EW INVEST

SYSTEM TVR T

CATALOG

Plastic elements for adjustment and assembly of manholes and rain water drains

Note:
Information contained in this document is an auxiliary material and in any case does not release from the duty to follow the valid Law, standards, guidelines, or engineering. Failure to observe the above cannot be the basis of any claims towards EW Invest.

1. General information

Introduction:

At the beginning of 21st century, EW Invest began manufacturing compensation rings, relief cones, and adapters from plastic as the first company on the Polish market. They are a part of innovative system of elements necessary to build tight surface finials of sanitary and rain water manholes.

The current requirements set before elements directly supporting manholes and drains are exceptionally high. Applied solutions must show high resistance to burdens caused by traffic and aggressive influence of operating environment. Providing such load-bearing capacity, tightness, safety, and structural strength of a well surface finial is the basic requirement to fulfil.

When creating the TVR T System, we carried out the identification of threats and thorough analysis of commonly occurring sewer manhole damages. We were interested by the causes and conditions of occurrence of damaged sewer manholes, damages in the area of finials, and destruction of surface around manholes and drains. We gave particular attention to the selection and properties of construction materials contained in a manhole finial, their mutual interaction, and problems related to the assembly technique, height adjustment, and operation in areas burdened by vehicle traffic.

Operating studies and tests conducted in various conditions of road loads and difficult weather conditions, carried out a.o. in the Nordic countries, have confirmed the usability of our material and construction solutions to a broad use in the manhole surface finials.

Height adjustment of a manhole done on TVR T System elements

Conclusions, results of analyses and tests, and collected research material became the basis for determining the directions of searching the best construction solutions. We further developed rules and guidelines regarding the correct installation and assembly of manholes and drains based on prefabricated elements of TVR T System surface finials.

Thanks to the use of a many years of experience in processing and use of thermoplastic materials, implementation of innovative construction solutions, and the application of modern manufacturing techniques, the products of EW Invest meet the highest quality and durability requirement. They ensure the safety of use and allow to solve numerous traditional problems met during the construction of new manhole finials, as well as during repairs and rehabilitation of existing sewage system finials.

We elaborated and implemented a modern system comprising of a series of mutually compatible adjustment, relief, cover, and support elements with universal applications that are made from plastic.

Manhole finial rehabilitation done based on TVR T System adjustment elements

The high product unification and universality level has made possible to use our product in various manhole systems, both concrete made acc. to **PN-EN-1917**, **DIN 4034**, and **DIN 4052** and made from plastics pursuant with **PN-EN 13598-2.**

They meet all the technical and construction requirements of sewage systems used on the European market. We gave much attention to the direct construction fit of TVR T System elements to cast-iron manholes and drains.

TVR T System connects into an integral, tight, safe, and coherent by design whole - a manhole with finial. It eliminates the negative influence of finials on elements directly supporting them and secures the manhole and sewage drain shafts, construction environment of manholes, and surface against any damage.

EW INVEST develops technology and production. The Company creates new products, complex construction solutions, shows new ways of using them, and ensures the training and technical support, as well as a more efficient logistics.

We offer a broad assortment of products that allows you to correctly adjust the height of manholes and install the finials of majority of manholes and drains available on the market.

TVR T System is recognised by designers, contractors, and operators. It is increasingly used as a standard solution and essential element of surface finials, manholes, and sewage drains.

Prefabricated plastic surface finial elements of TVR T System have been implemented as a system solutions in the placement of manholes and drains by the leading European producers and suppliers of sewage systems.

2. Legal aspects - approval for use

For the elements of surface finials made from recyclate plastics, the reference document for TVR T System manholes manufactured by EW INVEST is the National Technical Assessment No. IBDiM-KOT-2017/0047, issue no. 1 dated 30th August 2017.

The Road and Bridge Research Institute gave a positive review of user properties of the construction product for the intended use in communication engineering in the scope of:

- public roads without restrictions,
- internal roads without restrictions,
- road and train structures without restrictions.

The "TVR T System" prefabricated recyclate surface finial elements can be used in areas intended for vehicle and pedestrian and bicycle traffic, as well as in greenbelts separating lanes and other areas related to communication engineering.

By meeting the requirements determined in the National Technical Assessment, EW INVEST manufacturer has issued National Declarations of Performance for the manufactured surface finial elements made from recyclate plastics for manholes and has labelled its products with "B" sign.

All surface finial elements made from plastic comprising the TVR T System during the production are covered by an on-going quality control carried out under the supervision of Plant Quality Management System. System elements undergo regular durability tests carried out using method determined in standard PN-EN 124-1:07-2015 for class D 400.

Tests of the type of new TVR T System elements, before putting into service, are conducted in the IBDiM Institute in Żmigród. Regular material tests are carried out by the Polymer Institute of West Pomeranian University of Technology in Szczecin. Polymer Institute checks properties in the scope of durability, resilience, dampening, and energy absorption of construction material used to manufacture TVR T System elements. Material studies show high resistance to static contacts and dynamic loads, as well as high ability to dampen traffic vibrations.

3. Labels of TVR T System elements

Product type	Construction product name, construction feature, or intended use
T1	Flat and round compensation rings
T1K	Wedge and round compensation rings for adjustment of manhole and drain inclination angle
T1C	Flat and round compensation rings with assembly openings
T1N	Round compensation rings with central edge
T1R	Round compensation rings with external edge
T2	Compensation rings with chop for placement near kerb
T6	Flat and square compensation rings
ECO2	Square compensation rings with external edge
T3	Relief cones
T04	Square relief foundation slabs
T06	Round relief foundation slabs
T08	Octagonal relief foundation slabs
TX	Adapters placed under manholes and drains
TXP	Adapters placed under telescope manholes and drains and street boxes
TXO	Cover adapters for manholes, drains, and street boxes
TXS	Leading rings for self-levelling manholes and drains. Adapters

The naming of TVR T System elements contain in its index a upper case T letter - along with numeric and character information it informs about the element type. In the central part of index is contained information about the DN/ID internal diameter and H height of an element

3. 1. Marking of TVR T System elements according to the National Technical Assessment No. IBDiM-KOT-2017/0047 contains the following applied data:

- Name and/or Manufacturer's symbol: EW INVEST
- Construction product label, e.g.: T1R/625/40
- Number and year of issuance of National Technical Assessment: No. IBDiM-KOT-2017/0047
- Class of declared useful properties: D400
- Construction sign

4. TVR T System elements - Designation

To the surface finial elements for "TRV T System" manholes belong:

- compensation rings,
- foundation slabs,
- relief rings and cones,
- adapters placed under drains and manholes,
- support and protective elements of infrastructure fittings.

Those elements are prefabricated made from a mixture of thermoplastic plastics. They constitute the integral structure supporting manhole, street drain, and infrastructure fitting equipment finials and are intended to be installed between, around, and on the elements of manholes and street rain water drains, in particular:

4.1. Compensation rings made from plastics are prefabricates used to build surface finials of manholes and drains with DN/ID internal diameter between 150mm and 180mm and height from 10mm to 150mm (in class D400). The broad dimensional scope of compensation rings allows to adjust the total height of manhole or sewage drain based only on the prefabricated elements.

Compensation rings are elements placed on choke, cover plate, relief cone and ring, ring, or upper element of manholes. Their task is to provide technological access to working chambers of the manholes and to ensure the correct support of installed manhole finials. They enable to correct and precisely refer the upper surface of manhole or drain finial to the road surface ordinate.

TVR T System compensation rings are compatible among other with other manhole elements manufactured acc. to PN-EN 1917:2004, DIN 3034 p. 1 and 2, and DIN 4052. They supplement the height adjustment ability of standard concrete well systems and constitute an economic alternative for adjustment elements described in the standards mentioned above.

The dimensions and structure of compensation rings made from plastics allow to adjust and make a coherent structural connection of manhole and finial elements into a permanent, tight, and seamless upper manhole element.

Manhole finial made based on T1R/625 and T1/600 compensation rings along with T1K/600/9/22 wedge rings. Height adjustment 24 cm. Compensation and repair layer made based on poured resin mass.

The polygonal adjustment elements for wells marked with **T6** and **ECO$_2$** symbols are the prefabricated TVR T System elements in class C250 and D400 used to construct surface finials of manholes with square or rectangular cross-section. They are used for height adjustment. They are also the construction elements necessary to construct and install manholes and non-manholes with square body plates. ECO2 elements are also used to construct water meter, tele-communication, and gas wells.

Compensation rings and ECO2 elements of TVR T System are intended for, among others:

- adjusting the height of a manhole or rain water drain to the surface ordinate,
- adjusting the inclination angle of manhole and street non-manhole drain finials,
- securing the manhole or street drain shaft against the negative influence of cast-iron finial bodies subject to traffic loads,
- securing the concrete elements (surface finials) against the negative influence of environmental factors,
- installing a manhole finial, providing the whole load-bearing surface of the body, and equal and tight support on manholes made from concrete and plastics,
- providing a construction support for other surface finial elements, such as: rings leading to self-levelling finials, foundation slabs, adapters placed under drains,
- dampening, absorbing, and dispersing traffic vibrations.

4.2. Adapters

Adapters, leading rings made from plastics for self-levelling finials marked with **TXS** symbol are prefabricated elements in class D400 constituting as the upper element of a manhole surface finial that allows to install and assemble a manhole or floating drain (based on the asphalt road surface). Adapters are placed directly on a choke, cover plate, foundation slab, and compensation rings, as well as on a compacted substructure or in the road structure. They allow to centrically install the self-levelling manhole and tightly connect it with a well. The structure of adapters includes all technical details, dimensions, and assembly guidelines of floating finials that allow to connect the floating finial with well in a correct and construction coherent manner. Dimensional scope covers adapters with DN/ID internal dimensions of 200÷820mm and H heights of 45÷125mm.

TXS/635/80 adapter/leading ring supporting the EASY LOCK self-levelling manhole during assembly.

Adapters placed under drains (sewage drain finials) made from plastics and marked with **TX** symbol are prefabricated elements in class D400 used to construct tight surface finials of sewage drains, rain water wells, and other devices used to receive surface water. Adapters are the direct supporting/load-bearing element of sewage drain finial that simultaneously ensures support on the whole load-bearing surface of device's body. It is placed directly on: DN500 or DN450 concrete sewage drain rings, cones, rings, relief and self-levelling elements made from concrete or plastics, and telescopes. Drain openings in the adapters are placed in a centric or eccentric manner and their construction is adjusted to the dimensions and structures of sewage drain finials.

TX/765/410 adapter prepared for the assembly of a 400x600 street drain, placed on a DN450 concrete rain water well.

Adapters, support and protective elements marked with **TXP** symbol, are prefabricated elements made from plastics that constitute as a direct support for telescope finials of plastic wells placed in the area of vehicle traffic, as well as elements that are the foundation and cover for street boxes manufactured acc. to PN-EN 74081, DIN: 4056, DIN: 4058, DIN 4059, etc. Elements in the form of slabs, pyramids, or rings placed directly under infrastructure fitting elements both in the structure of road surface and roadside create a seamless construction element.

Adapters placed under manholes and drains, support and protective elements for infrastructure fittings marked with TX, TXP, TXO, and TXS symbols, are intended for:

- installing a sewage drain finial, ensuring the whole load-bearing surface of a body, and equal, tight, and permanent support on wells and rain water drains made from concrete and plastics,
- enabling the assembly (diameter and height adjustment), connecting well surface finial with manhole or self-levelling drain installed on/in road surface,
- providing a direct and indirect support, installing telescope finials of manholes and drains of plastic wells in the road surface structure,
- providing a construction support (basis, foundation, cover) for telescope finials, self-levelling plastic wells and street boxes, and infrastructure fitting elements,
- securing the road surface against a negative influence of devices and finials subject to traffic and environmental loads,
- providing a construction support for recreated or installed anew road surface around the finial of a street drain or manhole.

4.3. Relief cones, covers, and rings

TVR T System relief cones, rings, and (foundation) slabs made from plastics are elements used to construct surface finials of manholes and non-manholes installed in areas of vehicle traffic, as well as outside of it, marked with **T3** and **T04** symbols, and in class A15, B125, and D400. Elements relieving shafts of ascending pipes of plastic wells and concrete rings simultaneously allow to adjust the height of a well and constitute as a protective element and element allowing to support/install well finial. They also constitute as a support for telescopes of plastic wells and foundation for installing compensation rings and adapters. The structure of relief rings and cones is compatible with the upper elements of appropriate sewer and rain water manhole made acc. to PN-EN 1917:2004 and PN-EN 13598-2:2009. As the construction surface elements of plastic wells, they meet the suitability for use conditions determined, among others, in PN-EN 14802:2005.

T3/615 relief cone securing a shaft pipe of DN600 well.

Relief rings and cones, foundation slabs marked with T3, T04, T06, and T08 symbols, are intended for:

- moving traffic loads influencing the manhole and non-manhole finials, and street drains outside of the shaft of a well to the construction layers of ground or road surface,
- securing a sewer manhole shaft against damages resulting from vehicle traffic both in horizontal and vertical plane,
- adjusting the height of a sewer manhole to the road surface ordinate,
- reducing the free clearance and internal diameter of shaft pipe (chimney) of a manhole, inspection chamber, or street drain,
- creating a construction support (base and foundation) for compensation rings, adapters, as well as directly for manhole and street drain finials and for recreated or installed anew road surface around the finial of a street drain or manhole.

T04/850/620/50 foundation slab installed on T1/600 compensation rings and surface substructure, prepared for assembly of a manhole with 850x850 square plate.

5. Properties, parameters, and structure of TVR T System elements

- Material - composition of thermoplastic polymers (PVC, PE, and PEX) with viscoelastic properties that compensate tensions and is resistant to crawling in operating conditions.
- Hardness ≥ 46 Sh D according to PN-EN ISO 868:2005.
- Absorbability - 0.02% according to PN EN ISO 62:2008.
- Resistance to compression - 400 kN according to PN-EN 124-1:2015-07.
- Mechanical loss - ni=33%.
- Frost resistance in F 150 water (without the change of resistance and surface structure) according to the IBDiM research procedure No. PB/TB-1/23.
- Frost resistance in a 2% NaCl - F50 solution (without the change of resistance and surface structure) according to the IBDiM research procedure No. TWm-36/98. Exceptionally high resistance to regular freezing. Material is resistant to so-called passes through 0°C. Characterised by a low heat conductivity. Exceptionally good thermal insulator.
- Thermal resistance from -30 to +60°C in the conditions of constant work and up to 180°C during an assembly in asphalt surface (exceptionally good surface adhesion of the materials).
- Chemical resistance - high resistance to acids, alkaline, oil, salts, solvents, and fats in concentrations occurring in sewage and surface rain water and snowmelt. Resistant to sulphate, carbon-acid, magnesium, general acid, and lye corrosion.
- High resistance to biological corrosion (caused by lichens, algae, fungi, or plants).
- Exceptionally good vibration insulation properties: vibration dampening, high absorption and energy dispersion ratio.

TVR T System based on prefabricated plastic elements used to build tight surface finials of sewage manholes and street drains fully meets the requirements set before modern structures supporting manhole finials. Surface finial elements made from recyclate plastics for sewer manholes are integral, alternative upper structure elements of manholes and non-manholes and rain water drains described with standards PN-EN 1917, DIN 4034, and DIN 4052.

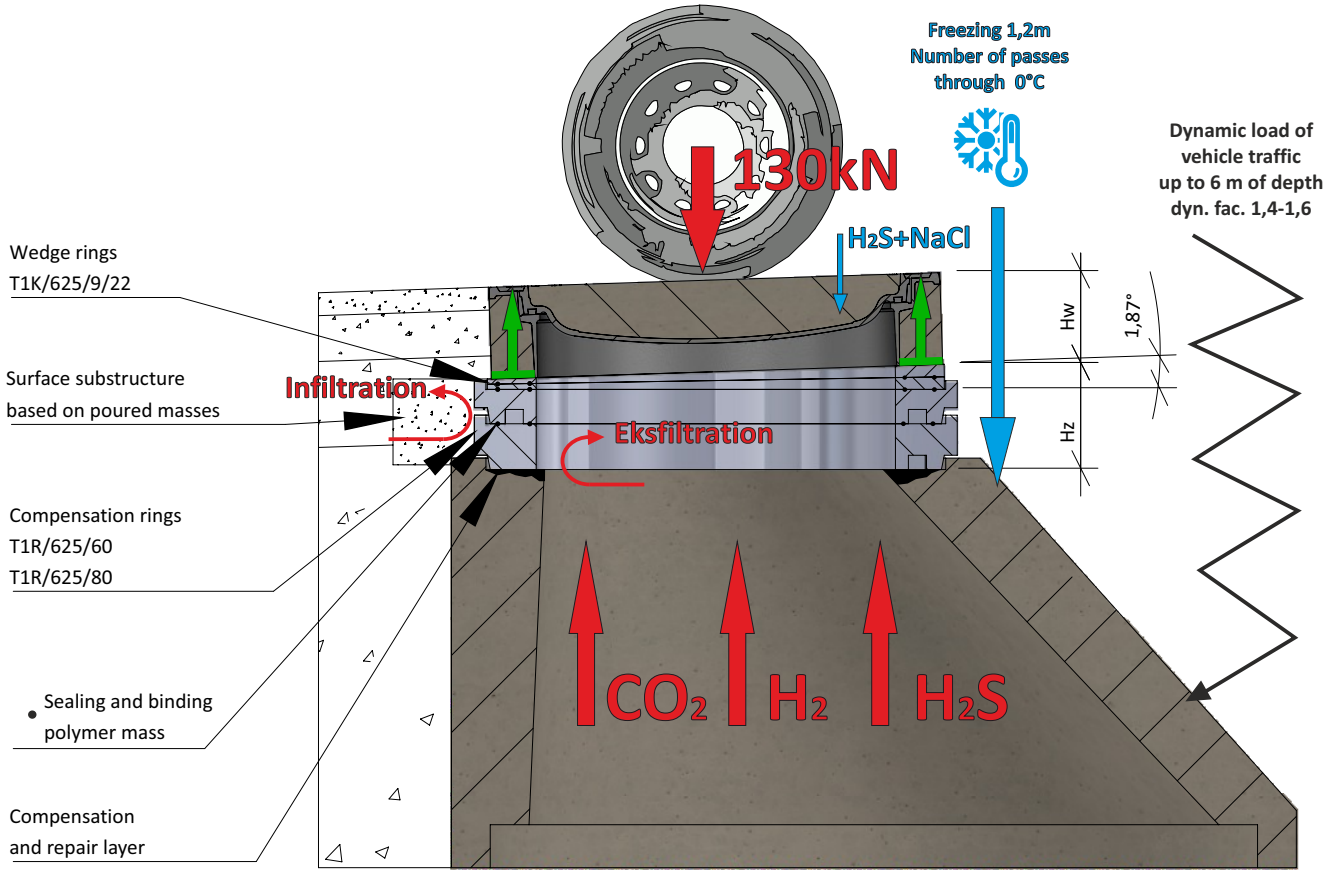


Fig. 1. Tight TVR T System surface finials - resistant to operating conditions.

6. Advantages and pros of using TVR T System elements

- Accurate adjustment of height and inclination angle of manholes and street drains allows to make a precise height reference of sewage manhole to road surface or terrain ordinate using the prefabricated elements with broad selection of heights and diameters of TVR T System series of types.
- Perfect co-operation with manholes and drains and other structure elements of sewer manhole surface finials. System provides a full support for load-bearing elements of manhole and drain bodies and frames and eliminates destructive compression points.
- Significant reduction of surface defects caused by traffic, surface cracking, and influence of water subject to freezing and melting due to a high tightness of connections of finial elements and flexibility and frost resistance of structure material of TVR T system elements.
- Significant elimination of reflected cracks occurring around the manhole finial thanks to the dampening-amortisation-dispersion effect.
- Smaller weight of specific elements that allows to eliminate or restrict the operation of heavy construction equipment and reduce effort and load of workers. Lower logistics and work costs.
- High resistance to the influence of operating environment factors, high chemical resistance to, among others de-icing salt and other substances, and high biological resistance.
- Easy and quick assembly in any weather conditions, achievement of D400 structure resistance and tightness immediately after the assembly.
- Increased safety and comfort in traffic thanks to the use of materials with guaranteed load resistance in class D400.
- TVR T System elements do not require additional protective layers and maintenance.

7. Conditions for using TVR T System elements

Conditions for installation, construction, assembly, and use of surface finial elements made from recycled plastics should be pursuant with the generally adopted rules of design, placement, and assembly of sewage systems determined in PN-EN 1610, PN-EN 476, PN-EN 13598, and other standards related to the water supply and sewage construction, as well as with the general guidelines and detailed technical specifications of the Manufacturer. The use of TVR T System finial elements made from recyclate plastics should be based on construction pr oject taking into account ground conditions and envisioned operating load, technical recommendations, and operating and assembly manuals of sewage manholes and their finials that are based on technical catalogues and manuals of manufacturers of sewage and finial systems.

The compensation rings of TVR T System can be assembled on sewage manholes and drains and other technical fitting devices provided that the mentioned objects are in a good technical condition and will move loads caused by a current and future vehicle and pedestrian traffic in a safe way.

Intense operation of manhole finial. Complete degradation of compensation rings, concrete levelling and binding mortars, and crack of cover plate. Lack of ability to rehabilitate the finial without the replacement of damaged well cover plate.

Any repairs and renovations of sewage manholes, sewage drains, and fitting devices, in particular rings, plate placed on well, chokes, and relief rings, should be carried out before the assembly of new surface finial with the use of TVR T System elements.

Compensation rings require the provision of a prepared, levelled, stable, consolidated, and durable base/foundation on which they are to be installed.

Choke of DN625 concrete well in a good technical condition that meets the requirements to assemble a surface finial. Small defects and irregularities are to be levelled with levelling layer.

Any detected irregularities, defects, and technological errors of elements constituting a direct support for compensation rings and other TVR T System elements should be removed using a repair and levelling layer. The repair and levelling layer should be made from waterproof fast-setting masses resistant to sulphates, frost, and de-icing salts based on cements or resins with a minimum 10N/mm^2 compression resistance after 60 minutes, 55N/mm^2 after 28 days, and F100 frost resistance. Material is pursuant with standard PN-EN 1504-3.

Application of a cement-based, fast-setting, flexible repair and levelling mass. Exceptionally short binding time allows to immediately assemble the surface finial elements.

Before the assembly of surface finials with the use of TVR T System elements, you should:

- check whether the diameter dimensions of compensation rings are correct for a given well of drain,
- check whether the construction elements of manhole and sewage drain finials are adjusted to the intended use by design,
- check whether the finial class is adjusted for a given location and road load,
- check for any signs of design collision of finial elements (cast-iron manholes and drains) with elements directly supporting them.

For the height adjustment you should choose such rings from the series of types, which allow to adjust the height of upper finial surface of a manhole or sewage drain to the road surface ordinate. We advise you to make a surface finial using as few compensation rings as possible so that the smallest number of seams will be present in the built finial.

Installed compensation rings and other TVR T System elements should touch with their whole surface:
- upper elements of sewage manhole shafts,
- sewage drains,
- chokes,
- cover plates,
- relief cones or rings.

Unacceptable lack of support for compensation rings, adapters. Finial does not provide load-bearing capacity, tightness, and safety of the structure!

Compensation rings should be placed centrically over the manhole/revision opening of a well, one on another, until the total required adjustment height is reached. During the adjustment take into account the application of wedge rings that allow to level the finial to the vertical and horizontal drops of road surface. Wedge rings are also a height adjustment element.

Incorrect ring arrangement (lack of centricity), lack of correct support between the elements

Surface finial of DN600 sewage well with height of 24 cm consisting of mutually compatible T1R/625 and T1/600 compensation rings and T1K/600/9/22 wedge rings.

On the internal and external sides between all the finial elements and on the upper surface of compensation element/ring you should apply a seamless polymer mass seal (shaft with 3÷5mm diameter). Tightly press the upper finial element in order to correctly distribute the sealing mass and remove possible “on height” error caused by the sealing mass.

Application of flexible sealing and binding polymer mass between all the adjustment elements and cast-iron.

The recommended surface finial height made with the use of TVR T System adjustment elements depends on the type, function, and location of sewage well and amounts to:

- 20÷30cm of height for manhole sewage wells made from concrete,
- 50÷60cm for manhole wells made from plastics with reference to the height of relief elements (15÷20cm),
- up to 70cm of height for non-manhole wells, inspection chambers, and rain water drains made from concrete or plastics.

All the mentioned wells may be located in the traffic area, groups 1÷4, up to and including class D400, acc. to PN-EN 124-1:2015.

Structure of a tight surface finial of concrete well with DN625 manhole opening made only on the base of TVR T System plastic rings. Height adjustment of 24,3 cm that refers to surface inclination angle. Lack of joints based on cement mortars. Polymer masses are used as sealing material.

Plastic compensation rings can be placed directly on compensation rings made from concrete while being a supplement for the adjustment capabilities of concrete rings system. Therefore, they allow to make a total height adjustment using ready prefabricates. They adjust the manhole inclination angle and its reference to road surface drops. We especially recommend the application of plastic compensation rings in the adjustment range from 0 to 60mm (lack of operationally durable concrete prefabricates with height up to 50mm) thanks to the ability to use rings with heights of 10mm, 15mm, 30mm, and 40mm and 9/22mm, 15/28mm, and 30/60mm wedge rings directly under the cast-iron finial.

TVR T System elements are compatible with the concrete elements of sewage wells made acc. to PN-EN 1917, DIN 4034 p. 1 and 2, and DIN 4052.

Standard application of TVR T System rings in concrete finial structures as the element adjusting the sitting height of manhole and damper. Plastic compensation rings with height of 15, 30, and 40 mm and T1K/600/9/22 or T1K/625/9/22 and T1K/635/30/60mm wedge rings eliminate the use of unreliable cement mortars.

The plates of manhole finial bodies should rest with their whole support surface on the compensation ring.

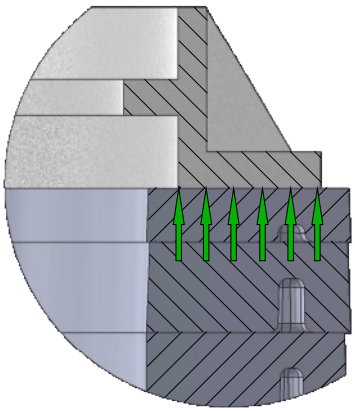


Fig. 2. Correct setting of manhole on compensation rings.

If the external ring diameter is smaller than the external manhole body plate diameter, then use a ring with bigger external diameter and min. 50mm thickness to directly support the manhole. The internal and external diameters of compensation rings that are a direct support for the finial should always be bigger or equal to the internal and external manhole body plate diameters.

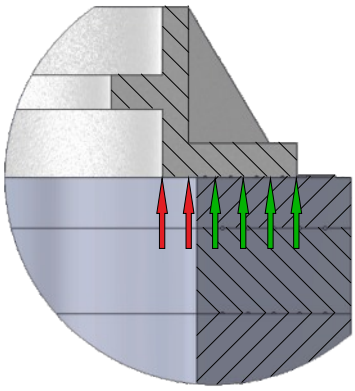


Fig. 3. Incorrect setting of manhole on compensation rings. Possible damage to the manhole and elements supporting from the internal side of the well.

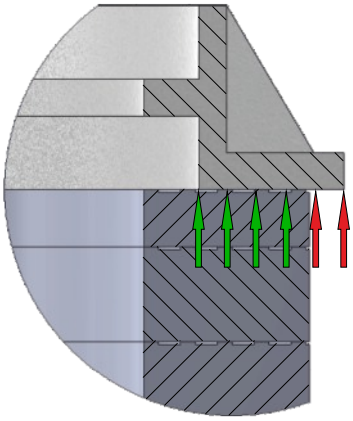


Fig. 4. Incorrect selection of support, compensation, and well finial elements. Lack of design integrity of finial components and lack of support for the portion of manhole body.

Load-bearing structure of a manhole

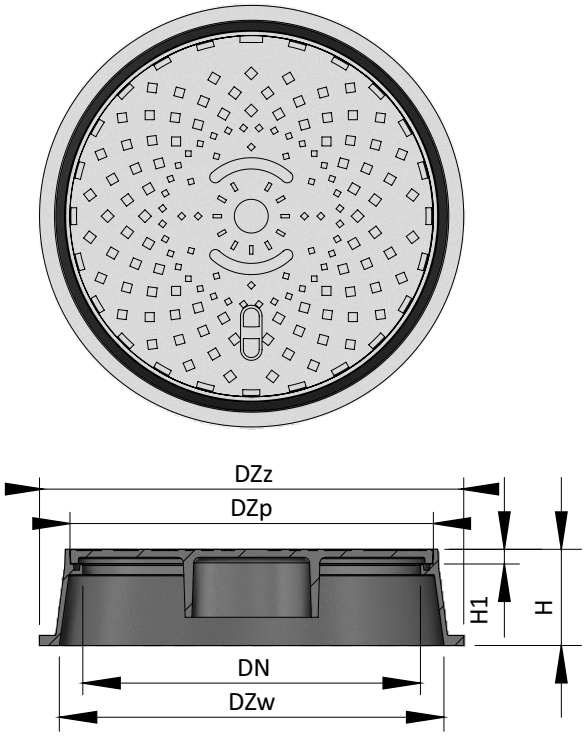


Fig. 5. Load-bearing structure of a manhole
DZz - external body support diameter
DZp - external cover diameter
DN - frame light diameter
DZw - internal body support diameter
H - frame height
H1 - cover setting depth

Important information during the selection of elements supporting manholes is the determination of design dimensions of body load-bearing plate, i.e. the DZw initial body plate support point (Manufacturer very often does not provide this dimension) and DZz end support point. Support points of manhole body, shape, and surface of body load-bearing plate influence the durability of elements supporting manholes. Determine which TVR T System support elements are best suited for setting the manhole and eliminating colliding structures.

Selection of manholes and TVR T System elements

TVR T System elements group			Manholes	
	Dn [mm]	Dz [mm]	DZw (min) [mm]	DZz (max) [mm]
T1/320	320	485	325	480
T1/435	435	580	440	575
T1/500	500	650	505	645
T1/600	600	770	605	765
T1/600/D	600	790	605	785
T1/625	625	790	630	785
T1R/625	625	810	630	805
T1/620	625	850	630	845
T1C/620	620	870	625	865
T1/700	700	875	705	870
T1/800	800	960	805	955
T3/615	615	780	620	775
T3/615/BR	615	840	620	835

Table depicting ring selection to manhole size.

At plates of multisided frame manhole bodies we advise you to use foundation slab (T04) that will provide the body with a support of the whole load-bearing surface and will secure the surface around the adjusted well against cracking.

Ductile cast iron manhole with square body plate of 850x850mm set on a T04/850/620/50 foundation slab that provides the full support of the manhole. Manhole anchored to the slab with bolts. Height adjustment is done using T1/600 compensation rings.

If the bodies of manhole finials or sewage drain finials are prepared by design and their manufacturer recommends anchoring, you can anchor the said finial using bolts for TVR T System elements.

Distance rings can be hot processed from the exterior with a mineral-bituminous mix (asphalt concrete) or concrete.

Preparation of a structure supporting self-levelling manhole made from TVR T System elements and hot asphalt mass. The temperature of asphalt mass (170° C) has no influence on the parameters of compensation and leading rings during the installation.

Diagram of sewage well surface finial made from prefabricated TVR T System elements

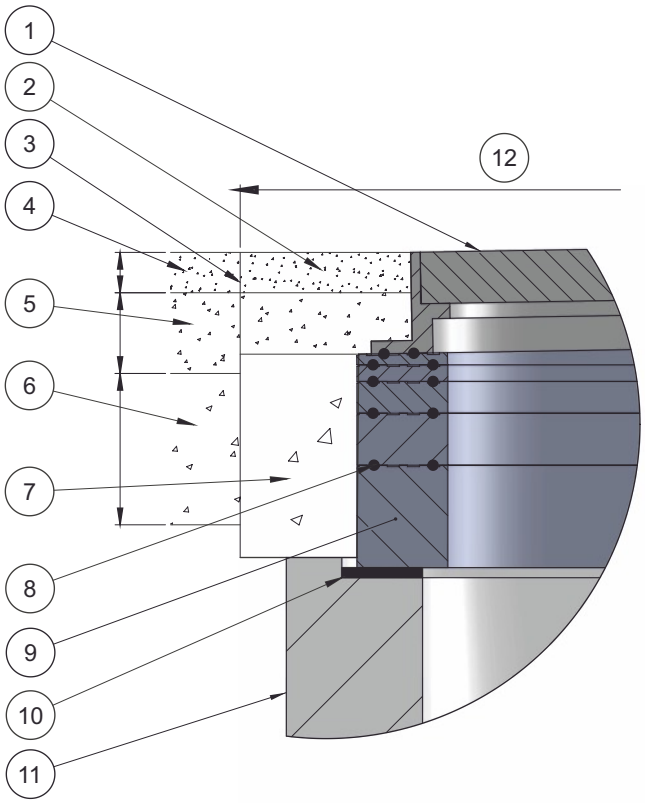


Fig. 6.
1. Manhole, e.g. class D400 2. Wearing layer of asphalt (reconstruction layer made after the manhole is adjusted) 3. Bituminous joint filler tape or poured mass between the old and new asphalt layers 4. Wearing layer 5. Binding load-bearing layer (thickness of the layer acc. to road category) 6. Frost resistant substructure 7. External reconstruction environment (fill of space between the finial and old road structure) made based on poured masses and aggregate. 8. Polymer sealing mass applied between all components of the finial. 9. TVR T System compensation rings adjusted by diameter and height to the well finial structure. 10. Repair and levelling layer of foundation for setting adjustment elements. 11. Choke or cover plate of the well. 12. Road surface area subject to removal during the rehabilitation of the finial (e.g. 1100mm circle)

After the execution of finial adjustment and assembly make/rebuild the road surface structure according to the project, SST, and load category. We advise you to make a substructure of road layer between the surface finial elements and the old structure using poured masses with the addition of crushed-stone aggregate maximum up to the height finial body plate. Concrete elements should not cover the finial body plates. Asphalt masses of specific layers should be hot-finished with the correct concentration and fill the whole area around the adjusted finial. Entry into service should take into account the necessary time of complete cooling of asphalt mass that allows its use.

7.1. Remarks concerning assembly conditions

During the height adjustment of sewer manholes and sewage drains with the use of TVR T System compensation rings, relief cones, and plastic adapters it is unacceptable to:

- **assemble the plastic surface finial elements on an unprepared ground, uneven, unlevelled, and not repaired surface supporting the adjustment elements and in case of relief elements - on an uncompacted ground or substructure,**
- **use cement-based mortar between plastic elements in the finial structure and between plastic and cast-iron elements of well finial,**
- **use rods, sheets, stones, rubble, rings cut into pieces, plates, etc. - elements that destroy or operate in one point to adjust, place foundations on/under plastic elements,**
- **place new surface without making a correct reconstruction/filling/compacting the area around the surface finial and without securing the adjustment elements against horizontal movement,**
- **make high adjustment based only on compensation rings with small dimensions (e.g. 21cm adjustment made using 10 pcs of 15mm rings and 2 pcs of 3cm rings), as the possibility of height problem occurring during the operation increases the finial costs without any justification,**
- **make adjustments contrary to the surface finial elements manufacturer's recommendations and manual.**

8. Conditions of using plastic well finials

urface finials for plastic wells comprise of relief rings, cones, and slab placed around the well shaft pipe in a centric manner. The basic task of TVR T System elements is to fully protect and relief the structure of a plastic well, shaft pipe, and sump from loads caused by road traffic. Relief elements should be assembled on properly prepared load-bearing structure that ensures safe movement of loads on the ground or surface structure layers.

Carry out compacting acc. to PN-ENV 1046:2007 so that a soil compaction degree bigger than 98% on Proctor's scale is achieved in the areas exposed to dynamic load originating from vehicle traffic (groups 3 and 4 of the construction site acc. to PN-EN 124-1). In areas with limited traffic and loads (groups 1 and 2) soil compaction should have > 95 and ≤ 98% on Proctor's scale.

We advise to possible application of:

- oil stabilisation using sand with cement in 1:4 ratio
- installation of relief elements on geotextile sheet with diameter of 1200mm.

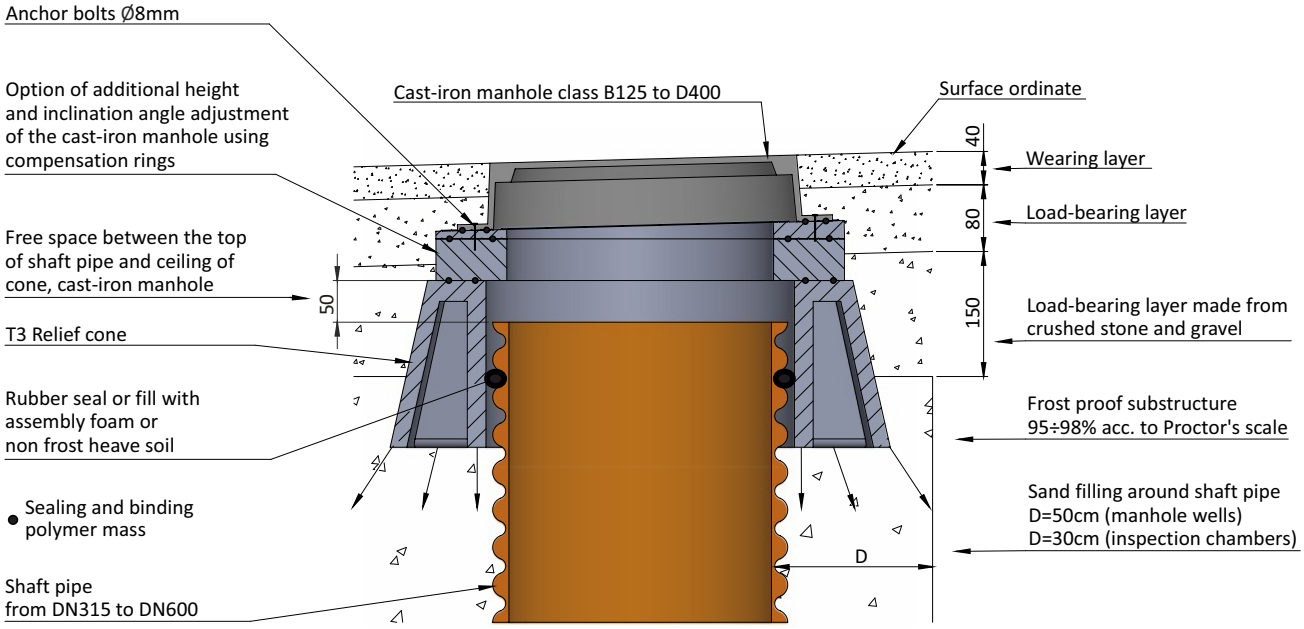


Fig. 7. Surface finial of plastic wells

The ascending/shaft pipe of plastic well should be separated with a structure gap with width of at least 5cm of free space between the top of the pipe and upper surface of the relief element. It is advised to make a seal between the external shaft pipe wall and internal relief element surface.

In case of changes of the surface ordinate after the adjustment of plastic well according to manufacturer's guidelines you can make an additional adjustment using compensating rings installed on relief elements.

TVR T System relief cones constitute as a foundation for compensation and leading rings, as well as adapters placed under sewage drains. They provide a direct support for manholes and drains. They increase the protection of fortified surface around the manhole through elimination of reflected cracks while using a dampening-amortisation-dispersion effect that is the property of a material used to make them.

** Application diagrams for TVR T System elements and example design solutions for plastic well finials are located on p.: 67÷87.*

Telescope finials of plastic wells can be additionally supported by the TXP and TXO adapters and T3 cones. Support and protective TVR T System elements increase the support and influence surfaces of manholes/telescope drains. They can be installed directly under the load-bearing body of a manhole or indirectly in construction layers of road surface. They eliminate the manhole collapse effect and creation of cracks in the road surface.

Telescope manhole for DN315 well damaged due to the lack of even and permanent support.

9. Surface finials of concrete street drains

The basic task of rain water drains placed on rain water well is to receive surface rain water and snowmelt and lead them into the rain sewer system. The arrangement of drains constituting as drainage of fortified surfaces depends on the type, and size of surface subject to drainage to which are adjusted the size and amount of drain installed on a given water catchment area. Traffic load forces the application of appropriate class of sewage drain finials and appropriate design solution that ensures the correct installation and operation of a drain.

Exploited roadway drain. Location is unfavourable - buses regularly ride over the drain. Surface cracks are caused by the lack of finial tightness and lack of substructure.

Operating efficiency and operation durability of street drains is significantly influenced by the correct location of a drain in the area of a lane. Placing drains in the lowest places of water collection from roadway surface and minimising the possibility and frequency of vehicles riding over the drain will ensure the high efficiency of water collection and high durability of road reinforcement. In urban areas and intensively exploited lanes it is advised to use kerb-roadway drains, kerb drains, or roadway drains placed in drain bays.

Verification of technical condition of a drain. Drain is collapsed. The grate in the frame is lowered.

DN500 type concrete street drains, made based on standard PN-EN 1917:2004, consist of a bottom element, indirect rings with height of 0.5 ÷ 1m, and elements constituting as a finial of drain, relief or distance ring, and cover plate. Adjustment elements and elements providing design reference of well to the cast-iron drain element do not occur in the system of concrete street drains. The finial is characterised by relieving the street drain structure at total lack of surface finial tightness and hard and demanding assembly.

The solution for traditional sewage drains assembly and operation problems is TVR T System, which introduces new material elements and construction rules for street drain surface finials.

TVR T System surface finials of the DN450 and DN500 concrete drains consist of T1/435/15÷100 and T1/500/15÷100 compensation rings, T1K/435/9/22 and T1K/500/9/22 wedge rings used to adjust drain inclination angle, T2/500/15÷100 compensation rings with preparation for placement near a kerb, and universal adapters placed under drains. Compensation rings with a broad height range ensure the rain water well height adjustment between the indirect rings and adapter placed under cast-iron drains.

TVR T System elements are a system supplement for traditional rain water wells. Placed on the indirect concrete rings, they allow to precisely refer the height of street drain to road surface and create a seamless, tight surface finial. Height adjustment is done using prefabricated plastic elements without the necessity to cut concrete rings and use cement mortars.

TX/4052/10A, TX/4052/10AP, and TX/765 plastic adapters placed under street drains are placed on a DN450 and DN500 rain water wells adjusted using plastic compensation rings. Adapters allow to correctly install a cast-iron drain and provide a perfect support for the whole surface of body plate.

Openings in the frame plates of drains are covered by adapter's surface - this allows to reconstruct the surface around the drains without problems and ensures a permanent structure tightness. Drains can be anchored to the adapter using M12 screws.

The internal diameters of drainage opening in adapters are smaller from the diameter of the concrete sewage drain and allow for central water flow into the drainage system.

The dampening and amortising properties of the material used to make adapters cause a significant reduction of negative vehicle traffic load influence on the well structure, as well as the cast-iron drain.

Diagram of a tight TVR T System surface finial of a sewage drain.

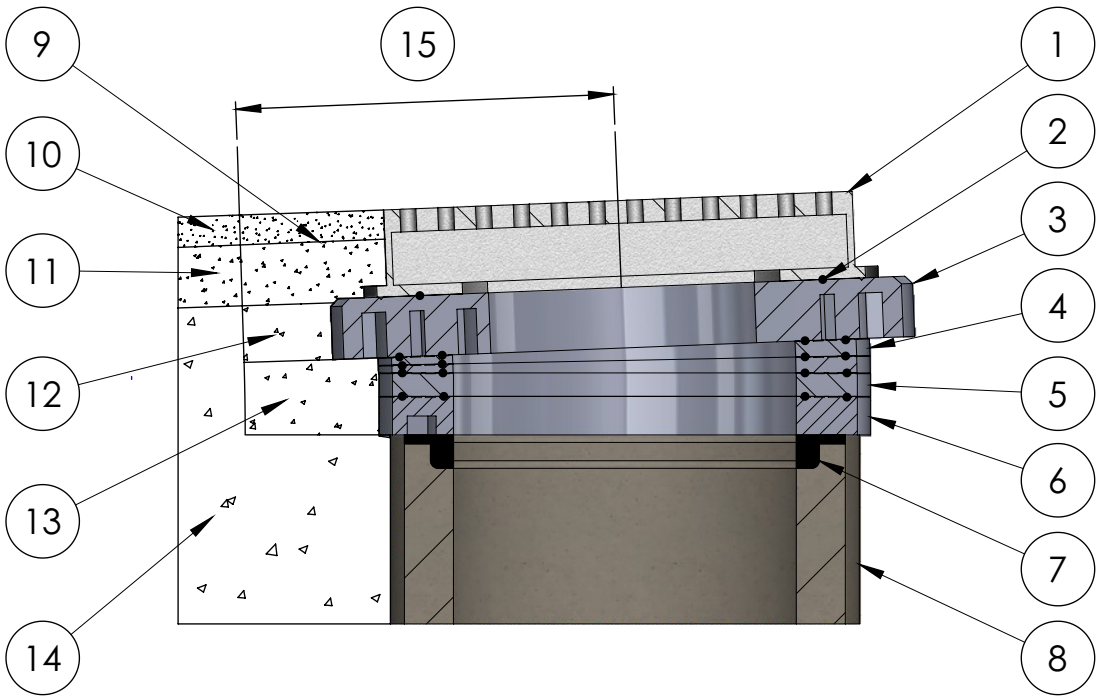


Fig. 8.
1. Full roadway drain 400x600 in class D400 acc. to PN-EN 124-2:2015. External diameter of load-bearing flange of min. Ø 650mm 2. Polymer mass sealing the surfaces between the drain and adapter (also applied between all finial components). 3. Adapter from TX group directly supporting the drain. 4. T1K/500/9/22mm drain inclination angle adjustment rings. 5-6. T1/500 or T2/500 height adjustment rings with internal diameter of Ø500mm, external diameter of Ø650mm, and height of 15, 30, 50, or 100 allowing to make a finial with height up to 60 cm. 7. Compensation and repair layer supplementing the defects and filling the irregularities in drain's concrete rings. 8. Indirect concrete ring of sewage drain with DN 500 internal diameter and external diameter ≥ 650 mm made based on standard PN-EN 1917, from C35/45 class concrete. 9. Reconstruction layer of road surface made on the basis of hot asphalt masses. 10-11. Top and binding layers of road surface made according to the road surface catalogue. 12. Road surface substructure made on the basis of fast-setting poured masses filling any space around the finial after a conducted renovation. 13. Substructure partially supporting the adapter and securing compensation rings against horizontal movement, made on the basis of poured masses. 14. Frost resistant and fortified road surface substructure - 95-98% on Proctor's scale. 15. Minimum area of road surface subject to removal in order to allow the height adjustment.

400x600 street drain, flange 3/4, installed on a TX/765/410/80 adapter. Drain anchored to the adapter. Adapter is secured with poured mass poured around the repaired finial. Poured mass constitutes as a substructure for road surface.

The application of adapter increases the support surface even up to 50% and at the same time reduces the unit compression on well structure. It is advised to use adapters placed under ductile cast-iron drains in order to improve the vibration dampening ratio and adapters placed under drains with body height up to 110 mm. The height of an adapter should be taken into consideration during the adjustment and installation of a drain. It is possible to cut the adapter to match a kerb. Seal between all the drain finial elements should be made using polymer sealing masses.

The reconstruction of surface around the adjusted and installed drain should be done using poured masses in order to secure the surface finial structure against horizontal movement and to provide a permanent load-bearing capacity of road substructure.

Application of polymer masses between the elements of rehabilitated street drain surface finial.

Elements from TVR T System can be also installed on concrete relief rings and drain cover plates as an additional height adjustment element.

10. Surface finials of sewage wells. Self-levelling manholes

During the intense operation of standard sewage wells based with body plate on the concrete well finial, concrete compensation rings connected with a concrete mortar, we observe the negative influence of road and environmental loads on the upper sewage well elements. The whole communication load originating from vehicle traffic is transported directly on all the components of a well and its substructure and frequently lead to the damage of surface elements supporting manholes, inter-ring connections of the well, rings, and connections with sewage network. In result of the above damages may occur further, more dangerous damages caused by infiltration and exfiltration up to and including the collapse of a whole well.

