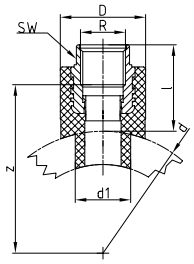


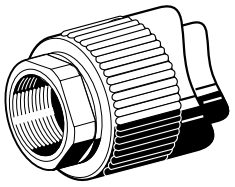



| SDR | Art.- Nr. | d | d1 | d2 | l | z | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Stumpfschweißverfahren | | | | | | | | | | | | |
| 11 | **15265** | **315** | **160,00** | **160,00** | 160,00 | 80,00 | 0,868 | • | • | | 1 | 1 | |
| | **15271** | **355** | **160,00** | **160,00** | 160,00 | 80,00 | 0,845 | • | • | | 1 | 1 | |

Mit Aufschweißfläche und zusätzlichem Einschweißstutzen zur Fusion mit der Rohrwandung.
Die erforderlichen Werkzeuge zur Verarbeitung sind ab Seite 160 aufgeführt.

## EINSCHWEISSSÄTTEL MIT INNENGEWINDE

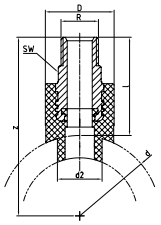


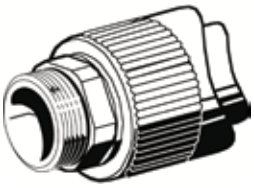



Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün
Hinweis * nicht für aquatherm blue pipe OT

| SDR | Art.- Nr. | d | d1 | l | z | D | R | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | | | |
| | **28214*** | **40** | **25,00** | 39,00 | 43,00 | 38,50 | 1/2“ | 24,00 | 0,088 | 5 | 1 | |
| | **28216** | **50** | **25,00** | 39,00 | 48,00 | 38,50 | 1/2“ | 24,00 | 0,090 | 5 | 1 | |
| | **28218** | **63** | **25,00** | 39,00 | 54,50 | 38,50 | 1/2“ | 24,00 | 0,089 | 5 | 1 | |
| | **28220** | **75** | **25,00** | 39,00 | 53,50 | 38,50 | 1/2“ | 24,00 | 0,083 | 5 | 1 | |
| | **28222** | **90** | **25,00** | 39,00 | 68,00 | 38,50 | 1/2“ | 24,00 | 0,090 | 5 | 1 | |
| | **28224** | **110** | **25,00** | 39,00 | 78,00 | 38,50 | 1/2“ | 24,00 | 0,089 | 5 | 1 | |
| | **28226** | **125** | **25,00** | 39,00 | 85,50 | 38,50 | 1/2“ | 24,00 | 0,092 | 5 | 1 | |
| | **28230** | **160** | **25,00** | 39,00 | 103,00 | 38,50 | 1/2“ | 24,00 | 0,092 | 5 | 1 | |
| | **28232** | **200-250** | **25,00** | 39,00 | 38,00 | 38,50 | 1/2“ | 24,00 | 0,092 | 5 | 1 | |
| | **28234** | **40** | **25,00** | 39,00 | 43,00 | 43,50 | 3/4“ | 31,00 | 0,107 | 5 | 1 | |
| 7,4 | **28236** | **50** | **25,00** | 39,00 | 49,50 | 43,50 | 3/4“ | 31,00 | 0,110 | 5 | 1 | |
| 11 | **28238** | **63** | **25,00** | 39,00 | 55,50 | 43,50 | 3/4“ | 31,00 | 0,109 | 5 | 1 | |
| 17,6 | **28240** | **75** | **25,00** | 39,00 | 63,00 | 43,50 | 3/4“ | 31,00 | 0,109 | 5 | 1 | |
| | **28242** | **90** | **25,00** | 39,00 | 73,00 | 43,50 | 3/4“ | 31,00 | 0,110 | 5 | 1 | |
| | **28244** | **110** | **25,00** | 39,00 | 80,50 | 43,50 | 3/4“ | 31,00 | 0,110 | 5 | 1 | |
| | **28246** | **125** | **25,00** | 39,00 | 96,00 | 43,50 | 3/4“ | 31,00 | 0,112 | 5 | 1 | |
| | **28250** | **160** | **25,00** | 39,00 | 58,50 | 43,50 | 3/4“ | 31,00 | 0,112 | 5 | 1 | |
| | **28254** | **200-250** | **25,00** | 39,00 | 66,00 | 43,50 | 3/4“ | 31,00 | 0,112 | 5 | 1 | |
| | **28260** | **75** | **32,00** | 43,00 | 76,00 | 60,00 | 1“ | 39,00 | 0,222 | 5 | 1 | |
| | **28262** | **90** | **32,00** | 43,00 | 83,50 | 60,00 | 1“ | 39,00 | 0,221 | 5 | 1 | |
| | **28264** | **110** | **32,00** | 43,00 | 101,00 | 60,00 | 1“ | 39,00 | 0,224 | 5 | 1 | |
| | **28266** | **125** | **32,00** | 43,00 | 123,00 | 60,00 | 1“ | 39,00 | 0,022 | 5 | 1 | |
| | **28270** | **160** | **32,00** | 43,00 | 118,00 | 60,00 | 1“ | 39,00 | 0,226 | 5 | 1 | |
| | **28274** | **200-250** | **32,00** | 43,00 | 121,00 | 60,00 | 1“ | 39,00 | 0,244 | 5 | 1 | |

## EINSCHWEISSSÄTTEL MIT AUSSENGEWINDE



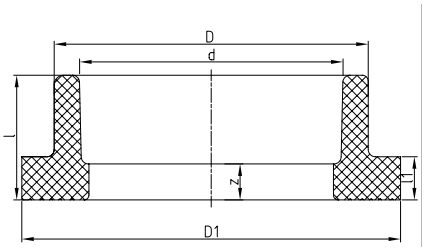
Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün
Hinweis * nicht für aquatherm blue pipe OT

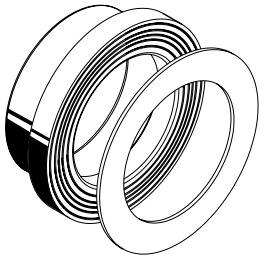
| SDR | Art.- Nr. | d | d2 | l | z | D | R | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | | | |
| | **28314*** | **40** | **25,00** | 55,00 | 75,00 | 38,50 | R1/2 | 21,00 | 0,088 | 5 | 1 | |
| | **28316** | **50** | **25,00** | 55,00 | 80,00 | 38,50 | R1/2 | 21,00 | 0,090 | 5 | 1 | |
| | **28318** | **63** | **25,00** | 55,00 | 86,50 | 38,50 | R1/2 | 21,00 | 0,089 | 5 | 1 | |
| | **28320** | **75** | **25,00** | 55,00 | 92,50 | 38,50 | R1/2 | 21,00 | 0,097 | 5 | 1 | |
| | **28322** | **90** | **25,00** | 55,00 | 100,00 | 38,50 | R1/2 | 21,00 | 0,090 | 5 | 1 | |
| | **28324** | **110** | **25,00** | 55,00 | 110,00 | 38,50 | R1/2 | 21,00 | 0,089 | 5 | 1 | |
| 7,4 | **28326** | **125** | **25,00** | 55,00 | 117,50 | 38,50 | R1/2 | 21,00 | 0,092 | 5 | 1 | |
| 11 | **28330** | **160** | **25,00** | 55,00 | 135,00 | 38,50 | R1/2 | 21,00 | 0,092 | 5 | 1 | |
| 17,6 | **28334** | **40** | **25,00** | 56,00 | 76,00 | 43,50 | R3/4 | 24,00 | 0,107 | 5 | 1 | |
| | **28336** | **50** | **25,00** | 56,00 | 81,00 | 43,50 | R3/4 | 24,00 | 0,110 | 5 | 1 | |
| | **28338** | **63** | **25,00** | 56,00 | 87,50 | 43,50 | R3/4 | 24,00 | 0,109 | 5 | 1 | |
| | **28340** | **75** | **25,00** | 56,00 | 93,50 | 43,50 | R3/4 | 24,00 | 0,109 | 5 | 1 | |
| | **28342** | **90** | **25,00** | 56,00 | 101,00 | 43,50 | R3/4 | 24,00 | 0,110 | 5 | 1 | |
| | **28344** | **110** | **25,00** | 56,00 | 111,00 | 43,50 | R3/4 | 24,00 | 0,110 | 5 | 1 | |
| | **28346** | **125** | **25,00** | 56,00 | 118,50 | 43,50 | R3/4 | 24,00 | 0,112 | 5 | 1 | |
| | **28350** | **160** | **25,00** | 56,00 | 136,00 | 43,50 | R3/4 | 24,00 | 0,112 | 5 | 1 | |

Mit Aufschweißfläche und zusätzlichem Einschweißstutzen zur Fusion mit der Rohrwandung. Die erforderlichen Werkzeuge zur Verarbeitung sind ab Seite 160 aufgeführt.

## BUNDBUCHSEN MUFFENSCHWEISSVERFAHREN
mit Dichtung

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



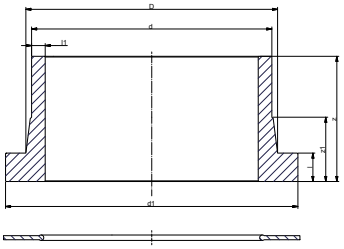



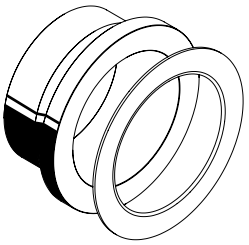
| SDR | Art.- Nr. | Durch-messer d [mm] | l | z | D | D1 | l1 | z1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Muffenschweißverfahren | | | | | | | | | | | |
| 7,4 11 | **15512** | **32** | 35,00 | 17,00 | 41,00 | 68,00 | 11,00 | 3,00 | 0,053 | 1 | 1 | |
| | **15514** | **40** | 36,50 | 16,00 | 50,00 | 78,00 | 12,00 | 3,00 | 0,071 | 1 | 1 | |
| | **15516** | **50** | 40,50 | 17,00 | 61,00 | 88,00 | 13,00 | 3,00 | 0,095 | 1 | 1 | |
| | **15518** | **63** | 44,50 | 16,00 | 76,00 | 102,00 | 15,00 | 3,00 | 0,130 | 1 | 1 | |
| | **15520** | **75** | 47,00 | 17,00 | 90,00 | 122,00 | 17,00 | 3,00 | 0,191 | 1 | 1 | |
| | **15522** | **90** | 50,00 | 17,00 | 108,00 | 138,00 | 17,00 | 3,00 | 0,258 | 1 | 1 | |
| | **15524** | **110** | 55,50 | 18,50 | 131,00 | 158,00 | 18,50 | 3,00 | 0,329 | 1 | 1 | |
| | **15526*** | **125** | 202,00 | 202,00 | 125,00 | 158,00 | 13,50 | 3,00 | 1,330 | 1 | 1 | |
| | **15527** | **125** | 63,00 | 23,00 | 165,00 | 188,00 | 20,00 | 3,00 | 0,724 | 1 | 1 | |

*nur mit Fitting verwendbar, mit 110 mm Bundbuchse

## BUNDBUCHSEN STUMPFSCHWEISSVERFAHREN
mit Dichtung

Material: Fusiolen® PP-R & PP-RP
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

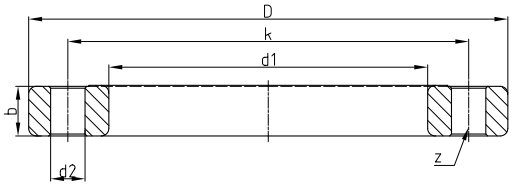


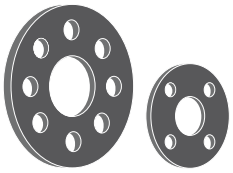



| SDR | Art.- Nr. | Durch-messer d [mm] | l | z | D | d1 | l1 | z1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Stumpfschweißverfahren | | | | | | | | | | | |
| 11 | **15531** | **160** | 25,00 | 93,00 | 175,00 | 212,00 | 14,60 | 6,00 | 0,955 | 1 | 1 | |
| | **15535** | **200** | 32,00 | 130,00 | 232,00 | 268,00 | 18,20 | 6,00 | 1,957 | 1 | 1 | |
| | **15539** | **250** | 35,00 | 130,00 | 285,00 | 320,00 | 22,70 | 6,00 | 2,717 | 1 | 1 | |
| | **15543** | **315** | 35,00 | 170,00 | 333,00 | 370,00 | 28,60 | 6,00 | 5,650 | 1 | 1 | |
| | **15545** | **355** | 42,00 | 185,00 | 370,00 | 432,00 | 32,20 | 6,00 | 9,000 | 1 | 1 | |
| | **15547** | **400** | 33,00 | 199,00 | 425,00 | 484,00 | 22,70 | 6,00 | | 1 | 1 | |
| | **15549** | **450** | 46,00 | 140,00 | 425,00 | 586,00 | 25,70 | 7,00 | | 1 | 1 | |
| | | | | | | | | | | | | |
| 17,6 | **2515530** | **160** | 25,00 | 93,00 | 175,00 | 212,00 | 9,10 | 3,00 | 0,821 | 1 | 11 | |
| | **2515534** | **200** | 32,00 | 130,00 | 232,00 | 268,00 | 11,40 | 6,00 | | 1 | 11 | |
| | **2515538** | **250** | 35,00 | 130,00 | 285,00 | 320,00 | 14,20 | 6,00 | 2,736 | 1 | 11 | |
| | **2515542** | **315** | 35,00 | 170,00 | 333,00 | 370,00 | 17,90 | 6,00 | 4,500 | 1 | 11 | |
| | **2515544** | **355** | 42,00 | 185,00 | 370,00 | 432,00 | 20,10 | 6,00 | 6,500 | 1 | 11 | |
| | **2515546** | **400** | 33,00 | 199,00 | 425,00 | 484,00 | 22,70 | 6,00 | 8,500 | 1 | 11 | |
| | **2515548** | **450** | 46,00 | 140,00 | 512,00 | 586,00 | 25,70 | 7,00 | 12,000 | 1 | 11 | |
| | **2515550** | **500** | 47,00 | 141,00 | 525,00 | 585,00 | 28,40 | 7,00 | 9,800 | 1 | 11 | |
| | **2515552** | **560** | 50,00 | 141,00 | 612,00 | 685,00 | 31,70 | 7,00 | 13,800 | 1 | 11 | |
| | **2515554** | **630** | 50,00 | 142,00 | 640,00 | 688,00 | 35,70 | 7,00 | 12,600 | 1 | 11 | |

