Construction

Tricosal® Waterstops - Tricomer

Waterstops for joint sealing in watertight concrete construction according to DIN 18541 and DIN 18541-2

Product Description	Tricosal Waterstops Tricomer are highly flexible waterstops made from PVC/NBR copolymer for sealing expansion and construction joints in watertight concrete structures. They are available in a range of different types, shapes and sizes to suit different structures and applications.
Designation	Tricosal® Waterstops - Tricomer [DIN 18541]
Uses	■ Joint sealing in concrete structures ■ Expansion and construction joint sealing in insitu concrete ■ For connecting new to existing structures use Tricomer flanged joint sealing waterstops in accordance with DIN 18541-2 ■ Typical Structures: - Residential building basements - Commercial building basements, underground car parks - Water treatment plants - Dams (using the special profiles with injection hoses)
Characteristics / Advantages	■ High tensile strength and elongation ■ Permanent flexibility and high resilience ■ Suitable for medium water pressures and stress ■ Resistant to all natural mediums aggressive to concrete ■ Bitumen resistant ■ Resistant to a broad spectrum of chemical agents (testing necessary for any additional specific situations) ■ Robust sections for handling on site ■ Weldable
Principles for Use	Design and installation principles according to DIN V 18197 Jointing system in accordance with DIN V 18197 and DIN 18541

Tests

Standards / Directives	■ DIN 18541-1-2 ■ DIN V 18197 ■ German WU Directive DAfStb. ■ Welding Instructions ■ Welding equipment SG 320 L instruction manual
Test Certificate / Approvals	■ Manufacturer's test certificate ■ Certificate of Conformity DIN 18541, parts 1 and 2 ■ External monitoring by institute MPA NRW, Germany ■ Standard external monitoring inspection certificates ■ Test certificates on resistance to sewage slurry, liquid manure and municipal wastewater

Product Data

Form	
Chemical Base	Tricomer = thermoplastic copolymer based on PVC-P with NBR, bitumen resistant
Colours	Black Grey for capping joint waterstops FA
Packaging	Standard rolls 20 or 25 m dependent on profile, on Euro or disposable pallets Factory produced waterstopping systems in coils, on Euro or disposable pallets dependent on size
Storage	
Storage Conditions / Shelf-Life	To be stored on the pallets as supplied on a flat base. *For long-term storage ≥ 6 months* In enclosed areas: The storage area should be covered, cool, dry, free from dust and moderately ventilated. The Tricomer waterstops must be protected from heat sources and strong artificial lights with a high UV content. *Short-term storage > 6 weeks and < 6 months* In enclosed areas: - As for long-term storage i.e. On construction sites, outdoors: - In dry storage protected by suitable covers from direct sunlight, snow and ice or any other form of contamination - Store separate from other potentially harmful materials, plant and equipment such as structural steel, reinforcement or fuels etc. - Store away from traffic and site roads *Short-term storage ≤ 6 weeks* On construction sites, outdoors: - Protected from contamination or damage- Protected by suitable covers from strong sunlight and snow or ice

Mechanical / Physical Properties

Shore-A Hardness	67 ± 5	DIN 53505
Tensile Strength	≥ 10 MPa	EN ISO 527-2
Elongation at Break	≥ 350%	EN ISO 527-2
Tear Propagation Resistance	≥ 12 N/mm	ISO34-1

Resistance

Reaction to cold Elongation at Break	at –20°C: ≥ 200%	EN ISO 527-2
Reaction after		

a) Storage in saturated limewash		DIN 53508
b) Heat ageing		EN ISO 846
c) Impact of microorganisms		EN ISO 4892-2
d) Weathering Allowable average value change [a)]	≤ 20%	
Tensile strength	≤ 20%	EN ISO 527-2
Elongation at Break	≤ 50%	
Elastic Modulus		

Weldability	**(Division of the tensile strength with welded seams by the tensile strength without seams)** ≥ 0.6	DIN 18541-2
Reaction in Fire EN 13501-1	Class E	EN ISO 11925-2 EN 13501-1
Reaction after Storage in Bitumen		DIN 18541-.2

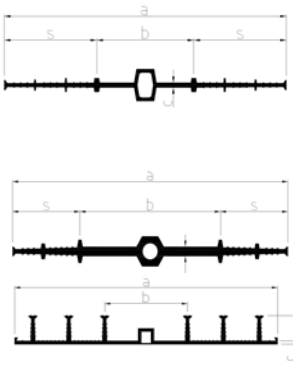
Allowable average value change [a]		EN ISO 291
Tensile strength	< 20%	EN ISO 527-2
Elongation	< 20%	
Elastic Modulus	< 50%	