Finial of a sewage well located centrally in the line of vehicle wheel ride. Kr 2-3 traffic load. Elements supporting the manhole are degraded, substructure is damaged, and road surface is cracked.

It should also be mentioned that the traditional manhole installation system does not compensate the road surface settlement process. If the road surface level lowers, the manhole will frequently remain stiff on the well and will stand out from the surface level.

Manhole elevated over the road surface level due to surface's settlement

The solution of above problems is the application of self-levelling manholes for rolling in asphalt surface that are integrated with the surface finial based on TVR T System elements. Self-levelling manholes are based on the road surface structure with the whole surface of load-bearing flange and the connection with surface finial and well is provided by a vertical manhole leading pipe acting as a "telescope". It seals and simultaneously secures the manhole against horizontal movement and gives a technological access to well's working chamber. It is implemented and connected with the surface finial elements of the well.

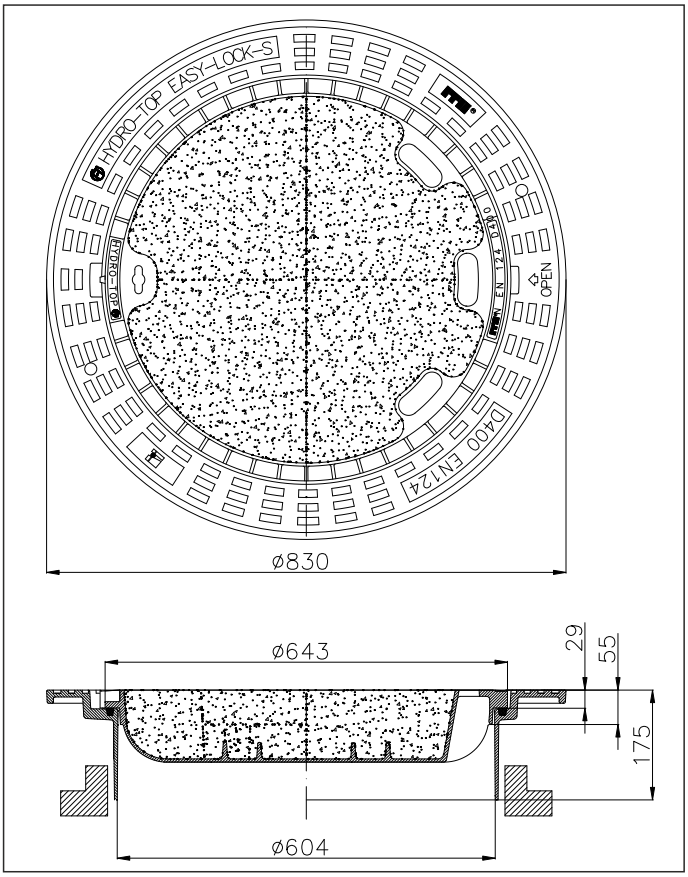


Fig. 9. Hydro Top brand self-levelling manhole for rolling in asphalt surface with TXS/635/80 adapter/leading ring.

Loads generated by road traffic influencing the self-levelling manhole are evenly distributed on the road surface supporting the manhole. The asphalt layer located directly under load-bearing flange has several functions:

- provides tightness and integrity of connection between manhole and surface,
- provides appropriate load-bearing capacity and resistance to manhole influence,
- moves loads to lower layers of road structure,
- allows to anchor and partially adjust the height and inclination of the manhole.

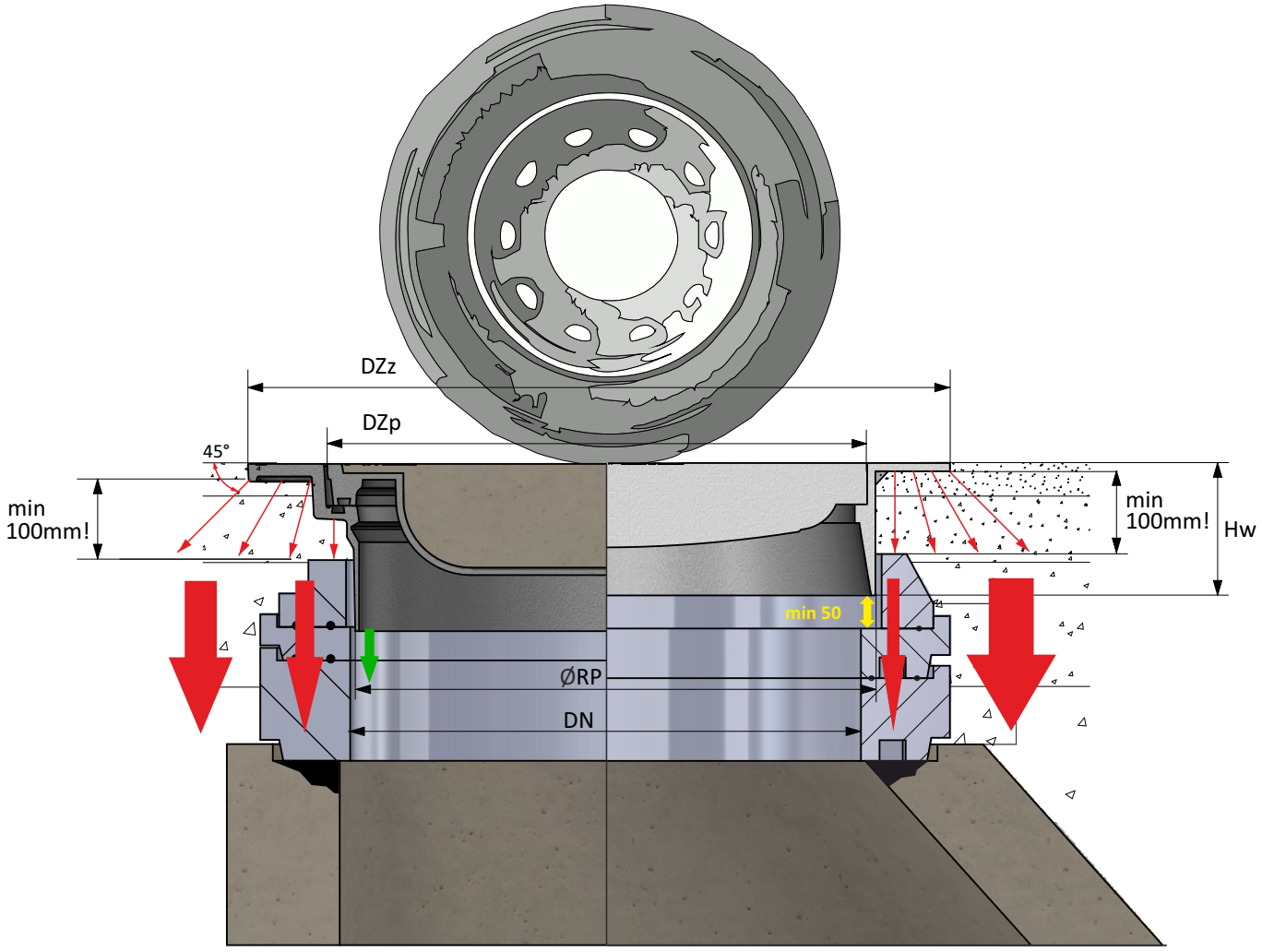


Fig. 10.
Differences in the forwarding of loads generated by road traffic on the well surface finial elements and the well itself stem from design differences of self-levelling manholes. From the point of view of load distribution and operation time extension, the most beneficial solution is the application of a manhole structure with the largest possible external diameters of leading pipe (ØRP 636÷695mm) and load-bearing flange (DZz 840÷860mm and manhole load-bearing surface above 2100cm^2). The condition for correct load distribution and transfer to the road surface and structure is the obligatory keeping of 10cm of exceptionally well fortified bituminous layer under the load-bearing flange of the manhole. In case of installation of self-levelling manholes, for which the ØRP external diameter of leading pipe is bigger than the DN internal diameter of compensation rings or well, it is necessary to keep 50mm of height between the ring/well and the lower part of manhole.

Depending on the structure of self-levelling manhole, i.e. external diameter of leading pipe, we can reduce the direct influence of road loads transferred to sewage well even by 15÷20% of total load. The majority of load (up to 85%) will be transferred to the road surface structure located under the load-bearing flange of the manhole and its external environment. The road surface is subjected to dynamic tensions originating from vehicle traffic and variable weather conditions that results in the surface making horizontal and vertical micro-movements.

The self-levelling manhole correctly installed in bituminous surface makes small micro-movements according to the behaviour of road surface. Manhole surface and road surface should remain levelled with each other during the whole operation process. Self-levelling manholes and their always increasing application on our roads and streets are the effect of searching design solutions aiming to minimise the negative influence of communication traffic load on well finials, sewage manholes, and surface around manholes and at the same time increase their operation durability and extend the maintenance interval periods.

The design and functionality features of self-levelling manholes have a positive impact on the operation durability of both sewage wells and road surface in their vicinity. They significantly contribute to the increase of road safety, ride comfort, minimisation of inconveniences for the environment, and cost reduction.

For the users, the benefits resulting from the application of self-levelling manholes are definitive. However, you should remember that even the best product may fail or wear out in case of an incorrect selection of operation conditions and incorrect assembly.

Disassembly of a self-levelling manhole with smaller frame support surface (about 1600cm^2) installed directly on concrete elements! Negative weather conditions. Operation period 1.5 year

EW INVEST supplies elements used to construct surface finials for self-levelling manholes used in exceptionally difficult road and climate conditions of Nordic countries and Eastern Europe for more than 12 years. Due to the unquestionable operating qualities, self-levelling manholes and drains are commonly used there and effectively replace the traditionally installed well and drain finials. We believe that our products, design solutions, hints, and suggestions concerning the assembly of self-levelling manholes will be received by you with interest.

TVR T System surface finial of a concrete well prepared for the installation of a self-levelling manhole for rolling in bituminous surface consists of plastic compensation rings and TXS adapters/leading rings.

TVR T System compensation rings placed on the choke/cone or cover plate of well allow to make a tight surface finial. They are the element of well height reference to the recommended installation height in the road surface structure. They constitute as a basis for installation of a TXS adapter.

TXS adapters are element that allows to refer the diameter and height of sewage well to the installed self-levelling manhole.

The internal diameters of TXS adapters are adjusted to implement a leading pipe of manhole and make the necessary connection and structure integration with the manhole. In the finial structure, they are located centrally on compensation rings, below the external structure elements of manhole body, such as pockets for hinges, baskets, trusses, and supports tightening the body.

TXS adapters of TVR T System ensure:

- correct and problem-free assembly (height and diameter reference of self-levelling manhole body to surface finial or well installed on and in the asphalt surface)
- protection of manhole against movement and influence of horizontal forces during operation
- resistance to damages during rolling or pressing of the manhole into bituminous surface
- perfect co-operation of road surface with the adapter due to the high tightness and close stiffness of materials
- protection of road surface against a negative influence of devices and finials subject to traffic and environmental loads
- damping and amortisation of vibrations, elimination of reflected cracks, tightness of finial, stabilisation of road substructure around the manhole, exceptionally good frost and chemical resistance

All of the functions and advantages listed above contribute to the high durability, load-bearing capacity, and reliability of a well finial.

10.1. Advantages of using self-levelling finials (manholes) integrated with the TVR T System elements:

- precise installation of manhole in the road surface, correct matching of manhole surface with road surface and thereby reduction of noise generated by vehicle traffic
- reduction of negative influence of road loads on sewage manhole elements due to the lack of a direct contact between manhole and well, elimination of occurrence of destructive pressure points, even distribution of tension, amortisation, and damping of communication vibrations
- high tightness of a manhole pressed into asphalt surface and increased low temperature resistance of the whole structure reduce the damage to and surface cracks around the self-levelling manhole
- surface of load-bearing flanges of self-levelling manholes are significantly bigger (1800÷2900cm^2) than in the traditional manholes and therefore the direct individual influence of self-levelling manholes on the surface is several times smaller. In result, it is possible to use them in areas of heavy and intense traffic.

Surface finials made using T1/700 compensation rings and TXS/710/80 adapter that allow to install the self-levelling manhole. Legnica, road S-3, cross ride on manhole, traffic load of Kr 4 lane. 9 years of operation.

An innovative application of self-levelling manholes with integrated TVR T System elements is using them in the domestic construction to build finials of DN/ID 600 plastic wells. Due to the installation method on and in road surface, self-levelling manholes can completely "relieve" the plastic sewage well thanks to the application of our design solutions. The whole load originating from road traffic will be transferred to the surface, road structure layers, and relief elements located around the well shaft (e.g. p.: 81, 85).

Surface finial of Tegra 600 well made from TVR T System elements (T1/700/50 compensation rings and TXS/700/80 leading ring) prepared for the installation of self-levelling manhole. Jelenia Góra-S-3.

10.2. Guidelines concerning self-levelling finials.

1. Pay particular attention to the correct construction selection of self-levelling manhole to the envisioned operating conditions, location in road lane, load, and ride frequency.

Self-levelling manhole installed in a fortified asphalt surface with the use of TVR T System elements used for construction of Tegra 600 plastic surface well. Jelenia Góra-S-3.

For heavy and intense traffic we recommend manholes with load-bearing surface above 2100cm^2, external diameter of flange bigger than 830mm, with cover with diameter of 680mm (cover support surface above 570cm^2), and with mass of 88kg or equipped in elements securing against getting blown upwards.

For medium and light traffic, less burdened with heavy vehicles, we recommend self-levelling manholes with external diameter of flange of 785÷830mm, body load-bearing surface 1770÷2000cm^2, cover diameter of 640mm and cover support surface of >370cm^2.

2. Self-levelling manholes with external diameter of ØRP leading pipe (635mm, 640mm, 669mm, 685mm, and 695mm) bigger than entry opening (600mm and 625mm) to the well require the application of adapters and compensation rings adjusted by diameter and height. When designing and installing a self-levelling manhole, a very important element is taking into account the structure height of manhole with spare 5cm of height for the vertical operation of manhole with surface with surface structure. For example, for a manhole with 20cm height, the upper surface of choke, cover plate, should be designed and installed at least 25cm below the surface design ordinate in order to correctly and safely install the manhole. The assembly of manhole is done during the placement of wearing layer of asphalt.

3. Elements used to build integrated surface finials with self-levelling manholes should be selected according to the table, so that the upper surface of leading adapter was 10cm below the load-bearing flange of manhole. Finial and height and diameter reference must be done properly and should consist of a compensation and repair layer, centric and tightly installed compensation rings, and leading adapter.

4. Self-levelling manholes are roller and pressed into a compacted layers of asphalt surface. Pay particular attention to full and compacted fill of space under load-bearing flange of manhole using asphalt mass. The correctness of compression execution decides about the correct operation of a manhole.

Adapter/leading rings and compensation rings selection table for example self-levelling manholes.

Manhole model manufacturer	Ext. diameter of manhole load-bearing flange Ø[mm]	External diameter of manhole leading pipe RP Ø[mm]	Manhole support and load-bearing surface [cm2]	Ext. diameter of cover / Manhole support surface Ø[mm]/[cm2]	Manhole height [mm]	Leading ring/TXS adapter [index]	TVR T System elements used to build height adjustment finial [index]
Ulefos/UFL 600	730	590	1543	560/330	330	T1/600/100 T1/610/100	T1/600/10÷150
Ulefos/UFU 800	800	633	1879	640/390	242	TXS/650/90 TXS/645/125/N	T1N/650/50 T1N/650/100
EJCO/ INFRATOP 190PKS	810	640	1936	666/390	190	TXS/650/90 TXS/650/45	T1R/625/40÷120
EJCO/ DINOSELF	810	640	1936	666/390	190	TXS/650/90	T1R/625/40÷120
SAINT GOBAIN VIATOP NIVEO	815	670	1691		140 LUB 200	TXS/700/80	T1R/625/40÷120 T1/700/15÷150
KZO WS-DO 600N	840	669	2026	640/370	160	TXS/675/90	T1R/625/40÷120
HYDRO TOP/ EASY LOCK EWF	850	620	2655	680/587	200	TXS/635/80	T1R/625/40÷120
HYDRO TOP/ EASY LOCK EWF 600	785	620	1819	680/587	200	TXS/635/80	T1R/625/40÷120
STAMEI MEILEVEL	860	695	2015	680/587	160	TXS/710/80	T1/700/15÷50 T1R/625/40÷120
STAMEI MEITOP-S	860	613	2857	680/587	190	TXS/635/80	T1/625/15÷30 T1R/625/40÷120
HYDRO TOP/ EASY LOCK EWF 800	1160	800	5539	891/	200	TXS/820/80	T1/800/15÷100

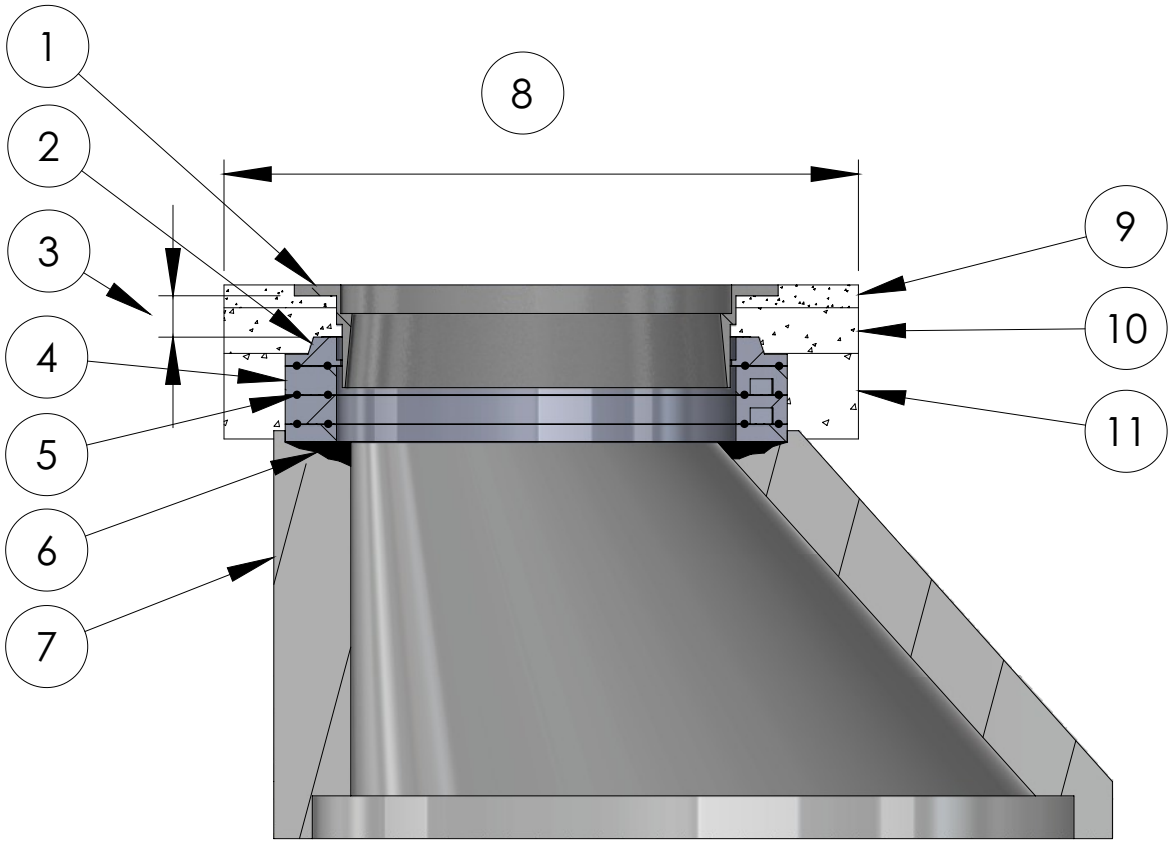


Fig. 11. **Self-levelling manhole installation diagram on a finial made from TVR T System elements.**

Structure elements:
1. D400 self-levelling manhole based on road surface, ØRP 695mm,
2. TXS/710/80 adapter/leading ring, class D400
3. Asphalt layer under manhole flange with thickness of min. 10cm,
4. T1/700/50 compensation rings - 2 pcs, T1/700/30 - 1pc, finial height of 210mm,
5. Polymer sealing and binding mass applied between all the finial elements,
6. Compensation and repair layer that supports compensation rings,
7. Concrete choke of a well,
8. Road surface area set for removal during the height adjustment of a well and assembly of surface finial elements during a renovation, replacement of a manhole min. Ø1100mm,
9. Wearing layer of road surface,
10. Load-bearing layer of road surface,
11. Frost proof substructure of road surface made on the basis of poured masses that secures the finial structure against movement.

11. Assembly mistakes

The operating correctness and durability of a surface finial is influenced by materials used to build it, execution method, assembly method, and structure of cast-iron reinforcement directly influencing the finial. Degradation and poor technical condition of portion of sewage manhole finials are the results of accumulation of all possible material, structure, and assembly mistakes, time and operating conditions, and aggressiveness of influencing environmental factors.

The following should be eliminated from the structure of surface finials:

- B15 and B20 class concrete mortars prepared on the construction site from handy materials without the correct durability and resistance to road and environment loads

Degradation of a structure supporting a manhole. Concrete mortars in a not bound state and cracked compensation rings. Finial has no tightness and load-bearing capacity.

- poured masses and concrete prefabricates (not standard) with low durability, frost and chemical resistances, and not adjusted by parameters to operating conditions of a well surface finial
- use of sheets, rods, plates, and elements acting on a specific point destroying both cast-iron and support elements for adjustment purposes.

Degradation of structure supporting the manhole. Reinforcement rods as a compensation material - destructive point pressures.

- finials of sewage manholes and street drains with load-bearing surface of bodies insufficient to meet the load and operating conditions that have destructive influence on support elements.

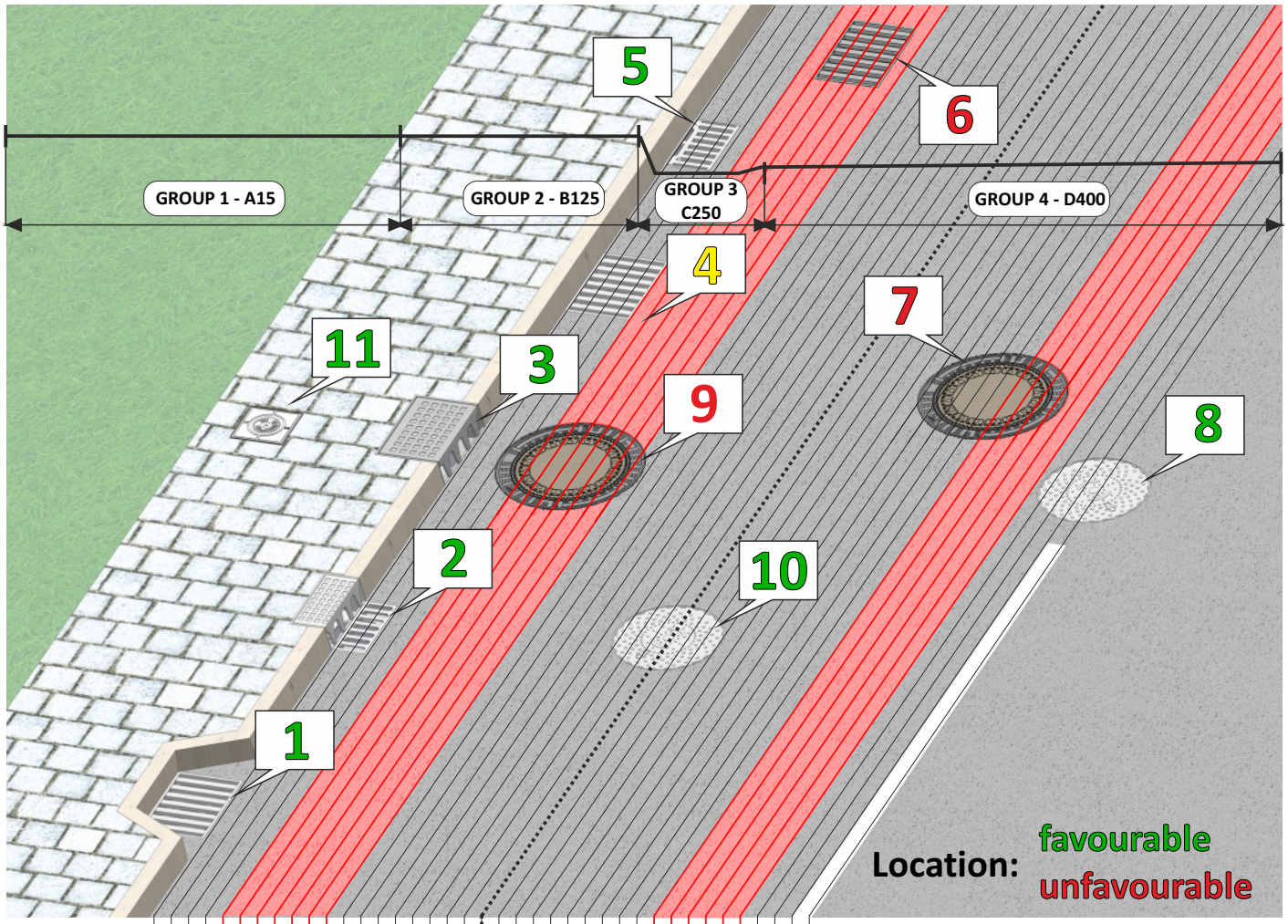
Manhole body with frame plate of load-bearing surface below 1000cm^2.

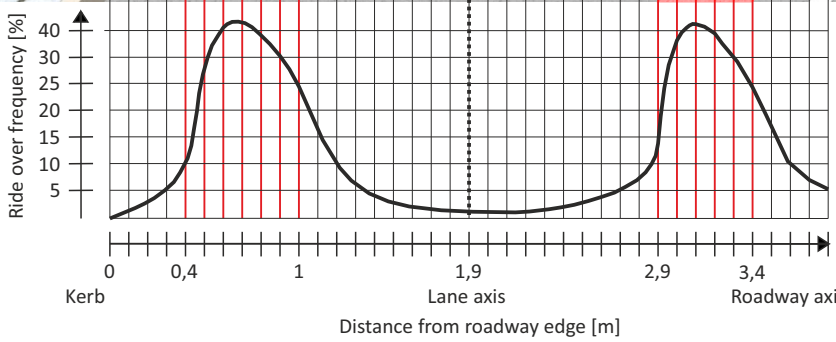
Pay also attention to aspects related to mistakes during the assembly of finials, in particular to:

- failure to match diameters and dimensions of adjustment elements to structure of manholes, which destroy support element when supported incorrectly,
- approval for use under a road traffic finials made using poured masses before the full durability is achieved (at the time of binding and without carrying out a maintenance),
- allowing high temperatures of asphalt mass to influence the immature concrete poured mass during its installation.

Selection of design and material solution appr opriate to the aggressiveness degree of traffic influence and communication loads is a key conditions impacting the operating durability of sewage manhole finials. The location of a well finial in a lane, risk, and frequency of riding over it determine the choice of correct design solution for a well finial and street drain.

In a lane we can indicate places and areas with various influence of load originating from vehicle wheels. We differentiate finials placed in areas of high (unfavourable location) or low (favourable location) frequency of vehicles riding over finials and drains.





Vehicle wheels ride over frequency chart for lane with width of 3,75 m.

Fig. 12. Location of manholes and drains in a lane.
1. *Drain 400x600 3/4 C250÷D400*
2. *Roadway and kerb drain C250÷D400*
3. *Kerb drain C250÷D400*
4. *Drain 400x600 3/4 D400*
5. *Drain 300x500 D400*
6. *D400 drain 400x600, full*
7. *D400 self-levelling or traditional manhole with big support surface*
8. *D400 traditional manhole, support surface > 1000cm2*
9. *D400 self-levelling or traditional manhole with big support surface*
10. *D400 traditional manhole, support surface > 1000cm2*
11. *Street box*

Unfavourable area covers:

- lanes intensely burdened by trucks and buses, traffic intensity KR 3÷KR 5,
- small heavy vehicle moving speed areas, where vehicles are stopped and traffic is slowed due to high intensity of traffic and exhaustion of a lane capacity (e.g. entrances to agglomerations),
- areas of crossroads (with lights), where the finials are additionally burdened with shear forces created when vehicles brake and start moving,
- lanes with width of 2.50÷2.75m and lanes equipped with technical elements used to slow the traffic,
- channelling - unfavourable accumulation of riding over (risk and frequency of vehicle wheels riding over a finial - above 40% of all vehicles passing on a given lane),
- ramps and road drops bigger than 6%,
- location of finials in area indicated by distances from kerb equal to 0,40÷1,25m and 2,80÷3,50m (see chart above).

Favourable area covers:

- area on which passenger cars are the majority of vehicles and trucks and van pass occasionally, traffic intensity KR 2,
- location of finials placed in the axis of a lane, in the axis of a roadway, and in the distance equal to 0÷0,40m and 1,50÷2,30m from the kerb,
- smooth movement without stops and vehicles slowing down, braking, and starting to move.

12. Location of manholes and drains in a lane

In areas with unfavourable placement of a well and its finial we suggest to use solutions characterised by a low influence of pressure forces on the support elements. The size of load-bearing surface of well finial bodies and sewage drains will have a crucial meaning for the operating durability. We advise you to use finial with as big load-bearing surface of a body/flange as possible in the areas exposed to intense wheeled vehicle movement.

Location of a manhole in a distance from 0.2m to 1.1m (Fig. 12, pt 9) and in a distance between 2.7 and 3.4m from the kerb, in the unfavourable area with high intensity of vehicles riding over it imposes the application of solutions characterised by a high resistance to road traffic loads.

We suggest the application of following solutions:

- Application of self-levelling manholes with following parameters: external diameter of load-bearing flange of 830÷860mm, load-bearing surface above 2100cm^2, cover diameter of 680mm, support surface above 570cm^2, and weight of 88kg. In the structure integrated with TVR T System elements – compensation and leading rings based on a concrete well choke made acc. to DIN 4034. Example solution diagram is on p.: 62 and 63. Finial of a DN600 plastic well should consist of a relief cone and TXS leading rings configured acc. to example diagram on p.: 81 and 85.
- Application of manholes with traditional installation method with load-bearing surface of body plate above 2400cm^2 (e.g. manholes with 850x850mm square plate and load-bearing surface of 3800cm^2), cover diameter of 680mm, cover support surface above 570cm^2, and installed directly on foundation slabs of TVR T System T04 product group. Height reference is provided by compensation rings from T1/600 and T1/620 product group that are installed on a well choke. Example solutions are on p.: 61.
- Application of concrete and cast-iron manholes with load-bearing plate above 1770cm^2 (acc. to DIN 19584), minimum external body diameter of 785mm, height of 150mm, cover diameter of 680mm, support surface above 570cm^2, and installed on compensation rings from product groups: T1/600/D, T1/620, and T1R/625 based on a concrete well choke. Example uses are on p.: 59.
- Finials of DN600 plastic wells consisting of relief cones and T1R/625 compensation rings are presented on example diagram on p.: 84.

Street drain 400x600 full (Fig. 12, pt 6) located centrally under the path of vehicle wheels is an example of a design mistake occurring at reconstruction (expansion) of a lane. Renovation was done without the reconstruction of road drainage. The time of correct operation of a drain placed in such way is exceptionally limited.

Each design solution for installation of a drain in this area does not guarantee the appropriate operating durability.

Minimum requirements concerning the 400x600 type roadway drain in the location for group 4 (in class D400) are: full flange drain with external flange diameter of minimum Ø700mm and effective load-bearing surface of the body of about 1300cm^2 with multi-point grate support.

Manholes installed in a traditional way with load-bearing surface of body smaller than 1300cm^2 should not be installed in areas with unfavourable location.

Manholes with load-bearing surfaces of body plates of 1000÷1300cm^2 can be installed in areas with favourable location in a lane, where there is a minimal risk of trucks riding over the finial. The lane axis (distance from 1,5 to 2,3m from the kerb) and roadway axis can be considered as areas with favourable location for finials (Fig. 12, pt 8 and 10). Manholes with diameters of external body plates up to 780mm and cover diameters smaller than 680mm can be installed on TVR T System compensation rings from groups: T1/600, T1/620, T1/625, and T1R/625 in the favourable location. Example use is on p.: 65.

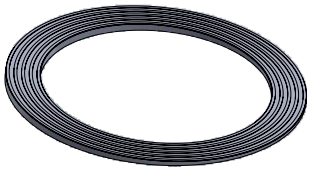
Street drains installed in the area burdened by vehicle traffic cover group 1÷3 acc. to PN-EN 124-1 2015 (Fig. 12, pt 1, 2, and 3) in a distance up to 0,4m from the kerb are located in the area with favourable location. DN450 or DN500 concrete rain water wells should be made as tight structures resistant to environmental conditions. The correct height adjustment, installation of cast-iron drains, and finial tightness are provided by TVR T System adjustment elements and adapters. Risk of riding over and road traffic burden on the structure of a street drain located in this area is minimal. A sufficient structural durability of concrete rings and bottom allows to install sewage drains directly on TVR T System elements without the necessity to use heavy relief elements in the drain finial. Example solutions for sewage drain surface finial are on p.: 47, 48, and 50÷57.

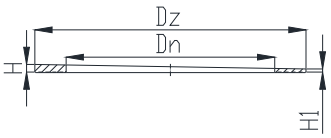
In drain bays touching the intensely burdened traffic lanes you can install 400x600 and 500x500 type flangeless sewage drains with effective support surface amounting to about 610cm^2. They are supported directly on TVR T System adapters placed under drains based on compensation rings or indirect rings of a rain water drain. Full-iron flange kerb and kerb and roadway drains located in the distance up to 30cm from the kerb and installed directly on TVR T System elements do not require relieving.

Plastic rain water wells should be located in the area 1÷3 acc. to PN-EN 124-1 2015 (Fig. 12, pt 1, 2, and 3). Example solutions for DN425 plastic well are on p.: 74÷76 and 78. For DN600 well located in the area of group 3 (Fig. 12, pt 4), the example diagram is on p.: 82.

13. Assortment

T1K Manhole or drain inclination angle adjustment rings



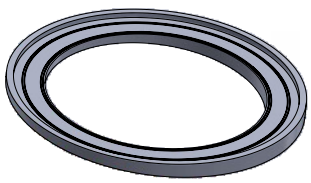


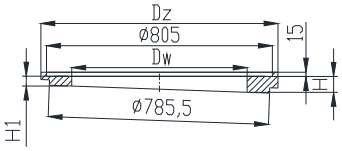
INDEX	Dn [mm]	Dz [mm]	H [mm]	H1 [mm]	Mass [kg]	Angle [%]	Angle [°]
T1K/320/9/22	320	485	22	9	2,0	1,54	2,69
T1K/435/9/22	435	580	22	9	2,7	1,28	2,23
T1K/500/9/22	500	650	22	9	3,2	1,15	2,01
T1K/600/9/22	600	780	22	9	4,2	0,95	1,66
T1K/600/9/22/D	600	790	22	9	4,5	0,94	1,64
T1K/620/15/28	625	850	28	15	8,8	0,88	1,54
T1K/625/9/22	625	790	22	9	4,3	0,94	1,64
T1K/635/30/60	635	785	60	30	10,4	2,19	3,82
T1K/700/9/22	700	875	22	9	4,6	0,85	1,48
T1K/800/15/28	800	960	28	15	6,1	0,78	1,36

Inclination angle is adjusted by moving the ring or a wedge ring set in a coaxial manner. Take the height of wedge rings into account during the manhole adjustment. Place directly under manholes, adapter, and drains.
Application diagrams - p.: 47, 51÷61, 66, and 83

T1RK Manhole inclination angle adjustment rings with edge

DN625.





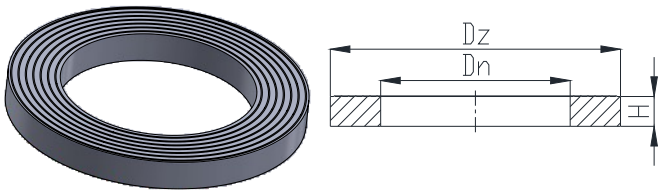
INDEX	Dn [mm]	Dz [mm]	H [mm]	H1 [mm]	Mass [kg]	Angle [%]	Angle [°]
T1RK/625/30/60	625	840	60	30	13,4	2,05	1,85

Inclination angle is adjusted by moving the ring or a wedge ring set with identical internal diameter (e.g. rings with heights 30/60 and 9/22) in a coaxial manner. Take the height of wedge rings into account during the manhole adjustment. Place directly under manholes, adapter, and drains. Intended for wells acc. to DIN 4034 p. 1 and p. 2. Applied directly under standard manholes with external body plate diameter of max. Ø800. DIN 19584.
Application diagrams - p.: 60 and 84

T1/320 Height adjustment rings

DN300, DN315, DN400 and DN450.

INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/320/15	320	485	15	2,4	D400
T1/320/30	320	485	30	3,7	D400
T1/320/50	320	485	50	6,4	D400
T1/320/100	320	485	100	11,9	D400
T1/320/150	320	485	150	19,6	D400

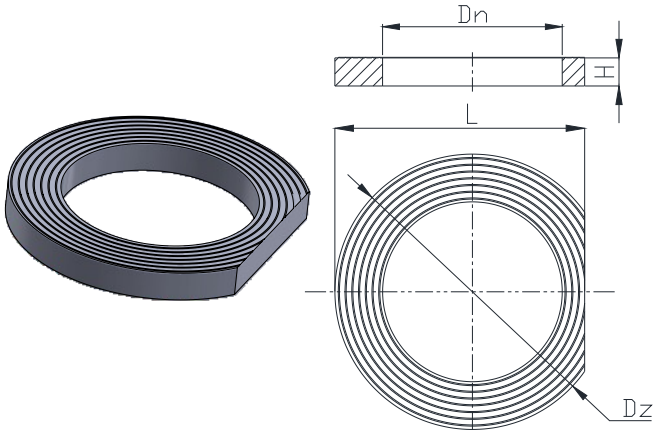


Rings with DN/ID 320mm diameter for height adjustment of DN400 and DN450 concrete wells acc. to DIN 4052, as well as DN300 and DN315 plastic wells (as a reduction on T3/315 relief cone). Used to adjust the height and installation of manholes with ext. round body plate of max. Ø480mm and as a leading ring for self-levelling manholes and drain with external leading pipe diameter of Ø308÷315mm. T1/320/100 ring can be used as a ring stabilising telescope manhole 315 in the upper layers of road structure.
Application diagrams - p.: 47, 71, and 72

T2/320 Height adjustment rings

DN315, DN400, and DN450 for assembly near a kerb.

INDEX	Dn [mm]	Dz [mm]	H [mm]	L [mm]	Mass [kg]	Class [kN]
T2/320/30	320	485	30	445	3,7	D400
T2/320/50	320	485	50	445	5,9	D400
T2/320/100	320	485	100	445	10,8	D400
T2/320/150	320	485	150	445	16,3	D400

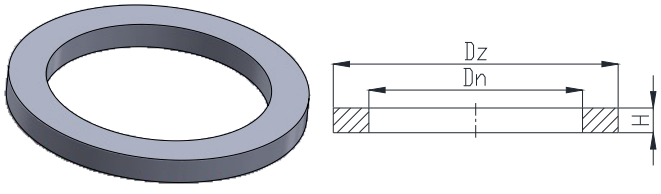


Compensation rings with chop for placement near kerb. Rings with DN/ID diameter of 320 mm used to adjust the height of DN400 and DN450 concrete wells acc. to DIN 4052, as well as DN300 and DN315 plastic wells (as a reduction on T3/315 relief cone). Used to adjust the height and installation of manholes with ext. round body plate of max. Ø480mm and as a leading ring for self-levelling manholes and drain with external leading pipe diameter of Ø308÷315mm.

T1/435 Height adjustment rings

For DN400, DN425, and DN450 wells.

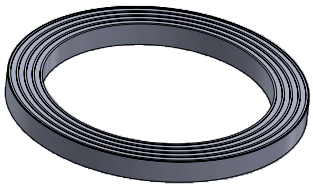
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/435/15	435	580	15	2,5	D400
T1/435/30	435	580	30	4,4	D400
T1/435/50	435	580	50	6,5	D400
T1/435/100	435	580	100	13,7	D400

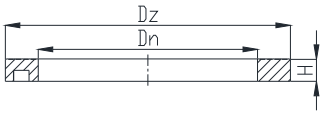


Rings used to adjust the height of DN425 and DN450 concrete wells acc. to DIN 4052 and DN400 plastic wells are installed on a T3/400 relief cone. Used to adjust the height and installation of manholes with ext. round body plate of max. Ø570 mm and as a leading ring for D2 Ø405÷420mm self-levelling manholes and drains (external dimension of the manhole leading pipe).
Application diagrams - p.: 47, 50, and 51

T1/500 Height adjustment rings

For DN425 and DN500 wells. For street drains with round base.



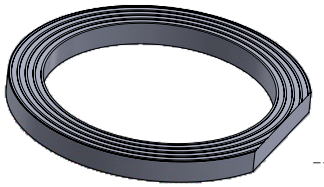


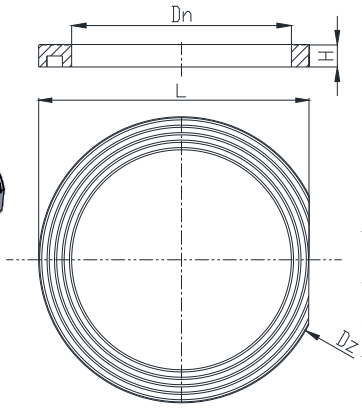
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/500/15	500	650	15	3,0	D400
T1/500/30	500	650	30	5,6	D400
T1/500/50	500	650	50	7,4	D400
T1/500/100	500	650	100	14,3	D400

Rings used to adjust the height of DN500 concrete wells, DN425 plastic drains and wells (DN/OD 486) with surface finial based on T3/425 relief cone. T1/500 rings are used under adapters (TX/765/420/470/BK, TX/765/410/80, TX/4052/10A, TX/4052/10AP, and TX/6060/75 type) supporting cast-iron street drains.
Application diagrams - p.: 47 and 52÷56

T2/500 Height adjustment rings

For DN500 wells. Adjusted for assembly near a kerb. For street drains with ¾ base.



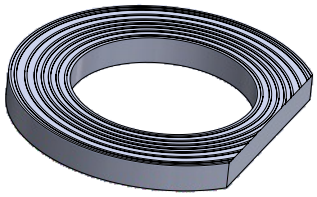


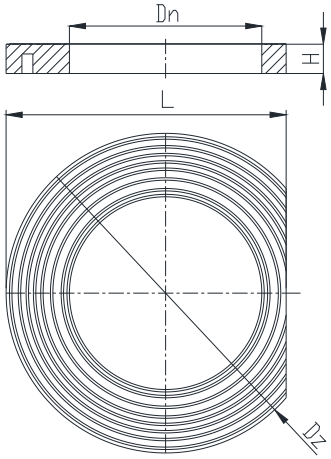
INDEX	Dn [mm]	Dz [mm]	H [mm]	L [mm]	Mass [kg]	Class [kN]
T2/500/15	500	650	15	610	2,8	D400
T2/500/30	500	650	30	610	5,2	D400
T2/500/50	500	650	50	610	7,1	D400
T2/500/100	500	650	100	610	13,3	D400

Adjustment rings with chop for placement near a kerb can constitute as a safe support for 400x600 mm street drains type ¾ with maximum body plate diameter of Ø650mm and TX group adapters placed under street drains.
Application diagrams - p.: 56

TX/4052/10A Adapter for street drains

For DN450 and DN500 street drains.



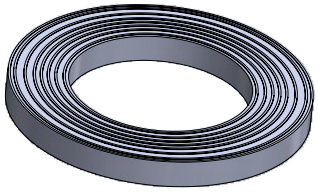


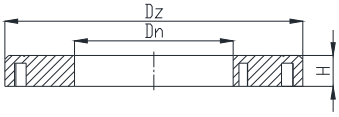
INDEX	Dn [mm]	Dz [mm]	H [mm]	L [mm]	Mass [kg]	Class [kN]
TX/4052/10A	390	650	60	575	12,7	D400

Adapter with preparation for placement near a kerb and at the same time reducing the internal diameter of DN450 concrete wells made according to DIN 4052 and DN500 concrete wells. It constitutes as a direct support for 500x500 type cast-iron sewage drains (roadway and kerb) and 400x600 drains with flange ¾ with external diameter of drain body plate of max. Ø650mm. It is installed directly on DN450 and DN500 rain water wells, compensation rings from T1/435, T1/500, and T2/500 series of types, and on T3/425 relief cone for plastic wells. Adapter constitutes as a standard surface finial element of DN385mm round plastic drain and acts as a relief ring.
Application diagrams - p.: 47, 53, 56, and 86

TX/4052/10AP Adapter for street drains

For DN450 and DN500 street drains.



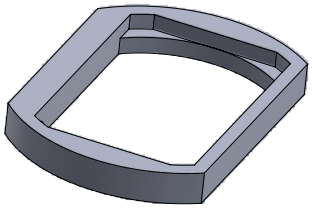


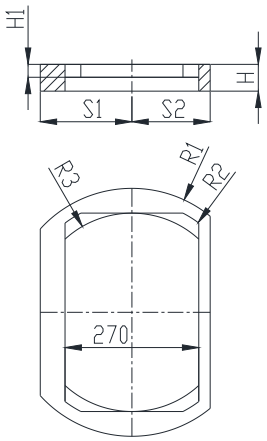
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
TX/4052/10AP	390	650	60	13,8	D400

Adapter adapted to directly support 400x600 full flange drains with external body plate diameter of Ø650mm, full-iron kerb and roadway drains, and concrete body, as well as in areas with low risk of vehicles riding over it (drain bays), can constitute as a support for 400x600 flangeless drains. Information as above. TX/4052/10A.
Application diagrams - p.: 47, 53, 74, 76, and 86

TX/4052/10B Adapter placed under 300x500 drain

For DN450 concrete wells acc. to DIN4052-10b



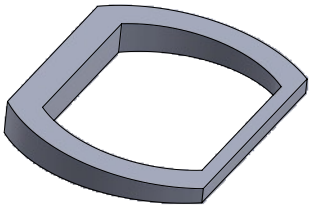


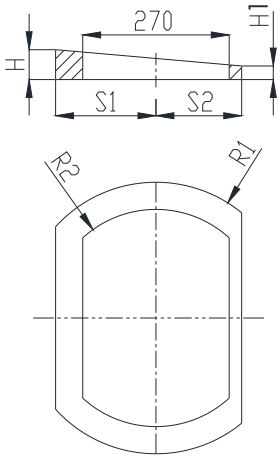
INDEX	R1 [mm]	R2 [mm]	R3 [mm]	S1 [mm]	S2 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TX/4052/10B	250	225	200	185	158	54	26	4,5	D400

Adapter placed under 300x500 type cast-iron flangeless sewage drains in the kerb area (road shoulder and drainage channel). It is placed directly on a concrete reduction ring/cone of a DN450 well (acc. to DIN 4052). It allows to adjust height and ensures a correct assembly, sealing, and installation of a drain. It is also used in plastic surface drainage systems as a relief element.
Application diagrams - p.: 47 and 86

TXK/4052/10B (wedge) Adapter placed under 300x500 drain

Do studzienek betonowych DN450 wg. DIN4052-10b



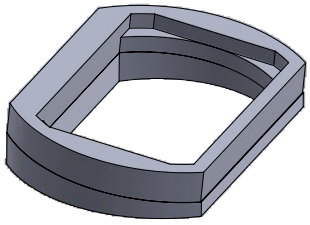


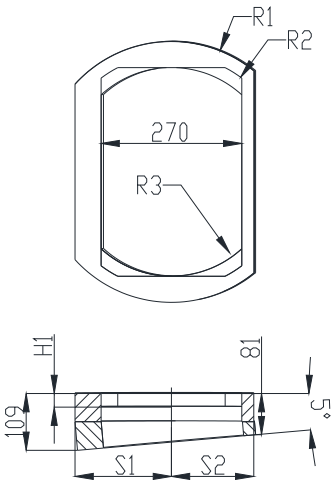
INDEX	R1 [mm]	R2 [mm]	S1 [mm]	S2 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXK/4052/10B	250	200	185	158	55	25	3,8	D400

Adapter used to adjust the inclination angle of a 300x500 sew age drain, supplement element for concrete well system acc. to DIN 4052 and plastic surface drainage systems.

