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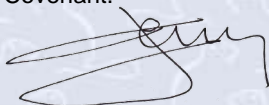
Water tight and air tight sealing systems for cable transits

STATEMENT BY KIWA

With this Kiwa Covenant, issued in accordance with the Kiwa Regulations for Product Certification, Kiwa declares that legitimate confidence exists that the products supplied by

Beele Engineering

as specified in this Kiwa Covenant and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with Kiwa Manual K15013 for Kiwa Covenants for products and processes - for the requirements described in this Covenant.



Luc Leroy
Kiwa

Publication of the Covenant is allowed.

Advice: consult www.kiwa.nl in order to ensure that this Covenant is still valid.

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**Certification process
consists of initial and
regular assessment of:**

- quality system
- product

Water tight and air tight sealing systems for cable transits

CERTIFIED PRODUCTS

NOFIRNO sealing system
CONTROFIL sealing system
SLIPSIL sealing system
DYNATITE sealing system
CET-A-SIL sealing system

TECHNICAL SPECIFICATION OF THE PRODUCTS

The technical specifications are described on pages 3 until 22.

APPLICATION AND USE

NOFIRNO sealing system is intended to be used for the water tight and gas tight sealing of the transit of a single cable or of multi cables through rigid walls, floors, bulkheads and decks. The tightness of the system is approved for cables with outer diameters between 4 and 105 mm. Application details are described in this Covenant.

CONTROFIL sealing system is intended to be used for the water tight and gas tight sealing of the transit of a single cable or of multi cables through rigid walls, floors, bulkheads and decks. The tightness of the system is approved for cables with outer diameters between 4 and 44 mm. Application details are described in this Covenant.

SLIPSIL sealing system is intended to be used for the water tight and gas tight sealing of the circular transit of a single cable or of multi cables through rigid walls, floors, bulkheads and decks. The tightness of the system is approved for cables with outer diameters between 5 and 105 mm.

DYNATITE sealing system is intended to be used for the water tight and gas tight sealing of the circular transit of a single cable or of multi cables through rigid walls, floors, bulkheads and decks. The tightness of the system is approved for cables with outer diameters between 5 and 105 mm.

CET-A-SIL sealing system is intended to be used for the water tight and gas tight sealing of the transits of cables through the wall of electrical cable boxes. The tightness of the system is approved for cables with outer diameters between 4 and 40 mm.

Application details of all sealing systems are described in this Covenant.

Hereby the following application conditions must be taken into account:

- the installation instructions of the producer.

MARKING

The following marks and indications must be provided on each product packaging in a clear, legible and indelible way:

- the name of manufacturer or the deposited trade mark;
- Kiwa Covenant mark "Water tight and air tight sealing systems" and Kiwa Covenant number;
- the nominal dimension or dimensions;
- the year of manufacturing and preferably the quarter.

If the dimensions of the products are such that the indications applied to them may impair the product, the products may be marked per package in consultation with the manufacturer, the buyer and Kiwa. Products produced by cutting or die cutting out of sheets may be marked per package.

RECOMMENDATIONS FOR CUSTOMERS

Check at the time of delivery whether:

- the supplier has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc.

Consult the supplier's processing guidelines for the proper storage, transport methods.

If you should reject a product on the basis of the above, please contact:

- Beele Engineering
and, if necessary,
• Kiwa Nederland B.V.

Consult the supplier's processing guidelines for the proper storage and transport methods.

Water tight and air tight sealing systems for cable transits

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Water tight and air tight sealing systems for cable transits

Preface

This Kiwa Covenant has been prepared by the Technical Committee “Sealing products” of Kiwa Nederland B.V. accepted by the Kiwa Committee of Covenant (KCC). The KCC also supervises the certification activities and where necessary requires the Kiwa Covenant to be revised.

This Kiwa Covenant will be used by Kiwa in conjunction with the Kiwa-Regulations for Product Certification. This regulation details the method employed by Kiwa for conducting the necessary investigations prior to issuing the product certificate and the method of external control. The inspection frequency is determined by the above mentioned Technical Committee and Kiwa Committee of Covenant.

Water tight and air tight sealing systems for cable transits

1. *NOFIRNO* sealing system for cable transits

1.1. Description of the NOFIRNO sealing system

The sealing system consists of a combination of rubber filler sleeves, rubber cable insert sleeves and a sealant. The aperture between penetrating pipe and penetration wall is filled with filler sleeves and on both sides the conduit opening is sealed with a sealant. The thickness of the sealant is 15 or 20 mm, depending on the specific application. For special applications the sealant layer may only be present at one side. The filler sleeves are available in six diameter sizes and in five lengths. The cable inserts sleeves are available in 29 diameter sizes and in five lengths.

1.2. Intended use

The sealing system is intended to be used for the sealing of the transit of a single cable or of multi cables through a penetration in rigid walls, floors, bulkheads and decks. The sealing system is applied in an opening in a concrete wall or floor, or a metal or glass-reinforced plastic conduit frame with maximum dimensions and minimum length in the transit direction as specified in section 1.3 and Annex C. The conduit frame is pre-installed in the wall, floor, bulkhead or deck by means of a proper method (e.g. installed during casting a concrete wall or welded in a metal bulkhead). The sealing system can be applied for cables with outer diameters 4 until 105 mm, using the necessary dimensional limits of the opening, conduit frame, sealant thickness and filling rate (ratio between total of the cable cross sections and penetrated surface of the conduit frame). To enable a proper tight installation the maximum filling rate is set to 50 %.