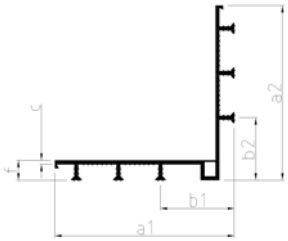
[a)] Relative to initial value

ExpansionJoint Waterstop Forms

The limits of water pressure and stress given in the tables below according DIN V 18197 apply to standard uses without specific additional testing. Different values may be used when precise information on all of the relevant stresses and structural requirements is available.

D ...





A = external anchors
W = internal/external anchors

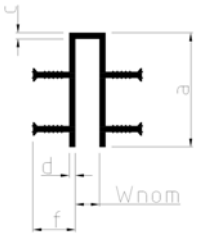
A = external anchors
W = internal/external anchors

Type	Tricosal Waterstop Tricomer	Total width a	Width of expansion part b	Thickness of expansion part C	Width of sealing parts s	Roll length	Water pressure p	Resulting movement v_r
		[mm]	[mm]	[mm]	[mm]	[m]	[bar]	[mm]
Internal	D 240 *	240	85	4.5	78	25	0 0.3	20 10
	D 320 *	320	110	5.5	105	25	0 1.0	25 15
	D 500	500	155	6.5	173	25	0 1.2	30 15
	D 260 TS	260	125	7/9	68	25	----[1)]	
	D 350 TS	345	175	9/11	85	25		
	D 400 TS	400	195	10/11	103	25		
External				Sealing Ribs				
				N [1] x f [mm]				
	DA 240	240	90	4.5	4 x 20	25	0 [1)]	25
	DA 240/2 *	240	90	4.5	4 x 25	25	0 0.2	25 20
	DA 320	330	104	4.5	6 x 20	25	0 [1)]	27
	DA 320/2 *	330	104	4.5	6 x 25	25	0 0.3	27 20
	DA 320/3 *	330	104	5	6 x 35	20	0 0.7	30 20
	DA 500	500	124	4.5	8 x 20	25	0	35
	DA 500/3	500	124	5	8 x 35	20	0 1.0	35 20
	DA 240 edge A **	146 /131	71/55	4.5	4 x 20	25	0 [1)]	15 [1)]
	DA 240 edge W **	146 /131	71/55	4.5	4 x 20	25	0 [1)]	15 [1)]
	DA 320 edge A **	192 /176	79/63	4.5	6 x 20	25	0 [1)]	15 [1)]
	DA 320 edge W **	192 /176	79/63	4.5	6 x 20	25	0 [1)]	15 [1)]

* Standard stock product ** Waterstop to DIN 18541-2
[1)] Special project-related data

v_r Resulting movement = $(v_x^2 + v_y^2 + v_z^2)^{1/2}$
N No. of sealing ribs with DA and FA
f Height of sealing ribs

Waterstops for Capping

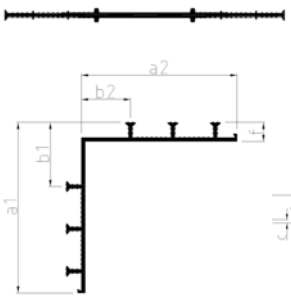


Type	Tricosal Waterstop Tricomer	Total width a	Joint width w_{nom}	Cover slab or waterstop leg thickness c / d	No. of stop anchors Profile depth N x f	Roll length	Water pressure p	Resulting Movement v_r
		[mm]	[mm]	[mm]	[1] x [mm]	[m]	[bar]	[mm]
	FA 50/3/2	50	20	5	2 x 25	25	0	20
	FA 90/3/2	95	20	5	4 x 25	25	0.1	20
	FA 130/3/2	140	20	5	6 x 25	25	0.3	20

Installation of waterstops for capping joints with spacers and joint formers TFL, see Accessories.

for joint width 10 mm: Tricosal TFL 20
for joint width 20 mm: Tricosal TFL 30
for joint width 30 mm: Tricosal TFL 40
for joint width 40 mm: Tricosal TFL 50

