SIMAX®

Industrial apparatuses

CERTIFICATE

TÜV NORD

Management system as per EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

KAVALIERGLASS, a.s.
Křižová 1018/6, 150 00 Praha 5
Production site: Sklářská 359, 285 06 Sázava
Czech Republic

KAVALIER

with the sites acc. to the annex

applies a quality system in line with the above standard for the following scope

Design and production of glass products for household, laboratories, technical and pharmaceutical use, of glass tubes, incl. production of metal glass moulds.

Certificate Registration No. 04 100 940602
Audit Report No. 623 174/610

Valid until 2012-11-04
Initial certification 1994-09-01

Certification Body
at TÜV NORD CERT GmbH

Praha, 2010-11-04

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.
The annex (1 page) is the integral part of the certificate.
TÜV NORD CERT GmbH Langemarckstrasse 20 45141 Essen www.tuev-nord-cert.com

IAF

TGA ZM-01-06-06

CATALOGUE OF GLASS INDUSTRIAL APPARATUSES AND PIPING

The Kavalierglass is a leading world producer of borosilicate glass, type 3.3, sold under the registered trademark SIMAX. With its chemical composition and properties SIMAX glass belongs to the group of transparent hard borosilicate glasses „3.3" characterized with a high thermal and chemical stability. The properties fully correspond with the requirements specified in the international standard ISO 3585 Borosilicate glass 3.3. Properties. The Kavalierglass established in 1837 and have the longest tradition in Europe in the area of technical glass production. The Kavalierglass acquired their first experience in the borosilicate glass production as early as in the 1930s. This was followed by a dynamic technological development, especially in 1950-80s.

With the technological level achieved and the complex know-how it belongs among the leading producers of laboratory and technical glass, pressed and blown products for homes and glass tubes. SIMAX glass is used to manufacture a wide range of both technical and laboratory glass products, industrial apparatus and boiling glass for domestic use. Thanks to their properties these products are in great demand worldwide. In view of its properties the SIMAX glass is used in areas with the highest requirements for products with respect to thermal and chemical stability as well as neutrality to substances or preparations containing these substances, e.g. in the chemical, petrochemical and food industries, energy, metallurgy, public health, microbiology, pharmacy, mechanical engineering and laboratories.

The products made of SIMAX glass have a smooth and non-porous surface, are perfectly transparent, catalytically neutral, resistant against corrosion even in long-term operations and sufficiently homogenous.

SIMAX glass is environment-friendly and ecologically absolutely free of any defects.

The Kavalierglass hold the quality certificate for system management according to ISO 9001, proving their high level of assuring quality of production and delivery of laboratory, domestic-use glass and tubes made of SIMAX glass. The product and services we offer bring optimal solutions and full satisfaction to our customers.

Conditions of using glass apparatus parts

Glass apparatus and glass equipment for chemical-technological processes are applied in all industrial branches, agriculture and health care. The advantage of glass apparatus, compared with equipment made of other materials, is its high resistance against the action of aggressive agents and a perfect wall smoothness which enables the high purity and hygiene of the process to be maintained and, thanks to transparency, it is possible to monitor the running process. Translucence enables the apparatus to be applied in biochemical and photosynthetic processes.

Glass industrial equipment can be used for processing chemical substances with the exception of hydrofluoric, fluorosilicic, phosphoric acids and hot concentrated lyes. The limiting factors in application can also be materials used for joint packing and production of non-glass accessories coming into contact with the process substance.

Other limiting factors are local labour safety regulations which should be complied with in case of poisonous and flammable substances, substances forming explosive mixtures, etc.

1. Basic features of SIMAX glass

All glass parts are made of borosilicate glass 3.3 – SIMAX.
This type of borosilicate glass is characterized by high chemical resistance, low coefficient of linear thermal expansivity and thus high resistance against temperature changes. Properties of the SIMAX glass are under a permanent supervision and are certified in accordance with ISO 3585.

Chemical composition

SiO_2	B_2O_3	$Na_2O + K_2O$	Al_2O_3
80.6	13	4	2.4

1.1. Chemical resistance

Products from SIMAX glass feature high resistance against the effects of water, steam, acids, salt solutions, and relatively good resistance against alkalis. For these reasons, SIMAX glass is used in cases where high chemical resistance and neutrality against stored or working substances are required for the products, i.e. in chemistry, laboratories, health care, pharmaceutics, food industry, etc. Chemical resistance is assessed by standard international methods defined by ISO standards.

Method according to standard ISO	Acceptable value		Max. value attained for SIMAX glass	
	Class	Value	Class	Value
Resistance against water at 98 °C according to ISO 719, loss of alkalis μg/g	HGB1	31	HGB1	25
Resistance against water at 121 °C according to ISO 720, loss of alkalis μg/g	HGA1	62	HGA1	28
Resistance against acids according to ISO 1776, loss of weight μg/dm²	1	100	1	11
Resistance against alkalis according to ISO 695, loss of weight mg/dm²	A2	175	A2	120

1.1.1. Resistance against water at 98°C

The test is carried out according to ČSN ISO 719. Data of the extract from 2 g of crushed glass, grain size between 300 and 500 μm, with water of degree of purity 2, for 60 min at 98 °C, are used for practical purposes.

1.1.2. Resistance against water at 121°C

The test is carried out according to ČSN ISO 720. Data of the extract from 10 g of crushed glass, grain size between 300 and 425 μm, with water of degree of purity 2, for 30 min at 121 °C, are used for practical purposes.

1.1.3. Resistance against acids

SIMAX glass, same as all internationally approved borosilicate glasses, is practically resistant against all aggressive agents except for hydrofluoric, fluorosilicic, phosphoric acids and hot concentrated lyes which markedly attack glass contact surfaces.
Glass surface is attacked by hydrofluoric acid even at low concentrations. Phosphoric acid and lyes only slightly attack glass at low temperatures and concentrations. At high concentrations and temperatures, glass resistance significantly decreases. Permanent alternation of acidic and alkaline environment increases corrosion.
The test is carried out according to ISO 1776. Sample pieces, size 30–40 cm², are subject to the effect of an aqueous solution of hydrochloric acid at 100 °C for 3 hours.

1.1.4. Resistance against alkalis

The test is carried out according to ČSN ISO 695. Sample pieces, size 10–15 cm², are submerged in boiling solution of same volumes of sodium carbonate and sodium hydroxide for 3 hours.

1.2. Physical properties

The mean coefficient of linear thermal expansivity $\alpha\nu\delta$ (20 °C; 300 °C)	$3.3 \cdot 10^{-6}\,K^{-1}$
Transformational temperature T_g	525 °C
The glass temperature at viscosity of η in dPa.s 10^{13} (the upper temperature of cooling)	560°C
The glass temperature at viscosity of η in dPa.s $10^{7,6}$ (the temperature of softening)	825°C
The glass temperature at viscosity of η in dPa.s 10^{4} (operation range)	1,260°C
The highest short-term allowed operation range	500°C
Density ρ at 20°C	$2.23\,g \cdot cm^{-3}$
Elastic modulus E (Young's modulus)	$64 \cdot 10^{3}$
Poisson's constant μ	0.20
Heat-carrying capacity λ (20 to 100°C)	$1.2\ W \cdot m^{-1} \cdot K^{-1}$

1.2.1. Thermal properties

High resistance of products made of Simax glass against sudden changes in temperature - thermal stability - depends on the low coefficient of linear thermal expansivity, relatively low module tensile elasticity and relatively high thermal conductivity which result in a lower thermal gradient in the product wall. When cooling and heating the glass product, no undesirable inner tension is created. If a glass product is broken down as a result of changing the temperature, it is caused by tensile stress on the product surface by linear expansivity of the glass at the time of quick cooling from the product surface.
Permissible thermal stress depends on the temperature gradient in the glass part wall.
Provided that there is no temperature shock, the glass can be used up to temperatures of about 300°C. Generally and with respect to packing and jointing material, it is recommended to use the glass piping and apparatus up to temperatures of about 200°C.
The boundary of possibility of quickly changing temperatures depends on thermal stress evoked by process conditions, connection and fixing of parts, and is also influenced by the different wall thickness of these parts. For these reasons, limiting value cannot be specified for all encountered technological and process conditions.
A substantial condition of good resistance against temperature shock is the absence of mechanical working and scratching of the uniform glass surface with coarse scratches or dull stains. Temperature shock is a quick temperature change between the glass part and the environment. It depends on the wall thickness of glass parts and the form of heating. Resistance of glass parts against sudden changes in temperature in relation to the maximum part wall thickness according to PN 13 8900.

Part size	Wall thickness, mm	Temperature difference, °C
DN 15–25	4	120
DN 40–100	5	100
DN 150–400	7	90
DN600	10	80

1.2.2. Heat transfer

Orientation values of total coefficient of heat transfer through SIMAX glass walls:
When used as a condenser (steam condensation around tubes, cooling water through tubes)
k = 290–580 W/m²K (250–500 kcal/m²h °C)
When used as an evaporator (water evaporation around tubes, steam condensation in tubes)
k = 465–814 W/m²K (400–700 kcal/m²h °C)
When used as a heat exchanger (heated liquid around tubes, heating liquid through tubes)
k = 250–400 W/m²K (200–350 kcal/m²h °C)

1.2.3. Change in length depending on temperature

The SIMAX glass features a very low coefficient of thermal expansivity.
Change in length of a piping line, length 100 m, in relation to temperature is given in the following table:

Temperature (°C)	50	100	150
Length change ∇ (mm)	17	33	50

In case of longer lines, the change in length of the piping due to change in temperature should be taken into consideration and the piping should be fixed in a way that allows for the change in length. This is usually achieved by using various expansion joints.

1.2.4. Mechanical properties

The mechanical properties and lifespan of products made of Simax glass depend partly on the level of their finishing, especially as a whole, i.e. deep damage on the surface by handling and subsequent thermal load deteriorates the lifespan.

Abrasion hardness of the glass matter 6° on the Mohs scale	
Allowed tensile stress	3.5 MPa

Cooling Simax glass

Cooling is a thermal process with the purpose of preventing the generation of undesirable and inadmissible high thermal stress in glass that would decrease the product resistance and/or remove any existing stress.
The cooling cycle involves three stages:
Temperature growth (heating of the product) with the heating rate from feeding temperature to the upper cooling temperature.
Persistence for a certain period (lag, temper, stabilization) of products on the upper cooling temperature, with the temperature differences in the product need to be balanced out, including a decrease in the stress to a permissible limit.
Temperature decrease (cooling and after-cooling) with the cooling rate from the upper to the lower cooling temperature (this stage is important because permanent stress might be generated) and from the lower cooling temperature to the final temperature or ambient temperature (important for subsequent practical manipulation with the product).

1.2.5. Permissible stress with inner overpressure

Permissible inner overpressure in glass piping and equipment depends on nominal inner diameter, shape, operating temperature, material of connecting parts, and type of gasket used.
In case of an apparatus assembled from parts of different inner diameters and shapes, the permissible stress by inner overpressure is always given by the part of the lowest permissible stress.

The operating values of liquid overpressure at a temperature difference between the inner and outer wall
t = 5 °C (and temperatures up to 120°C) are:

DN	15	25	40	50	80	100	150	200	300	400	600
MPa	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.07	0.07

value in MPa = overpressure

Table of permissible overpressures for "T" pieces and crosses

DN	80	100	150	200	300	400	600
25	0.3	0.2	0.2	0.1	0.1	0.07	0.07
40	0.3	0.2	0.2	0.1	0.1	0.07	0.07
50	0.3	0.2	0.2	0.1	0.1	0.07	0.07
80	0.2*	0.2	0.2	0.1	0.1	0.07	0.07
100		0.15*	0.15*	0.1	0.1	0.07	0.07
150			0.1*	0.07*	0.05*	0.05*	0.05*
200				0.07*	0.05*	0.05*	0.03*
300					0.03*		

* decreased value of permissible overpressure

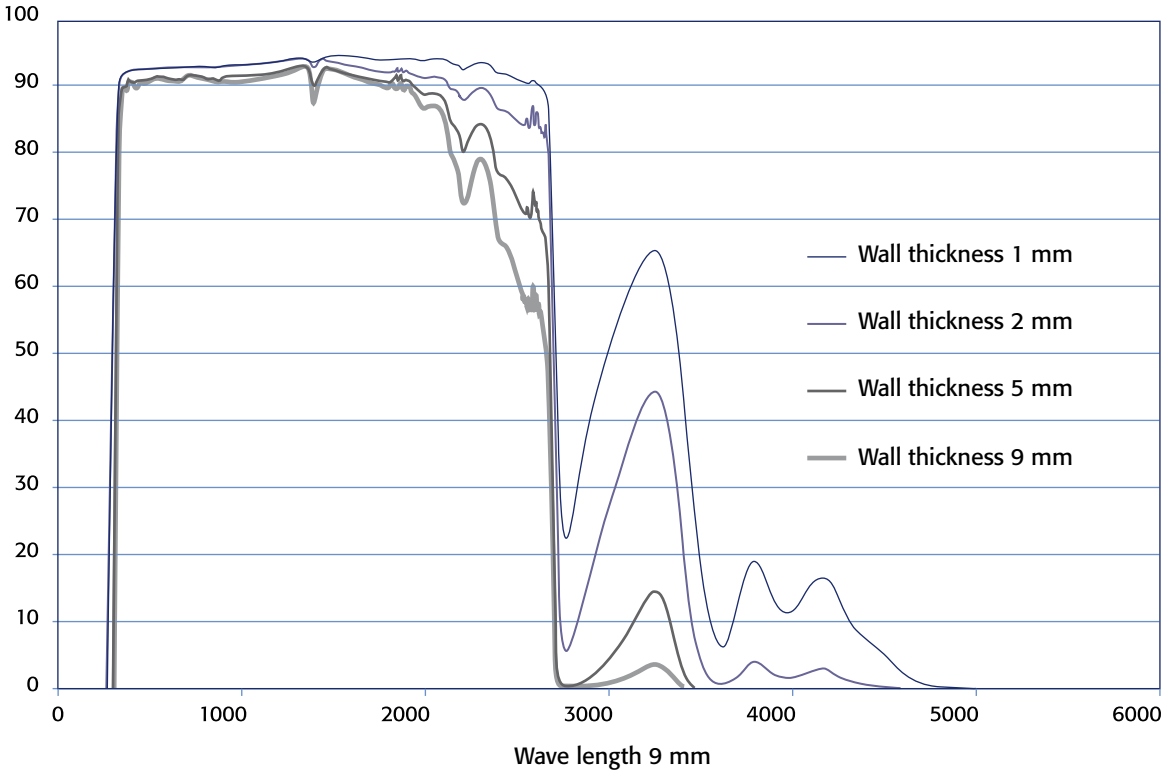
The pressure shocks caused by running pumps or fittings should not exceed the maximum operating pressure of the piping, the piping must be protected (safety valves, receivers, etc.).

1.2.6. Permissible stress by inner underpressure

Permissible stress of the apparatus by vacuum depends on shape stability of large glass parts, operating temperature, material of connecting parts and type of gasket used.
Long-term process experience has proven that an apparatus can be safely operated with the underpressure corresponding to the absolute pressure of 0.0015–0.0020 MPa.

1.2.7. Optical properties

The SIMAX glass does not show any significant absorption in the visible spectrum and it is clear and colourless. The permeability of ultraviolet rays is limited to middle-wave-length spectrum and it is higher than for normal table glass, which allows the glass apparatus to be used for photochemical reactions, e.g. sulfonation and halogenation processes.



1.2.8. Electrical properties

Under normal temperatures, Simax glass is a non-conductive material – it is insulant. Specific resistance in the environment resistant against humidity (20°C) above 10^{13} – 10^{15} Ω · cm. Permitivity ε (20°C, 1 MHz) 4.6. Loss angle tg ε (20 °C, 1 MHz) 4.9 · 10^{-3}. Electrical losses rapidly increase with increasing temperature and change with the frequency.

2. Layout and design of glass apparatus

The documentation of all steps of design preparation should contain the following items:
– flow sheet
– assembly diagram
– building layout
– requirements for building works
– list of materials
– technical report
– safety regulations

3. Assembly of glass apparatus

Guarantees for correct and safe operation are only granted in the case that the assembly and commissioning have been carried out professionally in accordance with the accompanying technical documentation and by technicians who have been authorised to work with glass equipment (assembly men of the Kavalierglass or individuals tested and approved by the Kavalierglass).
Assembly is to be carried out exclusively according to the contract documents approved by the customer. In case the apparatus assembly is to be carried out in a way different from that specified by the documentation, each such change should be approved in advance by the designer or the customer should write a record in the assembly log book and make a change in the documentation.
Inspection of the building site before the assembly includes inspection of building preparedness of the space intended for installing the apparatus and the space for assembly preparation. At the same time, realization of the construction is inspected with respect to safety during assembly. Taking-over connecting points applies particularly to technological piping to which the apparatus is to be connected and on which the assembly depends.
Glass as well as non-glass parts are wrapped in disposable packing. Only non-damaged parts of equipment can be assembled. Immediately before assembly, the glass parts should be cleaned to remove all impurities. Fittings should be checked for conditions of seats, cones and all parts should be cleaned.
The assembly of supporting structures, fastening stirrups, supporting beds and frames is carried out according to drawings and approved drawing documentation.
The assembly of parts is carried out by means of suitable mechanization tools in compliance with safety regulations. When mounting vertical sections of glass apparatus, it is necessary to meet the condition of a single firm support to prevent creating stress in glass parts. In case the whole weight of the apparatus cannot be fixed to a single support it is necessary to use one fixed support and other sliding supports. The main (fixed) support is to be fastened to a strength-appropriate glass part so that as much of the weight of the apparatus as possible is fixed completely. None of movable parts of the seating may be seized or twisted. Care should be taken to ensure that the assembly setting of movable parts of seating allows for the range of dilatation movement during operation.
The apparatus should be sufficiently secured in stability by assembly elements so that forced assembly cannot cause stress in glass parts. PTFE expansion joints are mounted so that they not only compensate dilatations in the direction of the piping line axis but also prevent transferring vibrations.

4. TESTING GLASS APPARATUS

After construction, reconstruction or repair and before commissioning, the assembled apparatus should be tested. Individual types of tests are specified in the contract documents, namely:
– check of assembled apparatus (constructional test) – it is used for ascertaining that overall realization and material used correspond to the submitted contract documents and agreed-upon requirements of the customer, and preparedness for pressure test is checked
– pressure tests – they serve for verifying pressure resistance of the piping
– test of temperature change – it verifies behaviour of the piping during temperature fluctuations
– tightness test – it checks the glass piping for tightness.

A protocol is to be elaborated about the tests carried out.

5. OPERATION AND MAINTENANCE OF GLASS APPARATUS

5.1. Technical requirements

The operating conditions of each glass apparatus should be specified in the design. In case the process has been designed by the customer using glass parts specified in design plans, leaflets and documentation of

the supplier, the limits of operating conditions cannot exceed the conditions specified for respective parts by the manufacturer. Written operating instructions which describe in details the process sections, including start-up, operation and termination of equipment operation, should be at disposal. Critical factors should be specified which would result in stopping the operation. If this applies to working procedures in which operating pressure limits can be exceeded, the glass apparatus should be protected at appropriate places with pressure safety valves, piercing shutter fuses, alarm devices, etc. In chemical processes where a risk of fire or explosion due to static electricity exists, the safety measures, particularly in processing and transport of liquids in glass piping, should include earthing of a point on the external surface of each glass part. The glass apparatus in which processing is carried out of chemical substances, the escape of which could result in detriment to the operator's health, should be protected by a suitably fitted shield or by installing the whole apparatus into a separate room which can be locked during operation.

5.2. Commissioning

Before putting the apparatus into operation, it is necessary to carry out a general inspection of all glass parts for the possibility of occurrence of mechanical damage (impacts and cracks) incurred during the assembly. These impacts and cracks could make performing glass apparatus testing impossible or could cause material damages. During filling, heating-up and putting the apparatus into operation, the glass stress cannot exceed the values considered by the designer according to valid regulations and standards.

5.3. Maintenance of glass apparatus

5.3.1. Cleaning of glass

For cleaning the surfaces of glass parts and preserving all required properties of the glass, it is necessary to clean parts immediately after shutting down the apparatus. No cleaning agent of abrasive character may be used and chemical dissolving of impurities should be preferred. Because of a danger of gradual loss in glass lustre and transparency of glass parts, cleaning agents of neutral reaction should be preferred to strongly alkaline ones.

5.3.2. Labour safety

During maintenance of the apparatus it is forbidden:
– to work on an apparatus and equipment in operation and under pressure
– to use glass parts of the apparatus as load-bearing parts
– to hang auxiliary assembly tools on glass parts
– to carry out a pressure test with a defective manometer or under pressure which is higher than the prescribed value
– dismantled parts should be cleaned and checked for possible damage
– after repair it is necessary to inspect flange joints and the whole apparatus in operation for the period of 24 hours
– a record should be made in the revision book on each repair of the apparatus and test performed.

6. Guarantee

The manufacturer of the glass apparatus, the Kavalierglass, confirms that the product has been made from SIMAX borosilicate glass 3.3 SIMAX, and that it meets the requirements of ČSN ISO 3585. The dimensions and quality of workmanship of glass parts complies with the standards ČSN EN 1595, ČSN EN 12 585 and the internal company standards. The manufacturer warrants for the period of one year that no spontaneous failure of glass parts shall occur. Correct and safe operation is only covered by the guarantee of the manufacturer if assembly and commissioning have been carried out professionally in compliance with the technical documentation and by technicians who were trained for working with the glass apparatus supplied by the joint-stock company Kavalierglass (assembly men of the Kavalierglass or persons tested and authorized by the experts of the joint-stock company Kavalierglass). The manufacturer does not provide a guarantee in the case of mechanical damage and other failures caused by improper storage, transport, non-professional assembly and cleaning, or by running the apparatus beyond the parameters specified in the technical documentation. The products listed in the documentation do not represent a binding production programme; the manufacturer reserves the right to implementing technical modifications.

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KAVALIERGLASS, A.S.

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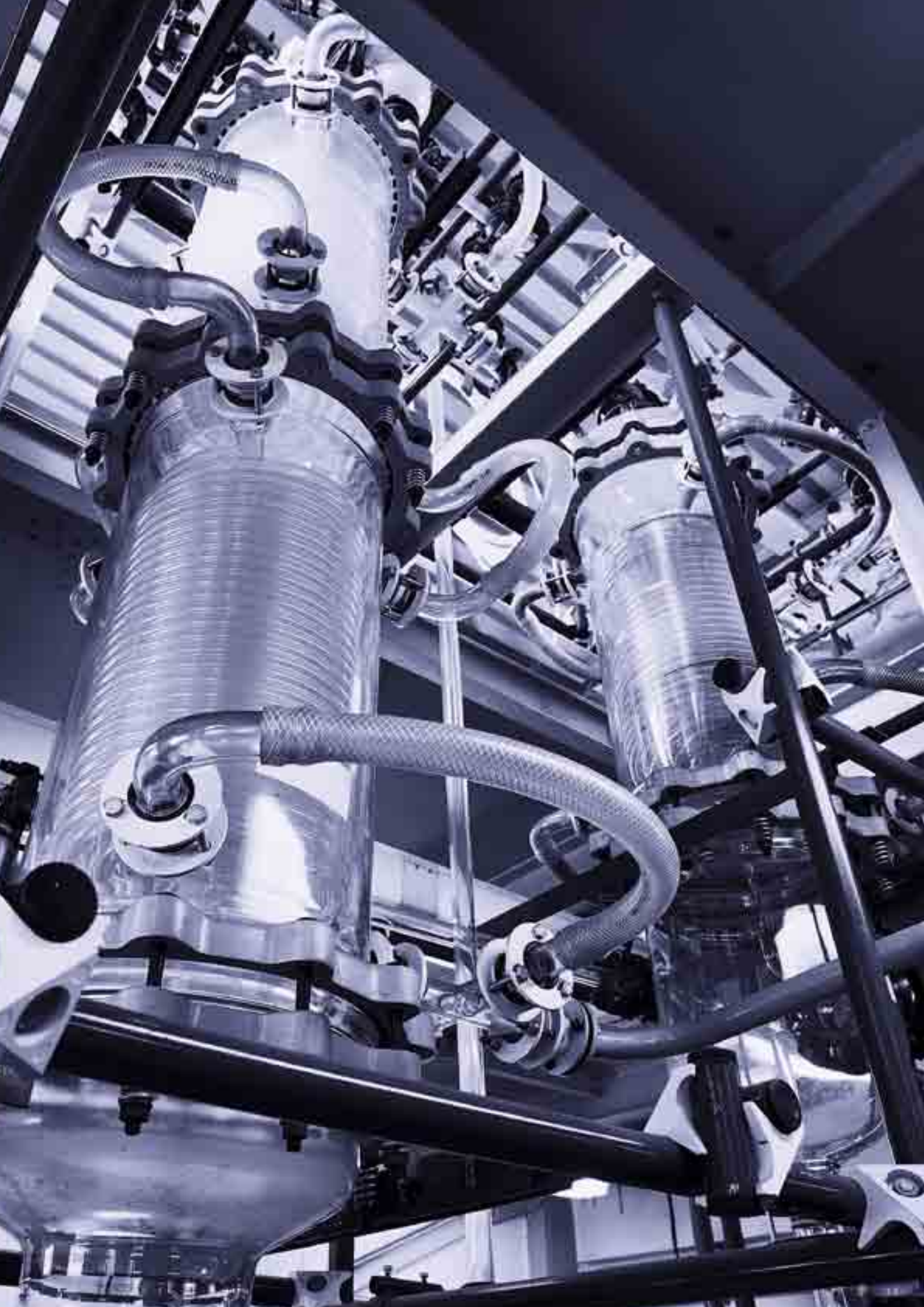
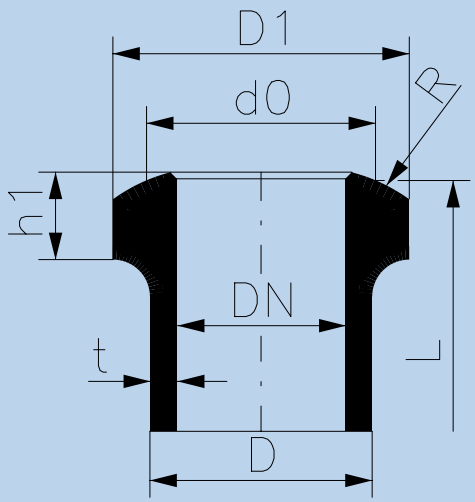


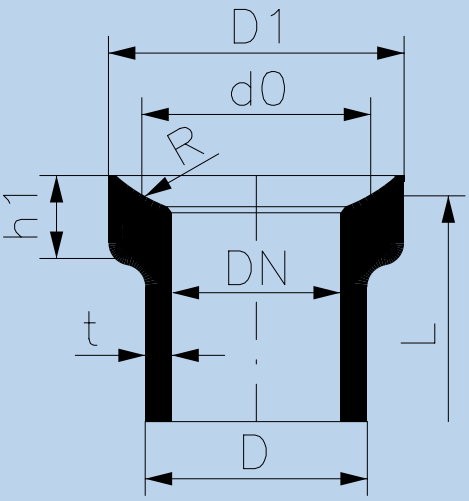
1 GLASS APPARATUS PARTS

1 GLASS APPARATUS PARTS

Glass apparatuses are assembled from individual parts which can be mutually connected by dismountable joints. The assortment of these standard kit elements includes cylinders, vessels and special parts which can be assembled into an apparatus suitable for the majority of technological processes.
Basic parts are made in nominal diameters DN 15, 25, 40, 50, 80, 100, 150, 200, 300, 400, and 600. Reinforced connecting ends are made in types PZ (flat ground joint), KZ (spherical ground joint) , and RK (conical ground joint) according to standards ČSN compiled in compliance with international standards ISO.
Practical application of glass parts is limited by packing, connecting and accessory parts used.

1.1 Types and dimensions of ground joints



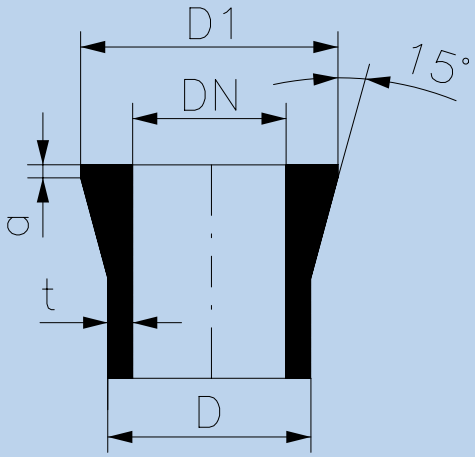


Spherical ground joints KZ

DN	D1 mm	h1 mm	R mm	D mm	t* mm	d0 mm
15	30 +0.0 −1.0	12	18	22 +0.5 −0.5	3.0 +0.4 −0.4	21
25	44 +0.0 −1.0	13	25	33 +0.8 −0.8	4.0 +0.5 −0.5	34
40	62 +0.0 −1.0	17	40	50 +1.0 −1.0	5.0 +0.5 −0.5	50
50	76 +0.0 −1.0	19	50	60 +1.0 −1.0	5.0 +0.5 −0.5	62
80	110 +0.0 −1.5	23	80	90 +1.5 −1.5	5.5 +1.0 −0.5	90
100	131 +0.0 −1.5	25	100	110 +2.0 −2.0	6.0 +1.0 −0.5	118
150	185 +0.0 −1.5	25	150	165 +2.0 −2.0	7.0 +1.0 −1.0	170
200	233 +0.0 −1.5	25	200	215 +2.0 −2.0	7.0 +1.0 −1.0	224
300	338 +0.0 −1.5	29	300	315 +2.0 −2.0	7.5 +1.5 −1.5	325

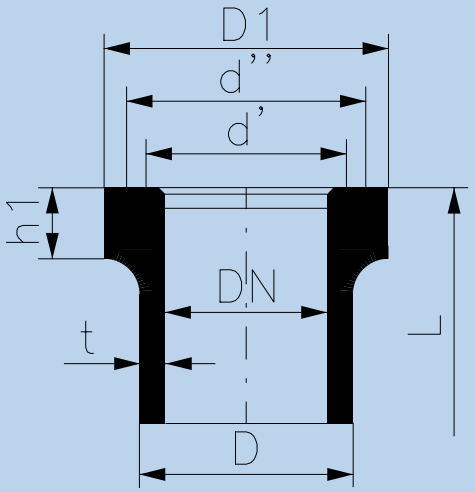
Conical ground joint RK

DN RK	D1 mm	D mm	t mm	a mm
15	28 +0.0 −1.0	22 +0.5 −0.5	3.0 +0.4 −0.4	2
25	42 +0.0 −1.0	33 +0.8 −0.8	4.0 +0.5 −0.5	2
40	60 +0.0 −1.0	50 +1.0 −1.0	5.0 +0.5 −0.5	3
50	72 +0.0 −1.0	60 +1.0 −1.0	5.0 +0.5 −0.5	3
80	105 +0.0 −1.0	90 +1.5 −1.5	5.5 +1.0 −0.5	3



Flat ground joint PZ

DN	D1 mm	h1 mm	D mm	t* mm	d' mm	d'' mm
15	30 +0.0 −1.0	10	22 +0.5 −0.5	3.0 +0.4 −0.4	21	23
25	44 +0.0 −1.0	11	33 +0.8 −0.8	4.0 +0.5 −0.5	31	37
40	62 +0.0 −1.0	15	50 +1.0 −1.0	5.0 +0.5 −0.5	46	52
50	76 +0.0 −1.0	15	60 +1.0 −1.0	5.0 +0.5 −0.5	58	64
80	110 +0.0 −1.5	20	90 +1.5 −1.5	5.5 +1.0 −0.5	87	93
100	131 +0.0 −1.5	22	110 +2.0 −2.0	6.0 +1.0 −0.5	111	117
150	185 +0.0 −1.5	22	165 +2.0 −2.0	7.0 +1.0 −1.0	163	169
200	233 +0.0 −1.5	22	215 +2.0 −2.0	7.0 +1.0 −1.0	216	227
300	338 +0.0 −1.5	25	315 +2.0 −2.0	7.5 +1.5 −1.5	312	334
400	465 +0.0 −1.5	25	415 +2.5 −2.5	7.5 +1.5 −1.5	420	442
600	684 +0.0 −4.0	30	620 +5.5 −5.5	10.0 +3.0 −3.0	628	650

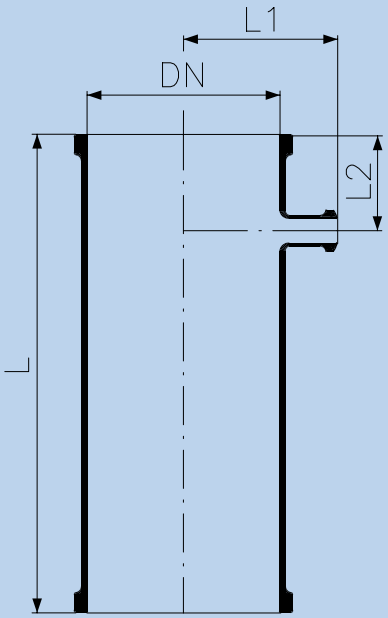


The area between d' and d'' is a ring zone needed for matching flat shaped ends in relation to diameters.
* Value t is valid for ends only.

1.2 Cylinders

Cylinder PZ

DN PZ	L mm	Weight kg	Order number
80	500	1.7	1 632 611 071 105
	1000	3.2	110
	1500	4.7	115
	2000	6.2	120
100	500	2.4	205
	1000	4.5	210
	1500	6.6	215
	2000	8.7	220
150	500	4.1	305
	1000	7.6	310
	1500	11.1	315
	2000	14.6	320
200	300	3.9	403
	400	4.9	404
	500	5.9	405
	1000	10.6	410
	1100	11.5	411
	1500	15.3	415
	2000	20.0	420
	3000	29.4	430
300	300	7.3	503
	400	8.8	504
	500	10.3	505
	1000	17.8	510
	1100	19.4	511
	1500	25.3	515
	2000	32.8	520
	3000	47.8	530
400	300	11.5	603
	400	13.8	604
	500	16.1	605
	1000	27.6	610
	1100	29.9	611
	1500	39.1	615
	2000	50.6	620
450	cylinders DN 450 PZ may be delivered upon agreement with the vendor of the apparatus		
600	500	33.5	805
	1000	54.9	810
	1500	76.3	815



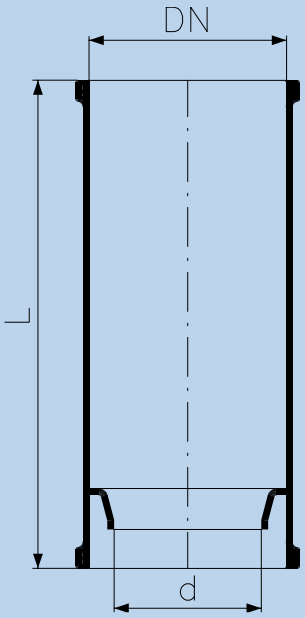
Cylinder PZ with side neck DN 25 KZA

DN PZ	L mm	L1 mm	L2 mm	Weight kg	Order number
80	500	100	100	1.7	1 632 611 072 112
	1000	100	100	3.2	132
100	500	125	100	2.4	212
	1000	125	100	4.5	232
150	500	150	125	4.1	312
	1000	150	125	7.6	332
	1500	150	125	11.1	342
200	500	175	125	5.8	412
	1000	175	125	10.6	432
	1500	175	125	15.3	442
300	500	225	125	10.3	512
	1000	225	125	17.8	532
	1500	225	125	25.3	542
400	500	275	150	16.1	612
	1000	275	150	27.6	632
	1500	275	150	39.1	642
*600	500	375	150	33.6	819
	1000	375	150	55.0	832
	1500	375	150	76.4	842

* it is furnished with side neck DN 50 KZA

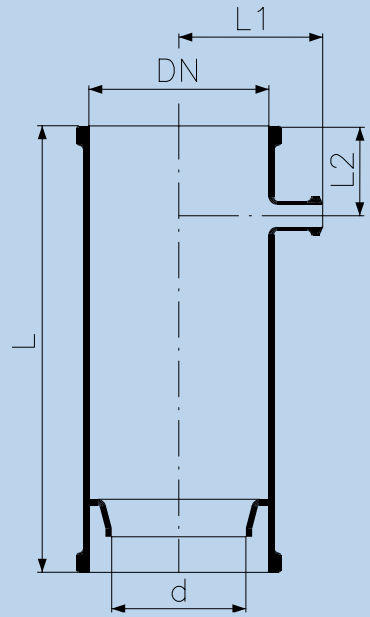
Fractional cylinder PZ without side neck

DN PZ	L mm	d mm	Filling l	Weight kg	Order number
80	500	45	2	1.8	1 632 611 073 110
	1000	45	4.5	3.8	130
	1500	45	7	5.8	140
100	500	65	4	2.3	210
	1000	65	8	4.8	230
	1500	65	12	7.3	240
150	500	105	8	3.8	310
	1000	105	17	7.8	330
	1500	105	25	11.8	340
200	500	150	13	6.2	410
	1000	150	27	10.9	430
	1500	150	40	15.6	440
300	500	200	28	10.9	510
	1000	200	60	18.4	530
	1500	200	88	25.9	540
400	500	275	53	17.7	610
	1000	275	115	29.2	630
	1500	275	168	40.7	640
600	500	420	99	35.2	810
	1000	420	240	56.6	830
	1500	420	380	78.0	840



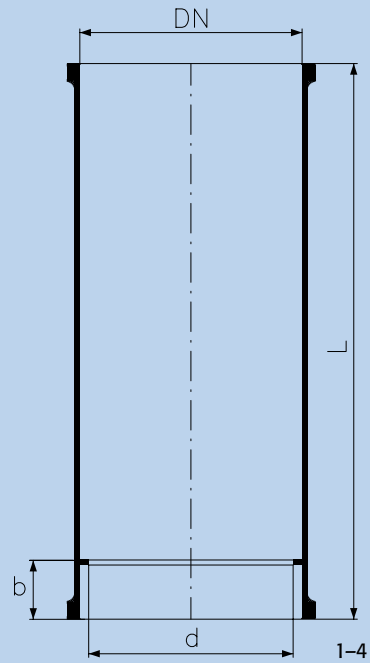
Fractional cylinder PZ with side neck DN 25 KZA

DN PZ	L mm	L1 mm	L2 mm	d mm	Filling l	Weight kg	Order number
80	500	100	100	45	2	1.8	1 632 611 074 112
	1000	100	100	45	4.5	3.3	132
	1500	100	100	45	7	4.8	142
100	500	125	100	65	4	2.5	212
	1000	125	100	65	8	4.6	232
	1500	125	100	65	12	6.7	242
150	500	150	125	105	8	4.3	312
	1000	150	125	105	17	7.8	332
	1500	150	125	105	25	11.8	342
200	500	175	125	150	13	6.2	412
	750	175	125	150	20	8.6	422
	1000	175	125	150	27	10.9	432
	1500	175	125	150	40	15.6	442
300	500	225	125	200	28	10.9	512
	750	225	125	200	43	14.7	522
	1000	225	125	200	60	18.4	532
	1500	225	125	200	88	25.9	542
400	500	275	150	275	53	17.7	612
	750	275	150	275	83	23.4	622
	1000	275	150	275	115	29.2	632
	1500	275	150	275	168	40.7	642
*600	500	375	150	420	99	35.3	819
	750	375	150	420	169	46.0	829
	1000	375	150	420	240	56.7	839
	1500	375	150	420	340	78.1	849

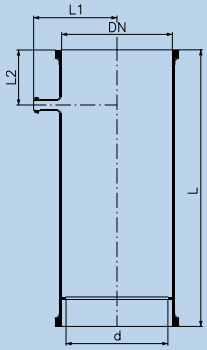


Fractional cylinder PZ for absorbers without side neck

DN PZ	L mm	b mm	d kg	Weight	Order number
300	750	80	255	14.1	1 632 611 075 050
400	750	110	360	21.9	060
600	750	125	540	44.3	080

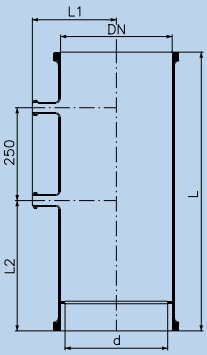


* it is furnished with side neck DN 50 KZA



Fractional cylinder PZ for absorbers with side neck DN 25 KZA

DN PZ	L mm	L1 mm	L2 mm	d mm	Weight kg	Order number
300	750	225	150	276	14.1	1 632 611 075 152



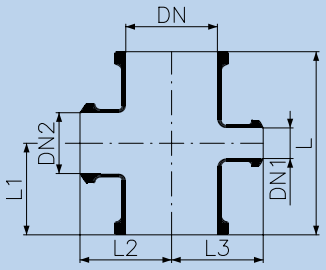
Fractional cylinder PZ for absorbers with two side necks DN 25 KZA over each other

DN PZ	L mm	L1 mm	L2 mm	L3 mm	d mm	Weight kg	Order number
300	750	225	220	250	255	14.2	1 632 611 075 252
400	750	275	220	250	360	22.0	262
600*	750	375	250	250	540	44.5	282

* it is furnished with side neck DN 50 KZA

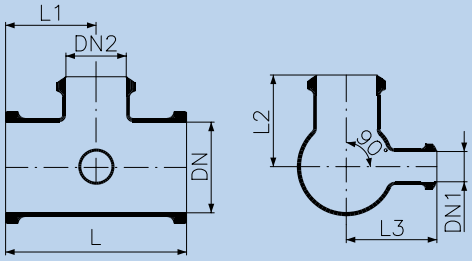
1.3 PIPE FITTINGS PZ

Special fitting "T" with two necks



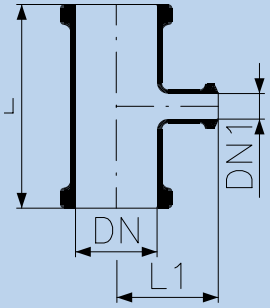
DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	L2 mm	L3 mm	Weight kg	Order number
150	50	100	300	150	150	150	3.3	1 632 232 245 335
200	50	100	300	150	225	175	4.5	435
		150	300	150	225	175	4.8	436
300	50	50	400	200	225	225	9.0	533
		200	500	250	275	225	11.5	537
		300	600	300	250	255	14.2	538

Special fitting "T" with two necks



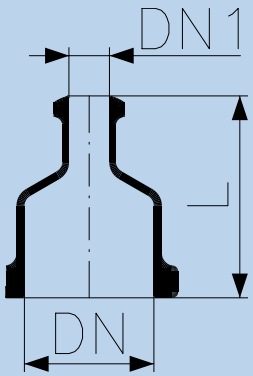
DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	L2 mm	L3 mm	Weight kg	Order number
150	50	100	300	150	150	150	3.3	1 632 232 246 335
200	50	100	300	150	225	175	4.5	435
300	50	200	500	250	275	225	11.6	537

