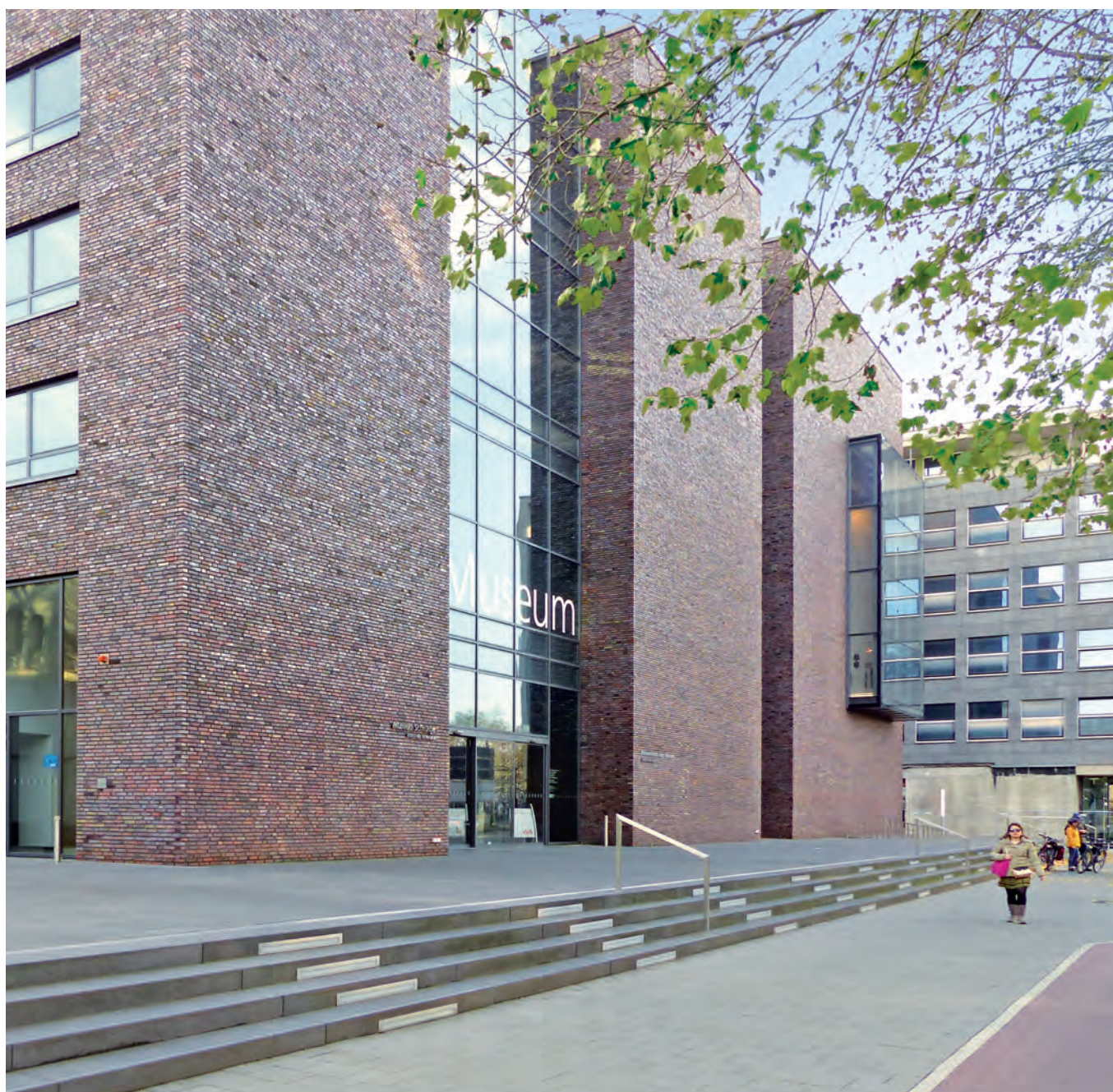


ROLLTOP

MANHOLE COVERS





HYDRO

ZEROWATERLOSS

ZEROWATERLOSS VISION BECOMES REALITY

Valued customers and business partners

Water is the foundation of life – this goes without saying. Despite this (or even because of this), we are not prepared to pay the right price for good, clean and safe water, or make investments to allow water to be safely transported using sustainable infrastructure, to retain its quality and to prevent theft and waste.

After decades of engagement with the issue of water, VONROLL HYDRO has developed the ZEROWATERLOSS mission statement. In doing so, we have seen how ZEROWATERLOSS has become a global challenge. Summer 2003 was the first time that even countries in Europe with plenty of water were shown how vulnerable the foundation of our life and our quality of life is. 2018 refreshed the (gladly suppressed) memory. In many places, sinking groundwater levels have been registered for years, and a significant portion of worldwide migration movements could be attributed to the increasing lack of water or conflicts connected to the control of water reserves. In addition to climate change, the key causes of water shortages are population growth, demands on the standard of living, overexploitation and ignorance. Where the Aral Sea still stood until recently, there are now dry boatyards in the desert. In many countries, over 50 % of the water generated in an energy-intensive manner in desalination plants gets lost on the way to the consumer.