Construction Joint Waterstop Forms



A = external anchors

W = internal/external anchors

Type	Tricosal Waterstop Tricomer	Total width a	Width of expansion part b	Thickness of expansion part C	Width of sealing part s	Roll length	Water pressure p	Resulting movement v_r
	Form	[mm]	[mm]	[mm]	[mm]	[m]	[bar]	[mm]
	A 240 *	240	85	4	77.5	25	0.3	
	A 320 *	320	110	5	105	25	1.0	3
External				Sealing Ribs				
					N x f			
					[1] x [mm]			
	AA 240	240	90	4.5	4 x 20	25	0 [1)]	
	AA 240/2 *	240	90	4.5	4 x 25	25	0.2	
	AA 320	330	104	4.5	6 x 20	25	0 [1)]	
	AA 320/2 *	330	104	4.5	6 x 25	25	0.3	
	AA 320/3 *	330	104	5	6 x 35	20	0.7	
		a1/a2	b1/b2					
	AA 240 edge A **	136/120	61/45	4.5	4 x 20	25	0 [1)]	3
	AA 240 edge W **	136/120	61/45	4.5	4 x 20	25	0 [1)]	
	AA 320 edge A **	181/165	68/52	4.5	6 x 20	25	0 [1)]	
	AA 320 edge W **	181/165	68/52	4.5	6 x 20	25	0 [1)]	

* Standard stock product ** Waterstop to DIN 18541-2

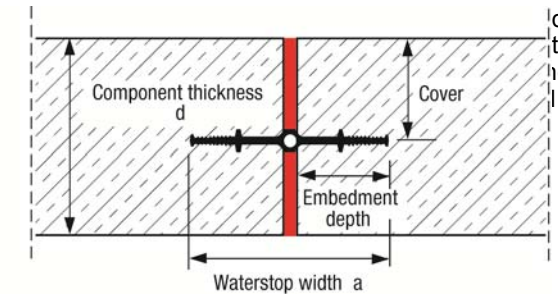
[1)] Special project-related data
v_r Resulting movement = $(v_x^2 + v_y^2 + v_z^2)^{1/2}$
N No. of sealing ribs for AA and FA f Height of sealing ribs

Waterstop Selection

Water Pressure / Cover Depth / Stress

The data in the above tables on water pressure and the resultant stress reflects the general application range in which the waterstops can be used without additional testing.
Shear strains in the y direction (transverse longitudinal to the waterstop) are limited to the dimensions of the nominal joint width w_{nom} without additional measures.

Rule of Cover Depth



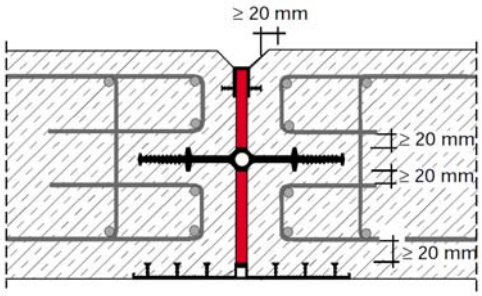
d in DIN V 18197.
to be exceeded, the values
ne basis of specific references,
l influences and stresses.

External waterstops and waterstops for capping joints can be selected without considering the component thickness.

Anchorage Depth

The anchorage depth/concrete cover of the anchor ribs / sealing ribs must be 30 mm minimum.

Reinforcement Clearance



The clearance between waterstop and reinforcement shall be at least 20 mm.

Nominal Joint Widths

The nominal joint width is:

Internal expansion waterstops	w_{nom} = 20 or 30 mm
External expansion waterstops	w_{nom} = 20 mm
Waterstops for capping joints	w_{nom} = in accordance with the profile clearance (10, 20, 30, 40 mm)

For a greater nominal joint width or compression joints subject to shear stress, internal expansion waterstops with encased centre bulb are used.

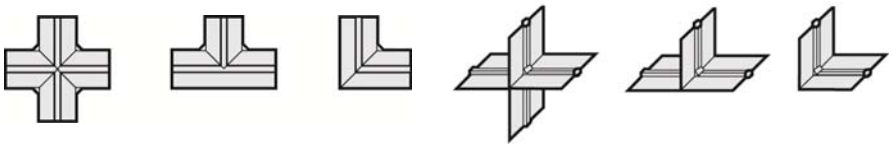
Temperature Range

The service temperature (waterstop temperature) is:

For pressurised water:	-20°C to +40°C,
For non pressurised water:	-20°C to +60°C.

