

5 INSTALLATION INSTRUCTIONS

ASSEMBLY INSTRUCTIONS: INSTALLATION SOCKET 200 x 200 x 1,5

1. Provide trapezoidal profile with hole for installation socket.

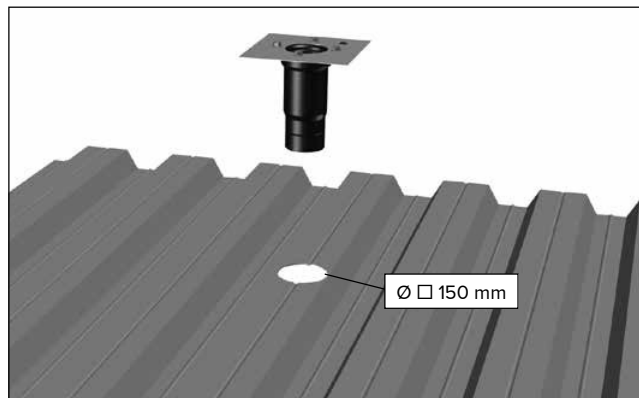


Image 5.1

2. Attach installation socket to trapezoidal roof profile.

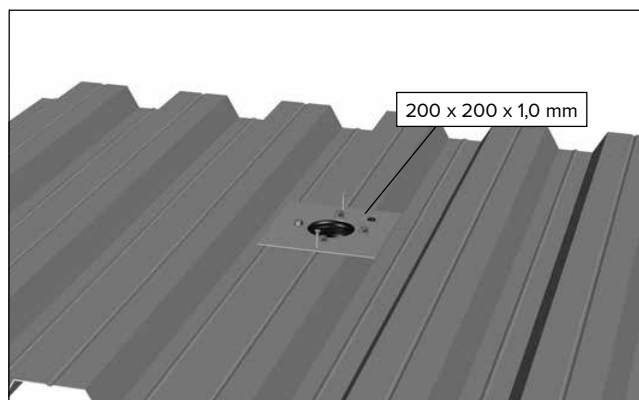


Image 5.2

3. Cut hole for heating cable (optional).

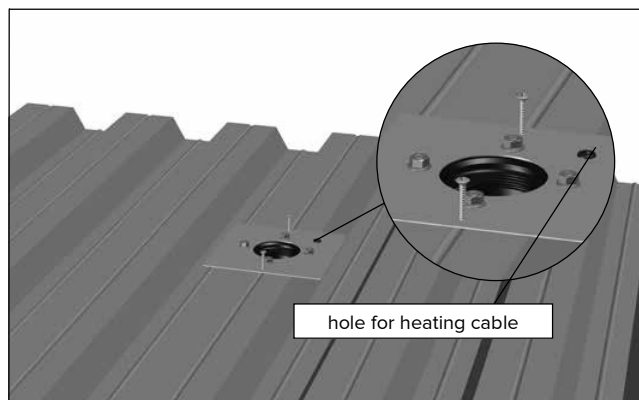


Image 5.3

4. Attach vapour barrier to installation socket.

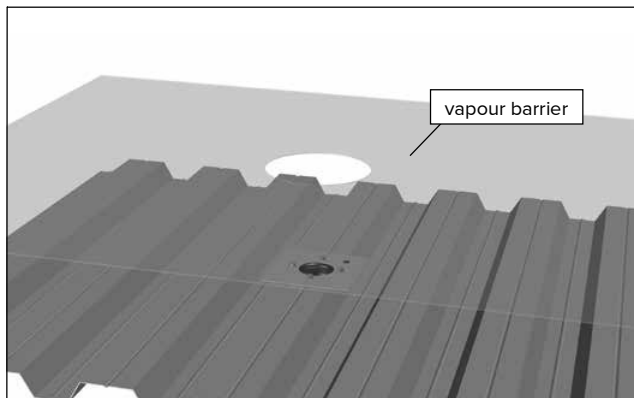


Image 5.4

5. Short connector of roof outlet (length of connector of roof outlet = height of insulation and roof covering + 100 mm).

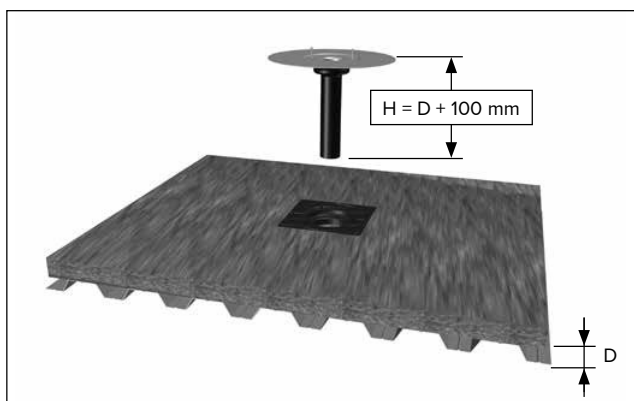


Image 5.5

6. Place roof outlet according to installation instructions.

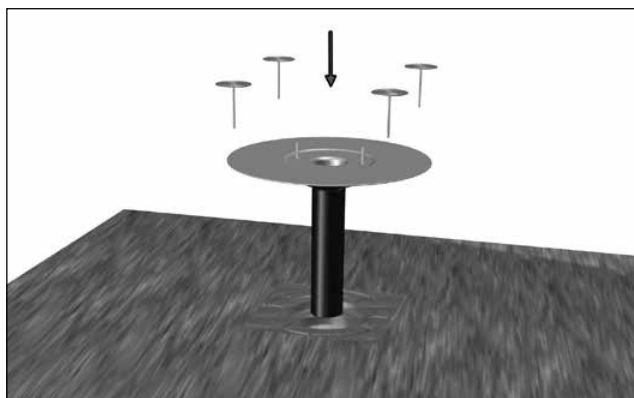


Image 5.6

ASSEMBLY INSTRUCTIONS: REINFORCEMENT PLATE 660 X 660 X 1,5

1. Provide trapezoidal profile with hole for reinforcement plate.

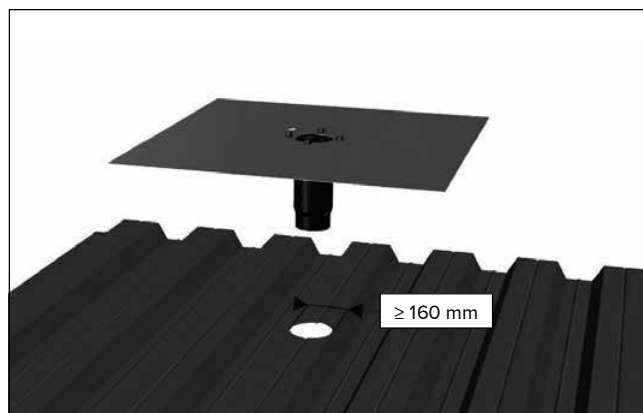


Image 5.7

2. Attach reinforcement plate to trapezoidal roof profile.

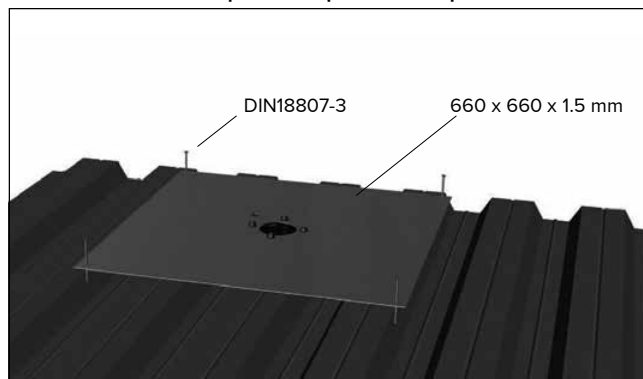


Image 5.8

3. Attach vapour barrier to reinforcement plate.

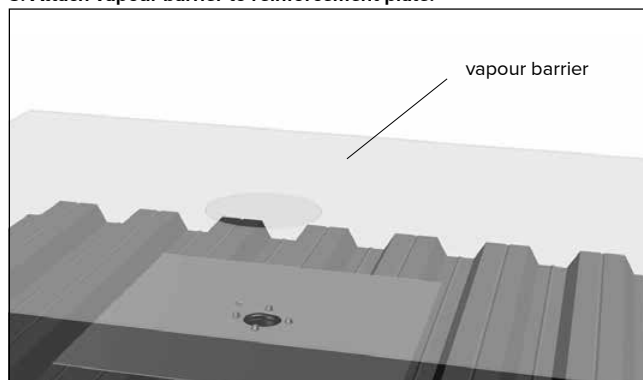


Image 5.9

4. Short connector of roof outlet (length of connector of roof outlet = height of insulation and roof covering + 100 mm).



Image 5.10

5. Place roof outlet according to installation instruction.

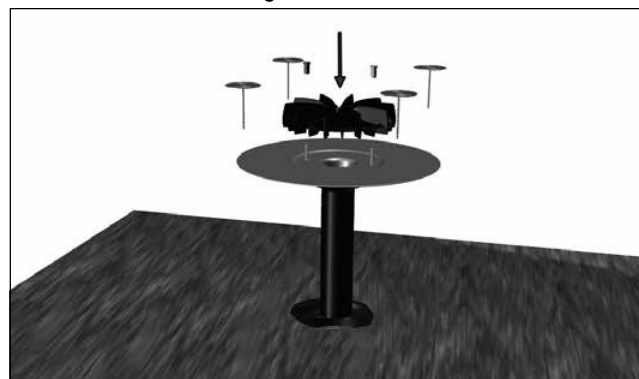


Image 5.11

ASSEMBLY INSTRUCTIONS: REINFORCEMENT PLATE INCLUDING FIRE PROTECTION 660 x 660 x 1,5

1. Provide a trapezium profile with hole for reinforcement plate including fire protection.

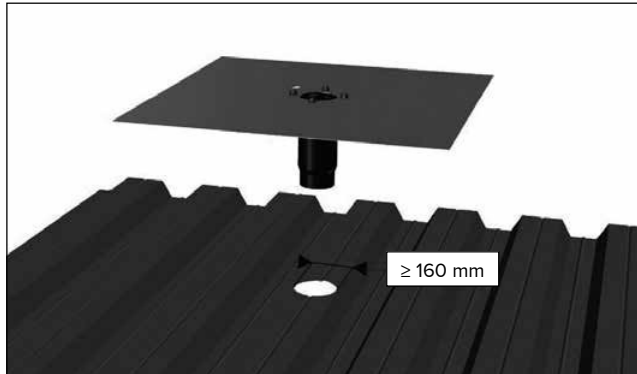


Image 5.12

2. Fill the space between the trapezoidal profile and the reinforcement plate with fire-resistant insulation.

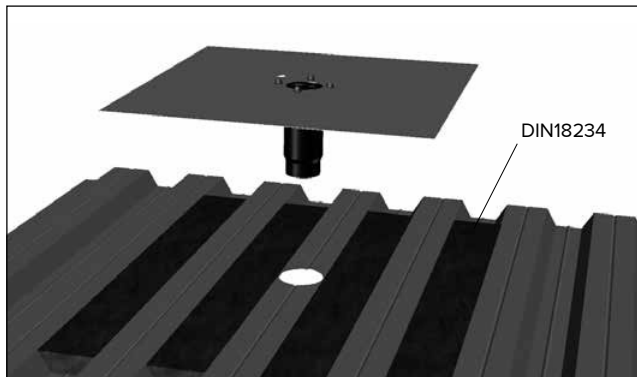


Image 5.13

3. Attach reinforcement plate to trapezoidal roof profile.

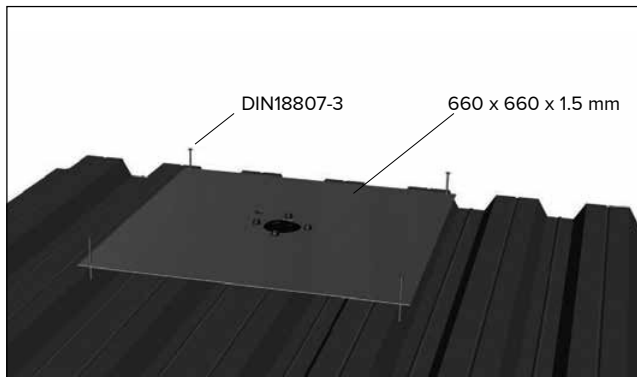


Image 5.14

4. Attach vapour barrier to reinforcement plate.

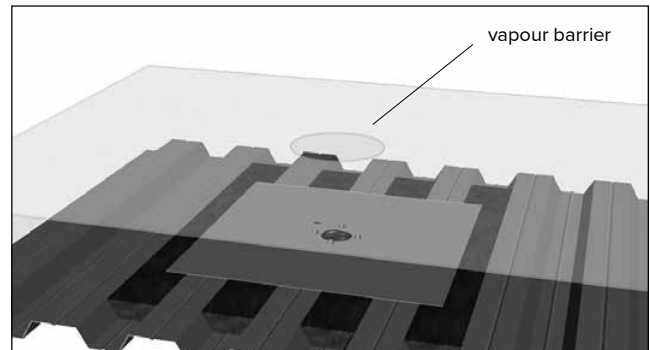


Image 5.15

5. Provide plate and trapezoidal profile with hole for heating cable (optional).

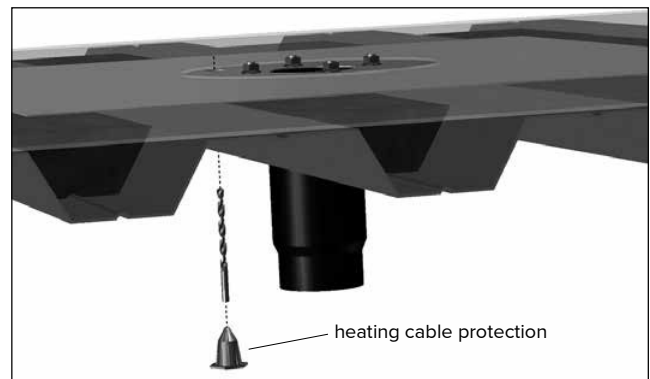


Image 5.16

6. Short connection of roof outlet (length of connection of roof outlet = height of insulation and roof covering + 100 mm).

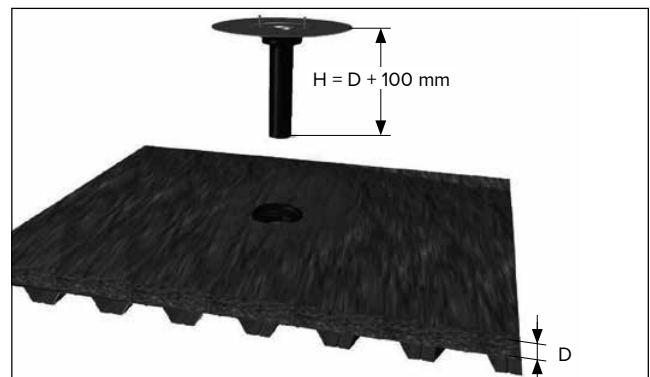


Image 5.17

7. Place roof outlet according to installation instructions.



Image 5.18

ASSEMBLY INSTRUCTIONS: ROOF OUTLET XL75 PVC

1. Roof outlet XL75 PVC.



Image 5.19

2. Provide trapezoidal profile with hole for roof outlet.

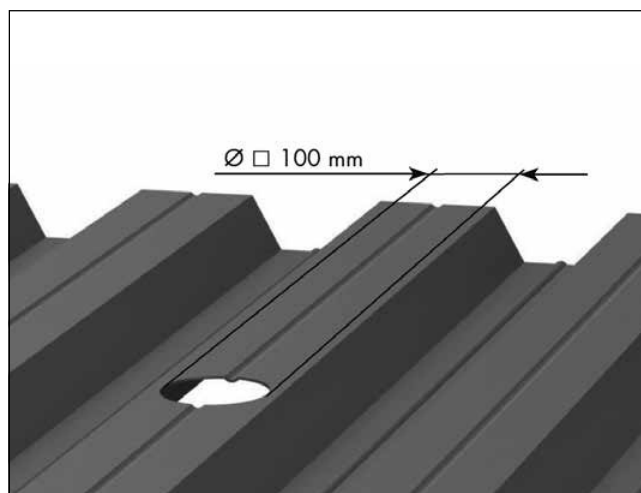


Image 5.20

**3. Place insulation and provide insulation with hole for roof outlet.
Alternatively: Provide insulation with hole for EPS-block and place
EPS-block (not included).**

