



Use existing pipe systems, realise new fibre optic networks.

# speed•pipe® bundle ground SRV-G and SRV-G tc. Laying instructions.

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## Publisher.

gabo Systemtechnik GmbH  
a Member of HellermannTyton  
Am Schaidweg 7  
94559 Niederwinkling  
GERMANY

Tel. +49 9962 950-200  
Fax +49 9962 950-202  
info@gabocom.com  
www.gabocom.com

Business division gabocom  
Author: Michael Gegenfurtner  
Approval: Markus Karl  
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Use existing pipe systems, realise new fibre optic networks.

# General information at the beginning. speed•pipe® bundle ground SRV-G and SRV-G tc.

Use existing pipe systems for fibre optics with the speed•pipe® bundle ground with flexible coating pipe SRV-G. Realise the new construction of broadband networks with the directly buriable speed•pipe® bundle ground tight covered SRV-G tc.

For the optimum use of existing pipe systems, the speed•pipe® bundle ground SRV-G, in which thick-walled speed•pipe® ground are loosely bundled through a flexible coating pipe, is ideally suited for optimum use of existing pipe systems. The tight covered outer coating pipe of the speed•pipe® bundles ground SRV-G tc bundles various individual pipe dimensions of the directly buriable speed•pipe® ground. The diverse combinations within the pipe bundle enable capacity reserves for the future through the construction of new fibre optic networks.

In chapters 1 – 10, first general notes are given which have to be observed in both cases of application:

1. General notes
2. Laying temperatures
3. Tensile forces
4. Opening of speed•pipe® bundle ground
5. Cutting of speed•pipe® / speed•pipe® bundle ground
6. Bending radius
7. Branch off speed•pipe® bundle ground
8. Connecting speed•pipe® bundle ground
9. gabo and DIN colour code
10. Blowing in micro cables / mini cables

These laying instructions are essential for the construction and assembly work in order to successfully guarantee the functionality of your network.



# 1. First indications.

The speed•pipe® bundle ground and the internal speed•pipe® ground must be protected against contamination and mechanical damage during transport, storage and processing.

Any damage and deformation of the speed•pipe® ground (e. g. ovalisation / crushing etc.) must be avoided and cause a decrease in the blowing distance of the micro cables.

The speed•pipe® ground ends must be protected against the penetration of dirt and water by means of dust covers (protection against dust, dirt and splashing water, not pressure-tight), end plugs ES (pressure-tight up to 0.5 bar) or sealing elements EZA-t (pressure-tight up to 0.5 bar).

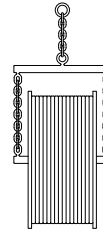
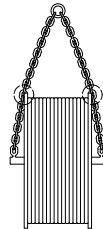
When storing them over a long period of time (several months) the speed•pipe® bundle must be protected against direct solar radiation.

**Note** The laying instructions are significant for the realisation of the construction and installation work.

## 1.1 Transport.

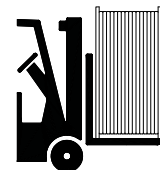
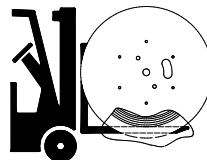
01.

Don't damage the coil by lifting!



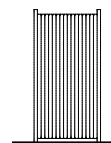
02.

When lifting the coil don't burden the speed•pipe® bundle ground!



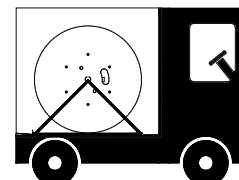
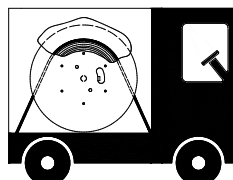
03.

Do not lay down the coil!



04.

During transport never charge the lashing straps at the bundle!



## 1.2. Using appropriate matching shafts for the spools of speed•pipe® bundle.

All spools (wood and steel) have a through bore of 125 mm for receiving tubular steel drum shafts.

The speed•pipe® bundle can hereby raised up with the tubular steel drum shaft or handled in a drum winder.

If no suitable tubular steel drum shaft is available with the correct diameter we recommend to use locating cones or stepped bushes (e. g. company Vetter), for the adaption of various shaft diameters. These ensure a smooth running during unwinding of the speed•pipe® bundle and avoid knocking out / ovalisation or even a defect of the through bore.



Locating cones; company Vetter



Stepped bushes; company Vetter



Example of a drum shaft suspension with a locating cone; company Vetter

## 1.3 Root penetration.

In general a hundred percent protection against root penetration is not possible with the exception of using filling material with less pores. The easiest and well-known way is the compliance to hold a minimum distance between trace and root.

Here is valid: Minimum distance > crest width (of the tree, bush etc.)

## 1.4 Minimum distance to external installation.

In the case of parallel layings and crossings with external installations, appropriate protective measures must be provided in accordance with the table below:

External installation	Parallel laying in m	Crossings in m
Power supply line (particularly high-voltage)	0.3	0.3
Other communication systems	0.1	0.3
Gas / water pipeline	0.8	1.0
District heating plant lines	0.8	1.0

→ Please definitely also note the details about distances of the manufacturer of the external installation!

## 2. Laying temperatures.

The high-quality material PE-HD of the speed•pipe® and the jacket pipe allows the laying at temperatures of 10 °C below zero. However, the optimum conditions are obtained at temperatures between 5 to 20 °C. At temperatures below the freezing point we recommend to store the coils with the SRV-G before laying in heated halls for 12 to 24 hours.

**Coefficient of linear expansion for PE-HD:**

$$16 \times 10^{-5} \times \frac{1}{K}$$

This means that each increase or decrease of the temperature of the duct by 1 Kelvin (1 K = 1 °C) the PE-HD duct shall extend or shorten by 0.16 mm per meter length.

**Note** For avoiding tensions in the duct system particularly in midsummer the duct string must be placed in the trench some time before it is filled, to reach an adaption between duct and soil.

Depth	1 Kelvin	10 Kelvin	20 Kelvin	30 Kelvin
1 meter	0.00016 m	0.0016 m	0.0032 m	0.0048 m
10 meters	0.0016 m	0.016 m	0.032 m	0.048 m
100 meters	0.016 m	0.16 m	0.32 m	0.48 m
1000 meters	0.16 m	1.6 m	3.2 m	4.8 m

**Recommendation**

To counteract against these laws of physics gabocom recommends the utilisation of the appropriate sealing and fixing elements.

## 3. Tensile forces.

During pulling of bundles the recommended tensile forces have to be respected and may not be exceeded.

Optimum tensile forces are reached at a temperature range from 5 to 20 °C. For the pulling in process into the duct always use a pulling grip. In doing so the speed•pipe® ground and the jacket pipe must be gradated in a way that a uniform force distribution is reached on the entire speed•pipe® bundle.

## 4. Opening of speed•pipe® bundle ground.

For opening of a speed•pipe® bundle we recommend to use the sheat cutter with sliding guide because there is a lower risk of injury as by using a knife for example.

→ Please take care on the speed•pipe® inside the bundle.



Sheat cutter with sliding guide



Ceramic security cutter

## 5. Cutting speed•pipe® / speed•pipe® bundle ground.

For cutting the speed•pipe® bundle or the speed•pipe® never use chip-producing tools like a saw.

Separate the bundle by means of a pipe cutter. The internal speed•pipe® must be separated with a speed•pipe® cutter.

Cutting a speed•pipe® for coupling it with a connector (DSM) must be carried out by a straight rectangular cut towards the pipe axis.

Cut speed•pipe® that are not coupled with a connector (DSM) afterwards, must be sealed immediately against dirt and the penetration of water by means of a corresponding EZA-t or ES.

→ Please consider the respective assembly instruction for installing the connector.



speed•pipe® cutter and pipe cutter

→ **Note:**

Uncut speed•pipe® (without connector) are the optimal requirement for blowing in a micro cable. Therefore, try to make less cuts. Therefore, pull the SRV-G in one step if possible e. g. during passing a route of several crossings / courtyard entrances.

## 6. Bending radius.

The smallest permissible bending radius of the speed•pipe® bundle depends on the laying temperature and never must fall below the values specified in the table.

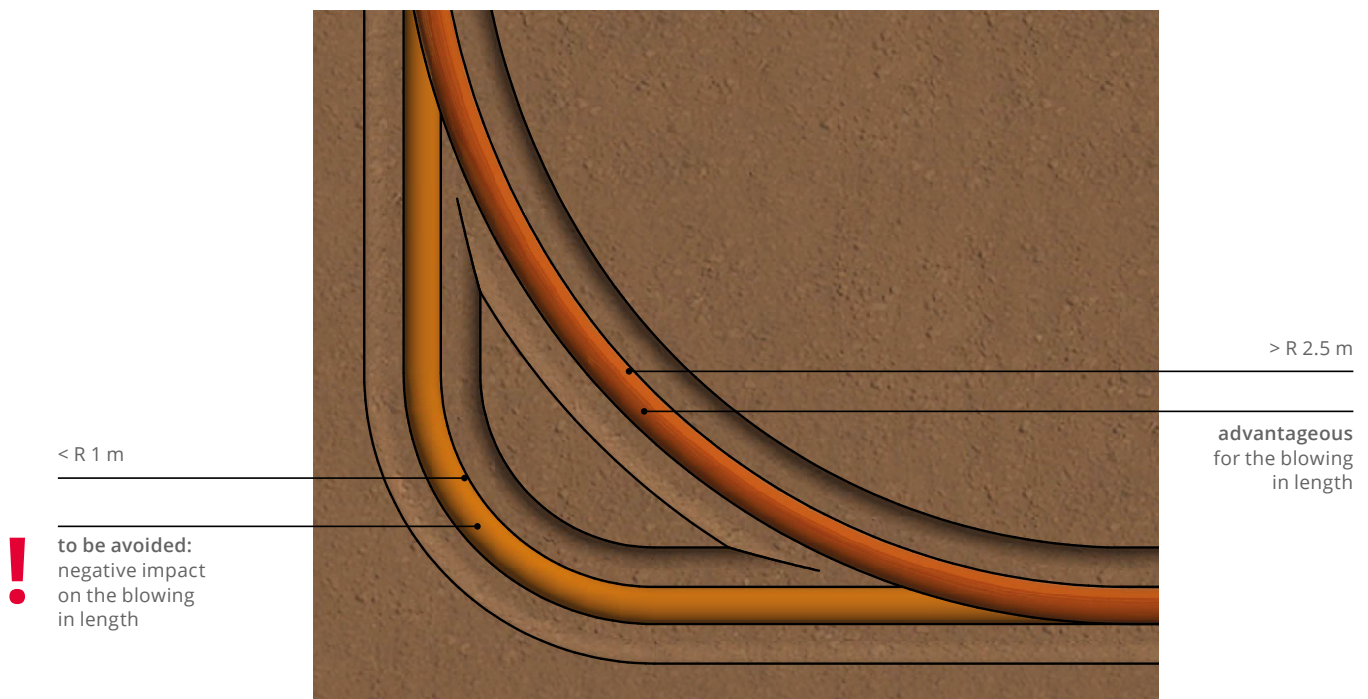
Laying temperature	Smallest permissible bending radius of the speed•pipe® bundle
20 °C	> 1.0 m
10 °C	> 2.0 m
0 °C	> 2.5 m

The minimum bending radius for speed•pipe® ground as an single duct are 10 x outer diameter, e. g. speed•pipe® ground 7 x 1.5 = minimum bending radius 10 x 7 mm = 70 mm.

→ **Note:**

Avoid connectors in a bending radius, as they can stop the blowing in process because of the internal edge of the open middle plot.