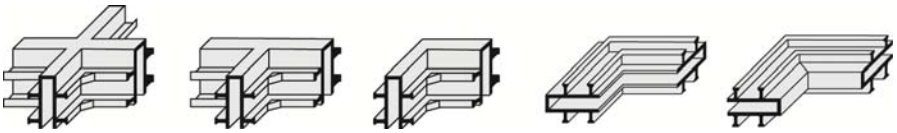
Special Stresses and Exposures

Exposure to Different Temperatures and Chemical Agents	For special stresses or exposure to different temperatures and/or chemical mediums outside the substances or situations specifically defined in DIN 4033, separate tests are always necessary.
System Information	
General	Only butt joints should be formed on site with Tricomer based waterstops; the other junctions / joints should be prefabricated. The factory production of different waterstopping systems and junctions reduces the joints required to be formed on site to a minimum.
Factory Produced Jointing Pieces	Special junctions or waterstopping systems can be factory produced for specific projects Standard junctions for internal and external Tricomer Waterstops include:



Cross piece flat | T-piece flat | L-piece flat | Cross piece vertical | T-piece vertical | L-piece vertical

Standard joint profiles of exposed / finishing Waterstops include



Cross piece vertical | T-piece vertical | L-piece vertical | L cross piece flat | L-piece flat, cover slab inside

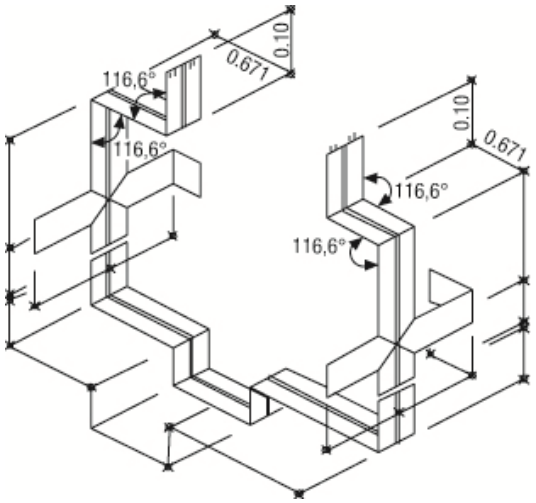
Production of these profiles is preferably in 90°sections, or in standard internal or external angles 60° - 175°.

Special junction

Combined junctions using different waterstop forms (as connections), e.g. form D with DA, or DA with FA.

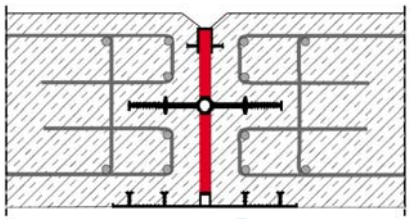
In the standard approach the preformed junctions / jointing pieces are built into the joint waterstopping system. The sizes of the system components are dependent on the waterstop forms involved and the type and number of joints required.

The normal maximum total length of waterstopping systems is up to 25 m maximum (total for all separate lengths).



Documentation	Manufacturer's test certificate, other test certificates as required Certificate of Conformity Regular external monitoring inspection certificates System drawings of the systems and components with detailed dimensions
Handling	As specified in DIN V 18197. - Careful transport and handling on site - Installation only at waterstop material temperatures ≥ 0°C - Protection is required until the waterstopping system is fully cast in - Special care to be taken of free waterstop ends - Waterstops are cleaned before casting in

Application Instructions

Application	As specified in DIN V 18197.  - Internal waterstops are installed within the concrete section and clearance from the edge of the concrete must be at least half the total width a of the waterstop. - External waterstops are installed flush with external face of the concrete. Do not install on the top surface of horizontal or slightly sloping concrete. - Waterstops for capping joints are installed in the joint, set back by the dimension of the joint chamfer. If there are very high stresses or difficult concreting conditions, the waterstops can be supplied with additional injection hoses to additionally inject / grout around the cast-in parts at a later date.
Jointing on Site: **Site Joints**	The thermoplastic Tricomer waterstops are jointed together by welding. The edges for connection are melted and joined together in the plastic state. Jointing with adhesives is not permitted. Site joints must be formed as stated in the welding instructions. Requirement: Minimum ambient temperature + 5°C and dry weather conditions. The welding equipment used must allow a weld over the full cross-section of the waterstop, be temperature controlled and allow measured pressure. Site joints must be formed only by trained and qualified personnel. The key steps for site jointing and complying with the welding instructions are: 1) Cut the waterstop ends, straight and square 2) Butt joint with welding equipment SG 320 L, or in special situations with a axe-shaped welding tool Welding process: Align Heat/melt Change round Join together Cool (in ambient temperature - Do not use coolant) 3) Inspect and protect the seam as necessary After cooling for about half an hour the joint is normally finished and may be fixed / installed / stressed.

