

**SAFETY
SEALING
SYSTEMS**



INSTALLATION INSTRUCTIONS NOFIRNO® (MULTI-) PIPE TRANSITS IN HR SLEEVES IN COMPOSITE PANELS E160 - A60 CLASS



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**TECHNOLOGY DEVELOPED BY BEELE ENGINEERING BV
COMPOUNDING AND PRODUCTION IN THE ULTRA-MODERN
MANUFACTURING FACILITIES IN AALTEN/THE NETHERLANDS
UNDER A STRINGENT ISO 9001:2015 QUALITY SYSTEM
MORE THAN 45 YEARS R&D ON QUALITY, DURABILITY & FUNCTIONALITY**

Beele campus 45.000 m²
building phase 1 started september 2017



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Research & Development

: BEELE Engineering BV, Aalten, the Netherlands.

Note

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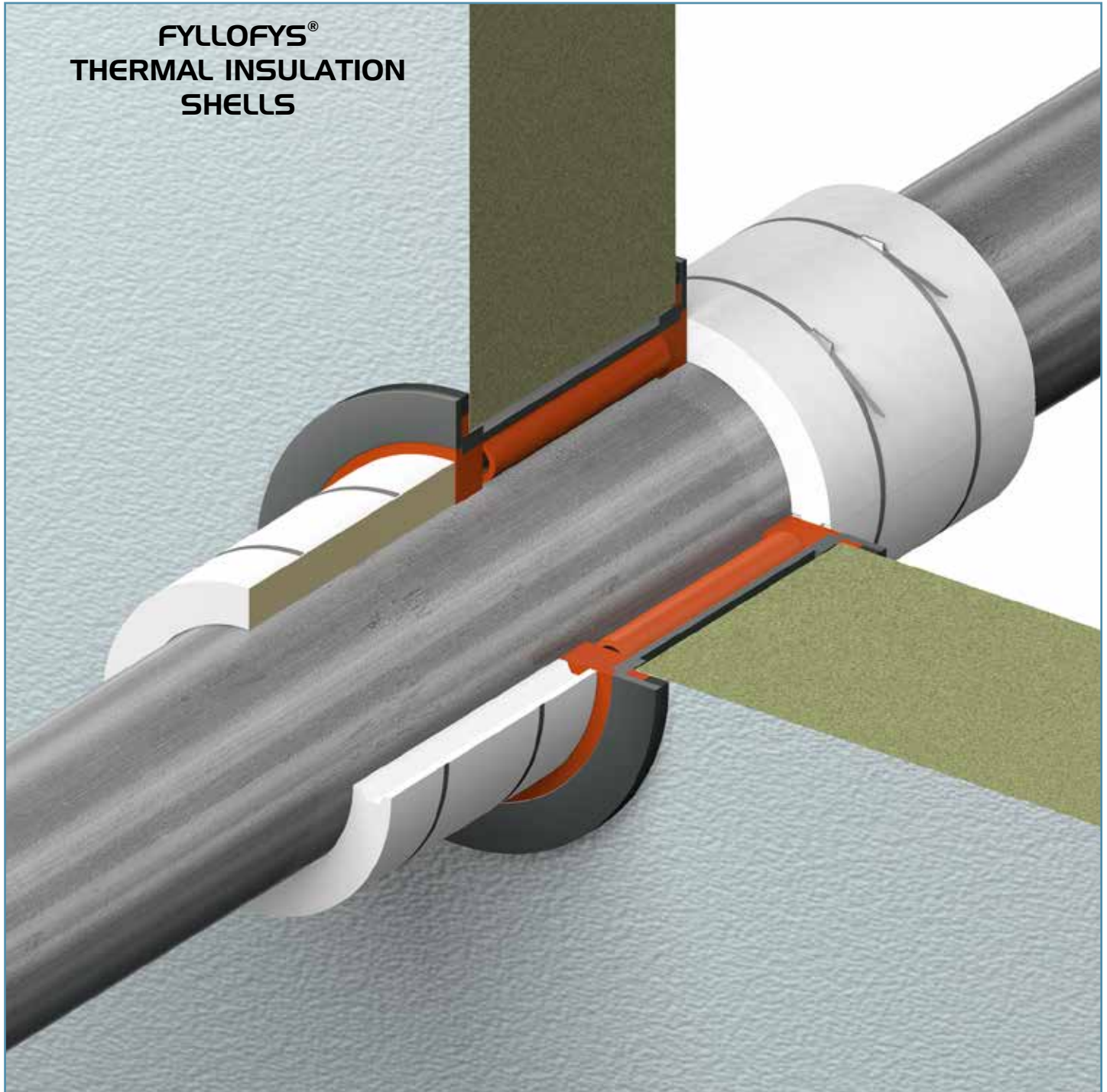
®

: ACTIFOAM, AQUASTOP, BEEBLOCK, BEEBOND, BEELE, BEELE WE CARE, BEESEAL, CONDUCTON, CONTITITE, CONTROFIL, CRUSHER, CRUSHNOF, CSD, CSD THE SIMPLE SEAL SYSTEM, DRIFIL, DYNATITE, FIRAQUA, FIREQUAKE, FIRSTO, FISSIC, FIWA, FYLLOFYS, GLANDMOD, LEAXEAL, MULTI-ALL-MIX, NOFIRNO, profiles NOFIRNO gaskets, RAPID TRANSIT SYSTEM, RIACNOF, RISE, RISWAT, SEALING VALLEY, \$, SLIPSIL, flanges SLIPSIL plugs, ULEPSI, XATTAX and YFESTOS are registered trade marks of BEELE Engineering.

brochure code

: installation NOFIRNO-HR composite pipe

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC



A requirement for EI and A-class (with the exception of A-0 class) testing resp. according to EN 1366-3:2009 and FTP Code 2010, International Code for Application of Fire Test Procedures (Resolution MSC.307(88)) 2012 Edition is not to exceed the specified maximum temperature rise of 180 °C on the unexposed side. To meet this criterion, parts with a high thermal conductivity have to be insulated. Generally the same insulation as used for thermal insulation of the bulkheads and decks is used for this purpose. FYLLOFYS® is developed and integrated in all BEELE® sealing systems to offer easy to apply, prefabricated insulation parts in the form of shells, rings and other shapes.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC

HR conduit sleeves and coamings, flanges and distance holders



HR plastic operating temperature
up to +240 °C continuously

HR plastic conduit sleeves and coamings have been developed for installation of NOFIRNO® cable and pipe transits in sandwich and composite panels. The thermoplastic is 40% glass filled and has a Limited Oxygen Index of 47%. These properties are useful to fulfil the required fire ratings.

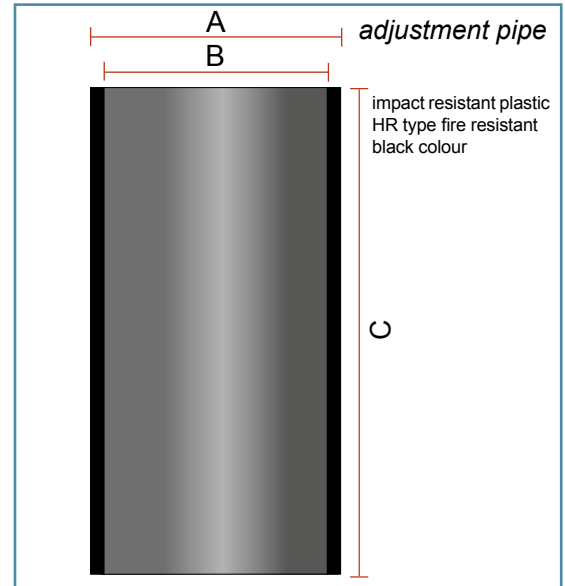
NOFIRNO® sealant adheres very well to the HR plastic, in this way providing a system that can be glued to the panels rather than bolting or clamping.

Flanges and adapter pipes with a maximum size of 250 mm and flanges and coamings to a maximum size of 300x150 mm are available. The adapter pipes/coamings have a length of 300 mm and can be cut to size. For the most common sizes telescope conduit sleeves (male/female) have been developed facilitating most easy installation of the conduits in the sandwich panels.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC

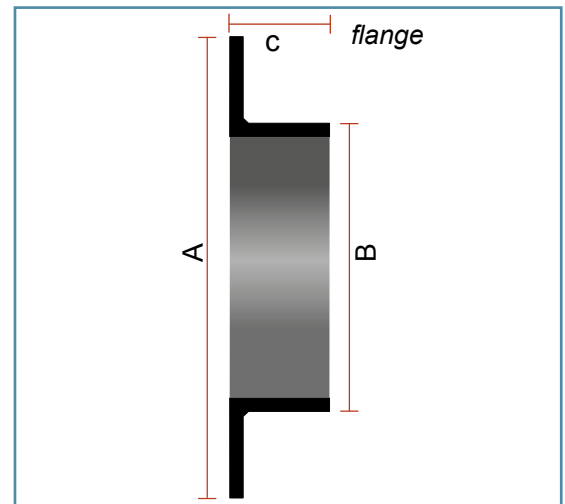
type	A	B	C	art. no. HR
HR 50 AP	58	50	200	60.9223
HR 80 AP	88	80	300	60.9226
HR 100 AP	110	100	300	60.9227
HR 125 AP	135	125	300	60.9228
HR 160 AP	170	160	300	60.9229
HR 200 AP	210	200 <td 300	60.9230	
HR 250 AP	260	250	300	60.9231

BEELE HR adjustment pipe cut to size to adjust to the required length on the basis of the thickness of wall/floor



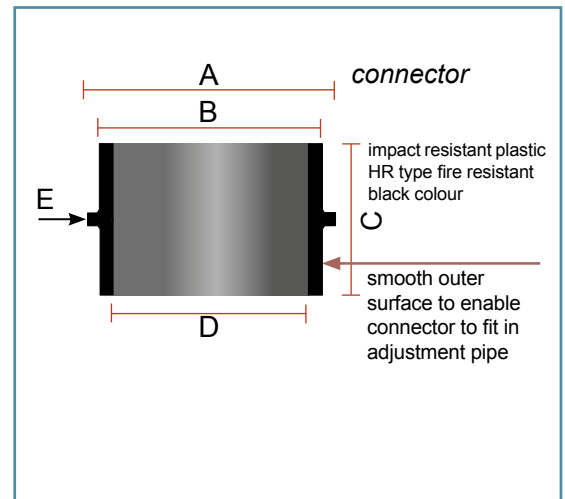
type	A	B	C	art. no. HR
HR 50 FL	110	66	30	60.9281
HR 80 FL	140	96	30	60.9284
HR 100 FL	170	130	30	60.9285
HR 125 FL	195	145	35	60.9286
HR 160 FL	240	180	35	60.9287
HR 200 FL	280	220	40	60.9288
HR 250 FL	330	270	40	60.9289

BEELE HR flanges to be glued on the BEELE HR adapter pipes and to the wall of the floor construction



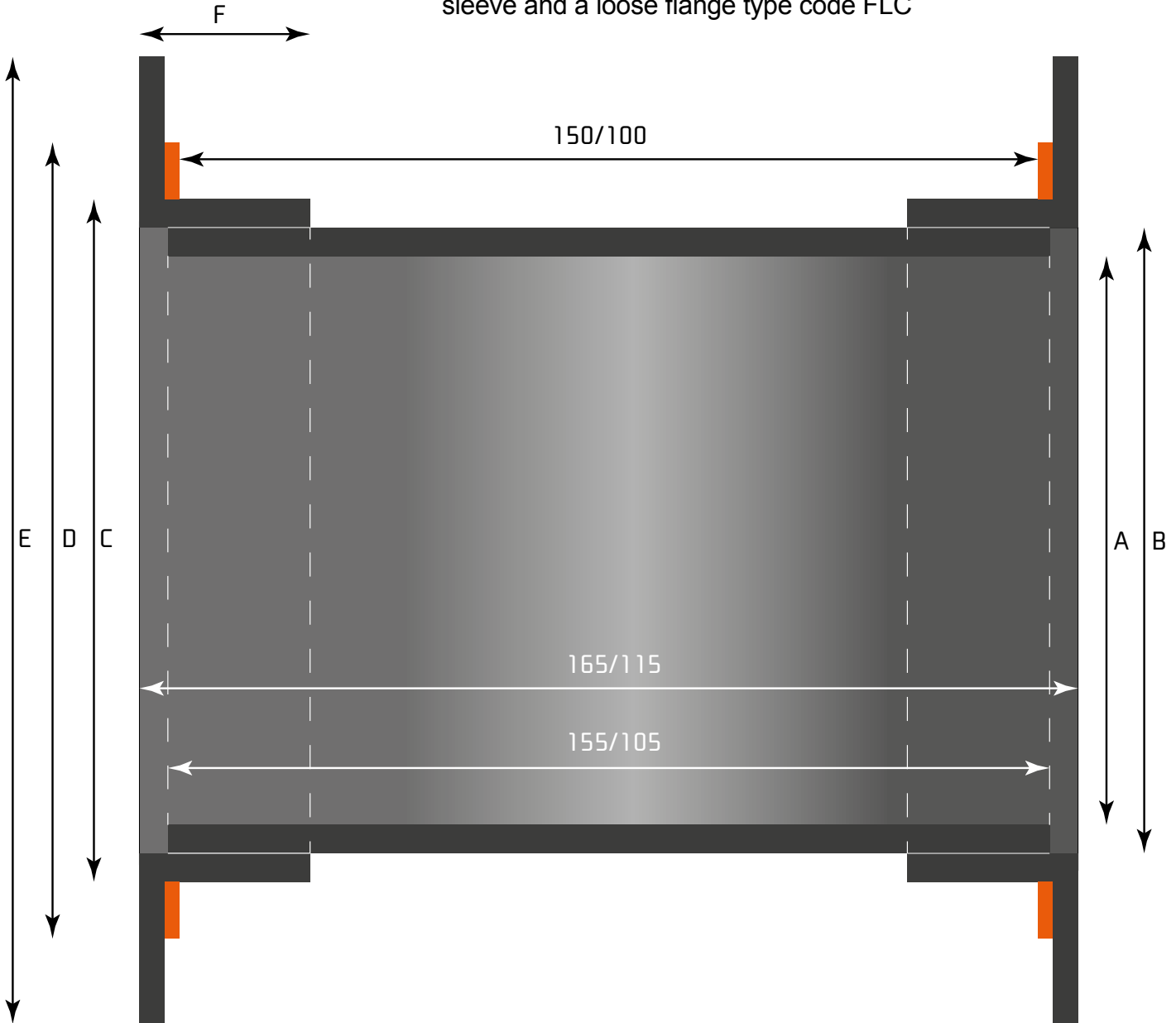
type	A	B	C	D	E	art. no. HR
HR 50 CP	58	50	48	38	6	60.9243
HR 80 CP	88	80	48	68	6	60.9246
HR 100 CP	110	100	48	88	6	60.9247
HR 125 CP	135	125	48	113	6	60.9248
HR 160 CP	170	160	48	148	6	60.9249
HR 200 CP	210	200	48	188	6	60.9250
HR 250 CP	260	250	48	238	6	60.9251

BEELE HR connectors to be used to connect BEELE HR adapter pipes for wall/floors thicker than 300 mm



INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC

BEELE HR sets for standard composite panels 100 and 150 mm thick can be delivered with a flange already fixed on the conduit sleeve and a loose flange type code FLC



type	A	B	C	D	E	F	art. no. FLC 100	art. no. FLC 150
HR 50 FLC	50	58	66	86	110	30	60.9700	60.9710
HR 80 FLC	80	88	96	116	140	30	60.9701	60.9711
HR 100 FLC	100	110	120	140	170	30	60.9702	60.9712
HR 125 FLC	125	135	145	165	195	35	60.9703	60.9713
HR 160 FLC	160	170	180	200	240	35	60.9704	60.9714
HR 200 FLC	200	210	220	240	280	40	60.9705	60.9715
HR 250 FLC	250	260	270	290	330	40	60.9706	60.9716

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC

PRODUCT INFORMATION SEALANT

01) colour	red brown
02) specific gravity	1.40 ± 0.03 g/cm ³
03) curing of top layer	0.5 - 1 hour depending on temperature and air humidity
04) service temperature	-50 °C up to +180 °C
05) tensile strength	1.5 MPa
06) elongation at break	200%
07) hardness	45 Shore A
08) elastic deformation	approx. 50%
09) resistance	UV, Ozone, arctic conditions
10) ageing	more than 20 years
11) supplied in	310 ml cartridges
12) storage	to be stored cool and dry min/max temperature = +5/+30° C
13) storage life	guaranteed 6 months; when applied later than 6 months after date of manufacturing, curing and adhesive properties have to be checked before application

article number 50.0102



NOFIRNO® is absolutely HALOGEN FREE with zero VOC (volatiles organic compounds) according to TÜV report 89206405-01. Furthermore NOFIRNO® has a low smoke index and a high oxygen index (ISO 4589-2: 1996), and low flame spread characteristics according to IMO Resolution A.653(16). NOFIRNO® is a paste-like compound which is simple to use. NOFIRNO® has a balanced viscosity and can be applied overhead.

black



article number 50.0104

white



article number 50.0105

blue grey



article number 50.0106

concrete grey



article number 50.0111

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC

NOFIRNO® MULTI-FILLER SLEEVES



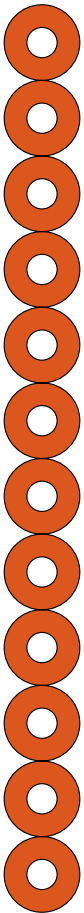
filler sleeves are not split lengthwise

Operating temperatures:
-50 °C up to +180 °C

NOFIRNO® filler sleeves are supplied in multi-sets of 6, 8 and 10 sleeves, depending on the outer dimensions of the sleeves. Single sleeves or smaller sets of sleeves can be torn off easily. To tear off sleeves from the multi-set, the procedure is to do this backwards/forwards and not sideways. This is because of the strength of the intermediate rubber parts.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC

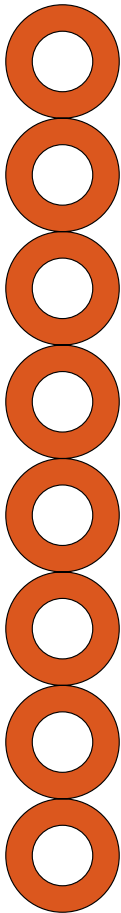
NOFIRNO® MULTI-FILLER SLEEVES



NOFIRNO® multi-filler sleeve 10/4

- art. no. 50.0301 for 60 mm length
- art. no. 50.0361 for 80 mm length
- art. no. 50.0311 for 110 mm length
- art. no. 50.0351 for 130 mm length
- art. no. 50.0321 for 140 mm length
- art. no. 50.0331 for 160 mm length
- art. no. 50.0341 for 210 mm length

to be used for smaller conduit openings

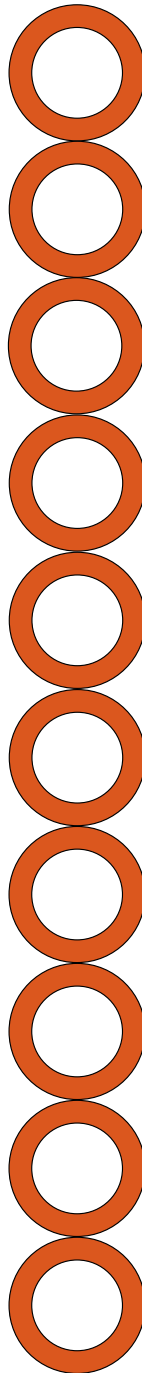


NOFIRNO® multi-filler sleeve 15/8

- art. no. 50.0302 for 60 mm length
- art. no. 50.0302 for 80 mm length
- art. no. 50.0362 for 110 mm length
- art. no. 50.0352 for 130 mm length
- art. no. 50.0322 for 140 mm length
- art. no. 50.0332 for 160 mm length
- art. no. 50.0342 for 210 mm length

NOFIRNO® multi-filler sleeve 20/12

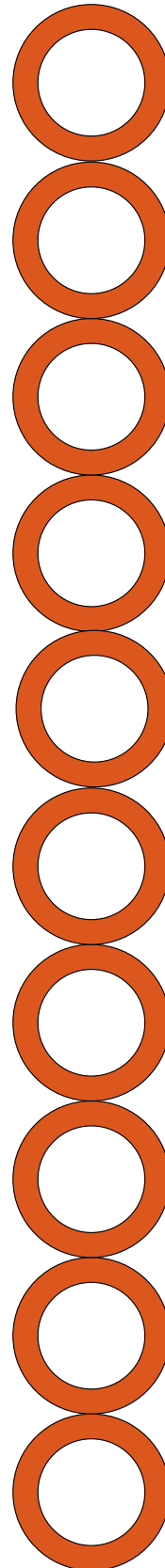
- art. no. 50.0303 for 60 mm length
- art. no. 50.0363 for 80 mm length
- art. no. 50.0313 for 110 mm length
- art. no. 50.0353 for 130 mm length
- art. no. 50.0323 for 140 mm length
- art. no. 50.0333 for 160 mm length
- art. no. 50.0343 for 210 mm length



NOFIRNO® multi-filler sleeve 18/12

- art. no. 80.5050 for 60 mm length
- art. no. 80.5056 for 80 mm length
- art. no. 80.5051 for 110 mm length
- art. no. 80.5055 for 130 mm length
- art. no. 80.5052 for 140 mm length
- art. no. 80.5053 for 160 mm length
- art. no. 80.5054 for 210 mm length

to be used for large conduit openings



NOFIRNO® multi-filler sleeve 22/15

- art. no. 80.5070 for 60 mm length
- art. no. 80.5076 for 80 mm length
- art. no. 80.5071 for 110 mm length
- art. no. 80.5075 for 130 mm length
- art. no. 80.5072 for 140 mm length
- art. no. 80.5073 for 160 mm length
- art. no. 80.5074 for 210 mm length

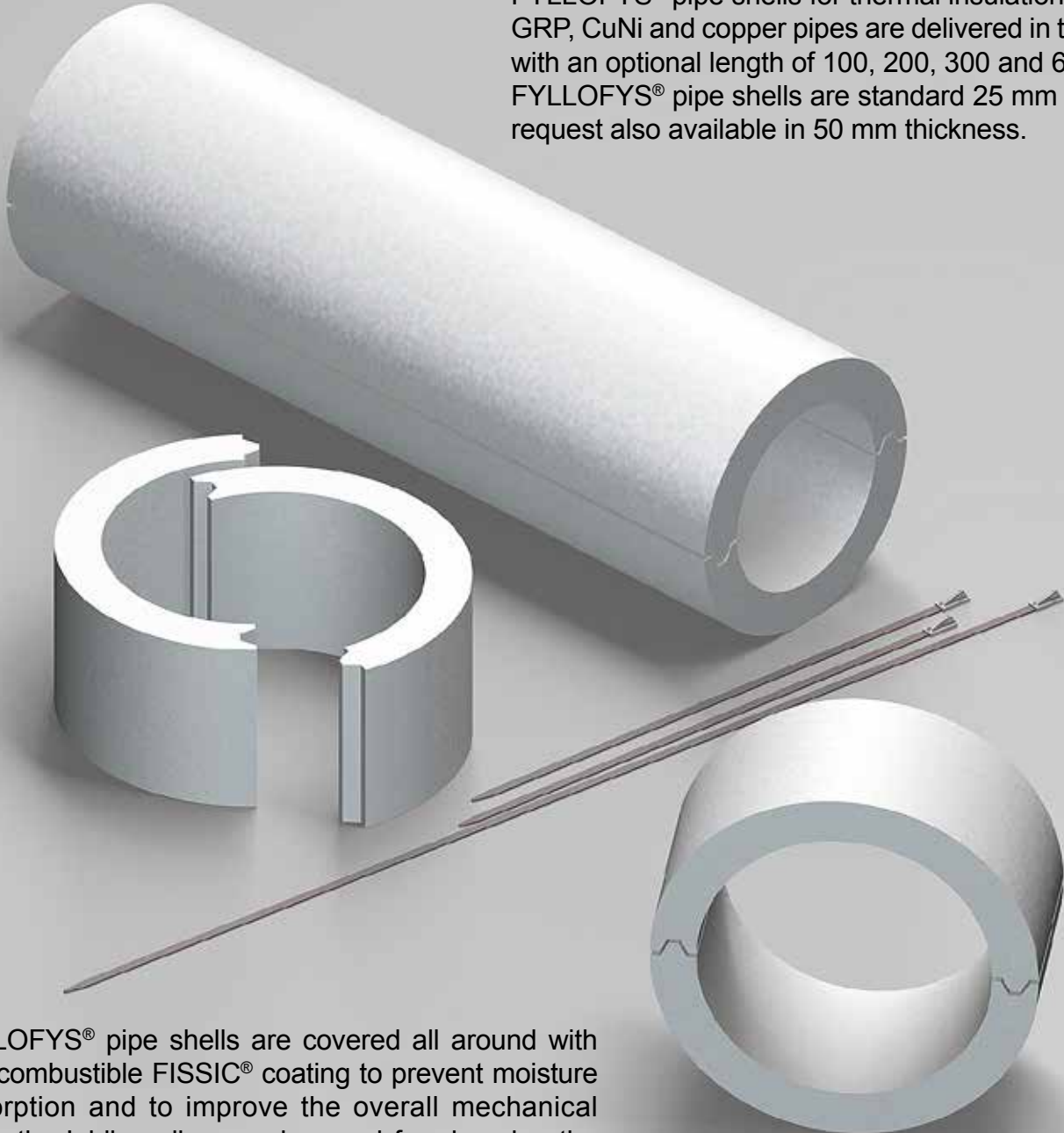
to be used for large conduit openings

filler sleeves are supplied non-split

Operating temperatures:
-50 °C up to +180 °C

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR AND STEEL SLEEVES

FYLLOFYS® pipe shells for thermal insulation of steel, GRP, CuNi and copper pipes are delivered in two parts with an optional length of 100, 200, 300 and 600 mm. FYLLOFYS® pipe shells are standard 25 mm thick, on request also available in 50 mm thickness.



FYLLOFYS® pipe shells are covered all around with non-combustible FISSIC® coating to prevent moisture absorption and to improve the overall mechanical strength. Jubilee clips can be used for clamping the shells on the ducted pipes.

type steel	art. no. 100mm	art. no. 200mm	art. no. 300mm	art. no. 600mm	type copper	art. no. 100mm	art. no. 200mm	art. no. 300mm	art. no. 600mm
FYL25 76.1	55.0110	55.0130	55.0150	55.0190	FYL25 22	55.1004	55.1024	55.1044	55.1084
FYL25 88.9	55.0111	55.0131	55.0151	55.0191	FYL25 28	55.1005	55.1025	55.1045	55.1085
FYL25 114.3	55.0112	55.0132	55.0152	55.0192	FYL25 35	55.1006	55.1026	55.1046	55.1086
FYL25 139.7	55.0113	55.0133	55.0153	55.0193	FYL25 42	55.1007	55.1027	55.1047	55.1087
FYL25 168.3	55.0114	55.0134	55.0154	55.0194	FYL25 54	55.1008	55.1028	55.1048	55.1088
FYL25 219.1	55.0115	55.0135	55.0155	55.0195	FYL25 104	55.1009	55.1029	55.1049	55.1089
* 450 mm on request - art. no. starting 55.0170 - for copper 55.1064					FYL25 108	55.1010	55.1030	55.1050	55.1090

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC

PRODUCT INFORMATION FYLLOFYS® THERMAL INSULATION

01) material base	hydrous phyllosilicate
02) finishing	FISSIC® non-combustible coating
02) specific gravity	500 ± 50 kg/m ³
03) application limit	1100 °C
04) cold compressive strength	1.5 N/mm ² (DIN-EN 1094-5)
05) thermal expansion (linear)	0.6% (750 °C)
06) permanent linear change	< 1% (1000 °C)
07) thermal conductivity	0.15 W/mK (200 °C) 0.17 W/mK (400 °C) 0.19 W/mK (600 °C) ASTM C 1113
08) non-combustible	test report Efectis No. EFR-17-OMI-003574 rev.1 according to FTP code 2010 - Part 1: non-combustibility test (ISO 1182)

PRODUCT INFORMATION FISSIC® PROTECTIVE COATING

FISSIC® is a fire retardant coating on the basis of an APEO-free water-based polymer emulsion without the addition of VOC containing solvents.

FISSIC® has been tested successfully on flame spread characteristics and toxicity and is classed as "not capable of producing excessive quantity of smoke or toxic product". MED certificate 39278/A0 EC issued by Bureau Veritas.

FISSIC® is fire proof and salt water resistance (even after fire). KIWA Netherlands report 20150421HN01.

FISSIC® is gas tight 30 mBar.