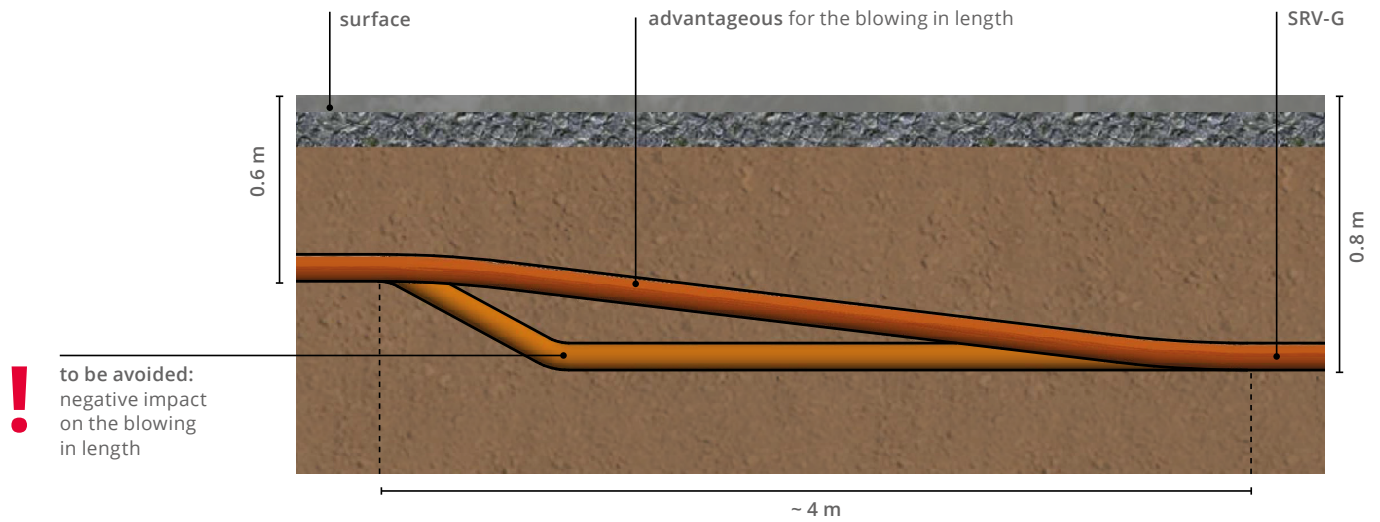
*Recommendation* Avoid bending radius < 2.5 m.



*Important* The larger the bending radius, the larger the blowing in values afterwards!  
Gently compensate any height difference of the trench bottom. Any rapid height difference will cause a negative impact on the blowing in success.



## 6. Bending radius.



## 7. Branching off the speed•pipe® bundle ground.

The following branch off procedure is valid for speed•pipe® bundles which were laid or plowed in open trenches. If the speed•pipe® bundles were pulled in ducts it is recommended to work with HRMA.

The branching off from the SRV-G should always realise with the help of branch off equipment (TBS / LBS), so it is guaranteed that the minimum bending radius is compliant and also a kinking during the compression process is prevented.

The coat duct of the speed•pipe® bundle should be opened with a suitable cutting tool (sheat cutter with sliding guide, see point 4) to a length of 80 – 100 cm.

The branching off speed•pipe® should be cutted with a speed•pipe® cutter (see point 5) in front of the branch off equipment and connect it with DSM to the single duct or the branch off speed•pipe® bundle.

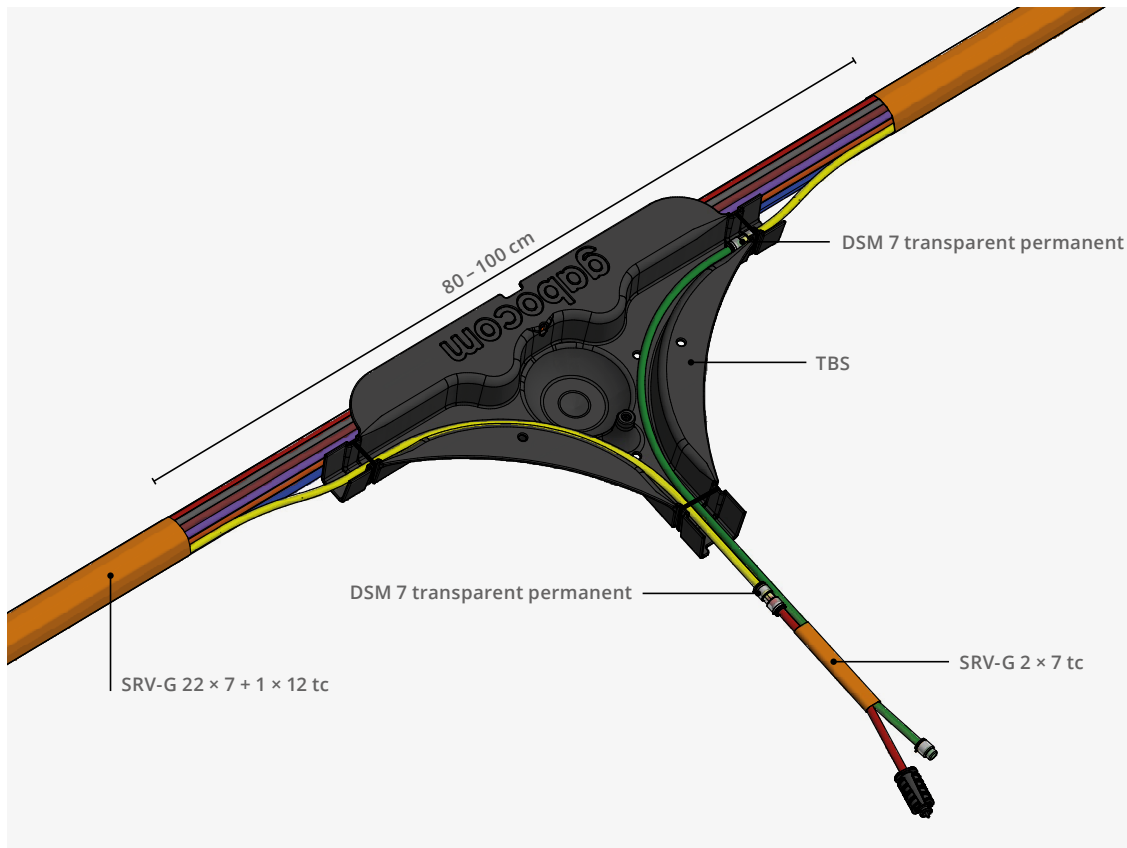
Fix the speed•pipe® in the branch off equipment with an cable ties in the prepared holes so the speed•pipe® are laying in the predefined bending radius.

*Option* Optionally a ball marker can be mounted for location on the branch off equipment with cable ties.

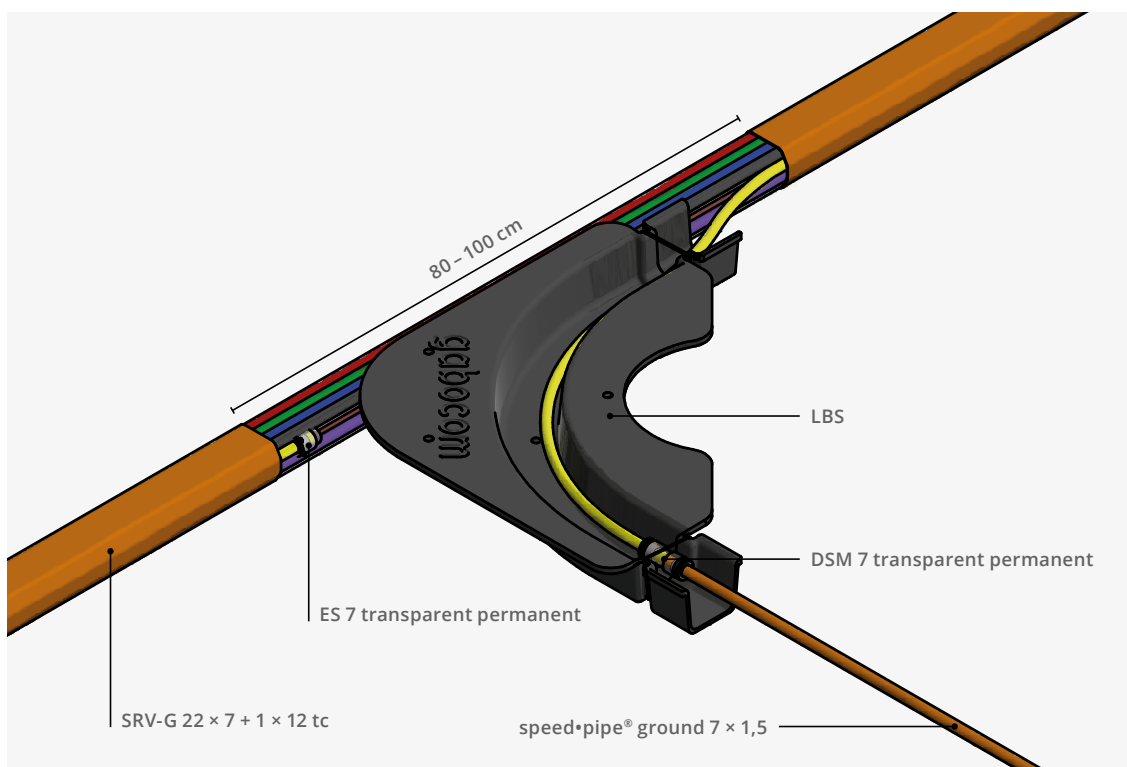
→ **Note:**

Avoid connectors in a bending radius as they can stop the blowing in process because of the internal edge of the open middle plot.

Example of a branch off a SRV-G 22 x 7 + 1 x 12 tc on a branch off speed•pipe® bundle SRV-G 2 x 7 tc with the branch off equipment TBS.



Example of a branch off a SRV-G 22 x 7 + 1 x 12 tc on a speed•pipe® ground 7 x 1.5 with the branch off equipment LBS.

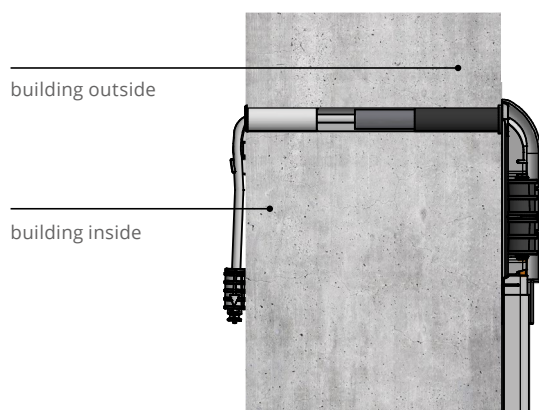


## 7. Branching off the speed•pipe® bundle ground.

For example branching off the speed•pipe® bundle is necessary for connecting a building. This house connectings can be executed in the following ways:

### House entrance

Overground usage with gabocom HEO

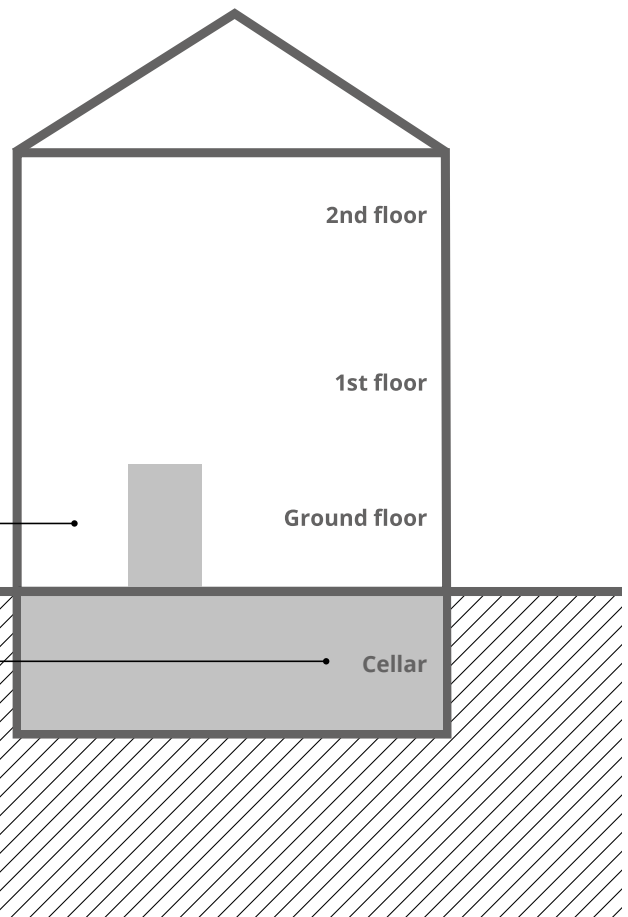


### House entrance

Overground usage

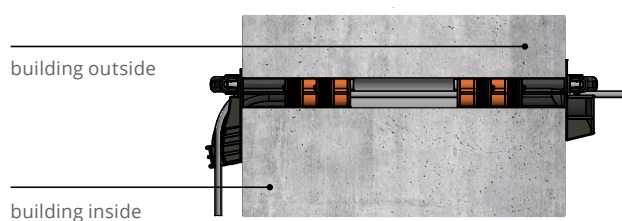
### House entrance

Use in cellar



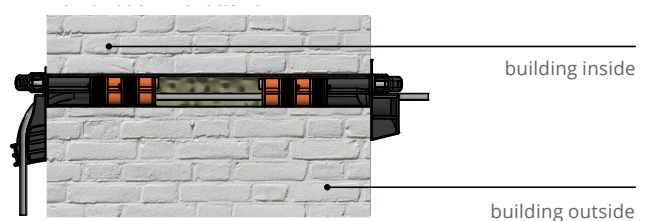
### A. Use in cellar

for concrete wall with gabocom ADSB



### B. Use in cellar

for brickwork with gabocom ADSB  
in combination with corresponding sleeve

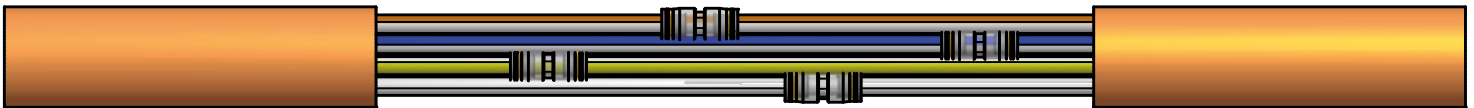


## 8. Connecting speed•pipe® bundle ground.

speed•pipe® ground of the same colour are connected by means of a connector DSM. For this purpose the single speed•pipe® are to be separated with a speed•pipe® cutter. It is absolutely important to carry out a straight rectangular cut towards the pipe axis.

→ **Note:**

Avoid connectors in a bending radius, because these can stop the blowing in process due to the inside edge of the open middle plot.



The various coloured speed•pipe® ground are variably connected to one another (approx. twice the connector length).

*Recommendation*

For protecting the joint we recommend combining the speed•pipe® ground by means of a split corrugated pipe PPWR-t 40 / 50.

## 9. Colour code.

### 9.1 Colour sequence gabocom.

Colour sequence gabocom  
speed•pipe® ground 7 x 1.5 (7 / 4)

no.	colour code	colour
1	red / yellow (SRV-G 2 x 7 tc: red)	 
2	red / green (SRV-G 2 x 7 tc: green)	 
3	red / blue	 
4	red / violet	 
5	red / grey	 
6	yellow / blue	 
7	yellow / violet	 
8	yellow / grey	 
9	green / blue	 
10	green / violet	 
11	green / grey	 
12	brown / blue	 
13	brown / violet	 
14	brown / grey	 
15	brown / green	 
16	brown / yellow	 
17	brown / red	 
18	black / red	 
19	black / yellow	 
20	black / green	 
21	black / blue	 
22	black / violet	 
23	black / grey	 
24	black / brown	 



**Colour sequence gabocom**  
speed•pipe® ground 10 x 2.0 (10 / 6)

no.	colour code	colour
1	black	
2	brown	
3	red	
4	orange	
5	yellow	
6	green	
7	blue	
8	violet	
9	grey	
10	white	
11	turquoise	
12	pink	

**Colour sequence gabocom**  
speed•pipe® ground 12 x 2.0 (12 / 8)




no.	colour code	colour
1	black	
2	brown	
3	red	
4	orange	
5	yellow	
6	green	
7	blue	

**Colour sequence gabocom**  
speed•pipe® ground 14 x 2.0 (14 / 10)


no.	colour code	colour
1	black	
2	brown	
3	red	
4	orange	
5	yellow	
6	green	
7	blue	

## 9.1 Colour sequence gabocom.

Colour sequence gabocom  
speed•pipe® ground 16 x 2.0 (16 / 12)

no.	colour code	colour
1	black	
2	brown	
3	red	
4	orange	
5	yellow	
6	green	
7	blue	

Colour sequence gabocom  
speed•pipe® ground 20 x 2.5 (20 / 15)

Nummer.	Farbbezeichnung	Farbe
1	black	
2	brown	
3	red	
4	orange	

## 9.2 Colour sequence DIN.

Colour sequence DIN  
speed•pipe® ground 7 x 1.5 (7 / 4)

no.	colour code	colour
1	red / 2 colour strips	
2	green / 2 colour strips	
3	blue / 2 colour strips	
4	yellow / 2 colour strips	
5	white / 2 colour strips	
6	grey / 2 colour strips	
7	brown / 2 colour strips	
8	violet / 2 colour strips	


### Colour sequence DIN

speed•pipe® ground 7 x 1.5 (7 / 4)

no.	colour code	colour
9	turquoise / 2 colour strips	
10	black / 2 colour strips	
11	orange / 2 colour strips	
12	pink / 2 colour strips	
13	red / 4 colour strips	
14	green / 4 colour strips	
15	blue / 4 colour strips	
16	yellow / 4 colour strips	
17	white / 4 colour strips	
18	grey / 4 colour strips	
19	brown / 4 colour strips	
20	violet / 4 colour strips	
21	turquoise / 4 colour strips	
22	black / 4 colour strips	
23	orange / 4 colour strips	
24	pink / 4 colour strips	

### Colour sequence DIN

speed•pipe® ground 10 x 2.0 (10 / 6)

no.	colour code	colour
1	red	
2	green	
3	blue	
4	yellow	
5	white	
6	grey	
7	brown	
8	violet	
9	turquoise	
10	black	
11	orange	
12	pink	

## 9.2 Colour sequence DIN.

### Colour sequence DIN

speed•pipe® ground 12 x 2.0 (12 / 8)

no.	colour code	colour
1	red	
2	green	
3	blue	
4	yellow	
5	white	
6	grey	
7	brown	

### Colour sequence DIN

speed•pipe® ground 14 x 2.0 (14 / 10)

no.	colour code	colour
1	red	
2	green	
3	blue	
4	yellow	
5	white	
6	grey	
7	brown	

### Colour sequence DIN

speed•pipe® ground 16 x 2.0 (16 / 12)

no.	colour code	colour
1	red	
2	green	
3	blue	
4	yellow	
5	white	
6	grey	
7	brown	

## Colour sequence DIN

speed•pipe® ground 20 x 2.5 (20 / 15)

no.	colour code	colour
1	red	<span style="color: red;">●</span>
2	green	<span style="color: green;">●</span>
3	blue	<span style="color: blue;">●</span>
4	yellow	<span style="color: yellow;">●</span>

## 10. Blowing in micro cables / mini cables.

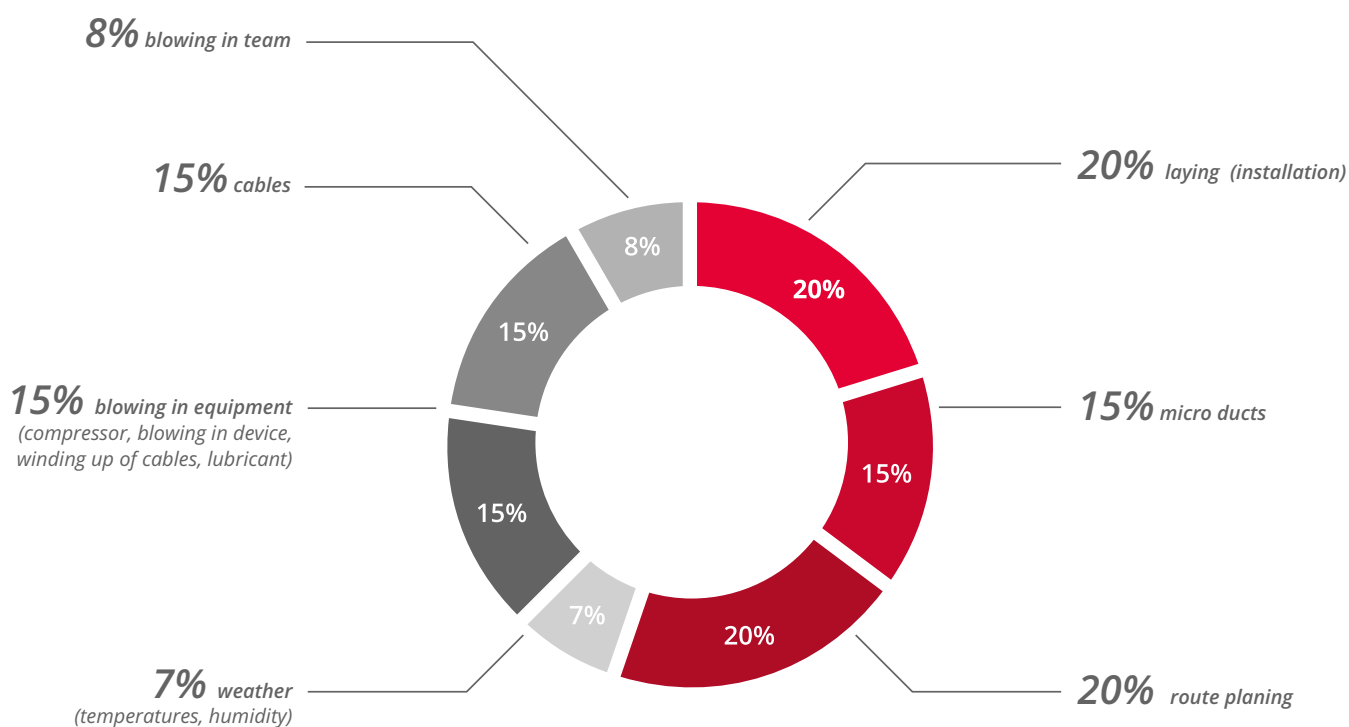
For blowing in micro and mini cables into the speed•pipe® that are integrated in the speed•pipe® bundle we recommend a blowing in pressure up to 15 bar at the speed•pipe®.

Optimum blowing in values are reached at a temperature range from 5 to 20 °C. The cable to be blown in must not be exposed to direct solar radiation.

It might also be helpful to use lubricants that are tested and recommended by specialist companies.