The ZEROWATERLOSS mission statement (www.zerowaterloss.world) presents the counter-thesis: Water is a key part of the intergenerational contract. We must build infrastructure today with first-class, long-lasting components. Water quality and water use must be monitored and safeguarded with innovative products and services (HYDROPORT and INFRAPORT as the

foundations of smart cities and smart villages). The components required here for our infrastructure should ideally be manufactured regionally. This allows our values, which are reflected, for instance, in labour and environmental protection laws, to feed into our infrastructure. Thanks to short transport distances, CO₂ and exhaust gas pollution are minimised at the same time.

Together with you, our customers and business partners, we want to see ZEROWATERLOSS become a reality, with integrated and coordinated products and services worldwide. The new VONROLL HYDRO 2020 full catalogue forms a solid foundation for joint commitment. Our engineering teams are glad to have the chance to support you in planning and implementing large and small infrastructure projects.

ZEROWATERLOSS – so that water also remains a safe foundation of life for our descendants.

On behalf of the companies of the VONROLL HYDRO Group



Jürg Brand
President of the
Board of Directors



Marta Lozano
Director
ZEROWATERLOSS

1

We recognise

discrimination-free access to clean water as a universal human right.

2

We are committed to

not using more water than can sustainably flow back – Supplying our customers with high-quality water – Feeding used water back into circulation once purified.

3

We favour

recycled and recyclable materials (ideally with no degradation), which are manufactured and transported with as little CO₂ and exhaust gas pollution as possible.

4

We respect

the intergenerational contract by using high-quality and long-lasting products and services, and paying the right price for them.



Intro

Architects and engineers design and realise living spaces. From the very beginning, they not only attach great importance to the functionality of a building. The aesthetic aspect plays at least as important a role. In order to achieve an absolutely flawless result, everything must be carefully thought out and planned, because perfect overall solutions require perfect details. The design of surfaces plays a very central role during the planning phase. They give the building its external appearance.

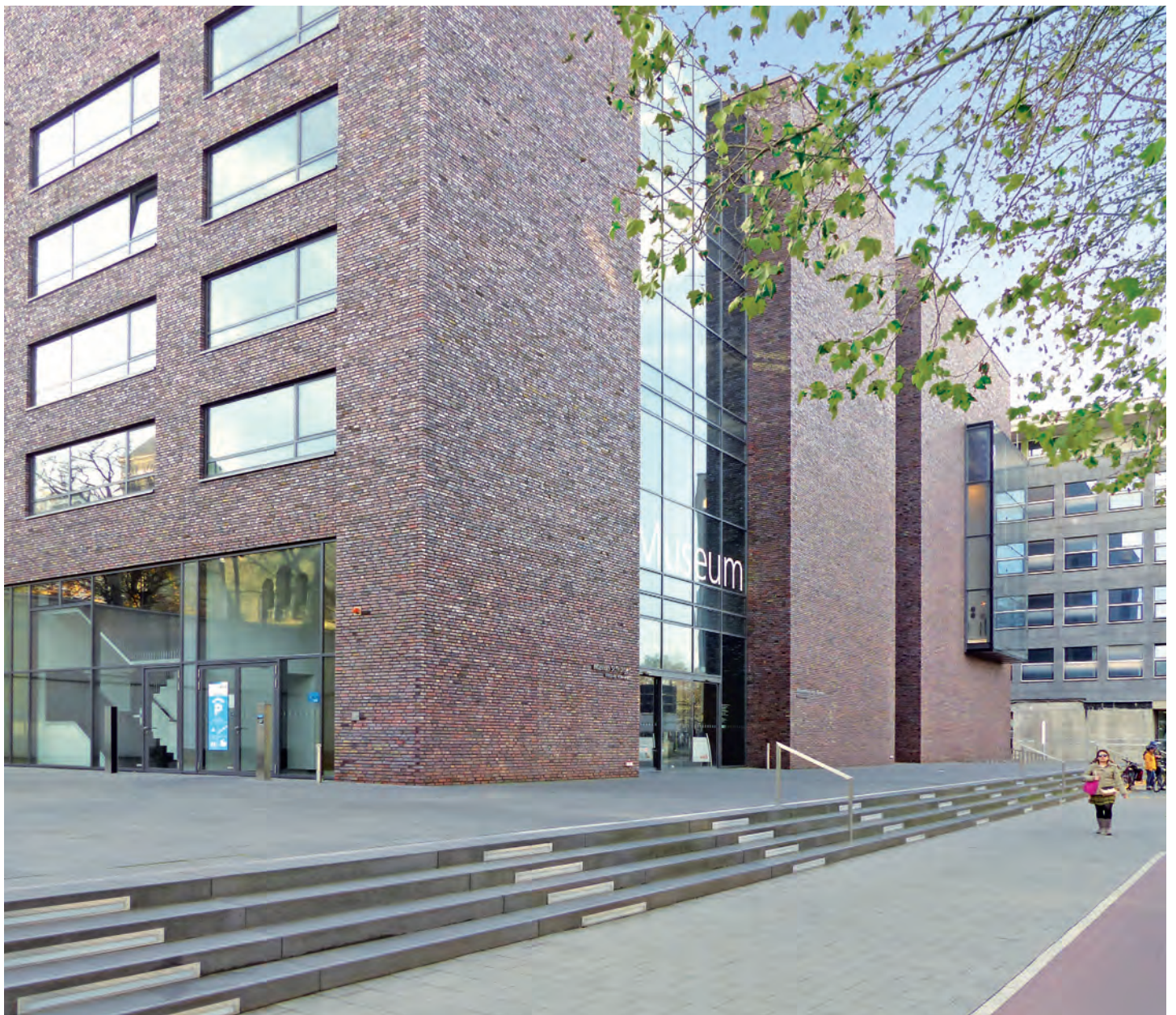
Conventional manhole covers can interrupt the structure of the selected surface and thus massively disturb the overall picture. ROLLTOP is an elegant and simple solution to this problem: The stainless steel manhole covers for all types of manhole structures blend harmoniously into their surroundings thanks to their designable surface and become almost invisible. There are almost no limits to individuality – the manhole covers can be paved, asphalted, concreted or even planted.