FISSIC® is water impermeable. KIWA Netherlands report 20160203TW01

FISSIC® resistance to diesel & petrol. KIWA Netherlands report 20160224TW01

FISSIC® prevents "CUI - corrosion underneath insulation"

FISSIC® successfully SBI tested according to EN 13823:2010 for B-1s-d0 class rating

FISSIC® successfully tested according to ISO 1716 for A2-1s-d0 non-combustible. Warrington report 18250B

FISSIC® adhesion 3.84 MPa according to ISO 4624:08-2003. KIWA report P 10498a

FISSIC® successfully tested on wear resistance according to EN 660-1:1999 - no mass reduction after 2000 double-strokes with a load of 17 kg. KIWA Polymer Institute report P 11035-E

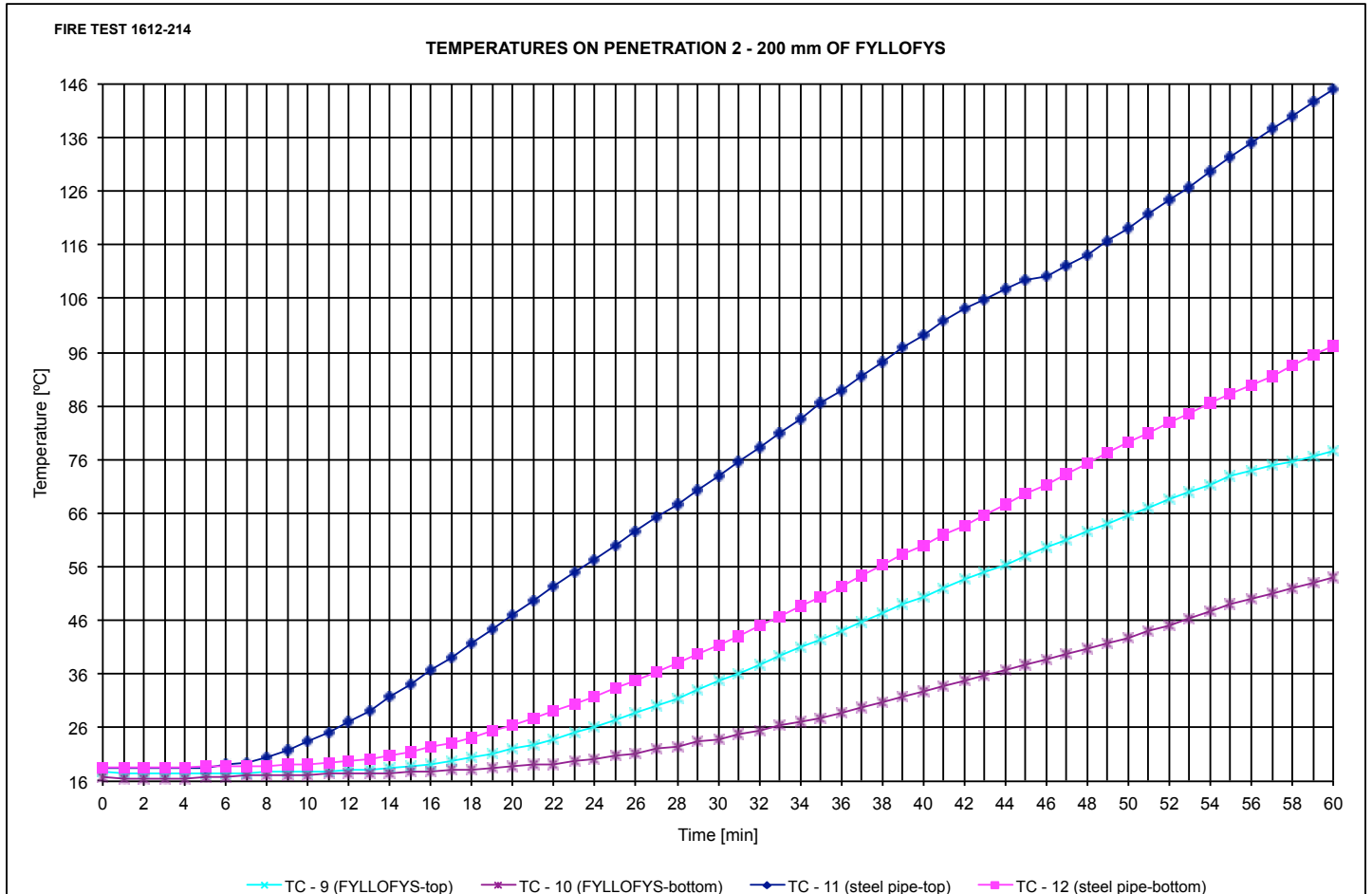
PRODUCT INFORMATION FYLLOFYS®/FISSIC® THERMAL INSULATION PRODUCTS

01) temperature cycling	-50 °C to + 100 °C - no changes
02) QUV weathering	96 hours + 336 hours exposure acc. to ISO 11507 method A - no changes with a 0.5 mm thick FISSIC® coating
03) seawater resistance	96 hours + 336 hours exposure acc. to ISO 9227 - with 0.5 mm thick coating - limited water absorption
04) mechanical stability	FYLLOFYS® with FISSIC® coating - 3 point bending test - improvement of Fmax (N) and DLbreak (%) with coating thickness 0.5 - 1.5 mm

IN-HOUSE TESTING NO. BBV_0042 - MARCH-MAY 2018

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC

FYLLOFYS® THERMAL INSULATION SHELLS



A requirement for EI and A-class (with the exception of A-0 class) testing resp. according to EN 1366-3:2009 and FTP Code 2010, International Code for Application of Fire Test Procedures (Resolution MSC.307(88)) 2012 Edition is not to exceed the specified maximum temperature rise of 180 °C on the unexposed side. To meet this criterion parts with a high thermal conductivity have to be insulated. TC 9 positioned acc. the test protocols satisfies the insulation criterion, as is shown on the graph, by using FYLLOFYS® thermal insulation.

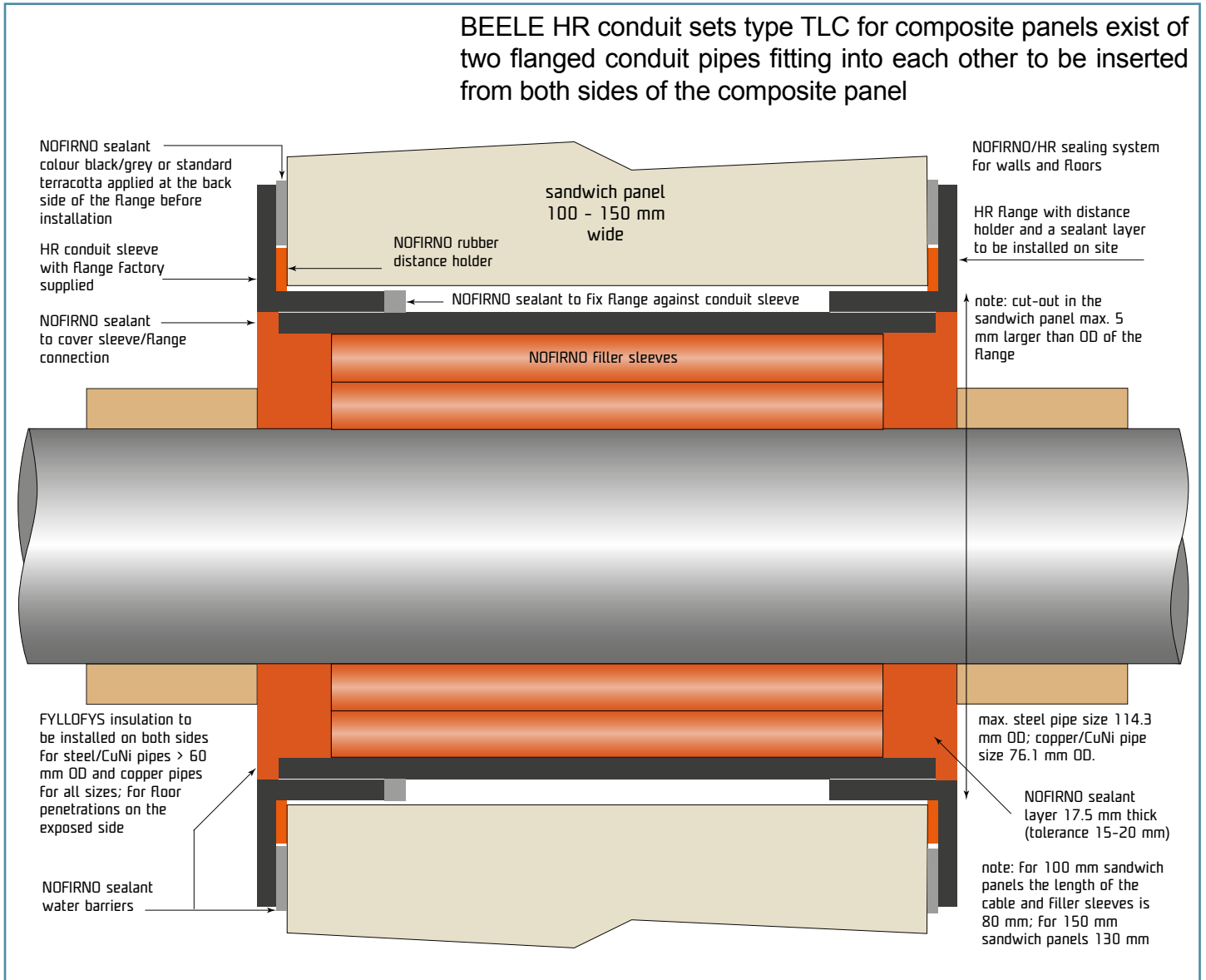


INSTALLATION INSTRUCTIONS FOR NO FIRNO® MULTI-CABLE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC



The tools needed for the installation are a steel brush (A), a tie-wrap cutter (B), a cutter for the nozzles of the sealant cartridges (C), flat nose pliers to adjust the set of fillers (D), a filler set adjuster (E), cloths for cleaning and compression of the sealant layer (F), a cleaner for the adhesive surfaces to apply the sealant on (G), a bucket with water (H) and a professional sealant dispenser (J).

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC



The HR conduit sleeves type TLC are made from a 40% glass filled thermoplastic with excellent properties and are very suitable for installation in challenging environments

- *) outstanding chemical and oxidative resistance
- *) UV resistant
- *) high hardness and rigidity
- *) low creep
- *) minimal water absorption (0.02%)
- *) high temperature resistance (240 °C continuous)
- *) flame retardant - LOI 47%
- *) thermal conductivity ca. 0.25 W/mK
- *) surface resistivity > 10¹³ Ohm
- *) density 1.65 g/cm³

Data based on external information of used thermoplastic



INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



Note: the composite panel has to be dried and cleaned before starting the installation of the HR conduit sleeve. NOFIRNO® sealant is applied in sufficient thickness on the flange around the NOFIRNO® rubber distance holder.

Note: apply the sealant shortly before installing the parts. After 10 minutes drying time skin formation of the sealant will take place, which causes losing adhesive properties.

Sealant is available in various colours.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



The HR conduit sleeve with the fixed flange is inserted through the composite panel first on the side of choice. The HR flange is then fixed in a way to leave space in front of the connection. The HR conduit sleeve enables to seal this spot with a view to prevent possible leakage.

Then the loose flange is installed on the other side of the composite panel.

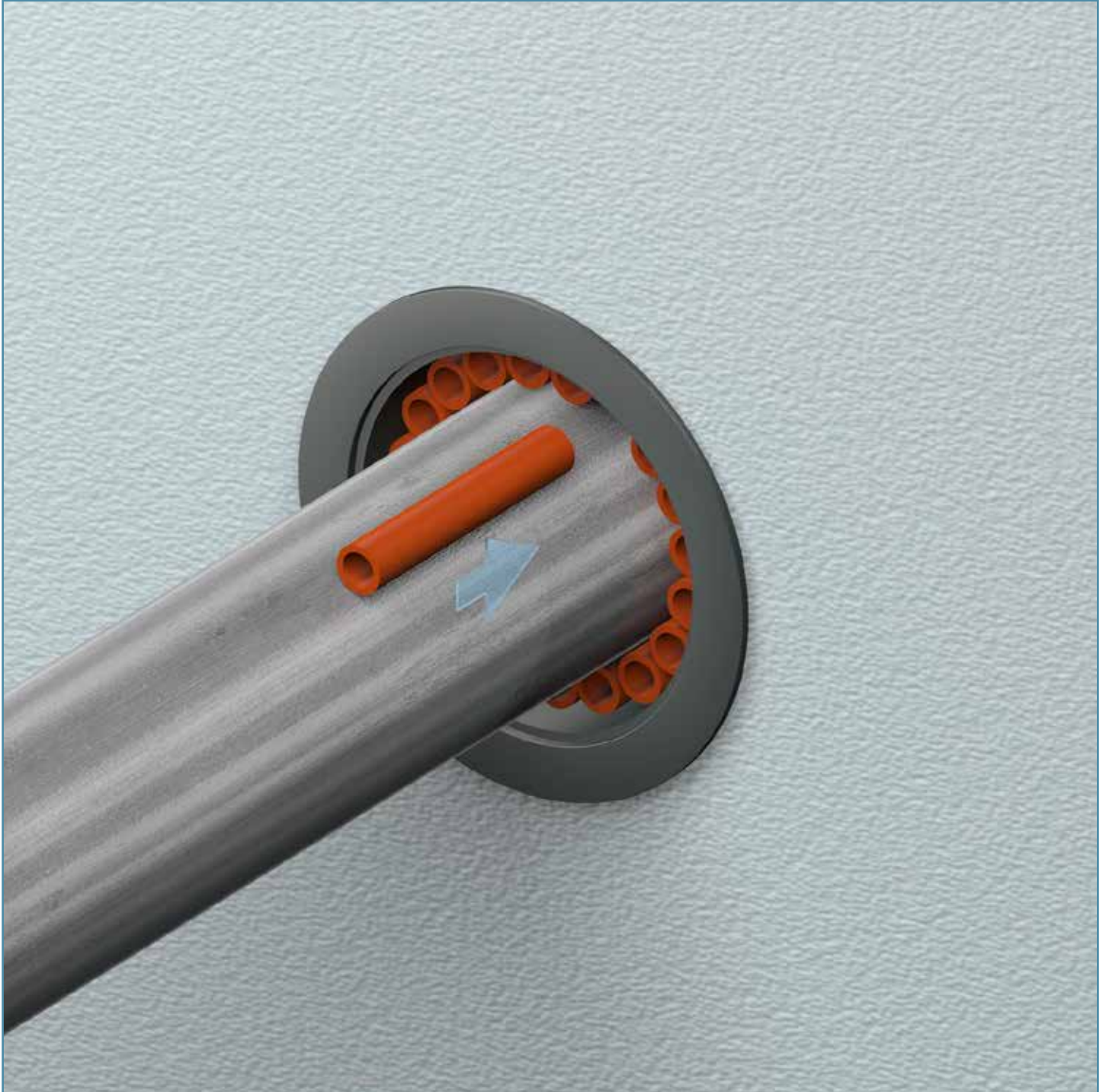
Note: be careful not to press the conduit sleeve out of the panel on the opposite side. Another option is to let the sealant on the first part cure. The adhesion will then be strong enough to prevent the conduit sleeve to be pushed out of the panel.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



The metallic pipe should preferably be passed through the conduit sleeve centrally. If in an off-centre position, there should be enough space between the conduit sleeve and the ducted pipe. Make sure that the minimum space between the pipe and the wall of the conduit sleeve is in accordance with the minimum allowed distance as certified.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



The remaining free space in the conduit opening is filled with NOFIRNO® filler sleeves type 18/12, 20/12 or 22/15 or a combination of these types. The smaller sleeves sizes 10/4 and 15/8 are used to fill small open spaces present in the complete set of filler sleeves.

For ease of filling, the NOFIRNO® filler sleeves are supplied non-split. They are delivered also as multi-filler sleeves (multi-sets of 6, 8 and 10 sleeves) which is extremely helpful for filling larger empty spaces. A very tight fit of the filling is vital for the performance of the sealing system.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



Before applying the sealant it is recommended to check the tight fit of the filling with NOFIRNO® sleeves.

Final smoke, gas and watertight sealing of the NOFIRNO® pipe transits is achieved with the application of NOFIRNO® sealant. NOFIRNO® sealant has proven excellent performance with regard to mechanical and fire resistance requirements. The NOFIRNO® sealing system has been successfully exposed to severe pressure, shock and vibration tests.

See the installation manual of the NOFIRNO® sealing system for more detailed information.

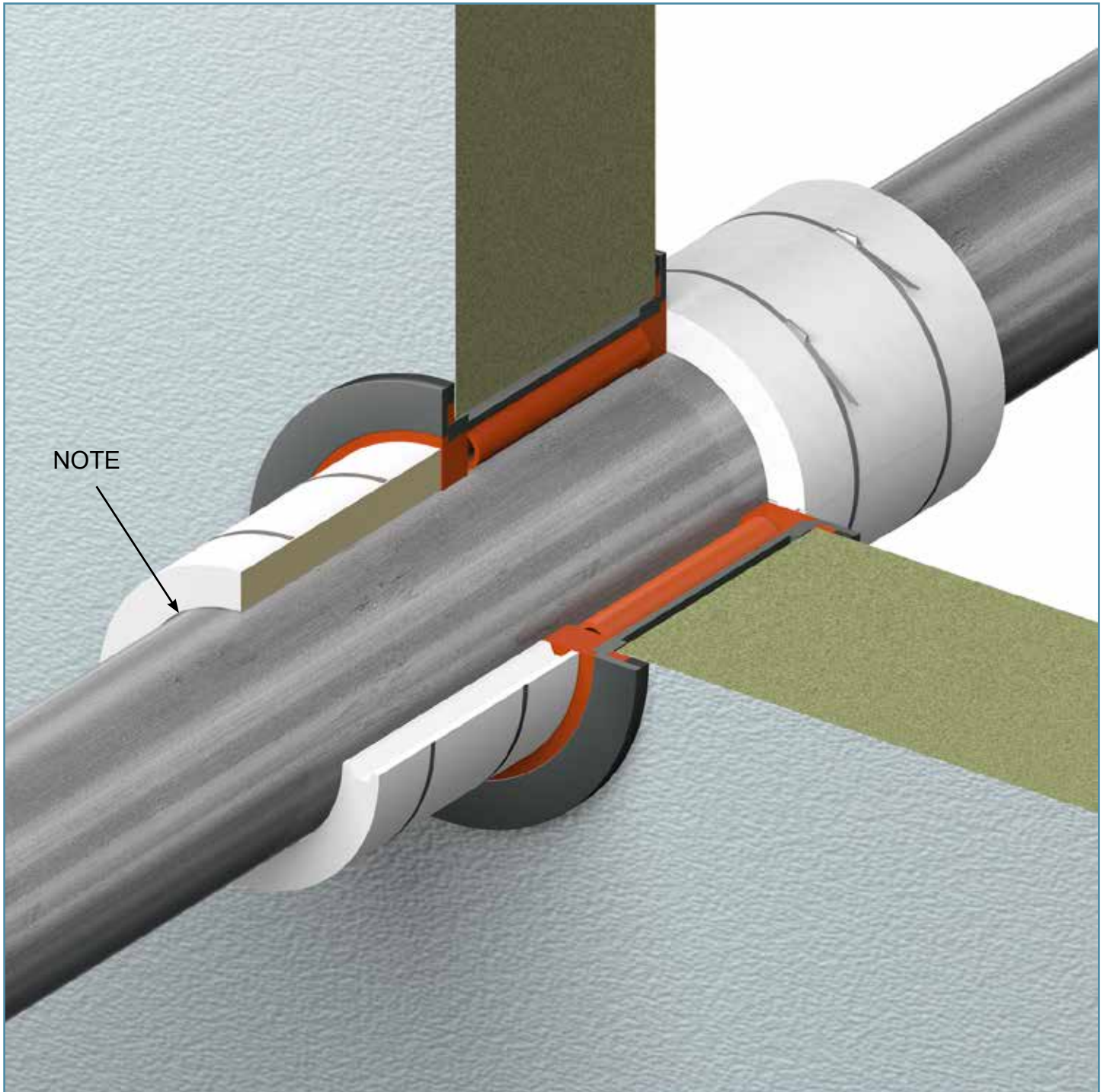
INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



To fulfill the criterion not to exceed a temperature rise of 180 °C for EI 60 and A 60 class according to resp. EN 1366-3:2009 and FTP Code 2010, International Code for Application of Fire Test Procedures (Resolution MSC.307(88)) 2012 Edition, copper pipes and steel pipes, larger than 60 mm OD have to be insulated. For this purpose FYLLOFYS® insulation shells can be used. FYLLOFYS® insulation shells are easier to apply than fibre mats and are free from fibers.

Note: in case the FYLLOFYS® pre-fabricated shells have to be cut to the required length on site, take care that the cuts are coated with a layer of FISSIC® to prevent water absorption.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC



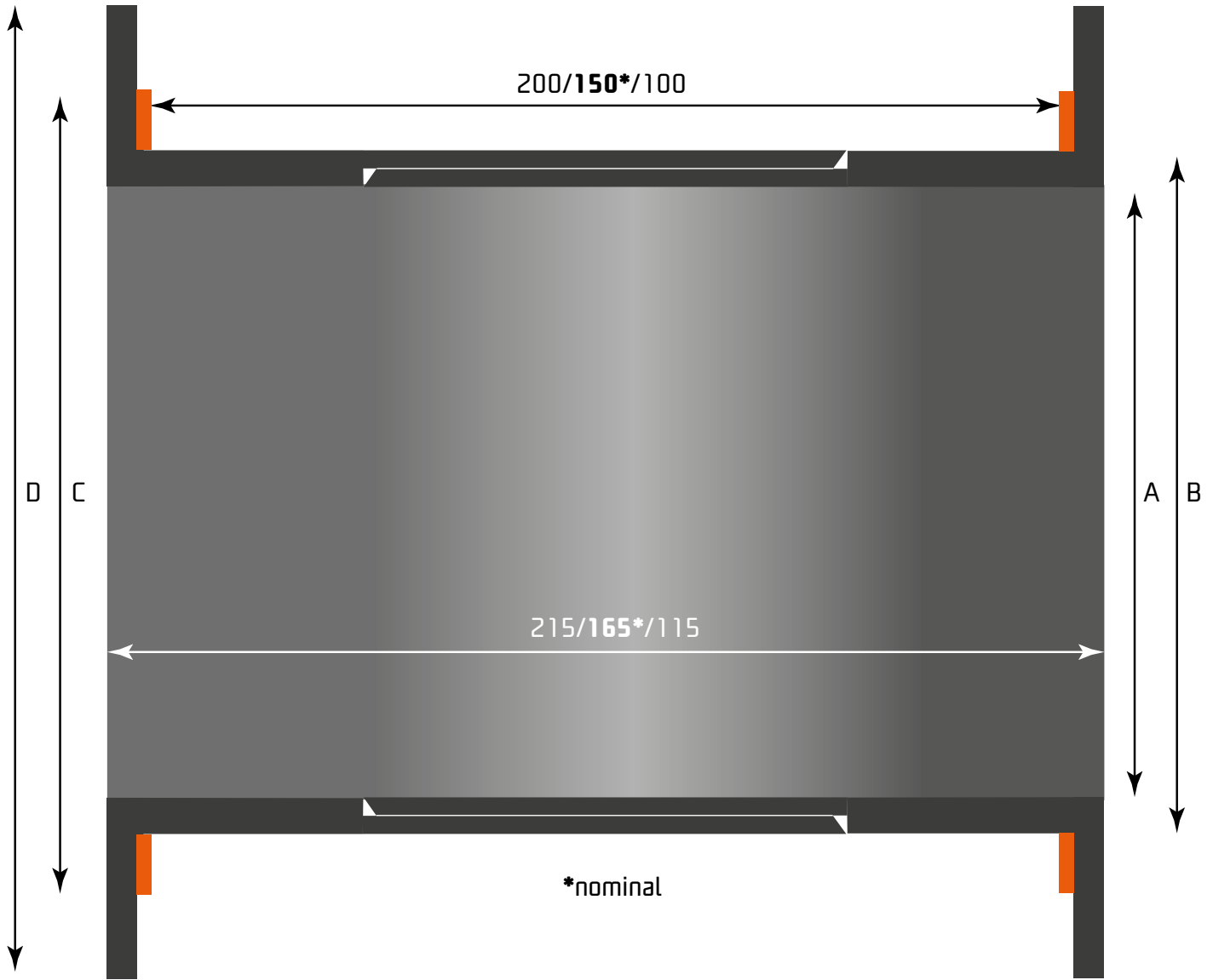
The finished penetration.

Note: to prevent CUI (Corrosion Underneath Insulation) the joint between the ducted pipe and the FYLLOFYS® insulation has to be sealed with NOFIRNO® sealant.

Design Verification Report 20180216/01 for EI60/A60 class issued by KIWA Netherlands.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC

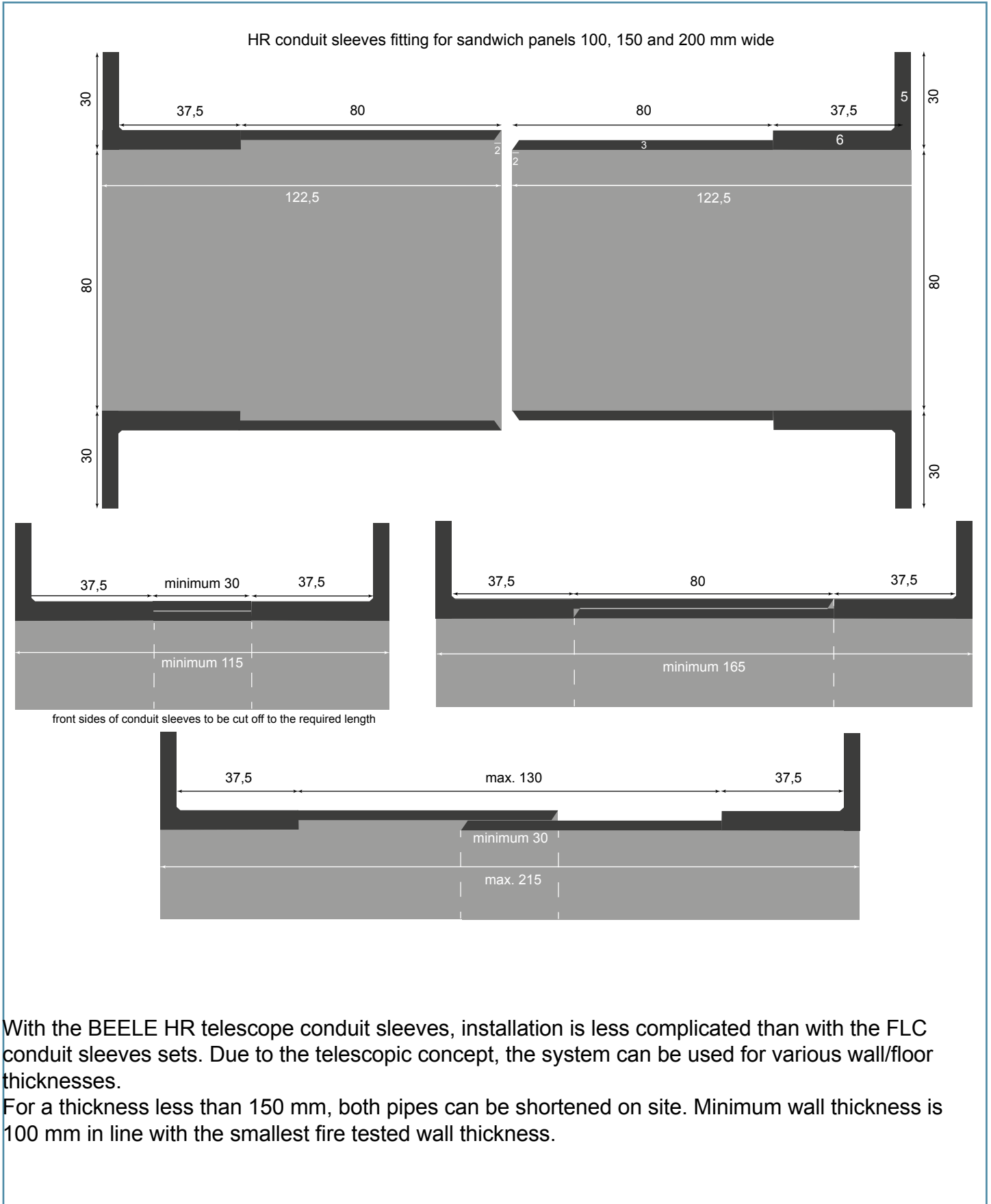
BEELE HR sets size 80, 100 and 125 for composite panels can be delivered in a telescopic version type code TLC. The set consists of two (male/female) HR flanged conduit sleeves.



*nominal

type	A	B	C	D	art. no. TLC
HR 80 TLC	80	92	112	140	60.9721
HR 100 TLC	100	112	132	160	60.9722
HR 125 TLC	125	137	157	185	60.9723

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC

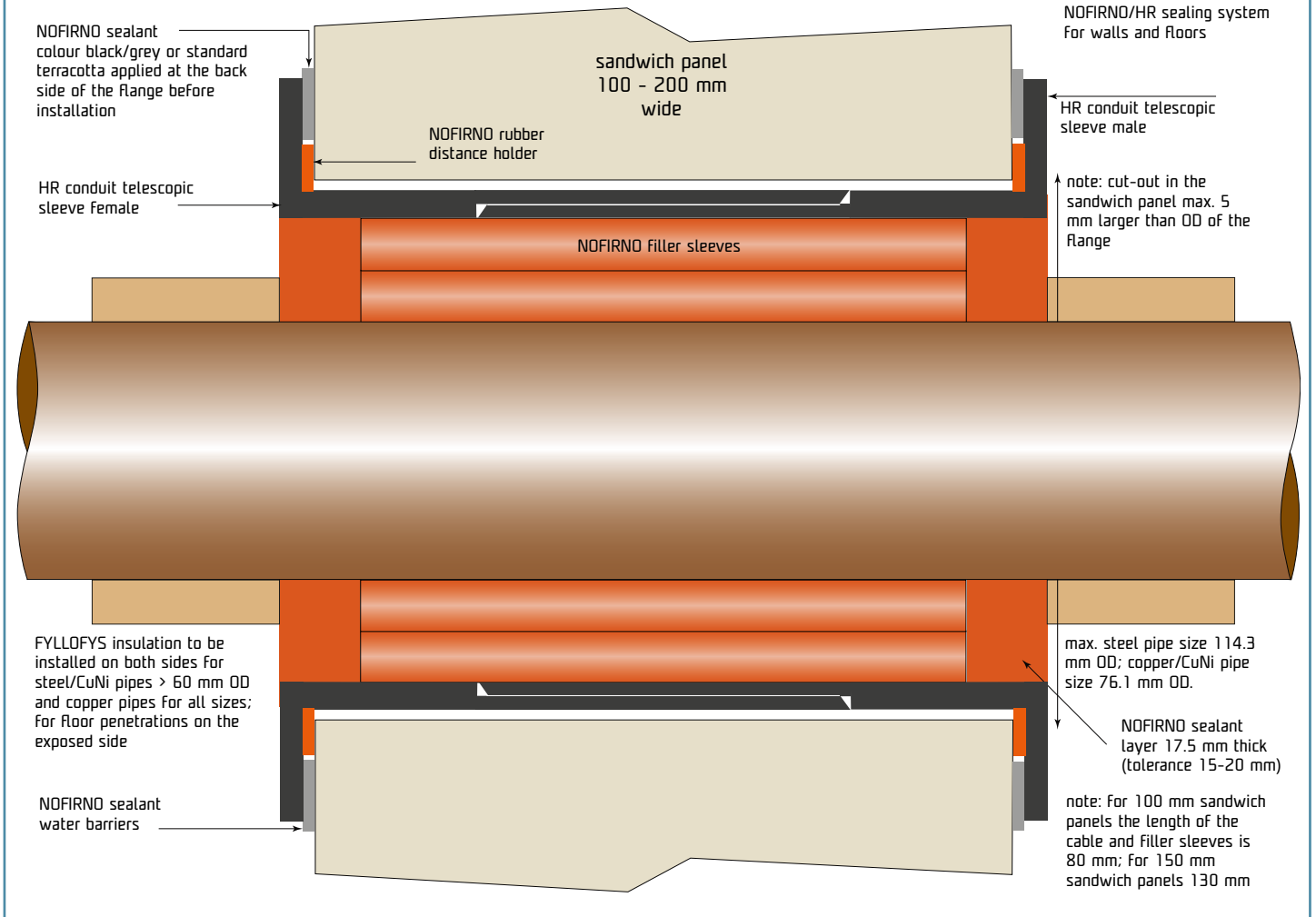


With the BEELE HR telescope conduit sleeves, installation is less complicated than with the FLC conduit sleeves sets. Due to the telescopic concept, the system can be used for various wall/floor thicknesses.