## FLANSCHE

Material: PP/Stahl
Farbe: grau

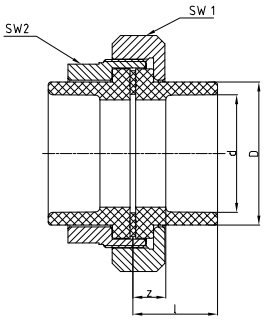


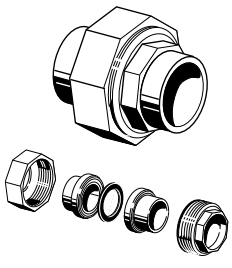



| SDR | Art.- Nr. | Durch-messer | passend zu Art-. Nr. | d1 | D | K | d2 | b | z | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 17,6 | Muffenschweißverfahren | | | | | | | | | | | | |
| | **15712** | **32** | 15512 | 42,00 | 116,00 | 85,00 | 14,00 | 15,50 | 4,00 | 0,466 | 1 | 1 | |
| | **15714** | **40** | 15514 | 51,00 | 141,00 | 100,00 | 18,00 | 17,50 | 4,00 | 0,681 | 1 | 1 | |
| | **15716** | **50** | 15516 | 62,00 | 151,00 | 110,00 | 18,00 | 17,50 | 4,00 | 0,767 | 1 | 1 | |
| | **15718** | **63** | 15518 | 78,00 | 166,00 | 125,00 | 18,00 | 19,00 | 4,00 | 0,885 | 1 | 1 | |
| | **15720** | **75** | 15520 | 92,00 | 186,00 | 145,00 | 18,00 | 19,00 | 4,00 | 1,154 | 1 | 1 | |
| | **15722** | **90** | 15522 | 110,00 | 201,00 | 160,00 | 18,00 | 21,00 | 8,00 | 1,404 | 1 | 1 | |
| | **15724** | **110** | 15524/26 | 133,00 | 221,00 | 180,00 | 18,00 | 22,00 | 8,00 | 1,461 | 1 | 1 | |
| | **15726** | **125** | 15527 | 167,00 | 251,00 | 210,00 | 18,00 | 26,00 | 8,00 | 2,096 | 1 | 1 | |
| | **15730** | **160** | 15531 2515530 | 178,00 | 286,00 | 240,00 | 22,00 | 27,00 | 8,00 | 3,628 | 1 | 1 | |
| | **15734** | **200** | 15535 2515534 | 235,00 | 341,00 | 295,00 | 22,00 | 28,00 | 8,00 | 4,643 | 1 | 1 | |
| | **15738** | **250** | 15539 2515538 | 288,00 | 406,00 | 350,00 | 22,00 | 31,00 | 12,00 | 7,216 | 1 | 1 | |
| | **15742** | **315** | 15543 2515542 | 340,00 | 460,00 | 400,00 | 22,00 | 34,50 | 12,00 | 9,500 | 1 | 1 | |
| | **15744** | **355** | 15545 2515544 | 380,00 | 520,00 | 460,00 | 22,00 | 39,00 | 16,00 | 15,300 | 1 | 1 | |
| | **15746** | **400** | 2515546 | 430,00 | 565,00 | 515,00 | 26,00 | 34,00 | 16,00 | 50,558 | 1 | 1 | |
| | **15748** | **450** | 2515548 | 517,00 | 670,00 | 620,00 | 26,00 | 42,00 | 20,00 | 65,789 | 1 | 1 | |
| | **15750** | **500** | 2515550 | 533,00 | 670,00 | 620,00 | 26,00 | 38,00 | 20,00 | 60,783 | 1 | 1 | |
| | **15752** | **560** | 2515552 | 618,00 | 785,00 | 725,00 | 30,00 | 50,00 | 20,00 | 95,096 | 1 | 1 | |
| | **15754** | **630** | 2515554 | 645,00 | 785,00 | 725,00 | 30,00 | 40,00 | 20,00 | 82,112 | 1 | 1 | |

## KUPPLUNGSVERSCHRAUBUNGEN

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün, messing

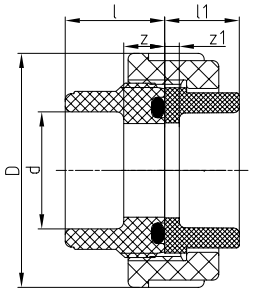


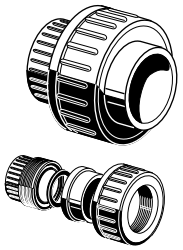



| SDR | Art.- Nr. | Durch-messer d [mm] | l | z | D | SW1 | SW2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | |
| | **15812** | **32** | 36,50 | 18,50 | 41,00 | 64,00 | 50,00 | 0,479 | 1 | 1 | |
| | **15814** | **40** | 38,00 | 17,50 | 50,00 | 80,00 | 60,00 | 0,841 | 1 | 1 | |
| | **15816** | **50** | 41,00 | 17,50 | 61,00 | 86,00 | 70,00 | 0,821 | 1 | 1 | |
| | **15818** | **63** | 45,00 | 17,50 | 76,00 | 108,00 | 90,00 | 1,498 | 1 | 1 | |
| | **15820** | **75** | 47,50 | 17,50 | 90,00 | 128,00 | 104,00 | 1,998 | 1 | 1 | |

## KUPPLUNGSVERSCHRAUBUNGEN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

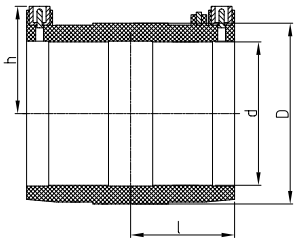


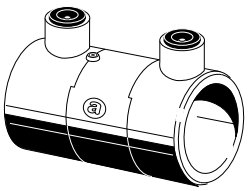



| SDR | Art.- Nr. | Durch-messer d [mm] | l | z | l1 | z1 | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | |
| | **15838** | **20** | 26,00 | 12,00 | 20,00 | 5,50 | 46,00 | 0,036 | 10 | 1 | |
| | **15840** | **25** | 28,00 | 12,00 | 21,00 | 5,00 | 56,00 | 0,058 | 10 | 1 | |
| | **15842** | **32** | 32,00 | 12,00 | 23,00 | 5,00 | 66,00 | 0,089 | 5 | 1 | |
| | **15844** | **40** | 38,00 | 14,00 | 25,50 | 5,00 | 79,00 | 0,136 | 5 | 1 | |
| | **15846** | **50** | 45,00 | 16,00 | 28,50 | 5,00 | 87,00 | 0,170 | 5 | 1 | |
| | **15848** | **63** | 55,50 | 20,00 | 32,50 | 5,00 | 107,00 | 0,240 | 1 | 1 | |
| | **15850** | **75** | 50,00 | 20,00 | 36,00 | 6,00 | 50,00 | 0,451 | 1 | 1 | |

## ELEKTROSCHWEISSMUFFEN

Material: Fusiolen® PP-R
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün
Hinweis: Elektroschweißmuffen nicht bei 160mm und 200mm-Formteilen einsetzbar
* nicht für aquatherm blue pipe OT

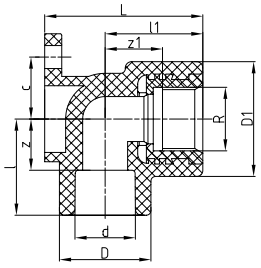


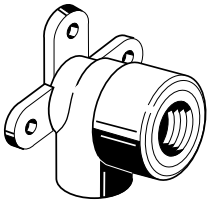



| SDR | Art.- Nr. | Durch-messer d [mm] | l | l1 | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 17,6 | Elektromuffenschweißverfahren | | | | | | | | |
| | **17208** | **20** | 35,00 | 36,00 | 31,50 | 0,049 | 1 | 1 | |
| | **17210** | **25** | 39,00 | 38,50 | 36,50 | 0,057 | 1 | 1 | |
| | **17212** | **32** | 40,00 | 42,50 | 45,00 | 0,077 | 1 | 1 | |
| | **17214** | **40** | 46,00 | 47,00 | 54,00 | 0,103 | 1 | 1 | |
| | **17216** | **50** | 51,50 | 52,00 | 65,00 | 0,142 | 1 | 1 | |
| | **17218** | **63** | 59,00 | 58,00 | 81,50 | 0,239 | 1 | 1 | |
| | **17220** | **75** | 65,00 | 64,50 | 96,00 | 0,347 | 1 | 1 | |
| | **17222** | **90** | 72,50 | 72,00 | 113,50 | 0,501 | 1 | 1 | |
| | **17224** | **110** | 80,00 | 82,50 | 139,00 | 0,821 | 1 | 1 | |
| | **17226** | **125** | 86,00 | 90,00 | 156,00 | 1,097 | 1 | 1 | |
| | **17230*** | **160** | 93,00 | 109,50 | 197,00 | 1,754 | 1 | 1 | |
| | **17234*** | **200** | 105,00 | 134,00 | 243,00 | 3,625 | 1 | 1 | |
| | **17238*** | **250** | 125,00 | 170,00 | 315,00 | 7,142 | 1 | 1 | |

## UNTERPUTZ - ANSCHLUSSWANDSCHEIBEN

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



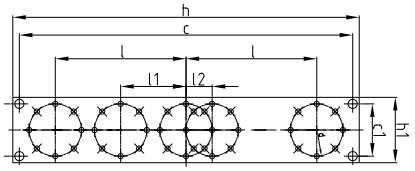
| SDR | Art.- Nr. | d | R | l | z | D | l1 | z1 | D1 | L | c | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | | | | | |
| | **20108** | **20** | **1/2"** | 31,00 | 16,50 | 29,50 | 31,50 | 15,50 | 37,00 | 51,00 | 20,00 | 0,079 | 10 | 1 | |
| | **20110** | **20** | **3/4"** | 37,00 | 22,50 | 34,00 | 37,00 | 24,00 | 44,00 | 54,00 | 25,00 | 0,102 | 10 | 1 | |
| | **20112** | **25** | **3/4"** | 37,00 | 21,00 | 34,00 | 37,00 | 24,00 | 44,00 | 54,00 | 25,00 | 0,105 | 10 | 1 | |
| | **20113** | **25** | **1/2"** | 33,50 | 17,50 | 34,00 | 31,00 | 15,00 | 37,00 | 53,00 | 20,00 | 0,081 | 10 | 1 | |

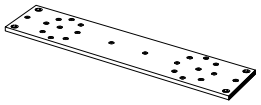
## MONTAGEPLATTE

verzinkt; zur Befestigung von Wandscheiben als Doppelanschluss

Material: Eisen, verzinkt

Farbe: Zink



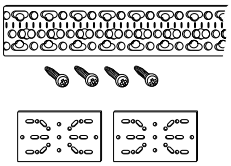
| Art.- Nr. | d | l | l1 | l2 | c | c1 | h | h1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **60010** | 40 | 100,00 | 50,00 | 20,00 | 255,00 | 40,00 | 265,00 | 50,00 | 0,221 | 1 | 1 | |
| In Verbindung mit der Schallschutz-Entkopplungsplatte Art.-Nr. 79080 kann dieser Artikel nicht eingesetzt werden. Hierfür empfehlen wir die Montageschiene Art.-Nr. 79090 | | | | | | | | | | | | |

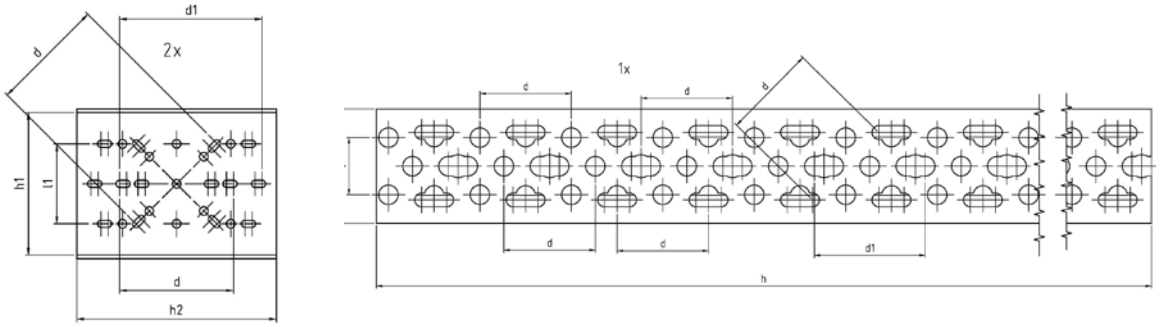
## MONTAGEPLATTE

verzinkt; zur Befestigung von Wandscheiben incl. 2 Fixierplatten und 4 Schrauben

Material: Eisen, verzinkt

Farbe: Zink





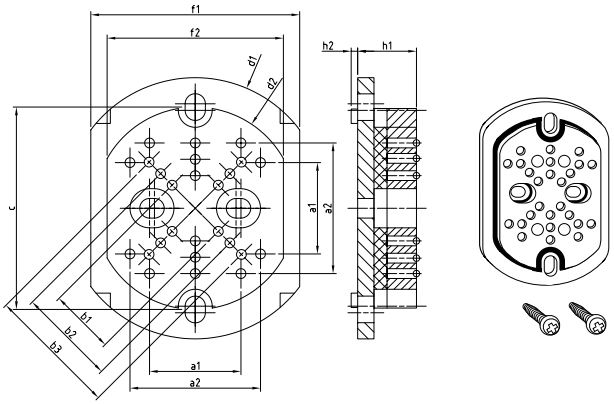

| Art.- Nr. | d | d1 | l | l1 | h | h1 | h2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| **79090** | 40 | 50,00 | 25,00 | 28,00 | 560,00 | 50,00 | 70,00 | 0,546 | 1 | 4 | |

## MONTAGEPLATTE

Für **U**nterputzanschluss-Wandscheiben

Material: PP

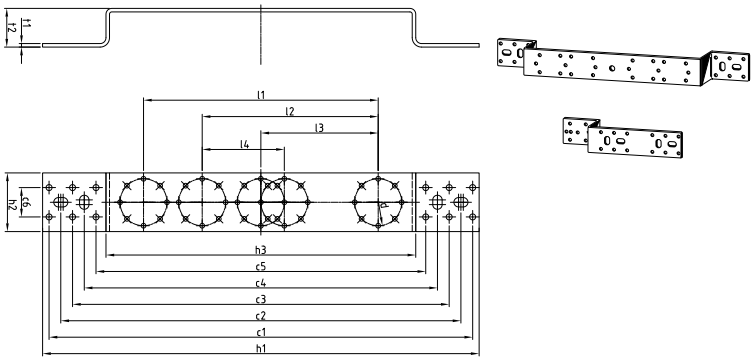
Farbe: weiß




| Art.- Nr. | a1 | a2 | b1 | b2 | b3 | c | d1 | d2 | f1 | f2 | h1 | h2 | Ge-wicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |
| **79080** | 28,00 | 40,00 | 20,00 | 30,00 | 40,00 | 62,00 | 80,00 | 62,00 | 64,00 | 54,00 | 18,00 | 2,00 | 0,058 | 2 | 1 | |

## MONTAGESCHIENE (DOPPELT UND EINFACH)

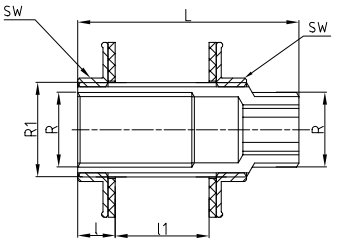
Material: Eisen /verzinkt
Farbe: zink

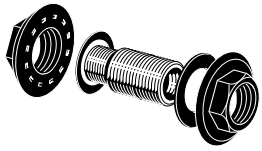



| Art.-Nr. | d | l1 | l2 | l3 | l4 | c1 | c2 | c3 | c4 | c5 | c6 | h1 | h2 | h3 | t1 | t2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | |
| **79095** | 40 | 200,00 | 150,00 | 100,00 | 70,00 | 361,00 | 341,00 | 321,00 | 301,00 | 281,00 | 25,00 | 372,00 | 50,00 | 264,00 | 3,00 | 33,00 | 0,412 | 2 | 4 | |
| **79096** | | | | | | | | | | | | | | | | | 0,235 | 2 | 4 | |

## HOHLWAND-ANSCHLUSSSTÜCK

Material: Messing

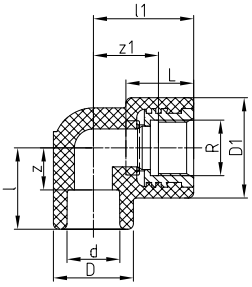


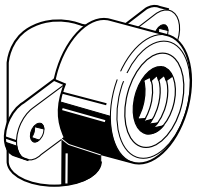



| Art.- Nr. | R | R1 | l | l1 | L | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **20114** | **1/2“** | 3/4“ | 10,50 | 26,00 | 62,00 | 30,00 | 0,213 | 10 | 1 | |

## UNTERPUTZ - ANSCHLUSSWANDSCHEIBEN

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



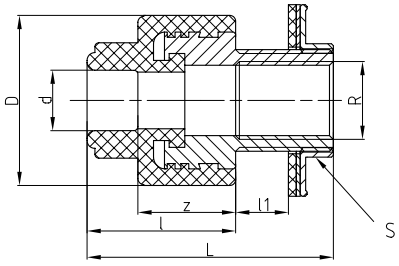



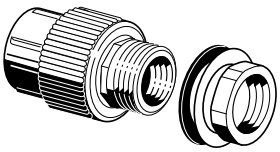
| SDR | Art.- Nr. | d | R | l | z | D | l1 | z1 | D1 | L | c | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | | | | | |
| | **20156** | **16** | **1/2“** | 30,00 | 17,00 | 29,50 | 37,00 | 24,00 | 37,00 | 25,00 | 59,00 | 0,079 | 10 | 1 | |
| | **20158** | **20** | **1/2“** | 30,00 | 15,50 | 29,50 | 37,00 | 24,00 | 37,00 | 25,00 | 59,00 | 0,079 | 10 | 1 | |