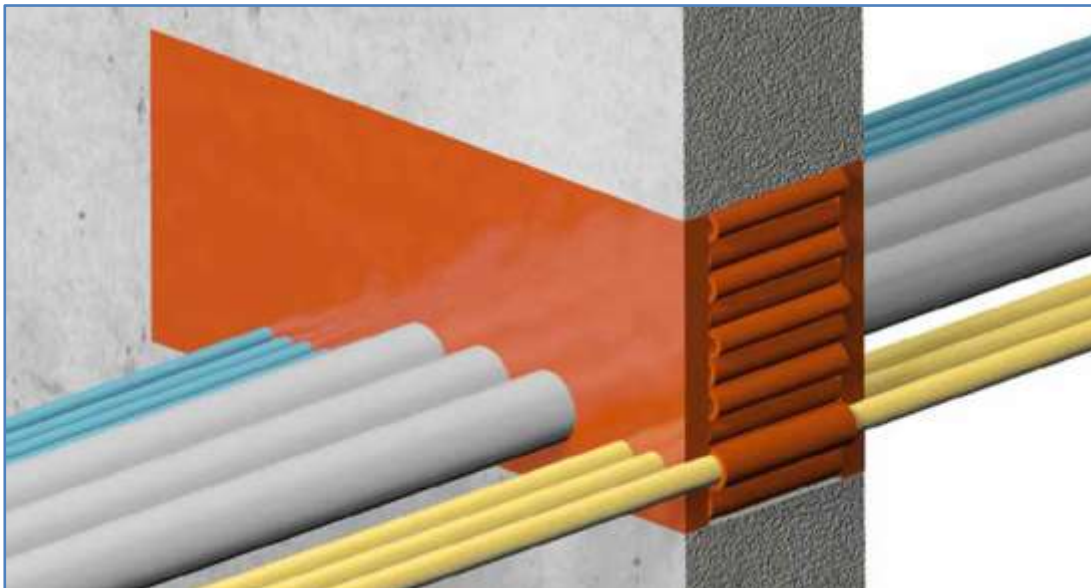


Figure 1. Principle of the NOFIRNO sealing system with cables in a concrete wall

Water tight and air tight sealing systems for cable transits

1.3. Water and air tightness of transits with NOFIRNO sealing system

1.3.1. Water tightness

The NOFIRNO sealing system is water tight and resistant to submerged conditions. Type testing at defined hydrostatic pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

The maximum allowed hydrostatic pressure depends on the dimensions of the wall or floor opening, the transit frame, the number and dimensions of the ducted cables and the thickness of the sealant layer(s).

Table 1. Water tightness

Standard NOFIRNO sealing system	water tightness
Blank circular transits, transit length ≥ 90 mm	from 2,3 bar for $\varnothing 400$ mm) to $\geq 10,3$ bar for $\leq \varnothing 89$ mm
Blank rectangular transits, transit lengths from ≥ 90 mm to ≥ 150 mm	from 0,5 bar for 1000×600 mm, length ≥ 150 mm to $\geq 10,2$ bar for $\leq 120 \times 60$ mm, length ≥ 90 mm

Transits of cables lead to higher values.

Users of the NOFIRNO sealing system shall consult Beele Engineering for the pressure rating for the applicable specific applications.

In Annex C an overview of the values for cable transits with the NOFIRNO sealing system is presented.

1.3.2. Air tightness

The NOFIRNO sealing system is air tight. Type testing at defined static air pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Because of the behaviour of flexible sealing products, assessment of the air/gas tightness is necessary for both low pressure as well as high pressure applications.

Table 2. Air tightness low pressure

NOFIRNO sealing system	air tightness
All transits	0,3 mbar

Table 3. Air tightness high pressure

NOFIRNO sealing system	air tightness
Blank circular transits, transit length ≥ 90 mm	from 2,3 bar for $\varnothing 400$ mm) to $\geq 10,3$ bar for $\leq \varnothing 89$ mm
Blank rectangular transits, transit lengths from ≥ 90 mm to ≥ 150 mm	from 0,5 bar for 1000×600 mm, length ≥ 150 mm to $\geq 10,2$ bar for $\leq 120 \times 60$ mm, length ≥ 90 mm

Water tight and air tight sealing systems for cable transits

2. **CONTROFIL sealing system for cable transits**

2.1. **Description of the CONTROFIL sealing system**

The sealing system consists of combinations of CONTROFIL multi-cable passage rubber blocks and/or multi-cable passage single row rubber blocks and/or CONTROFIL multi-cable passage rubber sleeves and/or CONTROFIL multi-cable rubber filler sleeves and/or CONTROFIL rubber block fillers; on both sides of the transit the conduit opening is sealed with a sealant. The thickness of the sealant is 15 or 20 mm, depending on the specific application.

2.2. **Intended use**

The sealing system is intended to be used for the sealing of the transit of a single cable or of multi cables through a penetration in rigid walls, floors, bulkheads and decks. The sealing system is applied in a metal or glass-reinforced plastic conduit frame with maximum dimensions and minimum length in the transit direction as specified in section 2.3 and annex D. The conduit frame is pre-installed in the wall, floor, bulkhead or deck by means of a proper method (e.g. installed during casting a concrete wall or welded in a metal bulkhead). The allowed maximum variation of the inner dimensions of the transit frames is $\pm 0,1$ mm in order to enable a tight fit of the CONTROFIL components. The sealing system can be applied for cables with outer diameters 4 until 44 mm, using the necessary dimensional limits of the conduit frame, sealant thickness and filling rate (ratio between total of the cable cross sections and penetrated surface of the conduit frame). To enable a proper tight installation the maximum filling rate is limited by the design of the CONTROFIL blocks and sleeves. All available cable openings in the CONTROFIL blocks may be used.