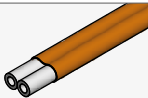
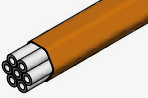
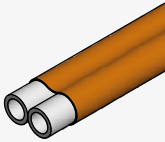
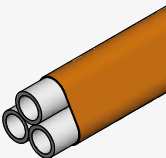

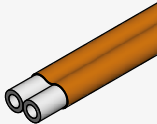
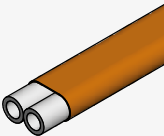
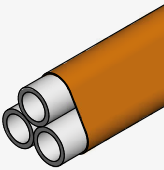

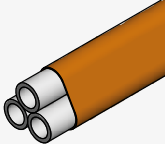
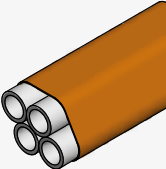

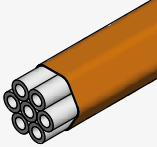
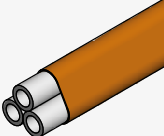
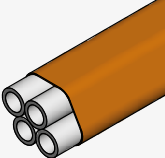

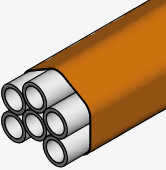

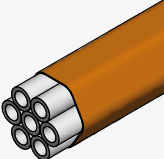
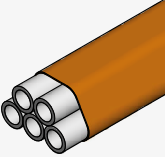
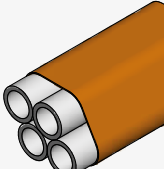
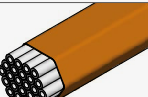
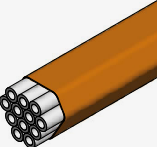
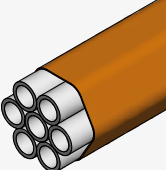

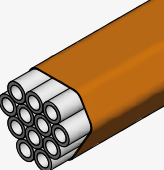
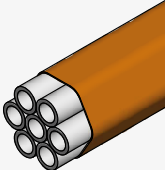
The blowing in lengths to be achieved depend on several factors.

Factors influencing the successful blowing of cables into micro ducts.

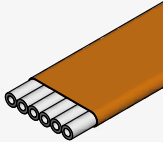
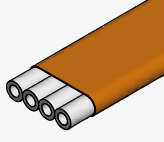
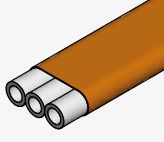
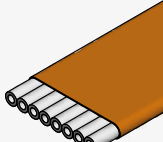
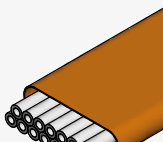
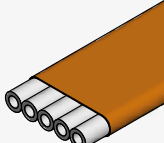
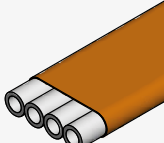
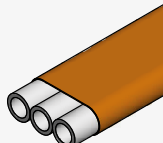
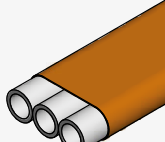
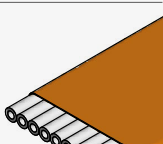

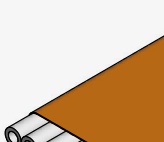
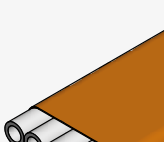
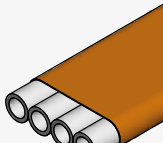
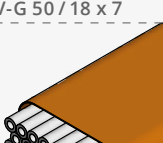
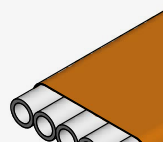
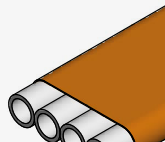


## 10. Blowing in micro cables / mini cables.

Reference values for blowing in lengths.

speed•pipe® 7 x 1.5	speed•pipe® 10 x 2.0	speed•pipe® 12 x 2.0	speed•pipe® 14 x 2.0	speed•pipe® 16 x 2.0	speed•pipe® 20 x 2.5
cable diameter	cable diameter	cable diameter	cable diameter	cable diameter	cable diameter
approx. 2.3 mm (12 fibres)	approx. 4.0 mm (48 fibres)	approx. 6.2 mm (72 fibres)	approx. 8.0 mm (96 fibres)	approx. 9.8 mm (144 fibres)	approx. 11.5 mm (288 fibres)
blow-in length	blow-in length	blow-in length	blow-in length	blow-in length	blow-in length
up to approx. 1000 m	up to approx. 1000 m	up to approx. 1300 m	up to approx. 1300 m	up to approx. 1300 m	up to approx. 1300 m
 SRV-G 2 x 7 tc					
 SRV-G 7 x 7 tc			 SRV-G 2 x 14 tc	 SRV-G 3 x 16 tc	
 SRV-G 8 x 7 + 1 x 12 tc	 SRV-G 2 x 10 tc	 SRV-G 2 x 12 tc			 SRV-G 3 x 20 tc
 SRV-G 12 x 7 tc			 SRV-G 3 x 14 tc	 SRV-G 4 x 16 tc	
 SRV-G 14 x 7 tc	 SRV-G 7 x 10 tc	 SRV-G 3 x 12 tc	 SRV-G 4 x 14 tc		
 SRV-G 18 x 7 tc				 SRV-G 6 x 16 tc	
 SRV-G 22 x 7 + 1 x 12 tc		 SRV-G 7 x 12 tc	 SRV-G 5 x 14 tc		 SRV-G 4 x 20 tc
 SRV-G 24 x 7 tc	 SRV-G 12 x 10 tc			 SRV-G 7 x 16 tc	
 SRV-G 24 x 7 + 1 x 14 tc		 SRV-G 12 x 12 tc	 SRV-G 7 x 14 tc		



	speed•pipe® 7 x 1.5	speed•pipe® 10 x 2.0	speed•pipe® 12 x 2.0	speed•pipe® 14 x 2.0	speed•pipe® 16 x 2.0
	cable diameter	cable diameter	cable diameter	cable diameter	cable diameter
	approx. 2.3 mm (12 fibres)	approx. 4.0 mm (48 fibres)	approx. 6.2 mm (72 fibres)	approx. 8.0 mm (96 fibres)	approx. 9.8 mm (144 fibres)
	blow-in length	blow-in length	blow-in length	blow-in length	blow-in length
	up to approx. 1000 m	up to approx. 1000 m	up to approx. 1300 m	up to approx. 1300 m	up to approx. 1300 m
jacket pipe Ø 32	 SRV-G 32 / 6 x 7	 SRV-G 32 / 4 x 10	 SRV-G 32 / 3 x 12		
jacket pipe Ø 40	 SRV-G 40 / 8 x 7				
	 SRV-G 40 / 14 x 7	 SRV-G 40 / 5 x 10	 SRV-G 40 / 4 x 12	 SRV-G 40 / 3 x 14	 SRV-G 40 / 3 x 16
jacket pipe Ø 50	 SRV-G 50 / 10 x 7				
	 SRV-G 50 / 18 x 7	 SRV-G 50 / 7 x 10	 SRV-G 50 / 5 x 12	 SRV-G 50 / 4 x 14	
	 SRV-G 50 / 24 x 7			 SRV-G 50 / 5 x 14	 SRV-G 50 / 4 x 16

## 10. Blowing in micro cables / mini cables.

### Requirements for achieving optimum blowing in lengths into SRV-G and speed•pipe® ground.

#### Trench.

- With plane ground (no bumps in the ground).
- As straight as possible.
- Radius as large as possible – recommended: more than 2.5 m (radius of at least 1 m).
- As far as possible compensate height differences of 0.1 m over a distance of at least 2 m.

#### SRV-G tc or speed•pipe® ground laid in a trench.

- As straight as possible – e. g. along the wall of the trench.
- Lay the SRV-G tc plane and do not twist.
- Lay SRV-G tc under tension.
- Never throw (large) stones onto the SRV-G tc or speed•pipe® ground; filling of the trench is to be carried out like the procedure with a direct buriable cable.
- Mechanical compacting equipment is not allowed until 30 cm depth of coverage.
- The later creation of a coiled bundle can have a negative effect on the installation.
- Compact the ground constantly.
- Keep integrated speed•pipe® ground free of dirt and soil – seal pipe ends!
- Wind off the SRV-G tc from the lower side of the coil (see pictures at point 16).

#### SRV-G tc or speed•pipe® ground ploughed.

- For avoiding elongations of the speed•pipe® ground due to tensile stress the coil axis must be easily rotatable.
- Make sure that the coil immediately can be retarded in case of a sudden stop of the plough.
- Carry out the ploughing as straight as possible.
- When changing the direction always keep a radius of at least 2.5 m.
- Rapid height differences should be avoided.
- Keep integrated speed•pipe® ground free from dirt and soil – seal pipe ends!

#### Micro cable / mini cable

- The cable diameter should be within the specified diameter ranges (see table).

speed•pipe®	min. cable diameter*	max. cable diameter*
7 × 1.5	1 mm	2.7 mm
10 × 2.0	1.8 mm	4.6 mm
12 × 2.0	3 mm	6.8 mm
14 × 2.0	3 mm	8.7 mm
16 × 2.0	6.5 mm	10.4 mm
20 × 2.5	8 mm	12.5 mm

\* Including tolerances

- The cable diameter has a significant influence on the blowing in length.
- The cable diameter should be uniform and should not vary for more than 0.3 mm.
- The cable sheath should be as smooth as possible
- The surface of the micro cable should be dry and clean and should not exceed temperatures of more than 25 °C (ideal 15 °C).
- The cable ideally has been optimised to the gabocom speed•pipe® and has been certified on a test track.
- The cable shouldn't have any axial run out.

## 10. Blowing in micro cables / mini cables.

### Requirements for achieving optimum blowing in lengths into speed•pipe® bundles and speed•pipe® ground.

#### Blowing in micro cables / mini cables.

- The coil of the micro cable must be easily rotatable.
- Make sure that the coil immediately can be retarded in case of an unexpected stop.
- Ensure cleanness of the cable.
- Clean the speed•pipe® (inside) with a clean cylindrical sponge.
- Only use an appropriate blowing in device (e. g. company Vetter).
- Use a compressor with strong airflow, with max. pressure of 15 bar (1000 l/m for speed•pipe® up to an internal diameter of 12 mm).
- The airflow out of the compressor must be clean, oil-free, dry and cooled down by using a recoler to approx. 8 °C – 10 °C above environmental temperature.
- The maximum blowing in speed should be limited to 80 m/min.
- Use appropriate lubricants.
- According to the common rules the permissible range of the blowing-in temperature amounts from -2 °C to +37 °C.
- The utilisation of a „lubricator“ for a permanent wetting of the micro cable with lubricants has a positive impact on the blowing in speed and blowing in length.
- Mount a cable conduct head on the top of the cable.

#### Lubricant.

- Pay attention to the correct dosing according to the manufacturer's data.
- Before blowing in the cable the lubricant must be spread in the speed•pipe® by means of a cylindrical sponge.

Source: Company Vetter, Lottstetten, Germany

Step 1 in broadband expansion: Use existing duct systems.

# Laying instructions. The speed•pipe® bundle ground SRV-G in practice.

**The fastest and cheapest way to expand broadband:**

Reduce civil engineering costs through the optimal use of existing pipe systems for fibre optics.

speed•pipe® bundles ground combine with their flexible coating pipe different coloured speed•pipe® ground in a loose connection. In just one step, you can pull several speed•pipe® ground into the existing pipe network at the same time.

In the following chapters 11 – 14 you will find all necessary steps for the professional installation of the speed•pipe® bundle ground SRV-G:

11. Use of SRV-G
12. Pulling of SRV-G into existing ducts
13. Tensile strengths and tensile strengths at break of SRV-G variations
14. Pictures from practice

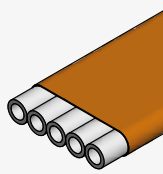
These installation instructions are essential for the construction and assembly work in order to successfully guarantee the functionality of your network.

## Laying instructions.

### 11. Utilisation of speed•pipe® bundle ground with flexible coating pipe SRV-G.

The speed•pipe® bundles consist of different coloured speed•pipe® ground which are bundled with a flexible coating pipe. The speed•pipe® ground are suitable for all laying procedures of point 12.

