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Multi-seal

One seal for all pipe connections

The same seal for all types of pipe Fitted with back stop Allows angling for slope Watertight at 5 mWC Can parallel-displace drill holes International and patented



- for tightness, strength and flexibility



Connection perpendicular and with slight slope

Product

US Multi-seal consists of a rubber seal, a rubber adjusting ring and a lubricant. US Multi-seal facilitates the sealing of all types of plastic pipes with an external diameter between 160-600 mm. So regardless of whether it is smooth, ribbed or corrugated plastic pipes, they can all be mounted in the same drill hole and with the same seal (see diagram 1, Seal Overview).

Application

US Multi-seal is designed so it can be used with drill holes in, e.g. pipes, wells or structures, both for new constructions, extensions and renovation work.

US Multi-seal is designed so it can also be used with drill holes displaced in relation to the pipeline's centre line, i.e. most connections can be parallel-displaced vertically.



Pipe with adjusting ring

With US Multi-seal it is also possible to angle the connection and thus achieve a slight sloping effect or connect a branch line with a greater slope. US Multi-seal is fitted with a back stop, which helps ensure that the delivery pipe does not protrude into the pipes or well.

Quality

US Multi-seal is made of EPDM rubber, which ensures an optimal seal for drilled connections. Test results show that US Multi-seal satisfy all applicable standards in Denmark, even in the most unfavourable tolerance combinations (see "Drilled connection requirements" on page 5).

Mounting

It is important to use well-suited drilling equipment to establish the hole, so as to avoid tracks or ridges in the hole surface and to observe the tolerance of the drill hole.



Drilling equipment with diamond drill



No projecting parts in pipes or well

Adjustment of delivery pipe

Smooth plastic pipes can be shortened to the desired length. Ribbed plastic pipes should be shortened, so the front part of the pointed end is a "rib", and corrugated plastic pipes should be shortened as closely to the "wave" as possible.



Because corrugated plastic piping can be of varying quality and stiffness, it is important to choose a type with a sufficient rib stiffness, so as to achieve water-tightness of 5 mWC. The delivery pipe should be long enough (e.g. 40 cm) so that it is possible to check and feel that there is no protrusion into the main pipe. When connecting a concrete pipe, use a standard concrete connecting pipe.



Well with drilled connections, ready for testing

Ordinary connections

- perpendicular on centre line

When the hole is drilled in the centre line or the main pipe's upper half, drilling is normally done perpendicular to the main pipe. With US Multi-seal, the drilled connection can also be displaced parallel and upward from the centre line.

Figure 1 shows which connections can be connected to different concrete pipes or wells.

Parallel-displaced connection

- parallel-displaced from centre line US Multi-seal opens the possibility of drilling "displaced" on the main pipeline, i.e. the connection can be vertically parallel-displaced. All connections can be displaced horizontally (see above). How much the drill hole's bottom level can be displaced is specified in figure 2.

As other seals cannot be displaced in the same way, connections below horizontal are considered an error in "Danva's photo manual". Therefore, you should have the solution approved by the builder or consultant before the project begins.

Connection of slope line to main pipeline The drill hole can be angled in relation to the external pipe wall/surface. How much the diamond drill can be "angled" is specified in figure 3.

As many other seals cannot or must not be angled, here too, you should have this solution approved by the builder or consultant before the start of the project.

Assembly guidelines



1. Drill the delivery hole with suitable drilling equipment, so the drill hole's surface is smooth after drilling.



3. Fold the seal and place it in the drilled hole 15-20 mm from the internal pipe wall. The seal must be tempered before mounting (over 0°).



5. Shorten the delivery pipe as close to the rib or "wave" as possible. With smooth pipes, round the sharp edge - avoid heavy chamfering.



7. Apply lubricant to both the seal and the delivery pipe/adjusting ring.



9. Check that the seal and delivery pipe do not protrude into the main line or well and that the delivery pipe is properly mounted to the seal's pipe stop.



 Apply a thin layer of lubricant to the drill hole, to facilitate "distribution" of the seal in the hole.



4. Using your palm, push the seal into place. Check that the seal is level (can be seen on external ribs) and is not protruding into the pipe or well.



6. Mount the adjusting ring (AR) on the delivery pipe if figure 1 says to do so.



8. Push the delivery pipe in place. It is advisable to begin with a short coupling piece, so insertion can be controlled.



10. Mark the delivery pipe (e.g. 200 mm inside the pipe), so you can quickly check that the connection has not been pushed into the main line when subsequent pipes are mounted. Compression of the excavated earth After exposure of the main line and mounting of delivery pipes, it is IMPORTANT to compress the dirt fill around the pipes.

It is normally beneficial to re-use the excavated material, so the soil and gravel layers have the same properties as before excavation.

Drilled connection requirements

There are currently no specific standards establishing requirements for drilled connections to pipelines or wells. Therefore, there is often a discrepancy between the terms of a tender, acceptance criteria and the different standards, each of which describes some of the terms for drilled connections.

Therefore, it is always a good idea to have the current connections approved, together with the current package solution.

Product standard requirements Below is a summary of the most important requirements from the different standards, each of which addresses the demands made of the manufacturers of the connections:

- 1. Requirements of DS/EN 1916 and DS/EN 1917 Sealing elements must be compliant with DS/EN 681-1 and the durability requirements specified in item 4.3.4.
- 2. Requirements of DS/EN 1916 and DS/EN 5.2

A drill hole in a concrete pipeline must observe the tolerances stated by the seal supplier. The tightness of a joint between a concrete pipe and a pipe connection / a sealing element is tested with 5 mWC and then a change of angle and 5 mWC again.