Reducing fitting "T" PZ/KZA



DN PZ/PZ	DN1 KZA	L mm	L1 mm	Weight kg	Order number
80	25	200	100	0.9	1 632 232 225 112
	40	250	100	1.1	122
	50	250	100	1.1	132
100	25	200	125	1.2	212
	40	250	125	1.5	222
	50	250	125	1.5	232
	80	300	125	1.9	242
150	25	200	150	2.1	312
	40	250	150	2.5	322
	50	250	150	2.5	332
	80	300	150	3.1	342
	100	300	150	3.2	352
200	25	200	175	3.0	412
	40	250	175	3.5	422
	50	250	175	3.6	432
	80	300	175	4.3	442
	100	300	175	4.4	452
	150	400	225	5.7	462
300	25	300	225	6.6	512
	40	400	225	8.9	522
	50	400	225	8.9	532
	80	400	225	9.1	542
	100	400	225	9.2	552
	150	500	225	11.1	562
	200	600	225	13.9	572
400	50	400	275	13.9	632
	80	400	275	14.1	642
	150	500	325	16.6	662
	200	500	325	17.2	672
450	fitting "T" DN 450 PZ may be delivered upon agreement with the vendor of the apparatus				
600	50	400*	375*	29.4	832
	80	600*	375*	38.1	842
	100	600*	375*	38.2	852
	150	600*	425*	38.6	862
	200	600*	425*	39.0	872
	300	800*	500*	48.5	882

* tolerance of all dimensions L and L1 is ±7 mm

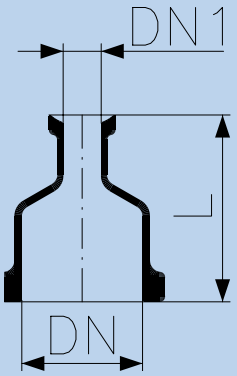


Adapter PZ/KZA

DN PZ	DN1 KZA	L mm	Weight kg	Order number
80	25	125	0.5	1 632 232 045 112
	40	125	0.6	122
	50	125	0.6	132
100	25	150	0.8	212
	50	150	0.9	232
	80	150	1.0	242
150	25	200	1.4	312
	50	200	1.5	332
	80	200	1.7	342
	100	200	1.8	352
200	25	200	1.8	412
	40	200	1.9	422
	50	200	1.9	432
	80	200	2.0	442
	100	200	2.1	452
	150	200	2.3	462
300	25	275	3.7	512
	40	275	3.8	522
	50	275	3.8	532
	80	275	4.0	542
	100	275	4.1	552
	150	275	4.5	562
	200	275	5.0	572
400	25	275	8.9	612
	40	275	9.0	622
	50	275	9.0	632
	80	275	9.0	642
	100	300	9.1	652
	150	300	9.2	662
	200	300	9.4	672
	300	300	9.9	682
450	adapters DN 450 PZ may be delivered upon agreement with the vendor of the apparatus			
600	50	450*	26.8	832
	80	450*	26.8	842
	100	450*	26.9	852
	150	450*	27.1	862
	200	450*	27.3	872
	300	450*	27.9	882

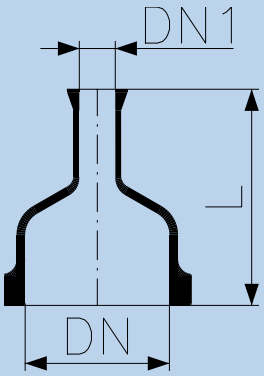
* tolerance of all dimensions is ±5 mm

Adapter PZ/KZB



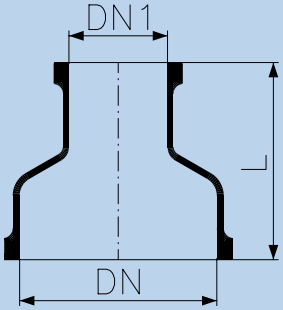
DN PZ	DN1 KZB	L mm	Weight kg	Order number
80	25	125	0.5	1 632 232 045 114
	40	125	0.6	124
	50	125	0.6	134
100	25	150	0.8	214
	50	150	0.9	234
	80	150	1.0	244
150	25	200	1.4	314
	50	200	1.5	334
	80	200	1.7	344
	100	200	1.8	354
	100	500	3.1	1 632 611 642 424
200	25	200	1.8	1 632 232 045 414
	40	200	1.9	424
	50	200	1.9	434
	80	200	2.0	444
	100	200	2.1	454
	150	200	2.3	464
300	25	275	3.7	514
	40	275	3.8	524
	50	275	3.8	534
	80	275	4.0	544
	100	275	4.1	554
	150	275	4.5	564
	200	275	5.0	574
400	25	275	8.9	614
	40	275	9.0	624
	50	275	9.0	634
	80	275	9.0	644
	100	300	9.1	654
	150	300	9.2	664
	200	300	9.4	674
	300	300	9.9	684
450	adapters DN 450 PZ may be delivered upon agreement with the vendor of the apparatus			
600	50	450*	26.8	834
	80	450*	26.8	844
	100	450*	26.9	854
	150	450*	27.1	864
	200	450*	27.3	874
	300	450*	27.9	884

Adapter PZ/RK



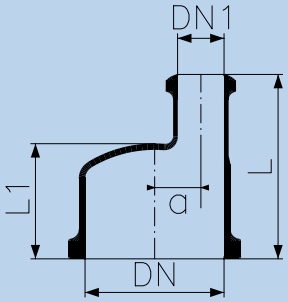
DN PZ	DN1 RK	L mm	Weight kg	Order number
100	25	150	0.8	1 632 232 045 217
	50	700	2.5	237
150	25	200	1.4	317
200	25	200	1.8	417
300	25	275	3.7	517
	50	275	3.8	537
400	25	275	8.9	617
	50	275	9.0	637
450	adapters DN 450 PZ may be delivered upon agreement with the vendor of the apparatus			

*) tolerance of all dimensions is ±5 mm



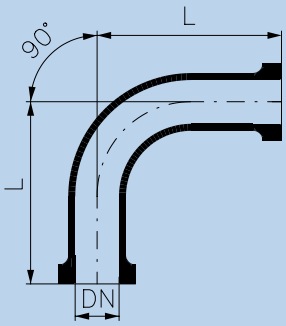
Adapter PZ/PZ

DN PZ	DN1 PZ	L mm	Weight kg	Order number
150	100	200	1.8	1 632 232 045 355
200	100	200	2.1	455
	150	200	2.3	465
300	100	300	4.1	555
	150	300	4.5	565
	200	300	5.0	575
400	100	300	9.1	655
	150	300	9.2	665
	200	300	9.4	675
	300	300	9.9	685
600	150	450	27.1	865
	200	450	27.3	875
	300	450	27.9	885
	400	450	29.2	895



Horizontal adapter PZ/KZA

DN PZ	DN1 KZA	a mm	L mm	L1 mm	Weight kg	Order number
150	50	50	200	125	1.5	1 632 232 055 330
200	60	60	200	125	2.0	440
300	100	100	250	175	4.1	550



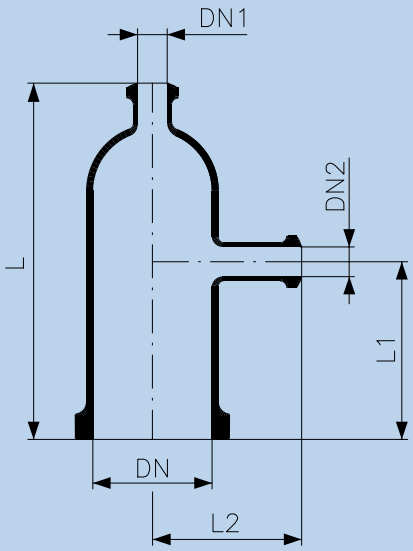
Bend 90° PZ

DN PZ/PZ	L mm	Weight kg	Order number
200	300	5.9	1 632 232 104 455

1.4 HEADS AND LIDS

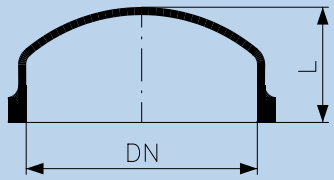
Head PZ with side necks KZA

DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	L2 mm	Weight kg	Order number
80	25	25	300	100	100	1.0	1 632 611 084 111
	25	50	300	125	100	1.1	131
100	25	25	300	150	125	1.3	211
	25	50	300	150	125	1.4	231
150	25	50	350	150	150	2.5	331
	25	80	350	150	150	2.7	341
200	25	50	400	150	175	4.2	431
	50	50	400	150	175	4.3	433
	50	80	400	150	175	4.5	443
		100	400	200	175	4.5	450
	50	100	450	200	175	5.1	453
300	50	50	500	200	225	8.7	533
	50	80	500	200	225	8.9	543
	50	100	500	200	225	9.0	553
	50	150	550	250	275	10.1	563
400	50	80	550	200	275	13.9	643
	50	150	650	250	325	16.6	663
	50	200	750	300	325	19.2	673
450	heads DN 450 PZ may be delivered upon agreement with seller of apparatus						
600	50	80	850	300	375	41.3	843
	50	100	850	300	375	41.4	853
	50	150	850	300	425	41.8	863
	50	200	850	300	425	42.2	873
	50	300	850	400	500	43.4	883
	100	300	850	400	500	43.7	885



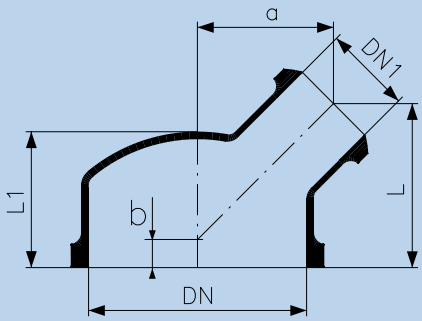
Pipe plug PZ

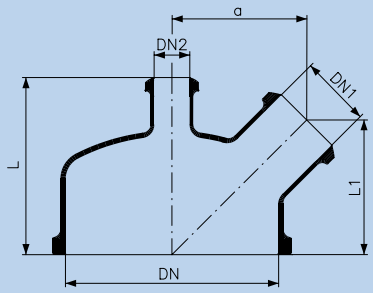
DN PZ/PZ	L mm	Weight kg	Order number
15	50	0.1	1 632 611 077 016
25	75	0.1	026
40	100	0.2	041
50	100	0.3	051
80	110	0.5	081
100	110	0.7	101
150	125	1.4	151
200	155	2.4	201
300	170	4.7	301
400	190	8.7	401
450	pipe plug DN 450 PZ may be delivered upon agreement with the vendor of the apparatus		
600	230	25.4	601

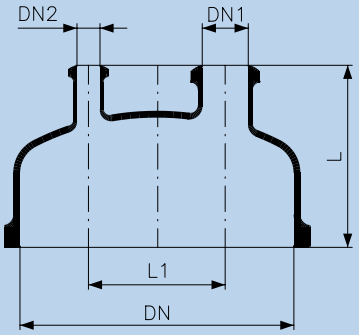


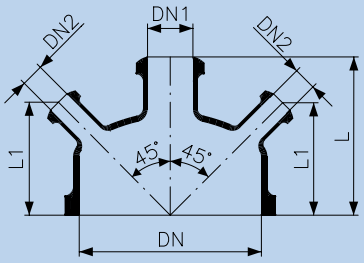
Lid PZ with neck KZA

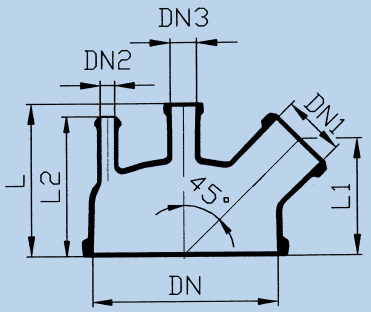
DN PZ	DN1 KZA	L mm	L1 mm	a mm	b mm	Weight kg	Order number
150	50	150	125	120	25	1.4	1 632 611 344 332
200	80	150	125	125	25	2.2	442
300	100	190	190	190	0	4.5	552

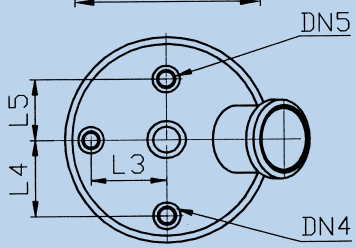


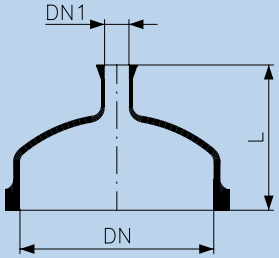












Lid PZ with two necks KZA for tube-plate heat exchanger

DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	a mm	Weight kg	Order number
300	100	50	225	190	190	4.7	1 632 611 345 562

Lid PZ with two necks KZA

DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	Weight kg	Order number
150	25	25	160	100	1.4	1 632 611 347 312
300	50	25	225	150	4.3	522
400	50	25	275	200	7.7	622

Lid PZ with necks KZA

DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	Weight kg	Order number
100	25	2 x 25	175	125	0.9	1 632 611 342 212
	50	2 x 25	175	125	1.0	232
150	25	2 x 25	175	150	1.4	312
	50	2 x 25	175	150	1.5	332
200	25	2 x 25	175	150	2.1	412
	50	2 x 25	175	150	2.2	432
300	25	2 x 25	225	175	4.2	512
	50	2 x 25	225	175	4.3	532
400	50	2 x 25	300	225	7.7	632
600	50	2 x 50	450	350	27.5	842
	100	2 x 50	450	350	27.7	862
300	50	4 x 25	225	175	4.4	343 532
	100	4 x 25	225	175	4.6	552
400	50	4 x 25	300	225	7.8	632
	100	4 x 25	300	225	8.0	652
	150	4 x 25	300	225	8.4	672

Lid PZ with vacuum seal

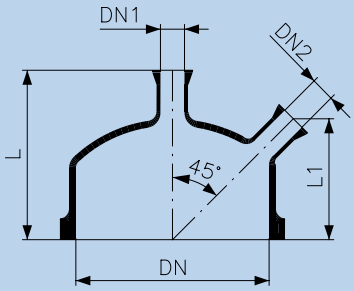
DN PZ	DN1 KZA	DN2 KZA	DN3 PZ	DN4 KZA	DN5 KZA		
300	100	25	40	25	25		
300	100	25	40	25	25		
L mm	**L1 mm**	**L2 mm**	**L3 mm**	**L4 mm**	**L5 mm**	**Weight kg**	**Order number**
250	190	225	125	125	125	4.6	1 632 611 349 504
250	190	225	125	125	100	4.6	514

Lid PZ with necks RK

DN PZ	DN1 RK	L mm	Weight kg	Order number
200	25	175	1.9	1 632 611 340 417
300	25	225	4.1	517
400	25	275	7.5	617

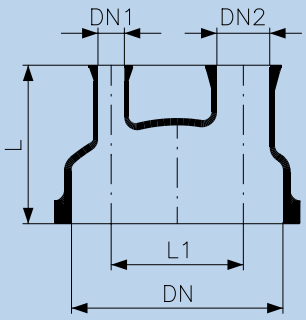
Lid PZ with two necks RK

DN PZ	DN1 RK	DN2 RK	L mm	L1 mm	Weight kg	Order number
200	25	25	175	150	2.0	1 632 611 341 417



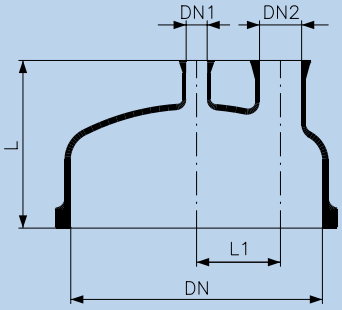
Lid PZ with two necks RK

DN PZ	DN1 RK	DN2 RK	L mm	L1 mm	Weight kg	Order number
150	25	25	160	100	1.4	1 632 611 347 317
200	25	50	175	125	2.1	427
300	25	50	225	150	4.3	527



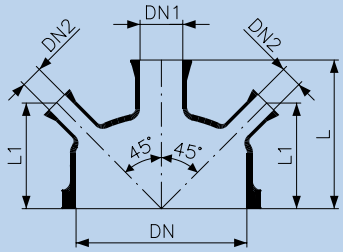
Lid PZ with two necks RK

DN PZ	DN1 RK	DN2 RK	L mm	L1 mm	Weight kg	Order number
300	25	50	225	100	4.3	1 632 611 346 527



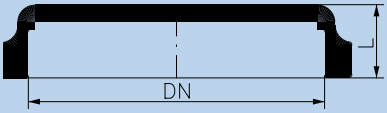
Lid PZ with necks RK

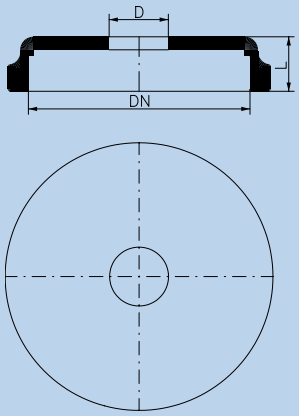
DN PZ	DN1 RK	DN2 RK	L mm	L1 mm	Weight kg	Order number
100	25	2 x 25	175	125	0.9	1 632 611 342 217
	50	2 x 25	175	125	1.0	237
150	25	2 x 25	175	150	1.4	317
	50	2 x 25	175	150	1.5	337
200	25	2 x 25	175	150	2.1	417
	50	2 x 25	175	150	2.2	437
300	25	2 x 25	225	175	4.2	517
	50	2 x 25	225	175	4.3	537
	50	4 x 25	225	175	4.4	343 537
400	50	2 x 25	300	225	7.7	342 637
	50	4 x 25	300	225	7.8	343 637



Universal blind lid (non-drilled)

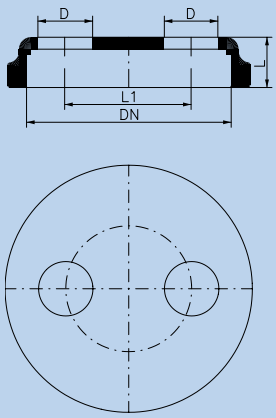
DN PZ	L mm	Weight kg	Order number
200	50	1.6	1 632 611 350 400
300	50	3.1	500
400	75	8.1	600





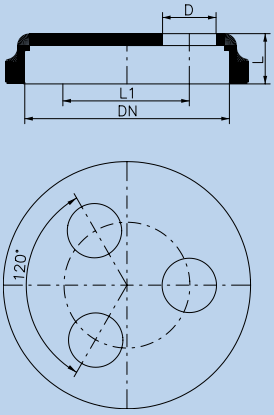
Universal lid with one drilled outlet

DN PZ	D mm	L mm	Weight kg	Order number
200	54.00	50	1.6	1 632 611 350 411
300	54.00	50	3.1	511



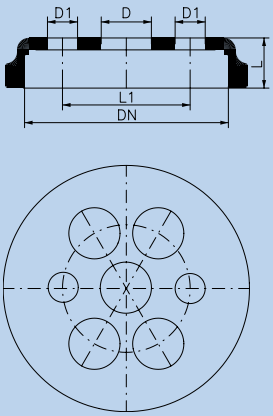
Universal lid with two drilled outlet

DN PZ	D mm	L mm	L1 mm	Weight kg	Order number
200	54.00	50	125	1.6	1 632 611 350 423
300	54.00	50	200	3.1	528



Universal lid with three drilled outlet

DN PZ	D mm	L mm	L1 mm	Weight kg	Order number
200	54.00	50	125	1.6	1 632 611 350 430

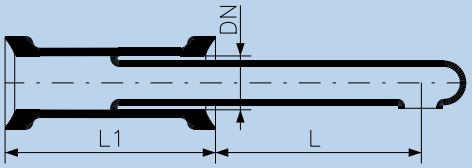


Universal lid with seven drilled outlet

DN PZ	D mm	D1 mm	L mm	L1 mm	Weight kg	Order number
300	5 x 54	2 x 34	50	200	3.1	1 632 611 350 573
	5 x 54	2 x 54	50	200	3.1	572
400	5 x 54	2 x 54	75	250	8.1	672

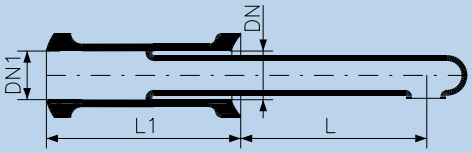
1.5 TUBES FOR INLET INTO APPARATUS

Feeding tube KZB/KZB



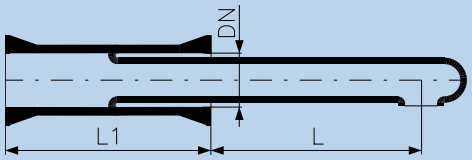
DN KZB	L mm	L1 mm	Weight kg	Order number
25	100	100	0.2	1 632 611 160 110

Feeding tube KZB/KZA



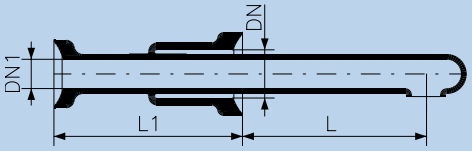
DN KZB	DN1 KZA	L mm	L1 mm	Weight kg	Order number
25	25	100	125	0.2	1 632 611 160 111
		150	125	0.2	112
		175	125	0.2	113
		225	125	0.2	114

Feeding tube RK/RK



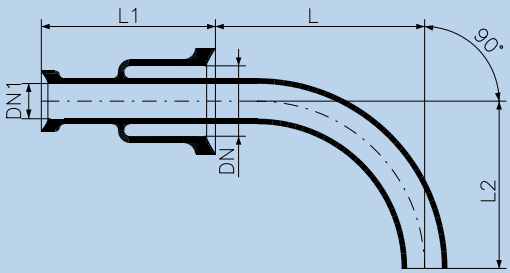
DN RK	L mm	L1 mm	Weight kg	Order number
25	100	125	0.2	1 632 611 160 115
	125	125	0.2	116
	150	125	0.2	117
	175	125	0.2	118
	225	125	0.2	119

Feeding tube reduced

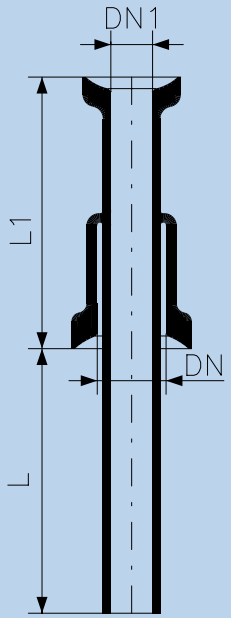


DN KZB	DN1 KZB	L mm	L1 mm	Weight kg	Order number
25	15	100	100	0.1	1 632 611 160 100
50	25	100	125	0.3	310
		125	125	0.3	311
		150	125	0.3	312
		175	125	0.3	313
		225	125	0.4	314
80	50	275	150	1.1	430
		300	150	1.1	431
		375	150	1.2	432

Feeding tube reduced with bend

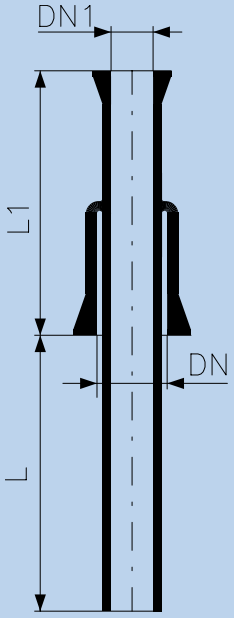


DN KZB	DN1 KZB	L mm	L1 mm	L2 mm	Weight kg	Order number
50	25	150	125	120	0.4	1 632 611 161 310
		175	125	120	0.4	311
80	50	275	150	160	1.2	430
		300	150	160	1.2	431



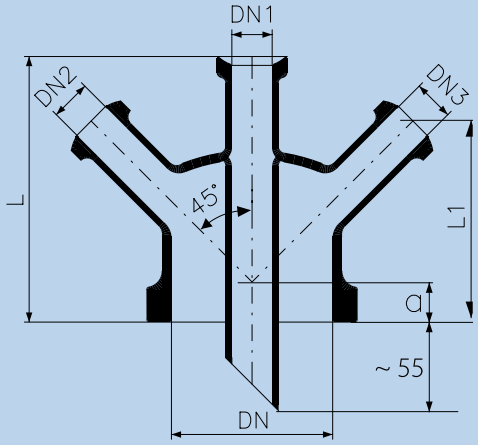
Inlet tube KZB/KZB reduced

DN KZB	DN1 KZB	L mm	L1 mm	Weight kg	Order number
25	15	100	100	0.1	1 632 611 162 100
50	25	100	125	0.3	310
80	50	100	150	0.8	430
100	50	100	150	0.9	530
	80	100	150	1.2	540



Inlet tube RK/RK reduced

DN RK	DN1 RK	L mm	L1 mm	Weight kg	Order number
50	25	100	125	0.3	1 632 611 169 310

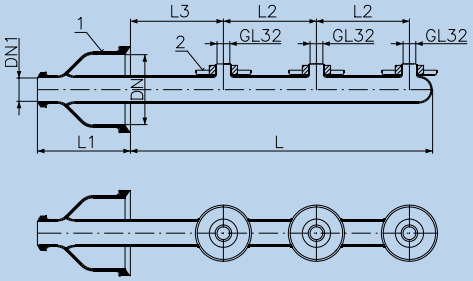


Inlet tube with necks

DN PZ	DN1 KZB	DN2 KZA	DN3 KZA	a mm	L mm	L1 mm	Weight kg	Order number ČJK
100	25	25	25	25	175	125	1.0	1 632 611 168 510
	50	25	0	25	175	115	1.1	530
200	25	25	25	0	175	150	2.2	710

Sprinkler tube – complete

DN KZB	DN1 KZA	L mm	L1 mm	Weight kg	Order number
150	50	320	200	2.0	1 632 611 643 813
150	50	453	200	2.3	913
150	50	640	200	2.8	953



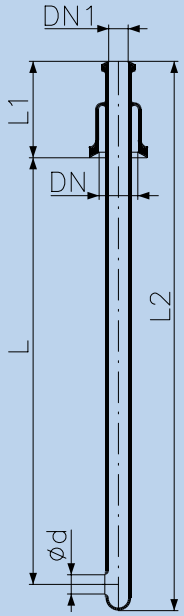
1 – glass sprinkler tube
2 – glass spraying disk

Sprinkler tube – glass

DN KZB	DN1 KZA	GL	L mm	L1 mm	L2 mm	L3 mm	Weight kg	Order number
150	50	1 x 32	320	200	–	275	1.8	1 632 611 165 630
		2 x 32	453	200	180	200	2.0	631
		3 x 32	640	200	200	200	2.4	632

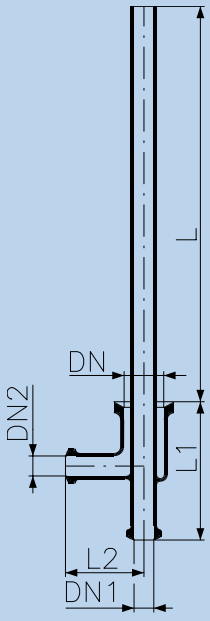
Feeding tube

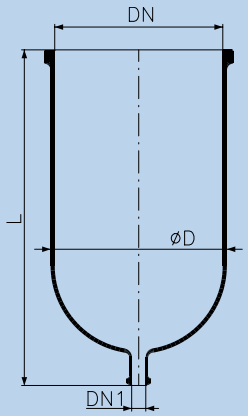
DN KZB	DN1 KZA	∅ d mm	L mm	L1 mm	L2 mm	Weight kg	Order number
50	25	25	550	125	710	0.6	1 632 611 163 310
			800	125	960	0.8	311
			1000	125	1160	1.0	312
			1200	125	1360	1.2	313



Overflow tube

DN KZB	DN1 KZA	DN2 KZA	L mm	L1 mm	L2 mm	Weight kg	Order number
50	25	25	500	175	100	0.7	1 632 611 164 310
			850	175	100	0.9	311
			1100	175	100	1.1	312
			1300	175	100	1.3	313

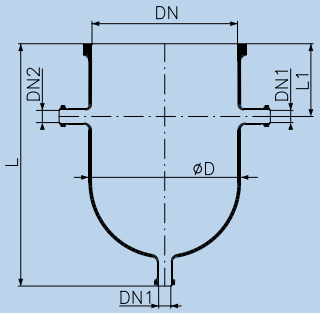




1.6 KETTLES

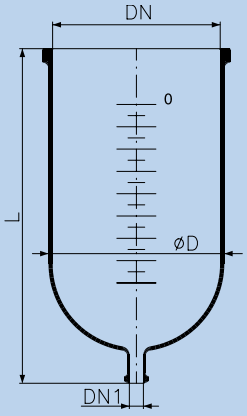
Cylindrical kettle PZ/KZA non-graduated

Volume l	DN PZ	DN1 KZA	L mm	D mm	Weight kg	Order number
2.5	100	25	500	110.0	2.2	1 632 611 552 012
5	150	25	500	165.0	3.5	553 112
10	200	25	550	215.0	5.5	554 212
25	300	25	600	315.0	9.9	555 312
25	300	50	600	315.0	10.0	332
50	300	25	900	315.0	14.4	512
50	300	50	900	315.0	14.5	532
50	400	25	700	415.0	16.4	556 512
75	300	25	1250	315.0	19.7	555 612
75	300	50	1250	315.0	19.8	632
100	400	25	1000	415.0	22.9	556 712
100	400	50	1000	415.0	23.0	732
150	400	25	1400	415.0	31.5	812
150	400	50	1400	415.0	32.6	832



Cylindrical kettle PZ/KZA non-graduated with necks DN 25 KZA

Volume l	DN PZ	DN1 KZA	DN2 mm	L mm	L1 mm	D mm	Weight kg	Order number
10	200	25	–	500	150	215	5.0	1 632 611 564 212
10	200	25	25	500	150	215	5.0	594 203
20	300	25	–	425	175	315	7.2	595 302



Cylindrical kettle PZ/KZA graduated

Scale of cylindrical kettles

Scale APROX ± 12%

Scale division:

for capacities	2.5 l	by	0.05 l
for capacities	5 l	by	0.1 l
for capacities	10 l	by	0.2 l
for capacities	25 l	by	0.5 l
for capacities	50–150 l	by	1 l

Volume l	DN PZ	DN1 KZA	L mm	D mm	Weight kg	Order number
2.5	100	25	500	110.0	2.2	1 632 611 572 012
5	150	25	500	165.0	3.5	573 112
10	200	25	550	215.0	5.5	574 212
25	300	25	600	315.0	9.9	575 312
50	300	25	900	315.0	14.4	512
50	400	25	700	415.0	16.4	576 512
75	300	25	1250	315.0	19.7	575 612
100	400	25	1000	415.0	22.9	576 712
150	400	25	1400	415.0	31.5	812

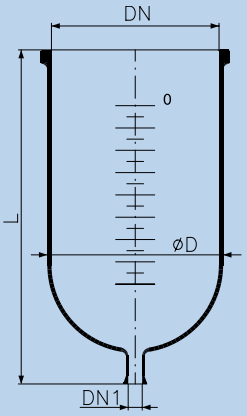
Cylindrical kettle PZ/RK graduated
Scale of cylindrical kettles

Scale APROX ±12%

Scale division:

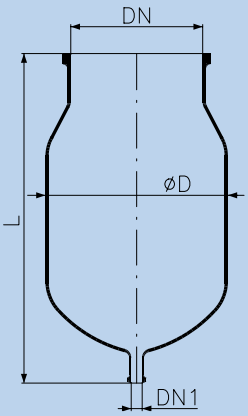
for capacities	2.5 l	by	0.05 l
for capacities	5 l	by	0.1 l
for capacities	10 l	by	0.2 l
for capacities	25 l	by	0.5 l
for capacities	50–150 l	by	1 l

Volume l	DN PZ	DN1 RK	L mm	D mm	Weight kg	Order number
2.5	100	25	500	110.0	2.2	1 632 611 572 017
5	150	25	500	165.0	3.5	573 117
10	200	25	550	215.0	5.5	574 217
25	300	25	600	315.0	9.9	575 317
50	300	50	900	315.0	14.5	537
75	300	25	1250	315.0	19.7	617
75	300	50	1250	315.0	19.8	637
50	400	25	700	415.0	16.4	576 517
100	400	25	1000	415.0	22.9	717
100	400	50	1000	415.0	23.0	737
150	400	25	1400	415.0	31.5	817
150	400	50	1400	415.0	31.6	837



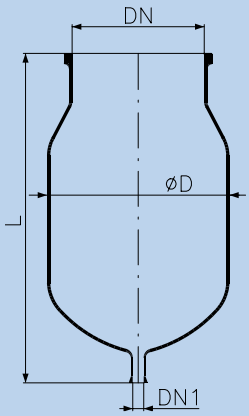
Processing kettle PZ/KZA non-graduated

Volume l	DN PZ	DN1 KZA	L mm	D mm	Weight kg	Order number
30	300	25	650	315.0	10.3	1 632 611 452 412
50	300	25	750	415.0	15.6	455 512
100	300	25	1150	415.0	23.6	712
100	300	50	1150	415.0	23.7	732
100	300	25	950	486.0	25.1	456 712
150	300	25	1275	486.0	33.7	812
200	300	25	1400	486.0	35.0	912
200	300	50	1400	486.0	35.1	932
300	400	50	1500	620.0	69.4	498 000



Processing kettle PZ/RK non-graduated

Volume l	DN PZ	DN1 RK	L mm	D mm	Weight kg	Order number
30	300	25	650	315.0	10.3	1 632 611 453 417
50	300	25	750	415.0	15.6	455 517
100	300	25	950	486.0	23.6	456 717
150	300	25	1275	486.0	33.7	817
200	300	25	1400	486.0	35.0	917
200	300	50	1400	486.0	35.1	937



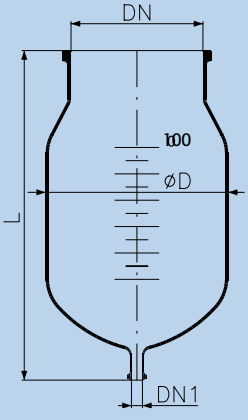
Cylindrical kettle PZ/KZA graduated
Scale of cylindrical kettles

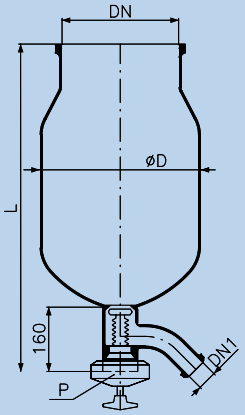
Scale APROX ±12%

Scale division:

for capacities	30 l	by	1 l
for capacities	50–200 l	by	2 l

Volume l	DN PZ	DN1 KZA	L mm	D mm	Weight kg	Order number
30	300	25	650	315	10.3	1 632 611 472 412
50	300	25	750	415	15.6	475 512
100	300	25	950	486	23.6	476 712
150	300	25	1275	486	33.9	812
200	300	25	1400	486	35.1	912





Processing kettle for built-in bottom closure – KZA, RK

Volume l	DN PZ	DN KZA	DN RK	L mm	D mm	Weight kg	Order number
30	300	50	–	760	315	11.4	1 632 611 483 432
30	300	–	50	760	315	11.4	437
50	300	50	–	845	415	16.7	485 532
50	300	–	50	845	415	16.7	537
100	300	50	–	1045	486	26.2	486 732
100	300	–	50	1045	486	26.2	737
100	300	50	–	1245	415	24.7	485 732
100	300	–	50	1245	415	24.7	737
200	300	50	–	1500	486	36.1	486 932
200	300	–	50	1500	486	36.1	937

P – built-in bottom closure (to be ordered separately)

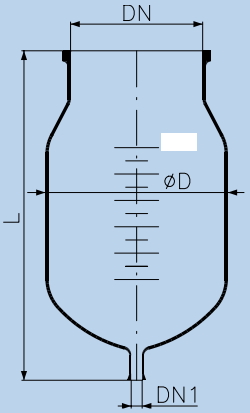
Built-in bottom closure DN 50

Version	Order number
Pneumatic	1 632 921 600 029
Manual	1 632 921 600 058

Spare parts

Cone with O-ring	9 180 001 461
Membrane DN 50	1 632 921 516 102

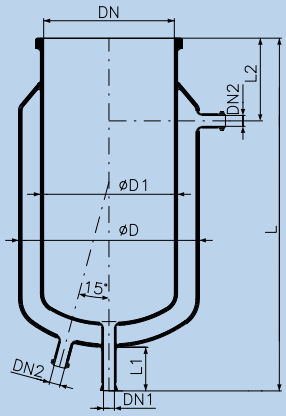
Warning!
In case of buying separate built-in closure it is recommended to complete the kettle in the Kavalierglass in order to assure correct function.



Processing kettle PZ/RK graduated

Scale APROX ±12%
Scale division: for capacities 30l by 1l
for capacities 50–200l by 2l

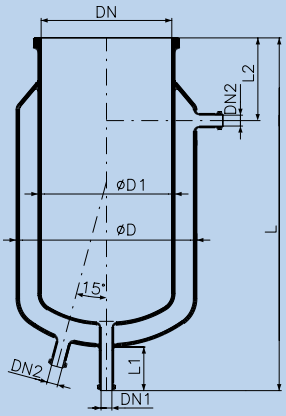
Volume l	DN PZ	DN1 RK	L mm	D mm	Weight kg	Order number
30	300	25	650	315	10.3	1 632 611 472 417
50	300	25	750	415	15.6	475 517
100	300	25	950	486	23.6	476 717
150	300	25	1275	486	33.7	817
200	300	25	1400	486	35.0	917



Jacketed kettle with bottom discharge – RK

Volume l	DN PZ	DN1 RK	DN2 KZA	ØD mm	ØD1 mm	L mm	L1 mm	L2 mm	Order number
15	300	25	25	315	260	600	100	125	1 632 611 044 217
30	300	25	25	415	315	825	100	250	417
50	300	25	25	486	415	850	100	265	517
100	300	25	25	486	415	1240	100	265	717

Volume/l	15	30	50	100
Weight/kg	12.7	22.1	30.2	46.5
Jacket volume, l	8	20	25	40



Jacketed kettle with bottom discharge – KZA

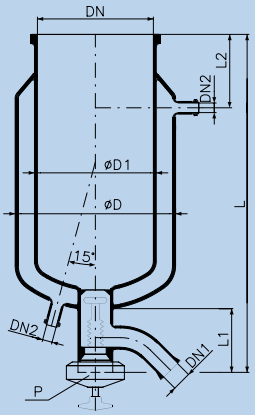
Volume l	DN PZ	DN1 KZA	DN2 KZA	ØD mm	ØD1 mm	L mm	L1 mm	L2 mm	Order number
15	300	25	25	315	260	600	100	125	1 632 611 044 212
30	300	25	25	415	315	825	100	250	412
50	300	25	25	486	415	850	100	265	512
100	300	25	25	486	415	1240	100	265	712

Volume/l	15	30	50	100
Weight/kg	12.7	22.1	30.2	46.5
Jacket volume, l	8	20	25	40

Jacketed kettle for built-in bottom closure – RK

Volume l	DN PZ	DN1 RK	DN2 KZA	∅D mm	∅D1 mm	L mm	L1 mm	L2 mm	Order number
15	300	50	25	315	260	665	165	125	1 632 611 045 237
30	300	50	25	415	315	890	165	250	437
50	300	50	25	486	415	915	165	265	537
100	300	50	25	486	415	1305	165	265	737

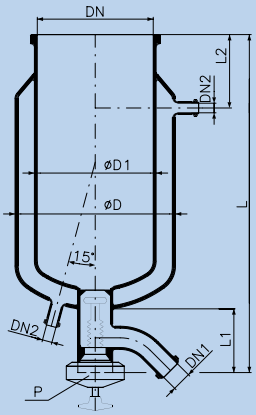
Volume/l	15	30	50	100
Weight/kg	13.8	22.2	31.3	47.6
Jacket volume, l	8	20	25	40



Jacketed kettle for built-in bottom closure – KZA

Volume l	DN PZ	DN1 KZA	DN2 KZA	∅D mm	∅D1 mm	L mm	L1 mm	L2 mm	Order number
15	300	50	25	315	260	665	165	125	1 632 611 045 232
30	300	50	25	415	315	890	165	250	432
50	300	50	25	486	415	915	165	265	532
100	300	50	25	486	415	1305	165	265	732

Volume/l	15	30	50	100
Weight/kg	13.8	22.2	31.3	47.6
Jacket volume, l	8	20	25	40



P – built-in bottom closure (to be ordered separately)

Built-in bottom closure DN 50

Version	Order number
Pneumatic	1 632 921 600 023
Manual	1 632 921 600 059

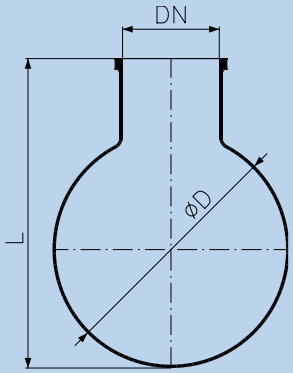
Spare parts

Cone with O-ring	9 180 001 460
Membrane DN 50	1 632 921 516 102

Warning!
In case of buying separate built-in closure it is recommended to complete the kettle in the Kavalierglass in order to assure correct function.