TXK/4052/10B5 (wedge) Adapter placed under 300x500 drain

Do studzienek betonowych DN450 wg. DIN4052-10b



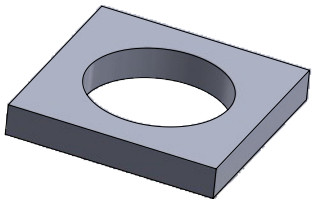


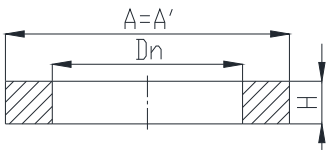
INDEX	R1 [mm]	R2 [mm]	R3 [mm]	S1 [mm]	S2 [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXK/4052/10B5	250	225	200	185	158	25	8,3	D400

Adapter placed under 300x500 type cast-iron flangeless sewage drains, with DIN 4052-3, installed in the kerb area (road shoulder and drainage channel). Placed directly on the cone of a concrete well or on a plastic sewage drain (Romold, Pipelife, or Wavin). Allows to adjust height and simultaneously ensures inclination angle of the drain equal to 9%.
Application diagrams - p.: 47, 49, and 86

TX/5050/75 Adapter placed under 420x340 drain

For DN450 concrete and DN315 telescope wells.



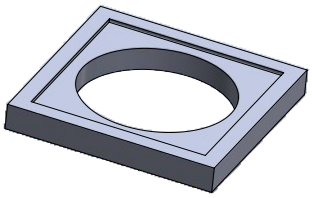


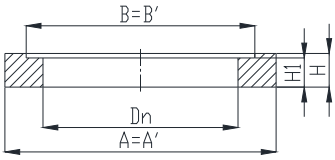
INDEX	Dn [mm]	A=A' [mm]	H [mm]	Mass [kg]	Class [kN]
TX/5050/75	335	500	75	13,0	D400

Adapter placed under 400x400 type cast-iron flangeless drains installed on compensation rings from T1/320 or T1/435 series of types or directly on DN450 concrete rain water drains (acc. to DIN 4052). Adapter also ensures a correct and tight installation of the drain on a well. It is also applied under 420x340 type telescope sewage drains with DN/OD 315 telescope pipe in order to increase the surface of the drain influencing the road structure.
Application diagrams - p.: 47

TX/6060/75 Adapter placed under 500x500 drain

For DN500 concrete and DN400 and 425 telescope wells.



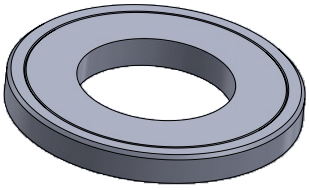


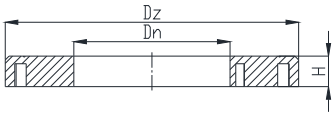
INDEX	Dn [mm]	A=A' [mm]	B=B' [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TX/6060/75	435	600	510	75	65	21,1	D400

Adapter placed under 500x500 cast-iron sewage drains and 500x500 telescope drains that ensures a correct assembly, installation, and tight connection of a drain with the structure of a rain water well. It is installed directly on DN450 and DN500 rain water wells, on a fortified road structure (regarding telescope drains) or on TVR T System adjustment elements - T1/435 or T1/500 compensation rings and T3/425 relief cone.
Application diagrams - p.: 47, 51, and 53

TX/765 Adapter placed under street drains

For DN450 and DN500 concrete and DN425 and DN600 plastic wells.



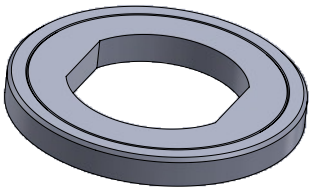


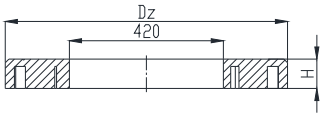
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
TX/765/395/80/P	395	765	80	29,0	D400
TX/765/410/80	410	765	80	28,0	D400
TX/765/500/80	500	765	80	24,5	D400

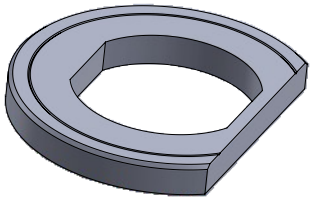
Universal adapter reducing the internal diameter of DN450 and DN500 concrete wells. It constitutes as a direct support for standard 400x600 cast-iron sewage drains with mesh flanges and full-iron drains with external body plate diameter of Ø580÷750mm and 500x500 and 400x600 flangeless drains (roadway and kerb), as well as it is placed under 400x600 drains with ¾ flange (for placement near a kerb). It is installed directly on DN450 and DN500 rain water wells and/or compensation rings of T1/435, T1/500, and T2/500 series of types and on T3/425, T3/600, and T3/615 relief cones constituting as a surface finial for plastic wells. The adapter constitutes as a standard surface finial element of a DN385mm round plastic drain and acts as a relief ring supporting a 500x500 sewage drain.
Application diagrams - p.: 47, 53÷55, 74, 75, 78, 79, and 86

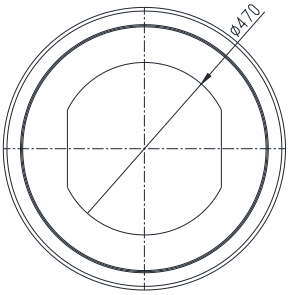
TX/765/420/470/BK Adapter placed under drain

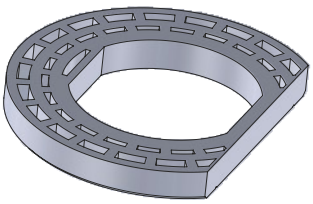
For DN500 and DN500 concrete and DN600 plastic wells.









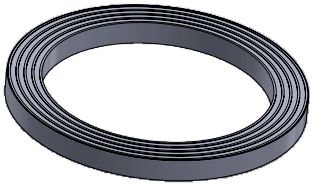


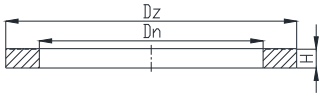
INDEX	Dn [mm]	H [mm]	Mass [kg]	Class [kN]
TX/765/420/470/BK	765	80	27,2	D400

Adapter placed under 400x600 drains with drainage edge with dimensions up to 420x470. Recommended use - for sewage wells with DN500 internal diameter. Adapters are delivered to the recipient in a full form. All adapters from TX/765 group can be used as kerb drains after prior matching and cutting of adapters on the construction site (allowed cut to ext. dimension of 630mm). Information as above.
Application diagrams - p.: 47, 53, 55÷57, and 79

T1/600 Height adjustment rings

For manhole opening of DN600 concrete wells.

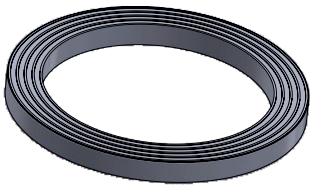


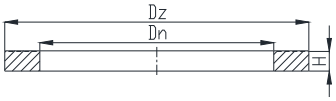


INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/600/10	600	780	10	3,1	D400
T1/600/15	600	780	15	4,1	D400
T1/600/30	600	780	30	6,8	D400
T1/600/50	600	780	50	10,9	D400
T1/600/100	600	780	100	19,3	D400
T1/600/150	600	780	150	27,8	D400
T1/600/10/D	600	790	10	3,3	D400
T1/600/15/D	600	790	15	4,5	D400
T1/600/30/D	600	790	30	8,1	D400
T1/600/50/D	600	790	50	12,9	D400
T1/600/100/D	600	790	100	21,9	D400
T1/600/150/D	600	790	150	31,1	D400

Universal compensation rings with a broad height variant that constitute as element used to build tight surface finials of sewage manholes with DN600 manhole opening diameter. T1/600/10÷150/D rings constitute as a direct support for standard sewage manholes with external body plate diameter of Ø785mm and ensure a diameter reference of self-levelling manhole to the external leading pipe diameter of Ø592mm with well structure.
Application diagrams - p.: 58, 59, and 64

T1/610 Height adjustment rings

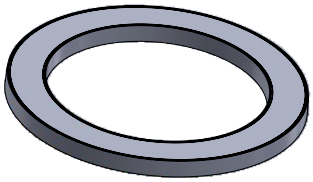


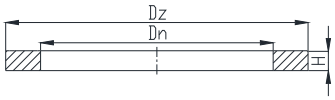


INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/610/100	610	790	100	18,4	D400
T1/610/150	610	790	150	24,8	D400

Compensation rings used for installation of self-levelling manholes with external leading pipe diameter of Ø592mm in a road surface with inclination angle bigger than 3%.

T1/620 Height adjustment rings

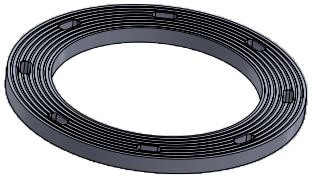


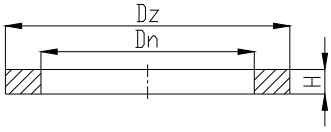


INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/620/15	625	850	15	5,9	D400
T1/620/30	625	850	30	10,5	D400
T1/620/50	625	850	50	16,0	D400
T1/620/100	625	850	100	29,0	D400

Compensation rings used to adjust height of sewage manholes with DN625 internal manhole opening diameter. They are installed of cover plates (flat and without flange), concrete chokes/cones of wells with DN625/DZ870 opening diameter, and T3/616/BR, T3/600/BR, and T3/680/BR relief cones. They constitute as a finial element supporting: standard sewage manholes with round, octagonal, and frame plate with external body plate diameter 850mm in a direct way and T04 slabs constituting as element supporting cast-iron and composite drains with square plate e.g. 850x850mm.
Application diagrams - p.: 58, 64, 79, and 83

T1C/620 Height adjustment rings



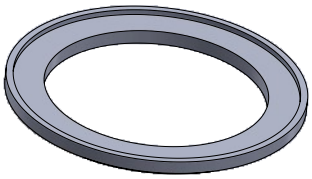


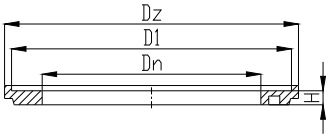
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1C/620/30	620	880	30	12,5	D400
T1C/620/50	620	880	50	18,8	D400

Compensation rings directly supporting manholes made from ductile cast-iron with frame, round, or octagonal plate, with external diameter of Ø850mm with pouring/anchoring openings for fast-setting masses. Elements are installed on T1/600 and T1/620 compensation and T3/600 and T3/615/BR cones.

T1R/625 Height adjustment rings

For manhole opening of DN625 concrete wells.



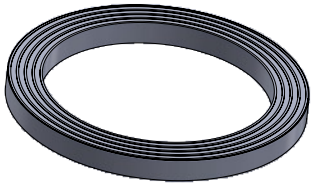


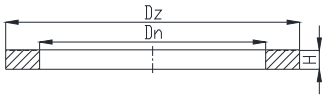
INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	Mass [kg]	Class [kN]
T1R/625/40	625	840	800	40	11,1	D400
T1R/625/60	625	840	800	60	16,6	D400
T1R/625/80	625	840	800	80	20,7	D400
T1R/625/100	625	840	800	100	29,0	D400
T1R/625/120	625	840	800	120	34,2	D400

Compensation rings with edge protecting against movement used to adjust height of concrete sewage manholes with DN625 internal manhole opening diameter made accor ding to DIN 4034. They allow to correctly refer the diameter and height of a sewage manhole and install manholes with external manhole plate diameter up to max. Ø805mm (e.g. DIN 19584). They are elements compatible with concrete compensation rings used to construct tight surface finials, and alternating finials without mortar. They are also installed on T3/600, T3/615, and T3/680 relief cones in plastic sewage manhole systems with DN600 manhole opening as an additional height adjustment element. Elements of surface finials for self-levelling manholes constitute as a basis for installation of leading adapters from TXS group.
Application diagrams - p.: 58, 60÷63, 66, 79, and 83

T1/625 Height adjustment rings

For manhole opening of DN625 concrete wells.



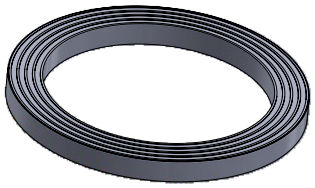


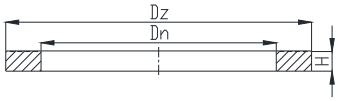
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/625/15	625	790	15	4,2	D400
T1/625/30	625	790	30	6,6	D400

Compensation rings without edge that along with T1K/625/9/22 and T1RK/625/30/60 inclination angle adjustment rings constitute as a complete supplement of height and angle adjustment abilities for wells with DN625 manhole opening. They allow to build a finial and refer its height using only prefabricates with a ± 5 mm precision.
Application diagrams - p.: 60

T1/700 Height adjustment rings

For manhole opening of DN700 concrete wells.



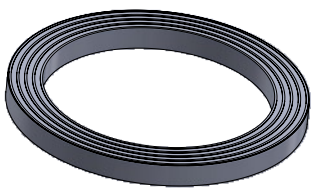


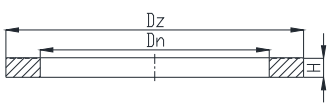
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/700/15	700	875	15	4,9	D400
T1/700/30	700	875	30	9,2	D400
T1/700/50	700	875	50	12,4	D400

Rings used to adjust height of concrete sewage manholes with DN700 manhole opening diameter. They provide a direct support to standard manholes with ext. body plate diameter of Ø870mm and indirect support for leading rings for TVR T system TXS/700/80 or TXS/710/80 type self-levelling manholes.
Application diagrams - p.: 62

T1/800 Height adjustment rings

For manhole opening of DN800 concrete wells.





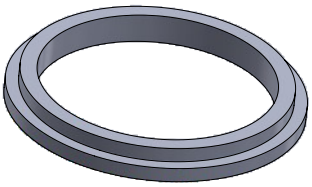
INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/800/15	800	960	15	5,2	D400
T1/800/30	800	960	30	8,2	D400
T1/800/50	800	960	50	13,9	D400
T1/800/100	800	960	100	24,2	D400

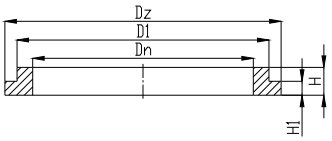
Rings for the height adjustment of concrete sewage manholes with DN800 manhole opening diameter provide a direct support to standard manholes with ext. body plate diameter of Ø960mm and indirect support for leading ring for TVR T system TXS/820/80 type self-levelling manhole.

TXS/635/80 Leading rings

For self-levelling manholes with leading flange external diameter of Ø615÷630mm.

INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXS/635/80	635	790	725	80	40	14,6	D400

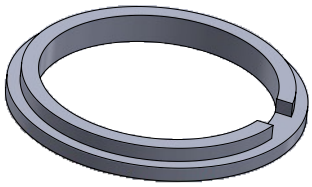


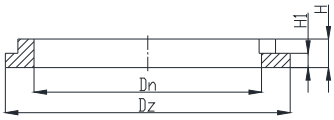


Adapter, leading ring for self-levelling manholes ensuring the correct diameter reference of manholes to the structure of sewage manhole that is installed on T1/600, T1/620, and T1R/625 compensation rings and T3/615 relief cones. Placed under Meilevel–K (Stamei) and Easy-Lock EWF (Hydro-Top) manholes.
Application diagrams - p.: 62, 63, 79, and 81

TXS/635/80/N Leading rings

INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXS/635/80/N	635	790	725	80	40	14,0	D400



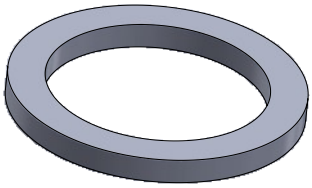


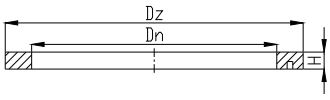
Adapter, leading ring for self-levelling manholes with pocket - manholes system cover.

TXS/650/45 Leading rings

For self-levelling manholes with leading flange external diameter of Ø630÷640mm.

INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
TXS/650/45	650	790	45	9,5	D400



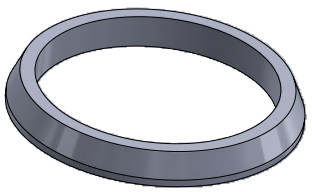


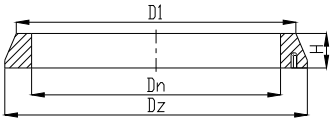
Finial height adjustment on rings from T1R/625 and T1/625 groups.

TXS/650/90 Leading rings

For self-levelling manholes with leading flange external diameter of Ø630÷640mm.

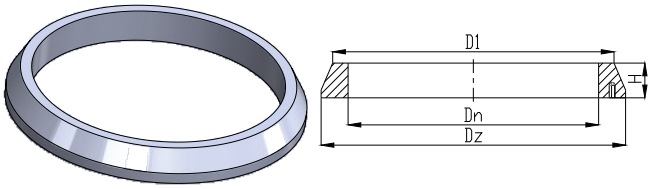
INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	Mass [kg]	Class [kN]
TXS/650/90	650	790	730	90	15,3	D400





Adapter, leading ring for self-levelling manholes ensuring the correct diameter reference of manholes to the structure of sewage manhole that is installed on T1/600, T1/620, and T1R/625 compensation rings and T3/615 relief cones.
Application diagrams - p.: 62

TXS/675/90 Leading rings

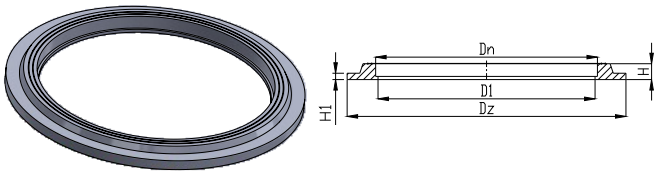


INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	Mass [kg]	Class [kN]
TXS/675/90	675	800	735	90	13,8	D400

Adapter - leading ring for self-levelling manhole with external leading pipe diameter of Ø660mm (KZO). Installed on T1R/625 and T1/620 compensation rings and T3/615 and T3/680 relief cones.
Application diagrams - p.: 62, 83, and 85

TXS/700 Leading rings

For self-levelling manholes with leading flange external diameter of Ø675÷695mm.



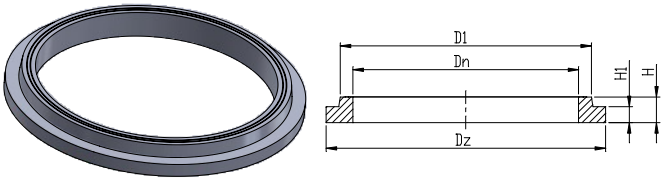
INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXS/700/50	700	880	685	50	20	10,2	D400
TXS/700/80	700	880	-	80	50	17,0	D400

Application diagrams - p.: 62

TXS/710/80 Leading rings

INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H [mm]	Mass [kg]	Class [kN]
TXS/710/80	710	870	790	80	50	18,2	D400

Adapter - leading ring for self-levelling manholes with external leading pipe diameter of Ø680÷695mm. Installed directly on T1/700 and T1/620 compensation rings and T3/615/BR and T3/680/BR relief cones.

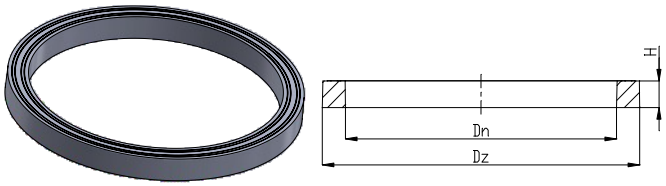


The installation of the adapter on T1R/625 group rings requires an application a T1/625/15 compensation ring, which allows to correctly refer structure, directly under the adapter.
Adapter can be installed on concrete rings made acc. to DIN 4034, in configuration:
1) TXS/710/80
2) T1/625/15
3) concrete rings

Application diagrams - p.: 62

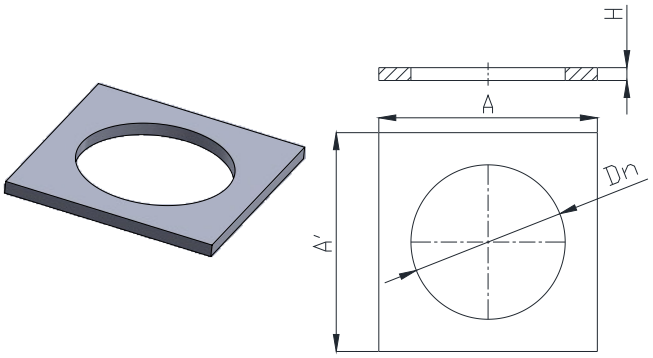
TXS/820/80 Leading rings

INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
TXS/820/80	820	960	80	21,0	D400



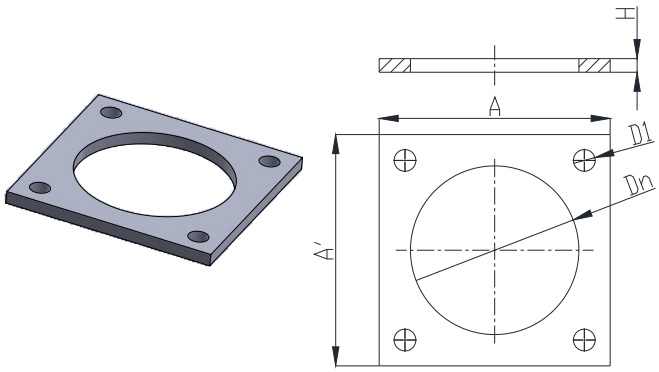
Adapter - leading ring for self-levelling manholes with external leading pipe diameter of max. Ø800mm. It is installed directly on T1/800 compensation rings.
Application diagrams - p.: 62

T04 DN600 Foundation and settlement slab



INDEX	Dn [mm]	A=A' [mm]	H [mm]	Mass [kg]	Class [kN]
T04/850/600/50	600	850	50	28,0	D400
T04/1000/600/50	600	1000	50	48,0	D400
T04/1200/600/50	600	1160	50	70,0	D400

Square foundation slabs relieving TVR T System element for installation directly under manholes with square, octagonal and frame body plate ensure a correct support for the manhole. It is installed on finials made using T1/600, T1/620, T1/625, and T1R/625 compensation rings and on T3/615/BR cones. Installed directly on sewage manholes, it constitutes as a stable substructure for making a finial using compensation rings.

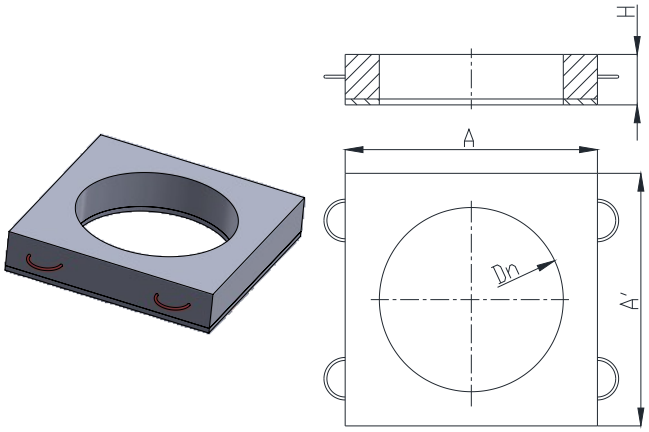


INDEX	Dn [mm]	A=A' [mm]	H [mm]	Mass [kg]	Class [kN]
T04/850/620/50	620	850	50	30,5	D400
T04/1000/620/50	620	1000	50	45,0	D400
T04/1200/620/50	620	1160	50	71,5	D400

Slabs provide a correct support for a manhole, where a Ø630 (DZW ≥ 630mm) structure support is required. It is installed on finials made using T1/620, T1/625, and T1R/625 compensation rings and on T3/615/BR cones. The slab possesses anchoring and pouring openings in corners. Installed directly on sewage manholes, it constitutes as a stable substructure for making a finial using compensation rings.

Application diagrams - p.: 58, 61, 79, and 83

T04/850/620/170 Foundation and settlement slab

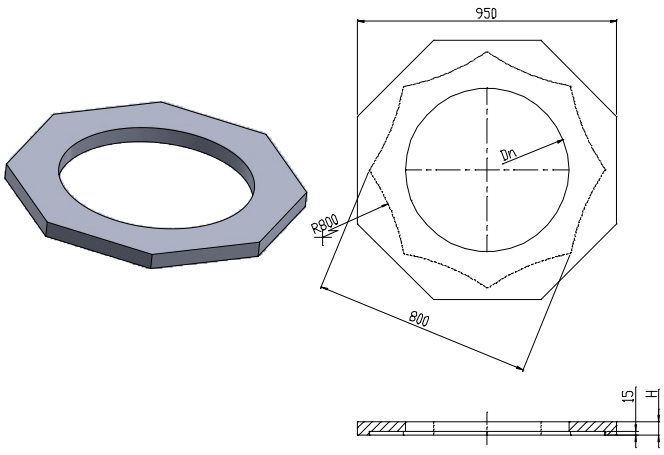


INDEX	Dn [mm]	A=A' [mm]	H [mm]	Mass [kg]	Class [kN]
T04/850/620/170	620	850	170	72,5	D400

Square relief slab installed around the DN/OD 610mm plastic well cone on a stabilised substructure acts as a relief element and element directly supporting manholes. It allows to install manholes with 850x850mm square plate, Ø850mm round plate, octagonal plate, and frame plate made from cast-iron. After a preparation along with T04/850/630/50 plate, it constitutes as an element installed on the telescope of DN600 plastic well.

Application diagrams - p.: 79 and 80

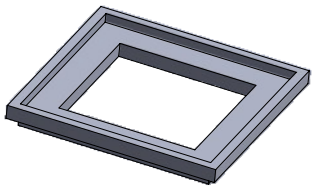
T08 DN600 Foundation and settlement slab

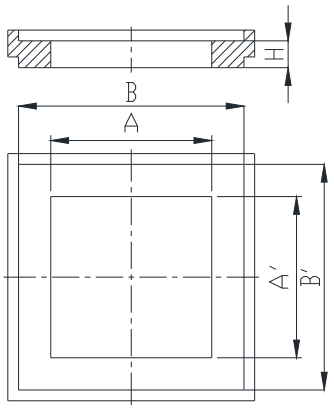


INDEX	Dn [mm]	H [mm]	Mass [kg]	Class [kN]
T08/950/600/50	600	50	31,0	D400

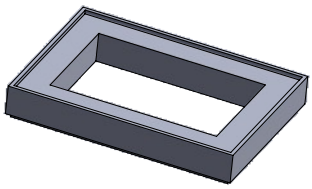
Foundation slab placed under manholes made from ductile cast-iron with octagonal frame body plate.

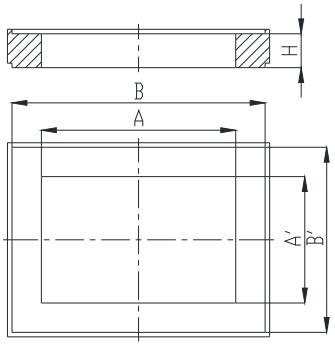
ECO2 Square/Rectangular compensation rings





INDEX	A=A' [mm]	B=B' [mm]	H [mm]	Mass [kg]	Class [kN]
ECO2/1515/25	150	190	25	1,1	C250
ECO2/1515/75	150	190	75	2,6	C250
ECO2/1818/25	180	290	25	2,7	C250
ECO2/1818/75	180	290	75	6,4	C250
ECO2/2323/25	230	340	25	3,2	C250
ECO2/2323/75	230	340	75	7,7	C250
ECO2/6161/25	610	770	25	9,9	D400
ECO2/6161/75	610	770	75	23,0	D400



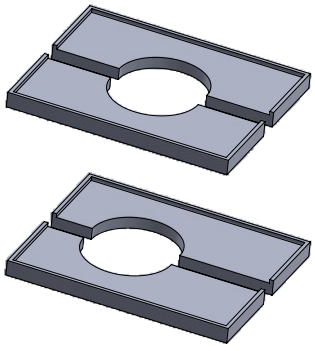


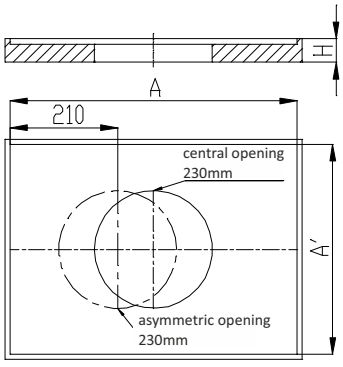
INDEX	A [mm]	A' [mm]	B [mm]	B' [mm]	H [mm]	Mass [kg]	Class [kN]
ECO2/4328/25	430	280	540	390	25	4,5	D400
ECO2/4328/50	430	280	540	390	50	8,0	D400
ECO2/4328/75	430	280	540	390	75	10,8	D400
ECO2/6145/25	610	455	765	615	25	8,9	D400
ECO2/6145/75	610	455	765	615	75	20,5	D400
ECO2/9161/25	915	610	1070	765	25	12,1	D400
ECO2/9161/75	915	610	1070	765	75	27,9	D400

Elements for construction of square and rectangular hydrant, water meter, valve, and telecommunication wells. Modules with heights of 75mm and 25mm create side walls and are installed on a poured plate or concrete prefabricate. They constitute as a support for square manholes. According to BS 5834-4:2009 on resistance to SN/2 side influence.

Application diagrams - p.: 88

ECO2 - foundation



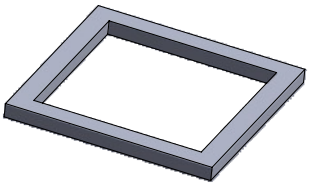


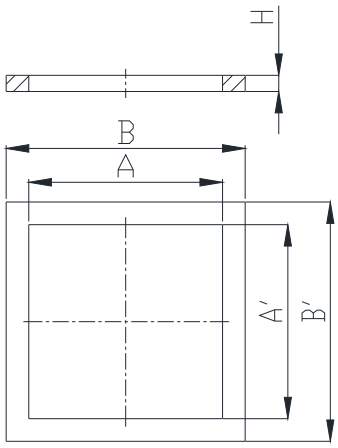
INDEX	A [mm]	A' [mm]	H [mm]	Mass [kg]	Class [kN]
ECO2/4328/BH central opening 230mm	540	390	40	11,8	D400
ECO2/4328/BV asymmetric opening 230mm	540	390	40	11,8	D400

Foundation constituting as a base/foundation element for installation of module elements of side walls (ECO2/4328) of hydrant and valve wells. The modular structure of the base allows to install the well over a pipe or wiring and provide access to valves, meters, etc.

Application diagrams - p.: 88

T6/IT Square compensation rings



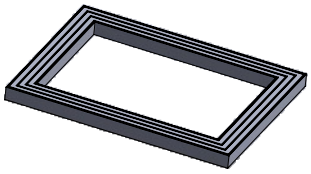


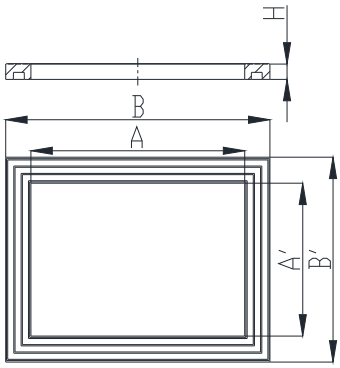
INDEX	A=A' [mm]	B=B' [mm]	H [mm]	Mass [kg]	Class [kN]
T6/IT/3030/15	300	370	15	1,2	C250
T6/IT/3030/25	300	370	25	1,9	C250
T6/IT/3030/50	300	370	50	3,2	C250
T6/IT/4040/15	400	540	15	2,7	D400
T6/IT/4040/25	400	540	25	4,9	D400
T6/IT/4040/50	400	540	50	7,9	D400
T6/IT/5050/15	500	640	15	3,4	D400
T6/IT/5050/25	500	640	25	5,5	D400
T6/IT/5050/50	500	640	50	9,3	D400
T6/IT/6060/15	600	770	15	5,4	D400
T6/IT/6060/25	600	770	25	8,6	D400
T6/IT/6060/50	600	770	50	13,4	D400
T6/IT/7070/15	700	870	15	5,5	D400
T6/IT/7070/25	700	870	25	9,6	D400
T6/IT/7070/50	700	870	50	15	D400
T6/IT/7070/100	700	870	100	27,3	D400
T6/IT/8080/15*	800	970	15	6,4	D400
T6/IT/8080/25*	800	970	25	11,0	D400
T6/IT/8080/50*	800	970	50	21,5	D400

*Products under construction

Application diagrams - p.: 89

T6/IT/7050 Rectangular compensation rings



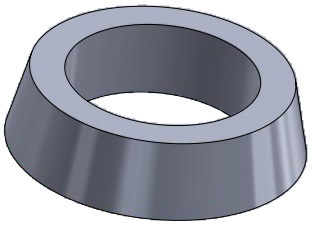


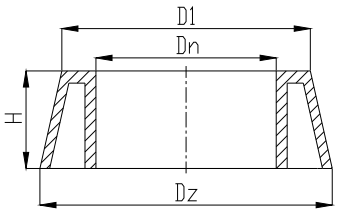
INDEX	A [mm]	A' [mm]	B [mm]	B' [mm]	H [mm]	Mass [kg]	Class [kN]
T6/IT/7050/50	700	500	865	670	50	13,2	D400
T6/IT/7050/100	700	500	865	670	100	25,0	D400

Compensation rings in the rectangular shape used to adjust height and assembly of manholes and street drains on concrete rain water, telecommunication, and sewage manholes. Compensation rings should be adjusted to the internal edges of the wells. The rings should be supported on the whole load-bearing surface.

Notes

T3 Relief cones

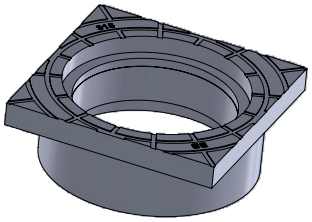


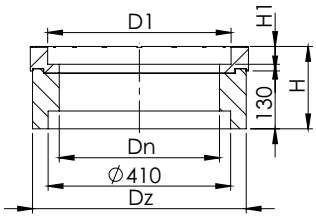


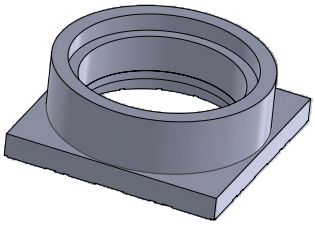
INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H1 [mm]	Mass [kg]	Class [kN]
T3/315/B125	365	600	510	200	25,1	B125
T3/315/D400	365	600	510	200	30,0	D400
T3/400/B125	425	595	535	150	17,3	B125
T3/400/D400	425	595	535	150	18,0	D400
T3/425	500	770	680	200	44,0	D400

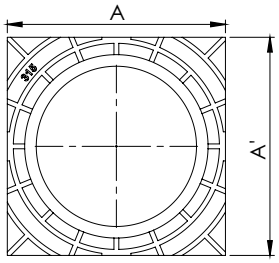
Cones relieving shaft/ascending pipes of inspection and water discharge chambers made from plastics. They are installed centrically around the chamber on an appropriately stabilised substructure. They allow to directly install both traditional and self-levelling manholes and drains and constitute as a structure support for T1 and T2 compensation rings and adapters from TX assortment group placed under manholes and drains. In areas excluded from vehicle and pedestrian traffic they constitute as an element supporting covers securing manholes (T4 type).
Application diagrams - p.: 68, 71, 72, 74÷76, and 78

T3/315/BB Relief cones





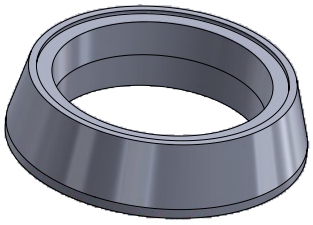


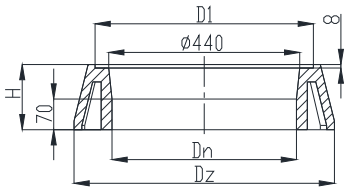


INDEX	A=A' [mm]	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
T3/315/BB	490	360	485	411	180	38	21,0	D400

Universal relief cone constituting as a functional finial of DN315 plastic inspection chamber (max. DN/OD of ascending pipe is 355mm) installed centrically around the shaft pipe. The structure of cone allows to refer to a surface structure made from paving stones, tiles (square side facing upwards), and asphalt (round side facing upwards) without problems.
Application diagrams - p.: 68 and 73

T3/400/N Relief cones

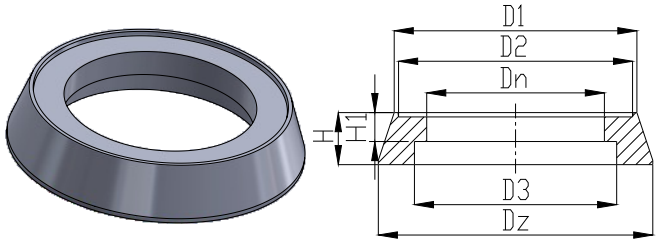




INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H1 [mm]	Mass [kg]	Class [kN]
T3/400/N	425	600	503	150	17,5	D400

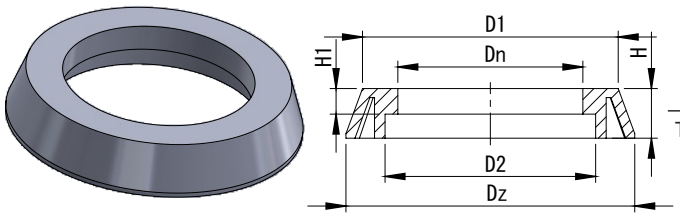
Cone relieving telescope manhole for Norson brand DN425 pipe.
Application diagrams - p.: 74 and 77

T3/615 Relief cones



INDEX	Dn [mm]	Dz [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
T3/615	615	950	840	780	700	180	85	53,6	D400

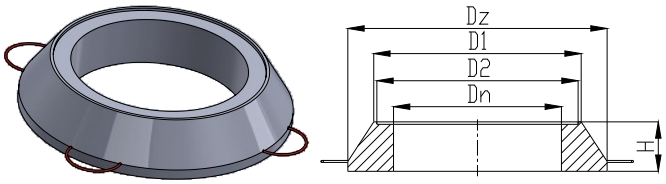
Universal relief cone for DN600 plastic inspection wells and DN800 and DN1000 manhole wells possessing a reduction cowl/choke with external diameter (DN/OD) of max. 692mm and height of min. 450mm. Installed on the stabilised substructure centric over the well opening. Constitutes as a relief and protective element of plastic well surface finial that is a direct support for T1/625 and T1R/625 compensation rings, TX/765 group adapters placed under sewage drains, leading adapters/rings for TXS/635/80, TXS/650/90, and TXS/675/90 self-levelling manholes, and manholes with round body plate (max. ext. diameter of Ø800mm and min. DZW int. diameter of Ø640mm).
Application diagrams - p.: 79, 81, and 82



INDEX	Dn [mm]	Dz [mm]	D1 [mm]	D2 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
T3/615/BR	615	950	850	700	165	85	52,0	D400

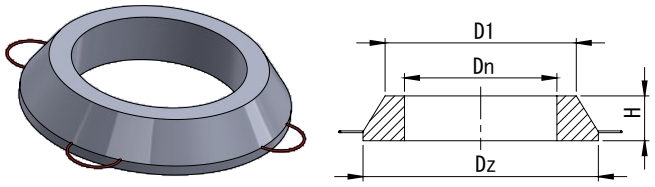
Universal relief cone for DN600 plastic inspection wells and DN800 and DN1000 manhole wells possessing a reduction cowl/choke with external diameter (DN/OD) of max. 692mm and height of min. 450mm. Installed on the stabilised substructure centric over the well opening. Constitutes as a relief and protective element of plastic well surface finial that is a direct support for T1/620 and T1C/625 compensation rings, TX/765 group adapters placed under sewage drains, leading adapters/rings for TXS/635/80, TXS/650/90, and TXS/710/80 self-levelling manholes, T04 foundation slabs, and manholes with round or octagonal body plate (max. ext. diameter of Ø800mm at min. DZW of Ø640mm).

T3/680 Relief cones



INDEX	Dn [mm]	Dz [mm]	D1 [mm]	D2 [mm]	H [mm]	Mass [kg]	Class [kN]
T3/680	680	1050	840	815	200	76,7	D400

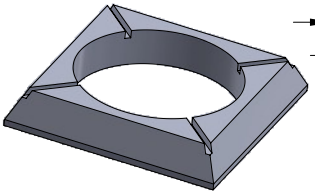
Relief cone for DN600 plastic inspection wells and DN800, DN1000, and DN1250 cover wells possessing a reduction cowl/choke with external diameter (DN/OD) of max. 675 mm and height of min. 450mm. Installed on the stabilised substructure centric over the well opening. Constitutes as a relief and protective element of plastic well surface finial that is a direct support for concrete and cast-iron manholes acc. to DIN 19584, T1R/625/40÷120 type of rings, and TXS/675/80, TXS/700/80, and TXS/710/80 leading adapters/rings placed under appropriate self-levelling manholes.
Application diagrams - p.: 83 and 84

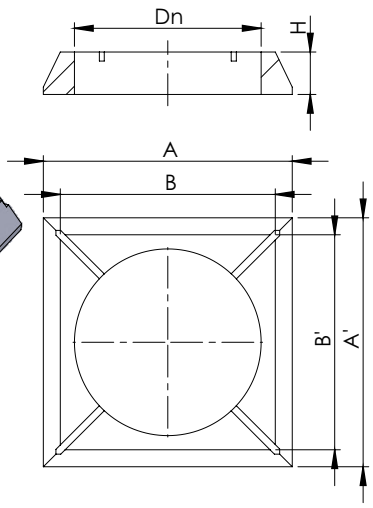


INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	Mass [kg]	Class [kN]
T3/680/BR	680	1050	850	190	75,5	D400

Relief cone for DN600 plastic inspection wells and DN800, DN1000, and DN1250 cover wells possessing a reduction cowl/choke with external diameter (DN/OD) of max. 675 mm and height of min. 450mm. Installed on the stabilised substructure centric over the well opening. Constitutes as a relief and protective element of plastic well surface finial that is a direct support for T1C/620/30÷50 and T1/620/15÷100 compensation rings, T04 foundation slabs, and manholes with round plate max. Ø850mm, 850x850mm square plate, concrete and cast-iron manholes acc. to DIN 19584, T1R/625/40-120 type of compensation rings, and TXS/675/80, TXS/700/80, and TXS/710/80 leading adapters/rings.
Application diagrams - p.: 83 and 84

TXP/315/PN Adapter placed under 315 manholes and drains

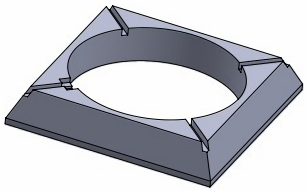


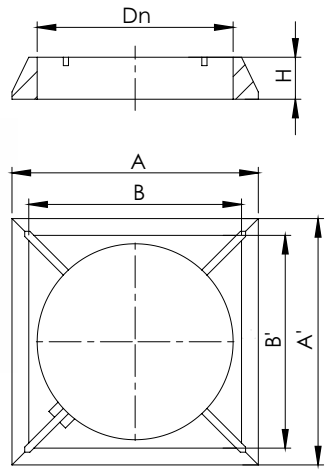


INDEX	Dn [mm]	A=A' [mm]	B=B' [mm]	H [mm]	Mass [kg]	Class [kN]
TXP/315/PN	330	440	380	75	8,3	D400

Support adapter used to support DN315 telescope manholes and drains installed in a bituminous layer. Intended to be placed under square load-bearing bodies of manholes with external flange dimensions of 370x370mm and external telescope diameter of 330 mm (e.g. Norson brand - model 370x370, KZO-model MAX, Bohamet 315) - support surface of 1027cm^2.
Application diagrams - p.: 68 and 69

TXP/315/PO Adapter placed under 315 manholes and drains



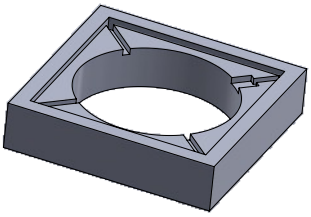


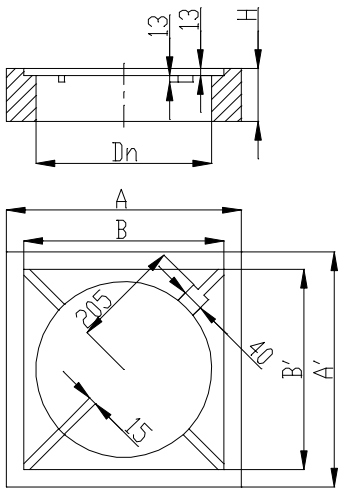
INDEX	Dn [mm]	A=A' [mm]	B=B' [mm]	H [mm]	Mass [kg]	Class [kN]
TXP/315/PO	350	440	380	75	7,7	D400

Support adapter used to support DN315 telescope manholes casted in Orzechowscy iron foundry and installed in bituminous surface that provides a support of 920cm^2 and possesses an internal diameter of 350mm. It can be placed under DN315 Stamei D400 telescope manhole.

Note:
PN and PO type of TXP support adapters can be used with other types of telescope manholes and drains based on DN315 pipe in an indirect way through the placement of an asphalt layer with thickness of 3÷5 cm, which will allow to install any DN315 telescope manhole, between adapter and cast-iron during the assembly.

TXO/315/PN Adapter





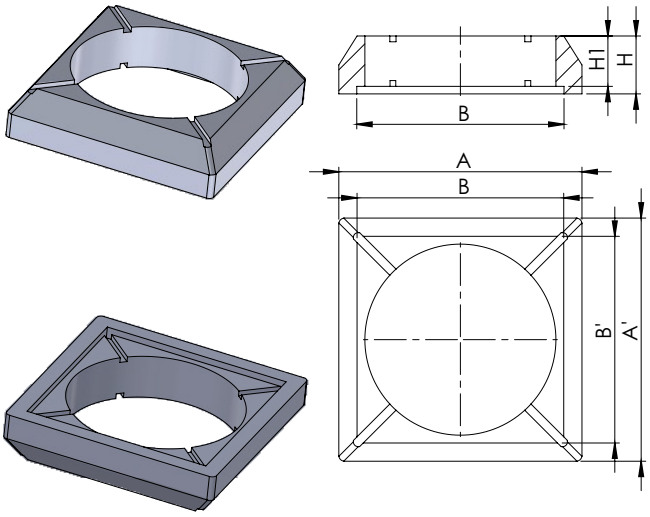
INDEX	Dn [mm]	A=A' [mm]	B=B' [mm]	H [mm]	Mass [kg]	Class [kN]
TXO/315/PN	330	440	375	90	14,1	D400

Support adapter used to support DN315 telescope manholes and drains installed in paved surface and sidewalks. Dedicated to be placed under square load-bearing bodies of manholes with external flange dimensions of 370x370x13 mm and external telescope diameter of 330mm. The adapter facilitates the installation and assembly of manholes inside a cobblestone surface. It is placed on a cement substructure, T06/320/55 foundation ring, or T1/320/50 compensation ring.