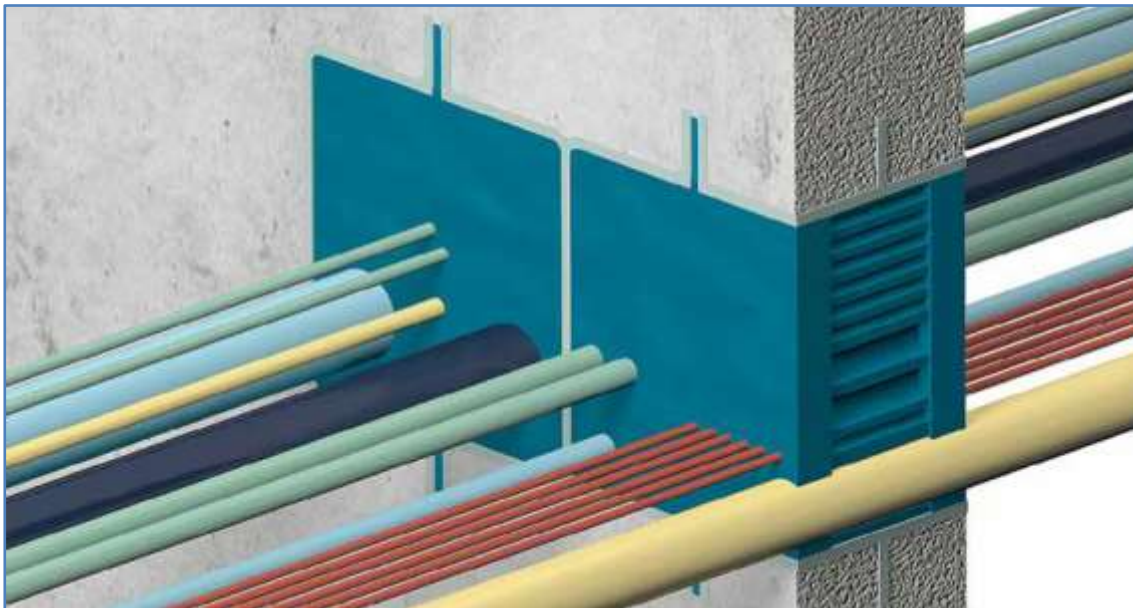


Figure 2. Principle of CONTROFIL sealing system with cables in a concrete wall.

Water tight and air tight sealing systems for cable transits

2.3. Water and air tightness of transits with CONTROFIL sealing system

2.3.1. Water tightness

The CONTROFIL sealing system is water tight and resistant to submerged conditions. Type testing at defined hydrostatic pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

The maximum allowed hydrostatic pressure depends on the dimensions of the wall or floor opening, the transit frame, the number and dimensions of the ducted cables and the thickness of the sealant layer(s).

Table 4. Water tightness

Standard CONTROFIL sealing system	water tightness
Blank rectangular transits, transit lengths from ≥ 90 mm to 190 mm	from 2,8 bar for 150 x 200 mm, length 90 mm, sealant layers 20 mm to 11,5 bar for 60 x 60 mm, length 190 mm, sealant layers 15 mm

Transits of cables lead to higher values.

Users of the CONTROFIL sealing system shall consult Beele Engineering for the pressure rating for the applicable specific applications.

In Annex D an overview of the values for cable transits with the CONTROFIL sealing system is presented.

2.3.2. Air tightness

The CONTROFIL sealing system is air tight. Type testing at defined static air pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Because of the behaviour of flexible sealing products, assessment of the air/gas tightness is necessary for both low pressure as well as high pressure applications.

Table 5. Air tightness low pressure

CONTROFIL sealing system	air tightness
All transits	0,3 mbar

Table 6. Air tightness high pressure

Standard CONTROFIL sealing system	water tightness
Blank rectangular transits, transit lengths from ≥ 90 mm to 190 mm	from 2,8 bar for 150 x 200 mm, length 90 mm, sealant layers 20 mm to 11,5 bar for 60 x 60 mm, length 190 mm, sealant layers 15 mm

Water tight and air tight sealing systems for cable transits

3. *SLIPSIL sealing system for cable transits*

3.1. Description of the SLIPSIL sealing system

The sealing system consists of SLIPSIL rubber sealing plugs, SLIPSIL stainless steel conduit sleeves with welded flange and NOFIRNO rubber gaskets. The rubber sealing plugs consist of two or more segments that are jointed together during installation to form one plug for the sealing of the transit of a single cable or of multi cables through a SLIPSIL conduit in a rigid wall, floor, bulkhead or deck. For building applications the use of CSD HR plastic conduit sleeves, pre-installed during casting of the concrete wall or floor, is also possible. The inner side wall of the plugs has a waved surface; during installation the wave tops are in close contact with the penetrated cable which enables the sealing between cable and plug. The outer side wall of the plugs has lips that are being bended and compressed during installation which enables the sealing between plug and conduit wall. The lips should prevent the plugs from moving while installed. The plug consists of two or more segments for installation reasons. The flat contact surfaces of the plug segments are pressed together while installed, enabling sealing between the segments. SLIPSIL conduit sleeves with welded flange and CSD HR plastic conduit sleeves are special designed and constructed for this application.

3.2. Intended use

The rubber sealing plugs are intended to be used for the sealing of the transit of a single cable or of multi cables through rigid walls, floors, bulkheads and decks. The sealing plugs are applied in a metal or glass-reinforced plastic conduit with corresponding suitable inner diameter. The conduit is pre-installed in the wall, floor, bulkhead or deck by means of a proper method (e.g. installed during casting a concrete wall or welded in a metal bulkhead). The sealing plugs can be applied for cables with diameter 5 until 105 mm.

