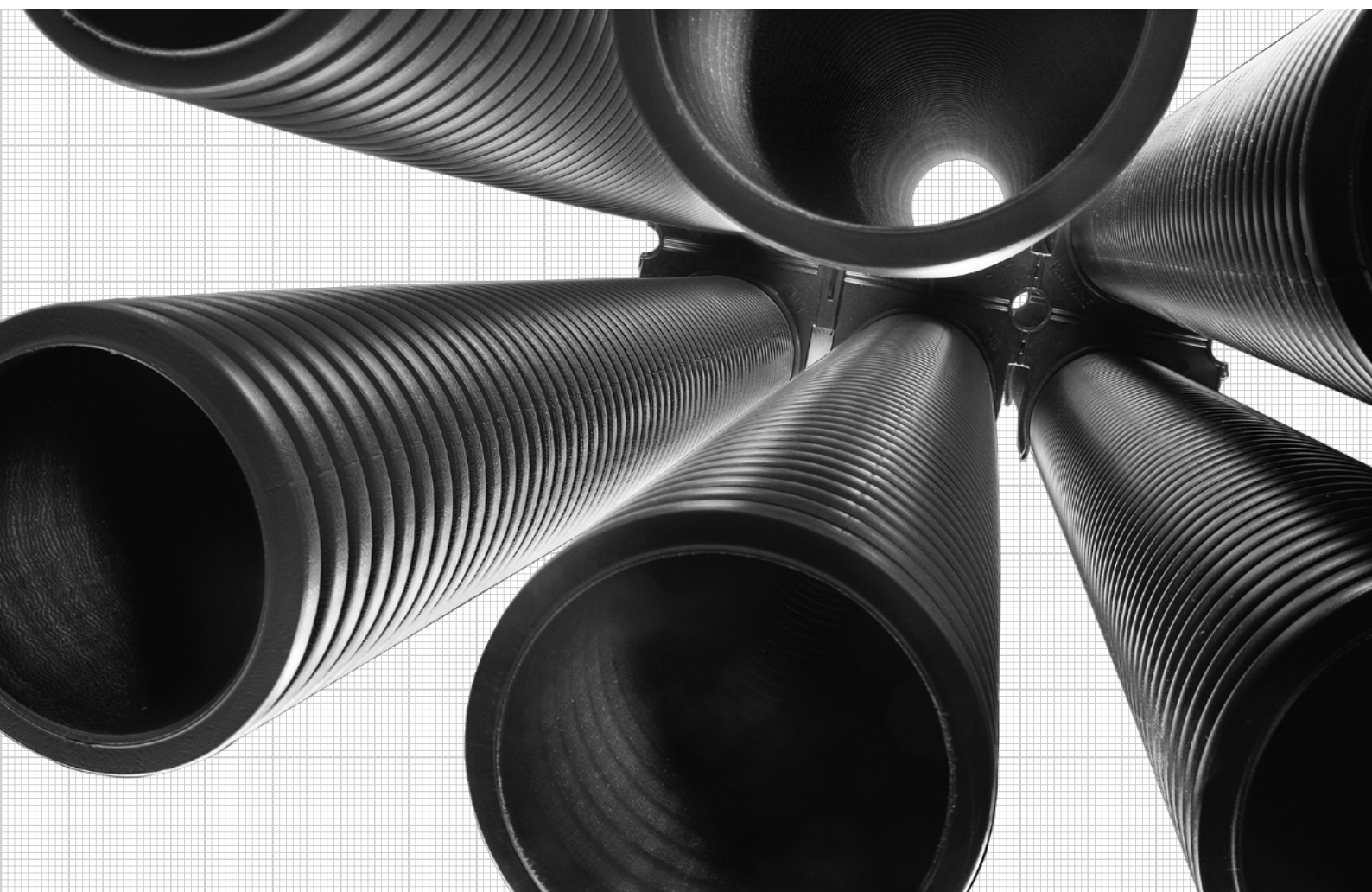


Installation manual

Kabuflex®



Cable conduits



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NB

Instructions for proper installation of Kabuflex PE cable conduits in structured-wall design in accordance with DIN EN 50626-1

General information on using our products and systems:

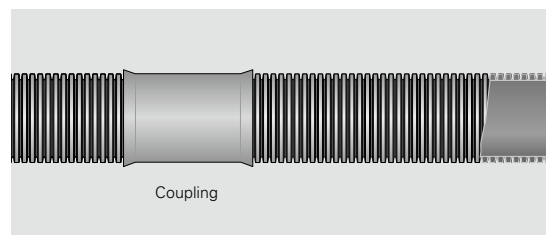
Information about or assessments of the use and installation of our products and systems is exclusively provided on the basis of the information submitted. We do not assume any liability for damage caused by incomplete information. If the actual situation deviates from the planned situation or if a new situation occurs or if different or new installation techniques are applied, these must be agreed upon with FRÄNKISCHE, since these situations or techniques may lead to different conclusions. Notwithstanding the above, the customer is solely responsible for verifying the suitability of our products and systems for the intended purpose. In addition, we do not assume any liability or responsibility for system characteristics and system functionalities when third-party products or accessories are used in combination with FRÄNKISCHE systems. We only assume liability if original FRÄNKISCHE products are used. For use in other countries than Germany, country-specific standards and regulations must also be observed.

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Preliminary remarks

The applicable standards and regulations such as DIN EN 1610, ZTV A-StB 97, DWA-A 139 and, in extracts, A 535 by the KRV and the additional provisions of utility companies must be observed.

The FGSV road and transportation research association (*Forschungsgesellschaft für Straßen- und Verkehrswesen*) specifications for the backfilling of conduit trenches must be additionally observed in the area of pavement.



1 Transport and storage of conduit components

Avoid dropping, dumping as well as hitting the palettes, conduits and accessories hard against each other!

In addition, DIN EN 1610 applies. Check the conduit components for defects before installation. Store on even ground!

Do not stack loose conduits more than 1.5 m high. You may stack packeted conduit palettes on top of each other (do not stack more than 2 palettes on top of each other). Store coiled conduits horizontally.

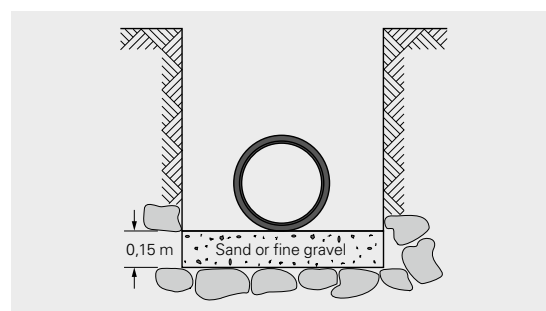


2 Conduit trench and bearing

The provisions of DIN 18300 "Earthworks" (*Erdarbeiten*), DIN 18303 "Timbering to trenchwork" (*Verbauarbeiten*), DIN 4124 "Excavations and trenches" (*Baugruben und Gräben*) and DIN EN 1610 apply.

NB

The bedding and embedding of conduits (stoneless, compactable soil!) are of decisive importance for possible conduit deflection! Execute carefully according to DIN EN 1610, ATV-DVWK-A 139 and KRV A 535!



In case of rocky, consolidated or stony ground: 0.15 m of stoneless cover (sand, fine gravel) required as lower bedding (see DIN EN 1610 and KRV A 535)

3 Straight or consistently bent installation

Place the conduits in a straight line on the conduit bedding avoiding meandering and secure them at the sides. Meandering installations significantly reduce later possible insertion lengths. Furthermore, make sure you excavate a head hole for the couplings in order to ensure an even bearing.

4 Backfilling and compacting

Fill up to 30 cm of the stoneless, compactable soil (20 mm maximum grain size) in layers on both sides of the conduit. Compact the cover right above the conduit by hand. Mechanically compact the main backfilling right above the conduit only after adding a layer with a minimum thickness of 30 cm above the conduit crown.

The total thickness of the layer right above the conduit required before mechanical compacting depends on the type of compaction equipment.

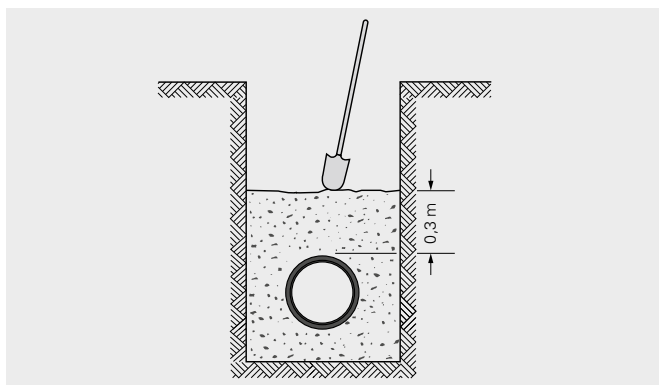
Do not shift conduits sideways during embedding.