For a thickness less than 150 mm, both pipes can be shortened on site. Minimum wall thickness is 100 mm in line with the smallest fire tested wall thickness.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC

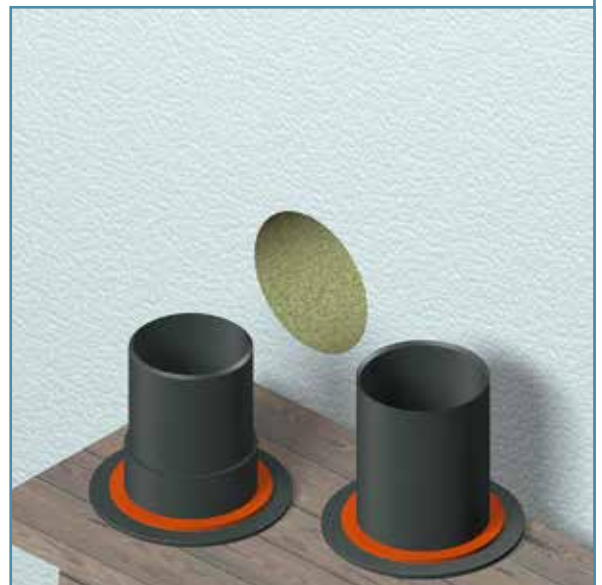
BEELE HR sets type TLC for standard composite panels 150 mm up to 200 mm thick exist of two flanged conduit pipes fitting into each other to be inserted from both sides of the composite panel



The HR conduit sleeves type TLC are made from a 40% glass filled thermoplastic with excellent properties and are very suitable for installation in challenging environments

- *) outstanding chemical and oxidative resistance
- *) UV resistant
- *) high hardness and rigidity
- *) low creep
- *) minimal water absorption (0.02%)
- *) high temperature resistance (240 °C continuous)
- *) flame retardant - LOI 47%
- *) thermal conductivity ca. 0.25 W/mK
- *) surface resistivity > 10¹³ Ohm
- *) density 1.65 g/cm³

Data based on external information of used thermoplastic



INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC

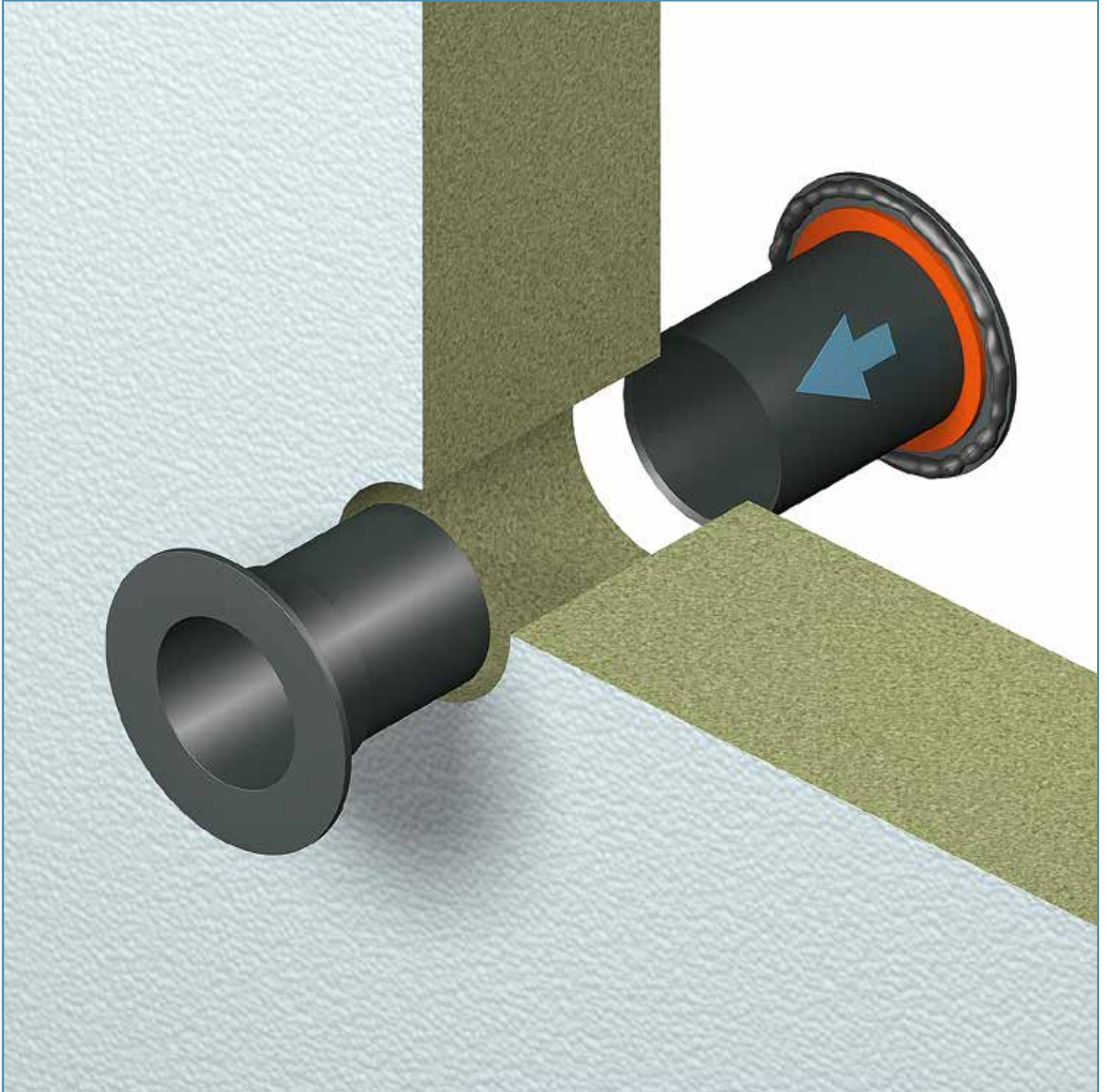


Note: the composite panel has to be dried and cleaned before starting the installation of the HR conduit sleeve. NOFIRNO® sealant is applied in sufficient thickness on the flange around the NOFIRNO® rubber distance holder.

Note: apply the sealant shortly before installing the parts. After 10 minutes drying time skin formation of the sealant will take place, which causes losing adhesive properties.

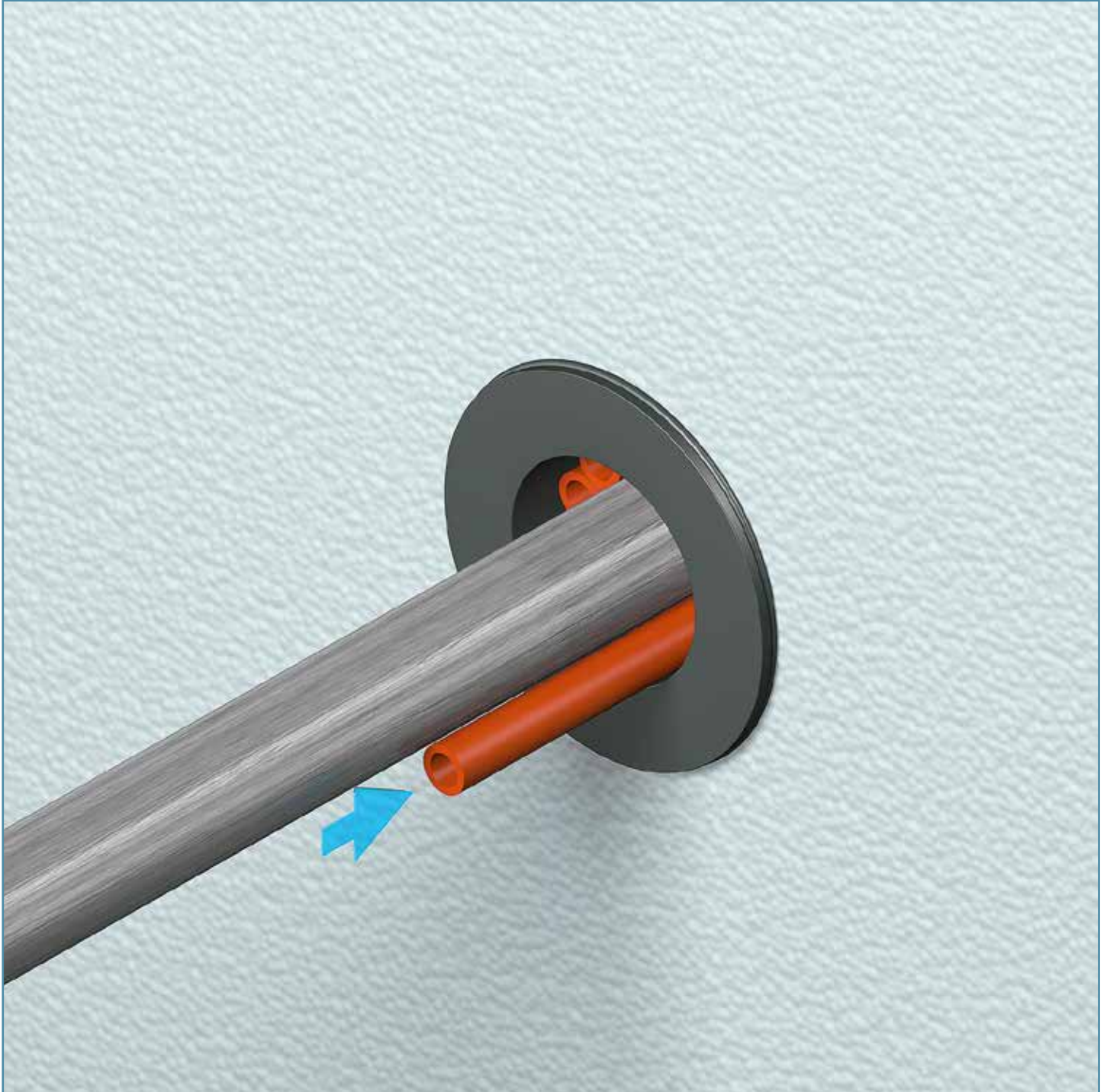
Sealant is available in various colours.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC



The flanged telescopic HR conduit sleeves are inserted from both sides into the composite panel.
Note: be careful not to press the conduit sleeve out of the panel on the opposite side. Another option is to let the sealant on the first part cure. The adhesion will then be strong enough to prevent the conduit sleeve to be pushed out of the panel.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC



The remaining free space in the conduit opening is filled with NOFIRNO® filler sleeves type 18/12, 20/12 or 22/15 or a combination of these types. The smaller sleeves sizes 10/4 and 15/8 are used to fill small open spaces present in the complete set of filler sleeves.

For ease of filling, the NOFIRNO® filler sleeves are supplied non-split. They are delivered also as multi-filler sleeves (multi-sets of 6, 8 and 10 sleeves) which is extremely helpful for filling larger empty spaces. A very tight fit of the filling is vital for the performance of the sealing system.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC

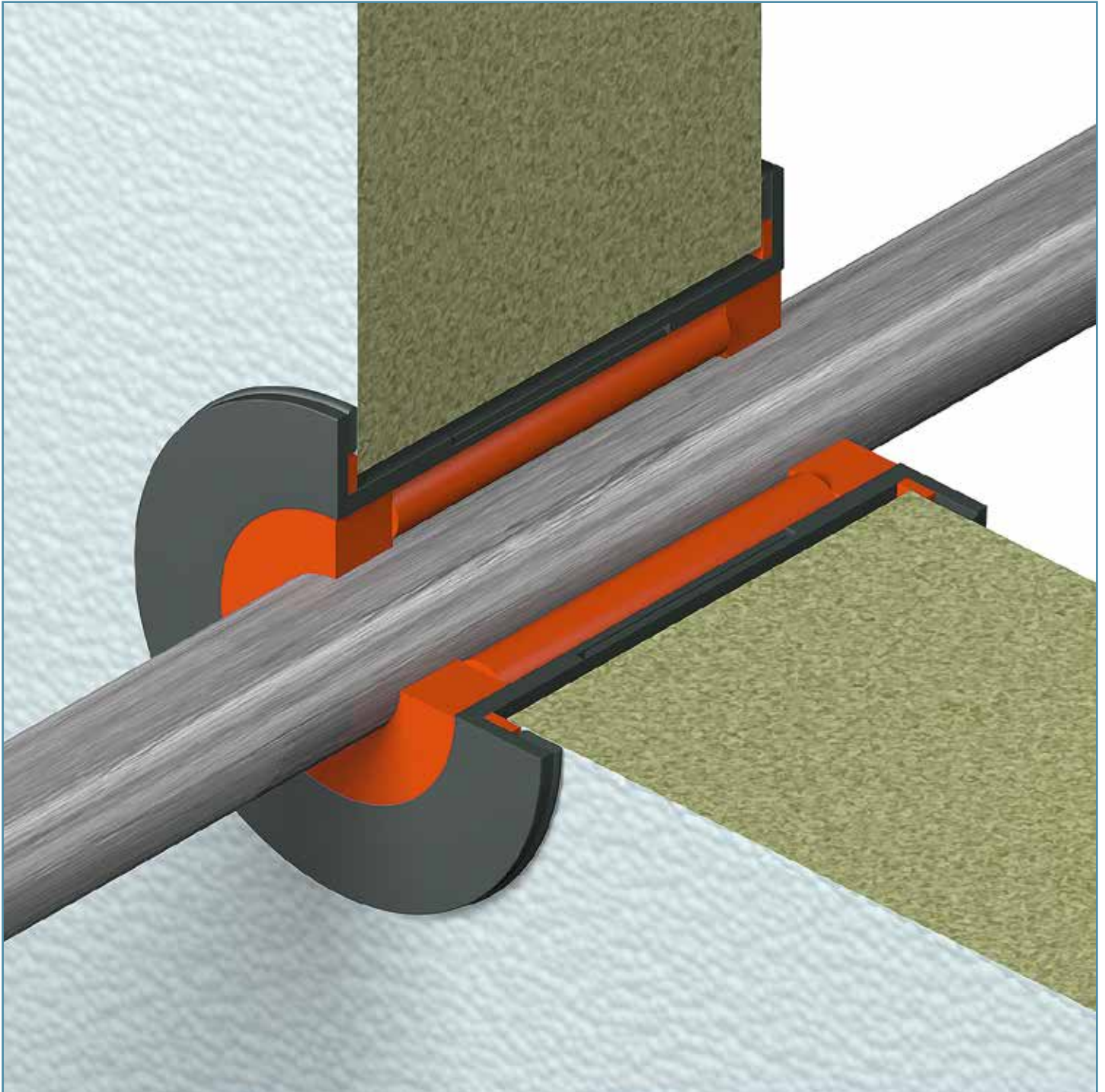


Before applying the sealant it is recommended to check the tight fit of the filling with NOFIRNO® sleeves.

Final smoke, gas and watertight sealing of the NOFIRNO® multi-cable transits is achieved with the application of NOFIRNO® sealant. NOFIRNO® sealant has proven excellent performance with regard to mechanical and fire resistance requirements. The NOFIRNO® sealing system has been successfully exposed to severe pressure, shock and vibration tests.

See the installation manual of the NOFIRNO® sealing system for more detailed information.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES TLC



The finished penetration.

Design Verification Report 20180216/01 for EI60/A60 class issued by KIWA Netherlands.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC

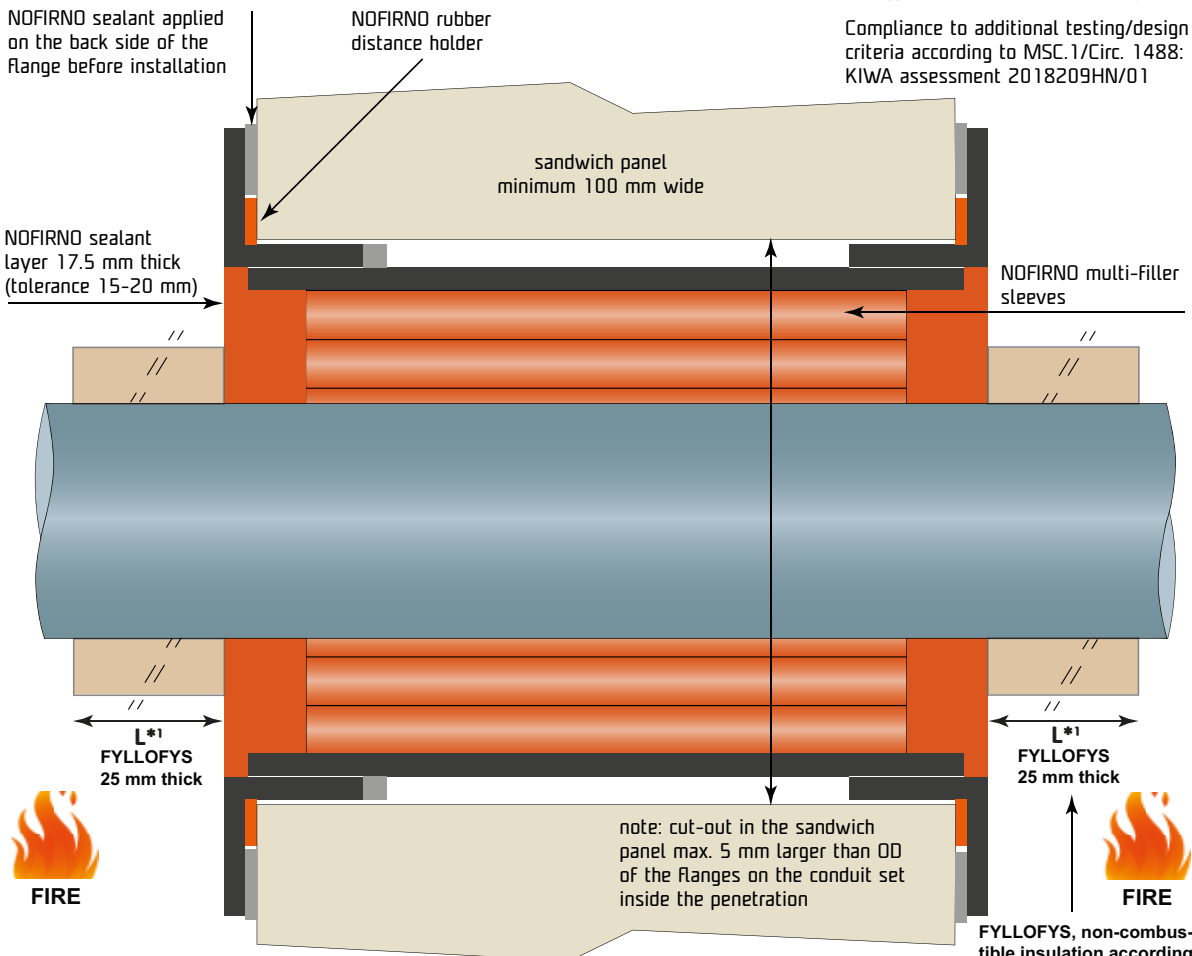
**direction of exposure:
fire from either side**

Minimum distance between ducted pipe and conduit sleeve:
at least 15 mm for steel/CuNi pipes
at least 20 mm for copper pipes

A-60/EI-60 class pipe transits with
max. steel/ss/CuNi pipe OD 114.3 mm and max.
copper pipe 76.1 mm sealed with the
**NOFIRNO system installed in HR plastic conduit
sleeves max. 250 mm ID and frames 300x150 mm
in A-60/EI-60 certified sandwich panels**

For the adequate analysis and assessment
of the risk(s) reference is made
to KIWA assessment 2018212HN/01

Compliance to additional testing/design
criteria according to MSC.1/Circ. 1488:
KIWA assessment 2018209HN/01



Insulation lengths (L) for walls 150 mm thick:		Insulation lengths (L) for walls 100 mm thick:	
OD steel/CuNi pipes	L (25mm thick)	OD steel/CuNi pipes	L (25mm thick)
≤ 60.3 mm	none	≤ 60.3 mm	2x100 mm
> 60.3 mm - 114.3 mm	2x100 mm	> 60.3 mm - 114.3 mm	2x200 mm
OD copper pipes	L (25mm thick)	OD copper pipes	L (25mm thick)
≤ 25 mm	2x100 mm	≤ 25 mm	2x200 mm
>25 - 42 mm	2x200 mm	>25 - 42 mm	2x300 mm
>42 - 54 mm	2x300 mm	>42 - 54 mm	2x400 mm
>54 - 76.1 mm	2x400 mm	>54 - 76.1 mm	2x500 mm

Note *: insulation either symmetrically installed or full length (2x L) totally on unexposed side

NOFIRNO/HR sealing system
for walls and floors

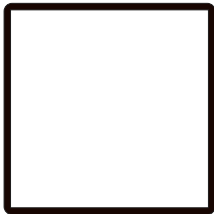
tested according to IMO Res. MSC 307(88)
alt. EN 1366-3:2009
max. size of aperture 250 mm ID mm or
300x150 mm equivalent of 450 cm²

A-60/EI-60

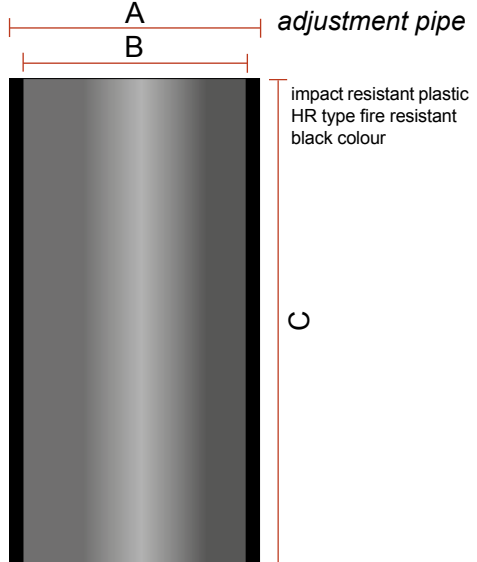
	Description: NOFIRNO sealing system for A-60/EI-60 class sandwich panels			
	Mat.: NOFIRNO rubber & sealant			
Ref.: JAB	Date:	15-05-2018	Scale:	
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	Rev. 2			

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC

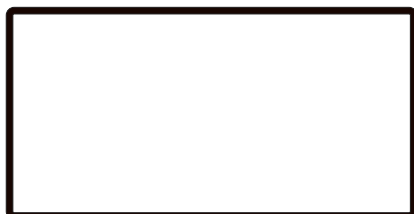
type	A	B	C	art. no. HR
HR 150x150 AC	160x160	150x150	300	60.9550



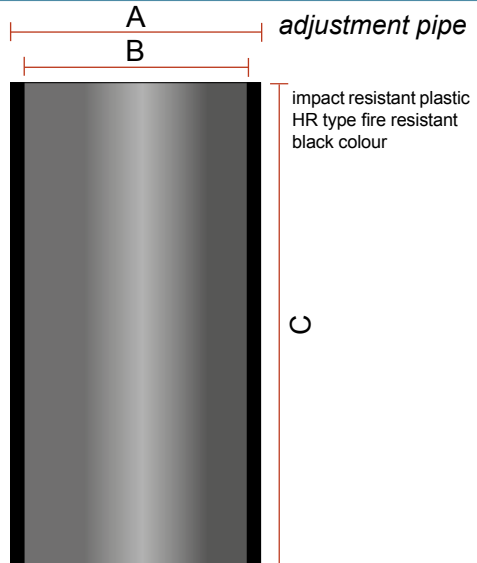
BEELE HR adjustment coaming cut to size to accommodate the thickness of wall/floor



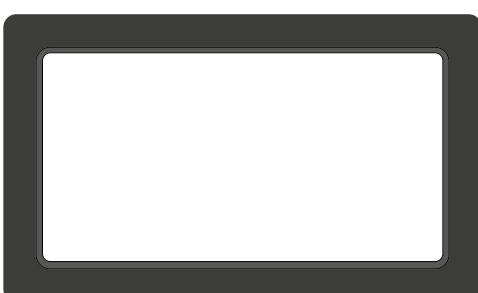
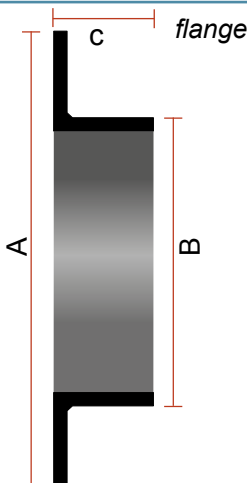
type	A	B	C	art. no. HR
HR 150x150 AC	310x170	300x150	300	60.9551



BEELE HR adjustment coaming cut to size to accommodate the thickness of wall/floor

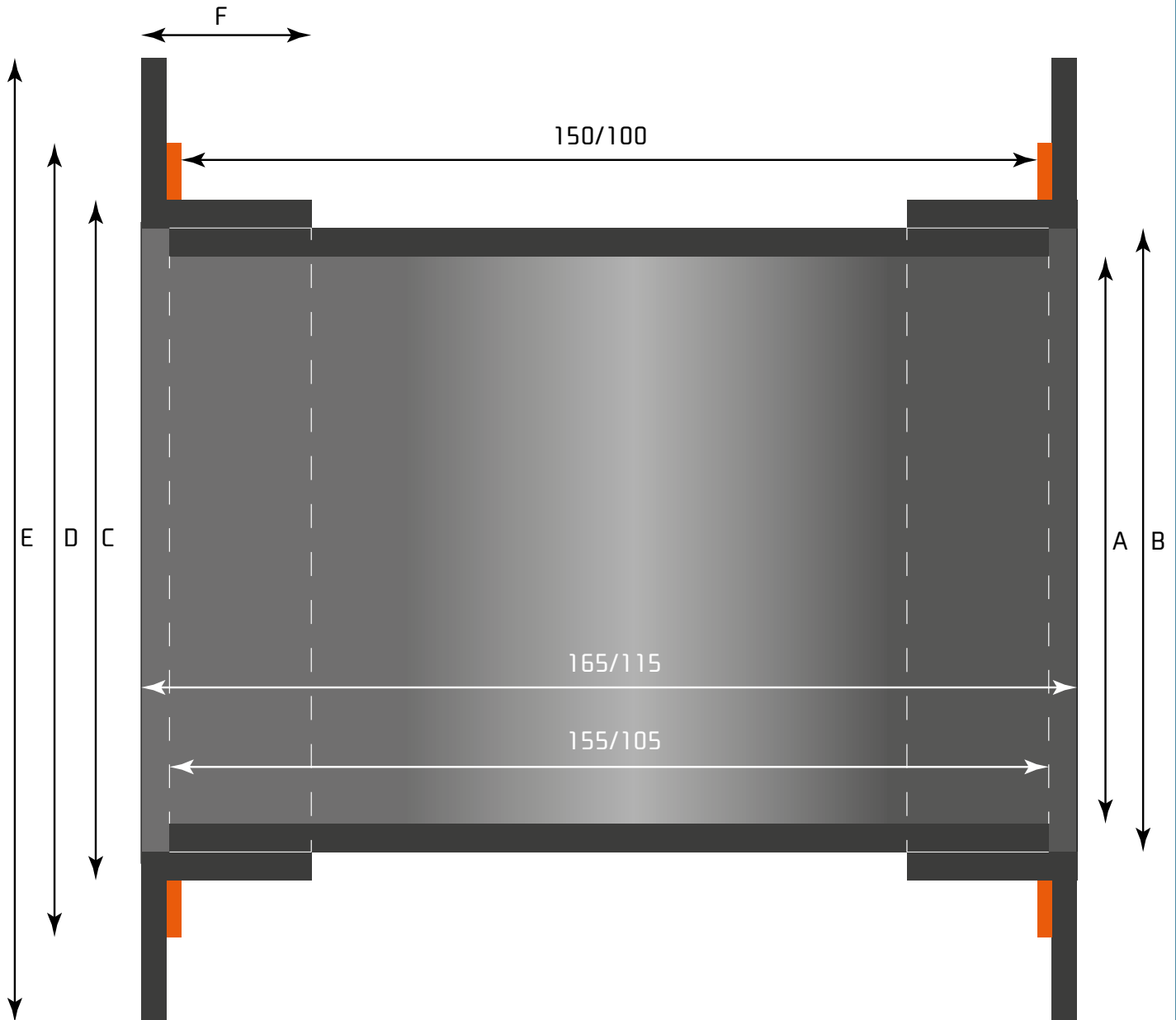


type	A	B	C	art. no. HR
HR 150x150 FL	220x220	170x170	35	60.9560
HR 300x150 FL	370x220	320x170	35	60.9561

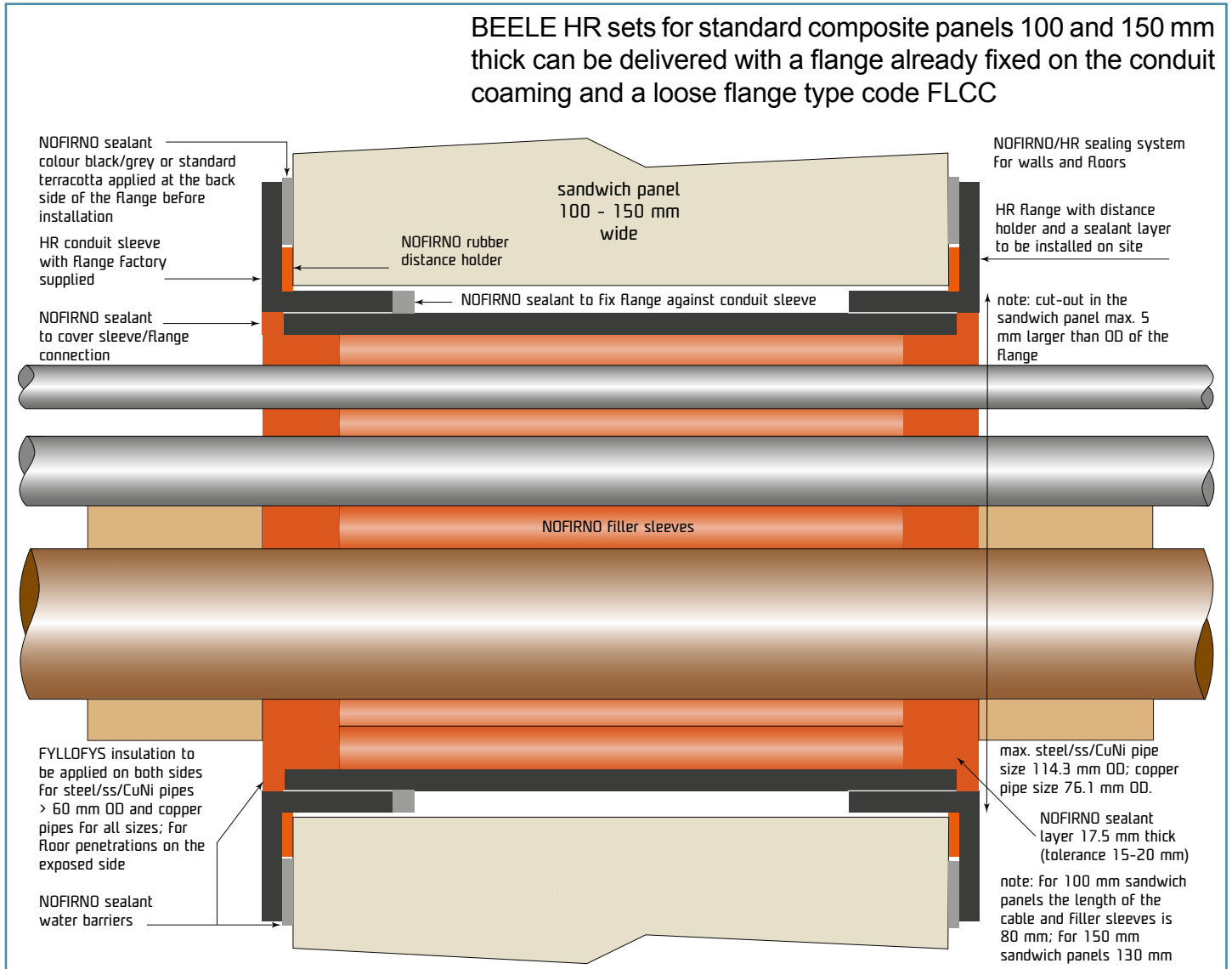
INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC

BEELE HR sets for standard composite panels 100 and 150 mm thick can be delivered with a flange already fixed on the conduit coaming and a loose flange type code FLCC



type	A	B	C	D	E	F	art. no.	
							FLCC 100	FLCC 150
HR 150x150 FLCC	150x150	160x160	170x170	190x190	220x220	35	60.9750	60.9760
HR 300x150 FLCC	300x150	310x160	320x170	340x190	370x370	35	60.9751	60.9761

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLCC



The HR conduit frames type FLCC are made from a 40% glass filled thermoplastic with excellent properties and are very suitable for installation in challenging environments

- *) outstanding chemical and oxidative resistance
- *) UV resistant
- *) high hardness and rigidity
- *) low creep
- *) minimal water absorption (0.02%)
- *) high temperature resistance (240 °C continuous)
- *) flame retardant - LOI 47%
- *) thermal conductivity ca. 0.25 W/mK
- *) surface resistivity > 10¹³ Ohm
- *) density 1.65 g/cm³

Data based on external information of used thermoplastic

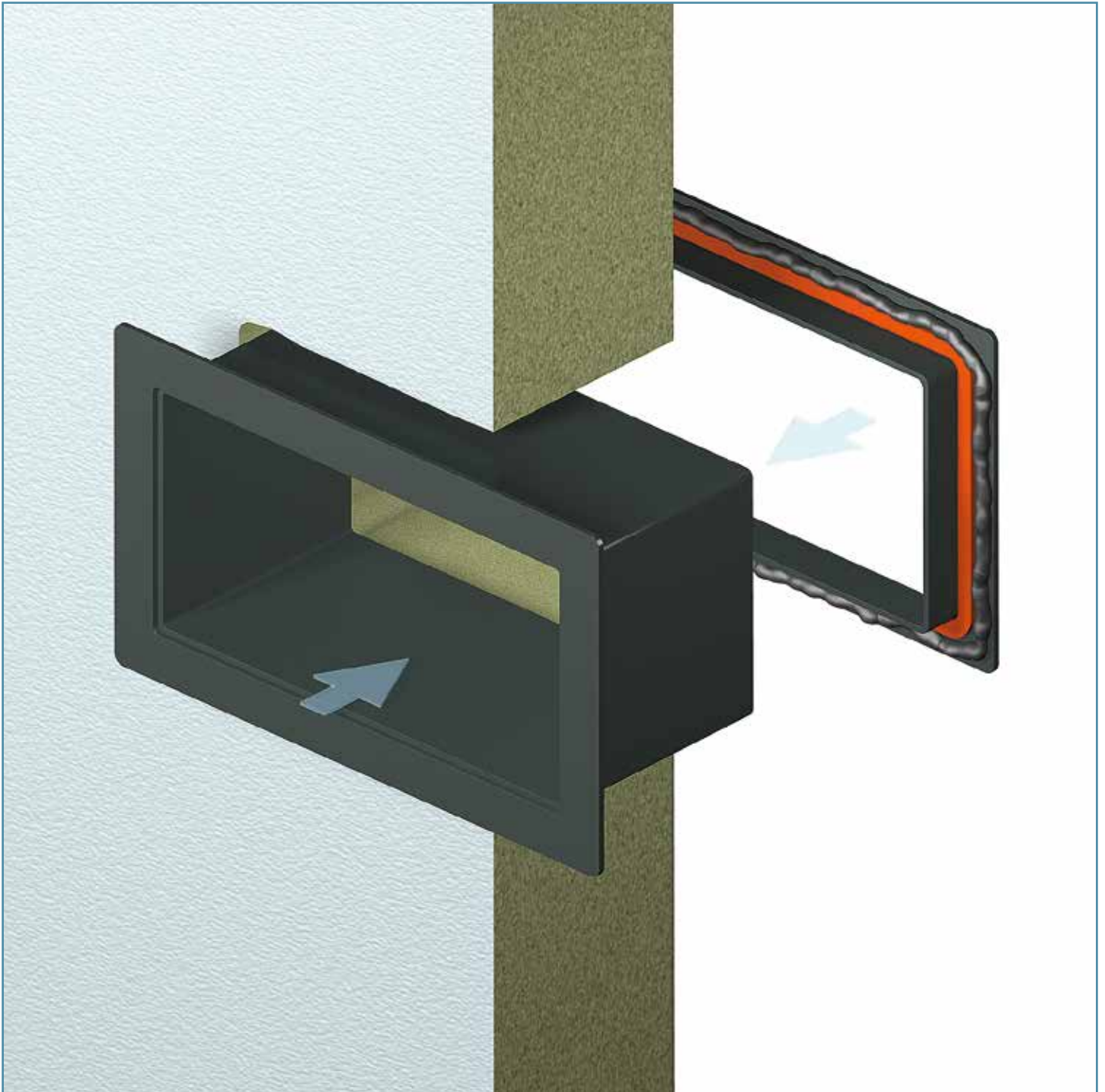


INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



The conduit opening has to be cut to size in the composite panel to prevent moisture ingress into the inside of the composite panel. The HR conduit set consists of a HR adapter coaming and two HR flanges. The HR coamings can be cut to size at site. The flanges can be fixed on the HR pipes with NOFIRNO® sealant. Rubber distance holders made of NOFIRNO® rubber are used to create an opening for the NOFIRNO® sealant between the flange and the surface of the composite panel. On request, the HR conduit set can be supplied with correct length with a flange fixed on one side of the HR conduit coaming and a loose flange to be installed at site.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC

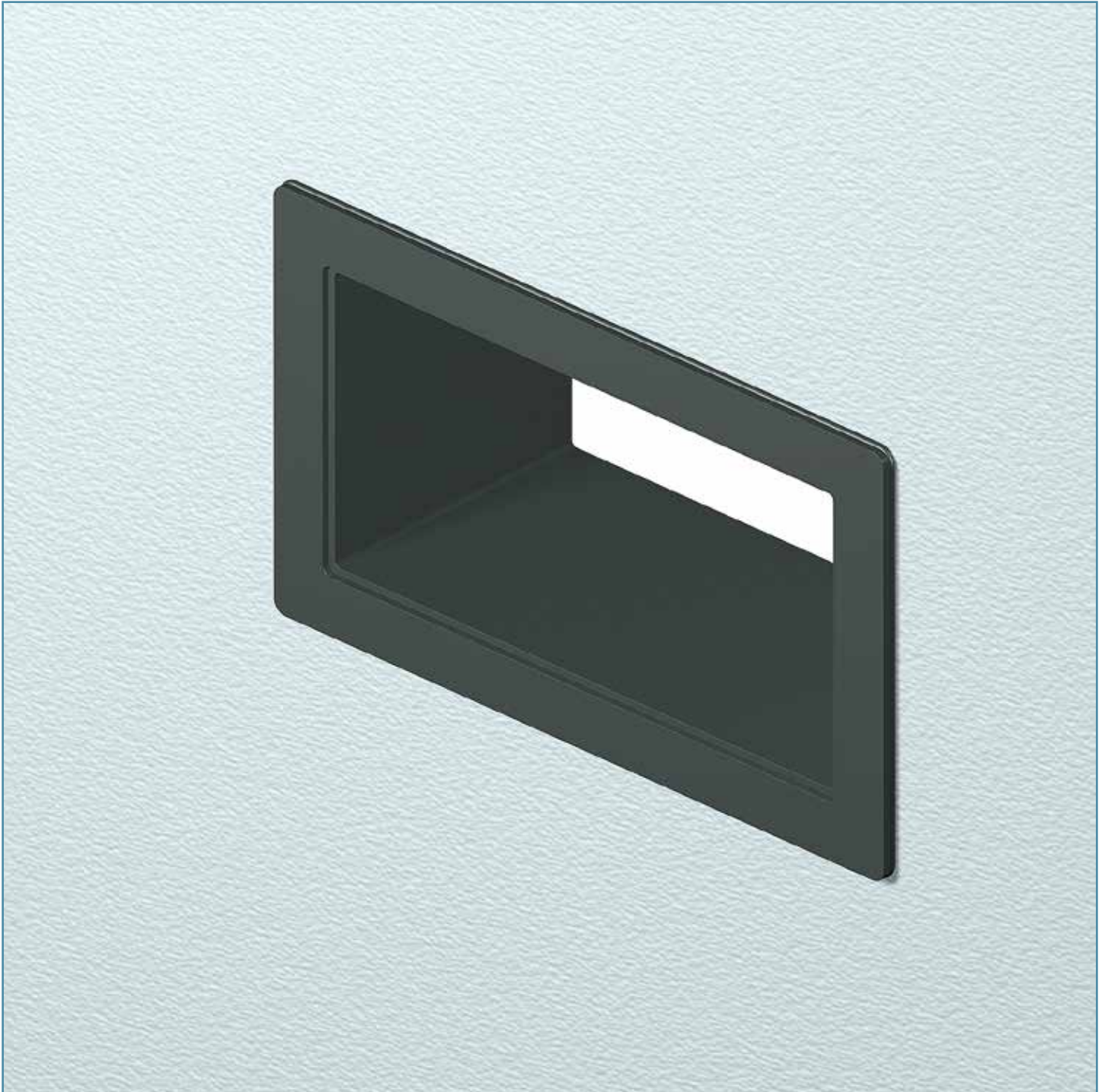


The HR conduit coaming with the fixed flange is inserted through the composite panel first at the side of choice. The HR flange is then fixed in a way to leave space in front of the connection. The HR conduit coaming enables to seal this spot with a view to prevent possible leakage.

Then the loose flange is installed at the other side of the composite panel.

Note: be careful not to press the conduit coaming out of the panel on the opposite side. Another option is to let the sealant on the first part cure. The adhesion will then be strong enough to prevent the conduit sleeve to be pushed out of the panel.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC

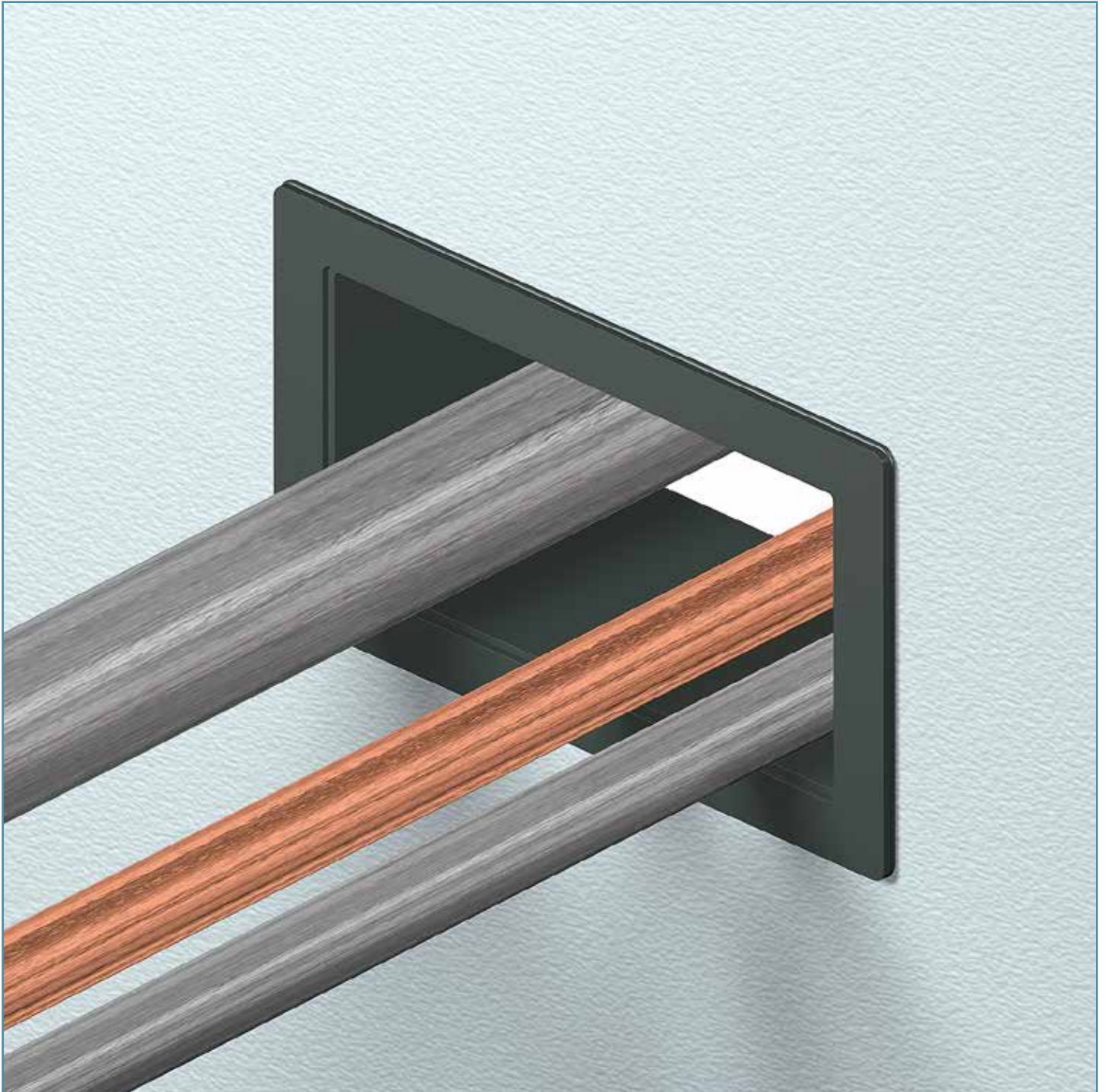


Note: the composite panel has to be dried and cleaned before starting the installation of the HR conduit sleeve. NOFIRNO® sealant is applied in sufficient thickness on the flange around the NOFIRNO® rubber distance holder.

Note: apply the sealant shortly before installing the parts. After 10 minutes drying time skin formation of the sealant will take place, which causes losing adhesive properties.

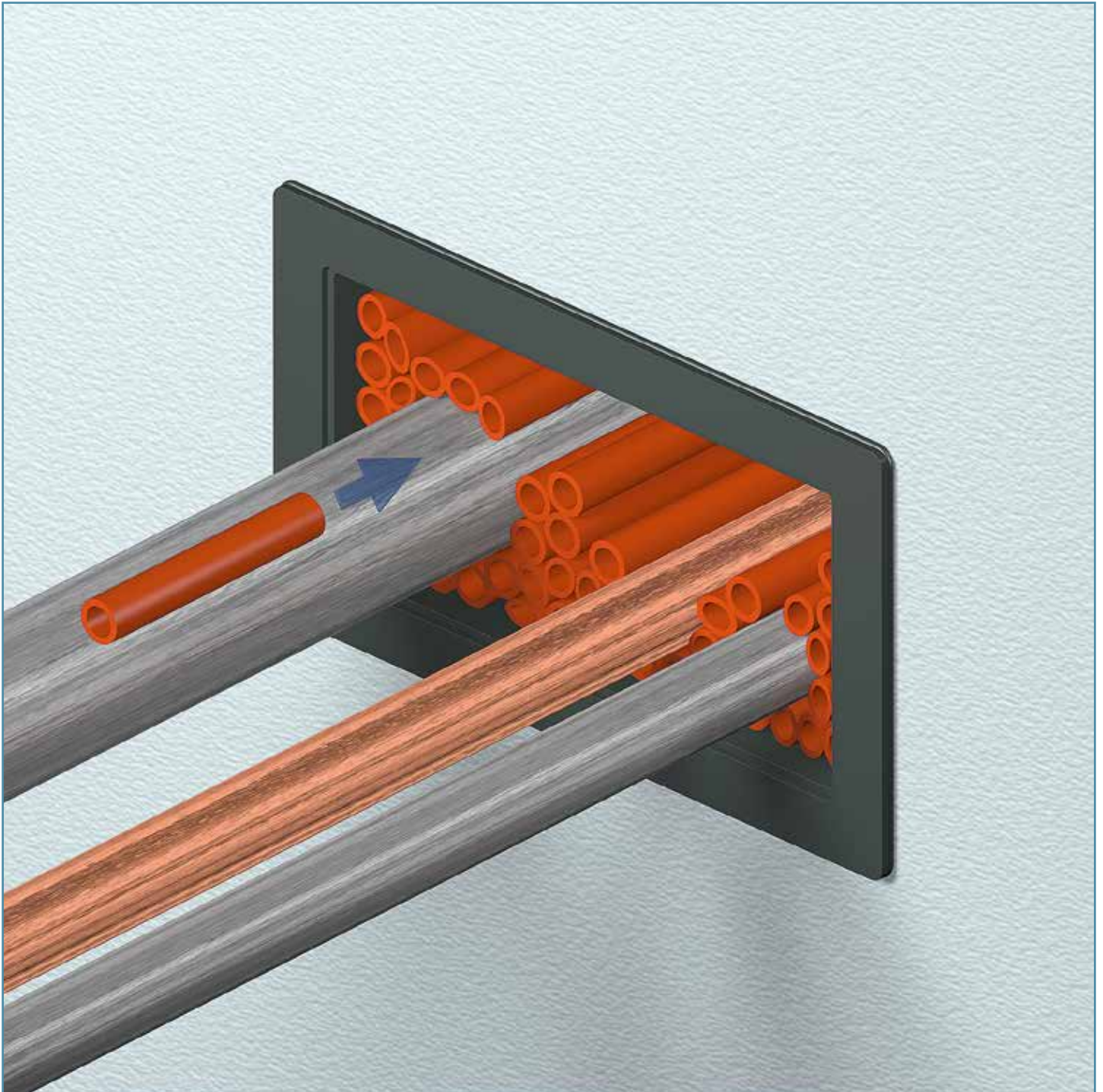
Sealant is available in various colours.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



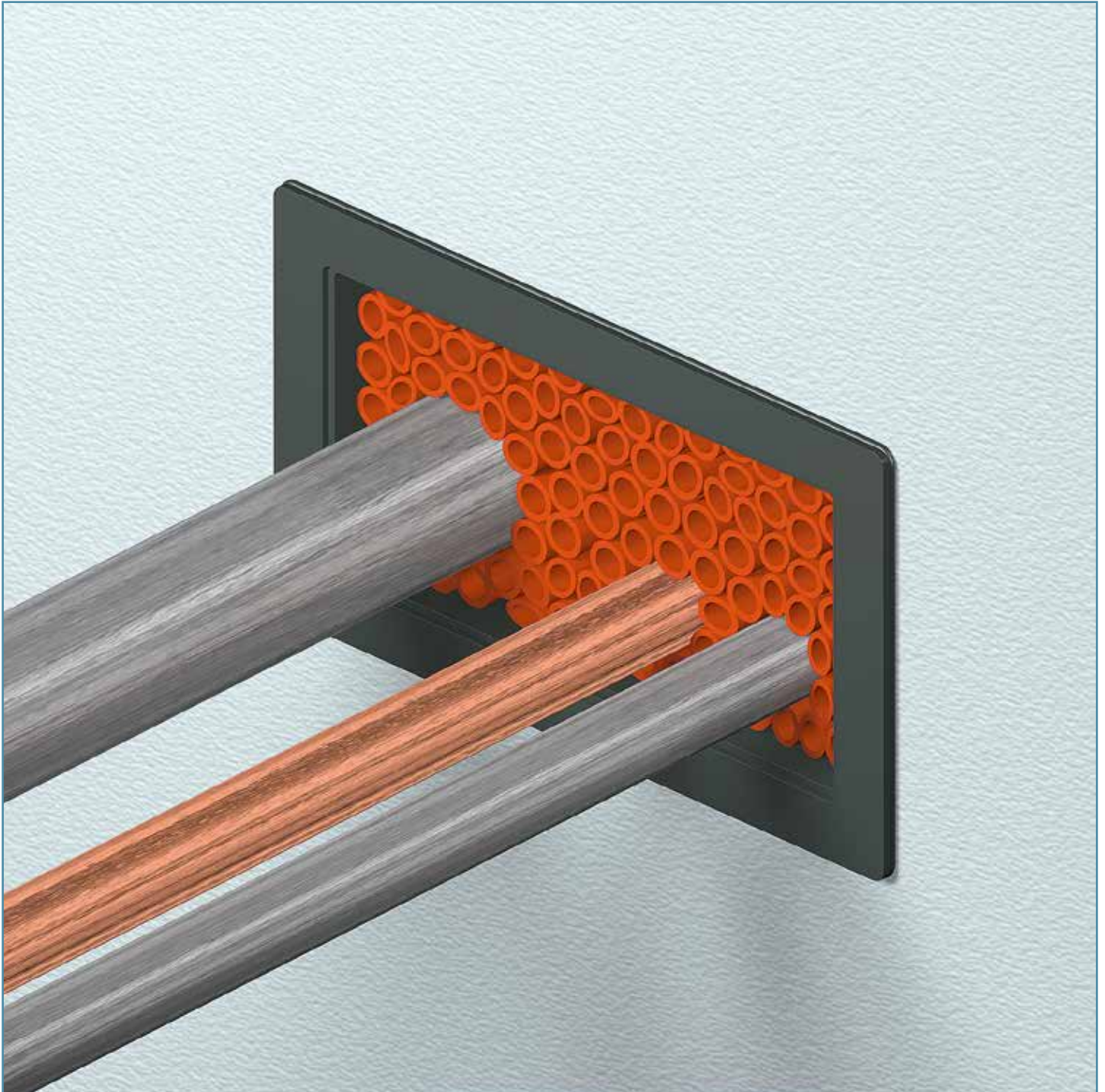
The pipes (steel, stainless steel, CuNi and copper) can be ducted through the conduit coaming in random order. It is most important that they are ducted and separated from each other according to the specifications (approvals) with regard to the minimum clearances. With ducting larger pipe dimensions, which have to be insulated to achieve EI 60/A 60 ratings, the installation of 25 mm thick FYLLOFYS® insulating shells around these pipes has to be taken into account.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



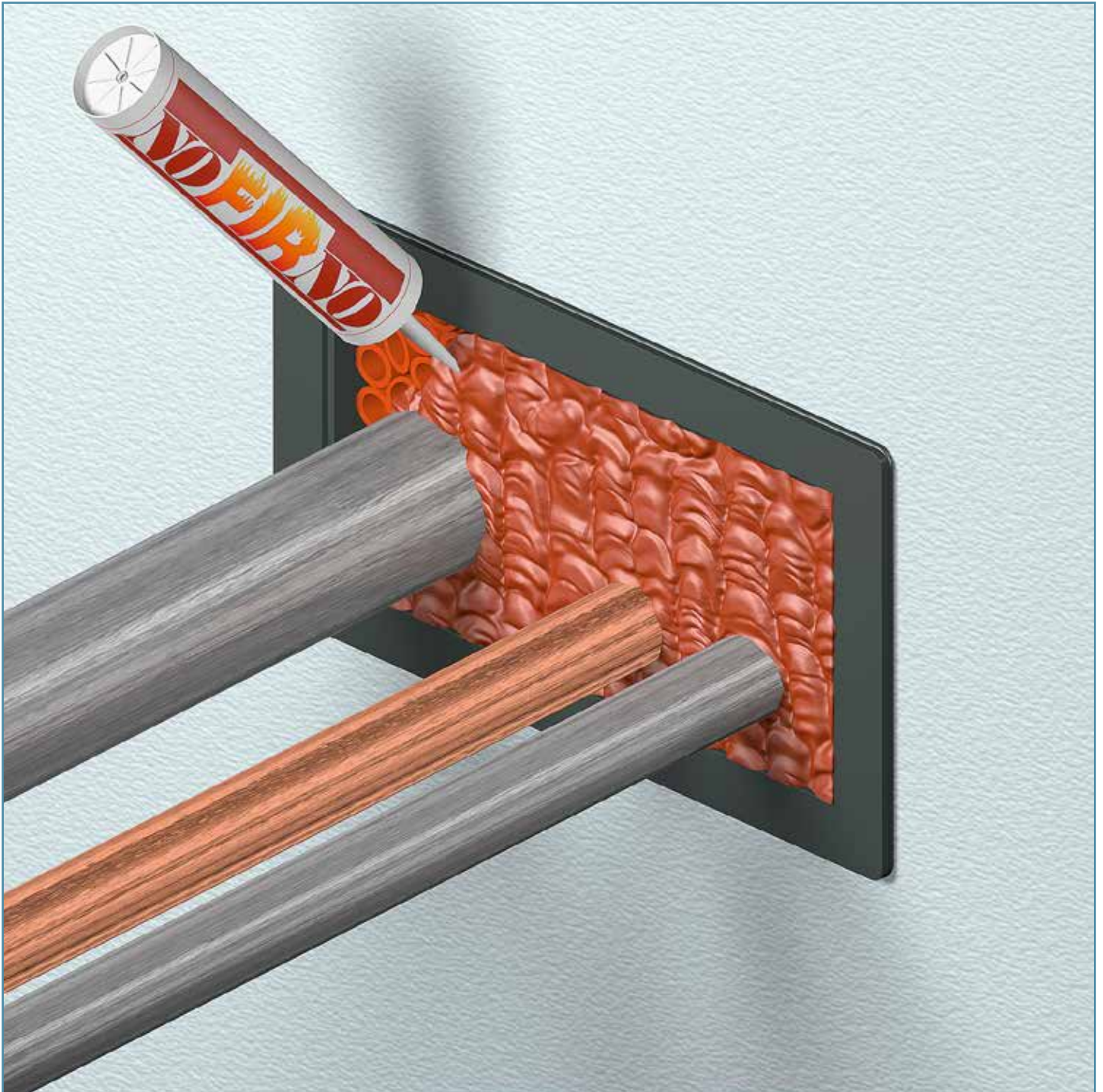
The remaining free space in the conduit opening is filled with NOFIRNO® filler sleeves type 18/12, 20/12 or 22/15 or a combination of these types. The smaller sleeves sizes 10/4 and 15/8 are used to fill smaller open spaces present in the complete set of filler sleeves. For ease of filling, the NOFIRNO® filler sleeves are supplied non-split. They are delivered also as multi-filler sleeves (multi-sets of 6, 8 and 10 sleeves) which is extremely helpful for filling larger empty spaces. A very tight fit of the filling is vital for the performance of the sealing system.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



The NOFIRNO® filler sleeves are pushed into the HR conduit coaming leaving minimum 17.5-20 mm free space for the application of the NOFIRNO® sealant.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



Before applying the sealant it is recommended to check the tight fit of the filling with NOFIRNO® sleeves.

Final smoke, gas and watertight sealing of the NOFIRNO® multi-cable transits is achieved with the application of NOFIRNO® sealant. NOFIRNO® sealant has proven excellent performance with regard to mechanical and fire resistance requirements. The NOFIRNO® sealing system has been successfully exposed to severe pressure, shock and vibration tests.

See the installation manual of the NOFIRNO® sealing system for more detailed information.

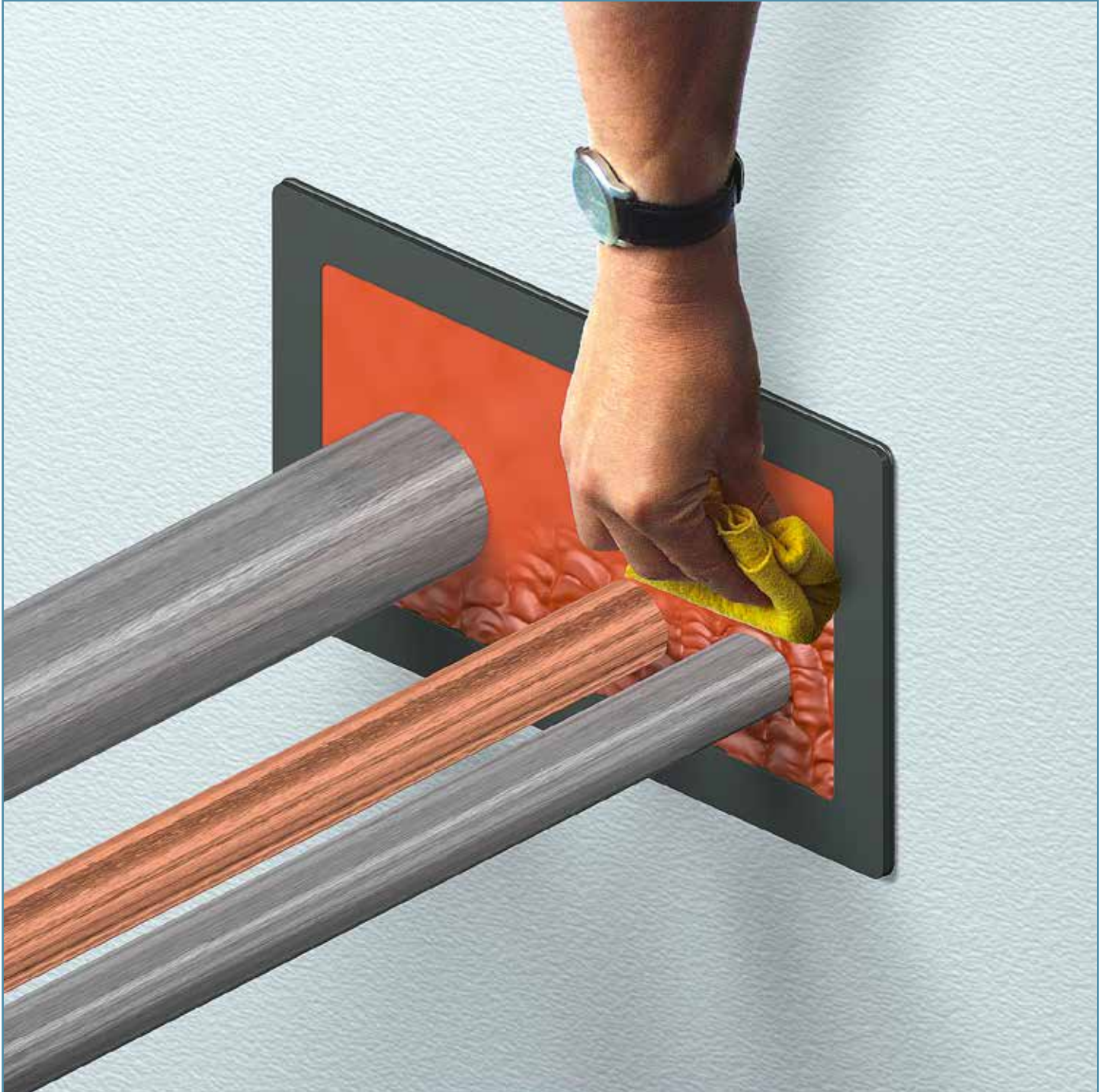
INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



To smooth the surface of the NOFIRNO® sealant layer, a cloth is sprayed with water. This prevents the sealant from sticking to the cloth.

