

## National technical approval

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamt

Eine vom Bund und den Ländern  
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Date:

22 May 2019

Reference:

III 53-1.42.1-20/18

**Approval number:**

**Z-42.1-569**

**Applicant:**

**Wavin GmbH**  
**Kunststoff-Rohrsysteme**  
Industriestraße 20  
49767 Twist, Germany

**Validity**

from: **22 May 2019**

to: **22 May 2024**

**Subject of approval:**

**'WAVIN AS+' drainage pipes and fittings made of polypropylene (PP) with nominal sizes of DN/OD 50 to DN/OD 200 with a three-layer wall structure of building material class B2 – 'flammable' (*normalentflammbar*) – in accordance with DIN 4102-1 for drainage pipes within buildings**

The subject of the approval named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*).

This decision contains 9 pages and 18 annexes.

Translation authorised by DIBt

DIBt

## I GENERAL PROVISIONS

- 1 This national technical approval confirms the fitness for use of the subject of approval within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 The national technical approval does not replace the permits, approvals and certificates prescribed by law for carrying out building projects.
- 3 The national technical approval is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the 'Special Provisions', manufacturers and distributors of the subject of approval shall make copies of the national technical approval available to the user and point out that the national technical approval must be available at the place of use. Upon request, copies of the national technical approval shall be placed at the disposal of the authorities involved.
- 5 The national technical approval shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional materials shall not contradict the national technical approval. In the event of a discrepancy between the German original of the national technical approval and this authorised translation, the German version shall prevail.
- 6 The national technical approval may be revoked. The provisions of the national technical approval can subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant on the subject of approval during the approval procedure. Alterations to the information on which this national technical approval was based are not covered by this decision and shall be notified to DIBt without delay.

## II SPECIAL PROVISIONS

### 1 Subject of approval and field of use

This national technical approval applies to the manufacture and use of 'Wavin AS+' drainage pipes with and without sockets as well as for 'Wavin AS+' fittings with sockets. The drainage pipes and fittings are made of mineral-reinforced polypropylene (PP) with nominal sizes of DN 50 to DN 200.

The drainage pipes and fittings are made of 'flammable' (*normalentflammbar*) building materials of building material class 'B2' in accordance with DIN 4102-1<sup>1</sup>. If such drains penetrate walls or floors, measures in accordance with the relevant regulatory provisions (e.g. DIN 4102-11<sup>2</sup>) shall be taken to prevent the spread of fire and smoke.

If piping systems made up of pipes in accordance with this national technical approval penetrate floors or walls to which regulatory fire resistance provisions apply,

- the regulatory provisions concerning the fire protection design of piping systems or for sealing combustible pipes shall be complied with or
- pipe penetration seals in accordance with national technical approvals granted for this purpose shall be installed or
- other fire-stopping measures shall be taken, the suitability of which has been verified through a national technical test certificate (*allgemeines bauaufsichtliches Prüfzeugnis*) on the basis of tests performed in accordance with DIN 4102-11<sup>2</sup>.

The regulatory provisions and guidelines for the use of combustible building materials in buildings shall remain unaffected.

The drainage pipes and fittings may only be used for drains within the building structure in accordance with the definition of application sign 'BD' in accordance with DIN EN 1451-1<sup>3</sup>.

The drainage pipes and fittings may further be used for drains and rainwater downpipes in buildings as well as for underground pipes in accordance with DIN 1986-100<sup>4</sup> in conjunction with DIN EN 12056-1<sup>5</sup>.

The drainage pipes and fittings are only intended for drainage in accordance with DIN 1986-3<sup>6</sup> in which the wastewater temperature does not exceed the temperatures specified in DIN EN 476<sup>7</sup>. In addition, the drainage pipes have satisfied the impact resistance requirements at -10°C in accordance with DIN EN 1451-1 and may bear the 'ice crystal' symbol.

1	DIN 4102-1	Fire behaviour of building materials and building components – Part 1: Building materials; concepts, requirements and tests, Sections 3 and 6; publication date: 1998-05
2	DIN 4102-11	Fire behaviour of building materials and building components; pipe encasements, pipe bushings, service shafts and ducts, and barriers across inspection openings; terminology, requirements and testing; publication date: 1985-12
3	DIN EN 1451-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – Polypropylene (PE) – Part 1: Specifications for pipes, fittings and the system; German version EN 1451-1:2017; publication date: 2018-10
4	DIN 1986-100	Drainage systems on private ground – Part 100: Specifications in relation to DIN EN 752 and DIN EN 12056; publication date: 2016-12
5	DIN EN 12056-1	Gravity drainage systems inside buildings – Part 1: General and performance requirements; German version EN 12056-1:2000; publication date: 2001-01
6	DIN 1986-3	Drainage systems on private ground – Part 3: Specifications for service and maintenance; publication date: 2004-11
7	DIN EN 476	General requirements for components used in drains and sewers; German version EN 476:2011; publication date: 2011-04

## 2 Provisions for drainage pipes and fittings

### 2.1 Properties and composition

#### 2.1.1 General

Unless otherwise specified below, the requirements of DIN EN 1451-1<sup>3</sup> in connection with DIN CEN/TS 1451-2<sup>8</sup> shall apply.

#### 2.1.2 Material

The composition of the mineral-reinforced polypropylene shall correspond to the formulation deposited with DIBt. Material of unverified composition shall not be used.

Use of scrap material of the same formulation from the applicant's manufacturing plants is permissible. In addition, unused drainage pipes and fittings manufactured using the same formulation as that used for manufacture of the drainage pipes and fittings of this approval may be used as recycled material.

#### 2.1.3 Density

Drainage pipes and fittings made of PP shall have a mean density of  $1.8 \text{ g/cm}^3 \pm 0.15 \text{ g/cm}^3$ .

#### 2.1.4 Melt mass-flow rate (MFR)

The melt mass-flow rate (MFR 190°C/5 kg) of the mineral-reinforced polypropylene for the drainage pipes and fittings shall lie in the range of 1.8 g/10 min to 3.8 g/10 min.

#### 2.1.5 Thermal stability (OIT)

The polypropylene used (raw material) and the processed mineral-reinforced polypropylene shall have an oxidation induction time of at least 8 min at a test temperature of 200°C during testing in accordance with DIN EN ISO 11357-6<sup>9</sup>.

#### 2.1.6 Properties after oven ageing

During testing in accordance with Section 2.3.2, the pipes and fittings shall comply with the permissible dimensional change of 2%. No damage shall occur as a result of this test.

#### 2.1.7 Colour

The drainage pipes and fittings shall be uniformly coloured light grey.

#### 2.1.8 Dimensions

The dimensions of the drainage pipes and fittings shall correspond to the information provided in Annexes 1 and 2. Wall thicknesses of less than the specified values are not permissible.

#### 2.1.9 Impact resistance and impact behaviour

##### 2.1.9.1 Impact resistance of the drainage pipes

In the testing of the impact resistance in accordance with Section 2.3.2, the drainage pipes shall have a failure rate of  $\leq 10\%$ .

##### 2.1.9.2 Impact behaviour of the fittings

In the testing of the impact behaviour using the method described in Section 2.3.2, the fittings shall have a failure rate of  $\leq 10\%$ .

<sup>8</sup> DIN CEN/TS 1451-2      Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – Polypropylene (PP) – Part 2: Guidance for the assessment of conformity; German version CEN/TS 1451-2:2012; publication date: 2012-05

<sup>9</sup> DIN EN ISO 11357-6      Plastics – Differential scanning calorimetry (DSC) – Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) (ISO 11357-6:2018); German version EN ISO 11357-6:2018; publication date: 2018-07

**2.1.10 Reaction to fire**

The drainage pipes and fittings shall meet the requirements for 'flammable' (*normalentflammbar*) building materials (building material class DIN 4102-B2) in accordance with DIN 4102-1<sup>1</sup>.