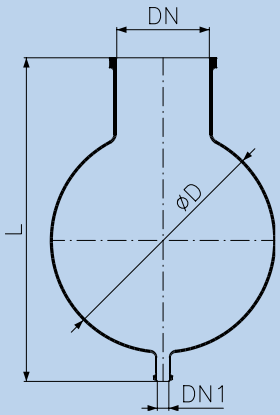
1.7 FLASKS

Basic flask



Volume l	DN PZ	H mm	D mm	L mm	Weight kg	Order number
5	100	190	220	300	1.9	1 632 611 060 100
10	100	245	280	385	3.6	200
20	100	310	350	485	5.8	300
50	200	390	490	635	12.7	500
100	200	440	610	745	20.4	700
200	300	545	750	920	33.8	900

Flask with bottom discharge KZA

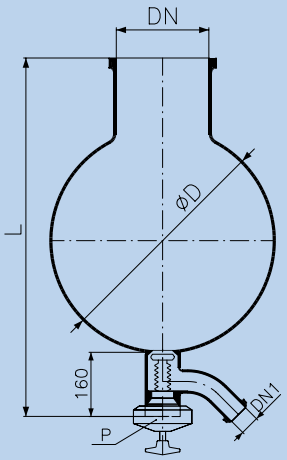


Volume l	DN PZ	DN1 KZA	D mm	L mm	Weight kg	Order number
5	100	25	220	350	1.9	1 632 611 061 101
10	100	25	280	455	3.6	201
20	100	25	350	565	5.8	301
50	200	25	490	710	12.7	501
100	200	25	610	825	19.7	701
200	300	25	750	1000	33.3	901

Flask with bottom discharge RK

Volume l	DN PZ	DN1 RK	D mm	L mm	Weight kg	Order number
5	100	25	220	350	1.9	1 632 611 061 111
100	200	25	610	825	19.7	709
200	300	25	750	1000	33.3	909

Flask for built-in bottom closure KZA



Volume l	DN PZ	DN1 KZA	D mm	L mm	Weight kg	Order number
20	100	50	350	640	6.9	1 632 611 061 332
50	200	50	490	790	13.8	532
100	200	50	610	900	20.8	732
200	300	50	750	1075	34.4	932

P – built-in bottom closure (to be ordered separately)

Built-in bottom closure DN 50

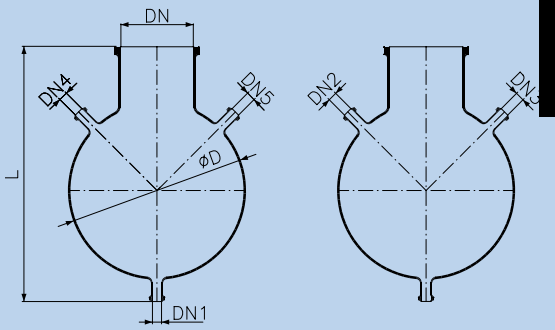
Version	Order number	Spare parts	
Pneumatic	1 632 921 600 029	Cone with O-ring	9 180 001 461
Manual	1 632 921 600 058	Membrane DN 50	1 632 921 516 102

Warning!
In case of buying separate built-in closure it is recommended to complete the kettle in the Kavalierglass in order to assure correct function.

Flask with bottom discharge and necks

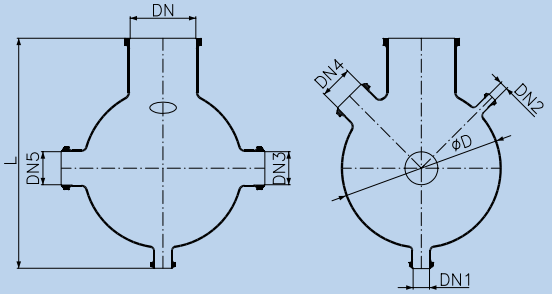
Volume l	DN KZA	DN1 PZ	DN2 KZA	DN3 KZA	DN4 KZA	DN5 KZA	D mm	L mm	Weight kg	Order number
5	50	100	25	–	–	–	220	350	2.0	1 632 611 069 100

Volume l	DN PZ	DN1 KZA	DN2 KZA	DN3 KZA	DN4 KZA	DN5 KZA	D mm	L mm	Weight kg	Order number
10	100	25	25	25	–	–	280	450	3.7	1 632 611 062 211
20	100	25	25	50	–	–	350	550	6.0	321
50	200	25	25	50	–	–	490	700	12.9	521
100	200	25	25	50	–	–	610	825	19.9	721
100	200	50	25	50	–	–	610	825	20.1	723
200	300	25	50	50	25	100	750	1000	34.2	063 941
200	300	50	50	50	25	100	750	1000	34.3	942



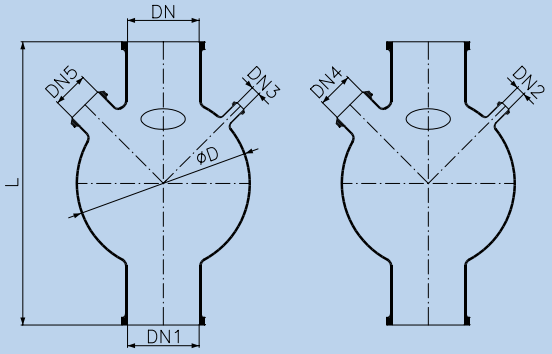
Circulating flask with bottom discharge and necks

Volume l	DN PZ	DN1 KZA	DN2 KZA	DN3 KZA	DN4 KZA	DN5 KZA	D mm	L mm	Weight kg	Order number
50	200	50	–	100	100	–	490	700	13.7	1 632 611 064 563
100	200	80	25	100	100	100	610	825	21.4	065 764
200	300	100	25	150	150	150	750	1000	35.3	975



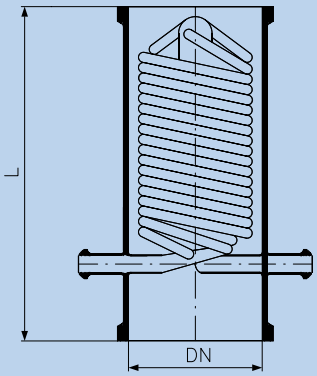
Flask for bottom heating (evaporating)

Volume l	DN PZ	DN1 PZ	DN2 KZA	DN3 KZA	DN4 KZA	DN5 KZA	D mm	L mm	Weight kg	Order number
20	100	200	25	–	–	–	350	600	7.0	1 632 611 066 317
50	200	200	25	–	–	–	490	775	7.4	517
100	200	300	25	–	–	–	610	875	22.3	718
20	100	200	25	–	50	–	350	600	7.3	067 327
50	200	200	25	–	50	–	490	775	14.2	527
100	300	300	25	–	25	–	610	875	23.7	718
100	200	300	25	–	50	–	610	875	22.5	728
20	100	150	25	80	50	50	350	600	7.5	068 336
20	100	200	25	80	50	50	350	600	7.9	337
50	200	200	25	100	100	50	490	775	15.1	557
100	200	200	25	50	100	100	610	875	22.2	747
100	200	300	25	50	100	100	610	875	23.4	748
200	300	300	25	150	150	150	750	1100	37.7	978



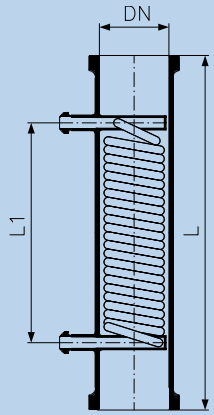
1.8 COIL COOLERS AND HEATERS

Maximum operating overpressure of liquid in the coil bundle (for coolers and heaters) and steam (for heaters and boilers) is 0.25 MPa. Pressure should be stabilized and secured against hydraulic and condensation shocks.



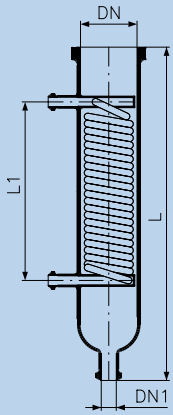
Coil heater with necks DN 25 KZA

DN PZ	L mm	F m²	Weight kg	Order number
100	500	0.2	3.3	1 632 611 215 551
150	500	0.5	5.7	661
200	500	1	9.1	771



Cooler with connections 2 x DN 25 KZA

DN PZ	DN1 PZ	L mm	L1 mm	F m²	Weight kg	Order number
100	100	500	310	0.3	3.2	1 632 611 201 550



Cooler with connections 2 x DN 25 KZA

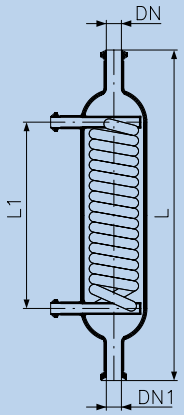
DN PZ	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
100	25	525	310	0.3	2.8	1 632 611 208 510

F - heat-exchanging area

Cooler with connections 2 x DN 25 KZA

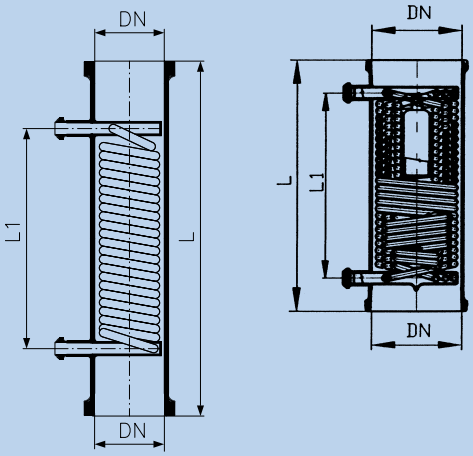
DN KZA	DN1 KZB	L mm	L1 mm	F m²	Weight kg	Order number
25	25	550	310	0.3	2.4	1 632 611 210 110
25	25	800	575	0.6	3.2	111
50	50	800	575	0.6	3.4	330

Outer ∅ of cylinder = 110



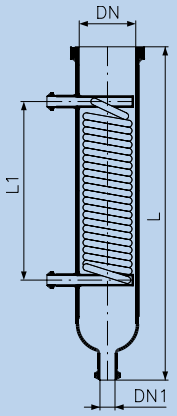
Cooler with connections 2 x DN 25 KZA

DN PZ	L mm	L1 mm	F m²	Weight kg	Order number
150	600	405	0.75	6.5	1 632 611 201 661
200	650	425	1.5	10.6	771*



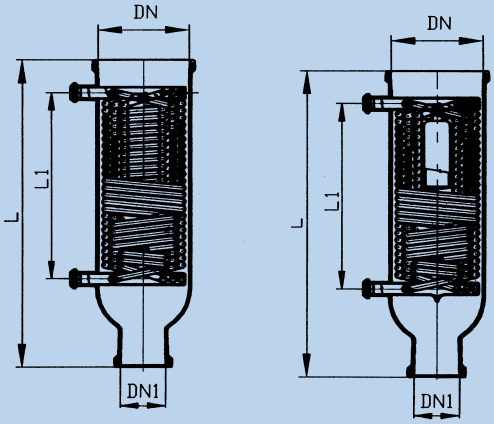
Cooler with connections 2 x DN 25 KZA

DN PZ	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
150	25	650	405	0.75	6.3	1 632 611 208 611
200	50	725	425	1.5	10.3	731

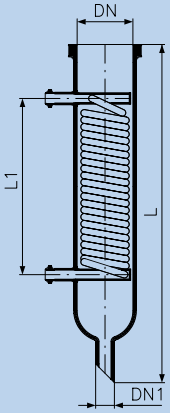


Cooler with connections 2 x DN 25 KZA

DN PZ	DN1 PZ	D mm	L mm	F m²	Weight kg	Order number
200	100	725	425	1.5	11.2	1 632 611 204 751
200	150	700	425	1.5	11.2	761*

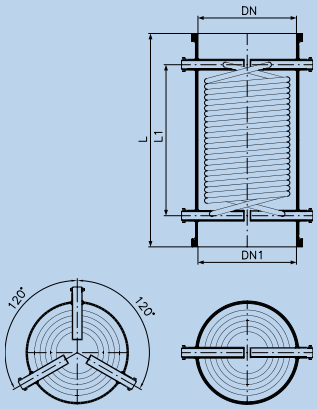


F - heat- exchanging area
* - cooler type



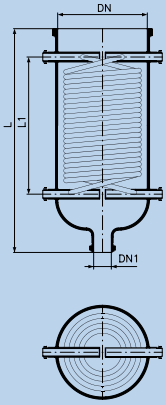
Cooler with connections 2 x DN 25 KZA

DN PZ	DN1 Ømm	L mm	L1 mm	F m²	Weight kg	Order number
200	33	760	425	1.5	10.3	1 632 611 207 711



Cooler with connections

DN PZ	DN1 PZ	L mm	L1 mm	F m²	Connections DN KZA	Weight kg	Order number
300*	300	650	460	2.75	4 x 25	21.3	1 632 611 202 881
300	300	750	600	3.5	6 x 25	25.5	203 881
400	400	850	580	6.5	6 x 50	45	992



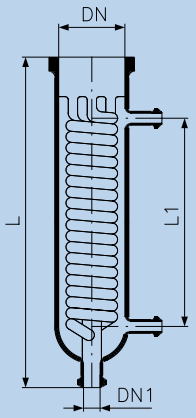
Cooler with connections 4 x DN 25 KZA

DN PZ	DN1 KZA	L mm	L1 mm	F m²	Connections DN KZA	Weight kg	Order number
300*	50 KZA	750	460	2.75	4 x 25	25.1	1 632 611 209 831
300*	150 PZ	750	460	2.75	4 x 25	25.3	205 861

F – heat- exchanging area

Aftercooler with connections 2 x DN 25 KZA

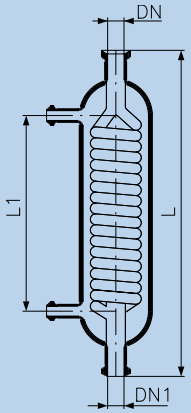
DN PZ	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
100	25	500	315	0.2	2.8	1 632 611 220 510



Aftercooler with connections 2 x DN 25 KZA

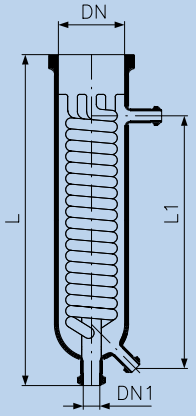
DN KZB	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
25	25	500	300	0.2	2.4	1 632 611 221 110
25	25	800	620	0.6	3.2	111

Outer ∅ of cylinder = 110 mm.

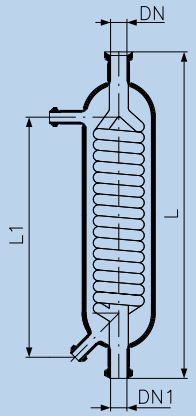


Aftercooler with connections 2 x DN 25 KZA

DN PZ	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
150	50	475	310	0.4	5.2	1 632 611 220 631



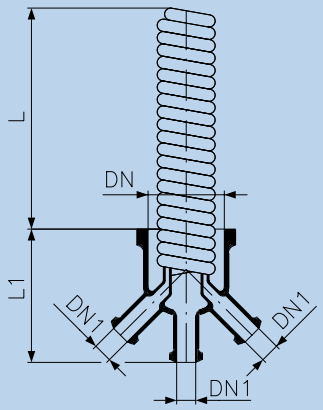
F – heat- exchanging area
Permissible overpressure of medium in jacket is 0.25 MPa.



Aftercooler with connections 2 x DN 25 KZA

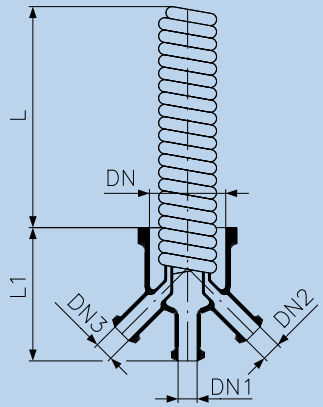
DN KZB	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
50	50	550	310	0.4	4.7	1 632 611 221 331

Permissible overpressure of medium in jacket is 0.25 MPa. Outer ∅ of cylinder = 165 mm.



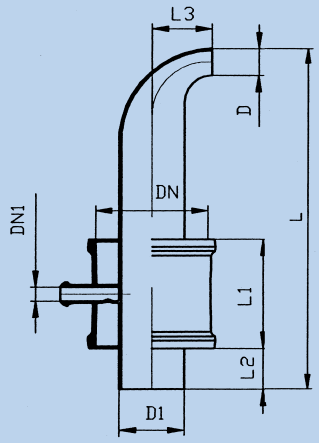
Immersion boiler

DN PZ	DN1 KZA	L mm	L1 mm	F m²	Weight kg	Order number
100	25	290	175	0.2	2.0	1 632 611 230 510
150	25	295	200	0.5	3.3	610
200	25	270	225	0.75	4.8	710
300	25	280	250	1	10.1	810



Immersion boiler for evaporators

DN PZ	DN1 KZA	DN2 KZA	DN3 KZA	L mm	L1 mm	F m²	For evapo-rator	Weight kg	Order number
200	25	25	25	420	200	0.3	10l	3.4	1 632 611 231 710
200	25	25	25	340	225	0.5	25l	4.6	711
300	25	25	50	390	300	1	50l	10.1	810



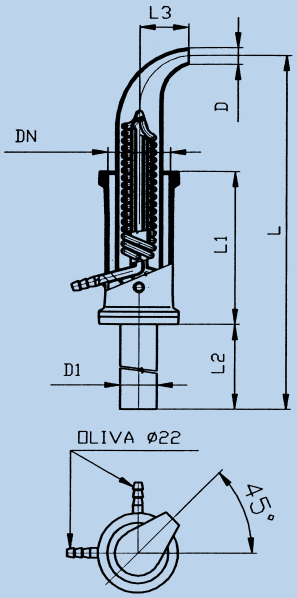
Circulation adapter for evaporator

Evapo-rator l/h	DN PZ	DN1 KZA	D mm	D1 mm	L mm	L1 mm	L2 mm	L3 mm	Weight kg	Order number
10	200	25	50	118	600	200	75	110	4.7	1 632 611 126 240
25	200	25	60	165	645	175	70	180	5.8	340
50	300	25	90	215	710	200	70	250	10.2	550

F - heat-exchanging area

Calorifer for evaporator

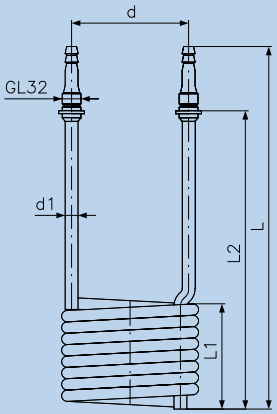
Evapo-rator l/h	F m²	DN PZ	D mm	D1 mm	L mm	L1 mm	L2 mm	L3 mm	Weight kg	Order num- ber
5	0.15	100	30	60	800	250	360	80	2.8	1 632 611 127 001



Glass coil for heating or cooling

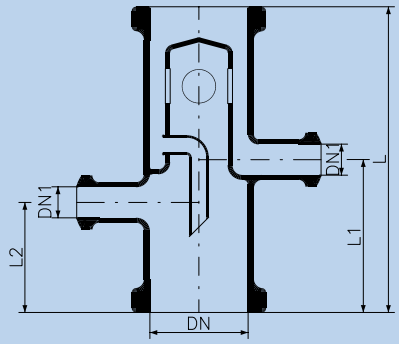
Kettle volume l	F m²	d mm	d1 mm	L mm	L1 mm	L2 mm	Weight kg	Order number
30	0.3	200	22	620	180	510	2.1	1 632 611 236 201
50	0.5	200	22	705	250	595	2.7	202
100	1	200	28	860	500	750	4.8	203

Permissible overpressure of medium in tube is 0.15 MPa.



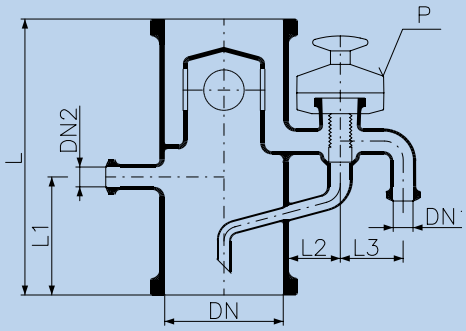
F - heat-exchanging area

1.9 SPECIAL PARTS



Distilling head with overflow

DN PZ	DN1 KZA	L mm	L1 mm	L2 mm	Weight kg	Order number
80	25	250	125	90	1.2	1 632 611 240 112
100	25	250	125	90	1.6	212
150	25	250	125	90	2.9	312
200	25	275	125	90	4.5	412
300	25	400	175	125	10.5	512
400	25	450	200	125	17.7	612

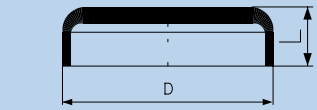


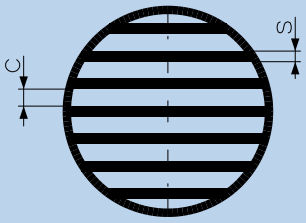
Reflux head with built-in pneumatic valve DN 25 KZA

DN PZ/PZ	Weight kg	Order number
80	3.1	1 632 611 107 306
100	3.5	406
150	4.2	506
200	5.8	606
300	11.9	806
400	19.2	906

DN PZ	DN1 KZA	DN2 KZA	L mm	L1 mm	L2 mm	L3 mm	Weight kg	Order number
80	25	25	325	150	90	80	4.4	1 632 611 241 112
100	25	25	325	150	90	90	2.8	212
150	25	25	350	150	90	80	3.5	312
200	25	25	350	150	90	80	5.1	412
300	25	25	450	175	90	80	11.2	512
400	25	25	500	175	90	80	18.5	612

P – built-in valve with bellows. Order number 1 632 921 600 018



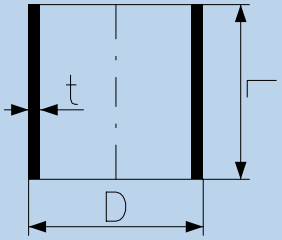


Packing support for columns

DN mm	D mm	L mm	c mm	s mm	Passage %	Weight kg	Order number
80	70	40	9	4	60	0.2	1 632 611 057 301
100	90	40	9	4	60	0.2	401
150	140	40	9	4	61	0.3	501
200	180	45	15	7	61	0.5	601
300	280	50	23	7	78	0.9	801
400	380	65	27	7	80	1.7	901
600	580	65	30	9	80	3.5	902

Raschig rings

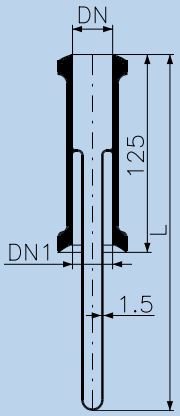
D mm	L mm	t mm	Area m^2/dm^3	Volume pcs/l	Order number
6	6	1.0	0.64	2880	1 632 691 001 061
8	8	1.0	0.58	1500	1 632 691 001 081
10	10	1.0	0.47	775	1 632 691 000 101
15	15	1.8	0.32	235	1 632 691 001 150
20	20	1.8	0.22	92	1 632 691 001 200
25	25	1.8	0.16	42	1 632 691 001 250
30	30	2.0	0.16	29	1 632 691 001 300
40	40	2.3	0.12	12	1 632 691 001 400
50	50	2.5	0.084	5.5	1 632 691 000 500
60	60	3.2	0.064	2.8	1 632 691 001 600



Thermometer pocket

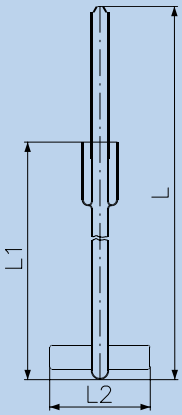
DN KZA	DN1 KZB	L mm	Weight kg	Order number
25	25	225	0.2	1 632 611 132 110
		250	0.2	111
		650	0.3	112
		800	0.2	113
		1000	0.3	114
		750	0.3	115*
		950	0.3	116*
		1000	0.3	117*
		1350	0.4	118*
25	50	250	0.3	130
		650	0.4	131
		800	0.4	132
		1000	0.4	133

* thicker wall



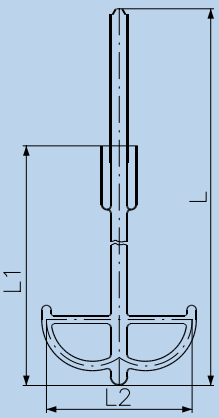
Stirrer – paddle type

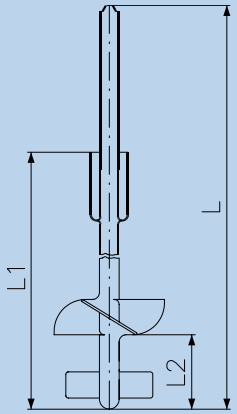
Kettle volume l	L mm	L1 mm	L2 mm	Weight kg	Order number
15	580	380	150	0.3	1 632 611 098 011
30	740	540	150	0.4	005
50	845	645	150	0.5	006
100	1000	800	150	0.6	007
200	1495	1295	150	0.8	008



Stirrer – anchor type

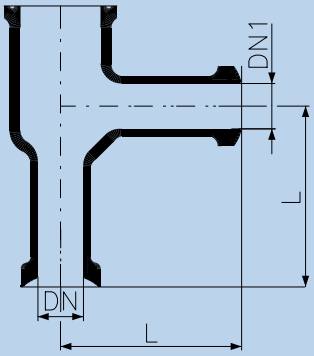
Kettle volume l	L mm	L1 mm	L2 mm	Weight kg	Order number
30	740	540	220	0.4	1 632 611 097 005
50	845	645	220	0.5	006
100	1245	1045	220	0.7	007
200	1495	1295	220	0.8	008





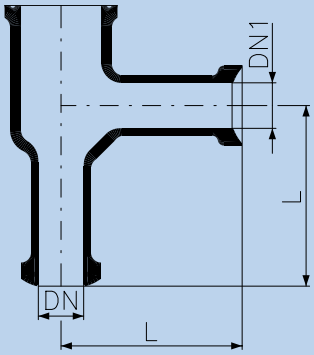
Stirrer – propeller type

Kettle volume l	L mm	L1 mm	L2 mm	Propeller ∅ mm	Weight kg	Order number
30	740	540	140	150	0.5	1 632 611 099 010
50	845	645	140	150	0.6	011
100	1000	800	140	150	0.7	012
100	1200	1000	140	150	0.8	013



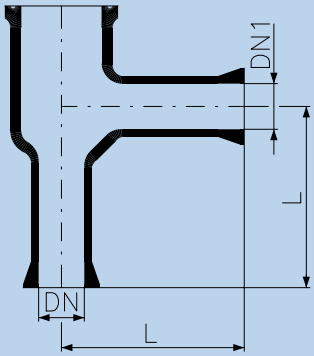
Glass body of angle valve with necks KZB/KZA

DN KZB	DN1 KZA	L mm	Weight kg	Order number
25	25	100	0.3	1 632 611 712 142
50	50	150	1.0	342



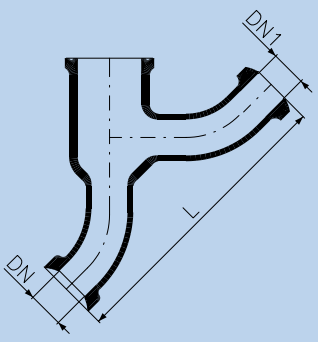
Glass body of angle valve with necks KZA/KZB

DN KZA	DN1 KZB	L mm	Weight kg	Order number
25	25	100	0.3	1 632 611 712 124
50	50	150	1.0	324
olive ∅22	25	100	0.3	714 216*
olive ∅33	25	100	0.3	714 217*



Glass body of angle valve with necks RK

DN RK	DN1 RK	L mm	Weight kg	Order number
25	25	100	0.3	1 632 611 712 177
50	50	150	1.0	377
olive ∅22	25	100	0.3	714 214*



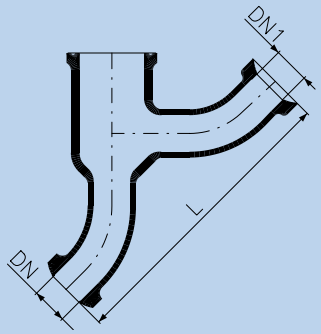
Glass body of straight valve with necks KZB/KZA

DN KZB	DN1 KZA	L mm	Weight kg	Order number
25	25	200	0.4	1 632 611 711 142
50	50	400	1.2	342

* for angle discharge valve

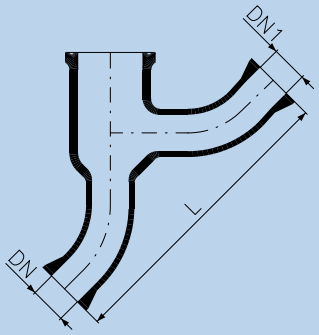
Glass body of straight valve with necks KZA/KZB

DN KZA	DN1 KZB	L mm	Weight kg	Order number
25	25	200	0.4	1 632 611 711 124
50	50	400	1.2	324
olive Ø33	25	225	0.4	714 110*
olive Ø22	22	225	0.4	714 113



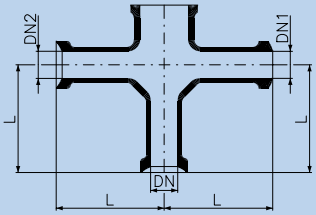
Glass body of straight valve with necks RK

DN RK	DN1 RK	L mm	Weight kg	Order number
25	25	200	0.4	1 632 611 711 177
50	50	400	1.2	377
olive Ø33	25	225	0.4	714 111*



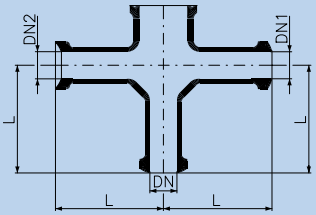
Glass body of branch valve with necks KZ

DN KZB	DN1 KZA	DN2 KZB	L mm	Weight kg	Order number
25	25	25	100	0.4	1 632 611 713 143
50	50	50	150	1.3	343

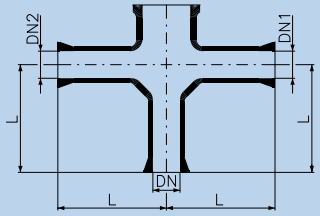


Glass body of branch valve with necks KZ

DN KZA	DN1 KZA	DN2 KZB	L mm	Weight kg	Order number
25	25	25	100	0.4	1 632 611 713 123
50	50	50	150	1.3	323

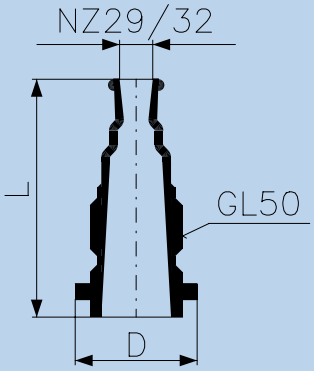


* for straight discharge valve



Glass body of branch valve with necks RK

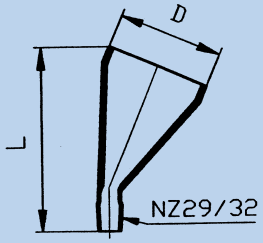
DN RK	DN1 RK	DN2 RK	L mm	Weight kg	Order number
25	25	25	100	0.4	1 632 611 713 177
50	50	50	150	1.3	377



Adapter with GL thread and ground joint

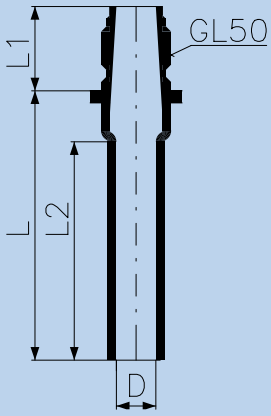
Ground joint NZ	L mm	D mm	Weight kg	Order number
29/32	125	64	0.2	1 632 611 024 800

Adapters can be supplied with plug NS 29/32. Order number – 1 632 493 501 080



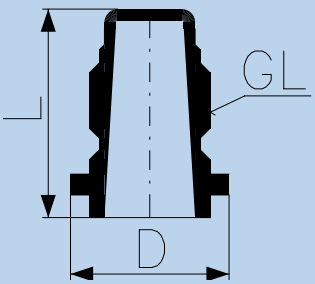
Feeding hopper with ground joint

Ground joint NZ	D mm	L mm	Weight kg	Order number
29/32	120	150	0.6	1 632 611 036 359



Stirrer bearing with GL thread

KPG	L mm	L1 mm	L2 mm	D mm	Weight kg	Order number
30	130	40	100	30.17	0.2	1 632 611 017 800

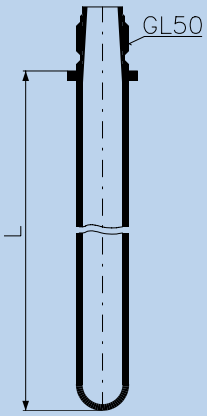


Pipe closure with GL thread

GL mm	L mm	D mm	Weight kg	Order number
32	64	44	0.1	1 632 611 022 600
50	95	64	0.2	800

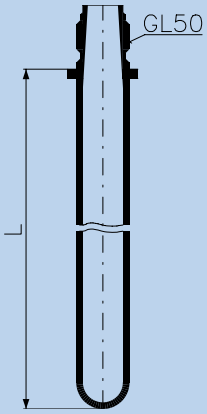
Turbulence stop with GL thread

For process kettle l	L mm	Weight kg	Order number
30	560	0.5	1 632 611 016 811
50	650	0.5	813
100	860	0.6	815



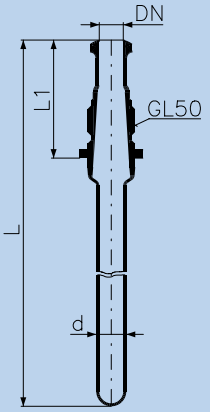
Turbulence stop with GL thread

For jacketed kettle l	L mm	Weight kg	Order number
15	440	0.4	1 632 611 016 810
30	620	0.5	812
50	675	0.5	816
100	1025	0.7	817



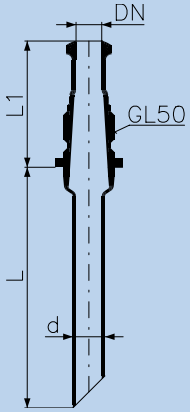
Thermometer pocket with GL thread

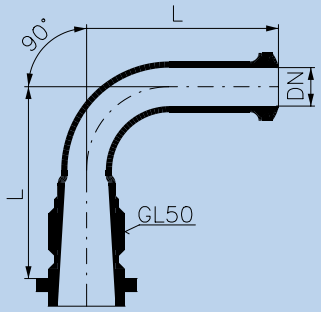
DN KZA	L mm	L1 mm	d mm	Weight kg	Order number
25	480	105	20	0.2	1 632 611 015 810
	805	105	20	0.3	811
	405	105	20	0.2	812
	550	105	20	0.2	813
	650	105	20	0.2	814
	725	105	20	0.3	815*
	775	105	20	0.3	816*
	850	105	20	0.3	817*
	1150	105	20	0.4	818*



Feeding tube – straight with GL thread

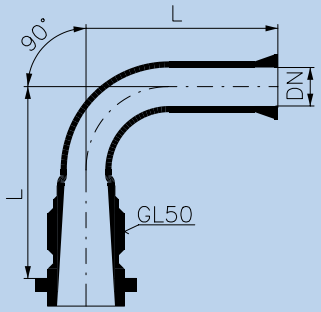
DN KZA	L mm	L1 mm	d mm	Weight kg	Order number
25	200	105	22	0.2	1 632 611 013 810





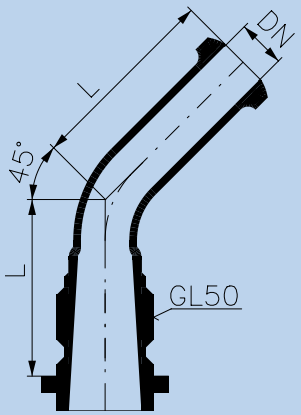
Adapter bend – 90° with GL thread/KZA

DN KZA	L mm	Weight kg	Order number
25	100	0.3	1 632 611 012 810



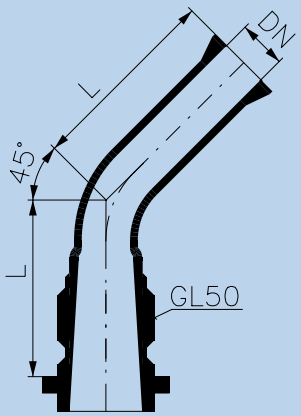
Adapter bend – 90° with GL thread/RK

DN RK	L mm	Weight kg	Order number
25	100	0.3	1 632 611 012 931



Adapter bend – 45° with GL thread/KZA

DN KZA	L mm	Weight kg	Order number
25	75	0.3	1 632 611 011 810

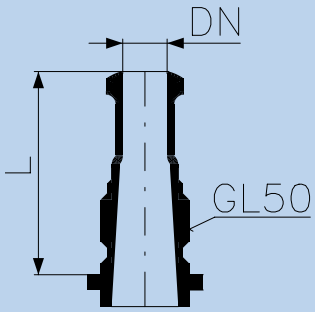


Adapter bend – 45° with GL thread/RK

DN RK	L mm	Weight kg	Order number
25	75	0.3	1 632 611 011 811

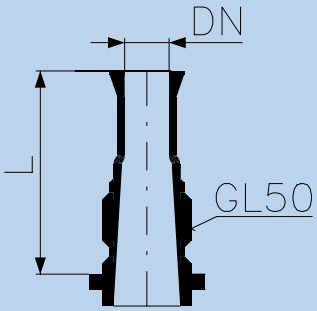
Adapter straight with GL thread/KZA

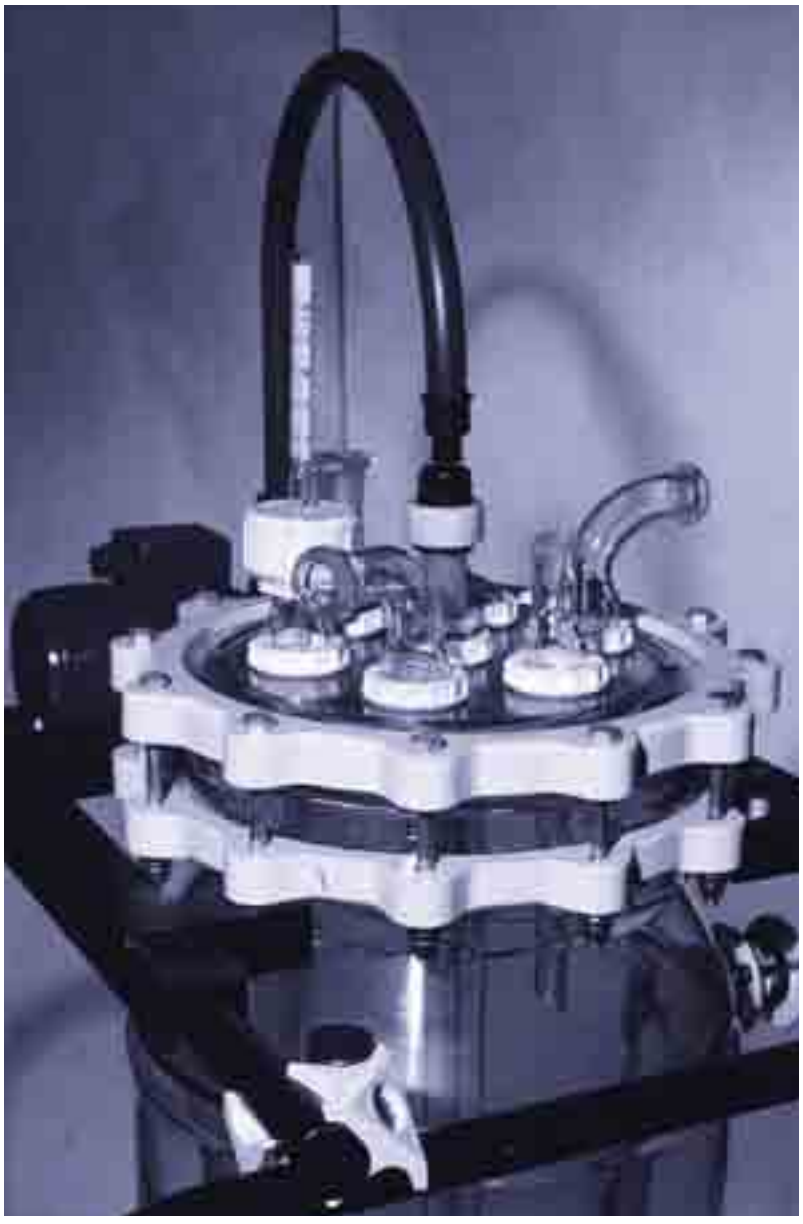
DN KZA	L mm	Weight kg	Order number
25	100	0.2	1 632 611 010 810



Adapter straight with GL thread/RK

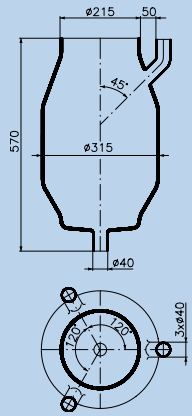
DN RK	L mm	Weight kg	Order number
25	100	0.2	1 632 611 010 811





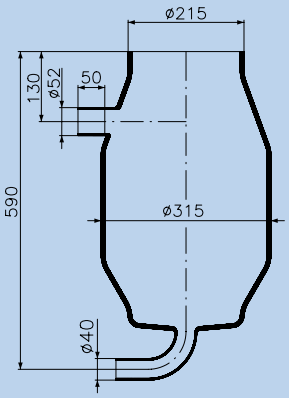
1.10 AGRO-VESSELS

Collecting vessel 25l



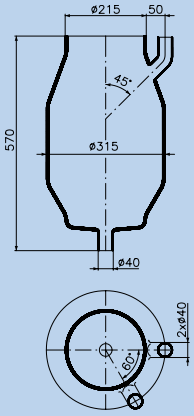
Weight kg	Order number
8.4	1 632 611 143 817

Vessel 25l with bend



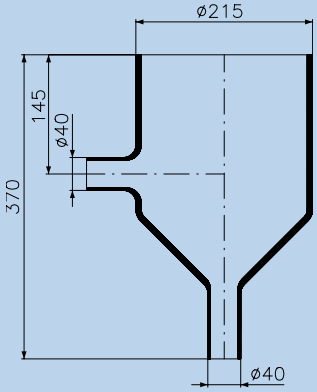
Weight kg	Order number
8.2	1 632 611 143 122

Vessel 25l with horn



Weight kg	Order number
8.3	1 632 611 143 116

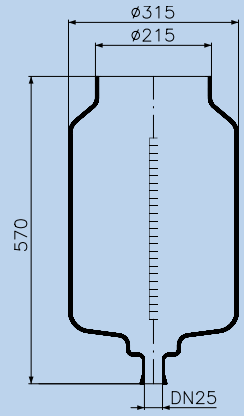
Equalizing vessel



Weight kg	Order number
2.4	1 632 611 138 618

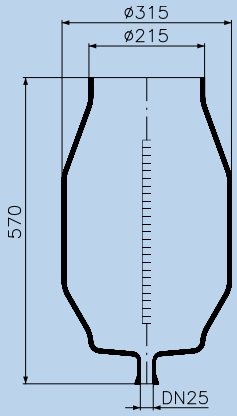
Volumetric vessel 25l

Weight kg	Order number
8.3	1 632 611 143 818



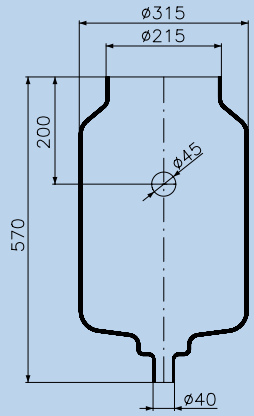
Graduated vessel 25l

Weight kg	Order number
8.1	1 632 611 143 816



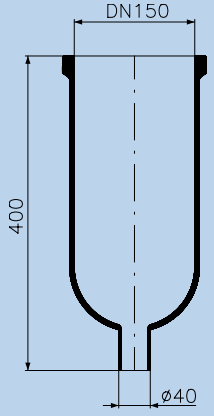
Vessel 25l with boring

Weight kg	Order number
8.3	1 632 611 143 821



Kettle 5l

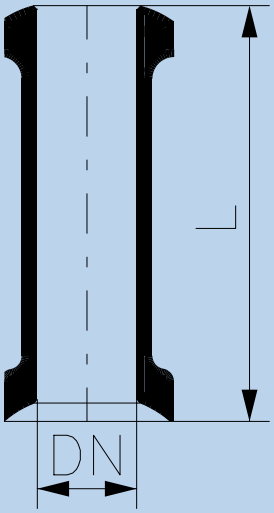
Weight kg	Order number
3.1	1 632 611 055 055



The way of connecting by means of HK fittings should be discussed with the vendor of apparatus in Sázava.