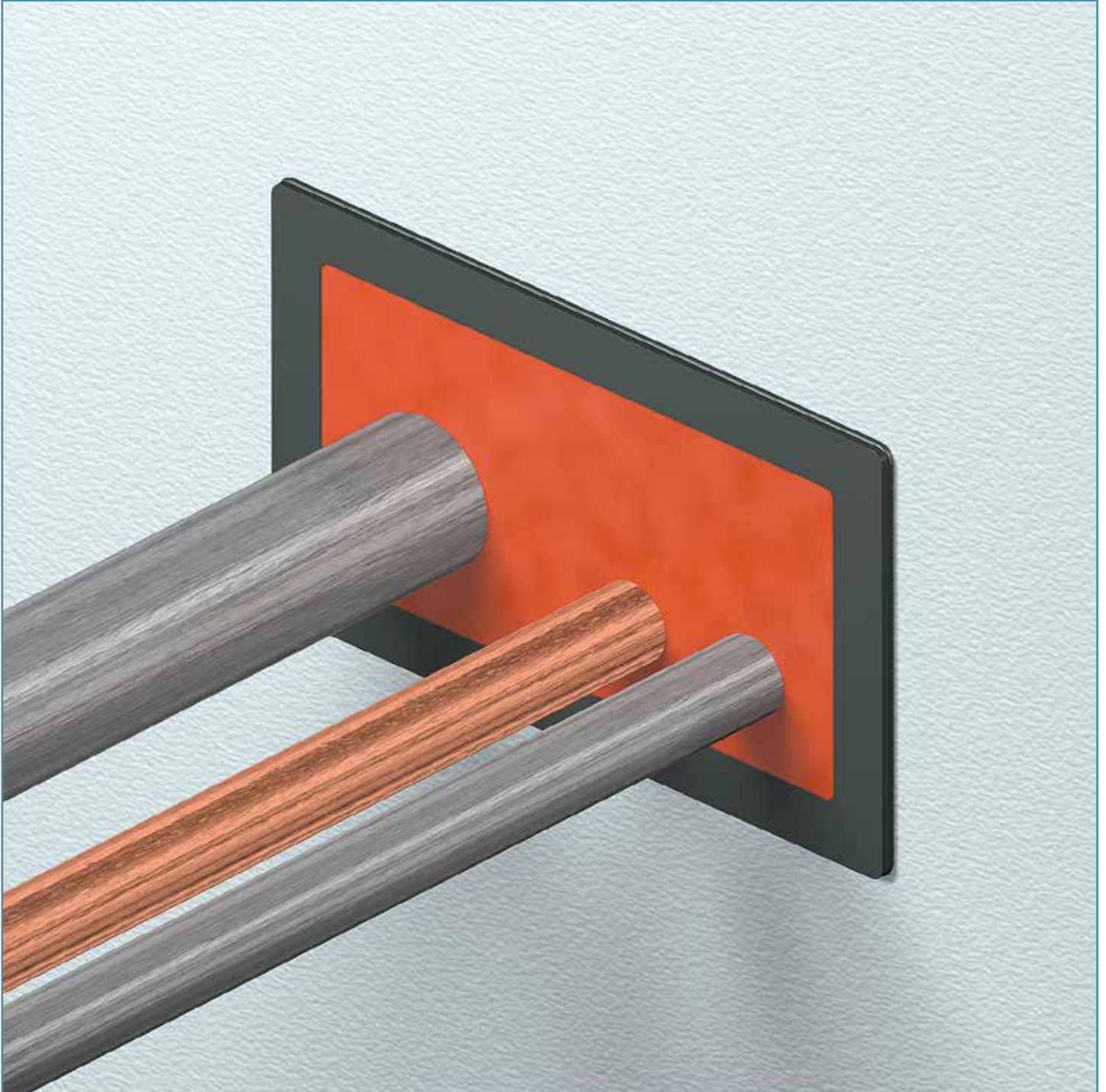
Note: do not use soap water! Soap water will have a negative impact on the adhesive properties of the sealant.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



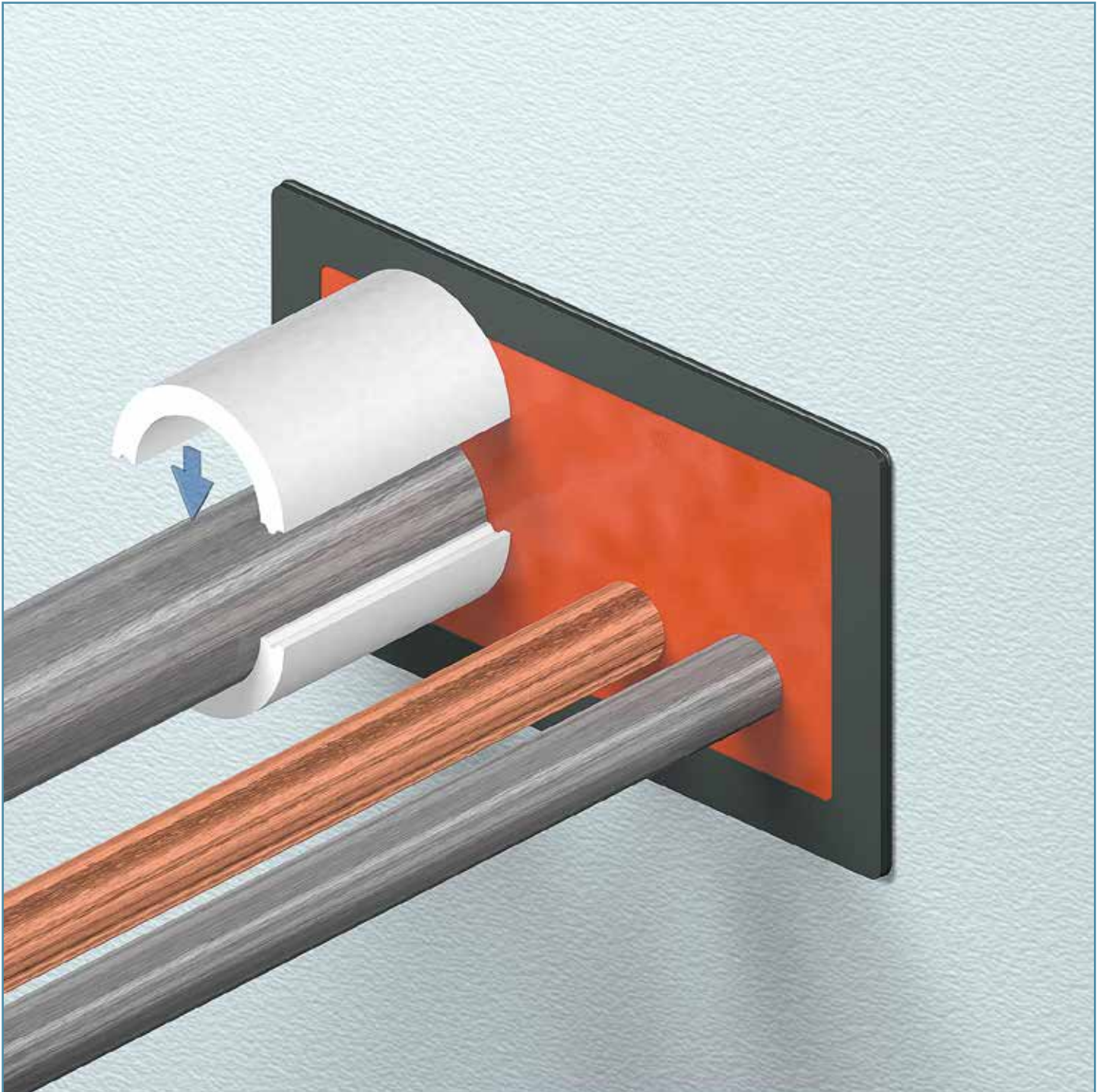
The cloth is then used to press down the sealant layer flush with the end of the transit frame. It is of utmost importance to ensure that the sealant is pressed very tightly so that the sealant is compressed into all empty spaces of the NOFIRNO® sleeve set, including partially into the hollow filler sleeves. The larger the adhesive surfaces of the sealant, the higher the performance of the system.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



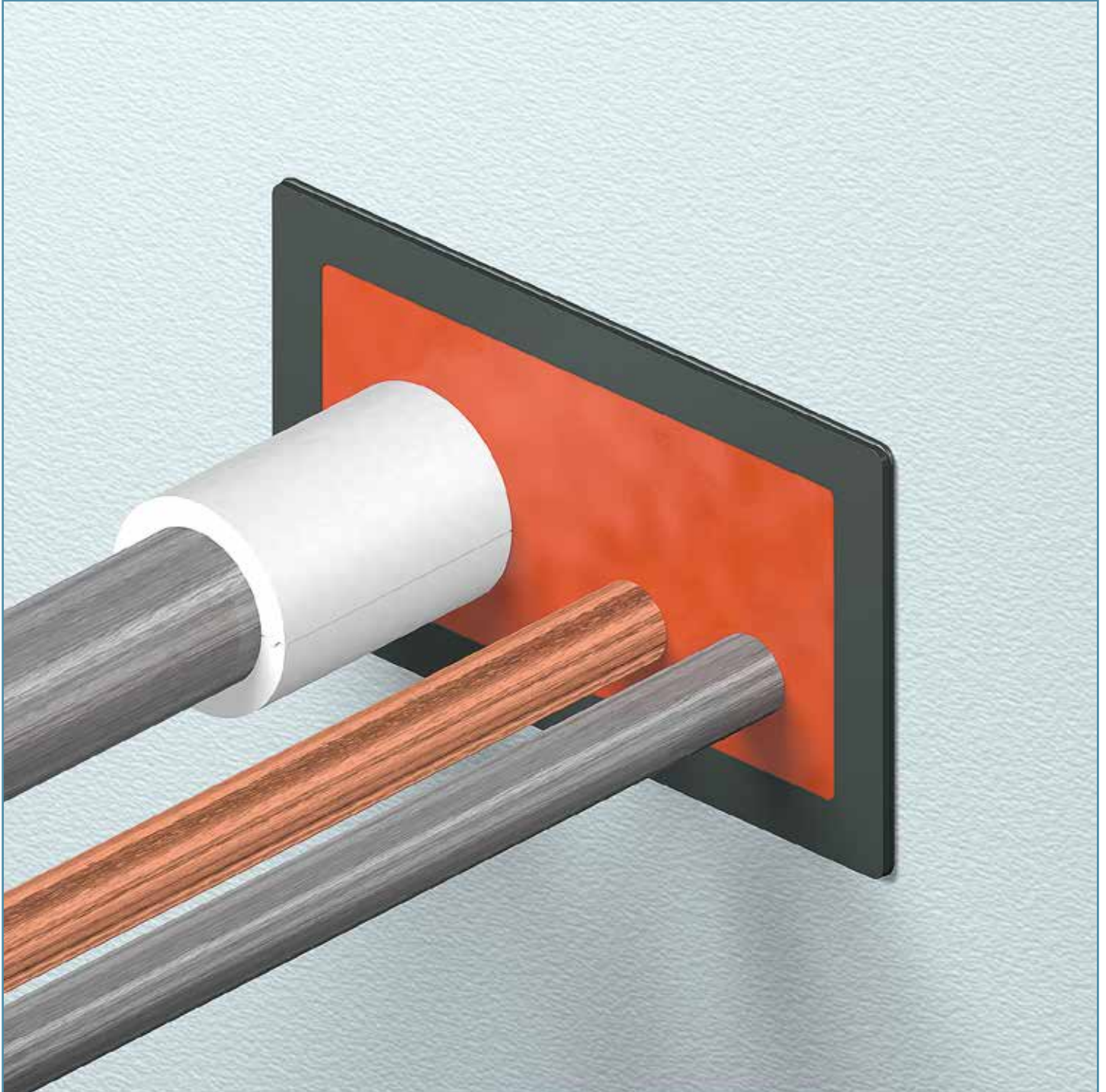
The NOFIRNO rubber grade of the sleeves and the NOFIRNO® sealant, which are compounded under strict conditions in our factory, are suitable for gas and water tight ducting, and for fire rated applications as well. The NOFIRNO® rubber and sealant stay flexible at temperatures of -50 °C, allowing application in arctic environments. The NOFIRNO® system can also be used for steam lines with temperatures up to +180 °C. The NOFIRNO® (multi-) pipe transits have excellent resistance to seawater, UV, ozone and weather. Based on the use of the high tech silicone composition of the NOFIRNO® sealant and rubber, the system offers excellent durability.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



For EI or A(15-60)-class penetrations, the NOFIRNO® larger pipe sizes have to be insulated on both sides of the penetration with the same length or on the unexposed side with the full length as installed on both sides of the sandwich panel. FYLLOFYS® pre-fabricated shells can be used for this purpose. Check the Type Approval Certificates for the insulation lengths to be installed around the ducted pipes to fulfil the criteria of maximum temperature rise for EI or A(15-60)-class penetrations according to the EN 1366-3:2009 or FTP 2010 code.

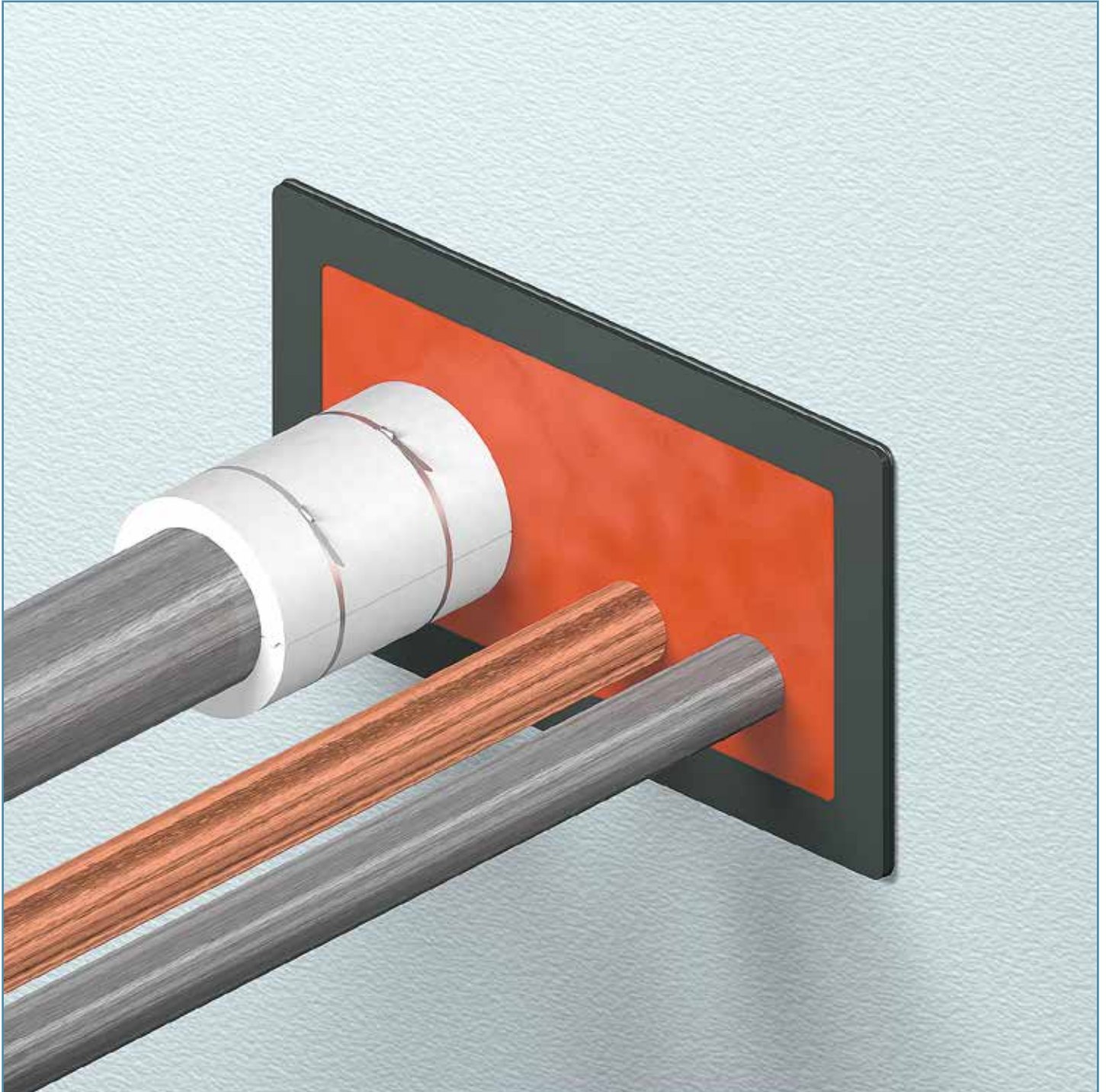
INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



The FYLLOFYSS® pre-fabricated shells can be glued to the the ducted pipe(s) using FISSIC® non-combustible, fire safe coating/adhesive.

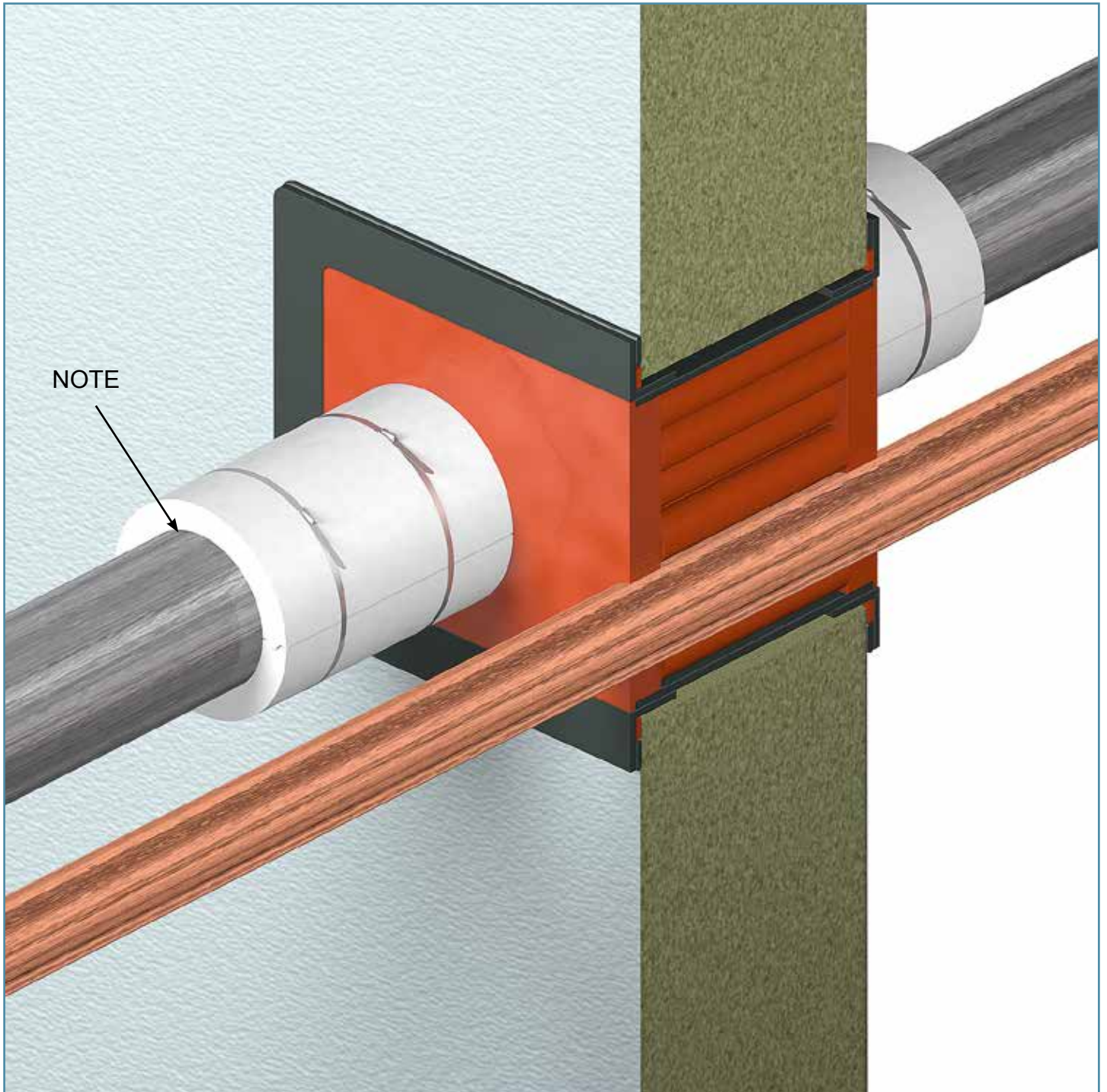
Note: in case the FYLLOFYSS® pre-fabricated shells have to be cut to the required length on site, take care that the cuts are coated with a layer of FISSIC® to prevent water absorption.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



Jubilee clips can be used to fix the FYLLOFYS® insulating shells to the ducted pipe. To prevent CUI (Corrosion Underneath Insulation), the joint between the ducted pipe and FYLLOFYS® shells should be covered/filled with sufficient FISSIC® coating or NOFIRNO® sealant.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC



The finished penetration.

Note: to prevent CUI (Corrosion Underneath Insulation) the joint between the ducted pipe and the FYLLOFYSS® insulation has to be sealed with NOFIRNO® sealant.

Design Verification Report 20180216/01 for EI60/A60 class issued by KIWA Netherlands.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR COAMINGS FLCC

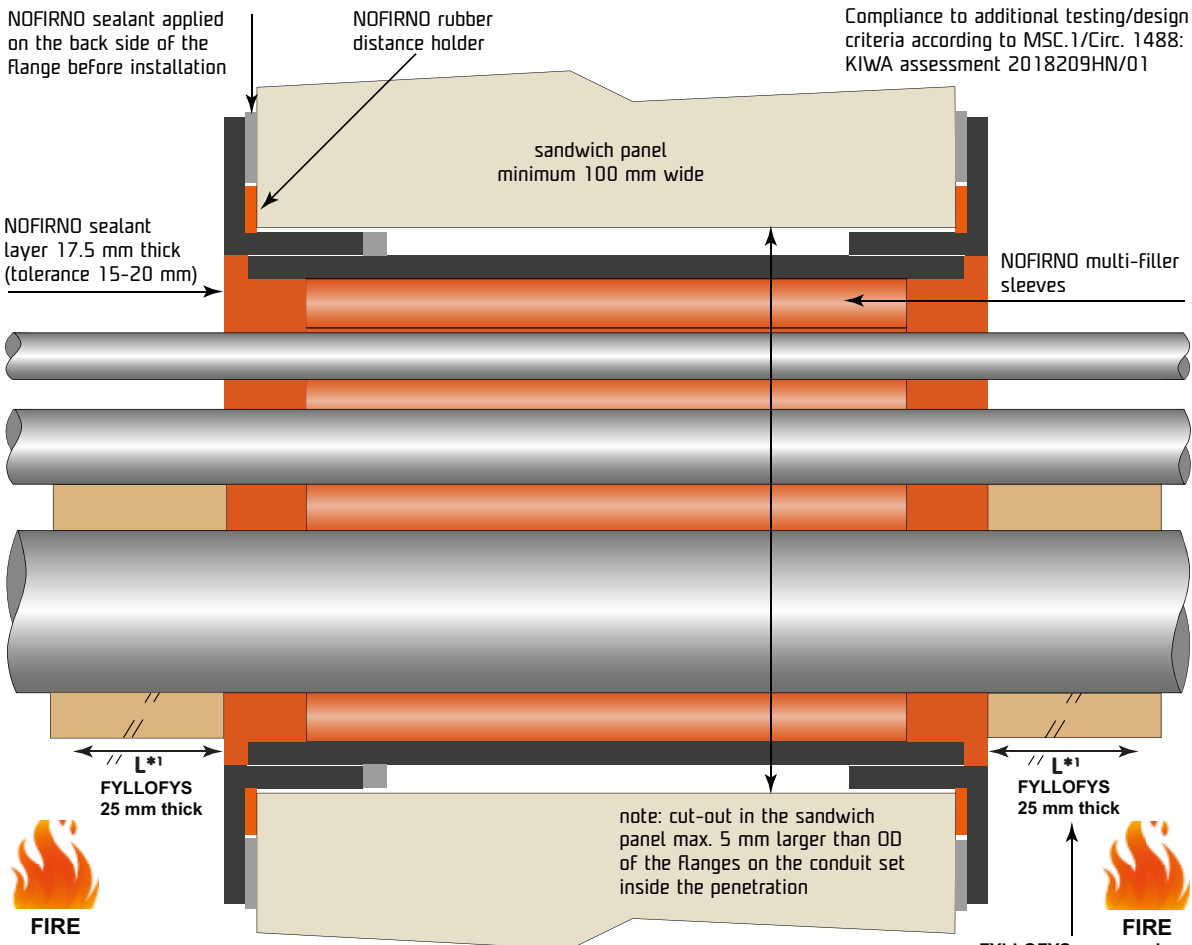
direction of exposure: fire from either side

Minimum distance between ducted pipe and conduit sleeve and between ducted pipes:
at least 15 mm for steel/CuNi pipes
at least 20 mm for copper pipes
Note *2: For multi-pipe penetrations 25 mm clearance should be taken into account, depending on the FYLLOFYS insulation to be installed for EI/A-class ratings

A-60/EI-60 class multi-pipe transits with max. steel/ss/CuNi pipe OD 114.3 mm and max. copper pipe 76.1 mm sealed with the NOFIRNO system installed in HR plastic conduit sleeves max. 250 mm ID and frames 300x150 mm in A-60/EI-60 certified sandwich panels

For the adequate analysis and assessment of the risk(s) reference is made to KIWA assessment 2018212HN/01

Compliance to additional testing/design criteria according to MSC.1/Circ. 1488: KIWA assessment 2018209HN/01



Insulation lengths (L) for walls 150 mm thick:		Insulation lengths (L) for walls 100 mm thick:	
OD steel/CuNi pipes	L (25mm thick)	OD steel/CuNi pipes	L (25mm thick)
≤ 60.3 mm	none	≤ 60.3 mm	2x100 mm
> 60.3 mm - 114.3 mm	2x100 mm	> 60.3 mm - 114.3 mm	2x200 mm
OD copper pipes	L (25mm thick)	OD copper pipes	L (25mm thick)
≤ 25 mm	2x100 mm	≤ 25 mm	2x200 mm
>25 - 42 mm	2x200 mm	>25 - 42 mm	2x300 mm
>42 - 54 mm	2x300 mm	>42 - 54 mm	2x400 mm
>54 - 76.1 mm	2x400 mm	>54 - 76.1 mm	2x500 mm

Note *1: insulation either symmetrically installed or full length (2x L) totally on unexposed side

FYLLOFYS, non-combustible insulation according to Efectis test report EFR-17-OMI-003574 Rev. 1

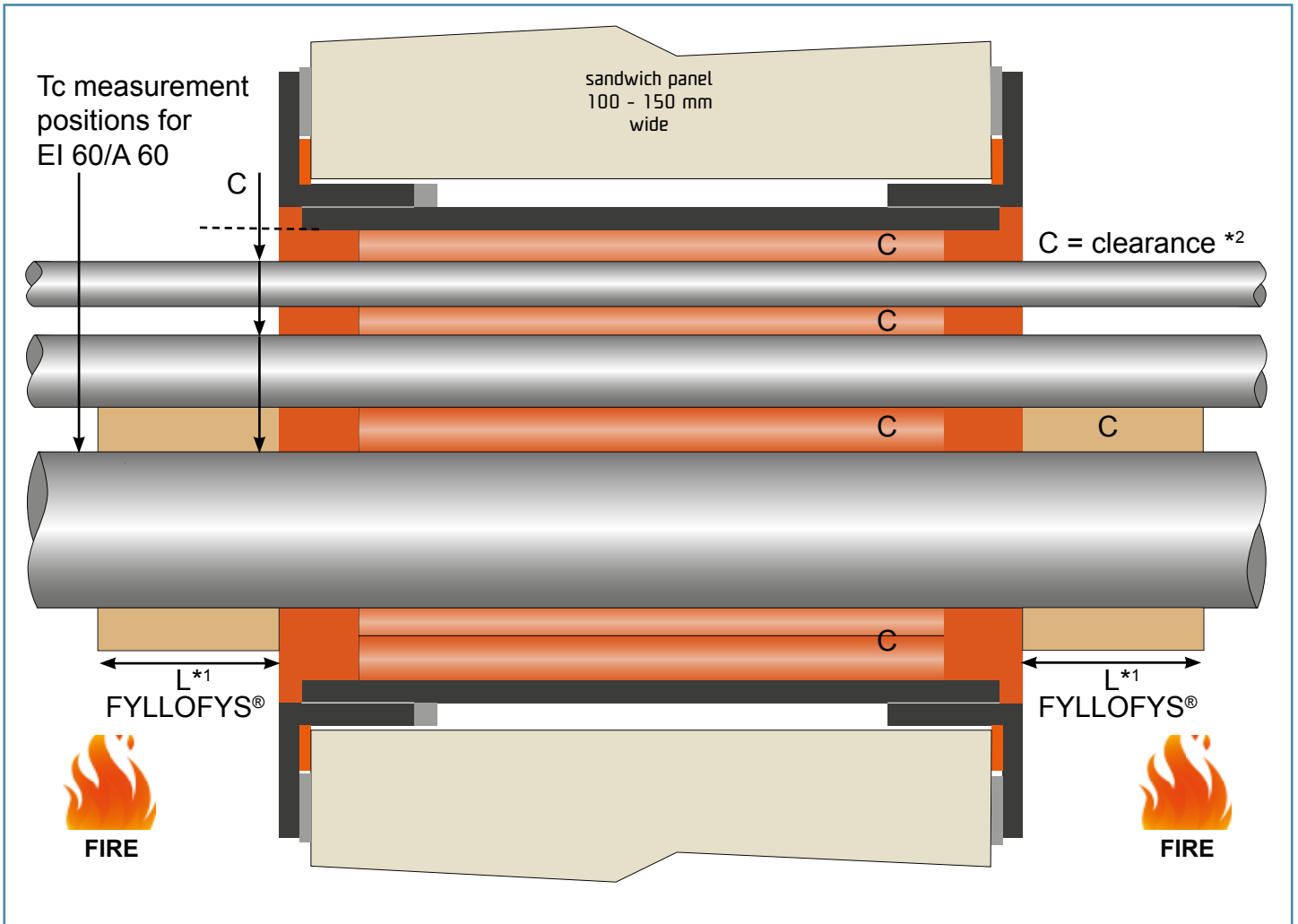
NOFIRNO/HR sealing system
For walls and floors

tested according to IMO Res. MSC 307(88)
alt. EN 1366-3:2009
max. size of aperture 250 mm ID mm or 300x150 mm equivalent of 450 cm²

A-60/EI-60

	Description: NOFIRNO sealing system for A-60/EI-60 class sandwich panels		
	Mat.: NOFIRNO rubber & sealant		
Ref.: JAB	Date:	15-05-2018	Scale:
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	Rev. 2		