**2.1.11 Pipe joints and sealants**

The drainage pipe and fitting joints as well as the elastomeric seals used for them and to be supplied by the applicant shall meet the requirements of DIN EN 681-1<sup>10</sup>. The pipe joints shall meet the requirements of DIN EN 1451-1<sup>3</sup>.

**2.2 Manufacture, packaging, transport, storage and marking****2.2.1 Manufacture**

The drainage pipes described in Section 2.1 shall be manufactured using an extrusion process and the fittings by injection moulding. During manufacture, the following production parameters shall be calibrated and recorded for each new batch and each time the machine is started:

- melt temperature
- melt flow rate
- zone temperatures
- cooling water temperature
- output rate
- material feed / volume
- speeds
- pressures
- cycle times
- vacuum
- dimensions.

**2.2.2 Packaging, transport and storage**

The drainage pipes and fittings shall be stored and transported such that they are not damagingly deformed. The sockets of the drainage pipes shall be free (uncovered) on all sides. The stack height of the drainage pipes at the construction site or in temporary storage shall not exceed 1.50 m, even if wood beams are inserted between the pipes. The drainage pipes and fittings shall be handled with care at temperatures of around  $\pm 0^{\circ}\text{C}$  and below due to the decreased impact resistance at these temperatures.

**2.2.3 Marking**

The drainage pipes and fittings shall be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) including the approval number Z-42.1-569 in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The mark shall only be applied if the requirements given in Section 2.3 are met.

The drainage pipes shall also each be marked at least once in a clearly visible and durable manner with the following information:

- nominal size
- manufacturing plant

<sup>10</sup>

DIN EN 681-1

Elastomeric seals – Material requirements for pipe joint seals used in water and drainage applications – Part 1: Vulcanised rubber; German version EN 681-1:1996 + A1:1998 + A2:2002 + AC:2002 + A3:2005; issue: 2006-11

- year of manufacture
- building material class 'flammable' (*normalentflammbar*) (DIN 4102-B2).

## 2.3 Confirmation of conformity

### 2.3.1 General

The manufacturer shall confirm for each manufacturing plant that the drainage pipe and fittings (construction products) comply with the provisions of this national technical approval by way of a declaration of conformity based on factory production control and a certificate of conformity issued by a certification body recognised for these purposes as well as on regular external surveillance carried out by a recognised inspection body in accordance with the following provisions.

To issue the certificate of conformity and for external surveillance, including the associated product testing to be carried out in the process, the manufacturer of the drainage pipes and fittings shall use an appropriately recognised certification body and an appropriately recognised inspection body.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction products with the national conformity mark including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

### 2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control is understood to be continuous monitoring of production by the manufacturer to ensure that the construction products manufactured satisfy the provisions of this national technical approval.

The factory production control shall at least include the following measures:

- Description and verification of the starting material and the components:

For the purposes of checking of the identities against the formulations deposited with DIBt and the material properties made known to the external surveillance body, the applicant shall ensure that the sub-supplier submits at least test reports 'type 2.2' in accordance with DIN EN 10204<sup>11</sup> for each delivery of the individual raw materials. The material-based tests required for this shall be carried out for each raw material delivery.

The composition of the mineral-reinforced polypropylene and its verification shall comply with the specifications given in Section 2.1.

- Checks and tests to be carried out during manufacture:

Compliance with the specifications in Section 2.2.1 shall be checked continuously.

- Verifications and tests to be carried out on the finished construction product:

The applicable requirements in accordance with DIN EN 1451-1<sup>3</sup> shall be checked as described in Section 2.1.1 General. Apart from that, at least the specifications given in the following sections shall be checked:

<sup>11</sup> DIN EN 10204

Metallic products – Types of inspection documents; German version EN 10204:2004; publication date: 2005-01

1. Density

Compliance with the specifications in Section 2.1.3 regarding density shall be checked in accordance with DIN EN ISO 1183-1<sup>12</sup> for each machine and dimension as well as each time the machine is started and every time the starting materials are changed for pipes and fittings at least once every production week.

2. Melt mass-flow rate (MFR)

Compliance with the specifications in Section 2.1.4 regarding the melt mass-flow rate shall be checked on the drainage pipes and fittings at least once per production week and every time the starting material is changed.

The test shall be carried out in accordance with DIN EN ISO 1133-1<sup>13</sup>.

3. Behaviour after heat treatment

Compliance with the specifications in Section 2.1.6 regarding behaviour after thermal ageing of the pipes shall be checked at least once every production day and for fittings at least once every production week for each machine and dimension as well as each time the machine is started and every time the starting materials are changed.

Thermal ageing shall be carried out at  $150^{\circ}\text{C} \pm 3^{\circ}\text{C}$ . The exposure time shall be  $60 \text{ min} \pm 2 \text{ min}$  for pipes and  $30 \text{ min} \pm 2 \text{ min}$  for fittings.

4. Colour

Compliance with the specifications in Section 2.1.7 regarding uniform coloration throughout shall be checked visually for each machine and dimension for pipes and fittings every two production hours and for fittings every four production hours.

5. Dimensions

Compliance with the specifications in Section 2.1.8 regarding the dimensions of the drainage pipes and fittings shall be continuously checked during production for each machine and dimension.

6. Impact resistance and impact behaviour

Compliance with the specifications in Section 2.1.9 regarding the impact resistance of the drainage pipes (Section 2.1.9.1) and the impact behaviour of the fittings (Section 2.1.9.2) shall be checked once every production week on each extrusion and injection moulding line:

a) Impact resistance of the drainage pipes

- For application case -10°C tests shall be verified in accordance with DIN EN ISO 11173<sup>14</sup> and
- for application case 0°C tests shall be verified in accordance with DIN EN ISO 3127<sup>15</sup>.

12	DIN EN ISO 1183-1	Plastics – Methods for determining the density of non-cellular plastics – Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2012); German version EN ISO 1183-1:2012; publication date: 2013-04
13	DIN EN ISO 1133-1	Plastics – Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics – Part 1: Standard method (ISO 1133-1:2011); German version EN ISO 1133-1:2011; publication date: 2012-03
14	DIN EN ISO 11173	Thermoplastics pipes – Determination of resistance to external blows – Staircase method (ISO 11173:1994); German version EN ISO 11173:2017; publication date: 2018-02
15	DIN EN ISO 3127	Thermoplastics pipes – Determination of resistance to external blows – Round-the-clock method (ISO 3127:1994); German version EN ISO 3127:2017; publication date: 2018-01

b) Impact behaviour of the fittings

The impact behaviour of the fittings shall be checked through the fall test based on DIN EN ISO 13263<sup>16</sup>.

Ten fittings shall be taken as test specimens. Of these, five fittings shall be stored for at least two hours at a temperature of  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . At the same temperature, each of these five fittings shall be dropped from a height of  $1.0 \text{ m} \pm 0.05 \text{ m}$  with a different orientation on to a flat concrete floor in a free-fall drop test.

If no failure (breakage) occurs, the test shall be considered to have been passed. If one fitting fails, the test shall also be carried out on the remaining five fittings. If more than 10% of the specimens fail, the associated production volume back to the last passed test shall be discarded.

7. Sealants

The elastomeric seals to be provided by the manufacturer shall meet the requirements set forth in DIN EN 681-1<sup>9</sup>.

To verify compliance with the specifications given in Section 2.1.11 pertaining to the elastomeric sealants, the applicant shall ensure for each delivery that the elastomeric seals or the respective accompanying documents bear the CE marking as well as the specific information required in accordance with DIN EN 681-1<sup>9</sup>.

8. Manufacture

Compliance with the specifications in Section 2.2.1 regarding manufacture shall be checked continuously during production.

9. Marking

Compliance with the marking specifications given in Section 2.2.3 shall be checked continuously during production.

The 'ice crystal' mark shall only be applied if the impact resistance at  $-10^{\circ}\text{C}$  has been verified.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material and the components,
- type of check or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- results of the checks and tests as well as, if applicable, comparison with requirements,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and submitted to the inspection body used for external surveillance. They shall be presented to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately – where technically feasible and necessary to show that the defect has been eliminated.

