csd®
sealing systems

EDITION 01/2003

CSD® SEALING PLUGS FOR THE EFFECTIVE SEALING OF METALLIC AND PLASTIC PIPE ENTRIES

SIMPLE SEAL SYSTEM®
GREASE AND PUSH: THAT'S IT

Websites: www.beele.com, www.rise-systems.com and www.yfestos.com

FIRESAFE SEALING SYSTEMS FOR PIPE AND CABLE PENETRATIONS

BEELE Engineering and CSD International have been working in the field of water and gas tight and fireproof sealing of conduits for pipes and cables for more than 25 years. In the field of passive fire prevention, we have invested substantial amounts of money in the development of systems which are capable withstanding fires for extended periods of time. Passive fire prevention is a very complicated matter due to the fact that cable and pipe penetrations have to be designed to the actual circumstances at site and not for a laboratory test. In case of a catastrophe penetrations are subject not only to flame erosion and very high temperatures, but also to mechanical loads due to collapsing cable ways and possibly a jet of fire-fighting water. This means that the performance in actual situations can differ dramatically from that in a regular fire test. In fact, the systems could only be applied as tested to guarantee the required fire safety.

And this means discussions and limitations!

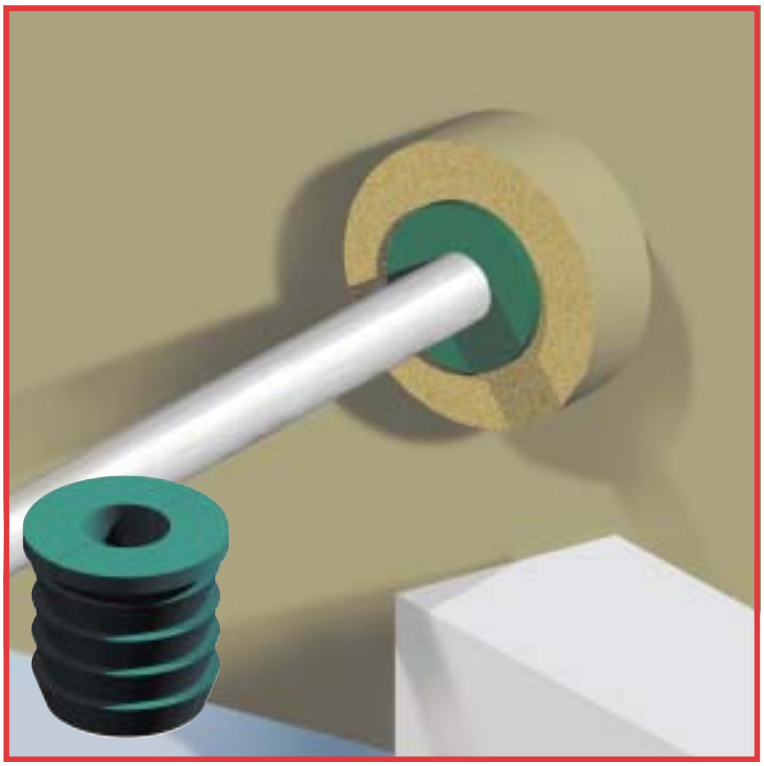
We have ensured that our systems will function under all circumstances, and the classification societies have awarded us signed and stamped installation drawings of our sealing systems. Approved for steel and aluminium partitions. Guaranteed safety in your installation will be the result.

SEALING PLUGS FOR PIPE CONDUITS

New ships and offshore installations today are generally manufactured in sections and assembled in a shipyard dock. This production method requires most of the steel and metal constructional parts to be pre-fabricated before they are fitted into the construction and also to have already undergone surface treatment. This method has been developed with a view to reducing the costs substantially. Further cost-savings can be achieved by using the CSD® sealing plugs for pipe penetrations.

The two-part CSD® plugs can be installed after the pipes have been passed through the conduit opening. The plugs are made for application in steel conduit sleeves of standard commercial quality, so that the yard can use its own bits and pieces for the conduit sleeves to be welded into the decks and bulkheads.

The sleeves are welded in and sandblasted/painted during the construction of the sections, in this way satisfying the requirements of avoiding cutting/welding onboard during the outfitting stage.



CSD® sealing plugs are supplied in eight different rubber grades in order to cater for a wide variety of applications. For ease of recognition, the plugs have a separate colour for each rubber grade. See pages 12 and 13.

Because the plugs exclude direct contact between the service pipe and the sleeve, different types of pipes can be passed through steel or aluminium constructions without the problems with joints and electric couples.
Pipe penetrations sealed with plugs can be shorter in length than the common methods, in this way saving weight.
With the use of CSD® sealing plugs vibrations and noise transmission will be easily absorbed.
No transmission of mechanical stresses to the construction!

The plugs are maintenance free!

CSD® sealing plugs for individually ducted pipes consist of two equal parts, so that they can be installed after the pipes have been laid. The unique profile both inside and outside the sealing plug guarantees a very high level of gas and water tightness.
The serrated profile on the outside is designed to absorb internal tolerances of -1.2/+0.3 mm in conduit sleeves. This makes sure that the rubber will transmit sufficient pressure to the inside of the plug at all times.
The flat trapezium-shaped O-rings which form the profile on the inside are located opposite the tops of the serrations at the outside of the plug. In this way the forces needed for sealing purposes are optimally used.
No metal parts!

The installation of the sealing plugs is most simple. Just grease the two halves of the plug with lubricant and push them into the conduit opening and that is it!
This eliminates the need for skilled labour and saves a lot of time. Another advantage of the CSD® sealing plugs is that mechanical tensions between the bulkhead/deck and the service pipes are avoided. And think about the possibility of using various pipe materials!

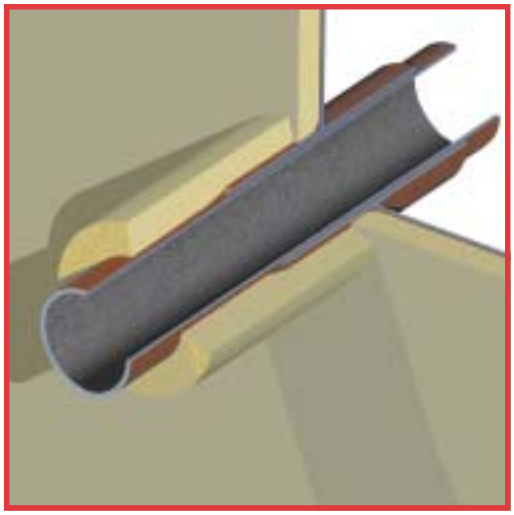
SEALING PLUGS FOR PIPE CONDUITS

CSD® sealing plugs are used for a wide variety of applications in ships and offshore installations. The outstanding quality has been proven by the enormous amounts of tests which have been carried out at many official institutes. Installation of the plugs in many vessels and offshore constructions worldwide has proven the ease of installation and the cost-savings obtained by stepping away from the traditional way of making penetrations and switching over to the simple seal system of CSD®.

Let's take a look at the traditional systems.

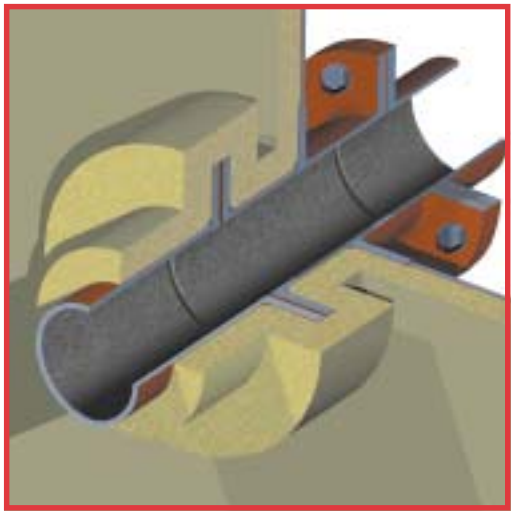
1) ***Doubling***
The oldest and simplest method used so far. The sleeve is welded into the partition. The ID of the sleeve is just a little bit larger than the OD of the service pipe. The service pipe is welded to the sleeve.

Advantages: Simple, cheap, water tight
Disadvantages: No movement, corrosion point at the service pipe, cannot be used for service pipes with higher temperatures, noise transmission, high maintenance costs and requires a lot of insulation for fire-rated penetrations.



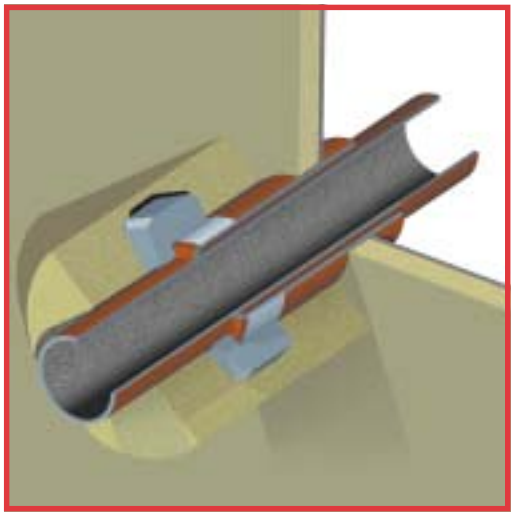
2) ***Flanging***
Connecting flanges are welded on both sides of a pipe length. In the centre of the pipe length another flange is welded for fixation into the bulkhead. A fairly large hole has to be cut in the bulkhead.

Advantages: Water tight
Disadvantages: Heavy, expensive, no movement, limited temperature range, noise transmission, high maintenance costs and requires a lot of insulation for fire-rated penetrations.



3) ***Screw coupling***
Pre-fabricated couplings are welded into the bulkhead. Service pipe is either pulled in full length through or mounted at each side. Sealed by tightening the nuts at both sides.

Advantages: Simple to install, water tight
Disadvantages: Expensive for stainless steel pipes, limited movement, noise transmission and requires a lot of insulation for fire-rated penetrations.



USE THE BENEFITS OF THE CSD® PLUGS

Advantages of the CSD® plugs:

* lower material costs
* no maintenance costs
* weight saving
* corrosion problems a thing of the past
* provides cathodic protection
* allows longitudinal movement of the service pipe
* no mechanical stresses transferred to the deck or bulkhead
* most easy to install
* reduced labour costs
* shortest possible conduit length, less insulation
* fire safe, gas and water tight
* EMC protection
* vibration proof/sound damping
* certified by the major classification societies, CE approved
* approved installation drawings, avoiding a lot of time consuming discussions about "how to apply"
* for steel, stainless steel, copper, GRP and plastic pipes
* approved for steel and aluminium partitions

Benefits of the CSD® plugs:

In a way the use of CSD® sealing plugs is an advantage for the builder, the installer and the owner of the installation.

The yard can save quite some welding and cutting time by using CSD® plugs.

Innovative design: the plug sealing system allows the shortest possible sleeve length for fire rated penetrations, whereby the insulation is reduced to an absolute minimum. The CSD® plugs can be used for metallic and plastic pipes!

For the installer it is most advantageous that the plugs can be installed in minutes and do not require any bolting or other mechanical outfitting.

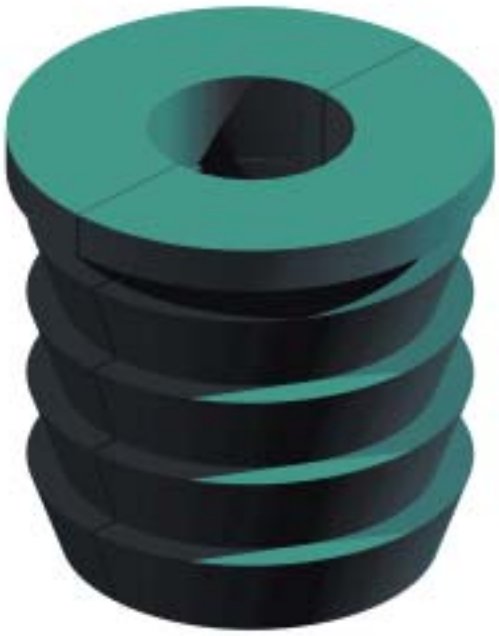
For the owner the savings are in the field of maintenance costs due to the exclusion of mechanical stresses and avoiding corrosion problems.

CSD® SEALING PLUGS

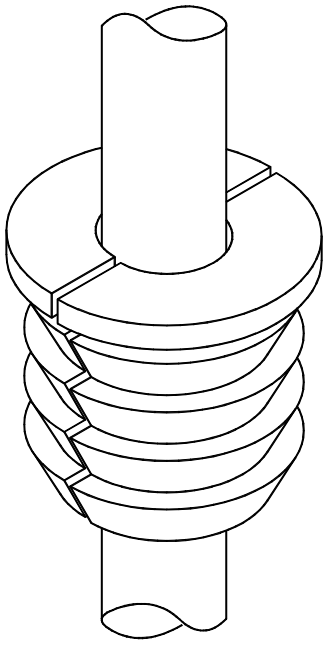
The actual sealing of the cable or pipe conduit is effected by pushing both parts of the CSD® sealing plug between the ducted pipe and the wall of the conduit sleeve.
This extremely simple method provides a seal which - depending on the rubber grade - is either gas and water tight only, or fire resistant as well. The sealing plugs are certified for A-0 up to A-60 class and H-0 to H-120 class divisions; certified watertightness up to pressures of 2.5 bar and approved for gastight penetrations.

Artificial ageing tests with the rubber grades, specifically for seals for weather deck conduits, have shown that the sealing capacity is retained in the very long term.
The fire resistant sealing plugs type FRR and FRR/SIL have been tested in full scale fire tests according to IMO Resolution A.754(18).
Pressure tests have been carried out on the sealing plugs with water pressure up to 2.5 bar as an average and 3 bar as a maximum. LRS certificate APE 9909162.
Investigation is in process to determine the maximum displacement of ducted pipes. Directly after the movement a water pressure will be applied again.

CE certificates Nº 09155/A8 EC, Nº 10154/A2 EC and Nº 10742/A3 EC issued by Bureau Veritas



CSD® sealing plugs are supplied in eight different rubber grades in order to cater for a wide variety of applications. For ease of recognition, the plugs have a separate colour for each rubber grade.
See pages 12 and 13.



MOST IMPORTANT!

The CSD® sealing plugs have been tested:

1) for A-0 up to A-60 class fire safe pipe penetrations according to IMO Resolution A.754(18)
2) for H-0 up to H-120 class fire safe penetrations according to the Hydrocarbon Curve
3) for watertight penetrations up to a pressure of 2.5 bar
4) for gastight penetrations
5) for EMC damping 45-85 dB according to Nordtest method NT ELEC 030, modified for conducted attenuation
6) tightness after longitudinal movement
7) aged for a lifespan of more than 20 years service
8) sound damping 71 dB according to EN ISO 717-1:1996
9) vibration damping properties
10) smoke index according to NES 711: issue 2
11) toxicity index according to NES 713: issue 3
12) oxygen index according to ISO 4589-2: 1996
13) temperature index according to ISO 4589-3: 1996
14) thermal cycling in the range -40 °C / ambient / +70 °C

CSD® SEALING PLUGS

SUMMARY OF SEALING PLUG TYPES

PLUG SERIES*	CONDUIT SLEEVE**	PLUG LENGTH	PIPE SIZES
25,6/..	32x3,2 32x3,5	50	5 - 12
27,3/..	33,7x2,6	50	5 - 15
27,6/..	34x3,2	50	5 - 16
28,4/..	-	50	5 - 16
32/..	40x4,0	50	5 - 18
33,6/..	40x3,2 40x3,5	50	5 - 20
35/..	42,4x3,6	50	5 - 20
35,7/..	42,7x3,5	50	5 - 20
36,5/..	-	50	5 - 20
37,2/..	42,4x2,6	50	5 - 20
40/..	50x5,0	50	5 - 22
41,1/..	48,3x3,6	50	5 - 24
41,6/..	48,6x3,5	50	5 - 24
42,4/..	-	50	5 - 24
43,6/..	50x3,2 50x3,5	50	5 - 28
50/..	60x5,0	50	5 - 33
51,3/..	60,3x4,5	50	5 - 34
52,5/..	60,3x3,9 60,3x4,5 72x10	50	5 - 34
52,9/..	60,5x3,8	50	5 - 34
53,7/..	-	50	5 - 34
54,5/..	60,3x2,9 60,3x4,5	50	5 - 34
57/..	63x3,0	50	10 - 40
60/..	70x5,0	60	16 - 40
62,3/..	-	60	16 - 40
67,1/..	76,1x4,5	60	20 - 48
67,9/..	76,3x4,2	60	20 - 48
68,6/..	75x3,2	60	20 - 50
70/..	80x5,0	60	21 - 50
75/..	-	60	21 - 50
77,9/..	88,9x5,5 105x13	60	25 - 50
80/..	88,9x4,5 90x5,0	60	25 - 56
80,7/..	89,1x4,2	60	25 - 56
81,7/..	-	60	25 - 56
82,5/..	88,9x3,2	60	25 - 60
90/..	100x5,0	60	30 - 62
94/..	100x3,0	60	30 - 62
97,2/..	-	60	30 - 64
100/..	110x5,0	60	30 - 80

SUMMARY OF SEALING PLUG TYPES

PLUG SERIES*	CONDUIT SLEEVE**	PLUG LENGTH	PIPE SIZES
102,3/..	114,3x6,0	60	40 - 72
103,6/..	110x3,2	60	25 - 74
105,3/..	114,3x4,5	60	30 - 76
106,3/..	-	60	30 - 76
107,1/..	114,3x3,6	60	42 - 80
110/..	120x5,0	60	48 - 80
118,6/..	125x3,2	60	50 - 92
122,2/..	-	60	50 - 92
125/..	131x3,0 133x4,0 135x5,0	60	50 - 92
128,1/..	141,3x6,6	60	60 - 94
130,8/..	139,8x4,5	60	60 - 104
131,7/..	139,7x4,0 139,7x4,5	60	60 - 100
146,3/..	-	60	60 - 120
150/..	156x3,0 159x4,5 160x5,0	60	60 - 124
152/..	160x4,0	60	60 - 124
154,1/..	168,3x7,1	60	80 - 124
155,2/..	165,2x5,0	60	80 - 124
156,2/..	-	60	80 - 124
159,3/..	168,3x4,5 168,3x5,0	60	88 - 124
160/..	170x,5,0	60	88 - 124
190,2/..	200x4,9	80	110 - 160
200/..	206x3,0 208x4,0 220x10,0	80	110 - 160
202,7/..	219,1/8,2	80	110 - 168
207,3/..	219,1x5,9 227x10	80	110 - 168
237,6/..	250x6,2	80	150 - 180
250/..	260x5,0	80	160 - 200
254,4/..	273x9,3	80	150 - 200
260,4/..	273x6,3	80	160 - 218
299,6/..	315x7,7***	80	180 - 250
336,6/..	355,6x9,5***	80	200 - 280
339,6/..	355,6x8,0*** 356,6x8,8*** 360x10***	80	200 - 280
380,4/..	400x9,8***	100	250 - 314
438,2/..	457,2x9,5***	120	280 - 370
590,6/..	609,6x9,5*** 610x10***	120	370 - 520

Note: for * ** *** see specifications on page 8

CSD® MULTI-SEALING PLUGS

SUMMARY OF MULTI-SEALING PLUG TYPES

PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****
40/2x..	5 - 10	62,3/2x..	11 - 15	100/2x..	21 - 30
41,1/2x..	5 - 10	67,1/2x..	11 - 18	102,3/2x..	21 - 30
41,6/2x..	5 - 10	67,9/2x..	11 - 18	103,6/2x..	21 - 30
42,4/2x..	5 - 10	68,6/2x..	11 - 20	105,3/2x..	26 - 30
43,6/2x..	5 - 12	70/2x..	11 - 20	106,3/2x..	26 - 30
50/2x..	5 - 12	75/2x..	11 - 20	107,1/2x..	26 - 30
51,3/2x..	5 - 15	77,9/2x..	16 - 22	110/2x..	26 - 30
52,5/2x..	5 - 15	80/2x..	13 - 22	118,6/2x..	31 - 35
52,9/2x..	5 - 15	80,7/2x..	13 - 22	125/2x..	31 - 35
53,7/2x..	5 - 15	81,7/2x..	13 - 22	128,1/2x..	31 - 40
54,5/2x..	5 - 15	82,5/2x..	16 - 25	130,8/2x..	31 - 40
60/2x..	11 - 15	90/2x..	21 - 25	131,7/2x..	31 - 40

PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****
40/3x..	5 - 7	62,3/3x..	5 - 10	100/3x..	15 - 20
41,1/3x..	5 - 7	67,1/3x..	5 - 10	102,3/3x..	15 - 20
41,6/3x..	5 - 7	67,9/3x..	5 - 10	103,6/3x..	13 - 20
42,4/3x..	5 - 7	68,6/3x..	5 - 12	105,3/3x..	15 - 20
43,6/3x..	5 - 7	70/3x..	5 - 12	106,3/3x..	15 - 20
50/3x..	5 - 8	75/3x..	5 - 12	107,1/3x..	15 - 20
51,3/3x..	5 - 10	77,9/3x..	5 - 15	110/3x..	15 - 20
52,5/3x..	5 - 10	80/3x..	5 - 15	118,6/3x..	21 - 25
52,9/3x..	5 - 10	80,7/3x..	5 - 15	125/3x..	21 - 25
53,7/3x..	5 - 10	81,7/3x..	5 - 15	128,1/3x..	21 - 30
54,5/3x..	5 - 10	82,5/3x..	5 - 15	130,8/3x..	21 - 30
60/3x..	5 - 10	90/3x..	10 - 15	131,7/3x..	21 - 30

PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****
67,1/3x..T	11 - 18	102,3/3x..T	21 - 31		
67,9/3x..T	11 - 18	103,6/3x..T	21 - 35		
68,6/3x..T	13 - 20	105,3/3x..T	21 - 35		
70/3x..T	13 - 20	106,3/3x..T	21 - 35		
75/3x..T	13 - 20	107,1/3x..T	21 - 35		
77,9/3x..T	16 - 22	110/3x..T	21 - 35		
80/3x..T	16 - 25	118,6/3x..T	26 - 40		
80,7/3x..T	16 - 25	125/3x..T	26 - 40		
81,7/3x..T	16 - 25	128,1/3x..T	31 - 40		
82,5/3x..T	16 - 25	130,8/3x..T	31 - 40		
90/3x..T	16 - 25	131,7/3x..T	31 - 42		
100/3x..T	21 - 31				

PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****	PLUG SERIES*	CABLES/ PIPES****
40/5x..	5 - 7	62,3/5x..	5 - 10	100/5x..	15 - 20
41,1/5x..	5 - 7	67,1/5x..	5 - 10	102,3/5x..	15 - 20
41,6/5x..	5 - 7	67,9/5x..	5 - 10	103,6/5x..	13 - 20
42,4/5x..	5 - 7	68,6/5x..	5 - 12	105,3/5x..	15 - 20
43,6/5x..	5 - 7	70/5x..	5 - 12	106,3/5x..	15 - 20
50/5x..	5 - 8	75/5x..	5 - 12	107,1/5x..	15 - 20
51,3/5x..	5 - 10	77,9/5x..	5 - 15	110/5x..	15 - 20
52,5/5x..	5 - 10	80/5x..	5 - 15	118,6/5x..	21 - 25
52,9/5x..	5 - 10	80,7/5x..	5 - 15	125/5x..	21 - 25
53,7/5x..	5 - 10	81,7/5x..	5 - 15	128,1/5x..	21 - 30
54,5/5x..	5 - 10	82,5/5x..	5 - 15	130,8/5x..	21 - 30
60/5x..	5 - 10	90/5x..	10 - 15	131,7/5x..	21 - 30

* All dimensions in mm. Maximum tolerances covered -1,2/+0,3 mm
** Minimum sleeve length 120 mm (up to 54,5) and 160 mm (up to 260,4)for A-60 penetrations
*** Minimum sleeve length 250 mm for A- and 300 mm for H-class penetrationsn
**** Only 2, 3 or 5 same diameter pipes or cables for each plug type

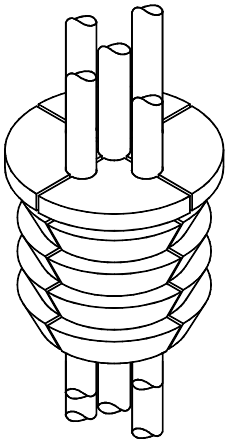
Note: select the required rubber grade on pages 12 and 13

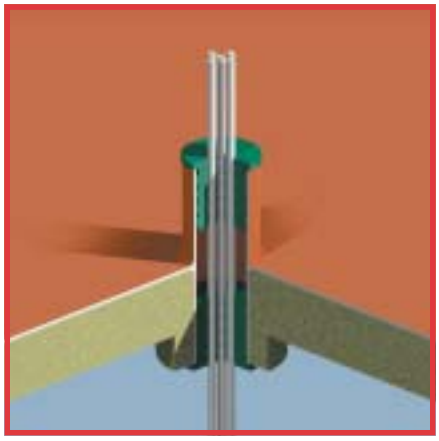
CSD® MULTI-SEALING PLUGS

CSD® multi-sealing plugs for two, three or five same diameter cables or pipes consist of two, three or four equal parts, so that they can be installed after the cables or pipes have been laid. For selecting the right type of sealing plug, look for the plug series from the tables and add the outer diameter of the cables or pipes and the rubber grade.