## ANSCHLUSSSTÜCK

mit Gegenmutter, Dichtung und Spannscheibe

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



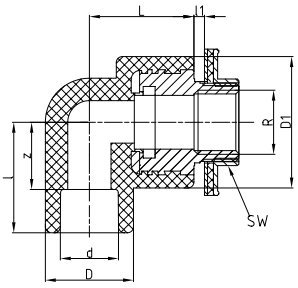



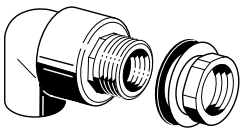
| SDR | Art.- Nr. | d | R | l | z | D | l1 | L | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | | | |
| | **20204** | **20** | **1/2“** | 40,00 | 25,50 | 43,50 | 13,50 | 65,00 | 29,00 | 0,204 | 10 | 1 | |

## ANSCHLUSSWINKEL

mit Gegenmutter, Dichtung und Spannscheibe

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



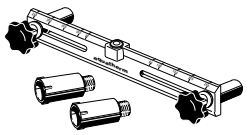



| SDR | Art.- Nr. | d | R | l | z | D | l1 | L | D1 | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | Muffenschweißverfahren | | | | | | | | | | | | | |
| | **20208** | **20** | **1/2“** | 37,00 | 22,50 | 29,50 | 3,50 | 35,00 | 44,00 | 29,00 | 0,154 | 10 | 1 | |
| | **20209** | **25** | **1/2“** | 37,00 | 21,00 | 34,00 | 3,50 | 37,00 | 44,00 | 29,00 | 0,206 | 10 | 1 | |

## MONTAGELEHRE

als Wasserwaage mit 2 Bauabdruckstopfen 1/2“

Material: Fusiolen® PP-R
Farbe: grün

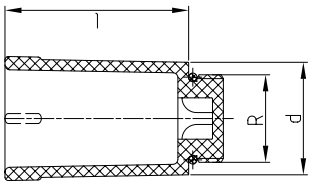


| Art.- Nr. | a | b | h1 | l1 | l2 | d | l | R | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **50700** | 280,00 | 36,00 | 8,00 | 80,00 | 250,00 | 28 | 55,50 | 1/2“ | 0,252 | 1 | 3 | |

## BAUABDRUCKSTOPFEN

mit Dichtung

Material: Fusiolen® PP-R
Farbe: grün

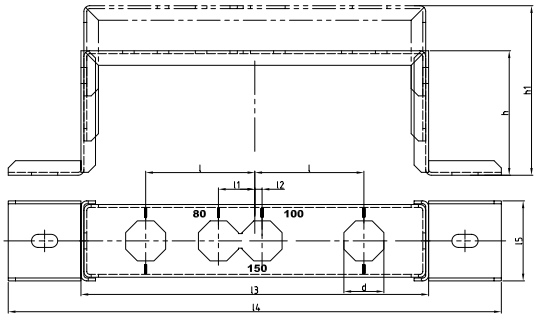


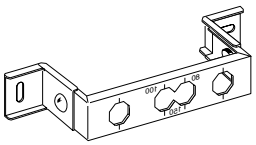

| Art.- Nr. | d | R | l | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **50708** | 28 | 1/2“ | 55,50 | 0,022 | 10 | 1 | |
| **50710** | 34 | 3/4“ | 55,50 | 0,027 | 10 | 1 | |

## MONTAGEEINHEIT

doppelt

Material: Eisen/verzinkt
Farbe: Zink



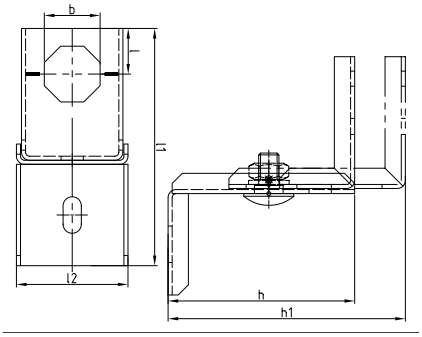



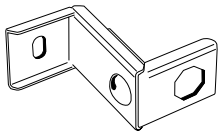
| Art.- Nr. | b | l | l1 | l2 | h | h1 | l3 | l4 | l5 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| **60110** | 27,50 | 75,00 | 25,00 | 5,00 | 92,50 | 122,50 | 239,00 | 339,00 | 55,00 | 0,630 | 1 | 1 | |

## MONTAGEEINHEIT

einfach

Material: Eisen/verzinkt
Farbe: Zink



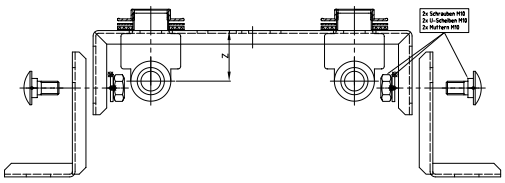



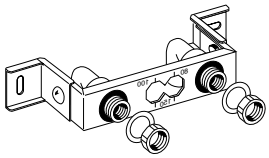
| Art.- Nr. | b | l | l1 | l2 | h | h1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| **60115** | 27,50 | 118,00 | 22,50 | 55,00 | 92,50 | 122,50 | 0,278 | 1 | 1 | |

## MONTAGEEINHEIT

mit zwei aquatherm green pipe-Anschlusswinkeln (Art.-Nr. 20208), Gegenmuttern, Dichtungen und Spannscheiben

Material: Fusiolen® PP-R, Messing
Eisen/verzinkt
Farbe: grün
Zink

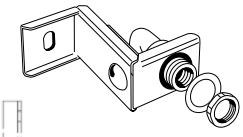


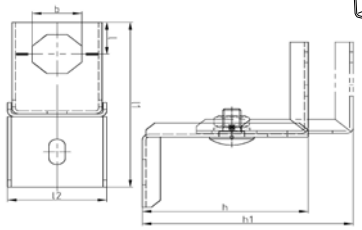
| Art.- Nr. | b | l | l1 | l2 | h | h1 | l3 | l4 | l5 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **60150** | 27,50 | 75,00 | 25,00 | 5,00 | 92,50 | 122,50 | 239,00 | 339,00 | 55,00 | 0,942 | 1 | 1 | |

## MONTAGEEINHEIT

mit einem **aquatherm green pipe**-Anschlusswinkel (Art.-Nr. 20208), Gegenmuttern, Dichtungen und Spannscheiben



Material: Fusiolen® PP-R, Messing
Eisen/verzinkt
Farbe: grün
zink

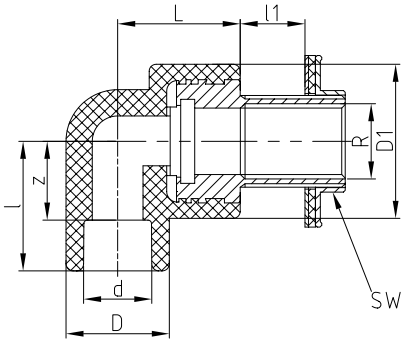


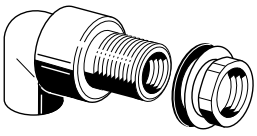

| Art.- Nr. | b | l | l1 | l2 | h | h1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| **60155** | 27,50 | 22,50 | 118,00 | 55,00 | 92,50 | 122,50 | 0,278 | 1 | 1 | |

## ANSCHLUSSWINKEL

für den Hohlwandanschluss

Material: Fusiolen® PP-R, Messing
Farbe: grün



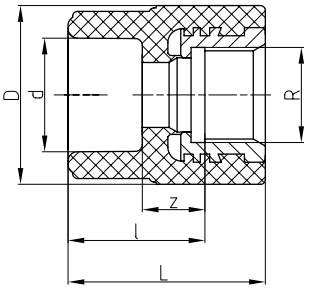



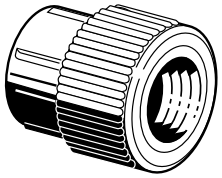
| SDR | Art.- Nr. | d | R | l | z | D | L | l1 | D1 | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6<br>7,4<br>11 | **20210** | 20 | 1/2“ | 37,00 | 22,50 | 29,50 | 35,00 | 18,50 | 44,00 | 29,00 | 0,223 | 10 | 1 | |
| mit 30 mm langem Gewinde, Gegenmutter, Dichtung und Spannscheibe | | | | | | | | | | | | | | |

## ÜBERGANGSSTÜCKE MIT INNENGEWINDE

rund

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



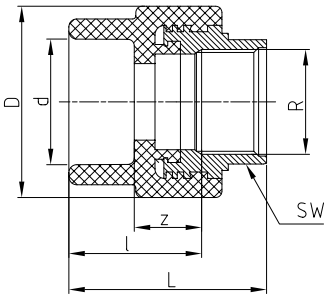



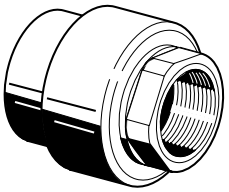
| SDR | Art.- Nr. | d | R | l | z | D | L | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **21008** | **20** | **1/2"** | 27,50 | 13,00 | 37,50 | 40,50 | 0,064 | 10 | 1 | |
| | **21010** | **20** | **3/4"** | 27,50 | 13,00 | 43,50 | 40,50 | 0,089 | 10 | 1 | |
| | **21011** | **25** | **1/2"** | 29,00 | 13,00 | 37,50 | 42,00 | 0,065 | 10 | 1 | |
| | **21012** | **25** | **3/4"** | 27,50 | 11,50 | 43,50 | 40,50 | 0,087 | 10 | 1 | |
| | **21013** | **32** | **3/4"** | 30,50 | 12,50 | 43,50 | 43,50 | 0,092 | 5 | 1 | |

## ÜBERGANGSSTÜCKE MIT INNENGEWINDE

mit 6-kant Schlüsselfläche

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



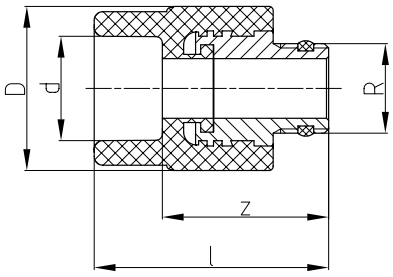



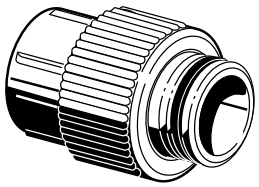
| SDR | Art.- Nr. | d | R | l | z | D | L | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **21108** | **20** | **1/2"** | 34,50 | 20,00 | 37,50 | 50,50 | 24,00 | 0,088 | 10 | 1 | |
| | **21110** | **20** | **3/4"** | 29,00 | 14,50 | 43,50 | 50,00 | 31,00 | 0,112 | 10 | 1 | |
| | **21111** | **25** | **1/2"** | 36,00 | 20,00 | 37,50 | 52,00 | 24,00 | 0,089 | 10 | 1 | |
| | **21112** | **25** | **3/4"** | 29,00 | 13,00 | 43,50 | 50,00 | 31,00 | 0,109 | 10 | 1 | |
| | **21113** | **32** | **3/4"** | 32,00 | 14,00 | 43,50 | 53,00 | 31,00 | 0,114 | 5 | 1 | |
| | **21114** | **32** | **1"** | 37,50 | 19,50 | 60,00 | 59,50 | 39,00 | 0,239 | 5 | 1 | |
| | **21115** | **40** | **1"** | 40,00 | 19,50 | 60,00 | 62,00 | 39,00 | 0,245 | 5 | 1 | |
| | **21116** | **40** | **1 1/4"** | 40,00 | 19,50 | 74,00 | 63,00 | 50,00 | 0,385 | 5 | 1 | |
| | **21117** | **50** | **1 1/4"** | 43,00 | 19,50 | 74,00 | 66,00 | 50,00 | 0,404 | 5 | 1 | |
| | **21118** | **50** | **1 1/2"** | 45,00 | 21,50 | 85,50 | 67,00 | 55,00 | 0,424 | 5 | 1 | |
| | **21119** | **63** | **1 1/2"** | 51,50 | 24,00 | 84,00 | 73,50 | 55,00 | 0,440 | 1 | 1 | |
| | **21120** | **63** | **2"** | 50,00 | 22,50 | 101,00 | 76,00 | 67,00 | 0,589 | 1 | 1 | |
| | **21122** | **75** | **2"** | 51,00 | 21,00 | 100,00 | 77,00 | 67,00 | 0,613 | 1 | 1 | |

## ÜBERGANGSSTÜCK MIT AUSSENGEWINDE

rund, selbstdichtend

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



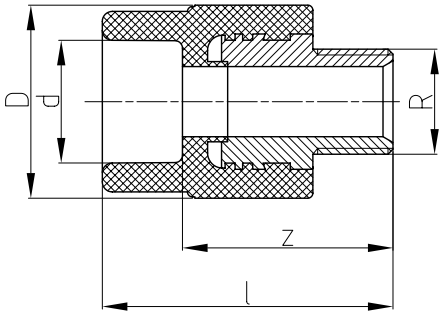



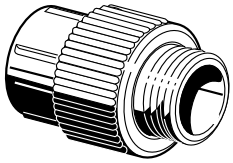
| SDR | Art.- Nr. | d | R | l | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **21258** | **20** | **1/2"** | 52,50 | 38,00 | 38,50 | 0,090 | 10 | 1 | |
| | **21261** | **25** | **1/2"** | 54,00 | 38,00 | 38,50 | 0,091 | 10 | 1 | |
| | **21262** | **25** | **3/4"** | 53,50 | 37,50 | 38,50 | 0,098 | 10 | 1 | |

## ÜBERGANGSSTÜCKE MIT AUSSENGEWINDE

rund

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



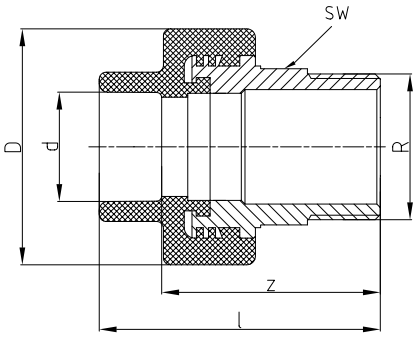



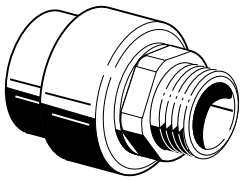
| SDR | Art.- Nr. | d | R | l | z | D | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 7,4 9 11 | **21208** | **20** | **1/2“** | 56,50 | 42,00 | 38,50 | 0,097 | • | • | • | 10 | 1 | |
| | **21210** | **20** | **3/4“** | 57,50 | 43,00 | 38,50 | 0,109 | • | • | • | 10 | 1 | |
| | **21211** | **25** | **1/2“** | 58,00 | 42,00 | 38,50 | 0,098 | • | • | • | 10 | 1 | |
| | **21212** | **25** | **3/4“** | 57,50 | 41,50 | 38,50 | 0,107 | • | • | • | 10 | 1 | |
| | **21213** | **32** | **3/4“** | 59,50 | 41,50 | 43,00 | 0,115 | • | • | • | 5 | 1 | |