<sup>16</sup>

DIN EN ISO 13263

Thermoplastics piping systems for non-pressure underground drainage and sewerage – Thermoplastics fittings – Test method for impact strength (ISO 13263:2010); German version EN ISO 13263:2017; publication date: 2018-01



### 2.3.3 External surveillance

The factory production control system at each manufacturing plant shall be inspected regularly, i.e. at least twice a year, by means of external surveillance.

Within the scope of external surveillance, the specifications of DIN EN 1451-1<sup>3</sup> as well as any other specifications given in the following sections shall be checked:

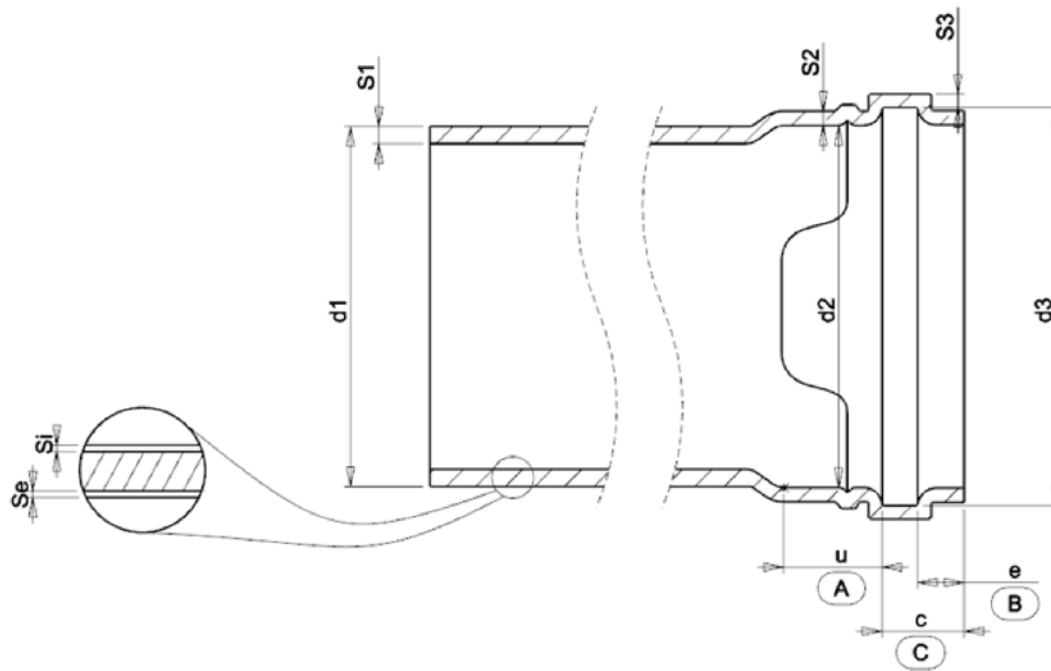
- 2.1.2 Material
- 2.1.3 Density
- 2.1.4 Melt mass-flow rate (MFR)
- 2.1.5 Thermal stability of the processed mineral-reinforced polypropylene
- 2.1.6 Properties after oven ageing
- 2.1.7 Colour
- 2.1.8 Dimensions
- 2.1.9 Impact resistance and impact behaviour
- 2.1.10 Reaction to fire
- 2.1.11 Sealants
- 2.2.1 Manufacture
- 2.2.3 Marking

Sampling and testing shall be the responsibility of the recognised inspection body, with the provisions of DIN CEN/TS 1451-2<sup>9</sup> thereby being taken into consideration.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

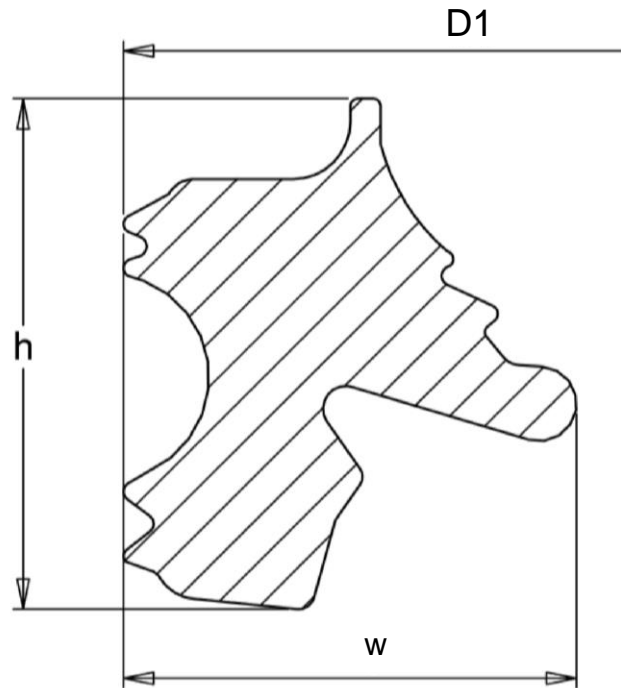
Rudolf Kersten  
Head of Section

Drawn up by



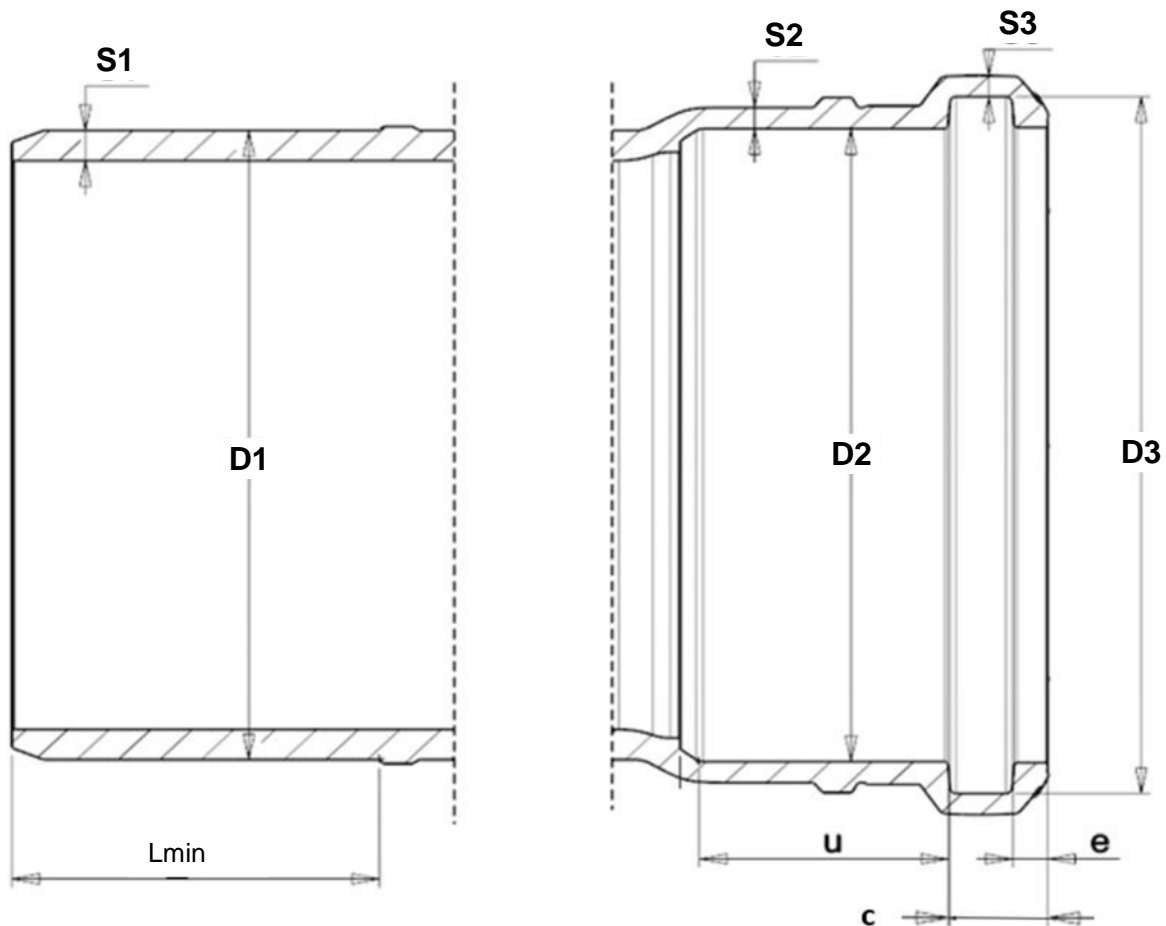
Dim. description		DN50	DN70	DN90	DN100	DN125	DN150	DN200
EN1451	Wavin							
d1 min	"	50.0	75.0	90.0	110.0	125.0	160.0	200.0
d1 max	"	50.4	75.4	90.4	110.4	125.7	160.5	200.6
d2 min	"	50.4	75.4	90.4	110.4	125.4	160.5	200.7
d3 min	"	60.0	84.8	100.0	121.5	138.4	175.2	216.6
d3 max	"	60.8	85.7	100.8	122.5	139.4	176.2	217.8
s1 min	"	2.7	3.2	4.3	4.9	4.9	5.2	5.6
s1 max	"	3.5	4.1	5.3	6.1	6.1	6.4	6.9
s2 min	"	2.5	2.3	2.8	3.1	3.3	3.3	4.0
s3 min	"	2.1	2.3	2.8	3.1	3.3	3.3	4.0
$S_i=S_e$ min	"	0.1	0.1	0.2	0.2	0.25	0.25	0.25
A min	u	24.9	27.9	26.8	28.9	32.3	37.0	48.6
B min	e	5.0	5.0	5.0	6.0	7.0	9.0	12.0
C max	c	18.4	19.5	23.4	26.2	26.5	28.5	31.5