If required, secure the conduit heights during embedding.

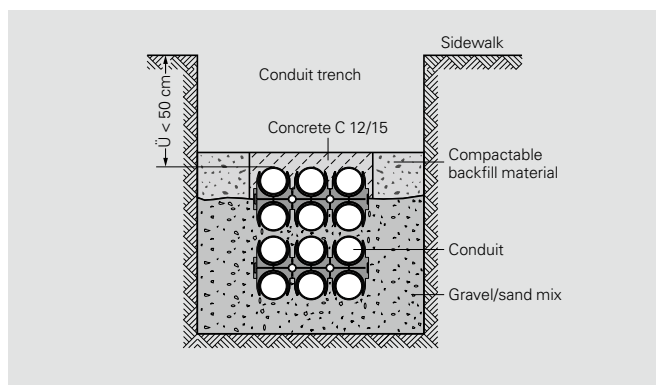
In case of multiple layer installations in the conduit trench, embed every conduit layer individually (backfilling and compacting); only then can you place the next layer! Afterwards, backfill and compact as described above. Arrange for measures of load separation (e.g. embedding in concrete) in traffic areas with less than the minimum cover of 50 cm, e.g. backfilling the conduit trench with a mixture of sand and cement (see FGSV specifications for the backfilling of pipe trenches). When embedding in concrete, make sure that conduit connections are watertight (with profile sealing rings, mounted onto the second corrugation trough) and secure against uplift! Select securing equipment which does not damage the conduits. Set mounting spans in a way which avoids inadmissible deflection (spans approx. 1.5 m). Give preference to the use of straight length conduits when embedding in concrete to achieve a correct axial alignment of the conduits.

NB

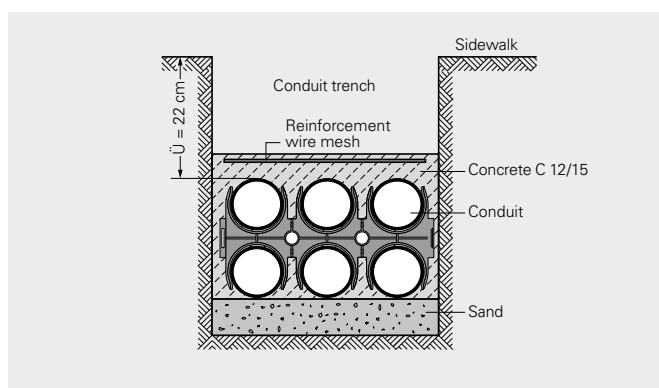
Kabuflex is not suited for installations in tunnel vaults. Seek advice from FRÄNKISCHE regarding the suitability of Kabuflex for special applications.



Backfill and compact conduit up to 30 cm above the conduit crown by hand with stoneless, compactable soil.



Conduit layer installed in concrete with minimum cover (example see also KRV A 515/A 535).



Protection of the conduit layer against deflection and mechanical damage when going below the minimum cover (example see also KRV A 515).