## ÜBERGANGSSTÜCKE MIT AUSSENGEWINDE

mit 6-kant Schlüsselfläche

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



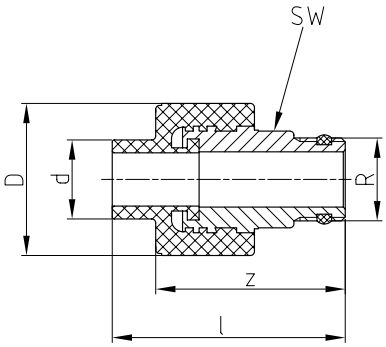
| SDR | Art.- Nr. | d | R | l | z | D | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 7,4 9 11 | **21308** | **20** | **1/2“** | 66,50 | 52,00 | 38,50 | 0,104 | • | • | • | 10 | 1 | |
| | **21310** | **20** | **3/4“** | 67,50 | 53,00 | 38,50 | 0,129 | • | • | • | 10 | 1 | |
| | **21312** | **25** | **3/4“** | 67,50 | 51,50 | 38,50 | 0,103 | • | • | • | 10 | 1 | |
| | **21314** | **32** | **1“** | 78,50 | 60,50 | 53,00 | 0,216 | • | • | • | 5 | 1 | |
| | **21316** | **32** | **1 1/4“** | 81,00 | 63,00 | 68,00 | 0,320 | • | • | • | 5 | 1 | |
| | **21317** | **40** | **1“** | 81,00 | 60,50 | 52,00 | 0,222 | • | • | • | 5 | 1 | |
| | **21318** | **40** | **1 1/4“** | 84,50 | 64,00 | 68,00 | 0,326 | • | • | • | 5 | 1 | |
| | **21319** | **50** | **1 1/4“** | 85,50 | 62,00 | 68,00 | 0,352 | • | • | • | 5 | 1 | |
| | **21320** | **50** | **1 1/2“** | 88,50 | 65,00 | 74,00 | 0,429 | • | • | • | 5 | 1 | |
| | **21321** | **63** | **1 1/2“** | 94,50 | 67,00 | 72,50 | 0,466 | • | • | • | 1 | 1 | |
| | **21322** | **63** | **2“** | 102,50 | 75,00 | 84,00 | 0,679 | • | • | • | 1 | 1 | |
| | **21323** | **75** | **2“** | 102,00 | 72,00 | 84,00 | 0,729 | • | • | • | 1 | 1 | |
| | **21324** | **75** | **2 1/2“** | 105,00 | 75,00 | 100,00 | 0,972 | • | • | • | 1 | 1 | |
| | **21325** | **90** | **3“** | 121,00 | 88,00 | 120,00 | 1,315 | • | • | • | 1 | 1 | |
| | **21327** | **110** | **4“** | 148,00 | 111,00 | 147,00 | 2,699 | • | • | • | 1 | 1 | |

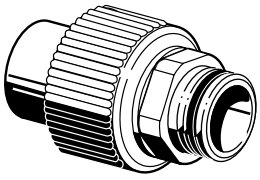
**HINWEIS:**
Metallverbund-Fittings für aquatherm blue und green pipe werden aus dem Werkstoff Fusiolen® PP-R und Messing hergestellt.
Einlegeteile, ohne 6-kant Schlüsselfläche, mit 1/2 “ und 3/4 “ IG erhalten Sie auf Wunsch auch in Edelstahlausführung.
Sonderpreisliste Best-. Nr.: D53180 auf Anfrage!

## ÜBERGANGSSTÜCK MIT AUSSENGEWINDE

selbstdichtend, mit 6-kant Schlüsselfläche, außen/außen

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



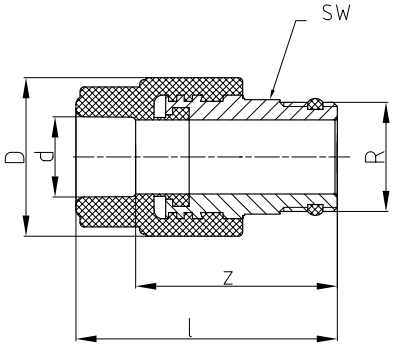



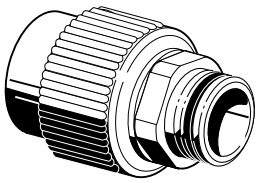
| SDR | Art.- Nr. | d | R | l | z | D | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **21355** | **20** | **1/2“** | 59,00 | 48,00 | 38,50 | 0,107 | • | • | • | 10 | 1 | |

## ÜBERGANGSSTÜCKE MIT AUSSENGEWINDE

selbstdichtend, mit 6-kant Schlüsselfläche

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

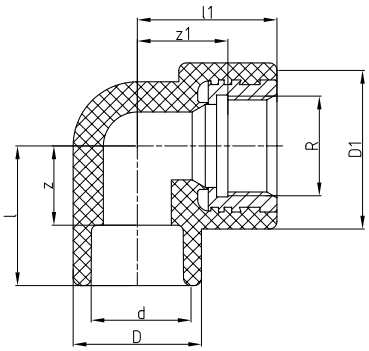


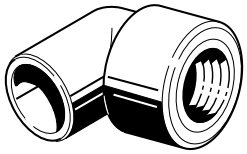



| SDR | Art.- Nr. | d | R | l | z | D | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **21358** | **20** | **1/2“** | 63,50 | 49,00 | 38,50 | 0,111 | 10 | 1 | |

## ÜBERGANGSWINKEL MIT INNENGEWINDE

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



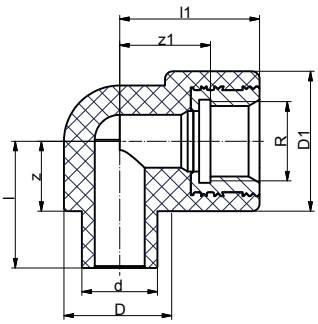



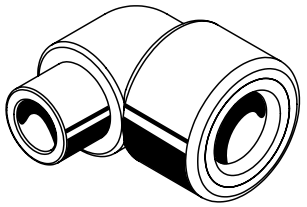
| SDR | Art.- Nr. | d | R | l | z | D | l1 | z1 | D1 | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **23008** | **20** | **3/4“** | 37,00 | 22,50 | 34,00 | 37,00 | 24,00 | 44,00 | 0,102 | • | • | • | 10 | 1 | |
| | **23010** | **20** | **1/2“** | 31,50 | 17,00 | 29,50 | 31,50 | 18,50 | 37,00 | 0,074 | • | • | • | 10 | 1 | |
| | **23012** | **25** | **3/4“** | 37,00 | 21,00 | 34,00 | 37,00 | 24,00 | 44,00 | 0,100 | • | • | • | 10 | 1 | |
| | **23014** | **25** | **1/2“** | 34,00 | 18,00 | 34,00 | 37,00 | 24,00 | 37,00 | 0,074 | • | • | • | 10 | 1 | |
| | **23016** | **32** | **3/4“** | 27,50 | 9,50 | 43,00 | 51,00 | 38,00 | 44,00 | 0,104 | • | • | • | 5 | 1 | |
| | **23018** | **32** | **1“** | 34,00 | 16,00 | 43,00 | 66,50 | 44,50 | 60,50 | 0,251 | • | • | • | 5 | 1 | |

**HINWEIS:**
Metallverbund-Fittings für aquatherm blue und green pipe werden aus dem Werkstoff Fusiolen® PP-R und Messing hergestellt.
Einlegeteile, ohne 6-kant Schlüsselfläche, mit 1/2 “ und 3/4 “ IG erhalten Sie auf Wunsch auch in Edelstahlausführung.
Sonderpreisliste Best-. Nr.: D53180 auf Anfrage!

## ÜBERGANGSWINKEL MIT INNENGEWINDE

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

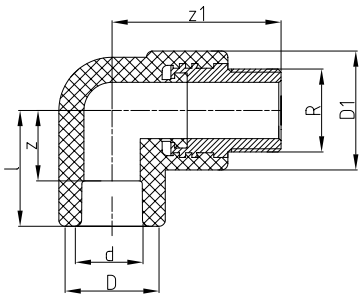


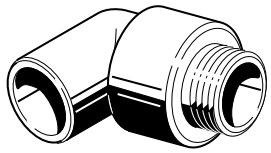



| SDR | Art.- Nr. | d | R | l | z | D | l1 | z1 | D1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **23208** | **20** | **1/2"** | 33,50 | 18,50 | 29,50 | 37,00 | 24,00 | 37,00 | 0,076 | 10 | 1 | |

## ÜBERGANGSWINKEL MIT AUSSENGEWINDE

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün

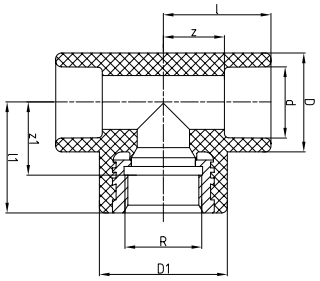


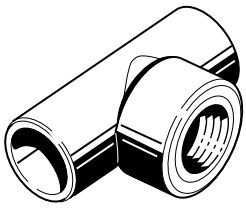



| SDR | Art.- Nr. | d | R | l | z | D | z1 | D1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **23506** | **20** | **1/2"** | 31,50 | 17,00 | 29,50 | 53,00 | 37,00 | 0,108 | 10 | 1 | |
| | **23508** | **20** | **3/4"** | 37,00 | 22,50 | 34,00 | 54,00 | 38,00 | 0,128 | 10 | 1 | |
| | **23510** | **25** | **3/4"** | 37,00 | 21,00 | 34,00 | 54,00 | 38,00 | 0,105 | 10 | 1 | |
| | **23512** | **32** | **3/4"** | 27,50 | 9,50 | 43,00 | 68,00 | 38,00 | 0,112 | 5 | 1 | |
| | **23514** | **32** | **1"** | 31,00 | 13,00 | 43,00 | 85,50 | 52,00 | 0,233 | 5 | 1 | |

## ÜBERGANGS-T- STÜCKE MIT INNENGEWINDE

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



| SDR | Art.- Nr. | d | R | l | z | D | l1 | z1 | D1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **25006** | **20** | **1/2"** | 31,50 | 17,00 | 29,50 | 37,00 | 24,00 | 37,00 | 0,086 | 10 | 1 | |
| | **25008** | **20** | **3/4"** | 37,00 | 22,50 | 34,00 | 38,00 | 25,00 | 44,00 | 0,121 | 10 | 1 | |
| | **25010** | **25** | **1/2"** | 34,00 | 18,00 | 34,00 | 38,00 | 25,00 | 37,00 | 0,091 | 10 | 1 | |
| | **25012** | **25** | **3/4"** | 37,00 | 21,00 | 34,00 | 38,00 | 25,00 | 44,00 | 0,109 | 10 | 1 | |
| | **25013** | **32** | **1/2"** | 35,00 | 17,00 | 37,00 | 37,00 | 24,00 | 37,00 | 0,103 | 5 | 1 | |
| | **25014** | **32** | **3/4"** | 27,50 | 9,50 | 43,00 | 51,00 | 38,00 | 44,00 | 0,111 | 5 | 1 | |
| | **25016** | **32** | **1"** | 31,00 | 13,50 | 43,00 | 67,00 | 49,00 | 60,00 | 0,254 | 5 | 1 | |
| | **25018** | **40** | **1/2"** | 42,50 | 22,00 | 52,00 | 39,00 | 26,00 | 37,00 | 0,180 | 5 | 1 | |
| | **25019** | **40** | **3/4"** | | | | | | | | 5 | 1 | |
| | **25020** | **40** | **1"** | 41,50 | 21,00 | 52,00 | 56,00 | 34,00 | 60,00 | 0,329 | 5 | 1 | |
| | **25022** | **50** | **1"** | 49,50 | 26,00 | 68,00 | 63,50 | 43,50 | 68,00 | 0,385 | 5 | 1 | |

**HINWEIS:**
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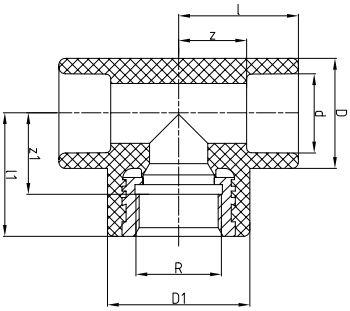
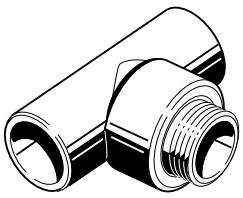
Einlegeteile, ohne 6-kant Schlüsselfläche, mit 1/2 " und 3/4 " IG erhalten Sie auf Wunsch auch in Edelstahlausführung.
Sonderpreisliste Best-. Nr.: D53180 auf Anfrage!

## ÜBERGANGS- T - STÜCK MIT AUSSENGEWINDE

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



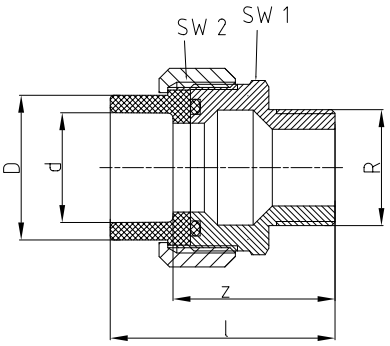



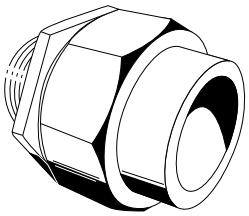
| SDR | Art.- Nr. | d | R | l | z | D | z1 | D1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | |
| | **25506** | **20** | **1/2"** | 31,50 | 17,00 | 29,50 | 53,00 | 37,00 | 0,102 | 10 | 1 | |

## ÜBERGANGSVERSCHRAUBUNGEN MIT AUSSENGEWINDE

Ausführung mit Überwurfmutter und Schweißmuffe

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



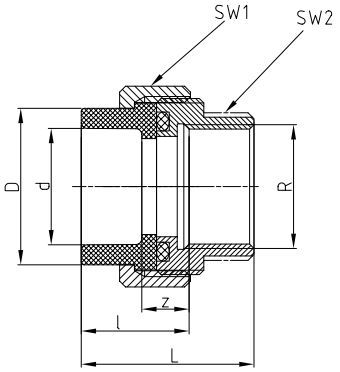



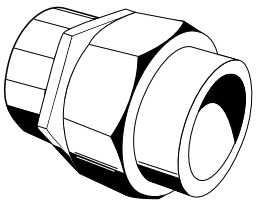
| SDR | Art.- Nr. | d | R | l | z | D | SW1 | SW2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | |
| | **26608** | **20** | **1/2"** | 54,50 | 40,00 | 27,50 | 36,00 | 36,00 | 0,145 | 1 | 1 | |
| | **26610** | **25** | **3/4"** | 59,50 | 43,50 | 36,00 | 46,00 | 46,00 | 0,243 | 1 | 1 | |
| | **26612** | **32** | **1"** | 64,50 | 46,50 | 41,50 | 52,00 | 50,00 | 0,336 | 1 | 1 | |
| | **26614** | **40** | **1 1/4"** | 70,00 | 49,50 | 53,00 | 64,00 | 65,00 | 0,632 | 1 | 1 | |
| | **26616** | **50** | **1 1/2"** | 86,50 | 63,00 | 59,00 | 72,00 | 57,00 | 0,624 | 1 | 1 | |
| | **26618** | **63** | **2"** | 95,50 | 68,00 | 74,00 | 89,00 | 66,00 | 1,212 | 1 | 1 | |

## ÜBERGANGSVERSCHRAUBUNGEN MIT INNENGEWINDE

Ausführung mit Überwurfmutter und Schweißmuffe

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



| SDR | Art.- Nr. | d | R | l | z | D | L | SW1 | SW2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | |
| | **26638** | **20** | **1/2"** | 30,00 | 15,50 | 27,50 | 45,00 | 36,00 | 25,00 | 0,083 | 1 | 1 | |
| | **26640** | **25** | **3/4"** | 32,00 | 16,00 | 36,00 | 49,00 | 45,00 | 32,00 | 0,193 | 1 | 1 | |
| | **26642** | **32** | **1"** | 37,00 | 19,00 | 41,50 | 54,00 | 52,00 | 40,00 | 0,291 | 1 | 1 | |
| | **26644** | **40** | **1 1/4"** | 36,50 | 16,00 | 53,00 | 58,50 | 64,00 | 47,00 | 0,423 | 1 | 1 | |
| | **26646** | **50** | **1 1/2"** | 45,50 | 22,00 | 59,00 | 64,50 | 72,00 | 57,00 | 0,610 | 1 | 1 | |
| | **26648** | **63** | **2"** | 50,50 | 23,00 | 74,00 | 74,50 | 89,00 | 68,00 | 0,924 | 1 | 1 | |

**HINWEIS:**
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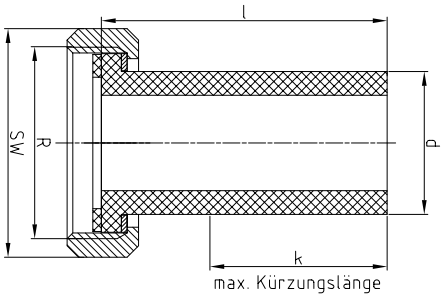
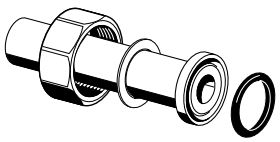
Sonderpreisliste Best-. Nr.: D53180 auf Anfrage!