Subject of approval	Wavin AS+	Annex  1
Annex contents	Pipe with socket	



DN	D1	w	h
50	61.5	7.4	8.5
70	86.6	7.4	8.5
90	102.8	8.3	8.3
100	123.9	9	8.6
125	142.2	10.4	9.9
150	179.8	11.9	11.3
200	223.7	13	12.7

Subject of approval	Wavin AS+	Annex 2
Annex contents	Seal	



Dim. description		DN50	DN70	DN90	DN100	DN125	DN150	DN200
EN1451	Wavin							
d1 min	"	50.0	75.0	90.0	110.0	125.0	160.0	200.0
d1 max	"	50.4	75.4	90.4	110.4	125.7	160.5	200.6
d2 min	"	50.4	75.4	90.4	110.4	125.4	160.5	200.7
d3 min	"	60.0	84.8	100.0	121.5	138.4	175.2	216.6
d3 max	"	60.8	85.7	100.8	122.5	139.4	176.2	217.8
s1 min	"	2.7	3.2	4.3	4.9	4.9	5.2	5.6
s1 max	"	3.5	4.1	5.3	6.1	6.1	6.4	6.9
s2 min	"	2.5	2.2	2.8	3.1	3.3	3.3	4.0
s3 min	"	2.1	2.3	2.8	3.1	3.3	3.3	4.0
A min	u	31.0	35.0	36.0	40.0	43.0	48.0	60.0
B min	e	4.1	5.1	5.2	5.5	5.4	6.4	7.3
C max	c	13.8	14.8	16.3	16.8	17.1	19.2	23.0
t_e min	Lmin	47.5	49.8	55.2	59.0	63.0	70.6	85.8

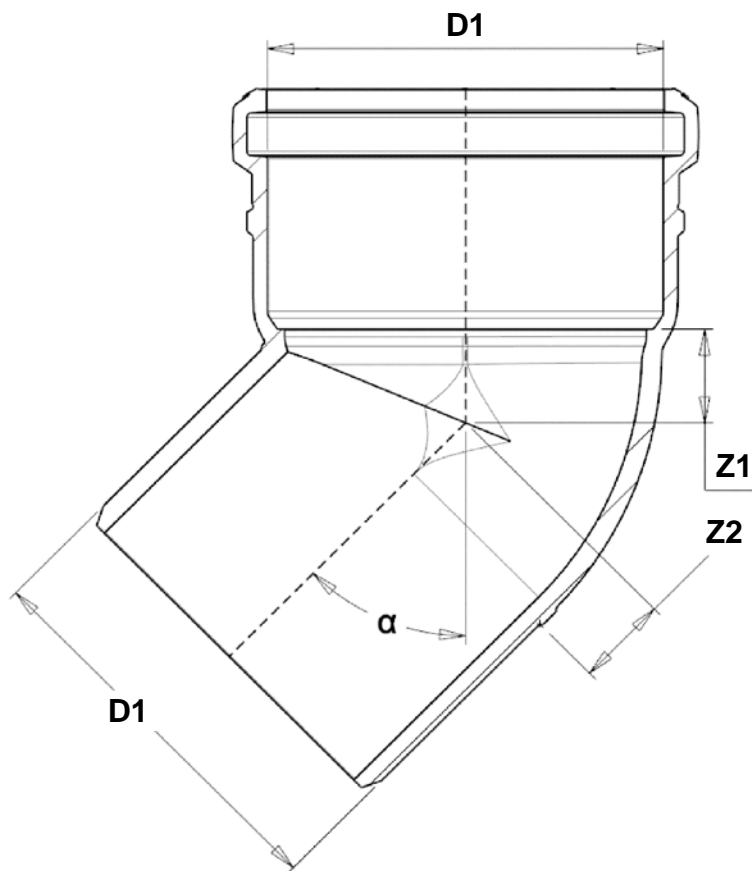
Subject of approval Wavin AS+

Annex

Annex contents

Moulded part: spigot end and socket

3



α	DN	D1	Z1	Z2
15°	50	50	7.9	5.3
	70	75	8.9	6.8
	90	90	14.3	8.4
	100	110	13.8	10.2
	125	125	13.7	11.4
	150	160	15.3	14.3

α	DN	D1	Z1	Z2
30°	50	50	10.4	8.7
	70	75	12.6	12.4
	90	90	16.6	14.6
	100	110	20.2	17.7
	125	125	22.7	20.0
	150	160	25.0	25.3

α	DN	D1	Z1	Z2
45°	50	50	15.1	12.4
	70	75	18.6	18.0
	90	90	21.7	21.0
	100	110	13.8	10.2
	125	125	31.4	29.1
	150	160	38.4	37.0
	200	200	47.5	31.4

α	DN	D1	Z1	Z2
67°	50	50	19.6	20.0
	70	75	27.1	27.2
	90	90	33.9	32.3
	100	110	40.8	39.4

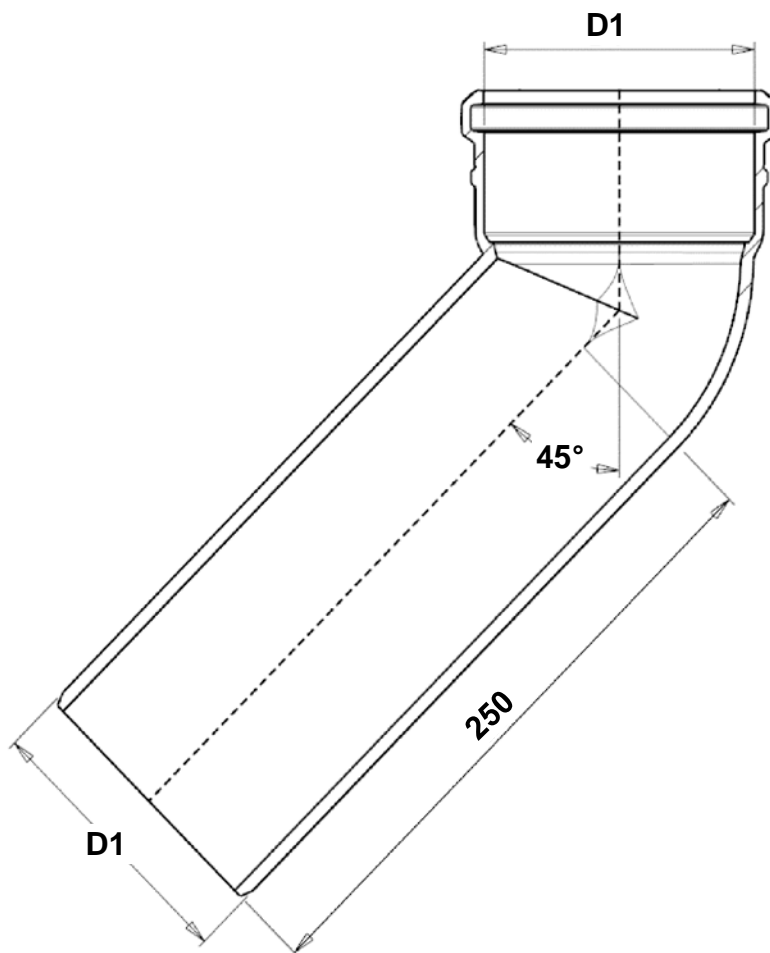
α	DN	D1	Z1	Z2
87°	50	50	28.7	25.8
	70	75	39.2	38.0
	90	90	46.3	45.2
	100	110	60.9	55.2
	125	125	67.5	62.6
	150	160	80.7	79.8
	200	200	101.7	99.4