Kulturquartier am Neumarkt
Cologne

Nothing to see

The surface of the ROLLTOP manhole cover can be designed individually and thus blends in with its surroundings. All that is visible is the joint gap between the outer frame and the pavement trough, as well as the wall thickness of the construction profiles.





BMW Munich

In good shape

Whether round, square, rectangular or as a special solution – the ROLLTOP manhole covers are available in all shapes.





Airport Munich

High load capacity

The manhole covers ROLLTOP withstand loads of up to 90 tonnes.





Outletcity Metzingen GmbH
Metzingen

Simple handling

Whether mechanically or hydraulically – all manhole covers ROLLTOP can be opened and closed quickly and easily.





AUDI Gebrauchtwagenzentrum
:PLUS Eching

Perfect fit

Numerous options offer the possibility of ROLLTOP manhole covers to your own requirements.



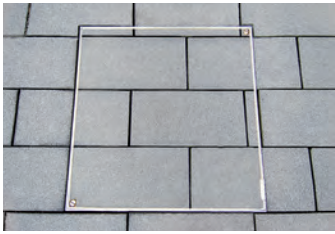


Galerie STIHL Waiblingen

Individual copies

We are specialised in the construction and the production of special solutions.





Steiff Museum
Giengen an der Brenz

Long lifetime

For the production of the ROLLTOP manhole cover only high-quality materials such as stainless steel and ductile stainless steel and ductile iron are used.

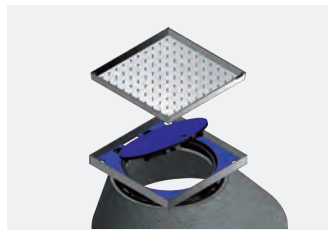


VIATOP Base body



Load class D400

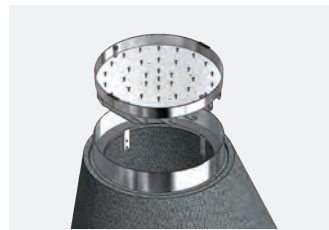
Clear entry width: DN 625 mm
Stainless steel door frame:
– round DN 890 mm
– square 800×800 mm
Tub height: 70 mm*
Total height: 205 mm



Load class D400

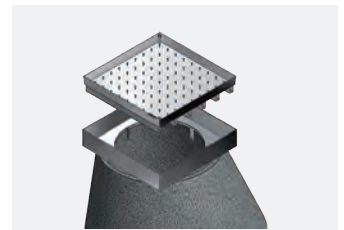
Clear entry width: DN 800 mm
Stainless steel door frame:
– round DN 1.100 mm
– square 1.000×1.000 mm
Tub height: 70 mm*
Total height: 230 mm

Completely stainless steel



Load class A15

Clear entry width: DN 625 mm*
Stainless steel door frame:
– round DN 750 mm
– square 750×750 mm
Tub height: 70 mm*
Total height: 110 mm



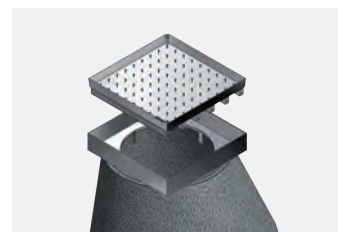
Load class B125

Clear entry width: DN 625 mm*
Stainless steel door frame:
– round DN 750 mm
– square 750×750 mm
Tub height: 70 mm*
Total height: 140 mm



Load class D400

Clear entry width: DN 625 mm
Stainless steel door frame:
– round DN 800 mm*
– square 800×800 mm*
Tub height: 70 mm*
Total height: 160 mm*



Load class D400

Clear entry width: DN 800 mm
Stainless steel door frame:
– round DN 1.000 mm*
– square 1.000×1.000 mm*
Tub height: 70 mm*
Total height: 160 mm*

The basic body is a VIATOP cover made of ductile cast iron. The polyurethane coating (blue) ensures an absolutely flat support surface for the ROLLTOP stainless steel tray. The cover of the VIATOP cover can be folded open after the stainless steel tray has been lifted out.

Benefit: This construction form has a significantly lower lifting weight compared to the "all stainless steel" version. For load class D, the difference corresponds to a weight of approx. 35 kg.

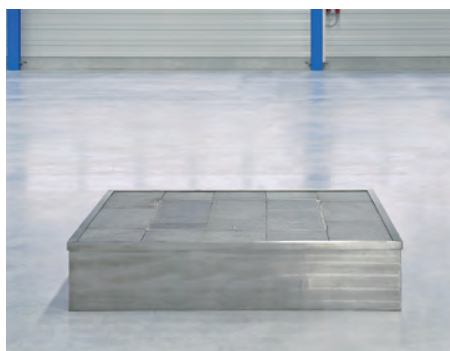
Only stainless steel is used in this construction.