Further steps may be necessary dependent on the joint requirements and the waterstop form.

These steps are described in full for all waterstop types in the individual waterstop welding instructions. These instructions are enclosed with every welding equipment unit or are supplied direct to the contract on request.

All welding work is subject to the relevant local Health and Safety regulations.

Formation of these site joints takes about a half to three-quarters of an hour of working time per joint, dependent on the specific waterstop form and therefore this time must be scheduled and the work completed properly before the next operations proceed.

Two people are required for the welding of site butt joints with a axe-shaped welding tool.

For internal construction joint waterstops, a manually welded lap joint is possible (with only 1 person required).

Welding jigs (provided on hire)

Welding equipment SG 320 L for waterstops up to 320 mm total width

Welding equipment SG 600 for waterstops up to 500 mm total width

Clamping moulds – according to the profiles being used.

Welding equipments are electrical appliances which are subject to standard regular safety checks which must be scheduled and arranged.

The operating instructions for welding equipment SG 320 L describe all of the steps required for waterstop welding and these must be closely followed when forming joints.

The welding equipment may only be used as described and according to all relevant regulations as stated in the operating instructions.

Manual Equipment and Tools

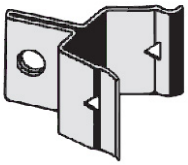
Cutting	Tape measure, metre rule, set square Marker pen Cutting knife
Seam protection: With welding foil ca. 25 x 2.5 mm	Scissors axe-shaped welding tool 200 W Hot-air blower Wire brush
With welding strip Ø 4 mm	Scissors welding tip 50 W Wire brush

Seam inspection tester	Spark tester / holiday detector

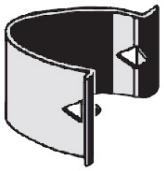
Welding Material	Welding foil ca. 25 x 2.5 mm Welding strip Ø ca. 4 mm Welding materials are supplied to order. Welding materials must be stored away from dust and contamination.	Roll ca. 25 m Coil ca. 2.3 kg

Accessories

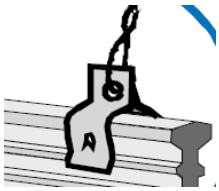
Waterstop clips



Clip Type 1



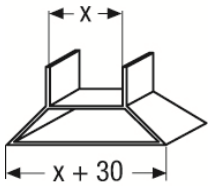
Round Clip

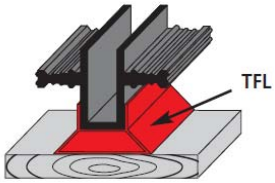


The waterstop fixings should be installed at maximum 25 cm centres.

Fixing to the reinforcement.

TFL Spacers and Joint Formers
for the secure installation of waterstops for capping joints





Profile	Joint width w_{nom} = x	Units
	[mm]	[m]
TFL 20	10	1 m / 2.50 m in coil of 10
TFL 30	20	1 m / 2.50 m in coil of 10
TFL 40	30	1 m
TFL 50	40	1 m

Future Injection Capability

- Injection hose SikaFuko®-VT 1 and 2 or SikaFuko® -Eco 1
- Round clip 12 (for SikaFuko®-VT 1 / Eco 1 and waterstop form D/A)
- Round clip 22 (for SikaFuko®-VT 2 waterstop form D/A)

Fixings to be at 12.5 cm centres max.

Installation and injection of the SikaFuko injection hoses is detailed in their respective Product Data Sheets Sika Method Statement / Installation guidelines and the relevant local regulations for the specific Sika injection hoses used.

Hose Stoppers
to plug the centre bulb at free waterstop ends (as DIN V 18197, section. 5.2.1).

On permanent free ends the projecting part is sealed / stopped and cut off.

On temporary free ends the stoppers are removed before forming the connecting butt joint.

Construction

Local Restrictions

Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.

Health and Safety Information

For information and advice on the safe handling, storage and disposal of chemical products, user shall refer to the most recent Material Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.

Legal Notes

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