#### General overview.

	jacket pipe Ø 32	jacket pipe Ø 40		jacket pipe Ø 50		
speed•pipe® 7 x 1.5	 SRV-G 32 / 6 x 7	 SRV-G 40 / 8 x 7	 SRV-G 40 / 14 x 7	 SRV-G 50 / 10 x 7	 SRV-G 50 / 18 x 7	 SRV-G 50 / 24 x 7
speed•pipe® 10 x 2.0	 SRV-G 32 / 4 x 10	 SRV-G 40 / 5 x 10		 SRV-G 50 / 7 x 10		
speed•pipe® 12 x 2.0	 SRV-G 32 / 3 x 12	 SRV-G 40 / 4 x 12		 SRV-G 50 / 5 x 12		
speed•pipe® 14 x 2.0		 SRV-G 40 / 3 x 14		 SRV-G 50 / 4 x 14	 SRV-G 50 / 5 x 14	
speed•pipe® 16 x 2.0		 SRV-G 40 / 3 x 16		 SRV-G 50 / 4 x 16		



## 12. Pulling SRV-G into existing ducts.

By the flexible coating pipe (loose outer jacket) the SRV-G bundles are suitable for pulling into existing duct systems. Pay attention to the recommended tensile forces during pulling in bundles and speed•pipe® (see point 13).

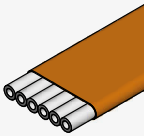
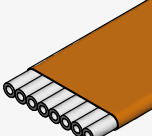
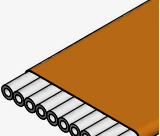
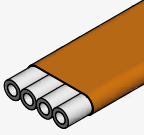
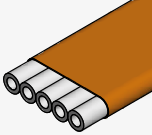
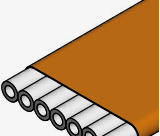
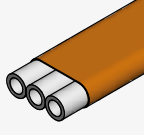
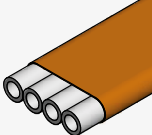
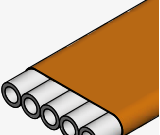
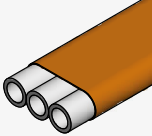
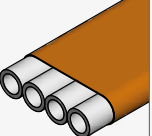
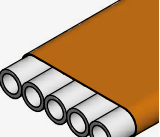
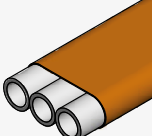
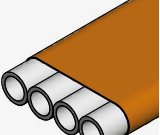
**Important**

Never exceed the recommended tensile forces.

### 12.1 Pulling SRV-G into existing ducts (> Ø 80 mm).

By pulling into existing ducts bigger than 80 mm the complete speed•pipe® bundle with jacket pipe is installed. For the occupancy of existing ducts SRV-G can be pulled in by means of a cable grip.

The maximum number of speed•pipe® bundles shouldn't exceed the expected occupancy of 60 % to the inner cross section.

	jacket pipe Ø 32	jacket pipe Ø 40	jacket pipe Ø 50	
speed•pipe® 7 x 1.5	 SRV-G 32 / 6 x 7	 SRV-G 40 / 8 x 7	 SRV-G 50 / 10 x 7	
speed•pipe® 10 x 2.0	 SRV-G 32 / 4 x 10	 SRV-G 40 / 5 x 10	 SRV-G 50 / 7 x 10	
speed•pipe® 12 x 2.0	 SRV-G 32 / 3 x 12	 SRV-G 40 / 4 x 12	 SRV-G 50 / 5 x 12	
speed•pipe® 14 x 2.0		 SRV-G 40 / 3 x 14	 SRV-G 50 / 4 x 14	 SRV-G 50 / 5 x 14
speed•pipe® 16 x 2.0		 SRV-G 40 / 3 x 16	 SRV-G 50 / 4 x 16	

## 12.1 Pulling SRV-G into existing ducts (> Ø 80 mm).

### Preparation.

- Cleaning the ducts.
- Testing and calibrating of the continuity of the duct.
- Inserting a lubricant (read the information of the manufacturer).
- Placing the laying carriage with the SRV-G (in linear direction to the manhole).
- Use placement support tools to prevent damages to the coat of the SRV-G (e. g. manhole edge-roller, protection bend for cable).



protection bend



manhole edge-roller

### Mounting the cable grip.

- Gradate speed•pipe® ground and jacket pipe to reach an equal power distribution of the whole SRV-G.  
Proceed like this:
  - a) Trim the outer coat by approx. 500 mm.
  - b) Buck the speed•pipe® ground in 70 mm gradations.
- Protect every single speed•pipe® ground with end plugs ES or dust caps SK against the penetration of dirt and water.
- Fold the end of the jacket pipe tight over the speed•pipe® ground and fix it with textile tape or similar.



- Pull the cable grip over the jacket pipe of the speed•pipe® bundle ground and fix it with textile tape (winding each with 10 cm over the cable grip and the outer coat).



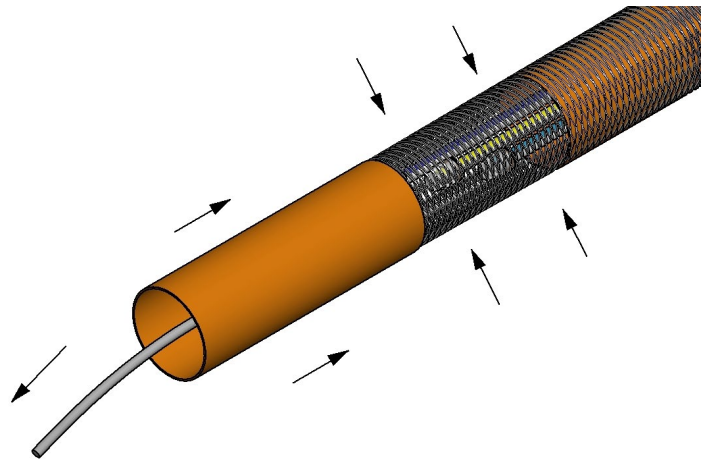


## 12.1 Pulling SRV-G into existing ducts (> Ø 80 mm).

→ **Note:**

For reducing the friction during the pulling in process additionally a piece of jacket pipe can be attached over the cable grip.

1) Pull a piece of jacket pipe over the cable grip.



2.) Wrap textile tape over the ends of the covered piece of the jacket pipe.



### Pulling in the speed•pipe® bundle ground.

- The speed•pipe® bundle ground is pulled in by means of a traction rope or a tube snake.
- Assistance by employees at the coil (e. g. stopping and rotating) as well as at the launching / pulling manhole.
- It is to be avoided that the speed•pipe® bundle ground is placed at the direct access area of the manholes. Therefore, consider the deflection at drawn through or connected SRV-G.
- In case of short distances between the manholes the SRV-G can be drawn through using protection bends and pulling spouts.
- In case the KKR is to be occupied with two speed•pipe® bundles ground, these can be pulled in one after the other or at the same time.
- The use of lubricant is reducing the pulling in friction.

## Sealing and fixing the SRV-G to the cable duct conduit.

Sealing and fixing the speed•pipe® bundle ground SRV-G to the KKR 110 in the cable duct is carried out by using the sealing element ADE / TDUX 100 (company TE connectivity) and is necessary on both sides in each manhole.



Combined installation of the TE connectivity ADE / TDUX in the KKR 110.



Filling and sealing the TE connectivity ADE / TDUX.

### → **Note:**

The different occupancy options of the KKR always result in other sealing situations. The company TE connectivity produces different sizes of the ADE / TDUX for being able to seal these different occupancy options. Therefore, if necessary, identify the right size of the ADE / TDUX so that every junction between the KKR and the SRV-G is filled out (also applies for several SRV-G).

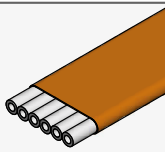
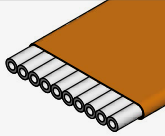
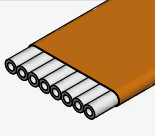
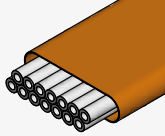
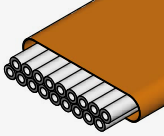
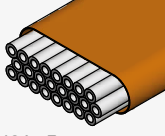
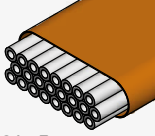
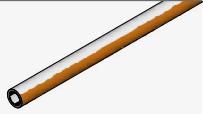
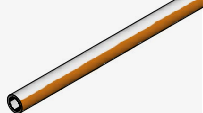
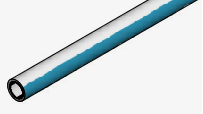
## 12.2 Pulling in speed•pipe® ground from the SRV-G into existing ducts (Ø 32 – 63 mm).

The main advantage is that only one spool has to be handled in comparison with the installation of single ducts.

By pulling into existing ducts smaller than 80 mm the coating pipe (outer jacket) of the bundle has to be removed by a cutting unit. Only SRV-G bundles with flexible coating pipes (loose outer jacket) can be used!

For a maximum occupancy of existing ducts (Ø 32, Ø 40, Ø 50 and Ø 63) speed•pipe® ground can be pulled in from the SRV-G. The single speed•pipe® ground are pulled in with the help of a pulling head. The SRV jacket pipe, before reaching the duct is slit by means of a slicing device and recycled (PE-HD).

The reachable pull in length is limited by the permissible tensile force of the speed•pipe® ground (see table). A positive effect can be achieved by rotating the coil and by using lubricants. The maximum number of speed•pipe® ground depends on the dimensions of the duct and a possible combination with larger speed•pipe® ground (see table).

speed•pipe® 7 x 1.5		speed•pipe® 7 x 1.5 + 1 speed•pipe®	
for duct	Ø 32 x 2.9 (2.0)	 SRV-G 32 / 6 x 7 max. recommended tensile force 1800 N	
	Ø 40 x 3.7 (2.5)	 SRV-G 50 / 10 x 7 max. recommended tensile force 3000 N	 SRV-G 40 / 8 x 7 max. recommended tensile force 2400 N
	Ø 50 x 4.6 (3.0)	 SRV-G 40 / 14 x 7 max. recommended tensile force 3900 N	 SRV-G 50 / 18 x 7 max. recommended tensile force 5000 N
	Ø 63 x 5.8 (4.7)	 SRV-G 50 / 24 x 7 max. recommended tensile force 6500 N	 SRV-G 50 / 24 x 7 max. recommended tensile force 6500 N
			 speed•pipe® 14 x 2.0 (12 x 2.0), max. recommended tensile force 800 N (700 N)
			 speed•pipe® 14 x 2.0 (12 x 2.0), max. recommended tensile force 800 N (700 N)
			 speed•pipe® 16 x 2.0 (14 x 2.0), max. recommended tensile force 900 N (800 N)

## Procedure:

### 1) Lead the SRV-G through the cutting unit.

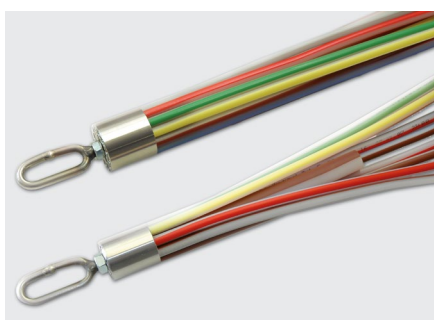
The complete SRV-G is thread through a cutting unit. In doing so the jacket pipe is lead to a cutter via the guiding element.



cutting unit for jacket pipe  
manufacturer Vetter, Lottstetten, Germany

### 2) Installation pulling head.

Cut all speed•pipe® ground of the SRV-G evenly and to the same length. The single speed•pipe® ground of the SRV-G are screwed together on the face at the appropriate pulling head.



pulling head  
manufacturer Vetter, Lottstetten, Germany

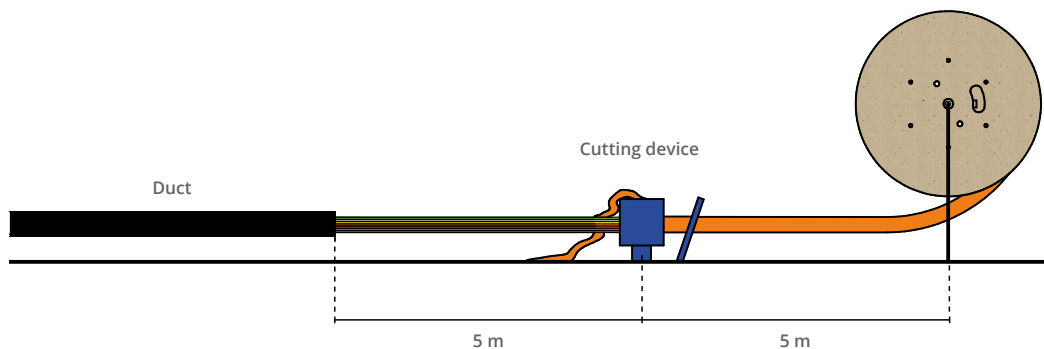
### 3) Pulling in.