Benefit: All parts can be made individually, which makes the cover extremely variable in its dimensions and therefore also adaptable. All construction forms are also available in load classes E600 and F900. All covers shown here are standard designs. Those marked with * can be selected individually.

ROLLIFTUP NT

INNOVATION

For the ROLLIFTUP NT manhole cover, all specifications marked with * can be selected individually.



ROLLIFTUP NT

In addition to our manhole covers, which can be lifted out using our keys or eyelets, we also offer a version with a hydraulic opening mechanism.



Hydraulic mechanism

All you need to open the ROLLIFTUP NT is the opening key supplied. However, it is even easier to open the cover with a standard cordless screwdriver.



One-man control

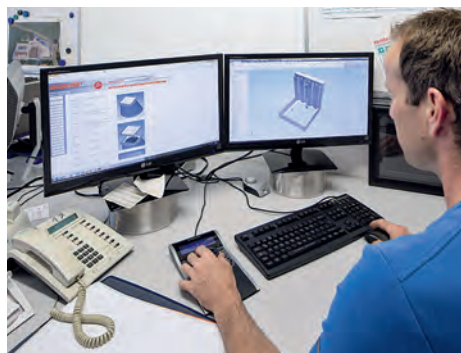
The innovative mechanism allows the cover to be opened and closed by just one person - without any physical strain. When the manhole cover is open, a support prevents the cover from closing by itself.



Load classes A, B, D, E und F

Clear entry width: round, square or rectangular, max. 2.800×1.300 mm*. Stainless steel outer frame: square or rectangular, at least 800×800 mm*, max. 3.000×1.500 mm*, Tub height: 120 mm*, Total height: 222 mm*

CONSTRUCTION PRODUCTION



Construction

Each individual manhole cover from ROLLTOP is designed using 3D CAD software and then statically calculated. This guarantees that the cover will withstand the required loads.



Made in Germany

Not only the design but also the production takes place in our company. This enables very close cooperation between all departments, resulting in perfect results in terms of design and production.



State of the art technology

In addition to a plasma cutter, a state-of-the-art water jet cutter is also available for the production of manhole covers. This enables even more precise production of the individual components.



Many years of experience

In the final step, all the individual parts are assembled by our experienced locksmiths. The result – a high-quality manhole cover made to measure.

FORM

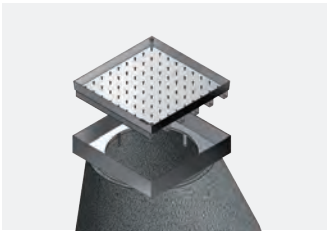
FRAME & OPENING

One-piece cover

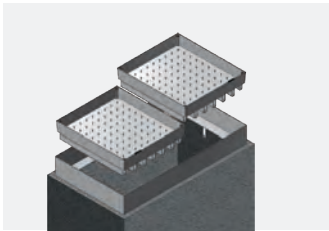


round – round
Multi-part frame: round
Opening: round

Multi-piece cover

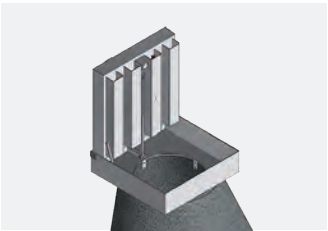


square/rectangular – round
Frame: square/rectangular
Opening: round

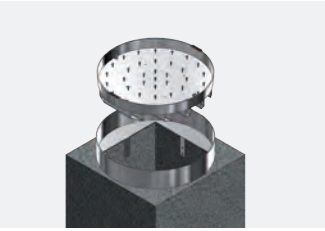


square/rectangular – square/rectangular (2-piece)
Frame: square/rectangular
Opening: square/rectangular

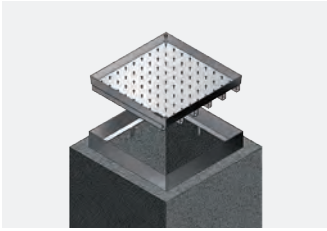
ROLLIFTUP NT



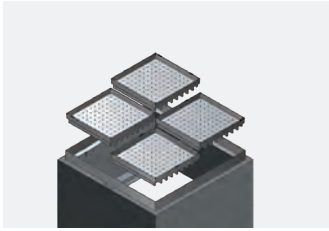
square/rectangular – round
Frame: square/rectangular
Opening: round



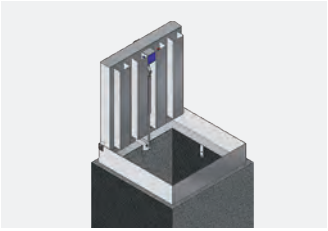
round – square/rectangular
Frame: round
Opening: square/rectangular



square/rectangular – square/rectangular
Frame: square/rectangular
Opening: square/rectangular



square/rectangular – square/rectangular (4-piece)
Frame: square/rectangular
Opening: square/rectangular



square/rectangular – square/rectangular
Frame: square/rectangular
Opening: square/rectangular

Paved over



round

Asphalted



round

Concreted out

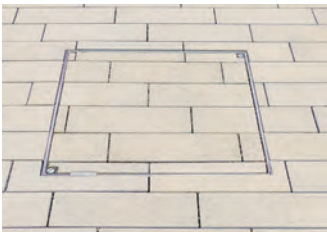


square / rectangular
Also available in round or multi-piece version available.

