Challenge annex: low-voltage branch joint information file

Contents

1 Current installation process

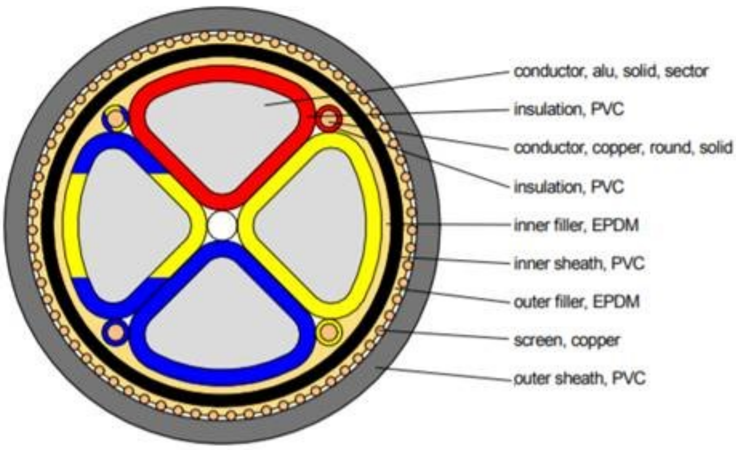
1.1 General explanation of the Liander low-voltage branch joint

For low-voltage sheathing, Liander uses compression connectors with wrapped sheaths. A gauze wrap is used to create an insulating distance between the conducting parts around the clamps, connections and cores of the cables that are in the sheath. The gauze is wrapped with PVC tape to create an isolated whole. The sheath is then filled with a liquid resin using an injection pump. Wrapping sufficient layers of gauze and tape plus the resin creates a protective sleeve that is properly electrically insulating, moisture-proof and mechanically resistant.

1.2 Preparing the main power line for installation

V-VMvKhsas power line

Liander and its predecessors have used V-VMvKhsas cables since the early 1970s. The vast majority of new connections to the low-voltage grid are installed using this type of cable. The V-VMvKhsas power cable is used whenever a new connection is laid. The abbreviation V-VMvKhsas stands for a cable with a PVC outer sheath (V), PVC insulation material (V), PVC inner sheath (MvK), auxiliary conductors (h) and an S-shaped earth screen (sas). The power line consists of 4 main sector conductors of solid aluminium and 4 round auxiliary conductors of solid copper wire. The main conductors and auxiliary conductors are pressed together. Around this pressed core, there is filler and a PVC inner sheath. For mechanical protection and to provide an earth screen, the next layer is a screen of copper wire held in place by a copper strip wound around it, twisting in the opposite direction. There is an outer sheath of PVC around the earth screen.



