krah-pipes.ee

KRAH PIPES

Applications

PE pressure pipes

Large polyethylene pipes

Krah pipes for pressure application

Krah-Pipes are large polyolefin pipes up to an internal diameter of 4000mm and a maximum solid wall thickness of 200mm. The preferred jointing technology is the butt-fusion technology, however for low pressure rates the integrated electro fusion technology is also acceptable. Nearly any internal and external diameter within the upper mentioned range can be produced, using the Krah-Spiral-Cross-Winding-Extrusion-Pro-cess.

Thanks to the unique pipe production machine developed by Krah, even the biggest pipe diameters can be produced on very little space (30m x 30m). Therefore a most efficient use of this production machine on site is possible.

Production process

Krah-Pipes are produced according to the Krah-Spiral-Cross-Winding-Extrusion-Process. During the production process the pipe is produced seamless and all sub-processes are continuously controlled by the integrated CPV and control visualizing software.

The first layer is produced on a heated calibration mandrel, the next layers are produced cross-over accordingly on top of the previous layers. The previous layers are heated by an IR-Heating system to provide a surface temperature between 170°C and 200°C.

With the help of the co-extruder the inner surface can be produced with an inspection friendly, coloured polyolefin material. The orientation of the molecules is in radial direction, which has a positive effect on the internal pressure. Another important quality advantage is, that due to the slow cooling down process no frozen stresses will occur in the pipe wall.

Material

The base material, high density polyethylene (PE80, with a minimum MRS of 8.0 N/mm² or PE100, with a minimum MRS of 10.0 N/mm²), is normally stabilized by the addition of carbon black. On special request and for special applications other polyolefin can be used, like for example polypropylene grades.

Pipe ends

The pipe ends are cut in-line, in 90° angle to the pipe axis.

Should Electro fusion joints or stubends be produced, the pipe ends are produced accordingly with socket and spigot.

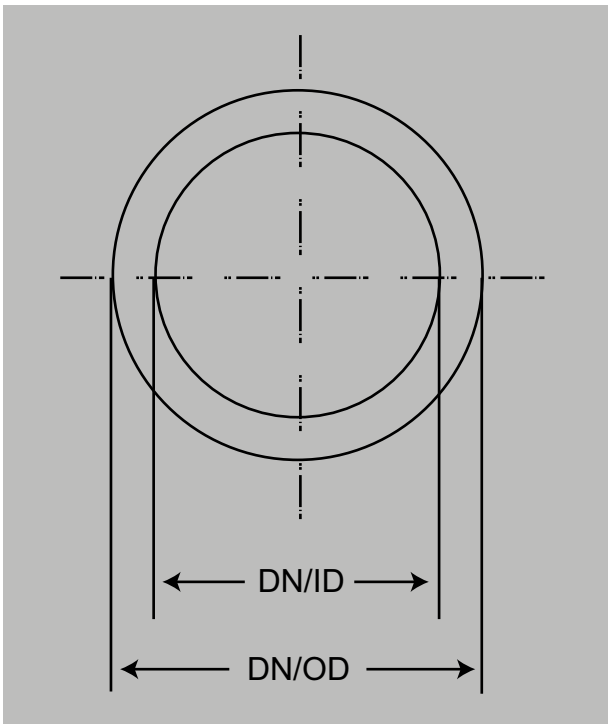
Surfaces

The internal and external pipe surface is smooth. Slight corrugation (especially on the outer surface), which necessarily involves variations in the wall thickness, is ac ceptable providing that the thickness of the pipe wall is at no point less than its given nominal value.

The inner surface can be produced of electro conductive or inspection-friendly coloured material.

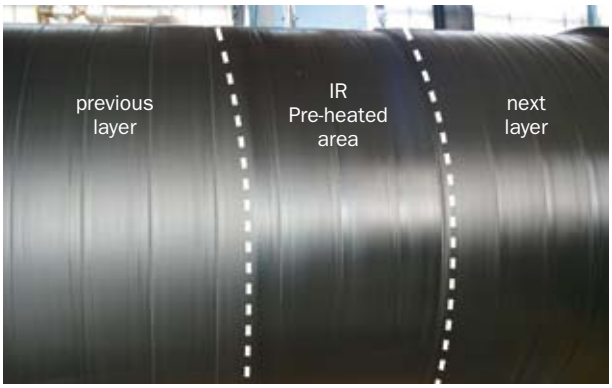
Dimensions

All dimensions are related to the reference temperature of +23/-2°C.



Sketch of a pipe

Overview of the production process



Production of the “next” layer

In-line cutting-unit

Nominal diameters

The nominal diameter (DN) is related to the internal diameter (ID) regardless of the pressure rate. The hydraulic radius is the same for each nominal diameter.