Note:
There is ability to individually select internal dimensions of and adjust the adapter to other type of telescope manhole upon agreement with the recipient.
Application diagrams - p.: 68 and 69

TXO/315/N355U Adapter

For 315 telescope manholes



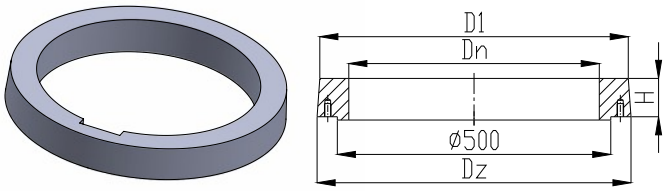
INDEX	Dn [mm]	A=A' [mm]	B=B' [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXO/315/N355U	330	420	357	100	87	10,4	D400

Universal manhole and support adapter for DN315 telescope manholes with square load-bearing bodies with external flange dimensions of 355x355x13mm and class B125 and D400. Adapter is placed directly under the body of cast-iron manhole and placed in the load-bearing structure of the road.

In the bituminous surface, the sloped side is the manhole supporting side and in the paving surface the cover is placed in the cover cavity of the adapter - square side. Adapter facilitates the placement and assembly of manholes. It is placed on a cement foundation in the paving surface. Making a correct filling in the bituminous surface and concentration of bituminous layer under the adapter is necessary. It is intended for the manholes: Norson - model 355x355 and Stamei - DN315 class B125.
Application diagrams - p.: 68 and 70

TXP/425 Adapter

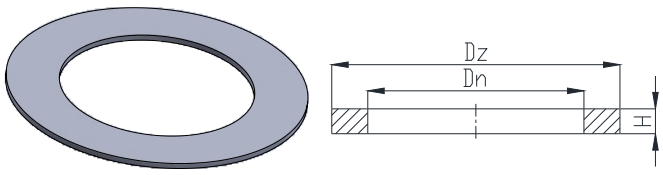
For T3/425 cone.



INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	Mass [kg]	Class [kN]
TXP/425	453	570	564	70	9,0	D400

Due to the internal dimension of a cone and dimension of Ø425mm manhole body, for Ø425mm well is used adapter reducing the opening diameter and increasing the width of support for Ø425mm manhole that is placed between the cone and manhole. Required external diameter of the manhole load-bearing flange is Ø560mm. The adapter possesses a flange that additionally secures the adapter against a mutual movement in relation to a cone.
Application diagrams - p.: 74

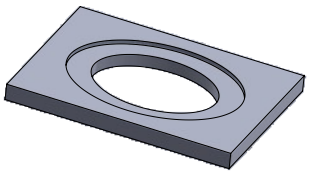
T06/1050/680 Foundation ring

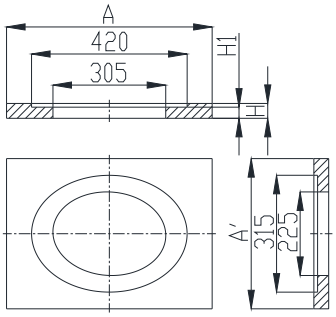


INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T06/1050/680	680	1050	20	19,5	D400

Foundation ring installed around the shaft of a plastic well DN/OD max. 675mm on a fortified and stabilised substructure. Constitutes as a support for T3/615 and T3/615/BR relief cones.
Application diagrams - p.: 79

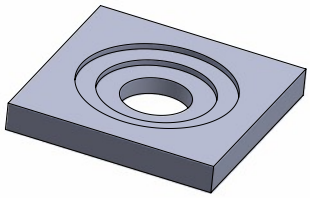
TXP Support adapters

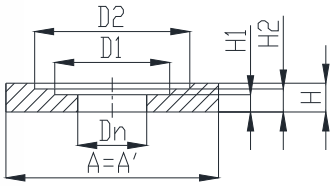




INDEX	A [mm]	A' [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXP/550/225	555	405	40	30	8,6	D400

Support adapter placed under the oval box for hydrant bolts made acc. to DIN 4055 and PN-M-74082:1998. It is installed on a sand bed (min. 5cm thick) or fortified substructure in order to provide a stable installation of a box and secure it against movement and settlement.

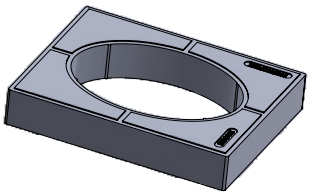


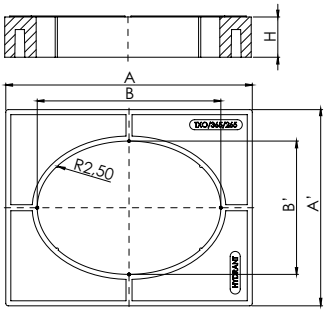


INDEX	Dn [mm]	D1 [mm]	D2 [mm]	A=A' [mm]	H [mm]	H1 [mm]	H2 [mm]	Mass [kg]	Class [kN]
TXP/335/100	100	-	275	335	50	-	38	6,5	D400
TXP/370/75	75	250	275	370	50	30	40	7,2	D400
TXP/370/100	100	255	275	370	50	30	40	7,2	D400
TXP/370/100b	100	245	275	370	50	30	40	7,3	D400
TXP/370/120	120	200	270	370	50	30	40	6,8	D400

Universal support adapters placed under street boxes that are used in water and gas installations executed acc. to DIN 4055, 4056, 4058, 4059, and PN-M-74081:1998. Installed on a sand bed (min. 5cm thick) or fortified substructure in order to provide a stable installation of boxes and secure them against movement and settlement.
Application diagrams - p.: 88

TXO/365/265 Protective elements for street box

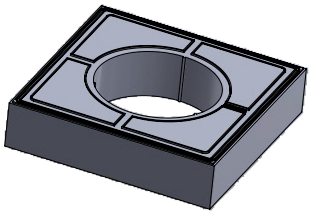


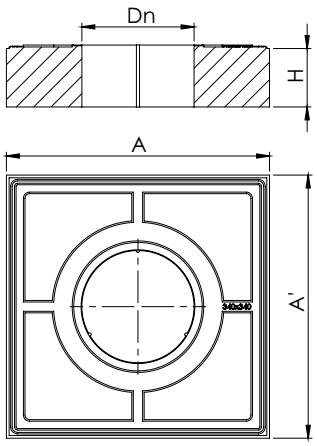


INDEX	A [mm]	A' [mm]	B [mm]	B' [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXO/365/265	490	390	365	265	80	11,5	D400

Protective element of oval street box for hydrants made acc. to DIN 4055 and PN-M-74082. Installed in a brick surface, on a prepared and stabilised ground.

TXO/340 Protective elements for street box

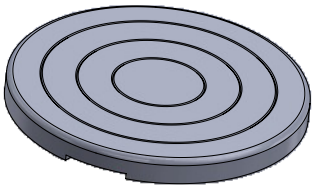


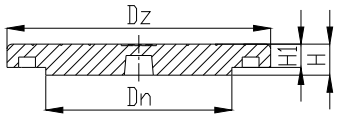


INDEX	A=A' [mm]	Dn [mm]	H [mm]	Mass [kg]	Class [kN]
TXO/340/125	340	125	80	9,0	D400
TXO/340/145	340	145	80	8,5	D400
TXO/340/195	340	195	80	7,2	D400

Surface, upper protective elements of water supply and gas street boxes are installed around the box on a compacted substructure or in a paved or bituminous surface or in a green area. They secure boxes against movement and facilitate the reference to paved surface.
Application diagrams - p.: 88

T4 Protective coverings



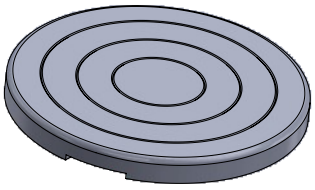


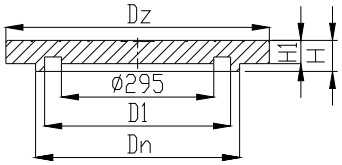
INDEX	Dn [mm]	Dz [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T4/315	360	510	60	50	10,4	200kg
T4/400	415	535	60	55	17,0	200kg
T4/425	490	680	55	40	18,4	200kg
T4/600	580	780	70	55	22,9	200kg
T4/615	790	840	55	40	30,8	200kg

Protective coverings for T3 relief cones and plastic shaft pipes, concrete sewage manholes, and street drains. They constitute as a temporary protection of wells, drains, and sewage system against contamination, unauthorised access, and accidents during construction and assembly works before the installation of target operating finial. Maximum load of a covers is 200kg. Used outside of area exposed to pedestrian and vehicle traffic.
Application diagrams - p.: 67

T4/315/400 Protective coverings

For 315 and 400 pipe.

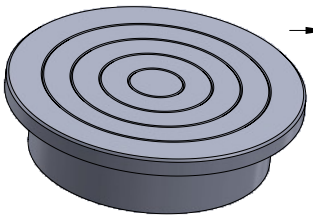


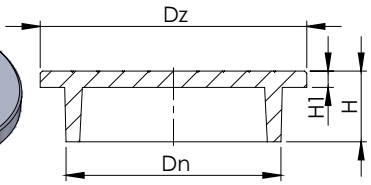


INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T4/315/400	395	510	360	60	45	11,0	200kg

Application diagrams - p.: 67

T4 Protective coverings





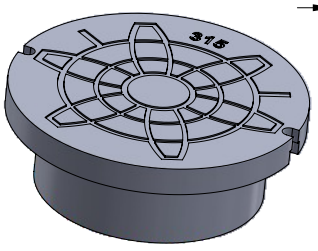
INDEX	Dn [mm]	Dz [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T4/315/300	300	350	70	30	5,0	200kg
T4/400/P.	400	490	130	30	11,4	200kg

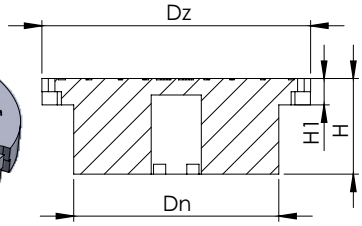
T4/400/P - Protective covering and possibly bottom element of a plastic single- and double-walled shaft pipe DN/ID 400. After appropriate preparation, it can act as a bottom of a pipe DN/OD 355mm.

Universal protective covering for plastic ascending pipes DN/ID 300, 315, and 400mm.

Application diagrams - p.: 67, 76

T4/315/BB Protective coverings





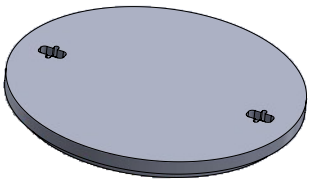
INDEX	Dn [mm]	Dz [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T4/315/BB	310	410	130	38	11,3	200kg

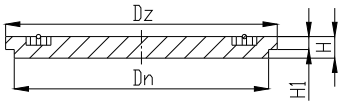
Universal protective covering for T3/315/BB relief cone and shaft pipe DN/ID 300mm.

T4/635 Protective coverings

For pipe 600. For DN600 cast-iron bodies.

INDEX	Dn [mm]	Dz [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T4/635	590	640	55	35	21,6	200kg

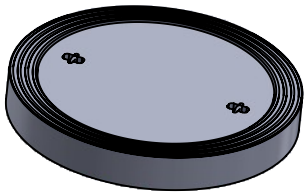


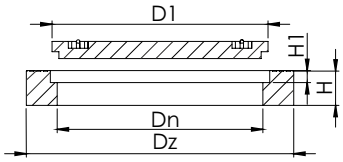


Protective covering for plastic shaft pipes and concrete sewage manholes DN/ID 600mm. They constitute as a temporary protection of wells and sewage system against contamination, unauthorised access, and accidents during construction and assembly works before the installation of a target operating finial. Maximum load of coverings is 200kg.
Used outside of area exposed to pedestrian and vehicle traffic.
Application diagrams - p.: 69

T5/600N Protective coverings

INDEX	Dn [mm]	Dz [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T5/600/N	600	780	630	100	35	40,6	200kg

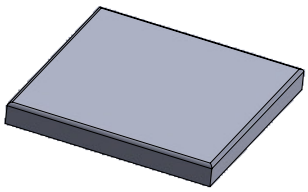


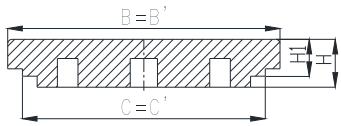


Protective covering elevated above the ground level of concrete wells (drainage, etc.) and plastic wells with DN600 manhole opening. Maximum load of a covers is 200kg. Used outside of area exposed to pedestrian and vehicle traffic. Does not contain metal elements, is not exposed to stealing, and is resistant to corrosion and influence of chemically aggressive environments.

T4/IT Protective coverings

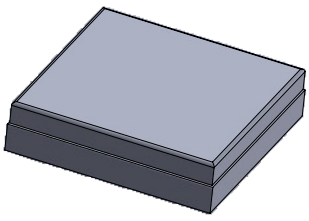
INDEX	B=B' [mm]	C=C' [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T4/IT/300	370	330	65	50	9,5	200kg
T4/IT/400	540	430	65	50	21,5	200kg

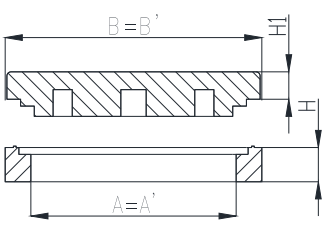




T5/IT Protective coverings

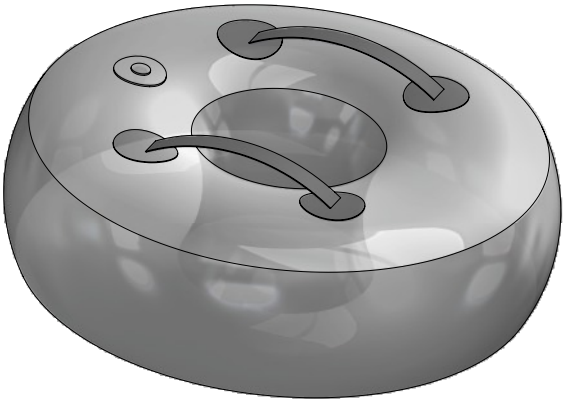
INDEX	A=A' [mm]	B=B' [mm]	H [mm]	H1 [mm]	Mass [kg]	Class
T5/IT/300	300	370	50	40	11,0	200kg
T5/IT/400	400	540	50	40	26,0	200kg





Protective coverings for inspection chambers with square 300x300mm and 400x400mm cross-section.

Pneumatic formworks



INDEX	Dn [mm]	Useful formwork height [mm]	Height [mm]
PU-TS 500	450÷500	150	200
PU-TS 600	600	150	200
PU-TS 625	625	150	200

We can deliver pneumatic formworks with different dimensions and shapes (e.g. square, rectangular) on customer's request.

Light, flexible, and functional PU-TS pneumatic formwork allows to make a compensation and repair layer from fast-setting poured masses based on cement or polyester resins that constitute as a foundation for assembly of TVR T System sewage manhole and street drain surface finials. It is also used to secure sewage system against contamination during the execution of disassembly works of damaged well finials.

Before commencing the disassembly works of a finial, the pneumatic formwork can be used as a protection against contamination.

Pu-TS 625 formwork installed in a manhole opening of a well allows to pour the compensation layer.

- Secures the well from internal side against loss of poured mass and perfectly seal the place of application.
- Maximum formwork height is 150mm and the recommended height of repair layer is between 10mm and 80mm (according to manual of poured masses' manufacturer).
- During the application of compensation mass, the formwork provides the ability to visually control the pouring process and correct filling of deluge spaces.
- Reusable; resistant to the adhesion of poured masses based on both cement and chemo-hardening resins.
- Short resistance to temperatures up to 160°C and allowed short contact with hot asphalt masses.
- The ease of assembly and disassembly - the formwork can be removed after the whole structure of a finial is done.
- Working pressure of 0,02 MPa.
- PU-TS 500 pneumatic formworks are intended for making a repair layer in rain water wells with DN 450 and DN 500 diameters. For DN600 manhole well finials we recommend the use of PU-TS 600 and for DN625 we recommend PU-TS 625.

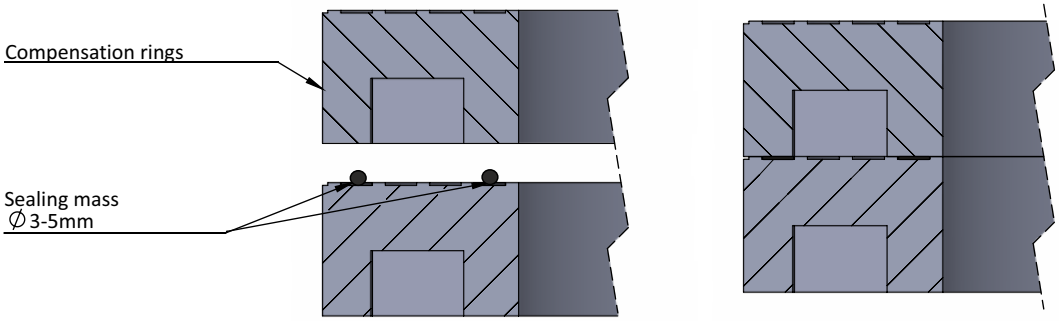
500x500 pneumatic formwork installed in a well with square cross-section.

To connect and bind structure of a surface finial made on the basis of compensation rings and other TVR T System elements you should use flexible, polymer-based sealing masses intended for binding plastics, concrete, and metal elements. The masses should be characterised by the following parameters: resistance to tearing (acc. to DIN 53515) of ab. 6,0 N/mm2; resistance to stretching (acc. to DIN 53504) of ab. 1,8 N/mm2; resistance to temperatures between -40°C and +90°C (short resistance up to +120°C); chemical resistance to influence of acids, alkaline, fats, fuels, and deicing salts located in the surface and snowmelt waters.

The sealing mass is not a compensation mass, therefore after the application you should apply the next finial element and tightly push it in order to properly distribute the mass. Carry out the application using a pistol and applying a 3÷5mm roll in a constant manner on the external and internal circumference of compensation ring. Applying the sealing mass will increase the tightness of finial.

During the operation, TVR T System elements tend to self-seal themselves under the pressure of manholes and street drains thanks to the special surface texture. Sealing mass should be located between all the finial elements, i.e. between TVR T System elements, concrete elements, and cast-iron.

We possess in our offer a Wurth brand sealing mass adhesive+sealant. 300ml of mass located inside the tube should be sufficient to seal about 6÷8 compensation rings.



In alternating structures using concrete elements for sealing, we recommend asphalt and rubber masses due to the irregularities of a concrete surface. Do not use cement-based mortars to connect TVR T System rings. Cement-based masses can only constitute as a support, a stiff foundation for the construction of a finial with the use of rings and other elements.

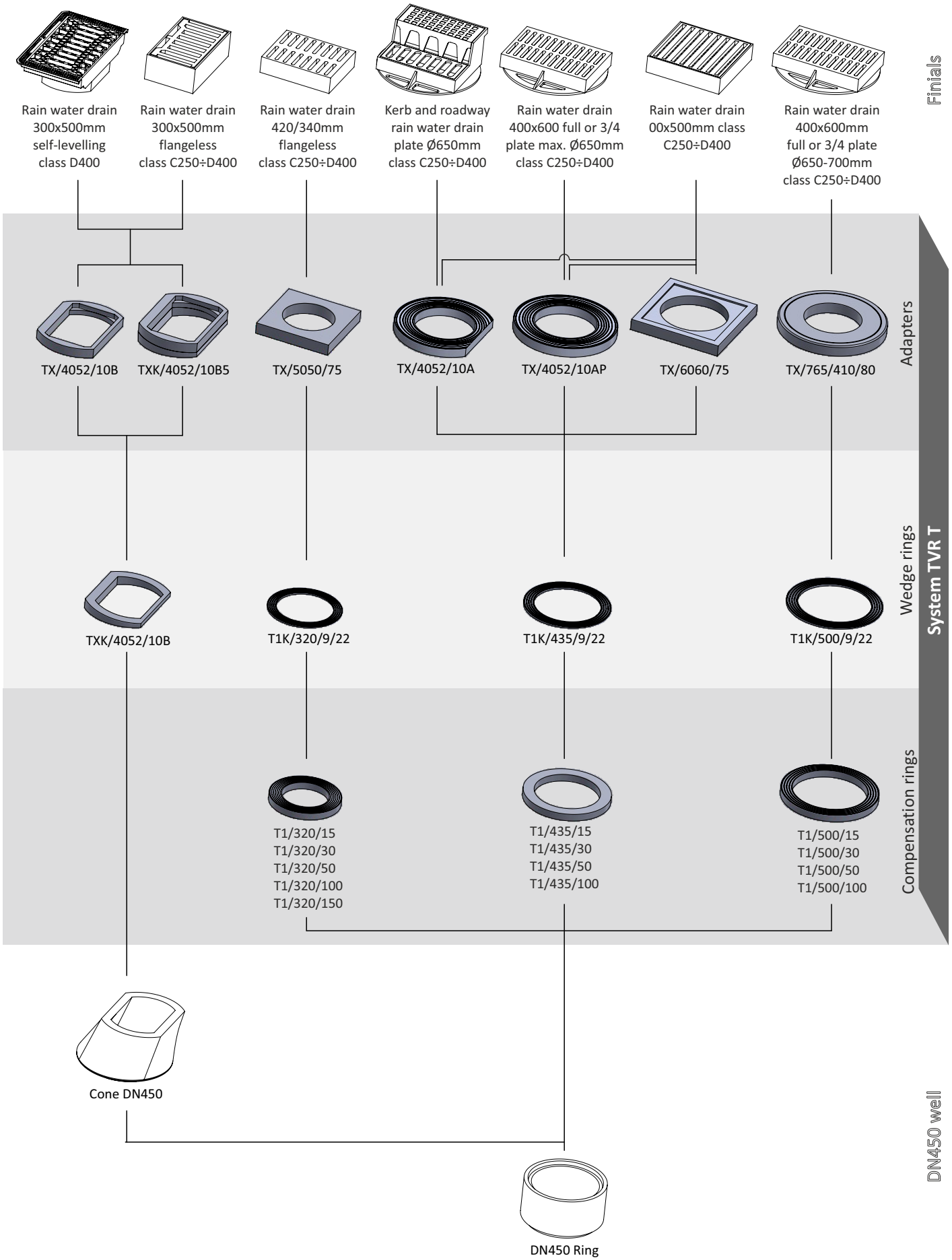
Application of a sealing and binding polymer mass on the surface of lower compensation ring

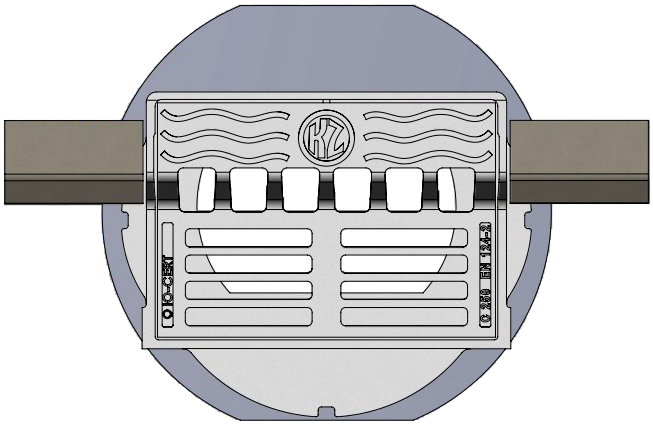
Application of a sealing and binding polymer mass on the surface of lower load-bearing plate of a sewage manhole

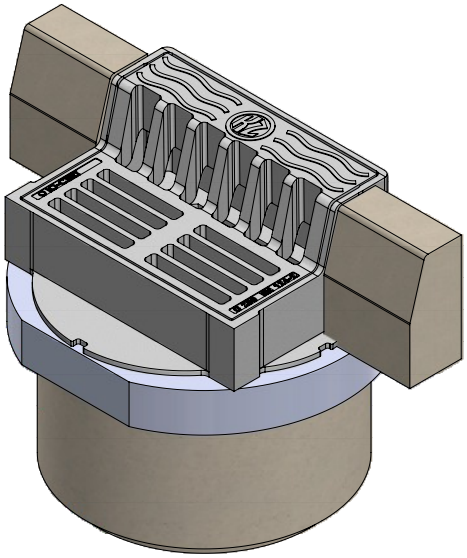
14. Application diagrams for TVR T System elements

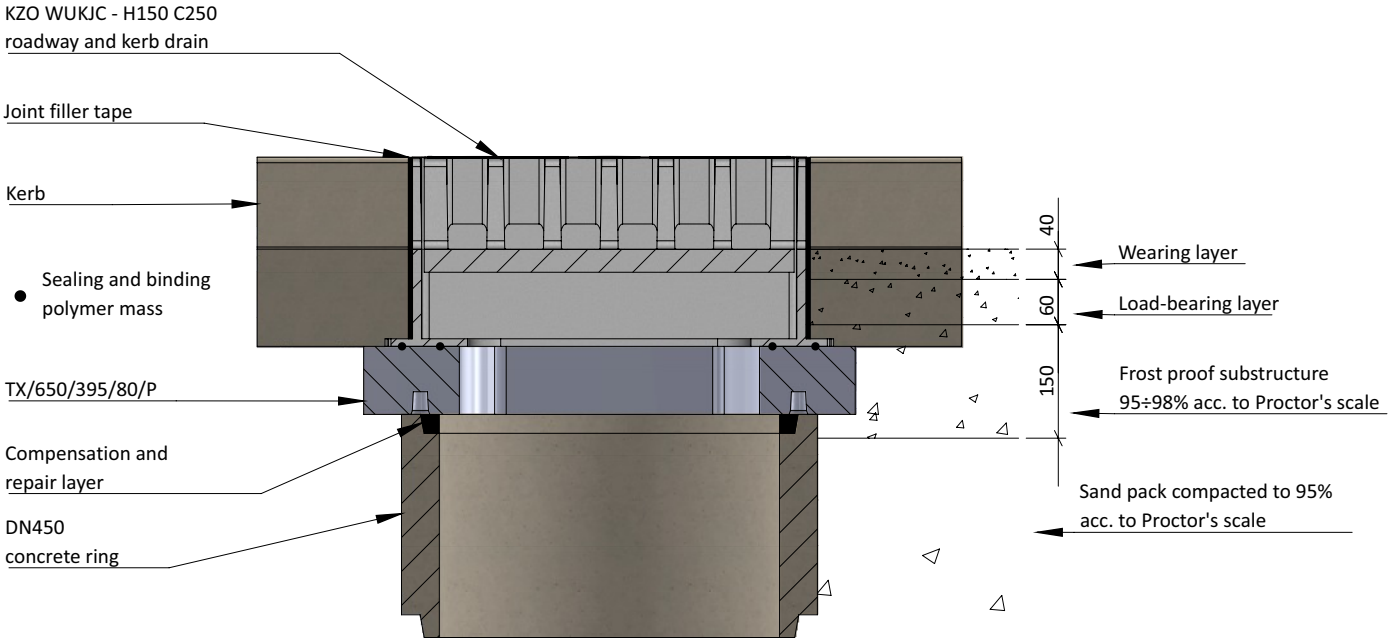
14.1 DN450 concrete street drain

Application diagram for surface finial elements of the TVR T system for height adjustment and assembly of rain water drains on DN450 concrete street drains acc. to DIN 4052.



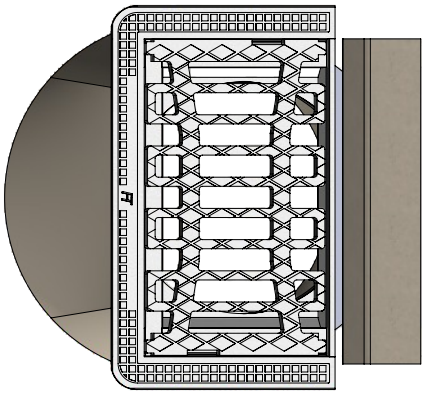


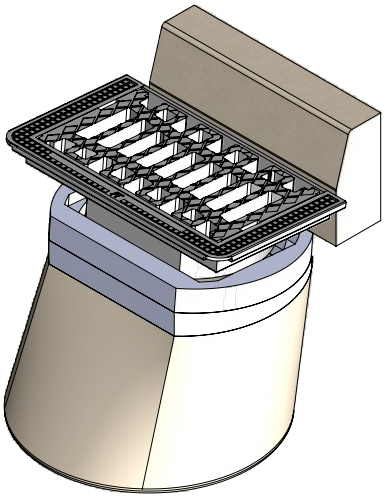


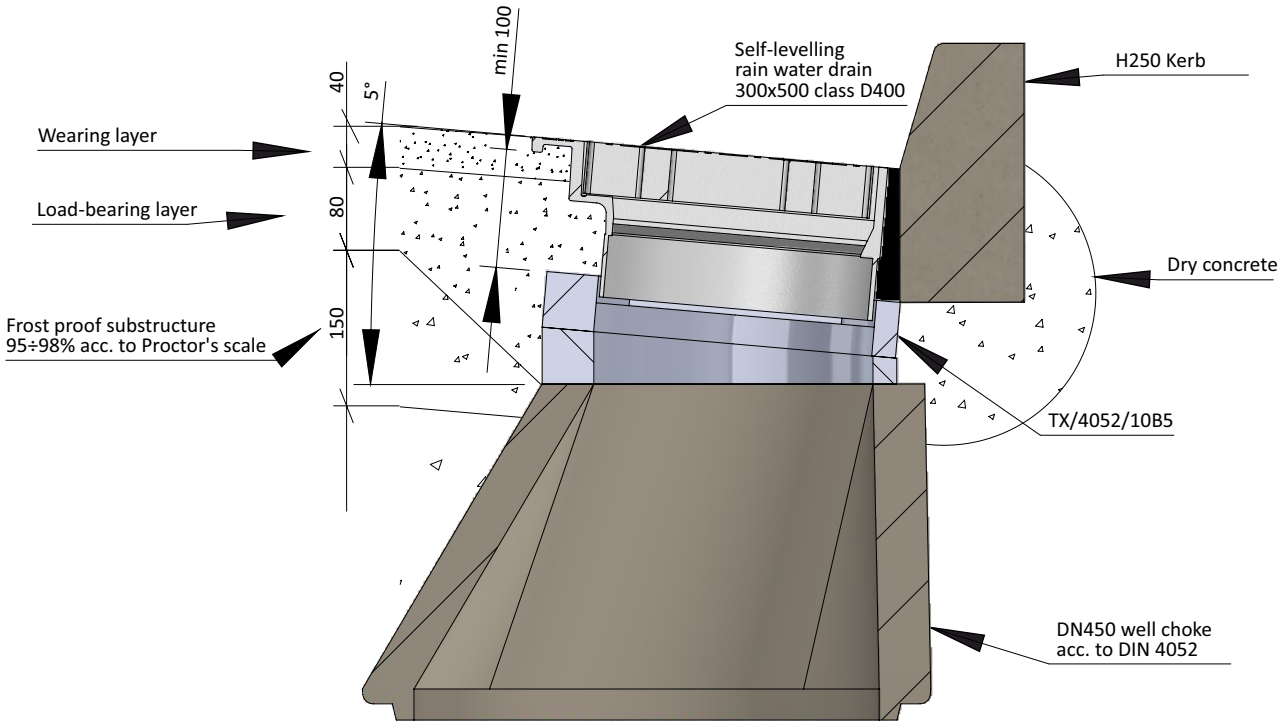


C250 class kerb and roadway drain, drainage surface of 700cm^2, installed on TX/650/395/80/P adapter. The adapter is based on indirect rings of concrete rain water drain. Provides tightness and correct assembly and use of drain. Design solution for DN450 manholes.

Notes

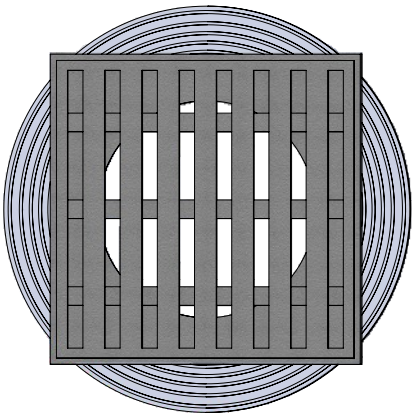


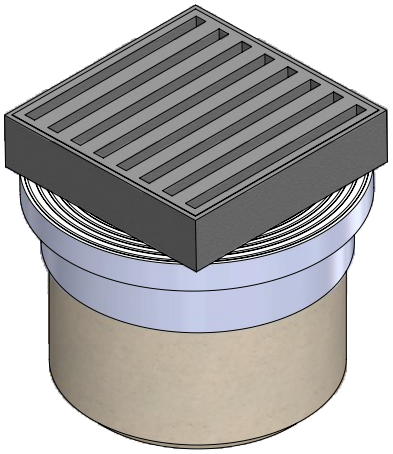


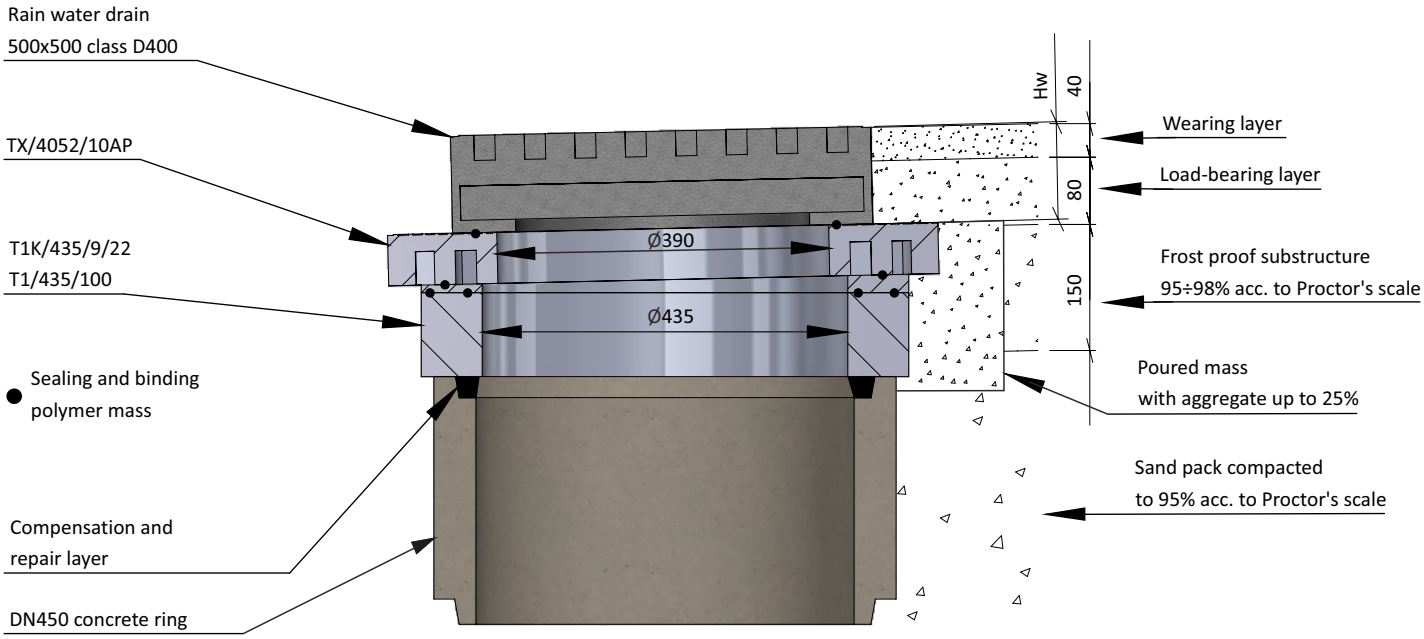


D400 class 300x500 self-levelling drain, drainage surface of 732cm^2, supported by load-bearing flange on asphalt surface, and integrated with a concrete choke of street drain with the use of TX/4052/10/B5 adapter. Adapter allows to implement leading/drainage pipe, make a tight connection with a well, and refer the height and inclination of a well. Provides tightness and correct assembly and use of drain. Design solution for DN450 manholes equipped with a cone/choke constituting as a support for adapter.

Notes

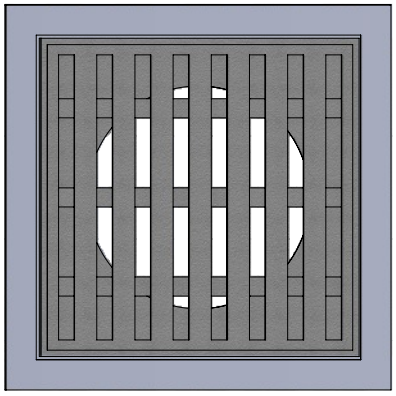


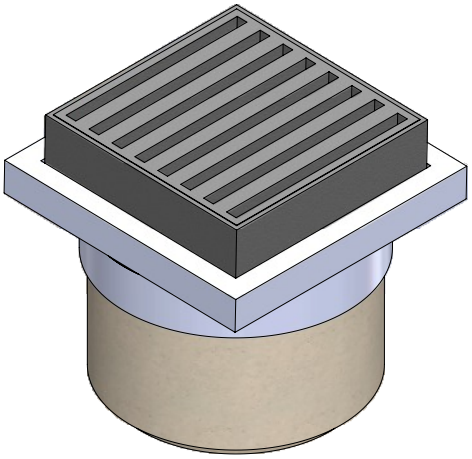


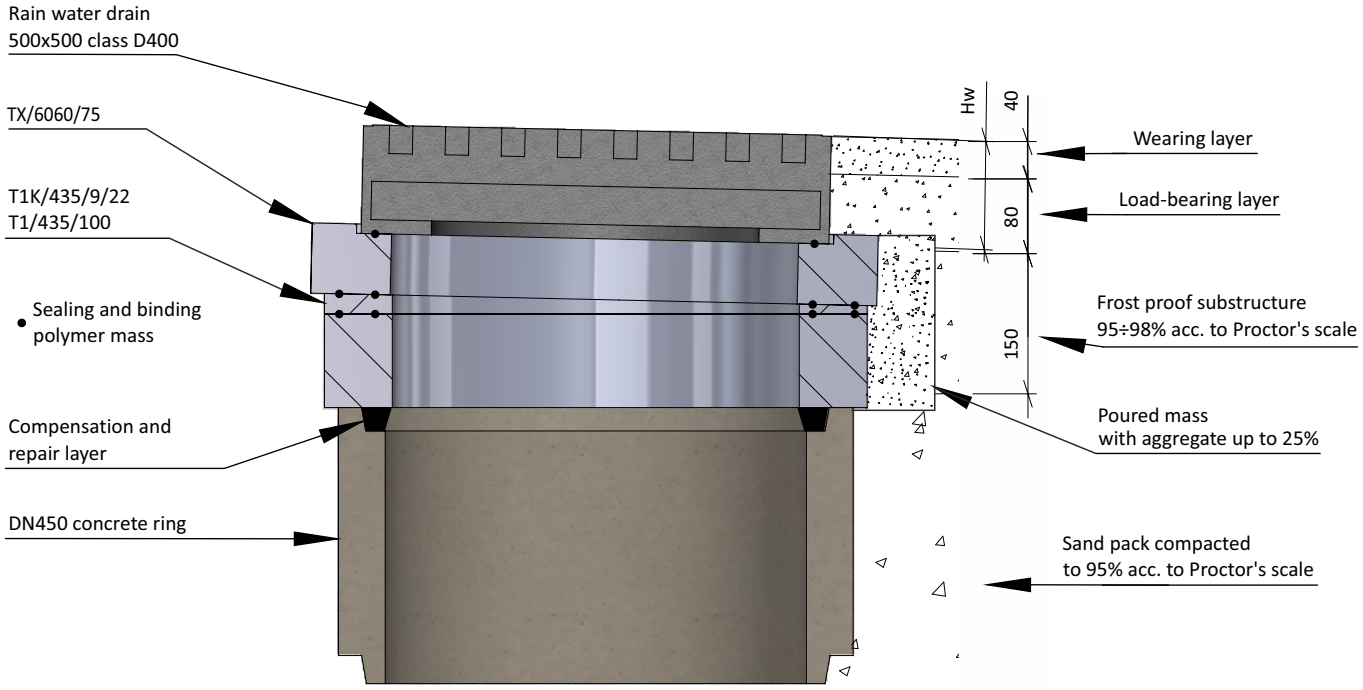


Surface finial of DN450 street concrete drain acc. to DIN 4052 consisting of TVR T System T1/435/100 type compensation rings, T1K/435/9/22 drain inclination angle adjustment rings, and TX/4052/10/AP adapter placed under drain with drainage opening of Ø390mm directly supporting a 500x500 cast-iron roadway drain. Design solution ensures the full tightness of a finial, correct height reference of concrete street drain to the installation height of a drain, and full support for all structure elements. Reconstruction poured mass poured around the finial constitutes as a protection against horizontal movement of finial elements, and support/foundation of TX/4052/10/AP adapter and substructure for reconstructed road surface. Structure can be used in areas 1÷3 acc. to PN-EN 124-1:2015, drain bays, and areas with low risk of vehicles riding over it due to the structure and support surface of the body.

Notes

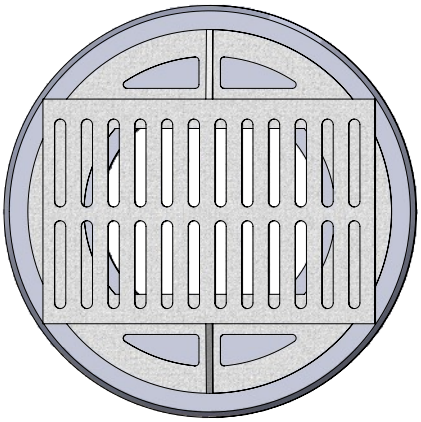


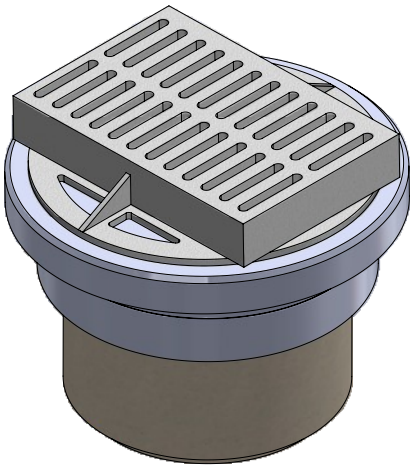


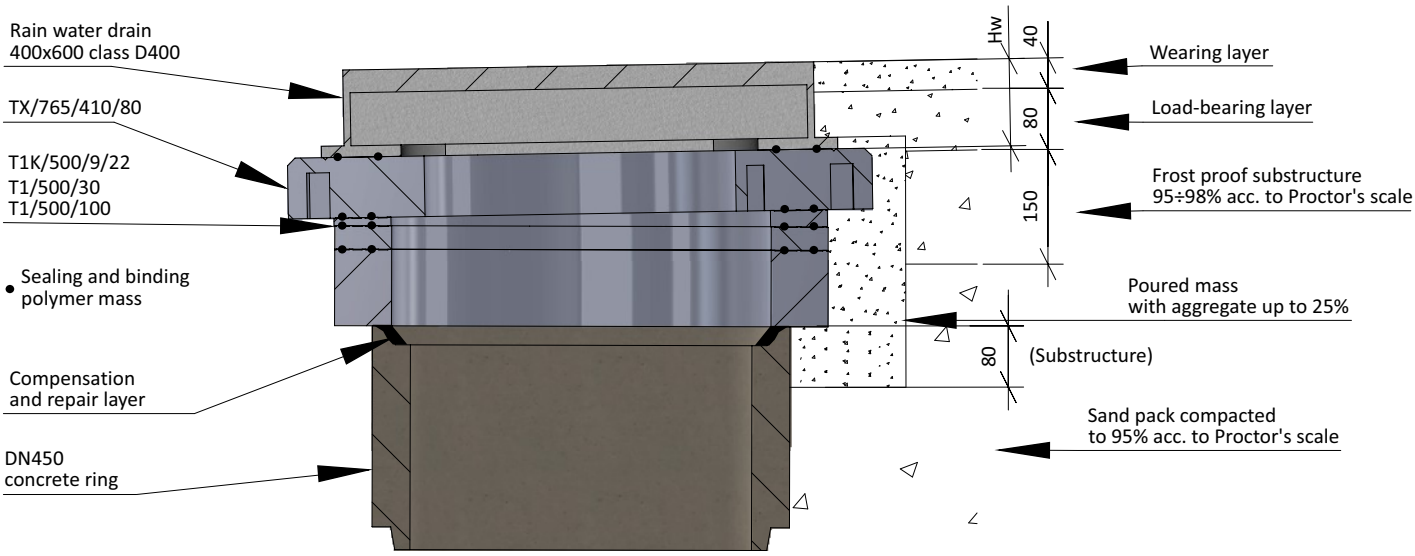


Surface finial of DN450 street concrete drain acc. to DIN 4052 consisting of TVR T System T1/435/100 type compensation rings, T1K/435/9/22 drain inclination angle adjustment rings, and TX/6060/75 adapter placed under drain with drainage opening of Ø435mm directly supporting a 500x500 cast-iron roadway drain. Design solution ensures the full tightness of a finial, correct height reference of concrete street drain to the installation height of a drain, and full support for all structure elements. Structure is to be used in areas 1÷3 acc. to PN-EN 124-1:2015, drain bays, and areas with low risk of vehicles riding over it due to the structure and support surface of the drain body.

Notes





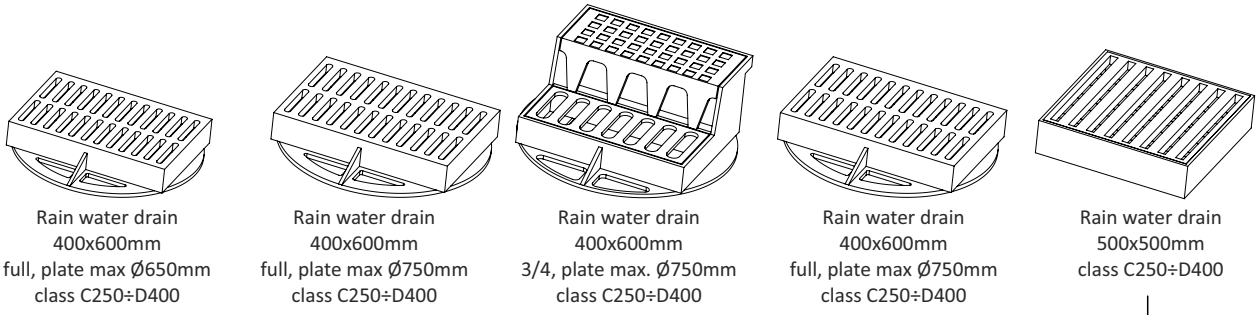


Surface finial of DN450 street concrete drain acc. to DIN 4052 consisting of TVR T System T1/500/30 and T1/500/100 type compensation rings and TX/765/410/80 adapter placed under drain directly supporting a 400x600 cast-iron roadway drain. Design solution ensures the full tightness of a finial, correct height reference of concrete street drain to the installation height of a drain, and full support for all structure elements. Reconstruction poured mass poured around the finial also constitutes as a support/foundation for compensation rings and TX/765 adapter.

Notes

14.2. DN500 concrete street drain

Application diagram for surface finial elements of the TVR T system for height adjustment and assembly of rain water drains on DN500 concrete street drains.