For selecting the right type of sealing plug, look for the plug series from the tables and add the outer diameter of the service pipes and the rubber grade.
For instance: 82,5/3x16T EMC is a sealing plug fitting in a conduit sleeve 88,9x3,2 through which 3 service pipes of 16 mm are ducted for an EMC safe penetration. See also page 10.
Ask for the detailed table booklet!

Unused openings in the CSD® multi-sealing plug are blanked off with CSD® blind profiles.

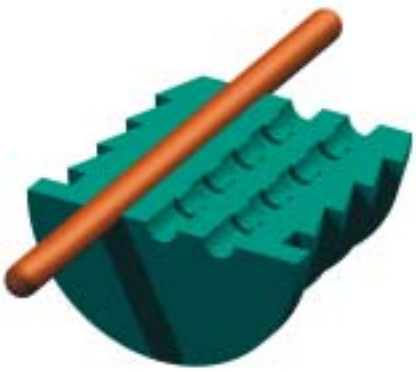




CSD® BLIND PROFILES

CSD® blind profiles are used for sealing unused conduit openings in multi-sealing plugs. The blind profiles are made from FRR/HF (fire resistant rubber/halogen free) rubber compound, which has proven to possess not only very good fire engineering properties, but also good mechanical properties. The blind profiles can be identified by their orange colour, in contrast to the customary blue colour used for the FRR/HF compound. This is because blind profiles are used for a number of conduit systems. The length of the blind profiles is 120 mm.

SEGMENT OF MULTI-PLUG WITH BLIND PROFILE



BLIND PROFILE	BLIND PROFILE	BLIND PROFILE
BPR5	BPR18	BPR31
BPR6	BPR19	BPR32
BPR7	BPR20	BPR33
BPR8	BPR21	BPR34
BPR9	BPR22	BPR35
BPR10	BPR23	BPR36
BPR11	BPR24	BPR37
BPR12	BPR25	BPR38
BPR13	BPR26	BPR39
BPR14	BPR27	BPR40
BPR15	BPR28	BPR41
BPR16	BPR29	BPR42
BPR17	BPR30	

CSD® ADAPTER PLUGS

CSD® adapter plugs are used for conduit openings which have to carry a pipe so small in diameter compared to the inner diameter of the conduit opening that no fitting sealing plug is available for it. CSD® adapter plugs consist of two equal parts, so that they can be installed after the cable of pipe has been laid. The inside of the adapter plug is perfectly smooth, so that the CSD® single plug to be installed in the adapter plug for the sealing of the ducted pipe can be easily pushed in and obtain an effective seal between the two plugs.

ADAPTER PLUG	ADAPTER PLUG	ADAPTER PLUG
590,6/438AD	155,2/125AD	107,1/50AD
438,2/336AD	155,2/100AD	106,3/50AD
380,4/298AD	154,1/125AD	105,3/50AD
339,6/250AD	154,1/100AD	103,6/50AD
336,6/254AD	152/125AD	102,3/50AD
299,6/250AD	152/100AD	100/50AD
299,6/200AD	150/125AD	94/50AD
260,4/200AD	150/100AD	90/50AD
254,4/200AD	131,7/90AD	82,5/50AD
250/200AD	131,7/50AD	81,7/50AD
237,6/190AD	130,8/80AD	80,7/50AD
207,3/150AD	130,8/50AD	80/50AD
202,7/150AD	128,1/80AD	77,9/50AD
200/150AD	128,1/50AD	75/50AD
190,2/150AD	125/80AD	70/50AD
160/125AD	125/50AD	68,6/35AD
160/100AD	118,6/80AD	67,9/35AD
159,3/125AD	118,6/50AD	67,1/35AD
159,3/100AD	110/70AD	62,3/35AD
156,2/125AD	110/50AD	60/35AD
156,2/100AD	107,1/70AD	

Example: when a flanged pipe with an OD of 114 mm is ducted through a conduit sleeve 260,4 mm there is no regular sealing plug available. This can be solved by using an adapter plug 260,4/200AD and a single sealing plug 200/114.
See for the rubber grades page 12 and 13.

See the tables on page 7 for single sealing plugs and conduit sleeve sizes

CSD® BLIND PLUGS

CSD® blind plug are used for temporarily sealing conduit openings. They are available for all plug series up to 207,3. For larger openings to be blanked off, a combination of an adapter plug and a blind plug is used.

PLUG SERIES	PLUG SERIES	PLUG SERIES	PLUG SERIES	PLUG SERIES	PLUG SERIES	PLUG SERIES
25,6/0	40/0	54,5/0	80/0	105,3/0	146,3/0	202,7/0
27,3/0	41,1/0	57/0	80,7/0	106,3/0	150/0	207,3/0
27,6/0	41,6/0	60/0	81,7/0	107,1/0	152/0	
28,4/0	42,4/0	62,3/0	82,5/0	110/0	154,1/0	
32/0	43,6/0	67,1/0	90/0	118,6/0	155,2/0	
33,6/0	50/0	67,9/0	94/0	122,2/0	156,2/0	
35/0	51,3/0	68,6/0	97,2/0	125/0	159,3/0	
35,7/0	52,5/0	70/0	100/0	128,1/0	160/0	
36,5/0	52,9/0	75/0	102,3/0	130,8/0	190,2/0	
37,2//0	53,7/0	77,9/0	103,6/0	131,7/0	200/0	

See for the rubber grades page 12 and 13.

THE SIMPLE SEAL SYSTEM®

CSD® SEALING PLUGS

cable/ pipe diameter	plug type	plug length
blind	82,5/0	40
25 - 26	82,5/25	60
26 - 27	82,5/26	60
27 - 28	82,5/27	60
28 - 29	82,5/28	60
29 - 30	82,5/29	60
30 - 31	82,5/30	60
31 - 32	82,5/31	60
32 - 33	82,5/32	60
33 - 34	82,5/33	60
34 - 35	82,5/34	60
35 - 36	82,5/35	60
36 - 37	82,5/36	60
37 - 38	82,5/37	60
38 - 39	82,5/38	60
39 - 40	82,5/39	60
40 - 42	82,5/40	60
42 - 44	82,5/42	60
44 - 46	82,5/44	60
46 - 48	82,5/46	60
48 - 50	82,5/48	60
50 - 52	82,5/50	60
52 - 54	82,5/52	60
54 - 56	82,5/54	60
56 - 58	82,5/56	60
58 - 60	82,5/58	60
60 - 61	82,5/60	60
16 - 17	82,5/2x16	60
17 - 18	82,5/2x17	60
18 - 19	82,5/2x18	60
19 - 20	82,5/2x19	60
20 - 21	82,5/2x20	60
21 - 22	82,5/2x21	60
22 - 23	82,5/2x22	60
23 - 24	82,5/2x23	60
24 - 25	82,5/2x24	60
25 - 26	82,5/2x25	60

SELECT RUBBER TYPE

82,5 series

ID conduit opening 81,3-82,8 mm

cable/ pipe diameter	plug type	plug length
5 - 6	82,5/3x5	60
6 - 7	82,5/3x6	60
7 - 8	82,5/3x7	60
8 - 9	82,5/3x8	60
9 - 10	82,5/3x9	60
10 - 11	82,5/3x10	60
11 - 12	82,5/3x11	60
12 - 13	82,5/3x12	60
13 - 14	82,5/3x13	60
14 - 15	82,5/3x14	60
15 - 16	82,5/3x15	60
5 - 6	82,5/5x5	60
6 - 7	82,5/5x6	60
7 - 8	82,5/5x7	60
8 - 9	82,5/5x8	60
9 - 10	82,5/5x9	60
10 - 11	82,5/5x10	60
11 - 12	82,5/5x11	60
12 - 13	82,5/5x12	60
13 - 14	82,5/5x13	60
14 - 15	82,5/5x14	60
15 - 16	82,5/5x15	60
16 - 17	82,5/3x16T	60
17 - 18	82,5/3x17T	60
18 - 19	82,5/3x18T	60
19 - 20	82,5/3x19T	60
20 - 21	82,5/3x20T	60
21 - 22	82,5/3x21T	60
22 - 23	82,5/3x22T	60
23 - 24	82,5/3x23T	60
24 - 25	82,5/3x24T	60
25 - 26	82,5/3x25T	60

SELECT RUBBER TYPE

82,5 series

ID conduit opening 81,3-82,8 mm

see pages 12 and 13 for the the technical data of the various rubber compounds

Ask for the detailed table booklet!
For ease of selection of the appropriate sealing plug, the rubber quality and the size of the conduit sleeve a comprehensive booklet is available, listing all CSD® sealing plug sizes! See example above.

For selecting the right type of sealing plug from the table on page 7, look for the pipe size to be ducted, select the plug series from the tables and add the outer diameter of the service pipe and the rubber grade.
Note: the plugs for service pipes up to 40 mm are in intervals of 1 mm; above 40 mm the interval is 2 mm. See the tables above!
For instance: a steel pipe of 60,3 mm OD has to be ducted through a fire class division. Select a most convenient conduit sleeve (88,9 up to 141,3 can be your choice). This choice determines automatically the plug series. When the choice is a conduit sleeve 88,9x3,2 mm a sealing plug 82,5/60 has to be used. For a fire rated penetration a rubber type FRR is commonly used (see page 12). The plug to be ordered is 82,5/60 FRR. In case the pipe to be ducted would be 57 mm OD the plug 82,5/56 is the right one. Multi-sealing plugs are selected in the same way. A multi-sealing plug 82,5/5x12 EMC fits in a conduit sleeve 88,9x3,2 mm for sealing 5 hydraulic lines 12-13 mm OD for an EMC proof penetration.

THE VARIOUS RUBBER TYPES

CSD® sealing plugs are manufactured from high-grade synthetic rubbers. In order to cater for the widest possible variety of requirements, the CSD® range includes eight different rubber types. When ordering, it is necessary to state the desired rubber type in addition to the type of the sealing plug.

A brief specification is given below of the area of application and the temperature range in which the sealing plugs can be applied. Because seal performance depends on an appropriate choice of rubber, in case of doubt it is advisable to consult our sales department.

FRR

rubber type	*area of application*	*pipe temperature*
FRR (fire resistant rubber)	*Standard rubber for fire resistant, gas and water tight conduits. Used for cables and steel, stainless steel, copper and GRP pipes. Not to be used for plastic pipes and CSD®-SQ.*	*temperature range* *-10° - +90° C*

FRR-E

rubber type	*area of application*	*pipe temperature*
FRR-E (fire resistant rubber-expanding)	*At exposure to heat or fire expanding rubber for fire resistant gas and water tight conduits. Specially developed for plastic and composite plastic pipes and CSD®-SQ.*	*temperature range* *-10° - +90° C*

FRR/SIL

rubber type	*area of application*	*pipe temperature*
FRR/SIL (fire resistant rubber silicone)	*Rubber for fire resistant conduits for pipework carrying media at extremely high or low temperatures. Specially developed for FREON pipes.*	*temperature range* *-40° - +180° C*

EPDM

rubber type	*area of application*	*pipe temperature*
EPDM (ethylene propylene rubber)	*Standard rubber for gas and water tight conduits. Good resistance to ozone and UV radiation. Used for outside/inside entries.*	*temperature range* *-50° - +110° C*

THE VARIOUS RUBBER TYPES

CSD® sealing plugs are manufactured from high-grade synthetic rubbers. In order to cater for the widest possible variety of requirements, the CSD® range includes eight different rubber types. When ordering, it is necessary to state the desired rubber type in addition to the type of the sealing plug.

A brief specification is given below of the area of application and the temperature range in which the sealing plugs can be applied. Because seal performance depends on an appropriate choice of rubber, in case of doubt it is advisable to consult our sales department.

EMC

rubber type	*area of application*	*pipe temperature*
EPDM (ethylene propylene rubber)	*Rubber for EMP/EMI protected, gas and water tight conduits. Used for cables and steel, stainless steel, copper and other metallic pipes.*	*temperature range* *-30° - +110° C*

NITRILE

rubber type	*area of application*	*pipe temperature*
NBR (nitrile butadiene rubber)	*Standard rubber for gas and water tight conduits required to be oil resistant. Specially developed for hydraulic installations.*	*temperature range* *-20° - +110° C*

SILICONE

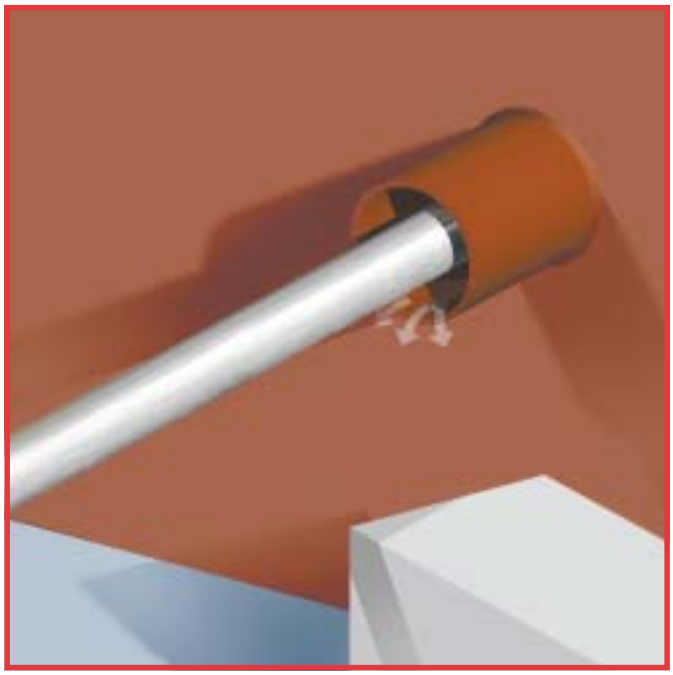
rubber type	*area of application*	*pipe temperature*
VMQ (silicone rubber)	*Rubber for gas and water tight conduits for pipework carrying media at extremely high or low temperatures. Suitable for cooling and steam pipes.*	*temperature range* *-60° - +200° C*

VITON

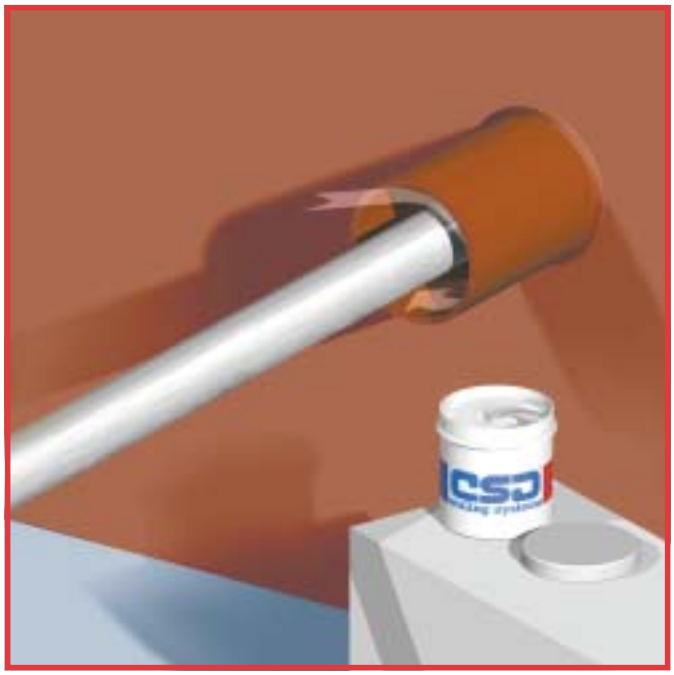
rubber type	*area of application*	*pipe temperature*
FPM (fluorocarbon rubber)	*Rubber for gas and water tight conduits, requiring a high level of resistance to chemicals. Suitable for petrochemical installations.*	*temperature range* *-20° - +200° C*

VITON is a registered trade mark of Dupont Dow Elastomers.

INSTALLATION INSTRUCTIONS FOR CSD® SEALING PLUGS



1) Before starting the installation procedure, any dirt or welding spots should be removed from the conduit sleeve. For ease of installation it is advisable to grind out the front side of the sleeve.



2) Then the inside wall of the conduit sleeve is treated with CSD® lubricant along a distance which approximately corresponds with the length of the sealing plug.

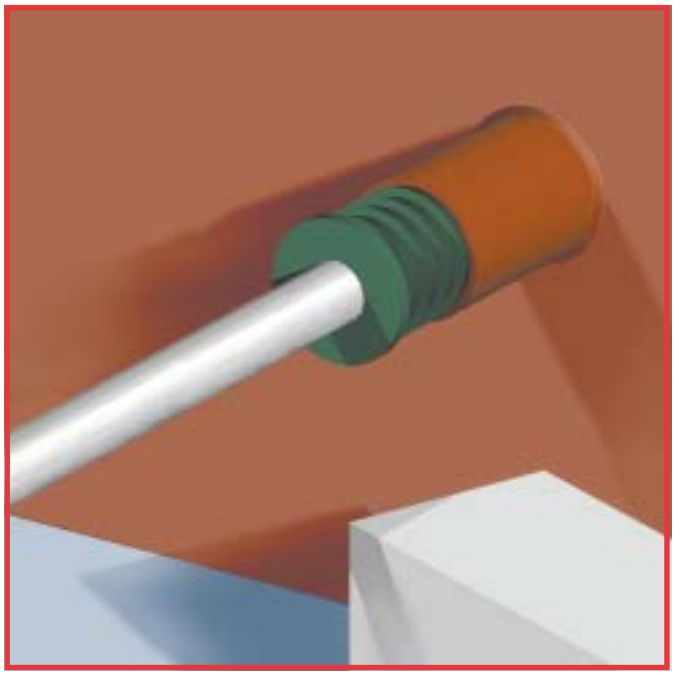
3) The outside surfaces of both segments of the CSD® sealing plug are then treated with CSD® lubricant.

4) The segments of the CSD® sealing plug are also treated with CSD® lubricant on the inside.

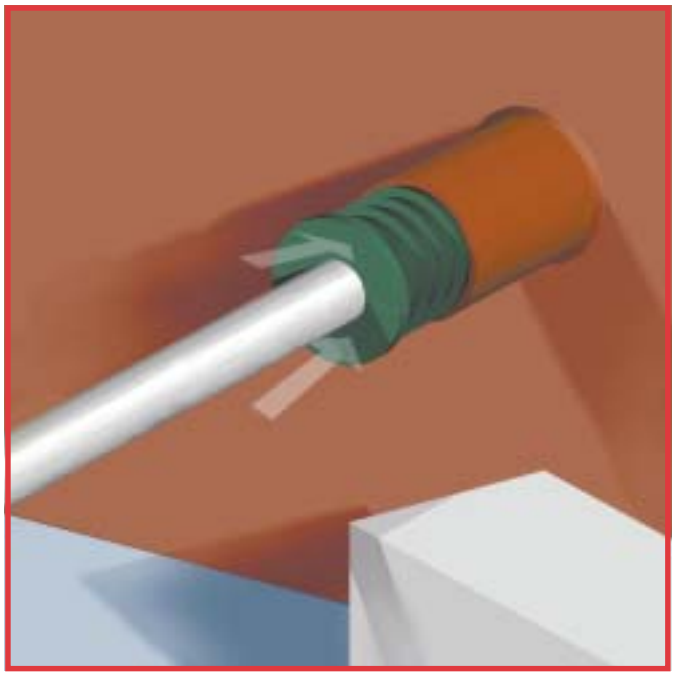
CSD® sealing systems

Installation of sealing plugs is a very simple matter. Grease and push: that's it.

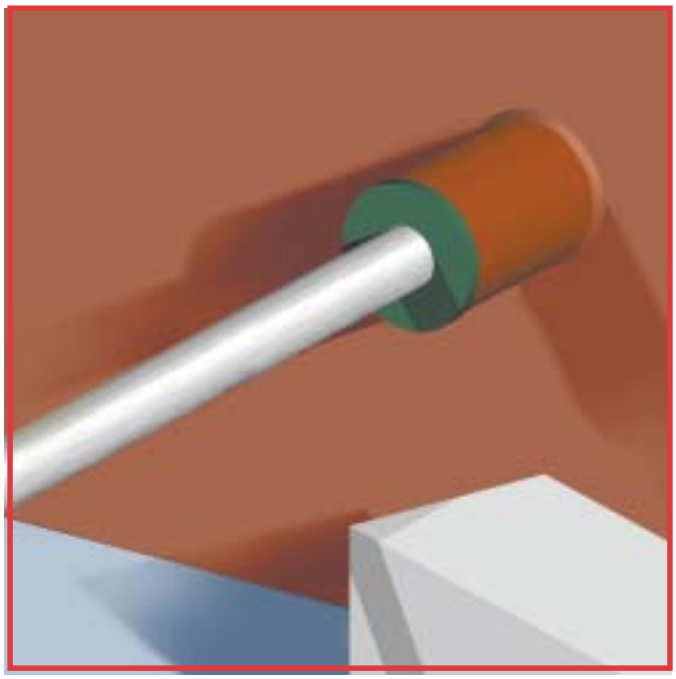
INSTALLATION INSTRUCTIONS FOR CSD® SEALING PLUGS



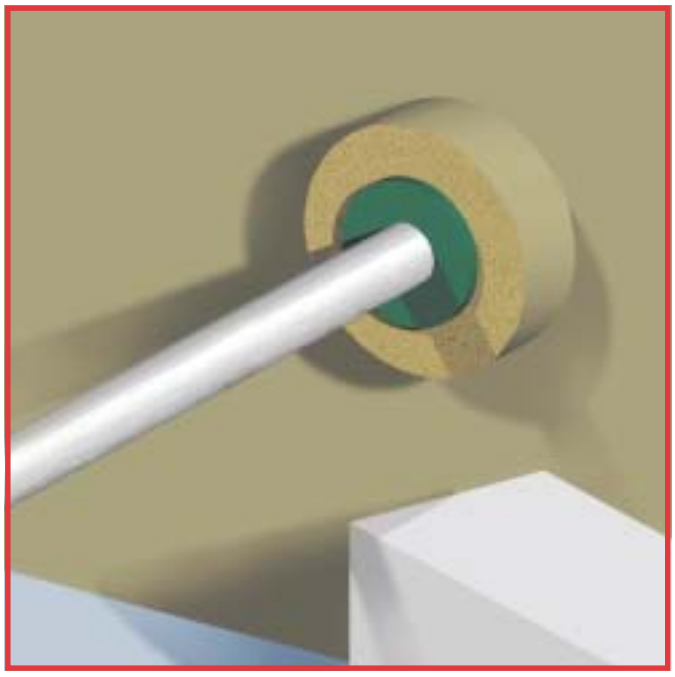
5) Both segments are placed around the pipe and then pushed into the conduit sleeve as far as the first serration.