Subject of approval Wavin AS+

Annex

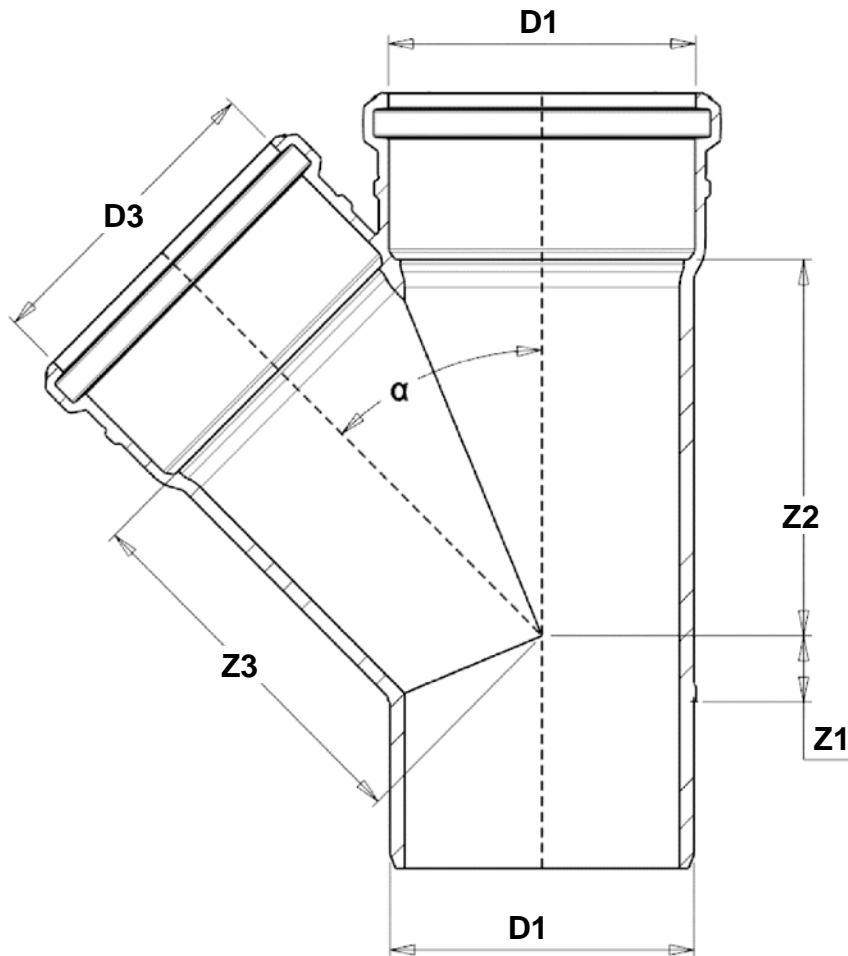
Annex contents  
Bends

4



DN	D1
90	90
100	110

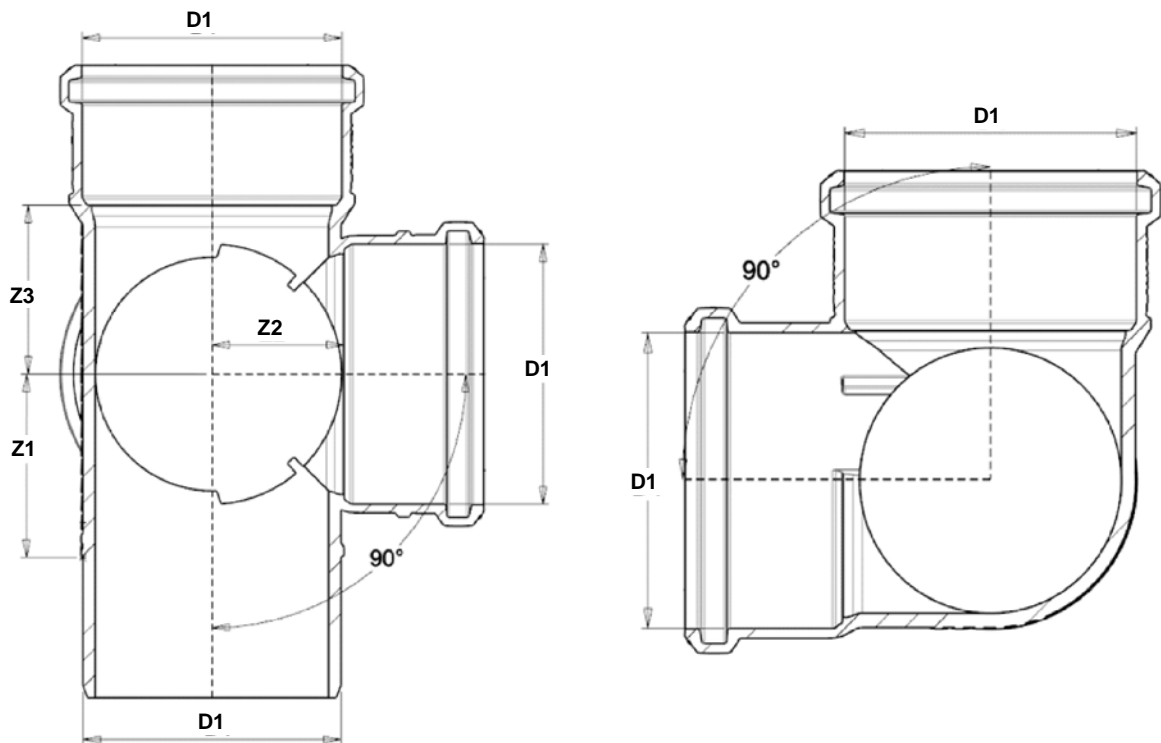
Subject of approval	Wavin AS+	Annex  5
Annex contents	Extended 45° bends	



$\alpha$	DN	D1	D3	Z1	Z2	Z3
45°	50-50	50	50	12.8	62.5	62.5
	70-50	75	50	-1.3	75.6	79.6
	70-70	75	75	17.4	93.3	93.3
	90-50	90	50	-10.8	85.0	92.5
	90-70	90	75	9.4	99.7	103.9
	90-90	90	90	21.2	111.3	111.3
	100-50	110	50	-16.7	94.5	103.0
	100-70	110	75	0.1	111.2	118.0
	100-90	110	90	9.3	120.8	125.5
	100-100	110	110	23.8	134.9	134.9
	125-100	125	110	18.3	146.5	149.5
	125-125	125	125	28.3	155.5	155.5
	150-100	160	110	0.3	161.7	172.3
	150-125	160	125	10.9	172.8	181.3
	150-150	160	160	37.0	195.6	196.6
	200-200	200	200	41.6	246.3	264.3