5 Installation manual for all Kabuflex® conduits

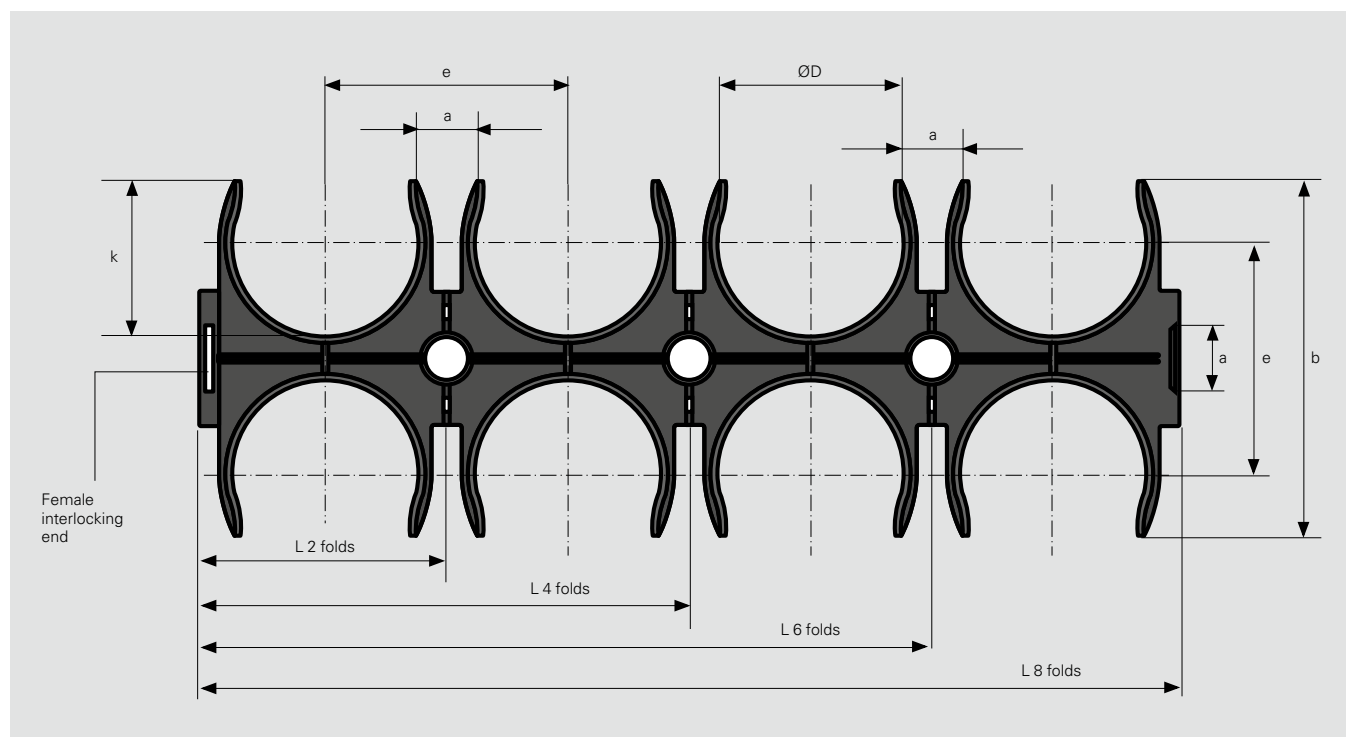
Spacer

Install spacers to secure conduits in multiple layer installations in the conduit trench.
Allow for spacing according to the local installation conditions.

DN	75 [mm]	110 [mm]	120 / 125 [mm]	160 [mm]	200 [mm]
D	75	110	120	160	200
L 2-folds	105	142	175	225	288
L 4-folds	208	284	336	445	556
L 6-folds	305	426	497	665	842
L 8-folds	408	568	658	885	1135
a	25	30	38	60	80
b	125	190	210	313	345
Thickness	12	15	20	33	30
e	100	140	158	220	280
k	50	80	88	126	132,5

Recommendation

1.5 m max. spacing, for Kabuflex R additionally shorter spacing!



Die tatsächliche Ausführung muss nicht der bildlichen Darstellung entsprechen. Tatsächliche Abmessungen können im Rahmen von Fertigungstoleranzen abweichen.

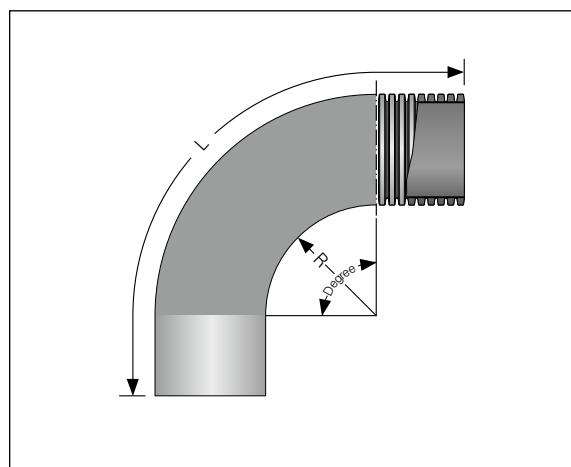
6 Change of direction in the conduit route

Avoid small bend radii theoretically possible with Kabuflex R as not to impede or prevent inserting wires and cables. The finished 45°/90° bends for Kabuflex S straight lengths serve as orientation for smallest possible installation radii (see table).