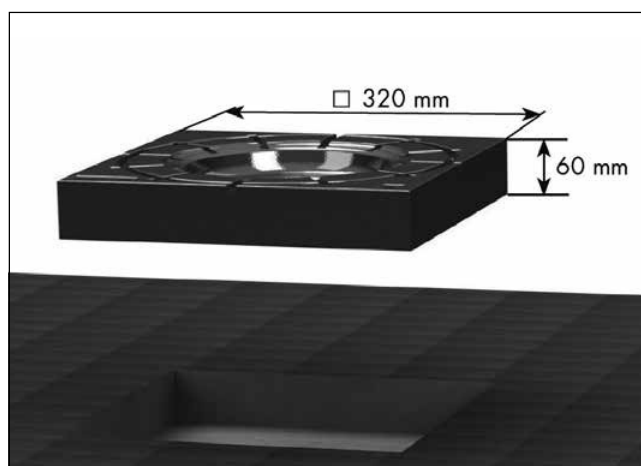


Image 5.21

4. Place roof outlet and secure with insulating screws.

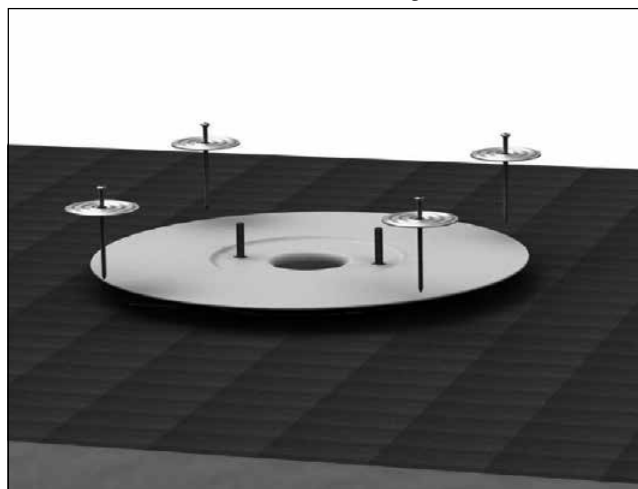


Image 5.22

**5. Provide PVC roof covering with hole at roof outlet and attach PVC
roof to roof outlet using a hot air gun.**

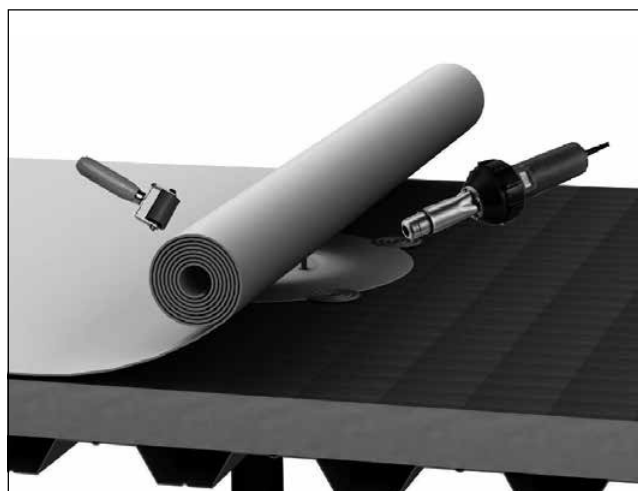


Image 5.23

6. Mount air baffle with the nuts supplied.

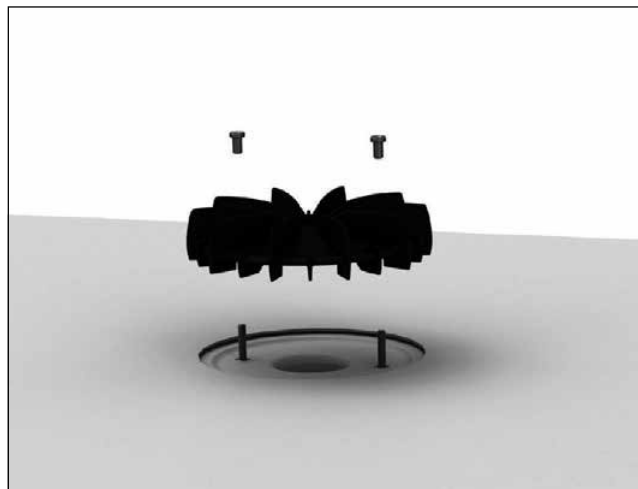


Image 5.24

ASSEMBLY INSTRUCTIONS: ROOF OUTLET XL75 BITUMEN

1. Mount roof outlet XL75 B plate on connector.

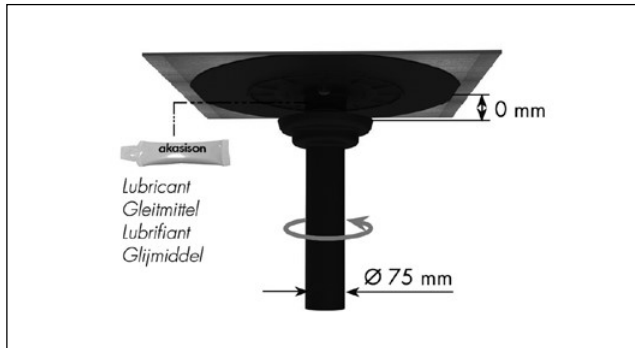


Image 5.25

2. Provide trapezoidal profile with hole for roof outlet.

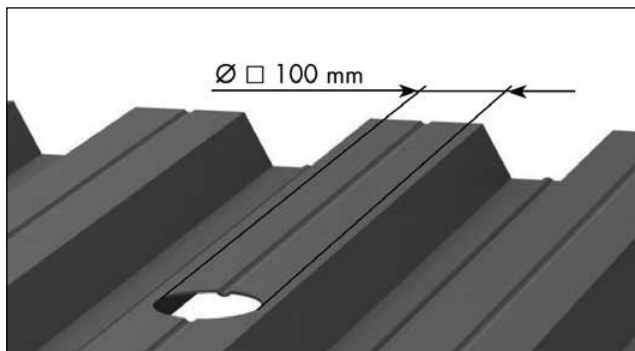


Image 5.26

3. Place insulation and provide insulation with hole for roof outlet. Alternatively: Provide insulation with hole for EPS-block and place EPS-block (not included).

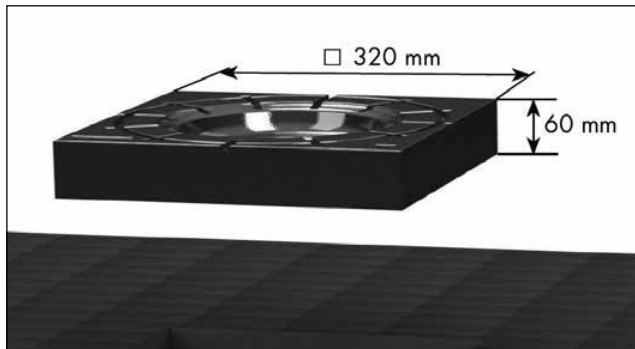


Image 5.27

4. Place roof outlet and secure with insulating screws. Place heat-resistant plate over roof outlet.

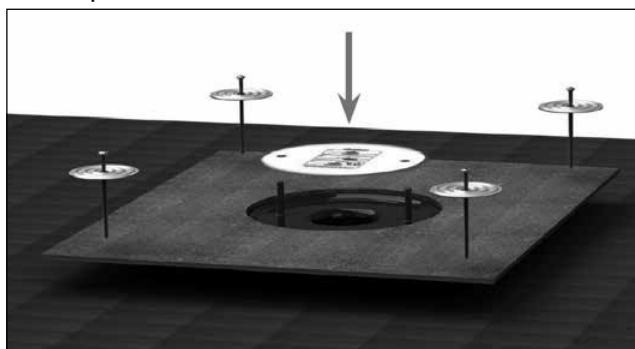


Image 5.28

5. Provide bitumen interlayer on hole for roof outlet and burn bitumen interlayer to the roof outlet.

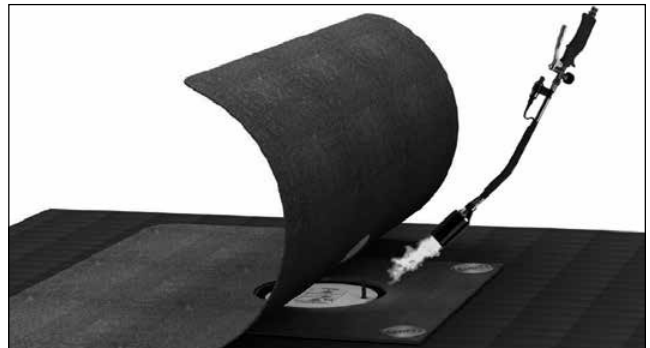


Image 5.29

6. Provide bitumen roof covering with hole for the roof outlet and burn bitumen roofing to the roof outlet with intermediate layer.



Image 5.30

7. Remove heat-resistant plate.

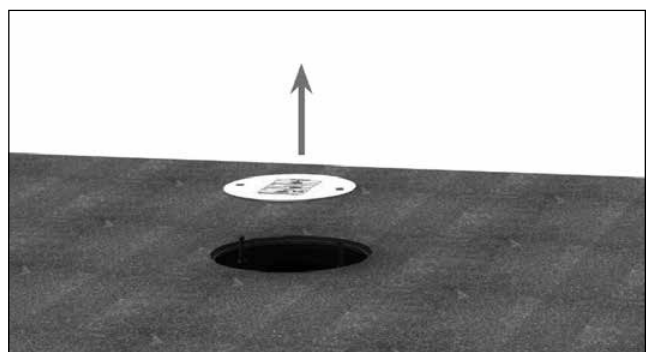


Image 5.31

8. Place cover plate to protect bitumen and mount air baffle with nuts supplied.

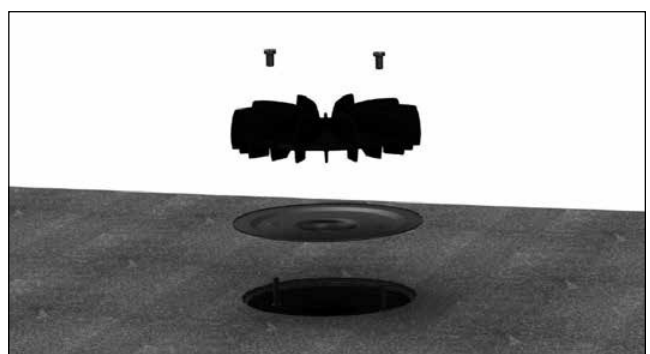


Image 5.32

ASSEMBLY INSTRUCTIONS: ROOF OUTLET XL75 CLAMP FLANGE

1. Mount roof outlet XL75 C plate on connector.

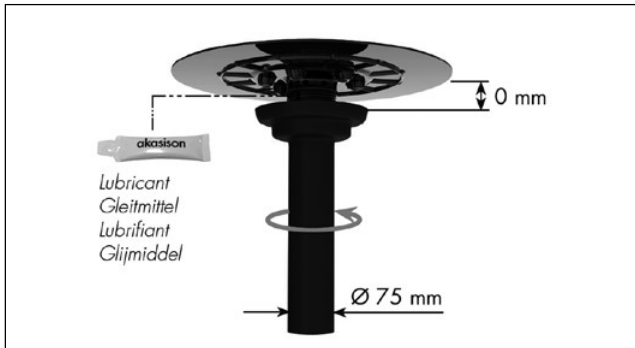


Image 5.33

2. Provide trapezoidal profile with hole for roof outlet.

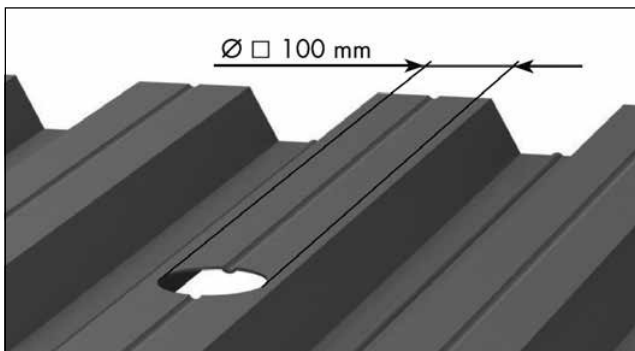


Image 5.34

3. Place insulation and provide insulation with hole for roof outlet. Alternatively: Provide insulation with hole for EPS-block and place EPS-block (not included).