6) Then both segments of the CSD® sealing plug are pushed evenly, serration by serration, into the conduit sleeve (larger plugs may be tapped in using a hammer and a wooden block).

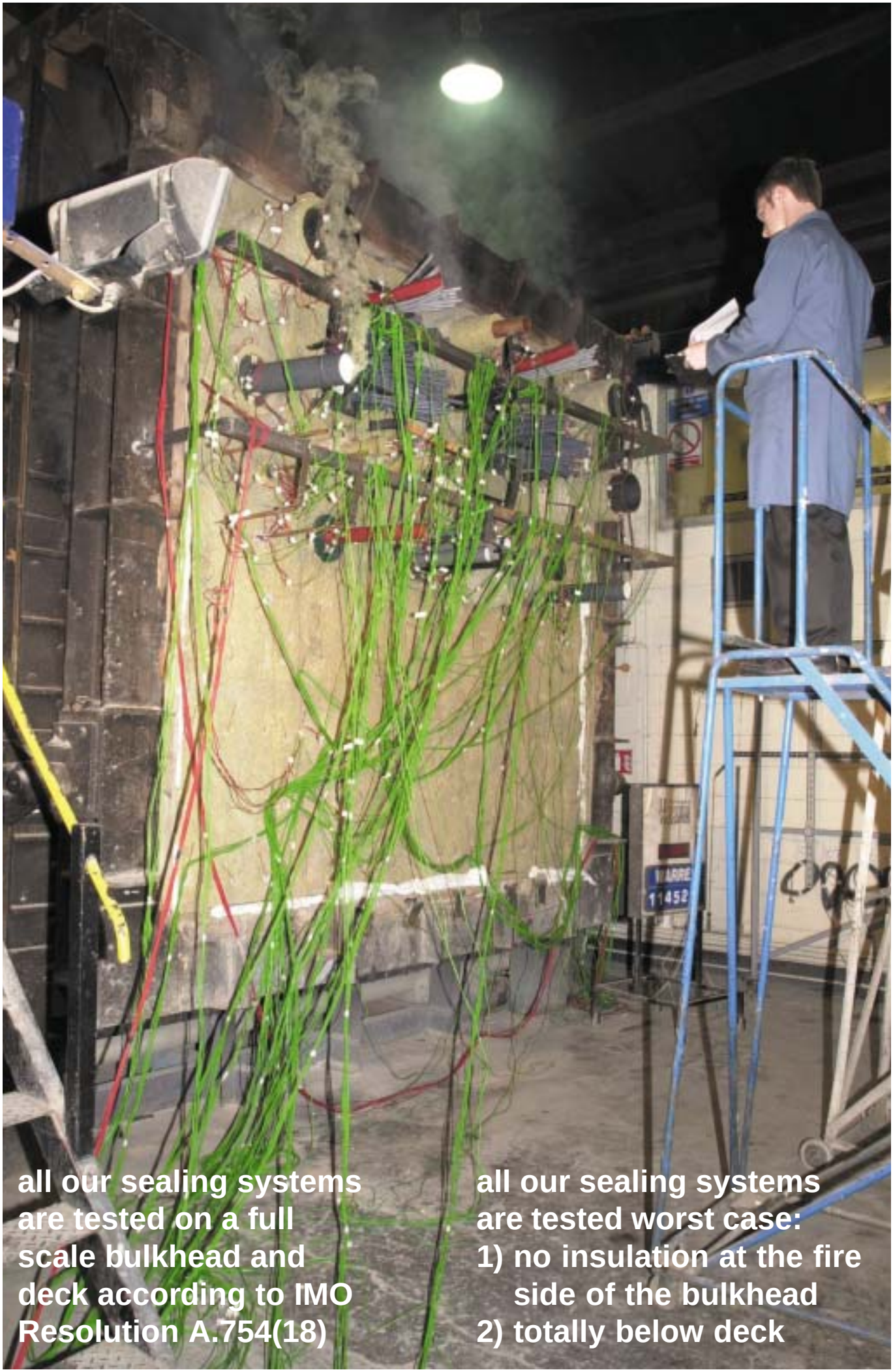


7) The flanged edge of the sealing plug must be flush against the front side of the conduit sleeve.



8) The conduit sleeve must be insulated along its full length at the insulated side of the bulkhead only or at the lower side of the deck for A-class penetrations. For H-class the conduit pipe has to be insulated at both sides of the bulkhead.
See pages 20 to 22.

Installation of sealing plugs is a very simple matter. Grease and push: that's it.


all our sealing systems are tested on a full scale bulkhead and deck according to IMO Resolution A.754(18)
all our sealing systems are tested worst case:
1) no insulation at the fire side of the bulkhead
2) totally below deck

CSD® CERTIFIED BY:

American Bureau of Shipping
Bureau Veritas
China Classification Society
China Corporation Register of Shipping
Det Norske Veritas
Germanischer Lloyd
Korean Register of Shipping
Lloyd's Register of Shipping
Nippon Kaiji Kyokai
Registro Italiano Navale
Transport Canada
US Coast Guard

EC certificates according to EUROPEAN UNION COUNCIL DIRECTIVE 96/98 EC on MARINE EQUIPMENT have been issued by BUREAU VERITAS, certificates N° 09155/A8 EC, N° 10154/A2 EC and N° 10742/A3 EC for CSD® sealing plugs type FRR and FRR/SIL and CSD® sealing plugs type FRR-E for single and multi-pipe penetrations for steel, stainless steel, copper, GRP, ABS, PVC, HDPE and PP pipes.

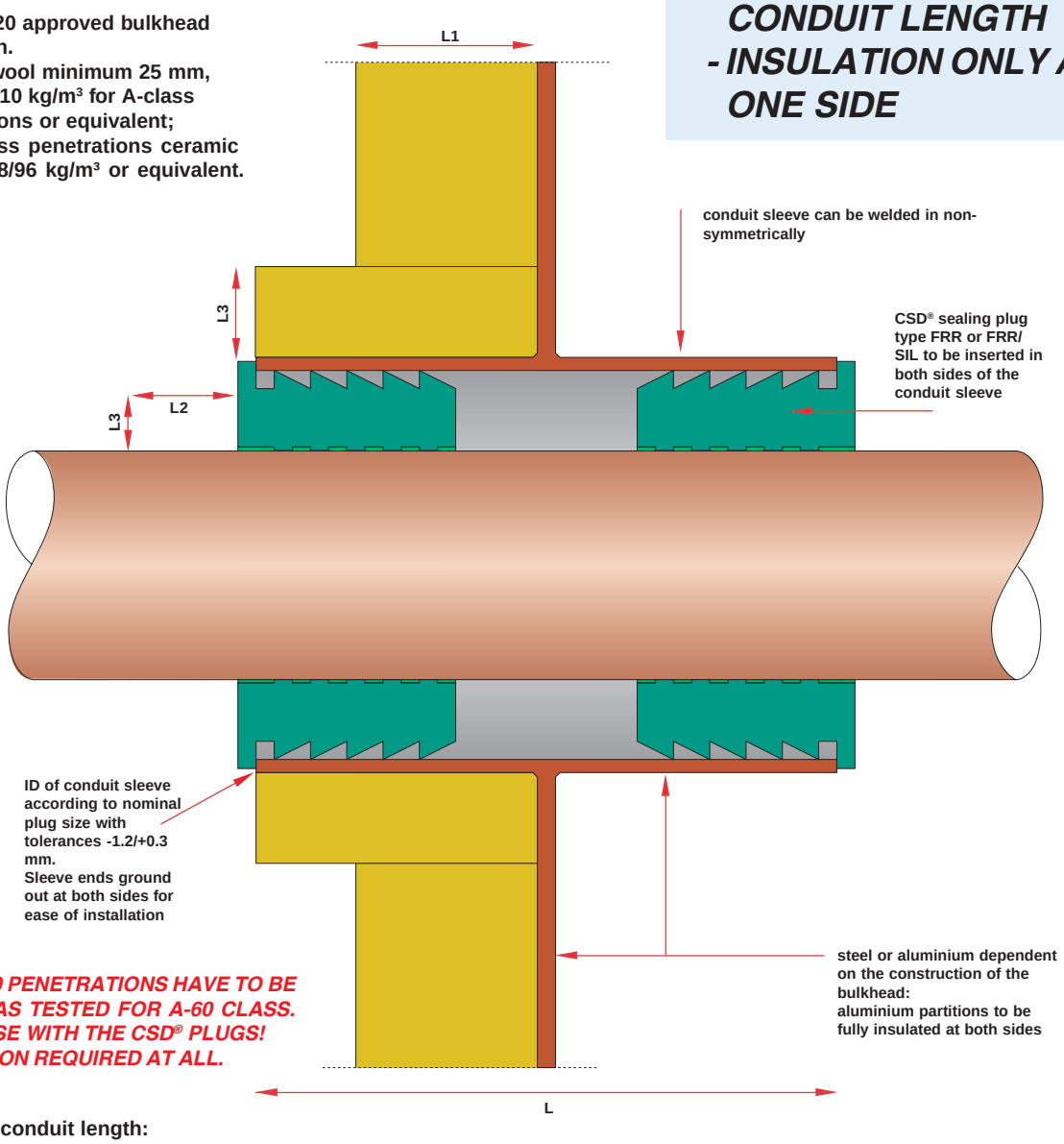
EC TYPE EXAMINATION CERTIFICATE
(CERTIFICATE OF TYPE APPROVAL)

SINGLE PIPE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60/H-120 approved bulkhead insulation.
L3: mineral wool minimum 25 mm, density 110 kg/m³ for A-class penetrations or equivalent; for H-class penetrations ceramic fibres 128/96 kg/m³ or equivalent.



USUALLY A-0 PENETRATIONS HAVE TO BE INSULATED AS TESTED FOR A-60 CLASS. NOT THE CASE WITH THE CSD® PLUGS! NO INSULATION REQUIRED AT ALL.

L = minimum conduit length:

120 mm for conduit sleeves max. 60,3 mm OD for A-class penetrations
160 mm for conduit sleeves max. 360 mm OD for A-class penetrations
250 mm for conduit sleeves above 360 mm OD for A-class penetrations

150 mm for conduit sleeves max. 60,3 mm OD for H-class penetrations
250 mm for conduit sleeves 60,3 mm up to 168,3 mm OD for H-class penetrations
300 mm for conduit sleeves above 168,3 mm OD for H-class penetrations

specifications for A-class according to CE certificates 09155/A8 EC, 10154/A2 EC and 10742/A3 EC issued by Bureau Veritas

NOTE: for H-class penetrations the conduit sleeve has to be insulated at both sides of the penetration.

L2 = insulation of service pipes on the insulated side of the penetration only for A-class; for H-class at both sides:

	A60	A0	H60	H120
steel & ss pipes/GRP				
up to 1"	none	none	100 mm	200 mm
1" up to 3"	200 mm	none	100 mm	200 mm
3" up to 6"	300 mm	none	200 mm	400 mm
above 6"	400 mm	none	300 mm	500 mm
copper pipes				
up to 2"	200 mm	none	300 mm	500 mm
2" up to 4"	200 mm*	none	300 mm	500 mm
above 4"	400 mm*	none	300 mm	500 mm

*** = both sides to be insulated**

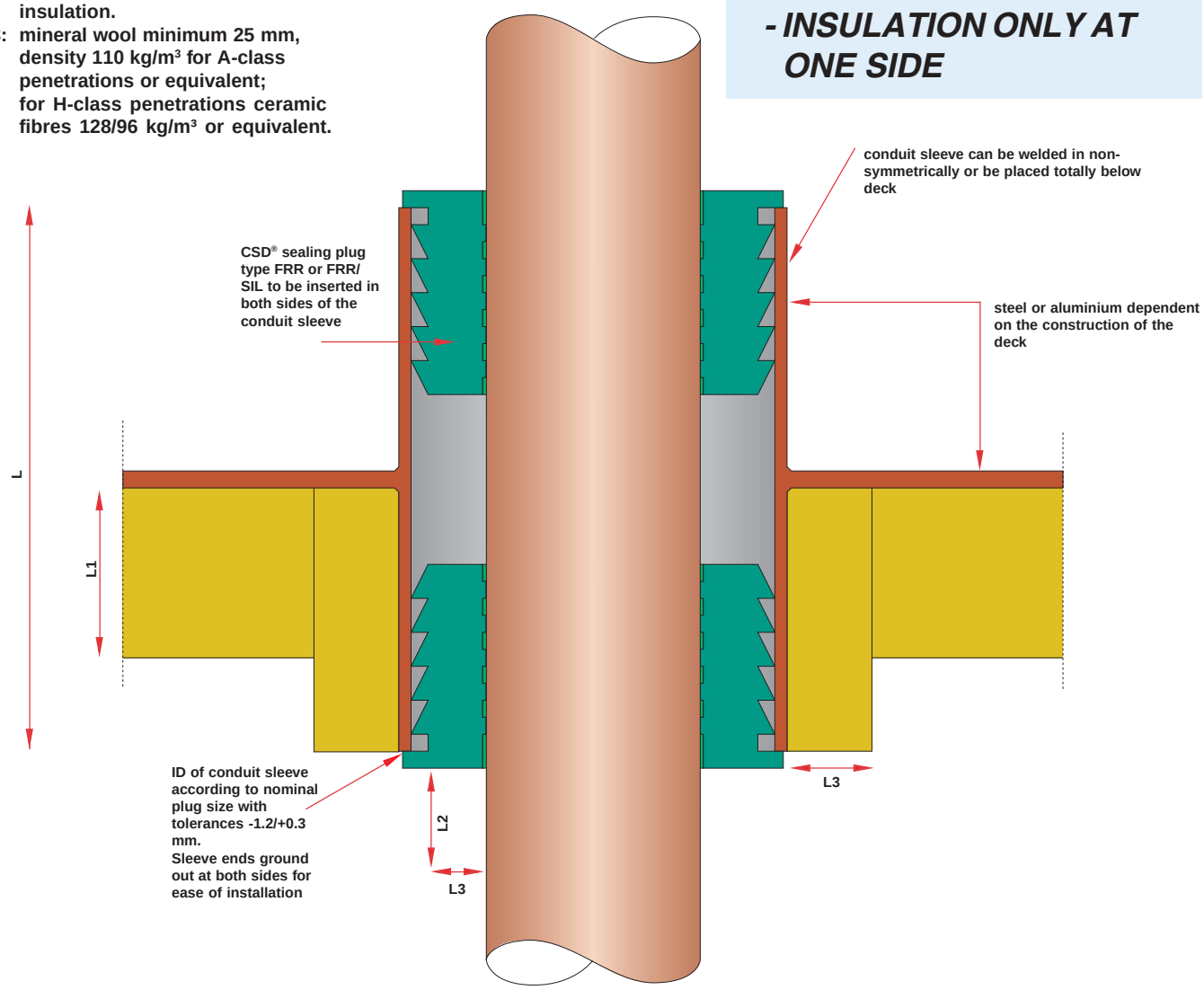
A0-A60 / H0-H120 PIPE PENETRATION BULKHEADS

SINGLE PIPE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60/H-120 approved deck insulation.
L3: mineral wool minimum 25 mm, density 110 kg/m³ for A-class penetrations or equivalent; for H-class penetrations ceramic fibres 128/96 kg/m³ or equivalent.



L = minimum conduit length

120 mm for conduit sleeves max. 60,3 mm OD for A-class penetrations
160 mm for conduit sleeves max. 360 mm OD for A-class penetrations
250 mm for conduit sleeves above 360 mm OD for A-class penetrations

150 mm for conduit sleeves max. 60,3 mm OD for H-class penetrations
250 mm for conduit sleeves 60,3 mm up to 168,3 mm OD for H-class penetrations
300 mm for conduit sleeves above 168,3 mm OD for H-class penetrations

specifications for A-class according to CE certificates 09155/A8 EC, 10154/A2 EC and 10742/A3 EC issued by Bureau Veritas

NOTE: for H-class penetrations the conduit sleeve has to be insulated at both sides of the penetration.

L2 = insulation of service pipes on the insulated side of the penetration only for A-class; for H-class at both sides:

	A60	A0	H60	H120
steel & ss pipes/GRP				
up to 1"	none	none	100 mm	200 mm
1" up to 3"	200 mm	none	100 mm	200 mm
3" up to 6"	300 mm	none	200 mm	400 mm
above 6"	400 mm	none	300 mm	500 mm
copper pipes				
up to 2"	200 mm	none	300 mm	500 mm
2" up to 4"	400 mm	none	300 mm	500 mm
above 4"	800 mm	none	300 mm	500 mm

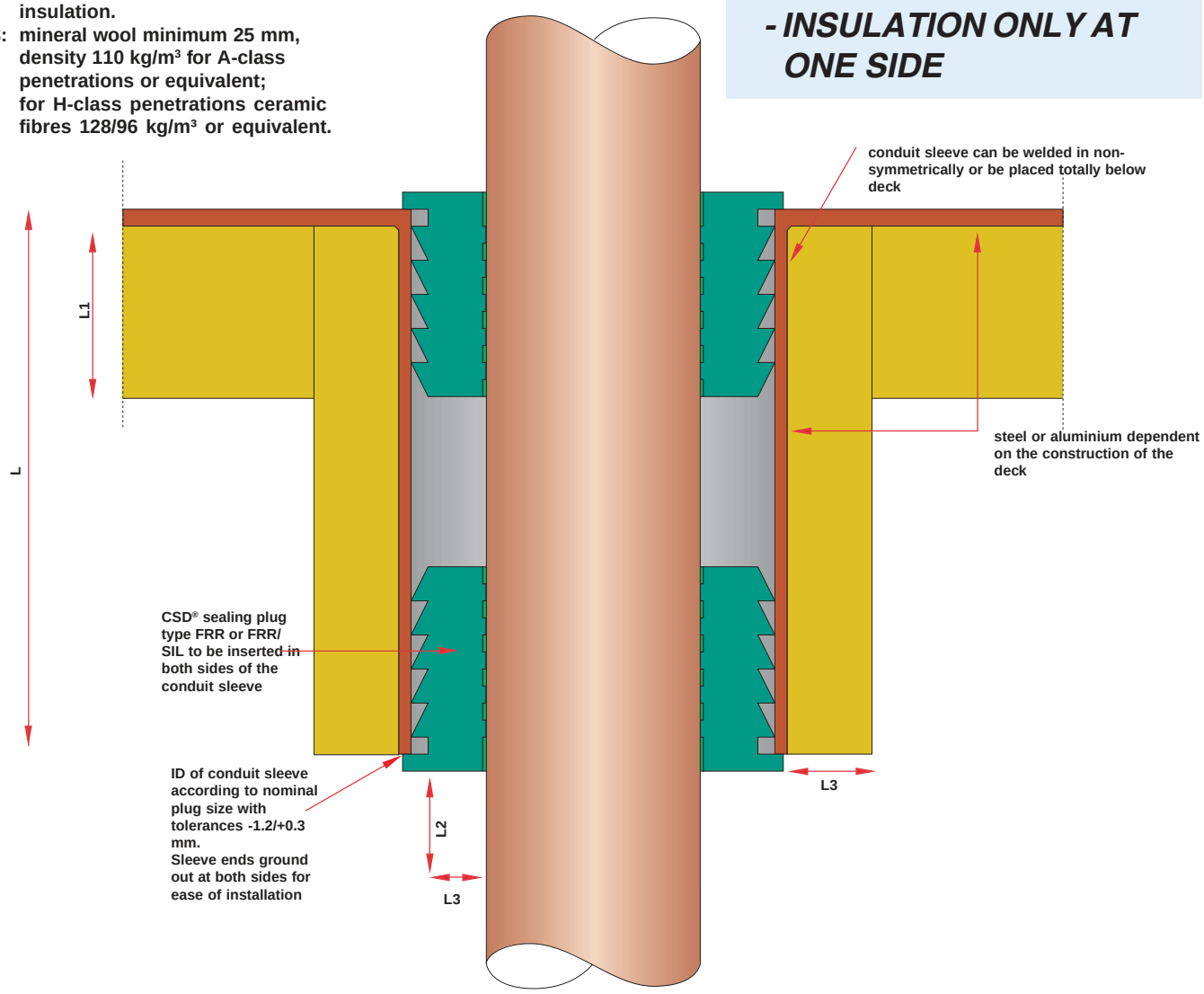
A0-A60 / H0-H120 PIPE PENETRATION DECKS

SINGLE PIPE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60/H-120 approved deck insulation.
L3: mineral wool minimum 25 mm, density 110 kg/m³ for A-class penetrations or equivalent; for H-class penetrations ceramic fibres 128/96 kg/m³ or equivalent.



L = minimum conduit length

120 mm for conduit sleeves max. 60,3 mm OD for A-class penetrations
160 mm for conduit sleeves max. 360 mm OD for A-class penetrations
250 mm for conduit sleeves above 360 mm OD for A-class penetrations

150 mm for conduit sleeves max. 60,3 mm OD for H-class penetrations
250 mm for conduit sleeves 60,3 mm up to 168,3 mm OD for H-class penetrations
300 mm for conduit sleeves above 168,3 mm OD for H-class penetrations

specifications for A-class according to CE certificates 09155/A8 EC, 10154/A2 EC and 10742/A3 EC issued by Bureau Veritas

NOTE: for H-class penetrations the conduit sleeve has to be insulated at both sides of the penetration.

L2 = insulation of service pipes on the insulated side of the penetration only for A-class; for H-class at both sides:

	A60	A0	H60	H120
steel & ss pipes/GRP				
up to 1"	none	none	100 mm	200 mm
1" up to 3"	200 mm	none	100 mm	200 mm
3" up to 6"	300 mm	none	200 mm	400 mm
above 6"	400 mm	none	300 mm	500 mm
copper pipes				
up to 2"	200 mm	none	300 mm	500 mm
2" up to 4"	400 mm	none	300 mm	500 mm
above 4"	800 mm	none	300 mm	500 mm

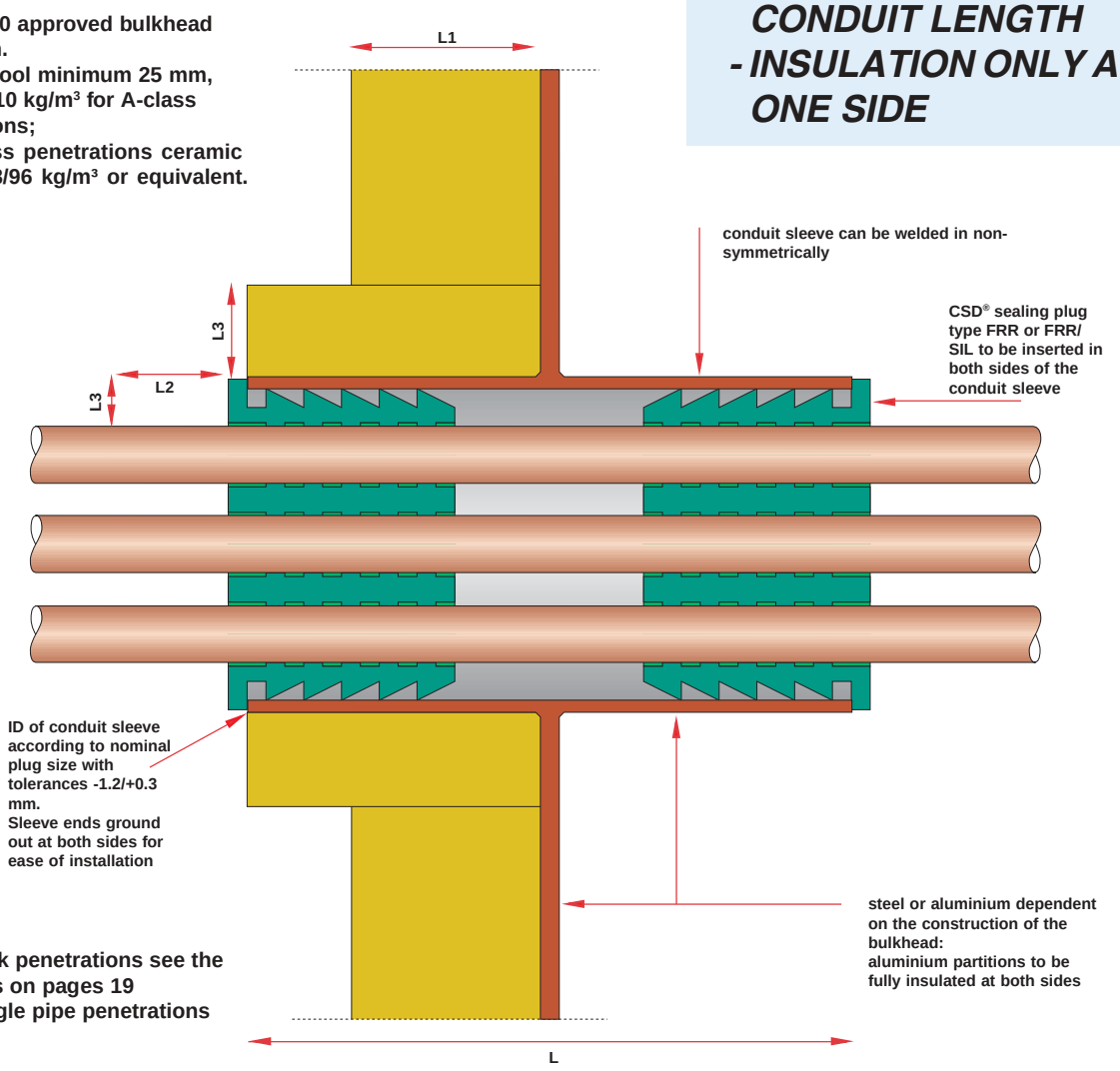
A0-A60 / H0-H120 PIPE PENETRATION DECKS

MULTI-PIPE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60/H-120 approved bulkhead insulation.
L3: mineral wool minimum 25 mm, density 110 kg/m³ for A-class penetrations;
for H-class penetrations ceramic fibres 128/96 kg/m³ or equivalent.