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/FLCC/TLC



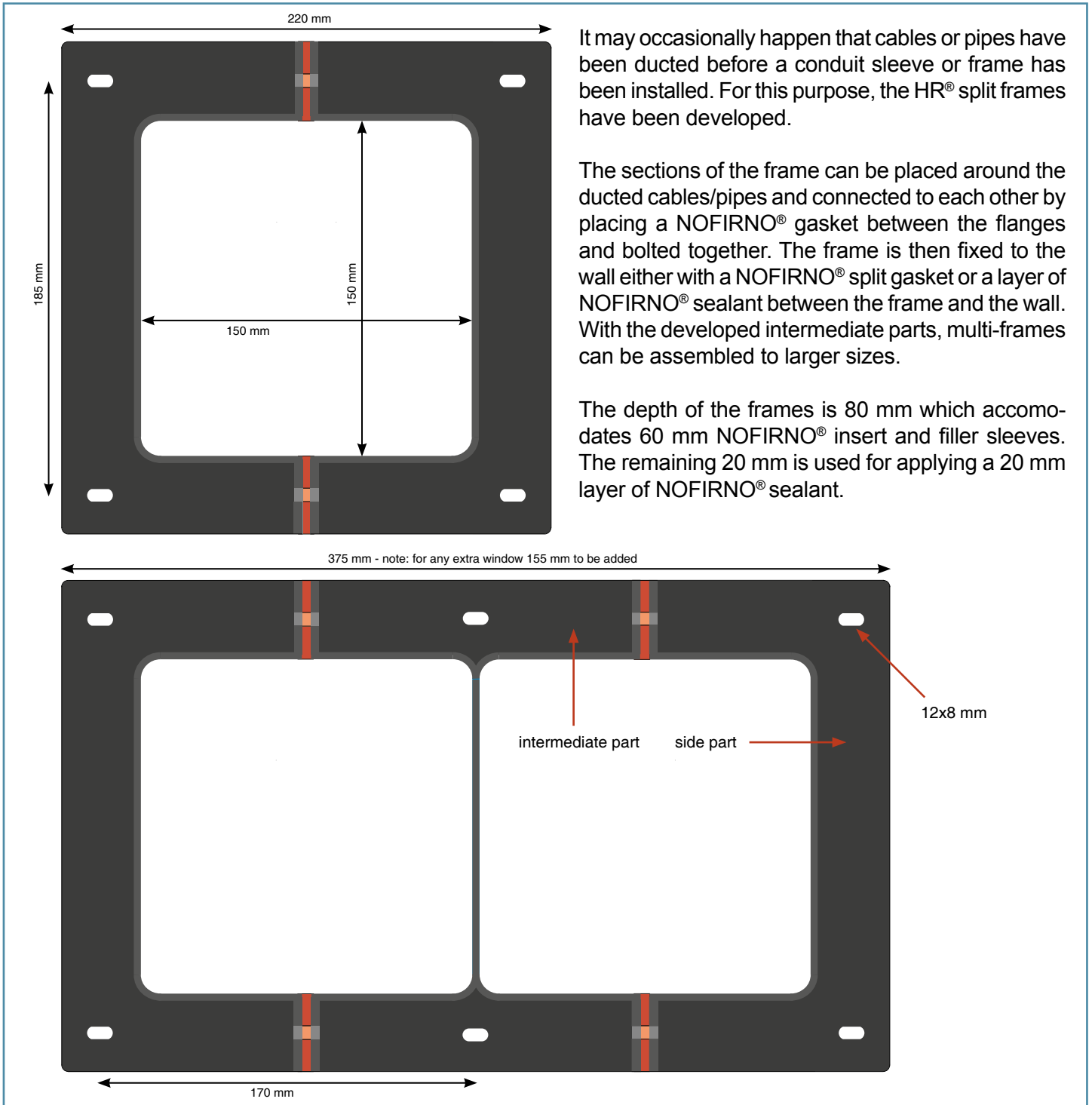
Insulation lengths (L) for walls 150 mm thick:		Insulation lengths (L) for walls 100 mm thick:	
OD steel/CuNi pipes	L (25mm thick)	OD steel/CuNi pipes	L (25mm thick)
≤ 60.3 mm	none	≤ 60.3 mm	2x100 mm
> 60.3 mm - 114.3 mm	2x100 mm	> 60.3 mm - 114.3 mm	2x200 mm
OD copper pipes	L (25mm thick)	OD copper pipes	L (25mm thick)
≤ 25 mm	2x100 mm	≤ 25 mm	2x200 mm
>25 - 42 mm	2x200 mm	>25 - 42 mm	2x300 mm
>42 - 54 mm	2x300 mm	>42 - 54 mm	2x400 mm
>54 - 76.1 mm	2x400 mm	>54 - 76.1 mm	2x500 mm

Note *1: insulation either symmetrically installed or full length (2x L) totally on unexposed side

C = Minimum distance between ducted pipe and conduit sleeve and between ducted pipes:
 at least 15 mm for steel/CuNi pipes
 at least 20 mm for copper pipes

Note *2: for multi-pipe penetrations 25-50 mm clearance should be taken into account, depending on the FYLLOFYS® insulation to be installed for EI/A-class ratings

INSTALLATION INSTRUCTIONS FOR NOFIRNO® MULTI-PIPE TRANSIT SEALING SYSTEM IN HR SPLIT MODULAR FRAMES



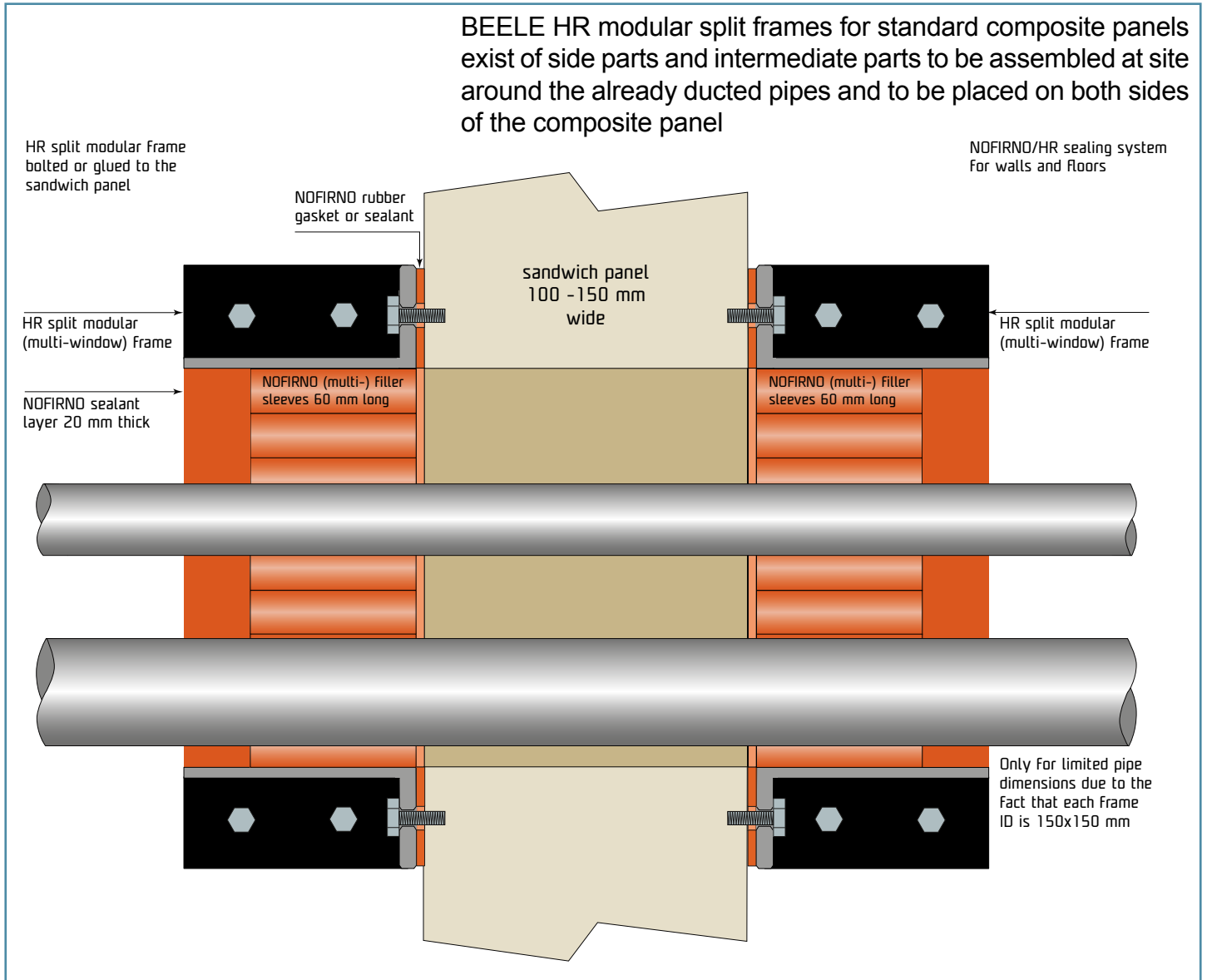
It may occasionally happen that cables or pipes have been ducted before a conduit sleeve or frame has been installed. For this purpose, the HR® split frames have been developed.

The sections of the frame can be placed around the ducted cables/pipes and connected to each other by placing a NOFIRNO® gasket between the flanges and bolted together. The frame is then fixed to the wall either with a NOFIRNO® split gasket or a layer of NOFIRNO® sealant between the frame and the wall. With the developed intermediate parts, multi-frames can be assembled to larger sizes.

The depth of the frames is 80 mm which accommodates 60 mm NOFIRNO® insert and filler sleeves. The remaining 20 mm is used for applying a 20 mm layer of NOFIRNO® sealant.

SPLIT CONDUIT FRAMES		GASKET SETS		PARTS	
frame 1x150 complete	60.9510	gasket 1x150 complete	51.9510	side part frame	60.9500
frame 2x150 complete	60.9511	gasket 2x150 complete	51.9511	intermediate part	60.9501
frame 3x150 complete	60.9512	gasket 3x150 complete	51.9512	gasket flanges	51.9500
frame 4x150 complete	60.9513	gasket 4x150 complete	51.9513	gasket side part 1x150	51.9501
frame 5x150 complete	60.9514	gasket 5x150 complete	51.9514	gasket side part nx150	51.9502
				extension gasket nx150	51.9503

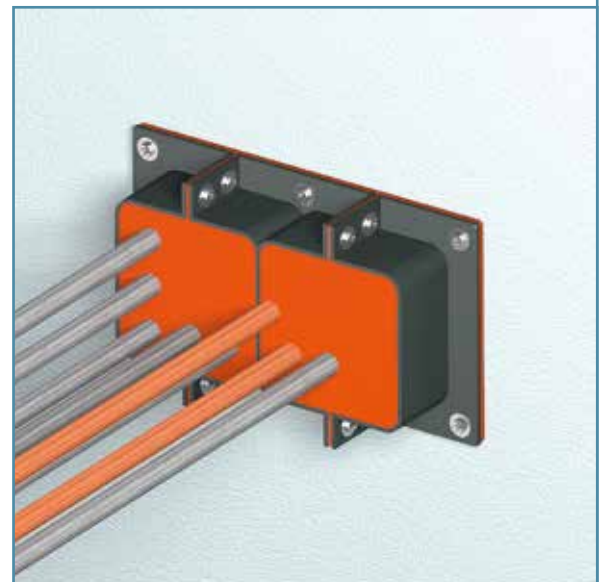
INSTALLATION INSTRUCTIONS FOR NOFIRNO® MULTI-PIPE TRANSIT SEALING SYSTEM IN HR SPLIT MODULAR FRAMES



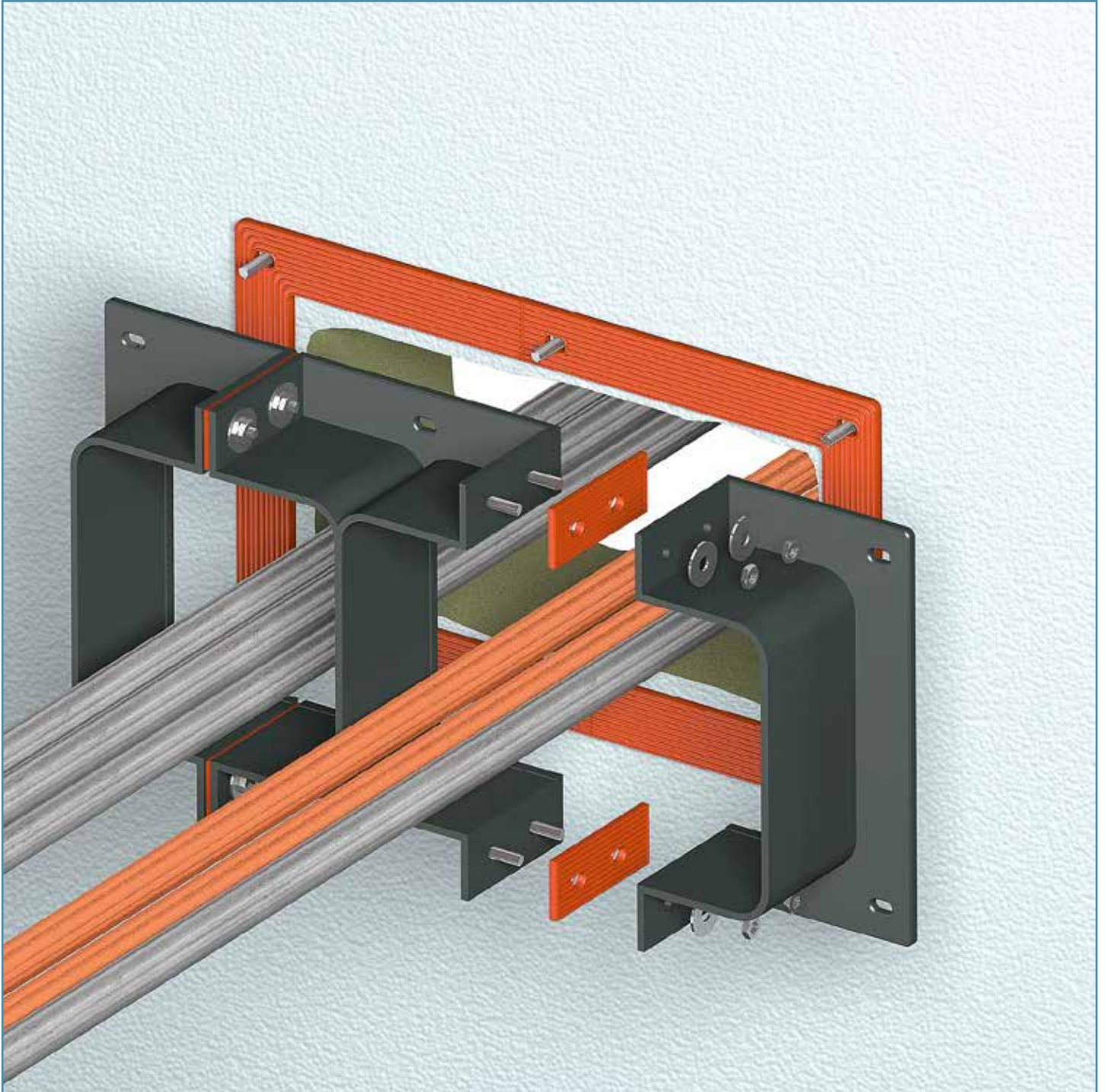
The HR modular conduit frames are made from a 40% glass filled thermoplastic with excellent properties and are very suitable for installation in challenging environments

- *) outstanding chemical and oxidative resistance
- *) UV resistant
- *) high hardness and rigidity
- *) low creep
- *) minimal water absorption (0.02%)
- *) high temperature resistance (240 °C continuous)
- *) flame retardant - LOI 47%
- *) thermal conductivity ca. 0.25 W/mK
- *) surface resistivity > 10¹³ Ohm
- *) density 1.65 g/cm³

Data based on external information of used thermoplastic

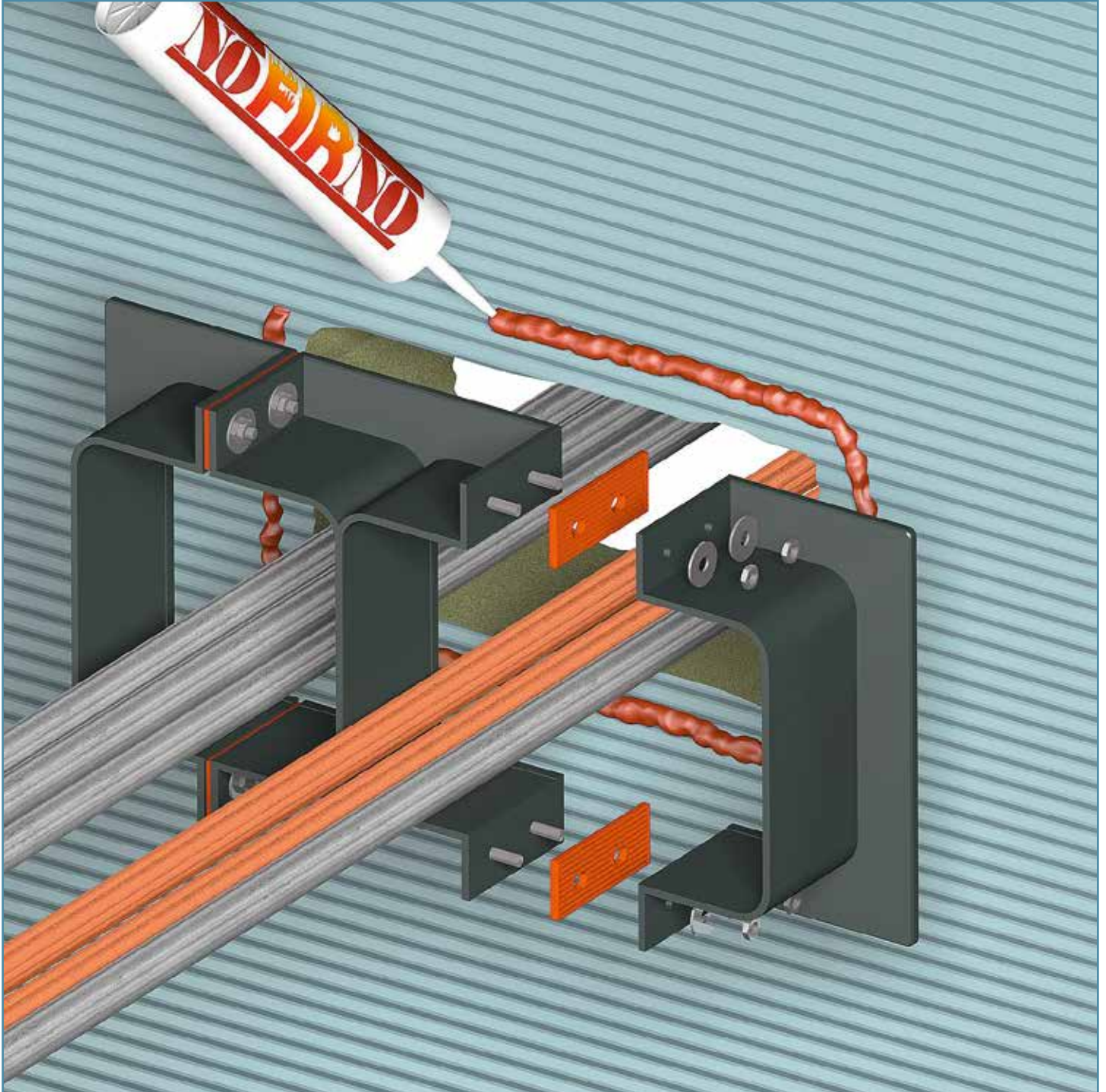


INSTALLATION INSTRUCTIONS FOR NOFIRNO® MULTI-PIPE TRANSIT SEALING SYSTEM IN HR SPLIT MODULAR FRAMES



The split flanged frame is disassembled and then re-assembled around the pipe set. In case the surface of the sandwich panels is smooth (not with a corrugated profile), split NOFIRNO gaskets are placed between the split (multi-window) coaming and the sandwich panel.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® MULTI-PIPE TRANSIT SEALING SYSTEM IN HR SPLIT MODULAR FRAMES



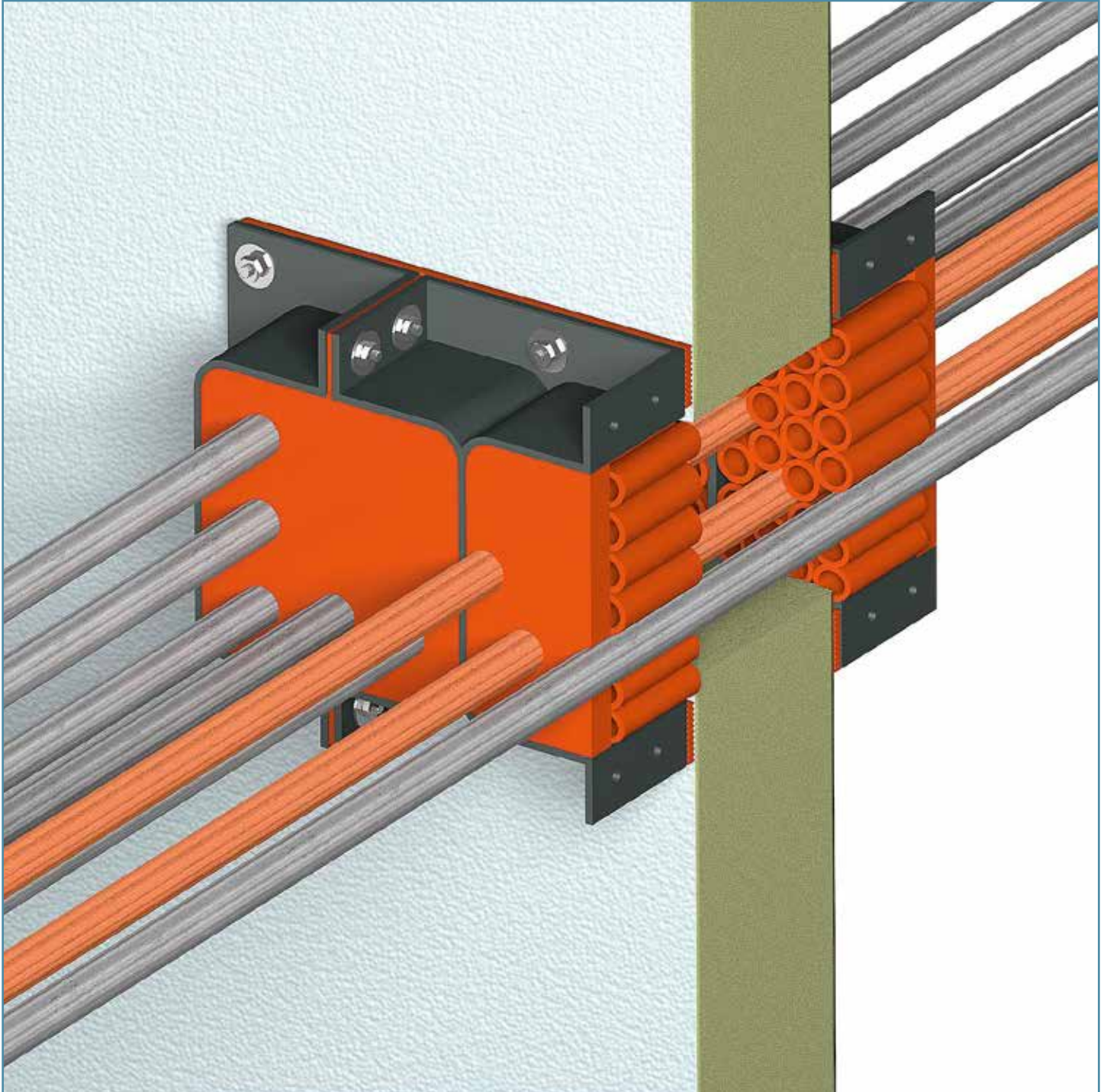
When the sandwich panel has a corrugated profile, the modular split frame is glued to the sandwich panel with a layer of NOFIRNO® sealant.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® MULTI-PIPE TRANSIT SEALING SYSTEM IN HR SPLIT MODULAR FRAMES



The pipes are separated with NOFIRNO® filler sleeves with a length of 60 mm and the remaining space inside the windows of the modular split HR frame is filled with NOFIRNO® (multi-) filler sleeves. On top of the set of filler sleeves a 20 mm thick layer of NOFIRNO® sealant is applied. Before applying the sealant it is recommended to check the tight fit of the filling with NOFIRNO® sleeves.

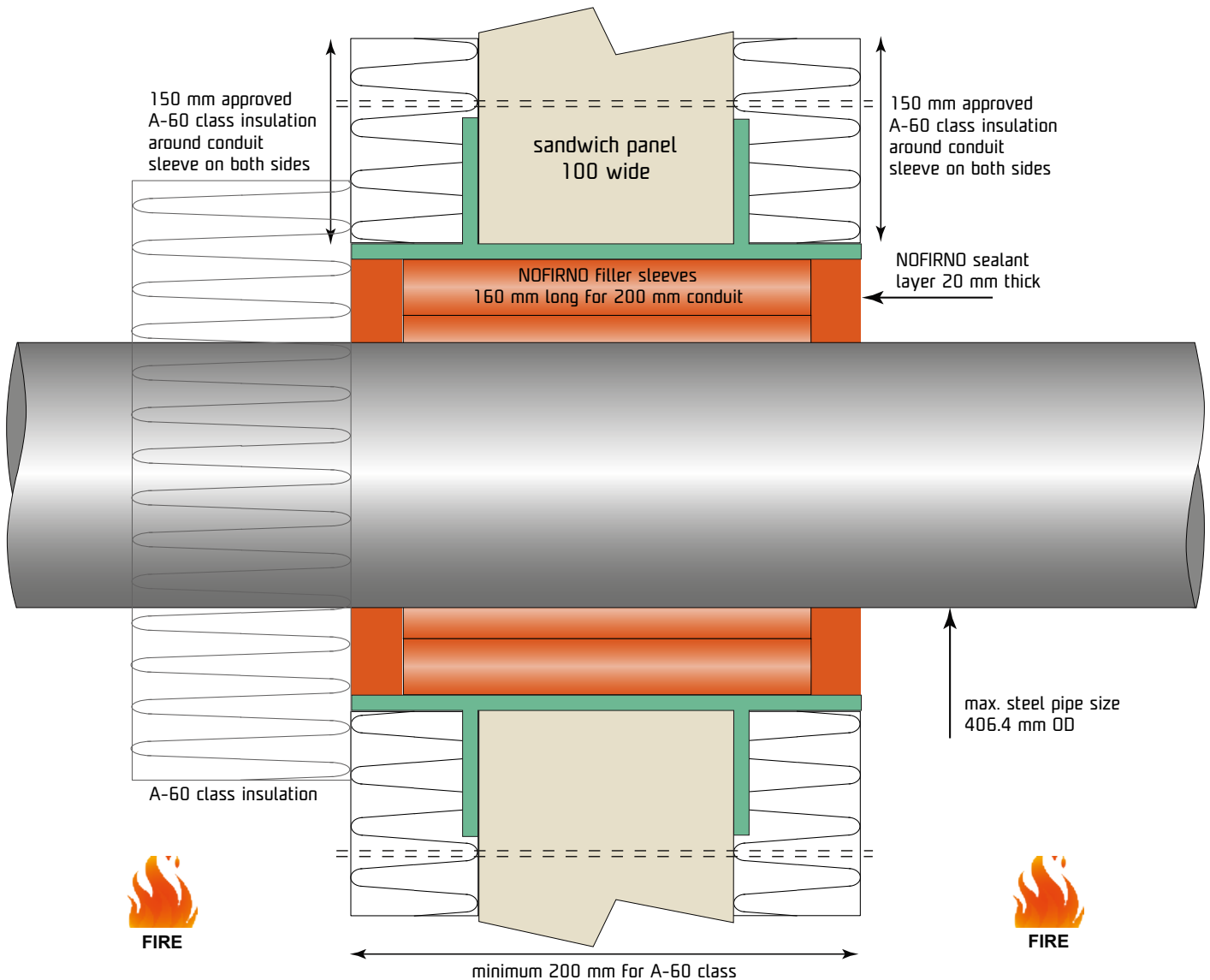
INSTALLATION INSTRUCTIONS FOR NOFIRNO® MULTI-PIPE TRANSIT SEALING SYSTEM IN HR SPLIT MODULAR FRAMES



For fire rated partitions, the NOFIRNO® sealing system has to be installed on both sides of the sandwich panel.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVES

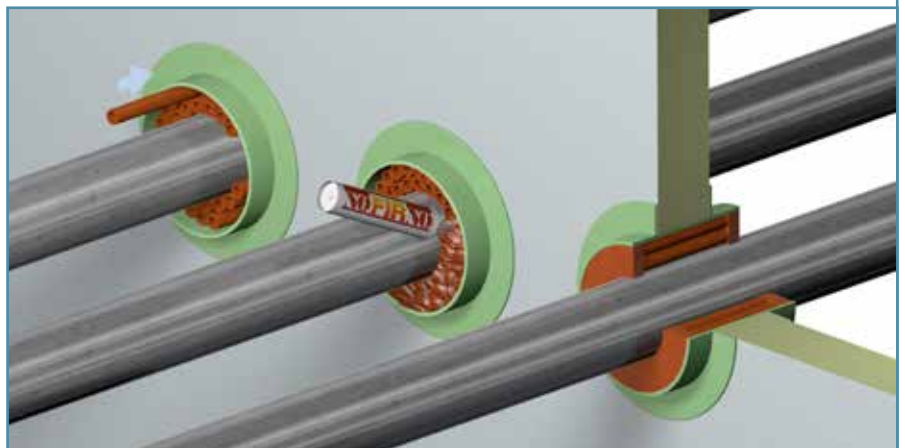
Steel conduit sleeves clamped or fixed against the sandwich panels can be used with a length of minimum 200 mm for A-60 class penetrations.