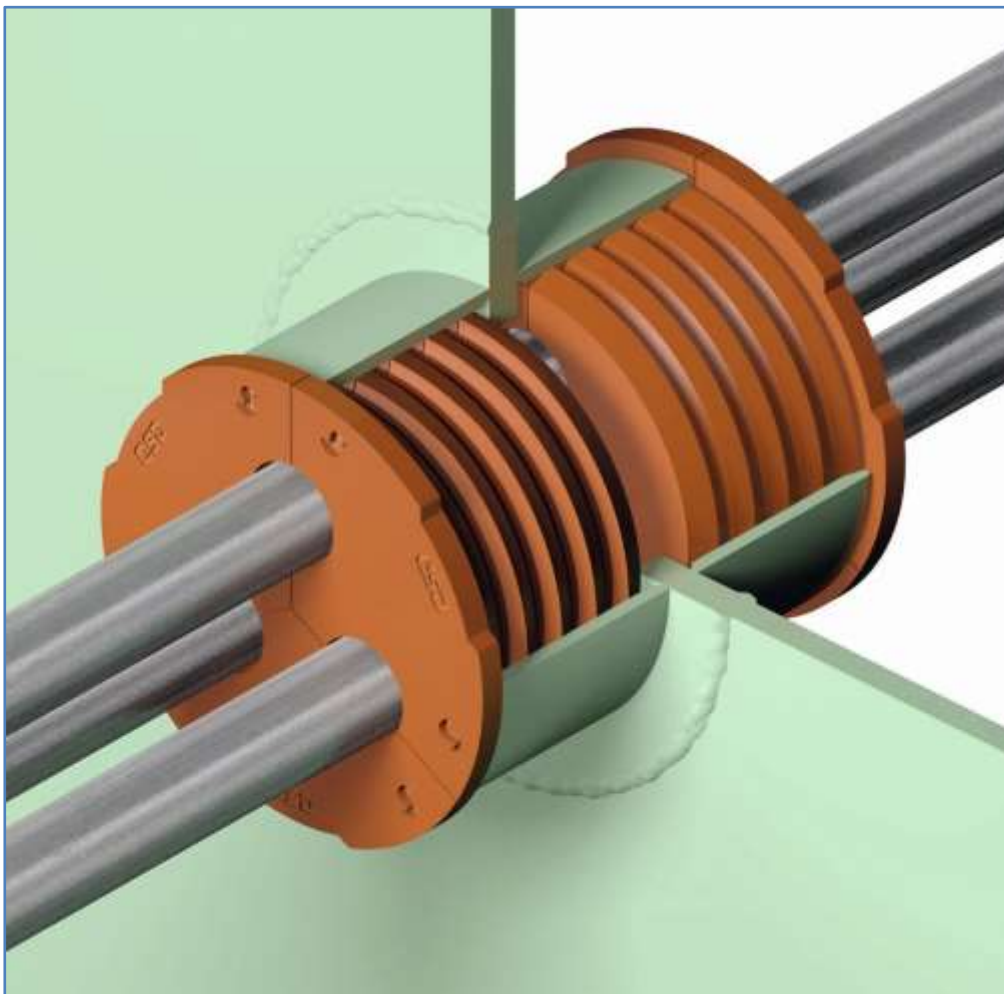


Figure 3. Principle of SLIPSIL sealing system with cables in a bulkhead.

Water tight and air tight sealing systems for cable transits

3.3. Water and air tightness of transits with SLIPSIL sealing system

3.3.1. Water tightness

The SLIPSIL sealing system is water tight and resistant to submerged conditions. Type testing at defined hydrostatic pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Table 7. Water tightness

SLIPSIL sealing system			water tightness
SLIPSIL plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
SLIPSIL 25/0 until 339/0	25 – 339 mm	Blank	2,5
SLIPSIL 25/5-6 until 339/105	25 – 339 mm	5 – 105 mm	2,5

3.3.2. Air tightness

The SLIPSIL sealing system is air tight. Type testing at defined static air pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Because of the behaviour of flexible sealing products, assessment of the air/gas tightness is necessary for both low pressure as well as high pressure applications.

Table 8. Air tightness low pressure

SLIPSIL sealing system	air tightness
All configurations	0,3 mbar

Table 9. Air tightness high pressure

SLIPSIL sealing system			air tightness
SLIPSIL plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
SLIPSIL 25/0 until 339/0	25 – 125 mm	Blank	2,5
SLIPSIL 25/5-6 until 339/105	25 – 339 mm	5 – 105 mm	2,5

Water tight and air tight sealing systems for cable transits

4. *DYNATITE* sealing system for cable transits

4.1. Description of the *DYNATITE* sealing system

The sealing system consists of *DYNATITE* rubber sealing plugs, *DYNATITE* stainless steel conduit sleeves with welded flange and *NOFIRNO* rubber gaskets. The rubber sealing plugs consist of two or more segments that are jointed together during installation to form one plug for the sealing of the transit of a single cable or of multi cables through a *DYNATITE* conduit in a wall, floor, bulkhead or deck. The inner side wall of the plugs has a waved surface; during installation the wave tops are in close contact with the penetrated cable which enables the sealing between cable and plug. The outer side wall of the plugs has lips that are being bended and compressed during installation around the cable inside the conduit sleeve which enables the sealing of the transit. The lips should prevent the plugs from moving while installed. The plug consists of two or more segments for installation reasons. The flat contact surfaces of the plug segments are pressed together while installed, enabling sealing between the segments. *DYNATITE* conduit sleeves with welded flange are special designed and constructed for this application.

4.2. Intended use

The rubber sealing plugs are intended to be used for the sealing of the transit of a single cable or of multi cables through rigid walls, floors, bulkheads and decks. The sealing plugs are applied in a *DYNATITE* stainless steel conduit with corresponding suitable inner diameter. The conduit is pre-installed to or in the wall, floor, bulkhead or deck by means of a proper method (e.g. mounted with the use of a *NOFIRNO* gasket or welded in a metal bulkhead). The *DYNATITE* sealing system can be applied for cables with diameter 5 until 105 mm.