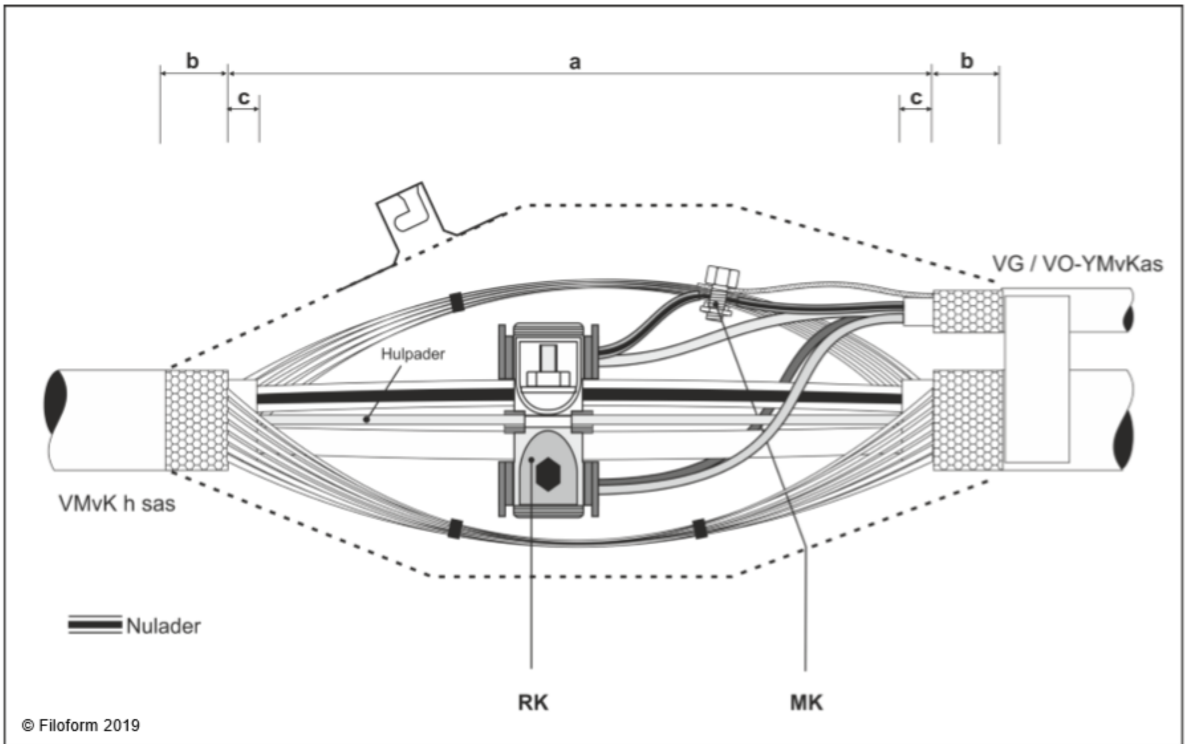
Cutting into the V-VMvKhsas power line

Steps for installation:
1. Determine the position of the sheath and mark out where the cuts are to be made.
2. Clean the PVC outer sheath and roughen up or sand a strip 5cm wide on either side of the markings.
3. Cut into the power line and remove the PVC outer sheath.
4. Free up the earth screen and remove the filler.
5. If the power line is live, insulate earth screen by wrapping it in gauze.
6. Leave 3cm of the PVC inner sheath at the ends and roughen it up.
7. Remove the intervening section of the inner sheath.
8. Spread the conductors apart and remove the cable core.
9. Continue installing the low-voltage branch joint.

1.3 Instructions for a domestic connection low-voltage branch joint (from Installation instruction N1512)

These instructions are for making a low-voltage branch joint for a domestic connection onto a PVC main power line with an earth screen (V-VMvKhsas). The table below gives the dimensions for cutting into the main power line and the clamps and connectors to be used. The installed low-voltage branch joint is shown in the diagram. The steps for installation start from the point when the cables have been prepared. Wrapping and filling the low-voltage branch joint with resin are described in the supplier's manual.

		Maattabel (mm)		
		A	B	C
hoofdkabel	aftakkabel	aansnijlengte	buitenmantel	binnenmantel
V-VMvKhsas 4 x 50 Al + 4 x 2,5 Cu + sas 25 Cu	VO/VG-YMvKasmb 4 x 10 Cu + as 10 Cu	260	50	30
	VG-YMvKasmb 4 x 16 Cu + as 16 Cu	260	50	30
	V-VMvKhsas 4 x 50 Al + 4 x 2,5 Cu + as 25 Cu	260	50	30
V-VMvKhsas 4 x 95 Al + 4 x 6 Cu + sas 35 Cu	VO/VG-YMvKasmb 4 x 10 Cu + as 10 Cu	260	50	30
	VG-YMvKasmb 4 x 16 Cu + as 16 Cu	260	50	30
	V-VMvKhsas 4 x 50 Al + 4 x 2,5 Cu + as 25 Cu	260	50	30
V-VMvKhsas 4 x 150 Al + 4 x 6 Cu + sas 50 Cu	VO/VG-YMvKasmb 4 x 10 Cu + as 10 Cu	260	50	30
	VG-YMvKasmb 4 x 16 Cu + as 16 Cu	260	50	30
	V-VMvKhsas 4 x 50 Al + 4 x 2,5 Cu + as 25 Cu	290	50	30



14-01-2019	Aftakmof HAS	VMvK h sas --- VO/VG-YMvKas	VMvKhsas1

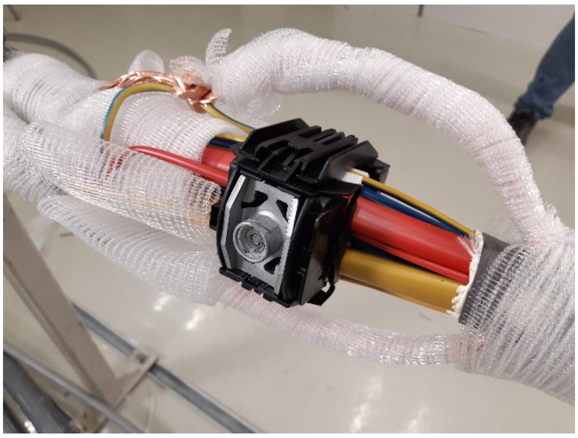
NL	UK
hoofdkabel	main power line
aftakkabel	branching cable
aansnijlengte	cutting length
buitenmantel	outer sheath
binnenmantel	inner sheath
Maattabel (mm)	Dimensions table (mm)
Aftakmof HAS	HAS low-voltage branch joint

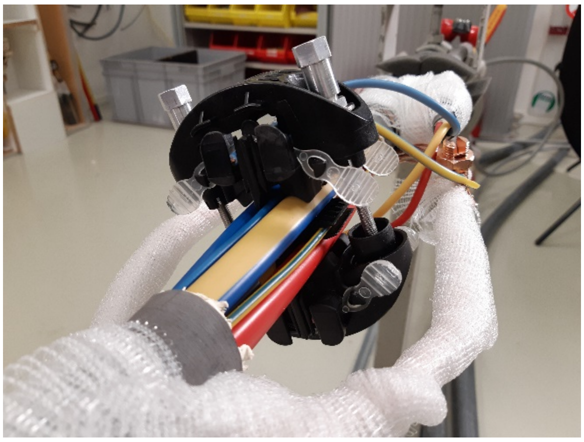
Steps for installation:

1. Prepare the main power line and the branching cable.
2. Cut any auxiliary conductors in the branching cable to length.