NOTE: for deck penetrations see the configurations on pages 19 and 20 for single pipe penetrations

L = minimum conduit length

120 mm for conduit sleeves max. 60 mm OD for A-class penetrations
160 mm for conduit sleeves max. 360 mm OD for A-class penetrations

150 mm for conduit sleeves max. 60,3 mm OD for H-class penetrations
250 mm for conduit sleeves 60,3 mm up to 168,3 mm OD for H-class penetrations

L2 = insulation of service pipes on the insulated side of the penetration only for A-class; for H-class at both sides:

	A60	A0	H60	H120
steel & ss pipes/GRP				
up to 1"	none	none	100 mm	200 mm
1" up to 2"	200 mm	none	100 mm	200 mm
copper pipes				
up to 2"	200 mm	none	300 mm	500 mm

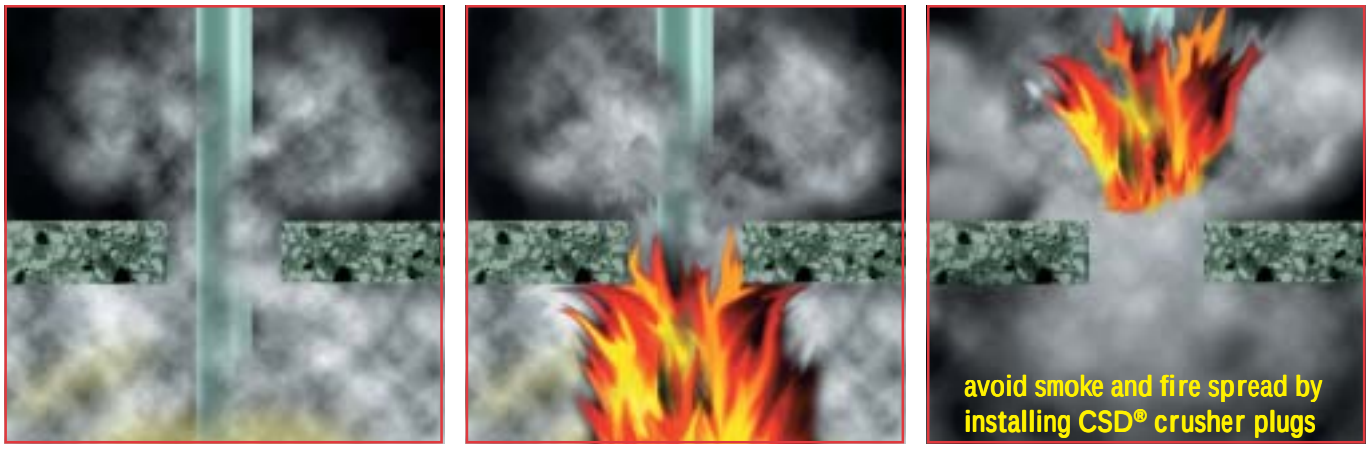
specifications for A-class according to CE certificates 09155/A8 EC, 10154/A2 EC and 10742/A3 EC issued by Bureau Veritas

NOTE: for H-class penetrations the conduit sleeve has to be insulated at both sides of the penetration.

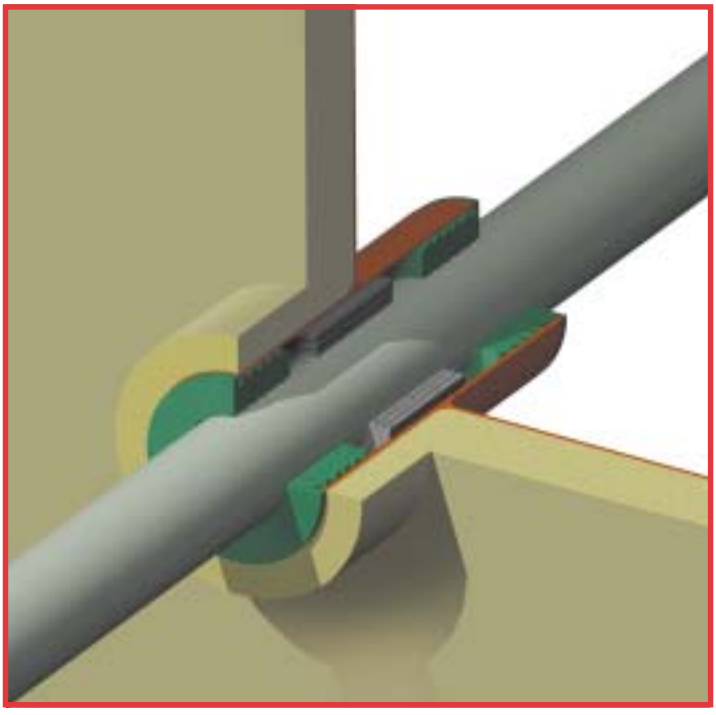
A0-A60 / H0-H120 MULTI- PIPE PENETRATION BULKHEADS

CRUSHER® PLUGS FOR PLASTIC PIPES

Plastic pipes which pass through fire-rated bulkheads and decks as part of, for example, sanitation systems, are a potential source of serious problems in case of fire. PVC/ABS/HDPE/PP pipes start to soften at a temperature of about 75 °C and ignite at a temperature of about 140 °C. This means that, should a fire occur, a hole will be formed by the softened or combusted plastic pipe, allowing fumes and flames to spread freely. In order to meet this problem, BEELE Engineering has developed the CSD® crusher plugs for firesafe penetrations of PVC, ABS, HDPE and PP pipes and PE/ALU flexible pipes.



For this purpose a totally new rubber compound (type FRR-E = fire resistant rubber - expanding) has been developed. When exposed to temperatures above 200 °C or flames, this rubber will expand vigorously to more than ten times its original volume with such a force that even an aluminium pipe will be crushed. This means that in case of a fire no opening will be left in the conduit for the passage of smoke and flames. For PVC, ABS, HDPE or PP pipes the cavity between the FRR-E plugs is to be partly filled with FRR/EHF (fire resistant rubber/expanding, halogen free) strips or sleeves. Other than with PE/ALU pipes the time to close off the opening left by the burned or softened PVC, ABS, HDPE or PP is very short. Otherwise a chimney effect will occur causing the pipe at the unexposed side to melt. Due to the vulcanized type of rubber, the FRR-E rubber has to break its surface to be able to expand. The FRR/EHF rubber, however, will expand as soon as the conduit sleeve is subjected to heat and as a result it will in a veryshort time seal off the opening created by the softened or combusted plastic pipe. The expanded FRR/EHF rubber possesses good thermal insulation properties, ensuring that the softened pipe will reharden after compression. After the expansion of the FRR/EHF rubber, the CSD® crusher plug at the exposed side will expand and squeeze the remainders of the plastic pipe and close up the FRR/EHF rubber totally. The expanding plug at the unexposed side will keep the penetration smoke tight during the fire.



The CSD® sealing plug system is a push-in system and requires no complicated installation work. Firesafe, gas and water tight. Official fire tests, both on a full scale deck and bulkhead, according to IMO Resolution A.754(18) have successfully been carried out at the Warrrington Fire Research Institute in England and TNO in The Netherlands.

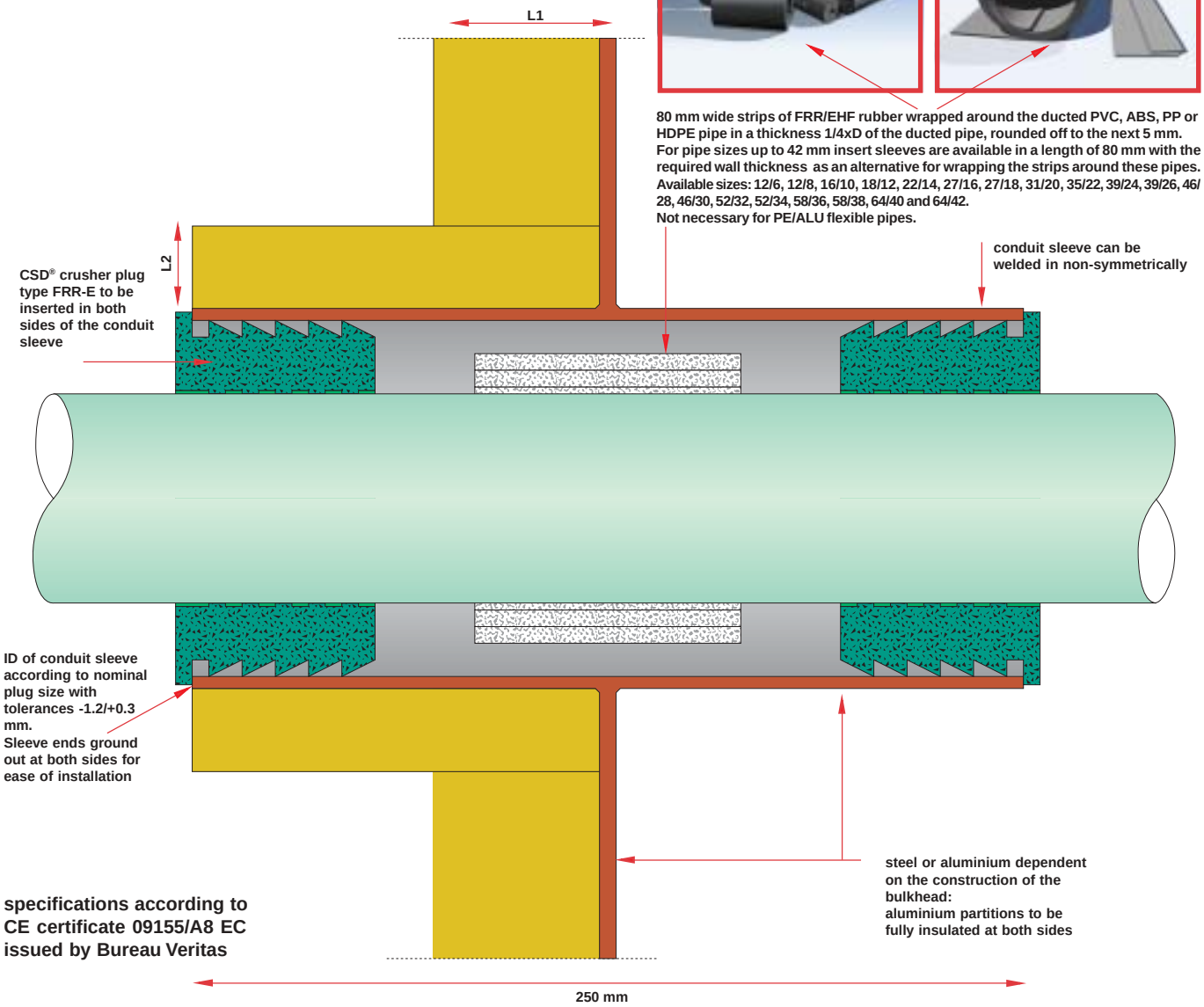
CE certificate Bureau Veritas Nr. 09155/A8 EC.

CRUSHER®

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

L1: A-60 approved bulkhead insulation.
L2: mineral wool minimum 25 mm, density 110 kg/m³ or equivalent.

80 mm wide strips of FRR/EHF rubber wrapped around the ducted PVC, ABS, PP or HDPE pipe in a thickness 1/4xD of the ducted pipe, rounded off to the next 5 mm. For pipe sizes up to 42 mm insert sleeves are available in a length of 80 mm with the required wall thickness as an alternative for wrapping the strips around these pipes. Available sizes: 12/6, 12/8, 16/10, 18/12, 22/14, 27/16, 27/18, 31/20, 35/22, 39/24, 39/26, 46/28, 46/30, 52/32, 52/34, 58/36, 58/38, 64/40 and 64/42.
Not necessary for PE/ALU flexible pipes.



specifications according to CE certificate 09155/A8 EC issued by Bureau Veritas

A0-A60 PLASTIC PIPE PENETRATION BULKHEADS

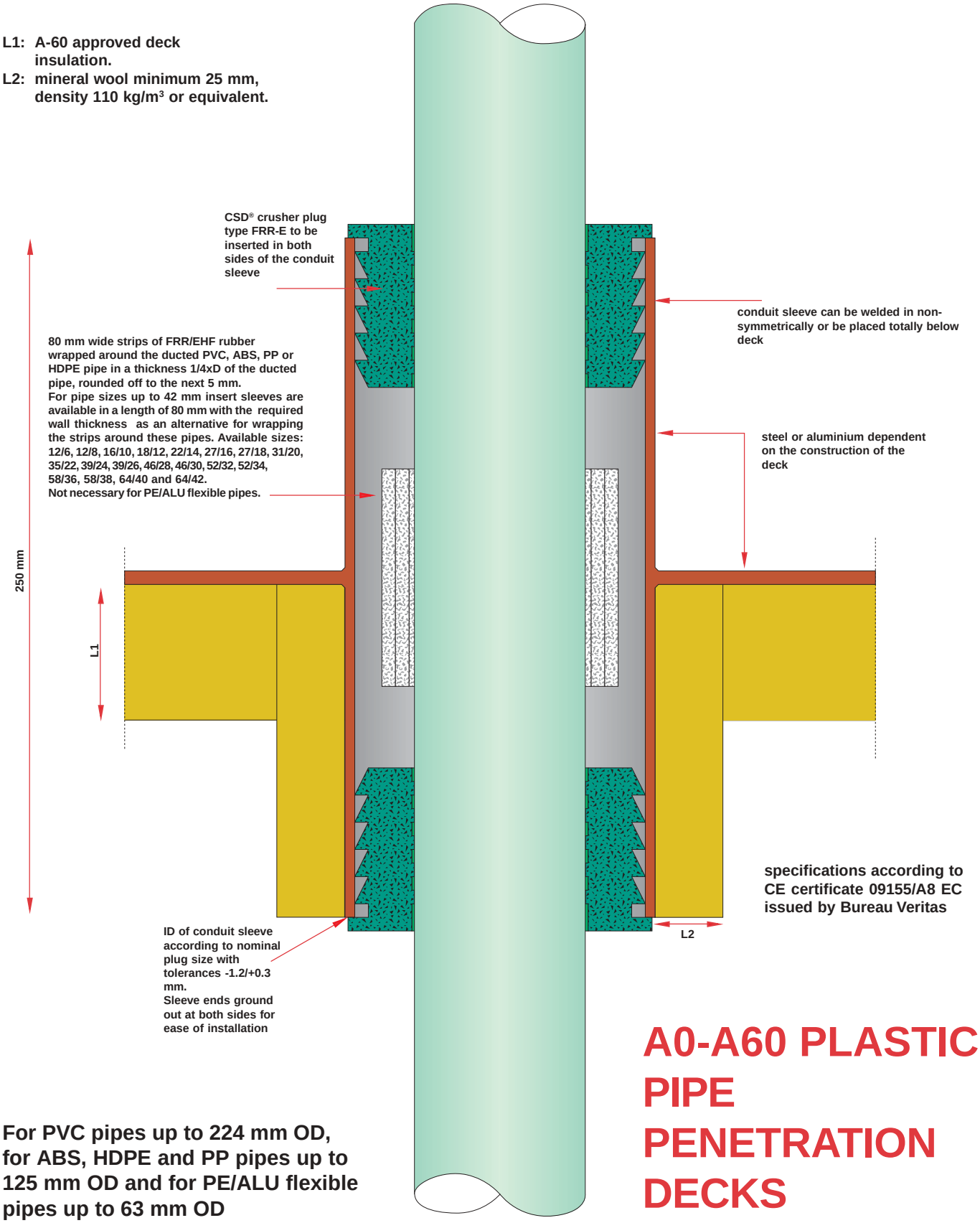
For PVC pipes up to 224 mm OD, for ABS, HDPE and PP pipes up to 125 mm OD and for PE/ALU flexible pipes up to 63 mm OD

CRUSHER®

CRUSHER® PLUGS FOR PLASTIC PIPES

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

L1: A-60 approved deck insulation.
L2: mineral wool minimum 25 mm, density 110 kg/m³ or equivalent.



specifications according to CE certificate 09155/A8 EC issued by Bureau Veritas

For PVC pipes up to 224 mm OD, for ABS, HDPE and PP pipes up to 125 mm OD and for PE/ALU flexible pipes up to 63 mm OD

A0-A60 PLASTIC PIPE PENETRATION DECKS

CRUSHER®

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

L1: A-60 approved deck insulation.
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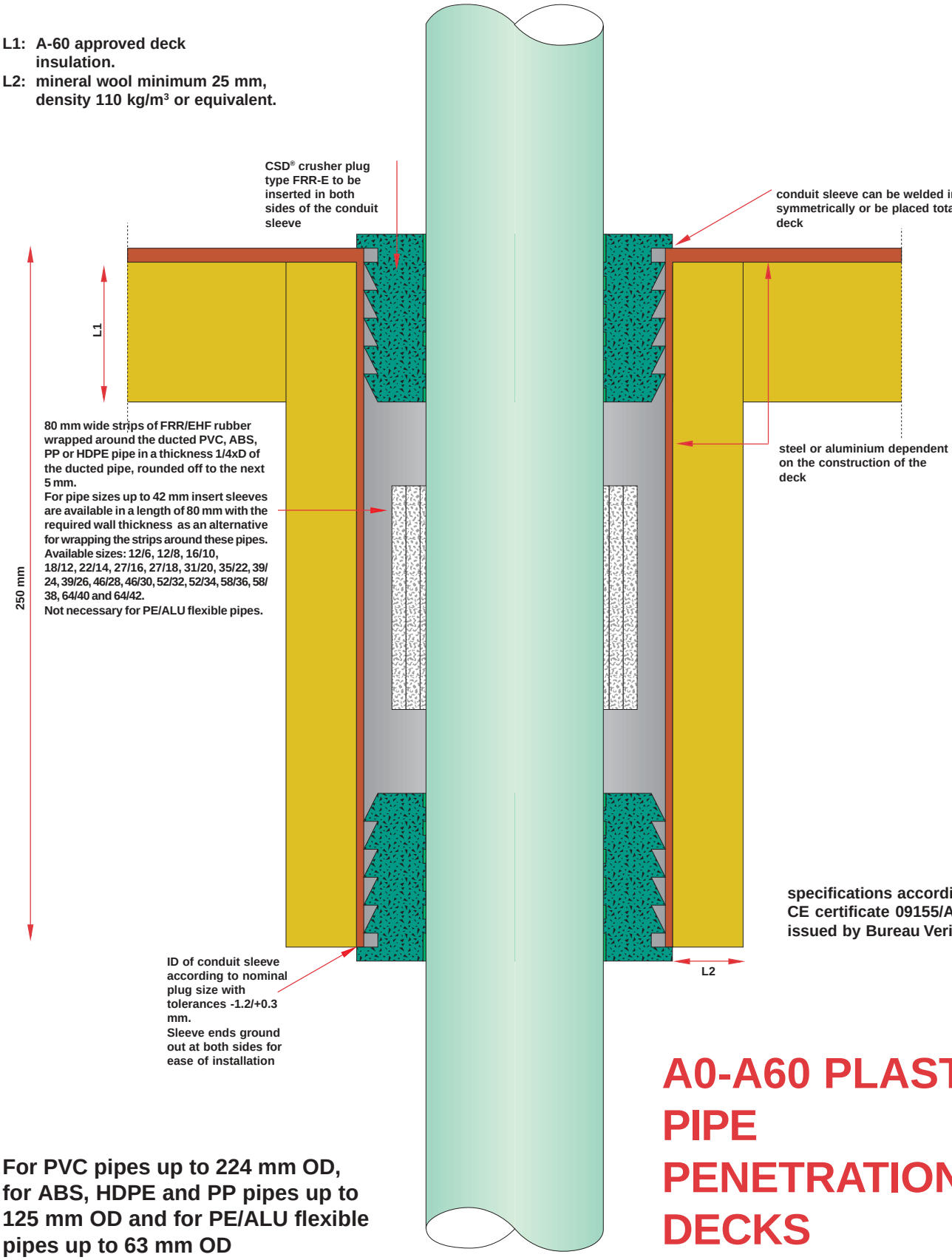


specifications according to CE certificate 09155/A8 EC issued by Bureau Veritas

A0-A60 PLASTIC PIPE PENETRATION DECKS

For PVC pipes up to 224 mm OD, for ABS, HDPE and PP pipes up to 125 mm OD and for PE/ALU flexible pipes up to 63 mm OD

CRUSHER®

SEALING PLUGS TYPE EMC FOR EMP/EMI PROTECTION

Interference sources such as laser equipment, relays, computer terminals, radar, lightning or NEPM can generate magnetic or electric fields. The induced interference currents are capable of affecting the performance of equipment fitted with sensitive microelectronics, such as control systems, process computers and electronic data processing systems and even causing failure of that equipment. It is therefore vital to shield microelectronic equipment against these interference currents. In areas where major electronic systems have to be installed, structural measures are taken with a view to safeguarding against the risks of disturbances in electronic components caused by electromagnetic fields. A Faraday cage is created by installing special shielding steel structures around the space.
Cables and pipes entering such shielded spaces perforate the protective screen provided and, if no measures are taken, are capable of conducting electromagnetic pulses and fields into the shielded area.

For the EMC protection of pipe penetrations entering shielded areas, BEELE Engineering has developed an electrically conductive rubber for the manufacturing of CSD® sealing plugs type EMC. Tests carried out at the TNO laboratories have shown that the electrical surface resistance is not more than 7 ohm. Attenuation tests at DELTA Electronics Testing/ Denmark have proved the outstanding damping properties of the EMC sealing plugs: 45-85 dB.
The EMC rubber is based on EPDM which guarantees a high grade of UV and ozone resistance.
Gas and water tight.

In case the penetrations have to be not only EMC proof, but also fire safe, a combination of fire safe plugs type FRR and CONDUCTON® putty/flexible rubber or CONDUCTON® tapes and sleeves for the conductive filling of the cavity in between the plugs can be used.
The putty is most easy to apply for deck penetrations; the tape and sleeves are easier to use for bulkhead penetrations. The attenuation with the flexible rubber is highest; with the putty lowest.