$\alpha$	DN	D1	D3	Z1	Z2	Z2
87°	50-50	50	50	27.2	26.9	26.9
	70-50	75	50	25.9	28.6	40.4
	70-70	75	75	39.0	39.6	39.6
	90-50	90	50	27.1	29.5	48.4
	90-70	90	75	37.6	42.0	46.7
	100-50	110	50	28.2	31.0	56.9
	100-70	110	75	37.7	43.0	57.2
	100-90	110	90	45.4	52.0	57.5
	125-100	125	110	54.8	59.9	66.5
	150-100	160	110	53.4	60.8	84.1

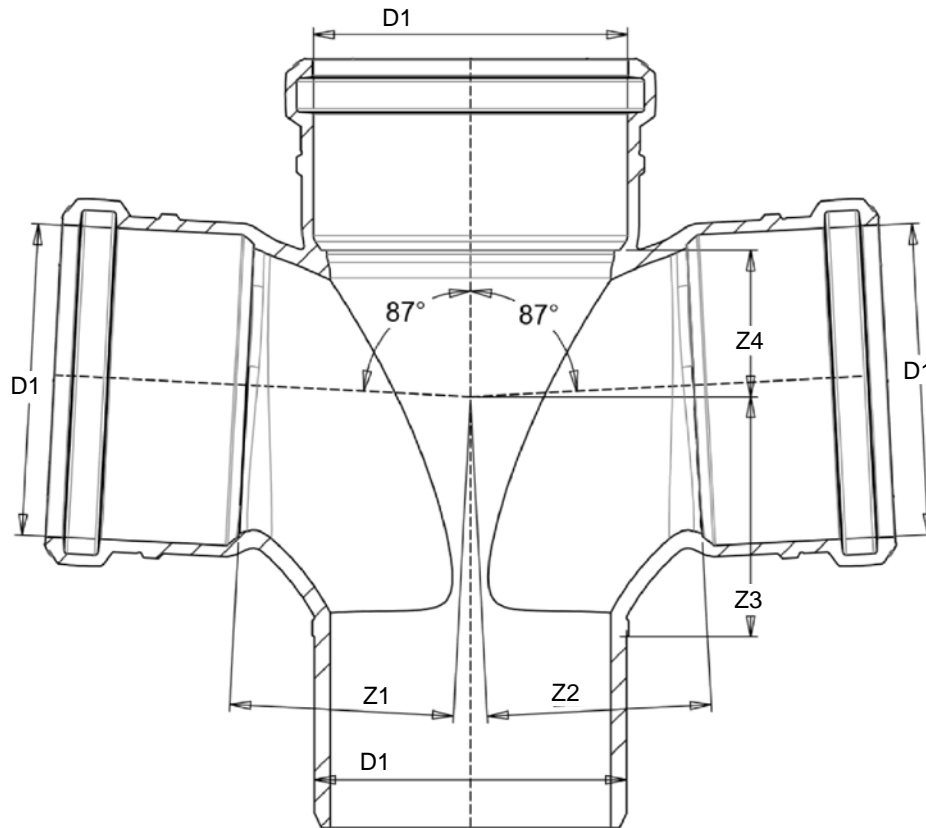
Subject of approval	Wavin AS+	Annex  6
Annex contents	Branches	



DN	D1	Z1	Z2	Z3
90-90-90	90	54.9	45.30	67.7
100-100-100	110	78.2	56.3	71.9

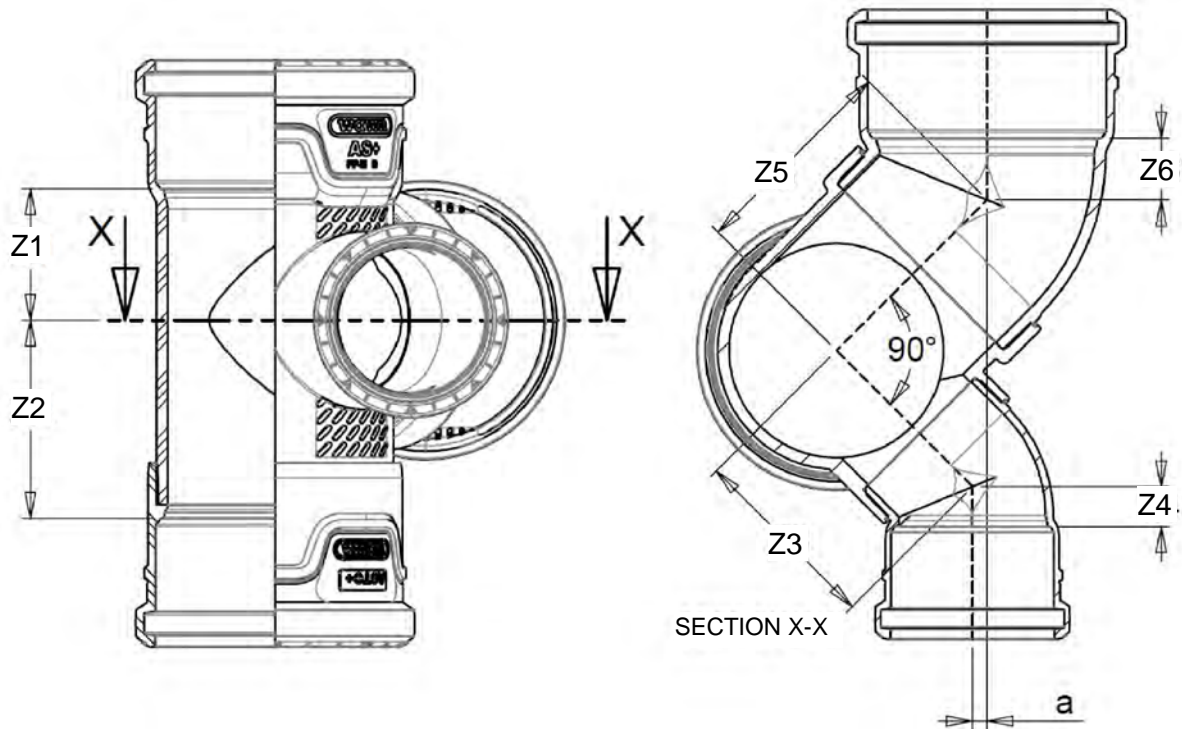
Subject of approval	Wavin AS+	Annex  7
Annex contents	Double socket 90° branches	





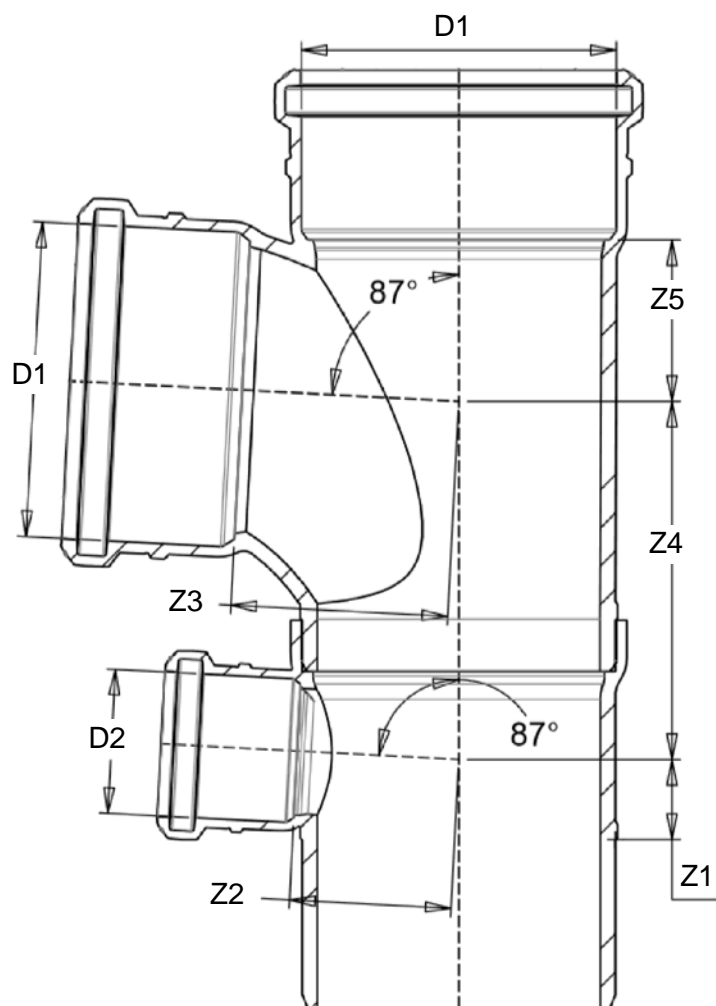
DN	D1	Z1	Z2	Z3	Z4
90-90	90	64.8	(-)	68.4	44.4
100-100	110	76.3	(-)	76.9	56.9
90-90-90	90	64.8	64.8	68.4	44.4
100-100-100	110	77.3	77.3	79.6	56.9