The pulling head with the single speed•pipe® ground is attached to the towing rope and is pulled into the duct. During the pulling in process it is necessary to use lubricants.

At the cutting unit the jacket pipe is separated from the speed•pipe® (the cutting unit must be sufficiently fixed to the ground). The distance from the coil to the cutting unit and from the cutting unit to the duct at least must amount to 5 m.

## Principal sketch:

Pulling in speed•pipe® ground from the SRV-G.



## 13. Tensile strengths and tensile strengths at break of SRV-G variations.

Max. recommended tensile strength and tensile strength at break of SRV-G in N (at 20 °C).

SRV-G with speed•pipe® ground 7 x 1.5	Max. recommended tensile strength (at 20 °C)	Tensile strength at break (at 20 °C)
SRV-G 32 / 6 x 7	1800	2500
SRV-G 40 / 8 x 7	2400	3400
SRV-G 50 / 10 x 7	3000	4200
SRV-G 40 / 14 x 7	3900	5600
SRV-G 50 / 18 x 7	5000	7300
SRV-G 50 / 24 x 7	6500	9600
SRV-G with speed•pipe® ground 10 x 2.0		
SRV-G 32 / 4 x 10	2100	2800
SRV-G 40 / 5 x 10	2600	3400
SRV-G 50 / 7 x 10	3500	4700
SRV-G with speed•pipe® ground 12 x 2.0		
SRV-G 32 / 3 x 12	2400	2800
SRV-G 40 / 4 x 12	3200	3700
SRV-G 50 / 5 x 12	4000	4600
SRV-G with speed•pipe® ground 14 x 2.0		
SRV-G 40 / 3 x 14	2800	3400
SRV-G 50 / 4 x 14	3700	4500
SRV-G 50 / 5 x 14	4500	5500
SRV-G with speed•pipe® ground 16 x 2.0		
SRV-G 40 / 3 x 16	3100	3900
SRV-G 50 / 4 x 16	4100	5100

Max. recommended tensile strength and tensile strength at break of coating pipes in N (at 20 °C). In case only the jacket pipe of the SRV-G is stressed the following tensile forces must not be exceeded:

Name	Max. recommended tensile strength (at 20 °C)	Tensile strength at break (at 20 °C)
Jacket pipe Ø 32	420	600
Jacket pipe Ø 40	550	800
Jacket pipe Ø 50	700	1.000



## 14. Pictures from practice – pulling in speed•pipe® ground from the SRV-G into existing ducts.



Step 2 in broadband expansion: Construction of micro duct systems.

# Laying instructions. The speed•pipe® bundle ground SRV-G tc in practice.

In case no existing duct systems are available for sections of a fibre optic project, the new construction of subterranean routes is recommendable – especially with respect to the reliability and durability of the fibre optic network.

Direct buriable speed•pipe® bundles ground tight covered SRV-G tc combine different coloured speed•pipe® ground with a tight covered coating pipe. In just one work step – the professional laying in the ground – you set up a long-lasting passive infrastructure for high distances when blowing in fibre optic cables.

In the following chapters 15 – 19 you will find all the necessary steps for the professional installation of the speed•pipe® bundle ground SRV-G tc:

15. Use of SRV-G tc
16. Laying principles of SRV-G tc
17. Types of installation of SRV-G tc in direct bury
18. Tensile forces and tensile forces at break of SRV-G tc variations
19. Pictures from practiceVerlegegrundsätze des SRV-G tc

These installation instructions are essential for the construction and assembly work in order to successfully guarantee the functionality of your network.

## Laying instructions.

### 15. Use of the speed•pipe® bundle ground tight covered SRV-G tc.

The speed•pipe® bundles consist of different coloured speed•pipe® ground which are tight covered with a coating pipe. The speed•pipe® ground tc are suitable for laying procedures of point 17.

The field of application of our SRV-G tc pipe bundles includes all floor groups that are classified in the DIN 18196:2011-05 (Earthworks and foundations – Soil classification for civil engineering purposes) » stonefree material, grain size < 63 mm.

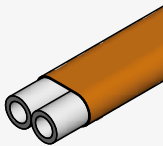
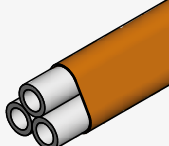


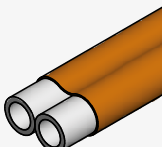
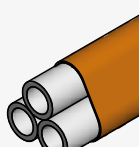



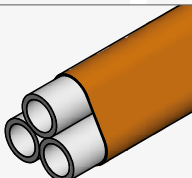
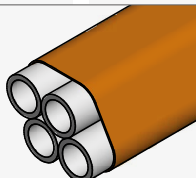
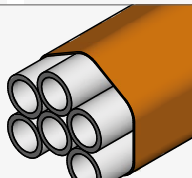

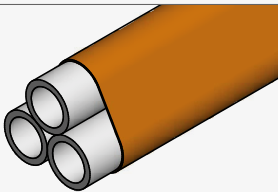
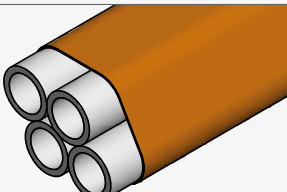
The internal speed•pipe® ground comply with IEC 61386-24:2004 (Conduit systems for cable management-Part 24: Particular requirements – conduit systems buried underground IEC 61386-24:2010) and are classified with L-750.

#### A) Customer connection network.

speed•pipe®	7 x 1.5 (12 x 2.0 / 14 x 2.0)					
		SRV-G 2 x 7 tc	SRV-G 7 x 7 tc	SRV-G 8 x 7 + 1 x 12 tc	SRV-G 12 x 7 tc	SRV-G 12 x 7 + 1 x 14 tc
	7 x 1.5 (12 x 2.0 / 14 x 2.0)					
		SRV-G 14 x 7 tc	SRV-G 18 x 7 tc	SRV-G 22 x 7 + 1 x 12 tc	SRV-G 24 x 7 tc	SRV-G 24 x 7 + 1 x 14 tc
	10 x 2.0					
		SRV-G 2 x 10 tc	SRV-G 7 x 10 tc	SRV-G 12 x 10 tc		

## 15. Use of the speed•pipe® bundle ground tight covered SRV-G tc.

### B) Access network.

speed•pipe®	12 x 2,0					
		SRV-G 2 x 12 tc	SRV-G 3 x 12 tc	SRV-G 7 x 12 tc	SRV-G 12 x 12 tc	
	14 x 2,0					
		SRV-G 2 x 14 tc	SRV-G 3 x 14 tc	SRV-G 4 x 14 tc	SRV-G 5 x 14 tc	SRV-G 7 x 14 tc
	16 x 2,0					
		SRV-G 3 x 16 tc	SRV-G 4 x 16 tc	SRV-G 6 x 16 tc	SRV-G 7 x 16 tc	
	20 x 2,5					
		SRV-G 3 x 20 tc		SRV-G 4 x 20 tc		

## 16. Laying principles of SRV-G tc.

For an optimal laying the speed•pipe® bundle must be uncoiled under tension because of physical reasons. For this the bundle has to be controlled decelerated during uncoiling.

For the adjustment of the correct braking force, the laying temperature and the version of the speed•pipe® bundle is deciding. Generally, the braking force has to be increased accordingly during low laying temperatures and high quantity of speed•pipe®. The permitted tensile forces (see point 18) aren't allowed to be exceeded.

### LAYING INSTRUCTIONS:

For a professional laying the following points have to be considered:

1. Laying of the SRV-G tc during the complete uncoiling under tension (from the first meter). For this purpose tighten possible loose layers on the spool before uncoiling.
2. Braking force.  
**It is necessary:** The more corrugated the laying is, the braking force has to be increased. The lower the outside temperature is, the braking force has to be increased.
3. After uncoiling fix the last layer of the SRV-G on the spool that the remaining layers on the spool cannot be untightened. Therefore, the requirements for the next uncoiling are prepared.

**Recommendation** For an expert laying we recommend using professional equipment and refer to appropriate spool brakes. These spool brakes allow a constant and controlled brake during uncoiling of the bundle and avoid an uncontrolled unrolling.

**Important** The compatibility with the according trailers and racks must be clarified with the respective producers.



drum band brake  
company Vetter



drum brake  
company Bagela



drum brake  
company Thaler

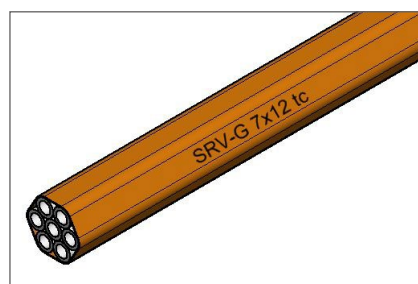


## 16. Laying principles of SRV-G tc.

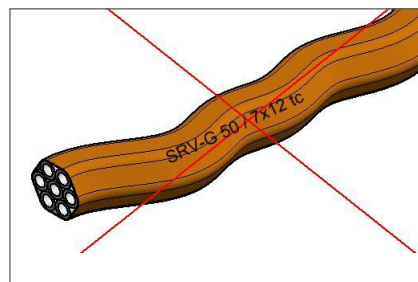


Unwinding SRV-G tc from the coil

- ✓ **Professional.**  
(Linear laying of bundle under tension / spool is slowed down in a controlled manner).  
» Optimum blowing in length of the cables



- ✗ **Unprofessional.**  
» Decrease in the blowing distance of the cables



## 17. Types of installation of the SRV-G tc in direct buried installation.

The following topics under point 17 apply for SRV-G tc and for the application of a speed•pipe® ground as a single micro duct.