2 PIPING PARTS

2.1 PIPES AND FITTINGS KZ



Pipe with ground joints KZ

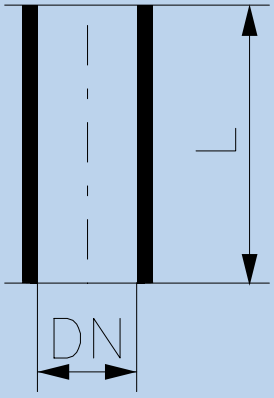
DN KZA/KZB	L mm	Weight kg	Order number
15	100	0.07	1 632 221 024 010
	125	0.08	012
	150	0.1	015
	175	0.12	017
	200	0.16	020
	300	0.2	030
	400	0.25	040
	500	0.3	050
	700	0.4	070
	1000	0.6	100
	1500	0.8	150
	2000	0.12	200
25	100	0.12	1 632 221 124 010
	125	0.14	012
	150	0.16	015
	175	0.18	017
	200	0.2	020
	300	0.28	030
	400	0.36	040
	500	0.44	050
	700	0.61	070
	1000	0.85	100
	1500	1.2	150
	2000	1.6	200
	3000	2.4	300
40	100	0.2	1 632 221 224 010
	125	0.3	012
	150	0.3	015
	175	0.4	017
	200	0.4	020
	300	0.6	030
	400	0.7	040
	500	0.9	050
	700	1.2	070
	1000	1.7	100
	1500	2.4	150
	2000	3.2	200
	3000	4.8	300
50	100	0.4	1 632 221 324 010
	125	0.4	012
	150	0.4	015
	175	0.5	017
	200	0.5	020
	300	0.7	030
	400	0.9	040
	500	1.1	050
	700	1.5	070
	1000	2.0	100
	1500	3.0	150
	2000	4.0	200
	3000	6.0	300
80	100	0.6	1 632 222 124 010
	125	0.7	012
	150	0.7	015
	175	0.7	017
	200	0.8	020
	300	1.1	030
	400	1.4	040
	500	1.7	050
	700	2.3	070
	1000	3.2	100
	1500	4.7	150
	2000	6.2	200
	3000	9.2	300

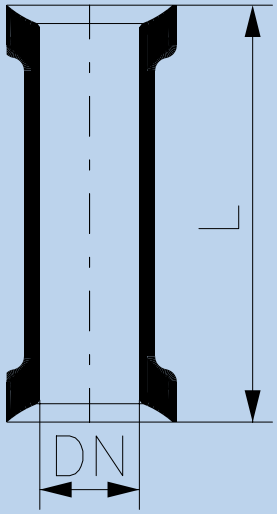
Pipe with ground joints KZ

DN KZA/KZB	L mm	Weight kg	Order number
100	100	0.7	1 632 222 224 010
	125	0.8	012
	150	0.9	015
	175	1.0	017
	200	1.1	020
	300	1.5	030
	400	2.0	040
	500	2.4	050
	700	3.2	070
	1000	4.5	100
	1500	6.6	150
	2000	8.7	200
	3000	12.9	300
150	100	1.5	1 632 222 324 010
	150	1.7	015
	175	1.9	017
	200	2.1	020
	300	2.7	030
	400	3.5	040
	500	4.2	050
	700	5.6	070
	1000	7.7	100
	1500	11.2	150
	2000	14.7	200
	3000	21.7	300
200	125	2.3	1 632 222 424 012
	150	1.9	015
	175	2.5	017
	200	3.0	020
	225	3.2	022
	250	3.5	025
	275	3.7	027
	300	4.0	030
	400	4.9	040
	500	5.8	050
	700	7.7	070
	1000	10.5	100
	1500	15.2	150
	2000	19.9	200
300	150	5.0	1 632 222 524 015
	200	5.7	020
	225	6.1	022
	250	6.5	025
	275	6.9	027
	300	7.3	030
	400	8.8	040
	500	10.3	050
	700	13.3	070
	1000	17.8	100
	1500	25.3	150
	2000	32.8	200
	3000	47.8	300

Tubes HK

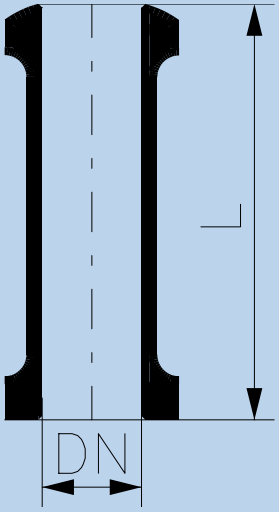
Tubes DN 15 - DN 600 can be delivered as HK type (smooth ending, ground front) in lengths 100 – 3,000 mm. Ordering upon agreement with the vendor of the apparatus.





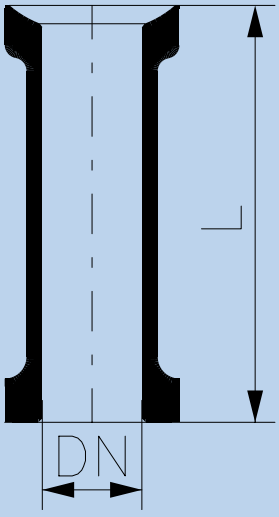
Pipe with ground joints KZ

DN KZB/KZB	L mm	Weight kg	Order number
25	100	0.12	1 632 221 144 010
	125	0.14	012
	150	0.16	015
	175	0.18	017
100	100	0.7	222 244 010
	150	0.9	015
150	1000	7.7	344 100



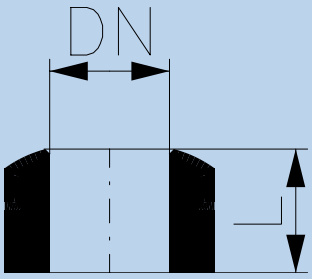
Pipe with ground joints KZA/PZ

DN KZA/PZ	L mm	Weight kg	Order number
40	100	0.2	1 632 221 252 010
50	100	0.4	352 010
80	125	0.7	222 152 012
100	125	0.8	252 012
200	200	3.0	452 020
300	200	5.7	552 020



Pipe with ground joints KZB/PZ

DN KZB/PZ	L mm	Weight kg	Order number
25	150	0.16	1 632 221 154 015
40	100	0.2	254 010
50	100	0.4	354 010
80	125	0.7	222 154 012
100	125	0.8	254 012
150	1000	7.7	354 100
200	200	3.0	454 020
200	1000	10.5	454 100
300	200	5.7	554 020

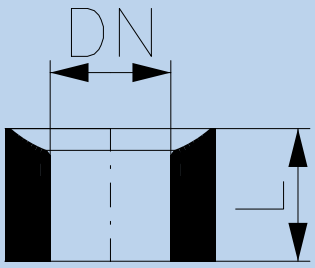


Adapter KZA/PZ

DN KZA/PZ	L mm	Weight kg	Order number
25	25	0.06	1 632 231 025 125
50	25	0.13	325
80	50	0.46	232 025 125
100	50	0.57	225

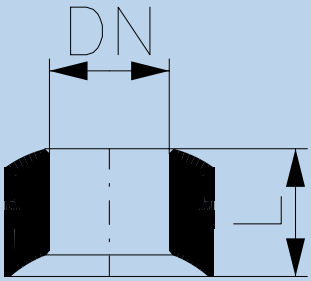
Adapter KZB/PZ

DN KZB/PZ	L mm	Weight kg	Order number
25	25	0.06	1 632 231 025 145
50	25	0.13	345
80	50	0.46	232 025 145
100	50	0.57	245



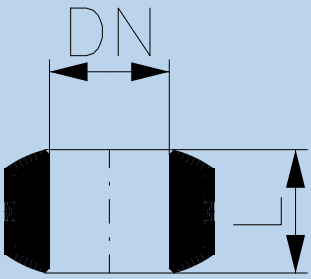
Spacing adapter KZA/KZB

DN KZA/KZB	L mm	Weight kg	Order number
25	25	0.06	1 632 231 020 130
25	50	0.12	131
50	25	0.13	330
50	50	0.26	331
80	50	0.46	232 020 130
100	50	0.57	230



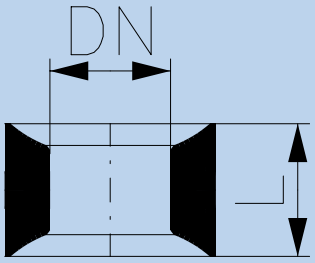
Spacing adapter KZA/KZA

DN KZA/KZA	L mm	Weight kg	Order number
25	25	0.06	1 632 231 020 120
25	50	0.12	121
50	25	0.13	320
50	50	0.26	321
80	50	0.46	232 020 120
100	50	0.57	220



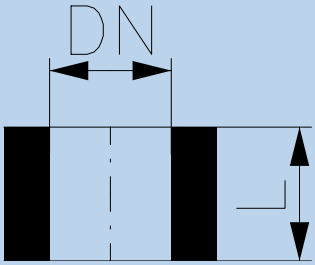
Spacing adapter KZB/KZB

DN KZB/KZB	L mm	Weight kg	Order number
25	25	0.06	1 632 231 020 140
25	50	0.12	141
50	25	0.13	340
50	50	0.26	341
80	50	0.46	232 020 140
100	50	0.57	240



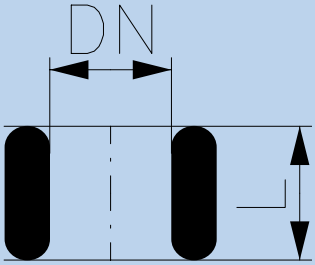
Spacing adapter PZ/PZ

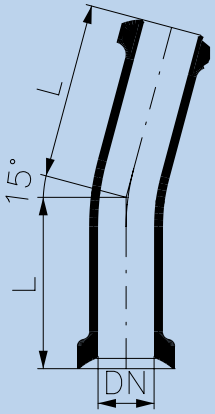
DN PZ/PZ	L mm	Weight kg	Order number
25	25	0.06	1 632 231 020 150
25	50	0.12	151
50	25	0.14	350
50	50	0.28	351
80	50	0.5	232 020 150
100	50	0.62	250



Spacing adapter PTFE

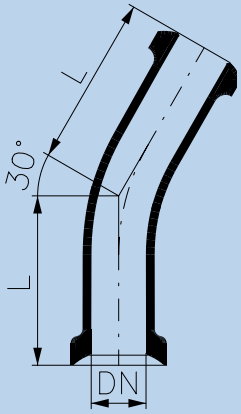
DN PZ/KZA/KZB	L mm	Weight kg	Order number
25	16	0.05	9 180 000 857
50	20	0.1	858





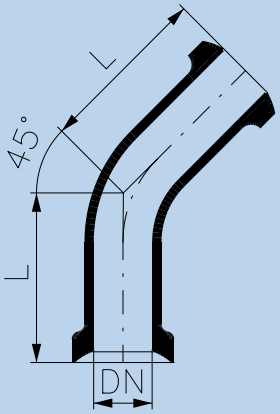
Bend 15° KZA/KZB

DN KZA/KZB	L mm	Weight kg	Order number
15	50	0.07	1 632 231 101 024
25	75	0.16	124
40	100	0.4	224
50	100	0.5	324
80	125	0.9	232 101 124
100	175	1.7	224
150	200	3.5	324



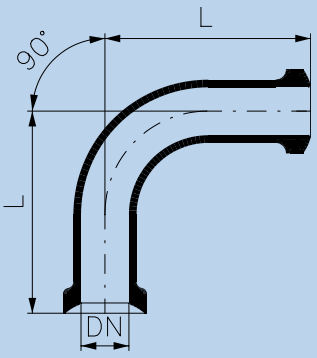
Bend 30° KZA/KZB

DN KZA/KZB	L mm	Weight kg	Order number
15	50	0.07	1 632 231 102 024
25	75	0.16	124
40	100	0.4	224
50	100	0.6	324
80	125	0.9	232 102 124
100	175	1.7	224
150	200	3.5	324
200	200	4.9	424
300	200	8.8	524



Bend 45° KZA/KZB

DN KZA/KZB	L mm	Weight kg	Order number
15	50	0.07	1 632 231 103 024
25	75	0.16	124
40	100	0.4	224
50	100	0.6	324
80	125	0.9	232 103 124
100	175	1.7	224
150	200	3.5	324
200	200	4.9	424
300	200	8.8	524

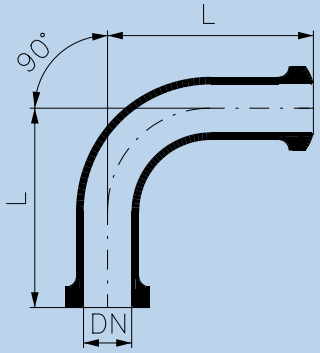


Bend 90° KZA/KZB

DN KZA/KZB	L mm	Weight kg	Order number
15	50	0.07	1 632 231 104 024
25	100	0.2	124
40	150	0.5	224
50	150	0.7	324
80	200	1.2	232 104 124
100	250	2.0	224
150	250	3.5	324
200	300	5.8	424
300	400	12.0	524

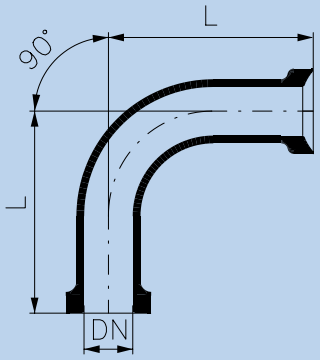
Bend 90° KZA/PZ

DN KZA/PZ	L mm	Weight kg	Order number
25	100	0.2	1 632 231 104 152
100	250	2.0	232 104 252
200	300	5.8	452
300	400	12.0	552



Bend 90° KZB/PZ

DN KZB/PZ	L mm	Weight kg	Order number
25	100	0.2	1 632 231 104 154
100	250	2.0	232 104 254
200	300	5.8	454
300	400	12.0	554



Bend 90° KZA/KZB

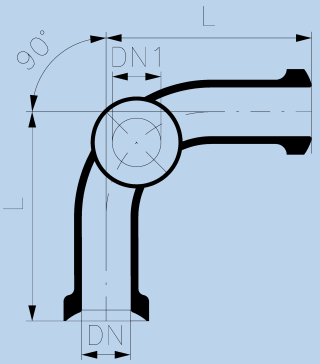
DN KZB/KZB	L mm	Weight kg	Order number
25	100	0.2	1 632 231 104 144

Bend 90° KZA/RK

DN KZB/RK	L mm	Weight kg	Order number
25	100	0.2	1 632 231 104 127

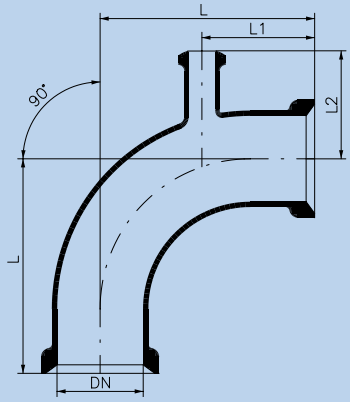
Bend 90° KZA/KZB with branch KZ

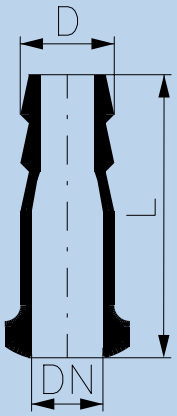
DN KZA/KZB branch	DN1 mm	L kg	Weight	Order number
25	25KZB	100	0.3	1 632 231 109 411
25	25KZA	100	0.3	412



Bend 90° KZB/KZB with neck DN 25 KZA

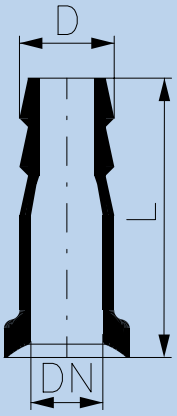
DN KZB/KZB	L mm	L1 mm	L2 kg	Weight	Order number
80	200	100	100	1.3	1 632 232 114 110
100	250	100	125	2.1	210
150	250	150	150	3.6	310
200	300	150	175	5.9	410
300	400	225	225	12.1	510





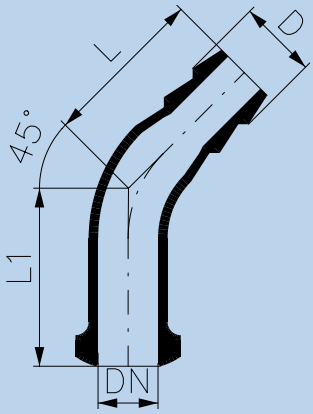
Straight shank piece KZA

DN KZA	L mm	D mm	Weight kg	Order number
15	100	11	0.1	1 632 231 030 022
	100	22	0.1	025
25	100	11	0.1	122
	100	22	0.1	125
	100	33	0.1	126
40	150	33	0.3	226
	150	50	0.3	227
50	150	58	0.4	328



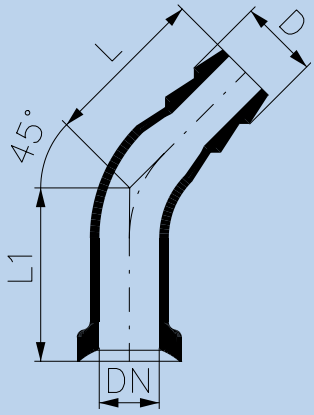
Straight shank piece KZB

DN KZB	L mm	D mm	Weight kg	Order number
15	100	11	0.1	1 632 231 030 042
	100	22	0.1	045
25	100	11	0.1	142
	100	22	0.1	145
	100	33	0.1	146
40	150	33	0.3	246
	150	50	0.3	247
50	150	33	0.4	346
	150	58	0.4	348



Shank piece 45° KZA

DN KZA	L mm	L1 mm	D mm	Weight kg	Order number
15	70	50	22	0.1	1 632 231 031 025
25	100	100	22	0.2	125
25	100	100	33	0.2	126

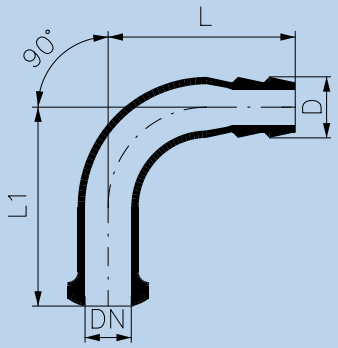


Shank piece 45° KZB

DN KZB	L mm	L1 mm	D mm	Weight kg	Order number
15	70	50	22	0.1	1 632 231 031 045
25	100	100	22	0.2	145
25	100	100	33	0.2	146

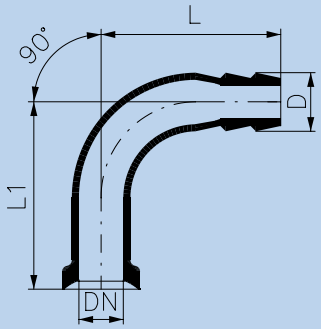
Shank piece 90° KZA

DN KZA	L mm	L1 mm	D mm	Weight kg	Order number
15	70	50	22	0.1	1 632 231 032 025
25	100	100	22	0.2	125
25	100	100	33	0.2	126



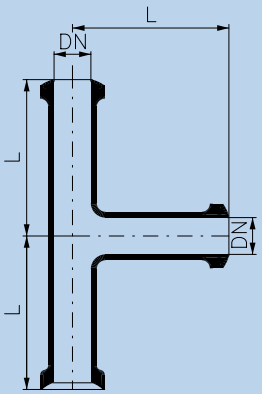
Shank piece 90° KZB

DN KZB	L mm	L1 mm	D mm	Weight kg	Order number
15	70	50	22	0.1	1 632 231 032 045
25	100	100	22	0.2	145
25	100	100	33	0.2	146



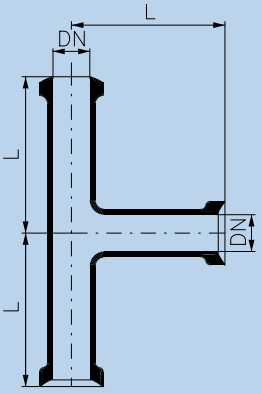
Fitting "T" KZA/KZB/KZA

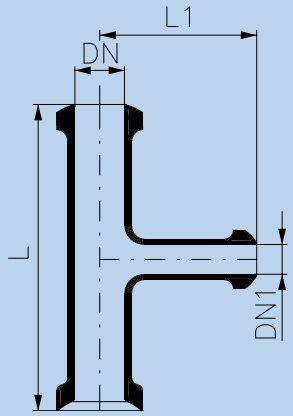
DN KZA/KZB/KZA	L mm	Weight kg	Order number
15	50	0.11	1 632 231 210 302
25	100	0.3	312
40	150	0.7	322
50	150	0.9	332
80	200	1.7	232 210 312
100	250	2.9	322
150	250	5.1	332
200	300	8.0	342
300	400	17.8	352



Fitting "T" KZA/KZB/KZB

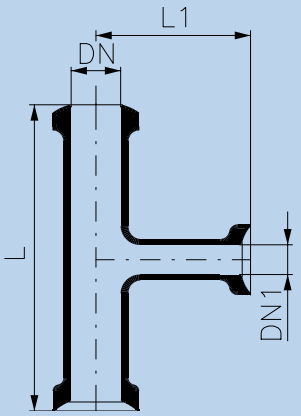
DN KZA/KZB/KZB	L mm	Weight kg	Order number
15	50	0.11	1 632 231 210 304
25	100	0.3	314
40	150	0.7	324
50	150	0.9	334
80	200	1.7	232 210 314
100	250	2.9	324
150	250	5.1	334
200	300	8.0	344
300	400	17.8	354





Reducing fitting "T" KZA/KZB/KZA

DN KZA/KZB	DN1 KZA	L mm	L1 mm	Weight kg	Order number
25	15	150	75	0.1	1 632 231 223 102
40	25	200	100	0.5	212
50	25	200	100	0.6	312
	40	200	100	0.7	322
80	25	200	100	0.9	232 223 112
	40	250	100	1.1	122
	50	250	100	1.2	132
100	25	200	125	1.2	212
	40	250	125	1.4	222
	50	250	125	1.5	232
	80	300	125	1.6	242
150	25	200	150	2.2	312
	40	250	150	2.5	322
	50	250	150	2.6	332
	80	300	150	3.0	342
	100	300	150	3.1	352
200	25	200	175	3.1	412
	40	250	175	3.6	422
	50	250	175	3.7	432
	80	300	175	4.3	442
	100	300	175	4.4	452
	150	400	225	5.8	462
300	25	300	225	7.4	512
	40	400	225	8.9	522
	50	400	225	9.0	532
	80	400	225	9.1	542
	100	400	225	9.2	552
	150	500	275	11.2	562
	200	600	275	13.1	572

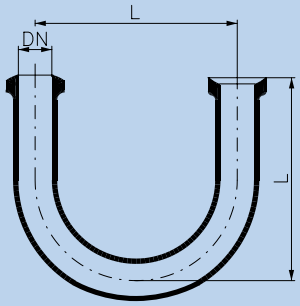


Reducing fitting "T" KZA/KZB/KZB

DN KZA/KZB	DN1 KZB	L mm	L1 mm	Weight kg	Order number
25	15	150	75	0.1	1 632 231 223 104
40	25	200	100	0.5	214
50	25	200	100	0.6	314
	40	200	100	0.7	324
80	25	200	100	0.9	232 223 114
	40	250	100	1.1	124
	50	250	100	1.2	134
100	25	200	125	1.2	214
	40	250	125	1.4	224
	50	250	125	1.5	234
	80	300	125	1.6	244
150	25	200	150	2.2	314
	40	250	150	2.5	324
	50	250	150	2.6	334
	80	300	150	3.0	344
	100	300	150	3.1	354
200	25	200	175	3.1	414
	40	250	175	3.6	424
	50	250	175	3.7	434
	80	300	175	4.3	444
	100	300	175	4.4	454
	150	400	225	5.8	464
300	25	300	225	7.4	514
	40	400	225	8.9	524
	50	400	225	9.0	534
	80	400	225	9.1	544
	100	400	225	9.2	554
	150	500	275	11.2	564
	200	600	275	13.1	574

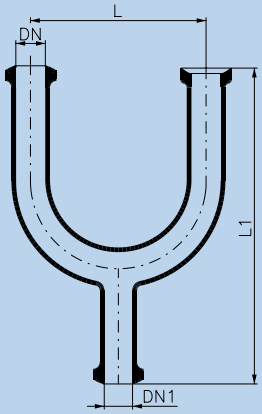
U-tube KZ

DN KZA/KZB	L mm	Weight kg	Order number
15	100	0.14	1 632 231 310 024
25	150	0.25	124
40	150	0.4	224
50	200	0.7	324
80	225	1.2	232 310 124
100	300	2.2	224
150	350	4.5	324



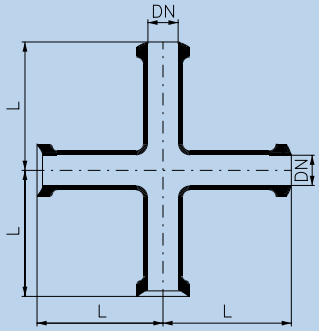
U-tube KZ with branch

DN 1 KZA/KZB	DN KZA	L mm	L1 mm	Weight kg	Order number
15	15	100	200	0.16	1 632 231 320 312
25	25	150	250	0.3	321 312
25	40	150	250	0.5	322 312
25	50	200	300	0.8	323 312
25	80	225	350	1.3	232 321 312
25	100	300	425	2.3	322 312
25	150	350	500	4.6	323 312



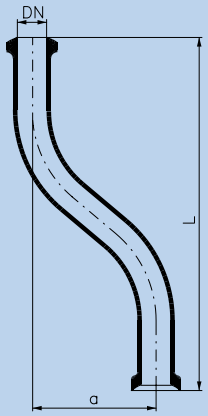
Cross fitting KZ

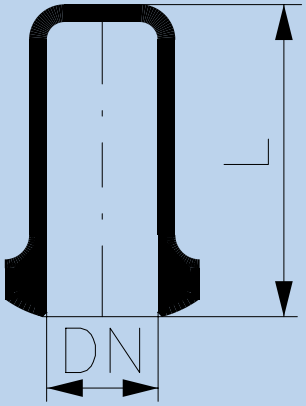
DN KZA/KZB/KZA/KZB	L mm	Weight kg	Order number
15	50	0.2	1 632 231 260 024
25	100	0.4	124
40	150	0.8	224
50	150	1.1	324
80	200	2.0	232 260 124
100	250	3.4	224
150	250	6.0	324



S-tube KZ

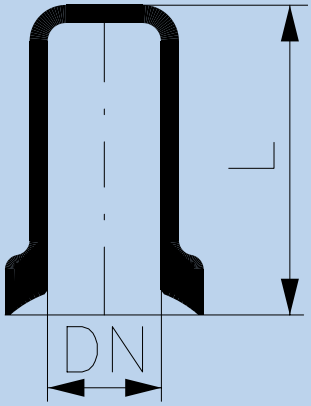
DB KZA/KZB	L mm	a mm	Weight kg	Order number
15	200	50	0.12	1 632 231 350 030
25	300	50	0.3	130
	300	100	0.35	132
40	300	50	0.6	230
	300	100	0.6	232
50	300	50	0.7	330
	300	100	0.8	332
80	400	50	1.5	232 350 130
	400	100	1.6	132
100	400	100	2.3	232
	400	150	2.5	234
150	500	100	4.5	332
	500	150	4.9	334





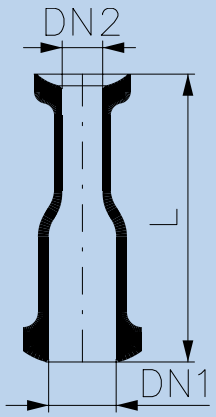
Pipe plug KZA

DN KZA	L mm	Weight kg	Order number
15	50	0.1	1 632 611 078 016
25	75	0.1	026
40	100	0.2	041
50	100	0.3	051
80	110	0.5	081
100	110	0.7	101
150	125	1.3	151
200	135	2.0	201
300	170	4.5	301



Pipe plug KZB

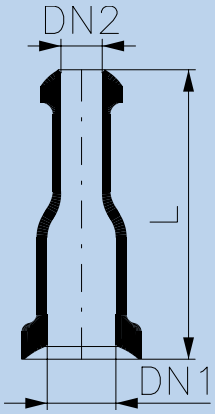
DN KZB	L mm	Weight kg	Order number
15	50	0.1	1 632 611 079 016
25	75	0.1	026
40	100	0.2	041
50	100	0.3	051
80	110	0.5	081
100	110	0.7	101
150	125	1.3	151
200	135	2.0	201
300	170	4.5	301



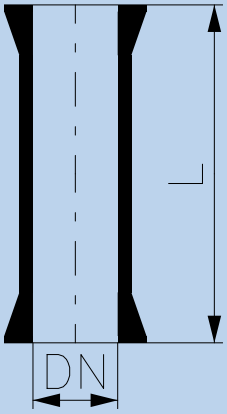
Adapter KZA/KZB

DN1 KZA	DN2 KZB	L mm	Weight kg	Order number
25	15	100	0.1	1 632 231 042 104
40	15	100	0.1	204
	25	100	0.2	214
50	15	100	0.2	304
	25	100	0.3	314
	40	100	0.4	324
80	25	125	0.5	232 042 114
	40	125	0.6	124
	50	125	0.6	134
100	25	150	0.8	214
	40	150	0.9	224
	50	150	0.9	234
	80	150	1.0	244
150	25	200	1.4	314
	40	200	1.5	324
	50	200	1.5	334
	80	200	1.7	344
	100	200	1.8	354
200	25	200	1.8	414
	40	200	1.9	424
	50	200	1.9	434
	80	200	2.0	444
	100	200	2.1	454
	150	200	2.3	464
300	25	275	3.7	514
	40	275	3.8	524
	50	275	3.8	534
	80	275	4.0	544
	100	300	4.2	554
	150	300	4.7	564
	200	300	5.3	574

Adapter KZB/KZA



DN1 KZB	DN2 KZA	L mm	Weight kg	Order number
25	15	100	0.1	1 632 231 044 102
40	15	100	0.1	202
	25	100	0.2	212
50	15	100	0.2	302
	25	100	0.3	312
	40	100	0.4	322
80	25	125	0.5	232 044 112
	40	125	0.6	122
	50	125	0.6	132
100	25	150	0.8	212
	40	150	0.9	222
	50	150	0.9	232
	80	150	1.0	242
150	25	200	1.4	312
	40	200	1.5	322
	50	200	1.5	332
	80	200	1.7	342
	100	200	1.8	352
200	25	200	1.8	412
	40	200	1.9	422
200	50	200	1.9	432
	80	200	2.0	442
	100	200	2.1	452
	150	200	2.3	462
300	25	275	3.7	512
	40	275	3.8	522
	50	275	3.8	532
	80	275	4.0	542
	100	300	4.2	552
	150	300	4.7	562
	200	300	5.3	572



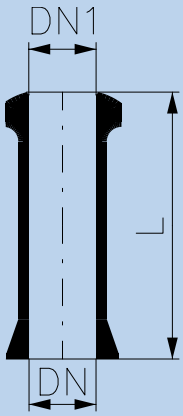
2.2 PIPES AND FITTINGS RK

Pipe with RK ground joints

DN RK	L mm	Weight kg	Order number
25	100	0.1	1 632 221 177 010
	125	0.1	012
	150	0.1	015
	175	0.2	017
	200	0.2	020
	300	0.2	030
	400	0.3	040
	500	0.4	050
	700	0.6	070
	1000	0.8	100
	1500	1.2	150
	2000	1.6	200
	3000	2.4	300
40	100	0.2	277 010
	125	0.3	012
	150	0.3	015
	175	0.4	017
	200	0.4	020
	300	0.6	030
	400	0.7	040
	500	0.9	050
	700	1.2	070
	1000	1.7	100
	1500	2.4	150
	2000	3.2	200
	3000	4.8	300
50	100	0.4	377 010
	125	0.4	012
	150	0.4	015
	175	0.5	017
	200	0.5	020
	300	0.7	030
	400	0.9	040
	500	1.1	050
	700	1.5	070
	1000	2.0	100
	1500	2.0	150
	2000	4.0	200
	3000	6.0	300
80	100	0.6	222 177 010
	125	0.7	012
	150	0.7	015
	175	0.7	017
	200	0.8	020
	300	1.1	030
	400	1.4	040
	500	1.7	050
	700	2.3	070
	1000	3.2	100
	1500	4.7	150
	2000	6.2	200
	3000	9.2	300

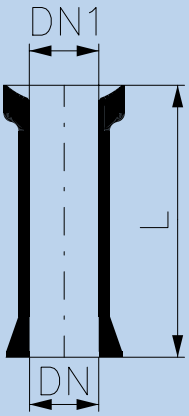
Adapter RK/KZA

DN RK	DN1 KZA	L mm	Weight kg	Order number
25	25	100	0.1	1 632 231 025 172
40	40	100	0.2	272
50	50	125	0.4	372
80	80	150	0.7	232 025 172



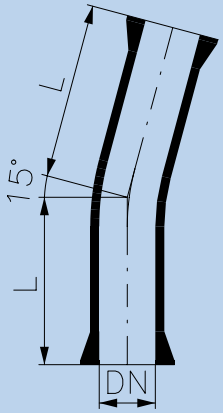
Adapter RK/KZB

DN RK	DN1 KZB	L mm	Weight kg	Order number
25	25	100	0.1	1 632 231 025 174
40	40	100	0.2	274
50	50	125	0.4	374
80	80	150	0.7	232 025 174



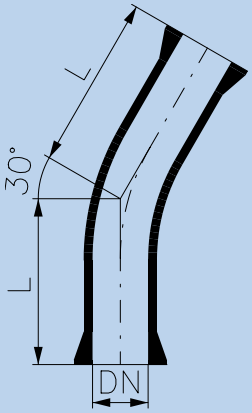
Bend 15° RK

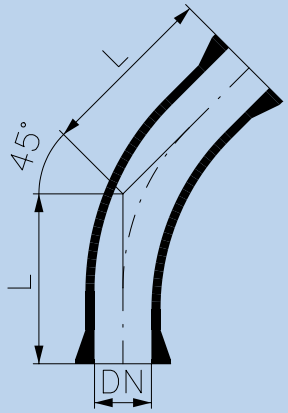
DN RK	L mm	Weight kg	Order number
25	75	0.1	1 632 231 101 177
40	100	0.4	277
50	100	0.5	377
80	125	0.9	232 101 177



Bend 30° RK

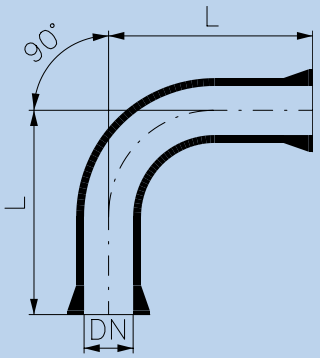
DN RK	L mm	Weight kg	Order number
25	75	0.1	1 632 231 102 177
40	100	0.4	277
50	100	0.5	377
80	125	0.9	232 102 177





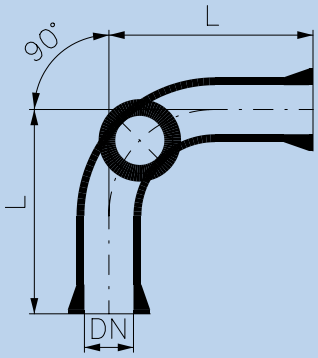
Bend 45° RK

DN RK	L mm	Weight kg	Order number
25	75	0.1	1 632 231 103 177
40	100	0.4	277
50	100	0.6	377
80	125	0.9	232 103 177



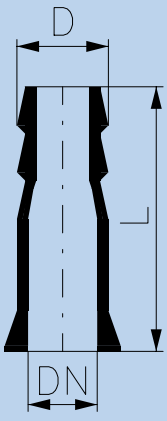
Bend 90° RK

DN RK	L mm	Weight kg	Order number
25	100	0.2	1 632 231 104 177
40	150	0.5	277
50	150	0.7	377
80	200	1.2	232 104 177



Bend 90° RK with neck DN 25 RK

DN RK	L mm	Weight kg	Order number
25	100	0.3	1 632 231 109 410

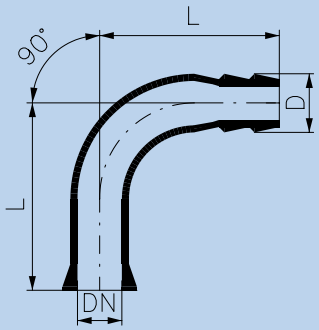


Straight shank piece RK

DN RK	L mm	D mm	Weight kg	Order number
25	100	11	0.1	1 632 231 030 172
25	100	22	0.1	175
25	100	33	0.1	176
50	150	58	0.4	378

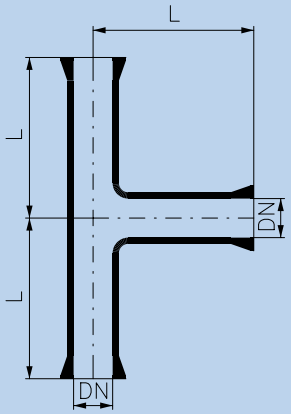
Bend 90° shank piece

DN RK	L mm	D mm	Weight kg	Order number
25	100	33	0.2	1 632 231 032 176
50	150	58	0.7	378



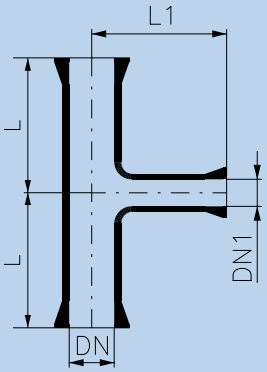
"T" fitting RK

DN RK	L mm	Weight kg	Order number
25	100	0.2	1 632 231 210 717
40	150	0.7	727
50	150	0.9	737
80	200	1.7	1 632 232 210 717



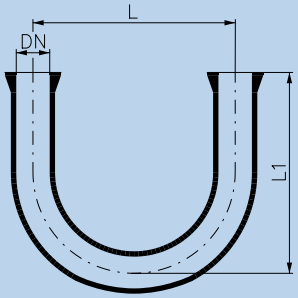
Reducing "T" fitting RK

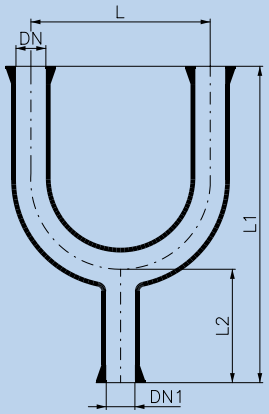
DN RK	DN1 RK	L mm	L1 mm	Weight kg	Order number
40	25	100	100	0.5	1 632 231 227 217
50	25	100	100	0.6	317
	40	100	100	0.7	327
80	25	100	100	0.9	232 227 117
	40	125	100	1.1	127
	50	125	100	1.2	137



U-tube RK

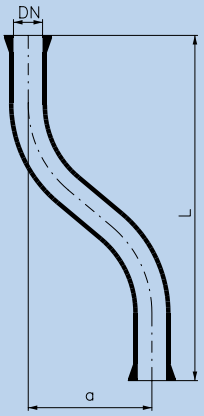
DN RK	L mm	L1 mm	Weight kg	Order number
25	150	150	0.2	1 632 231 310 177
40	150	150	0.4	277
50	200	175	0.7	377
80	225	200	1.2	232 310 177





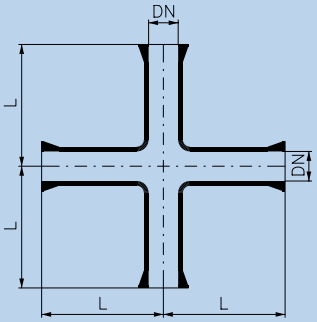
U-tube RK with bottom neck

DN RK/RK	DN RK	L mm	L1 mm	L2 mm	Weight kg	Order number
25	25	150	225	75	0.3	1 632 231 321 717
50	25	200	300	75	0.8	323 717
	50	200	300	75	0.9	737



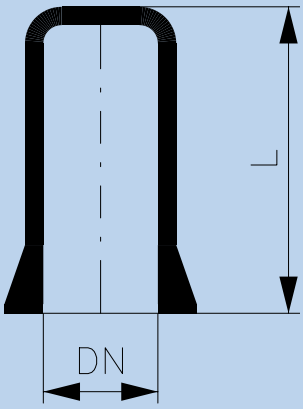
S-tube RK

DN RK	L mm	a mm	Weight kg	Order number
25	300	50	0.3	1 632 231 350 170
	300	100	0.3	172
40	300	50	0.6	270
	300	100	0.6	272
50	300	50	0.7	370
	300	100	0.8	372
80	400	50	1.5	232 350 170
	400	100	1.6	172



Cross fitting RK

DN RK	L mm	Weight kg	Order number
25	100	0.3	1 632 231 260 177
40	150	0.8	277
50	150	1.1	377
80	200	2.0	232 260 177

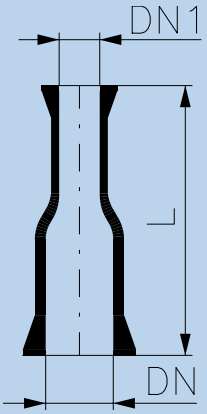


Pipe plug RK

DN RK	L mm	Weight kg	Order number
15	50	0.1	1 632 232 040 117
25	65	0.1	217
40	80	0.2	407
50	90	0.3	507
80	110	0.5	807

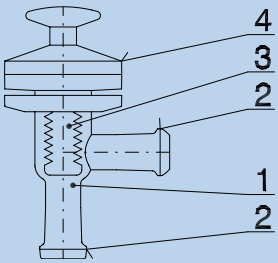
Adapter RK

DN RK	DN1 RK	L mm	Weight kg	Order number
40	25	100	0.2	1 632 231 047 217
50	25	100	0.3	317
	40	100	0.4	327
80	25	125	0.5	232 047 117
	40	125	0.6	127
	50	125	0.6	137



The issue of mill fittings should be discussed with the vendor of the apparatus in Sázava.