Subject of approval	Wavin AS+	Annex  8
Annex contents	Double branches	



DN	D1	D2	a	Z1	Z2	Z3	Z4	Z5	Z6
100-70	110	75	6.7	61.0	92.0	89.4	18.6	98.9	28.7

Subject of approval	Wavin AS+	Annex  9
Annex contents	Combination branch	



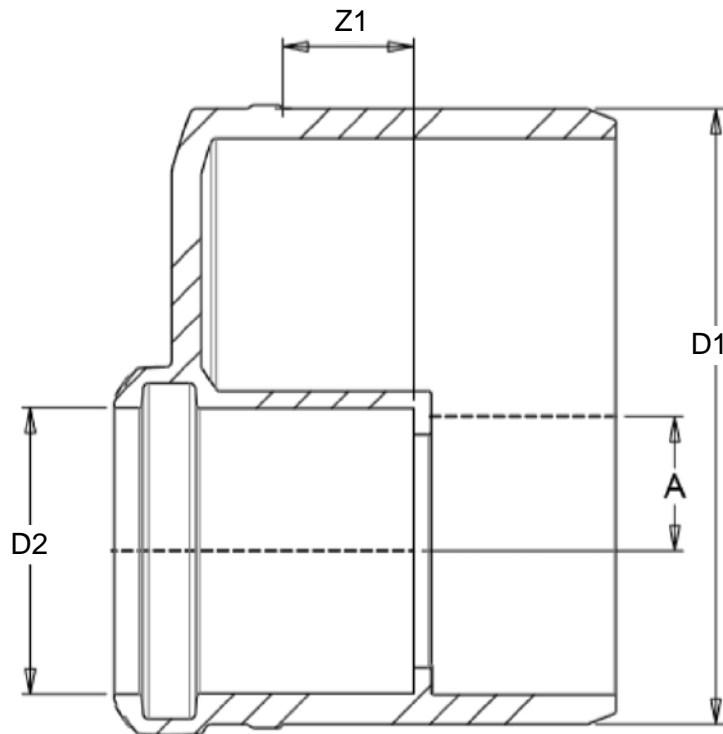
DN	D1	D2	Z1	Z2	Z3	Z4	Z5
100-100-50	110	50	28.2	56.9	76.3	126.0	56.9
90-90-50	90	50	27.0	48.4	64.8	114.0	44.4

Subject of approval Wavin AS+

Annex

Annex contents  
Shower double branch

10



DN	D1	D2	Z1	a
70-50	75	50	20.9	8.7
90-50	90	50	17.7	14.7
90-70	90	75	23.0	2.6
100-50	110	50	23.4	24.1
100-70	110	75	26.3	11.6
100-90	110	90	29.5	4.3
125-100	125	110	24.3	1.9
150-100	160	110	17.1	19.1
150-125	160	125	20.9	11.6
200-150	200	160	36.2	13.3

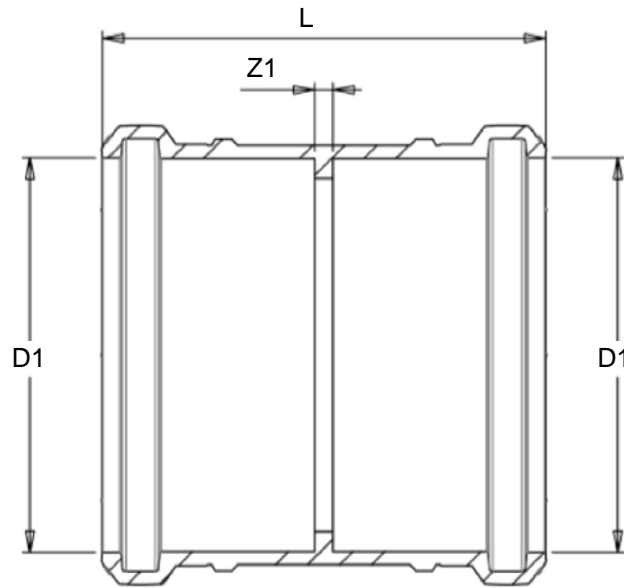
Subject of approval Wavin AS+

Annex

Annex contents

Reducers

11



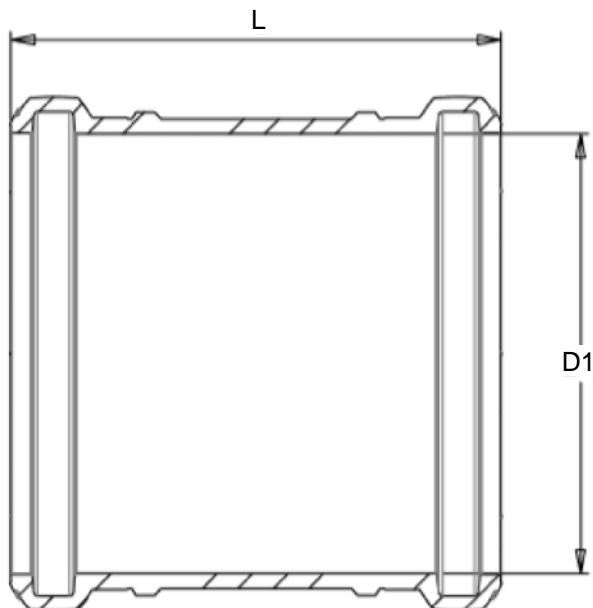
DN	D1	L	Z1
50	50	99.0	3.0
70	75	107.6	3.0
90	90	114.7	3.3
100	110	124.4	5.0
125	125	132.0	5.0
150	160	148.3	5.5
200	200	181.3	8.4