45° and 90° conduit bends

DN		R [m]
75	45°	0,75
	90°	0,75
90	45°	0,75
	90°	0,75
110	45°	0,90
	90°	0,90
120	45°	0,90
	90°	0,90
125	45°	1,00
	90°	1,00
145	45°	1,00
	90°	1,00
160	45°	1,00
	90°	1,00
175	45°	1,00
	90°	1,00

Dimensions and bending radii Kabuflex



Nominal diameter and radius R of the conduit bend (inside of bend)

Kabuflex® dimensions and bend radii

Kabuflex S – rigid cable conduit		D _o [mm] ¹⁾	D _i [mm] ¹⁾	R _{min} [m]
Kabuflex S	DN 75	76	62	2,0 ²⁾
	DN 110	111	93	2,8 ²⁾
	DN 120	118	99	3,0 ²⁾
	DN 125	126	107	3,2 ²⁾
	DN 145	146	125	3,6 ²⁾
	DN 160	161	138	4,0 ²⁾
	DN 175	174	148	4,5 ²⁾

Kabuflex R – pliable cable conduit		D _o [mm] ¹⁾	D _i [mm] ¹⁾	R _{min} [m]
Kabuflex R	DN 40	40	32	0,35 ²⁾
	DN 50	50	40	0,35 ²⁾
	DN 63	64	52	0,35 ²⁾
	DN 75	76	62	0,35 ²⁾
	DN 90	91	75	0,35 ²⁾
	DN 110	111	93	0,50 ²⁾
	DN 120	118	99	0,50 ²⁾
	DN 125	126	107	0,50 ²⁾
	DN 160	161	138	0,75 ²⁾
	DN 200	201	172	0,80 ²⁾

¹⁾ Production-related dimensional tolerances

²⁾ Minimum bend radius applies to an ambient temperature of 20 °C. In lower temperatures, we recommend that the minimum bend radii be increased as follows (by a factor of ≥ 1.5 x at approx. 10 °C, by a factor of ≥ 2 x at approx. 0 °C).

NB

Irrespective of that: include the installation of a cable chute after narrow curves!

7 Feed cord and insertion of wires and cables, insertion lengths

Kabuflex® R feed cord

The feed cord included with Kabuflex R is used to insert the cable feed wire/cord, **not** for inserting cables! The feed cord has a tensile strength of approx. 30 kg.

Inaccurate positioning and curves in the conduit route increase required insertion force and limit the possible insertion length with the feed cord.

Always release the cord ends attached to the conduit before installing conduits. Do not install conduit ends and couplings while the cord ends are still attached.

If you do not need the feed cord, remove it from the conduit before installation! If you need the feed cord for inserting the cable feed cord, knot the cord ends together.

Before uncoiling the conduit, remove the cord fastening and open the ball at the conduit end with the long excess cord (ball) only and tie the cord end to the conduit outside profile. Then, uncoil the conduit. Then, unroll the conduit.

Inserting Kabuflex® S and Kabuflex® R

The following factors determine possible insertion lengths:

- Cable (type/weight/flexibility)
- Course of the conduit
(height profile, number/position/curve radii/inaccuracies)
- Friction coefficient and admissible tensile forces (cable/conduit wall)
- Lubricant (type/amount)
- Insertion method and speed (also surface temperature)
- Ratio of inside conduit diameter to cable diameter
- Installation quality (bedding/compacting of the embedding material = influences conduit deflection, backfilling/compacting of embedding around conduit bends/curves = important also to absorb mechanical stress when inserting wires and cables)

Observe careful installation and narrow distances of spacers (insertion forces) in particular with Kabuflex R! You can achieve greater insertion lengths under specified conditions using Kabuflex S straight length conduits.

Due to a number of factors which cannot be determined exactly, the manufacturer cannot issue a definite statement regarding maximum insertion lengths. Always use a sufficient amount of appropriate lubricant!

8 Cutting the Kabuflex® conduit

If necessary, cut to length with a fine-toothed saw or another appropriate tool; cuts in corrugation troughs must be at right angles!

Cutting the corrugation trough at right angles is required for ensuring that the pull-out protection in the coupling snaps in exactly!