3 VALVES AND COCKS



1 valve body with seat

2 connecting ends

3 teflon bellows with sealing cone

4 control head

3 VALVES AND COCKS

Glass fittings are used in assemblies of piping lines and apparatuses.
The assortment of glass fittings includes:
valves – closing element is teflon bellows
ball cocks – closing element is glass ball
cone cocks – closing element is glass cone

Glass valves

The valves close passage of fluids by teflon cone bearing against body glass seat. The cone is a part of teflon bellows piece which enables its lifting and, at the same time, it safely (with no gland) separates the control part from the working substance. Corrosion and temperature resistance of the valve complete is given by properties of the SIMAX glass, material PTFE and materials of the control part. The working substances must not contain solid particles which could permanently damage the sealing surface of the teflon cone.

Glass bodies of valves are manufactured in the following types:
a) straight
b) angle
c) closable branch

The valves are supplied with manual or pneumatic control.
Pneumatic valves can also be controlled manually. The endings are of types KZ, RK and as olive for hose connection.

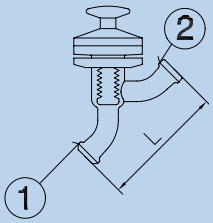
Built in valves

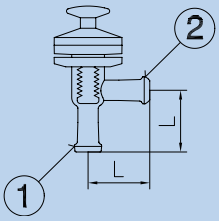
The closing valves DN 25 and 50 are composed of valve glass body and manual or a pneumatic built in control part.

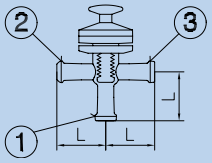
DN	Weight kg	design	Order number
25	0.7	manual	1 632 921 600 118
25	0.8	pneumatic	018
50	2.6	manual	057
50	2.8	pneumatic	157

Closing valves DN 25 with manual control

The valve head with manual control wheel is made of plastic based on polyphenylene sulphide (PPS) with heat resistance up to 140°C and high chemical resistance. Maximum operating pressure is 350 kPa.



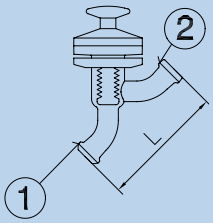


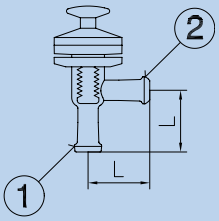


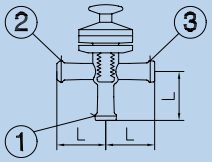
End type ①	②	③	L mm	Weight kg	Order number
straight valves					
KZB	KZA		200	1.0	1 632 611 637 942
KZA	KZB		200	1.0	851
RK	RK		200	1.0	977
olive ∅ 33	KZB		225	1.0	960
olive ∅ 33	RK		225	1.0	870
angle valves					
KZB	KZA		100	1.0	1 632 611 637 952
KZA	KZB		100	1.0	853
RK	RK		100	1.0	983
olive ∅ 22	KZB		100	1.0	872
olive ∅ 22	RK		100	1.0	873
olive ∅ 33	KZB		100	1.0	871
valves with branch					
KZA	KZB	KZA	100	1.1	1 632 611 637 931
KZB	KZB	KZA	100	1.1	932
RK	RK	RK	100	1.1	992

Closing valves DN 25 with pneumatic control

The plastic valve head has a connection to a source of compressed air (air pressure 150 kPa – pressure opens) and hand wheel for emergency control. Maximum operating pressure is 350 kPa.



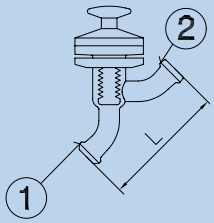


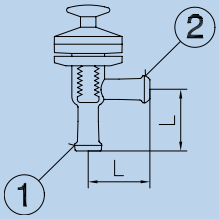


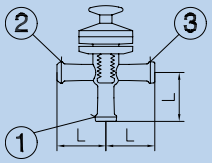
End type ①	②	③	L mm	Weight kg	Order number
straight valves					
KZB	KZA		200	1.2	1 632 611 637 943
KZA	KZB		200	1.2	852
RK	RK		200	1.2	976
olive ∅ 33	KZB		225	1.2	906
angle valves					
KZB	KZA		100	1.1	1 632 611 637 953
KZA	KZB		100	1.1	854
RK	RK		100	1.1	984
valves with branch					
KZA	KZB	KZA	100	1.2	1 632 611 637 934
KZB	KZB	KZA	100	1.2	933
RK	RK	RK	100	1.2	993

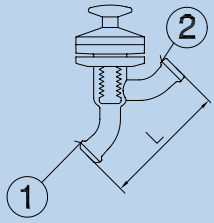
Spare parts for valves DN 25

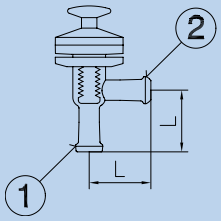
bellows DN 25 PTFE	9 180 000 711
membrane DN 25	1 632 921 516 101

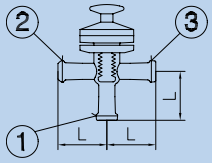












Closing valves DN 50 with manual control

Maximum operating pressure is 250 kPa.

End type ①	②	③	L mm	Weight kg	Order number
straight valves					
KZB	KZA		400	3.5	1 632 611 637 302
KZA	KZB		400	3.8	301
RK	RK		400	3.5	303
angle valves					
KZB	KZA		150	3.5	1 632 611 637 305
KZA	KZB		150	3.8	304
RK	RK		150	3.5	306
valves with branch					
KZB	KZB	KZA	150	3.5	1 632 611 637 308
KZA	KZB	KZA	150	3.9	307
RK	RK	RK	150	3.5	309

Closing valves DN 50 with pneumatic control

The plastic valve head has a connection to a source of compressed air (air pressure 150 kPa – pressure opens) and hand wheel for emergency control. Maximum operating pressure is 250 kPa.

End type ①	②	③	L mm	Weight kg	Order number
straight valves					
KZB	KZA		400	3.5	1 632 611 637 947
KZA	KZB		400	4.0	856
RK	RK		400	3.5	980
angle valves					
KZB	KZA		150	3.5	1 632 611 637 957
KZA	KZB		150	3.8	855
RK	RK		150	3.5	988
valves with branch					
KZB	KZB	KZA	150	3.5	1 632 611 637 937
KZA	KZB	KZA	150	4.1	938
RK	RK	RK	150	3.5	997

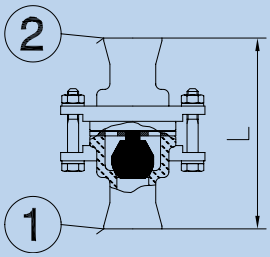
Spare parts for valves DN 50

bellows DN 50 PTFE	9 180 000 712
membrane DN 50	1 632 921 516 102

Non return valve DN 25

It is assembled from glass dosing pump parts(two glass bodies and teflon sealing cone with guiding plate). It can only be fitted in vertical position with feeding from the bottom as passage is closed by the cone weight. Connecting endings DN 25 RK are face ground so that hard packing can also be used for connection.

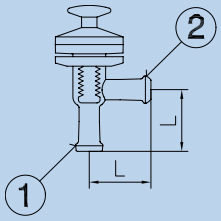
End type ①	②	③	L mm	Weight kg	Order number
straight valves					
RK	RK		130	1.1	426 928 041 918

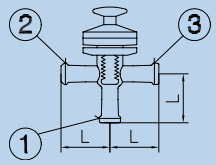


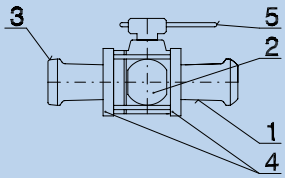
Regulating valves with manual control DN 25

For a continuous regulation of fluid flowrate, the glass bodies of valves are fitted with bored seats ∅ 8 mm. Closing teflon cones are of parabolic shape which is designed so that the dependence between the cone lift and fluid flowrate is linear. The cone is lifted manually with mechanical indication of position. Regulating valve should not be used as closing valve to prevent permanent deformation of the cone.

End type ①	②	③	L mm	Weight kg	Order number
angle valves					
KZB	KZA		100	1.0	1 632 611 637 891
valves with branch					
KZB	KZA	KZB	100	1.0	1 632 611 637 892



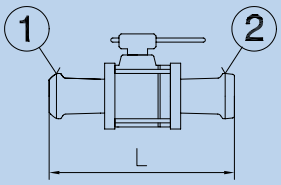




1 cock body with end
2 glass or teflon ball
3 connecting end
4 flanges
5 control lever

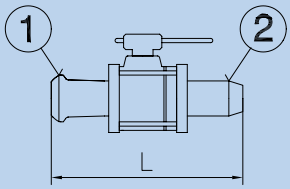
Ball cocks DN 25

Ball cocks are fittings appropriate for closing passage of fluids, including dirty fluids. Seats, spring-back seats, packing between glass bodies are made of teflon. Packing of the ball control stem is made of rubber or plastic. The valve is controlled manually by slewing the lever by 90°. Maximum operating pressure is 0.2 MPa, maximum operating temperature is 100 °C.



Straight-way ball cocks

Ending type ①	②	type jointing	L mm	Weight kg	Order number
KZB	KZA	M	175	0.7	1 632 611 048 827
KZA	KZB	V	175	0.7	840
RK	RK	M	175	0.7	826
RK	RK	V	175	0.7	841



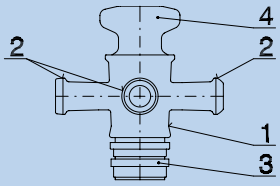
Discharge ball cocks

Ending type ①	②	type jointing	L mm	Weight kg	Order number
KZB	olive ∅ 33	M	175	0.7	1 632 611 048 825
KZB	olive ∅ 33	V	175	0.7	842
RK	olive ∅ 33	M	175	0.7	824
RK	olive ∅ 33	V	175	0.7	843

Mrubber resistant to swelling
V Viton

Cone cocks

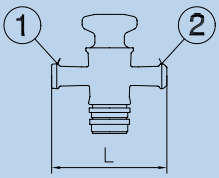
They are used in apparatus sets for closing passage of working substances. They are manually controlled by slewing the glass cone. Tightness of the cock is given by fine grinding of surface of the cone and glass body. The cone is pushed into the body by securing plastic nut. Maximum operating pressure is 0.15 MPa, maximum operating temperature is 120 °C.
To provide for a faultless function of the cock, the cone should be taken out from the body from time to time and smeared on its entire ground surface with an appropriate lubricant (silicone grease).



1 cock body
2 connecting end
3 securing nut
4 cone with knob

Straight-way passage cone cocks

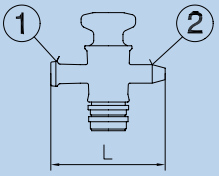
Serves to closing passage of medium in pipes and apparatus.



End type ①	②	③	L mm	Weight kg	Order number
Straight-way passage cocks DN 25					
KZB	KZA		200	0.8	1 632 613 641 201
RK	RK		200	0.8	200
Straight-way passage cocks DN 50					
KZB	KZA		250	1.7	1 632 613 641 501
RK	RK		250	1.7	500

Straight-way discharge cone cocks

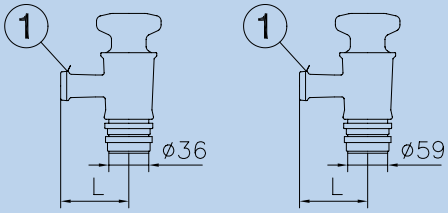
They are used for closing piping ends, piping discharges and branches, for closing discharge, venting and other openings in apparatus.



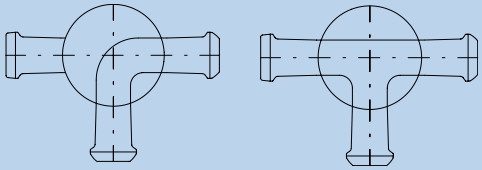
End type ①	②	③	L mm	Weight kg	Order number
Straight-way discharge cocks DN 25					
KZB	olive ∅ 22		200	0.8	1 632 613 642 202
RK	olive ∅ 22		200	0.8	207
Straight-way discharge cocks DN 50					
KZB	olive ∅ 33		250	1.7	1 632 613 642 502
RK	olive ∅ 33		250	1.7	507

Angle discharge cone cocks

Their function is the same as for the straight-way discharge cocks; they just change direction of discharge by 90 °C. They are not intended for connecting a hose.



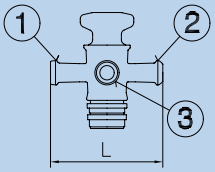
End type ①	②	③	L mm	Weight kg	Order number
Angle discharge cocks DN 25/ ∅ 36					
KZB			100	0.8	1 632 613 645 202
RK			100	0.8	207
Angle discharge cocks DN 50/ ∅ 59					
KZB			125	1.5	1 632 613 645 502
RK			125	1.5	507



Type "L" Type "T"

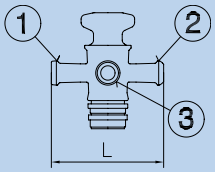
Three-way cone cocks

They are used to change direction of medium passage by slewing the cock cone. They are made in "L" and "T" types.



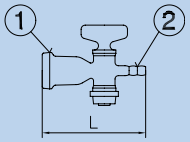
Three-way cone cocks with "L" boring

End type ①	②	③	L mm	Weight kg	Order number
Three-way cocks DN 25					
KZB	KZA	KZA	200	0.9	1 632 613 643 212
KZB	KZA	KZB	200	0.9	222
RK	RK	RK	200	0.9	272
Three-way cocks DN 50					
KZB	KZA	KZA	250	1.9	1 632 613 643 512
KZB	KZA	KZB	250	1.9	522
RK	RK	RK	250	1.9	572



Three-way cone cocks with "T" boring

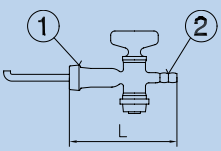
End type ①	②	③	L mm	Weight kg	Order number
Three-way cocks DN 25					
KZB	KZA	KZA	200	0.9	1 632 613 643 210
KZB	KZA	KZB	200	0.9	220
RK	RK	RK	200	0.9	270
Three-way cocks DN 50					
KZB	KZA	KZA	250	1.9	1 632 613 643 510
KZB	KZA	KZB	250	1.9	520
RK	RK	RK	250	1.9	570



Venting cone cocks

They are intended for controlled aeration of evacuated apparatus, e.g. after terminating the operation.

End type ①	②	③	L mm	Weight kg	Order number
Venting cocks DN 25					
KZB	olive ∅ 11		125	0.1	1 632 613 049 213

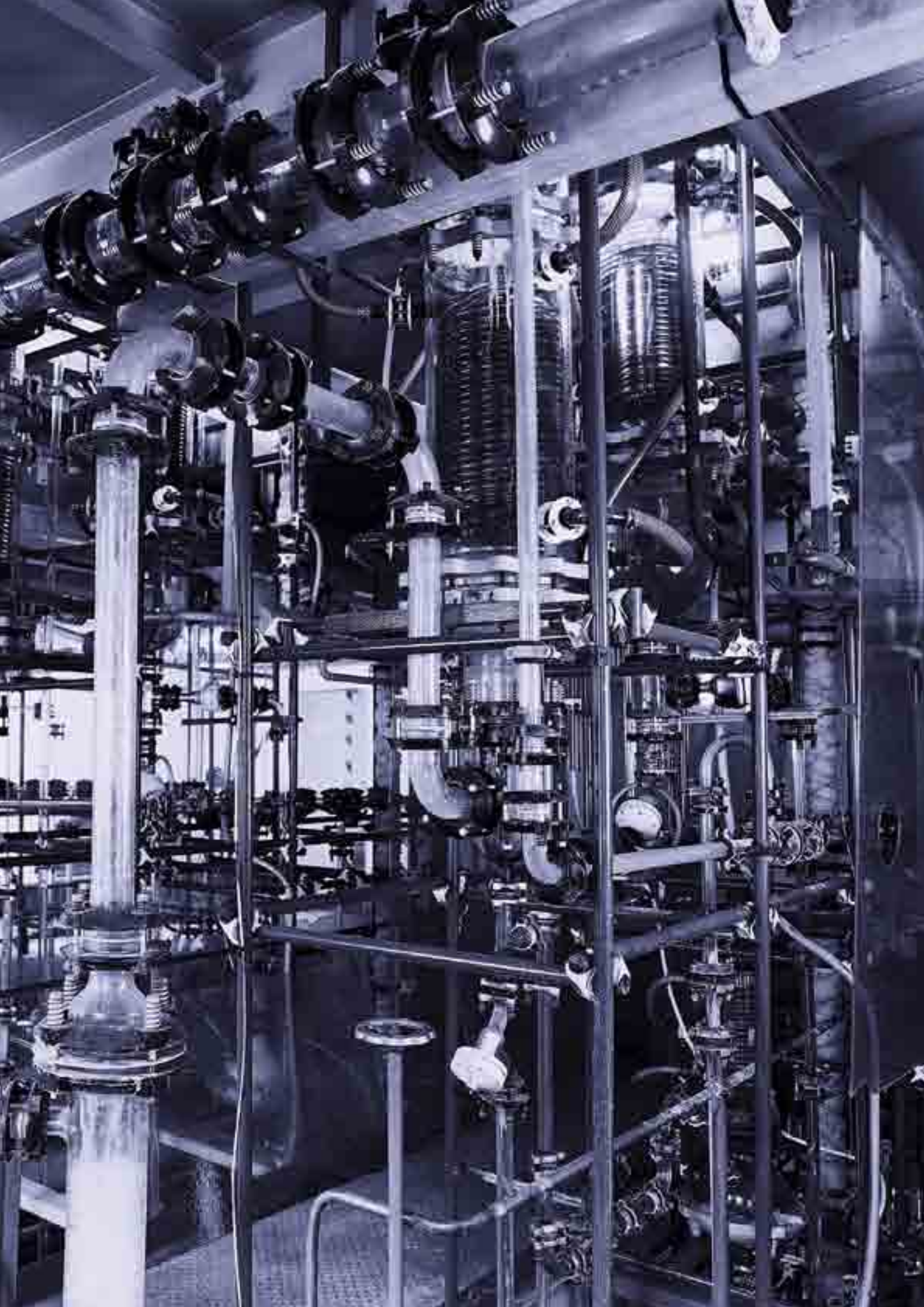


Cone cocks for aeration

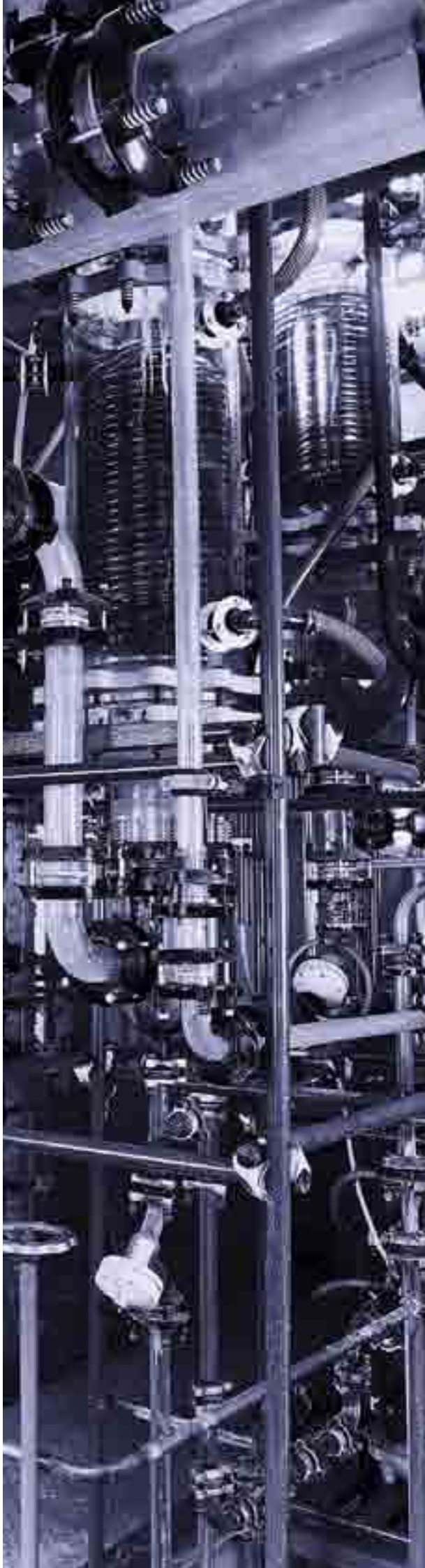
They are used to ensure permanent agitation of process solution in apparatus running under vacuum and to prevent bumping.

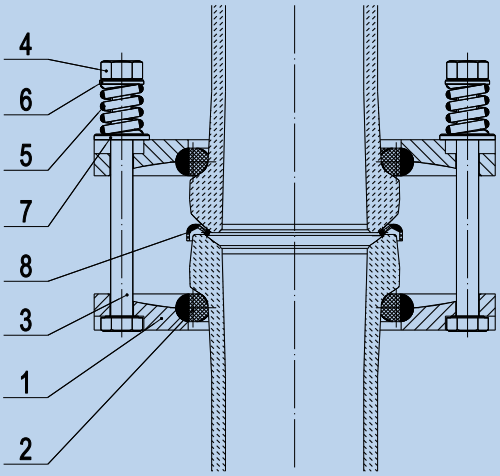
End type ①	②	③	L mm	Weight kg	Order number
Venting cocks DN 15					
KZB	olive ∅ 11		125	0.1	1 632 613 050 162

NOTES



4 JOINING AND PACKING ELEMENTS





1 Flange
2 Underlying segment (ring, bead or spiral)
3 Bolt
4 Nut
5 Spring (for PTFE)
6 Washer
7 Washer
8 Packing (not a part of joint)

4 JOINING AND PACKING ELEMENTS

Joining and connecting glass parts with ends KZ, PZ

Two types of flanges are used for jointing glass parts with endings KZ and PZ. The flanges are pulled over the glass end pieces. An underlying segment (ring, bead or spiral) is inserted into flanges and prevents a direct contact of flange with glass and also fills-in the pull-over space of the flange.
The flange joints are used for two basic groups of packing – soft (SA, rubber) and hard (PTFE). Complete joints are supplied without packing which should be ordered separately. Basic series of joints are composed of flanges made of surface-finished aluminium alloy. Temperature resistance of the flange joint depends on material of the underlying segment and packing.
Suitability of packing for certain media should be assessed on the basis of its corrosion resistance and exact knowledge of process conditions (temperature, pressure, concentration and/or other factors).
Flange joints with PTFE packing include springs providing for permanent tightness of the joint.
The flange joints marked with * enable connection to flanges according to ISO 2084. Dimensions of all types of flanges are listed in the paragraph "Dimensions of flanges".

Flange joints are suitable for connecting glass parts according to ČSN - ISO 13 8900 up to an operating overpressure of:

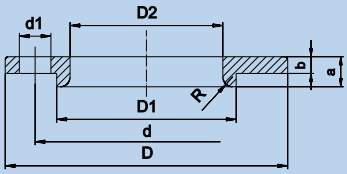
Nominal diameter	≤DN 50	DN 80	DN 100	DN 150	DN 200	DN 300	DN 400	DN 600
Max. overpressure (MPa)	0.4	0.3	0.2	0.2	0.1	0.1	0.07	0.07

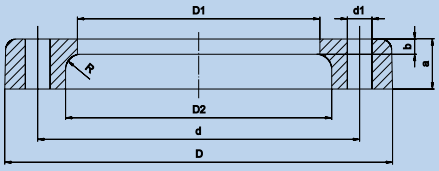
Bolts, nuts, washers and springs are only supplied as a part of the flange joint.

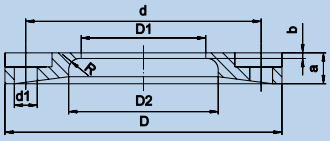
Name	Use	wire ∅	outer ∅	height	threads
Spring M 08	DN 15–DN 50	3.15	15.8	18.5	4.5
Spring M 10	DN 80–DN 600	4.5	20.0	23.3	4.5

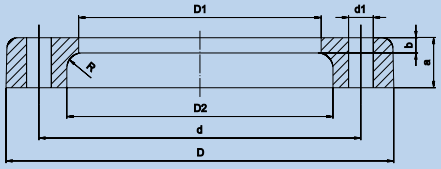
Flange joints KZ and PZ

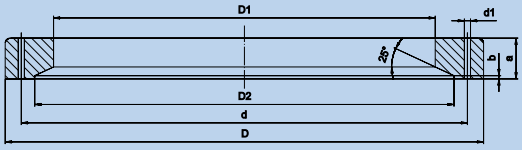
DN	Packing	Type of flange	Max. heat resistance	Underlying segment		Screw		Weight kg	Order number
				Type	Materiel	Pcs	Size		
15	soft	No. 6	110°C	spiral	17 246	3	M8 x 55	0.21	632 913 604 601
15	PTFE	No. 6	200°C	spiral	17 246	3	M8 x 75	0.2	104 601
25	soft	No. 1	110°C	ring	Spolamid	3	M8 x 60	0.21	632 913 603 102
25	PTFE	No. 1	120°C	ring	Spolamid	3	M8 x 80	0.2	104 102
*25	soft	No. 3	110°C	ring	Spolamid	4	M8 x 50	0.3	601 402
*25	PTFE	No. 3	120°C	ring	Spolamid	4	M8 x 70	0.3	103 402
25	PTFE	No. 6	200°C	spiral	17 246	4	M8 x 80	0.3	104 402
40	PTFE	No. 6	200 °C	spiral	17 246	4	M8 x 90	0.51	632 913 105 404
*50	soft	No. 3	110°C	ring	PPS	4	M8 x 70	0.61	632 913 603 405
*50	PTFE	No. 3	140°C	ring	PPS	4	M8 x 90	0.6	106 405
50	PTFE	No. 6	200°C	spiral	17 246	4	M8 x 100	0.8	105 405
80	soft	No. 4	110 °C	beads	Nylatron	4	M10 x 100	1.11	632 913 607 408
80	PTFE	No. 4	120 °C	beads	Nylatron	4	M10 x 120	1.2	108 408
80	PTFE	No. 4	200 °C	spiral	17 246	4	M10 x 120	1.3	908 408
100	soft	No. 4	110°C	beads	Nylatron	4	M10 x 100	1.31	632 913 607 410
100	PTFE	No. 4	120°C	beads	Nylatron	4	M10 x 120	1.5	108 410
100	PTFE	No. 4	200°C	beads	17 246	4	M10 x 120	1.7	908 410
150	soft	No. 4	110°C	beads	Nylatron	8	M10 x 110	2.41	632 913 607 415
150	PTFE	No. 4	120°C	beads	Nylatron	8	M10 x 130	2.5	108 415
150	PTFE	No. 4	200°C	spiral	17 246	8	M10 x 130	2.9	908 415
200	soft	No. 4	110°C	beads	Nylatron	8	M10 x 110	2.61	632 913 607 420
200	PTFE	No. 4	120°C	beads	Nylatron	8	M10 x 130	2.8	108 420
200	PTFE	No. 4	200°C	spiral	17 246	8	M10 x 130	3.2	908 420
*300	soft	No. 4	110°C	beads	Nylatron	12	M10 x 120	6.51	632 913 609 430
*300	PTFE	No. 4	120°C	beads	Nylatron	12	M10 x 140	6.8	110 430
*300	PTFE	No. 4	200°C	spiral	17 246	12	M10 x 140	7.5	910 430
400	soft	No. 5	110 °C		rubber	12	M10 x 150	8.91	632 913 612 240
400	PTFE	No. 5	120 °C		rubber	12	M10 x 170	9.2	119 240
600	soft	No. 5	110 °C		rubber	16	M10 x 170	17.71	632 913 616 260
600	PTFE	No. 5	120 °C		rubber	16	M10 x 190	18.3	115 260











Dimensions of flanges for endings KZ and PZ

Type no. 1

DN	D	D1	D2	d	d1	a	b	R	Weight kg	Number of holes
25	85	54	46	67	9.5	9	5	3	0.1	3

Type no. 6

DN	D	D2	D1	d	d1	a	b	R	Spiral	Weight kg	Number of holes
15	72	38	32	56	9	10	5	3.5	Ø7	0.1	3
25	92	53	45	72	9	13	5	4.5	Ø9	0.1	4
40	110	73	64	90	9	14	5	5	Ø10	0.2	4
50	132	89	76	110	9	18	5	6.5	Ø13	0.2	4

Type no. 3

DN	D	D1	D2	d	d1	a	b	R	Weight kg	Number of holes
25	100	45	54	85	8.5	11	2	4	0.1	4
50	144	77	88	125	8.5	13	3	6	0.2	4

The segment can be beads or stain-less spiral.

Type no. 4

DN	D	D1	D2	d	d1	a	b	R	Segment	Weight kg	Number of holes
80	180	113	124	150	11.5	23	7	7	Ø14	0.3	4
100	200	134	145	170	11.5	24	7	7	Ø14	0.4	4
150	255	186	197	225	11.5	26	8	7	Ø14	0.7	8
200	300	234	248	270	11.5	27	8	7	Ø14	0.8	8
300	440	340	355	400	11.5	30	10	8.5	Ø16	2.5	12

Type no. 5

DN	D	D1	D2	d	d1	a	b	R	Weight kg	Number of holes
400	525	435	470	495	11.5	38	3	–	3.7	12
600	760	655	685	710	11.5	48	4	–	8.0	16

Packing for glass endings KZ and PZ

1) soft shaped (for endings KZ)
   – SA – SARLINK 3260 – thermoplastic which can be used for most common applications and temperatures of up to 110°C
   – KX – polymeric material based on plastizol – until the stock is consumed

DN	Material	Order no.
15	KX	9 180 000 825
25	SA	678
50	SA	670

2) soft profiled (for endings PZ as well as KZ)

DN	Material	Order no.
80	SA	9 180 000 826
100	SA	671
150	SA	674
200	SA	676
300	SA	680
400	SA	668

3) hard (for endings PZ as well as KZ)
– PTFE (joints fitted with springs)

DN	Material	Order no.
15	PTFE	9 180 000 672
25	PTFE	677
40	PTFE	681
50	PTFE	669
80	PTFE	683
100	PTFE	667
150	PTFE	673
200	PTFE	675
300	PTFE	679
400	PTFE	682
600	PTFE	9 180 001 379

Connection of glass piping and apparatus KZ and PZ to non-glass piping and apparatus

The following conditions should be met in connecting glass piping and parts to endings from non-glass materials:
a) Non-glass parts should be properly fixed.
b) No stress or vibrations may be transferred to glass parts.
c) Matching surfaces of non-glass parts must be adapted for using packings commonly used for glass endings.
The flanges used for connecting glass piping and glass apparatus with KZ and PZ endings to non-glass piping and apparatus are parts of basic flange joints. For flanges marked with * in the par. "Flange joints", pitches and sizes of bolt holes are identical with values for metallic flanges according to ISO 2084.

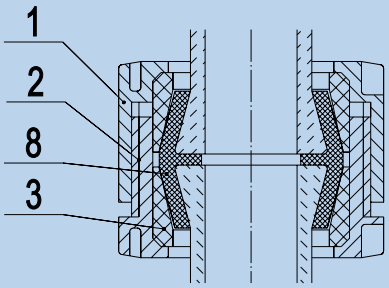
Connection of endings KZ to non-glass apparatus can be realized by:

a) Flange joint with compensating insert
b) Using the joint for spacing and adapter and particular adapter.

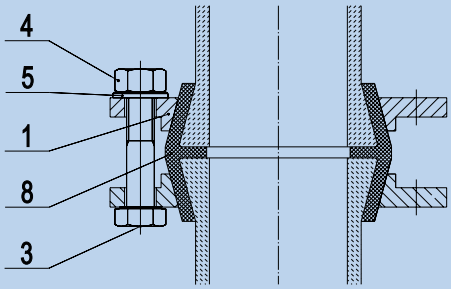
In case of corresponding diameters of holes and their pitches, a part of the joint for spacing and adapter can be used with particular adapter (see chapter "Flange joints" for spacing and adapter).
In case the dimensions do not correspond it is necessary that the customer ensures particular counter-flange with respect to significant dimensions (see chapter "Dimensions of flanges".

Connection of PZ endings to non-glass apparatus can be realized by:

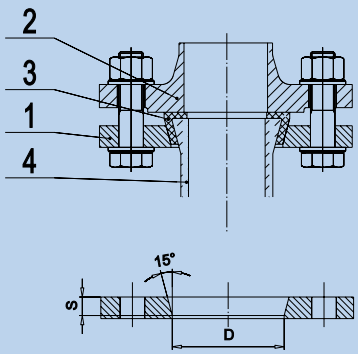
a) Flange joint with compensating insert
b) Using the flange joint
In case of corresponding diameters of holes and their pitches, a part of usual joint can be used (see chapter "Flange joints").
In case the dimensions do not correspond it is necessary that the customer ensures particular counter-flange with respect to significant dimensions (see chapter "Dimensions of flanges".



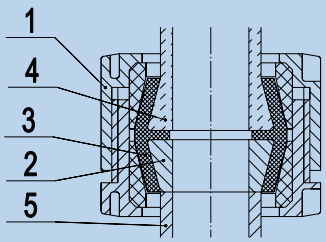
1 Nut
2 Bolt
3 Ring
8 Bushing
(not a part of joint)



1 Flange
3 Bolt
4 Nut
5 Washer
8 Bushing
(not a part of joint)



1 Counter-flange
2 Welding flange
3 Bushing cut to half
4 Glass ending RK



1 Pipe union or lange joint
2 Tapered cone
3 Bushing
4 Glass ending RK
5 Non-glass tube

Joining and connecting glass parts with endings RK

Two types of joins are used for jointing RK glass endings and their connecting to non-glass parts:

pipe union for DN 25 and 50
flange joint for DN 25 to 80

Both types of joints are suitable for joining and connecting glass parts up to operating an overpressure of:

up to DN 50 max. 0.4 MPa
for DN 80 max. 0.3 MPa

Pipe union RK

Pipe union is mainly used in less aggressive process conditions.

DN	Material of pipe union	Weight kg	Order no.
25	PPS-based plastic	0.1	9 180 000 651
25	Aluminium alloy with surface finish	0.2	821
50	Aluminium alloy with surface finish	0.4	652

Flange joint RK

The flange joint is used in a more aggressive environment where threads of pipe union could become corroded and the joint would become non-dismountable.

DN	Material of flanges	Bolt Pcs	Pitch Dimension	∅ (mm)	Weight kg	Order no.
25	Aluminium alloy with surface finish	3	M8 x 40	67	0.2	1 632 913 701 702
40	Aluminium alloy with surface finish	3	M8 x 50	85	0.3	702 704
50	Aluminium alloy with surface finish	3	M10 x 50	100	0.4	714 705
80	Aluminium alloy with surface finish	4	M10 x 65	140	1.0	715 708

Connection of glass piping and apparatus RK to non-glass piping and apparatus

When connecting glass piping and parts to endings from non-glass materials, the following basic conditions should be met:
a) Non-glass parts should be properly fixed.
b) No stress or vibrations may be transferred to glass parts.
c) Matching surfaces of non-glass parts should be adapted for using packings commonly used for glass endings RK.

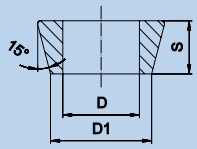
Connection can be realized by:

a) Flange joint with compensating insert.
b) Using counter-flange. In case the non-glass part is terminated with a welded flange, the customer must use a counter-flange with specified dimensions. Other dimensions (holes for bolts and their pitch diameter) should correspond to the relevant dimensions of the welded flange.

DN	D	S
25	43	9
40	61	12
50	73	12
80	105	15

c) Using a tapered cone. A tapered cone can be fixed (welded, stuck, soldered) on the non-glass part ending. This transition piece is provided by the customer from material which is, according to its corrosion properties, suitable for operating medium used.

Important dimensions of tapered cone



DN	D	D_1	S
25	25	34	17
40	40	50	18
50	50	60	21.5
80	80	90	30

Packing for glass endings RK

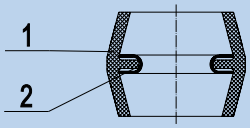
A bushing is used as a packing for pipe union and for flange joint.

DN	Bushing material	Order no.
25	SA	9 180 000 587
40	oil-resistant rubber	791
50	SA	586
80	oil-resistant rubber	792

– SA – SARLINK 3260 – thermoplastic which can be used for most common applications and temperatures up to 110°C.
– Oil-resistant rubber – resistant against swelling, in chemical industry for environment of mineral oils at operating temperatures –25°C to 120°C.

Pull-over for bushing

A pull-over can be used to increase the resistance of bushings for glass endings RK.

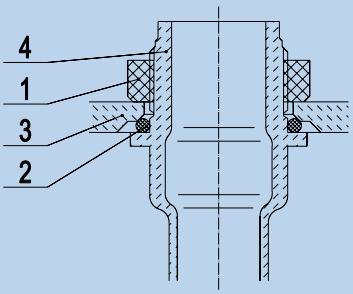


1 – Bushing
2 – Pull-over

DN	Pull-over material	Order no.
25	PTFE	9 180 000 793
40	PTFE	868
50	PTFE	794

Joining of glass parts to endings GL

Nut GL



1 Nut GL
2 Packing
3 Universal lid
4 Adapter with GL thread

GL	Nut material	Order no.
32	Polypropylene	9 180 000 538
50	Polypropylene	1 150

Packing for nut GL

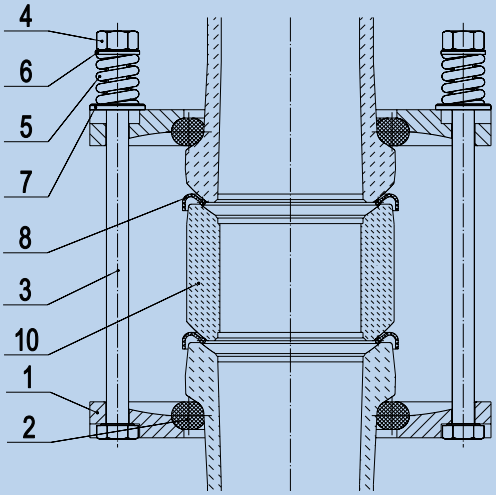
GL	Shape and material of packing	Order no.
32	O-ring, rubber	9 180 000 381
32	Ring from expanded PTFE	684
50	O-ring, rubber	382
50	Ring from expanded PTFE	685

Flange joints for spacing and adapter

a) Spacing is used for achieving required lengths in assembling piping lines and apparatus.
b) The adapter is used for changing type of ending of the same inner diameter (e.g. DN 25 KZ to DN 25 PZ).

Spacings and adapters are short glass tubes of inner diameters DN 25 to 100 (see chapter 2. "Piping parts" in the catalogue "Glass industrial apparatuses"). Spacings of inner diameters DN 25 and 50 are serial-made in 25 and 50 mm lengths, adapters in 25 mm length only. Spacings and adapters of inner diameters DN 80 and 100 are made in 50 mm length only.
Fitting of lengths of piping lines DN 150, 200 and 300 can be realized using glass tubes in the range of 100, 125, 150, 175, 200, 225, 250 and 300 mm. Tubes of 200 mm length PZ/KZA or PZ/KZB can be used as adapters (see chapter 2. "Piping parts" in the catalogue "Glass industrial apparatuses"). Regular flange joints are used for their jointing.
Flange joints for spacing and adapter with PTFE packing contain springs that provide for a permanent tightness of the joint.

The packing and spacing or adapter are not a part of the complete flange joint and should be ordered separately.



1 Flange
2 Underlying segment (ring, beads, spiral)
3 Bolt
4 Nut
5 Spring (for PTFE)
6 Washer
7 Washer
8 Packing (not a part of joint)
10 Spacing, adapter (not a part of joint)

Joint designation: DAX/Y – DNZ

X – type of packing (P – soft based on plastic or rubber, T – hard from PTFE)
Y – spacing or adapter length
Z – nominal inner diameter of piping

DN	Designation	Type of flanges	Max. thermal resistance	Underlying segment		Bolt		Weight kg	Order number
				Type	Material	Pcs	Dimension		
25	DAP/25–DN 25	No. 1	110 °C	ring	Spolamid	3	M8 x 90	0.3	1 632 913 206 402
	DAP/50–DN 25	No. 1	110°C	ring	Spolamid	3	M8 x 120	0.3	209 402
	DAP/25–DN 25	No. 3	110°C	ring	Spolamid	4	M8 x 80	0.3	206 602
	DAP/50–DN 25	No. 3	110°C	ring	Spolamid	4	M8 x 100	0.3	209 602
	DAT/25–DN 25	No. 1	120°C	ring	Spolamid	3	M8 x 110	0.3	210 402
	DAT/50–DN 25	No. 1	120°C	ring	Spolamid	3	M8 x 140	0.3	211 402
	DAT/25–DN 25	No. 3	120°C	ring	Spolamid	4	M8 x 100	0.3	210 602
	DAT/50–DN 25	No. 3	120°C	ring	Spolamid	4	M8 x 120	0.3	211 602
	DAT/25–DN 25	No. 6	200°C	spiral	17 246	4	M8 x 120	0.4	210 502
	DAT/50–DN 25	No. 6	200°C	spiral	17 246	4	M8 x 140	0.4	211 502
	DAT/16–DN 25	No. 6	200°C	spiral	17 246	4	M8 x 110	0.6	212 102
40	Spacings and adapters not made in DN 40								
50	DAP/25–DN 50	No. 3	110 °C	ring	PPS	4	M8 x 100	0.6	806 405
	DAP/50–DN 50	No. 3	110°C	ring	PPS	4	M8 x 120	0.7	821 405
	DAT/25–DN 50	No. 3	120°C	ring	PPS	4	M8 x 120	0.6	808 405
	DAT/50–DN 50	No. 3	120°C	ring	PPS	4	M8 x 140	0.7	811 405
	DAT/25–DN 50	No. 2	200°C	spiral	17 246	4	M8 x 130	0.9	808 505
	DAT/50–DN 50	No. 2	200°C	spiral	17 246	4	M8 x 150	0.9	811 505
	DAT/20–DN 50	No. 6	200°C	spiral	17 246	4	M8 x 130	0.7	212 105
80	DAP/50–DN 80	No. 4	110°C	beads	Nylatron	4	M10 x 150	1.1	211 408
	DAT/50–DN 80	No. 4	120°C	beads	Nylatron	4	M10 x 170	1.1	218 408
	DAT/50–DN 80	No. 4	200°C	spiral	17 246	4	M10 x 170	1.3	219 408
100	DAP/50–DN 100	No. 4	110°C	beads	Nylatron	4	M10 x 150	1.3	211 410
	DAT/50–DN 100	No. 4	120°C	beads	Nylatron	4	M10 x 170	1.3	218 410
	DAT/50–DN 100	No. 4	200°C	spiral	17 246	4	M10 x 170	1.6	219 410

Flange joints with compensation insert

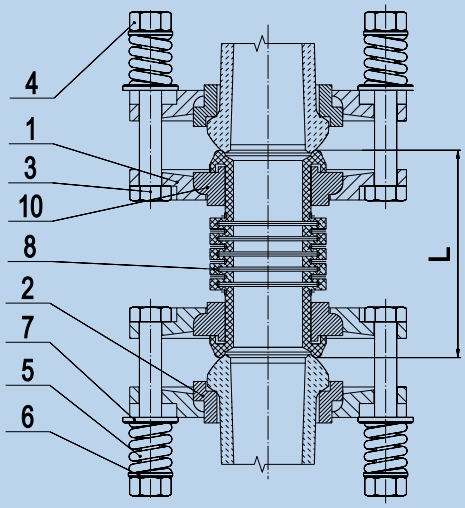
Use and application:
– for fitting longitudinal deviations arisen during assembling glass piping or due to temperature changes in operation.
– for removing or alleviating mechanical shocks transferred from non-glass aggregates and other vibrating equipment.