Rain water drain 400x600mm full, plate max Ø650mm class C250÷D400

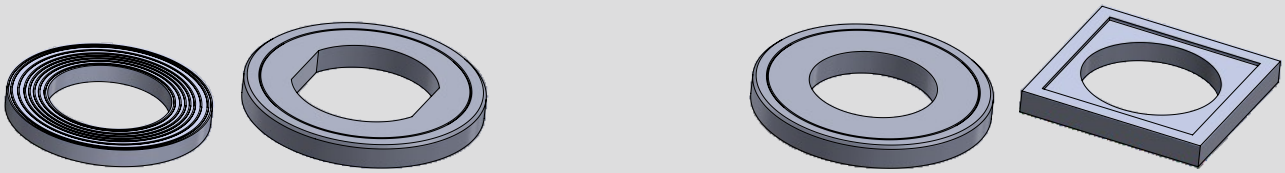
Rain water drain 400x600mm full, plate max Ø750mm class C250÷D400

Rain water drain 400x600mm 3/4, plate max. Ø750mm class C250÷D400

Rain water drain 400x600mm full, plate max Ø750mm class C250÷D400

Rain water drain 500x500mm class C250÷D400

Finials



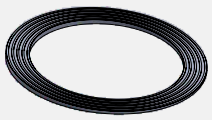
TX/4052/10AP

TX/765/420/470/BK

TX/765/410/80
TX/765/500/80

TX/6060/75

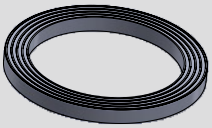
Adapters



T1K/500/9/22

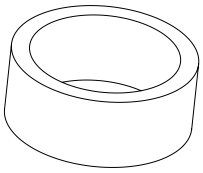
Wedge rings

System TVR T



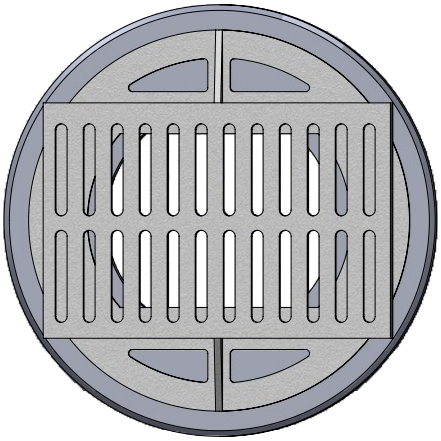
T1/500/15
T1/500/30
T1/500/50
T1/500/100

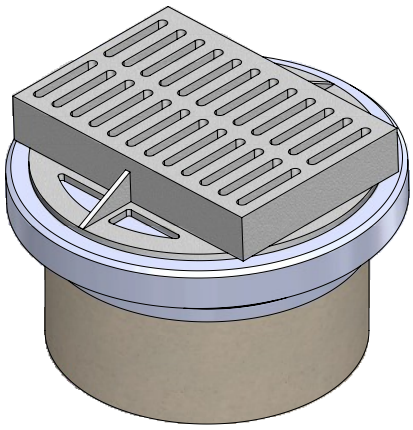
Compensation rings

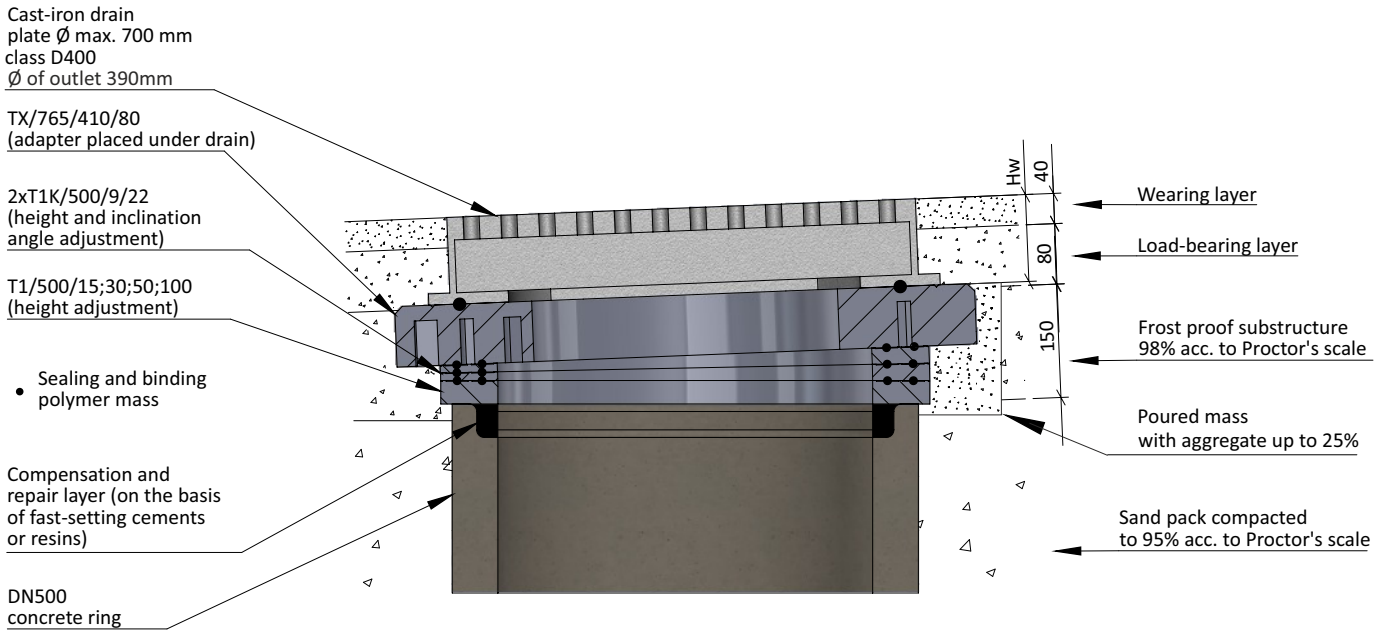


DN 500 Ring

DN500 well

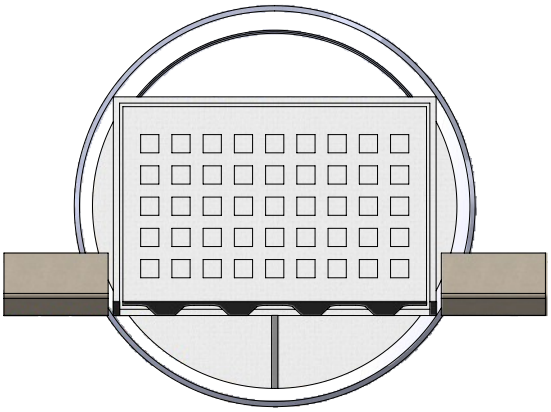


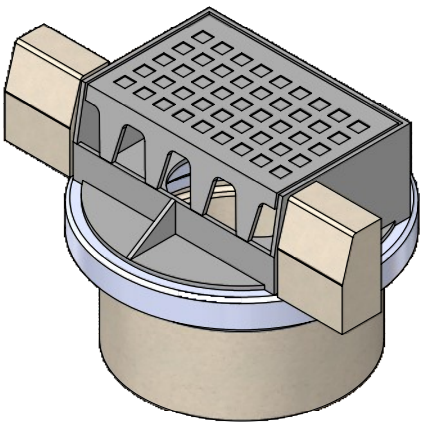


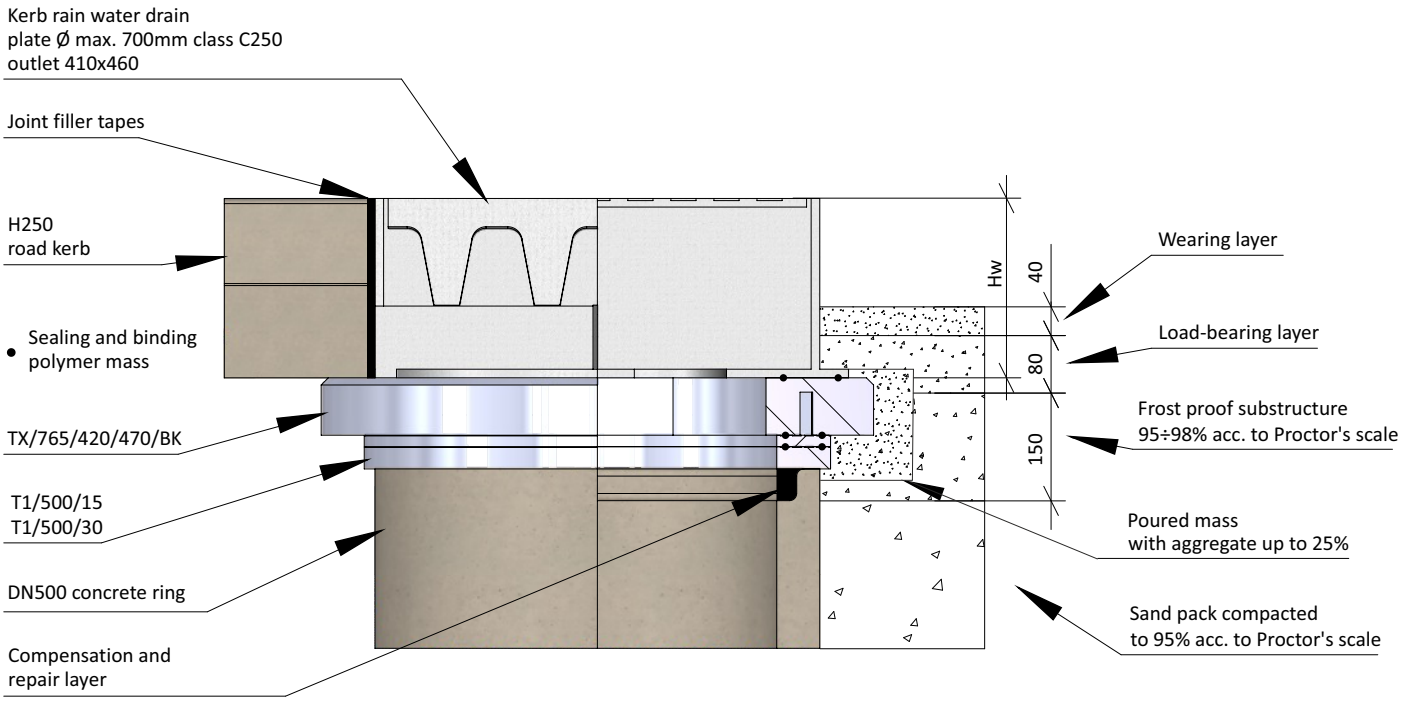


400x600 full cast-iron drain with body plate diameter from Ø620 to Ø750mm installed directly on TX/765/410/80 adapter that provides a full support for body frame and a correct drainage of rain water to the drainage system. Height and inclination angle reference of concrete street drain is done using the T1/500/15÷100 and T1K/500/9/22 plastic compensation and wedge rings based on compensation layer.

Notes





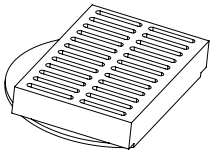


Surface finial of DN500 concrete street drain consisting of TVR T System T1/500/30 and T1/500/15 type compensation rings and TX/765/420/470/BK adapter placed under drain directly supporting full-iron kerb drain. Design solution ensures the full tightness of a finial, correct height reference of concrete street drain to the installation height of a drain, and full support for all structure elements.

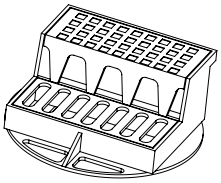
Notes

Application diagram for surface finial elements of the TVR T system
for height adjustment and assembly of rain water drains on DN500 concrete street drains (with preparation to install near a kerb).

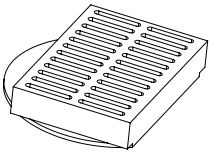
Finials



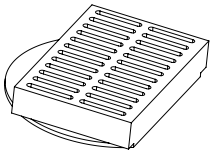
Rain water drain
400x600 mm
plate 3/4 Ø650mm
class C250÷D400



Kerb and roadway
rain water drain
plate Ø650mm
class C250÷D400



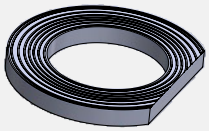
Rain water drain
400x600 mm
plate 3/4 Ø700mm
class C250÷D400
(outlet 420x470 mm)



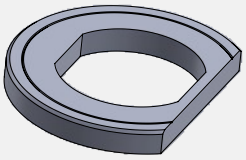
Rain water drain
400x600 mm
plate 3/4 Ø700mm
class C250÷D400
(outlet Ø320÷410mm)

System TVR T

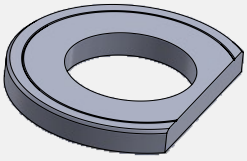
Adapters



TX/4052/10A

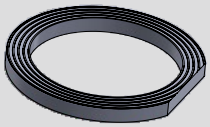


TX/765/420/470/BK

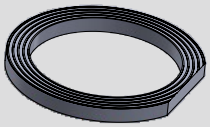


TX/765/410/80
TX/765/500/80

Adjustment rings

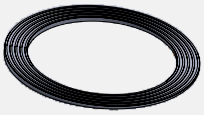


T2/500/15
T2/500/30
T2/500/50
T2/500/100



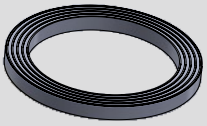
T2/500/15
T2/500/30
T2/500/50
T2/500/100

Wedge rings



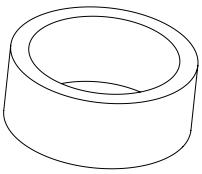
T1K/500/9/22

Compensation rings

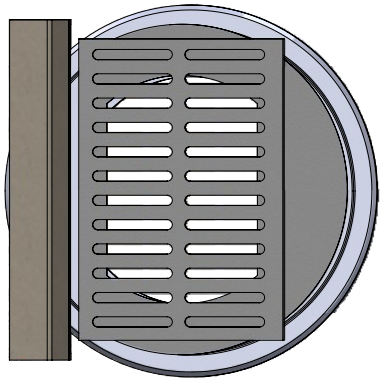


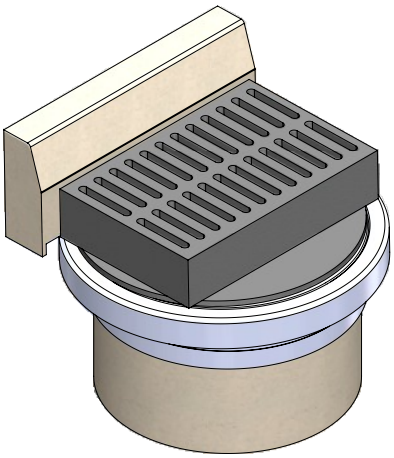
T1/500/15
T1/500/30
T1/500/50
T1/500/100

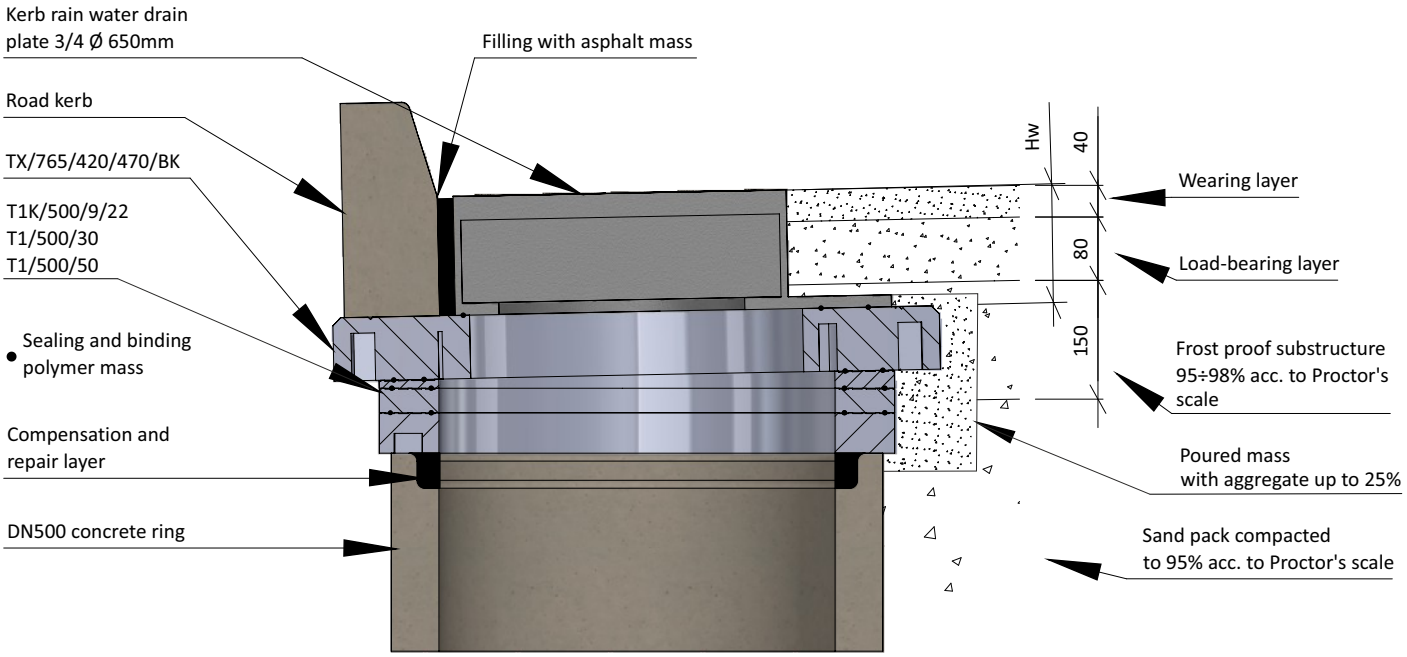
DN450 well



DN500 Ring





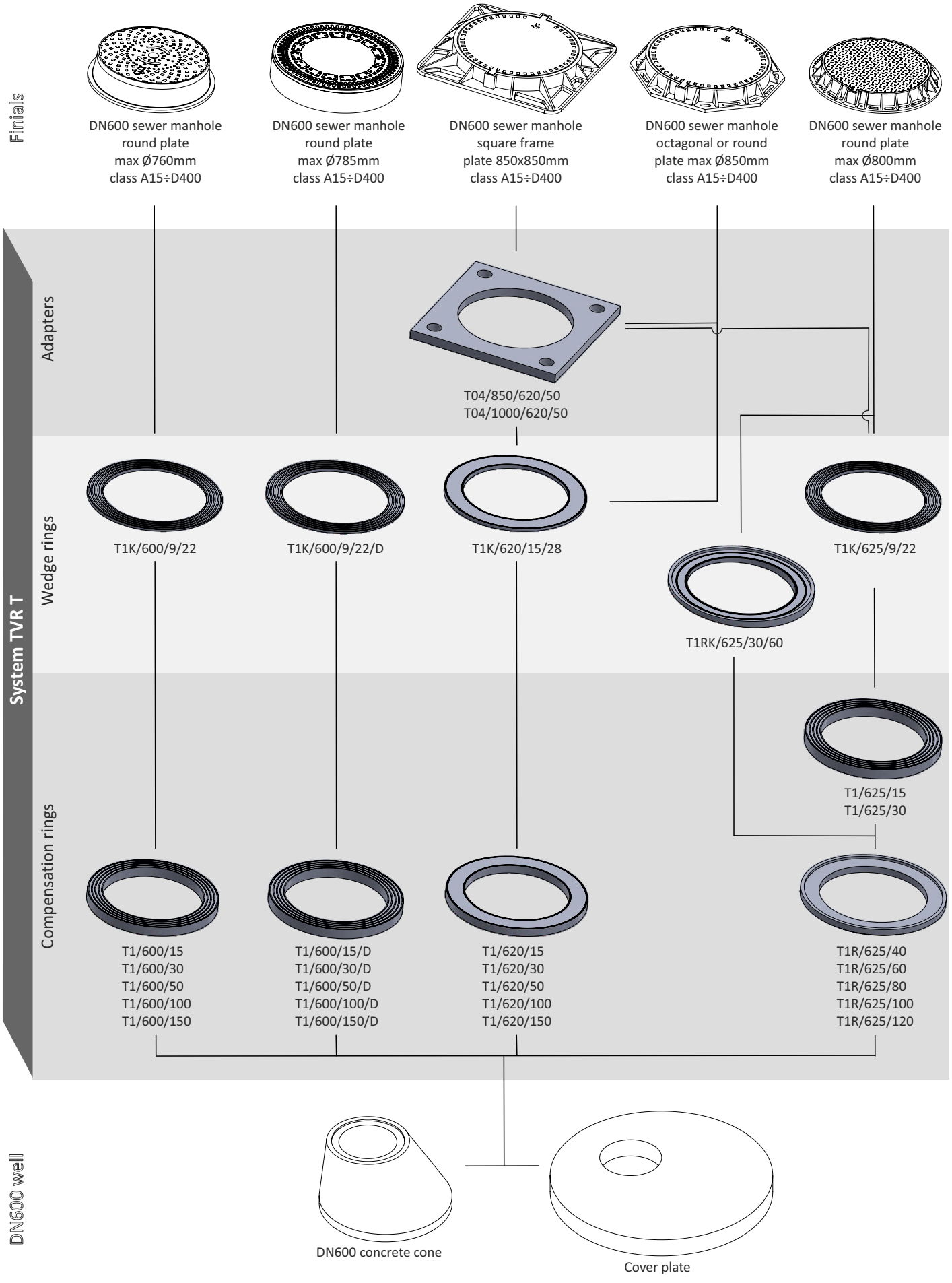


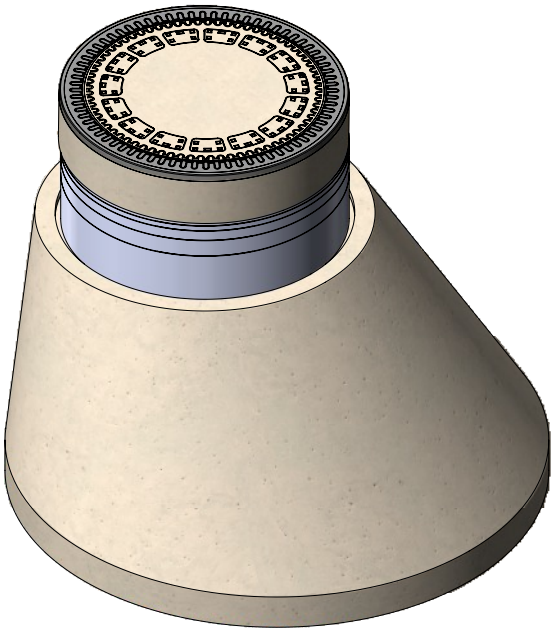
Surface finial of DN500 concrete street drain consisting of TVR T System T1/500/30 and T1/500/50 type compensation rings, T1K/500/9/22 wedge ring, and TX/765/420/470/BK adapter placed under drain. Compensation and wedge rings allow to refer the height and inclination angle of a concrete drain to the height of installation ordinate of the adapter that will allow to install the sewage drain. The adapter is installed on compensation rings and on poured mass securing the rings and adapter against horizontal movement poured around the finial. Poured mass also constitutes as a stable substructure for the road surface reconstructed around the adjusted drain. The tightness of structure will be provided by the application of polymer sealing masses between all structure elements. Compensation rings are supported on the compensation layer made on concrete ring of the drain.

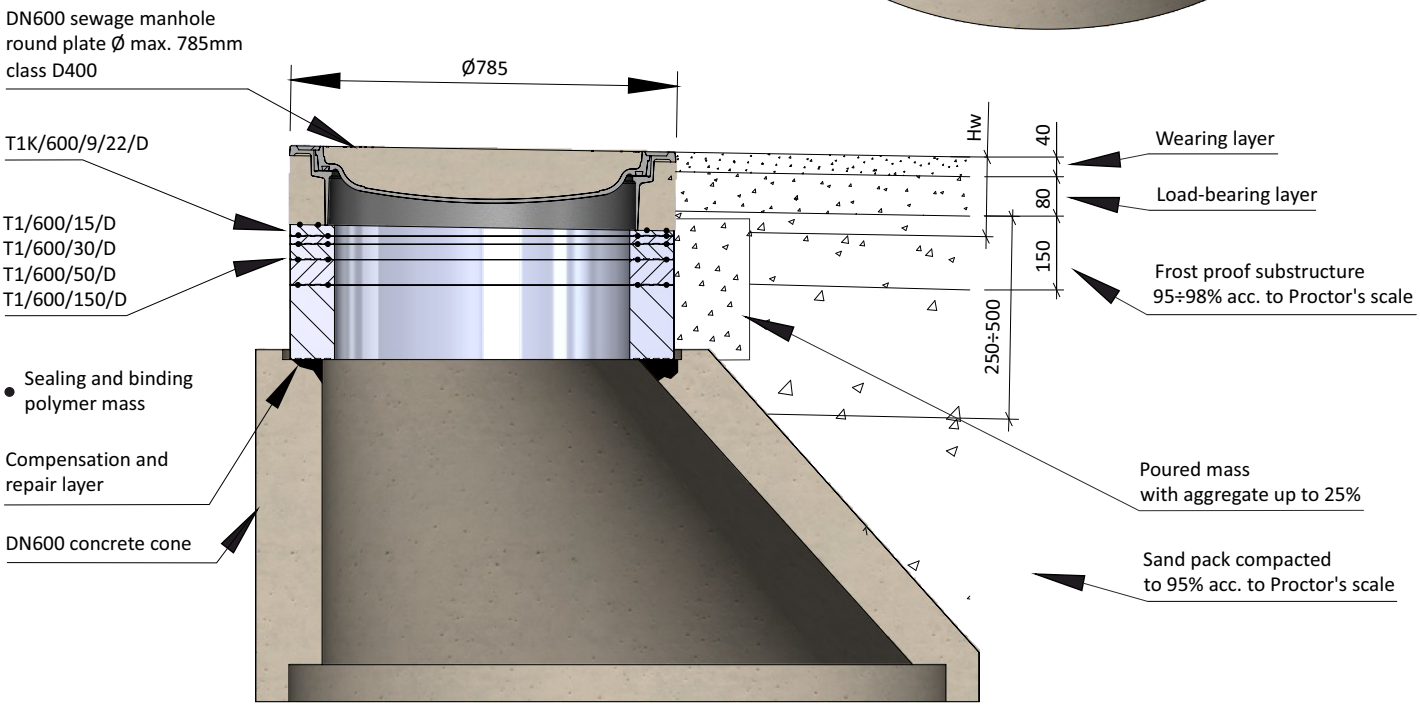
Notes

14.3. DN600 concrete well

Application diagram for surface finial elements of the TVR T system
for height adjustment and assembly of sewage manholes on DN600 and DN625 concrete sewage wells.

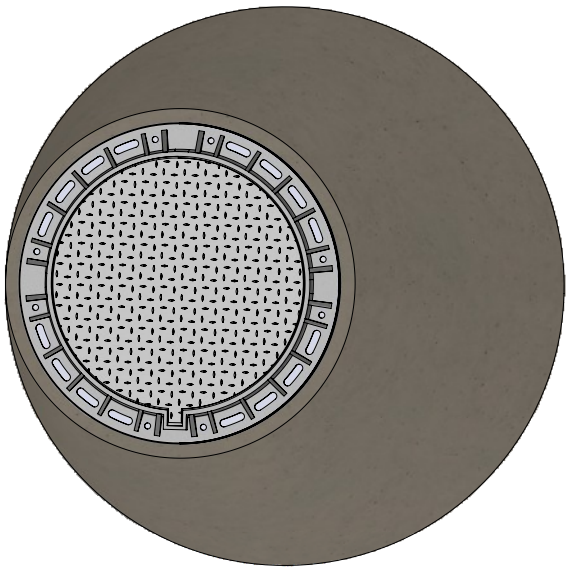


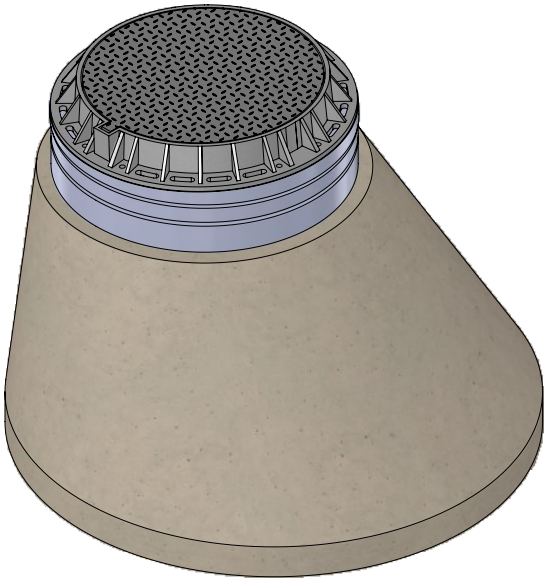


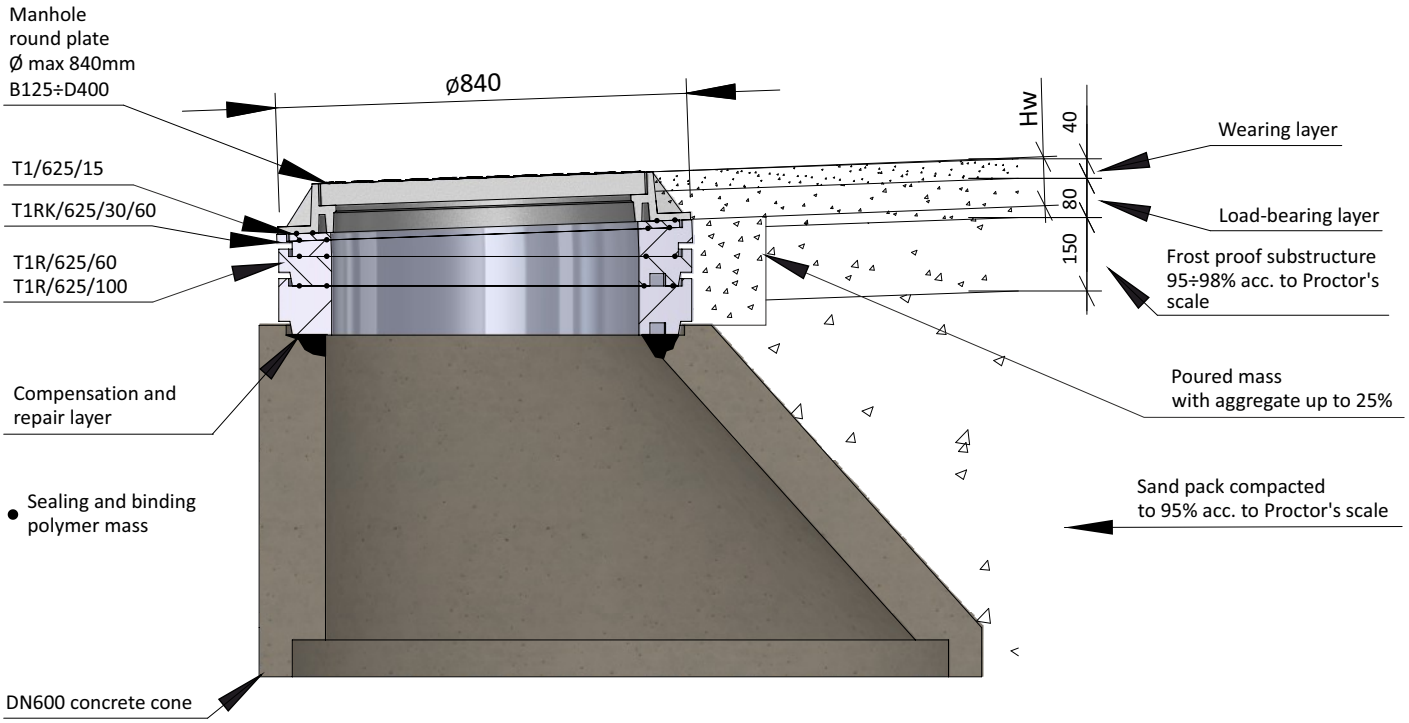


TVR T System T1/600/10÷150/D plastic compensation rings with height of 10mm, 15mm, 30mm, 50mm, 100mm, and 150mm are used to construct tight finials of manholes. They ensure the correct adjustment of height, inclination angle, and installation of a cast-iron manhole with external body plate diameter of Ømax. 785mm (e.g. acc. to DIN 19584). They can be placed on a choke, cover plate, or relief cone up to the recommended height of 25 cm. The broad height scope of average TVR T System rings allows to precisely adjust the manhole installation height. Sealing and binding connection between the specific finial elements is done using adhesive-sealant type of polymer masses that guarantee the tightness of connection during operation. Wedge rings with height of 9/22mm allow to adjust the manhole inclination angle up to 3%. In order to secure the compensation rings against movement, it is necessary to make a reconstruction later around the surface finial using poured masses.

Notes

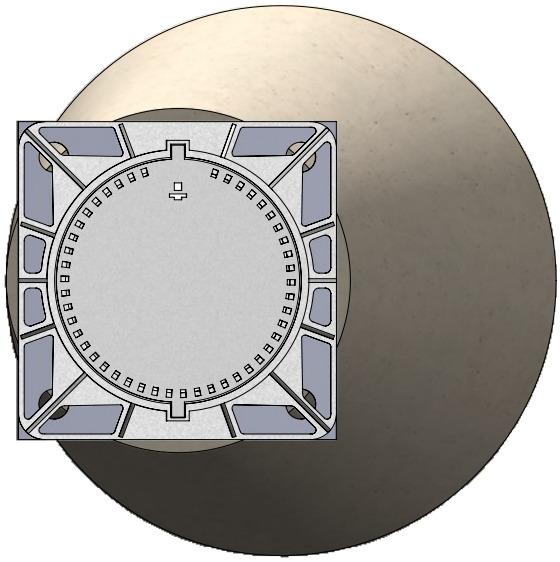


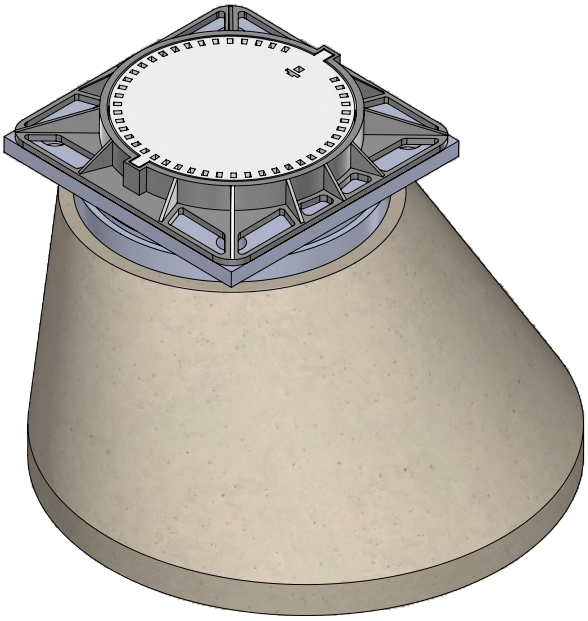


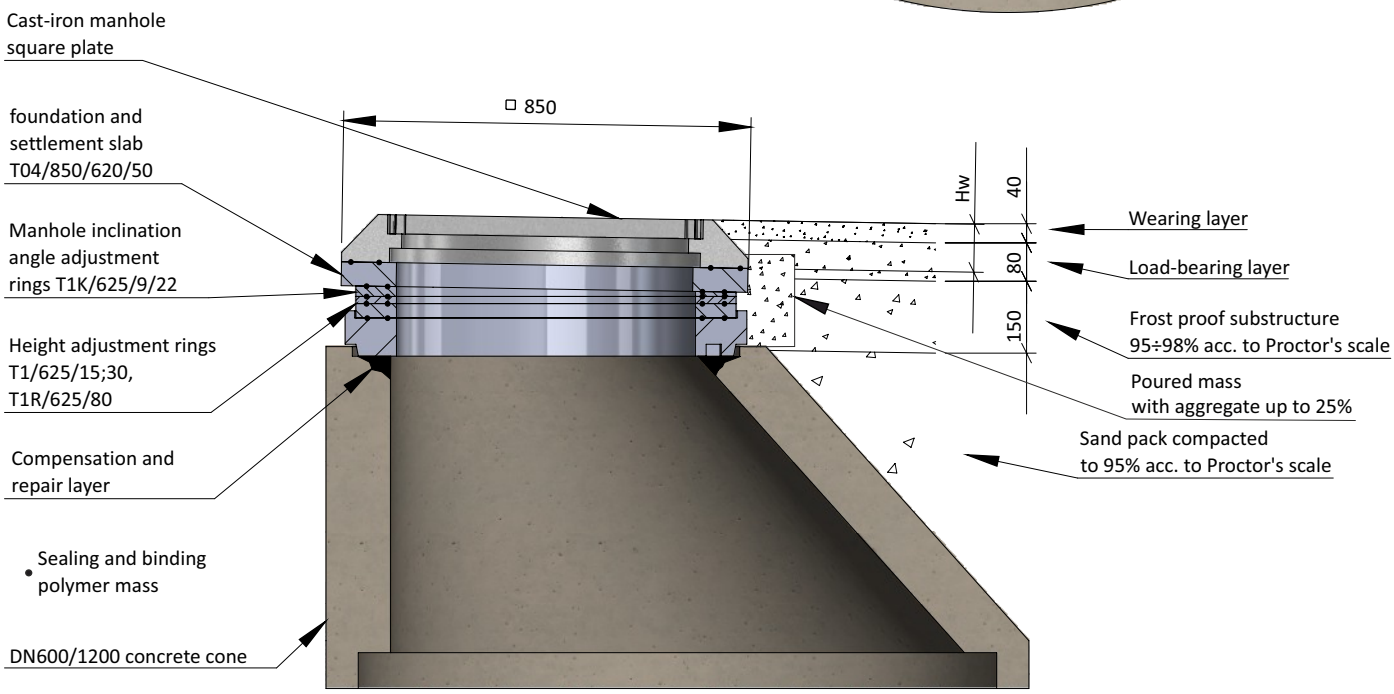


Surface finial of a concrete well with DN625 manhole opening that consists of TVR T System T1R/625, T1/625/15, and T1RK/625/30/60 type compensation and wedge rings constituting as a direct support for manholes made from ductile cast-iron with external body plate diameter of Ø840mm. T1/625/15 ring acts, among others, as a protection of edges of compensation rings with edge and allows to correctly install a manhole with diameter equal to the external diameter of compensation rings.

Notes







Variant A

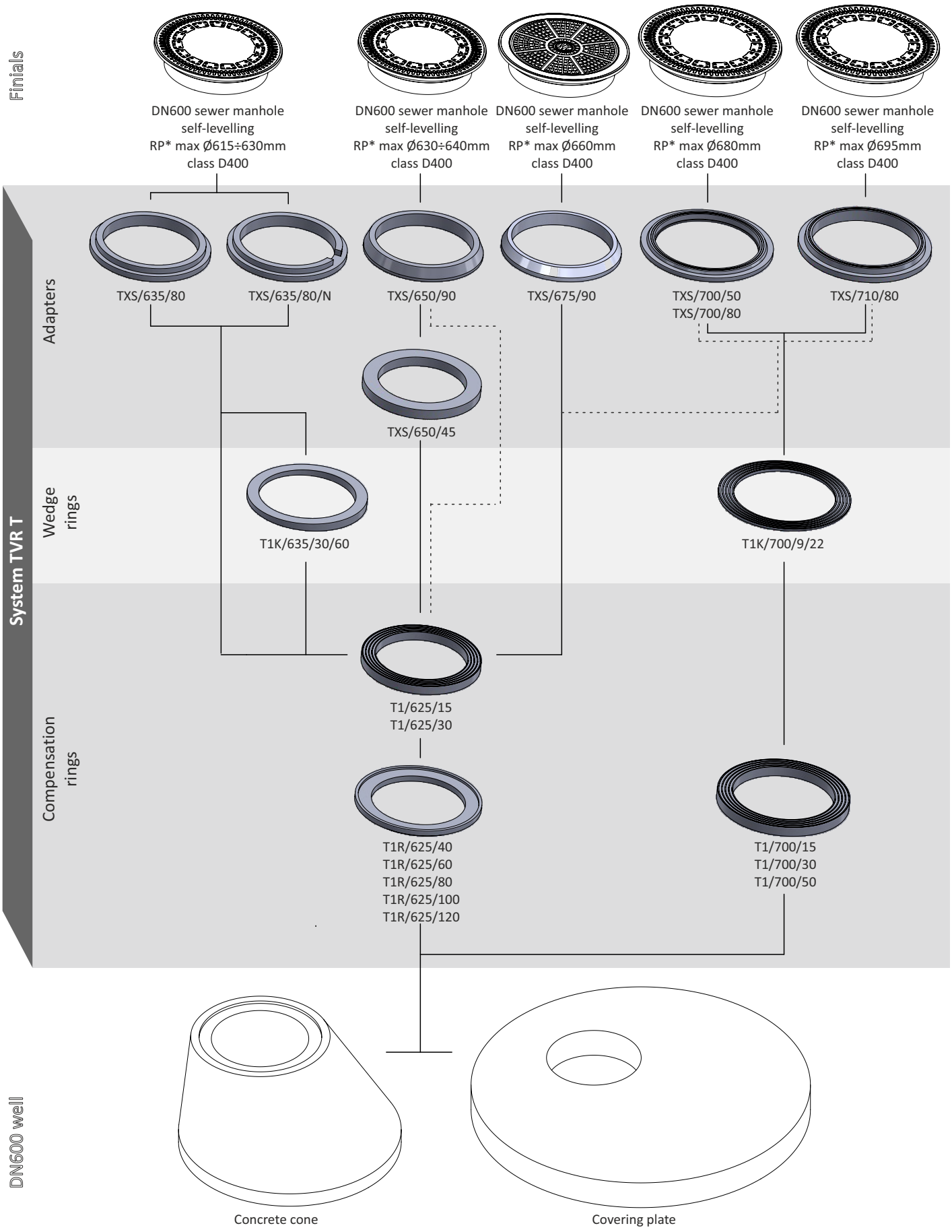
Foundation and relief slab placed directly under a cast-iron manhole constitutes as a basis for correct installation of manholes with external body plate diameter bigger than 840mm and for body plates with square and multisided shape, as well as frame structure, etc. The plate provides an even support of cast-iron or composite manhole on the whole surface of body plate. We install the plate after adjusting the finial height using compensation rings and reconstructing the substructure up to the plate installation level. Application of a plate in the finial structure will ensure a partial transfer of vertical road traffic loads outside of the finial structure and will fulfil the substructure stabilisation function during the reconstruction of road surface. This will reduce the creation of operating cracks around the manhole. In this case we advise the use of manholes made from ductile cast-iron due to the dampening and amortisation properties of the plate.

Variant B

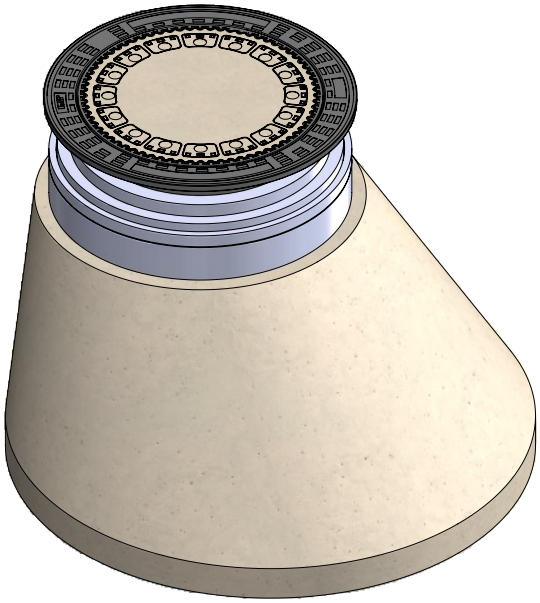
Foundation and relief slab constitutes as a basis for construction of finial from TVR T System elements and is installed directly on cover plate of a well choke. It provides a partial transfer of vertical road traffic loads outside of the finial structure and will fulfil the substructure stabilisation function during the reconstruction of road surface.

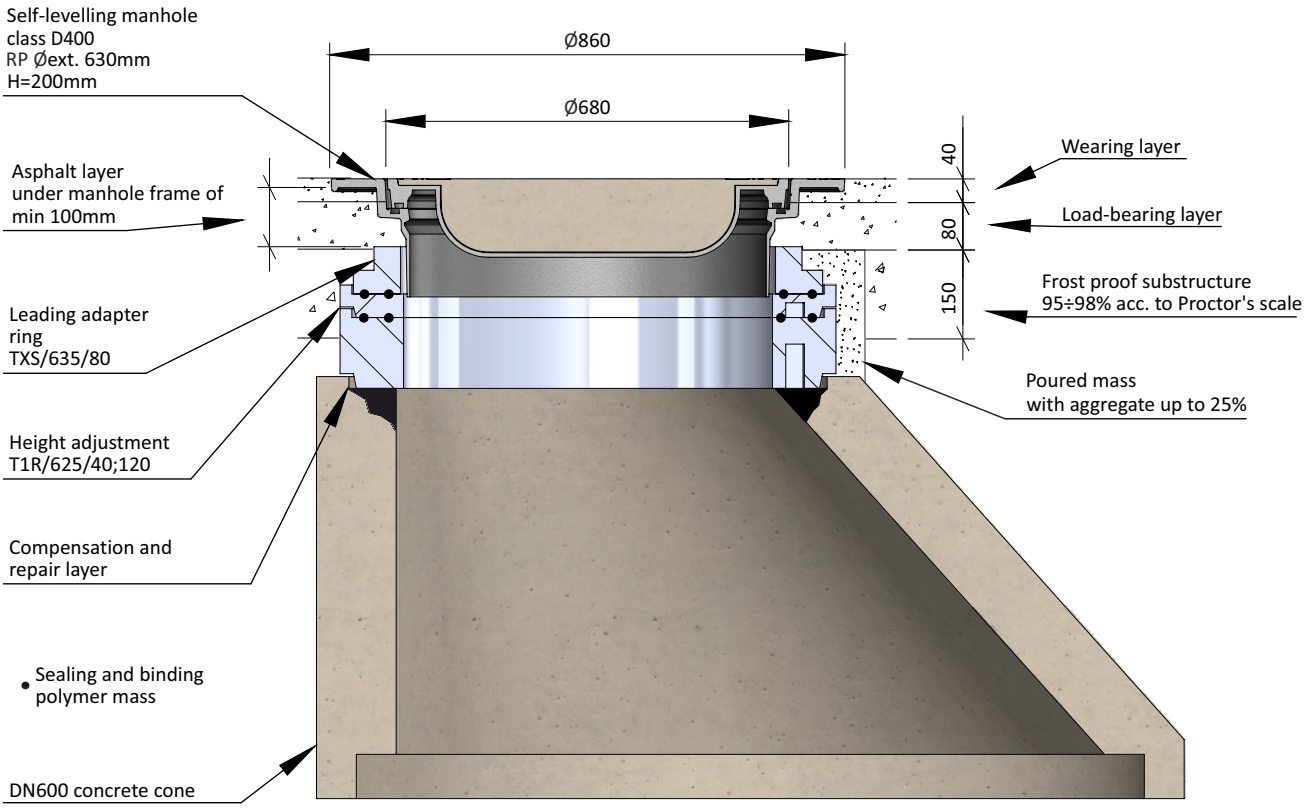
14.4. DN600-700 concrete well

Application diagram for surface finial elements of the TVR T system
for height adjustment and assembly of self-levelling manholes on DN600, DN625, and DN700 concrete sewage wells.



* External leading diameter of self-levelling manhole body

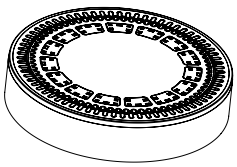




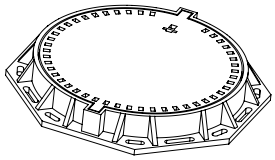
Structure of a DN625 concrete well tight surface finial consists of TVR T System T1R/625 compensation rings and TXS/635/80 adapter (leading ring) intended to be placed under self-levelling manholes with external leading diameter of a body of Ø615-630mm. The adapter allows to support the manhole during an assembly and to correctly install in on the well finial. Structure of the adapter allows to correctly and tightly fill with asphalt mass the space under retaining body and guarantees a resistance to damages during the pressing of manhole. We envision that the height of asphalt layer under the retaining body of a manhole amounts to 10cm. Full fill with asphalt mass and its correct fortification influences the operating durability of the whole finial structure. Finial elements, compensation rings, and adapter should be secured from the external side with poured mass or asphalt mass of a binding layer. The binding layer should be fortified evenly around the finial in order to prevent the horizontal movement of elements. Recommended height of finial structure is up to 35cm. A sealing based on polymer masses should be done between the elements of a finial structure.

Application diagram for surface finial elements of the TVR T system
for height adjustment and assembly of sewage manholes on DN600 and DN625 concrete sewage wells.