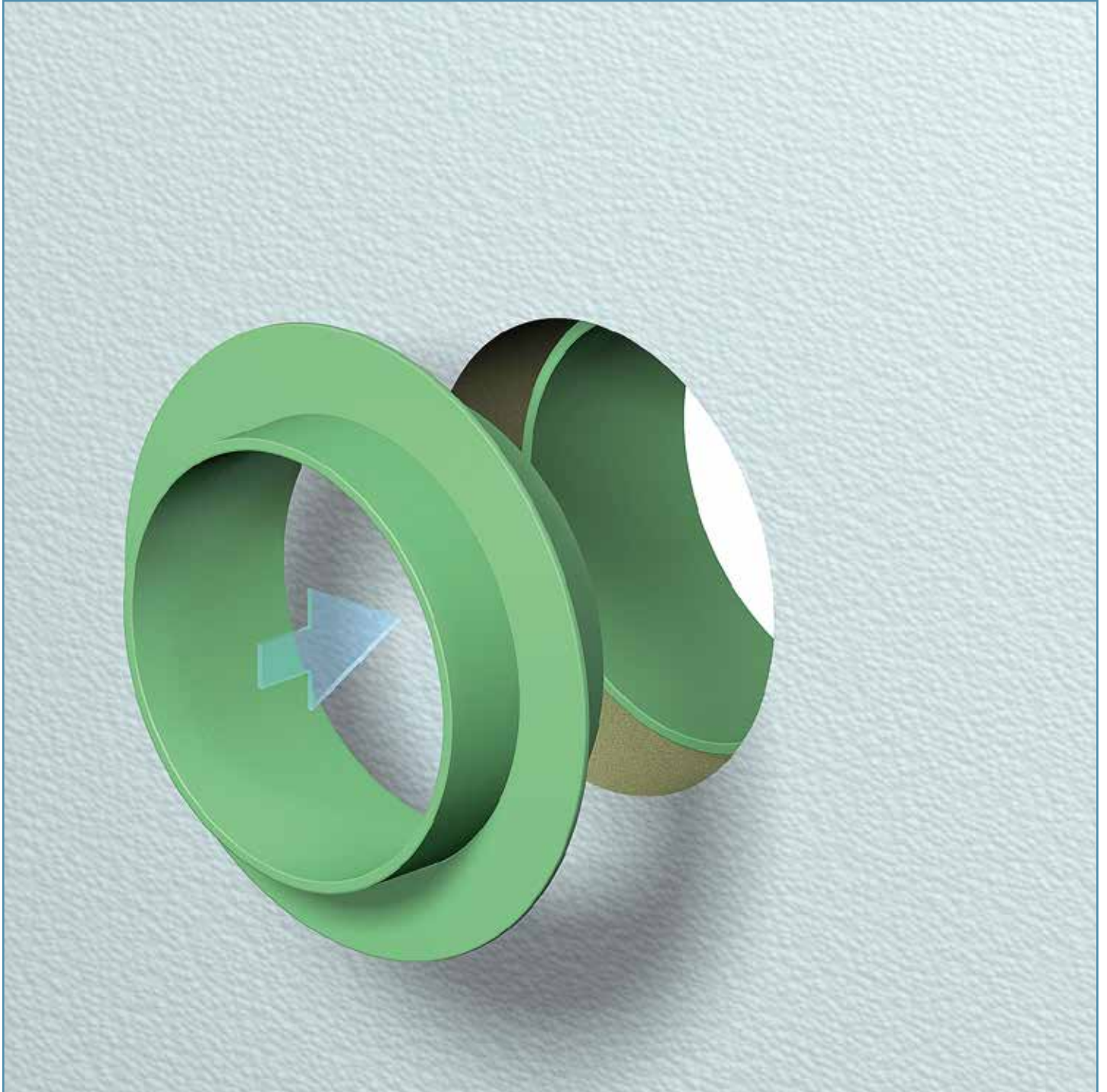
The HR sleeves are available for pipes up to 6" max. For larger pipe sizes steel conduit sleeves with a length of 200 mm have been tested with steel pipes up to 16".

Common A-60 approved insulation is required 150 mm around the conduit sleeve and the ducted pipe.

Alternatively FYLLOFYS® pipe shells are available up to pipe sizes 219.1 mm.

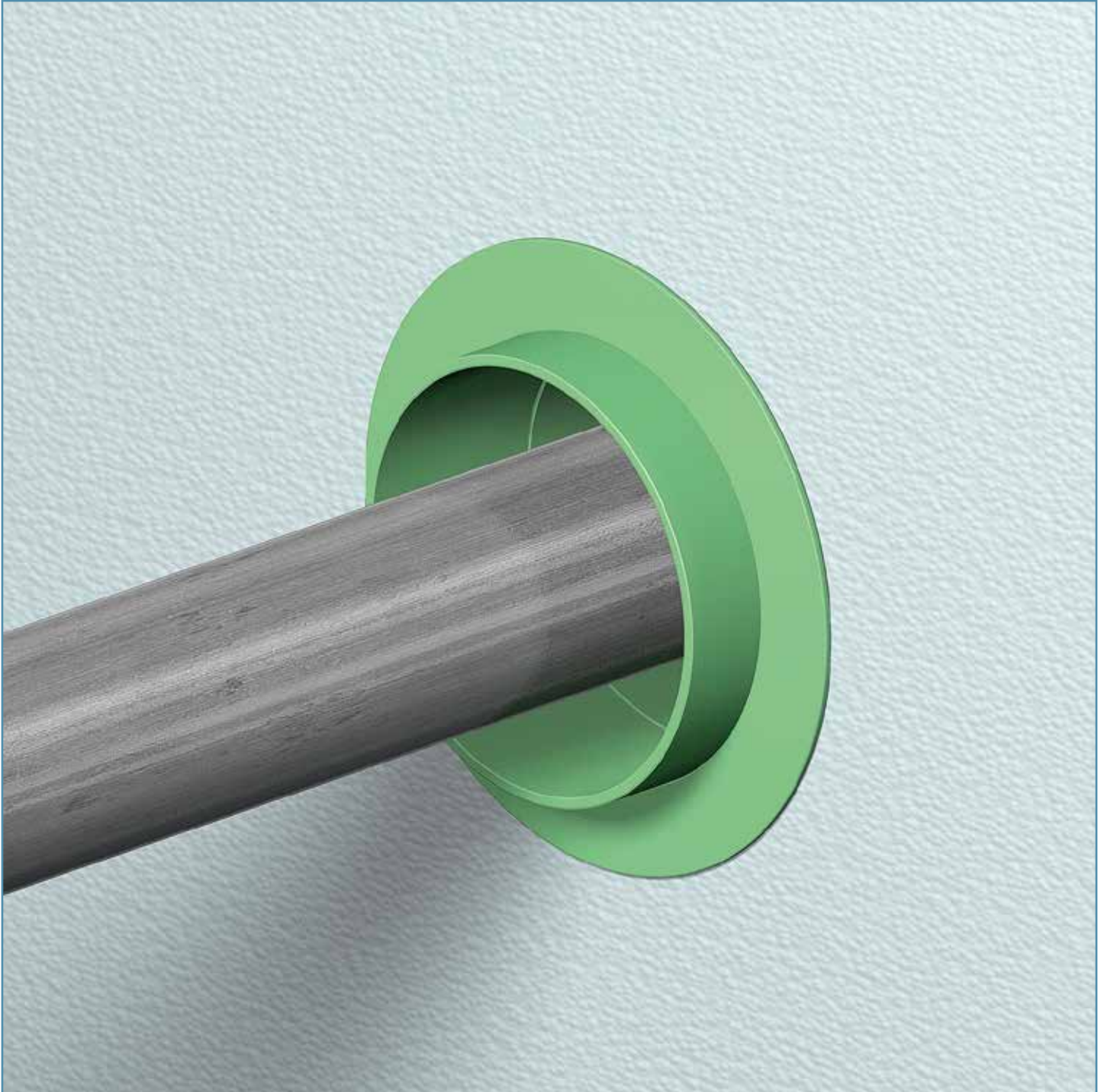


INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE



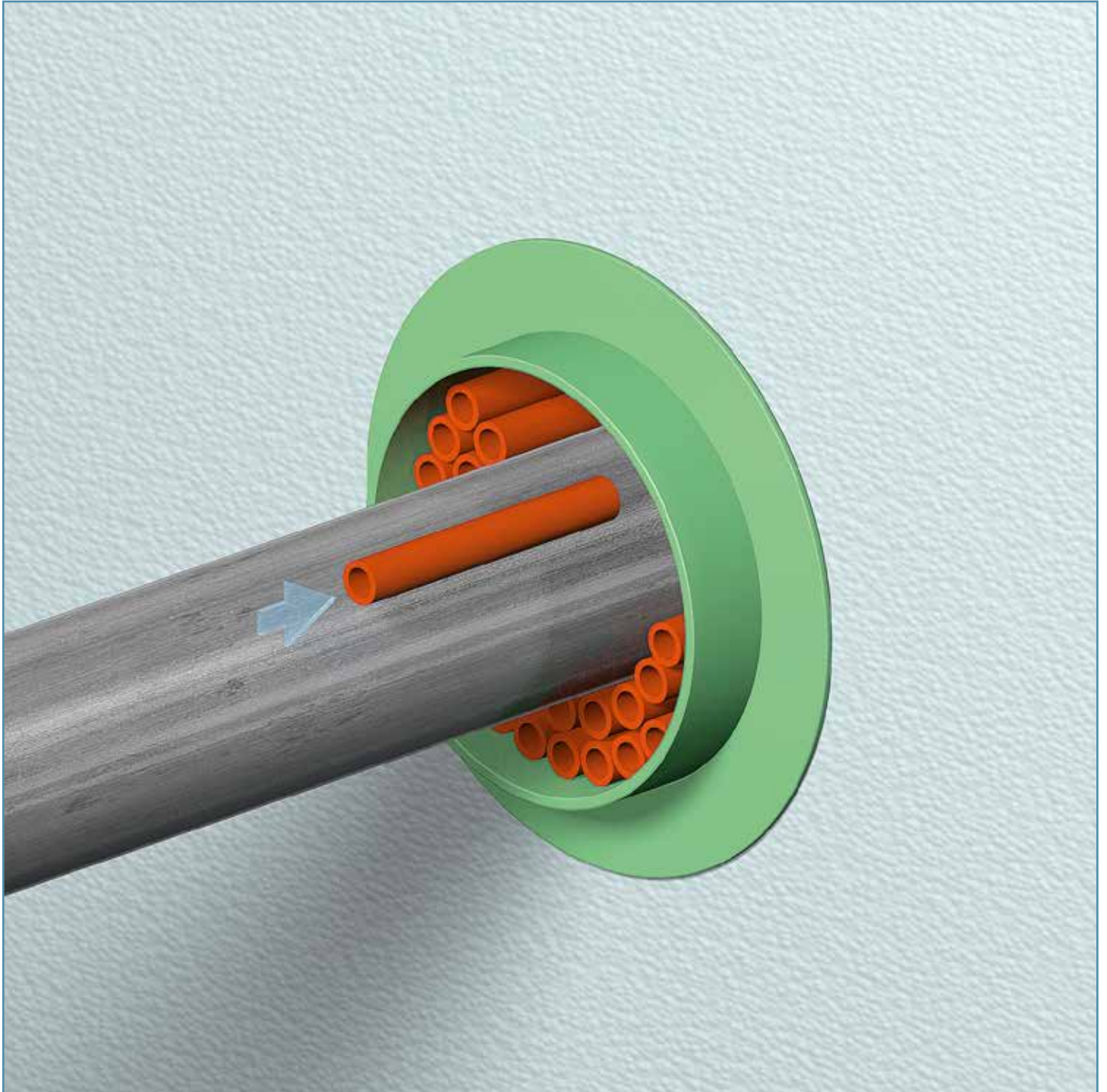
Fitting steel conduit sleeves can be supplied or fabricated on site. The NOFIRNO® sealing system is very flexible with regard to shape. Due to the tightness ratings achieved with the NOFIRNO® sealant, the conduit sleeves can be constructed in two equal parts to avoid working with loose flanges. This is a matter of preferred construction methods on site.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE



The metallic pipe should preferably be passed through the conduit sleeve centrally. If in an off centre position, there should be enough space between the conduit sleeve and the ducted pipe. Make sure that the minimum space between the pipe and the wall of the conduit sleeve is in accordance with the minimum allowed distance as certified.

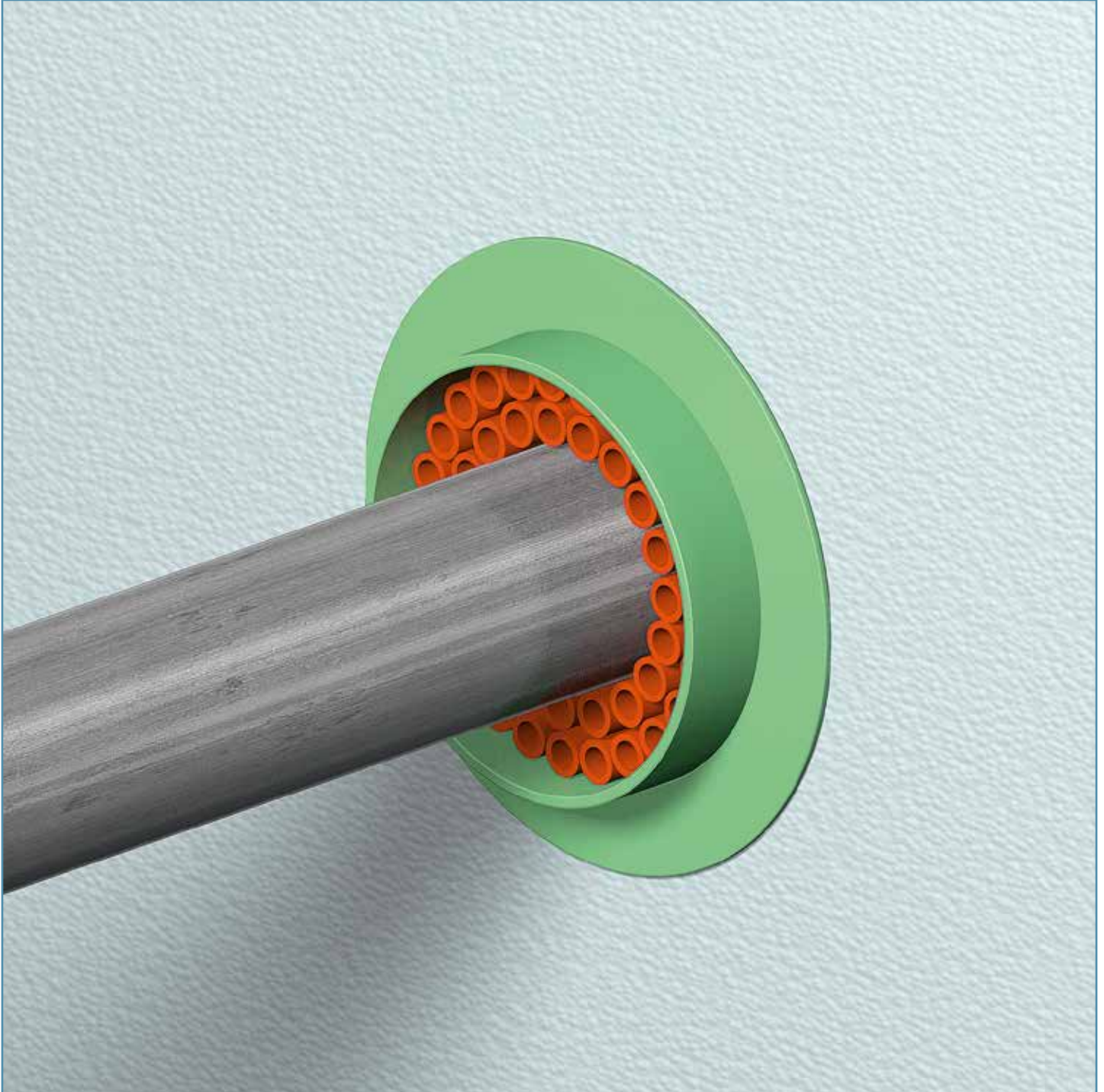
INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE



The remaining free space in the conduit opening is filled with NOFIRNO® filler sleeves type 18/12, 20/12 or 22/15 or a combination of these types. The smaller sleeves sizes 10/4 and 15/8 are used to fill small open spaces present in the complete set of filler sleeves.

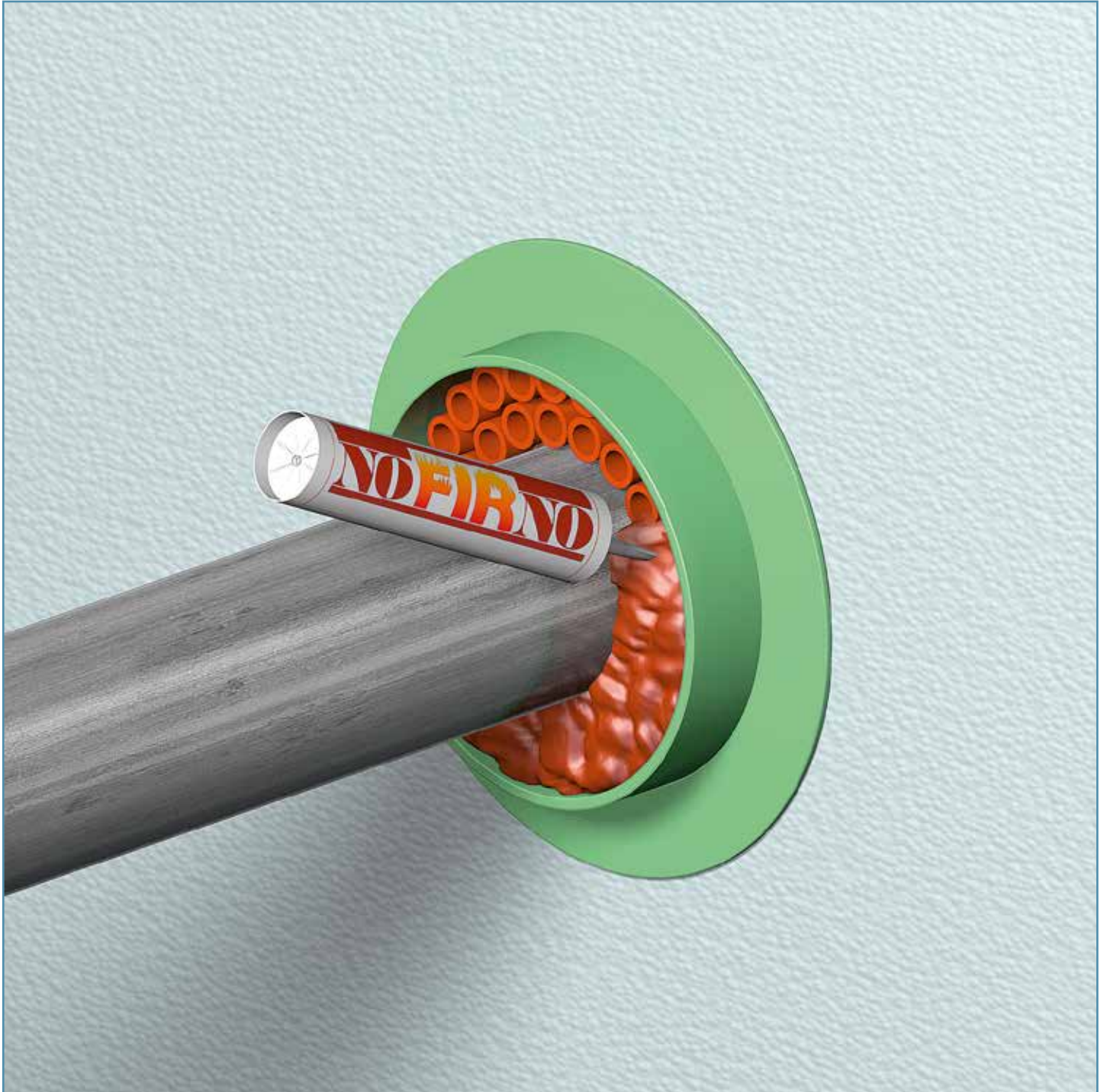
For ease of filling, the NOFIRNO® filler sleeves are supplied non-split. They are delivered also as multi-filler sleeves (multi-sets of 6, 8 and 10 sleeves) which is extremely helpful for filling larger empty spaces. A very tight fit of the filling is vital for the performance of the sealing system.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE



Smaller openings are filled with parts of sets of multi-filler sleeves. To tear off sleeves from the multi-set, the procedure is to do this backwards/forwards and not sideways. This is because of the strength of the intermediate rubber parts.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE

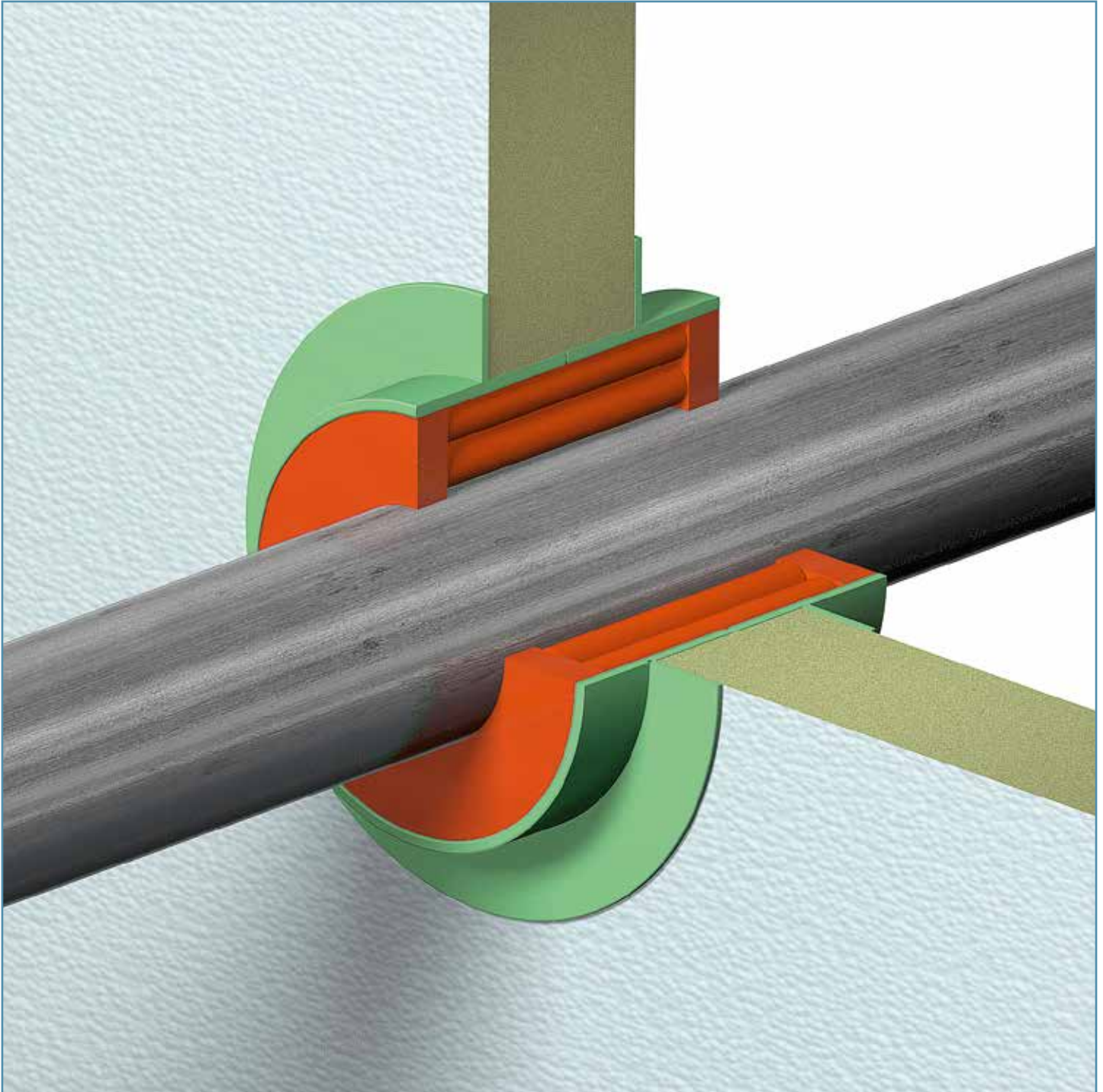


Before applying the sealant it is recommended to check the tight fit of the filling with NOFIRNO® sleeves.

The pipe transit should be overfilled with NOFIRNO® sealant, because some sealant will be pushed into the empty spaces between and into the hollow NOFIRNO® (multi) filler sleeves during further finishing. This will contribute also to obtain higher tightness ratings.

Skin formation of the sealant takes place after ca. 10-15 minutes. In case of large transits, do not apply more sealant than can be finished within this time-slot of 10-15 minutes.

INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE



For A-class penetrations the NOFIRNO® pipe transit frame needs to be insulated 150 mm around the conduit sleeve on both sides of the partition. The ducted pipe has to be insulated on the non-exposed side with a view not to exceed the max. allowable temperature rise of 180 °C in case of fire exposure.

Check the Type Approval Certificates for the insulation lengths to be installed around the ducted pipes to fulfill the criteria of the maximum temperature rise for A-class penetrations according to FTP 2010 code, International Code for Application of Fire Test Procedures (Resolution MSC.307(88)) 2012 Edition and EI classification to EN 13501-2.

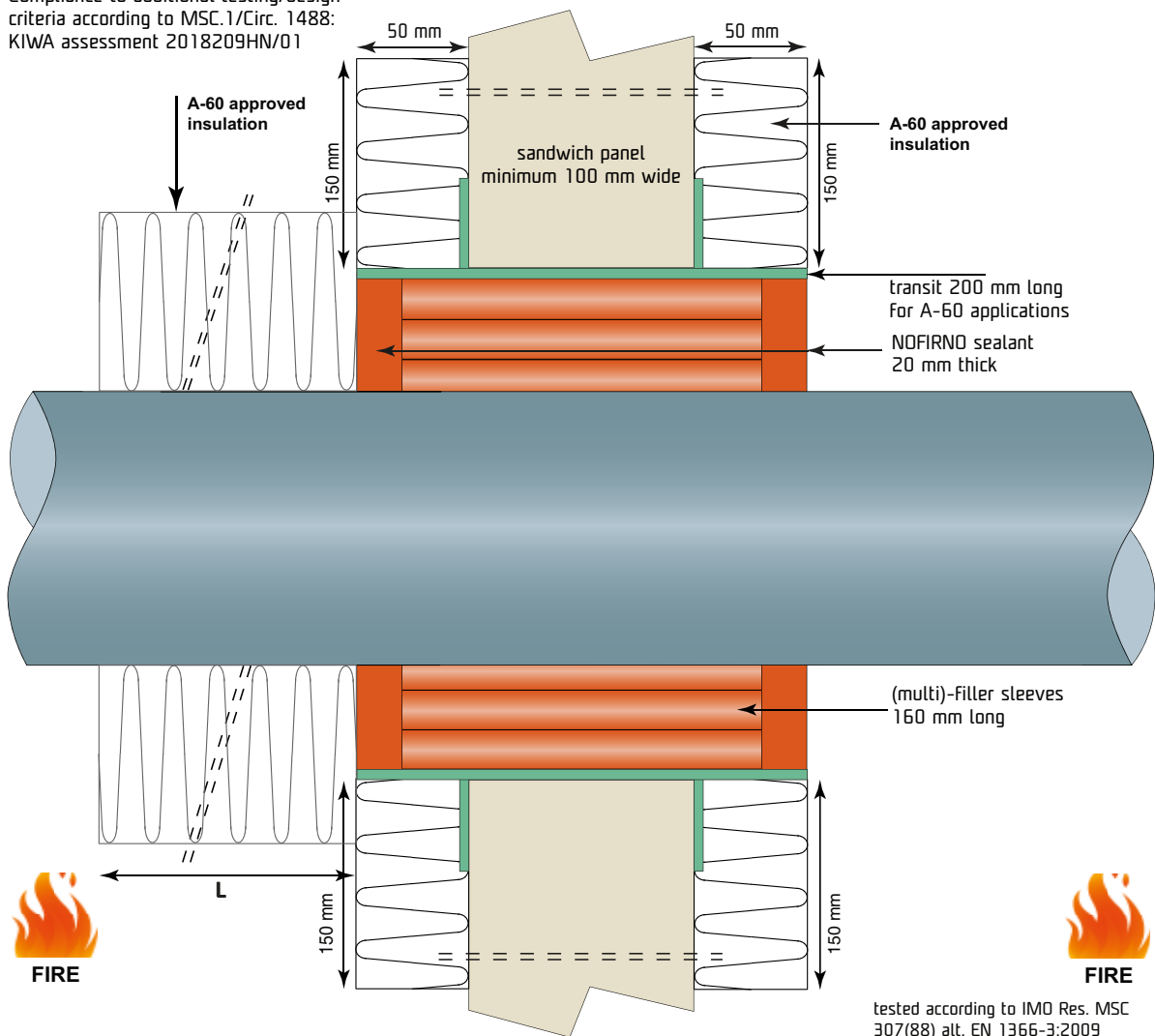
INSTALLATION INSTRUCTIONS FOR NOFIRNO® (MULTI-) PIPE TRANSIT SEALING SYSTEM IN STEEL CONDUIT SLEEVE

**direction of exposure:
fire from either side**

For the adequate analysis and assessment of the risk(s) reference is made to KIWA assessment 2018212HN/01

Compliance to additional testing/design criteria according to MSC.1/Circ. 1488: KIWA assessment 2018209HN/01

A-60/EI-60 pipe transits for steel pipes max. OD 406.4 mm, sealed with the NOFIRNO system installed in steel sleeves max. 500x4 mm with a depth of 200 mm in A-60/EI-60 certified sandwich panels



tested according to IMO Res. MSC 307(88) alt. EN 1366-3:2009 max. size of aperture 492 mm ID mm

L = length of insulation on ducted pipe. Length changes to previous certification are possible. See note 1.