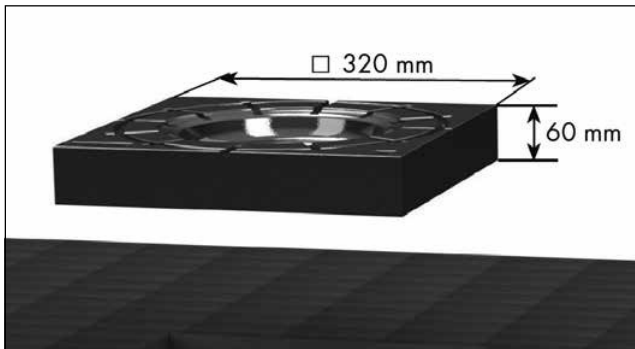


Image 5.35

4. Place roof outlet and secure it with insulating screws.

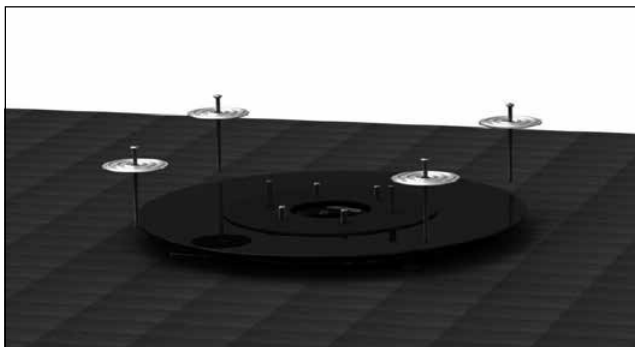


Image 5.36

5. Roll out roofing.



Image 5.37

6. Provide roofing with holes for studs and hole for drainage. Place roofing over studs.

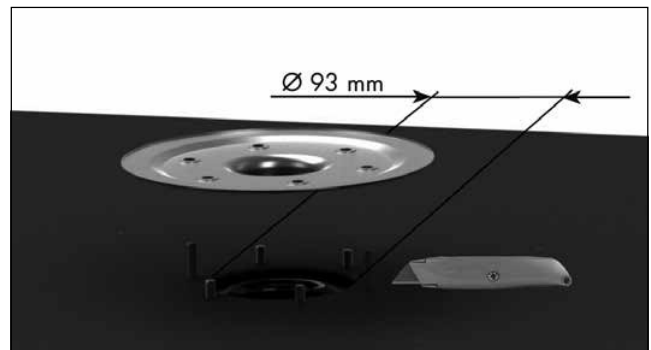


Image 5.38

7. Mount clamping ring with nuts supplied.

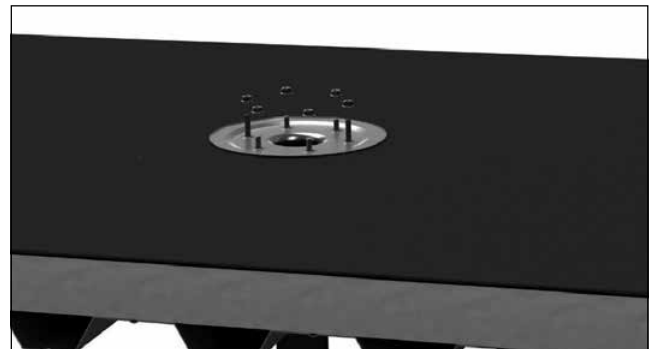


Image 5.39

8. Mount air baffle with nuts supplied.



Image 5.40

ASSEMBLY INSTRUCTIONS: ROOF OUTLET XL75 PVC HR

1. Mount roof outlet XL75 PVC plate on 90° connector.

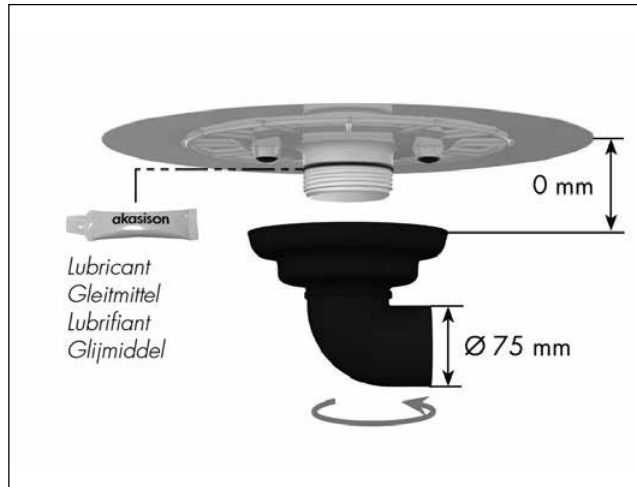


Image 5.41

2. Install roof outlet on the roof to the drainage system.

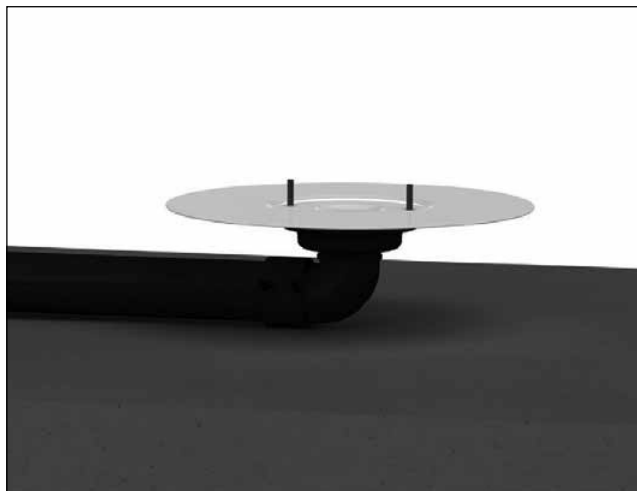


Image 5.42

3. Add roof insulation.

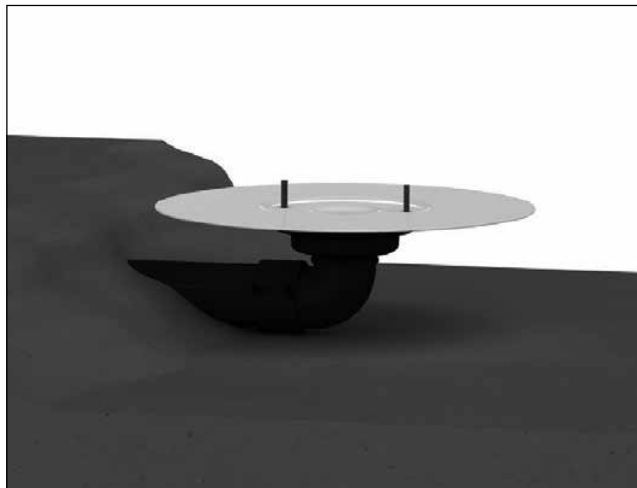


Image 5.43

4. Connect insulation with roof outlet.

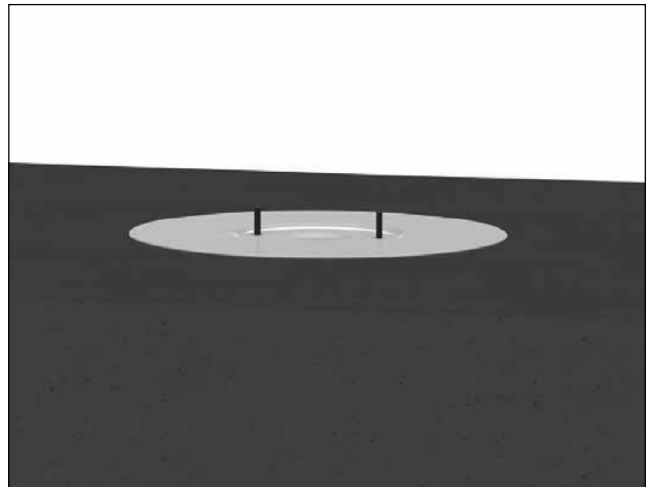


Image 5.44

5. Provide PVC roof covering with hole for roof outlet and connect PVC covering with hot air gun to roof outlet.

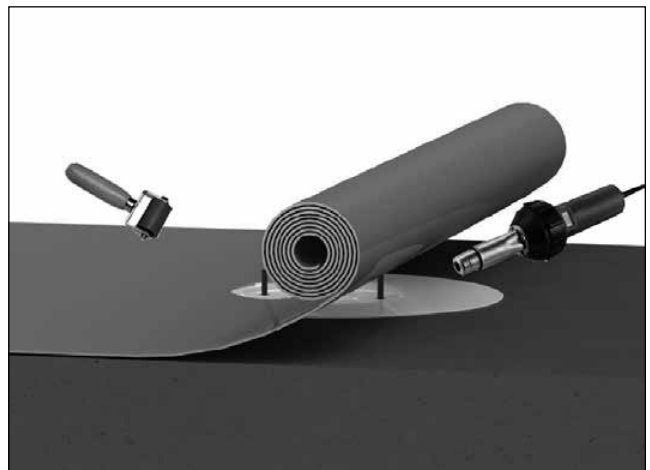


Image 5.45

6. Mount air baffle with nuts supplied.

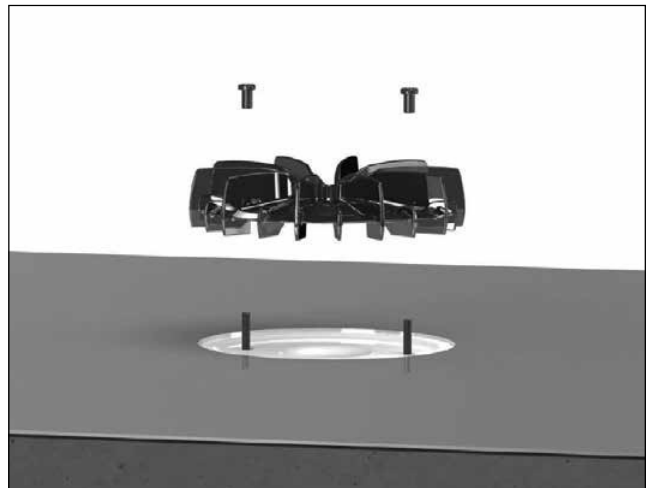


Image 5.46

ASSEMBLY INSTRUCTIONS: ROOF OUTLET XL75 BITUMEN HR

- 1. Mount Roof outlet XL 75 B plate on 90° connector.**

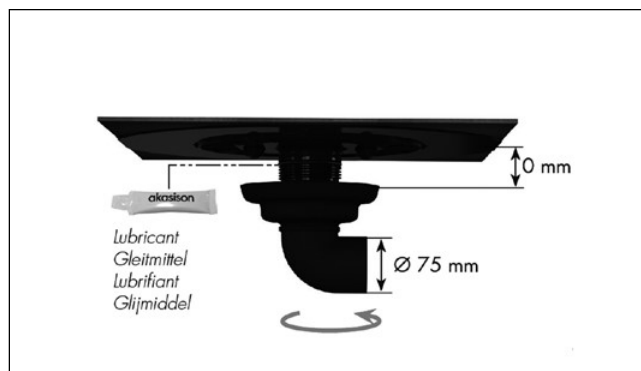


Image 5.47

- 2. Install roof outlet on the roof to the drainage system.**

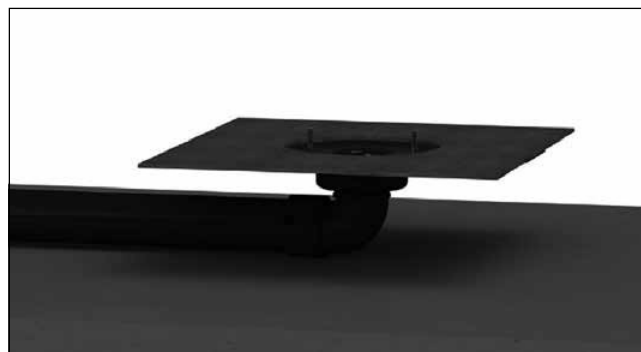


Image 5.48

- 3. Provide roof with insulation and connect insulation with roof outlet.**

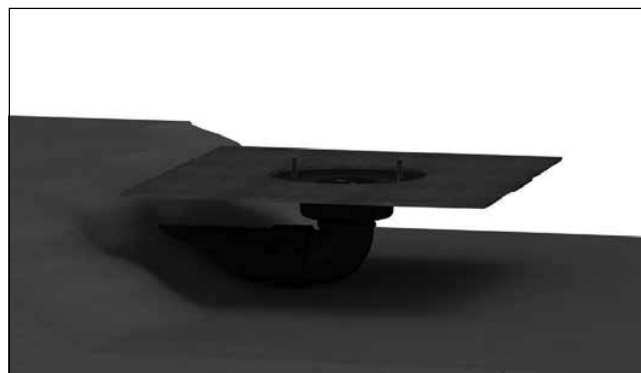


Image 5.49

- 4. Place heat-resistant plate over roof outlet.**

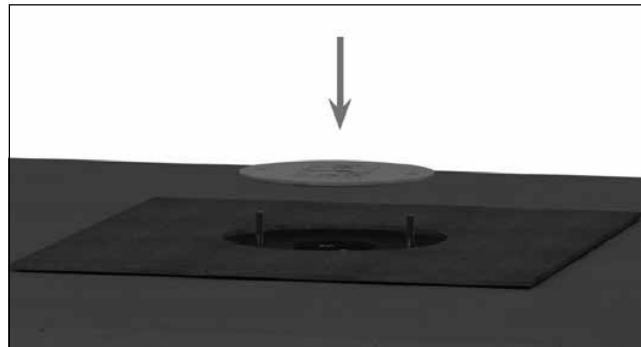


Image 5.50

- 5. Provide bitumen roof covering with hole for roof outlet and burn bitumen roofing to the roof outlet.**



Image 5.51

- 6. Remove heat-resistant plate.**

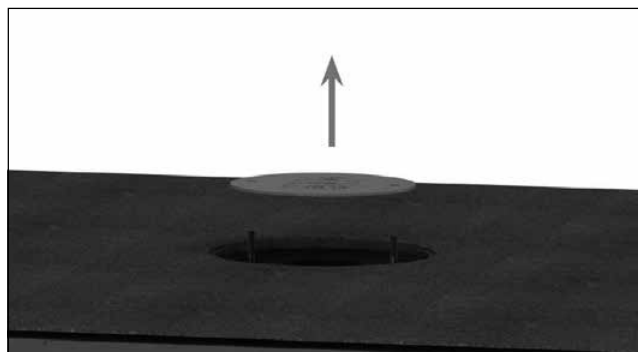


Image 5.52

- 7. Place cover plate for protection of bitumen and mount air baffle with nuts supplied.**

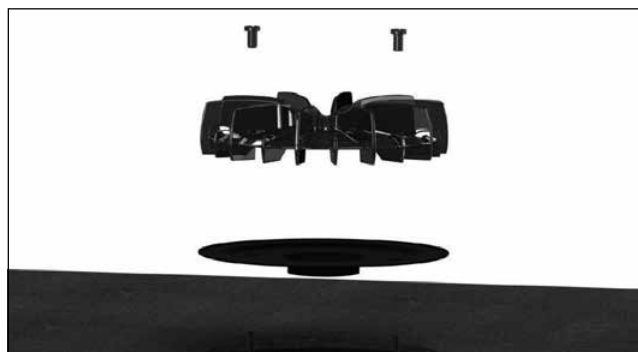


Image 5.53

ASSEMBLY INSTRUCTIONS: ROOF OUTLET XL75 CLAMP FLANGE HR

1. Mount roof outlet XL75 C plate on 90° connector.

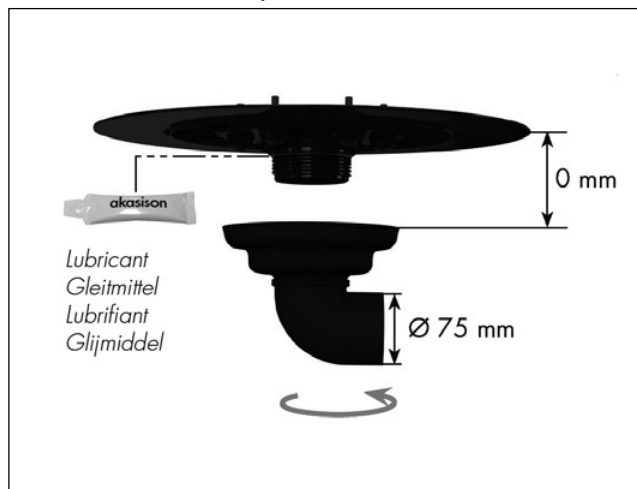


Image 5.54

2. Install roof outlet on roof to drainage system.

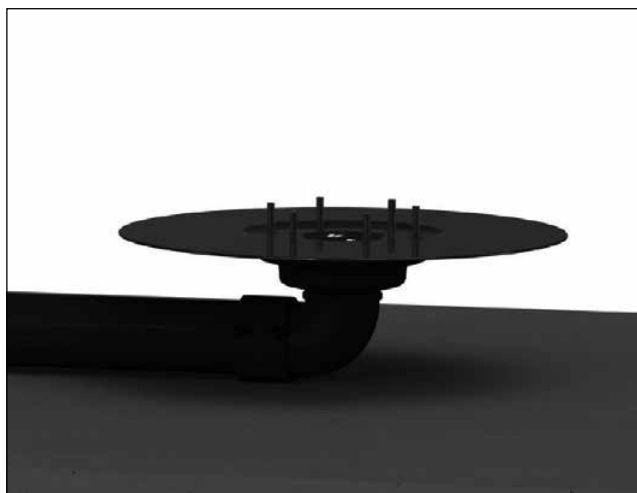


Image 5.55

3. Add roof insulation.

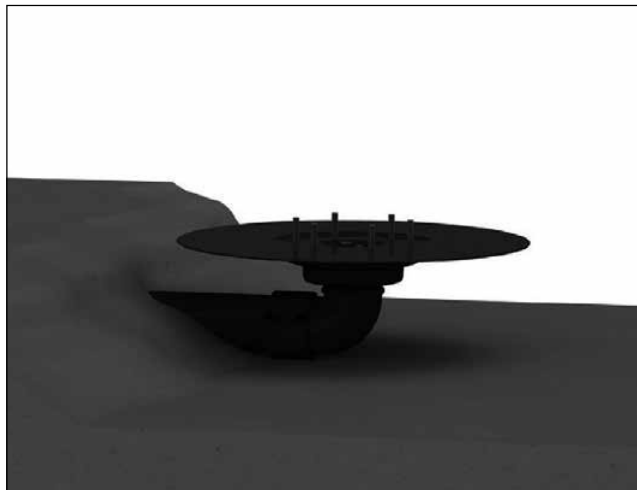


Image 5.56

4. Connect insulation with roof outlet.

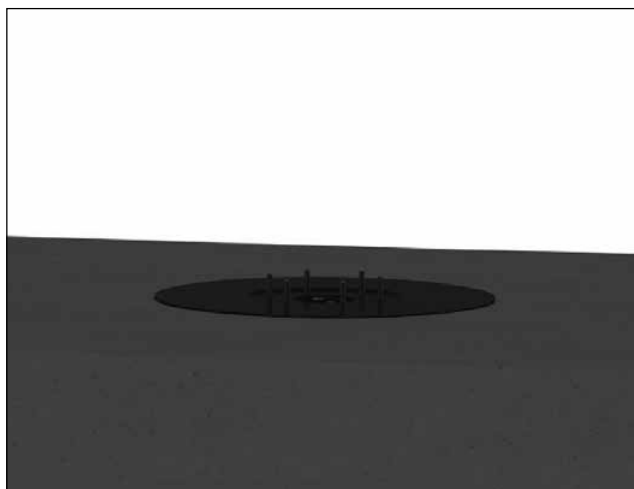


Image 5.57

5. Provide roofing with holes for studs and hole for drainage. Place roofing over studs.

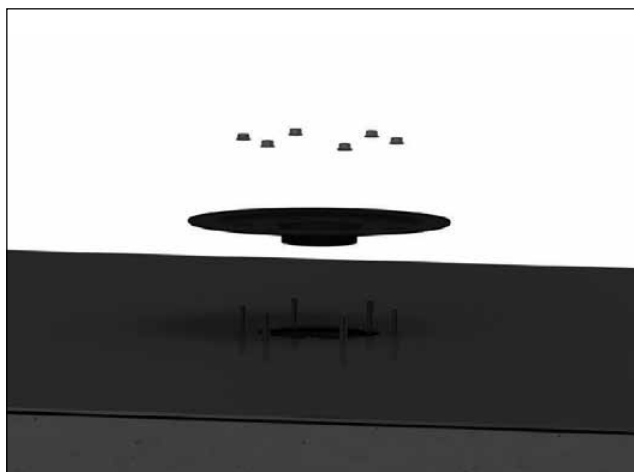


Image 5.58

6. Mount the air baffle with nuts supplied.

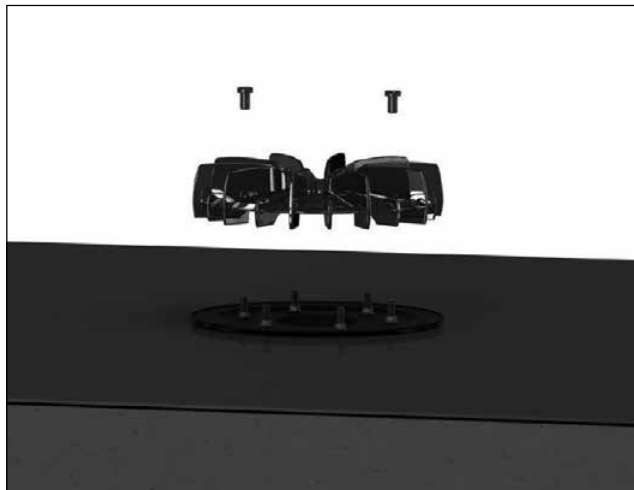


Image 5.59

**MOUNTING INSTRUCTIONS: CONCRETE GUTTER OUTLET
AKASISON XL 75**

- 1. Drill hole with diameter of 100 mm.**

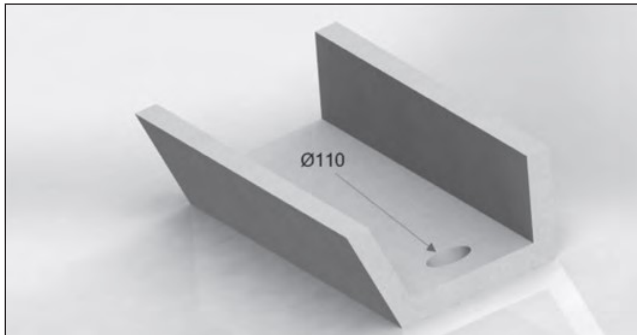


Image 5.60

- 2. Insert the base outlet into the hole and indicate the area covered by the outlet and mark the holes for the plugs.**