Greened



square / rectangular
Also available in round or multi-piece version available.



square / rectangular



square / rectangular



multi-piece



multi-piece

ACCESSORIES AND OPTIONS



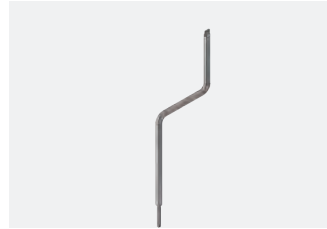
Extraction key

The ROLLTOP covers can be lifted out by hand with the aid of the two lifting keys.



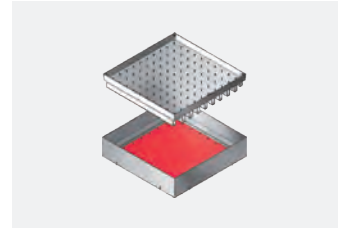
Lifting lugs

For covers that can no longer be lifted out manually due to their heavy weight, we offer lifting lugs.



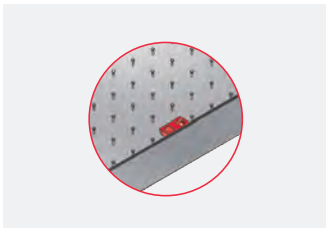
Key ROLLIFTUP NT

This key is required for the hydraulic opening mechanism of the ROLLIFTUP NT.



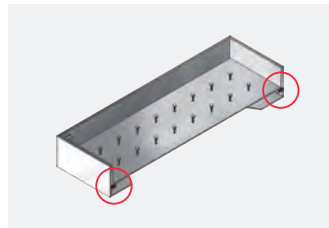
Pressure / gas tight

The pressure- or gas-tight installation of an additional plate prevents unpleasant odours.



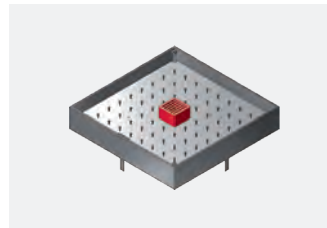
Lift-out pockets

Lift-out pockets can be offered as a special solution in several variants as required.



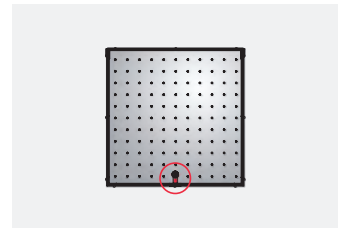
Daywaterproof

The daywaterproof version also includes a side-mounted, all-round seal including drainage holes.



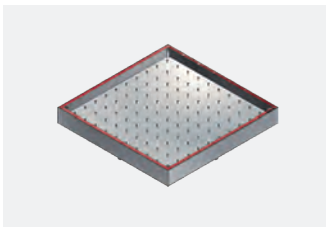
Ventilation / Drainage

The cover can additionally be used as a gully or as an aeration and ventilation unit in round or square form.



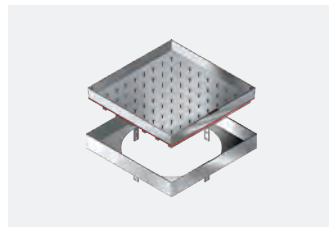
Lockable

The covers can additionally be fitted with a lock to prevent opening by unauthorised persons.



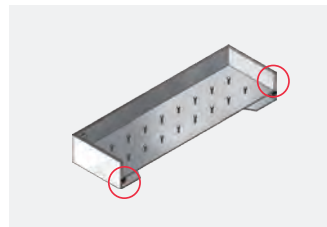
Ventilation / drainage according to DIN

The cover can be designed as a ventilation and drainage system according to DIN by selecting the slot size between the tray and the frame.



Heat / sound insulated

With our plastic coating, we can equip the covers with additional heat or sound insulation.



Heatable seal

To prevent the cover from freezing to the frame in winter, a heatable seal can be fitted to the cover.

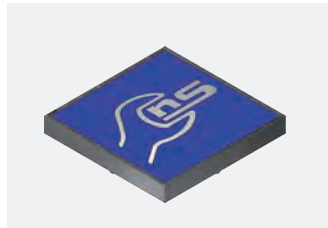


Railing ROLLIFTUP NT

The ROLLIFTUP NT can be equipped with a railing that folds out automatically when the lid is opened.

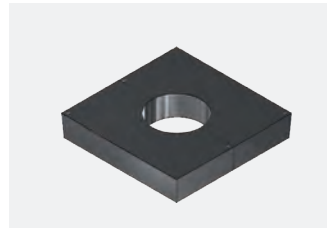
SPECIAL SOLUTIONS

EXAMPLES



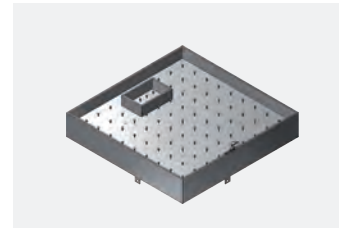
Logo image

In order to be able to design a man-hole cover even more individually, we offer the possibility of displaying your own logo on it. The logo itself is made of stainless steel, the background is coloured concrete.