## ANSCHLUSSVERSCHRAUBUNGEN

Länge: 100 mm, mit Dichtung

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



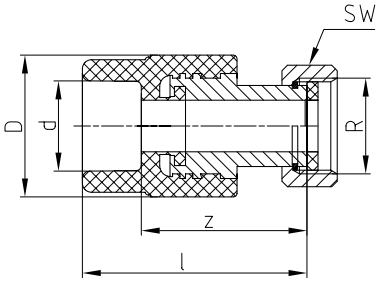



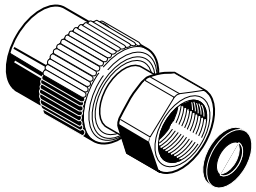
| SDR | Art.- Nr. | d | Mutter Gewinde R | l | k | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | |
| | **26708** | **20** | **1“** | 100,00 | 65,00 | 36,00 | 0,079 | 1 | 1 | |
| | **26710** | **25** | **1 1/4“** | 100,00 | 62,00 | 46,00 | 0,104 | 1 | 1 | |
| | **26712** | **32** | **1 1/2“** | 100,00 | 58,00 | 52,00 | 0,175 | 1 | 1 | |
| | **26714** | **40** | **2“** | 100,00 | 53,00 | 64,00 | 0,258 | 1 | 1 | |
| | **26716** | **50** | **2 1/4“** | 100,00 | 49,00 | 72,00 | 0,344 | 1 | 1 | |
| | **26718** | **63** | **2 3/4“** | 100,00 | 43,00 | 89,00 | 0,583 | 1 | 1 | |
| | **26720** | **75** | **3 1/2“** | 100,00 | 34,00 | 110,00 | 0,918 | 1 | 1 | |
| | **26722** | **90** | **4“** | 100,00 | 26,00 | 120,00 | 1,238 | 1 | 1 | |

## WASSERZÄHLERANSCHLUSSVERSCHRAUBUNGEN

mit Dichtung

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



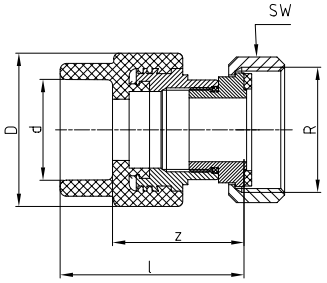



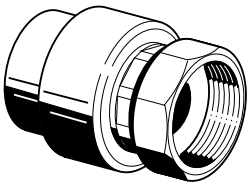
| SDR | Art.- Nr. | d | Mutter Gewinde R | l | z | D | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | |
| | **26808** | **20** | **3/4“** | 59,50 | 45,00 | 38,50 | 30,00 | 0,153 | 1 | 1 | |
| | **26810** | **25** | **3/4“** | 61,00 | 45,00 | 38,50 | 30,00 | 0,155 | 1 | 1 | |
| | **26812** | **32** | **3/4“** | 62,00 | 44,00 | 43,50 | 30,00 | 0,162 | 1 | 1 | |

## ÜBERGANGSVERSCHRAUBUNGEN

ISO-Norm

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



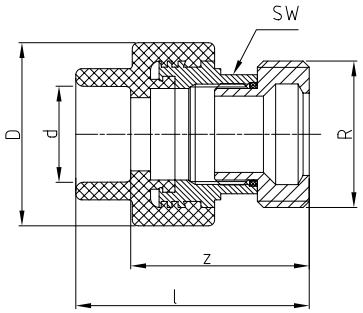



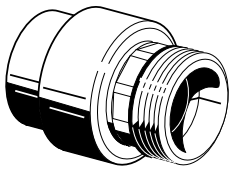
| SDR | Art.- Nr. | d | Mutter Gewinde R | L | z | D | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | |
| | **27010** | **20** | **1“** | 58,50 | 36,00 | 38,50 | 36,00 | 0,182 | 10 | 1 | |
| | **27011** | **25** | **1“** | 60,00 | 44,00 | 38,50 | 36,00 | 0,186 | 10 | 1 | |
| | **27012** | **25** | **1 1/4“** | 60,00 | 44,00 | 43,50 | 46,00 | 0,274 | 10 | 1 | |
| | **27013** | **32** | **1 1/4“** | 63,00 | 45,00 | 43,50 | 46,00 | 0,279 | 5 | 1 | |
| | **27014** | **32** | **1 1/2“** | 69,50 | 51,50 | 60,00 | 52,00 | 0,446 | 5 | 1 | |
| | **27015** | **40** | **1 1/2“** | 72,00 | 51,50 | 60,00 | 52,00 | 0,421 | 5 | 1 | |
| | **27016** | **40** | **2“** | 74,00 | 53,50 | 74,00 | 64,00 | 0,719 | 5 | 1 | |
| | **27017** | **50** | **2“** | 77,00 | 53,50 | 74,00 | 64,00 | 0,736 | 5 | 1 | |
| | **27018** | **50** | **2 1/4“** | 77,00 | 54,50 | 84,00 | 72,00 | 0,831 | 5 | 1 | |
| | **27019** | **63** | **2 1/4“** | 83,50 | 56,00 | 84,00 | 72,00 | 0,889 | 1 | 1 | |
| | **27020** | **63** | **2 3/4“** | 84,00 | 56,50 | 101,00 | 89,00 | 1,306 | 1 | 1 | |
| | **27021** | **75** | **2 3/4“** | 85,00 | 55,00 | 100,00 | 89,00 | 1,275 | 1 | 1 | |
| | **27022** | **75** | **3 1/2“** | 91,00 | 61,00 | 100,00 | 110,00 | 1,818 | 1 | 1 | |

## GEGENSTÜCKE

mit Schweißmuffe und Außengewinde zur ISO-Norm-Verschraubung

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



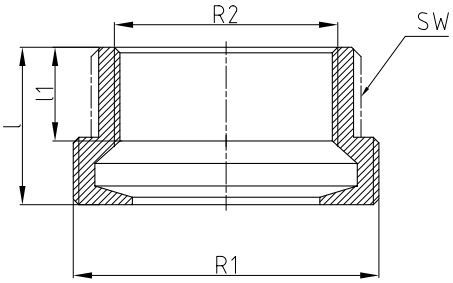



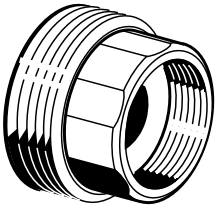
| SDR | Art.- Nr. | d | Gewinde R | l | z | D | SW | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | | |
| | **27310** | **20** | **1“** | 61,50 | 47,00 | 38,50 | 24,00 | 0,151 | • | • | • | 10 | 1 | |
| | **27311** | **25** | **1“** | 63,00 | 47,00 | 38,50 | 24,00 | 0,153 | • | • | • | 10 | 1 | |
| | **27312** | **25** | **1 1/4“** | 63,00 | 47,00 | 43,50 | 31,00 | 0,221 | • | • | • | 10 | 1 | |
| | **27313** | **32** | **1 1/4“** | 66,00 | 48,00 | 43,50 | 31,00 | 0,226 | • | • | • | 5 | 1 | |
| | **27314** | **32** | **1 1/2“** | 76,50 | 58,50 | 60,00 | 39,00 | 0,408 | • | • | • | 5 | 1 | |
| | **27315** | **40** | **1 1/2“** | 79,00 | 58,50 | 60,00 | 39,00 | 0,414 | • | • | • | 5 | 1 | |
| | **27316** | **40** | **2“** | 81,00 | 60,50 | 74,00 | 50,00 | 0,650 | • | • | • | 5 | 1 | |
| | **27317** | **50** | **2“** | 84,00 | 60,50 | 74,00 | 50,00 | 0,634 | • | • | • | 5 | 1 | |
| | **27318** | **50** | **2 1/4“** | 83,00 | 59,50 | 84,00 | 55,00 | 0,750 | • | • | • | 5 | 1 | |
| | **27319** | **63** | **2 1/4“** | 89,50 | 62,00 | 84,00 | 55,00 | 0,728 | • | • | • | 1 | 1 | |
| | **27320** | **63** | **2 3/4“** | 94,00 | 66,50 | 101,00 | 67,00 | 1,093 | • | • | • | 1 | 1 | |
| | **27321** | **75** | **2 3/4“** | 95,00 | 65,00 | 100,00 | 67,00 | 1,117 | • | • | • | 1 | 1 | |
| | **27322** | **75** | **3 1/2“** | 100,00 | 70,00 | 100,00 | 67,00 | 1,436 | • | • | • | 1 | 1 | |

## MESSINGGEGENSTÜCKE

mit Innengewinde, zur ISO-Norm-Verschraubung / Anschlussverschraubung

Material: Fusiolen® PP-R, Messing
Farbe: grün



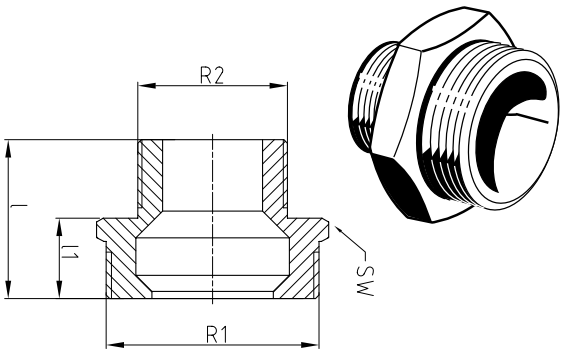
| SDR | Art.- Nr. | Außen-gewinde R1 | Innen-gewinde R2 | l | l1 | SW | Gewicht [kg] | System | | | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | |
| | **27510** | **1“** | **1/2“** | 25,00 | 15,00 | 25,00 | 0,063 | • | • | • | 10 | 1 | |
| | **27512** | **1 1/4“** | **3/4“** | 28,00 | 18,00 | 32,00 | 0,119 | • | • | • | 10 | 1 | |
| | **27514** | **1 1/2“** | **1“** | 31,00 | 17,00 | 40,00 | 0,175 | • | • | • | 5 | 1 | |
| | **27516** | **2“** | **1 1/4“** | 33,00 | 22,00 | 47,00 | 0,263 | • | • | • | 5 | 1 | |
| | **27518** | **2 1/4“** | **1 1/2“** | 36,00 | 19,00 | 57,00 | 0,333 | • | • | • | 5 | 1 | |
| | **27520** | **2 3/4“** | **2“** | 42,00 | 24,00 | 68,00 | 0,517 | • | • | • | 1 | 1 | |
| | **27522** | **3 1/2“** | **2 1/2“** | 46,00 | 27,00 | 84,00 | 0,801 | • | • | • | 1 | 1 | |
| | **27524** | **4“** | **3“** | 46,00 | 27,00 | 97,00 | 0,943 | • | • | • | 1 | 1 | |

**HINWEIS:**
Metallverbund-Fittings für aquatherm blue und green pipe werden aus dem Werkstoff Fusiolen® PP-R und Messing hergestellt.
Einlegeteile, ohne 6-kant Schlüsselfläche, mit 1/2 “ und 3/4 “ IG erhalten Sie auf Wunsch auch in Edelstahlausführung.
Sonderpreisliste Best-. Nr.: D53180 auf Anfrage!

## MESSINGGEGENSTÜCKE

mit Außengewinde, zur ISO-Norm-Verschraubung / Anschlussverschraubung

Material: Messing
Farbe: grün

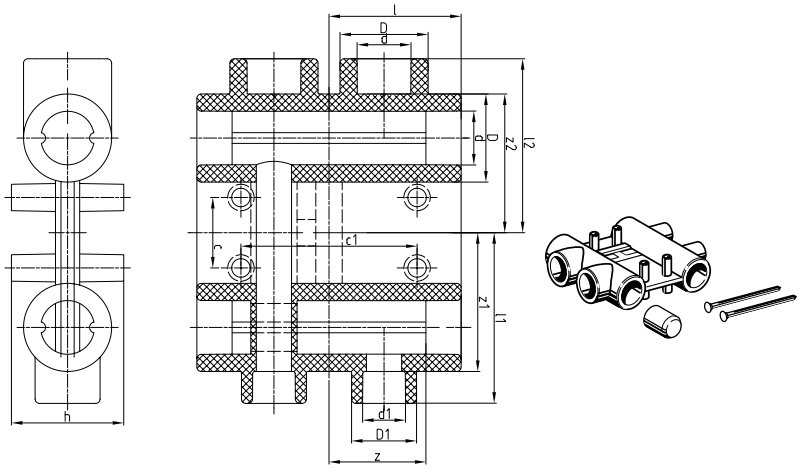



| SDR | Art.- Nr. | Gewinde R1 | Gewinde R2 | l | l1 | SW | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | |
| | **27710** | **1“** | **1/2“** | 34,50 | 18,50 | 36,00 | 0,109 | 10 | 1 | |
| | **27712** | **1 1/4“** | **3/4“** | 38,50 | 21,00 | 46,00 | 0,188 | 10 | 1 | |
| | **27714** | **1 1/2“** | **1“** | 41,50 | 22,50 | 50,00 | 0,211 | 5 | 1 | |
| | **27716** | **2“** | **1 1/4“** | 44,50 | 22,50 | 65,00 | 3,630 | 5 | 1 | |
| | **27718** | **2 1/4“** | **1 1/2“** | 58,00 | 36,00 | 57,00 | 0,472 | 5 | 1 | |
| | **27720** | **2 3/4“** | **2“** | 63,00 | 38,00 | 66,00 | 0,803 | 1 | 1 | |
| | **27722** | **3 1/2“** | **2 1/2“** | 70,00 | 42,00 | 82,00 | 1,189 | 1 | 1 | |
| | **27724** | **4“** | **3“** | 74,00 | 42,00 | 97,00 | 1,398 | 1 | 1 | |

## VERTEILERBLOCK-SANITÄR

einschließlich 1 Stopfen und 2 Befestigungsdübel

Material: Fusiolen® PP-R
Farbe: grün

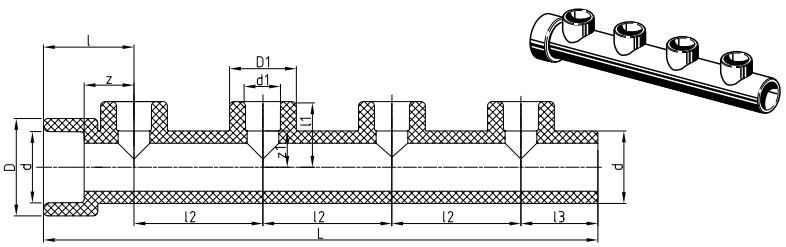



| SDR | Art.- Nr. | d | l | z | D | d1 | l1 | z1 | D1 | l2 | z2 | c | c1 | cl | l3 | h | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | | | | | | | | |
| | **30115** | **25** | 60,00 | 44,00 | 40,00 | 20,00 | 77,50 | 63,00 | 29,50 | 79,00 | 63,00 | 32,00 | 80,00 | 100,00 | 36,00 | 51,00 | 0,273 | 1 | 1 | |