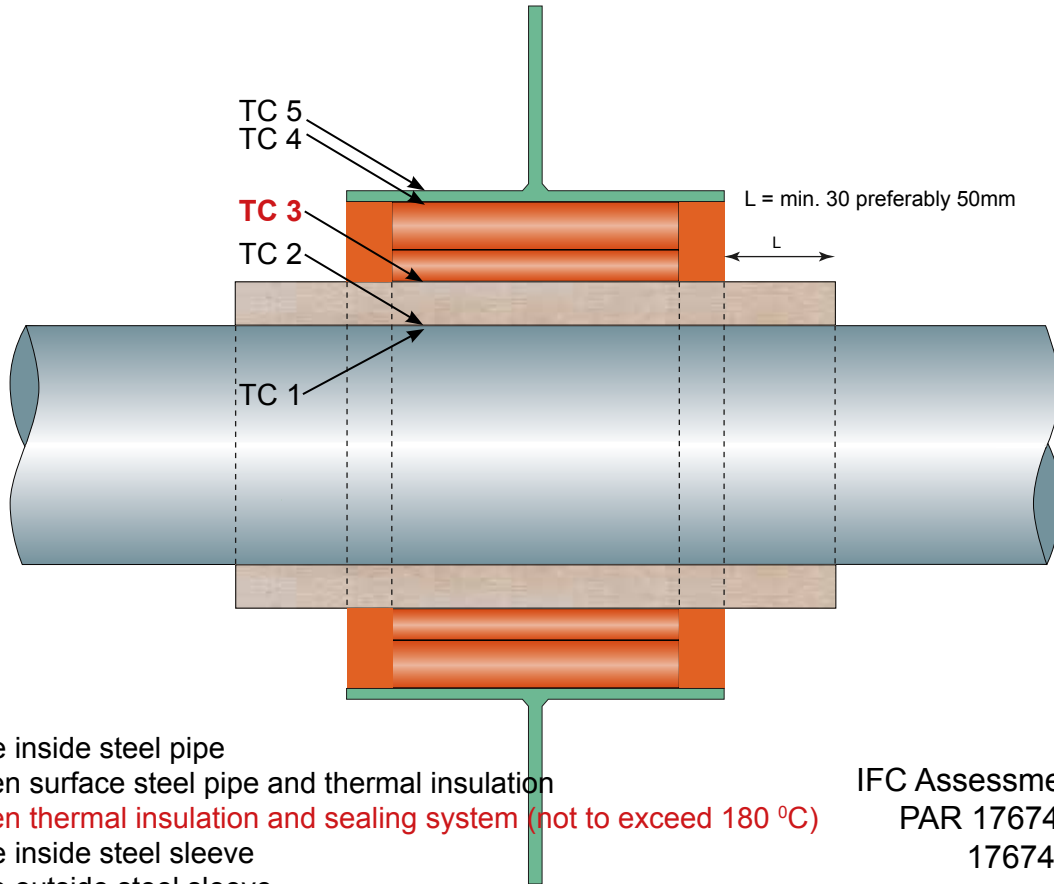
OD	copper pipe	steel/ss/CuNi
up to 1"	200 mm	100 mm
>1" up to <3"	400 mm	200 mm
3" up to <6"	800 mm	400 mm
6" up to <10"	1200 mm	500 mm
10" up to <14"	1600 mm	650 mm
14" up to incl. 16"	1800 mm	750 mm

Note 1:
Change of temperature measurement in the furnace to IMO res. MSC 307(88) is leading to a higher heat input during the first 15 minutes of the fire test compared to IMO res. A754.18. IFC letter report 13-02-2018

A-60/EI-60

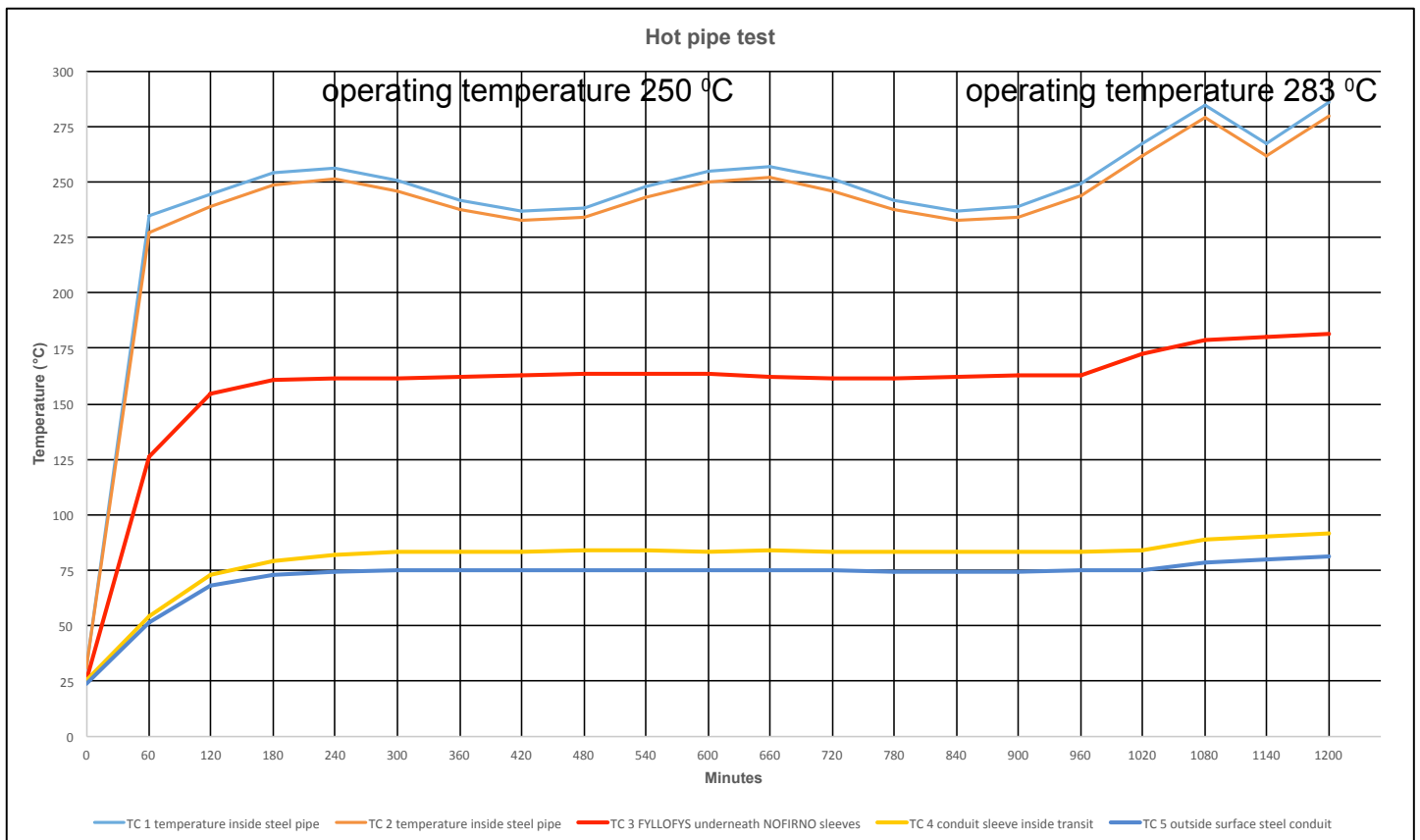
	Description: NOFIRNO sealing system for A-60/EI-60 class sandwich panels		
	Mat.: NOFIRNO rubber & sealant		
Ref.: JAB	Date:	15-05-2018	Scale:
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	Rev. 2		

FYLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C

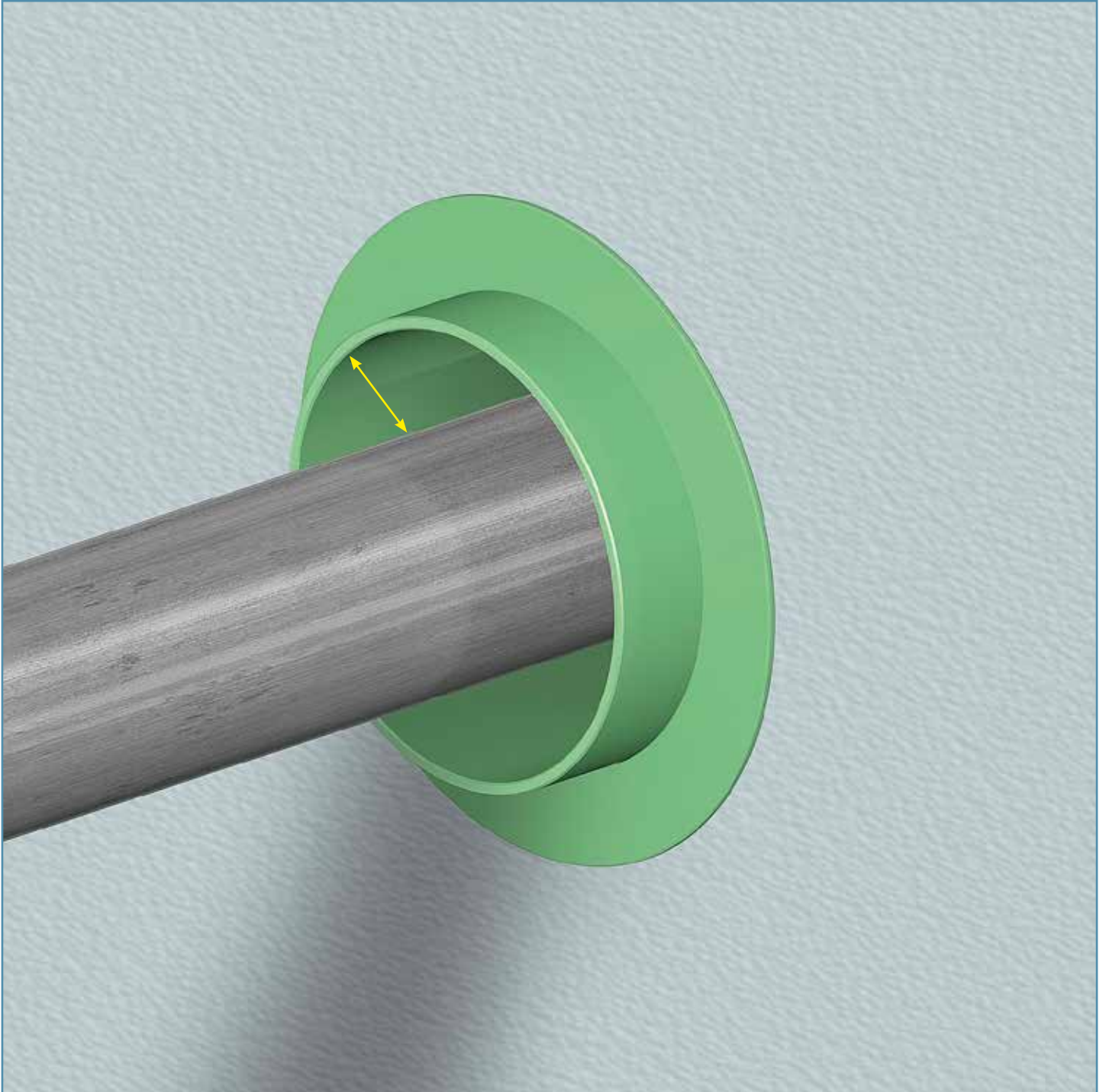


- TC 1 = surface inside steel pipe
- TC 2 = between surface steel pipe and thermal insulation
- TC 3 = between thermal insulation and sealing system (not to exceed 180 °C)
- TC 4 = surface inside steel sleeve
- TC 5 = surface outside steel sleeve

IFC Assessment Reports
PAR 17674/01 and
17674/02



FYLLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C



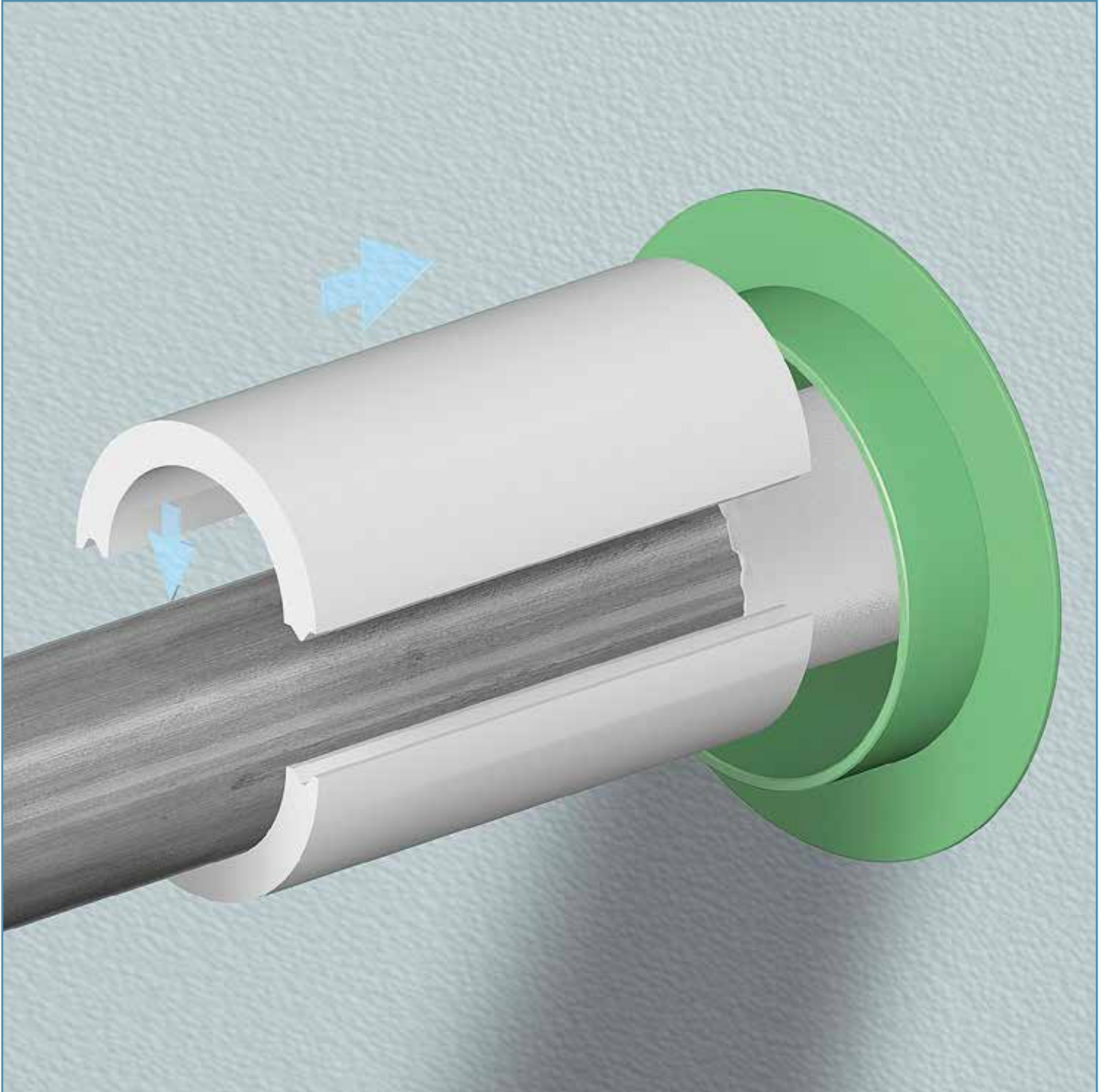
The NOFIRNO® sealing system can be used for steam pipes max. 180 °C. For higher temperatures the pipes have to be insulated inside the penetration. The clearance between the ducted pipe and the conduit sleeve is larger than as specified for the standard NOFIRNO® pipe penetrations. In case of fire penetrations with insulated pipes passing through, the clearance should be thickness of the FYLLOFYS® insulation plus the specified clearance for fire rated NOFIRNO® pipe transits. Note: the thickness of the FYLLOFYS® insulation and the NOFIRNO® sealing system by various steam pipe temperatures are listed in the IFC Assessments Reports. Calculations up to 600 °C available.

FYLLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C



To prevent CUI (Corrosion Underneath Insulation) the ducted pipe should be coated with FISSIC® non-combustible, water repellent coating. The coating is also used as a glue to fix the FYLLOFYS® insulation to the ducted pipe.

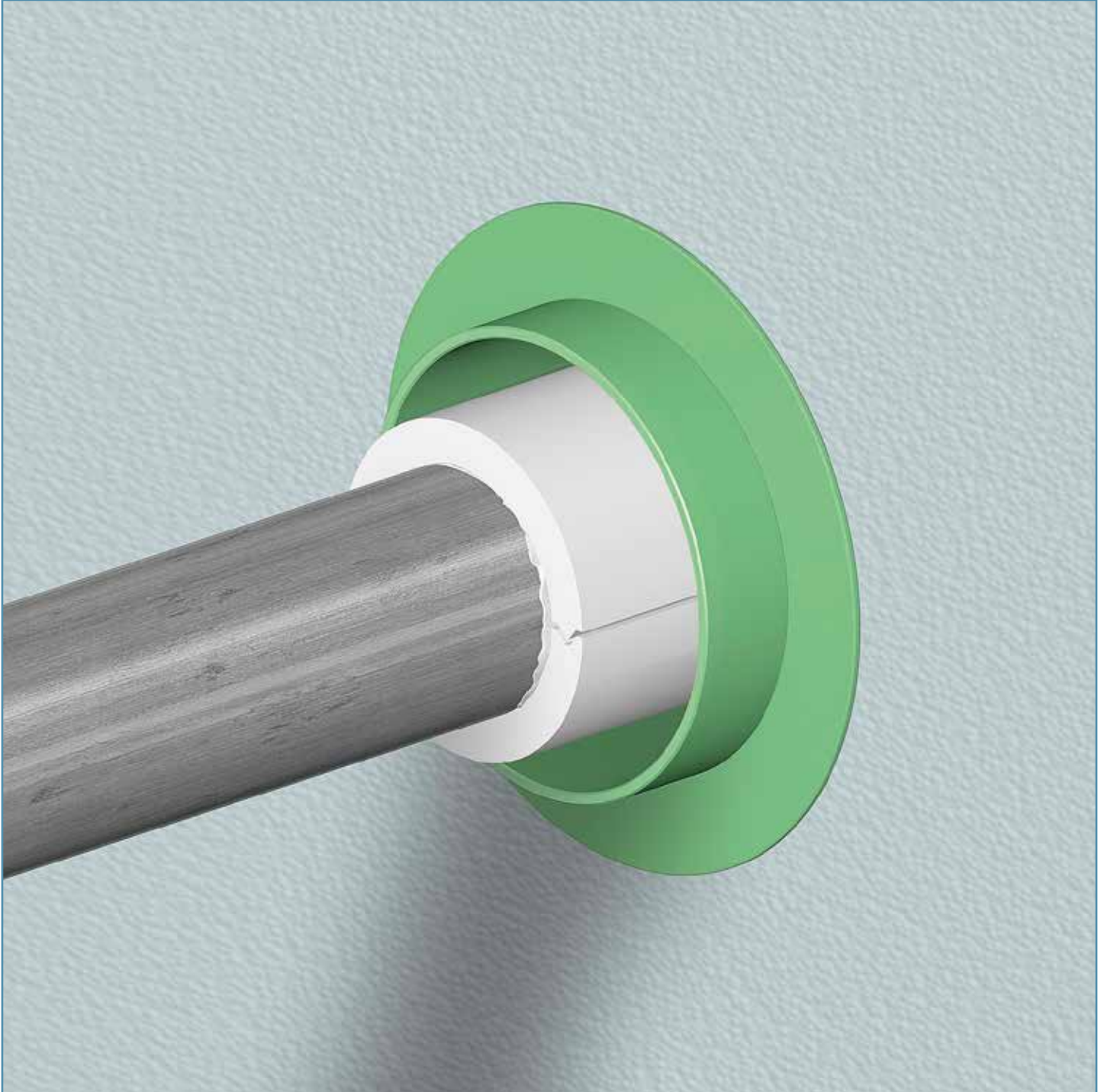
FYLLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C



The FYLLOFYS® pipe shells insulation are placed around the ducted pipe and inserted in the conduit sleeve. Note: with regard to the fast drying time of the FISSIC® coating this has to be done directly after applying the FISSIC® coating.

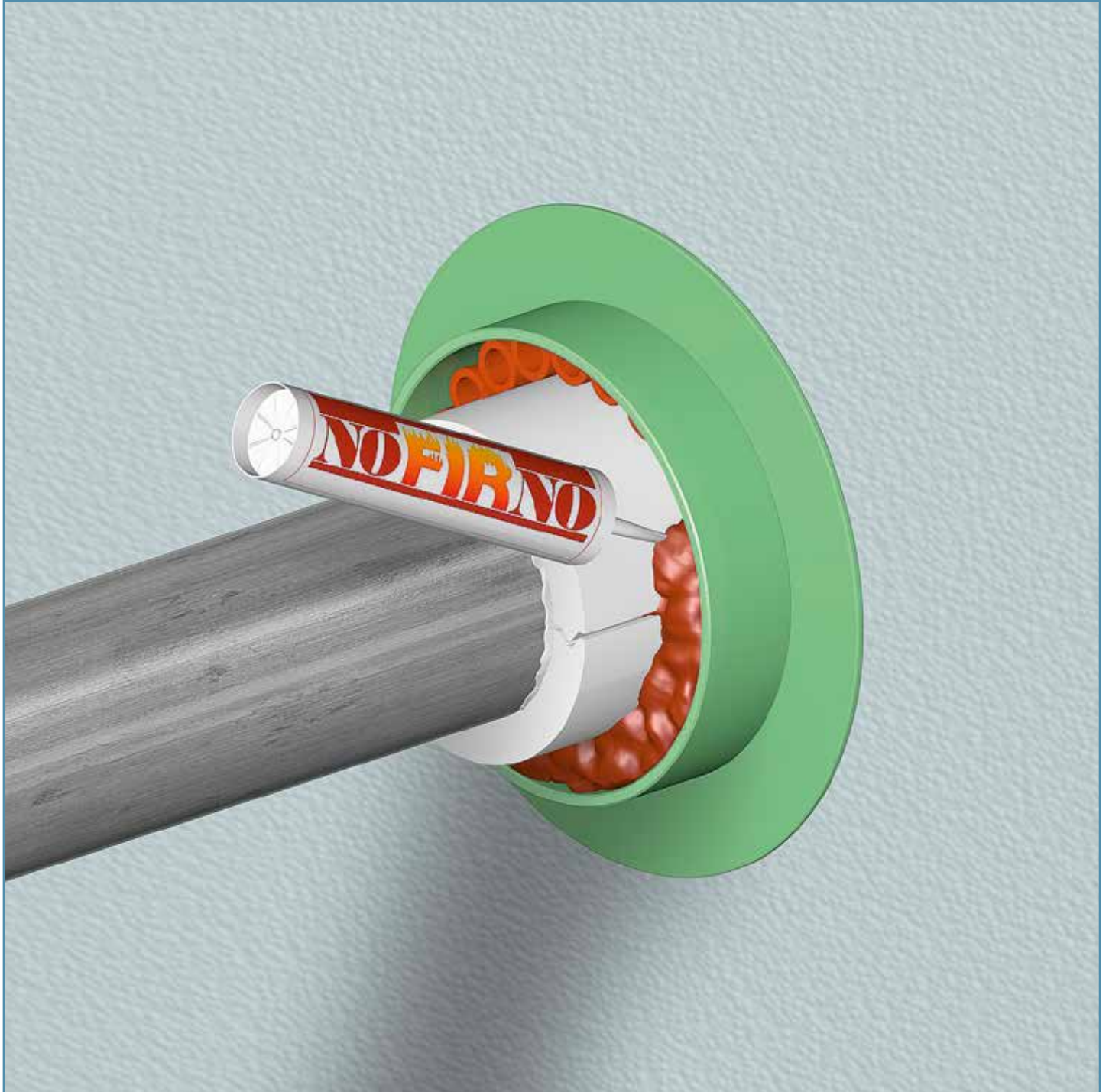
Note: in case the FYLLOFYS® pre-fabricated shells have to be cut to the required length on site, take care that the cuts are coated with a layer of FISSIC® to prevent water absorption.

FYLLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C



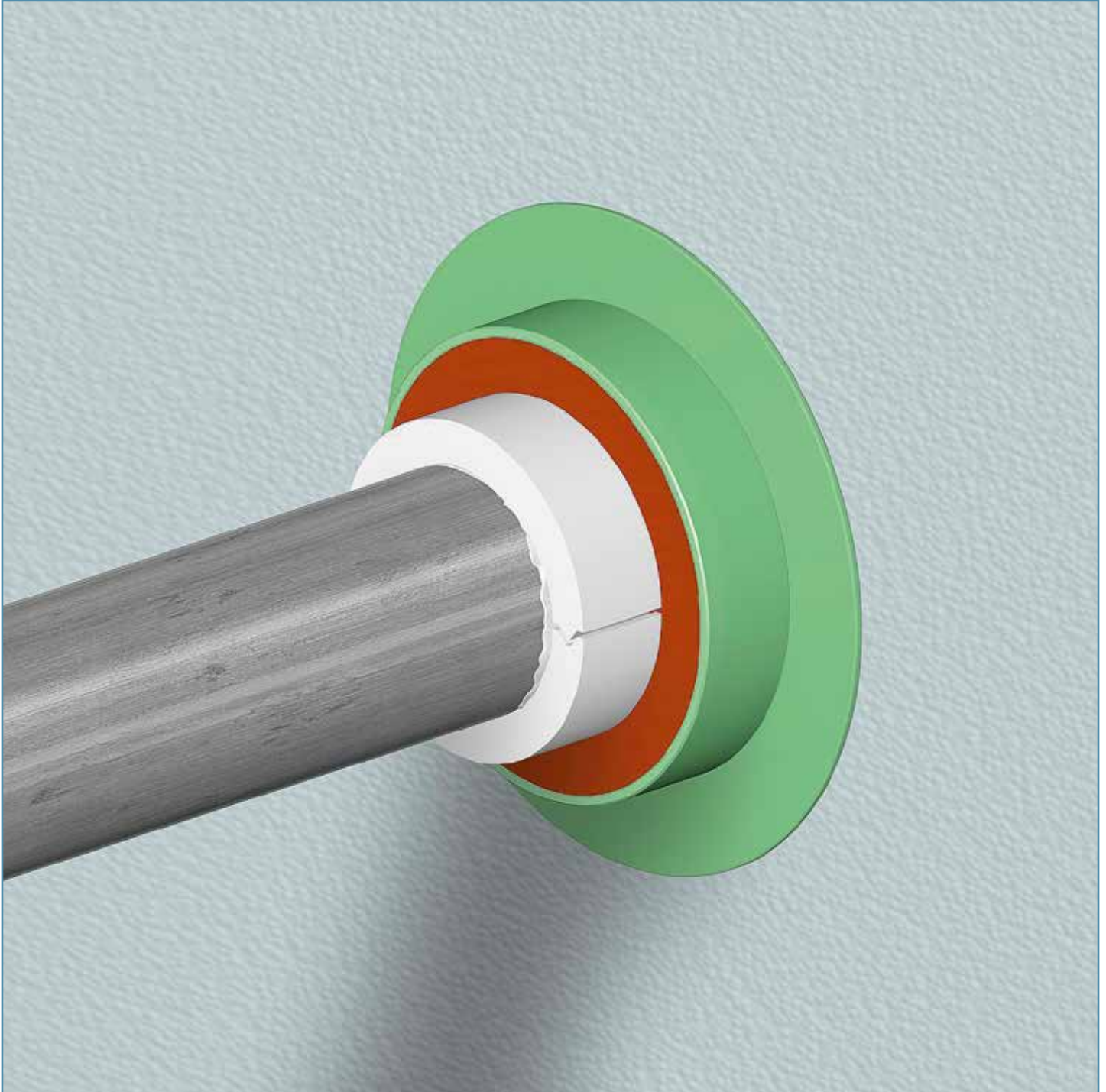
To prevent CUI (Corrosion Underneath Insulation) the ducted pipe should be coated with FISSIC® non-combustible, water repellent coating. The coating is also used as a glue to fix the FYLLOFYS® insulation to the ducted pipe.

**FYLLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR
STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C**



The NOFIRNO® sealing system is installed in the usual way around the FYLLOFYS® insulation.

FYLLOFYS® FIRE SAFE INSULATION COATED WITH FISSIC® FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C



The finished penetration.

Note: to prevent CUI (Corrosion Underneath Insulation) the joint between the ducted pipe and the FYLLOFYS® insulation and between the joint between the FYLLOFYS® shells has to be sealed with sufficient FISSIC® coating.

CERTIFICATION FOR NOFIRNO® MULTI-CABLE TRANSIT SEALING SYSTEM IN HR SLEEVES FLC/TLC & COAMINGS TYPE FLCC



Design Verification Report DVR 20180430/01

Issued 2018-04-30

Replaces -

Page 1 of 11

NOFIRNO Sealing System for cable and pipe transits in sandwich panels

Manufacturer: Beele Engineering B.V.
Beunkdijk 11, 7122 NZ Aalten, The Netherlands

Client: Fluor Ltd.
140 Pinehurst Road, Farnborough, Hants GU14 7BF, United Kingdom

Project: Kazakh Projects Joint Venture Ltd (PJV)

STATEMENT BY KIWA

This is to verify that the design of the NOFIRNO Sealing System for cable and pipe transits in sandwich panels, as specified in this Design Verification Report, has been reviewed and found to comply with the fire rating properties as described.

Hans Naus
Certification Engineer

Jaap Havinga
Authorisation

Kiwa Nederland B.V.

Publication of this approval is allowed (only as complete document).

APPROVAL

ASSESSMENT REPORT FOR STEAM PIPE TRANSITS WITH A DESIGN TEMPERATURE > 180 °C



INTERNATIONAL FIRE
CONSULTANTS LIMITED

PRIVATE & CONFIDENTIAL

IFC ASSESSMENT REPORT

**Calculations for Fyllofys Pipe Insulation on Steel
Pipes Penetrating a Nofirno Sealing System
Steady State Heat transfer when heated to 283°C
constant steam temperature inside the pipe**

IFC Report PAR/17674/02

Prepared on behalf of: Beele Engineering b.v.
Beunkdijk 11
NL-7122 NZ Aalten
The Netherlands

NOTE: This report should not be manipulated, abridged or otherwise presented without the written consent of International Fire Consultants Ltd

Issue Date – November 2017
Valid Until – November 2022

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Registered No: 2194010 England

An International Fire Consultants Group Company

STATE-OF-THE ART METALLIC & PLASTIC PIPE SEALING SYSTEMS



NOFIRNO

slipsil
slipsil
XL-120

DYNATITE



CRUSHER

NOFIRNO®

- Approved for harshest fire ratings for pipe transits (A, H and Jet Fire class).
- Allows axial and radial movement of the ducted pipe. High pressure ratings - designed for gas and/or watertight penetrations.
- Prevents corrosion inside the penetration.
- NOFIRNO® rubber sleeves and sealant will remain stable and not be consumed by fire.
- **Breakthrough - MULTI-ALL-MIX® SYSTEM**
- Approved for any combination of cable and/or metallic, GRP or plastic pipes!

SLIPSIL®

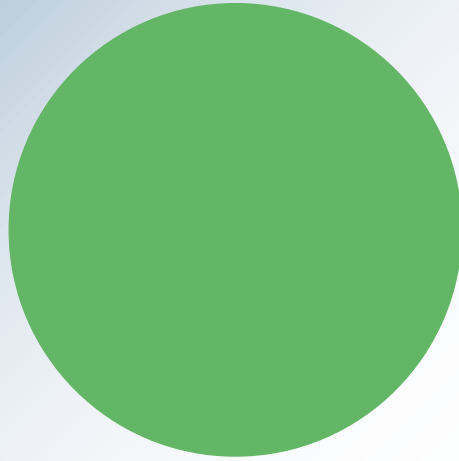
- Designed to provide fire safe, gas and watertight seals for pipe penetrations.
- For transits carrying single or multiple metal pipes with the same diameter (hydraulic and pneumatic lines).
- Installs in a couple of minutes. Lubricate and push - that is it!
- No bolting or other mechanical devices.
- Absorbs mechanical stresses, vibration and prevents galvanic corrosion problems.
- Wide temperature range: -50 °C up to +180 °C.
- **Proven - simple, shortest conduit length**
- The system of choice in shipyards worldwide for more than 30 years!

DYNATITE®

- For applications where a high degree of (instantaneous) tightness is required.
- Dynamic sealing when a disaster occurs.
- Plugs are compressible and will return to their original shape after shock pressure.
- Easily withstands shock pressure loads of up to 15 bar (220 psi).
- Ideal solution for the columns of offshore rigs and collision bulkheads.
- **Breakthrough - dynamic compression**
- Based on high-tech rubber grade and engineered profiling, the DYNATITE® plugs can be substantially compressed and get tighter with excessive pressure.

CRUSHER®

- Simple and effective system for all plastic pipe transits.
- RISE®/ULTRA C-FIT crushers squeeze and seal.
- RISE®/ULTRA wraps to be used for non-SLIPSIL® and oversized conduit sleeves.
- RISE®/ULTRA C-FIT crushers and wraps integrated in the NOFIRNO® sealing system.
- NOFIRNO® sealant adheres well to plastics: high degree of water tightness feasible.
- **Breakthrough - adhesion under fire load**
- RISE®/ULTRA compound forms an adhesive mass during fire exposure!
- Approved for a multiple mixture of all kinds of plastic pipes.



WE CARE

**BEELE ENGINEERING:
A COMPANY DEDICATED TO SAFETY
FOR OVER 45 YEARS**



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