Krah-Pipe DN/OD 1800mm SDR9

Large polyethylene pipes

DN/ID	DN/OD range
300 mm	310 - 460 mm
400 mm	410 – 560 mm
500 mm	510 – 660 mm
600 mm	610 – 760 mm
800 mm	810 – 960 mm
1000 mm	1010 – 1160 mm
1200 mm	1210 – 1360 mm
1400 mm	1410 – 1560 mm
1600 mm	1610 – 1760 mm
1800 mm	1810 – 1960 mm
2000 mm	2010 – 2160 mm
2200 mm	2210 – 2360 mm
2400 mm	2410 – 2560 mm
3000 mm	3010 – 3160 mm

Standard nominal diameter, other dimensions on request

Higher wallthicknesses (s > 80 mm) can be realised in several production steps.

Tolerances for diameters	
DN/ID ≤ 700 mm	+ 3.0 mm
800 mm < DN/ID ≤ 1000 mm	+ 5.0 mm
DN/ID > 1000	+ 6.0 mm
DN/ID > 1600	+ 8.0 mm

Other dimensions on request

Wall thickness

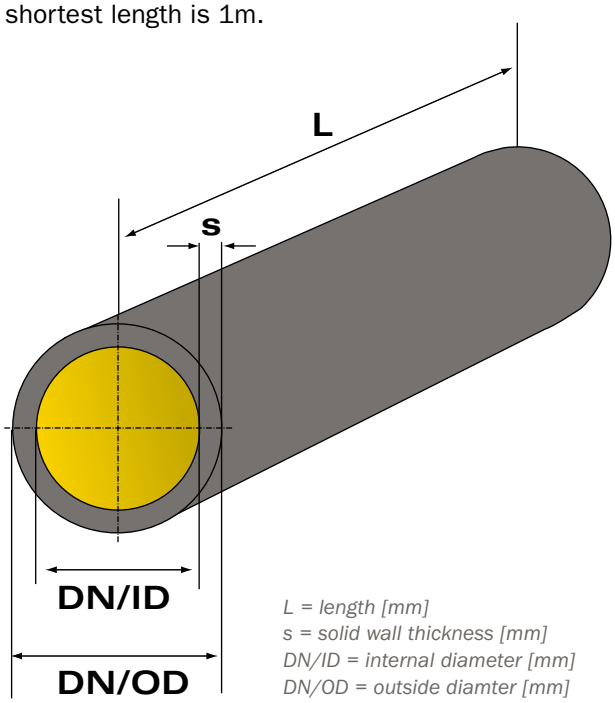
The wall thickness (s) is half of the difference between the internal diameter and the external diameter.

$$s = \frac{DN/OD - DN/ID}{2} \quad [mm]$$

The pipes shall be free of blisters, shrink holes and inhomogenities which might impair their performance in service.

Pipe length

The standard pipe length is 6m (+/- 10mm). If required, shorter pipe lengths are possible. The shortest length is 1m.



L = length [mm]
s = solid wall thickness [mm]
DN/ID = internal diameter [mm]
DN/OD = outside diamter [mm]

Pipe length

The Standard Dimesion Ratio is the difference between the external diameter DN/ OD and the wall thickness (s).

For DN/OD pipes :

$$SDR = \frac{DN / OD}{s}$$

For DN/OD pipes :

$$SDR = \frac{DN / ID + 2s}{s}$$

Pipe marking

Generally the pipes have to be marked according to DIN 8074 No.8. The minimum marking should indicate:

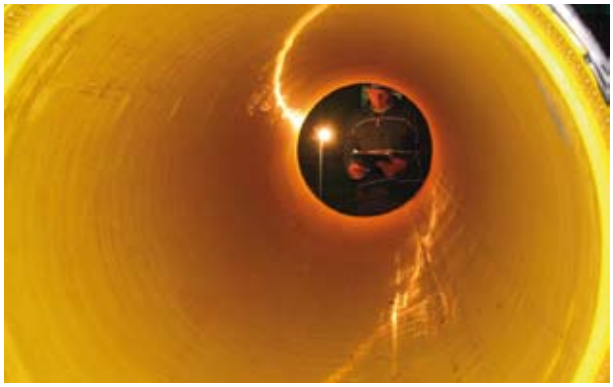
- Manufacturer Code, e.g. KRAH
- If available, third-party control marks
- Material Code, e.g. PE100
- DIN-Number, e.g. DIN16961
- External diameter, e.g. DN/OD 1200 or internal diameter, e.g. DN/ID 1200
- Wall thickness, e.g. 30 mm
- Melt Flow Rate, e.g. MFR005
- Standard Dimension Ratio, e.g. SDR11
- Date of Manufacturing, e.g. 20030824
- Machine No., e.g. no. 7/KR600

The marking should be clear and should be placed outside of the pipe in radial direction, at least once per 1 m pipe length.