Image 5.61

- 3. Drill holes for the knock-in-plugs (Ø6 mm) 45 mm deep.**



Image 5.62

- 4. Clean and remove grease at area of the gutter. For example use acetone.**

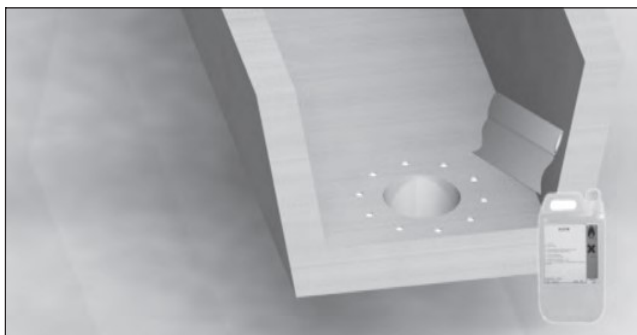


Image 5.63

- 5. Apply primer to the gutter.**



Image 5.64

- 6. Apply kit to make connection of the gutter and the outlet leak-tight.**



Image 5.65

- 7. Fasten outlet with the knock in plugs.**



Image 5.66

- 8. Secure the air baffle with the nuts provided.**



Image 5.67

- 8. Secure the air baffle with the nuts provided.**



Image 5.68

**MOUNTING INSTRUCTIONS: CONCRETE GUTTER WITH COVERING
OUTLET AKASISON XL 75**

1. Drill hole with diameter of 100 mm.

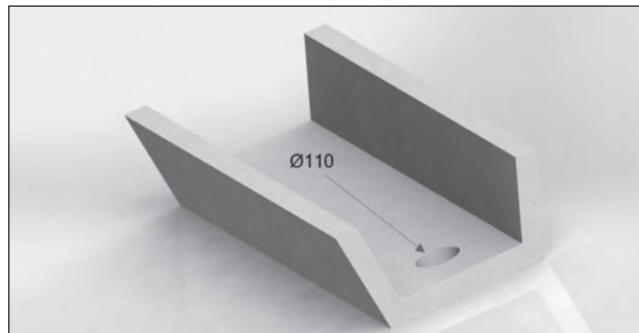


Image 5.69

2. Insert the base outlet in the hole and indicate the area covered by the outlet and mark the holes for the plugs.

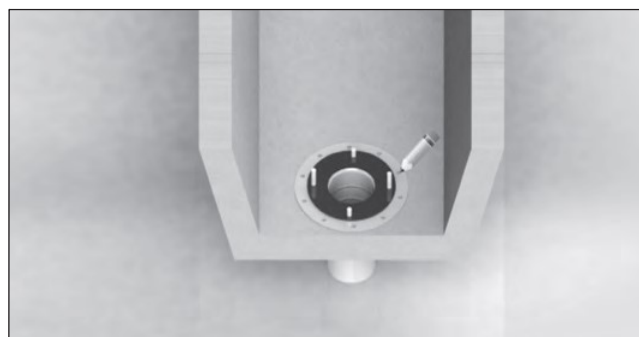


Image 5.70

3. Drill holes for the knock-in-plugs (Ø6 mm) 45 mm deep.

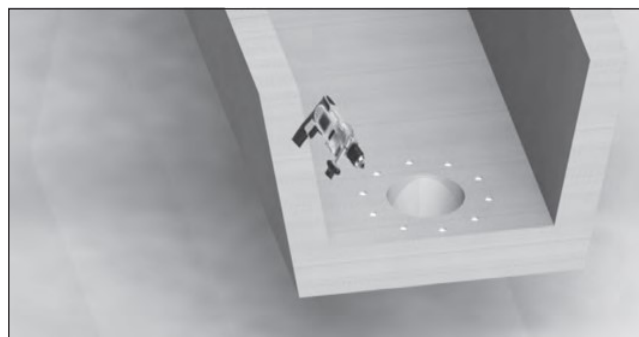


Image 5.71

4. Clean and remove grease at area of the gutter. For example use acetone.

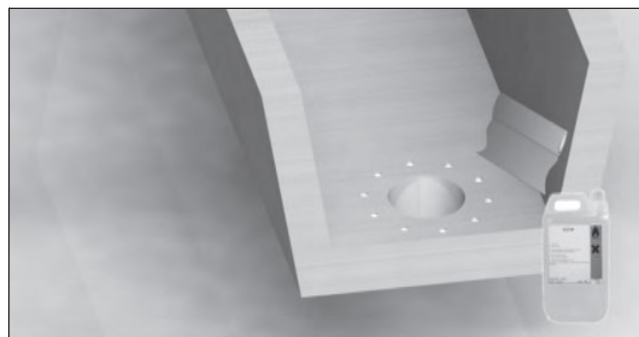


Image 5.72

5. Apply primer to the gutter outlet.

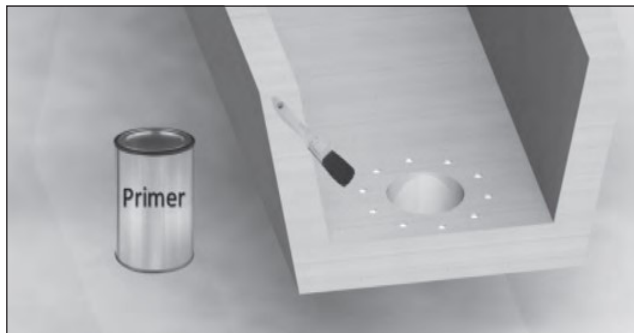


Image 5.73

6. Apply kit to make the connection of the gutter and the outlet leak-tight.



Image 5.74

7. Place the gutter outlet and fix it using the knock in plugs.

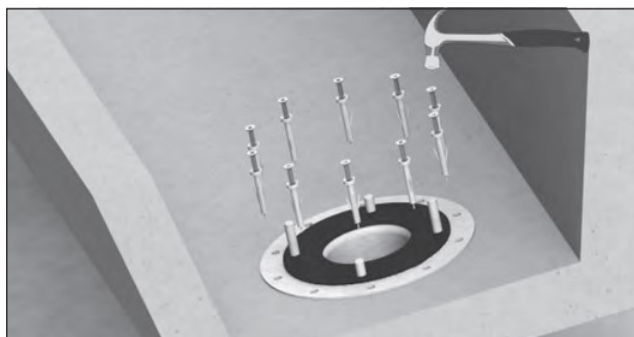


Image 5.75

8. Seal the gutter outlet around and at the location of the screws.

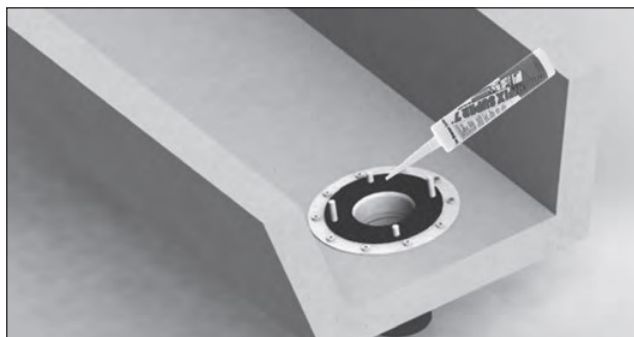


Image 5.76

9. Cut the covering in the area of the studs and guide the cover over the studs.

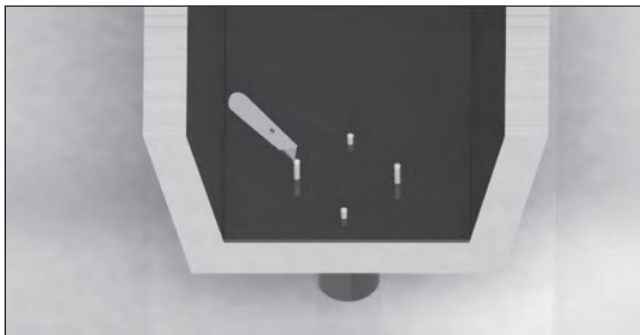


Image 5.77

10. Mount the clamping flange with the supplied bolts.

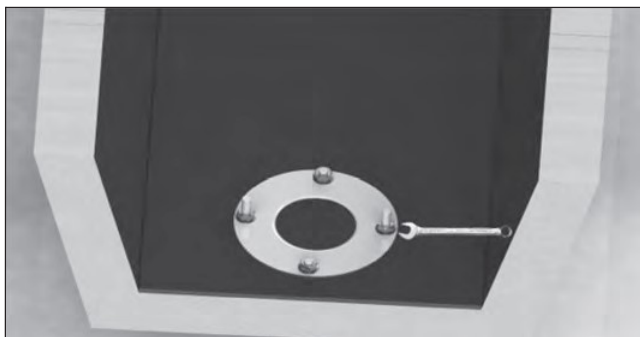


Image 5.78

11. Cut a hole in the covering the size of the hole in the clamping flange.



Image 5.79

12. Secure the air baffle with the nuts provided.

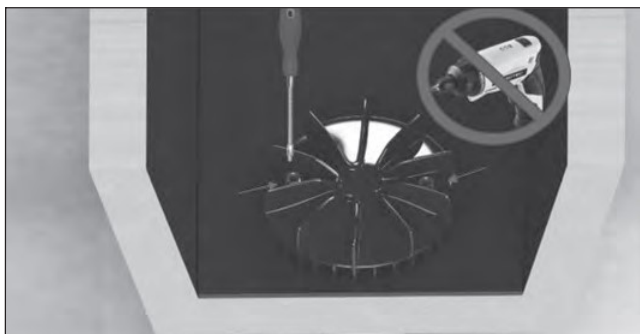


Image 5.80

**MOUNTING INSTRUCTIONS: METAL GUTTER OUTLET
AKASISON XL 75**

1. Drill/cut hole with diameter of 110 mm.

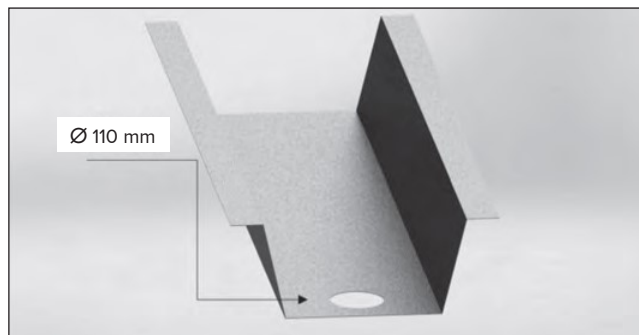


Image 5.81

2. Insert the outlet into the hole and indicate the area covered by the outlet and mark the holes for the plugs.

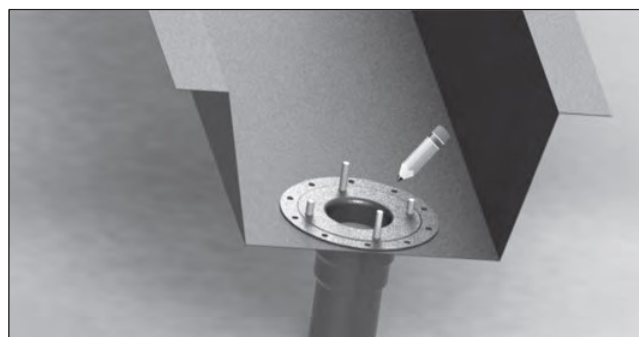


Image 5.82

3. Drill holes for pop rivets (Ø 6 mm).

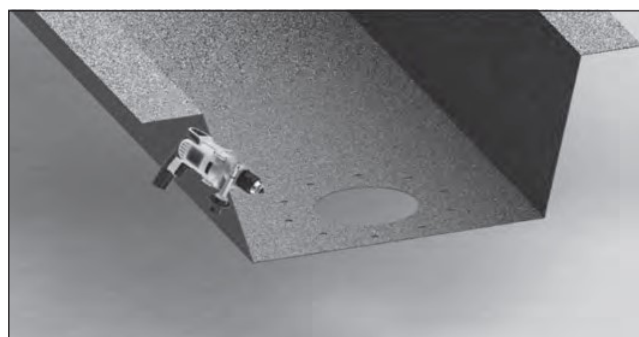


Image 5.83

4. Clean the area of the gutter covered by the outlet with acetone.



Image 5.84

5. Place outlet and mount it with pop rivets.

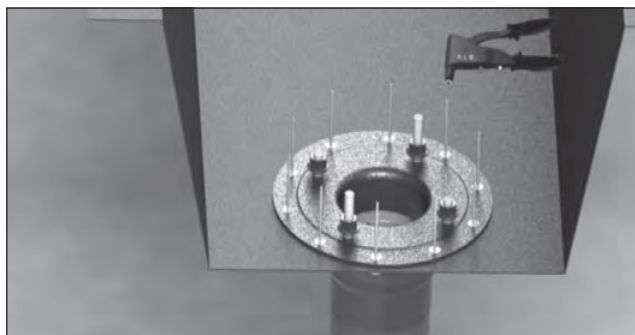


Image 5.85

6. Solder the rivets and outlet watertight to the gutter.

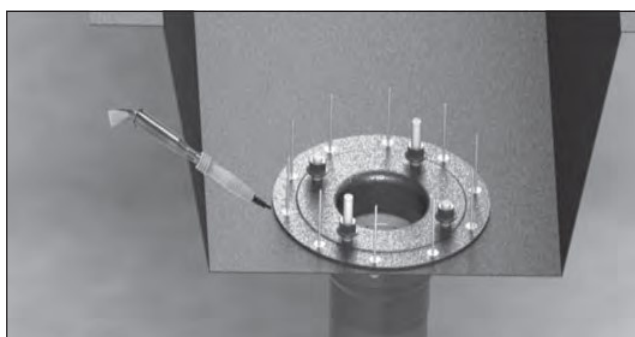


Image 5.86

7. Secure the air baffle with the nuts provided.

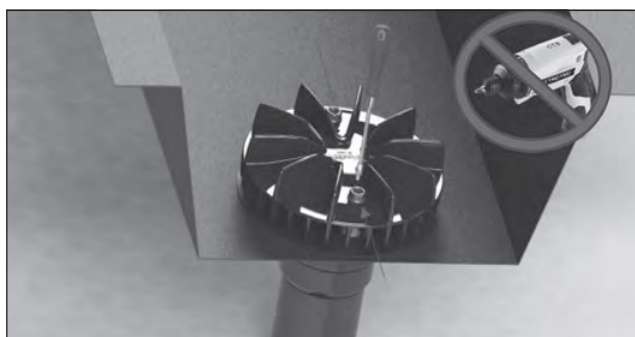


Image 5.87

**MOUNTING INSTRUCTIONS: METAL GUTTER WITH COVERING
OUTLET AKASISON XL 75**

1. Drill/cut hole with diameter of 100 mm in the metal gutter.

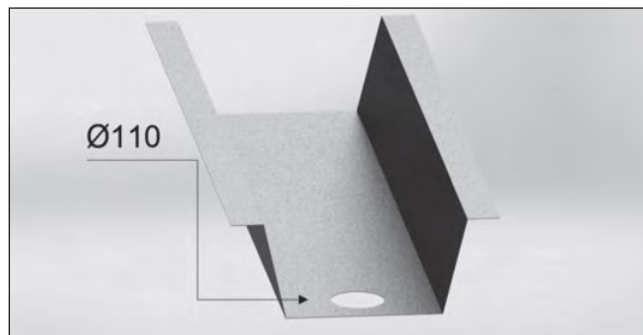


Image 5.88

2. Insert the base chute into the hole, draw the circumference of the chute funnel and mark the holes.

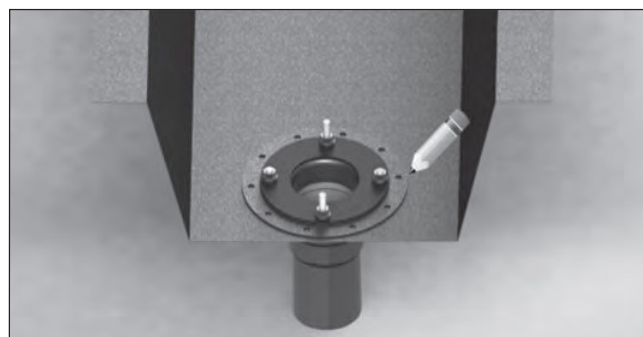


Image 5.89

3. Drill holes for pop rivets (Ø6 mm).

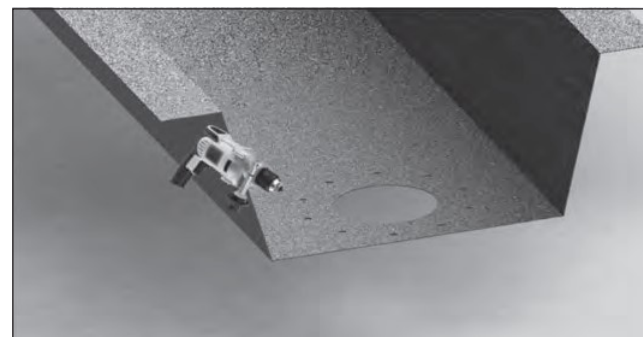


Image 5.90

4. Clean the area of the gutter covered by the outlet with acetone.



Image 5.91

5. Place outlet and mount it with pop rivets.

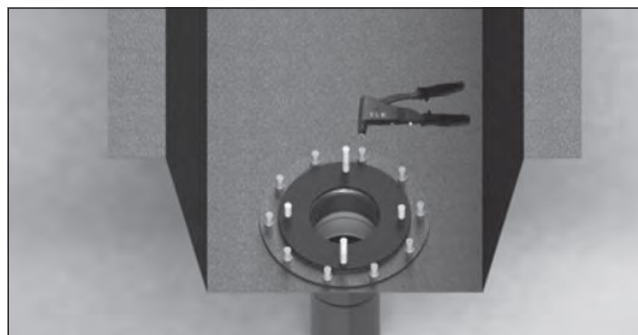


Image 5.92

6. Solder/kit the rivets.

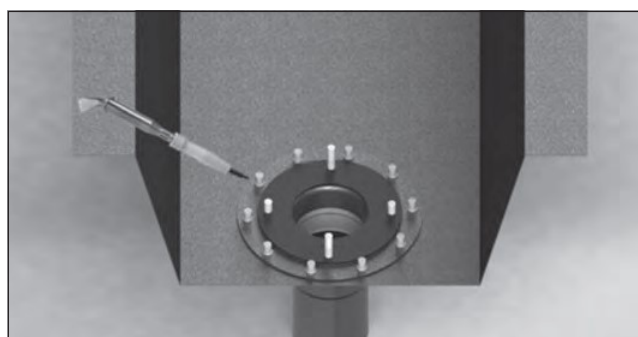


Image 5.93

7. Cut the covering in the area of the studs and guide the cover over the studs.

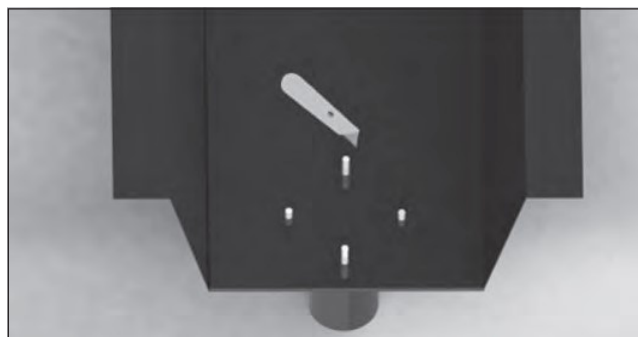


Image 5.94

8. Mount the clamping flange with the supplied bolts.

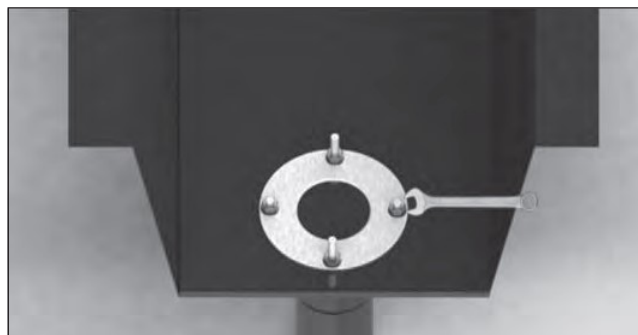


Image 5.95

9. Cut a hole in the covering the size of the hole in the clamping flange.

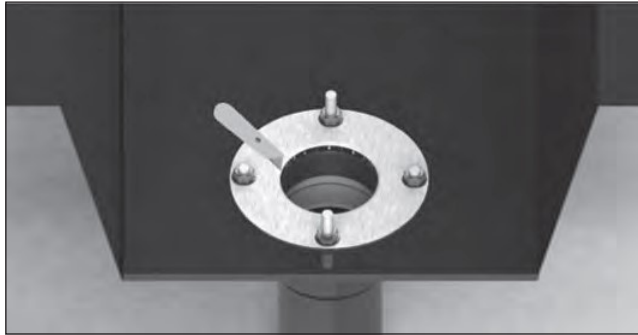


Image 5.96

10. Secure the air baffle with the nuts provided.

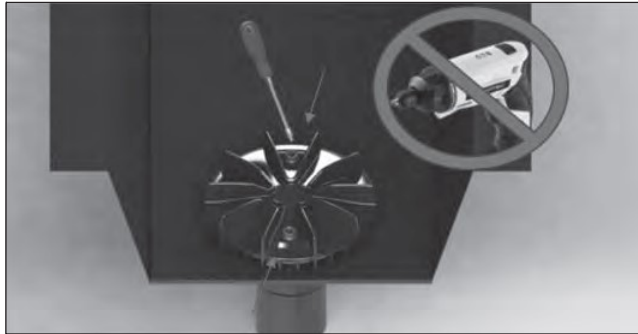


Image 5.97

HEATING ELEMENT

Most Akasisson outlets have the option of a heating element. The heating element ensures the inlet of the outlet remains free of ice and makes it possible for meltwater to flow into the outlet. The heating element only keeps the inlet free of ice and does not melt snow or ice from the roof or gutter.

The heating element of the heated version of the Akasisson XL75 roof outlet is already integrated and cannot be added afterwards.