Tested at DELTA Electronics Testing/Denmark:
Attenuation 45-85 dB
Test report DELTA-K221073-1

The EMC electrically conductive rubber compound incorporates conductive components which possess a unique morphology. The amount of these components to be mixed into the rubber compound for obtaining the desired conductivity is relatively small so that the rubber properties of the end product are maintained.

In the laboratory of TNO Industry at Delft, The Netherlands, resistivity measurements were carried out on the electrically conductive compound from which the EMC sealing plugs are made. For that purpose, use was made of a sample measuring 100x100x10 mm. The measurements were performed in accordance with the requirements of ISO 2878 (1987): Rubber, vulcanized - Antistatic and conductive product - Determination of electrical resistance.
On the surface of the test piece, using Aquadag (a colloidal dispersion of graphite in water) electrodes were positioned at an interspacing of 50 mm; the electrodes were square and had 25 mm sides (configuration according to section 6.1).
The resistance, measured in duplicate, was found to average 7 Ohm (≤1000 Ohm is conductive).

SEALING PLUGS TYPE EMC FOR EMP/EMI PROTECTION

To differentiate them clearly from the standard EPDM type – which is also coloured black - EMC sealing plugs, transit plugs and transit modules carry red markings on the flange side. This also facilitates inspections. The serrated profile on the outside and the flat trapezium-shaped O-rings on the inside of the sealing plug give a sealing power of 2.5 bar. This means that the conductive EMC penetration is also gas and water tight. The rubber is UV and ozone resistant and can therefore be used for outdoor applications.

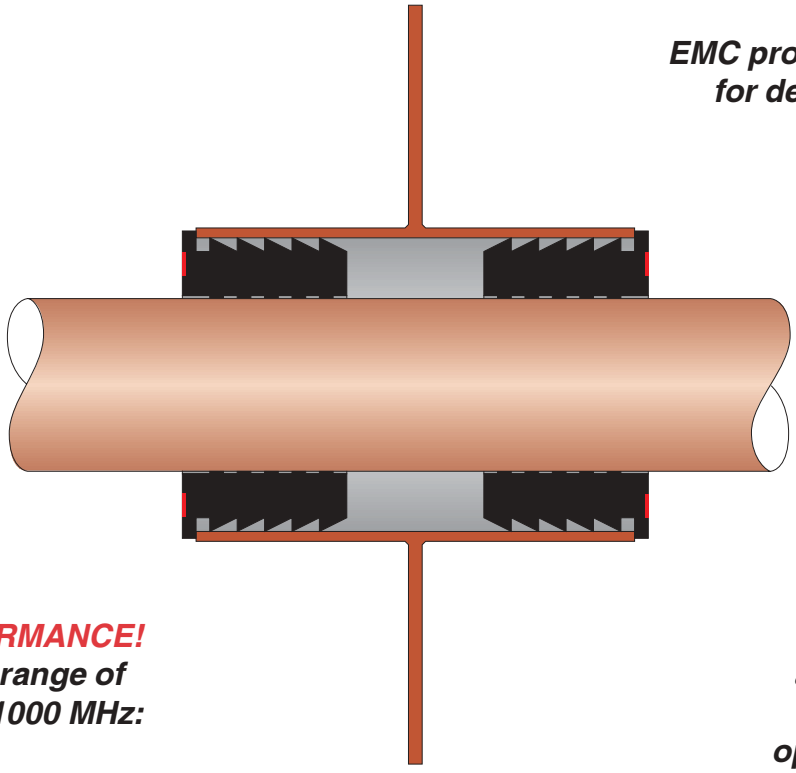
CSD® sealing plugs type EMC are used on a large scale for EMP/ EMI protected pipe penetrations on the Rauma class 2000 vessel for the Finnish Navy built by Aker Finnyards Oy. For the firesafe pipe penetrations CSD® sealing plugs type FRR are used.

Tests carried out at the TNO laboratories have shown that the electrical surface resistance is not more than 7 ohm. Attenuation tests at DELTA Electronics Testing/Denmark have proven the outstanding damping properties of the EMC sealing plugs: **45-85 dB**.

A combination of FRR plugs and CONDUCTON® flexible rubber for firesafe, EMC proof penetrations:
damping: **35-85 dB**.
A combination of FRR plugs and CONDUCTON® tape/sleeves for firesafe, EMC proof penetrations:
damping: **30-60 dB**.
A combination of FRR plugs and CONDUCTON® putty for firesafe, EMC proof penetrations:
damping: **10-30 dB**.

CONFIGURATIONS PIPE PENETRATIONS EMC PROOF

water and gas tight
EMC proof pipe penetration
for decks and bulkheads



HIGHEST PERFORMANCE!
attenuation in the range of
measurements 0-1000 MHz:
45 - 85 dB

EMC sealing plugs
at both sides of the
conduit sleeve for
optimum attenuation

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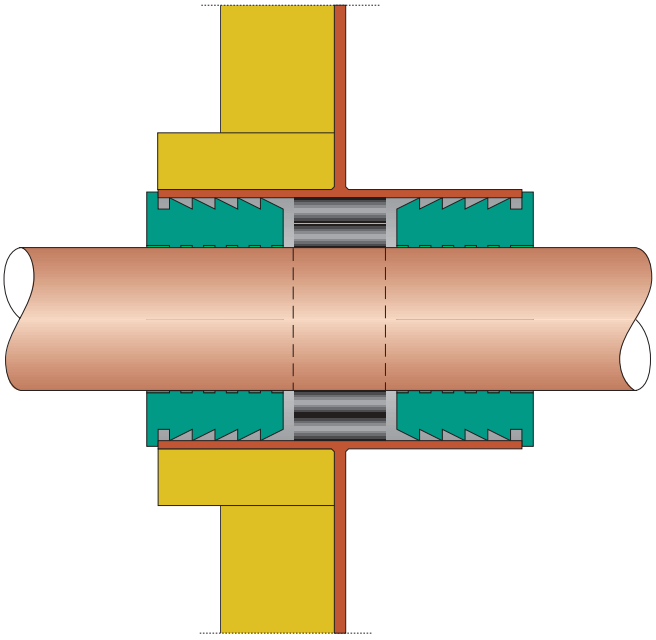
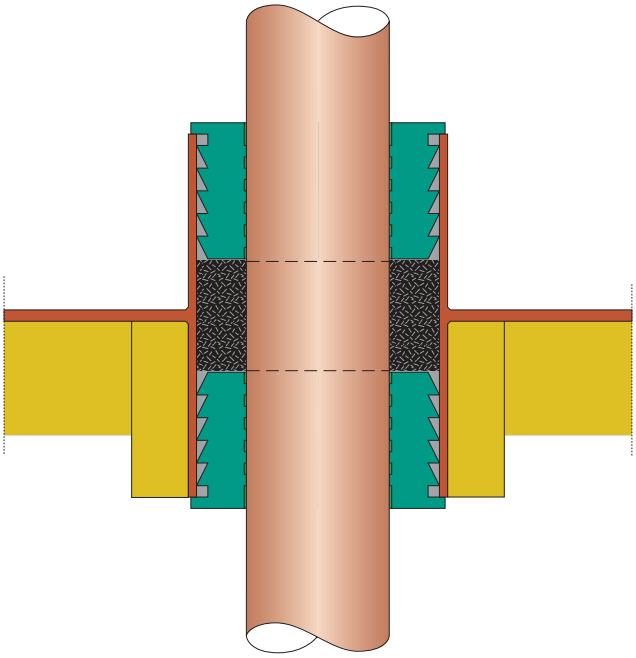
for larger bulkhead penetrations it
is advisable to use CONDUCTON®
flexible rubber or sleeves instead of putty



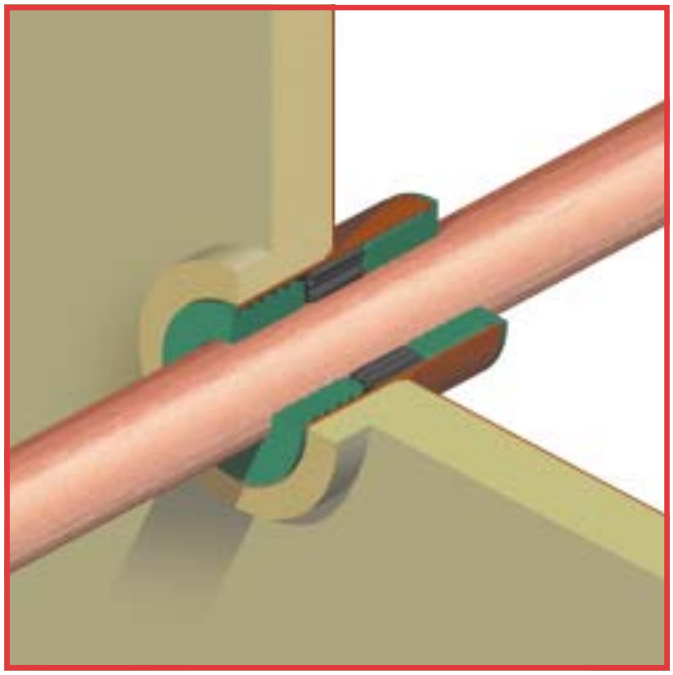
attenuation in the range of
measurements 0-1000 MHz:
40 mm putty: 10 - 30 dB;
40 mm tape/sleeves: 20 - 50 dB;
60 mm tape/sleeves: 30 - 60 dB
40 mm flexible rubber: 35-85 dB

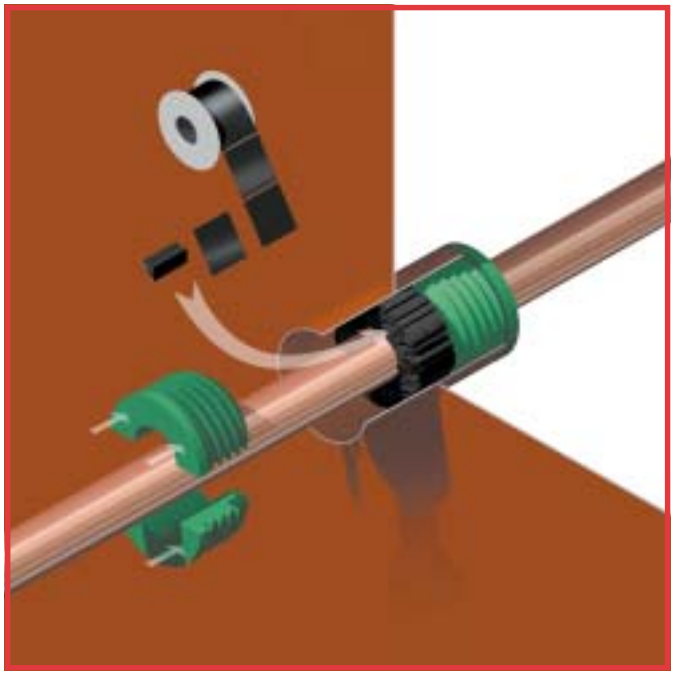
fire rated, water and gas tight,
EMC proof pipe penetration for
decks and bulkheads

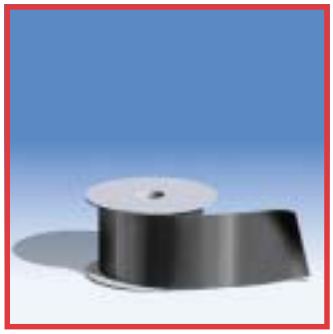


FRR sealing plugs, cavity filled
with 40 mm CONDUCTON®
putty/flexible rubber or 40 mm or
60 mm CONDUCTON® tape/sleeves

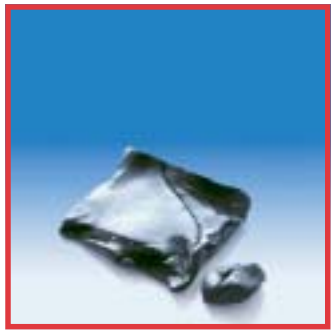
CONFIGURATIONS FIRE SAFE PIPE PENETRATIONS EMC PROOF



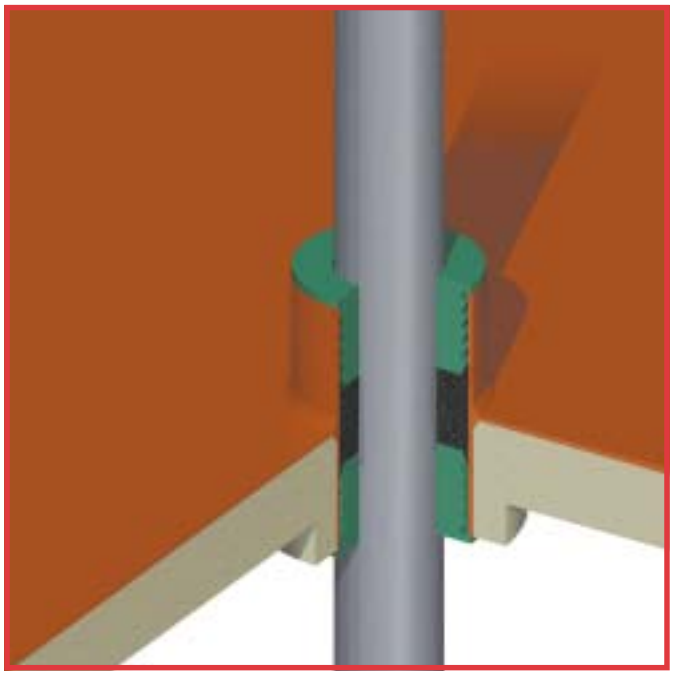


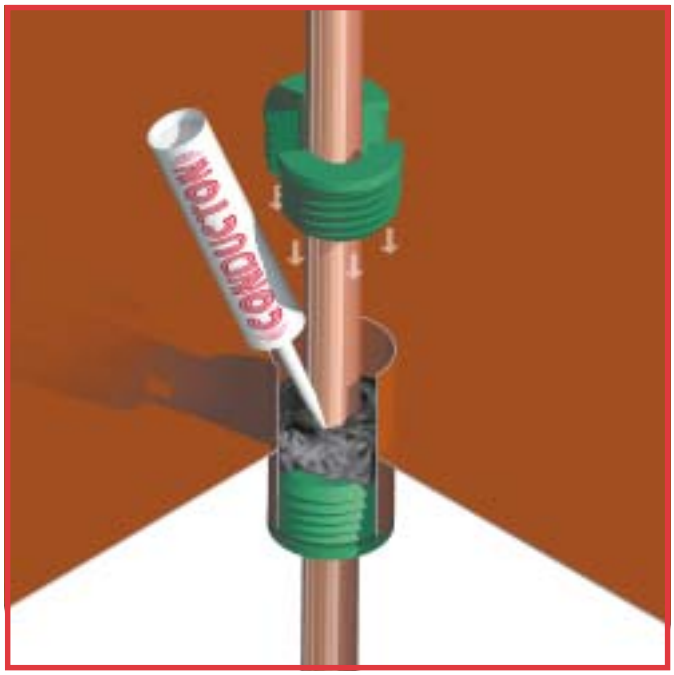


Use is made of CONDUCTON® tape and sleeves to fill the cavity in between the FRR sealing plugs with electrically conductive materials. Minimum length of conductive filling is 40 mm. Can be used both for horizontal and vertical penetrations.



For vertical penetrations the CONDUCTON® putty is most easy to apply. The attenuation is lower than with the tape/sleeves. CONDUCTON® flexible rubber is used to fill the cavity around the ducted pipe in the conduit sleeve in stead of making use of the putty. This rubber can be modelled by hand and offers the highest attenuation.





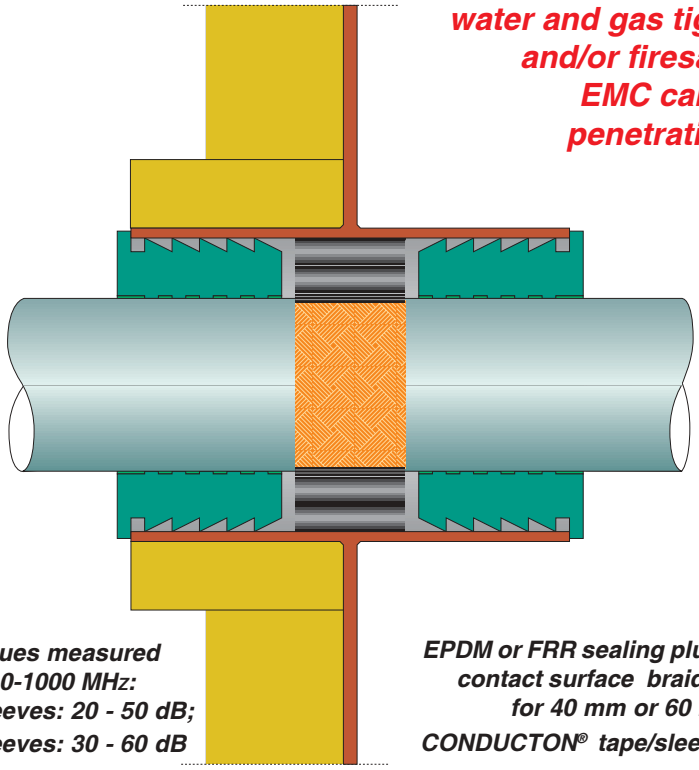
CONFIGURATIONS CABLE PENETRATIONS EMC PROOF

CONDUCTON® is an electrically conductive sealing putty based on a single component silicone compound. CONDUCTON® is also water-repellent. The putty adheres well to metal subsurfaces and is reasonably flexible.

PRODUCT INFORMATION

01) colour	black
02) specific gravity	1,4 ± 0,03 g/cm³
03) tensile strength	0,8 MPa
04) elongation at break	40%
05) hardness	30 Shore A
06) elasticity	approx. 25%
07) good adhesion to	steel, zinc, copper, aluminium
08) resistance	< 100 W
09) supplied in	cartridges containing 310 ml
10) storage	to be stored cool and dry min/max temperature = 5-30 °C
11) storage life	approx. 6 months

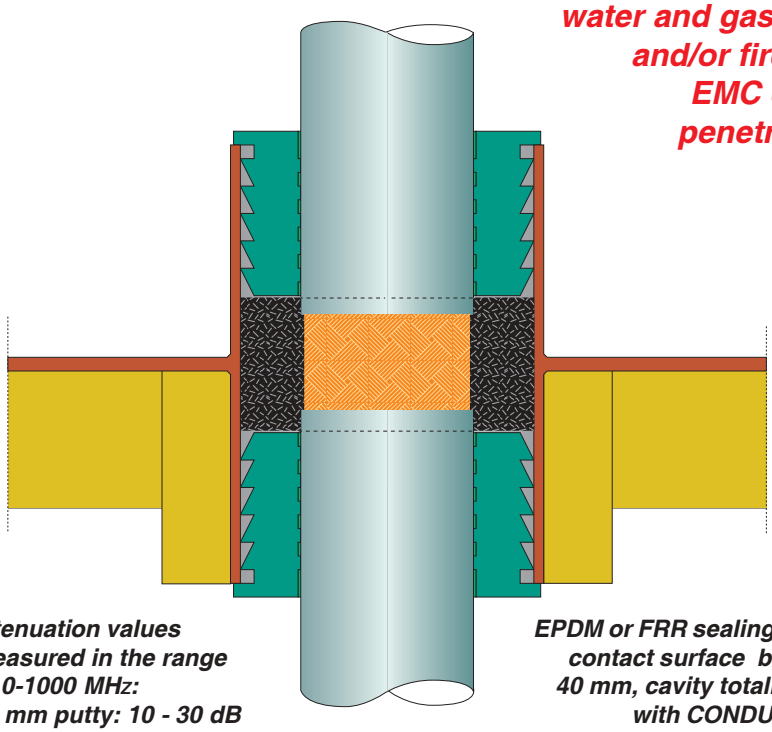
water and gas tight and/or firesafe EMC cable penetration



attenuation values measured in the range of 0-1000 MHz: 40 mm tape/sleeves: 20 - 50 dB; 60 mm tape/sleeves: 30 - 60 dB

EPDM or FRR sealing plugs, contact surface braiding for 40 mm or 60 mm CONDUCTON® tape/sleeves

water and gas tight and/or firesafe EMC cable penetration



attenuation values measured in the range of 0-1000 MHz: 40 mm putty: 10 - 30 dB 40 mm flexible rubber: 35-85 dB

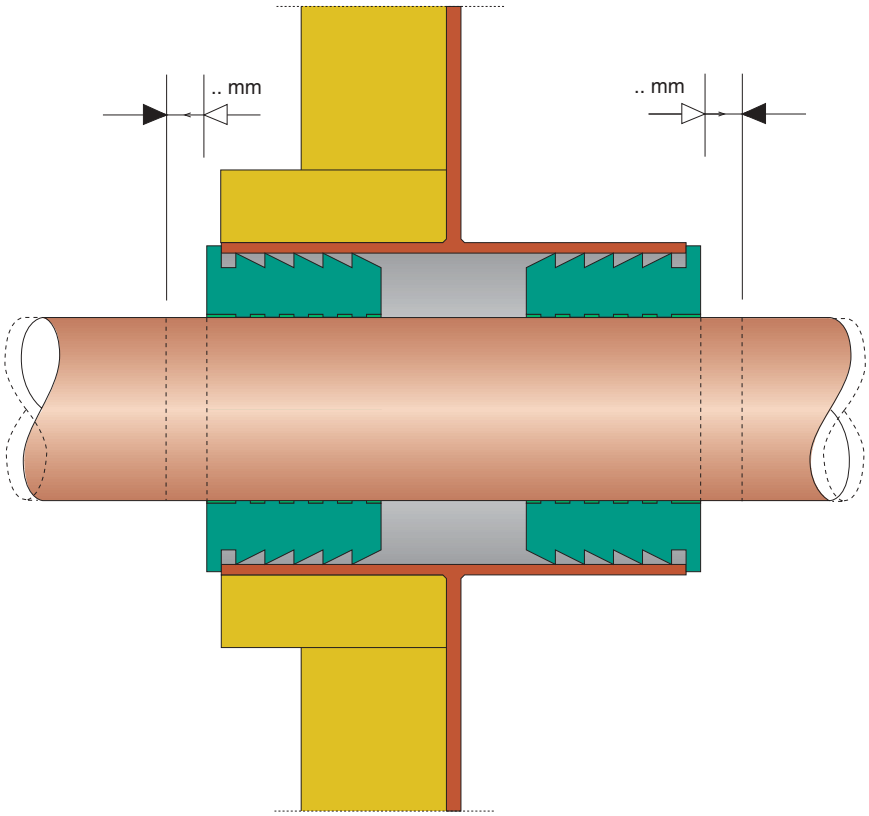
EPDM or FRR sealing plugs, contact surface braiding 40 mm, cavity totally filled with CONDUCTON® putty/flexible rubber

IMPORTANT INFORMATION:

The level of attenuation obtained with a CONDUCTON® penetration is partly dependent on:

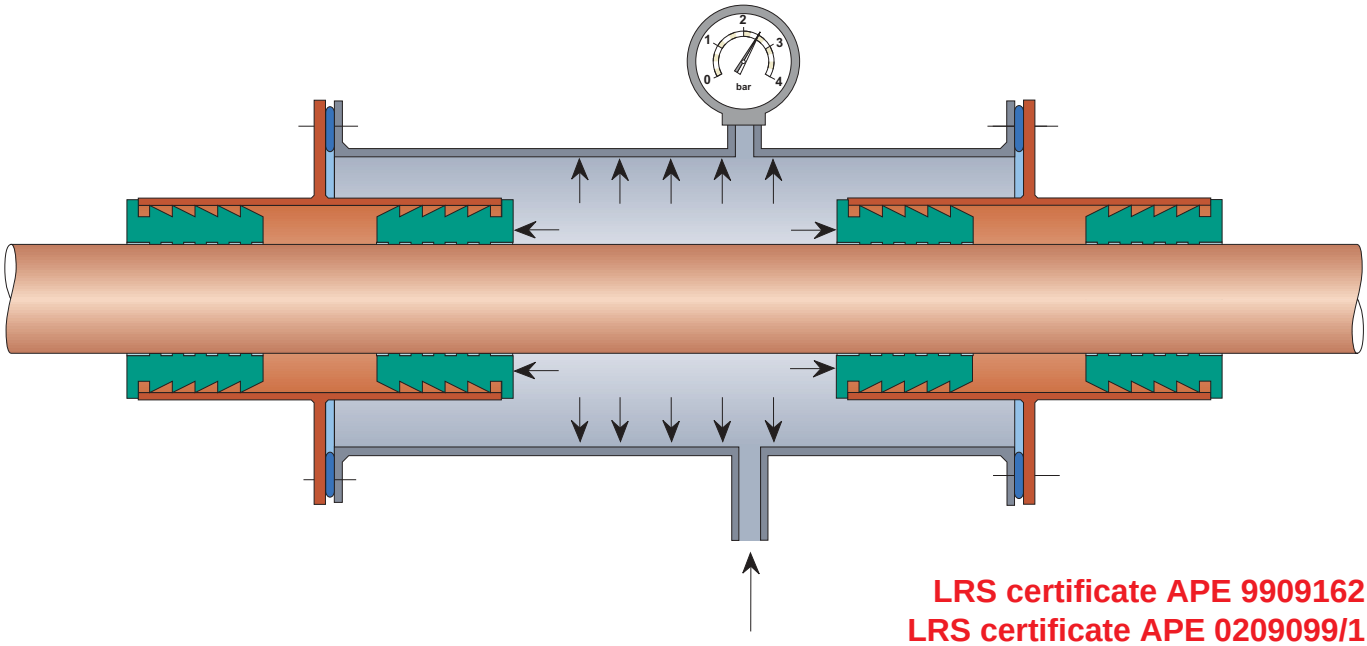
a) the distance between the ducted cable and the penetration wall
b) the contact surface with the conductive materials
c) the greater or lesser homogeneous filling of the conductive mass
d) the condition of the contact surface in the conduit pipe

LONGITUDINAL MOVEMENT OF CSD® PIPE PENETRATIONS



testing in process

WATER AND AIR TIGHTNESS OF CSD® PIPE PENETRATIONS



LRS certificate APE 9909162
LRS certificate APE 0209099/1

LEAXEAL® HIGH PRESSURE SEAL

To facilitate the effective sealing of penetrations with excessively large tolerances, BEELE Engineering bv has developed the LEAXEAL® grip seal. The new grip seal is extremely suited for high pressure loads. The LEAXEAL® grip seals for pipe penetrations are tested in a full scale fire test according to IMO Resolution A.754(18). The minimum sleeve length is 160 mm as it is for the normal CSD® sealing plugs for pipe penetrations. Insulation only at one side of the penetration! Approved for A-60 class pipe penetrations. Water tight up to 4 bar. LRS certficate 0109047/3. CE certificate 10986/A3.