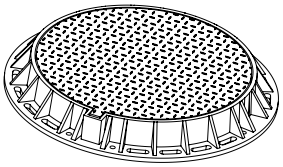
Finials



DN600 sewer manhole
round plate
max Ø785mm
class A15÷D400



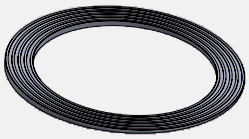
DN600 sewer manhole
octagonal or round
plate max Ø850mm
class A15÷D400



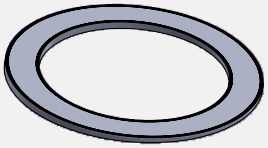
DN600 sewer manhole
round plate
max Ø800mm
class A15÷D400

System TVR T

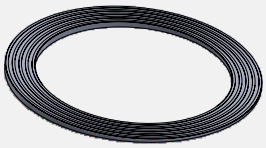
Wedge rings



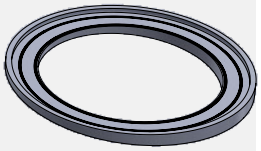
T1K/600/9/22/D



T1K/620/15/28

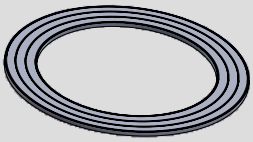


T1K/625/9/22

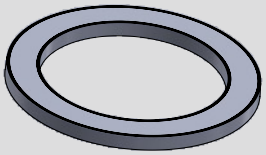


T1RK/625/30/60

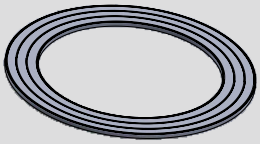
Compensation rings



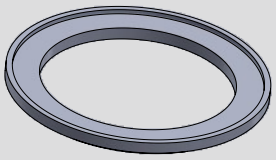
T1/600/10/D
T1/600/15/D
T1/600/30/D
T1/600/50/D



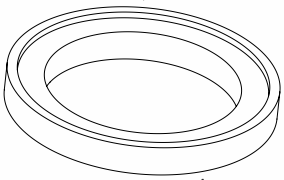
T1/620/15
T1/620/30
T1/620/50



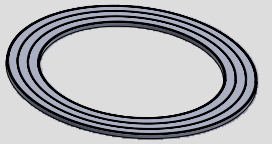
T1/625/15



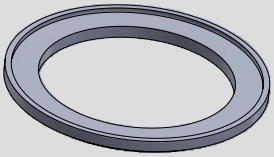
T1R/625/40



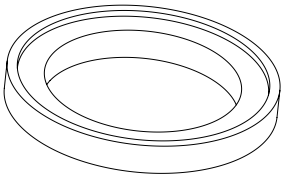
BET AVR 625/60



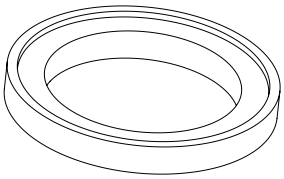
T1/625/15
T1/625/30



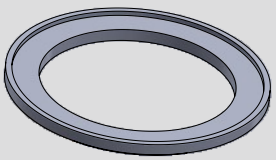
T1R/625/40
T1R/625/60



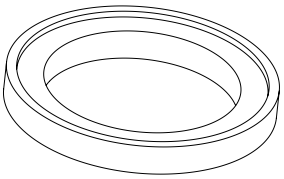
BET 600/80
BET 600/100



BET AVR 625/80
BET AVR 625/100

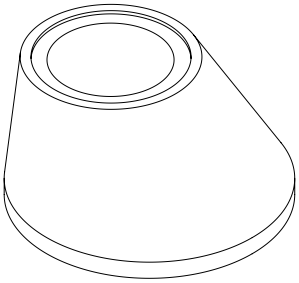


T1R/625/60

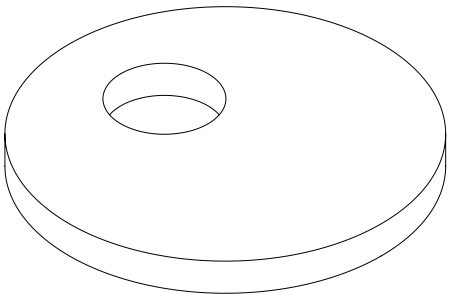


BET AVR 625/80
BET AVR 625/100
acc. to DIN 4034

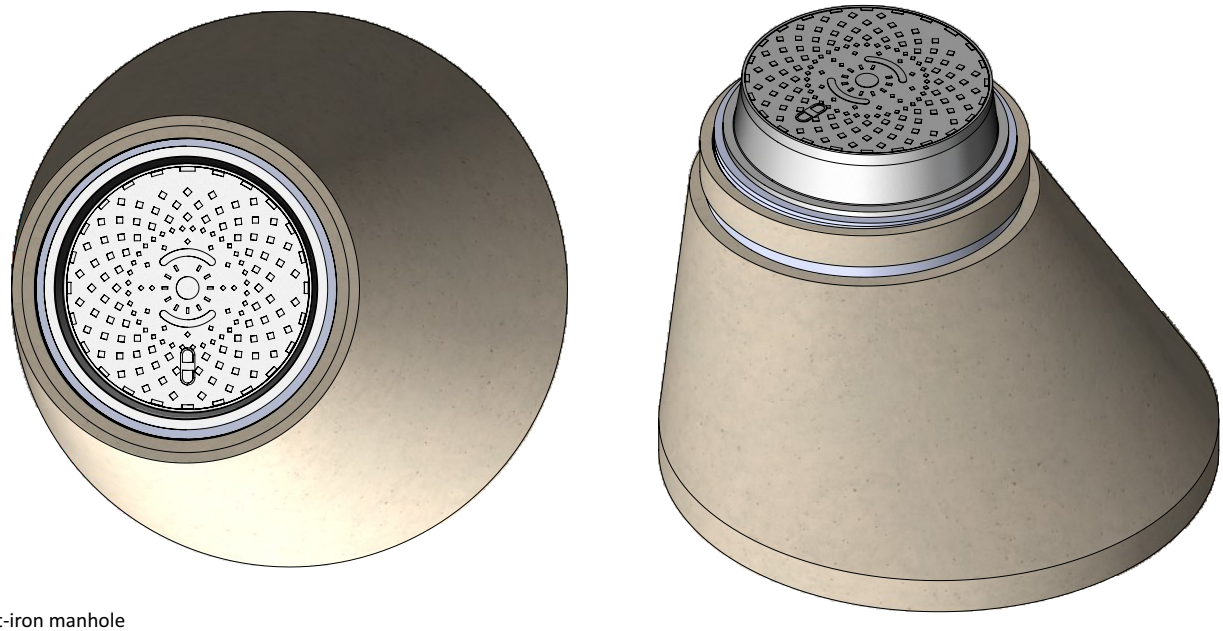
DN600 well

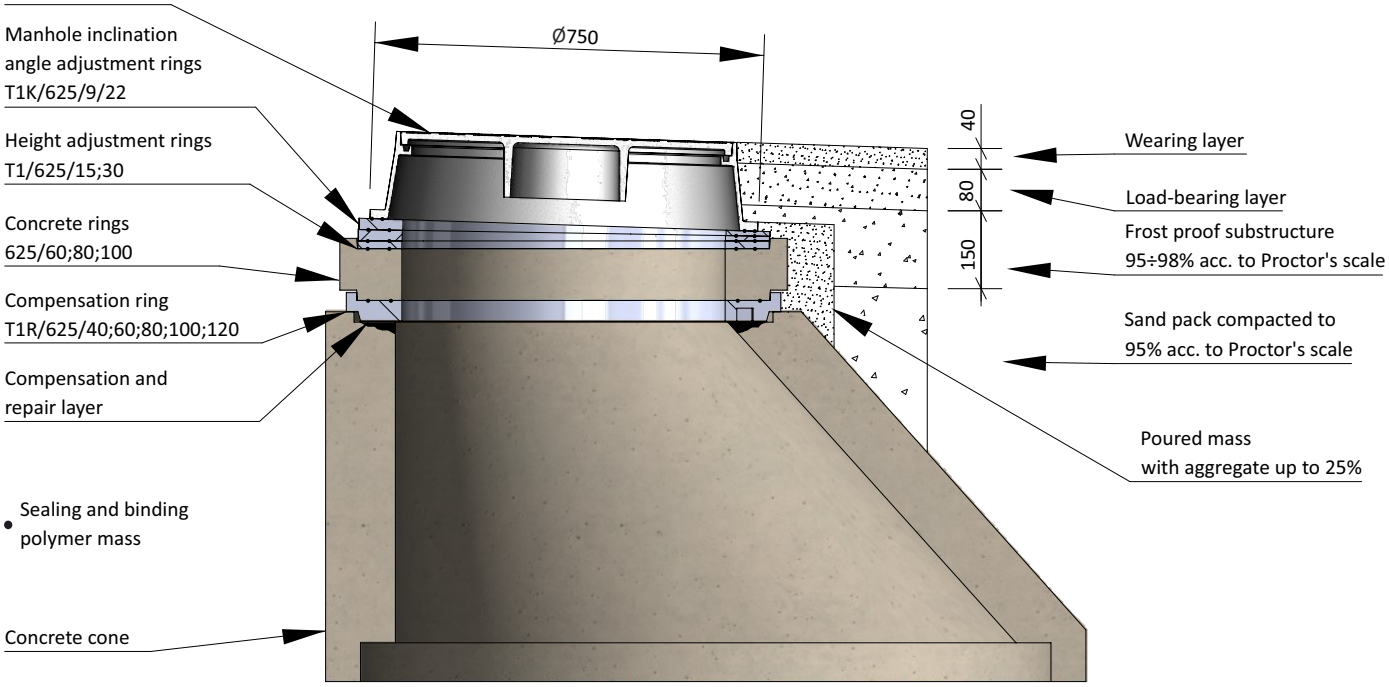


Konus betonowy



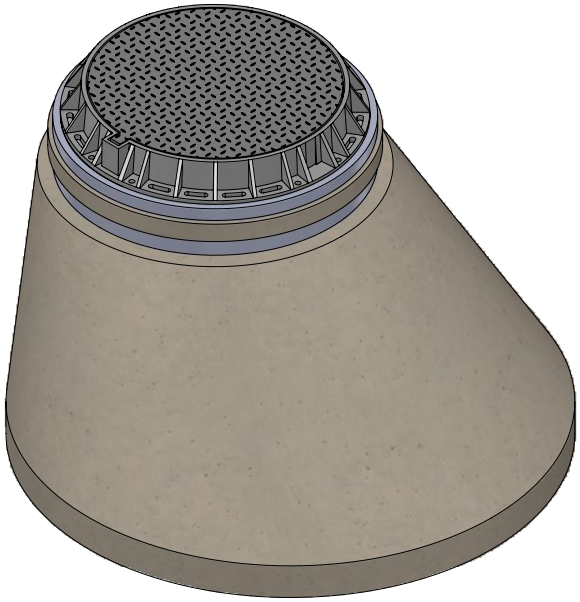
Płyta pokrywowa

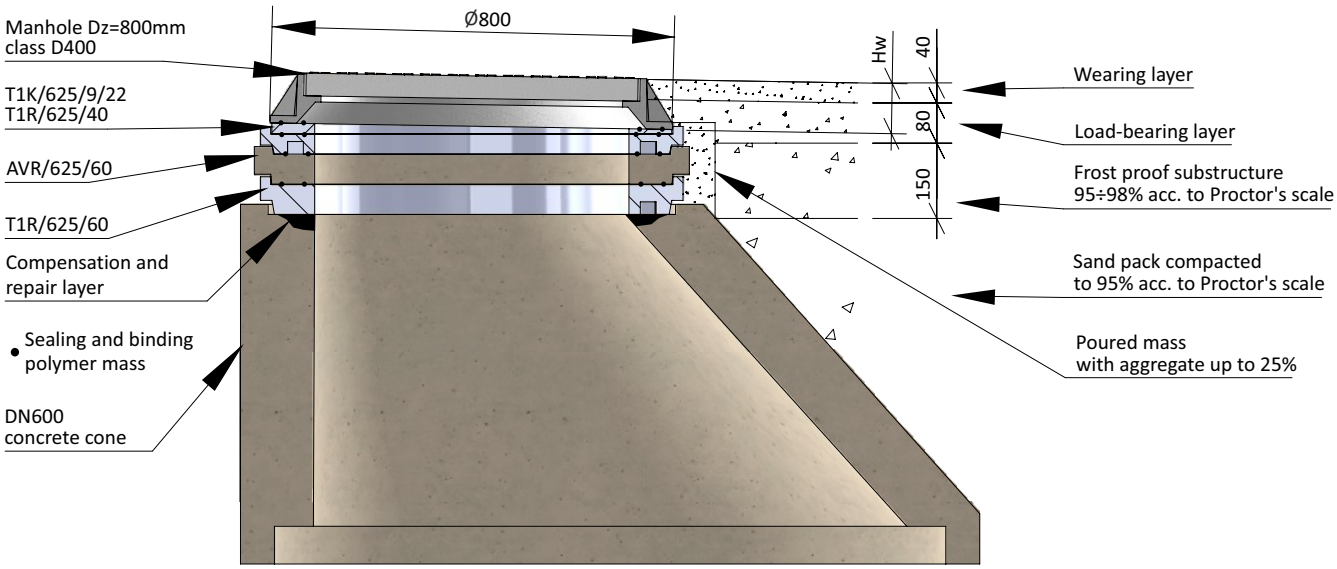




TVR T System compensation rings with height of 10, 15, 30, and 40mm and 9/22mm and 30/60mm wedge rings are the perfect supplement for adjustment abilities of systems based on compensation rings made from concrete. Compensation rings made from plastic can be used with all systems of compensation rings made from concrete and ferroconcrete made in alternating manner, which will improve the finial tightness, provide a correct support of manholes, secure concrete elements against freezing, increase the resistance of well finial against dynamic loads, and eliminate the application of unreliable cement mortars. TVR T System rings are also compatible with rings made according to DIN 4034, p. 1 and 2. Manhole inclination angle adjustment can be acquired through the use of wedge rings in finial structure (inclination range from 0% to 3%).

Notes



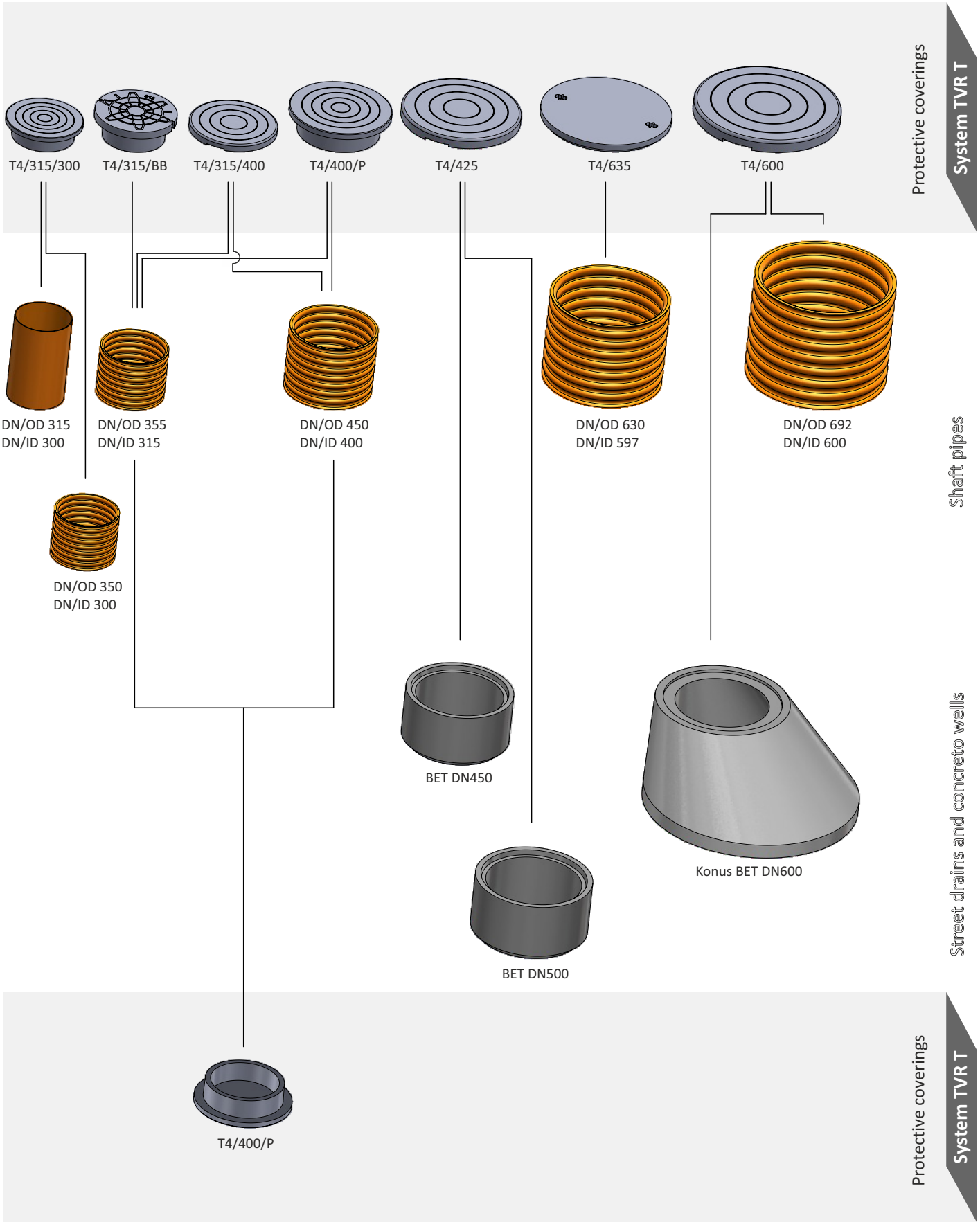


Alternating surface finial of a concrete well with DN625 manhole opening consists of concrete compensation rings made acc. to DIN 4034 and TVR T System T1R/625 and T1K/625/9/22 type compensation and wedge rings. It constitutes as a support for manholes made from ductile cast-iron with external body plate diameter of Ø800mm. T1R/625 plastic compensation ring installed on compensated and repaired upper surface of a well choke/cone acts as a support and amortisation for the installation of a concrete compensation ring. In order to improve the tightness between compensation rings, we advise you to use polymer sealing and binding mass. Manhole inclination angle adjustment is provided by T1K/625/9/22 wedge ring set installed directly under sewage manhole. We install a plastic ring with appropriate height on the concrete ring. Alternating structures eliminate unreliable concrete mortars from the structure of a finial, secure concrete elements against point pressure and freezing, and allow to construct high (above 50cm) surface finials of non-manhole wells. The finial is protected from external side with a mass poured around it.

Notes

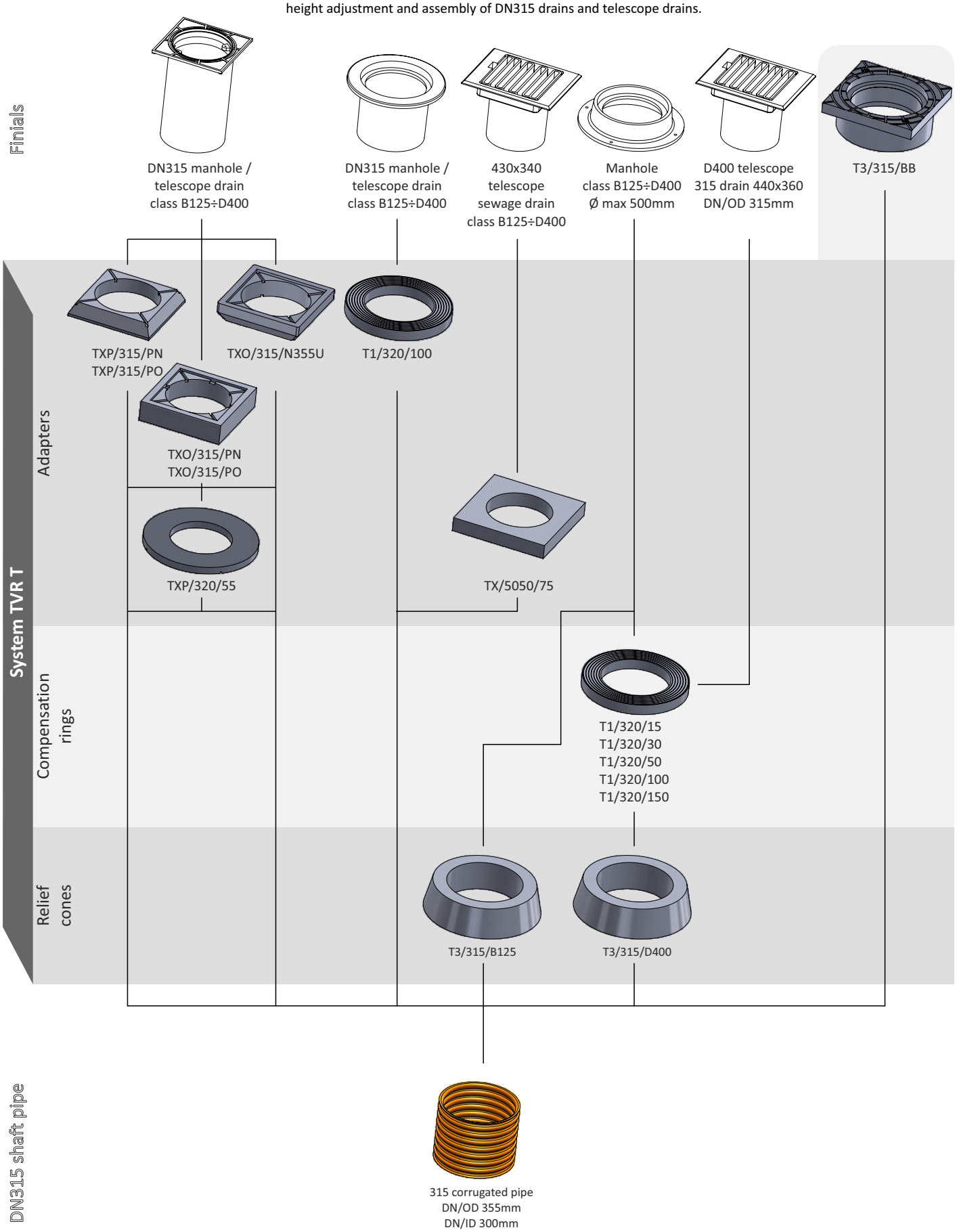
14.5. T4 Protective coverings

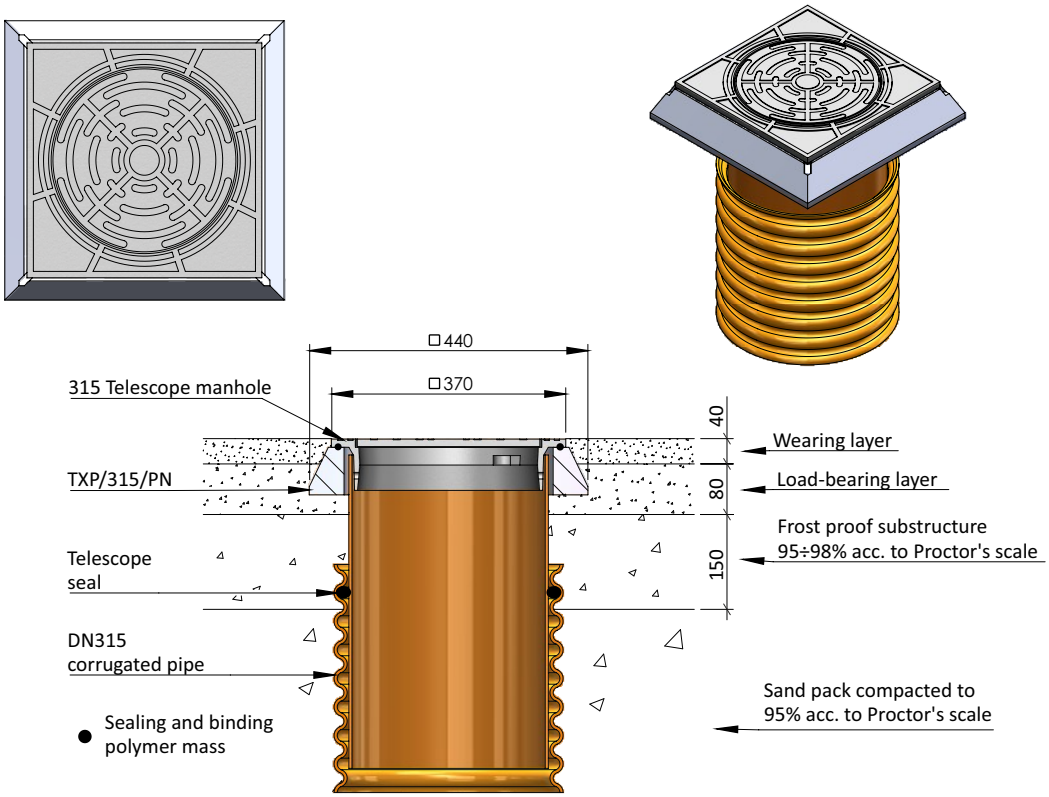
Selection diagram for TVR T System coverings
on shaft pipes and DN300÷600 concrete sewage manholes.



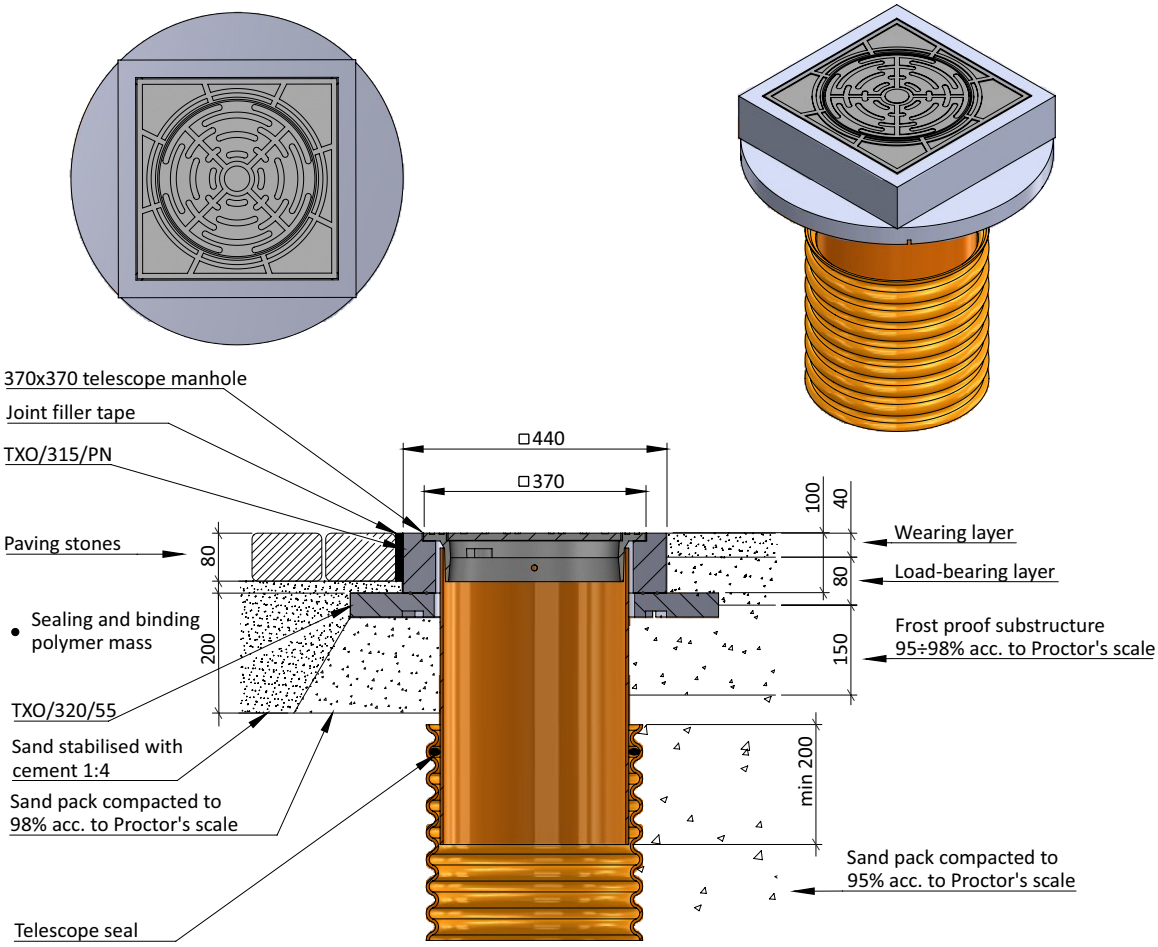
14.6. DN315 Plastic wells

Application diagram for surface finial elements of the TVR T system for height adjustment and assembly of DN315 drains and telescope drains.

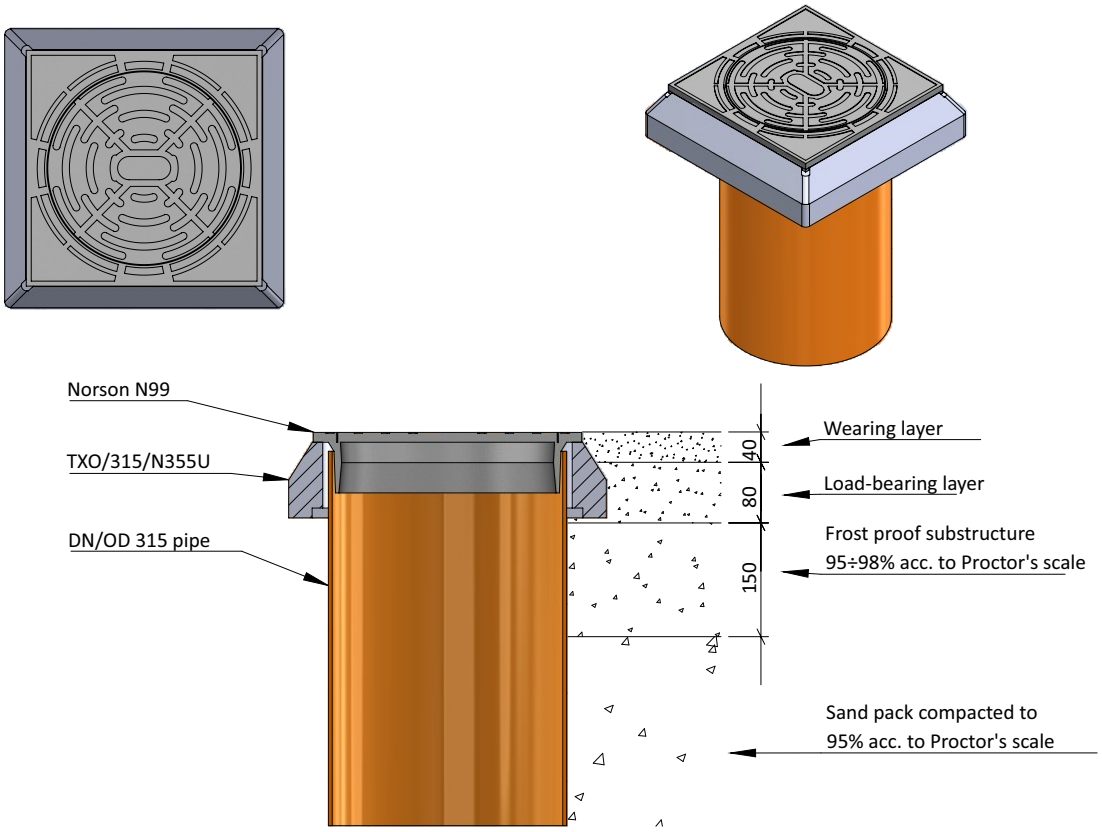




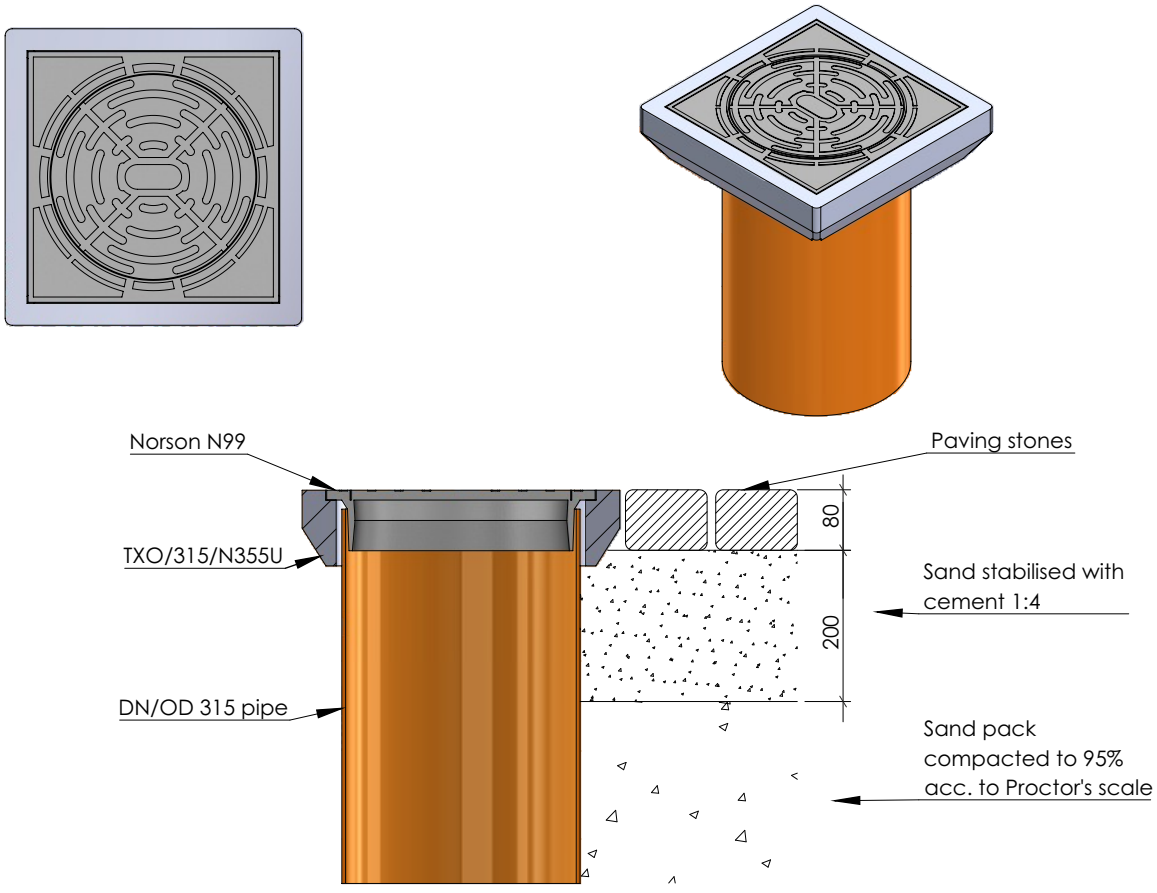
TXP/315/PN adapter directly supporting 315 telescope manhole in a road surface.



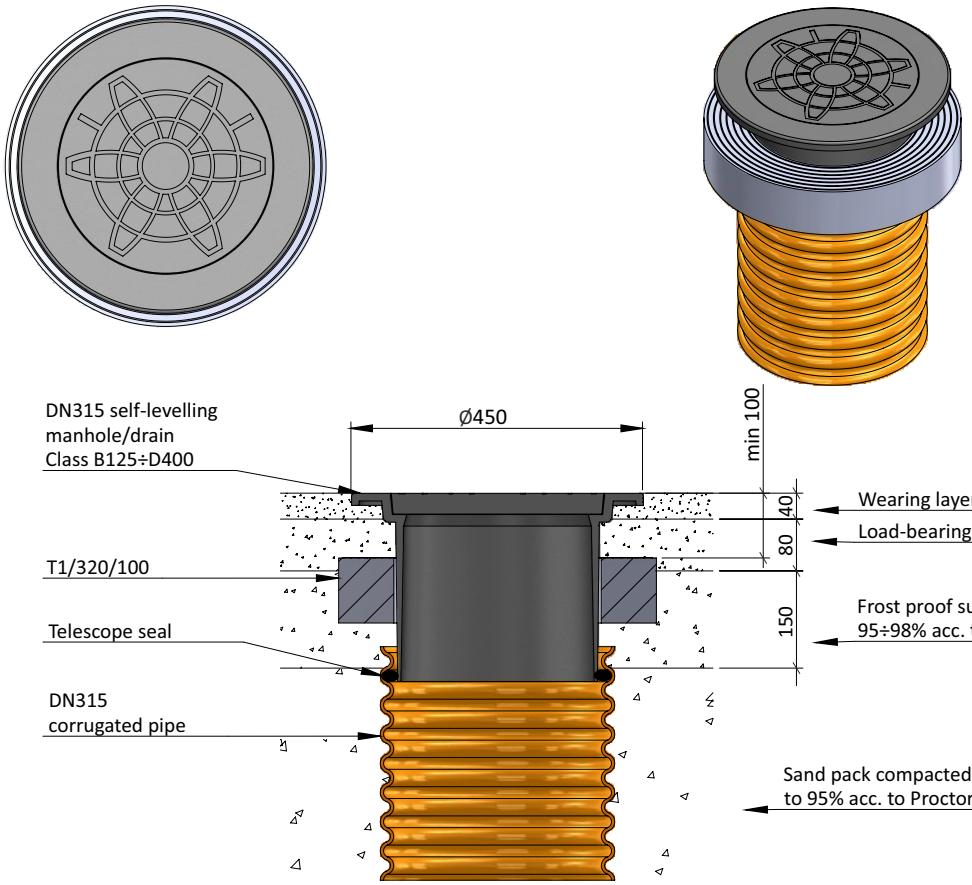
TXO/315/ adapter based on TXO/320/55 foundation ring supporting a telescope manhole.



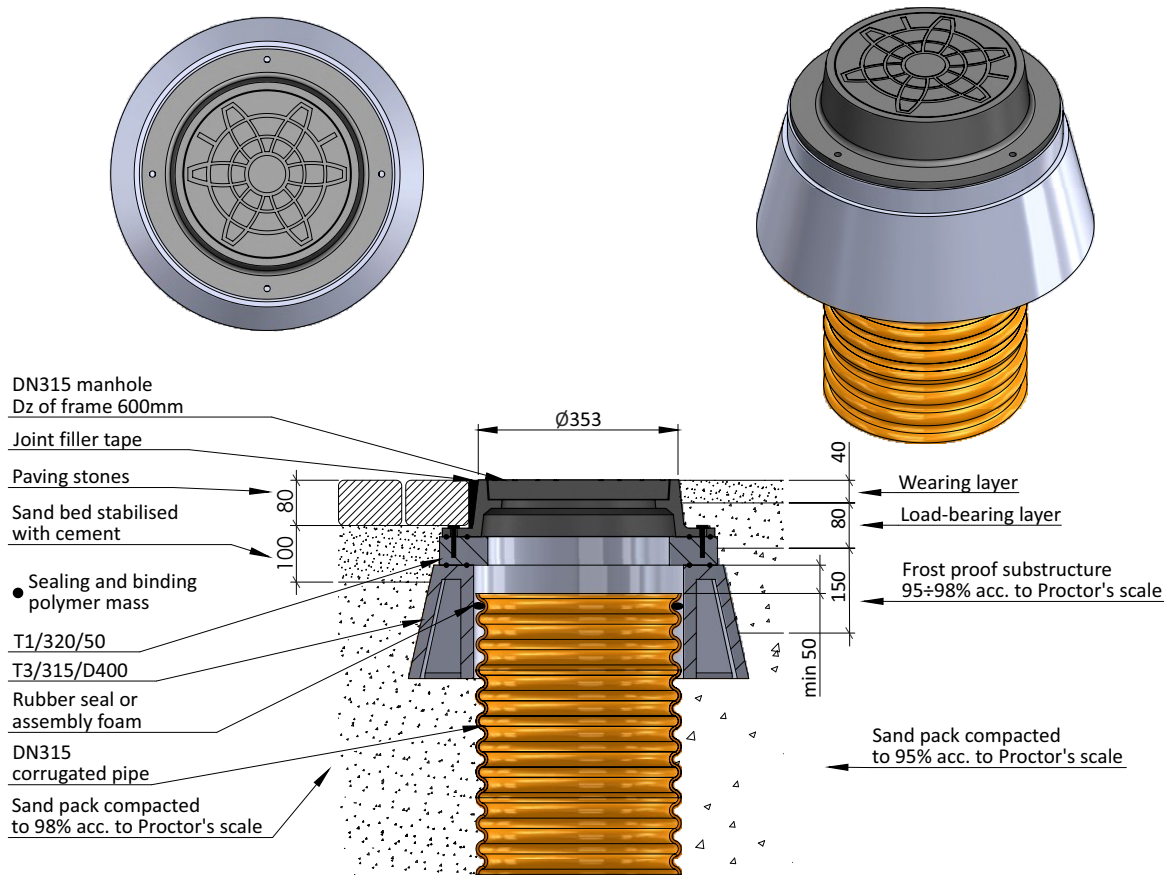
Application of TXO/315/N355U universal adapter supporting 315 manhole/telescope drain in a bituminous surface.



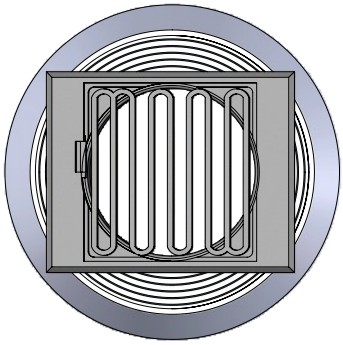
Application of TXO/315/N355U universal adapter supporting 315 manhole/telescope drain in a bricked surface providing support and problem-free structure reference.

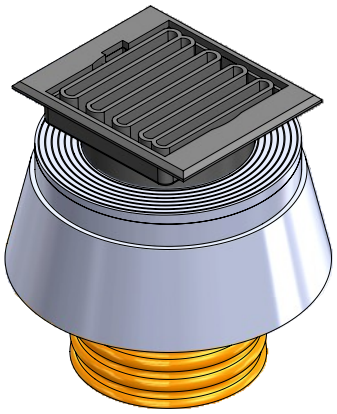


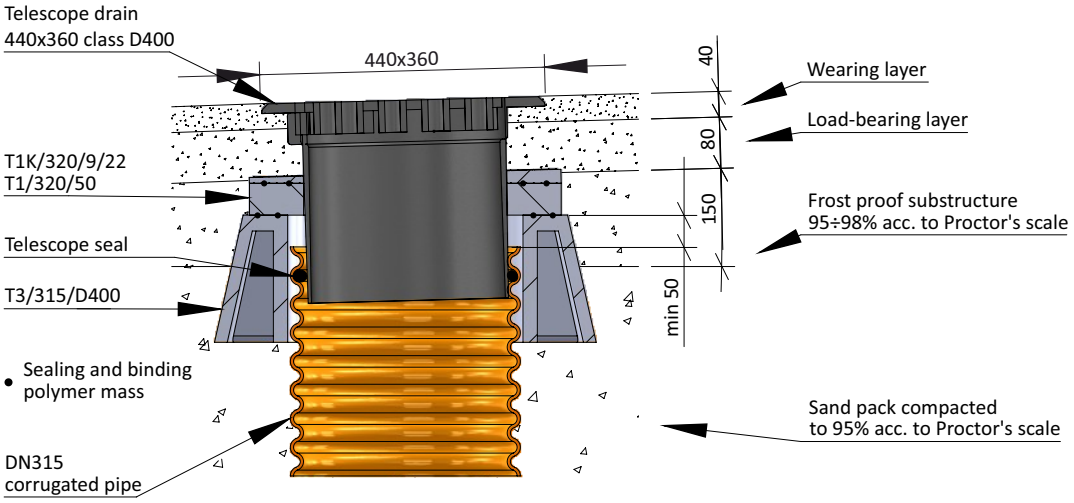
Self-levelling drain/manhole based on and in asphalt surface supported indirectly by T1/320/100 compensation ring acting as a stabiliser.



In a lane, a T3/315 relief cone in class D400 or B125 acts as a base of cast-iron manholes and drains. Cone is installed centrically over the ascending pipe on a fortified ground or in the lower layers of road surface substructure.

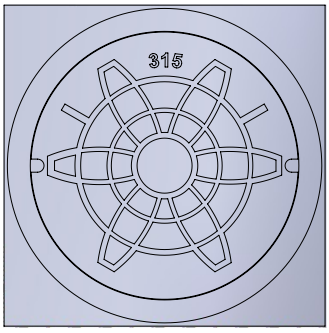


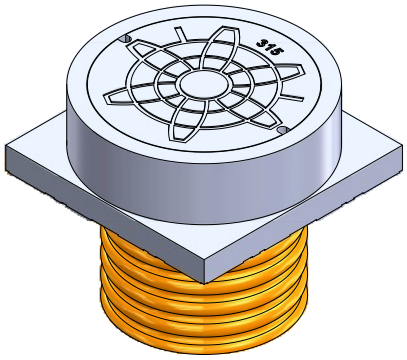


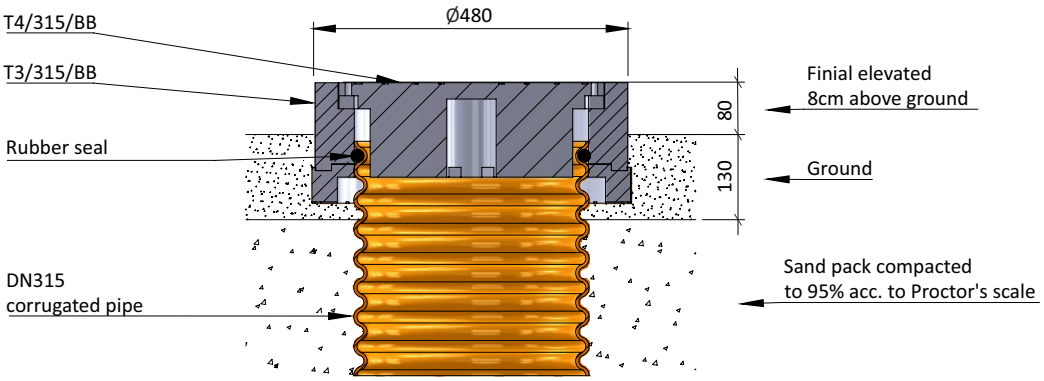


Surface finial of a DN315 plastic rain water well made in bituminous surface consists of T3/315 relief cone in class D400, T1/320/50 compensation rings, and T1 K/320/9/22 wedge ring. The 440x360 self-levelling rain water drain with height of 320mm and external leading pipe diameter of Ø315mm is installed on and in a bituminous surface. Drain leading pipe is integrated with compensation rings, relief cone, and shaft pipe of a well in a centric manner. Load originating from road traffic is transferred from a flange directly to the road surface and partially to surface finial elements. T1/320 compensation rings act as adapter reducing the internal diameter of relief cone, allow to adjust the diameter of drain leading pipe, and are element supporting asphalt layers. T3/315 relief cone ensures a complete relief of a plastic well, secures the upper part of a shaft pipe against the influence of horizontal forces, and allows the vertical operation of a shaft pipe. Additional height adjustment is provided by a high structure of self-levelling manholes, ab. 10cm.

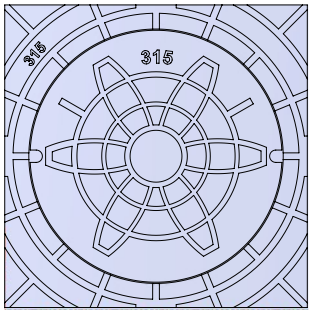
Notes

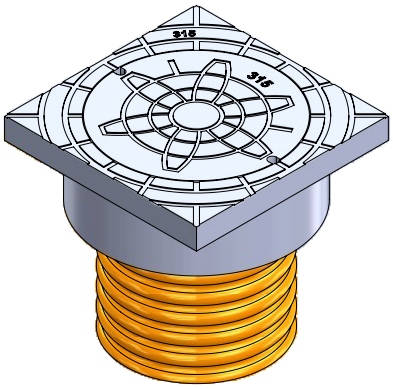


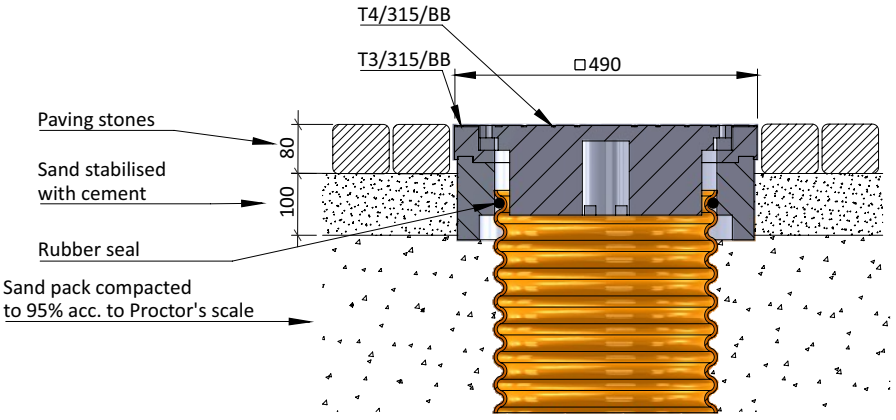




T3/315/BB universal cone protecting the shaft pipe of DN315 plastic well in green area not burdened by pedestrian and vehicle traffic.