May-/Christmas tree opening

This special solution has been developed especially for municipalities. The lid consists of two parts which, when closed, leave space for the trunk of a May or Christmas tree by means of a round opening.



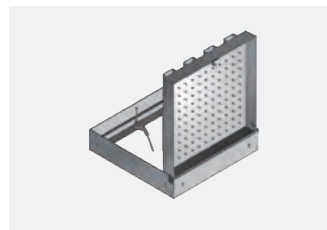
Cable / hose opening

In order not to have to leave the entire cover open, another small opening can be inserted into the cover through which cables and hoses can be routed.



Asymmetric shape

There are almost no limits to the shape. Here you can see an asymmetrical cover with one side bevelled. Each cover can be equipped with a lock in addition to a normal lock.



LIFTUP with emergency exit

The LIFTUP is also available with an emergency exit. This means that the cover cover can be opened not only from the outside, but also from the inside.



Cover for function shaft

The covers are equipped with a checker plate surface made of stainless steel depending on the load class.



Solutions for plastic manholes

For plastic chambers, we offer cover variants with stainless steel chamber neck and concrete support ring. Our product range also includes telescopic manhole covers for all concrete and plastic manholes to enable height adjustments to be made.

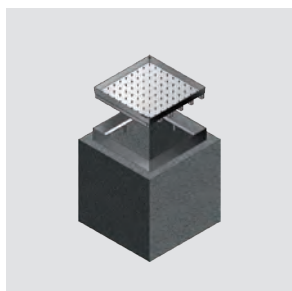


Individual special solution

Not the right one? Contact us. We are specialised in the design and manufacture of special solutions.

ARTICLE LIST

VONROLL TOP INOX STAINLESS STEEL



Code-No.	Load class	loadable up to (to)	Frame design	Frame dimension (mm)	Total height (mm)	Tube height (mm)	Opening (mm)
97	D	40	square	1000 × 1400	180	70	800 × 1200
96	D	40	square	1000 × 1200	180	70	800 × 1000
95	D	40	square	750 × 950	160	70	600 × 800
94	D	40	square	550 × 750	160	70	400 × 600
93	B	12.5	square	1000 × 1400	160	70	800 × 1200
92	B	12.5	square	1000 × 1200	160	70	800 × 1000
91	B	12.5	square	750 × 950	140	70	600 × 800
90	B	12.5	square	550 × 750	140	70	400 × 600
89	A	1.5	square	1000 × 1400	140	70	800 × 1200
88	A	1.5	square	1000 × 1200	140	70	800 × 1000
87	A	1.5	square	750 × 950	110	70	600 × 800
86	A	1.5	square	550 × 750	110	70	400 × 600



84	D	40	square	1200 × 1200	180	70	DN 1000
83	D	40	square	1200 × 1200	180	70	1000 × 1000
82	D	40	round	DN 1200	180	70	DN 1000
81	D	40	square	1000 × 1000	160	70	DIN 800
80	D	40	square	1000 × 1000	160	70	800 × 800
79	D	40	round	DN 1000	160	70	DN 800
78	D	40	square	900 × 900	160	70	DN 700
77	D	40	square	900 × 900	160	70	700 × 700
76	D	40	round	DN 900	160	70	DN 700
75	D	40	square	800 × 800	160	70	DN 625
74	D	40	square	800 × 800	160	70	600 × 600
73	D	40	round	DN 800	160	70	DN 625
72	D	40	square	700 × 700	160	70	DN 500
71	D	40	square	700 × 700	160	70	500 × 500
70	D	40	round	DN 700	160	70	DN 500

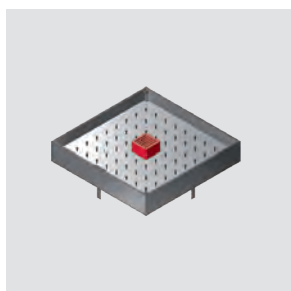


64	B	12.5	square	1200 × 1200	160	70	DN 1000
63	B	12.5	square	1200 × 1200	160	70	1000 × 1000
62	B	12.5	round	DN 1200	160	70	DN 1000
61	B	12.5	square	950 × 950	160	70	DIN 800
60	B	12.5	square	950 × 950	160	70	800 × 800
59	B	12.5	round	DN 950	160	70	DN 800
58	B	12.5	square square	850 × 850	140	70	DN 700
57	B	12.5	square	850 × 850	140	70	700 × 700
56	B	12.5	round	DN 850	140	70	DN 700
55	B	12.5	square	750 × 750	140	70	DN 600 / 625
54	B	12.5	square	750 × 750	140	70	600 × 600
53	B	12.5	round	DN 750	140	70	DN 600 / 625
52	B	12.5	square square	700 × 700	140	70	DN 500
51	B	12.5	square	650 × 650	140	70	500 × 500
50	B	12.5	round	DN 650	140	70	DN 500
44	A	1.5	square	1200 × 1200	140	70	DN 1000
43	A	1.5	square	1200 × 1200	140	70	1000 × 1000
42	A	1.5	round	DN 1200	140	70	DN 1000
41	A	1.5	square	950 × 950	140	70	DN 850
40	A	1.5	square	950 × 950	140	70	800 × 800
39	A	1.5	round	DN 950	140	70	DN 850
38	A	1.5	square	850 × 850	120	70	DN 700
37	A	1.5	square	850 × 850	120	70	700 × 700