## VERTEILERROHR

Länge: 246 mm, mit 4 Abgängen

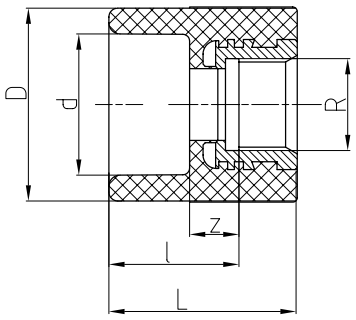
Material: Fusiolen® PP-R
Farbe: grün

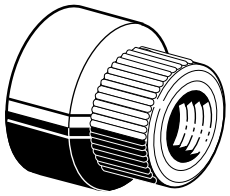



| SDR | Art.- Nr. | d | d1 | l | z | D | l1 | z1 | D1 | l2 | l3 | L | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | | | | |
| | **30602** | **32** | **16,00** | 40,00 | 22,00 | 43,00 | 29,00 | 16,00 | 29,50 | 57,00 | 36,00 | 245,00 | 0,141 | 1 | 1 | |
| | **30604** | **32** | **20,00** | 40,00 | 22,00 | 43,00 | 29,00 | 14,50 | 29,50 | 57,00 | 36,00 | 245,00 | 0,134 | 1 | 1 | |
| Je nach Bedarf kann das Verteilerrohr gekürzt bzw. mit weiteren Verteilerrohren durch Fusion ergänzt werden. Andere Verteiler auf Anfrage. | | | | | | | | | | | | | | | | |

## VERTEILERROHR-ENDSTÜCK*

Material: Fusiolen® PP-R, Messing
Standard: DIN 16962, DIN EN ISO 15874
Farbe: grün



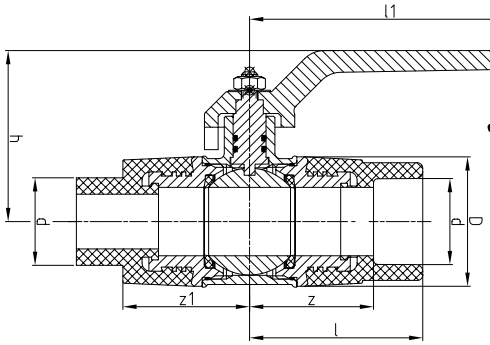
| SDR | Art.- Nr. | d | R | l | z | D | L | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **30804** | **32** | **1/2"** | 30,00 | 12,00 | 43,00 | 43,00 | 0,077 | 2 | 1 | |
| *Übergangsstück als Verteilerrohr-Endstück mit Innengewinde. | | | | | | | | | | | |

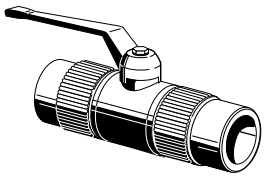
**HINWEIS:**
Metallverbund-Fittings für aquatherm blue und green pipe werden aus dem Werkstoff Fusiolen® PP-R und Messing hergestellt.
Einlegeteile, ohne 6-kant Schlüsselfläche, mit 1/2 " und 3/4 " IG erhalten Sie auf Wunsch auch in Edelstahlausführung.
Sonderpreisliste Best-. Nr.: D53180 auf Anfrage!

## KUGELHAHN FÜR VERTEILERROHR

innen/außen

Material: Fusiolen® PP-R, Messing
Farbe: grün

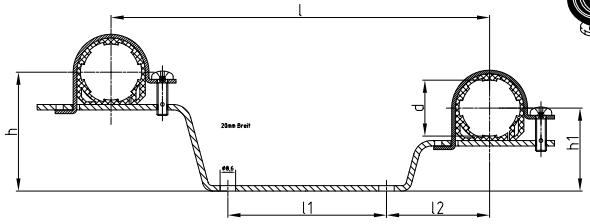


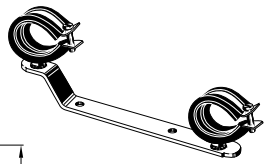



| SDR | Art.- Nr. | d | l | z | D | z1 | h | l1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | **78000** | **32** | 63,00 | 45,00 | 47,50 | 46,50 | 78,00 | 108,00 | 0,575 | 2 | 4 | |

## TRAGBÜGEL FÜR VERTEILERROHR

verzinkt, doppelt



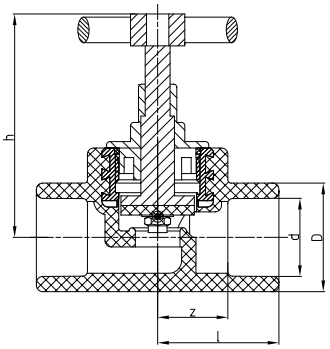



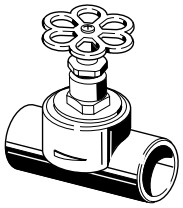
| Art.- Nr. | d | l | l1 | l2 | h | h1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| **60210** | **32** | 210,00 | 80,00 | 57,00 | 66,00 | 46,00 | 0,226 | 2 | 1 | |

## GERADESITZVENTILE

für Aufputzmontage

Material: Fusiolen® PP-R, Messing
Farbe: grün



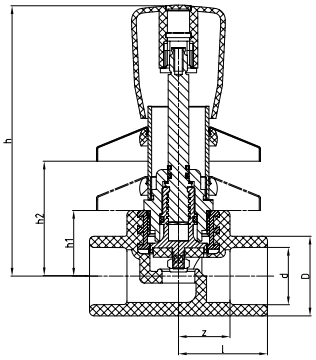



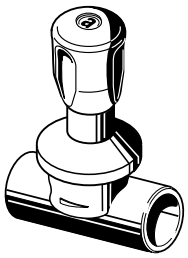
| SDR | Art.- Nr. | d | l | z | D | h | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | |
| | **40808** | **20** | 35,00 | 20,50 | 29,50 | 70,00 | 0,165 | 1 | 1 | |
| | **40810** | **25** | 38,00 | 22,00 | 34,00 | 70,00 | 0,172 | 1 | 1 | |
| | **40812** | **32** | 49,00 | 31,00 | 43,00 | 86,50 | 0,314 | 1 | 1 | |
| | **40814** | **40** | 60,00 | 39,50 | 52,00 | 100,50 | 0,585 | 1 | 1 | |

## UNTERPUTZVENTILE

verchromt

Material: Fusiolen® PP-R, Messing
Farbe: grün



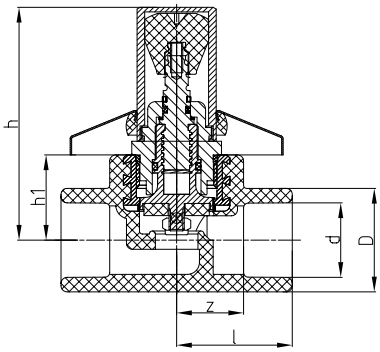



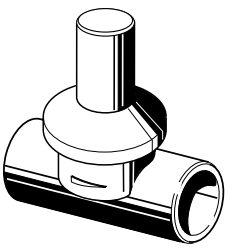
| SDR | Art.- Nr. | d | l | z | D | h | h1 | h2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | |
| | **40858** | **20** | 35,00 | 20,50 | 29,50 | 116,00 | 28,00 | 59,00 | 0,319 | 1 | 1 | |
| | **40860** | **25** | 38,00 | 22,00 | 34,00 | 116,00 | 28,00 | 59,00 | 0,330 | 1 | 1 | |
| | **40862** | **32** | 49,00 | 31,00 | 43,00 | 121,00 | 34,00 | 59,00 | 0,416 | 1 | 1 | |

## UNTERPUTZVENTILE

Behördenausführung / verchromt / kurze Ausführung

Material: Fusiolen® PP-R, Messing
Farbe: grün, chrom



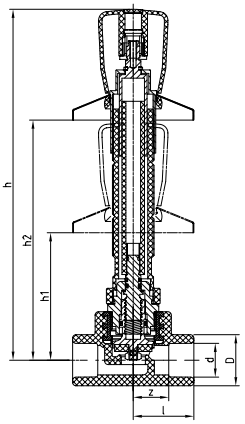



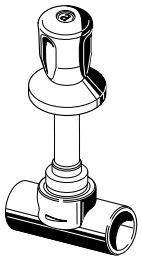
| SDR | Art.- Nr. | d | l | z | D | h | h1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | |
| | **40868** | **20** | 35,00 | 20,50 | 29,50 | 71,50 | 28,00 | 0,258 | 1 | 1 | |
| | **40870** | **25** | 38,00 | 22,00 | 34,00 | 71,50 | 28,00 | 0,288 | 1 | 1 | |
| | **40872** | **32** | 49,00 | 31,00 | 43,00 | 82,50 | 34,00 | 0,376 | 1 | 1 | |

## UNTERPUTZVENTILE

verchromt, flexibel für Bautiefen von 55 mm bis 100 mm einsetzbar

Material: Fusiolen® PP-R, Messing
Farbe: grün, chrom



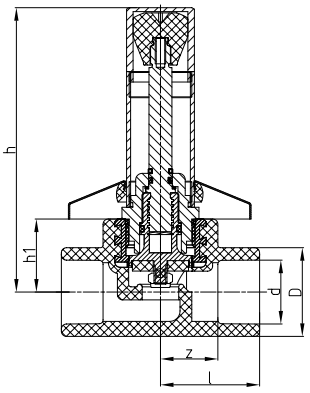



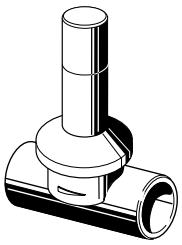
| SDR | Art.- Nr. | d | l | z | D | h | h1 | h2 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 7,4 11 | **40878** | **20** | 35,00 | 20,50 | 29,50 | 213,00 | 59,00 | 147,00 | 0,357 | 1 | 1 | |
| | **40880** | **25** | 38,00 | 22,00 | 34,00 | 213,00 | 59,00 | 147,00 | 0,369 | 1 | 1 | |
| | **40882** | **32** | 49,00 | 31,00 | 43,00 | 219,00 | 65,00 | 153,00 | 0,455 | 1 | 1 | |

## UNTERPUTZVENTILE

Behördenausführung / verchromt

Material: Fusiolen® PP-R, Messing
Farbe: grün, chrom



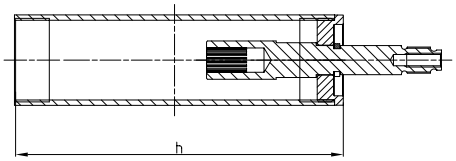



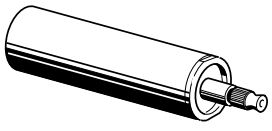
| SDR | Art.- Nr. | d | l | z | D | h | h1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| 7,4 11 | **40888** | **20** | 35,00 | 20,50 | 29,50 | 109,00 | 28,00 | 0,342 | 1 | 1 | |
| | **40890** | **25** | 38,00 | 22,00 | 34,00 | 109,00 | 28,00 | 0,350 | 1 | 1 | |
| | **40892** | **32** | 49,00 | 31,00 | 43,00 | 115,00 | 34,00 | 0,432 | 1 | 1 | |

## VERLÄNGERUNGEN FÜR UNTERPUTZVENTILE

verchromt für Art.-Nr. 40858-40862

Material: Messing
Farbe: chrom

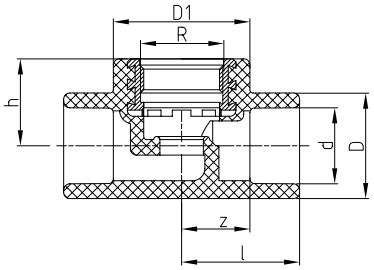


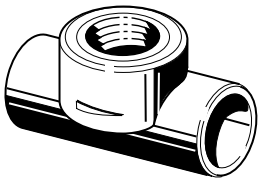



| Art.- Nr. | h | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|
| | | | | | |
| **40900** | 92,00 | 0,148 | 1 | 1 | |
| **40902** | 132,00 | 0,209 | 1 | 1 | |

## ABSPERRVENTIL - UNTERTEILE

Material: Fusiolen® PP-R, Messing
Farbe: grün



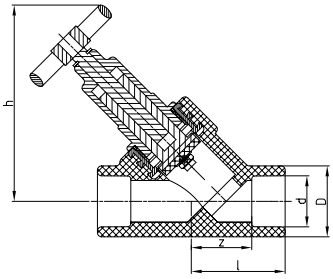



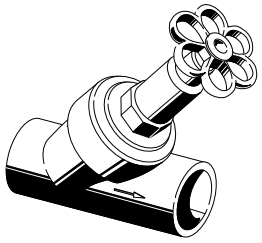
| SDR | Art.- Nr. | d | R | l | z | D | h | D1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | |
| | **40908** | **20** | **3/4"** | 35,00 | 20,00 | 29,50 | 28,00 | 44,00 | 0,093 | 1 | 1 | |
| | **40910** | **25** | **3/4"** | 38,00 | 22,00 | 34,00 | 28,00 | 44,00 | 0,101 | 1 | 1 | |
| | **40912** | **32** | **1"** | 49,00 | 31,00 | 43,00 | 34,00 | 52,00 | 0,146 | 1 | 1 | |
| | **40914** | **40** | **1 1/4"** | 60,00 | 39,50 | 52,00 | 41,00 | | 0,313 | 1 | 1 | |

## SCHRÄGSITZVENTILE

ohne Entleerung

Material: Fusiolen® PP-R, Messing
Farbe: grün



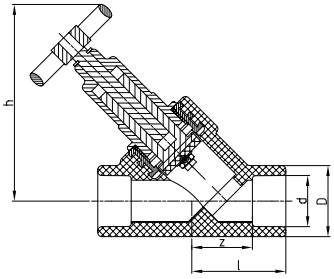



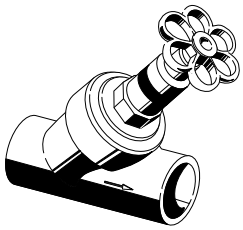
| SDR | Art.- Nr. | d | l | z | D | h | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | |
| | **41108** | **20** | 45,00 | 30,50 | 34,00 | 95,50 | 0,294 | 1 | 1 | |
| | **41110** | **25** | 45,00 | 29,00 | 34,00 | 95,50 | 0,283 | 1 | 1 | |
| | **41112** | **32** | 56,00 | 38,00 | 43,00 | 111,50 | 0,421 | 1 | 1 | |
| | **41114** | **40** | 65,00 | 44,50 | 52,00 | 135,00 | 0,834 | 1 | 1 | |

## KFR - VENTILE

ohne Entleerung

Material: Fusiolen® PP-R, Messing
Farbe: grün

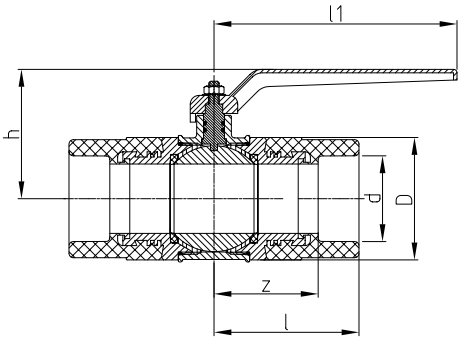


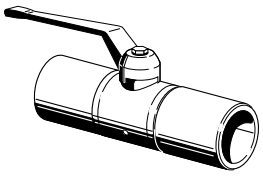



| SDR | Art.- Nr. | d | l | z | D | h | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | |
| | **41208** | **20** | 45,00 | 30,50 | 34,00 | 95,50 | 0,297 | 1 | 1 | |
| | **41210** | **25** | 45,00 | 29,00 | 34,00 | 95,50 | 0,292 | 1 | 1 | |
| | **41212** | **32** | 56,00 | 38,00 | 43,00 | 111,50 | 0,432 | 1 | 1 | |
| | **41214** | **40** | 65,00 | 44,50 | 52,00 | 135,00 | 0,840 | 1 | 1 | |