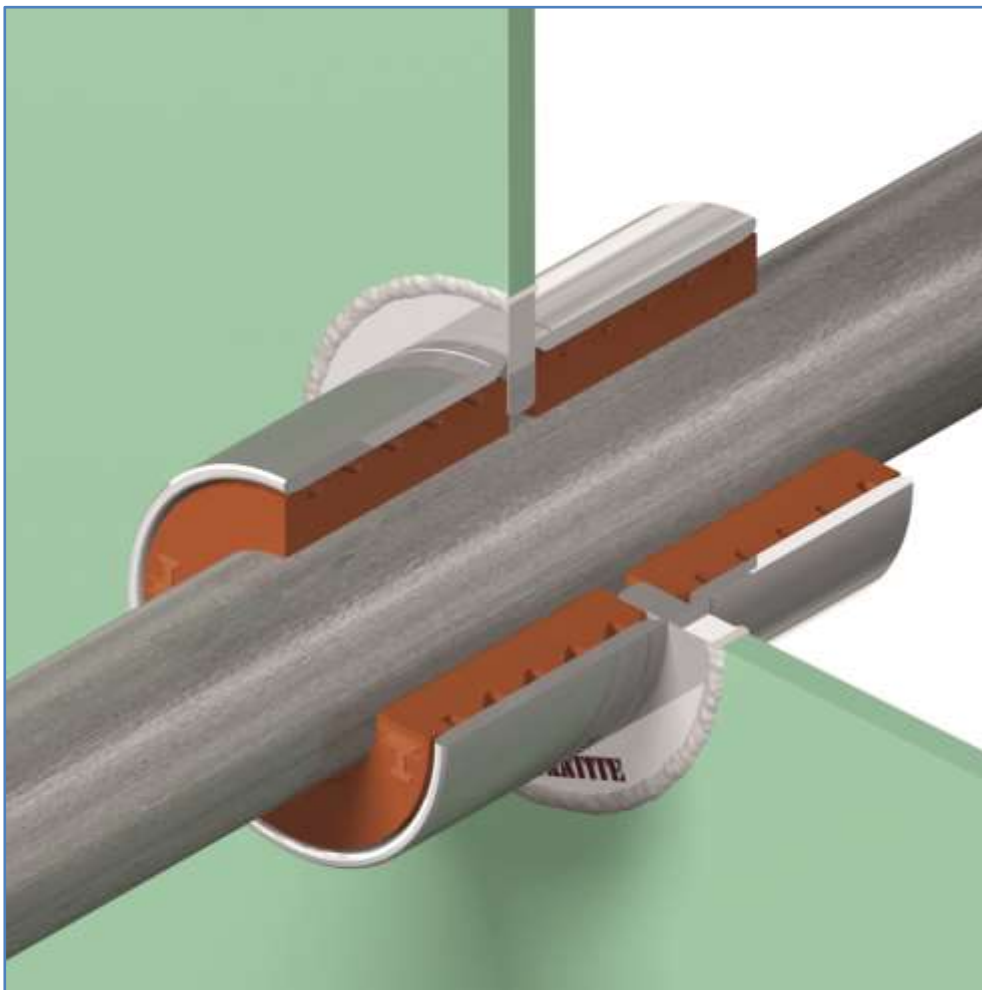


Figure 4. Principle of *DYNATITE* sealing system with cables in a bulkhead.

Water tight and air tight sealing systems for cable transits

4.3. Water and air tightness of transits with DYNATITE sealing system

4.3.1. Water tightness

The DYNATITE sealing system is water tight and resistant to submerged conditions. Type testing at defined hydrostatic pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Table 10. Water tightness

DYNATITE sealing system			water tightness
DYNATITE plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
DYNATITE 25/ODT until 339/ODT	25 – 339 mm	Blank	2,5
DYNATITE 25/5-6DT until 339/105DT	25 – 339 mm	5 – 105 mm	2,5
DYNATITE 25/5-6DT until 150/105DT	25 – 150 mm	5 – 105 mm	8

Table 11. Water tightness

DYNATITE sealing system			water tightness
DYNATITE plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
DYNATITE 25/5-6DT until 82/42-44DT	25 – 82 mm	5 – 44 mm	15

4.3.2. Air tightness

The DYNATITE sealing system is air tight. Type testing at defined static air pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Because of the behaviour of flexible sealing products, assessment of the air/gas tightness is necessary for both low pressure as well as high pressure applications.

Table 12. Air tightness low pressure

DYNATITE sealing system	air tightness
All configurations	0,3 mbar

Table 13. Air tightness high pressure

DYNATITE sealing system			air tightness
DYNATITE plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
DYNATITE 25/ODT until 339/ODT	25 – 339 mm	Blank	2,5
DYNATITE 25/5-6DT until 339/273DT	25 – 339 mm	5 – 105 mm	2,5

Water tight and air tight sealing systems for cable transits

5. *CET-A-SIL sealing system for cable transits*

5.1. Description of the CET-A-SIL sealing system

The sealing system consists of a combination of rubber plugs, rubber gasket and an aluminium body or a body of multi-holed high-modulus poly ethene (HMPE). The sealing system is applied in the wall of electrical cable boxes. The aluminium or HMPE body is mounted with bolts to the opening in a cable box. A rubber gasket is used for the sealing between body and cable box. The rubber sealing plugs consist of two segments that are jointed together during installation to form one plug for the sealing of the penetration of a single cable through a circular hole in the aluminium or HMPE body. The inner side wall of the plugs has a waved surface; during installation the wave tops are in close contact with the penetrated cable which enables the sealing between cable and plug. The outer side wall of the plugs has lips that are being bended and compressed during installation which enables the sealing between plug and aluminium or HMPE body. The lips should prevent the plugs from moving while installed. The plug consists of two segments for installation reasons. The flat contact surfaces of the two plug segments are pressed together while installed, enabling sealing between the two segments.

5.2. Intended use

The sealing system is intended to be used for the sealing of the transit of a single cable or of multi cables through the walls of electrical cable boxes. The sealing system can be applied for cables with outer diameter 4 until 40 mm.