VONROLL TOP INOX STAINLESS STEEL



Code-No.	Load class	loadable up to (to)	Frame design	Frame dimension (mm)	Total height (mm)	Tube height (mm)	Opening (mm)
36	A	1.5	round	DN 850	120	70	DN 700
35	A	1.5	square	750 × 750	110	70	DN 600 / 625
34	A	1.5	square	750 × 750	110	70	600 × 600
33	A	1.5	round	DN 750	110	70	DN 600 / 625
32	A	1.5	square	650 × 650	110	70	DN 500
31	A	1.5	square	650 × 650	110	70	600 × 600
30	A	1.5	round	DN 600	110	70	DN 500
22	Class D for PE shafts	40	square	750 × 750	160	70	DN 600
21	Class D for PE shafts	40	round	DN 750	160	70	DN 600
20	Class D for PE shafts	20	square	750 × 750	140	70	DN 600
19	Class D for PE shafts	20	round	DN 750	140	70	DN 600
18	Class D for PE shafts	1.5	square	750 × 750	110	70	DN 600
17	Class D for PE shafts	1.5	round	DN 750	110	70	DN 600
16	Private courtyard areas	5	square	750 × 750	130	70	DN 625
15	Private courtyard areas	5	round	DN 750	130	70	DN 625
14	Walk-in-private areas	1.5	square	750 × 750	80	70	DN 625
13	Walk-in-private areas	1.5	round	DN 750	80	70	DN 625
12	Class B-plantable	12.5	square	750 × 750	210	70	DN 625
11	Class B-plantable	12.5	round	DN 750	210	70	DN 625
10	Class A-plantable	1.5	square	750 × 750	180	70	DN 625
09	Class A-plantable	1.5	round	DN 750	180	70	DN 625
08	Class D-800	40	square	1000 × 1000	230	70	DN 800
07	Class D-800	40	round	DN 1080	230	70	DN 800
06	Class D	40	square	800 × 800	205	70	DN 625
05	Class D	40	round	DN 890	205	70	DN 625
04	Class B	12.5	square	750 × 750	140	70	DN 625
03	Class B	12.5	round	DN 750	140	70	DN 625
02	Class A	1.5	square	750 × 750	110	70	DN 625
01	Class A	1.5	round	DN 750	140	70	DN 625

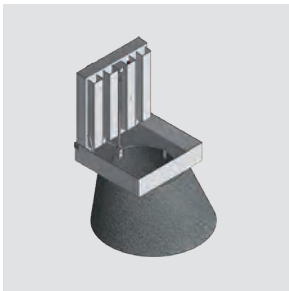


222	Surcharge for ventilation opening (drainage opening) in lid center for class A40						
223	Surcharge for ventilation opening (drainage opening) in lid center for class B						
224	Surcharge for ventilation opening (drainage opening) in lid center for class D40						
225	Surcharge for ventilation opening (drainage opening) in lid center for class D-800						
226	Surcharge for higher trough for paving up to 100 mm for class A						
227	Surcharge for higher trough for paving up to 100 mm for class B						
228	Surcharge for higher trough for paving up to 100 mm for class D						
229	Surcharge for higher trough for paving up to 100 mm for class D-800						
76	D	40	round	DN 900	160	70	DN 700
75	D	40	square	800 × 800	160	70	DN 625
74	D	40	square	800 × 800	160	70	600 × 600
73	D	40	round	DN 800	160	70	DN 625
72	D	40	square	700 × 700	160	70	DN 500
71	D	40	square	700 × 700	160	70	500 × 500
70	D	40	round	DN 700	160	70	DN 500

VONROLL TOP LIFTUP



Code-No.	Load class	loadable up to (to)	Frame design	Frame dimension (mm)	Total height (mm)	Tube height (mm)	Opening (mm)
NT-A 900×900-DN625	A	1.5	square	900×900	222	120	DN 600 / 625
NT-A 900×900-600×600	A	1.5	square	900×900	222	120	600×600
NT-A 900×900-DN700	A	1.5	square	900×900	222	120	DN 700
NT-A 900×900-700×700	A	1.5	square	900×900	222	120	700×700
NT-A 1000×1000-DN800	A	1.5	square	1000×1000	222	120	DN 800
NT-A 1000×1000-800×800	A	1.5	square	1000×1000	222	120	800×800
NT-A 1200×1200-DN1000	A	1.5	square	1200×1200	222	120	DN 1000
NT-A 1200×1200-1000×1000	A	1.5	square	1200×1200	222	120	1000×1000
NT-B 900×900-DN625	B	12.5	square	900×900	222	120	Dn 600 / 625
NT-B 900×900-600×600	B	12.5	square	900×900	222	120	600×600
NT-B 900×900-DN700	B	12.5	square	900×900	222	120	DN 700
NT-B 900×900-700×700	B	12.5	square	900×900	222	120	700×700