Joints with compensation inserts are designed so that they can be used for any combination of endings KZA, KZB and PZ and for connection to non-glass parts. Parameters of their endings and flanges (diameter of holes, their number and pitch diameter) should correspond to ISO 2084.

The joint is also suittable for an aggressive environment as the compensation insert is made of PTFE.

Under special circumstances of required sterile environment, the customer has to solve the question of health safety as bacteria cultures could grow in folds of the compensation joint.

Serial completion is carried out in case of joints with compensation insert for DN 25 and 50. Joints for other inner diameters and/or for endings RK can be ordered after consultation.



1 Flange
2 Underlying segment
3 Bolt
4 Nut
5 Spring (for PTFE)
6 Washer
7 Washer
8 Compensation insert
10 Matching ring of compensation joint

Flange joints with compensation insert up to 120 °C

Flange joint with pressure-free compensation insert (glass/glass)

DN	L	L min	L max	Underlying segment Type	Material	Bolt Pcs	Dimension	Order no.
25	75	65	85	ring	Spolamid	8	M8 x 60	1 632 913 303 402
50	100	90	110	ring	PPS	8	M8 x 80	405

Flange joint with compensation insert for elevated pressure (glass/glass)

DN	L	L min	L max	Underlying segment Type	Material	Bolt Pcs	Dimension	Order no.
25	75	70	80	ring	Spolamid	8	M8 x 60	1 632 913 303 302
50	100	95	105	ring	PPS	8	M8 x 80	305

Flange joints with compensation insert up to 200°C

Flange joint with pressure-free compensation insert (glass/glass)

DN	L	L min	L max	Underlying segment Type	Material	Bolt Pcs	Dimension	Order no.
25	75	65	85	spiral	17 246	8	M8 x 80	1 632 913 302 402
50	100	90	110	spiral	17 246	8	M8 x 90	405

Flange joint with compensation insert for elevated pressure (glass/glass)

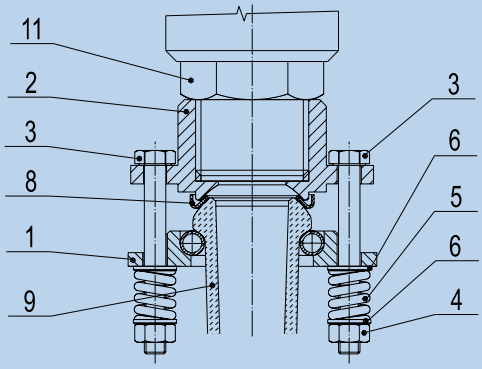
DN	L	L min	L max	Underlying segment Type	Material	Bolt Pcs	Dimension	Order no.
25	75	70	80	spiral	17 246	8	M8 x 80	1 632 913 302 302
40	100	95	105	spiral	17 246	8	M8 x 80	304
50	100	95	105	spiral	17 246	8	M8 x 90	305
80	100	95	105	spiral	17 246	8	M10 x 110	303 308
100	100	95	105	spiral	17 246	8	M10 x 110	310
150	125	120	130	spiral	17 246	16	M10 x 120	315

Compensation inserts

DN	Pressure-less Order number	Pressure Order number
25	9 180 000 705	9 180 000 706
40		707
50	708	709
80		702
100		703
150		704

	Temperature °C	Pressure MPa	Temperature °C	Pressure MPa
25–150	50	0.11	50	0.4
	100	0.08	100	0.3
	150	0.06	150	0.2

Permissible stress of glass parts is shown on page 4–1.



1 Flange
2 Valve flange
3 Bolt
4 Nut
5 Spring
6 Washer
8 PTFE packing
(not a part of joint)
9 Ending KZA
(not a part of joint)
10 Safety valve
(not a part of joint)

Flange joint DN 25 for safety valve

Safety valves are destined for protecting glass apparatus against damage by undesirable overpressure. Operating pressure is introduced under the valve cone. Relief of overpressure is given by adjustment of the spring on the cone lifting stem.

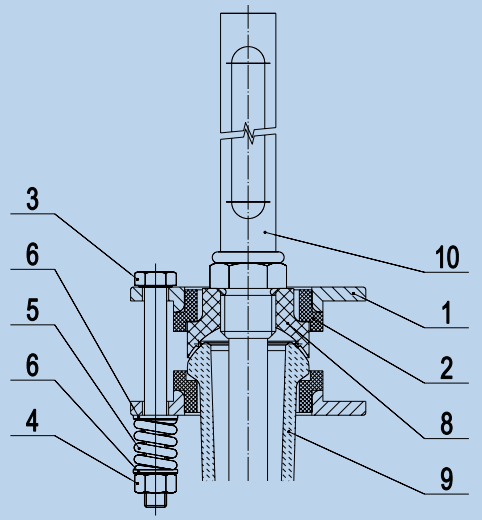
Name of part:	Weight kg	Pressure-less Order. no.	Pressure Order. no.
Flange joint DN25 for safety valve	**0.45**		**1 632 913 950 110**
Safety valve for overpressure 0.1 MPa – grey cast iron	2.8	9 180 000 879	54 769
Safety valve for overpressure 0.1 MPa – stainless steel	2.8	9 180 001 378	59 391

Connection of manometer and thermometer

Use and application:
For connecting manometers, glass and technical thermometers to a glass part with ending DN 25 KZA and DN 50 KZA.

Connection of technical manometers and thermometers is realized by means of flange joint and pertaining inserts from PTFE with thread M20 x 1.5. Connection of glass thermometers is realized by means of pipe union and relevant inserts.
Technical manometers and thermometers should be provided for by the customer itself. Glass thermometers are supplied by Kavalierglass.

Type of joint:	Weight kg	Order number
Flange joint for connecting technical thermometer or manometer to part DN 25 KZA	0.2	1 632 913 504 502
Flange joint for connecting technical thermometer or manometer to part DN 50 KZA	0.6	505 505
Pipe union for connecting glass thermometer to part DN 25 KZA	0.2	921 534 302



1 Flange
2 Underlying segment
3 Bolt
4 Nut
5 Spring
6 Washer
8 Insert
9 Ending KZA
(not a part of joint)
10 Thermometer or manometer
(not a part of joint)

Glass industrial thermometers with a range 0–200 °C and division by 2 °C

Type of thermometer	Order no.
Submerged length 100 mm	9 180 000 878
Submerged length 120 mm	657
Submerged length 170 mm	659
Submerged length 220 mm	660
Submerged length 400 mm	661
Submerged length 500 mm	662
Submerged length 600 mm	663

Quick joints

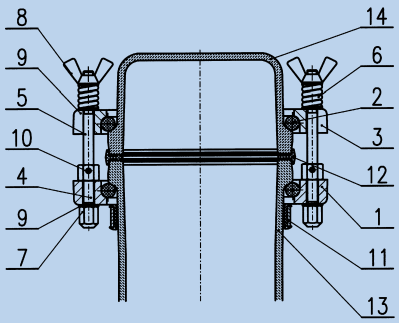
Quick joints DN 80 and DN 100 contain 2 underlying sleeves, quick joints DN 150 to 400 contain only 1 underlying sleeve. Upon request, quick joints for DN 25 to DN 50 can be made.

DN	Bolts	Weight kg	Order number
80	4	1.8	1 632 913 901 908
100	4	2.7	910
150	8	3.3	915
200	8	4.2	920
300	12	8.0	930
400	12	11.9	940

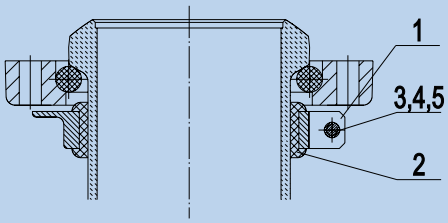
Underlying sleeve for quick joints (it is a part of quick joint)

Underlying sleeve with rubber packing is intended for holding-up the quick joint flange on a glass part in case of releasing the quick joint bolts.

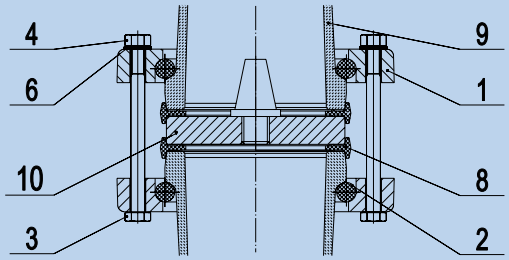
DN	Bolts	Weight kg	Order number
80	2	0.3	1 632 913 009 080
100	2	0.3	100
150	2	0.4	150
200	2	1.0	200
300	2	1.6	300
400	2	2.0	400



1 Flange
2 Underlying segment
3 Modified flange
4 Fixed bolt
5 Rotating bolt
6 Spring
7 Closed nut
8 Wing nut
9 Washer
10 Pin
11 Underlying sleeve
12 Packing (not a part of joint)
13 Ending (not a part of joint)
14 Blind (not a part of joint)



1 Flange
2 Underlying rubber
3 Bolt
4 Nut
5 Washer



1 Flange
2 Underlying segment
3 Bolt
4 Nut
6 Washer
8 Packing
(not a part of joint)
9 Ending PZ
(not a part of joint)
10 Nozzle bottom
(not a part of joint)

Flange joints for nozzle bottoms

DN	Underlying segment Type	Material	Pcs	Bolt Dimension	Weight kg	Order number
100	beads	Nylatron	4	M10 x 100	1.3	1 632 913 409 210
150	beads	Nylatron	8	M10 x 130	2.4	410 215
200	beads	Nylatron	8	M10 x 130	2.5	410 220
300	beads	Nylatron	12	M10 x 140	6.7	420 230
400		Rubber	12	M10 x 170	8.9	413 240

Nozzle bottoms

DN	Number of nozzles	Weight kg	Order number
100 complete	1	0.5	1 632 921 600 002
150 complete	3	0.7	003
200 complete	7	0.9	004
300 lower complete	19	1.4	005
300 upper complete	9	1.2	006
400 lower complete	23	2.3	007
400 upper complete	15	2.1	008

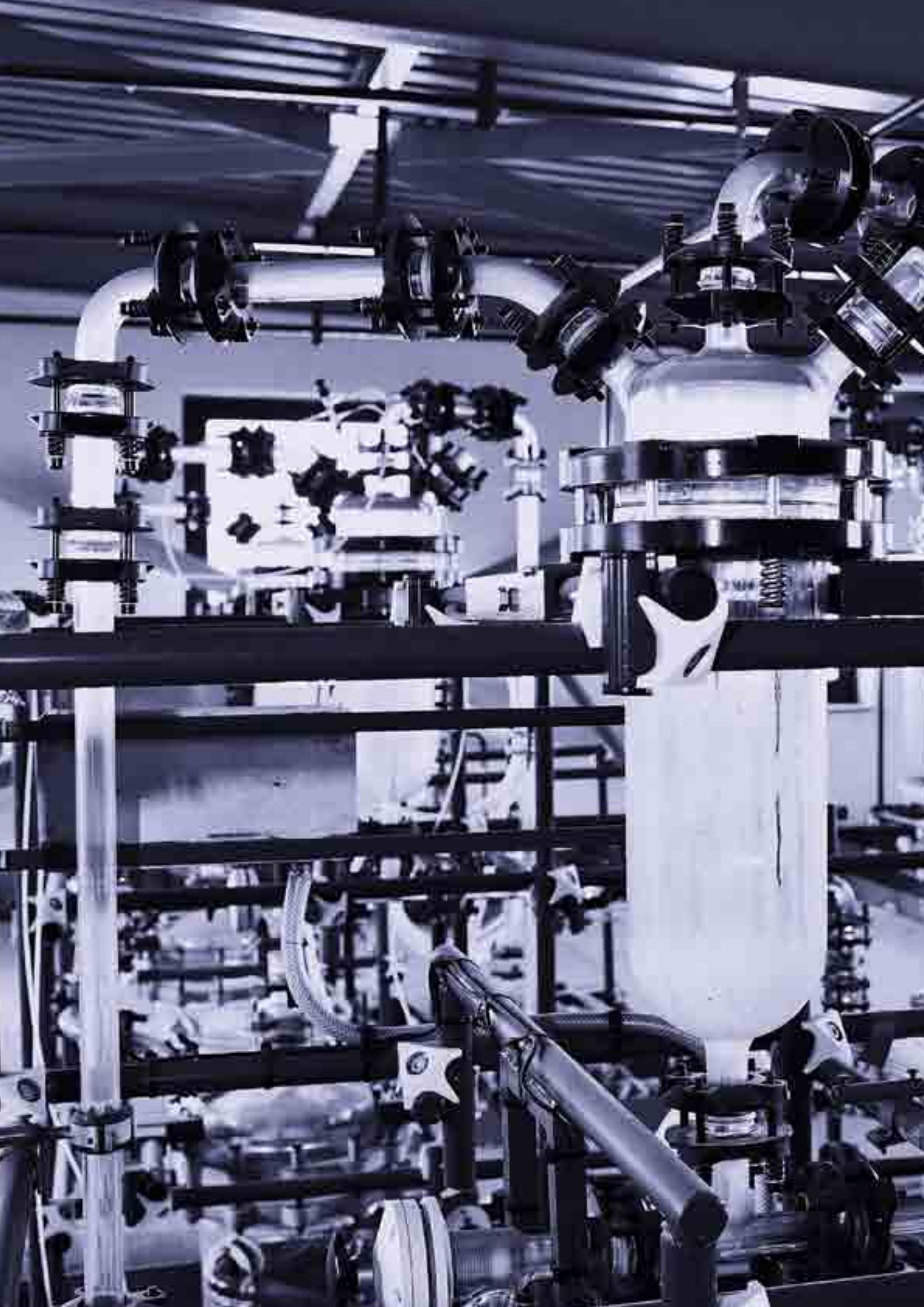
Table of corrosion resistance of PTFE

The material PTFE has a very good corrosion resistance 1 in any environment of alcohols, aldehydes, alkaline solutions, esters, ethers, ketones, aliphatic, aromatic and halogenated hydrocarbons, weak, strong and oxidizing acids at 20 °C and 50 °C.

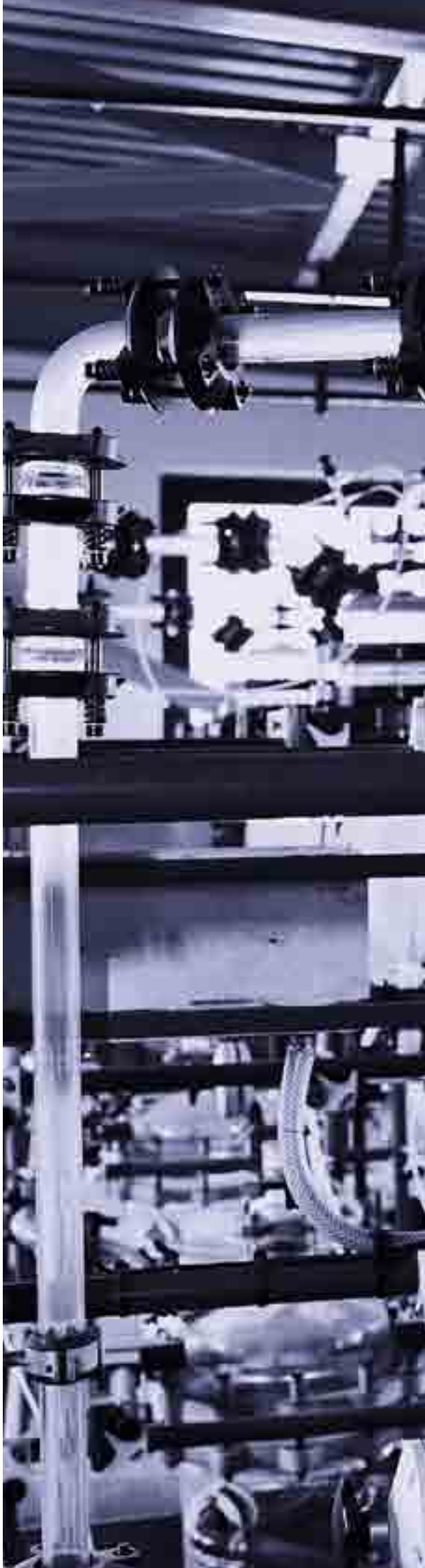
Table of corrosion resistance of Sarlink 3260

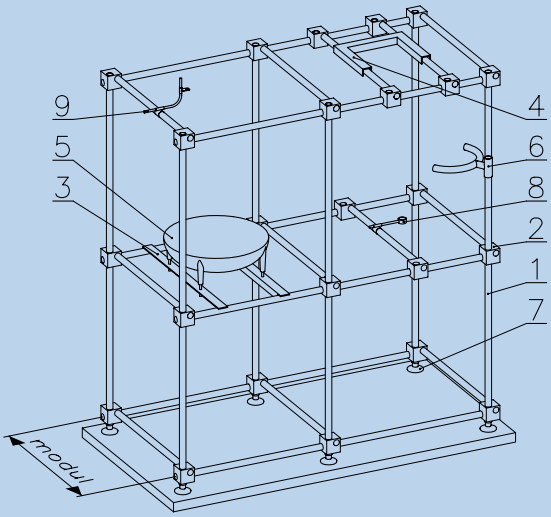
Environment	Temperature	Resistance
Water solutions		
Water	100°C	1
Sea water	23°C	1
Zinc chloride 10 %	23°C	1
Sodium chloride 15 %	23°C	1
Acids and bases		
Hydrochloric acid. 10 %	23°C	1
Potassium hydroxide 10 %	23°C	1
Sodium hydroxide 50 %	23°C	1
Sulphuric acid 98 %	23°C	1
Organic solvents		
Acetic acid	23°C	1
Acrylonitrile	23°C	1
Aniline	23°C	1
1-Butylacetate	23°C	1
Dethylether	23°C	1
Ethanol	23°C	1
Glycerine	23°C	1
n-Hexane	23°C	2
Methanol	23°C	1
Methylethylketone	23°C	2
Nitrobenzene	23°C	1
1-Propanol	23°C	1
Oils and petrols		
ASTM type 1 – oil	100°C	3
ASTM type 2 – oil	100°C	3
ASTM type 3 – oil	100°C	3
Iso-octane/toluene 70/30	23°C	3
Iso-octane/toluene 50/50	23°C	3
Brake fluid	23°C	1
Brake fluid	100°C	2
Glycol/water – 50/50	125°C	1

NOTES

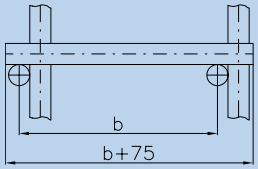


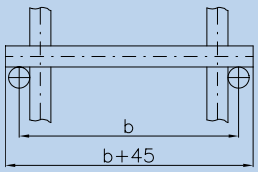
5 SUPPORTING AND FIXING PARTS

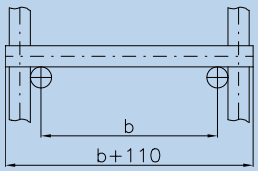




1 Structural tube / 32 x 2 mm
2 FH coupling
3 Supporting angle
4 Supporting frame
5 Supporting bed
6 Supporting stirrup
7 Adjustable base
8 Tube holder with sleeve
9 Universal holder of glass parts







5 SUPPORTING AND FIXING PARTS

Designation and use

Sectional supporting structures are destined for installing glass industrial apparatus up to diameter DN 600.
They are either produced for standard apparatus or for individual assemblies. They are intended for sheltered areas, exceptionally in an open area, however always on a prepared and solid floor.
Individual parts of the kit system compose rectangular rack structures which can be diagonally braced and are normally equipped with accessories necessary for assembling the apparatus. Recommended modules of structures are 600, 800 and 1000 mm.
Metal parts are surface-finished.

SUPPORTING PARTS AND ACCESSORIES

Structural tube

This is a basic structural element of the supporting structure.
Required number of pieces of tubes of respective lengths should be specified in the order.

Weight kg/m	Material	Order number
1.5	stainless steel ∅ 32 x 1.5 mm	1 632 912 001 011

Structural tube 75 mm

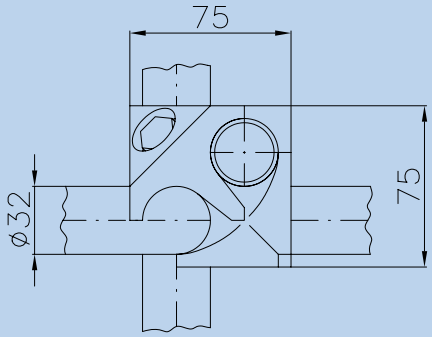
In cases when just two tubes come in touch in the FH coupling the third tube of 75 mm in length is used.

Weight kg	Material	Order number
0.1	stainless steel ∅ 32 x 1.5 mm	1 632 912 001 006

FH coupling

It provides for connection of structural tubes in three mutually perpendicular axles not crossing each other. The connection is secured by a single bolt M 10 with a nut. The recommended bolt torque is 35 Nm. Permissible connection load after tightening is 2000 N in any direction.

Weight kg	Material	Order number
0.30	Al alloy with surface finish	1 632 912 001 030
0.30	Al alloy with surface finish	031

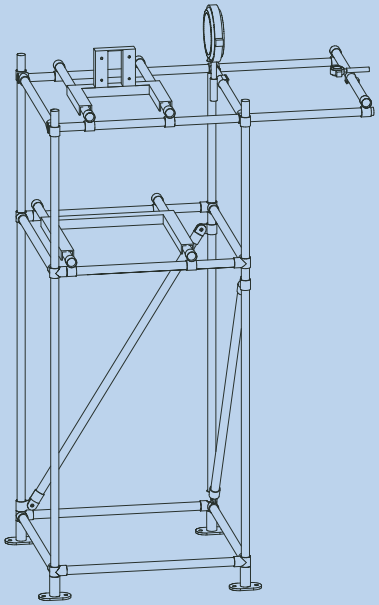


Special supporting structure

Upon request of the customer the sectional supporting structures for glass industrial apparatus can be assembled from galvanized supporting tubes and cast-iron couplings. The supporting structure can be delivered with supporting tubes of 1" or $1^1/_2$" .

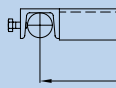
Weight kg/m	Material	Order number
2.44	tube 1" (∅ 33.7 x 3.2)	1 632 912 001 016
3.61	tube $1^1/_2$" (∅ 48.3 x 3.2)	1 632 912 001 017

Upon agreement with the vendor of the apparatus the supporting structure parts (frames, angles, holders, stirrups etc.) can be supplied with surface finish of galvanization.

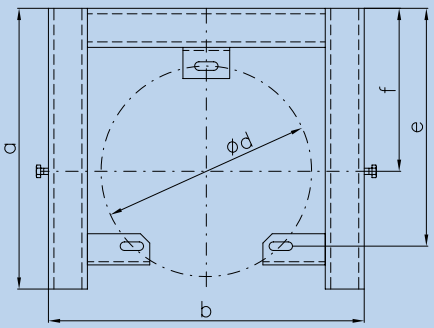


Supporting frames

They are made of profiled steel and serve for fixing glass parts in the structure by their flanges. They are laid horizontally on two parallel tubes. They are secured against shifting by bolts M 10 tightened to tubes. The apparatus flanges are fixed in three points by means of bolts M 10 which are part of supply.

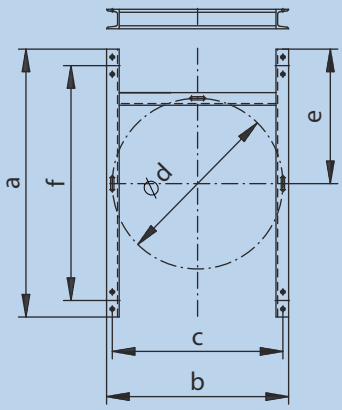


DN	Dimensions a mm	b mm	c mm	d mm	e mm	f mm	Weight kg
100	210	318	268	170	159	100	4.0
150	315	373	320	225	266	186	5.7
200	360	405	350	270	305	209	6.4
300	460	530	480	400	374	274	8.1
400	480	638	585	495	445	320	9.2
600	1110	748	710	710	555	1000	20.5

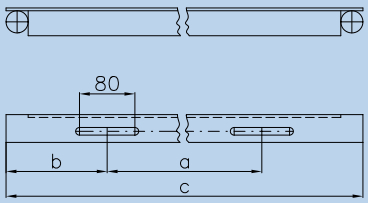


DN	Order numbers Material steel	Material stainless steel
100	1 632 912 004 100	1 632 912 004 105
150	150	155
200	200	205
300	300	305
400	400	405
600	600	1 632 912 004 600

Frame DN 600 is galvanized and beside bolts it consist of stirrups for fastening to supporting structure.



Supporting frame DN 600



Supporting angles

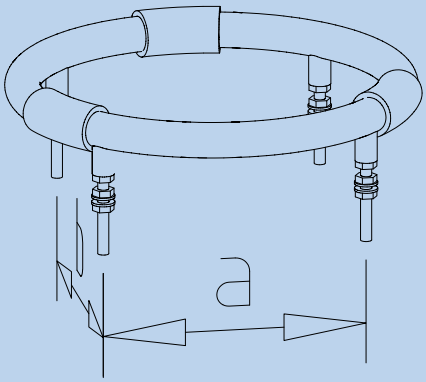
They are made of rolled L-profiles and serve for bearing supporting rings. They are laid horizontally, perpendicularly on tubes of the structure. The supporting angles are supplied for tube pitch 600 and 800 mm. Generally, they are not secured against shifting. Oval holes for bolts M 10 allow for motion range 80 mm.

For supporting ring	Span of supporting tubes	a mm	b mm	c mm	Weight kg
ring 340	600	210	211	632	1.80
ring 340	800	210	311	832	1.50
ring 470	800	270	281	832	1.9

Supporting rings	Span of supporting tubes	Order numbers Material steel	Material stainless steel
ring 340	600	1 632 912 003 120	1 632 912 003 125
ring 340	800	110	115
ring 470	800	010	015

Supporting rings

They serve for seating glass vessels (flasks, kettles). The ring itself is made of a steel or stainless tube. Matching surface is a thick-wall silicon tube. The rings are fastened to supporting angles with four bolts M 10 screwed in welded-on pieces of the ring bottom side.

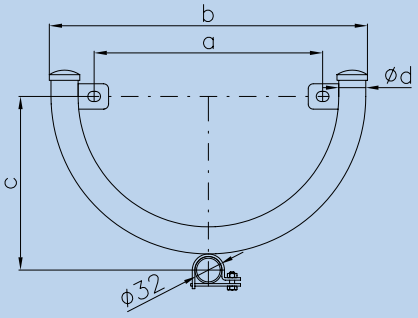


Ring for flasks and kettles	a mm	b mm	Weight kg
ring 340	210	270	1.7
ring 470	270	380	2.9

Ring for flasks and kettles	Order number material steel	stainless steel
ring 340	1 632 912 012 010	1 632 912 012 015
ring 470	1 632 912 012 020	1 632 912 012 025

Supporting stirrups

They serve for bearing or fixing flange joints of apparatus parts. The flanges are fixed on them in two opposite points. The support stirrup is fastened with a brace to a vertical tube of the supporting structure. They are supplied for inner diameters DN 80, 100, 150, 200, 300.

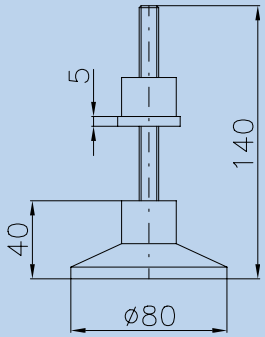


	Dimensions in mm				Weight
DN	a	b	c	d	kg
80	150	254	141	32	0.9
100	170	274	150	32	1.0
150	225	329	183	32	1.1
200	270	374	205	32	1.2
300	400	504	277	32	1.6

	Order numbers	
DN	Material steel	Material stainless steel
80	1 632 912 006 080	1 632 912 006 085
100	100	105
150	150	155
200	200	205
300	300	305

Adjustable base

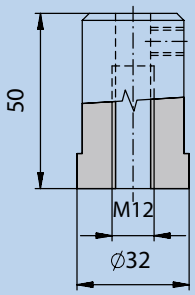
It enables the supporting structure to be adjusted in the horizontal position. It is made of plastic or metal, with a cemented steel bolt and adjustable nut.



Weight kg	Material	Order number ČJK
0.3 plastic	plastic	1 632 912 001 060
0.5 metal	metal	1 632 912 001 070

Revolving wheel insert

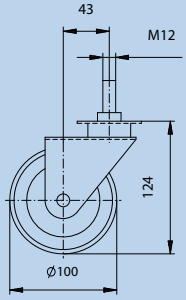
It is used for mobile supporting structures. It is a transition part made of stainless steel. It is fastened in the vertical tube of the supporting structure using M8 bolt and the revolving running wheel is screwed to it through M12 thread.



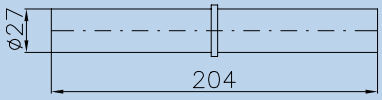
Weight kg	Order number
0.3	1 632 921 597 201

Revolving running wheel

The revolving running wheel is made of a deep-drawing sheet and has a zinc chromate surface finish. Vulcanized rubber hoop has a hardness of 70 – 80 °Sh. The wheels may be ordered in two designs: revolving and revolving with a brake. The brake is designed so that by stepping on it both axles are locked at the same time. The maximum load of a wheel is 150 kg.



Wheel type	Weight kg	Order code
revolving	1.1	9 110 014 251
revolving with a brake	1.3	252



Tube coupling

It is used in case that supporting tubes are to be connected (extended).

Weight kg	Material	Order number
0.12	stainless steel	1 632 912 001 055

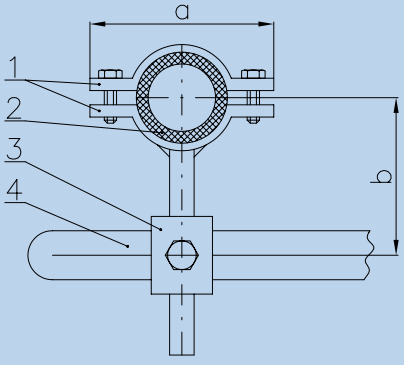
Plug into structural tube

It serves for closing internal space of supporting tubes to protect them against the effects of a corrosive environment. It is made of plastic.

Weight kg	Order number
0.01	9 180 000 723

Complete holders of glass piping

They are used for fixing horizontal glass piping DN 25 to DN 150. These holders are designed to be anchored in walls but, after modifications, they can be used for fastening to a steel structure (piping bridges, etc.).
Anchorage of the beam should be sufficiently firm and strong, in compact masonry or solid steel structures. Several holders of piping DN 25 to DN 80 but only one piping line DN 100 or DN 150 can be placed on standard beam fixed on one side.
Consoles and firm supports are used in case of vertical support. Standard sleeves and pipe holders are used for installing the piping in the apparatus supplied with standard sectional supporting structures.
The holder consists of a steel beam with a horizontally sliding element in which the vertically adjustable sleeve is placed. Securing in both directions of the adjustable holder is realized with a single bolt.
The holder sleeve is composed of two segments clamped by means of bolts. Two types of underlying rubber are used as insert; one type for DN 25 to DN 50 and the other type for DN 80 to DN 150. The rubber fills a gap between the sleeve and the glass tube.
Moving element enables vertical and horizontal shifting of the sleeve.
Holder beam is anchored in the wall and serves for fastening the moving element with the sleeve. It is made in three designs according to diameter and length of rod.
In some cases, standard elements for fastening the apparatus – supporting stirrup and supporting frame, can be used for fixing the piping DN 200 and DN 300.
The use of other parts (supports) for horizontal piping should be solved for individual specific cases according to the proposed layout of the piping line, its location in the process and auxiliary steel structures.



Complete holders for glass piping

Piping DN	a mm	b mm	Weight kg	Order number
DN 25	97	45–80	1.0	1 632 913 005 025
DN 40	117	60–100	0.8	040
DN 50	129	70–110	0.9	050
DN 80	199	92–130	2.9	080
DN 100	220	102–150	2.1	100
DN 150	272	128–170	3.5	150

Sleeves including bolts and underlying rubber (position 1 and 2)

Piping DN	Weight kg	Order number
DN 15	0.1	1 632 913 005 016
DN 25	0.3	026
DN 40	0.1	041
DN 50	0.2	051
DN 80	1.4	081
DN 100	0.6	101
DN 150	2.0	151

Moving element (position 3)

Piping DN	Weight kg	Order number
DN 15–50	0.1	1 632 913 005 501
DN 80–150	0.2	9 180 000 654

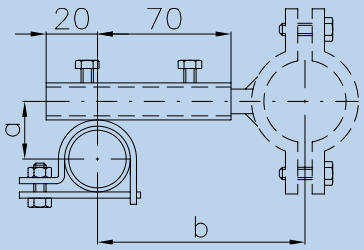
Beams (position 4)

Piping DN	length mm	∅ of rod mm	Weight kg	Order number
DN 15–50	350	12	0.6	9 180 000 550
DN 15–50	500	12	0.9	551
DN 80–150	500	15	1.3	552

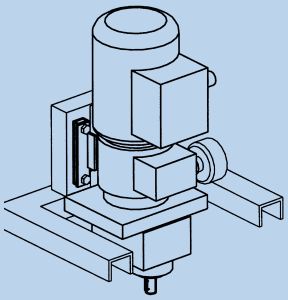
Pipe holder

It serves for fastening the sleeve of glass piping DN 15 to 150 to the structural tube ∅ 32 mm. It enables fixing the position of glass parts in a wide range. It is made in two sizes according to the diameter of the sleeve which is not included in the complete pipe holder and is to be ordered separately.

Piping DN	a mm	Weight kg	Order numbers	
			Material steel	Material stainless steel
15– 50	28	0.2	1 632 913 004 010	1 632 913 004 015
80–150	32	0.2	020	025



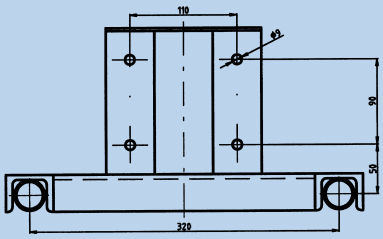
b – see table of complete holders



Complete variator

The assembly is composed of a variator, a variator holder, a pair of inserts under the variator, and jointing material.

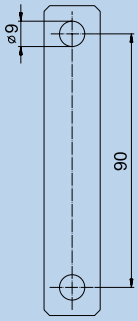
Weight kg	Material	Order number
25.0	steel	1 632 932 001 100



Variator holder

It is made of profiled steel and serves for fastening the variator to the supporting structure. It is mounted horizontally on two parallel tubes. Bolts M 10 tightened to supporting tubes secure the holder against shifting.

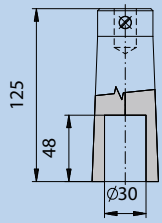
Weight kg	Material	Order number
6.4	steel	1 632 913 005 490
6.4	stainless steel	495



Insert under variator

It is used as a spacer for mounting the variator to the holder.

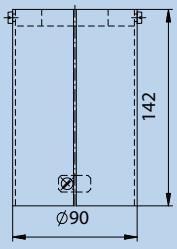
Weight kg	Material	Order number
0.3	steel	1 632 921 587 101
0.3	stainless steel	105



Variator coupling

It serves for transmitting torque between the drive and stirrer. It is made of aluminium alloy vulcanized with rubber, assuring flexible engagement upon switching the drive on. The stirrer is generally fixed with a hose clip in the coupling.

Weight kg	Order number
0.3	1 632 921 558 013



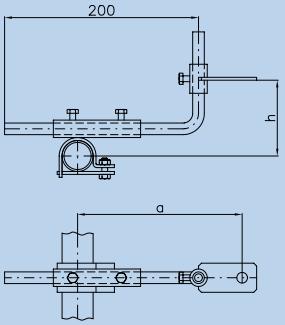
Variator coupling cover

The cover is mounted to the variator and prevents any contact and possible injury of the operator by the rotating variator coupling.

Weight kg	Order number
0.4	1 632 921 587 110

Universal holder of glass parts

It is used to fasten apparatus parts behind the flanges. The bolt of the glass apparatus flange is fixed in a hole ∅ 12 mm of the fastening footing which is sliding on the supporting rod so that its position can be adjusted in the required range.



a mm	h mm	Weight kg	Order numbers	
			Material steel	Material stainless steel
90–225	65–110	0.45	1 632 913 001 0	101 632 913 001 015

6 STANDARD ASSEMBLIES OF APPARATUS

6 STANDARD ASSEMBLIES OF APPARATUS

6.1 PROCESSING KETTLES

Designation and use

Complete process kettles are basic construction units of technological processes in chemical, pharmaceutical and food industries, in research, health care as well as in other branches. They enable to carry out chemical operations which require cooling or heating of liquids with constant stirring, measuring of temperature and feeding of liquid or solid components. The standard set is for use in a normal environment only.

Description and use

Kettles are glass vessels fitted with a lid with a stirrer, heating coil, driving unit and discharge/ closing element. They are supplied in sizes 30, 50 and 100 l in several variants and are designed for operation under normal pressure only. Standard assemblies are intended for a maximum operating temperature of 120°C which is limited by flange joint inserts. As a variant, it is possible to use other flange joints and thus increase maximum operating temperature up to 200 °C.

Processing kettle

The kettle has a neck DN 300 and bottom outlet with discharge valve DN 25 or bottom closure DN 50 with manual control.
Maximum permissible temperature shock during heating/cooling is 90 °C.
Maximum permissible overpressure in kettle is 0.07 MPa.

Stirrer drive

a) ELECTRIC DRIVE:
It consists of an electric motor 3 x 230/400 V, 50 Hz, 120 W with worm gearbox with a constant output speed of 112 r.p.m. It can be used in a normal environment only.
Order number of drive type "A" is 1 632 921 001 130.
Order number of drive type "B" is 1 632 921 600 043.
Standard assemblies with electric drive have only variant "A".
Variant "B" is just as a spare part for 100 l process kettles with electric drive.

b) ELECTRIC DRIVE WITH VARIATOR:
It consists of an electric motor 3 x 230/400 V, 50 Hz, 370 W with a front gearbox and variator with a constant output speed of 55–328 r.p.m. The drive can only be used in a normal environment. Manual speed control.
Order number of complete variator is 1 632 932 001 100.

Flat lid UNI

In addition to a central hole for the stirrer, four holes ∅ 54 mm are drilled in the lid which are occupied as follows:
– feeding tube for liquid inlet,
– thermometer pocket without thermometer,
– angle adapter 90 °C for venting,
– adapter with ground joint NZ 29/32 with feeding hopper and plug
2 holes ∅ 34 mm containing:
- heating coil which serves for heating or cooling process liquid. Maximum permissible overpressure in the heating coil is 0.15 MPa.

Plastic nuts for fastening adapters are located on the external side of the lid.

Stirrer

The glass bearing and glass propeller stirrer are used for electric drive. Glass propeller stirrers are also used for electric drive with a variator but, due to a high rotation speed, the bearings are from PTFE. The sense of rotation of the stirrer should be such that paddles of the stirrer drive liquid against the kettle bottom.

Supporting structure

The kettle is mounted on a supporting structure with module 800 mm. The structure is composed of stainless steel tubes Ø32 x 1.5 mm and connected with FH couplings. The kettle is suspended by its flange joint in the supporting frame DN 300. The supporting structure is fitted with adjustable bases for setting vertical position. Standard assemblies with kettles of capacity 100 l are completed with a supporting ring which is connected with the structure by means of supporting angles.

Complete process kettles with PTFE packing

with electric drive (Fig. 1)		
Volume l	with discharge valve DN 25 KZB/olive ∅ 33 mm	with bottom closure DN 50 KZA
30	1 632 611 623 311	1 632 611 623 310
50	511	510
100	921	910

with electric drive and variator (Fig. 2)		
Volume l	with discharge valve DN 25 KZB/olive ∅ 33 mm	with bottom closure DN 50 KZA
30	1 632 611 622 350	1 632 611 622 351
50	550	551
100	950	951

Non-standard assemblies

Standard assemblies are designed according to long-term experience of the traditional manufacturer of industrial apparatuses as universal and they meet the requirements of the majority of applications. If you belong among those whom our assortment of standard assemblies does not suit, we have prepared an offering list of process kettles operating at normal pressures for you. The offering list provides for several dozens of options. Additional variants can be obtained by changing the motor and constant speed of electric drive, by changing motor output and range of speeds of the electric motor with a variator. Specific requirements should be discussed with the manufacturer.