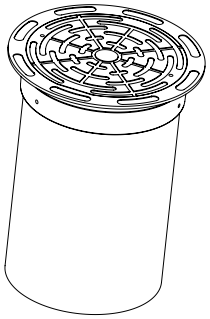




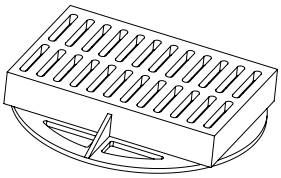
T3/315/BB universal cone levelled with the surface with square side constitutes as the structure reference of DN315 well in a cobblestone surface.

Application diagram for surface finial elements of the TVR T system for height adjustment and assembly of DN425 drains and telescope drains.

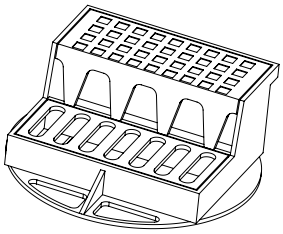
Finials



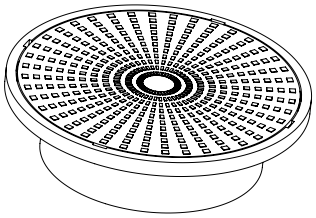
Telescope manholen
for 425 pipe
class D400



400x600 rain water drain
full or 3/4
plate max Ø650 mm
class C250÷D400



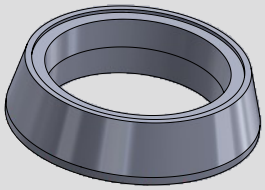
Kerb and roadway
rain water drain
plate Ø650 mm
class C250÷D400



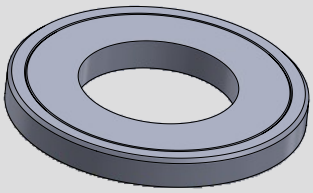
Manhole with flange
Ø560 mm
class C250÷D400

System TVR T

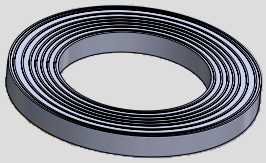
Adapters



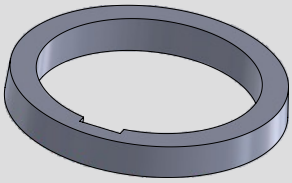
T3/400/N



TX/765/410

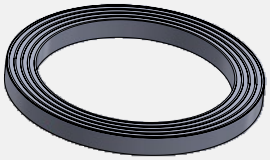


TX/4052/10AP



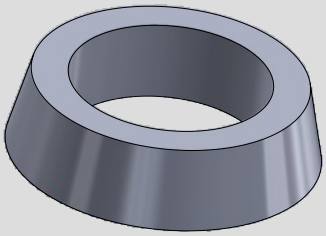
TX/425

Compensation rings



T1/500/15÷100

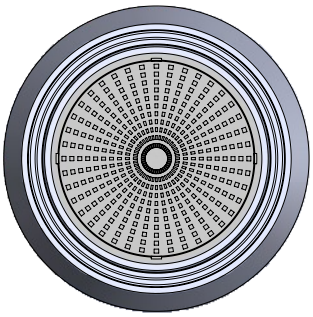
Relief cones

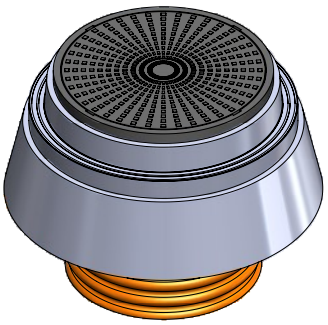


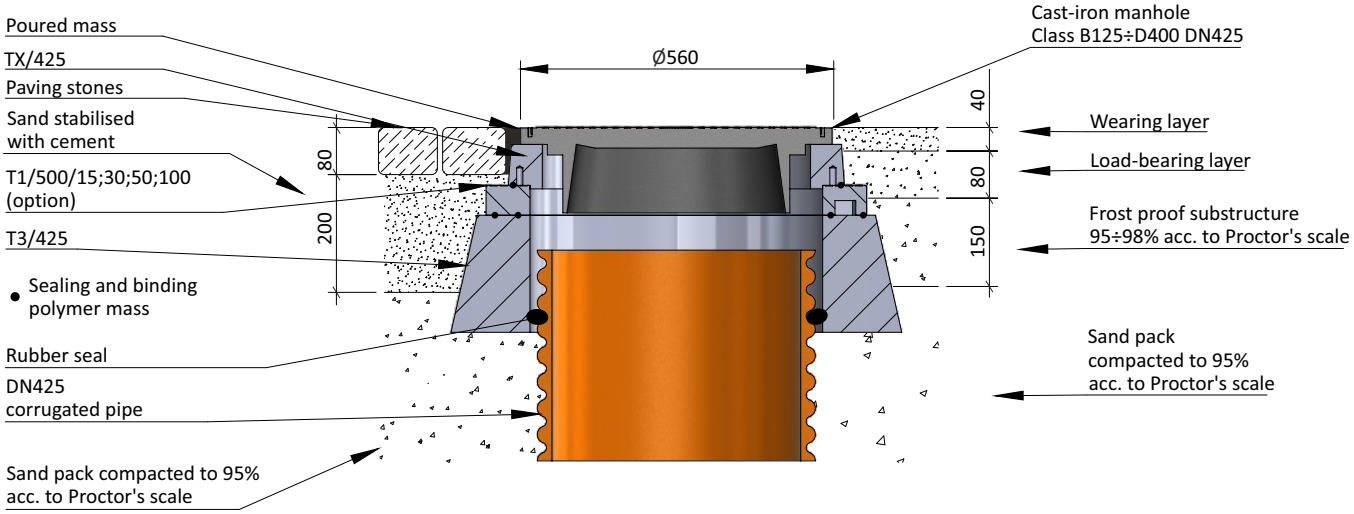
T3/425

DN425 shaft pipe

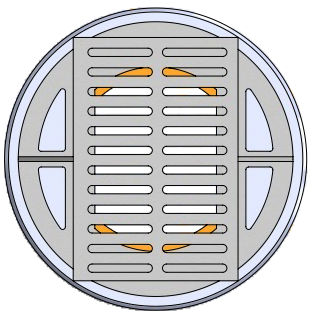
DN425
corrugated pipe

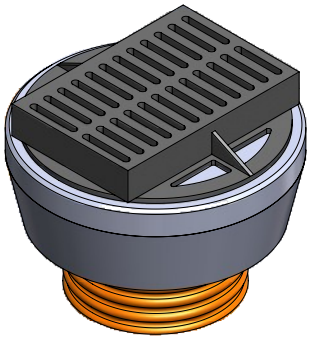


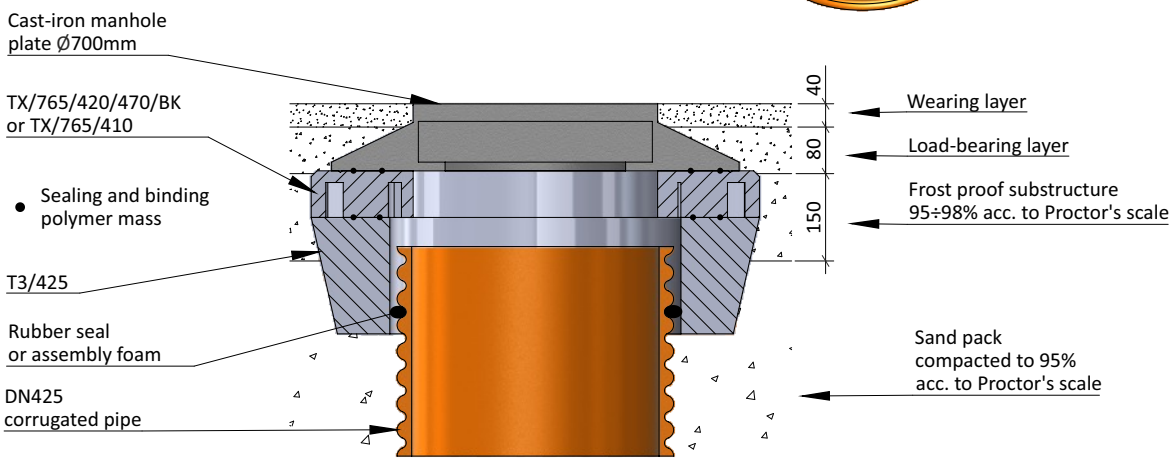




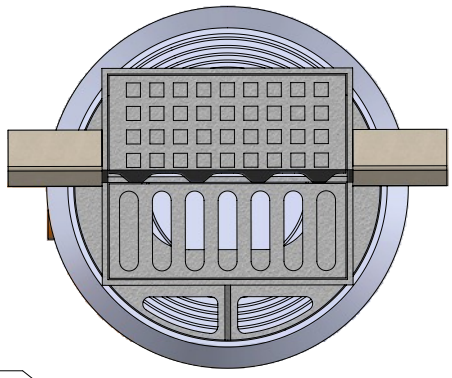
Telescope manhole with external diameter of 560 mm installed on TX/425 adapter that provides a support for a manhole, reduces internal diameter, and allows to adjust it to the cobblestone surface without problems.

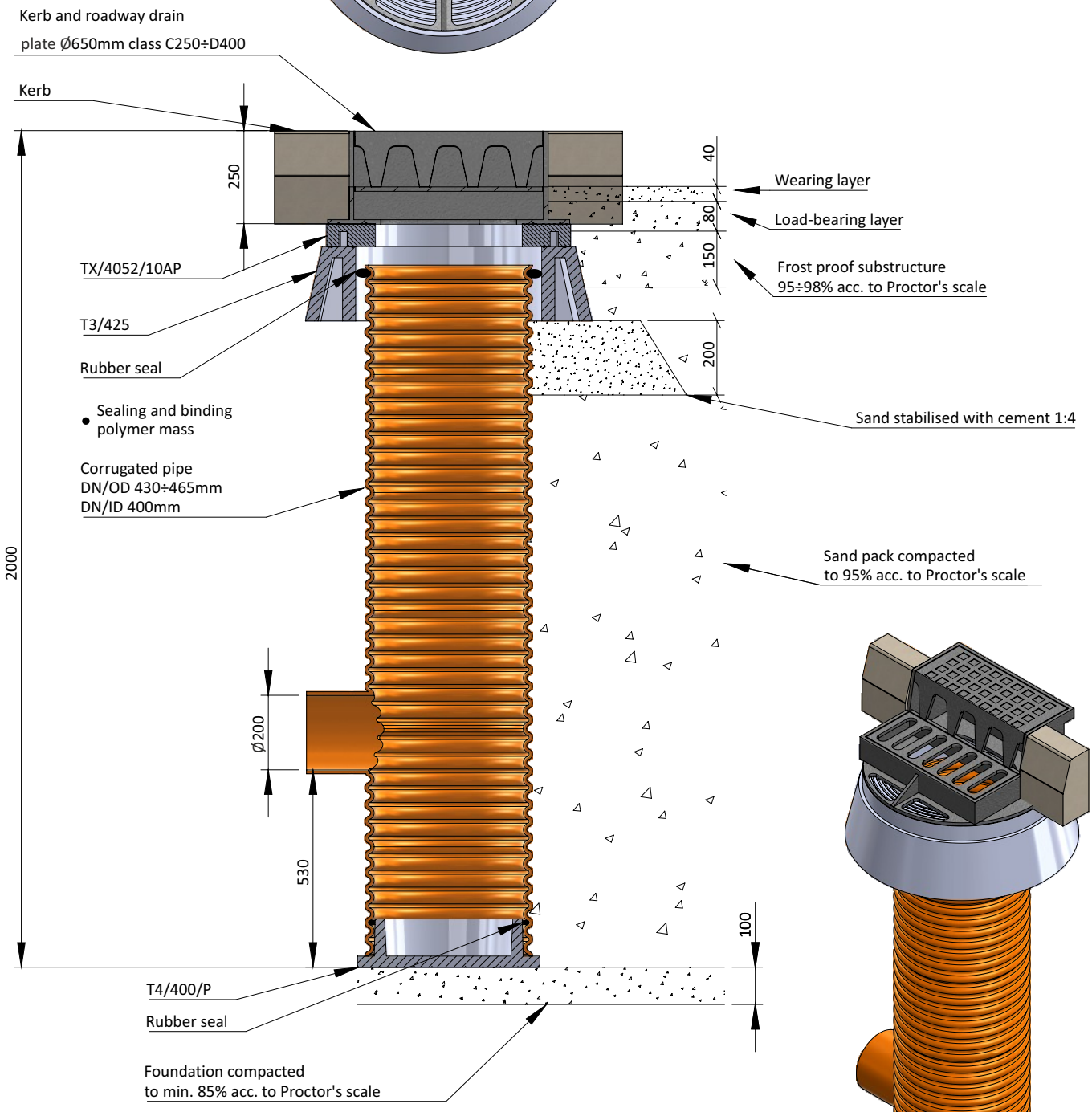


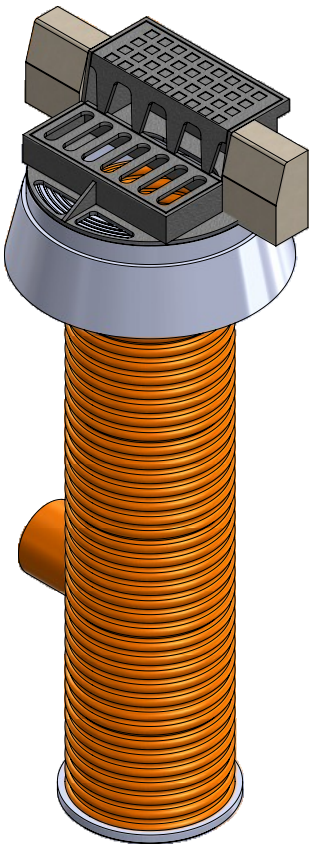




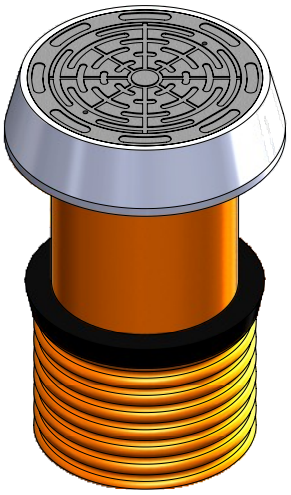
Finial of DN425 well prepared for cast-iron street drains with external body plate diameter between 620 and 750mm that consists of T3/425 relief cone installed in a reverse manner and TX/765 group adapter. Structure durability class D400.

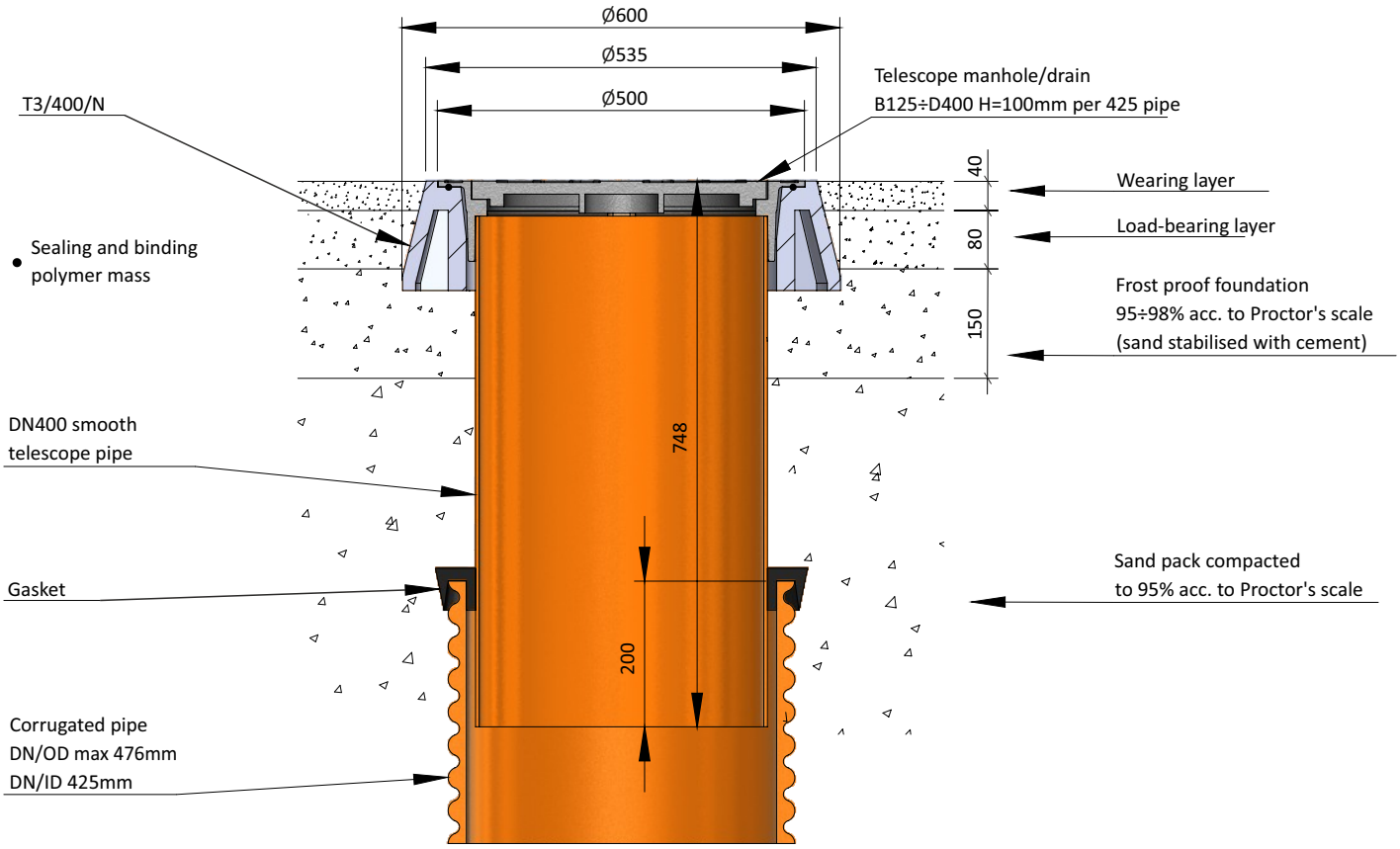






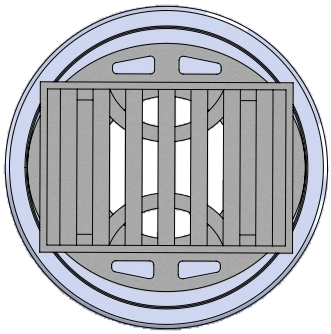
Plastic well DN/ID 400 acting as a sewage drain with settling tank. Surface finial made from T3/425 relief cone and TX/4052/AP adapter placed under full-iron kerb and roadway drain. T4/400/P covering constitutes as a bottom.

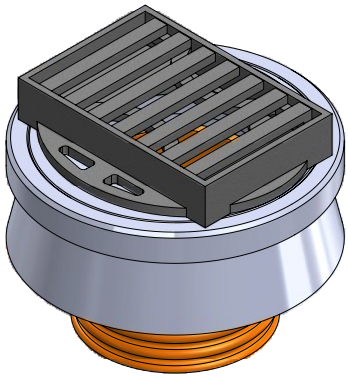


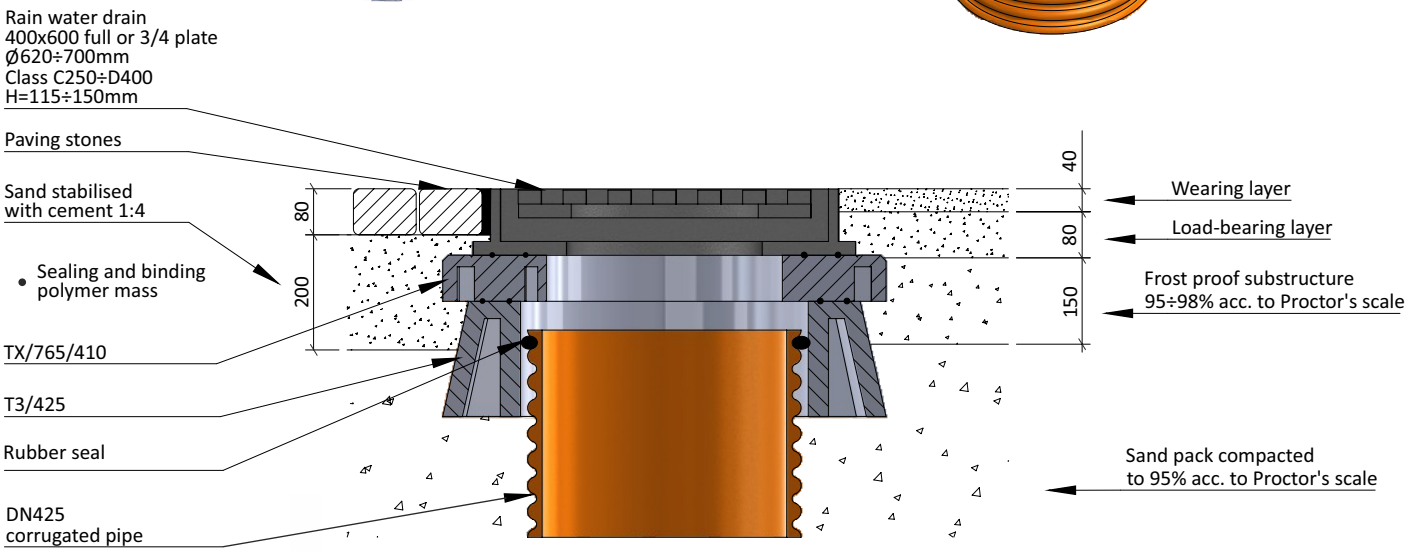


Telescope finial of DN425 plastic well consists of a telescope manhole integrated with DN400 smooth plastic pipe installed directly on T3/400/N relief cone. The cone installed in structure layers of road surface increases the support surface for telescope manhole. Recommended height of telescope pipe: 70cm. In case of a change of surface ordinate, the cone remains in the place of initial installation and the telescope manhole can be lifted and supported with fortified layer of asphalt mass applied between the cone and manhole flange.

Notes





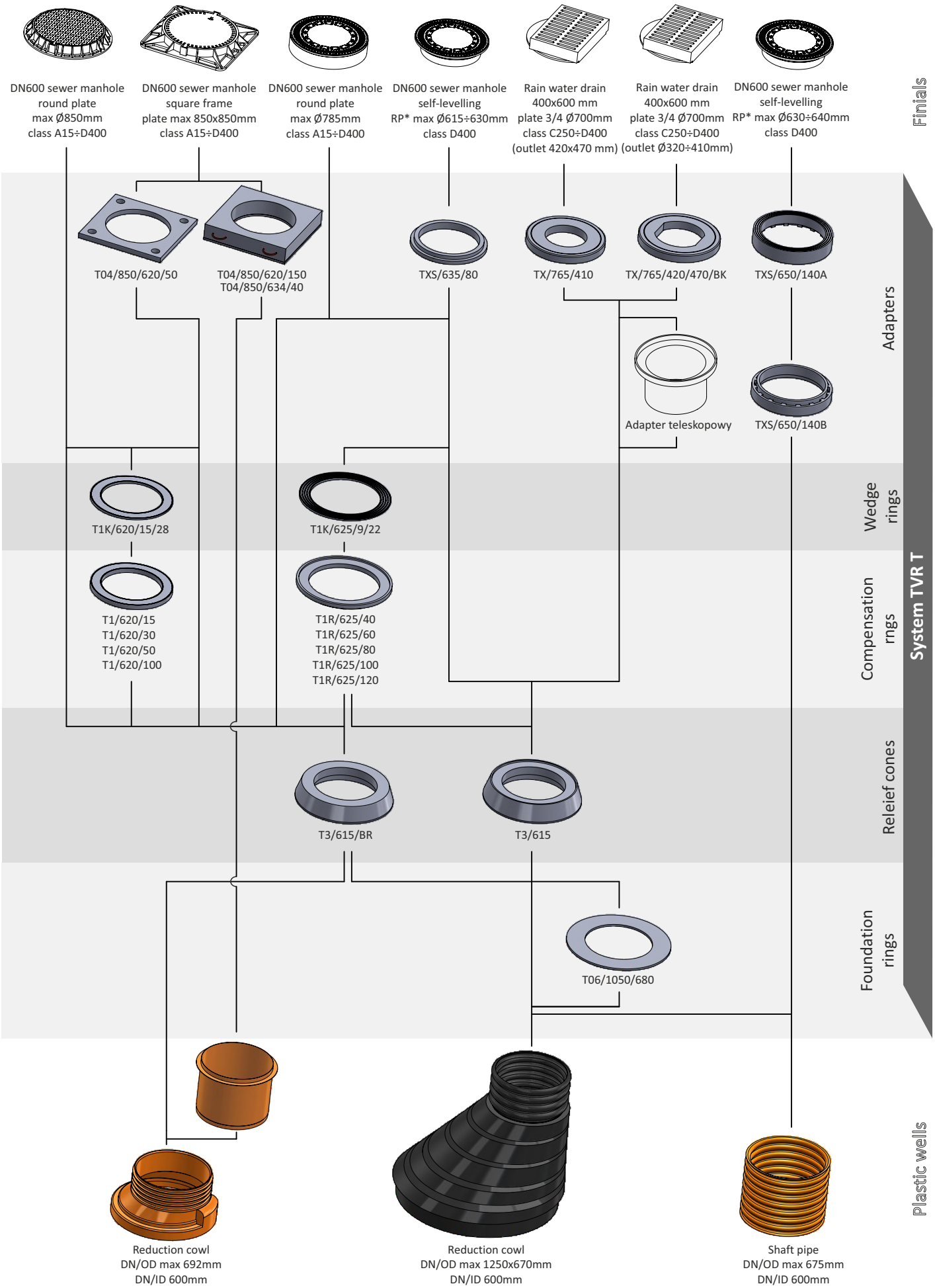


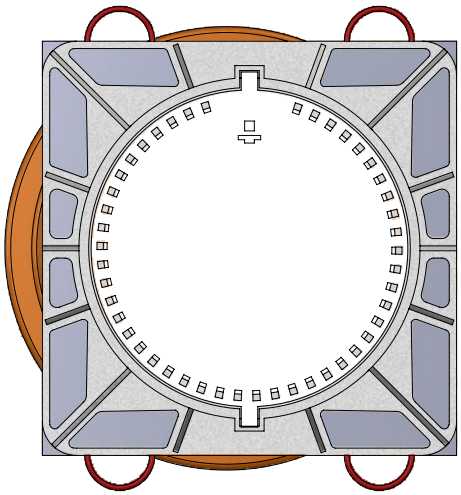
Surface finial of DN425 plastic well acting as a street drain. 400x600 sewage drain, full or ¾ flange, and with external load-bearing plate diameter of 620÷750mm installed directly on TX/765/410 support adapter that is also adjusted to the shape and diameter of outflow opening of the sewage drain. The adapter should provide a full support for drain load-bearing plate and the central flow of surface waters to the well. A direct support for the adapter is T3/425 relief cone, which is installed in the structure layers of a road around the shaft of a plastic well. It provides a full relief of the well and support of adapters and drains. Design solution allows to use standard sewage drains used so far in concrete surface dehydration systems in the systems of plastic wells. Any tensions are compensated in the internal space of relief cone. The tightness of the finial is acquired through the application of polymer sealing masses between all components. It is advised to apply seal between the internal wall of relief cone and external wall of shaft pipe. We recommend to use the structure in areas 1÷3 acc. to PN-EN 124-1:2015.
400x600 and 500x500 flangeless drains with small support surface can be installed when the structure of well is located outside of a ride over area, e.g. bay for drains.

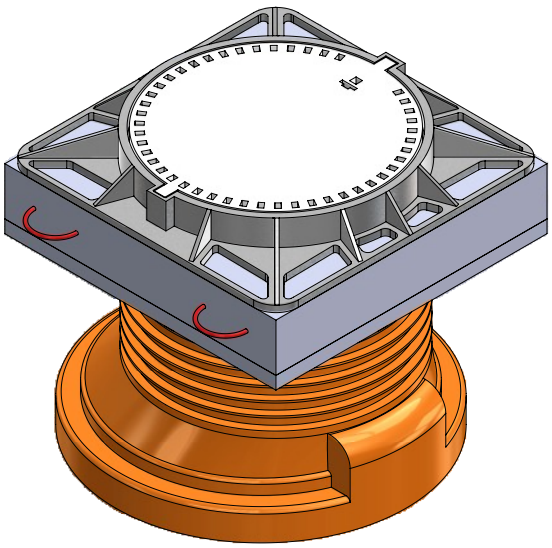
Notes

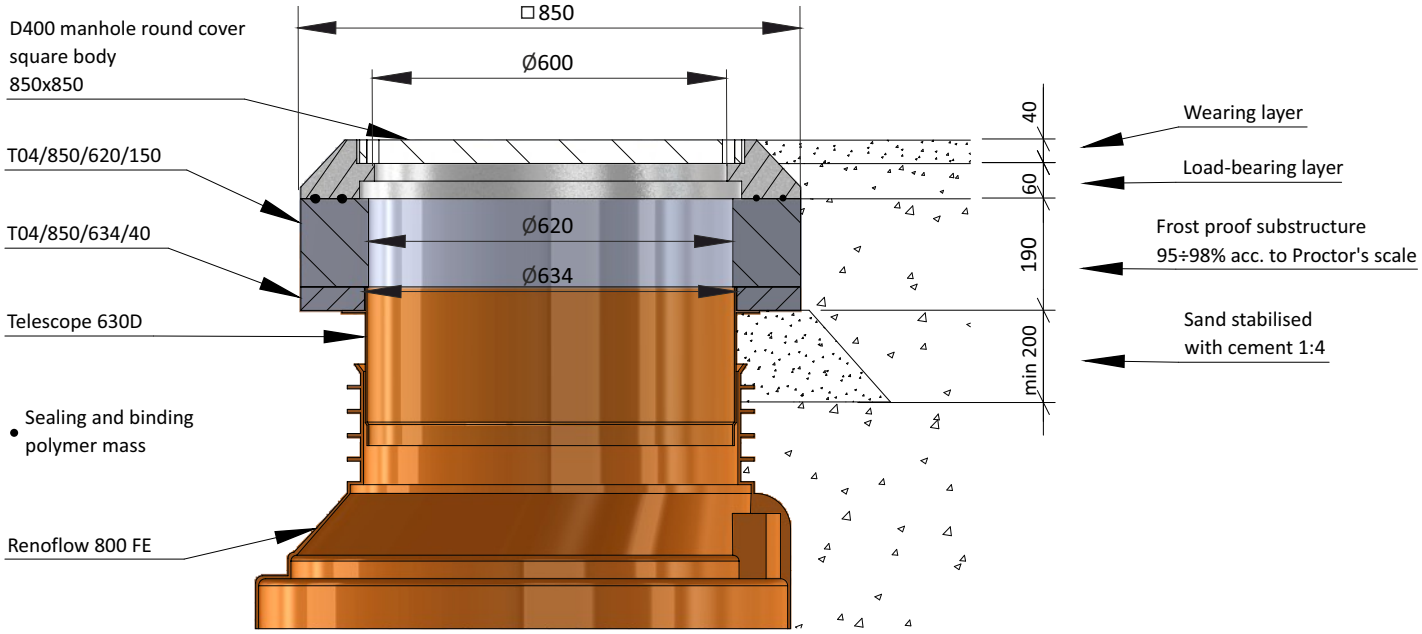
14.7. DN425 Plastic wells

Application diagram for surface finial elements of the TVR T system
for height adjustment and assembly of sewage manholes on relief cones for DN600÷1250 plastic wells.



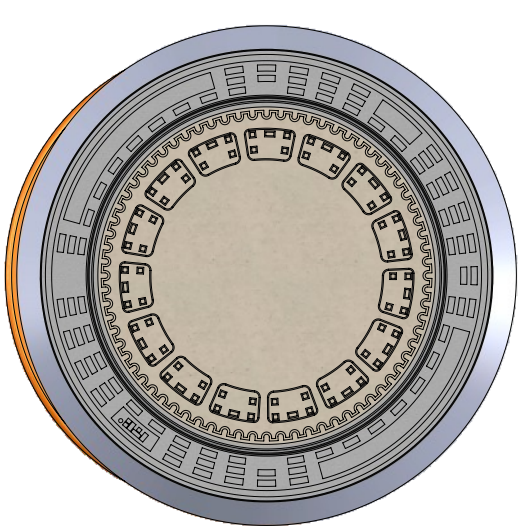


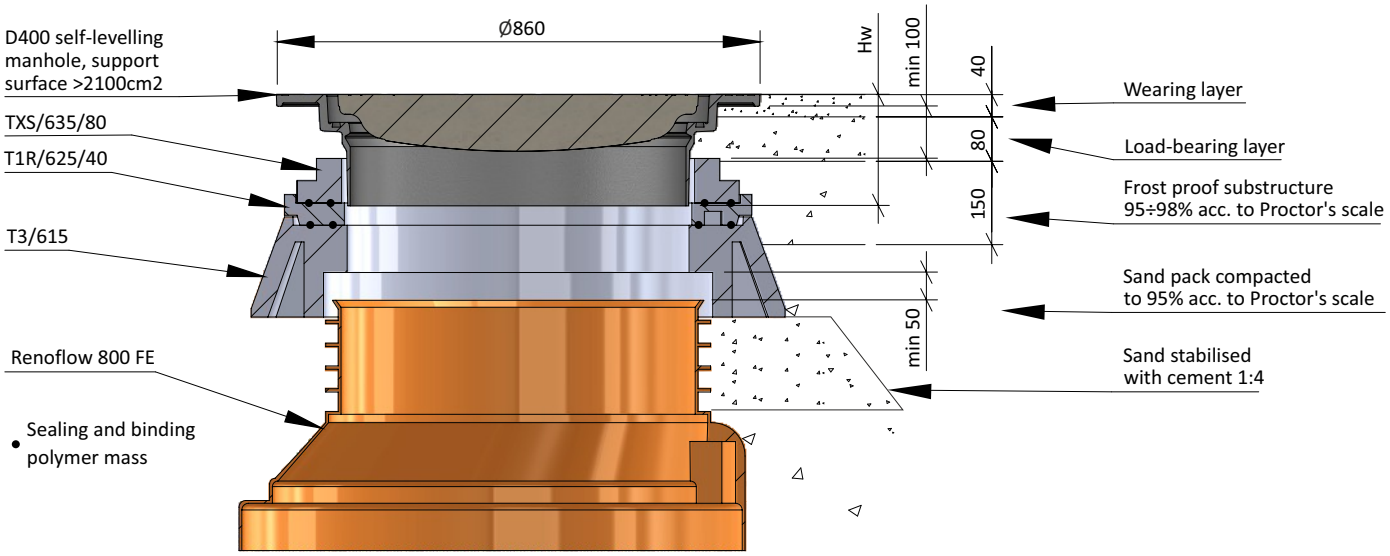




Surface finial of DN800 and DN1000 plastic manhole wells consists of 630D segment telescope and T04/850/634/40 and T04/850/620/150 square foundation and relief slabs. Install integrated foundation slabs centrically over the telescope on the fortified and stabilised substructure made around the well telescope. The telescope spigot is implemented into the internal opening of slab at a depth of 4cm. Relief slab is based on telescope flange and stabilised substructure. Design solution allows to install sewage manholes with square, octagonal, and round plates with max. diameter of Ø850mm (850x850mm). Relief slabs with support surface of 4206cm^2 provide a full relief of sewage manhole, stable support of manholes, and tightness of the structure. The occurring tensions related to the operation of ground are compensated by the operation of telescope installed in well and relief slab.

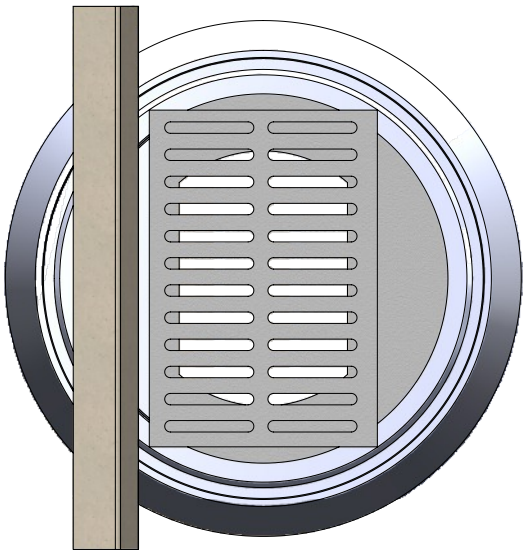
Notes

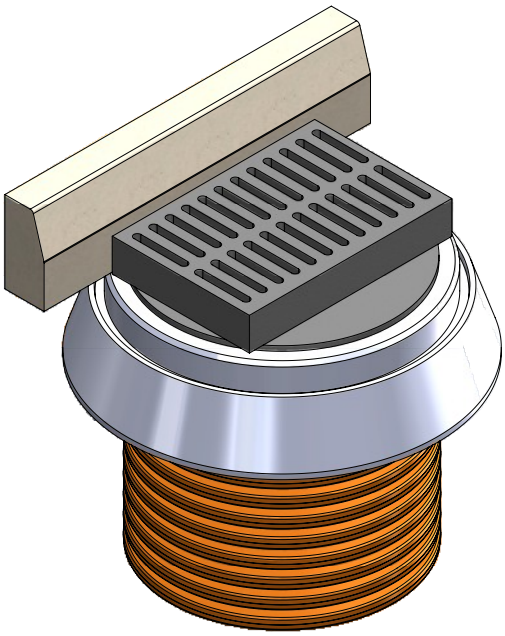


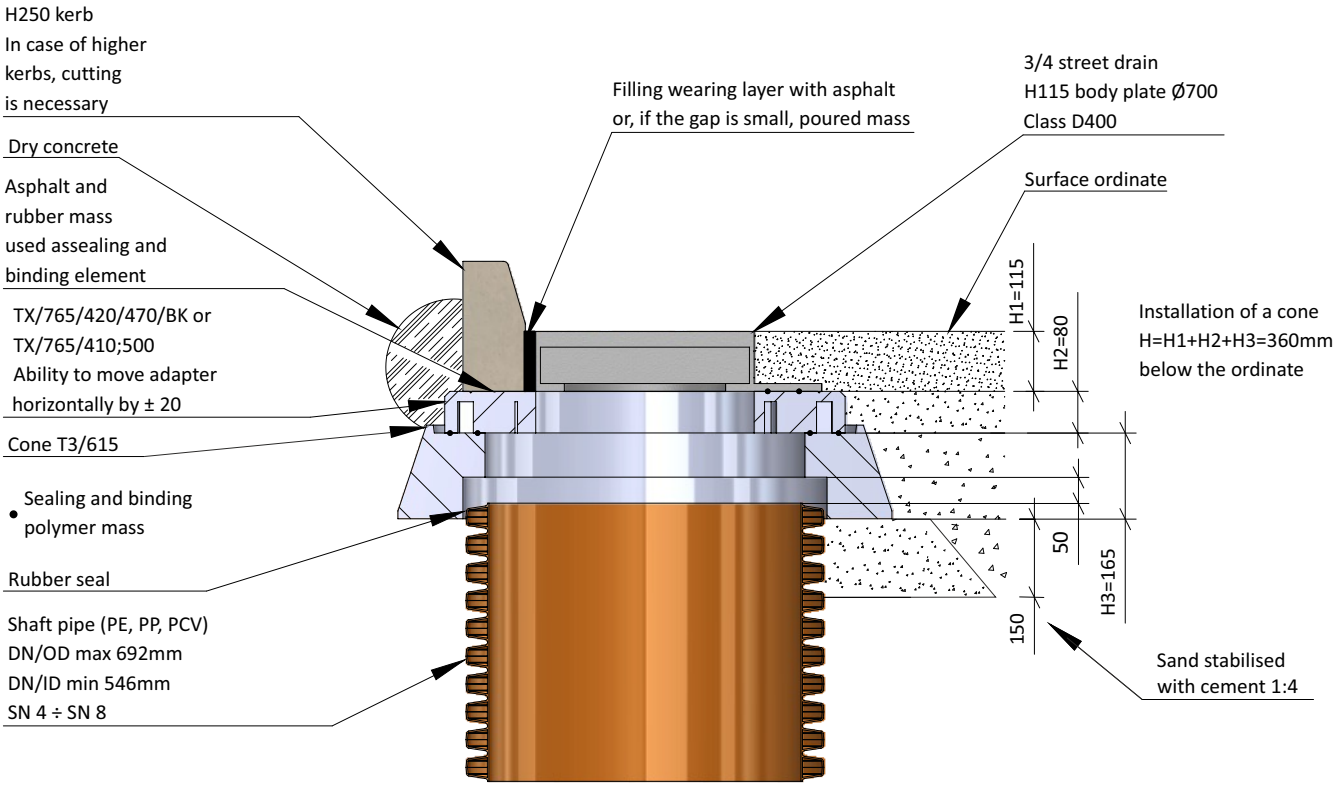


Surface finial of DN800, DN1000, and DN600 plastic manhole and non-manhole wells consists of a T3/615 relief cone, T1R/625/40÷120 compensation rings (optionally), and TXS/635/80 leading adapter/ring. T3/615 relief cone is installed centrically around the shaft pipe and well chimney on a stabilised substructure and provides support for compensation rings and leading adapters. Surface finial made in such way allows to install a self-levelling manhole based directly on bituminous surface. Minimum layer of asphalt mass between the manhole flange and TVR T system elements is 10cm. The solution provides a full relief of sewage system, tightness, and durability.

Notes



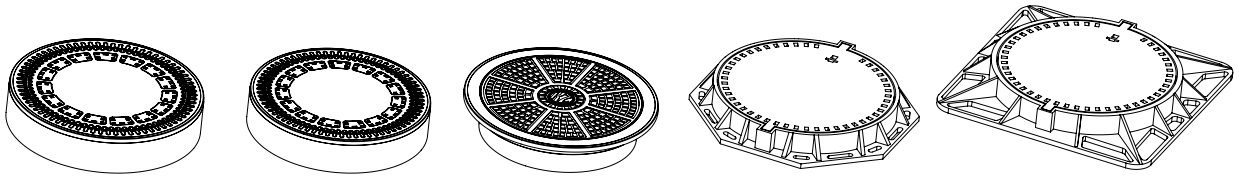




Surface finial or DN600 plastic non-manhole well acting as a sewage drain and consisting of T3/615 relief cone and TX/765 group adapter placed under street drains. The structure ensures a correct and tight support of standard 400x600 full drains with body plate diameter of Ø700mm. T3/615 cone is installed on stabilised substructur e and provides a structure support for TX/765 adapters and street drains, and secures and relieves the shaft pipe of a well. Adapters should be adjusted to outflow openings of street drains, so that a correct and central water outflow and tightness are provided. Design solution for use in areas of group 1-3 acc. to PN-EN 124-1:2015. 500x500 type street drain can be used only in the location of a drain bay, where no vehicles will ride over it.

Notes

Application diagram for surface finial elements of the TVR T system
for height adjustment and assembly of sewage manholes on relief cones for DN600÷1250 plastic wells.