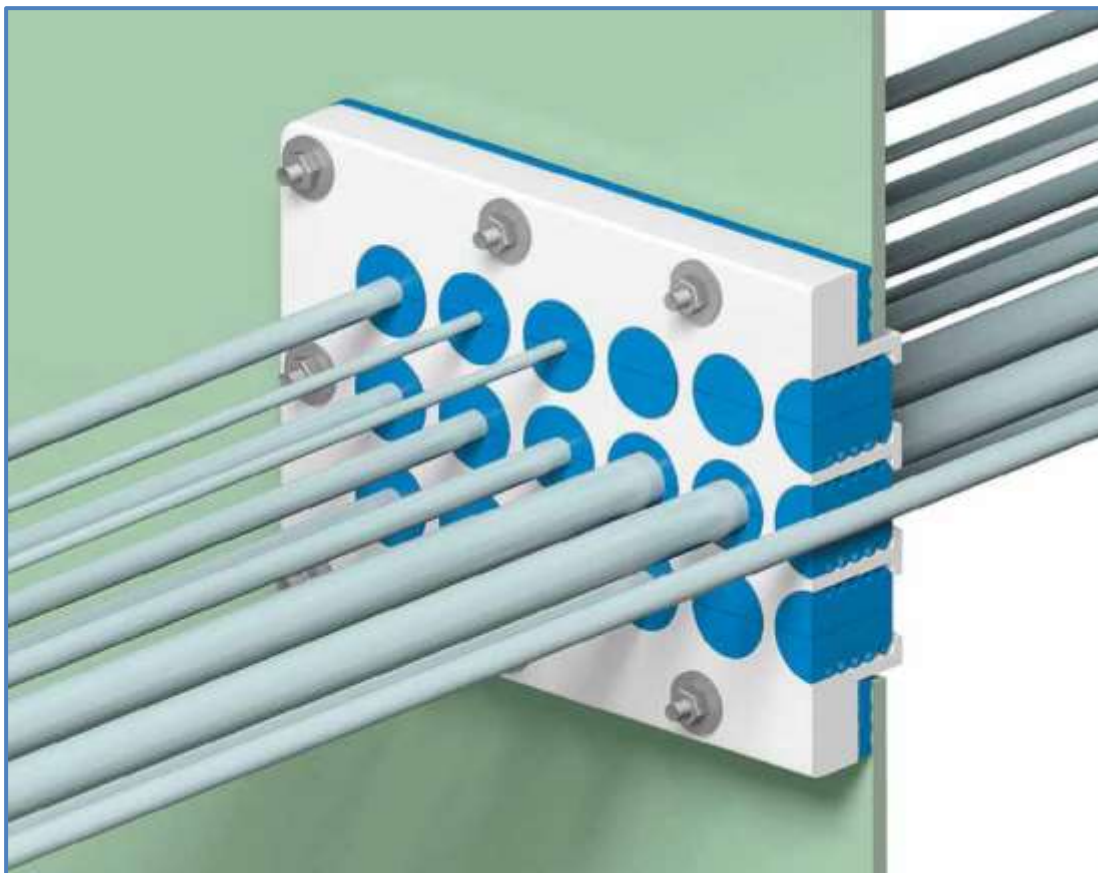


Figure 5. Principle of CET-A-SIL sealing system with cables in a metal wall.

Water tight and air tight sealing systems for cable transits

5.3. Water and air tightness of transits with CET-A-SIL sealing system

5.3.1. Water tightness

The CET-A-SIL sealing system is water tight and resistant to submerged conditions. Type testing at defined hydrostatic pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Table 14. Water tightness

CET-A-SIL sealing system			water tightness
CET-A-SIL plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
CET-A-SIL 15/0 until 60/0	15 – 60 mm	Blank	0,4
CET-A-SIL 15/4 until 60/40	15 – 60 mm	4 – 40 mm	0,4

5.3.2. Air tightness

The CET-A-SIL sealing system is air tight. Type testing at defined static air pressure on transit seals before and after minimum 1 year after installation, without any allowed manipulation (repair, replacement, re-tightening, et cetera) of the sealing system after initial installation.

Because of the behaviour of flexible sealing products, assessment of the air/gas tightness is necessary for both low pressure as well as high pressure applications.

Table 15. Air tightness low pressure

CET-A-SIL sealing system	air tightness
All configurations	0,3 mbar

Table 16. Air tightness high pressure

CET-A-SIL sealing system			air tightness
CET-A-SIL plugs	Conduit range Inner diameters	Cable range Outer diameter	Maximum pressure [bar]
CET-A-SIL 15/0 until 60/0	15 – 60 mm	Blank	0,4
CET-A-SIL 15/4 until 60/40	15 – 60 mm	4 – 40 mm	0,4

The CET-A-SIL sealing system is resistant to sudden pressure shocks (blast incidents).

Table 17. Blast resistance

CET-A-SIL sealing system	Blast resistance
All configurations	1 bar in 200 msec

Water tight and air tight sealing systems for cable transits

6. *Quality system requirements*

6.1. **General**

This chapter contains the requirements that have to be fulfilled by the manufacturer's quality system.

6.2. **Manager of the quality system**

Within the manufacturer's organisational structure an employee must be appointed who is in charge of managing the quality system.

6.3. **Internal quality control/quality plan**

As part of the quality system the manufacturer must implement an internal quality control schedule (IQC-scheme).

In this IQC-scheme the following must be demonstrably recorded:

- which aspects are inspected by the manufacturer;
- according to which methods these inspections are carried out;
- how often these inspections are carried out;
- how the inspection results are registered and stored.

The ICQ-schedule must be detailed in such a way that it provides Kiwa sufficient confidence that requirements will be continuously fulfilled.