Accessories

Name	Material	Order number
Bearing for glass stirrer	PTFE	9 180 000 529
Bearing for metallic stirrer	PTFE	779
Bearing nut	PTFE	537
Stirrer clutch for variator	Al alloy and rubber	1632921558013
Stirrer clutch for variator	Steel and nylon	558 014
Securing ring of glass stirrer	Nylon	597 101
Securing ring of metallic stirrer	Stainless steel	597 102

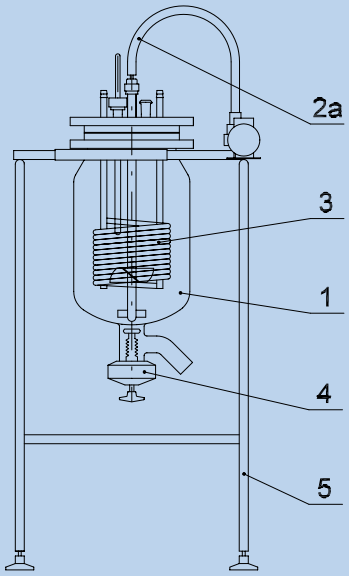


Fig. 1
Process kettle
with electric drive
and bottom closure

1 process kettle
2 electric drive
3 heating coil
4 closing element
5 supporting structure

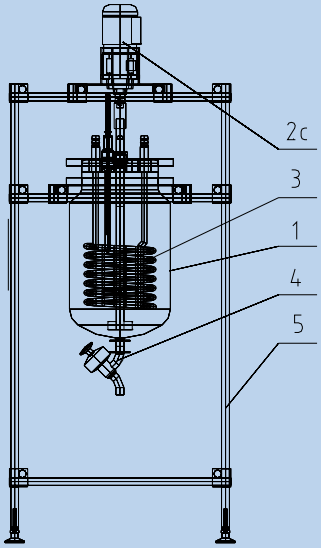


Fig. 2
Process kettle
with variator
and discharge valve

1 process kettle
2 electric motor with variator
3 heating coil
4 closing element
5 supporting structure

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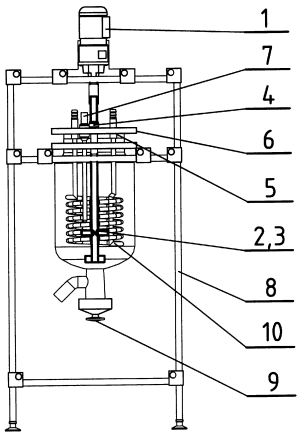
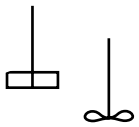
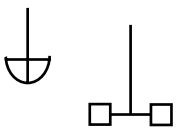
Offer List

for process kettles
and normal pressures



Volume	☐	30 l
	☐	50 l
	☐	100 l
Packing	☐	Sarlink 3260
	☐	PTFE
-éEnviron-	☒	Normal
ment		Explosive

Required range of temperatures:
Required speed:

		Standard offer	Extended offer
1.	Stirrer drive	☐ Electric motor 112 r.p.m. ☐ Electric motor with variator (EEx) 55 to 328 r.p.m.)	☐ Electric motor and frequency changer
2.	Stirrer	☐ Glass	☐ PTFE ☐ Metallic with Halar coat ☐ Stainless steel ☐ Titanium
3.	Stirrer shape	☐ Paddle ☐ Propeller 	☐ Anchor ☐ Turbine 
4.	Stirrer bearing	☐ Glass	☐ PTFE with filling
5.	Kettle lid	☐ Glass with 5 holes ∅54mm and 2 holes ∅34mm	☐ Glass with different number of holes ☐ Polypropylene
6.	Lid holes occupation	☐ 2x heating coil ☐ 1x feeding hopper ☐ 1x thermometer pocket ☐ 1x inlet tube ☐ 1x vapour exhaust ☐ 1x stirrer bearing	☐ According to customer's requirements
7	Thermometer	☐ Without	☐ Digital with converter
8.	Supporting structure	☐ Coated steel	☐ Stainless steel
9.	Closing valve	☐ Manual discharge valve ☐ Manual bottom closure	☐ Pneumatic discharge valve ☐ Pneumatic bottom closure
10.	Heating coil	☐ Glass	☐ Stainless steel

6.2 JACKETED KETTLES

Designation and use

Complete jacketed kettles find their application in the same fields as process kettles with a heating coil. In comparison with them, however, they have certain advantages in many processes.
They are suitable for carrying out chemical operations which require cooling or heating of liquids with constant stirring, measuring temperature and feeding liquid or solid components. The standard set is for use in a normal environment only.

Description and use

Kettles are glass vessels with a double jacket for heating or cooling liquid; they are fitted with a lid with a stirrer, a driving unit and discharge/closure element. They are supplied in sizes 15, 30, 50 and 100 l in several variants and are intended for operation under normal pressure only.

Standard assemblies are intended for a maximum operating temperature of 120°C which is limited by flange joint inserts. As a variant, it is possible to use other flange joints and thus increase the maximum operating temperature to 200°C.

Jacketed kettle

The kettle has a neck DN 300 and bottom outlet with discharge valve DN 25 or bottom closure DN 50 with manual control. Two necks DN 25 are led out from the side and bottom of the kettle double jacket. Shank pieces ∅ 33 mm are connected to them by means of flange joints for inlet and outlet of heating or cooling medium.
Maximum permissible temperature shock during heating/cooling is 90 °C.
Maximum permissible overpressure in a kettle is 0.07 MPa.

Stirrer drive

a) ELECTRIC DRIVE:
   It consists of an electric motor 3 x 230/400 V, 50 Hz, 120 W with worm gearbox with a constant output speed of 112 r.p.m. It can be used in a normal environment only.
   Order number of drive type "A" is 1 632 921 001 130.

b) ELECTRIC DRIVE WITH VARIATOR
   It consists of an electric motor 3 x 230/400 V, 50 Hz, 370 W with front gearbox and variator with a constant output speed of 55–328 r.p.m. The drive can only be used in a normal environment. Manual speed control.
   Order number of complete variator is 1 632 932 001 100.

Flat lid UNI

In addition to a central hole for the stirrer, six holes ∅ 54 mm are drilled in the lid which are occupied as follows:
– two turbulence stops for preventing rotation of liquid,
– feeding tube for liquid inlet,
– thermometer pocket without thermometer,
– angle adapter 90 °C for venting,
– adapter with ground joint NZ 29/32 with feeding hopper and plug,

Plastic nuts for fastening adapters are located on the external side of the lid.

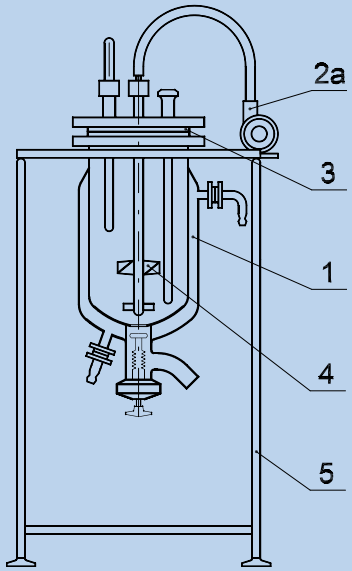


Fig. 1
Jacketed kettle
with electric drive
and bottom closure

1 jacketed kettle
2 electric drive
3 flat lid
4 glass stirrer
5supporting structure

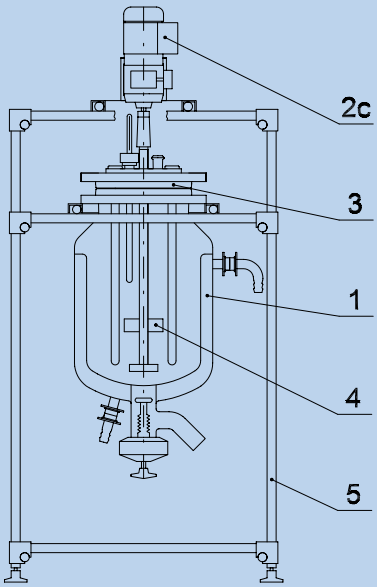


Fig. 2 Jacketed kettle
with variator
and bottom closure

1 jacketed kettle
2 electric motor with variator
3 flat lid
4 glass stirrer
5 supporting structure

Stirrer

The glass bearing and glass propeller stirrer are used for electric drive. Glass propeller stirrers are also used for electric drive with a variator but, due to a high rotation speed, the bearings are from PTFE. The sense of rotation of the stirrer should be such that paddles of the stirrer drive liquid against the kettle bottom.

Supporting structure

The kettle is mounted on a supporting structure with module 800 mm. The structure is composed of stainless steel tubes ∅32 x 1.5 mm and connected with FH couplings. The kettle is suspended by its flange joint in the supporting frame DN 300. The supporting structure is fitted with adjustable bases for setting vertical position. Standard assemblies with kettles of capacity 100 l are completed with a supporting ring which is connected with the structure by means of supporting angles.

Complete jacketed kettles with PTFE packing

with electric drive (Fig. 1)		
Volume l	with discharge valve DN 25 KZB/olive ∅ 33 mm	with bottom closure DN 50 KZA
15	1 632 611 620 167	1 632 611 620 166
30	317	316
50	517	516
100	917	916
with electric drive and variator (Fig. 2)		
Volume l	with discharge valve DN 25 KZB/olive ∅ 33 mm	with bottom closure DN 50 KZA
15	1 632 611 620 180	1 632 611 620 181
30	330	331
50	530	531
100	930	931

Non-standard assemblies

Standard assemblies are designed according to long-term experience of the traditional manufacturer of industrial apparatuses as universal and they meet the requirements of the majority of applications. If you belong among those whom our assortment of standard assemblies does not suit, we have prepared an offering list of jacketed kettles operating at normal pressures for you. The offering list provides for several dozens of options. Additional variants can be obtained by changing the motor and constant speed of electric drive, by changing motor output and range of speeds of the electric motor with a variator. Specific requirements should be discussed with the manufacturer.

Accessories

Name	Material	Order number
Bearing for glass stirrer	PTFE	9 180 000 529
Bearing for metallic stirrer	PTFE	779
Bearing nut	PTFE	537
Stirrer clutch for variator	Al alloy and rubber	1632921558013
Stirrer clutch for variator	Steel and nylon	558 014
Securing ring of glass stirrer	Nylon	597 101
Securing ring of metallic stirrer	Stainless steel	597 102

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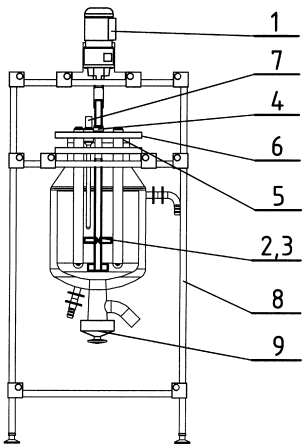
Offer List

for jacketed kettles
and normal pressures

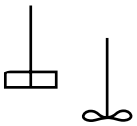
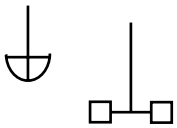


Volume
- ☐ 15 l
- ☐ 30 l
- ☐ 50 l
- ☐ 100 l

Packing
- ☐ Sarlink 3260
- ☐ PTFE

Environment
- ☒ Normal
- Explosive

Required range of temperatures:
Required speed:

		Standard offer	Extended offer
1.	Stirrer drive	☐ Electric motor 112 r.p.m. ☐ Electric motor with variator (EEx) 55 to 328 r.p.m.)	☐ Electric motor and frequency changer
2.	Stirrer	☐ Glass	☐ PTFE ☐ Metallic with Halar coat ☐ Stainless steel ☐ Titanium
3.	Stirrer shape	☐ Paddle ☐ Propeller 	☐ Anchor ☐ Turbine 
4.	Stirrer bearing	☐ Glass	☐ PTFE with filling
5.	Kettle lid	☐ Glass with 7 holes ∅54mm	☐ Glass with different number of holes ☐ Polypropylene
6.	Occupation of holes of lid DN 300	☐ 2x turbulence stops ☐ 1x feeding hopper ☐ 1x thermometer pocket ☐ 1x inlet tube ☐ 1x vapour exhaust ☐ 1x stirrer bearing	☐ According to customer's requirements
7	Thermometer	☐ Without	☐ Digital with converter
8.	Supporting structure	☐ Coated steel	☐ Stainless steel
9.	Closing valve	☐ Manual discharge valve ☐ Manual bottom dosure	☐ Pneumatic discharge valve ☐ Pneumatic bottom dosure

6.3 JACKETED KETTLES FOR VACUUM OPERATION

Designation and use

Complete jacketed kettles are suitable for chemical processes which require cooling or heating of liquids with constant stirring, measuring of temperature and feeding of liquid or solid components. The standard set is for use in a normal environment only.

Description and use

Kettles are glass vessels with a double jacket for heating or cooling liquid; they are fitted with a lid with a stirrer, a driving unit and discharge/closure element. They are supplied in sizes 15, 30, 50 and 100 l in one variant and are intended for operation from an overpressure of 0.7 bar to full vacuum.

Standard assemblies are intended for a maximum operating temperature of 120°C which is limited by flange joint inserts. As a variant, it is possible to use other flange joints and thus increase the maximum operating temperature up to 200°C.

Jacketed kettle

The kettle has neck DN 300 and bottom closure DN 50 with manual control. Two necks DN 25 are led out from the side and bottom of the kettle double jacket. Shank pieces ∅ 33 mm are connected to them by means of flange joints for inlet and outlet of heating or cooling medium.
Maximum permissible temperature shock during heating/cooling is 90 °C.
Maximum permissible overpressure in a kettle is 0.07 MPa.

Stirrer drive

ELECTRIC DRIVE WITH VARIATOR

It consists of an electric motor 3 x 230/400 V, 50 Hz, 370 W with front gear-box and variator with a constant output speed of 55–328 r.p.m. The drive can only be used in a normal environment. Manual speed control.
Order number of complete variator is 1 632 932 001 100.

Vaulted lid

In addition to a central hole DN 40 for stirrer, there are four endings in the lid:
– DN 25 with olive ∅22 m for connecting vacuum,
– DN 25 with thermometer pocket without thermometer,
– DN 25 with feeding tube,
– DN 100 with blind and quick joint.

Stirrer

Steel propeller stirrer with HALAR plastic coating is seated in ball bearings and fitted with a mechanical vacuum gland for a chemically aggressive environment. The sense of rotation of the stirrer should be such that paddles of the stirrer drive liquid against the kettle bottom.
Most chemicals cannot penetrate through HALAR (E-CTFE). From the chemicals tested only chlorinated solvents attack HALAR and this material cannot be used in the environment of molten alkaline metals or hot amines. With no attack, it is resistant against nitric acid, aqua regia and 50% sodium hydroxide.

Supporting structure

The kettle is mounted on a supporting structure with module 800 mm. The structure is composed of stainless steel tubes ∅32 x 1.5 mm and connected with FH couplings. The kettle is suspended by its flange joint in the supporting frame DN 300. The supporting structure is fitted with adjustable bases for setting vertical position. Standard assemblies with kettles of capacity 100 l are completed with a supporting ring which is connected to the structure by means of supporting angles.

Complete jacketed kettles with PTFE packing

Volume l	Order number
15	1 632 611 620 182
30	332
50	532
100	932

Non-standard assemblies

Standard assemblies are designed according to long-term experience of the traditional manufacturer of industrial apparatuses as universal and they meet the requirements of most applications. If you belong among those whom our assortment of standard assemblies does not suit, we have prepared an offering list of jacketed kettles operating under vacuum for you. The offering list provides for several dozens of options. Additional variants can be obtained by changing the motor and constant speed of electric drive, by changing motor output and range of speeds of the electric motor with a variator. Specific requirements should be discussed with the manufacturer.

Accessories

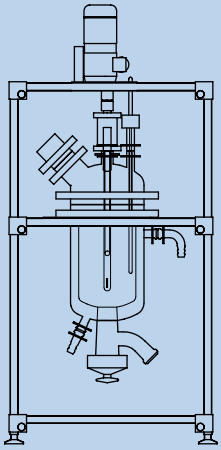
Name	Material	Order number
Stirrer clutch for variator	Al alloy and rubber	1 632 921 558 013
Stirrer clutch for variator	**Steel and nylon**	**014**

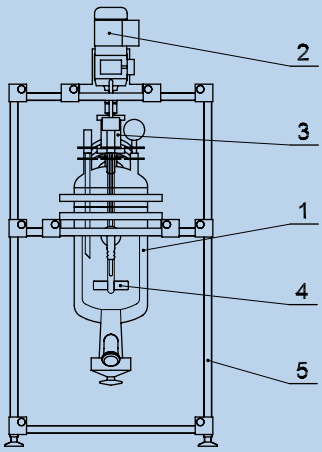
Drive for Ex environment

Drive for Ex environment is a universal drive unit consisting of an electric motor with a gearbox, flexible drive shaft, driving box and stirrer. It can be installed on glass kettles, flasks and duplicators with a volume of 15 to 200 l and/or reactors from different materials. The stirrer is driven by an electric motor with a gearbox with ATEX for an explosive environment. The motor output is 0.37 kW, the standard rotation range 36–180 r.p.m., rotation control by frequency changer that must be located in a normal environment.
In the drive box there are two lubricated ball bearings, the vacuum seal can be adjusted without the need of disassembly of the drive box, the flow rate of the cooling water through the seal is 3 l/min.
The stirrer is divided and can be replaced without the need to disassemble the drive box. Three rows of propellers made of conductive PTFE assure perfect interspersion and removal of the static charge from the inside of the kettle. The drive box with vacuum seal and stirrer is T5 certified.

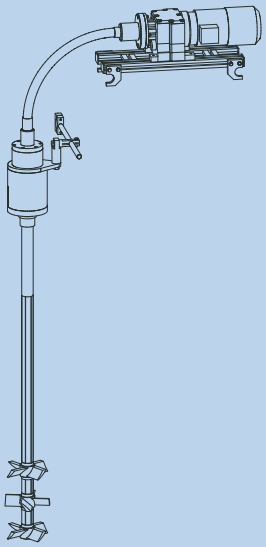
Weight kg	**Order number**
35	9 180 001 487

The drive can be sold separately or as part of glass industrial apparatus. The apparatus is designed so that it meets all the requirements for an explosive environment as requested by the customer.





1 Jacketed kettle with bottom closure
2 electric drive with variator
3 bushing with fastening of stirrer and mechanical gland
4 stirrer from stainless steel coated with material HALAR
5 supporting structure



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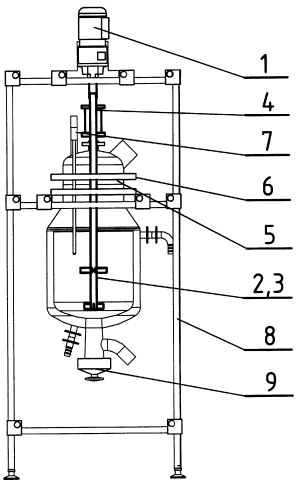
Offer List

for jacketed kettles
with vacuum operation

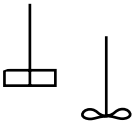
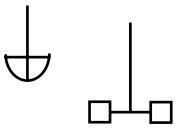


Volume
- ☐ 15 l
- ☐ 30 l
- ☐ 50 l
- ☐ 100 l

Packing
- ☐ Sarlink 3260
- ☐ PTFE

Environment
- ☒ Normal
- Explosive

Required range of temperatures:
Required speed:

		Standard offer	Extended offer
1.	Stirrer drive	☐ Electric motor with variator (EEx) 55 to 328 r.p.m.)	☐ Electric motor and frequency changer
2.	Stirrer	☐ Metallic with Halar coat	☐ PTFE ☐ Stainless steel ☐ Titanium
3.	Stirrer shape	☐ Paddle ☐ Propeller 	☐ Anchor ☐ Turbine 
4.	Stirrer bearing	Stirrer is seated in two ball bearings and has vacuum gland for chemically aggressive environment.	
5.	Kettle lid	Glass DN 300 with central neck DN 40 for stirrer. Max. occupation of lid with necks DN 100 and 80 inclined and DN 50 and 25 perpendicular.	
6.	Lid holes occupation of lid DN 300	☐ DN 100 vapour exhaust ☐ DN 25 inlet ☐ DN 25 vacuum ☐ DN 25 thermometer	According to customer's requirements
7	Thermometer	☐ Without	☐ Digital with converter
8.	Supporting structure	☐ Coated steel	☐ Stainless steel
9.	Closing valve	☐ Manual discharge valve ☐ Manual bottom dosure	☐ Pneumatic discharge valve ☐ Pneumatic bottom dosure

6.4 ION-EXCHANGE STATIONS

An ion-exchange station can be used for the treatment of water, the quality of which has been evaluated by the apparatus manufacturer or supplier on the basis of chemical analysis. Ion exchange takes place on macromolecular compounds - ion exchangers, the three-dimensional skeleton containing exchanging (active) groups. According to the properties of ion exchangers used and the form of regeneration, ion exchange stations can be divided into:

Softening

They are used for preparing water deprived of cations causing water hardness. Softened water does not form solid encrustations (so-called scale) and can be used for feeding heating boilers, filling cooling and air-conditioning systems, etc. They are made in the IZ–KP (doubled) design.

Demineralization

In these stations water can be, among others, deprived of the majority of dissolved mineral substances. Water treated in this way can be used for preparing pure chemicals, in health care and pharmaceutics, in electric and mechanical engineering, and many other branches.
They are manufactured in the following designs:

Designation	Description
ID PP	**Interrupted operation (single)**
ID KP	**Continuous operation (possibility of regenerating one section of ion exchangers while the other is in operation)**
MIX	**Station with mixed filter (single)**
S-MIX	**Separate mixed filter (double)**

Technological

These stations find application in trapping metals from splashing or waste waters, particularly in lead-free technologies of galvanizing plants, in cleaning solutions from undesirable admixtures, and verifying new technologies (regeneration of baths) etc.
They are made in the design – with three filters
– with four filters

Tailored assemblies

Basic constructional parts of ion exchange stations can be used for assembling a station according to the specific needs of the customer which will meet special requirements (for pharmaceutics, food industry, pure chemistry etc.) or will be intended for the treatment of water of higher salinity and other cases.

Description and design of ion exchange stations

Ion exchangers are filled in glass cylinders (filters) with nozzle bottoms and closed with glass lids. Nozzle bottoms prevent the cylinder filling from being washed out. Storage tanks of regenerating agents are 100 (200) litre vessels with lids. Water vacuum aspirator is used for pumping a concentrated regenerating agent.
Piping distributions of stations are assembled from glass piping DN 25 with glass closing valves controlled pneumatically or manually. The piping and valves enable setting of all necessary ways of process substances (operation, back flush, regeneration, etc.) in common types of stations from the central control panel (automatic control can be provided); in other types according to agreement when concluding the contract.
Control panels for controlling operation of ion exchange stations are generally equipped with mains supply 220 V/12 V DC, controllers for selection of operating regimes and signalling of status, diode or microprocessor logic, system of measuring conductivity, and solenoid valves 12 V DC. Compressed air 150 kPa is applied for transferring signals to controlled glass valves.
Supporting structures of ion exchange stations are built on the assembly site from stainless steel tubes ∅ 32 x 1.5 mm connected with FH couplings.

Function of respective ion exchange stations

Softening

Water flows from the filter head (filled with cation exchanger) and at the same time as an equivalent exchange of cations Ca++ and Mg++ (causing water hardness) for Na+ takes place on free bonds of the ion exchanger (soluble salts are formed). The quality of the treated water should be periodically tested for hardness by methods of unified chemical analysis of waters. After a certain time of passing the treated water, efficiency of ion exchange is reduced and available capacity of the ion exchanger is exhausted. It is renewed by regeneration with NaCl solution. When regeneration of one section is being carried out the station can deliver on outlet water treated by the other section.

Demineralization

Type ID

In the filter filled with a cation exchanger (in H+ form, HCl-regenerated), cations of dissolved mineral substances are exchanged for H+ ions and water treated in this way flowing through the cation exchange filter from head to bottom contains a mixture of free mineral acids and free CO_2 formed by HCO_3- ions decomposition. This mixture of free mineral acids is neutralized in the second step, i.e. by a strong basic anion exchanger in OH- form (OH- regenerated).

At the outlet from the anion exchange filter the water is continuously tested by a built-in conductivity meter. During operation, the conductivity value is under the lower set limit, after it is exceeded the outlet is closed and after the second set limit is exceeded the station closes its outlet valve and ion exchangers should be regenerated.

Type MIX

In the stations of type MIX, water is first treated by a strongly acidic cation exchanger and strongly basic anion exchanger (as in stations of type ID) and its outlet conductivity is continuously tested by a built-in conductivity meter. Water complying with requirements is transferred to the filter with a mixed bed (MIX-BED) where residues of dissolved mineral substances are removed. On the filter outlet it is again continuously tested by a built-in conductivity meter.

The filter with a mixed bed containing the mixture of a strongly acidic cation exchanger in H+ form and strongly basic anion exchanger in OH- form achieves the demineralization effect which is the same as that attained by multiple repetition of double-step demineralization. Thereby, water purity is attained which is close to the theoretical values of water specific conductivity.

Type S-MIX

It is used for treating waters with conductivity around 15 μS/cm, i.e. water treated by single-step demineralization, distilled water, condensates, etc.

Technological and tailored assemblies

Their design, choice of ion exchangers, operation and regeneration are carried out on the basis of the customer's requirements.

Basic technological data of ion exchange stations

Softening ion exchange stations

Type	Nominal flow rate m³/h	Filter DN mm	Built-up area mm x mm	Height mm	Weight kg	Filling exchanger l	Order number
IZ 250 KP	0.3	200	1700x3200	2700	700	2x32	1 632 611 305 000
IZ 500 KP	0.7	300	1900x3600	2700	1250	2x71	306 000
IZ 1500 KP	1.3	400	2100x3600	2700	1500	2x126	308 000

Demineralization ion exchange stations type ID-PP

Type	Nominal flow rate m³/h	Filter DN mm	Built-up area mm x mm	Height mm	Weight kg	Filling exchanger l	Order number
ID 250 PP	0.3	200	1700x3200	2700	700	32	1 632 611 350 000
ID 500 PP	0.7	300	1900x3600	2700	1250	71	351 000
ID 1500 PP	1.3	400	2100x3600	2700	1500	126	353 000

Demineralization ion exchange stations type ID-KP

Type	Nominal flow rate m³/h	Filter DN mm	Built-up area mm x mm	Height mm	Weight kg	Filling exchanger l	Filling ion-exchanger l	Order number
ID 250 KP	0.3	200	1700x5000	2700	1400	2x32	2x32	1 632 611 354 000
ID 500 KP	0.7	300	1900x5800	2700	2500	2x71	2x71	355 000
ID 1500 KP	1.3	400	2100x5800	2700	3000	2x126	2x126	357 000

Demineralization ion exchange stations type MIX-PP

Type	Nominal flow rate m³/h	Filter DN* mm	Built-up area mm x mm	Height mm	Weight kg	Filling exchanger l	Filling exchanger l	Cation mixed-bed	Anion mixed-bed	Order number
MIX 250 PP	0.3	200/200	1700x2700	2650	1100	32	32	11	22	1 632 611 329 000
MIX 500 PP	0.7	300/300	2200x3300	2700	2000	71	71	25	50	200
MIX 1500 PP	1.3	400/300	2200x3500	2800	2200	126	126	25	50	500

Demineralization ion exchange stations type S-MIX-KP

Type	Nominal flow rate m³/h	Filter DN mm	Built-up area mm x mm	Height mm	Weight kg	Cation mixed-bed l	Anion mixed-bed l	Order number
S-MIX 250 KP	0.3	200	3200x1500	2600	1600	2x11	2x22	1 632 611 330 000
S-MIX 500 KP	0.7	300	3600x1800	2700	2000	2x25	2x50	200

Technological ion exchange stations with four filters

Type	Nominal flow rate m³/h	Filter DN mm	Volume of filter l	Built-up area mm x mm	Height mm	Weight kg	Order number
DN 100	0.1	100	11.8	1400x2300	2700	700	1 632 611 360 100
DN 200	0.3	200	47	1400x2300	2700	1050	200
DN 300	0.7	300	106	1400x2300	2700	1500	300

Technological ion exchange stations with three filters

Type	Nominal flow rate m³/h	Filter DN mm	Volume of filter l	Built-up area mm x mm	Height mm	Weight kg	Order number
DN 100	0.1	100	11.8	1400x2300	2700	600	1 632 611 361 100
DN 200	0.3	200	47	1400x2300	2700	900	200
DN 300	0.7	300	106	1400x2300	2700	1200	300

Common technical data

Pressure of treated water upstream of reducing valve	[kPa]	190–580
Pressure of treated water downstream of reducing valve	[kPa]	150
Air pressure upstream of reducing station	[kPa]	190–580
Air pressure downstream of reducing station	[kPa]	150

Compressed air should be dry, free of mechanical impurities, water and oil. The stations are connected to electric mains supply 220 V / 50 Hz, 150 VA.
A description of control panels is given in the accompanying technical documentation for the specific ion exchange station.

Designation of ion exchange stations

Softening ion exchange stations
They are marked with the abbreviation IZ, rated output (litres of treated water per hour).

Demineralizing ion exchange stations
They are marked with the name abbreviation (ID, MIX, S-MIX), rated output and type of operation (KP – continuous operation or PP – interrupted operation).

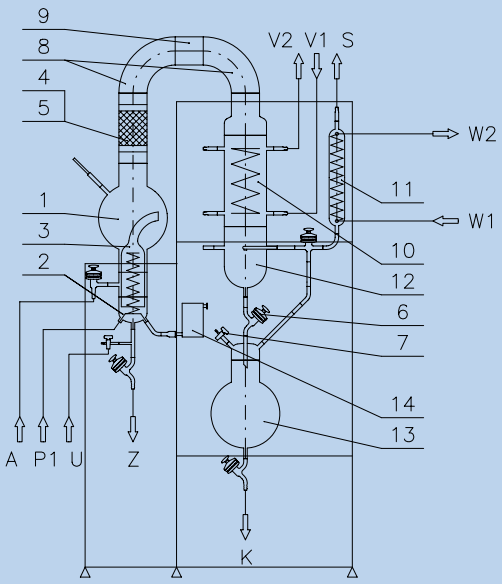
Technological ion exchange stations
They are marked with name and size of filters.

The following technical data are shown in a separate catalogue list.
– calculation of capacity of ion exchange filling
– volume of waste waters and their character
– consumption of chemicals for regeneration of ion exchangers
– building-up conditions

Instructions for operation, drawings of assemblies and lists of basic parts are in the accompanying technical documentation delivered with the station.

6.5 VACUUM CIRCULATING EVAPORATORS

Vacuum circulating evaporators are glass apparatuses destined for evaporating diluted solutions in food, chemical and pharmaceutical industries, e.g. in the production of fruit juices or biological materials. They can be used as distilling apparatus for the distillation of alcohols (mono-, bi- and trivalent), acetone and other solvents. The use of evaporators for other technological applications should be discussed with the manufacturer. Standard assemblies are manufactured in output series 5, 10, 25, 50 l/h – amount of water evaporated at pressure in the apparatus about 10 kPa and boiling temperature 45°C. For different media and different operating regimes outputs of evaporators are proportionally varied. The evaporator consists of a boiling and condensing part (branch) – see figure. Operation is started by opening the inlet valve of processed solution A. After the level reaches the upper edge of the boiler coil, the inlet A is closed and the inlet of vacuum S is opened. Simultaneously, the heating medium P1 is brought in by gradual opening and the inlet of cooling water to the cooler V1 and aftercooler W1 is opened. V2 and W2 are outlets (discharges) of cooling water. The processed solution is heated up in the boiling flask 1 by the submersion boiler coil 2 to the temperature of evaporation and is sprayed by the circulating adapter 3 on the boiling flask wall. Vapours are exhausted through fraction cylinder 4 with filling 5 which prevents drops from spirting into the condensing part. The cooled processed solution flows down the flask walls into the bottom part of the boiler, it is reheated and circulates in the boiling flask. Steady boil is attained by controlling the vacuum, steam supply, and inflow of the processed solution (in case of continuous operation). Possible bumping is prevented by controlled aeration through the cock U from the atmosphere. The condensate is collected in the flask connected to the vacuum. If the condensate is to be discharged through K , outlet 6 from the condensing branch should be closed and the vacuum in the flask should be eliminated by the aerating cock 7. During discharge, the condensate is collected in the lower part of this branch. In case of long-lasting disconnection of the collecting flask it is necessary to stop the operation of the whole apparatus to prevent risk of suctioning condensate into the vacuum part. When discharging condensate from the boiling flask Z, it is necessary to stop the operation of the evaporator, i.e. to close the steam inlet P1, vacuum inlet S, and to aerate the apparatus by the cock 7.



1 boiling flask
2 submersion boiler
3 circulating adapter
4 fraction cylinder
5 packing (Raschig rings)
6 valve
7 aeration cock
8 bend
9 cylinder
10 spiral cooler
11 aftercooler
12 vacuum receiver
13 collecting flask
14 continuous discharge of condensate

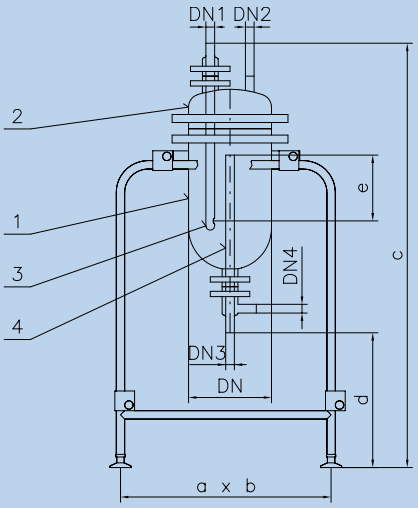
Basic technical requirements

– heating medium – mostly heating steam
  (overpressure max. 0.15 MPa, temperature up to 125°C),
– condensate removal – interconnection to collecting piping,
– cooling water (outlet to free space),
– vacuum supply,
– feeding of processed solution,
– offtake of concentrated solution,
– offtake of distillate.

In designing the space for construction and operation of the evaporator it is necessary to consider the conditions of labour safety with respect to the character of working substances (risk of fire, explosion, industrial harmful substances, etc.). It is assumed for this character of process that the apparatus is installed in such a way that all safety measures are observed for work in an explosive environment (in case that the process includes dangerous solvents in terms of fire). Vacuum circulating evaporators are supplied in standard design including the supporting structure.

Type	w x d x h (mm)	Order number soft packing	Order number hard packing (PTFE)
Evaporator 5 l/h	700 x 600 x 2500	1 632 611 641 505	1 632 611 641 506
Evaporator 10 l/h	1400 x 700 x 3300	510	511
Evaporator 25 l/h	2000 x 700 x 3700	525	526
Evaporator 50 l/h	2200 x 900 x 4600	550	551

Evaluation of process conditions of the evaporator, corrosion resistance of packing, possible supply of storage tanks, piping, I&C elements, and other technical details can be discussed. Spare parts can be ordered for respective types of evaporators.



6.6 VERTICAL SEPARATING VESSELS

Separating vessels are apparatuses serving for separating a mixture of two mutually immiscible liquids of different density. Their size is given by the of the kettle which is a basic part of the apparatus, i.e. 25, 50, 75, 100 and 150 l with soft or hard (PTFE) packing.

Main features:

– high chemical resistance of glass parts
– possibility of monitoring the process of liquids separation
– easy flushing and sterilization of glass surface

Use

The separating vessels can be used for all types of liquids with exceptions given by the range of resistance of SIMAX glass.

Apparatus description and function

The mixture of liquids flows through the neck DN 1 of the feeding tube (position 3). In kettle (position 1) both components of the mixture are separated. Lighter liquid flows off through the overflow tube (position 4) and is removed through the bottom neck DN 3. Heavier liquid flows through the lower tube of the kettle and is removed through the side neck DN 4. Correct function of the separating vessel depends, in addition to the properties of liquids, also on the mutual position of the feeding and overflow tubes and the phase boundary. As both tubes are fix-connected by flange joints it is necessary to set an appropriate position of the phase boundary by regulating the amount of inlet mixture. If quality of separation cannot be assured in this way a larger type of separating vessel should be chosen.

Technical data

– constant operating temperature – max. 120°C
(limited by packing and jointing material applied)
– max. temperature shock during heating – 120°C
– max. temperature shock during cooling – 90°C
– operating pressure – separating vessels are designed for operation at normal pressure.

Limiting operating conditions should always be discussed with the manufacturer!

Volume l	25	50	75	100	150
a mm	800	800	800	800	800
b mm	800	800	800	650	650
c mm	1 590	1890	2370	2150	2550
d mm	490	490	600	550	550
e mm	225	525	625	575	825
DN	300 PZ	300 PZ	300 PZ	400 PZ	400 PZ
	Weight of apparatus without supporting structure (kg)				
	14	18	20	25	33

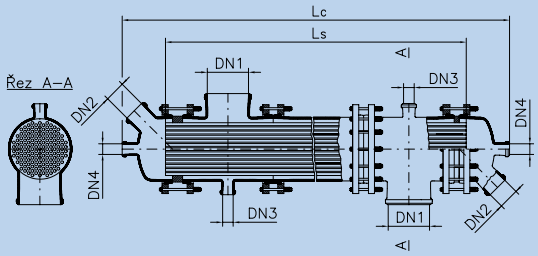
Volume l	Order numbers with soft packing	with hard packing
25	1 632 611 1 632 251	1 632 611 1 632 250
50	501	500
75	751	750
100	911	910
150	951	950

Endings DN1 – DN 4 have nominal diameter DN 25 KZ

6.7 TUBE-PLATE HEAT EXCHANGERS

Designation and use

Glass tube-plate heat exchangers serve for heat exchange between working substances flowing through separated tubes and inter-tubular space. They can be used not only in the chemical industry for a very aggressive environment but also in the food industry, and in industrial branches where metallic heat exchangers cannot be used.
Heat exchangers are designed for operation in a vertical position; however, using a special accessory, they can work in a position within the range from 0° to 90°.
Tube-plate heat exchangers are not designed for technologies using explosive gases, vapours and mixtures of solids and gases.



Technical description

The glass tube-plate heat exchanger is composed of a multi-part jacket (cylinder, "T"-pieces, lids) with particular joints, two tube-plates, transversal partition walls directing the flow of the working substance through the jacket, and a bundle of thin-wall glass heat-exchange tubes fixed with their ends in the tube-plates. Tilting of partition walls with respect to necks depends on the operating position.
Non-glass parts of heat exchangers (tube-plates, partition walls) are made of polytetrafluoroethylene (PTFE). Tubes are sealed in the tube-plates according to process conditions either with O-rings from Viton or with special lip sealing from PTFE.
The delivery includes a welded supporting structure, the mounting of which should always be discussed with the manufacturer.

Basic technical data

Nominal inner diameter of jacket	DN	mm	150	300
Heat exchanging area	F	m^2	4	20
Length of tube bundle	Ls	mm	2700	3150
Number of tubes in bundle		pc	37	151
Outer ∅ of tube bundle		mm	14	14
Tube wall thickness		mm	1.4	1.4
Total weight		kg	60	320
	DN1 KZA	mm	100	200
Nominal inner diameter	DN2 KZA	mm	50	100
of connecting endings	DN3 KZA	mm	50	50
	DN4 KZA	mm	50	50
Total length of heat exchanger	Lc	mm	3000	3580

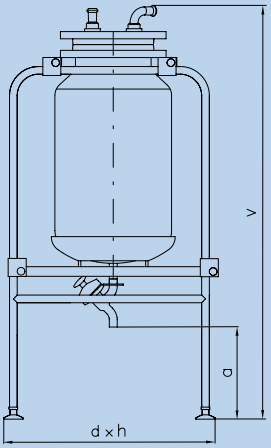
DN	Packing	Order number
DN 150 F = 4 m^2	O-ring, VITON	1 632 611 341 100
DN 300 F = 20 m^2	O-ring, VITON	150
DN 150 F = 4 m^2	lip, PTFE	102
DN 300 F = 20 m^2	lip, PTFE	152

Process parameters

Permissible operating temperature in tubes and jacket		max. 120°C
Temperature shock on cooling		max. 60°C
Permissible operating pressure in jacket at permissible operating temperature	for DN 150	overpressure 0.2 MPa
	for DN 300	overpressure 0.05 MPa

In case of use in a temperature range of 0 °C to –30 °C, this fact should be mentioned in the order. These heat exchangers cannot be used for temperatures below –30 °C.

Limiting operating conditions should always be discussed with the manufacturer!



6.8 STORAGE TANKS

Storage tanks are designed for the storage of aggressive liquids or liquids, the purity and quality of which should be preserved.

Main features:

a) high chemical and heat resistance of glass parts
b) good visual control of level of stored liquid and orientation scale for dosage
c) easy flushing and possibility of sterilization.

Basic technical data

The storage tanks are designed for operation at atmospheric pressure. Conditions of use are given by the temperature and corrosion resistance of glass parts, packing and joints.

Storage tanks of volume 5–200 litres

They are composed of graduated kettles, the lid has two necks DN 25 for filling and deaeration. The storage tank discharge is fitted with ball cock DN 25 or straight valve DN 25 with manual control. They are supplied with or without supporting structure.

Storage tanks with supporting structure

Volume	Dimension	Weight	Order numbers cock	cock
litres	l x d x h (mm)	kg	KZ	RK
5	255 x 255 x 850	6.5	1 632 611 692 051	1 632 611 692 053
10	300 x 300 x 900	8.0	101	103
30	440 x 440 x 1000	15.0	693 301	693 303
50	440 x 440 x 1100	19.0	501	503
100	486 x 486 x 1300	23.0	911	913
150	486 x 486 x 1525	30.0	921	923
200	486 x 486 x 1750	40.0	931	933

Volume	Dimension	Weight	Order numbers valve	valve
litres	l x d x h (mm)	kg	KZ	RK
5	255 x 255 x 900	6.5	1 632 611 692 052	1 632 611 692 054
10	300 x 300 x 950	8.0	102	104
30	440 x 440 x 1050	15.0	693 302	693 304
50	440 x 440 x 1150	19.0	502	504
100	486 x 486 x 1350	23.0	912	914
150	486 x 486 x 1575	30.0	922	924
200	486 x 486 x 1800	40.0	932	934

Storage tanks with stirrups for suspension

Volume	Dimension	Weight	Order numbers cock	cock
litres	l x d x h (mm)	kg	KZ	RK
5	310 x 303 x 850	7.0	1 632 611 692 055	1 632 611 692 057
10	355 x 374 x 900	8.5	105	107

Volume	Dimension	Weight	Order numbers valve	valve
litres	l x d x h (mm)	kg	KZ	RK
5	310 x 303 x 900	7.0	1 632 611 692 056	1 632 611 692 058
10	355 x 374 x 950	8.5	106	108

Storage tanks with supporting structure

Volume	Dimension	Weight	a	Order numbers cock	cock
litres	l x d x h (mm)	kg	mm	KZ	RK
30	875 x 875 x 1450	38.0	430	1 632 611 693 305	1 632 611 693 307
50	875 x 875 x 1750	42.0	630	505	507
100	875 x 875 x 1800	47.0	480	915	917
150	875 x 875 x 2100	82.0	550	925	927
200	875 x 875 x 2300	94.0	530	935	937

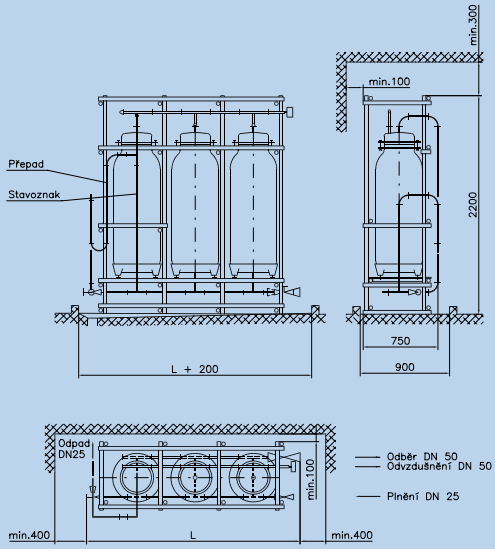
Volume	Dimension	Weight	a	Order numbers valve	valve
litres	l x d x h (mm)	kg	mm	KZ	RK
30	875 x 875 x 1450	38.0	380	1 632 611 693 306	1 632 611 693 308
50	875 x 875 x 1750	42.0	580	506	508
100	875 x 875 x 1800	47.0	430	916	918
150	875 x 875 x 2100	82.0	500	926	928
200	875 x 875 x 2300	94.0	480	936	938

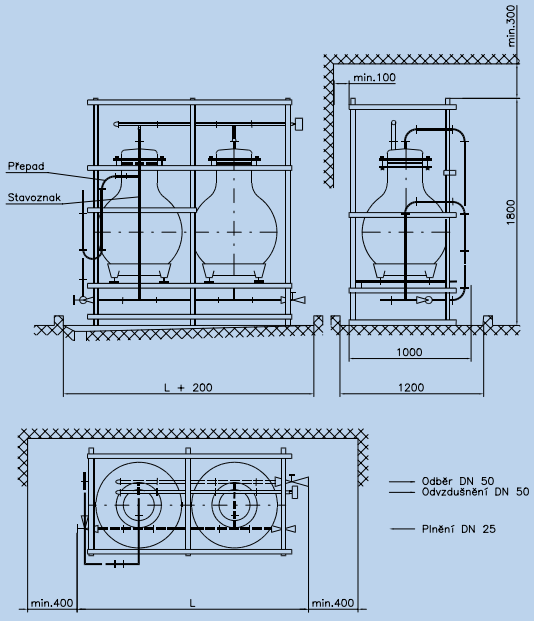
Storage tanks of volume 200–1,000 litres

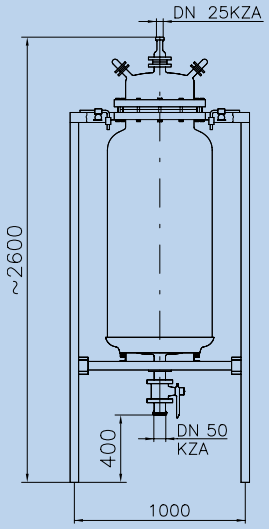
They are composed of glass cylindrical kettles or flasks with 200 l capacity. Bottom discharges of vessels are interconnected by glass piping DN 50. The piping DN 25 serves as a level gauge to which a level sensor alarm can be fitted.