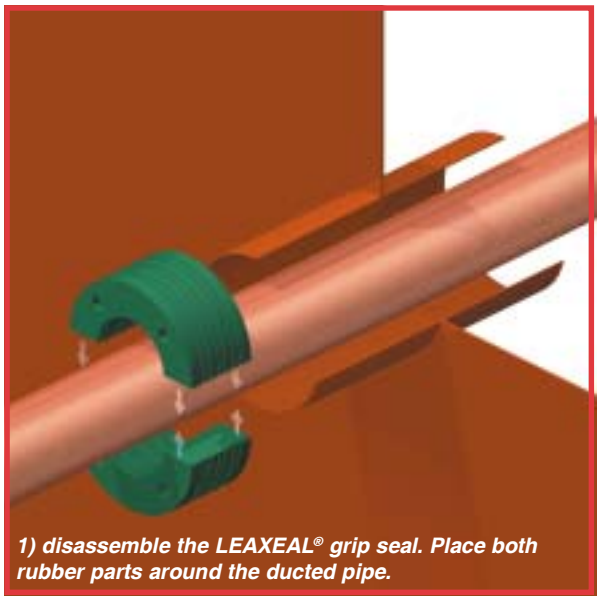
type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length
50/5LX	5-10	50-55	50	65/20LX	20-25	65-70	50	75/20LX	20-25	75-80	50
50/10LX	10-15	50-55	50	65/25LX	25-30	65-70	50	75/25LX	25-30	75-80	50
50/15LX	15-20	50-55	50	65/30LX	30-35	65-70	50	75/30LX	30-35	75-80	50
50/20LX	20-25	50-55	50	65/35LX	35-40	65-70	50	75/35LX	35-40	75-80	50
								75/40LX	40-45	75-80	50
type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length
80/20LX	20-25	80-85	50	100/40LX	40-45	100-105	50	105/45LX	45-50	105-110	50
80/25LX	25-30	80-85	50	100/45LX	45-50	100-105	50	105/50LX	50-55	105-110	50
80/30LX	30-35	80-85	50	100/50LX	50-55	100-105	50	105/55LX	55-60	105-110	50
80/35LX	35-40	80-85	50	100/55LX	55-60	100-105	50	105/60LX	60-65	105-110	50
80/40LX	40-45	80-85	50	100/60LX	60-65	100-105	50	105/65LX	65-70	105-110	50
80/45LX	45-50	80-85	50	100\65LX	65-70	100-105	50	105/70LX	70-75	105-110	50
type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length
125/60LX	60-65	125-130	50	130/65LX	65-70	130-135	50	150/85LX	85-90	150-155	50
125/65LX	65-70	125-130	50	130/70LX	70-75	130-135	50	150/90LX	90-95	150-155	50
125/70LX	70-75	125-130	50	130/75LX	75-80	130-135	50	150/95LX	95-100	150-155	50
125/75LX	75-80	125-130	50	130/80LX	80-85	130-135	50	150/100LX	100-105	150-155	50
125/80LX	80-85	125-130	50	130/85LX	85-90	130-135	50	150/105LX	105-110	150-155	50
125/85LX	85-90	125-130	50	130/90LX	90-95	130-135	50	150/110LX	110-115	150-155	50
type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length	type	pipe/ cable	conduit opening	plug length
155/85LX	85-90	155-160	50	200/130LX	130-135	200-205	50	205/135LX	135-140	205-210	50
155/90LX	90-95	155-160	50	200/135LX	135-140	200-205	50	205/140LX	140-145	205-210	50
155/95LX	95-100	155-160	50	200/140LX	140-145	200-205	50	205/145LX	145-150	205-210	50
155100LX	100-105	155-160	50	200/145LX	145-150	200-205	50	205/150LX	150-155	205-210	50
155/105LX	105-110	155-160	50	200/150LX	150-155	200-205	50	205/155LX	155-160	205-210	50
155/110LX	110-115	155-160	50	200/155LX	155-160	200-205	50	205/160LX	160-165	205-210	50
155/115LX	115-120	155-160	50	200/160LX	160-165	200-205	50	205/165LX	165-170	205-210	50

for rubber types see pages 12 and 13

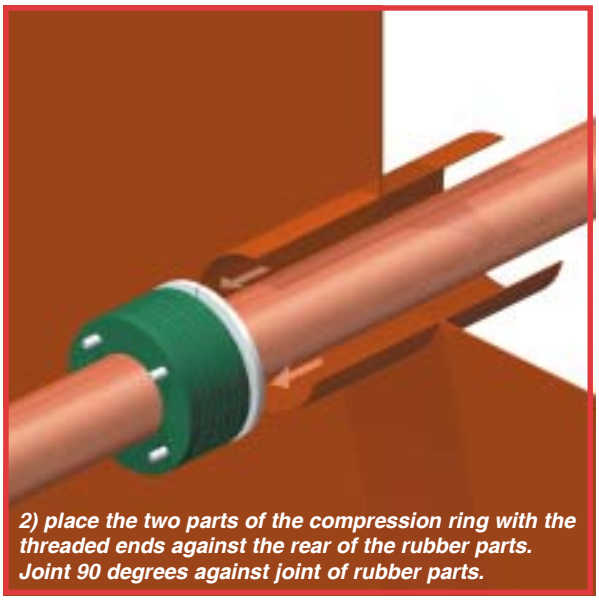
all dimensions in mm

1) The use of a high-grade rubbers enables the LEAXEAL® grip seal to be manufactured as a split unit. This makes it simple to install the grip seal after the pipe has been ducted.
2) The internal and external profile – just like the familiar CSD® sealing plugs – optimizes the distribution of forces in the rubber, thereby assuring an effective seal.
3) The compression plates are made of corrosion-resistant material.
4) A thrust flange is fitted at the front, which prevents the grip seal from being pushed too deeply into the penetration.
5) Available in several rubber grades to cater for a wide range of applications.
6) Tolerances of 5 mm in the penetration opening and 5 mm in the ducted pipe are absorbed with ease.

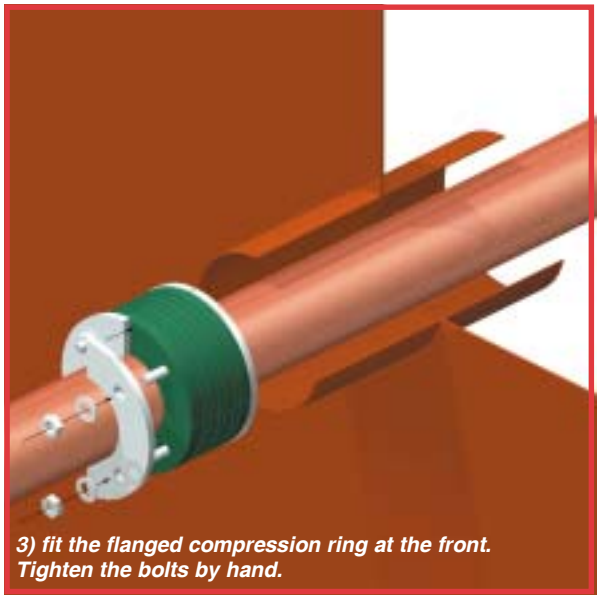
INSTALLATION INSTRUCTIONS



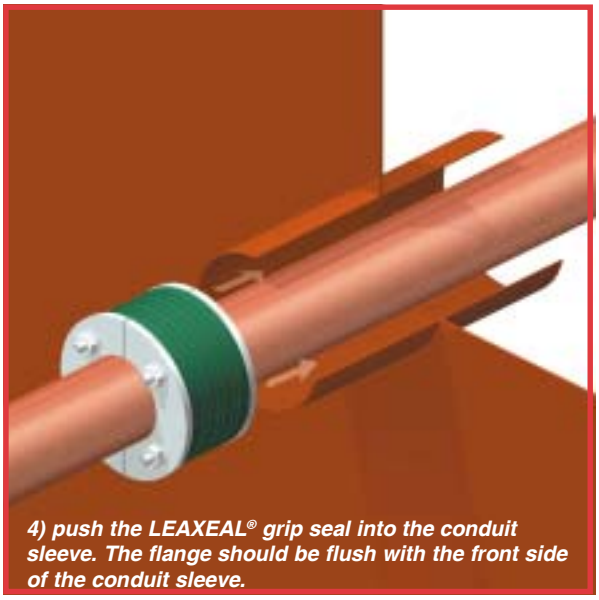
1) disassemble the LEAXEAL® grip seal. Place both rubber parts around the ducted pipe.



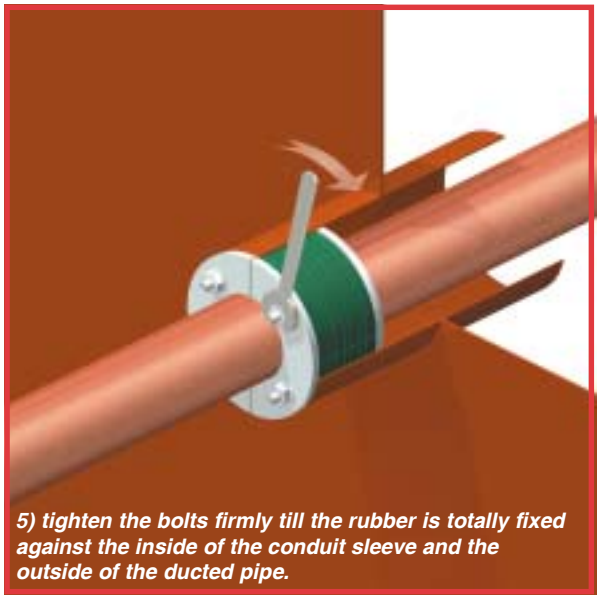
2) place the two parts of the compression ring with the threaded ends against the rear of the rubber parts. Joint 90 degrees against joint of rubber parts.



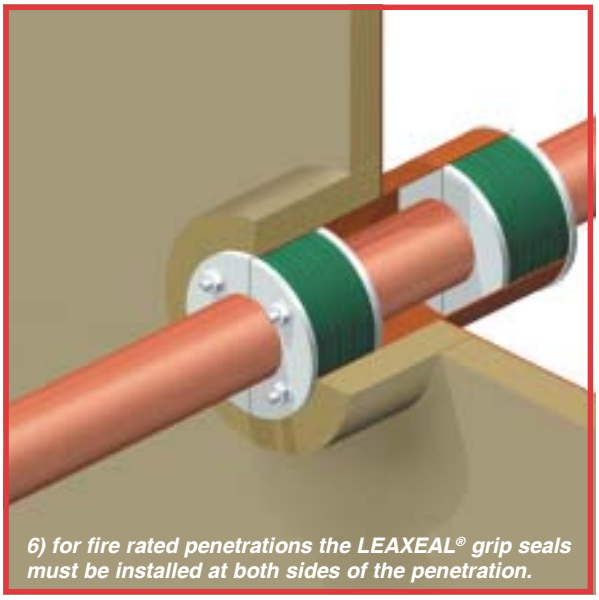
3) fit the flanged compression ring at the front. Tighten the bolts by hand.



4) push the LEAXEAL® grip seal into the conduit sleeve. The flange should be flush with the front side of the conduit sleeve.



5) tighten the bolts firmly till the rubber is totally fixed against the inside of the conduit sleeve and the outside of the ducted pipe.



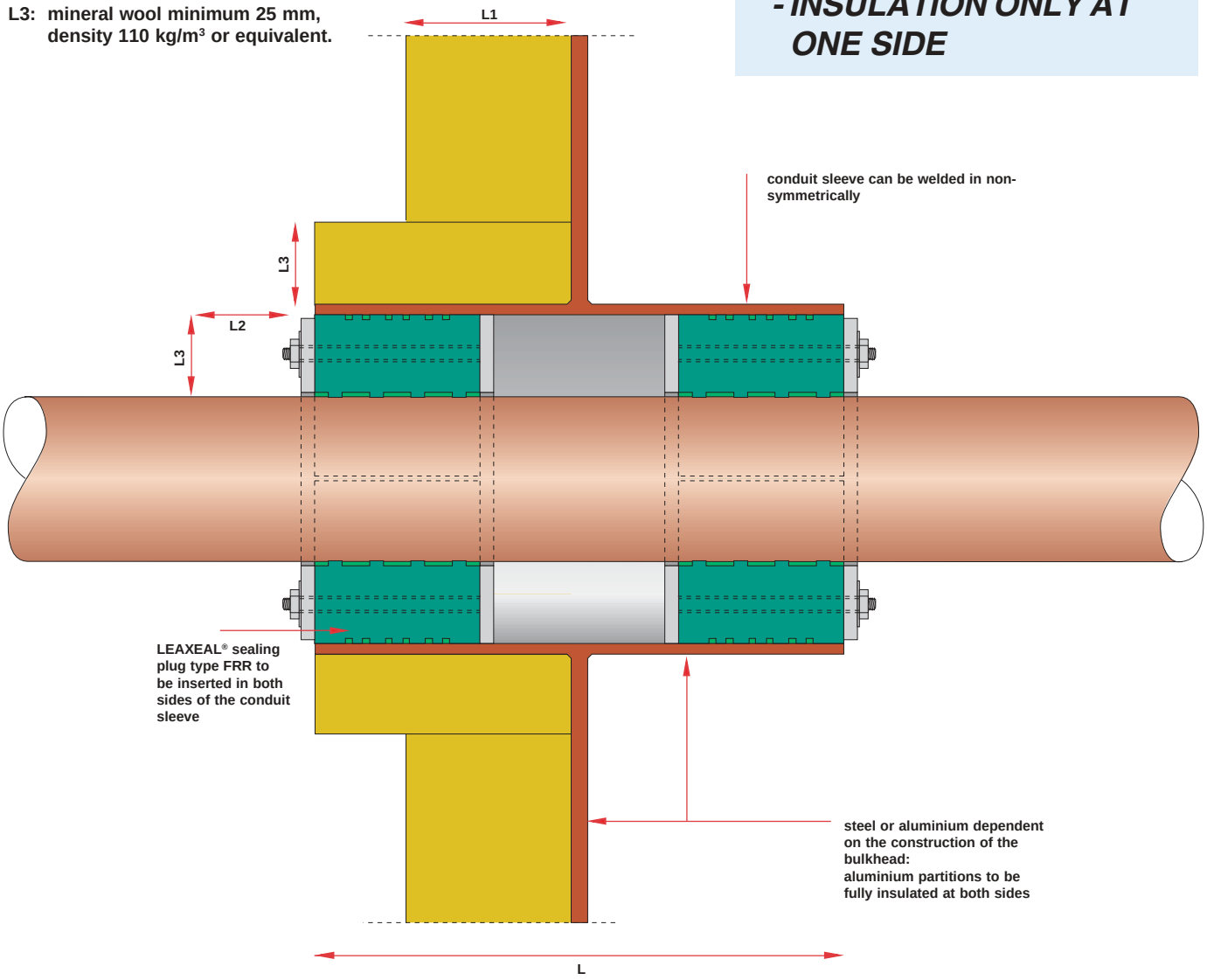
6) for fire rated penetrations the LEAXEAL® grip seals must be installed at both sides of the penetration.

LEAXEAL® PIPE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60 approved bulkhead insulation.
L3: mineral wool minimum 25 mm, density 110 kg/m³ or equivalent.



specifications for A-class according to CE certificate 10986/A3 EC issued by Bureau Veritas

L =

160 mm for conduit sleeves max. 360 mm OD for A-class penetrations
250 mm for conduit sleeves above 360 mm OD for A-class penetrations

L2 =

insulation of service pipes on the insulated side of the penetration

	A60	A0
steel & ss pipes/GRP		
up to 1"	none	none
1" up to 3"	200 mm	none
3" up to 6"	300 mm	none
above 6"	400 mm	none
copper pipes		
up to 2"	200 mm	none
2" up to 4"	200 mm*	none
above 4"	400 mm*	none

*** = both sides to be insulated**

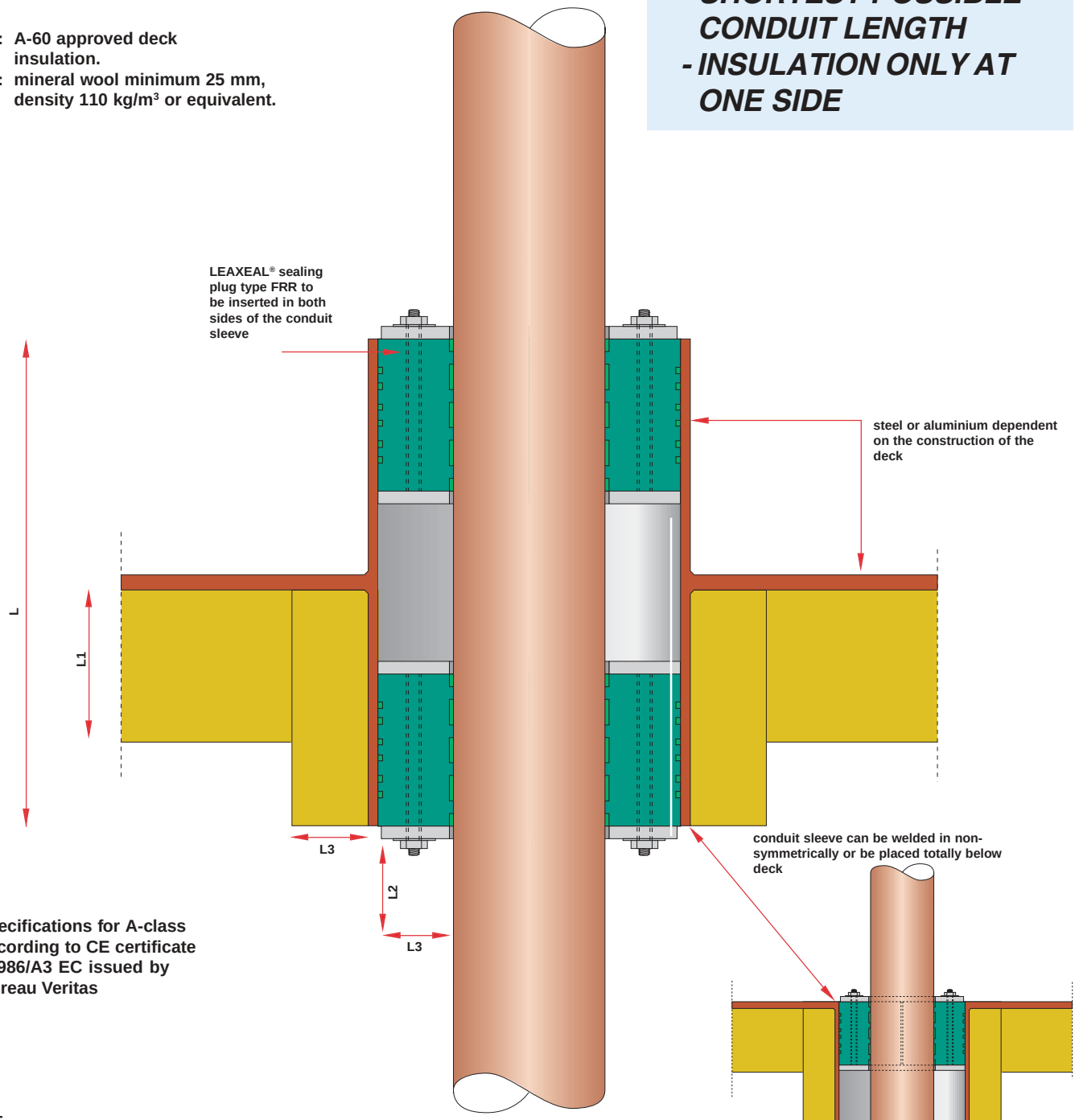
A0-A60 PIPE PENETRATION BULKHEADS

LEAXEAL® PIPE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60 approved deck insulation.
L3: mineral wool minimum 25 mm, density 110 kg/m³ or equivalent.



specifications for A-class according to CE certificate 10986/A3 EC issued by Bureau Veritas

L =

160 mm for conduit sleeves max. 360 mm OD for A-class penetrations
250 mm for conduit sleeves above 360 mm OD for A-class penetrations

L2 =

insulation of service pipes on the insulated side of the penetration only

	A60	A0
steel & ss pipes/GRP		
up to 1"	none	none
1" up to 3"	200 mm	none
3" up to 6"	300 mm	none
above 6"	400 mm	none
copper pipes		
up to 2"	200 mm	none
2" up to 4"	400 mm	none
above 4"	800 mm	none

A0-A60 PIPE PENETRATION DECKS

CSD®-SQ MULTI-TRANSIT PLUGS

CSD® multi-sealing plugs are suitable only for ducting same-diameter cables/pipes. In order to eliminate the above-mentioned drawback, the CSD®-SQ multi-transit plug has been developed. After the cables have been ducted, the multi-transit plug is sealed off by fitting BEEBLOCK® packing blocks with semicircular openings around the cables and pushing them into the passage opening of the CSD®-SQ plug. Installation is simple, just grease the inside of the plug and the blocks fitting around the cables and push all the components evenly into the conduit opening.