## KUGELHÄHNE PP/MS

Material: Fusiolen® PP-R, Messing
Farbe: grün



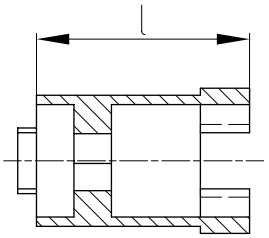



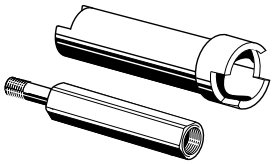
| SDR | Art.- Nr. | d | l | z | D | h | l1 | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | |
| | **41308** | **20** | 55,00 | 40,50 | 32,00 | 66,00 | 85,00 | 0,280 | 1 | 1 | |
| | **41310** | **25** | 55,00 | 39,00 | 41,00 | 73,00 | 85,00 | 0,375 | 1 | 1 | |
| | **41312** | **32** | 63,50 | 45,50 | 47,00 | 82,00 | 108,00 | 0,592 | 1 | 1 | |
| | **41314** | **40** | 72,50 | 52,00 | 58,00 | 93,00 | 108,00 | 1,034 | 1 | 1 | |
| | **41316** | **50** | 83,50 | 60,00 | 70,50 | 114,00 | 140,00 | 1,339 | 1 | 1 | |
| | **41318** | **63** | 102,50 | 75,00 | 87,00 | 132,00 | 140,00 | 2,552 | 1 | 1 | |

## VERLÄNGERUNGEN FÜR KUGELHÄHNE

verchromt für Art.-Nr. 41308-41318

Material: Messing
Farbe: chrom



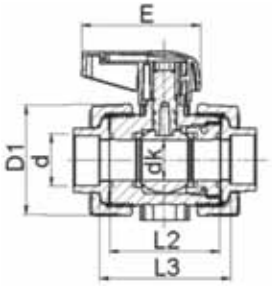



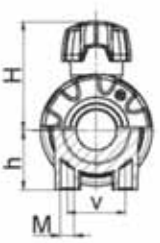
| Art.- Nr. | l | für Art.- Nr. | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|
| | | | | | | |
| **41378** | **35,00** | **41308 / 41310** | 0,120 | 1 | 1 | |
| **41382** | **35,00** | **41312 / 41314** | 0,120 | 1 | 1 | |
| **41386** | **46,00** | **41316 / 41318** | 0,273 | 1 | 1 | |

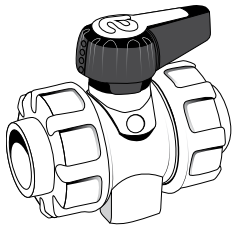
## KUGELHÄHNE PP

Ausführung mit Überwurfmutter und Schweißmuffe

Material: Fusiolen® PP-R
Farbe: grün



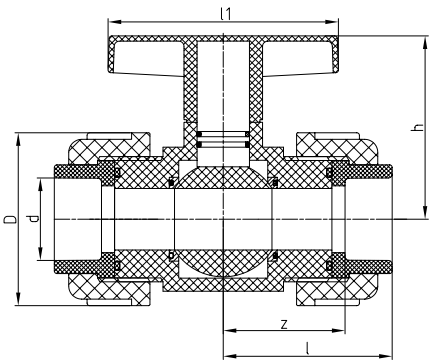



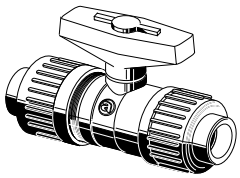
| SDR | Art.- Nr. | d | dk | D1 | E | h | H | L2 | L3 | DN | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | | |
| | **41488** | **20** | 13,5 | 50,30 | 66 | 27,00 | 48 | 56,50 | 68,00 | 15 | 0,118 | 1 | 1 | |
| | **41490** | **25** | 18,5 | 59,00 | 81 | 30,00 | 56,5 | 65,50 | 78,50 | 20 | 0,188 | 1 | 1 | |
| | **41492** | **32** | 23,9 | 70,30 | 81,5 | 40,00 | 64,5 | 72,00 | 84,50 | 25 | 0,277 | 1 | 1 | |
| | **41494** | **40** | 31,0 | 85,90 | 91,5 | 46,00 | 83,3 | 85,00 | 100,00 | 32 | 0,434 | 1 | 1 | |
| | **41496** | **50** | 38,5 | 99,50 | 91,5 | 55,00 | 89,4 | 89,00 | 107,00 | 40 | 0,549 | 1 | 1 | |
| | **41498** | **63** | 50,0 | 125,50 | 141,5 | 70,00 | 115 | 101,00 | 118,00 | 50 | 0,922 | 1 | 1 | |

## KUGELHÄHNE PP

Ausführung mit Überwurfmutter und Schweißmuffe

Material: Fusiolen® PP-R
Farbe: grün



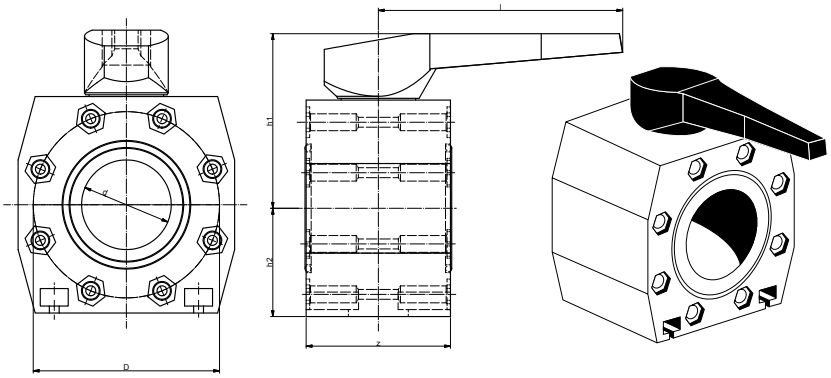



| SDR | Art.- Nr. | d | l | z | D | h | l1 | Zoll R | DN | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | | | |
| | **41400** | **75** | 138,00 | 108,00 | 129,00 | 137,00 | 186,00 | | 65 | 2,615 | 1 | 1 | |

## KUGELHÄHNE PP

Ausführung mit beidseitigem Flanschanschluss

Material: Fusiolen® PP-R
Farbe: grün



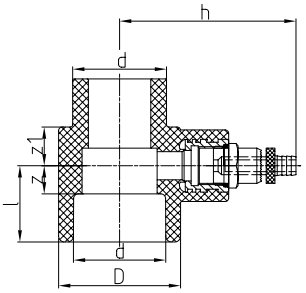

| SDR | Art.- Nr. | für ø | d | l | z | D | h1 | h2 | DN | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 17,6 | | | | | | | | | | | | | |
| | **41601** | **75** | | | | | | | - | | 1 | 1 | |
| | **41602** | **90** | 77 | 210,00 | 124,00 | 160,00 | 150,00 | 93,00 | 80 | 4,171 | 1 | 1 | |
| | **41604** | **110** | 94 | 260,00 | 145,00 | 180,00 | 165,00 | 103,00 | 100 | 5,612 | 1 | 1 | |
| | **41607** | **160** | 135 | 310,00 | 205,00 | 240,00 | 210,00 | 136,50 | 150 | 5,615 | 1 | 1 | |

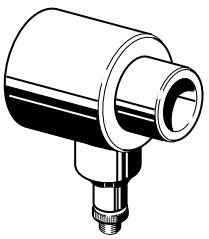
Für die Dimension 125 mm wird der PP- Kugelhahn Art-. Nr. 41604 mit der Bundbuchse Art-. Nr. 15526 und dem Flansch Art-. Nr. 15724 verwendet.
Zur Verbindung verweisen wir auf die aquatherm green pipe- Bundbuchse (Art.-Nr. 15522 - 15531) sowie auf den aquatherm green pipe- Kunststoff -Flansch (Art.-Nr. 15722-15730)
Sechskantschr. M16x60mm zu Art. 41602/41604
Sechskantschr. M20x80mm zu Art. 41607
dazugehörige Unterlegscheibe M16
ACHTUNG: Diese sind nicht im Lieferumfang enthalten

## ENTLEERUNGSSTUTZEN

zum Einschweißen in aquatherm green pipe-Ventile

Material: Fusiolen® PP-R, Messing
Farbe: grün



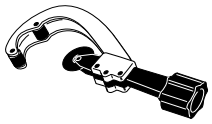



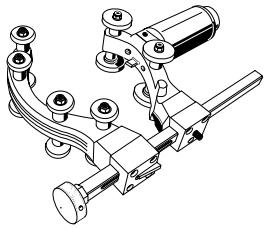
| SDR | Art.- Nr. | d | z | l | D | z1 | h | Gewicht [kg] | LE | PG | Preis € m/St |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,4 11 | | | | | | | | | | | |
| | **41408** | **20** | 11,50 | 26,00 | 34,00 | 16,50 | 67,00 | 0,098 | 1 | 1 | |
| | **41410** | **25** | 10,00 | 26,00 | 34,00 | 16,50 | 67,00 | 0,096 | 1 | 1 | |
| | **41412** | **32** | 14,00 | 32,00 | 43,00 | 17,00 | 70,50 | 0,118 | 1 | 1 | |
| | **41414** | **40** | 12,00 | 32,50 | 52,00 | 16,50 | 76,50 | 0,140 | 1 | 1 | |
| | **41416** | **50** | 15,50 | 39,00 | 68,00 | 17,00 | 83,75 | 0,202 | 1 | 1 | |
| | **41418** | **63** | 16,50 | 44,00 | 84,00 | 16,50 | 93,00 | 0,288 | 1 | 1 | |

**WICHTIG:**
aquatherm-Rohre nicht mit handelsüblichen Eisensägen absägen. aquatherm-Rohre können mit Säbelsägen oder Bandsägen, die für Kunststoff geeignete Sägeblätter besitzen, abgeschnitten werden.

### aquatherm ROHRABSCHNEIDER

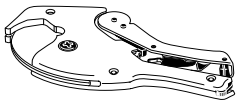
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50102** | für Rohre ø 16 - 40 mm | 1 | 3 | |
| **50105** | für Rohre ø 50 - 125 mm | 1 | 3 | |
| **50106** | für Rohre ø 110 - 160 mm | 1 | 3 | |





### aquatherm ROHRSCHERE

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50104** | für Rohre ø 16 - 40 mm | 1 | 3 | |



### aquatherm UMLAUFKREISSÄGE

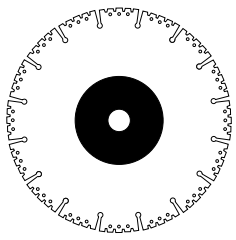
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50108** | für Rohre ø 160 - 355 mm | 1 | 3 | |

Die Umlaufkreissäge kann auch direkt bei Rothenberger unter der Art.-Nr. 5.5620 bezogen werden (www.rothenberger.de).
Hochleistungs-Umlauf-Kreissäge zum schnellen, exakten, versatzfreien und winkelgerechten Trennen von Kunststoffrohren ø 160 - 355 mm auf der Baustelle und in der Werkstatt.

### aquatherm TRENNSCHEIBE FÜR KUNSTSTOFF

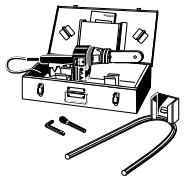
| Art.-Nr. | Abmessung | Bohrung | LE | PG | Preis € m/St |
|---|---|---|---|---|---|
| **50107** | ø 125 mm | 22,2 mm | 1 | 3 | |
| **50109** | ø 230 mm | 22,2 mm | 1 | 3 | |

Einsatzbereich: Einsetzbar auf jedem Winkelschleifer oder Motortrenner.
Ausführung: Galvanisch belegte segmentierte Diamanttrennscheibe.



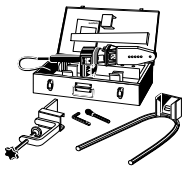
### aquatherm HANDSCHWEISSGERÄT (500 W)

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50336** | für Rohre ø 16 - 32 mm | 1 | 3 | |



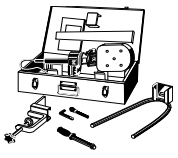
### aquatherm HANDSCHWEISSGERÄT (800 W)

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50337** | für Rohre ø 16 - 63 mm | 1 | 3 | |



### aquatherm HANDSCHWEISSGERÄT (1400 W)

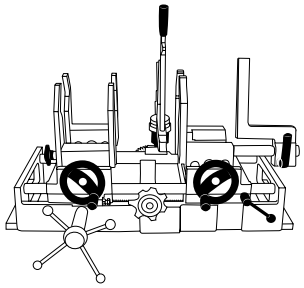
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50341** | für Rohre ø 50 - 125 mm | 1 | 3 | |



## aquatherm SCHWEISSMASCHINE (1400 W)

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50148** | für Rohre ø 50-125 mm - 230 V | 1 | 3 | |

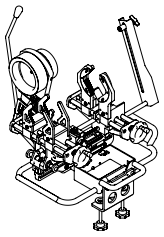
incl. Schweißwerkzeuge 50-125 mm, Rollenständer u. Holztransportkiste



## aquatherm SCHWEISSMASCHINE (1400 W) LIGHT

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50145** | für Rohre ø 63 - 125 mm | 1 | 3 | |

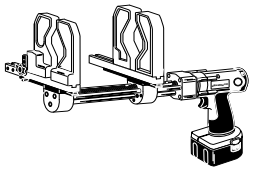
incl. Handschweißgerät (1400 W) u. Holztransportkiste



## aquatherm ELEKTRISCHE ZUGVORRICHTUNG

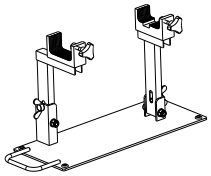
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50159** | für Rohre ø 63 - 125 mm | 1 | 3 | |

incl. Ersatzakku, Ladestation und Metallkoffer



## aquatherm UNTERGESTELL FÜR ART-.NR. 50159

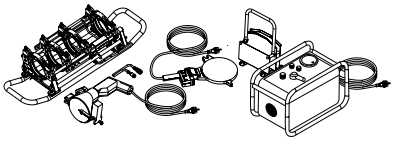
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50151** | | 1 | 3 | |



## aquatherm STUMPFSCHWEISSMASCHINEN ROTHENBERGER

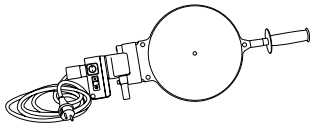
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50163** | für Rohre ø 160 - 250 mm | 1 | 3 | |
| **50178** | für Rohre ø 160 - 355 mm | 1 | 3 | |

incl. Holztransportkiste
Die Stumpfschweißmaschinen können auch direkt bei Rothenberger (www.rothenberger.com) bezogen werden.



## aquatherm HANDSCHWEISSGERÄT (1500 W) FÜR SATTELSCHWEISSWERKZEUGE Ø 50-160mm

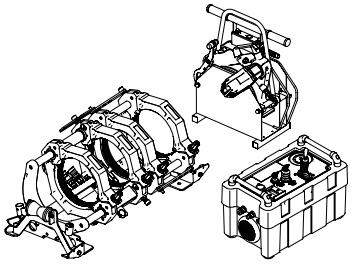
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50330** | für Rohre Ø 50 - 160 mm | 1 | 3 | |



## aquatherm STUMPFSCHWEISSMASCHINEN RITMO

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50165** | für Rohre ø 160 - 250 mm | 1 | 3 | |
| **50166** | für Rohre ø 160 - 315 mm | 1 | 3 | |
| **50177** | für Rohre ø 160 - 355 mm | 1 | 3 | |
| **50169** | für Rohre ø 400 - 630 mm | 1 | 3 | |

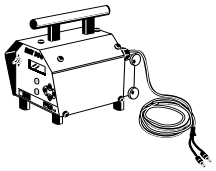
incl. Holztransportkiste
Die Stumpfschweißmaschine kann auch direkt bei Ritmo (www.ritmo.it) bezogen werden.