3. Put the neck seal in place and fit the branching cable.
4. Place the ring clamp on the main power line.
5. Connect the earth screen and the neutral conductor of the branching cable to the earth screen of the main power line using a clamping nut.
6. Fit the branching cable into the ring clamp.
7. If necessary, apply wads (5 layers of gauze wrap) between the pressure points.
8. Rotate the ring clamp as per the supplier's installation instructions.
9. Check the installation, as described in the Safe Working Instructions.

The preparation work at the site takes an average of 30 minutes and the installation itself takes about 60 minutes.





1.4 Video instructions for the wrapped sheath

This video shows how the compression connector with wrapped sheath is installed.

2 Projection for 2020

2.1 New installations

The number of new installations of low-voltage branch joints is determined by a variety of factors. How many new houses are constructed is the major determinant of the need for new installations. A second factor is the number of charging stations for electric vehicles. These two factors together are expected to result in 29,000 new low-voltage branch joints needing to be installed in 2020.

2.2 Reinforcing the electricity grid

We are also going to have to work at places where there are already low-voltage branch joints. This is because of the need for expansion of the capacity provided by the electricity grid. By 2022, about 30,000 to 50,000 homes will have to stop using natural gas. Of those homes, 60% will get all-electric solutions. To meet this increased demand for electricity, the capacity can be increased by adding fuses. This is not always possible, however. In those cases, the connecting cable will have to be replaced and a new low-voltage branch joint will have to be created. It is expected that this will need to be done about 1200 times in 2020.

There will even be cases where replacing the connecting cable is not enough and the main power line will have to be replaced. And again, new branches will have to be fitted from the new main power line to the homes. This means once again that a larger number of low-voltage branch joints will be needed. Although the specific numbers are difficult to predict, we assume that replacements of main power lines will mean 19,000 low-voltage branch joints will be needed.

Taking into account both the newly laid cables and the requisite reinforcement of the grid, we expect to be installing around 49,200 low-voltage branch joints in 2020.

3 Component specification

3.1 General

The low-voltage branch joint is a cable connector used on underground, low-voltage cables. These are the low-voltage cables that distribute electricity and power public street lighting (230/400V). The low-voltage cables have four main conductors and four auxiliary conductors. These cables and the associated fittings are located below ground, at a depth of 60 to 80cm.

3.2 Technical requirements

- The current that can pass from the low-voltage branch joint must be at least equal to the maximum current rating of the branching cable.
- The low-voltage branch joint must be able to resist an overpressure equal to a water column of 10 metres.
- The low-voltage branch joint must be suitable for being fitted safely onto live cables, in accordance with the Safe Working Instructions and BEI-BLS (Electrical System Operations, Low-Voltage Sector).
- The materials of the low-voltage branch joint must not be hygroscopic (attracting water) and must continue to function in damp conditions.
- The materials and components of the low-voltage branch joint must not constitute a hazard to human health or the environment when used correctly (storage, installation and waste disposal).
- The low-voltage branch joint must have a technical life of at least 50 years.

3.3 Installation

It must be possible to fit the product under the following conditions:

- Cable temperatures from 5 to 40 degrees Celsius.
- Outdoor temperatures from 5 to 40 degrees Celsius.

Materials and substances that are released during installation and that have to be processed as waste must not be classified as hazardous waste as described in the European List of Waste (EWC) regulations.

3.4 Standards and requirements

If the new connecting technique is adopted, Liander will be obliged to comply with a number of standards and requirements. The current low-voltage branch joint complies with the following standards.

National and international standards and directives		
Document	Description	Issue
1. NEN-EN 50393	Testing methods and requirements for fittings for distribution cables with a nominal voltage of 0.6/1.0 (1.2) kV	03/2015
2. NEN-HD 631.1	Power lines – Fittings – Determining the material properties – Part 1: Determination procedure and type tests	01/2008

National and international standards and directives		
Document	Description	Issue
3. NEN-EN-IEC 60455-3-8	Resin-based reactive compounds used for electrical insulation – Part 3: Specifications for individual materials – Sheet 8: Resins for cable accessories	07/2013
4. IEC 60287	IEC 60287 series: Electric cables – Calculation of the current rating	2007
5. NEN 3172	Paper lead cables for power current – Construction and inspection	1999
6. NPR 3107	Paper lead cables for power current – Continuous current rating	2011
7. NEN-ISO 11014-1	Safety Data Sheet for Chemical Products – Content and order of sections	03/2009
8. European Waste Catalogue and Hazardous Waste List	Ministry of Housing, Spatial Planning and the Environment European List of Waste Commodities	05/2002
9. NEN-EN-ISO 9001	Quality Management Systems – Requirements	2015
10. NEN-EN-ISO 14001	Environmental Management Systems – Requirements with Guidelines for Use	2015
11. Safe Working Instructions relating to BEI-BLS	including the Safe Working Instructions E-40, E-41, E-42, E-43 and E-62. *See* http://netwerkbedrijven.dearbocatalogus.nl/nl/home	

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