TYPE	PASSAGE
77,9/40 SQ	40x40
80/40 SQ	40x40
80,7/40 SQ	40x40
82,5/40 SQ	40x40
90/40 SQ	40x40

block	cable
15/0	-
20/0	-
20/4	4-5
20/5	5-6
20/6	6-7
20/7	7-8
20/8	8-9
20/9	9-10
20/10	10-11
20/11	11-12
20/12	12-13

block	cable
60/0	-
60/32	32-34
60/34	34-36
60/36	36-38
60/38	38-40
60/40	40-42
60/42	42-44
60/44	44-46
60/46	46-48
60/48	48-50
60/50	50-52

TYPE	PASSAGE
100/60 SQ	60x60
102,3/60 SQ	60x60
103,6/60 SQ	60x60
105,3/60 SQ	60x60
107,1/60 SQ	60x60
110/60 SQ	60x60
118,6/60 SQ	60x60

block	cable
30/0	-
30/4	4-5
30/5	5-6
30/6	6-7
30/7	7-8
30/8	8-9
30/9	9-10
30/10	10-11
30/11	11-12
30/12	12-13
30/13	13-14
30/14	14-15

block	cable
80/0	-
80/50	50-52
80/52	52-54
80/54	54-56
80/56	56-58
80/58	58-60
80/60	60-62

TYPE	PASSAGE
125/80 SQ	80x80
128,1/80 SQ	80x80
130,8/80 SQ	80x80
131,7/80 SQ	80x80
150/90 SQ	90x90
152/90 SQ	90x90
154,1/90 SQ	90x90
155,2/90 SQ	90x90
159,3/90 SQ	90x90
160/90 SQ	90x90

block	cable
30/15	15-16
30/16	16-17
30/17	17-18
30/18	18-19
30/19	19-20
30/20	20-21
30/21	21-22
30/22	22-23

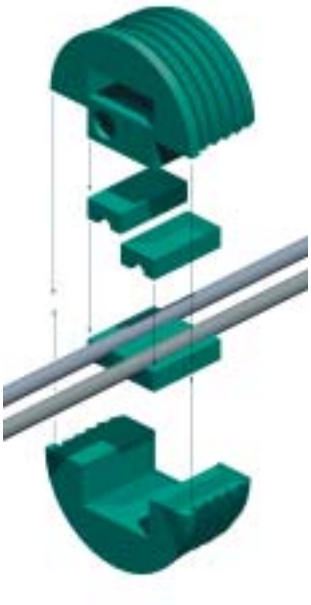
block	cable
90/0	-
90/50	50-52
90/52	52-54
90/54	54-56
90/56	56-58
90/58	58-60
90/60	60-62
90/62	62-64
90/64	64-66
90/66	66-68
90/68	68-70
90/70	70-72

TYPE	PASSAGE
190,2/120 SQ	120x120
200/120 SQ	120x120
202,7/120 SQ	120x120
207,3/120 SQ	120x120

block	cable
40/0	-
40/22	22-23
40/23	23-24
40/24	24-25
40/25	25-26
40/26	26-27
40/27	27-28
40/28	28-29
40/29	29-30
40/30	30-31
40/31	31-32
40/32	32-33

block	cable
120/0	-
120/70	70-72
120/72	72-74
120/74	74-76
120/76	76-78
120/78	78-80
120/80	80-82
120/82	82-84
120/84	84-86
120/86	86-88
120/88	88-90
120/90	90-92

Please specify rubber type with your order. All dimensions in mm.

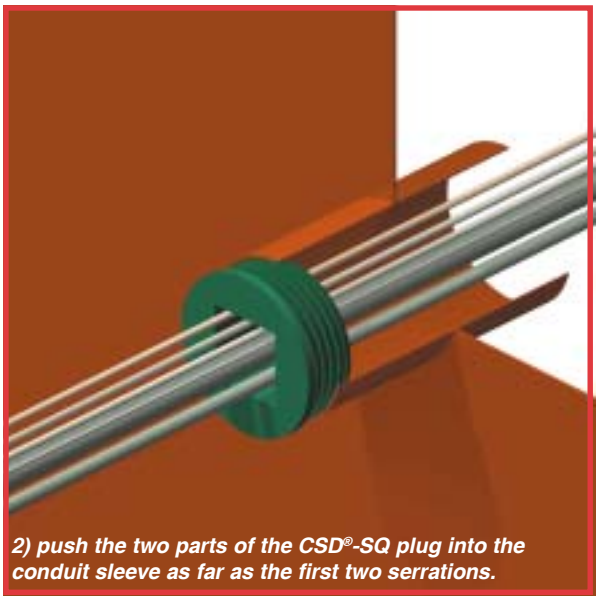


1) The CSD®-SQ plug is split, and therefore it can be fitted after the cables have been ducted.
2) The CSD®-SQ plug has the well-known serrated profile of the conventional CSD® sealing plugs, so that optimized use is made of the pressure forces to assure an effective seal.
3) Insertion of the CSD®-SQ plug in the passage opening reduces the size of the square passage opening in such a way that the packing blocks are automatically gripped tightly.
4) A stop shoulder is fitted at the rear of the passage opening to prevent the packing blocks from being pushed in too deeply.
5) The inside surfaces of the packing blocks, i.e. on the semicircular openings, are provided with the proven O-rings of the CSD® sealing plugs.
6) For the purpose of making an effective seal and ensuring simple installation, the tolerances of the external diameters of the cables up to 32 mm are limited to 1 mm, and to 2 mm for larger diameters. The same applies in the case of the CSD® sealing plugs (40 mm), with which it has been demonstrated for many years that these tolerances are the only feasible values to get an effective seal.
7) Available in several rubber grades (see pages 12 and 13).
8) Approved A-60 class multi-cable penetration according to IMO Resolution A.754(18). Watertight up to 2.5 bar. LRS certificates APE 0109113/3 and APE 0109113/4. CE certificate 10985/A0.

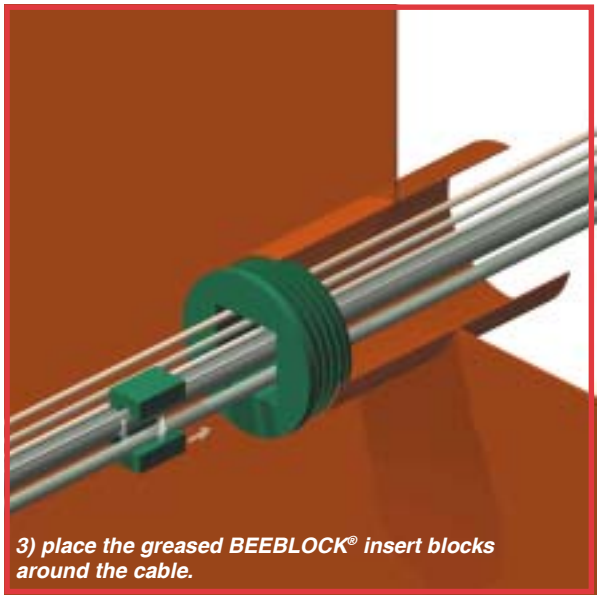
CSD®-SQ

INSTALLATION INSTRUCTIONS

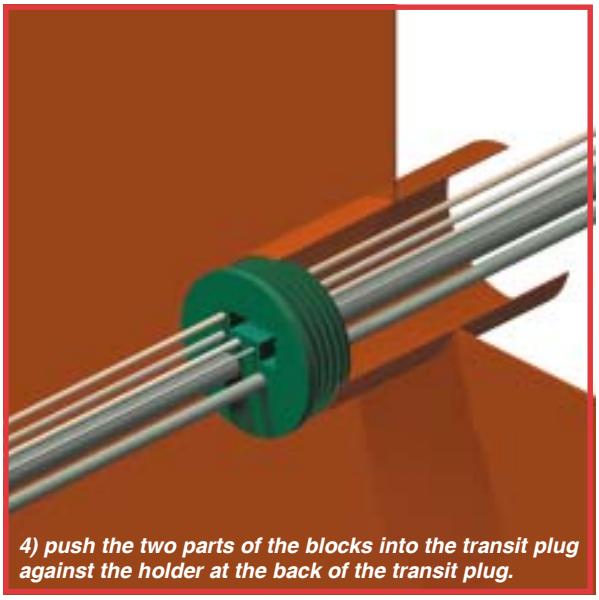
1) treat the CSD®-SQ plug and the inside of the conduit pipe with CSD® lubricant.



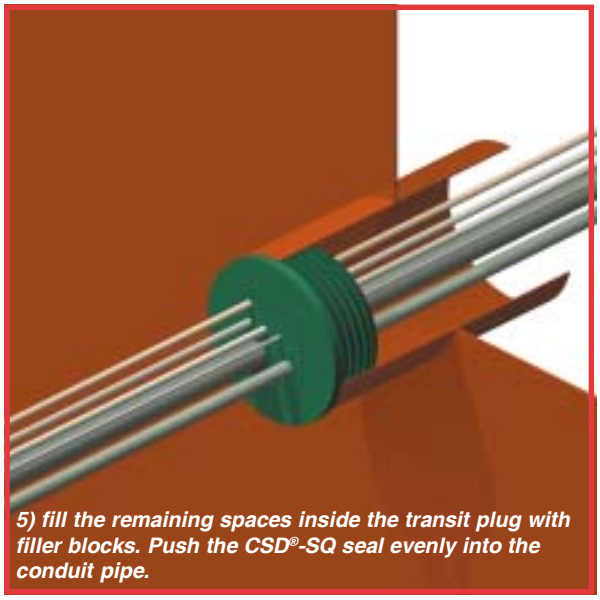
2) push the two parts of the CSD®-SQ plug into the conduit sleeve as far as the first two serrations.



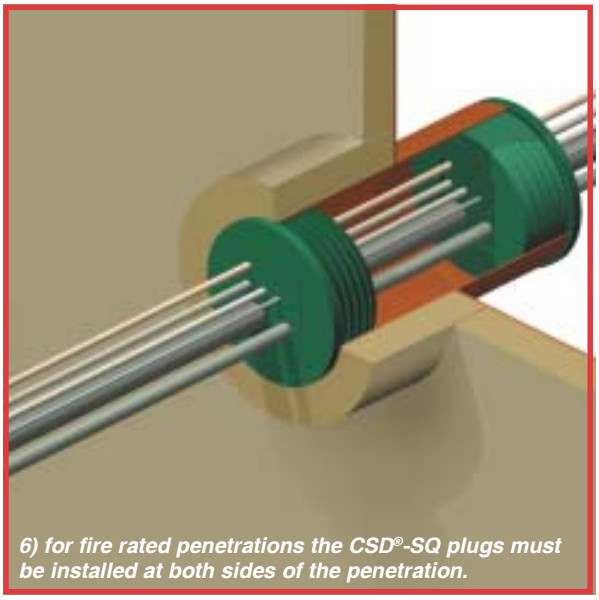
3) place the greased BEEBLOCK® insert blocks around the cable.



4) push the two parts of the blocks into the transit plug against the holder at the back of the transit plug.



5) fill the remaining spaces inside the transit plug with filler blocks. Push the CSD®-SQ seal evenly into the conduit pipe.



6) for fire rated penetrations the CSD®-SQ plugs must be installed at both sides of the penetration.

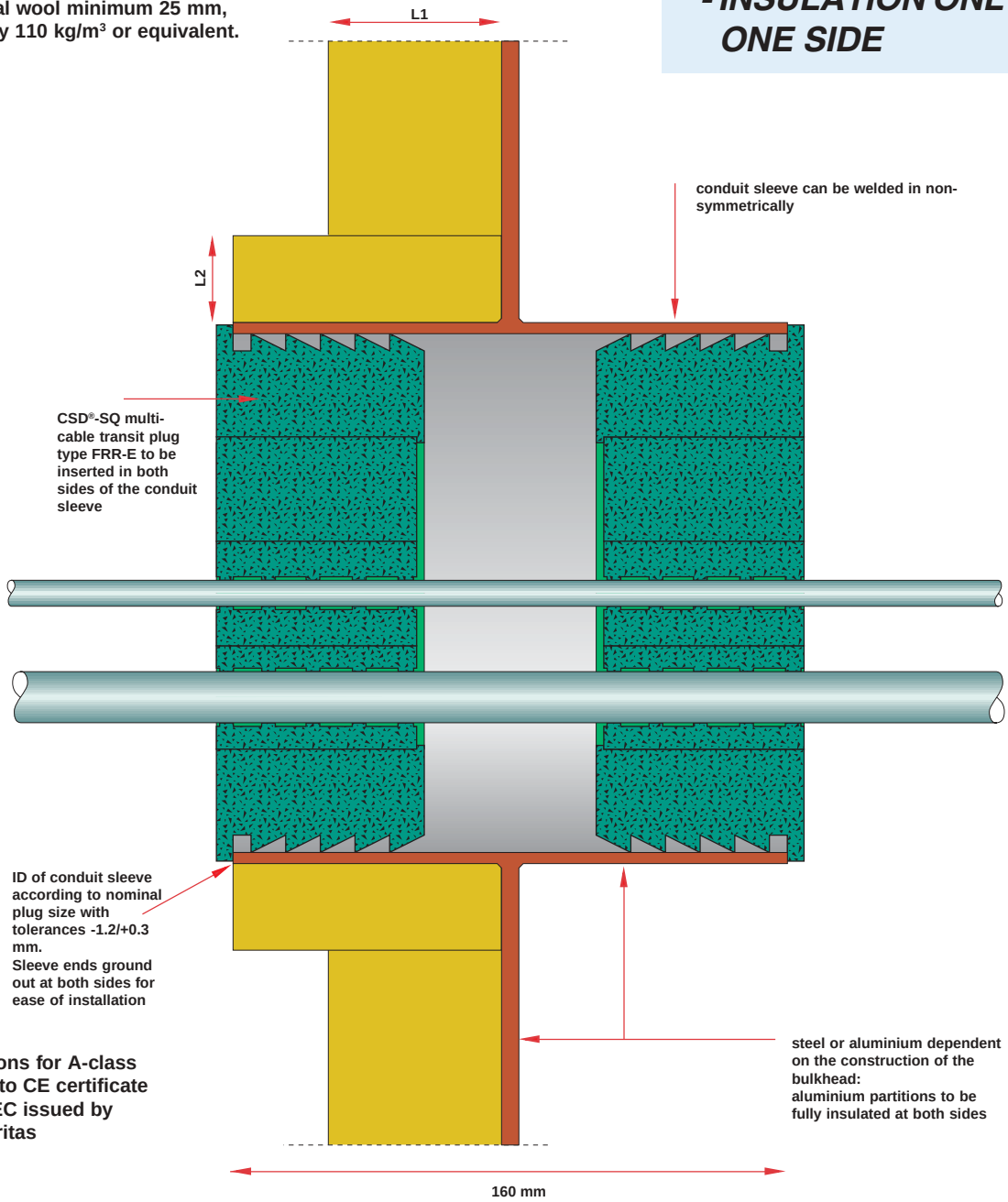
CSD-SQ®

CSD®-SQ CABLE PENETRATIONS

DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- SHORTEST POSSIBLE CONDUIT LENGTH
- INSULATION ONLY AT ONE SIDE

L1: A-60 approved bulkhead insulation.
L2: mineral wool minimum 25 mm, density 110 kg/m³ or equivalent.



specifications for A-class according to CE certificate 10985/A0 EC issued by Bureau Veritas

A0-A60 CABLE PENETRATION BULKHEADS

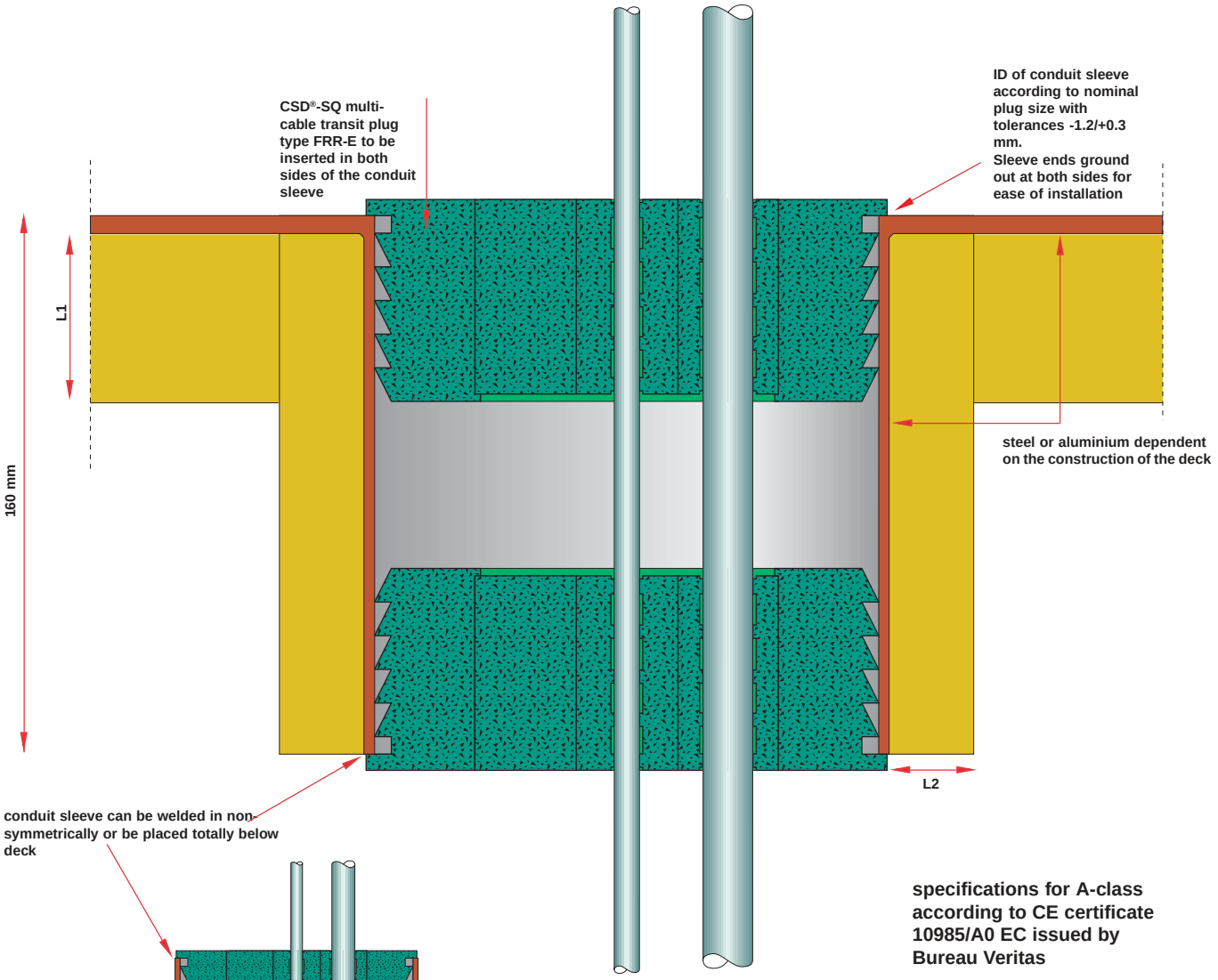
CSD®-SQ

CSD®-SQ CABLE PENETRATIONS

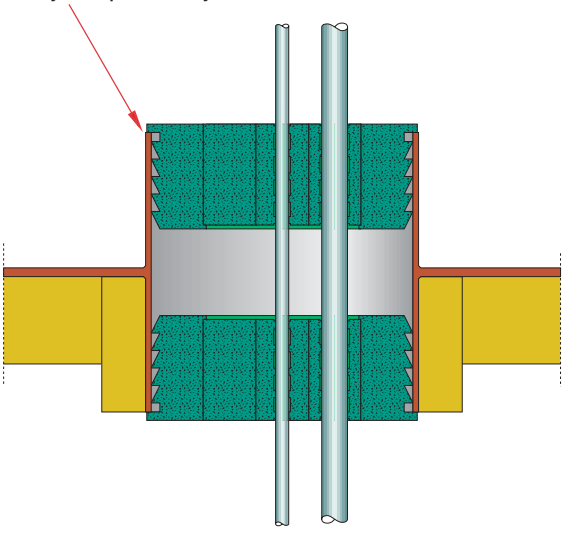
DIAGRAMMATIC OVERVIEW OF SHIPBUILDING/ OFFSHORE APPLICATIONS

- ***SHORTEST POSSIBLE CONDUIT LENGTH***
- ***INSULATION ONLY AT ONE SIDE***

L1: **A-60 approved deck insulation.**
L2: **mineral wool minimum 25 mm, density 110 kg/m³ or equivalent.**



specifications for A-class according to CE certificate 10985/A0 EC issued by Bureau Veritas



A0-A60 CABLE PENETRATION DECKS

CSD®-SQ

CSD® SEALING PLUGS: WORLDWIDE APPLIED IN NUMEROUS INSTALLATIONS

"M340 and M350": ships built of composite material for the new fleet of 9 minesweepers for the Norwegian Navy, built by Kvaerner Mandal AS, Norway.
CSD® sealing plugs type FRR used for firesafe and watertight penetrations. EPDM and NITRILE plugs for the hydraulic system; RISE® crusher collars for PEH pipes and BEESEAL® multi-cable transits for the cable penetrations.

Series of multi-purpose frigates: built by De Schelde Shipyard, The Netherlands.

CSD® sealing plugs type FRR used on a large scale for firesafe and watertight bulkhead and deck penetrations. Special tests have been carried out to determine the sound and vibration damping properties of the plugs.

M/S 'COSTA ATLANTICA": built by Kvaerner Masa-Yards Inc. Helsinki New Shipyard, FINLAND.
Several thousand CSD® sealing plugs type FRR used for firesafe bulkhead and deck penetrations. Also used for high-pressure pipe lines. CSD® sealing plugs are a standard also on the new buildings at Kvaerner Masa-Yards Inc. Turku Shipyard.

CSD® SEALING PLUGS: WORLDWIDE APPLIED IN NUMEROUS INSTALLATIONS

M/S “JØRGEN LAURITZEN”: built by Danyard a.s., DENMARK

Several hundred CSD® sealing plugs type EPDM, FRR and FRR/SIL used for fire safe and watertight bulkhead and deck penetrations. FRR/SIL plugs used for the cooling installation.
RISE® system used for eccentric pipe conduits.

“NORNE - 6608/1C”: built by Far East Levington Shipyard, SINGAPORE

Floating Production, Storage & Offloading (FPSO) vessel designed for developing oilfields in the North Sea.
CSD® sealing plugs type FRR and FRR/SIL used for all firesafe and watertight bulkhead and deck penetrations.

OIL RIG “SLEIPNER” built for Statoil, NORWAY. CSD® sealing plugs type EPDM and FRR used for firesafe and watertight bulkhead and deck penetrations. RISE® is used for eccentric pipe installations. CSD® sealing plugs and the RISE® multi-cable penetrations are used on numerous offshore installations and lately also on the BINGO and GORILLA rigs built in USA.

Revolutionary sealing systems used on the RV Triton

The Trimaran craft is regarded as the naval vessel of the 21st century. On board this advanced naval vessel RV Triton, the RISE® system and CSD® Sealing Plugs are used extensively for sealing cable and pipe penetrations.





RISE® for multi-cable penetrations

The RISE multi-cable system is used for sealing all the cable penetrations on board of the RV Triton. RISE was chosen for the following reasons:

- **Improved Safety** - RISE has been tested in accordance with the IMO A.754(18) standard and is approved for use in A60 class boundaries. RISE expands 5-10 times when exposed to fire, creating the best possible barrier, preventing the passage of flames, gases, smoke and water even if the deck is collapsing.
- **Space and weight saving -** RISE is the most compact system on the market, saving space and weight. The RISE system does not require the use of special transit frames, almost any size or shape pipe or conduit can be utilised, giving more flexibility in designing the size and position of transits.
- **Reduced design time -** A specially developed RISE software program enables customers to design a RISE transit in a few minutes calculating the size, shape, free space and material required.
- **Ease and flexibility of installation -** The RISE system is quick to install. It consists of just two components: rubber insert sleeves or sheets and a silicone-based fire resistant and water repellent sealant. Expanding Halogen Free Rubber insert sleeves are placed around each cable, the remaining spare space is filled with extra sleeves, leaving about 20 mm space at either end of the penetration. A layer of FIWA putty is then applied on both sides.
- **Extremely easy to remove or add a new cable -** This is important as it is envisaged that the cabling will be changed throughout the life of RV Triton. Re-entering the RISE system for later extension is a simple and fast procedure.
- **Certification - RISE has been successfully tested to the ISO and Naval Engineering standards for shock and vibration, toxicity, oxygen and smoke index, ageing process and surface flame propagation.** ***The system is fully certified for use in A-60 fire divisions and water and gas tight bulkheads and decks by all major classification societies. CE certified.***

RISE® for pipe penetrations

RISE has also been used for pipe penetrations where the pipe is off centre or passing through the penetration at an angle and for all multiple-pipe penetrations.