The table below indicates the maximum number of roof outlets that can be connected within one group. The number of outlets depends on the start-up temperature. All heating elements are provided with a three wire cable (L, N and PE) and have a length of approximately 80 cm.

	6 Apm	10 Apm	16 Amp	20 Amp
5	124	208	292	-
0	120	200	292	-
-15	96	164	260	292

Table 5.1

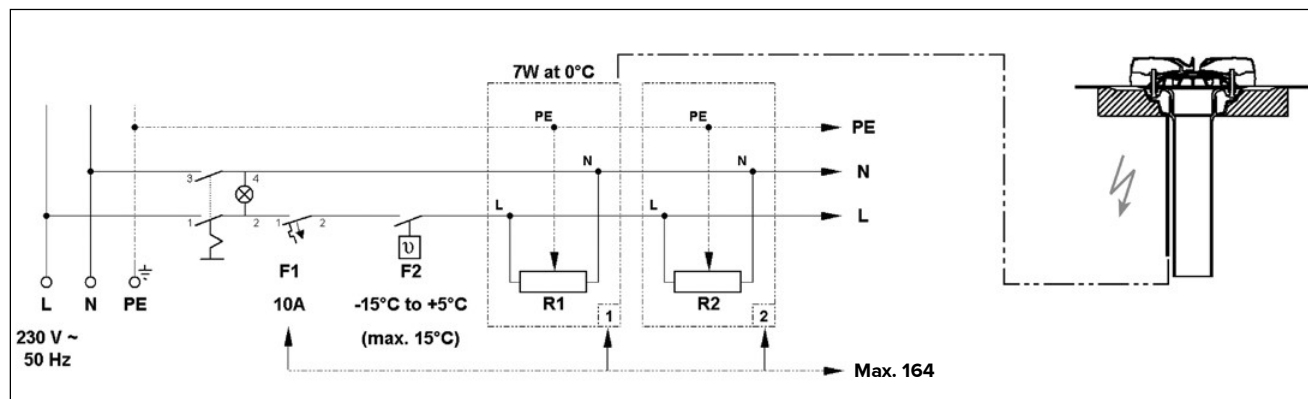


Image 5.98

The heating element of the Akasisson XL gutter outlet is delivered separately and needs to be attached under the outlet during installation.

6 MOUNTING SYSTEM

The Akason XL system includes a unique fixing system. This system ensures the correct installation of the Akason drainage system.

6.1 AKASISON FIXING SYSTEM

The Akason XL system has to be fixed to the roof construction using the Akason fixing system. The fixing system is a rigid installation with anchor points that will absorb any expansion and contraction of the HDPE as a result of temperature changes. It protects the integrity of the HDPE installation.

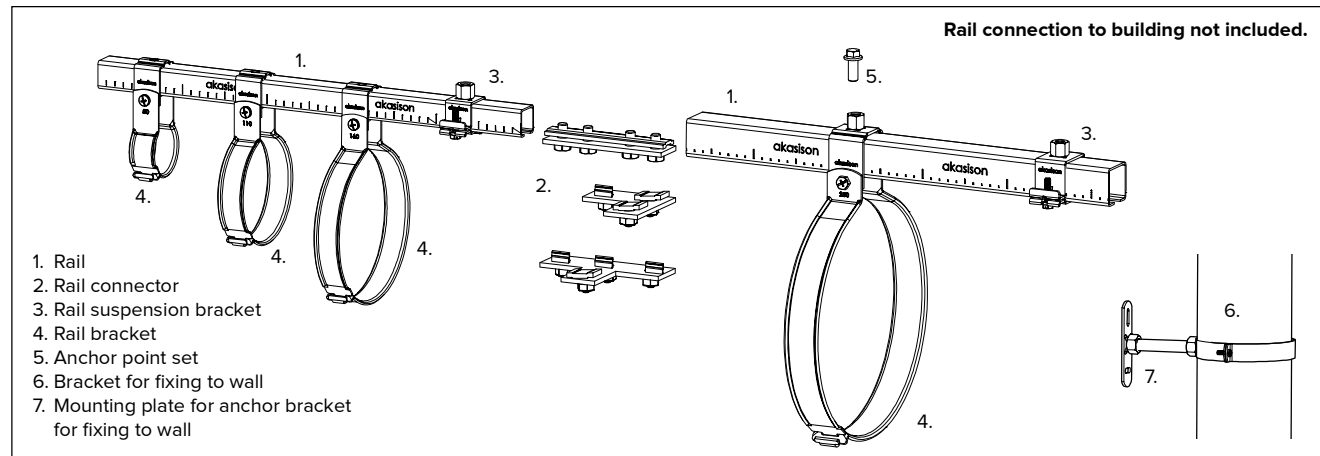


Image 6.1

Rail

Type	Code	Application
30x30 mm x 5 m	700005	Rail bracket 40-200 mm
41x41 mm x 5 m	700007	Rail bracket 250 and 315 mm

Table 6.1

Rail connector

Type	Code	Application
Rail connector straight	700015	Rail 30x30 and 41x41 mm
Rail connector L	700016	Rail 30x30 and 41x41 mm
Rail connector T	700017	Rail 30x30 and 41x41 mm

Table 6.2

Rail suspension bracket

Type	Code	Application
30x30 mm	700025	Rail 30x30 mm
41x41 mm	700027	Rail 41x41 mm

Table 6.3

Rail bracket

Type	Code
40 mm	750435
50 mm	750535
56 mm	755635
63 mm	750635
75 mm	750735
90 mm	750935
110 mm	751135
125 mm	751235
160 mm	751635
200 mm	752035
250 mm	752535
315 mm	753135

Table 6.4

Anchor point

Type	Code	Application
M10x20 (Set of 2)	730025	Anchorpoint for $d_1 = 200$ mm
M10x45 (Set of 2)	730027	Anchorpoint for $d_1 \geq 250$ mm

Table 6.5

Bracket for fixing to wall

Diameter	Code	Thread
40 mm	700478	1/2"
50 mm	700578	1/2"
56 mm	705678	1/2"
63 mm	700678	1/2"
70 mm	700778	1/2"
90 mm	700978	1/2"
110 mm	701178	1/2"
125 mm	701278	1/2"
160 mm	701678	1/2"
200 mm	702080	1"
250 mm	702580	1"
315 mm	703180	1"

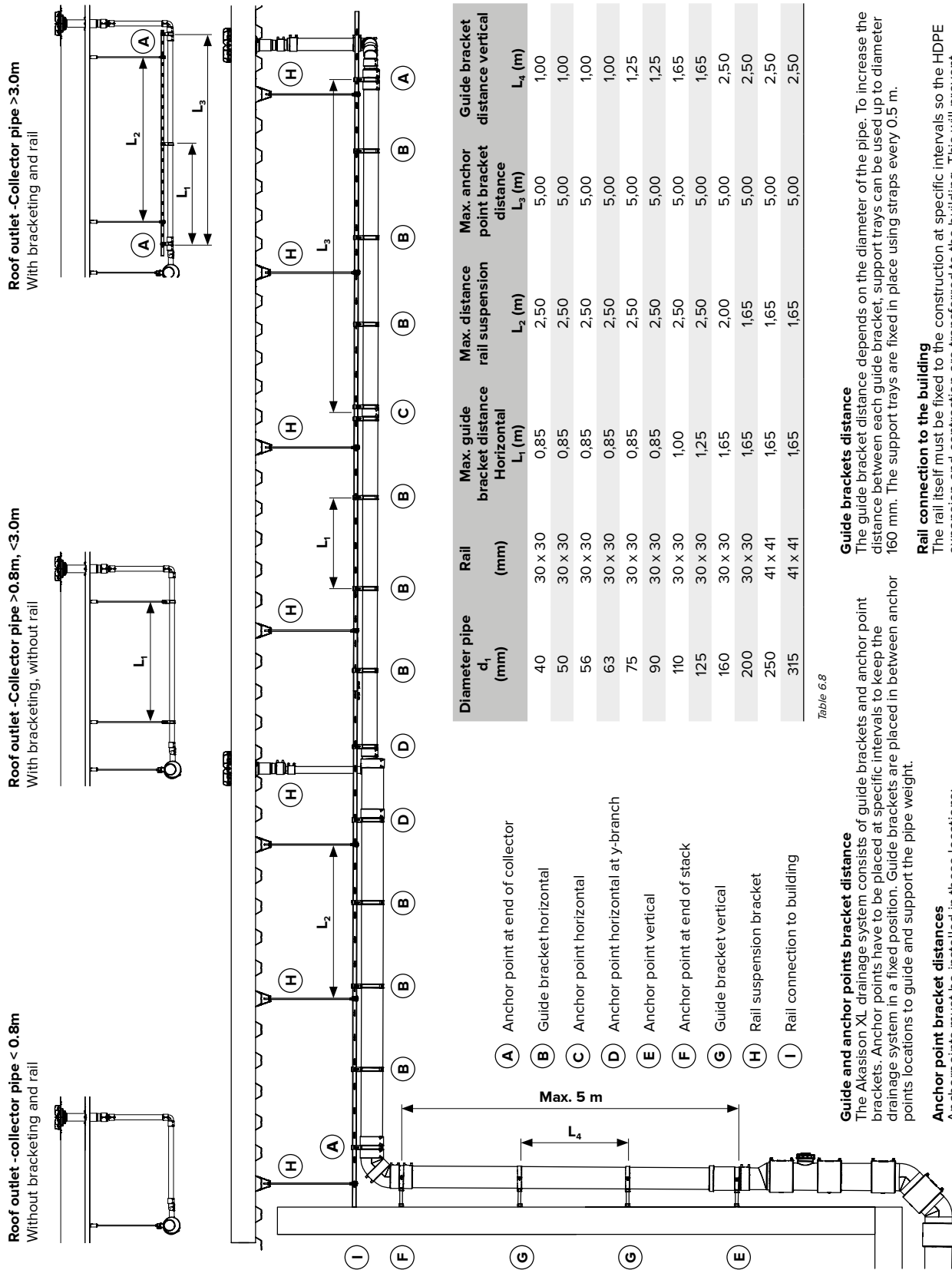
Table 6.6

Mounting plate for 1/2" and 1" anchor bracket

Thread	Code
1/2"	709478
1"	709480

Table 6.7

6.2 OVERVIEW OF AKASISON FIXING SYSTEM



Guide brackets distance

The guide bracket distance depends on the diameter of the pipe. To increase the distance between each guide bracket, support trays can be used up to diameter 160 mm. The support trays are fixed in place using straps every 0.5 m.

Rail connection to the building

The rail itself must be fixed to the construction at specific intervals so the HDPE expansion and contraction are transferred to the building. This will prevent movement of the installation.

- The rail must be fixed to the building at:
 - The beginning of each horizontal pipe section
 - Every 12 m of each horizontal pipe section
 - A horizontal direction change
 - A wall-interruption at both sides of the wall
 - A vertical direction change

Guide and anchor points bracket distance

The Akasisson XL drainage system consists of guide brackets and anchor point brackets. Anchor points have to be placed at specific intervals to keep the drainage system in a fixed position. Guide brackets are placed in between anchor points locations to guide and support the pipe weight.

Anchor point bracket distances

Anchor points must be installed in these locations:

- Every 5 m horizontal pipe
- At the beginning and the end of the collector
- At every 45° branch
- At every change of direction
- At the beginning and end of the pipe from roof outlet to collector (>3m)

6.3 GUIDELINES FOR THE PERFORMANCE OF HORIZONTAL ANCHOR POINT AND HORIZONTAL GUIDE BRACKET

6.3.1 OVERVIEW

The Akason XL drainage system consists of guide brackets and anchor points brackets. Anchor points have to be placed at specific intervals to keep the drainage system in a fixed position. Guide brackets are placed in between anchor point locations to guide and support the pipe weight.

When installing an Akason rail system, an anchor point needs to be applied:

- Every 5 metres of horizontal pipe section
- At the beginning and end of the collector
- At every 45° Y-branch
- At every bend and every change of direction
- At the beginning and end of the drain connection line > 3,0 m

Between anchor points, horizontal guide brackets need to be installed. The maximum distance between the brackets (guide-guide or guide-anchor point) are indicated as L_1 in the table of paragraph 6.2. A standard anchor point is installed with two rail brackets and an electrofusion coupler. The rail brackets are mounted on both sides of the electrofusion coupler. It is also possible to use two electrical couplers and one rail bracket. This is mainly used in combination with fittings. To prevent the brackets from sliding, the screws of the brackets need to be firmly tightened. Extra anchorpoint screws are also used for 200-315 mm brackets.

6.3.2 EXAMPLES OF ANCHOR POINTS AND GUIDE BRACKETS

Anchor point in the horizontal collector

Diameter 40-160 mm

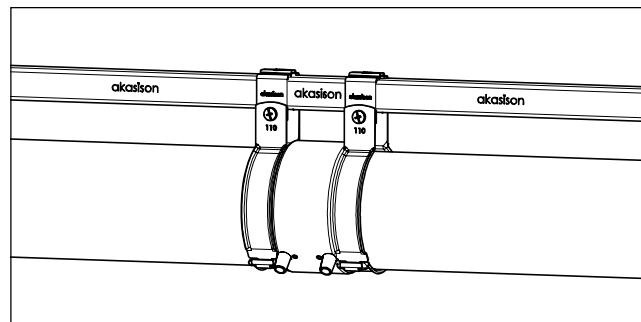


Illustration 6.1

1 x electrofusion coupler
2 x rail brackets

Diameter 200-315 mm

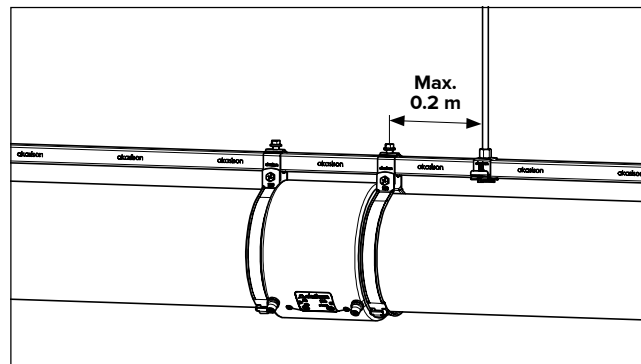


Illustration 6.2

1 x electrofusion coupler
2 x rail brackets
2 x anchor point sets

Anchor point at the beginning of the collector

Diameter 40-160 mm

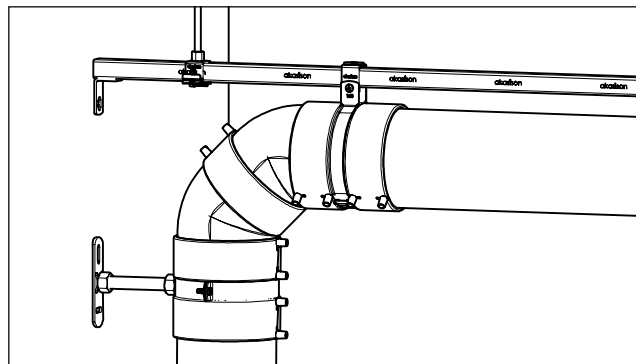


Illustration 6.3

2 x electrofusion couplers
1 x rail bracket

Diameter 200-315 mm

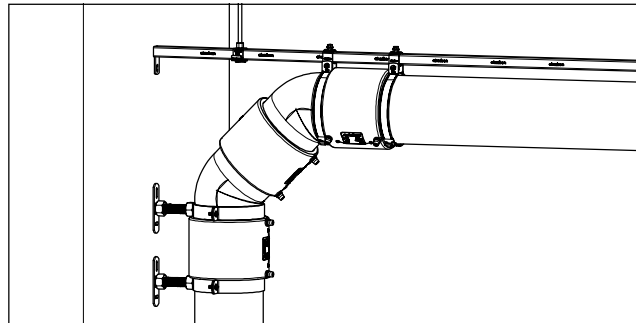


Illustration 6.4

1x electrofusion coupler
2 x rail brackets
2 x anchor point sets

Anchor point at the end of the end of the collector

Diameter 40-160 mm

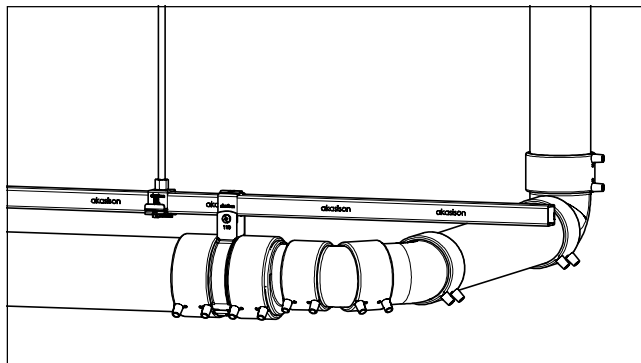


Illustration 6.5

2 x electrofusion couplers
1 x rail bracket

Anchor point by change of direction

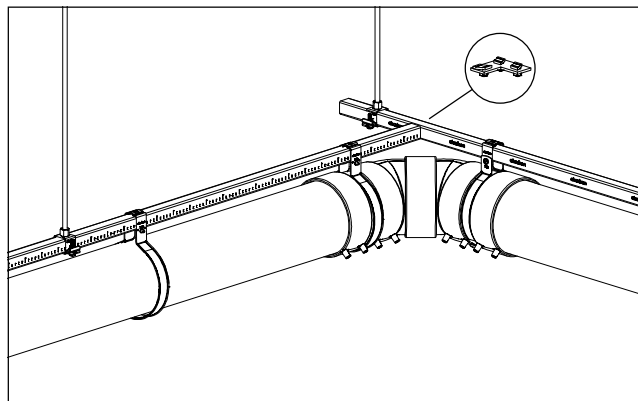


Illustration 6.7

2 x electrofusion couplers
1 x rail bracket

Anchor point 45° Y-branch

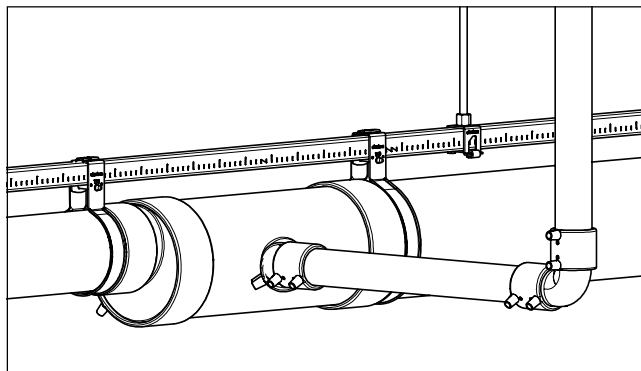


Illustration 6.6

2 x electrofusion couplers
2 x rail brackets

Guide bracket

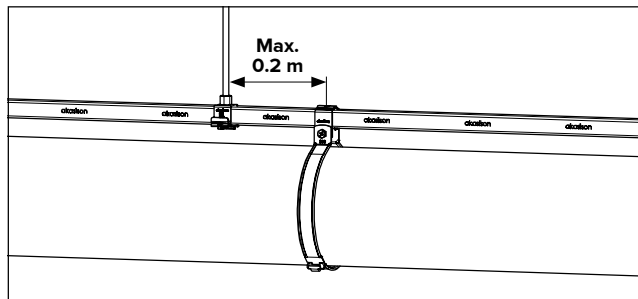


Illustration 6.8

1 x rail bracket

6.4 GUIDELINES FOR THE PERFORMANCE OF VERTICAL ANCHOR POINT AND GUIDE BRACKET

6.4.1 OVERVIEW

When installing an Akason rail system, an anchor point needs to be applied:

- Every 5 metres in the vertical collector tube
- At the beginning (top) of the vertical collector tube

Between anchor points, vertical guide brackets need to be applied. The maximum distance between the brackets (guide-guide or guide-anchor point) are indicated as L4 in the table 6.8 of paragraph 6.2.