Remove edges and irregularities on the cutting surfaces with a grater or another suitable tool.

9 Establishing connections with conduits and fittings

Sandtight design

SD: EN 60529

(IP-Code 54)

Code: 5 = protected from limited dust ingress

4 = protected from water spray from any direction

- Clean dirt off spigot and coupling
- Insert spigot all the way into the coupling

Watertight design

WD: EN 60529

(IP-Code 68)

Code: 6 = protected from total dust ingress

8 = protected from long term immersion up to a specified pressure

- Clean dirt off spigot, coupling inside and sealing ring
- Mount sealing ring onto the spigot (onto the second corrugation trough)
- Apply lubricant to the sealing ring and the coupling
- Insert spigot all the way into the coupling

NB

Please ensure proper and clean installations using sealing rings in case of WD connections. The inspection specifications of DIN EN 1610 apply.

10 Building connections

Use our wall collar for connections to buildings (shafts, etc.)! Include respective protective measures (e.g. target distances according to A 515 A 535 by the KRV) for intersections with external equipment.

External installation	Electrical clearances at intersections and/or the proximity area [m]
High-voltage cables/high voltage systems	0,3
Telecommunication systems	0,3
Gas/water pipes	1,0
Other service pipes	0,3
District heating plants	1,0

Table: Electrical clearances at intersections and/or in the proximity area of external installations (according to A 515 by the KRV)

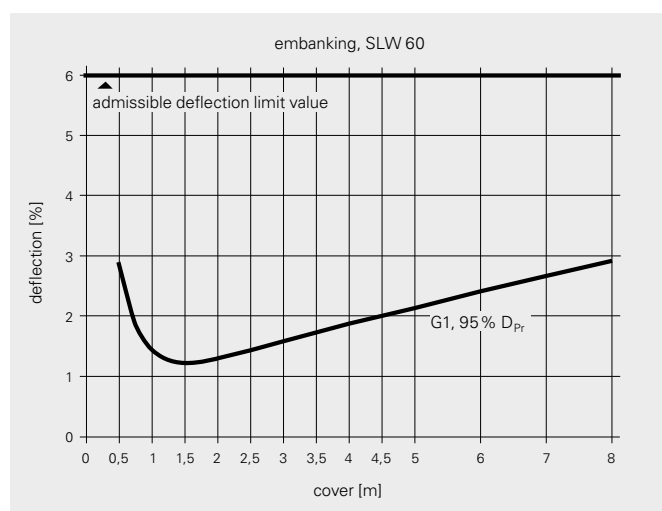
11 Standard stress for PE cable conduits

The below diagram shows the deflection of Kabuflex S DN 110 (individual cable conduit installation) with an increasing cover and takes into consideration the installation conditions next to the chart. For this purpose, a professional installation according to relevant provisions is assumed.

NB

The pipe stress analysis procedure according to ATV-DVWK-A 127 generally applies to individual cable conduits only! For cable conduit bundles, observe the information in our installation manual and A 535 by the KRV!

Diagram of expected pipe deformation



The following installation conditions apply:

- Kabuflex S DN 110
- Individual cable conduit installation
- Embanking
- Soil cover 0.5 – 8.0 m
- HGV 60 traffic loads
- Conduit zone: soils of the category **G1**/non-cohesive soils, 180° bedding angle, loose bedding
- Native soil and backfill **G3** with 95 % D_{pr}

12 Conduit fill and conduit dimensioning for cable occupation

Select conduit fill and/or minimum diameter of the cable conduit depending on the installation conditions, on cable type and diameter (see in particular Chapters 6 and 7):

Conduit type	Conduit fill	Ratio of inside conduit diameter to cable diameter for occupation with 1 cable
Kabuflex S	≤ 35 %	≥ 1,70
Kabuflex R	≤ 25 %	≥ 2,00

Kabuflex R	Kabuflex S	Conduit fill	Constant a
R	S	20 %	2,24
R	S	25 %	2,00
–	S	30 %	1,83
–	S	35 %	1,70

The information on possible applications and installations is provided to the best of our knowledge. Our application department must be consulted when installation situations and installation techniques deviate from our recommended uses. FRÄNKISCHE, however, is not responsible to check the suitability of the product for the intended purpose. Before product use, customers must check the product for suitability. Also observe our general terms of delivery.