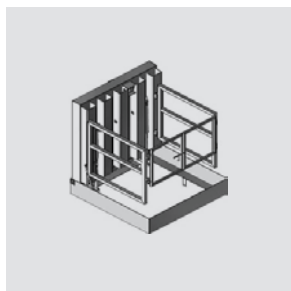
NT-B 1000×1000-DN800	B	12.5	square	1000×1000	222	120	DN 800
NT-B 1000×1000-800×800	B	12.5	square	1000×1000	222	120	800×800
NT-B 1200×1200-DN1000	B	12.5	square	1200×1200	222	120	DN 1000
NT-B 1200×1200-1000×1000	B	12.5	square	1200×1200	222	120	1000×1000
NT-D 900×900-DN625	D	40	square	900×900	222	120	DN 600 / 625
NT-D 900×900-600×600	D	40	square	900×900	222	120	600×600
NT-D 900×900-DN700	D	40	square	900×900	222	120	DN 700
NT-D 900×900-700×700	D	40	square	900×900	222	120	700×700
NT-D 1000×1000-DN800	D	40	square	1000×1000	222	120	DN 800
NT-D 1000×1000-800×800	D	40	square	1000×1000	222	120	800×800
NT-D 1200×1200-DN1000	D	40	square	1200×1200	222	120	DN 1000
NT-D 1200×1200-1000×1000	D	40	square	1200×1200	222	120	1000×1000

VONROLL TOP – PLANTABLE



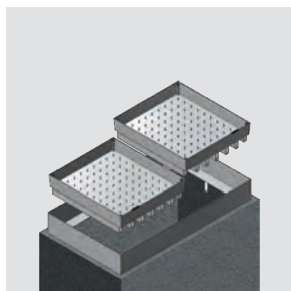
NT-A 900×900-DN625	A	1.5	square	900×900	222	120	DN 600 / 625
NT-A 900×900-600×600	A	1.5	square	900×900	222	120	600×600
NT-A 900×900-DN700	A	1.5	square	900×900	222	120	DN 700
NT-A 900×900-700×700	A	1.5	square	900×900	222	120	700×700
NT-A 1000×1000-DN800	A	1.5	square	1000×1000	222	120	DN 800
NT-A 1000×1000-800×800	A	1.5	square	1000×1000	222	120	800×800
NT-A 1200×1200-DN1000	A	1.5	square	1200×1200	222	120	DN 1000
NT-A 1200×1200-1000×1000	A	1.5	square	1200×1200	222	120	1000×1000
NT-B 900×900-DN625	B	12.5	square	900×900	222	120	Dn 600 / 625
NT-B 900×900-600×600	B	12.5	square	900×900	222	120	600×600
NT-B 900×900-DN700	B	12.5	square	900×900	222	120	DN 700
NT-B 900×900-700×700	B	12.5	square	900×900	222	120	700×700
NT-B 1000×1000-DN800	B	12.5	square	1000×1000	222	120	DN 800
NT-B 1000×1000-800×800	B	12.5	square	1000×1000	222	120	800×800
NT-B 1200×1200-DN1000	B	12.5	square	1200×1200	222	120	DN 1000
NT-B 1200×1200-1000×1000	B	12.5	square	1200×1200	222	120	1000×1000

VONROLL TOP EASYLIFTUP GALA – PLANTABLE



Surcharge für higher tub depth	100 mm	120 mm	140 mm
Outer frame 500 × 500	44.00	60.00	109.00
Outer frame 600 × 600	48.00	68.00	124.00
Outer frame 700 × 700	52.00	76.00	135.00
Outer frame 800 × 800	60.00	84.00	160.00
Outer frame 900 × 900	68.00	99.00	160.00
Outer frame 1000 × 1000	76.00	115.00	175.00
Outer frame 1200 × 1200	96.00	135.00	202.00
Surcharge for stainless steel railing			
Ring pipe DN1000 with 30 cm height for insertion into PE shaft			
Pressure or gas-tight intermediate plate screwed in place 900 × 900-DN625A			
Cable opening			

MULTI-PART STAINLESS STEEL MANHOLE COVERS



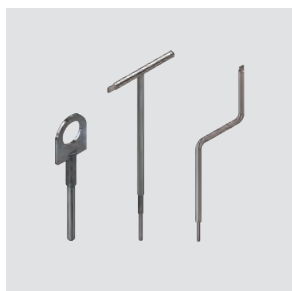
Code-No.	Load class	loadable up to (to)	Frame design	Frame dimension (mm)	Total height (mm)	Tube height (mm)	Opening (mm)
300	D	40	square	2200 × 1200	180	70	2000 × 1000
300	D	40	square	3200 × 1200	180	70	3000 × 1000

CHECKER PLATE STAINLESS STEEL MANHOLE COVERS



All equal in price to the paving covers

ACTUATION SETS AND ADDITIONAL EQUIPMENT FOR STAINLESS STEEL MANHOLE COVERS



T-shaped lever wrench with slotted screwdriver
Lifting eye
Opening key – Crank (at LIFTUP) always with the manhole cover
Screw locking 2-fold over corner
Stainless steel surcharge V4A
Lockable
4 Mounting straps 300×50
Spigot ½" for drainage
Weld-on flange for gasket (per m)
Lifting with double slots, 2 piece
Insulation (per m²)

Outer frame
500 × 500 Daytime waterproof /with ventilation
600 × 600 Daytime waterproof /with ventilation
700 × 700 Daytime waterproof /with ventilation
800 × 800 Daytime waterproof /with ventilation
900 × 900 Daytime waterproof /with ventilation
1000 × 1000 Daytime waterproof /with ventilation
1200 × 1200 Daytime waterproof /with ventilation