DN600 sewer manhole round plate max Ø805mm class A15÷D400

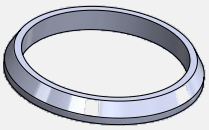
DN600 sewer manhole round plate max Ø785mm class A15÷D400

DN600 sewer manhole self-levelling RP* max Ø660mm class D400

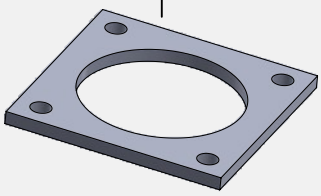
DN600 sewer manhole octagonal or round plate max Ø850mm class A15÷D400

DN600 sewer manhole square frame plate max 850x850mm class A15÷D400

Finials

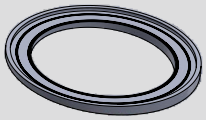


TXS/675/90

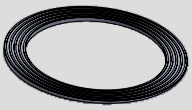


T04/850/620/50

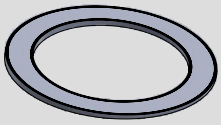
Adapters



T1RK/625/30/60

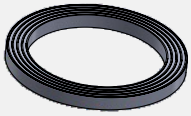


T1K/625/9/22

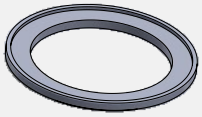


T1K/620/15/28

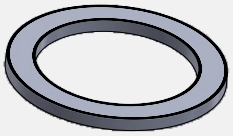
Wedge rings



T1/625/15
T1/625/30



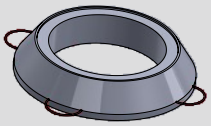
T1R/625/40
T1R/625/60
T1R/625/80
T1R/625/100
T1R/625/120



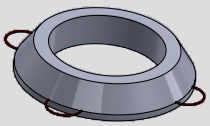
T1/620/15
T1/620/30
T1/620/50
T1/620/100

Compensation rings

System TVR T

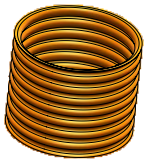


T3/680

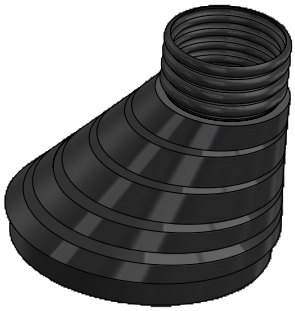


T3/680/BR

Relief cones

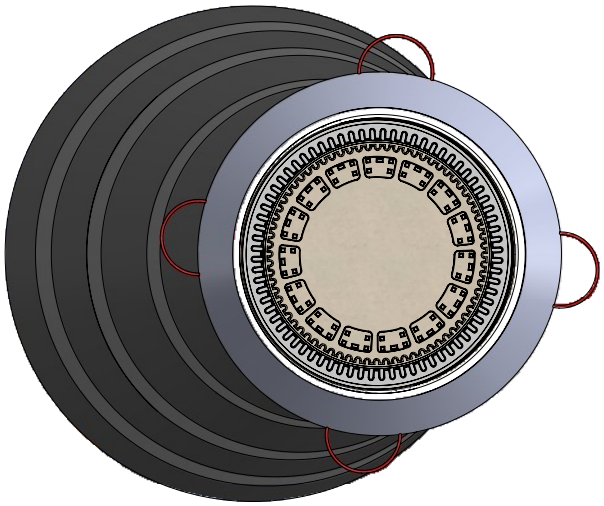


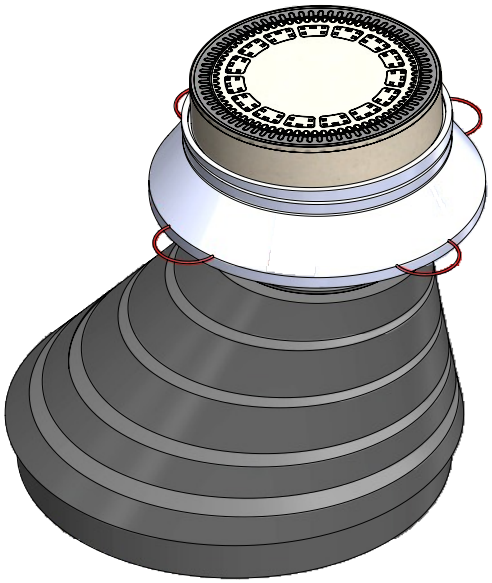
Shaft pipe
DN/OD max 675mm
DN/ID 600mm

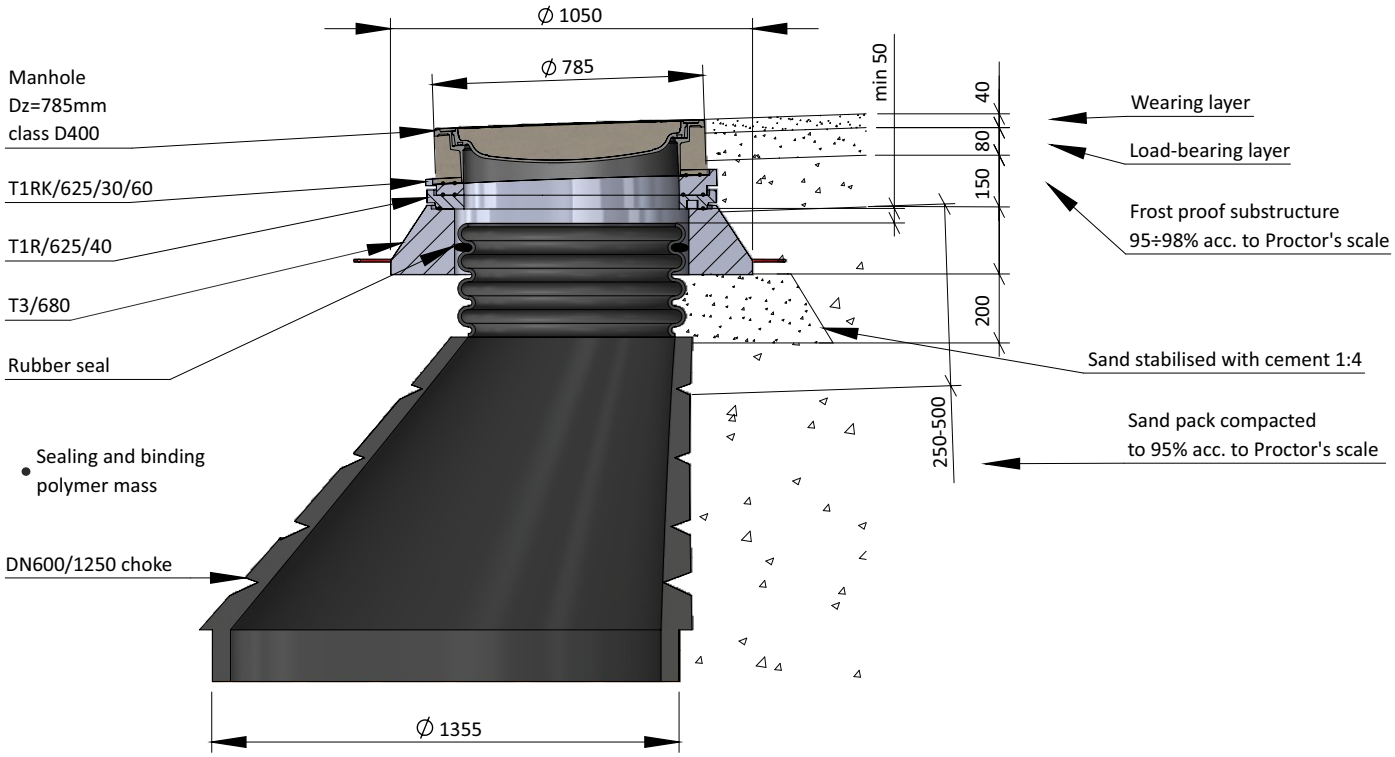


Reduction cowl
DN/OD max 1250x670mm
DN/ID 600mm

Plastic wells

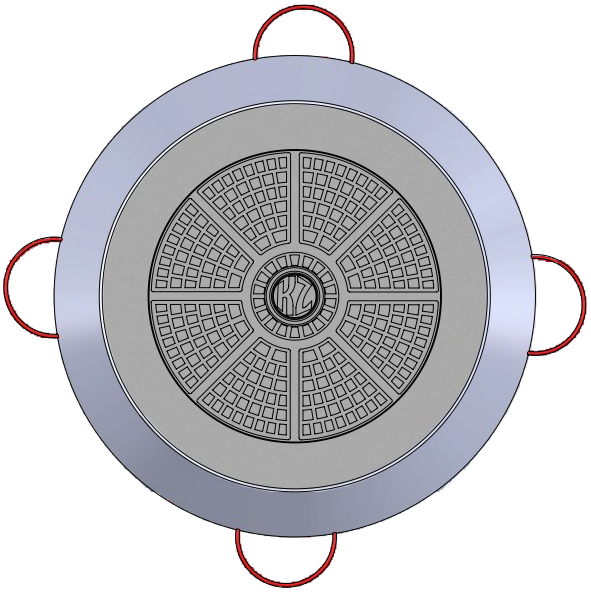


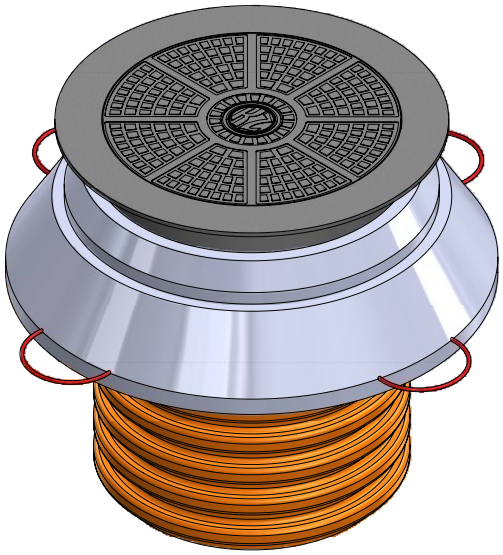


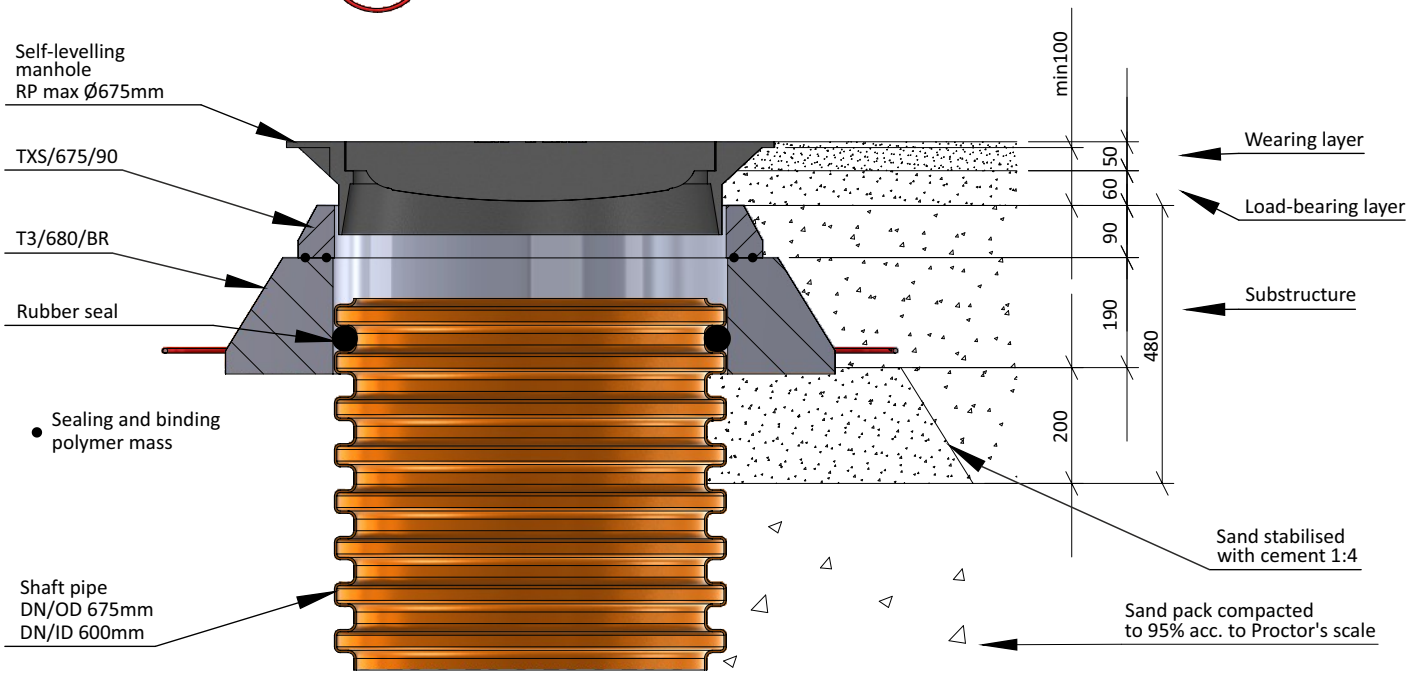


Surface finial of Tegra 1250 plastic well consists of a T3/680 relief cone installed centrically around well chimney and T1R/625 compensation rings with minimum height of 40mm. T1R/625 compensation rings reduce the free space of relief cone, ensure the ability of additional height and inclination angle adjustment, and also provide support for sewage manholes made acc. to DIN 19854. T3/680 relief cone with support surface of 5027cm^2 provides a full relief of plastic well and provides support for compensation and wedge rings.

Notes





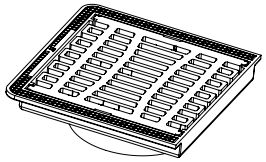


Surface finial of DN800, DN1000, and DN600 plastic manhole and non-manhole wells consists of a T3/680 relief cone and TXS/675/80 leading adapter/ring. T3/680 relief cone is installed centrically around shaft pipe and well chimney on a stabilised substructure providing a support for leading adapter/ring intended for KZO WS-DO-600N self-levelling manhole. The surface finial allows to install a self-levelling manhole based directly on bituminous surface. Minimum layer of asphalt mass between the manhole flange and TVR T system elements is 10cm. The solution provides a full relief of sewage system, as well as partial relief of relief elements according to the influence principle of self-levelling manholes.

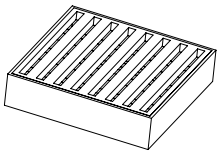
Notes

14.9. Plastic street drains

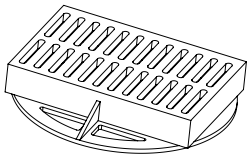
Finials



500x500mm self-levelling
kerb drain
class C250÷D400

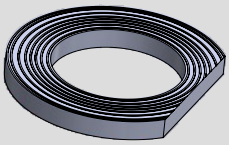


Rain water drain
500x500mm
class C250÷D400

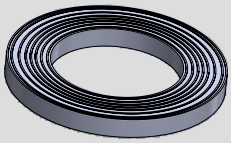


Rain water drain
400x60 mm
full, plate max. Ø700mm
outlet max. Ø360mm
class C250÷D400

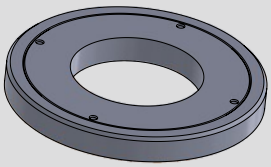
System TVR T
Adapters



TX/4052/10A

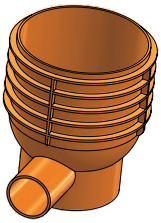


TX/4052/10AP



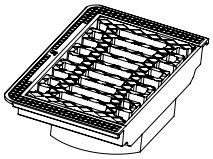
TX/765/395/80/P

Plastic well

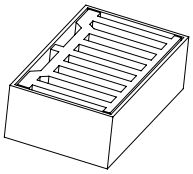


Plastic well
DN/ID max 370mm

Finials

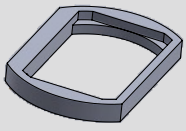


Rain water drain
300x500 mm
self-levelling
class D400

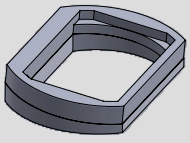


Rain water drain
300x500mm
class D400

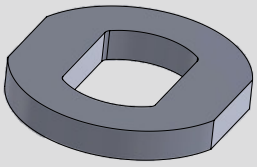
System TVR T
Adapters



TX/4052/10B

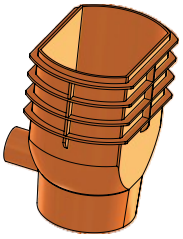


TX/4052/10B5

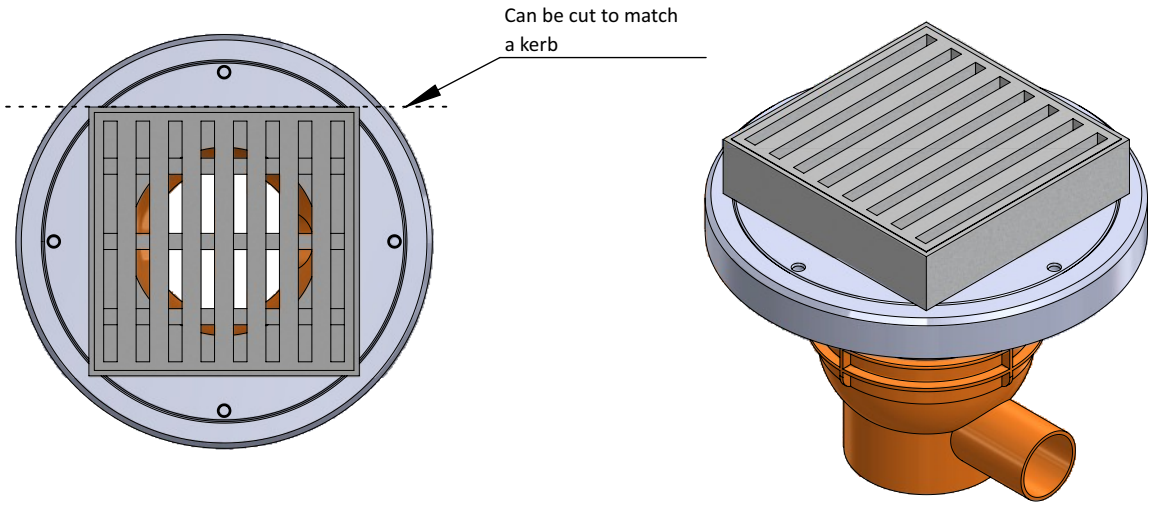


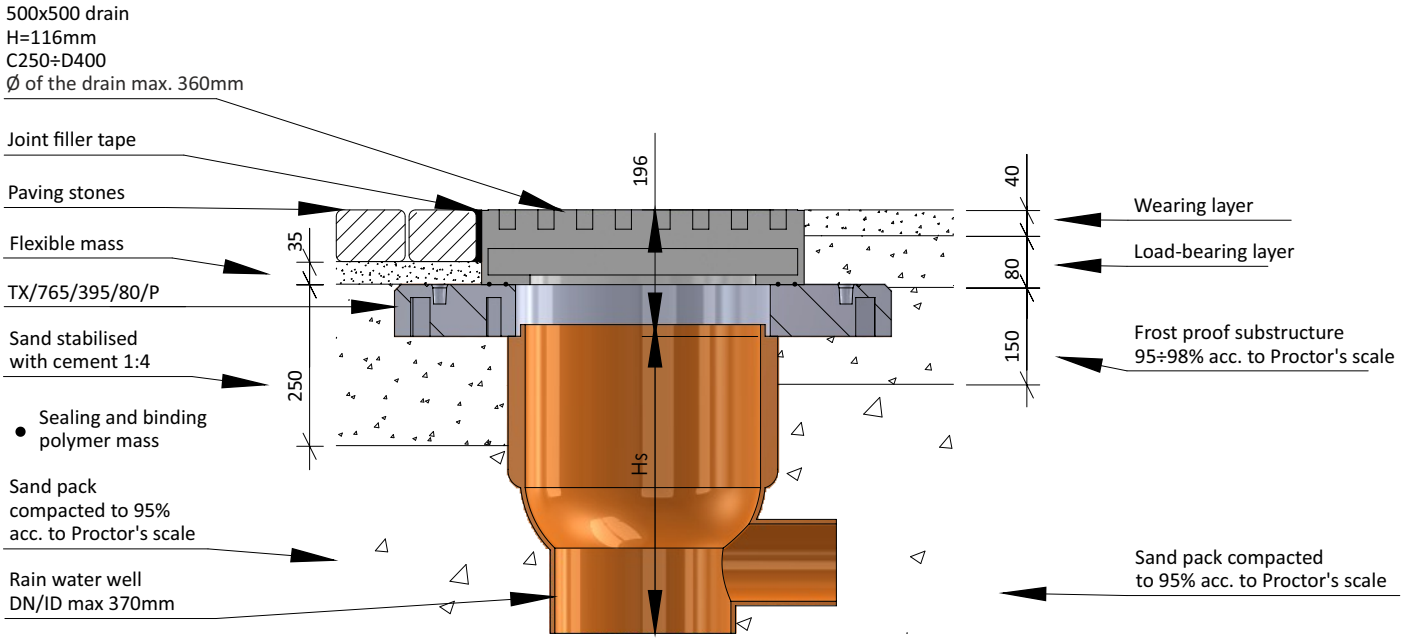
TX/650/395/P

Plastic well



Plastic rain water
well, placed under
300x500mm drains

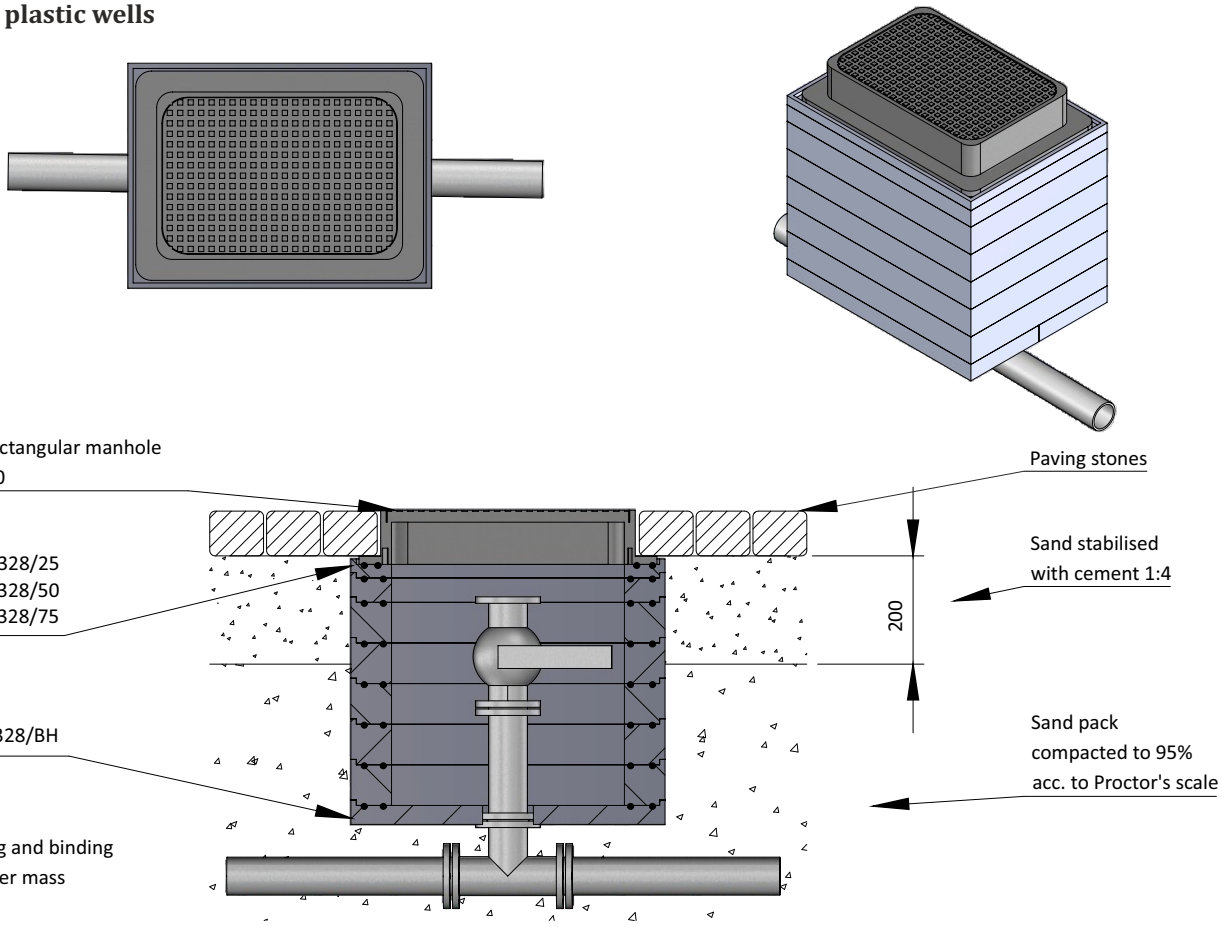




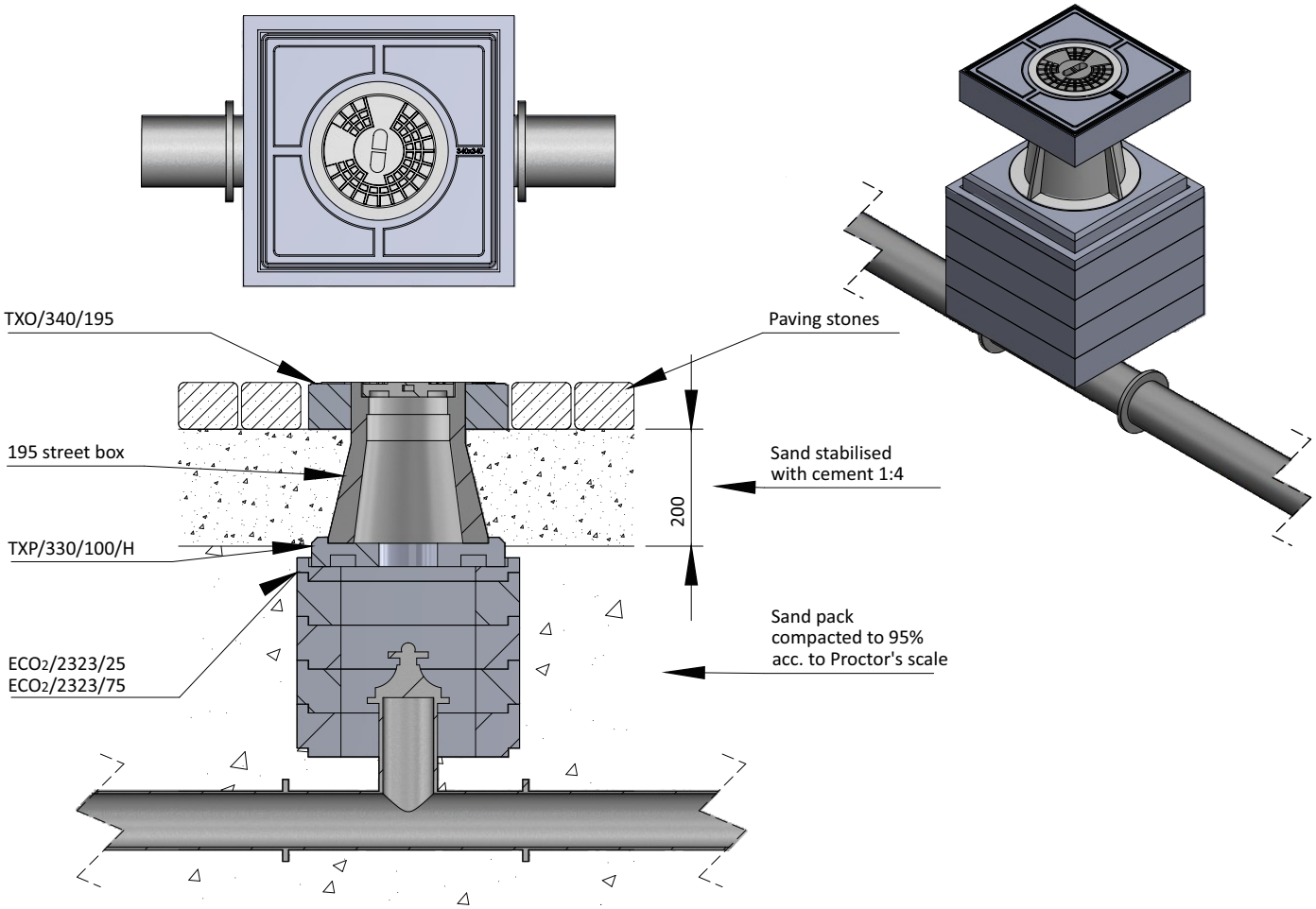
Surface finial of DN400 plastic street drain consists of TX/765/395/80 adapter (optionally TX/4052/10A or TX/4052/10/AP adapter placed under 500x500 drain) installed centrically over/around street drain on a stabilised and fortified substructure. The adapter allows to install 500x500 cast-iron street drains, as well as standard 400x600 street drain, full and ¾ flange and with minimum external flange diameter of Ø620mm. The drain outlet diameter should have maximum 370mm. Relief of a plastic outflow is fully secured by the adapter.

Notes

14.10. ECO2 plastic wells

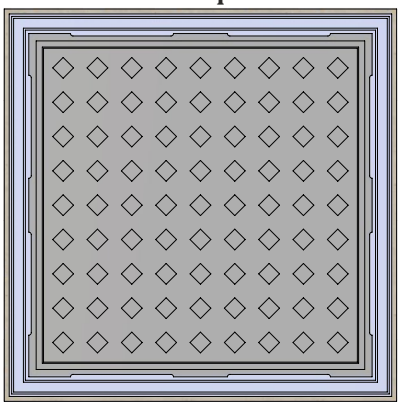


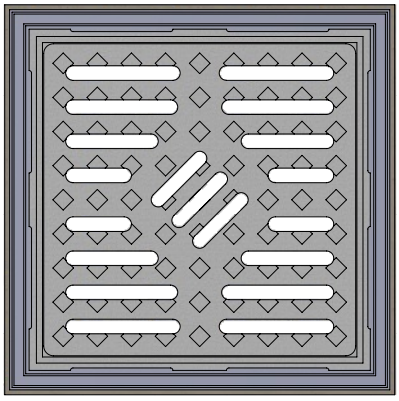
Valve or water meter chamber made completely out of ECO2/4328 plastic segment elements.

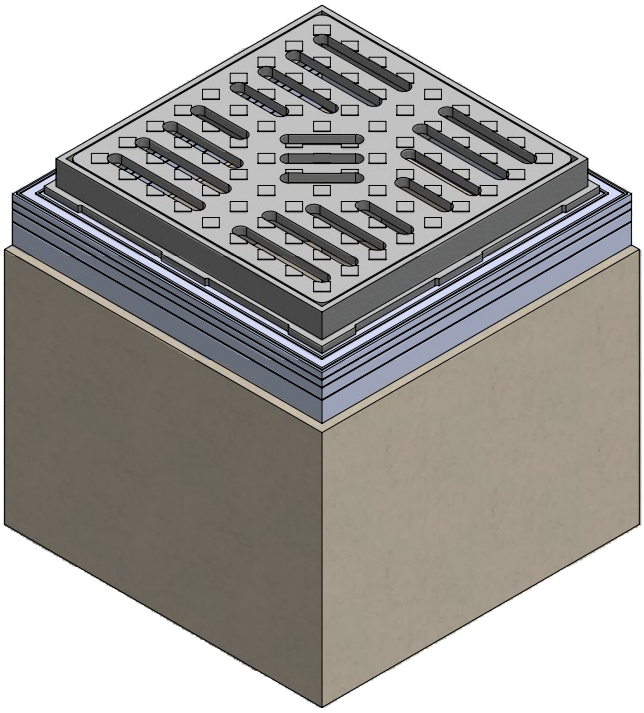


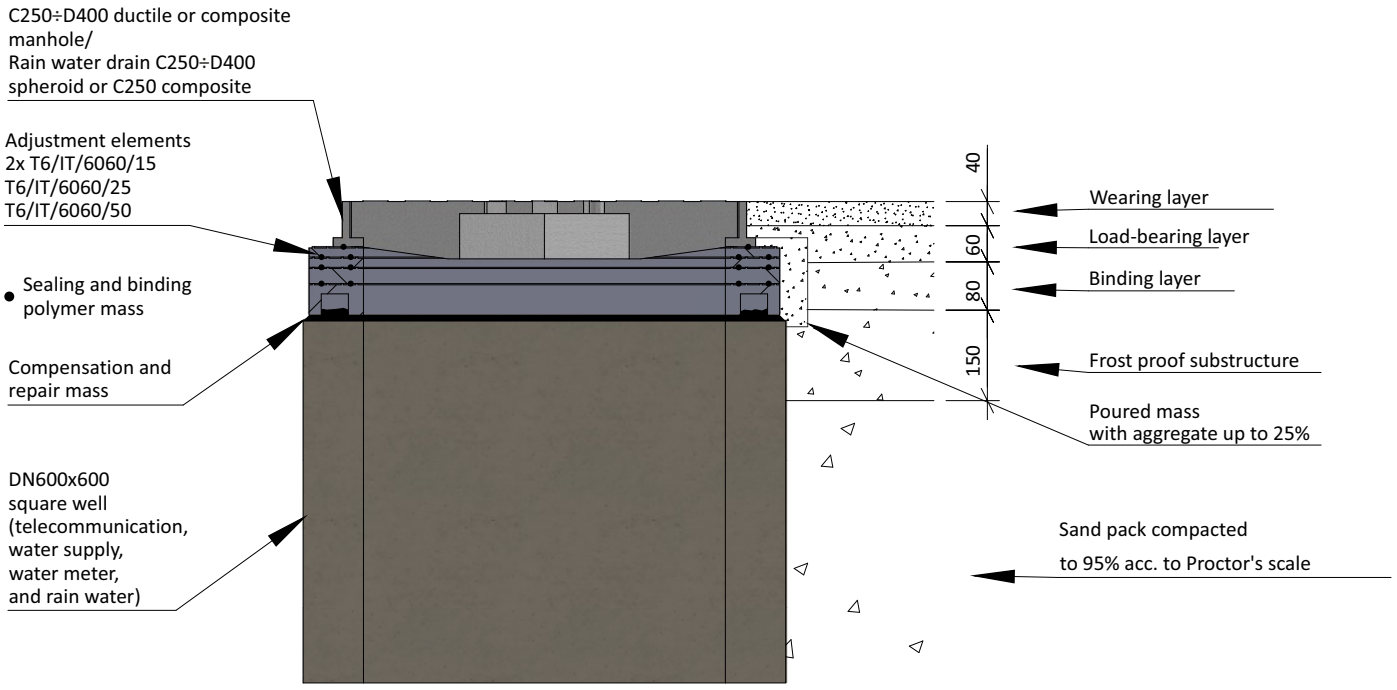
Structure of a valve box made from ECO2 segment elements, TXP/330/100/H support adapter, and element protecting the upper part of TX0/340/195 street box.

14.11. DN300÷DN700 concrete square wells





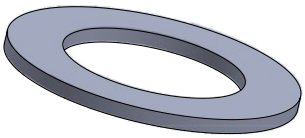


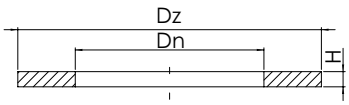


Notes

T1/700/430/30 Compensation ring/drain-supporting adapter

INDEX	Dn [mm]	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
T1/700/430/30	430	700	15	12	D400

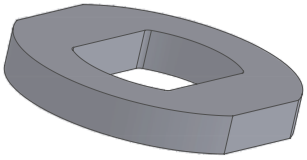


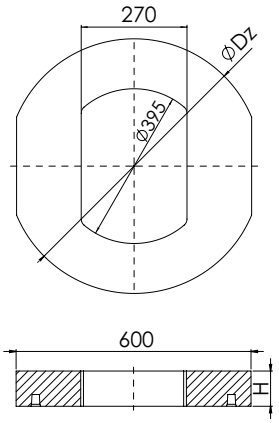


Compensation ring reducing the internal diameter of the street drain, intended for direct support of 400x600 flanged drains, drains with maximum external body diameter of 680mm, 400x600 drains with a 3/4 flange, roadway and kerb drains, and 500x500 drains. Laid on: T1/500 or T1/435 compensation rings, concrete indirect rings, cover plates, and street drain relief elements.

TX/650/395/P Drain-supporting adapter

INDEX	Dz [mm]	H [mm]	Mass [kg]	Class [kN]
TX/650/395/P	650	90	23	D400

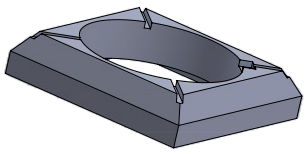


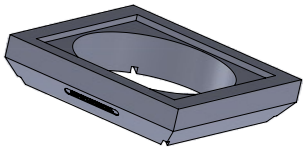


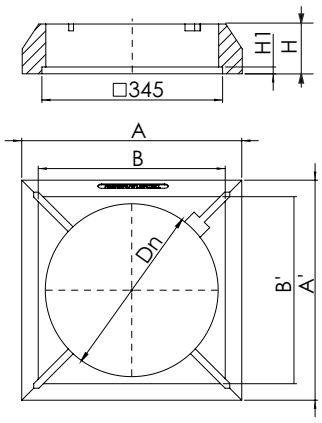
Supporting adapter for the following types of drains: 300x500 drains of the BEGU and Europa types, 400x600 roadway and kerb drains, 400x600 roadway and kerb drains with a 270x395 outlet, laid directly on DN450 and DN500 concrete rainwater wells, plastic compensation rings of the T1 and T2/500 types. It is also a drain supporting element with the function of relieving plastic rainwater wells and DN400 outlets (Wavin, Romold, and Pipelife types). The TX/650/395/P adapter can be used as a kerb element after being cut on site to the size of 490mm (on wells, plastic drains). For application diagram, see pages 48 and 86.

XO/315/M345U Support and cover adapter for 315 telescope manholes

INDEX	Dn [mm]	A=A' [mm]	B=B' [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXO/315/M345U	330	420	357	95	13	10,4	D400



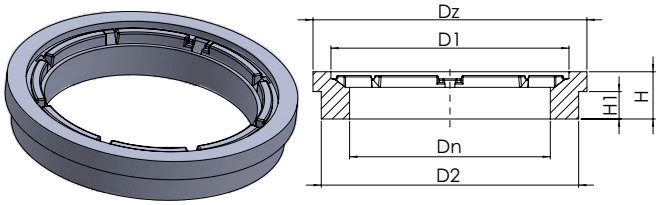




Universal adapter for supporting and protecting DN 315 telescope manholes with square bearing bodies 342x342x13mm, class B125 and D400 (Magnaplast model casted by Orzechowscy iron foundry). In surfaces made of cobblestone, flagstone, the telescope manhole is mounted in the cover cavity of the adapter - the square side, while in bituminous surfaces, the sloped side is the manhole supporting side.

TXP/425/K Support and cover adapter for 425 telescope manholes

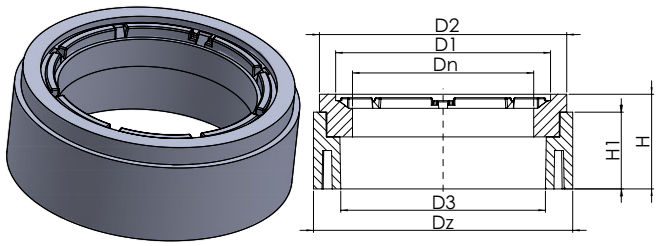
INDEX	Dz [mm]	Dn [mm]	D1 [mm]	D2 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXP/425/K	580	425	504	545	100	58	12,8	D400



Adapter for supporting a 425 telescope manhole, with the body diameter of 500 (Kaczmarek, Bohamet, Norson 110/1 models). Installed in a cobblestone surface on a cement substructure, in a bituminous surface in the wearing layer, or as a lost element in the load-bearing layer. In combination with a relieving element, it can be used as a relieving set (TXP/480/425/230) for DN425 plastic manholes equipped with the above-mentioned telescope finials.

TXP/480/425/230 Support and relief adapter

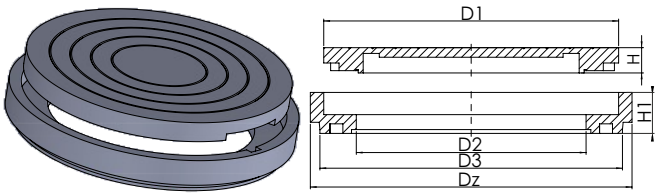
INDEX	Dz [mm]	Dn [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
TXP/480/425/230	608	425	504	580	480	222	180	32,4	D400



A set of support elements for telescope manholes and drains (with the body flange outer diameter of 500mm, models: Kaczmarek, Bohamet, Norson 110/1) with simultaneous relief of the corrugated pipe rising the DN425 wells. Installed around the DN425 well on a stabilised compacted substructure/road structure. In a bituminous surface, it can be flush with the wearing layer or embedded in the load-bearing layer as a lost element (indirect support of the telescope manhole, compacted bitumen mass between the manhole flange and the top of the supporting adapter, 3÷5 cm thick).

T5/600/DK Covering with a protective body

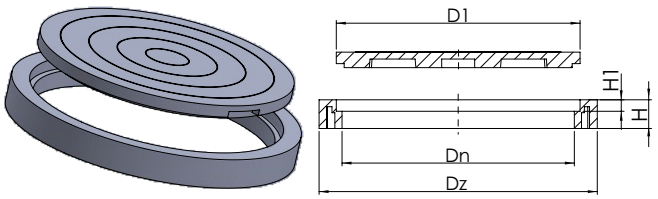
INDEX	Dz [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
T5/600/DK	840	770	600	790	66	107	40	D400



Protective covering with a protective body for concrete wells with a DN600 or DN625 manhole as well as for plastic wells equipped with a T3/615 relieving cone. It provides protection against pollution, unauthorised access, and surface water inflow in areas excluded from car and pedestrian traffic. The finial should be raised above the ground and surface level (approx. 8 cm). The covering is protected against damage caused by mowing devices.

T5/800/100 Covering with a protective body DN800

INDEX	Dz [mm]	Dn [mm]	D1 [mm]	H [mm]	H1 [mm]	Mass [kg]	Class [kN]
T5/800/100	970	810	850	100	40	54	D400



Protective covering with a protective housing for wells with a DN800 opening. It provides protection against pollution and rainwater inflow in areas excluded from car and pedestrian traffic.

Step 1 - Dismantling the manhole

- Carve out and forge the surface as close as possible to the base of the manhole flange to be repaired (e.g. with a minimum diameter of 1100mm);
- pull the lid out of the body frame;
- secure the well against debris falling from the dismantled finial;
- remove the frame of the manhole body;
- remove all damaged elements up to the point where the finial does not show any signs of damage and the technical condition of the well is good (compact, uniform structure of concrete).

Step 2 - Measurement of the adjustment height, selection of materials and dimensional control

- Determine the height of the adjustment taking into account the angle of inclination, the height of the manhole and the thickness of the repair layer;
- check that the diameters of the compensation rings are dimensionally and structurally matched to the well and will provide full support for the flange/foot of the manhole;
- it is inadmissible for the manhole foot to be unsupported from the inside and outside;
- determine the necessary number, height, and type of compensation rings for the height adjustment;
- in order to verify the correct selection of the ring height and the correct setting of the manhole inclination angle to the surface inclination angle, it is recommended to perform a “dry” assembly and mark the assembly point on the elements of the finial;
- the manhole inclination angle should be corrected by coaxial rotation of the wedge rings.

Step 3 - Compensation and repair layer

TVR T System compensation rings require to be installed on a level and strong base/foundation. The compensation and repair layer made with the use of quick-setting cement compounds or resin-based compounds should remove all defects, unevenness and damage occurring on the upper part of the well. The layer thickness cannot exceed the recommendations of the manufacturer of the quick-setting compounds.

- Protect the well opening with pneumatic formwork, fill the formwork with compressed air, check the tightness of the formwork adherence to the vertical edges of the well;
- prepare the surface of the well for the application of the repair layer, remove all impurities and dust from the surface, and then roughen and moisten the surface;
- repare, in accordance with the instructions of the manufacturer of the quick-setting compounds, an appropriate amount of grouting mortar for the compensation and repair layer;

Step 4 - Installation of compensation rings and manhole

- Place the first ring, with a polymer seal applied on it, onto the hardened compensation and repair compound, centrally around the well opening;
- between all the finial elements, on the horizontal surface, apply a continuous and closed roll of the polymer seal, on the inside and outside of the ring;
- each subsequent compensation ring from the selected set should be firmly pressed in order to distribute the seal well and remove any error resulting from the excess of sealing compound;
- the rings for adjusting the manhole inclination angle are placed in accordance with the marking previously made on the well element;
- the maximum height of well adjustment made with the use of plastic compensation rings is 25 cm;
- place the manhole frame, with seal applied on its foot, on the surface finial of the well and press it firmly;
- use a spirit level and a patch to check the correctness of the manhole height adjustment to the ordinate of the manhole surrounding surface (tolerance ±5mm, it is preferable to make the adjustment at +2÷3mm);
- manholes with openings in the frame foot can be anchored to the compensation rings using screws with a diameter of 8÷10mm;
- remove the pneumatic formwork from inside the finial;
- clean and remove all contamination from the surface of hinges, locks, and manhole body faying surface before inserting the lid.

Step 5 - Reconstruction of the road subsurface

- Perform reconstruction/substructure of the road surface around the surface finial by filling with road crushed stone with a minimum granulation of 25/30. Fill the space with crushed stone in 65-70%;
- in accordance with the instructions of the manufacturer of hydraulic quick-setting compounds, prepare the mass for pouring in the space filled with crushed stone between the finial and the exposed road substructure around the manhole being adjusted. The share of quick-setting mortar is approx. 30-35%;
- pour the quick-setting mortar up to the height above the foot of the manhole frame.

Step 6 - Reconstruction of the road surface

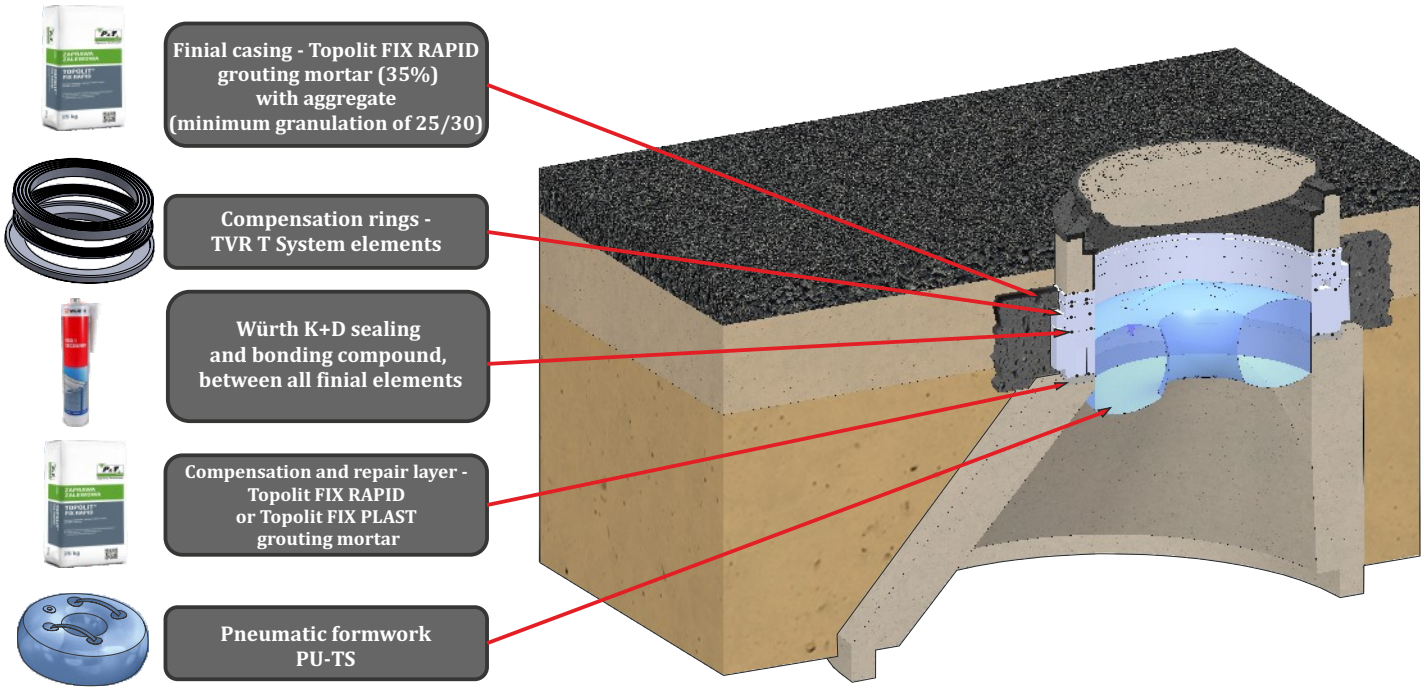
- At the junction of the old and new layers of the wearing surface, stick a bituminous joint filler tape with dimensions of at least 40x5mm;
- apply the bituminous masses hot, in layers, ensuring the appropriate compaction of each layer;
- putting into operation may take place after the asphalt mass has cooled down.

7 - Inspection after height adjustment and installation of the manhole

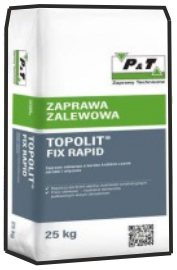
After completing the surface finial and installing the sewage manhole, before putting it into operation and subjecting it to traffic load, the following activities should be performed:

- Check that the compensation rings are fully supported and placed centrally around the manhole and that they fit snugly together;
- clean all the finial elements, remove contamination from the manhole lid and frame contact surfaces, check for any improper interaction between the contact surfaces of the lid and its body (in the horizontal and vertical planes);
- verify that the appropriate material hardening time has elapsed (this applies to the compensation layer, the road substructure layer, and the surface);
- check that all auxiliary equipment of the manhole (locks, bolts, hinges, screws) functions properly;
- check that the manhole body is fixed and placed centrally on the compensation rings;
- check that the lid is firmly seated in the body (secured) and not going to alter under the influence of vehicle traffic;
- check that the upper surface of the sewage manhole lid is properly fitted with the adjacent hardened surface (the sewage manhole should be flush with the upper surface, taking into account the longitudinal and transverse slopes of the roadway. Deviations of 0.3 cm above and 0.3 cm below the top surface within the vehicle wheel line are allowed).

An exemplary well finial diagram - materials and accessories



Topolit FIX RAPID grouting mortar - In our assortment



Topolit FIX RAPID - a self-leveling cement-based grouting mortar with a very short treatment and setting time, used at the substrate and ambient temperatures from +1 to + 30°C, intended for:

- repair and re-profiling of concrete elements of sewage wells, quick execution of a compensation and repair layer enabling proper support and foundation of compensation rings and other elements of surface finials of the TVRT System (layer thickness - 5 to 55 mm in one working cycle);
- pouring, repair and assembly works where it is required to quickly increase the strength of the mortar with the possibility of early dynamic loading of the structure;
- making a durable casing around the surface finial of a sewage well, serving also as the base for reconstructed road surface.

Properties:

- high early and final mechanical strength of 15N/mm2 after 1 hour;
- removal of the pneumatic formwork possible after 30 minutes;
- passenger vehicle traffic load possible after 1.5 hours.

The product meets the requirements for R4 class mortars in accordance with PN-EN 1504-3. The product has obtained the National Technical Assessment No. IBDiM-KOT-2018/0126 edition 1.

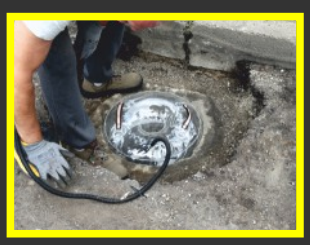










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