NB

Observe the following formula for dimensioning when filling the conduit with several cable strands:

$$d_{Ri} = a \cdot \sqrt{d_1^2 + d_2^2 \dots + d_n^2}$$

d_{Ri} ...Kabuflex conduit inside diameter

d_n ...conduit outside diameter

a ...constant depending on conduit fill



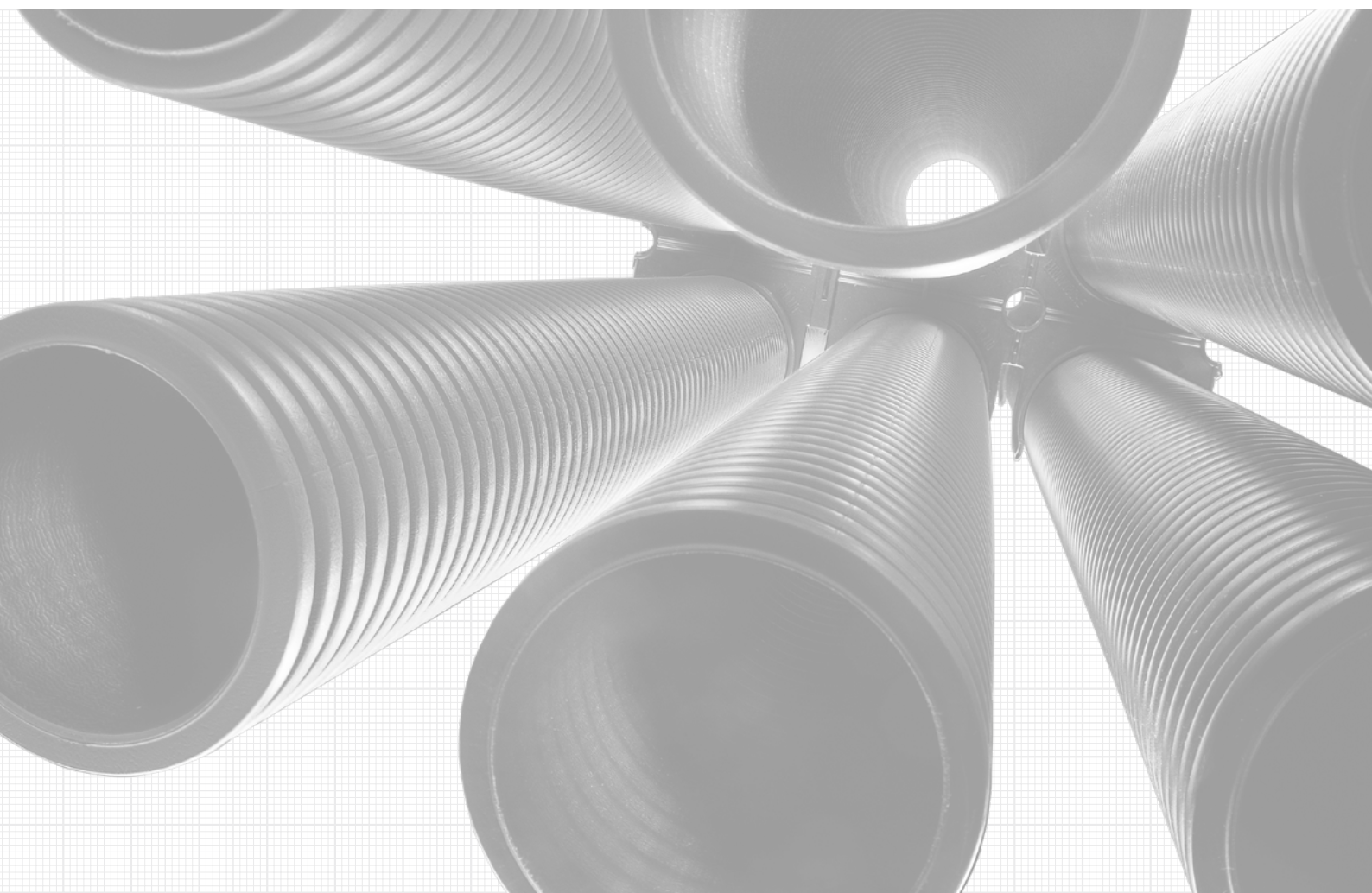
13 Contact and service



www.fraenkische.com/contact-drainage



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