6.4. **Procedures and work instructions**

The manufacturer must be able to submit:

- procedures for:
 - the handling of non-conforming products;
 - corrective actions in case non-conformities are found;
 - the handling of complaints regarding the products and / or services supplied;
- the work instructions and inspection sheets in use.
- instructions for packaging and closing off of products during storage and transport.

6.5. **External inspection**

The manufacturer's quality system shall be assessed by Kiwa with regard to at least the aspects mentioned in the Kiwa-Regulations for Product Certification.

The Kiwa Committee Covenant will determine the inspection frequency. At the time of validation of this Covenant this frequency has been fixed at 2 inspection visits per year.

Water tight and air tight sealing systems for cable transits

6.6. Quality control of products

6.6.1. Rubber sealing products

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned:

- a. dimensions – internal method
- b. surface imperfections, appearance and colour – internal method
- c. hardness
- d. air tightness of plugs

The product control tests shall be carried out on lots of finished products.

6.6.2. Sealants

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned.

Non cured material:

- a. film structure – internal method
- b. viscosity – internal method
- c. curing - internal method

Cured material:

- a. hardness
- b. appearance and colour – internal method
- c. density

The product control tests shall be carried out on lots of finished products (filled cartridges).

Water tight and air tight sealing systems for cable transits

Annex A. Components and material compositions used for the sealing systems

A.1. NOFIRNO filler and cable sleeves, NOFIRNO gaskets, SLIPSIL and DYNATITE plugs

These components are made of NOFIRNO rubber. The colour of the compound is terracotta. The rubber compound is manufactured and converted into products by Beele Engineering.

A.2. CONTROFIL rubber components

The CONTROFIL rubber components are made of CRUSHNOF rubber. The colour of the compound is blue. The rubber compound is manufactured and converted into products by Beele Engineering.

A.3. CET-A-SIL plugs and gaskets

The CET-A-SIL rubber components are made of CET-A-SIL rubber. The colour of the compound is light blue. The rubber compound is manufactured and converted into products by Beele Engineering.

A.4. NOFIRNO sealant

The material of the sealant is a room temperature curing sealant. For the polymer base two different types are used. The colour of the compound is terracotta. The sealant is also available in blue, black and white. Other colours are admitted on the condition that only the pigment is exchanged in the composition. The sealant compound is manufactured by Beele Engineering and packed in 310 ml plastic cartridges.

Water tight and air tight sealing systems for cable transits

Annex B. Material and product properties

B.1. Physical-mechanical material properties

NOFIRNO rubber filler and cable sleeves

Hardness (ISO 7619-1)	65 – 85 Shore A
Density (ISO 2781)	1,55 – 1,65 Mg/m ³
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Limited oxygen index (ASTM D2863)	min 40 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %

SLIPSIL and DYNATITE rubber sealing plugs; NOFIRNO gaskets

Hardness (ISO 7619-1)	65 – 85 Shore A
Density (ISO 2781)	1,55 – 1,65 Mg/m ³
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Limited oxygen index (ASTM D2863)	min 40 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %
Stress relaxation (ISO 3384) after 7 days at 23 °C	max 19 %
Stress relaxation (ISO 3384) after 100 days at 23 °C	max 28 %
Compression set (ISO 815) after 72 hours at 23 °C	max 15 %
Compression set (ISO 815) after 24 hours at 70 °C	max 20 %

CONTROFIL rubber components

Hardness (ISO 7619-1) *	65 – 85 Shore A
Density (ISO 2781) *	1,55 – 1,65 Mg/m ³
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Stress relaxation after 7 days at 23 °C (ISO 3384)	max 20 %
Stress relaxation after 100 days at 23 °C (ISO 3384)	max 30 %
Volume change in water after 7 days at 70 °C (ISO 1817)	max +15 / -1 %
Compression set after 72 hours at 23 °C (ISO 815)	max 17 %
Compression set after 24 hours at 70 °C (ISO 815) *	max 22 %

CET-A-SIL rubber sealing plugs; CET-A-SIL gaskets

Hardness (ISO 7619-1)	65 – 85 Shore A
Density (ISO 2781)	1,55 – 1,65 Mg/m ³
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %
Stress relaxation (ISO 3384) after 7 days at 23 °C	max 19 %
Stress relaxation (ISO 3384) after 100 days at 23 °C	max 28 %
Compression set (ISO 815) after 72 hours at 23 °C	max 15 %
Compression set (ISO 815) after 24 hours at 70 °C	max 20 %

NOFIRNO sealant (cured)

Hardness (ISO 7619-1)	35 – 55 Shore A
Density (ISO 2781)	1,42 – 1,52 Mg/m ³
Elongation at break (ISO 37)	min 50 %
Limited oxygen index (ASTM D2863)	min 37 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %

Water tight and air tight sealing systems for cable transits

B.2. Durability and Serviceability

The use category of the sealing systems is:

Category type X : intended for use at conditions exposed to weathering.

This includes use at external and internal conditions, high temperatures in summer, frost and frost-thaw in winter, exposure to UV and exposure to rain.

B.3. Durability of physical-mechanical properties of surface layer

Physical-mechanical properties after exposition during 28 days to UV-irradiation in a UV chamber, followed by 14 days in an environmental chamber, using the exposure conditions according to clause 4.2.3 EOTA TR 024.