Subject of approval Wavin AS+

Annex

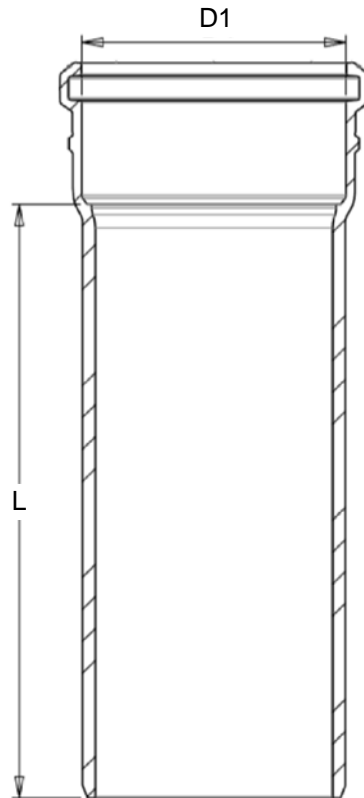
Annex contents  
Double socket

12



DN	D1	L
50	50	99.0
70	75	107.6
90	90	114.7
100	110	124.4
125	125	132.0
150	160	148.3
200	200	181.3

Subject of approval	Wavin AS+	Annex  13
Annex contents	Slip-on socket	



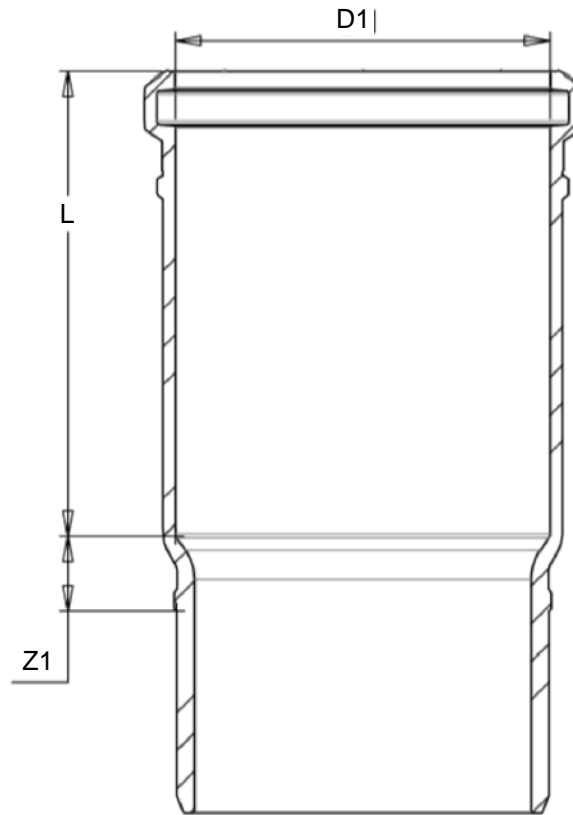
DN	D1	L
50	50	150
70	75	
90	90	
100	110	
125	125	
150	160	
200	200	
50	50	250
70	75	
90	90	
100	110	
125	125	
150	160	
200	200	

Subject of approval Wavin AS+

Annex

Annex contents  
 Special fitting lengths

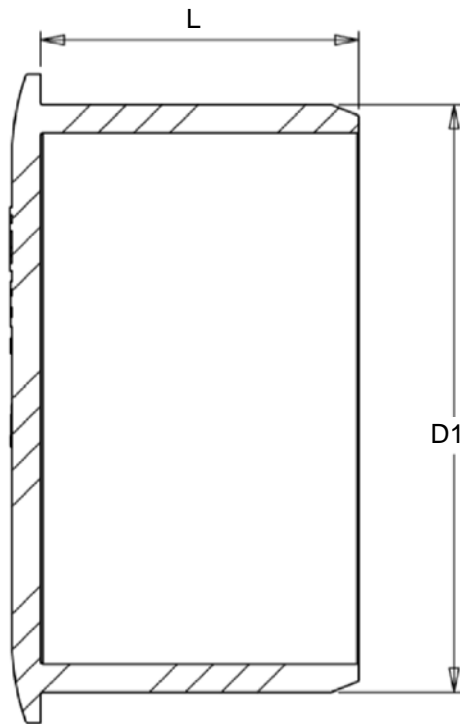
14



DN	D1	Z1	L
50	50	17	105.9
70	75	17.4	116.1
90	90	20.1	110.7
100	110	22.1	121.5
125	125	24.4	133.2
150	160	27.7	147

Subject of approval	Wavin AS+	Annex  15
Annex contents	Extended socket	





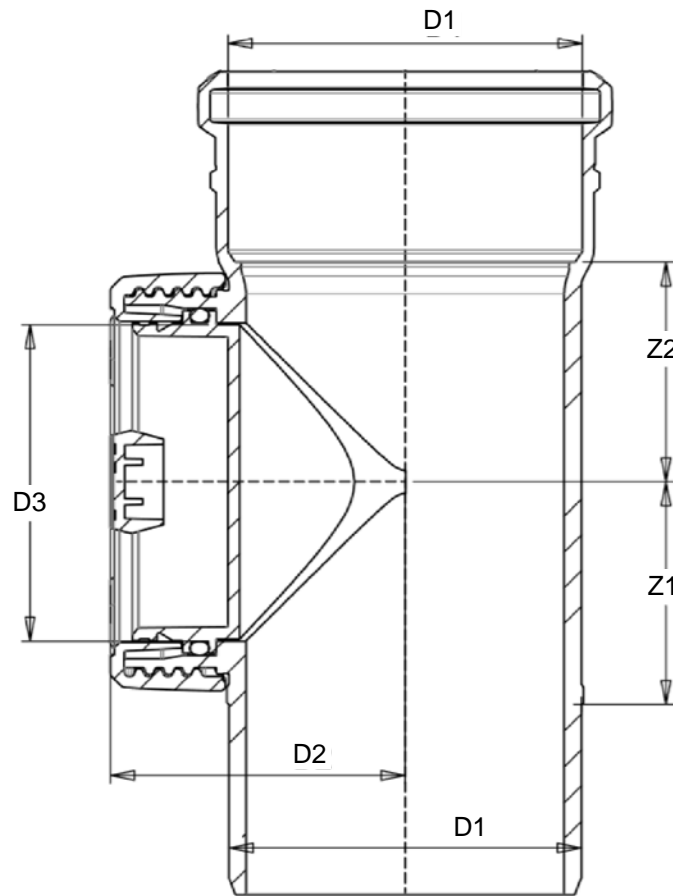
DN	D1	L
50	50	48.0
70	75	52.3
90	90	55.5
100	110	59.7
125	125	63.5
150	160	71.2
200	200	80.0

Subject of approval Wavin AS+

Annex

Annex contents  
 Socket end cap

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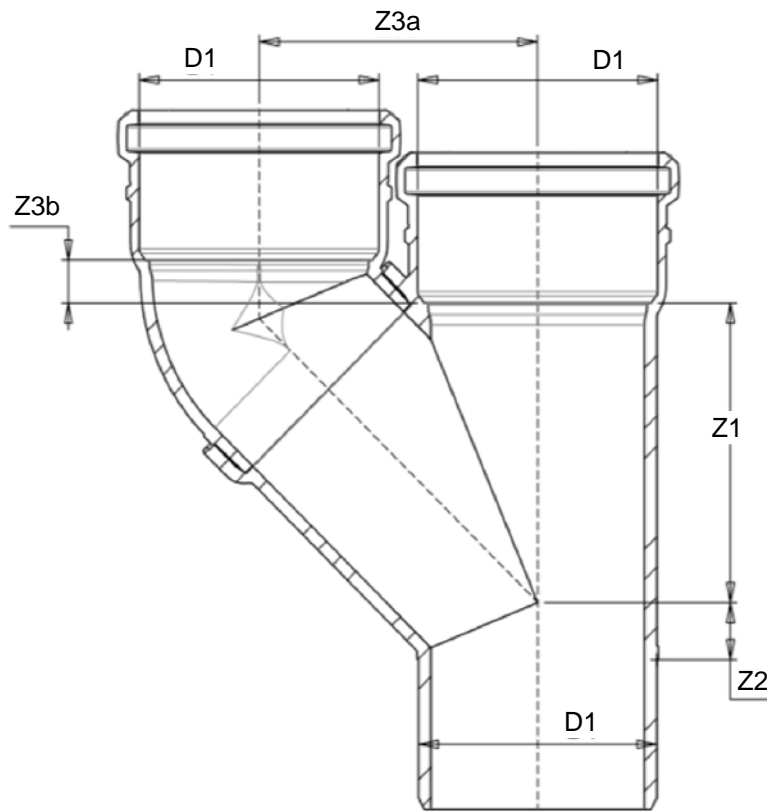
DN	D1	D2	D3	Z1	Z2
50	50	51	40.6	34.3	40.6
70	75	66.6	64.8	44.8	50.5
90	90	78.4	80.8	58.8	58
100	110	91.6	99.8	69.7	69
125	125	100.6	99.8	63.8	67.5
150	160	122.2	99.8	64.2	64.3

Subject of approval Wavin AS+

Annex

Annex contents  
 Cleaning pipe

17



DN	D1	Z1	Z2	Z3a	Z3b
100-100-50	110	136.9	25.9	130.0	21.8
90-90-50	90	111.3	21.3	105.5	21.7

Subject of approval Wavin AS+

Annex

Annex contents

Parallel branch

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