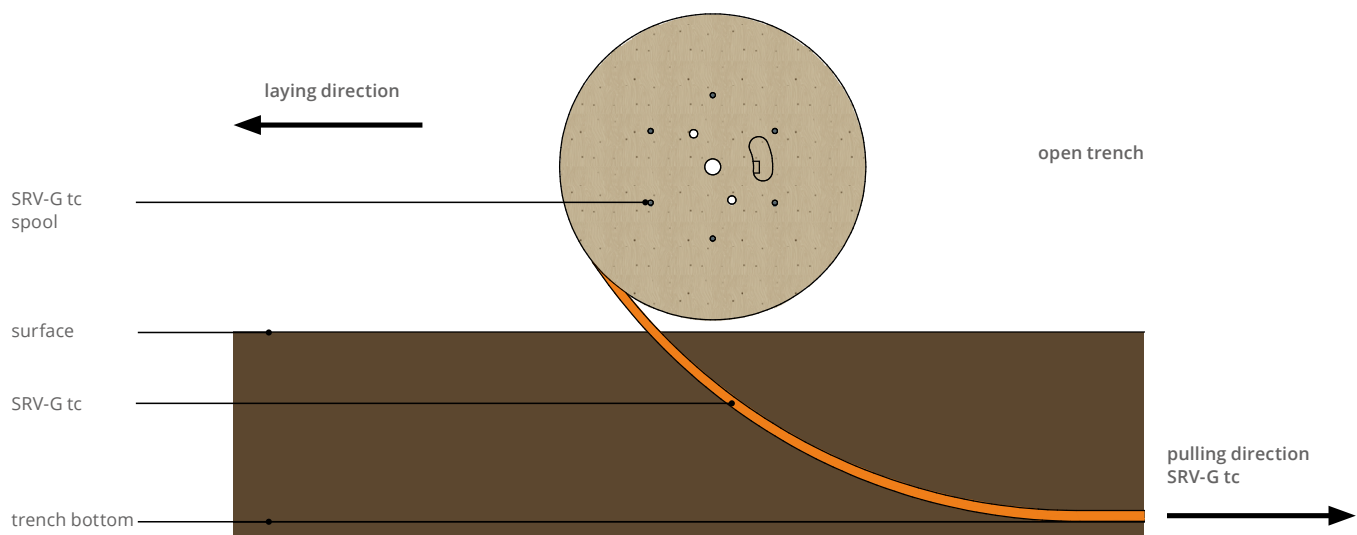
**Important** The structurally engineered specifications and standards for the following laying procedures have to be fulfilled and clarified with the according administrations.

### 17.1 In the open trench.

**Important note** The speed•pipe® bundle ground SRV-G tc must not be wound off by rolling the drum over the ground. By doing so there is the risk to squeeze the speed•pipe® ground.

Therefore, a trailer for drums or a laying carriage always must be used.

#### INSTALLATION RECOMMENDATION\*:



The SRV-G tc must be wound off the coil as described in the illustration (see picture). It is particularly important to respect the linear laying under tension (**spool slowed down in a controlled manner**).

It is not permitted to unwind the SRV-G tc on the flange (in direction of the coil axis, because of spiral forming of the SRV-G tc). Avoid a wave like laying (neither horizontal nor vertical) coercively.

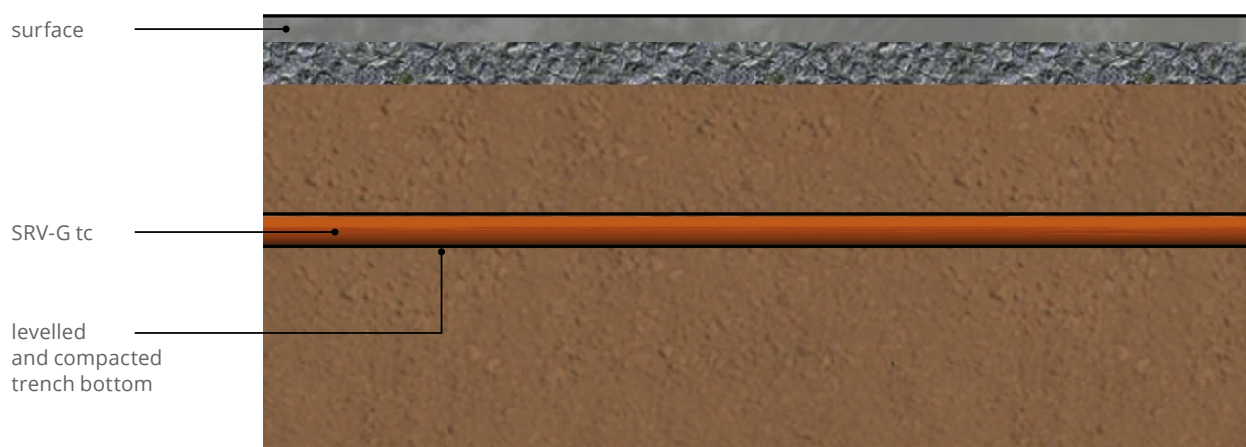
\* Special conditions on the construction site or laying process may differ from the recommended principle.

## 17.1 In the open trench.

**Important** An undulating installation (neither horizontal nor vertical) must be avoided.

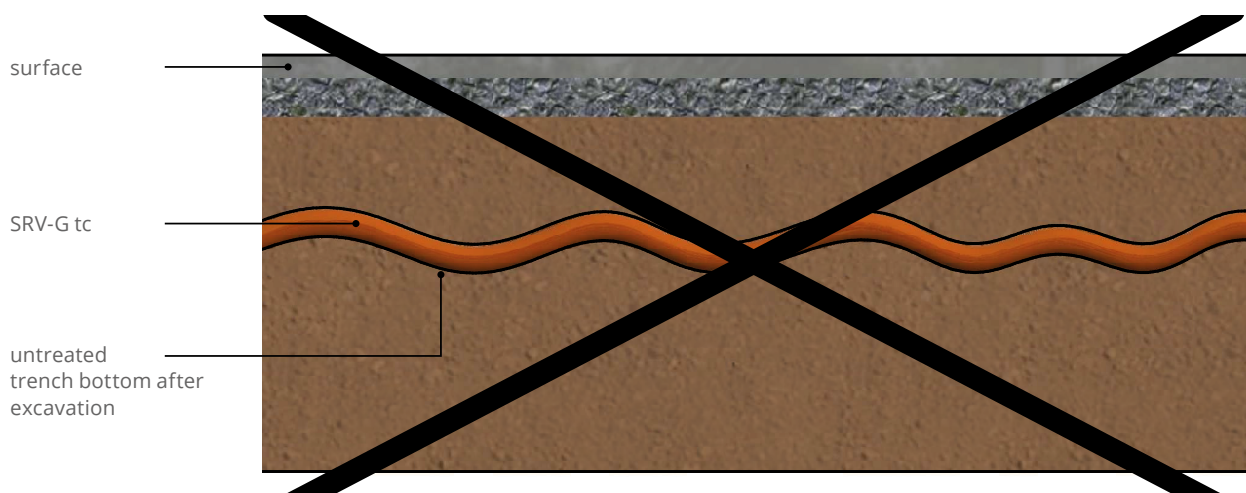
### ✓ Professional laying.

The trench bottom should be plane. In case the bottom is undulating e. g. due to an excavator, this section must be compensated.



### ✗ Unprofessional laying.

Here the undulating trench bottom was not compensated and thus it is transferred to the bundle. A considerable decrease in the blowing in length is to be expected!





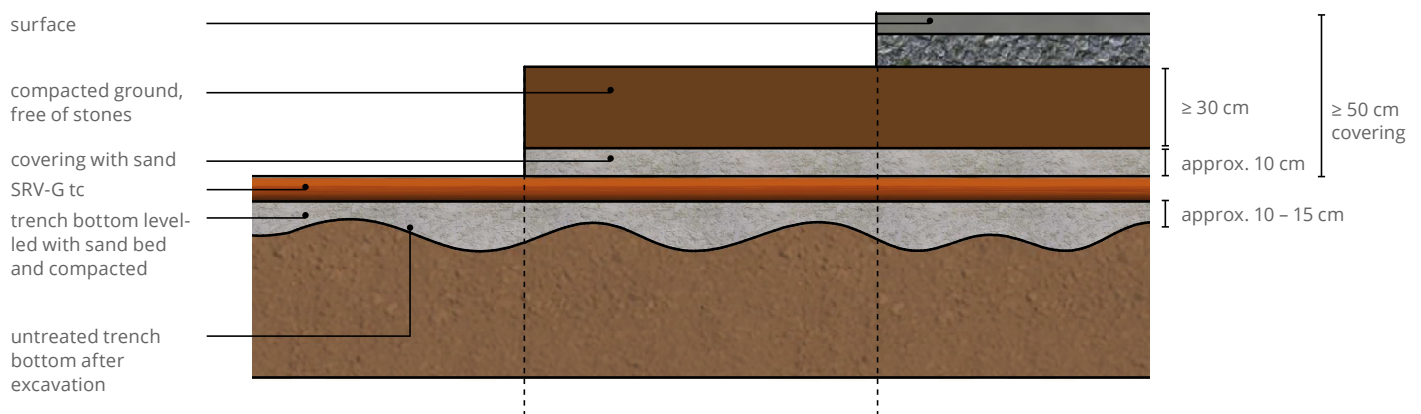
### Trench bottom and duct bedding.

For the trench bottom and the duct bedding only compactable and stonefree material (grain-size < 63 mm) may be used. Before the laying process the trench bottom must be gently vibrated with a compactor. Pay attention to an even compacting. Mechanical compacting equipment is not allowed under 30 cm depth of coverage.

In case of rocky or stony subsoil (grain-size > 63 mm) the trench bottom must be excavated at least 0.15 m deeper and the excavation must be replaced by a stone-free layer (sand 0 – 2, with maximum grain size Ø 2 mm).

After laying, the duct zone must be backfilled with sand up to 10 cm above the top of the duct bundle apex in the tensioned state. (See ZTV-TKNetz 10 / 11).

### Example for an optimal duct bedding.

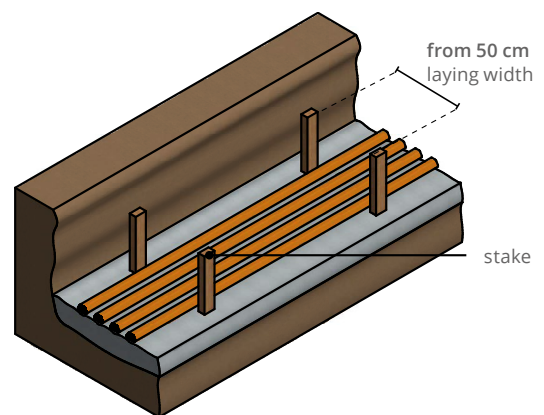
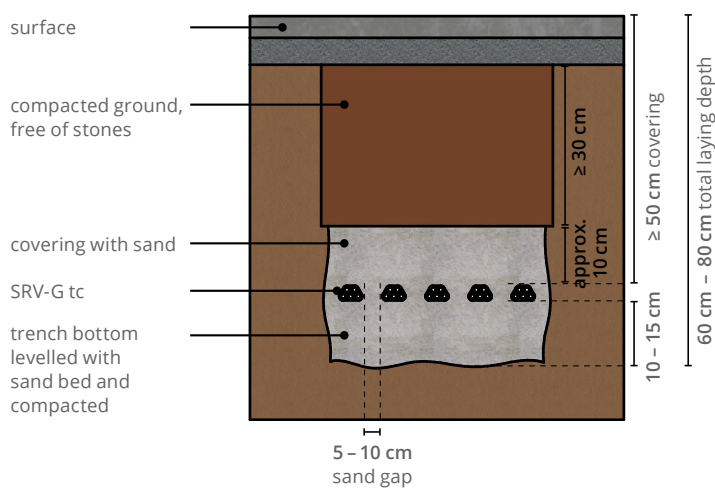


**Recommendation** The unpredictability recurring in practice is well known to all and cannot be assumed by the manufacturer. Therefore, we generally recommend laying in a sand bed for optimal pipe bedding.