3. Requirements of DS/EN 1917, item 4.1.2 and Appendix C and DS/EN 2420-2, item 4.1.2.1 A drill hole in a manhole ring must observe the tolerances stated by the seal supplier. The tightness of a joint between a concrete well and a pipe connection / a sealing element is tested in accordance with C.7.2. Design requirements

 Requirements of DS/EN 1610 item 9.1 Connections to lines and wells must be made of prefabricated components. The connection must not project into the pipe or well. The connection must be sealed. The connection should be made in the upper part of the pipe, preferably with a 45 degree angle. For details, see the manufacturer's instructions.

The strength of the connected pipes must not be compromised. Therefore, it may be necessary to reinforce the pipeline around the connection or, if needed, replace the pipeline with a new construction - e.g. a new well.

- Photo manual (acceptance criteria)
 A class 1 drilled connection is connected with
 the centre line on or over the main line's hori zontal centre line. The branch pipe must extend
 inside up to 5% of the main line's dimension.
 If nothing else is accepted, it is considered class
 4 if the centre of the side connection lies below
 the main line's horizontal level.
- DS 432 Drainage installations Drainage installations must be tight, allowing no unintended leakage and penetration of water. Drainage installations should be watertight at actual water pressure levels.

Test of US Multi-seal

US Multi-seal satisfies the above requirements with both smooth, ribbed and corrugated pipes, with up to 15 mWC and both with and without a change of angle. To achieve the greatest water-tightness safety, the tests were conducted by testing the most unfavourable combinations of goals/tolerances. This means that the tests were performed with the smallest pipe diameters in the largest drill holes, fitted with the thinnest seals.

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iev		Um./1 dril	DN/to	186 m	m 90c	216 m	226 m	235 m	246 m	256 m	266 m	276 m	286 m	296 m	316 m	326 m	336 m	341 m	346 m	356 m	366 m	376 m	386 m	396 m	406 m	416 m	426 m	436 m	446 m	40CH	476 m	486 m	496 m	506 m	516 m	526 m	536 m	546 m	556 m	566 m	576 m	586 m	596 m	606 m	626 m
verv	Tal diam	IoI. dim. delivery pipe	Ext. DN	156-165 mm	176-185 mm	186-195 mm	196-205 mm	206-215 mm	216-225 mm	226-235 mm	336-245 mm	246-255 mm	256-265 mm	266-275 mm	mm 202-0/2	296-305 mm	306-315 mm	311-320 mm	316-325 mm	326-335 mm	336-345 mm	346-355 mm	356-365 mm	366-375 mm	376-385 mm	386-395 mm	396-405 mm	406-415 mm	416-425 mm	420-435 mm	446-455 mm	456-465 mm	466-475 mm	476-485 mm	486-495 mm	496-505 mm	506-515 mm	516-525 mm	526-535 mm	536-545 mm	546-555 mm	556-565 mm	566-575 mm	576-585 mm	596-605 mm
Seal c		Main line minimum dim.	Int. DN/thick.	300/50 mm	400/70 mm	500/90 mm	mm 06/005	500/90 mm	600/100 mm	600/100 mm	600/100 mm	600/100 mm	600/100 mm	600/100 mm	800/100 mm	900/100 mm	1000/110 mm	1000/110 mm	1000/110 mm																										

Guidelines for figure 1

Example: Can a DN250 mm smooth PVC-S pipe be connected to a DN500 mm concrete main line?

1. Find pipe type (top) and then go down to the relevant dimension (250). (AR) indicates whether an adjusting ring is needed.2. The column "seal type" shows that seal "type 250 mm" is required.

3. The column "dim./tolerance drill hole" indicates that the drill hole must be 276 mm, with a tolerance of -2, +0 mm.

4. The column "main line minimum dim." indicates that the main line must be minimum DN400 mm, with a wall thickness of 70 mm or more.

Seal types marked with grey are standard stock goods.



US Multi-seal/drilled connection options Figure 2. Max. parallel displacement of drill hole

	406	ı	1		ı	45	65	95				
	396				0	50	70	100	636		1	ı
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	366	,		10	15	65	85	135	606	,		ı
	356	,		15	20	70	90	120	596	,		0
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	341	ŗ		25	30	80	100	130	576	,		10
	336			30	35	85	105	135	566			15
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[mm]	316	ŗ	5	40	45	85	115	145	546	,		25
ll hole [r	306	ı	10	45	50	100	120	150	536		0	30
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	276	ı	45	80	85	135	155	185	506		15	45
	266	ı	50	85	90	140	160	190	496	0	20	50
	256	ı	55	90	95	145	165	195	486	5	25	55
	246	0	40	75	80	130	150	180	476	10	30	60
	236	5	45	80	85	135	155	185	466	15	35	65
	226	10	50	85	90	140	160	190	456	20	40	70
	216	15	55	90	95	145	165	195	446	25	45	75
	206	20	60	95	100	150	170	200	436	30	50	80
	196	25	65	100	105	155	175	205	426	35	55	85
	186	30	70	105	110	160	180	210	416	40	60	06
Diameter main line/ wall thickness [mm]		400/70	500/85	600/100	700/90 (feet)	800/100 (feet)	900/105 (feet)	1000/110 (feet)		800/100 (feet)	900/100 (feet)	1000/110 (feet)

Figure 3. Max. diameter of drill hole and angling/drill difference

Angling (A) max. [mm]	30	50	70	65	65	80	110
Diameter drill hole [mm]	186-286	186-366	186-426	186-436	186-536	186-576	186-636
lnt. diameter main line [mm]	400/70	500/88	600/100	200/90	800/100	900/100	1000/110



Figure 4. Connection to concrete well

Diameter drill hole	[mm]	186-476	186-606	186-636
Diameter well rings	[mm]	1000	1250	>1250



Drilled connections with ribbed piping and corrugated piping



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