NOFIRNO sleeves and gaskets, SLIPSIL and DYNATITE plugs

Change of appearance:	no change
Change of dimensions:	max. -1 / +1 %
Change of density:	max 2 %
Change of hardness	max 7 Shore A
Change of tensile strength:	max 5 %

CONTROFIL rubber components

Change of appearance:	no change
Change of dimensions:	max. -1 / +1 %
Change of density:	max 2 %
Change of hardness	max 7 Shore A
Change of tensile strength:	max 5 %

CET-A-SIL plugs and gaskets

Change of appearance:	no change
Change of dimensions:	max. -1 / +1 %
Change of density:	max 2 %
Change of hardness	max 7 Shore A
Change of tensile strength:	max 5 %

NOFIRNO sealant

Change of appearance:	no change
Change of density:	max 2 %
Change of hardness	max 5 Shore A

B.4. Components and materials compatibility

The materials of the NOFIRNO rubber filler sleeves and cable insert sleeves, CET-A-SIL, SLIPSIL and DYNATITE rubber sealing plugs, the CONTROFIL rubber components and the NOFIRNO sealant are compatible with metal parts, unplasticised plastic parts and polymeric cable sheaths.

Water tight and air tight sealing systems for cable transits

Annex C. Water tightness NOFIRNO sealing system

Table C1. NOFIRNO sealing system – sealant layer at both sides - blank seals (no cables)

Applicable transits – NOFIRNO sealing system – sealant layer at both sides				Hydrostatic pressure resistance [bar]
Circular transit Inner diameter [mm]	Transit length [mm]	Sealant layers [mm]	Cable range Outer diameter	Minimal 60 minutes
0 – 89	≥ 90	20	Blank	10,3*
89 – 133	≥ 90	20	Blank	6,8*
133 – 168	≥ 90	20	Blank	5,4*
168 – 219	≥ 90	20	Blank	4,1*
219 – 273	≥ 90	20	Blank	3,3*
273 – 400	≥ 90	20	Blank	2,3*
0 - 89	≥ 90	15	Blank	7,7*
89 - 133	≥ 90	15	Blank	5,1*
133 - 168	≥ 90	15	Blank	4,1*
168 - 219	≥ 90	15	Blank	3,1*
Rectangular transit W x H [mm]	Transit length [mm]	Sealant layers [mm]	Cable range Outer diameter	Minimal 60 minutes
120 x 240	≥ 90	15	Blank	3,8*
120 x 60	≥ 90	15	Blank	7,7*
120 x 240	≥ 100	20	Blank	5,1*
120 x 60	≥ 100	20	Blank	10,2*
170 x 200	≥ 90	15	Blank	3,3*
170 x 200	≥ 100	20	Blank	4,4*
200 x 273	≥ 150	20	Blank	3,5*
300 x 600 (4 partitions)	≥ 150	20	Blank	4,1*
600 x 600 (4 partitions)	≥ 150	20	Blank	2,7*
600 x 1000	≥ 150	20	Blank	0,8*

* circular transits: for smaller diameters than the maximum diameter of this range, the hydrostatic pressure resistance is higher.
 rectangular transits: for smaller transits than mentioned here, the hydrostatic pressure resistance is higher
 Consult Beele Engineering for the pressure rating for your specific applications

Water tight and air tight sealing systems for cable transits

Table C2. NOFIRNO sealing system – sealant layer at one side - blank seals (no cables)

Applicable transits – NOFIRNO sealing system – sealant layer at one side				Hydrostatic pressure resistance [bar]
Circular transit Inner diameter [mm]	Transit length [mm]	Sealant layer [mm]	Cable range Outer diameter	Minimal 60 minutes
0 – 89	≥ 90	20	Blank	9,1*
89 – 133	≥ 90	20	Blank	6,1*
133 – 168	≥ 90	20	Blank	4,8*
168 – 219	≥ 90	20	Blank	3,7*
219 – 240	≥ 90	20	Blank	3,4*
Rectangular transit W x H [mm]	Transit length [mm]	Sealant layer [mm]	Cable range Outer diameter	Minimal 60 minutes
120 x 240	≥ 90	15	Blank	3,2*
120 x 60	≥ 90	15	Blank	6,5*
120 x 240	≥ 100	20	Blank	4,3*
120 x 60	≥ 100	20	Blank	8,6*
170 x 200	≥ 90	15	Blank	2,8*
170 x 200	≥ 100	20	Blank	3,7*
200 x 273	≥ 150	20	Blank	3,0*
300 x 600 (4 partitions)	≥ 150	20	Blank	3,4*

* for smaller transits than mentioned here, the hydrostatic pressure resistance is higher

Transits of cables lead to higher W60 Class values.

Users of the NOFIRNO sealing system shall consult Beele Engineering for the pressure rating for the applicable specific applications.

Water tight and air tight sealing systems for cable transits

Annex D. Water tightness CONTROFIL sealing system

Table D1. CONTROFIL sealing system – sealant layer at both sides - blank seals (no cables)

Applicable transits – CONTROFIL sealing system – sealant layer at both sides				Hydrostatic pressure resistance [bar]
Rectangular transit W x H [mm]	Transit length [mm]	Sealant layer [mm]	Cable range Outer diameter	Minimal 60 minutes
60 x 60	≥ 90	15	Blank	8,5*
60 x 60	≥ 90	20	Blank	8,0*
60 x 60	≥ 130	20	Blank	11,5
60 x 120	≥ 90	15	Blank	6,4*
60 x 120	≥ 90	20	Blank	6,0*
60 x 120	≥ 130	20	Blank	8,5*
120 x 120	≥ 90	15	Blank	3,3*
120 x 120	≥ 90	20	Blank	4,0*
120 x 120	≥ 130	20	Blank	5,7*
150 x 150	≥ 90	15	Blank	3,4*
150 x 150	≥ 90	20	Blank	3,4*
150 x 150	≥ 130	20	Blank	4,6*
150 x 200	≥ 90	15	Blank	3,0*
150 x 200	≥ 90	20	Blank	2,8*
150 x 200	≥ 130	20	Blank	4,0

* for smaller transits than mentioned here, the hydrostatic pressure resistance is higher

Transits of cables lead to higher W60 Class values.

Users of the CONTROFIL sealing system shall consult Beele Engineering for the pressure rating for the applicable specific applications.