For the installation of the system to the wall, a mounting plate and a wall-bracket is used. For diameters up to 160 mm ½" is used. For diameters above 200 mm 1" is used. The required threaded rod is not included. For an anchor point, an electrofusion coupler and an expansion socket are also used.

6.4.2 EXAMPLES OF ANCHOR POINTS AND GUIDE BRACKETS

Anchor point

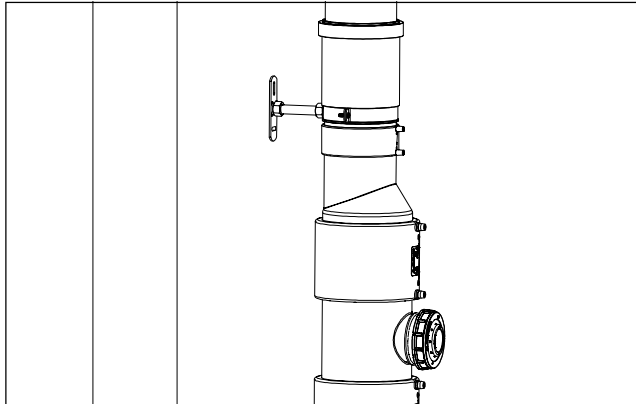


Illustration 6.9

- 1 x expansion socket
- 1 x electrofusion coupler
- 1 x rail bracket
- 1 x mounting plate

Anchor point at the beginning of the collector

Diameter 40-160 mm

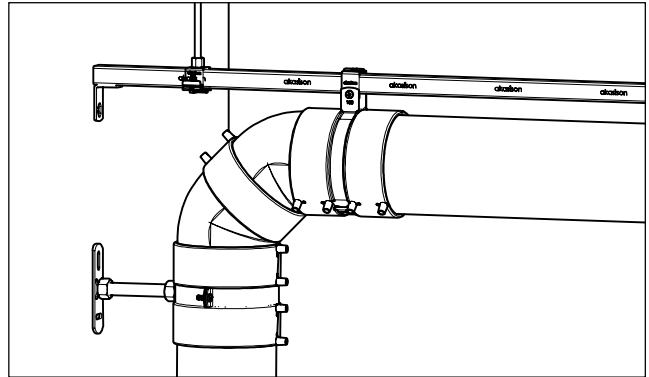


Illustration 6.10

- 2 x electrofusion couplers
- 1 x rail bracket
- 1 x mounting plate ½"

Diameter 200-315 mm

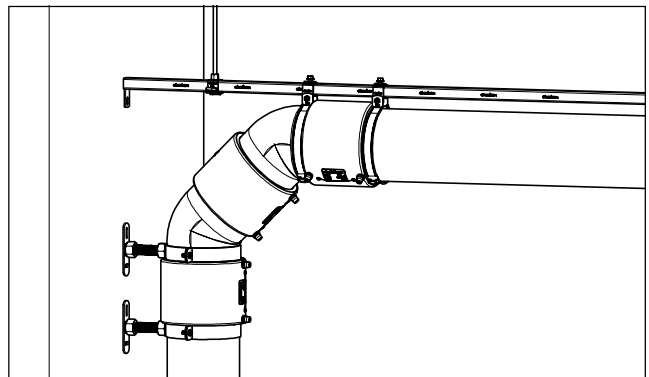


Illustration 6.11

- 1x electrofusion coupler
- 2 x rail brackets
- 2 x Mounting plates 1"

Anchor point at the beginning of the collector with reduction

Diameter reduction 200-300 mm

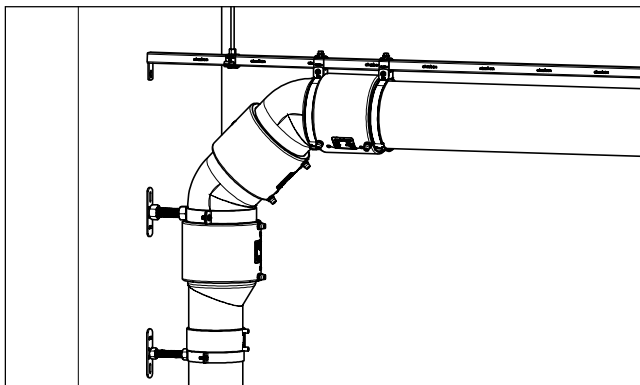


Illustration 6.12

- 2 x electrofusion couplers
- 2 x rail brackets
- 2 x mounting plates 1" (when diameter after reduction is > 160 mm)

or

- 2 x electrofusion couplers
- 2 x rail brackets
- 1 x mounting plate 1"
- 1 x mounting plate ½ " (when diameter after reduction is ≤ 160 mm)

Diameter 40-160 mm

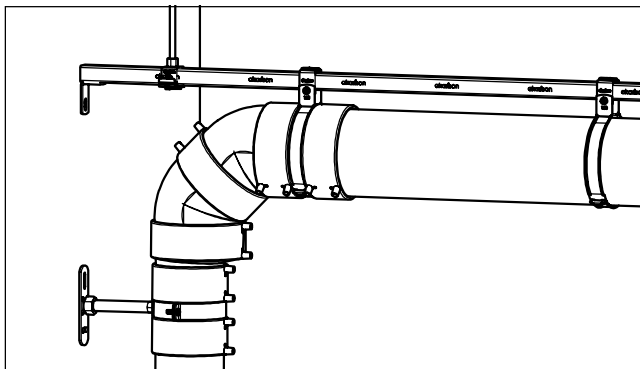


Illustration 6.13

- 2x electrofusion coupler
- 1 x rail bracket
- 2 x mounting plate ½"

Guide bracket

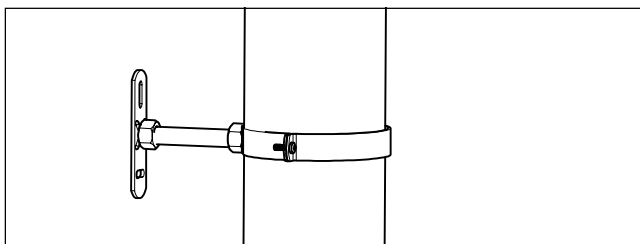


Illustration 6.14

- 1 x rail bracket
- 1 x mounting plate ½" (diameter ≤160) or 1 x mounting plate 1" (diameter > 160 mm)

6.4.3 MAXIMUM DISTANCE BETWEEN WALL AND DRAINAGE SYSTEM

The threaded rods for the fixation of the mounting plate to the bracket is limited.

For a distance up to 100 mm of 40-160 mm pipe, a ½" bracket and mounting plate is needed. For 200-315 mm pipe, a 1" mounting plate and bracket is required.

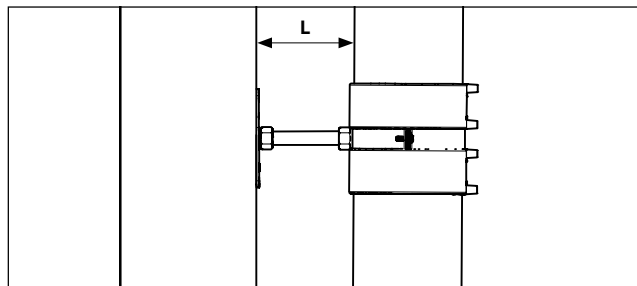


Illustration 6.15

6.5 ATTACHMENT OF THE MOUNTING SYSTEM TO THE BUILDING CONSTRUCTION

6.5.1 OVERVIEW

Akason rails need to be attached the building:

- at the start and end of a horizontal collector tube
- at every 12 metres of the collector tube
- at every transit of the wall, at both sides of the wall
- at every vertical change of direction

6.5.2 EXAMPLES THE ATTACHMENT OF THE SYSTEM TO THE BUILDING

At the beginning of the horizontal collector tube

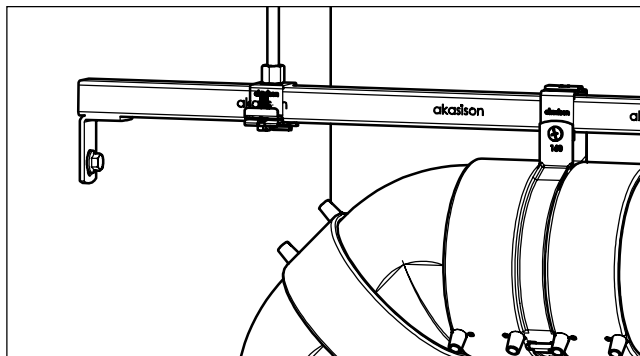


Illustration 6.16

Connection with a horizontal beam (both sides)

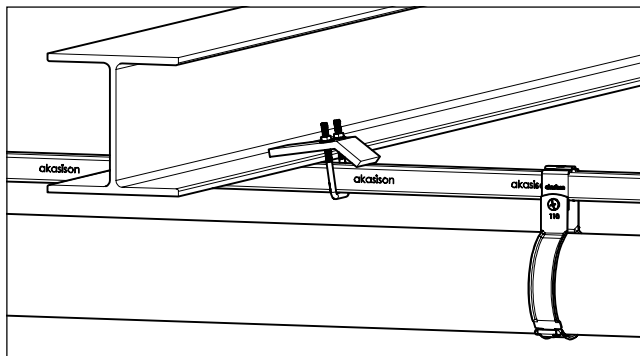


Illustration 6.17

Connection with a concrete beam (both sides)

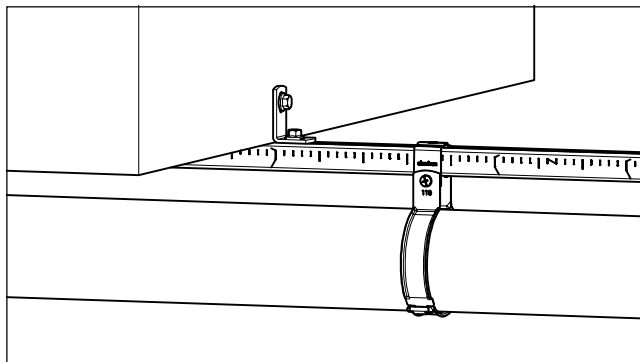


Illustration 6.18

Connection with the transit of a wall (both sides)

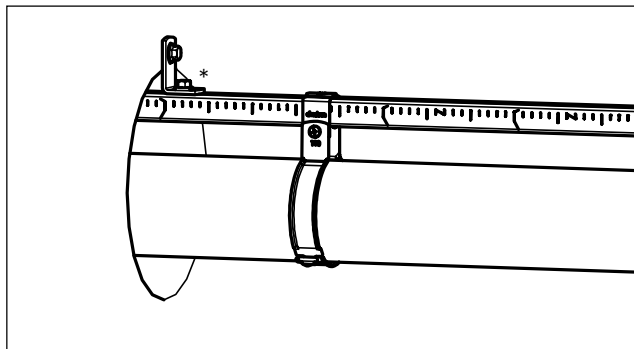


Illustration 6.19

* Rail can be used upside down.

6.6 ATTACHMENT OF THE RAIL SUSPENSION BRACKET TO THE TRAPEZOID ROOF PROFILE

6.6.1 OVERVIEW

The maximum distance of the rail suspension (as defined in the table f paragraph 6.2) must not be exceeded. The construction of the roof might limit this maximum distance. The impact on the construction of the drainage system needs to be approved by the constructor responsible before starting the installation the system.

In the table below the total weight and forces of the system are given, by the maximal distance of the suspension brackets.

Operational system (tube, mounting system, totally filled with water)

d_1 [mm]	40	50	56	63	75	90	110	125	160	200	250	315
G [kg/m]	2,9	3,7	4,2	4,8	6,2	8,1	11,2	14,0	21,8	33,3	51,9	81,0
F [kg/T]	7,4	9,1	10,4	12,1	15,4	20,3	28,1	35,0	43,7	55,0	85,7	133,7

Table 6.8

Non-operational system (tube, mounting system, no water)

d_1 [mm]	40	50	56	63	75	90	110	125	160	200	250	315
G [kg/m]	2,0	2,2	2,2	2,2	2,5	2,7	3,1	3,5	4,7	6,5	10,3	14,6
F [kg/T]	5,0	5,4	5,6	5,6	6,2	7,7	8,9	8,9	9,4	10,8	17,0	24,1

Table 6.9

G = weight of the system

F = resulting point load applying the maximum distance between the suspension brackets

In the table below maximum distances between the suspension brackets (L_2) are calculated based on a maximum point load.

d_1 [mm]	15 kg/m ² L_2 [m]	20 kg/m ² L_2 [m]	25 kg/m ² L_2 [m]	30 kg/m ² L_2 [m]	35 kg/m ² L_2 [m]	40 kg/m ² L_2 [m]	45 kg/m ² L_2 [m]	50 kg/m ² L_2 [m]
40	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50
50	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50
56	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50
63	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50
75	2,40	2,50	2,50	2,50	2,50	2,50	2,50	2,50
90	1,80	2,50	2,50	2,50	2,50	2,50	2,50	2,50
110	1,30	1,80	2,20	2,50	2,50	2,50	2,50	2,50
125	1,10	1,40	1,80	2,10	2,50	2,50	2,50	2,50
160	-	-	1,10	1,40	1,60	1,80	2,00	2,00
200	-	-	-	-	1,10	1,20	1,40	1,50
250	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-

Table 6.10

Distances less than one metre, there is no standard connection possible. In that case a project solution needs to be derived. A possible solution is to divide the load, or mount the system to metal beams.

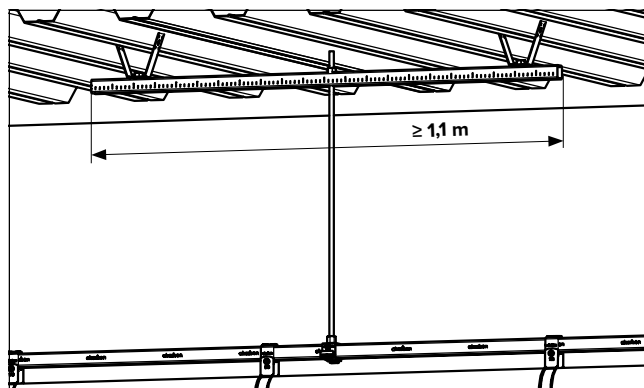


Illustration 6.20

7 PIPE SYSTEM

7.1 CONNECTION TO THE ROOF OUTLET

The connection of the roof outlet to the Akatherm PE pipe system depends on the roof outlet.

Roof outlet	Connection method	Art. Nr.
Roof outlet Akasison 75	Electrofusion coupler 75 mm	410795
Roof outlet Akasison 63	Screw coupler	749283
Gutter outlet Akasison 63		749283
Roof outlet Akasison 90	Screw coupler	749285
Gutter outlet Akasison 90		749285
Gutter outlet Akasison 110	Flange connection	741187

Table 7.1 Roof outlet connection to the pipe system

The isometric drawing will list the outlet and transition to the PE pipe as a separate pipe section (according to VDI 3608). The length of this pipe section is the height of the roof outlet. The parts list will separately specify the connection piece and the possible reduction to the diameter of the following pipe section.

The transition from the vertical to the horizontal pipe section under the roof outlet must be done under a 90° angle for optimal siphonic priming. A 90° bend can be used but requires a butt weld on one end. Use an 88.5° elbow for an installation that can be 100% electrofused.

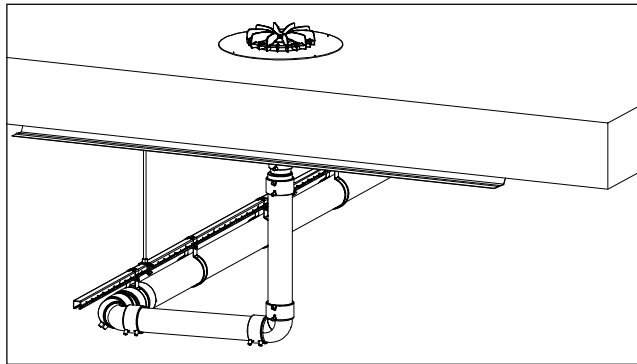


Illustration 7.1

7.2 CHANGE OF DIRECTION

Except for the transition underneath the roof outlet, the pipe system does not include any 90° bends. All changes of direction are made by using 45° elbows.

7.3 BRANCHES

Only branches of 45° are used in the PE pipe system. For the connection to the main collector a 45° branch and a 45° elbow are combined to make the angle of 90°. At a horizontal or vertical branch the rules for direction changes and branches are combined.

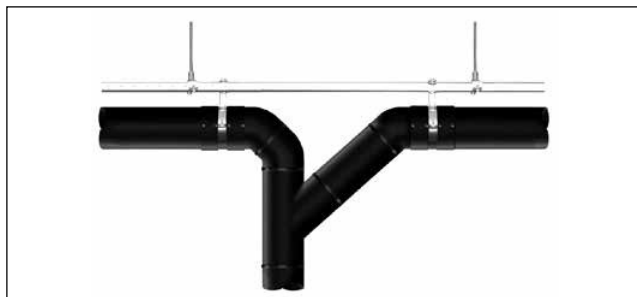


Illustration 7.1

7.4 REDUCTIONS

It is not permitted to reduce the pipe diameter in the direction of flow, except in the vertical pipe section directly underneath the roof outlet, and in the downpipe. Only ex-centric reducers are used. When a diameter change is needed directly underneath a roof outlet, a centric reducer can be used.