## 17.1 In the open trench.

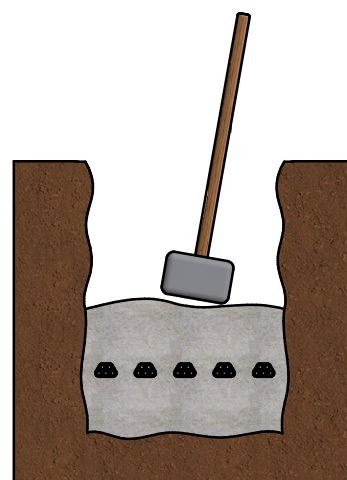
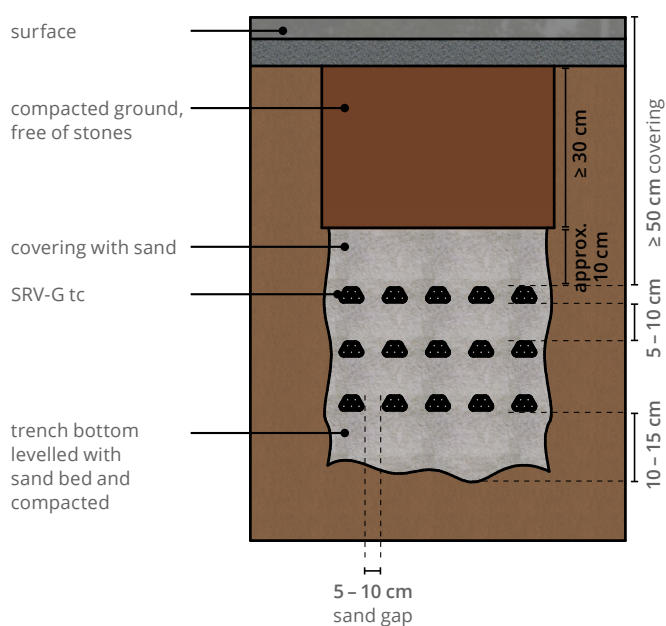
### Laying of SRV-G tc in one deposition side by side.

**Note** When laying several SRV-G tc in one deposition, we recommend leaving distance between them. At wider trenches than 50 cm it is recommended to stake out the layers for a better order.



### Laying of SRV-G tc in several depositions.

**Note** After each layer fill in sand manually (in no case mechanically) and compact.

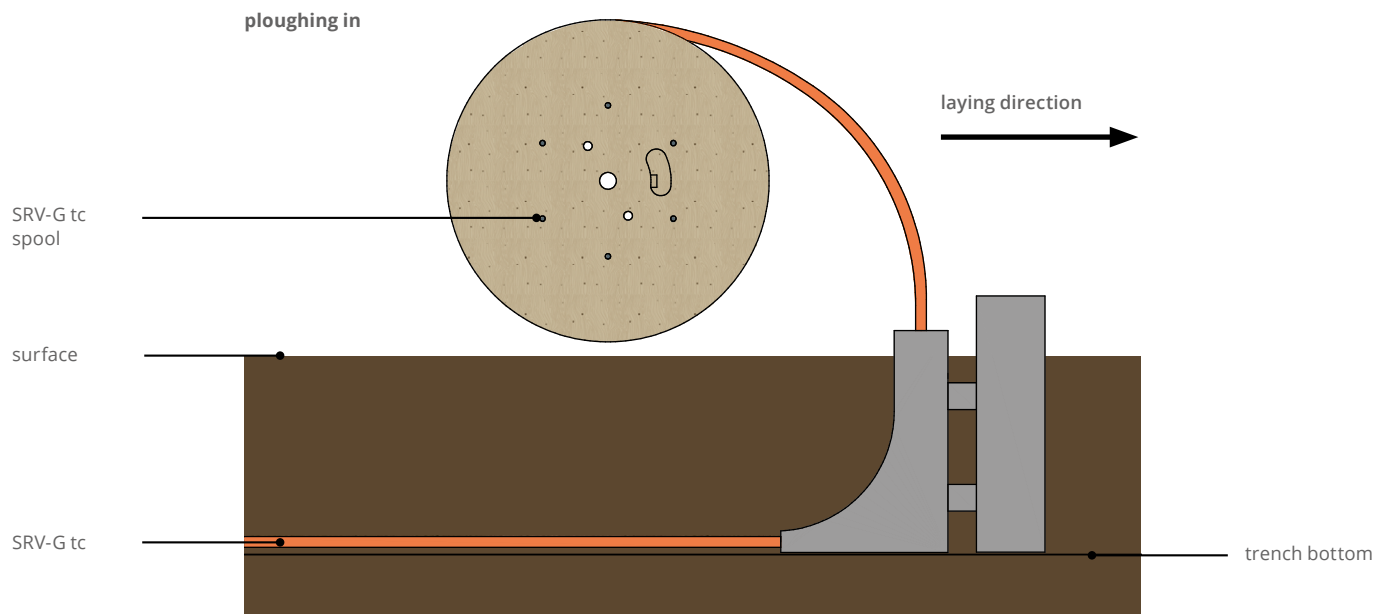


## 17.2 Ploughing.

The laying of SRV-G tc by means of a plough generally is applicable, if

- there is no paved surface.
- there are no impediments in the ground.
- the location of external plants is known.
- there are no reasons of nature protection against it.

### INSTALLATION RECOMMENDATION\*:



\* Special conditions on the construction site or laying process may differ from the recommended principle.

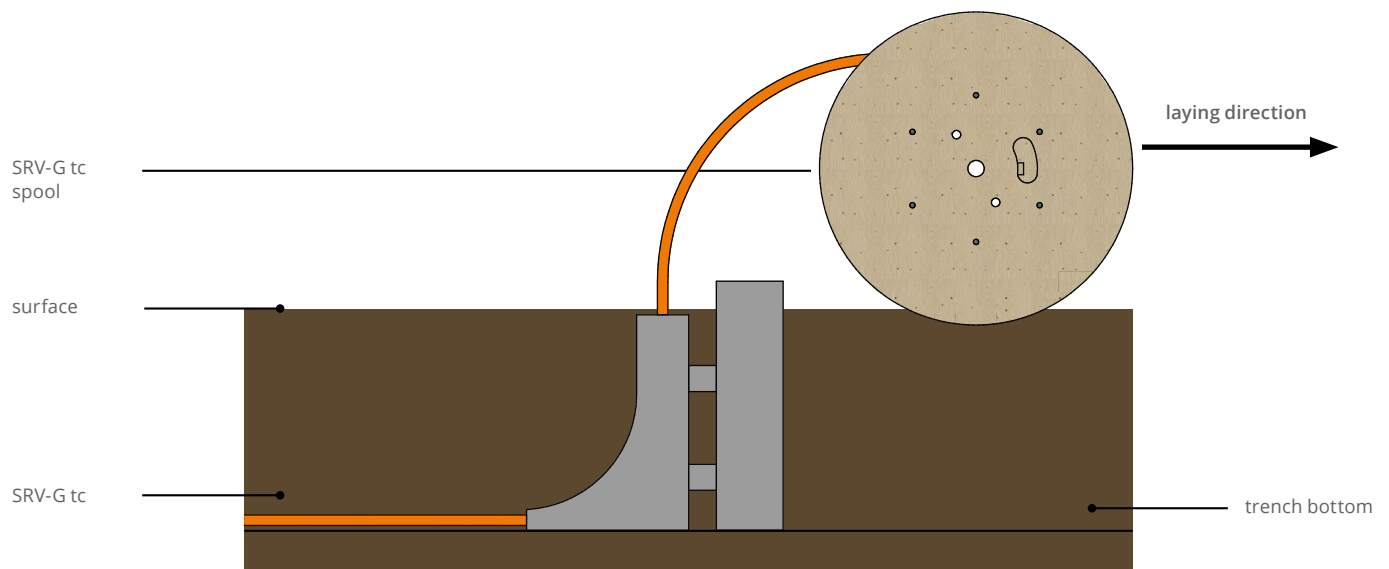
## 17.2 Ploughing.

The SRV-G tc must be wound off the coil as described in the illustration (see picture). It is particularly important to respect the linear laying under tension (**spool slowed down in controlled manner**).

**Note** Besides these laying instructions also possible existing instructions of the customer concerning the ploughing in of SRV-G tc, ducts or cables must be considered.

### INSTALLATION RECOMMENDATION\*:

#### ploughing in



\* Special conditions on the construction site or laying process may differ from the recommended principle.

## 17.3 Laying with water drilling (HDD).



SRV-G tc are suitable for water drilling under following conditions:

- If you work with cable grip, mount it like described under point 12.1:
  - reset the coat.
  - displaced cutting of the speed•pipe® ground.
  - take care for equal power division.
- You can also work with sub duct pulling heads, company Vetter.
- Comply with the maximum allowed tensile force.
- Seal the speed•pipe® ground with end plugs ES.

*Recommendation*

It is recommended to make a sufficiently large hole in order to have optimal conditions for the pulling of the SRV-G tc.



## 17.4 Laying with Micro- and Minitrenching.



SRV-G tc are in general suitable for all Micro- and Minitrenching techniques. But until now there is no relevant long-time experience regarding damage to the road surface and although the influence for SRV-G (tc) and the speed•pipe® ground.

We recommend using these techniques on little loaded walkways and streets.

**Take care for following conditions:**

- The trench bottom have to be free from stones (laid ideally in sand bed).
- Throw no stones on speed•pipe® ground or SRV-G tc.
- Linear laying of the SRV-G tc.
- Laying under tension.
- No twisting of the SRV-G tc.
- Realize bending radius so big as possible.
- Branch off with controlled bending, e. g. with TBS or LBS.
- Max. temperature for SRV-G tc and speed•pipe® ground is 80 °C.

By sealing with heated pottant (e. g. hot asphalt) the bundle respectively the speed•pipe® ground have to be protected against temperature. This can be handled for example with a sufficient overlap of sand ( $\geq 2$  cm).

## 18. Tensile strengths and tensile strengths at break of SRV-G tc variations.

Max. recommended tensile strength and tensile strength at break of SRV-G tc in N (at 20 °C).

SRV-G tc with speed•pipe® ground 7 x 1.5	Max. recommended tensile strength (at 20 °C)	Tensile strength at break (at 20 °C)
SRV-G 2 x 7 tc	700	900
SRV-G 7 x 7 tc	1900	2800
SRV-G 8 x 7 + 1 x 12 tc	3000	4100
SRV-G 12 x 7 tc	3300	4800
SRV-G 14 x 7 tc	3900	5600
SRV-G 18 x 7 tc	5000	7300
SRV-G 22 x 7 + 1 x 12 tc	6600	9600
SRV-G 24 x 7 tc	6500	9600
SRV-G 24 x 7 + 1 x 14 tc	7200	10500
<b>SRV-G tc with speed•pipe® ground 10 x 2.0</b>		
SRV-G 2 x 10 tc	1100	1400
SRV-G 7 x 10 tc	3500	4700
SRV-G 12 x 10 tc	5700	7900
<b>SRV-G tc with speed•pipe® ground 12 x 2.0</b>		
SRV-G 2 x 12 tc	1700	1900
SRV-G 3 x 12 tc	2400	2800
SRV-G 7 x 12 tc	5200	6200
SRV-G 12 x 12 tc	8800	10500
<b>SRV-G tc with speed•pipe® ground 14 x 2.0</b>		
SRV-G 2 x 14 tc	1800	2200
SRV-G 3 x 14 tc	2800	3400
SRV-G 4 x 14 tc	3700	4500
SRV-G 5 x 14 tc	4500	5500
SRV-G 7 x 14 tc	6000	7400
<b>SRV-G tc with speed•pipe® ground 16 x 2.0</b>		
SRV-G 3 x 16 tc	3100	3900
SRV-G 4 x 16 tc	4100	5100
SRV-G 6 x 16 tc	5800	7400
SRV-G 7 x 16 tc	6700	8600
<b>SRV-G tc with speed•pipe® ground 20 x 2.5</b>		
SRV-G 3 x 20 tc	4300	5100
SRV-G 4 x 20 tc	5600	6800



## 19. Pictures from practice.

### 19.1 SRV-G tc in the open trench.





## 19.2 Ploughing of the SRV-G tc.



# Indications.

## 20. Notes.

## 20. Notes.



**Contact.**  
Personal. Competent.

**gabo Systemtechnik GmbH**  
a Member of HellermannTyton  
Am Schaidweg 7  
94559 Niederwinkling  
GERMANY

Tel. +49 9962 950-200  
Fax. +49 9962 950-202

[info@gabocom.com](mailto:info@gabocom.com)  
[www.gabocom.com](http://www.gabocom.com)