## aquatherm ELEKTROSCHWEISSGERÄT

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50175** | für Rohre ø 20 - 250 mm | 1 | 3 | |

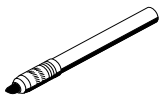
für Elektro-Schweißmuffen Art.-Nr. 17208-17238



## aquatherm TEMPERATUR-FARBWECHSELSTIFT

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50190** | | 1 | 3 | |

zur Überprüfung der korrekten Schweißtemperatur



## aquatherm TEMPERATUR-MESSGERÄT

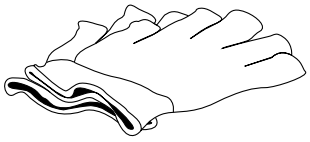
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50188** | | 1 | 3 | |

zur Überprüfung der korrekten Schweißtemperatur

## aquatherm TEMPERATUR SCHUTZHANDSCHUH

für den Werkzeugwechsel

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50195** | | 2 | 3 | |



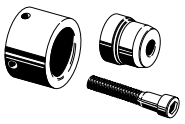
## aquatherm REINIGUNGSTÜCHER

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50193** | Dose/100 Tücher | 1 | 3 | |

für Elektroschweißmuffen

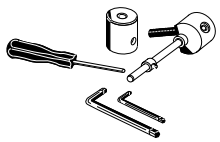
## aquatherm SCHWEISSWERKZEUGE

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50206** | 16 mm | 1 | 3 | |
| **50208** | 20 mm | 1 | 3 | |
| **50210** | 25 mm | 1 | 3 | |
| **50212** | 32 mm | 1 | 3 | |
| **50214** | 40 mm | 1 | 3 | |
| **50216** | 50 mm | 1 | 3 | |
| **50218** | 63 mm | 1 | 3 | |
| **50220** | 75 mm | 1 | 3 | |
| **50222** | 90 mm | 1 | 3 | |
| **50224** | 110 mm | 1 | 3 | |
| **50226** | 125 mm | 1 | 3 | |



## aquatherm REPARATUR-SET

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50307** | 7 mm | 1 | 3 | |
| **50311** | 11 mm | 1 | 3 | |

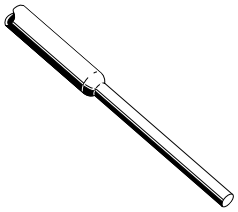


zum Zuschweißen von Löchern bis 10 mm im Rohr (Lochstopfen Art.-Nr. 60600)

## aquatherm LOCHSTOPFEN

für Rohrreparaturen

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **60600** | 7/11 mm | 10 | 1 | |



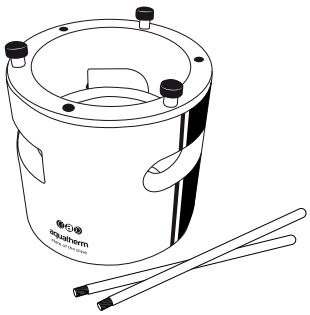
## NEU aquatherm UNIVERSAL-SCHÄLGERÄTE

für aquatherm blue pipe MF UV und aquatherm blue pipe MF OT

Erforderlich für das **Muffenschweißen**
(mit Formteilen für das Muffenschweißverfahren ab Seite 118 kombinierbar, z.B. Muffen, Winkel , T-Stücke, Übergangsstücke mit Gewinde)

Auch für die Handschälung geeignet (Bolzen liegen bei)

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50479** | 20 mm | 1 | 3 | |
| **50480** | 25 mm | 1 | 3 | |
| **50481** | 32 mm | 1 | 3 | |
| **50482** | 40 mm | 1 | 3 | |
| **50483** | 50 mm | 1 | 3 | |
| **50484** | 63 mm | 1 | 3 | |
| **50485** | 75 mm | 1 | 3 | |
| **50486** | 90 mm | 1 | 3 | |
| **50487** | 110 mm | 1 | 3 | |
| **50488** | 125 mm | 1 | 3 | |



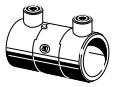
inkl. Bolzen
für die Handschälung

nicht geeignet für aquatherm blue pipe S, aquatherm blue pipe MF, aquatherm blue pipe TI

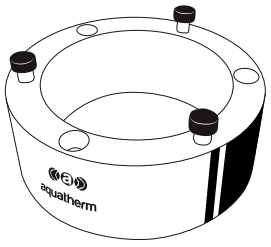
**S** = einschichtig, **MF** = mehrschichtig faserverstärkt, **OT** = sauerstoffdicht, **UV** = UV-beständig, **TI** = thermische Isolierung

## NEU aquatherm VERLÄNGERUNG FÜR UNIVERSAL-SCHÄLGERÄTE

Erforderlich für das **E-Muffenschweißen**
(aquatherm Elektroschweiß-Muffen auf Seite 136)



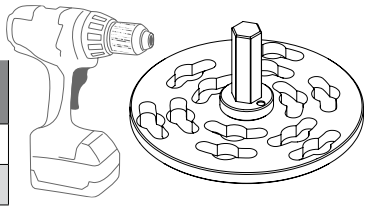
Beim E-Muffenschweißen ist eine längere Einschweißtiefe erforderlich, die durch die Kombination von Universal-Schälgerät und Verlängerung für Universal-Schälgeräte erreicht wird (z.B. Art.-Nr. 50479+50489)



| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50489** | für Schälgerät 20 mm Art.-Nr. 50479 | 1 | 3 | |
| **50490** | für Schälgerät 25 mm Art.-Nr. 50480 | 1 | 3 | |
| **50491** | für Schälgerät 32 mm Art.-Nr. 50481 | 1 | 3 | |
| **50492** | für Schälgerät 40 mm Art.-Nr. 50482 | 1 | 3 | |
| **50493** | für Schälgerät 50 mm Art.-Nr. 50483 | 1 | 3 | |
| **50494** | für Schälgerät 63 mm Art.-Nr. 50484 | 1 | 3 | |
| **50495** | für Schälgerät 75 mm Art.-Nr. 50485 | 1 | 3 | |
| **50496** | für Schälgerät 90 mm Art.-Nr. 50486 | 1 | 3 | |
| **50497** | für Schälgerät 110 mm Art.-Nr. 50487 | 1 | 3 | |
| **50498** | für Schälgerät 125 mm Art.-Nr. 50488 | 1 | 3 | |

## NEU MITNEHMERPLATTE FÜR UNIVERSAL-SCHÄLGERÄTE

in Kombination mit oder ohne Verlängerung für Universal-Schälgeräte für Bohrmaschine



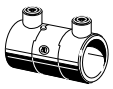
| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50499** | für Schälgeräte 50479 – 50484 | 1 | 3 | |
| **50500** | für Schälgeräte 50485 – 50488 | 1 | 3 | |

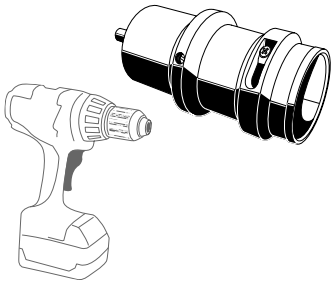
**Auslieferung ohne Bohrmaschine!**

## aquatherm SCHÄLWERKZEUGE FÜR ELEKTROSCHWEISS-MUFFEN (ART.-NR. 17208-17238)

für aquatherm blue pipe S, aquatherm blue pipe MF und aquatherm blue pipe MF TI

Erforderlich zum **Entfernen der Oxidschicht**
(aquatherm Elektroschweiß-Muffen auf Seite 136)

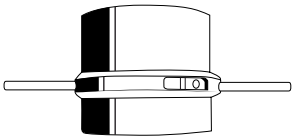




Art.-Nr. 50558-50572

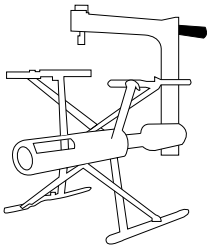
in Kombination mit Bohrmaschine
(nicht im Lieferumfang enthalten!)

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **in Kombination mit Bohrmaschine** | | | | |
| **50558** | 20 mm | 1 | 3 | |
| **50560** | 25 mm | 1 | 3 | |
| **50562** | 32 mm | 1 | 3 | |
| **50564** | 40 mm | 1 | 3 | |
| **50566** | 50 mm | 1 | 3 | |
| **50568** | 63 mm | 1 | 3 | |
| **50570** | 75 mm | 1 | 3 | |
| **50572** | 90 mm | 1 | 3 | |



Art.-Nr. 50574-50580

| | | | | |
|---|---|---|---|---|
| **für die Handschälung** | | | | |
| **50574** | 110 mm | 1 | 3 | |
| **50576** | 125 mm | 1 | 3 | |
| **50580** | 160 mm | 1 | 3 | |



Art.-Nr. 50592

| | | | | |
|---|---|---|---|---|
| **für die Handschälung** | | | | |
| **50592** | 200 + 250 mm | 1 | 3 | |

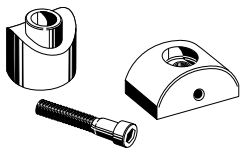
Nicht geeignet für aquatherm blue pipe UV und aquatherm blue pipe OT

**S** = einschichtig, **MF** = mehrschichtig faserverstärkt, **OT** = sauerstoffdicht, **UV** = UV-beständig, **TI** = thermische Isolierung

**Ersatzteile wie z.B. Ersatzmesser können unter service@aquatherm.de angefragt werden!**

## aquatherm SATTELSCHWEISSWERKZEUGE

Zum Einschweißen von aquatherm Einschweißsätteln

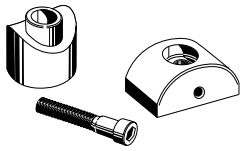


| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50614** | 40 x 20/25 mm | 1 | 3 | |
| **50616** | 50 x 20/25 mm | 1 | 3 | |
| **50619** | 63 x 20/25 mm | 1 | 3 | |
| **50620** | 63 x 32 mm | 1 | 3 | |
| **50623** | 75 x 20/25 mm | 1 | 3 | |
| **50624** | 75 x 32 mm | 1 | 3 | |
| **50625** | 75 x 40 mm | 1 | 3 | |
| **50627** | 90 x 20/25 mm | 1 | 3 | |
| **50628** | 90 x 32 mm | 1 | 3 | |
| **50629** | 90 x 40 mm | 1 | 3 | |
| **50631** | 110 x 20/25 mm | 1 | 3 | |
| **50632** | 110 x 32 mm | 1 | 3 | |
| **50634** | 110 x 40 mm | 1 | 3 | |
| **50635** | 110 x 50 mm | 1 | 3 | |
| **50636** | 125 x 20/25 mm | 1 | 3 | |
| **50638** | 125 x 32 mm | 1 | 3 | |
| **50640** | 125 x 40 mm | 1 | 3 | |
| **50642** | 125 x 50 mm | 1 | 3 | |
| **50644** | 125 x 63 mm | 1 | 3 | |
| **50648** | 160 x 20/25 mm | 1 | 3 | |
| **50650** | 160 x 32 mm | 1 | 3 | |
| **50652** | 160 x 40 mm | 1 | 3 | |
| **50654** | 160 x 50 mm | 1 | 3 | |
| **50656** | 160 x 63 mm | 1 | 3 | |
| **50657** | 160 x 75 mm | 1 | 3 | |
| **50658** | 160 x 90 mm | 1 | 3 | |
| **50660** | 200 x 20/25 mm | 1 | 3 | |
| **50662** | 200 x 32 mm | 1 | 3 | |
| **50664** | 200 x 40 mm | 1 | 3 | |
| **50666** | 200 x 50 mm | 1 | 3 | |
| **50667** | 200 x 75 mm | 1 | 3 | |
| **50668** | 200 x 63 mm | 1 | 3 | |
| **50669** | 200 x 90 mm | 1 | 3 | |
| **50670** | 200 x 110 mm | 1 | 3 | |
| **50671** | 200 x 125 mm | 1 | 3 | |
| **50672** | 250 x 20/25 mm | 1 | 3 | |
| **50674** | 250 x 32 mm | 1 | 3 | |
| **50676** | 250 x 40 mm | 1 | 3 | |
| **50678** | 250 x 50 mm | 1 | 3 | |
| **50680** | 250 x 63 mm | 1 | 3 | |
| **50682** | 250 x 75 mm | 1 | 3 | |

## aquatherm SATTELSCHWEISSWERKZEUGE

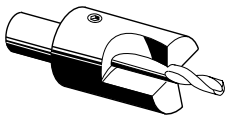
Zum Einschweißen von aquatherm Einschweißsätteln

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50684** | 250 x 90 mm | 1 | 3 | |
| **50686** | 250 x 110 mm | 1 | 3 | |
| **50688** | 250 x 125 mm | 1 | 3 | |
| **50690** | 315 x 63 mm | 1 | 3 | |
| **50692** | 315 x 75 mm | 1 | 3 | |
| **50694** | 315 x 90 mm | 1 | 3 | |
| **50696** | 315 x 110 mm | 1 | 3 | |
| **50698** | 315 x 125 mm | 1 | 3 | |
| **50699** | 315 x 160 mm | 1 | 3 | |
| **50712** | 355 x 63 mm | 1 | 3 | |
| **50714** | 355 x 75 mm | 1 | 3 | |
| **50716** | 355 x 90 mm | 1 | 3 | |
| **50718** | 355 x 110 mm | 1 | 3 | |
| **50720** | 355 x 125 mm | 1 | 3 | |
| **50722** | 355 x 160 mm | 1 | 3 | |
| **50726** | 400-630 x 63 mm | 1 | 3 | |
| **50728** | 400-500 x 75 mm | 1 | 3 | |
| **50730** | 560-630 x 75 mm | 1 | 3 | |
| **50732** | 400-500 x 90 mm | 1 | 3 | |
| **50734** | 560-630 x 90 mm | 1 | 3 | |
| **50736** | 400-450 x 110 mm | 1 | 3 | |
| **50738** | 500-560 x 110 mm | 1 | 3 | |
| **50740** | 630 x 110 mm | 1 | 3 | |
| **50742** | 400 x 125 mm | 1 | 3 | |
| **50744** | 450-500 x 125 mm | 1 | 3 | |
| **50746** | 560-630 x 125 mm | 1 | 3 | |

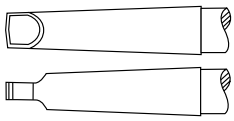


## **aquatherm BOHRER** für die Montage von Einschweißsätteln

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50940** | 20 & 25 mm (für Rohre 40 - 160 mm) | 1 | 3 | |
| **50941** | 20 & 25 mm (für Rohre 63 - 250 mm) | 1 | 3 | |
| **50942** | 32 mm | 1 | 3 | |
| **50944** | 40 mm | 1 | 3 | |
| **50946*** | 50 mm | 1 | 3 | |
| **50948*** | 63 mm | 1 | 3 | |
| | | | | |
| **50950*/**** | 75 mm | 1 | 3 | |
| **50952*/**** | 90 mm | 1 | 3 | |
| **50954*/**** | 110 mm | 1 | 3 | |
| **50956*/**** | 125 mm | 1 | 3 | |
| **50958*/**** | 160 mm | 1 | 3 | |



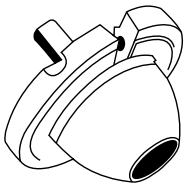
* Der Einsatz von Standbohrmaschinen wird empfohlen.



** Werkzeugaufnahme MK4

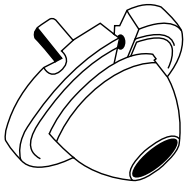
## **aquatherm SATTELFRÄSER FÜR aquatherm blue pipe OT ROHRE Ø 50-125mm**

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50921** | für Einschweißsättel ø 20 & 25 mm | 1 | 3 | |
| **50922** | für Einschweißsattel ø 32 mm | 1 | 3 | |
| **50924** | für Einschweißsattel ø 40 mm | 1 | 3 | |
| **50926** | für Einschweißsattel ø 50 mm | 1 | 3 | |
| **50928** | für Einschweißsattel ø 63 mm | 1 | 3 | |



## **aquatherm SATTELFRÄSER FÜR aquatherm blue pipe OT ROHRE Ø 160-250 mm**

| Art.-Nr. | Abmessung | LE | PG | Preis € m/St |
|---|---|---|---|---|
| **50421** | für Einschweißsättel ø 20 & 25 mm | 1 | 3 | |
| **50422** | für Einschweißsattel ø 32 mm | 1 | 3 | |
| **50424** | für Einschweißsattel ø 40 mm | 1 | 3 | |
| **50426** | für Einschweißsattel ø 50 mm | 1 | 3 | |
| **50428** | für Einschweißsattel ø 63 mm | 1 | 3 | |



Management System
ISO 9001:2008
ISO 14001:2004
ISO 50001:2011

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