7.5 EMERGENCY OVERFLOW

Every roof should be equipped with an emergency overflow system. This system operates when the primary system cannot deal with the rainwater. This can be the case when the amount of rain exceeds the rainfall on which the system was dimensioned, or by a blocked sewer. For the dimensioning and design of the emergency overflows, the local standards prevail. The system can be designed as a siphonic system, a traditional system, or with spouts in the facade of the roof. In this case the emergency system works as an early warning that something is amiss.

The emergency overflow system cannot be connected to the main sewer but has to exit freely.

7.6 MAINTENANCE AND CLEANING WHEN IN USE

It is important that the roof is kept clean in spite of the self-cleaning of the Akasison siphonic roof drainage system.

Items such as leaves and plants that are on the roof should be removed regularly to prevent blocking pipes and obstructing water flow. The frequency of inspection and cleaning depends largely on the surroundings of the building. A location with large trees in the vicinity will need a more frequent inspection than a location in an open field. When cleaning the roof outlet, the air baffle can be easily removed to clean the roof outlet on the inside.

A roof covered with snow needs particular attention. The heating elements in the roof outlets will only melt the snow in the roof outlet and the siphonic system will only drain melted snow. Snow is a good insulator and so even with temperatures above 0°C the bottom layer of snow will not necessarily melt, and draining will be minimal. The outlets have to be cleared of snow. When the snow load exceeds the maximum load allowed on the roof it needs to be removed.

8 JOINTING METHODS

8.1 JOINT METHODS



Illustration 8.1

Akatherm HDPE is made of High Density Polyethylene, a material with welded joints. These are secure and durable connections lasting 50 to 100 years. Welded joints are made without additional glue or rubber rings and are actually the strongest points of the pipe system. HDPE welded joints are both pull-tight and leak proof, so once tested there is very little risk of future failure because of the flexibility, impact resistance and overall toughness of the material.

Akatherm HDPE pipes and fittings can also be joined by other methods, depending on the application. Joints are divided in welded/mechanical and pull-tight/not pull-tight types. Pull-tight joints can't come apart under the influence of external forces.

Joint method	Welded/mechanical	Pull-tight
Electrofusion	Welded	Yes
Butt-weld	Welded	Yes
Plug-in socket	Mechanical	No
Snap socket	Mechanical	Yes
Screw-thread	Mechanical	No
Screw-thread with bushing	Mechanical	Yes
Flange	Mechanical	Yes
Contraction sleeve	Mechanical	No
Metal Coupling	Mechanical	No

8.2 BUTT-WELD JOINTS



Illustration 8.2

Butt-welding is an economical and reliable way of jointing requiring only butt-welding equipment and without using additional components.

All Akatherm products can be welded using this jointing method. Fittings can be shortened by up to the k-dimension (when indicated in the catalogue), still allowing butt-welding. This jointing method is very suitable for prefabrication and producing special fittings.

Preparation

Establish a work space where the jointing can be done without being affected by adverse weather conditions. The use of wind shields is advised to keep the weld plate at a constant temperature. Working temperature $-5^{\circ}\text{C}/+40^{\circ}\text{C}$.

Without removing the oxygen layer, a weld cannot be guaranteed. The oxidation layer will form again within one hour. The butt-weld needs to be made immediately after machining the ends.

Used surface of heating element for welding diameter d_1	Δt_{tot}
$d_1 = 40-160$	8°C
$d_1 = 200-315$	10°C

Table 8.1 Maximum temperature variation heating element

Welding process

The butt-welding of Akatherm HDPE operates according to the following steps:

Machining the surface

Both sides should be machined until they run parallel. When the machining is completed, open the carriages (the plastic shavings must be continuous and uniform on both sides to weld). Take off the milling cutter.

Verify the alignment between the machined surfaces. Remove the plastic shaving. Do not dirty or touch the machined surfaces.

! Without removing the oxygen layer a weld cannot be guaranteed.

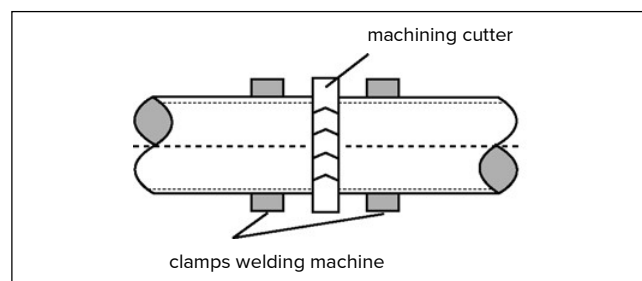


Illustration 8.3 Machining the surface

Preheating under pressure

Gradually press the two ends to be jointed to the heating element until a bead is created. The size of the bead is a good indication that the appropriate pressure and time is used. For pressure and bead size see table 8.2.

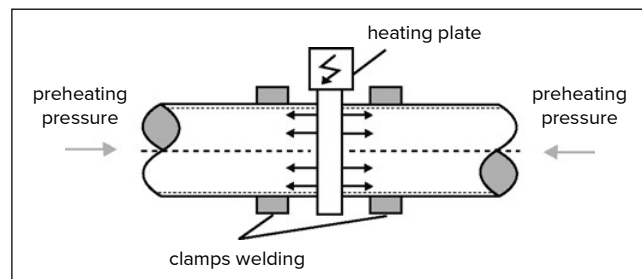


Illustration 8.4 Preheating under pressure

Heating up with less pressure

HDPE is a good insulator, therefore at this stage it is necessary that the correct heating depth of the pipe ends is obtained. Only a small amount of pressure ($0,01 \text{ N/mm}^2$) is required to maintain the contact of the ends with the heating element. The heat will gradually spread through the pipe/fitting end. The size of the bead will increase a little. The time and pressure needed for this phase can be found in table 8.2.

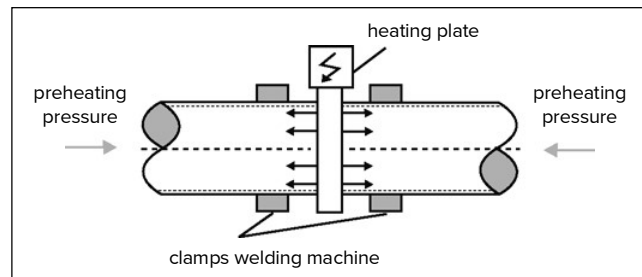


Illustration 8.5 Obtaining the correct heating depth

Change over

Remove the heating element from the jointing areas and immediately join the two ends. Do not push the ends abruptly onto each other.

The removal of the heating element needs to be done quickly to prevent the ends from cooling down. The times for changing over can be found in table 8.2.

Welding and cooling

After the jointing areas have made contact they should be joined with a gradual increase in pressure up to the specified value. The building-up of pressure should be linear and not differ more by than $0,01 \text{ N/mm}^2$. When the buildup occurs too fast the plastic material will be pushed away. If the pressure buildup is too slow, the material cools down. In both cases the quality of the weld will be questionable. Keep the specified welding pressure at a constant level during the complete cooling period. There must not be any load or strain at the joint. Do not cool artificially.

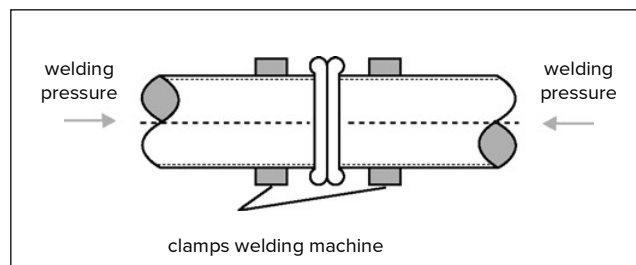
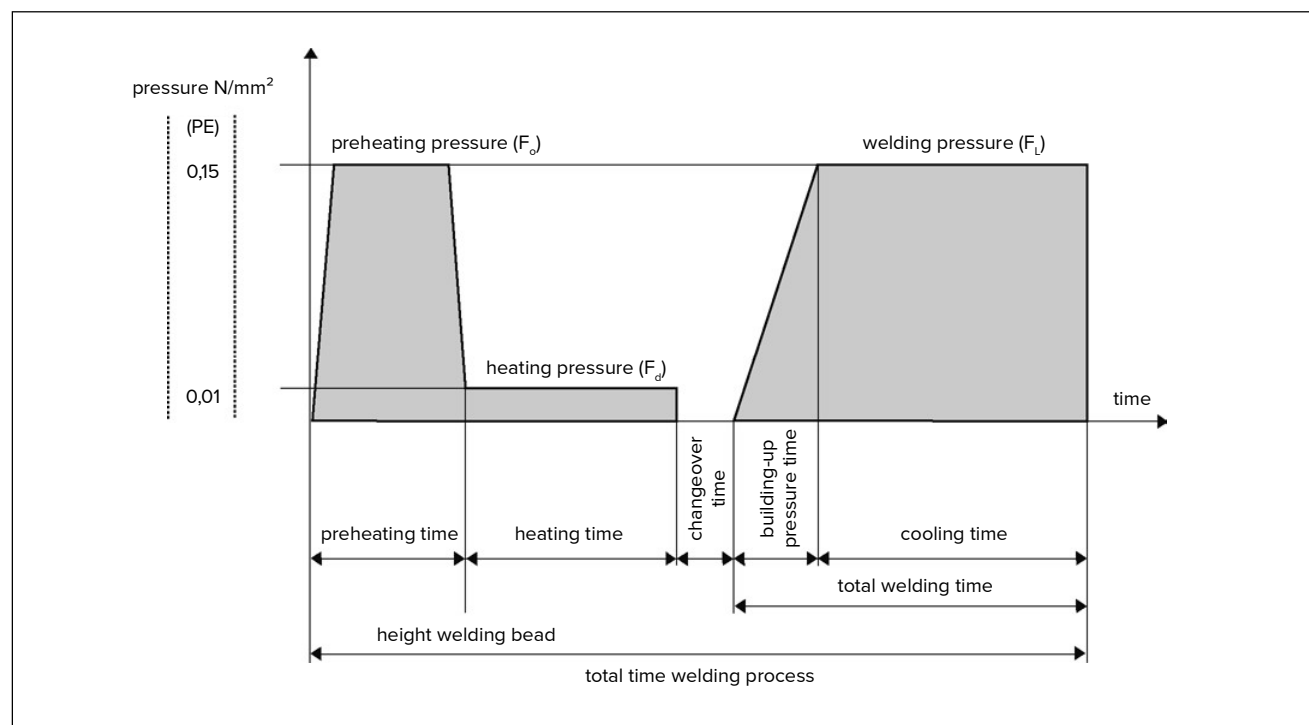


Illustration 8.6 Welding and cooling

The welded components can be removed from the machine when 50% of the cooling period has elapsed, providing that this is done carefully, with no load or strain being placed on the joint. The joint must then be left undisturbed for the remainder of the cooling period.



Graphic drawing 8.1

Diameter	Wall thickness	Preheating pressure/welding pressure (0,15 N/mm ²)	Heating pressure (0,01 N/mm ²)	Height welding bead	Heating time	Changeover time	Building-up pressure time	Cooling time
d _i	e	F ₀ /F _L	F _d	mm	sec.	sec.	sec.	min.
mm	mm	N	N					
40	3,0	55	4	0,5	29	4	4	4
50	3,0	70	5	0,5	30	4	4	4
56	3,0	75	5	0,5	30	4	4	4
63	3,0	85	6	0,5	31	4	4	4
75	3,0	105	7	0,5	32	5	5	4
90	3,5	145	10	0,5	35	5	5	4
110	4,2	210	14	0,5	42	5	5	6
125	4,8	275	18	1,0	48	5	5	6
160	6,2	450	30	1,0	62	6	6	9
110	3,4	175	12	0,5	35	5	5	4
125	3,9	225	15	0,5	39	5	5	5
160	4,9	370	25	1,0	49	5	5	7
200	6,2	570	38	1,0	62	6	6	9
250	7,8	900	60	1,5	77	6	6	11
315	9,7	1400	93	1,5	77	6	6	11
200	7,7	700	47	1,5	77	6	6	11
250	9,6	1090	73	1,5	97	7	7	13
315	12,1	1730	115	2,0	121	6	8	16

Table 8.2 Welding parameters Akatherm HDPE drainage

In table 8.2 the welding parameters can be found for Akatherm HDPE. The exact regulation of the welding machine depends on its mechanical resistance. The tables provided with the machine are to be used for regulating the machine.

Evaluating the butt-weld joint

The butt-weld can be evaluated using destructive and nondestructive evaluation methods. For these evaluations, special equipment has to be used. Butt-welds can easily be judged by visual inspection, making this the recommended method for a first evaluation.

The shape of the welding bead is an indication for the proper operation of the welding process. Both welding beads should have the same shape and size. The width of the welding bead should approximately be 0.5 x the height. Differences between the beads can be caused by the difference in HDPE material used in the welded components. Despite the differences in welding bead the butt-weld can be of sufficient strength. A good weld with a uniform welding bead is shown in illustration 8.7. During a visual inspection this would be classified as an "acceptable" weld.

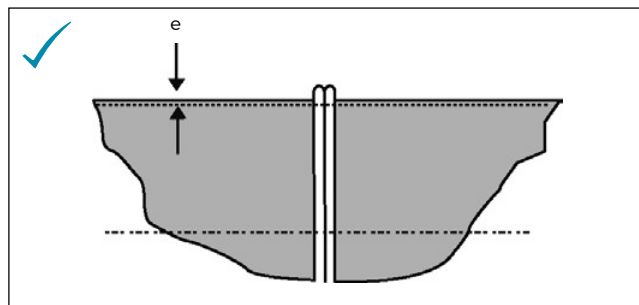


Illustration 8.7 Butt-weld with even welding beads (acceptable)

Misalignment between fittings and pipe can occur for several reasons. Oval pipe ends or irregular necking of the pipe can cause an incomplete fit. If this sagging is less than 10% of the wall thickness the weld can still be classified as "acceptable" (see illustration 8.8).

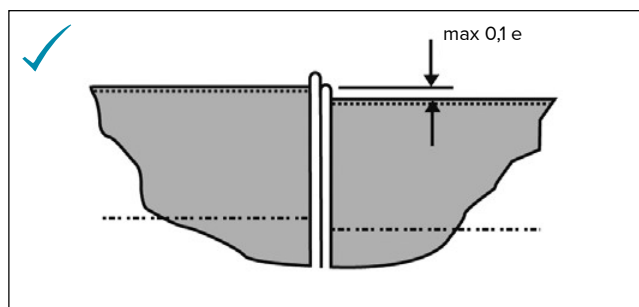


Illustration 8.8 Butt-weld with mis-alignment of pipe (acceptable)

Illustration 8.9 shows a joint with beads that are too big. The uniformity indicates a good joint preparation. However, heat supply and/or jointing pressure seem to be too high. A purely visual assessment would still classify the weld as "acceptable".

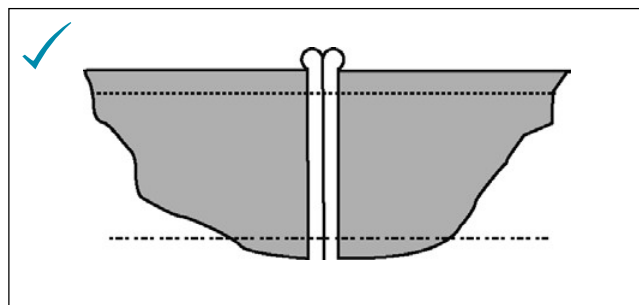


Illustration 8.9 Butt-weld with big welding beads (acceptable)

When there is either insufficient heat applied or not enough welding pressure there are hardly any beads. In cases like this, thick walled pipes often form shrinking cavities. The weld must be classified as "not acceptable" (see illustration 8.10).

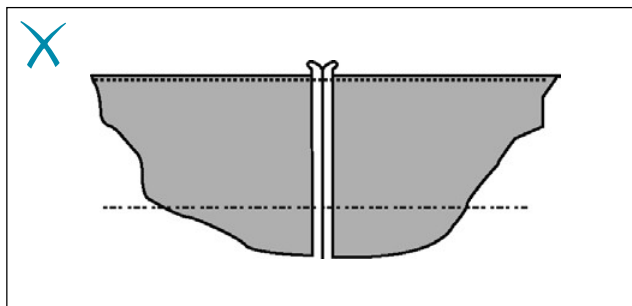


Illustration 8.10 Butt-weld (not acceptable)

Illustration 8.11 shows a cross-section of a regular, round fusion bead, free of notches or sagging. Special attention should be paid to the fact that the collar value 'K' is greater than 0.

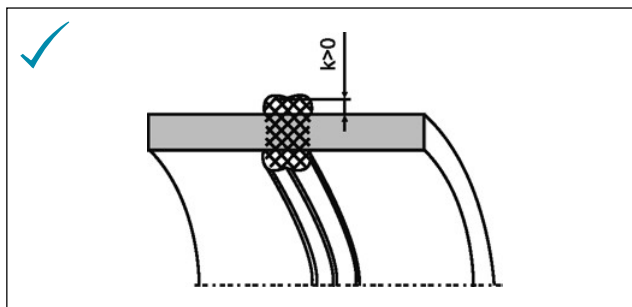


Illustration 8.11 Cross section of a good butt-weld

Welding by hand

In general, butt-welds are made using an Akatherm butt-welding machine. However up to the diameter $d_1 = 75$ mm the weld can be made by hand. At 90 mm and above, the welding pressures are too great to make a good weld by hand. The welding process is identical to butt-welding with a machine:

Preheating

Push the pipe/fittings against the heating plate until the required welding bead has been formed (for height of welding bead see table 8.2).

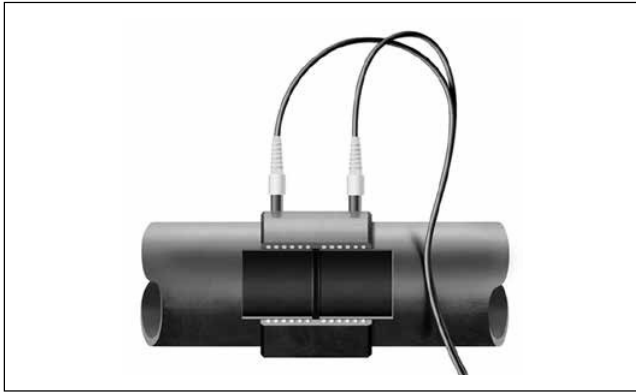
Heating up

Hold the pipe/fittings against the heating plate with no pressure (for time see table 8.2).