Low pressure and high stiffness

In some applications wall thickness for low pressure is not stiff enough to be buried. Usually pipes with thicker solid wall have to be empolyed. Krah technology proposes another solution - a PR profile can be added to the pipe wall. This keeps the low pressure pipe properties and adds more stiffness that makes it possible to install the low pressure pipe underground.

Acc. to DIN 8074, the following hoop stress formula is used:



Inspection friendly inside surface

Butt-fusion of a Krah-Pipe DN/OD 1600mm SDR17

Electro fusion socket

Different co-extruded inside color: yellow, blue and electro conductive

Large polyethylene pipes

$$\sigma_h = \frac{p\,(d_s - s_{min})}{2s_{min}}$$

with:

s_{min} = minimum wall thickness [mm]
d_s = minimum outside diameter [mm]
σ_h = hoop stress [MPA]
p = pressure [MPA]

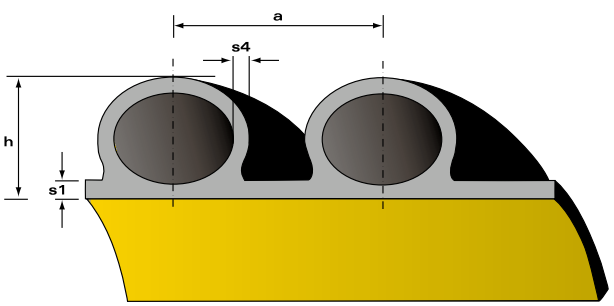
The hoop stress is related to the MRS value of the used material. The safety factor c is usually 1,25 for water applications. In DIN 16961 (Thermoplastics pipes and fittings with profiled outer and smooth inner surface) the same basic formulae can be used and rewritten as:

$$\sigma_h = \frac{p\,(d_s - s_{min})}{2s_{min}} = \frac{p\,(d_i + 2s_{min} - s_{min})}{2s_{min}} = \frac{p\,(d_i + s_{min})}{2s_{min}}$$

with:

d_s = di + 2 smin [mm]
d_i = internal diameter [mm]
s_{min} = minimum solid wall thickness (waterway) [mm]

According to the Krah Production Technology pipes can be produced with a structured / profiled wall (Type PR).



Sketch of a PR profile

The s_{min} in above mentioned formula is for type PR the minimum thickness (s_1) smooth / solid inner surface (waterway wall thickness, between the profiles).

Jointing

For the jointing of the pipes the Butt-Fusion technology according to DVS 2207 is recommended.

However for low pressure applications the integrated electro fusion joint can be used. Also the flange connection, where the stub ends are integrated in the pipes, is applicable.

Quality control

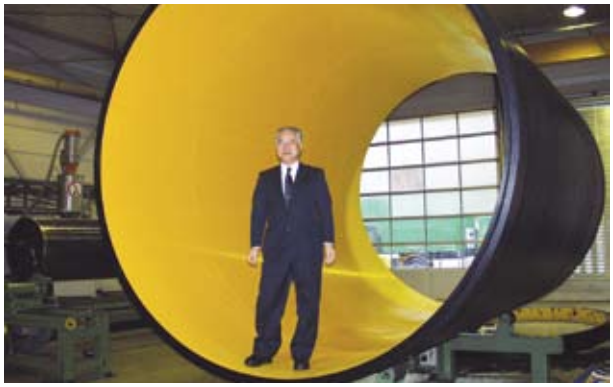
The quality control requirements and tests are according to DIN 8075, or other international standards. Individual requirements specified in this standard may be omitted or supplemented in technical delivery conditions relating to particular applications.

Fittings

All kinds of fittings can be manufactured out of pipe segments. The preferred jointing procedure is butt welding.

Relevant standards

DIN 323:	Preferred numbers and series of preferred numbers; basic values, calculated values, rounded values
DIN 8074:	Polyethylene (PE) pipes PE63, PE80, PE100, PE-HD
DIN 8075:	(at present at the stage of draft) High-density polyethylen (HDPE) pipes; dimensions
DIN 50011:	Testing of materials, components and equipment; ovens; concepts, requirements
DIN 16776:	Plastic moulding materials; polyethylene (PE) moulding materials; classification and designation
DIN 50049:	Materials testing certificates
DIN 53759:	Testing of plastic articles; longterm internal pressure testing of hollow bodies
ISO 161:	Thermoplastics pipe for the transport of fluids – Nominal outside diameters and nominal pressures
ISO 4065:	Thermoplastics pipes – Universal all thickness table
DIN 16961:	Thermoplastics pipes and fittings with profiled outer and smooth inner surfaces
EN 13476:	Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly (vinyl chloride) (PVC-U). polypropylene (PP) and polyethylene (PE)
SR04B023:	Krah-Pipes in relation to internal pressure



Large solid wall pipe

Outfall pipeline DN/ID 1800mm

Complicated bend

Heavy wall pipes DN/ID 500mm, s = 140mm

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