This system provides all the same benefits as the plugs.

CSD® Plugs for pipe penetrations

CSD Sealing Plugs have been used extensively on board the RV Triton for pipe penetrations through watertight and Fire Rated Bulkheads and Decks. The sealing plugs are made from fire safe FRR rubber and provide many benefits over the traditional methods of passing pipes through bulkheads and decks:

- **Weight saving -** Combined with pipe couplings the system has helped to reduce weight significantly as it eliminates the need for bulkhead pieces and flange sets.
- **Reduce corrosion -** The system provides cathodic protection between dissimilar metals as the service pipe is isolated from the bulkhead. This eliminates the problems of welding.
- **Improved design and production times -** The pipe sleeve can be designed and installed prior to knowing the exact service pipe dimensions allowing them to be installed at the plating stage. This is made possible because one sleeve can accommodate a wide size range of service pipes and the size of CSD plug is simply chosen to fit the service pipe.
- **Reduced labour costs -** The plugs can be installed in minutes.
- **No bulkhead pieces are required -** The plugs allow the service pipe to be passed straight through the bulkhead without the need for a joint, there is no Hot Dip Galvanising required.
- **Vibration and sound damping -** The plugs are made of rubber therefore providing significant vibration and sound damping.
- **Certification -** CSD Sealing Plugs are approved by all the major classification societies including the new EC Marine Directive, for use in A60, water and gas tight bulkheads and decks for all pipe penetrations including GRE and plastic pipes.

Conclusion

RISE and CSD Plugs can enable users to realise substantial cost savings throughout their entire project and reduce lifetime costs for the owner.

"We used the RISE system for all our cable penetrations on board the RV Triton and found it extremely versatile, we will certainly look to use the RISE system on future projects."
Steve Nicholson, Electrical Manager, RV Triton, Vosper Thornycroft

CSD® sealing systems

A copy of the video showing the actual installation on board the RV Triton is available direct from BEELE Engineering bv:
Tel:+31 (0)543 461673, Fax:+31 (0)543 461786 E-mail: info@beele.com Websites: www.beele.com and www.rise-systems.com

FIRE SAFE SEALING SYSTEMS FOR CABLE AND PIPE PENETRATIONS

May we remind you of a number of recent fires? For example, there were the tragic losses of the Scandinavian Star ferry and the Piper Alpha rig. Each of these fires caused more than 160 fatalities. Although the fire on board of the Achillo Lauro resulted in no casualties, it did lead to the sinking of the vessel. In addition, there have been fateful fires on navy vessels, like the Sheffield in the Falklands, the Stark in the Gulf, and the Walrus while still under construction, all of which have gone to prove how vulnerable ships can be in the event of fire.

All the more reason, you will surely agree, to give particular consideration not only to the installation of smoke detectors, sprinkler systems, fire-fighting equipment, etc. but also to the products and systems for passive fire prevention which have been specially developed by BEELE Engineering.

FIRESAFE SEALING SYSTEMS FOR PIPE AND CABLE PENETRATIONS

FIRESAFE
GAS- AND WATERTIGHT
VIBRATION PROOF
SOUND DAMPING
MAINTENANCE FRIENDLY
CERTIFIED
IN OTHER WORDS:
OPTIMIZED SAFETY ON BOARD

LIMIT THE RISK OF FLAME AND SMOKE SPREAD

PIPE APPLICATIONS

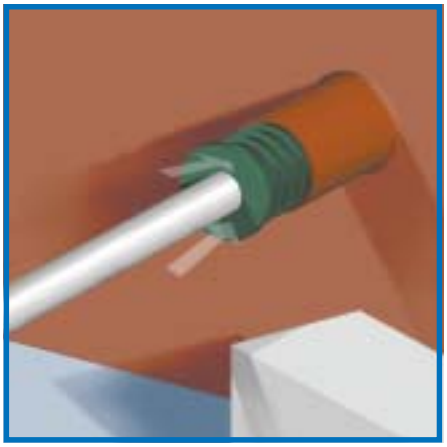
CSD® SEALING PLUGS FOR PIPE CONDUITS

CSD® sealing plugs for individually ducted pipes consist of two equal parts so that they can be installed after the pipes have been laid. The unique profile both inside and outside the sealing plug guarantees a very high level of gas and water tightness.
The serrated profile on the outside is designed to allow the plug halves to be snugly fitted in the conduit sleeves. The sealing plugs are gas and water tight up to excess pressures of 2 bar on the flanged side and up to 1 bar at the other side of the plug.
CSD® sealing plugs are supplied in six different rubber grades to cater for a wide variety of applications.
Certified for A- and H-class conduits.

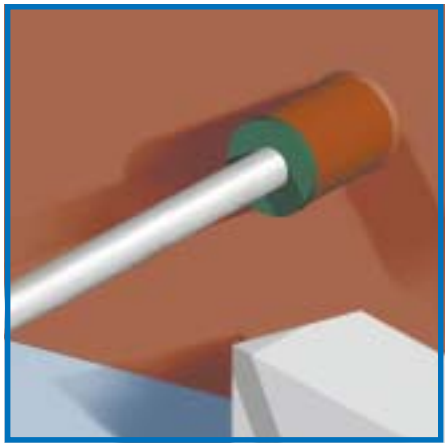
csd® sealing systems

MOST EASY TO INSTALL - FIRESAFE - WATER TIGHT - GAS TIGHT - DUST TIGHT - VIBRATION PROOF - SOUND DAMPING - NO CORROSION

The inside wall of the conduit sleeve and the segments of the sealing plug are treated with CSD® lubricant.

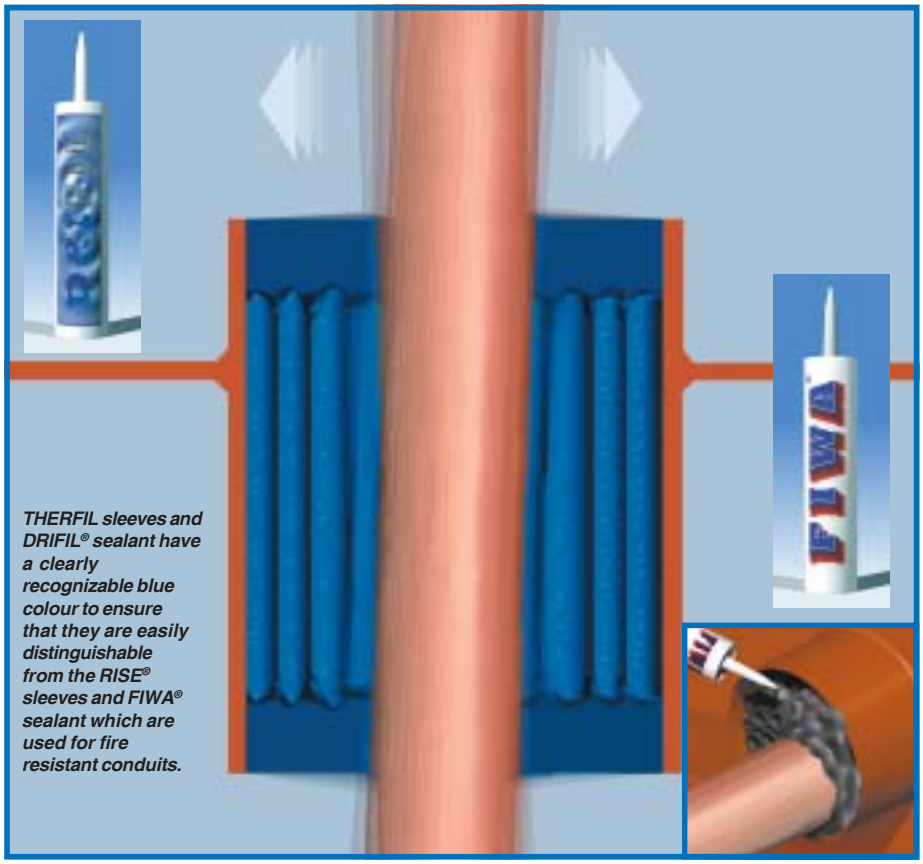


Both segments of the CSD® sealing plug are pushed evenly, serration by serration, into the conduit opening.



The flanged edge of the sealing plug must be flush against the front side of the conduit sleeve.

RISE® AND RISWAT® SEALING SYSTEM FOR ECCENTRIC AND HIGHLY FLEXIBLE CONDUITS



THERFIL sleeves and DRIFIL® sealant have a clearly recognizable blue colour to ensure that they are easily distinguishable from the RISE® sleeves and FIWA® sealant which are used for fire resistant conduits.

The RISE® system can be used for eccentrically positioned firesafe pipe penetrations. CSD® sealing plugs can generally not be applied in such cases because the pipe has to be in the centre of the conduit opening. Use is made of rubber strips made of expandable FRR/EHF rubbber (placed around the pipes) and RISE® filler sleeves. On both sides of the penetration a layer of FIWA® sealant (fire resistant, water repellent) is applied.
Colour: anthracite

The RISWAT® system was specially developed for gas and water tight pipe penetrations in which the pipe(s) are allowed to move in all directions. The entire space around the pipe in the conduit is filled up with THERFIL insert sleeves. The shorter the length of the sleeves, the more movement of the ducted pipe is allowed. A layer of DRIFIL® sealant is then applied on the resultant carrier.
Colour: blue

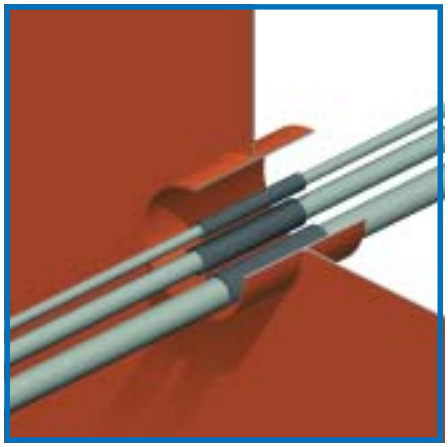
CABLE APPLICATIONS

RISE® MULTI-CABLE PENETRATIONS

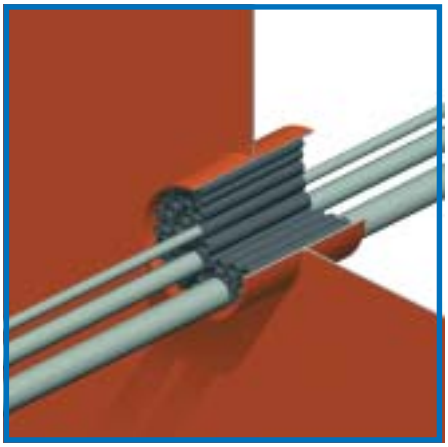
RISE® multi-cable penetrations are an alternative for the casting compounds and block systems in fire-rated decks and bulkheads. Very easy to install. The very limited amount of different parts makes this system easy to handle on site. Use is made of rubber inserts (placed around the cables) and filler sleeves.

On both sides of the penetration a layer of FIWA® sealant (fire resistant, water repellent) is applied.
No pre-engineering of the conduit is needed. In contrast to many other sealing systems, RISE® multi-cable penetrations do not require the use of special conduit frames.
Certified for A- and H-class conduits.

**FIRESAFE - WATER TIGHT -
EASY TO INSTALL -
NO PRE-ENGINEERING -
NO SPECIAL CONDUIT FRAMES -
VERY COMPACT ASSEMBLY**



After all the cables have been ducted, a RISE® insert sleeve is applied around each cable.



The remaining free space in the conduit is filled with RISE® empty sleeves. Fill the space on top with FIWA® sealant.

With a damp cloth the FIWA® sealant is forced into and between the empty sleeves to ensure a homogeneous filling.

THE COMPONENTS OF A RISE® CABLE PENETRATION

For the RISE® insert sleeves and the FIWA® sealant special compounds were developed. When these compounds are exposed to fire or temperatures in excess of 200 °C they expand to 5-10 times their original volume.

LIMITED NUMBER OF COMPONENTS - NO SPECIAL TOOLS - NO BOLTS AND NUTS - NO SPECIAL CONDUIT FRAMES - NO BLOCKS

a) An extremely limited number of different components are used for the sealing of the conduit. Only fifteen different sizes of insert sleeves are used, for cables from 5 mm to 63 mm. For larger diameters, rubber strips cut from rubber sheets are applied.

b) The only tools and accessories needed to finish the conduit are a compound gun, a flower spray, a trowel, a cloth and a small spatula.

c) The sealing is finished by applying a layer of FIWA® sealant at each side of the conduit.

CABLE/PIPE APPLICATIONS

BEESEAL® MULTI-PIPE/CABLE PENETRATIONS

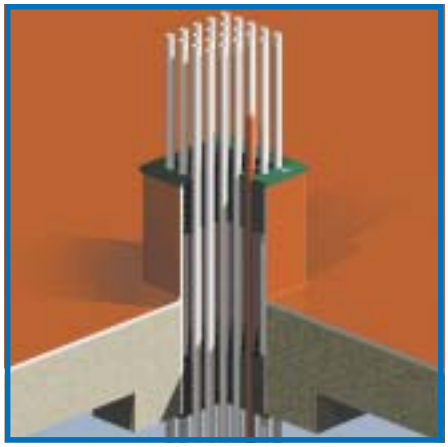
The BEESEAL® multi-sealing module system (MSM) is used particularly in cases where large numbers of pipes/cables have to be ducted as compactly as possible.
The modules are supplied in a wide range of types, so that it is a simple matter to adjust the modular system to the pipe/cable configuration.

The serrated profile on the outside is designed to allow the modules to be snugly fitted in the conduit frames. The MCP conduit frames are available in numerous configurations.
The BEESEAL® transit system is gas and water tight up to excess pressures of 1 bar.
Certified for A- and H-class conduits.

MOST EASY TO INSTALL - FIRESAFE - WATER TIGHT - GAS TIGHT - ABSORBING THE VIBRATIONS OF HYDRAULIC LINES - VERY COMPACT ASSEMBLY

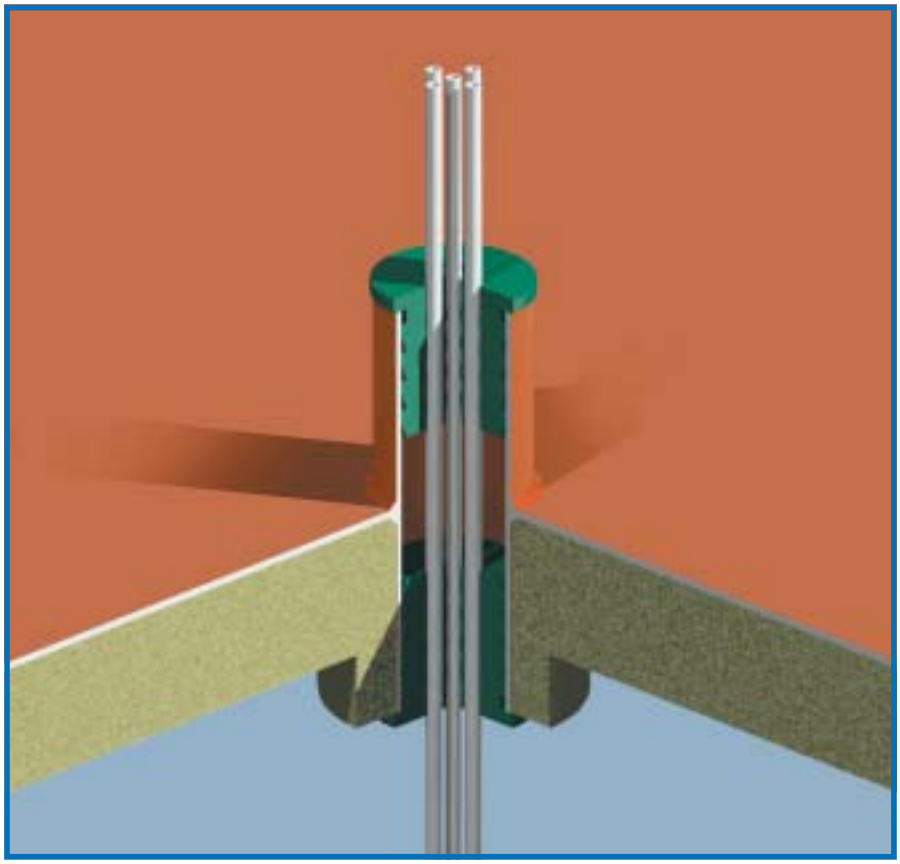
The inside wall of the conduit frame and the outer surfaces of the BEESEAL® sealing modules are treated with CSD® lubricant.

All the modules are pushed into the frame as far as the first serration and then tapped in evenly until the flange edges are flush with the front of the frame.



The conduit frame must be insulated with the same insulation in the same thickness as used to insulate the bulkhead or deck.

CSD® MULTI-SEALING PLUGS FOR A WIDE VARIETY OF APPLICATIONS



CSD® multi-sealing plugs consist of two, three or four equal parts, so that they can be installed after the cables or pipes have been laid. The unique profile both inside and outside the sealing plug guarantees a very high level of gas and water tightness.
CSD® multi-sealing plugs are used for two, three or five same diameter cables or pipes ducted through the same transit opening.

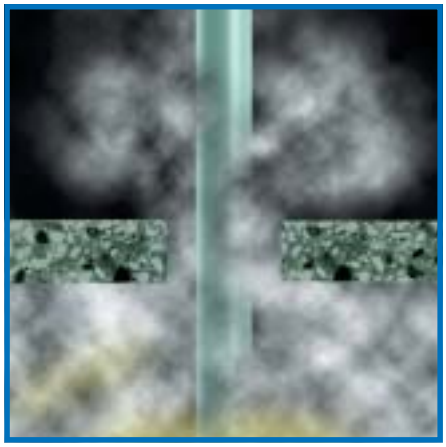
PLASTIC PIPE APPLICATIONS

FIRESAFE PLASTIC PIPE PENETRATIONS

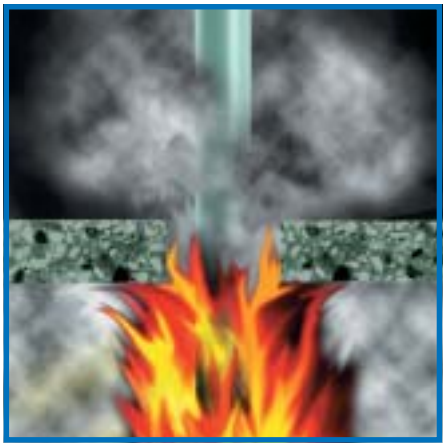
Plastic pipes which pass through fire-rated bulkheads and decks as part of, for example, sanitation systems, are a potential source of serious problems in case of fire. PVC/ABS/PE/PP pipes start to soften at a temperature of about 75 °C and ignite at a temperature of about 140 °C.
This means that, should a fire occur, a hole will be formed by the softened or combusted plastic pipe, allowing fumes and flames to spread freely. In order to meet this problem, use can be made of the RISE® sealing system.
For larger plastic pipes the CSD® crusher plugs can be used for firesafe penetrations of PVC, ABS, PP and HDPE pipes.

RISE®

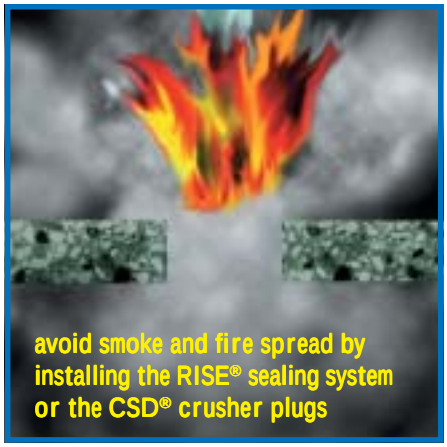
CRUSHER®



Immediately after a fire breaks out, fumes will be able to spread to adjacent areas through unsealed conduit openings.

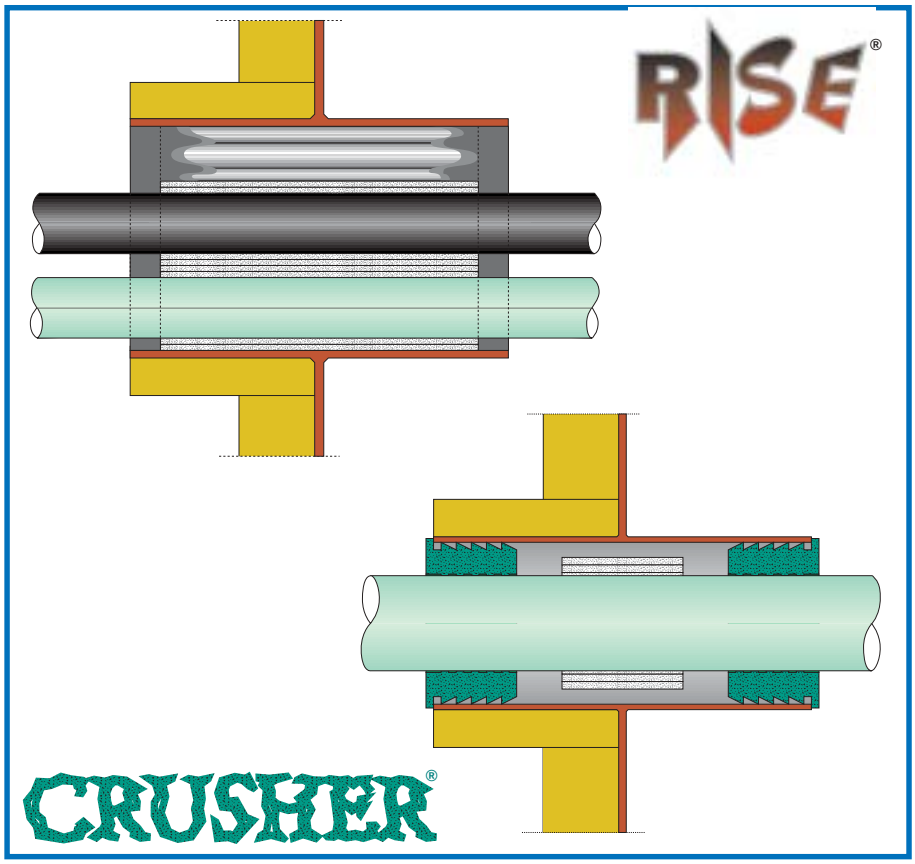


As soon as the plastic pipe ignites, the fire will be able to spread and grow virtually unhampered ..... so that ultimately



the pipe disappears altogether at that site, thereby creating an even larger opening through which fumes and flames can pass at will.

THERE ARE JUST TWO SOLUTIONS TO THIS PROBLEM .....



RISE® single and multi-plastic pipe penetrations can be used for plastic pipes up to 75 mm. For plastic pipes larger than 75 mm up to 125/160 mm the CSD® crusher plugs, above 160 mm RISE® crusher collars are to be used. Official fire tests, both on a full scale deck and bulkhead, according to IMO Resolution A.754(18) have successfully been carried out at the Warrrington Fire Research Institute in England. **CE certificate Bureau Veritas Nr. 10710/A1 EC.**

For the same purpose CSD® crusher plugs have been developed for firesafe deck and bulkhead penetrations of plastic and composite plastic pipes. For this purpose a totally new rubber compound (type FRR-E = fire resistant rubber - expanding) has been developed. **CE certificate Bureau Veritas Nr. 09155/A8 EC.**

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