Change over/welding/cooling

As the spigots are thoroughly heated up, both parts need to be joined as quickly as possible using a gently build up of pressure. The jointing has to be carried out accurately because moving the parts during and after jointing is not possible.

Keep the parts joined together under pressure as long as the welding bead is still plasticised (this can be checked by pressing your fingernail into the bead). The joint then needs to cool down without any additional load. The use of a support structure is recommended when jointing long pipe parts. Using a butt-welding machine gives a better result under all circumstances.

8.3 ELECTROFUSION JOINT*Illustration 8.12*

Electrofusion is a rapid and simple way of permanent jointing. Pipes, fittings and prefabricated pipe sections can be efficiently assembled using electrofusion couplers and equipment. All Akasison products can be welded by electrofusion unless specifically stated in the product table.

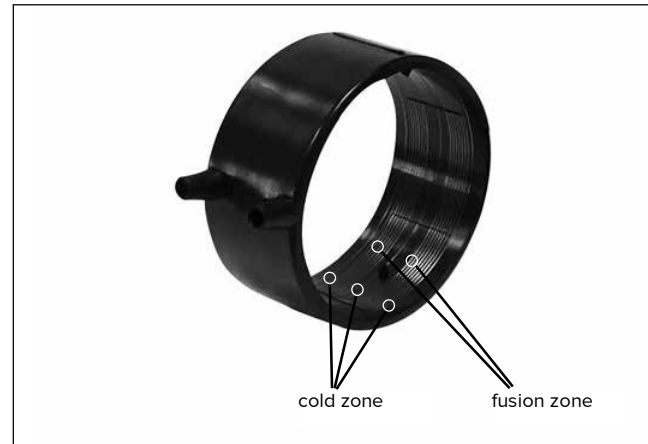
Preparation

The following guidelines are important when making a proper electrofusion joint:

- Establish a work space where the welding can be done without being effected by major weather conditions. Operating temperature: -10°C to +40°C.
- Check that the equipment functions properly. Welding equipment used on site deserves special attention.
- Akafusion couplers have surface resistance wires to provide good heat exchange. The resistance wires need to be covered by the inserted pipe or fitting to work properly.
- Complete insertion is essential to utilise the fusion and cold zones in the coupler.
- Make sure both ends are inserted into the coupler have been properly scraped and cleaned. The Oxidation layer needs to be removed from both pipes and fittings.

The resistance wires are positioned in the fusion zone. On both sides of a fusion zone, a cold zone prevents the molten HDPE from leaking or spreading, thereby containing the fusion process.

During the fusion process the pipe/fitting expands and touches the inner coupler wall. The electrofusion joint is made with the pressure caused by the expanding HDPE and the heat from the resistance wires.

*Illustration 8.13 Akafusion coupler with fusion and cold zones*

Warning: Without removing the oxygen layer a weld cannot be guaranteed. The oxidation layer will form again within one hour. The butt-weld needs to be made right after machining the ends.

Welding process

Cut pipe square

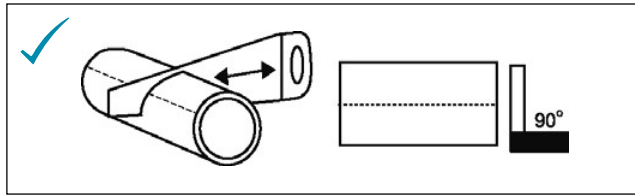


Illustration 8.14

The pipe ends must be cut square to ensure that the resistance wire in the coupler is completely covered by the pipe or fitting.

Mark surface for scraping

Mark insertion depth +10 mm to ensure that the oxidised layer will be removed across the complete welding zone.

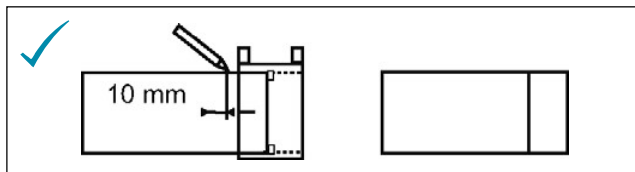


Illustration 8.15

Scrape pipe and mark insertion depth

The full outer surface of the pipe that will be covered by the coupler must be scraped (about 0,2 mm deep) to remove any surface 'oxidation'. The insertion depth should be marked again to ensure full insertion.

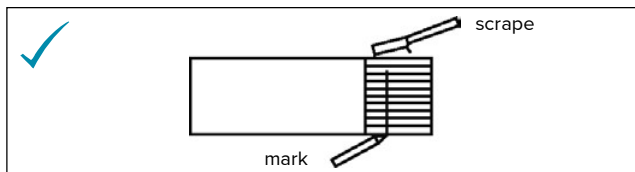


Illustration 8.16

Clean electrofusion coupler

Before assembling the pipes in the coupler ensure that all surfaces are clean and dry.



Illustration 8.17

! Insert pipe/fitting until marked line

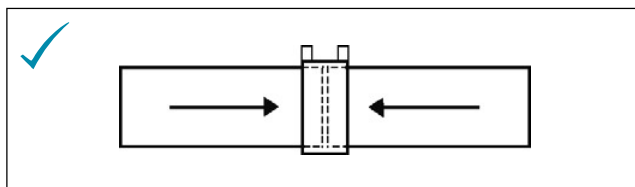


Illustration 8.18

Ensure that the pipe is pushed into the coupler as straight as possible and up to the marked insertion depth. This will ensure that all the wires are covered with HDPE during the fusion cycle.

! Prevent misalignment

Misalignment will cause extra load on the fusion zone causing additional HDPE to melt, resulting in the leakage of HDPE or wire movement.

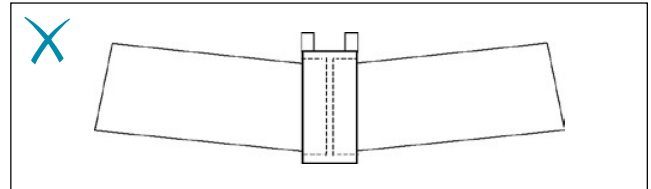


Illustration 8.19

! Prevent joint movement during welding

The movement of the pipe can cause melted HDPE to flow out of the joint. This can result in wire movement, and possibly a short circuit. This causes a bad weld and potential fire hazard.

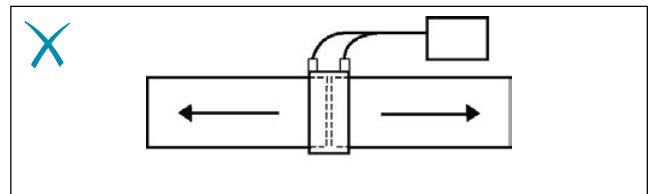


Illustration 8.20

! Prevent coupler from sliding down when centre stop removed

An electrofusion coupler sliding down will cause movement of the wires and possibly a short circuit. This causes a bad weld and potential fire hazard.

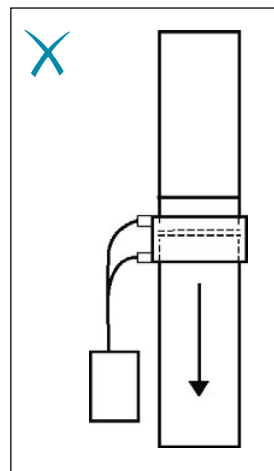


Illustration 8.21

! Remove vertical loading during welding

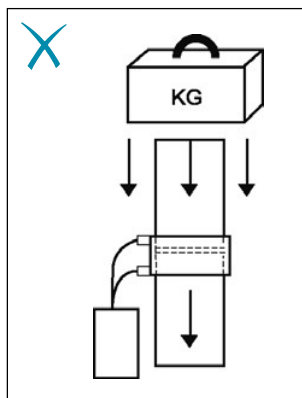


Illustration 8.22

An additional load on the vertical pipe will transfer extra HDPE material to the fusion zone. This will cause movement of the wires, possibly a short circuit, and thus a bad weld or fire hazard.

Welding electrofusion coupler and cooling down

After connecting the cables of the control box, the fusion process can be begun by pushing the start button. Both the CB315 and CB160 control boxes adapt the welding time to the ambient temperature. When it is colder than 20°C the welding time is extended and when the ambient temperature exceeds 20°C the welding time is shortened. Welding below an ambient temperature of -10°C is not recommended. For welding times and cooling down times see table 8.3. For extensive instructions see the manual of CB315 and CB160. The joint assembly should not be disturbed during the fusion cycle and for the specified cooling time afterwards.

diameter d_1 mm	system	welding time sec	cooling time min
40-160	Constant current 5A	80	20
200-315	Constant power 220V	420	30

Table 8.3 Welding parameters Akafusion couplers

The full load can only be applied after the complete cooling time.

The cooling period can be reduced by 50% when there is no additional load or strain during cooling.

! Never weld a coupler twice

During the fusion cycle the correct amount of energy is applied to the fusion zones to make a good electrofusion joint. A second fusion cycle would apply so much energy to the joint the HDPE would melt extensively. This will cause movement of the wires and possibly a short circuit. In an extreme case it can even cause fire.

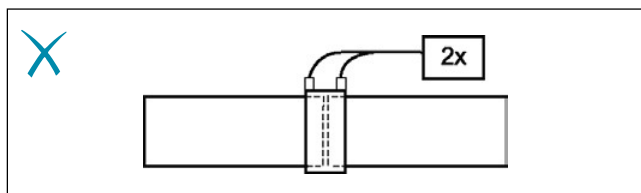


Illustration 8.23

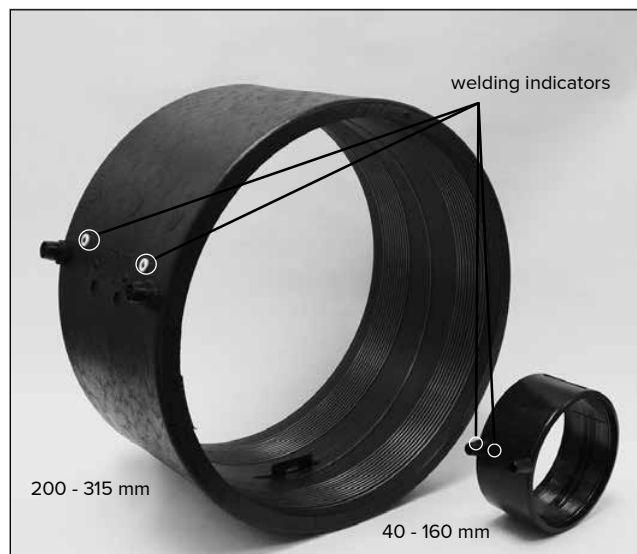


Illustration 8.24

Assessing an electrofusion weld

Compared to a butt-weld, it is more difficult to judge a good electrofusion weld. The welding indicators on the electrofusion coupler provide an indication if the weld has actually been executed. However, they do not guarantee the integrity of the joint. The amount of movement of the pop-out depends on several factors, including the size tolerances of the components and any ovality of the pipe or fitting.

A joint can be considered satisfactory when the welding indicators are protruded, and all welding preparations such as marking insertion depth, scraping, and avoiding additional load during welding and cooling have been executed successfully. If a significant quantity of melt flows from the fitting after welding, there may be a misalignment of the components, the tolerances may be excessive, or a second welding may have accidentally occurred. The integrity of such a joint is doubtful.

Please note that the fitting will become too hot to touch during the welding process. The temperature will continue to rise for some time after the fusion process has been completed.

Deformation

A too big deformation can cause problems during assembly and welding of the components. The maximum allowed deformation of pipe or fitting spigot is $0,02 \times d_1$. This results in a maximum difference between the largest and smallest diameter corresponding with table 8.4. When the deformation is larger, the pipe or fitting spigot needs to be "rounded" using clamps.

diameter d_1	$d_1 \text{ max} - d_1 \text{ min (mm)}$
40	1,0
50	1,0
56	1,0
63	1,0
75	1,5
90	2,0
110	2,0
125	2,5
160	3,0
200	4,0
250	5,0
315	6,0

Table 8.4 Deformation pipe

8.4 PLUG-IN JOINT



Illustration 8.25

A plug-in joint is an easy to make detachable and not pull-tight jointing method.

Jointing process:

Cut pipe square and remove burr

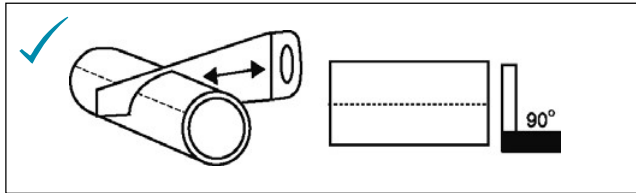
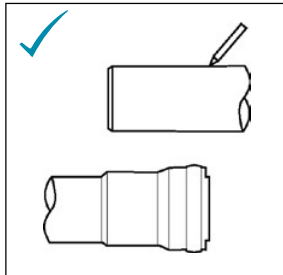


Illustration 8.26

Mark insertion depth

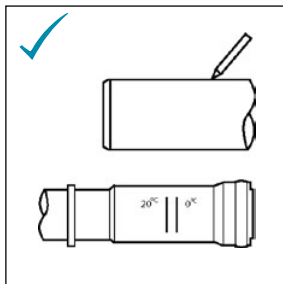


Plug-in socket:

The pipe needs to be inserted in the plug-in socket using the full insertion depth.

A plug-in joint is not to be used to accommodate the expansion and contraction of a pipe system.

Illustration 8.27

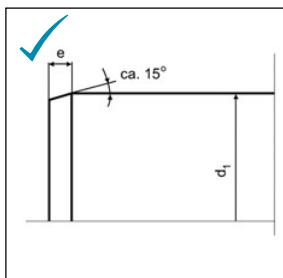


Expansion socket:

A snap-expansion socket is used to accommodate the expansion and contraction in a pipe system.

The insertion depth is marked on the socket for both ambient temperatures of 0°C and 20°C.

Illustration 8.28



Chamfer pipe end

The pipe-end needs to be chamfered at an angle of 15°. A chamfering tool should be used to get an even cut and chamfer.

Illustration 8.29

Make joint

Lubricate the pipe end and insert the pipe up to the marked insertion depth.

8.5 SNAP JOINT



Illustration 8.30

For making pull-tight connections, snap (expansion) sockets are available. These sockets are plug-in sockets with an extra snap ring which, in combination with a groove in the pipe, provides a pull-tight connection.

Jointing process:

Cut pipe square and remove burr

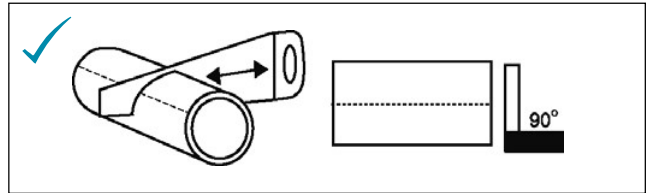
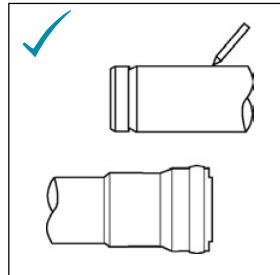


Illustration 8.31

Mark insertion depth

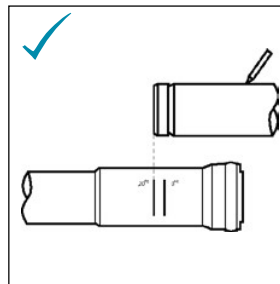


Snap socket:

The pipe needs to be inserted in the snap socket using the full insertion depth.

A snap socket is not to be used to accommodate the expansion and contraction of a pipe system.

Illustration 8.32

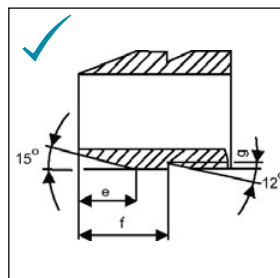


Snap-expansion socket:

Snap-expansion sockets are available from d40 to 75 mm and are used to accommodate the expansion and contraction in a pipe system.

The insertion depth is marked on the socket for both ambient temperatures of 0°C and 20°C.

Illustration 8.33



Chamfer pipe end and make snap groove

The pipe end needs to be chamfered at an angle of 15°. The groove needs to be cut at an angle of 12°.

The correct dimensions can be found in table 8.5. To get an even cut and chamfer it is recommended to use an Akatherm groove cutter.

Illustration 8.34

d_1	e	f	g
40	5	15	1
50	5	15	1
56	5	15	1
63	5	15	1
75	5	15	1
90	6	15	1
110	8	15	1
125	9	15	1
160	11	15	1
200	11	30	2
250	15	30	2
315	18	50	3

Table 8.5 Dimensions chamfer and groove

Make joint

Lubricate the pipe end and insert the pipe to the marked insertion depth. A distinct click can be heard when the snap ring is inserted in the groove.

Remark:

When the groove is omitted, the Akatherm snap and snap-expansion sockets are detachable like a not pull-tight joint.

8.6 SCREW-THREADED JOINT

Illustration 8.35

The Akatherm screw threaded joint can be used in both pull-tight and not pull-tight joints.

Not pull-tight joints

In this case the pipe or fitting is inserted directly into the joint.

Joining process:

- Cut pipe square and remove burr
- Disassemble screw threaded joint
- Discard the yellow protection cap as it is no longer needed.
- Assemble joint and insert pipe
- Push the nut, washer and seal (in this order) over the pipe and insert the pipe end into the threaded piece completely. Tighten nut.
- The washer prevents damage to the seal and delivers an even pressure onto the joint.

Pull-tight joints

In combination with the flange bushing a pull-tight joint can be made.

Joining process:

- Cut pipe square and remove burr
- Disassemble screw threaded joint
- Discard yellow protection cap and washer as no longer needed.
- Assemble joint and insert pipe
- Push the nut over the pipe before butt-welding the flange bushing onto the pipe. After welding, everything can be assembled.
- The flange bushing prevents damage to the seal and delivers an even pressure to the joint.

83

Akatherm BV
Industrieterrein 11
P.O. Box 7149
NL-5980 AC Panningen
The Netherlands

Tel +31 (0)77 30 88 650
Fax +31 (0)77 30 75 232

info@akasison.com
www.akasison.com