Type	Volume litres	End-ing type	Pack-ing type	Dimension d x h x v mm	Weight kg	Order number
IV 200	200	RK	bushing	900 x 750 x 2200	150	1 632 611 691 200
		KZ	hard			201
		KZ	soft			202
IV 400	400	RK	bushing	1500 x 750 x 2200	250	400
		KZ	hard			401
		KZ	soft			402
IV 600	600	RK	bushing	2100 x 750 x 2200	350	600
		KZ	hard			601
		KZ	soft			602
IV 800	800	RK	bushing	2700 x 750 x 2200	450	800
		KZ	hard			801
		KZ	soft			802
IV 1000	1000	RK	bushing	3300 x 750 x 2200	550	900
		KZ	hard			901
		KZ	soft			902

Type	Volume litres	End-ing type	Pack-ing type	Dimension d x h x v mm	Weight kg	Order number
IB 200	200	RK	bushing	1200 x 1000 x 1800	140	1 632 611 691 250
		KZ	hard			251
		KZ	soft			252
IB 400	400	RK	bushing	2000 x 1000 x 1800	240	450
		KZ	hard			451
		KZ	soft			452
IB 600	600	RK	bushing	2800 x 1000 x 1800	340	650
		KZ	hard			651
		KZ	soft			652







Storage tank Z 300

It consists of an non-graduated kettle of volume 300 litres and diameter 620 mm. It is fitted with a lid, discharge and supporting structure. Connection of inlets and outlets is generally realized by glass piping of a particular nominal diameter. In cases when non-glass piping is to be connected, particular principles should be observed (see chapter "Jointing and packing elements").

Type	Volume	Packing type	Dimension	Weight	Order number
	litres		l x d x h (mm)	kg	
Z 300	300	soft	1000 x 1000 x 2600	250	632 611 691 313
Z 300	300	hard	1000 x 1000 x 2600	250	314

6.9 GLASS ABSORBERS WITH HELIX FILLING

Designation and use

Absorption processes represent one of the most frequent operations in chemical engineering. Importance and utilization of absorption processes in the field of environmental protection are ever increasing. Removal of toxic and undesirable components from a gaseous mixture can in principle result in a reduced degree of air pollution by gaseous exhalations.

Technical description

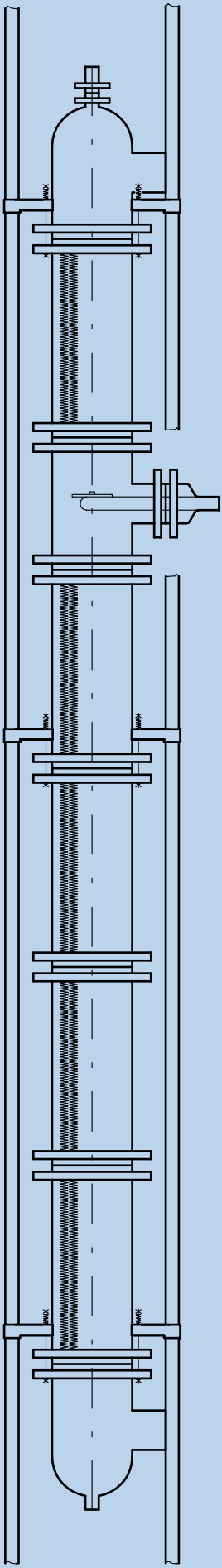
The absorber body with oriented helix filling consists of standardized glass fractional cylinders, injection part; in its bottom and top part it is closed with cupolas with an inlet and outlet of gaseous and liquid media - see figure of overall layout. The absorber filling includes individual sections with rows of vertically oriented helixes fixed in self-supporting glass frames. In order to prevent their mutual contact the helixes are held at a distance from each other and the frames are centred.

The absorber can be completed with a recirculating device for spraying liquid (storage tank, pump, piping and accessories can be delivered as a complete piece consignment).

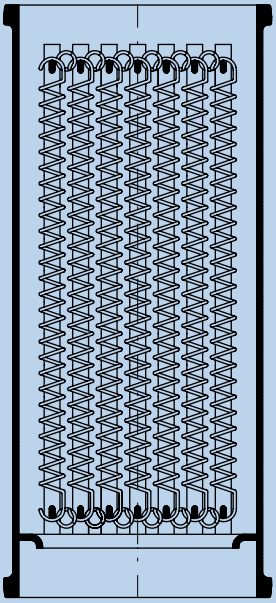
The supporting structure of the absorber is designed according to specific conditions of installation after consultation with the manufacturer. It is not a part of standard assembly and should be ordered separately. Number of sections, and thus total height of the absorber, depend on the required efficiency of the equipment. If necessary, absorbers can be connected in series or, for higher flow rates of gases, they can be assembled in parallel lines.

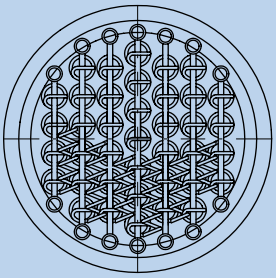
As a standard unit, the manufacturer supplies the absorber according to the specification in the table (one trapping section, other sections fractional); however, the absorber can be completed with additional sections.

Parameter	DN 300	DN 400	DN 600
Number of sections with filling (pcs)	5	7	7
Section height (mm)	750	750	750
Surface area of column filling (m^2)	15	35	80
Maximum flow rate of gas (m^3/h)	1300	2300	5000
Spraying intensity (m^3/h)	1	2	4
Pressure drop at maximum flow rate of gas (Pa)	1000	1500	1500
Total height of absorber (mm)	6000	7350	8500
Weight of absorber (kg)*	800	1000	2500



* without supporting structure





Absorber section

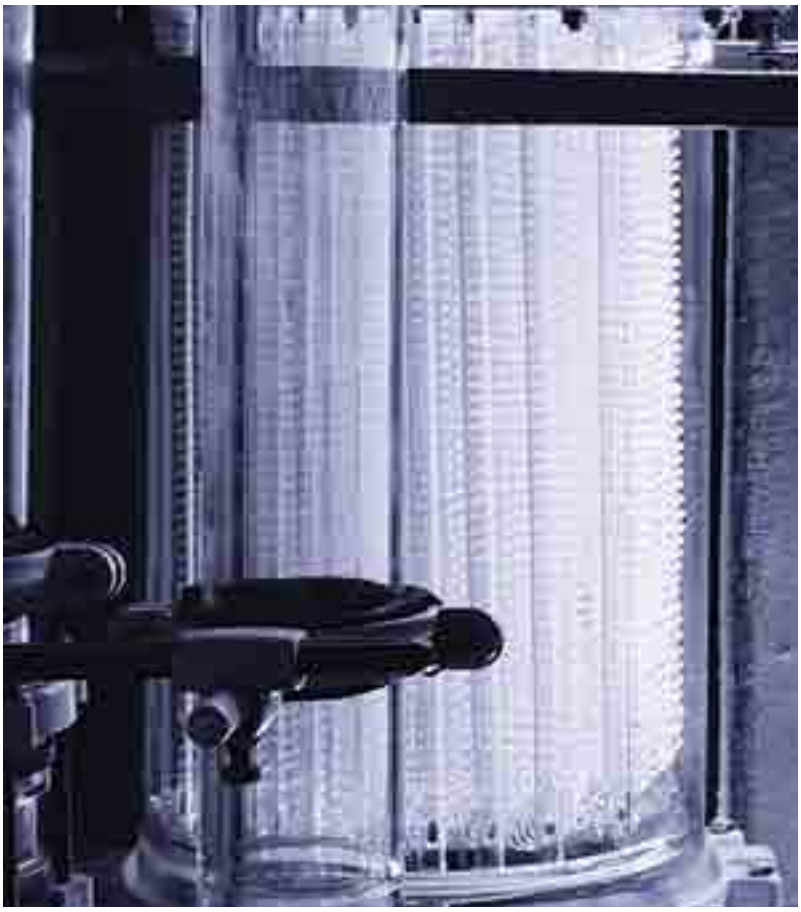
The absorber is marked with the name "Absorber" and with nominal inner diameter DN 300, 400 or 600. As a standard unit, the absorber is supplied according to the specification in the table:

Type	Packing	Order number
DN 300	soft	1 632 611 644 300
	hard – PTFE	310
DN 400	soft	400
	hard – PTFE	410
DN 600	soft	600
	hard – PTFE	610

The delivery of these standard assemblies does not include:

– chemical-engineering calculation for the given process
– system of inlets and outlets of the working substances
– system of measuring and regulation

Requirements from this field should be applied separately.



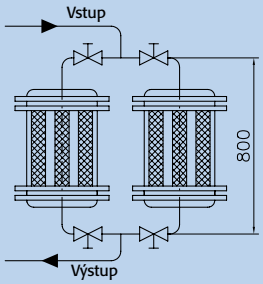
6.10 FILTERS

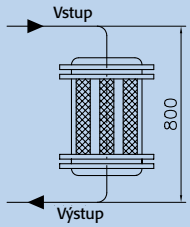
Designation and use

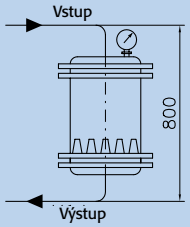
Filters are designed for trapping mechanical impurities from liquids and gases, and for softening water under the below stated technical parameters.

Technical description

The filters are assembled from glass parts filled with filter mass (see the tables). Except for filtration inserts and the cation exchanger, the packing is not a part of delivery. Filtration inserts are made of polypropylene in three series and are able to trap particles from 2, 5 or 10 μm depending on the design. Individual filtration elements can be assembled to a filtration unit (e.g. SFJ 300) or, after completion with a pump and other accessories, to a filtration station.







Filter SFJ DN 300

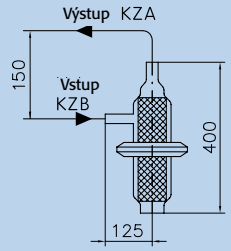
Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
olive ∅ 22 (25RK)	filtration inserts	100	3000	55	1 632 611 732 310

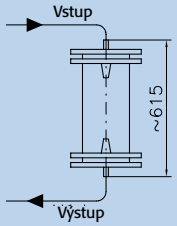
Filter SVF 5 DN 300

Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
olive ∅ 22 (25RK)	filtration inserts	100	3000	55	1 632 611 732 510

Filter UNI DN 300

Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
olive ∅ 22 (25RK)	filtration sand, active charcoal	100	3000	70	1 632 611 733 501



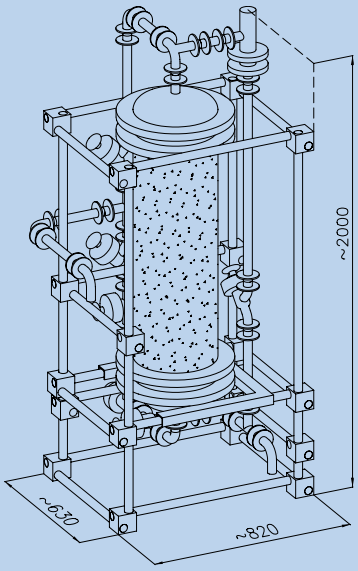


Filter FN DN 80

Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
25 KZ	filtration insert	300	4000	70	1 632 611 731 110
25 RK					111
olive Ø 22					105
olive Ø 33					106

Filter MIRA DN 100

Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
olive Ø 10	cation exchanger filtration sand, active charcoal	300	80	40	1 632 611 325 071 with filling 1 632 611 325 070 without filling



Sand filter DN 300

It is supplied as an independent unit with "station inlet" type PP.

Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
25 RK	filtration sand, active charcoal	150	1000	70	1 632 611 700 001

Sand filter DN 300

It is supplied as a pre-filter to DEMI stations without a "station inlet".

Connecting endings	Filling	Operating over-pressure kPa	Max. flow rate l/h	Max. temperature °C	Order number
25 RK	filtration sand, active charcoal	150	1000	70	1 632 611 700 002

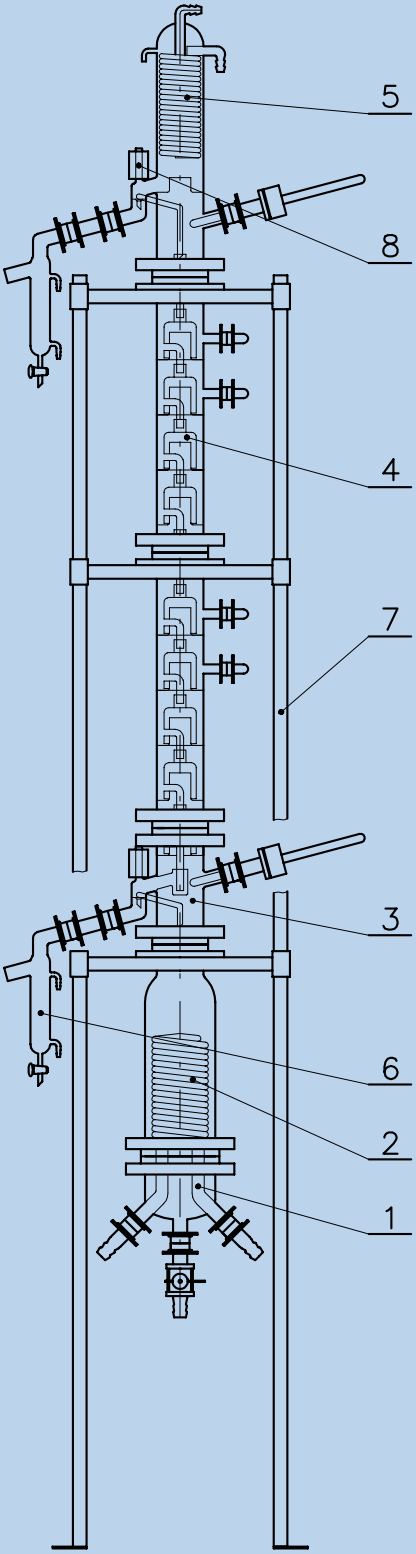
6.11 GLASS DOSING PUMPS

Glass dosing pumps – type S

Designation and use

Pumps are used for laboratory, pilot-plant and full-process applications in the chemistry, food industry, pharmaceutics and in other processes of similar character. They serve for pumping and/or continuous dosing of chemically aggressive liquids or liquids which should not come into contact with metals. Repumped liquids that may not contain solid admixtures come into contact with glass and PTFE only.
A receiver can be added for compensating pressure shocks resulting from pump piston pulsation.

Separately delivered by NEDFORM, Votice, Masarykovo náměstí 373, 259 39 Votice (CZ),
Phone: +420 317 830 211, Fax: +420 317 830 298.



Main parts

1, 2 reboiler
3 distilling receiver
4 plate section
5 column head
6 liquid closure with aftercooler and possibility of taking samples
7 supporting structure

6.12 GLASS RECTIFICATION COLUMN DN 100

Designation and use

The column is destined for rectification of liquid mixtures to the boiling point of 115°C at barometric pressure for laboratory and pilot-plant purposes. The column plates are fitted with necks for temperature sensors or injection of distilled mixture, and the column operation is controlled automatically. The column can be operated in continuous or discontinuous regime.

Technical description

Sectional character of the column enables assembly of the required number of plates in the impoverishing and enriching parts of the column. The standard section part is formed of five plates. Withdrawal of the bottom product and distillate is controlled by regulating valves from the controller of reflux ratio. The values of both flow rate ratios are set by controllers - timers U-RK. Set values of both ratios can be changed as required by this timer, which controls both liquid dividers. The timer includes two controlling electromagnetic coils (8).

Basic technical data

Average output of column	8 l/h
Optimum vapour velocity	0.5–0.75 m/s
Plate efficiency	0.76–0.88 according to Hausen 0.57–0.73 according to Murphree
Pressure drop per plate	max. 250 Pa
Time constant of plate	10–90 s
Steam	max. pressure 250 kPa max. 8–10 kg/h
Cooling water	max. pressure 150 kPa flow rate ~ 100 l/h
Built-up area	800 x 800 mm
Height	10 plates – 3 600 mm 15 plates – 4 200 mm

The glass rectification bubble-cup column DN 100 is supplied as a standard set with connecting material and packing from PTFE in designs with 10 or 15 plates, including supporting structure and timer.

Number of plates	Order number
10	1 632 611 642 420
15	430

The delivery of these standard assemblies does not include:
– chemical-engineering calculation of column for given process
– solving of the system of injection (storage flasks, etc.), product withdrawal and form of heating
– fixing of parts of supporting structure and building conversions.

Requirements from this field should be applied separately.

6.13 WATER DISTILLING APPARATUS I-DPE AND DPP

The Glass Works Kavalier complete glass apparatus for the production of distilled water, the quality of which complies with ČSN 68 40 63.
The output of this apparatus ranges from 4 litres per hour to 90 litres per hour of distilled water.

Heater designs:
– electrodes from shaped stainless steel sheet or graphite shaped pieces (rods)
– direct electrode heating
– direct electric heating
– single or double heating coil (steam heating)

Use

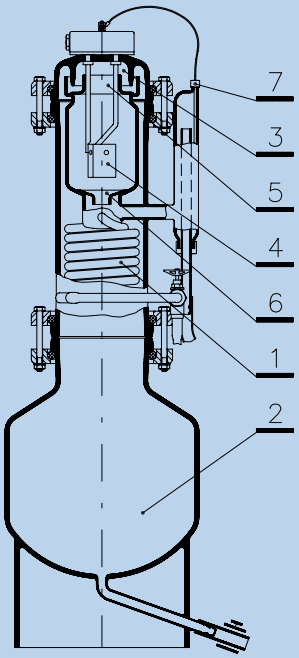
Water distilling apparatuses are exclusively designed for distilling water in processes where capacity requirements for distilled water correspond to rated output of individual types (particularly in pharmacy, health care, photochemical and chemical processes).
The apparatuses are mainly intended for distilling water of common hardness 7 to 15 °N and composition corresponding to potable water (drinking water). The distilling apparatus **I-DPE 10-ZF** with a softening filter is particularly suitable for processes where feeding water has a total hardness in the range of 15 to 20 °N. In the softening ion exchange filter calcium and magnesium cations are exchanged for sodium cations, which prevents depositing of scale in the boiling kettle (total salinity, specific electric conductivity and pH of feeding water remain practically unchanged).
On average, the redistilling apparatus provides 10 litres of distilled water and 3 litres of redistilled water per hour. Distilling apparatuses operate at normal atmospheric pressure.

Designation and description of apparatus

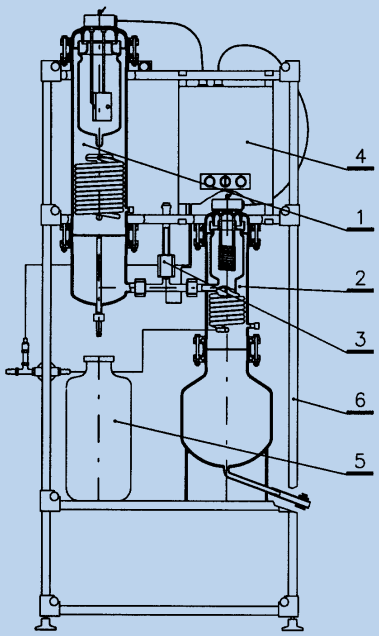
Water distilling apparatuses are manufactured in the following designs and outputs:

Type	Description	Order number
DP–4RS	table-top design	*
DP–4RZ	suspended design	*
I-DPE 10	divided, for water hardness 4–7 °N	*
I-DPE 10	divided, for water hardness 8–18 °N	*
I-DPE 10	divided, for water hardness 19–25 °N	*
I-DPE 10	divided, carbon heating	*
I-DPE 10-ZF	divided with softening filter	*
I-DPE 30-Z	suspended design	*
I-DPE 30	in supporting structure	*
DPP 50	steam – in supporting structure	1 632 611 602 500
I-DPE 60	electric – in supporting structure	1 632 612 007 600
DPP 90	steam – in supporting structure	1 632 611 602 900
I-RDPE	redistilling apparatus in supporting structure	1 632 612 008 050

**** Separately delivered by NEDFORM, Votice, Masarykovo náměstí 373, 259 39 Votice (CZ), Phone: +420 317 830 211, Fax: +420 317 830 298.***



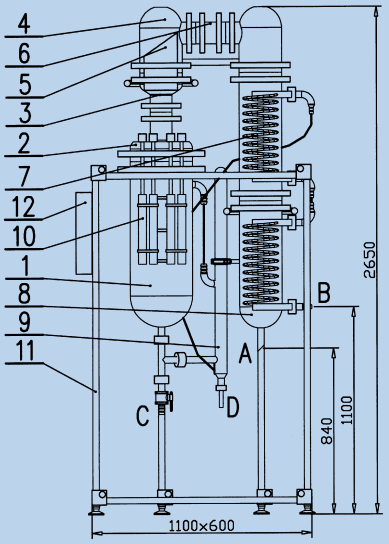
1 boiling kettle with cooler, overflow and discharge tube
2 storage flask 20 l
3 lid with terminal board
4 electrode heating
5 dephlegmation insert
6 desludging bowl
7 electrode for down-lead of escape currents



1 1st step – boiling kettle with cooler
2 2nd step – boiling kettle with cooler and storage flask for redistilled water
3 level alarm
4 control panel
5 storage flask for distilled water
6 supporting structure

DISTILLING APPARATUS I-RDPE

Type of distilling apparatus	I-RDPE
Operation voltage (V)	3 x 380
Rated input (kW)	8–12.6
Max. permanent current load (A)	26
Specific input (W/litre of distilled water)	720 + 70
Feeding water pressure (MPa)	0.1 - 0.6
Total consumption of feeding water at a temperature of 9–12°C (l/h)	150–190
Apparatus output (l/h)	7.4–14.5
Apparatus weight (kg)	about 150
Main construction dimensions	
width	1000
depth	580
height	2250



1 boiling kettle
2 lid
3 adapter
4 cupola
5 dephlegmation insert
6 tube
7 cooler
8 final cooler
9 overflow tube
10 electrode heating
11 supporting structure
12 control panel

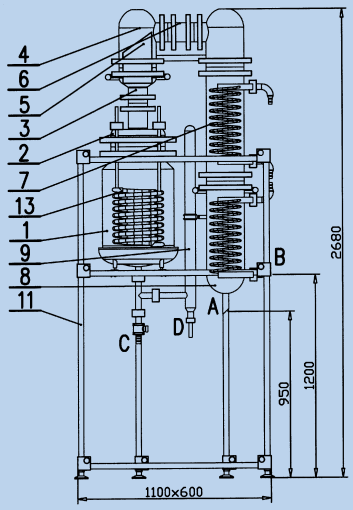
A Offtake of distilled water
B Inflow of water
C Desludging
D Water overflow

DISTILLING APPARATUS I-DPE 60

Type of distilling apparatus	I-DPE 60
Operation voltage (V)	3 x 380
Rated input (kW)	2 x 20.5
Max. permanent current load (A)	63
Specific input (W/litre of distilled water)	720 + 70
Feeding water pressure (MPa)	0.1 - 0.6
Total consumption of feeding water at a temperature of 9–12°C (l/h)	750–1000
Apparatus output (l/h)	55 - 65
Apparatus weight (kg)	about 240
Main construction dimensions	
width	1110
depth	680
height	2650

DISTILLING APPARATUS DPP 50, DPP 90

Type of distilling apparatus	DPP 50	DPP 90F
Feeding water pressure (MPa)	0.1–0.6	0.1–0.6
Total consumption of feeding water at a temperature of 9–12°C (l/h)	550–650	950–1000
Apparatus output (l/h)	50	90
Apparatus weight (kg)	about 210	about 280
Main construction dimensions		
width	1110	1110
depth	680	680
height	2650	2600
Consumption of heating steam (kg/h)	55–57	100–105



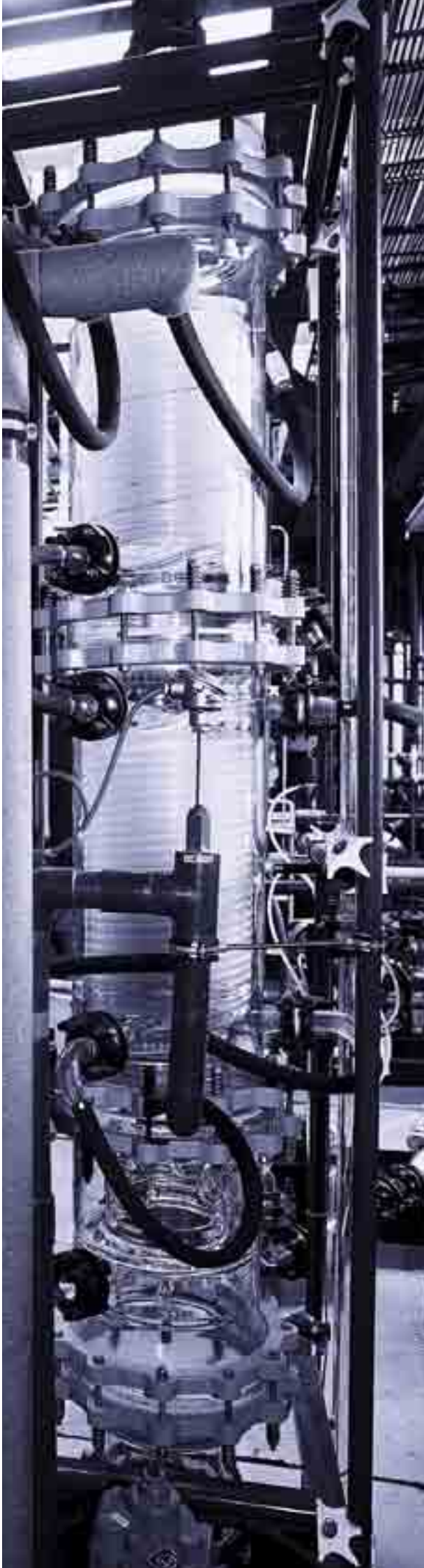
1 boiling kettle
2 lid
3 adapter
4 cupola
5 dephlegmation insert
6 tube
7 cooler
8 final cooler
9 overflow tube
11 supporting structure
13 heating coil

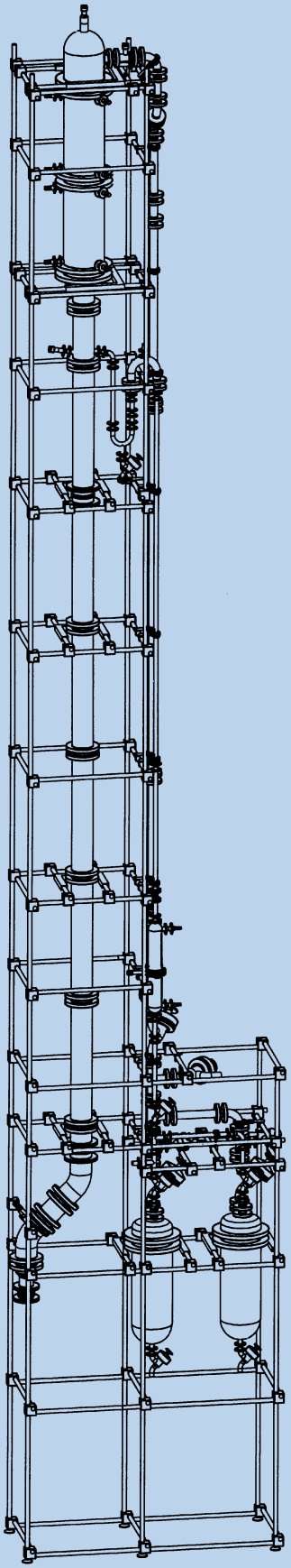
A Offtake of distilled water
B Inflow of water
C Desludging
D Water overflow

NOTES


A-110A

7 INDIVIDUAL ASSEMBLIES FOR TECHNOLOGICAL PROCESSES





Column DS 150
with storage tanks
destined for vacuum
operation.

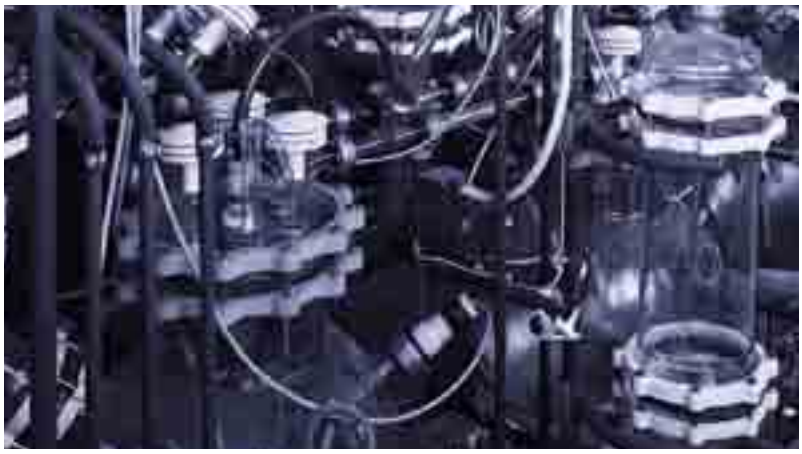
7 INDIVIDUAL ASSEMBLIES FOR TECHNOLOGICAL PROCESSES

Many chemical processes quite often use glass apparatus designed according to customer's wishes which are drawn up either as universal or single-purpose; however, always with the aim of constructing a functional and, at the same time, the simplest and, consequently, price-advantageous apparatus. It is particularly advantageous to use glass apparatus for the assembly of experimental and pilot-plant units which can be modified as required and subsequently rebuilt, e.g. by replacement of some parts, to production units. Using glass together with high-quality packing materials is particularly advantageous in terms of its high chemical resistance, possibility of visual inspection of running processes, and easy monitoring of apparatuses assembled from a wide assortment of glass parts.

Before discussing the delivery of an apparatus assembly, the customer should clarify and specify any issues which could influence the apparatus design. This concerns the following data, in particular:

- quality requirements – analyses of materials at inlet and outlet, methods and precision of measurements, etc.,
- quantitative requirements – volumes, flow rates, amount of heat for heating and cooling, volume of wastes, measurement of consumptions and flow rates, etc.,
- process conditions – temperatures, pressures, corrosion effects on packing, handling of materials, labour safety and environmental protection, apparatus attendance, degree of danger of explosion, toxicity, etc.,
- placement of the apparatus – size of the space, inlets, outlets and discharges of process substances, possibility of easy assembly, repairs and operation, accidental measures, outfit of the space (floors, walls, lighting, ventilation, safety devices), type of supporting structure, fixing of glass piping, etc.,
- connection to non-glass parts – kettles, pumps, fittings, filters, various gauges with technical data (dimensions and shape of endings, type of packing of expansion joints and bushings),
- scope of measurements, regulation and control – determination of measured (controlled) variables, location of sensors and their type with respect to corrosion resistance, explosion danger, etc.,
- specification of controllers, indicators, data transfer and registration,
- specification of form of control (manual, automatic) and choice of the control point and necessary actuators,
- handling of inlet raw materials, products and wastes – amount of transport containers (per shift, week), pumping from/into them, necessary process stock, etc.

The above mentioned issues should be addressed particularly in cases when the customer requires a "turn-key" delivery, including all guarantees. In case the customer solves its technological problems with its own means or solutions provided by another organization, we recommend discussing the delivery.



Design of glass industrial apparatus can contain:

Glass apparatus parts
In combination with products made of stainless steels, enamelled parts, or plastic materials.

Apparatus assembly
For vacuum operation or for operation under normal pressure

Special glass parts
Piping parts of various lengths and combination of endings
UNI lids of various number of holes
Vaulted lids with a different number of DN necks and combination of endings
Stirrers, inflow and injection tubes, turbulence stops, and thermometer pockets

Supporting structure
Including supporting frames, angles, variator holders, and tube holders from varnished or galvanized surface-finished steel tubes or stainless steel tubes

Supporting structure
Stationary or mobile

Flange joints
In designs of up to 120 °C or 200 °C
Flange joints with bolts, nuts, washers, and/or steel springs with surface finish by glossy galvanizing, or joint material from stainless steel

Packing
Soft, Sarlink SA or hard – teflon PTFE

Valves
Straight, angle or branch

Cocks
Ball or cone

Built-in bottom closure and valves
Controlled manually or pneumatically

Kettles
With or without a scale, without discharge, with discharge and with built-in bottom closure

Kettles, flasks and cylinders
With plastic coat protecting the vessel against damage and against loss of vessel content

Flasks
In designs without discharge, with discharge and with built-in bottom closure

Packed columns
With Raschig ring packing, polypropylene PALL rings, structured ceramic packing, oriented stainless steel packing, or according to the customer's wishes

Filtration nutches
With stainless steel or PTFE supporting plate for filter cloth

Stirrers
Paddle, propeller, anchor types, or according to the customer's requirements

Stirrers
From glass, stainless steel, PTFE, titanium, or according to the customer's requirements

Stirrer drives
Electric motors with gearbox and constant rotations, electric motors with frequency changer, or electric motors with variator and gearbox and smooth rotation control, electric motors with gearbox for Ex environment

Pumps
Glass, regulating or non-regulating, or according to the customer's requirements

Sensors
Of various variables, such as temperature, pressure, pH, redox value, oxygen content, conductivity

Thermometers
Glass or resistance for normal or Eex environment

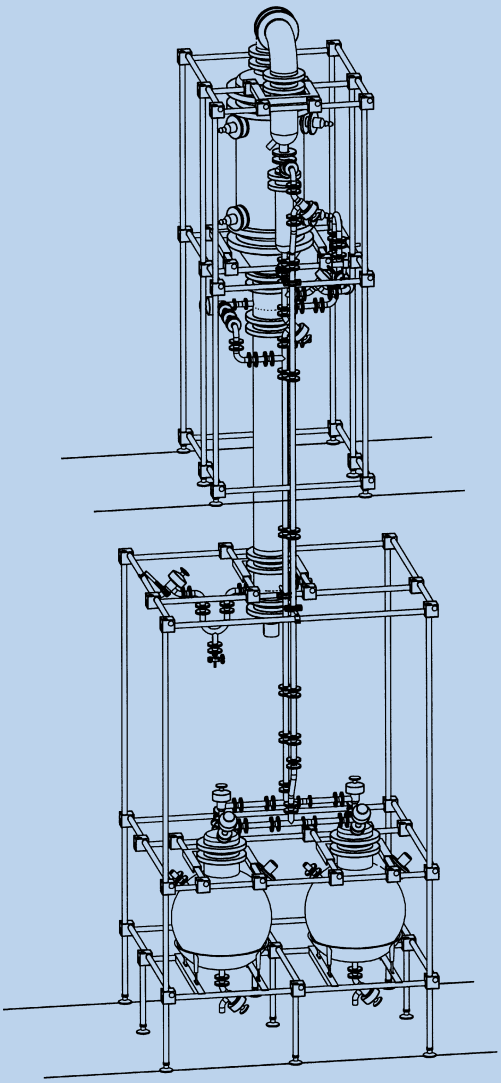
Heating coils
Glass or stainless steel for higher pressures of heating medium, electric resistance heating with a protective silica tube for kettles and flasks

Source of heating medium
Steam generators and oil thermostats, mobile or mounted into the supporting structure. For flasks: electric heating mantle or electric resistance heating into pocket with the possibility of continuous regulation

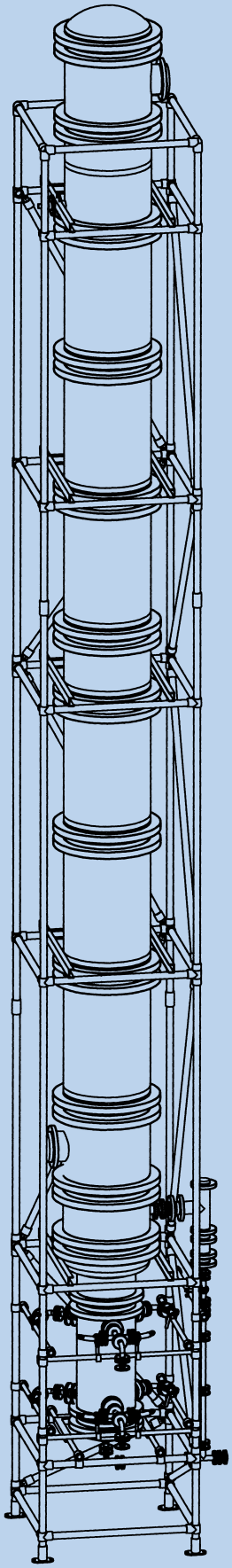
Thermostats
Assembled directly into supporting structure, they can have one or two tubes, single or double jacket, with or without expansion vessel, in designs from surface-finished steel or stainless steel, with or without circulation pump of various heating output

Accessories
Such as compressors and vacuum pumps

Switchboards
With complete wiring, with imaging of scanned variables or with recorders, with control of drives of stirrers, pumps, vacuum pumps, control of thermostat heating, and/or control of pneumatic valves



Column DN 200 with storage flasks destined for vacuum operation.



Column DN 600 with cooler and Raschig rings packing

7.1 RECTIFICATION PACKED COLUMNS

Designation and use

Rectification columns are apparatuses intended for complete separation of two- or multi-component mixtures of volatile liquids which are partially or completely soluble. The column works in a counter-current manner, i.e. vapours are rising up and liquid is flowing down in the counter-current. The vapours are gradually enriched with a more volatile and the flowing-down liquid with a less volatile component, respectively. Multiple repetition of the process of evaporation and condensation on the required number of plates can result in a practically pure, more volatile component in the column head and a practically pure less volatile component in the column bottom. This process of mass exchange proceeds on a suitably chosen column packing. Important criterion in choosing the column packing is its chemical resistance against the passing medium.
In addition to Raschig rings of proper size made of SIMAX glass, the following materials can be used for column packing: polypropylene rings PALL (hydrophilized), oriented stainless steel packing (steel of Class 17 347), and/or oriented plastic packings.
Structured ceramic packings are used in case of rectification with high demands for chemical resistance of the packing. Columns with oriented packing are generally completed with appropriate distributors and/or redistributors of reflux. Glass packed rectification columns are kit-type apparatuses enabling to choose layout according to requirements of the particular technology. Therefore, each column has its own individual character which applies also for supporting and fixing elements of these apparatuses.

Basic technical parameters

Packed rectification columns are supplied in four series of nominal diameters DN 100, 200, 300 and 400 mm. Main part of the column is the assembly of fractional cylinders with packing and/or fractional cylinders with packing fitted with a tube for installing a thermometer pocket. The injection plate is inserted at the required height.
The column bottom is formed by a boiling space which can be realized according to one of the variants depicted in the figures.
Vapours flow via a distillation receiver, respective fractional cylinders and reflux head into coolers. As necessary, the column can be fitted with an injection preheater and product final cooler by means of properly designed heat exchangers. The piping distributions and inlets of cooling medium are individually solved with respect to local conditions and the customer's needs.
The columns can be used for continuous as well as discontinuous rectification at atmospheric or reduced pressure. Closing elements (valves) are pneumatically controlled (air pressure 150 kPa) and control systems of corresponding outlets can thus be used.

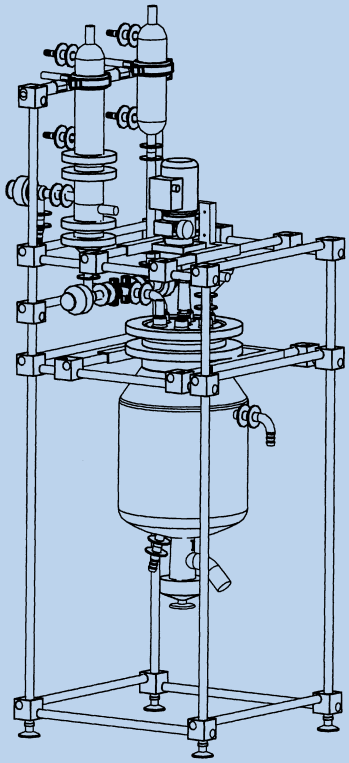
7.2 Extractors

Production of active substances, e.g. dyes, essential oils, aromatic extracts from natural materials (medicinal plants, needles, spices, dried blood, etc.) is quite often realized in glass extractors. The glass used eliminates the danger of deteriorating the final product by possible leaching from structural materials, e.g. steel. The main part of the extractor can consist of a cylindrical kettle with discharge (volumes from 10 to 200 litres) fitted with an easy-to-remove lid for filling/removing the extracted raw material which is generally stored in textile bags. The solvent (extraction agent) is circulated by means of a pump. A heater is used for maintaining the required temperature and piping distribution with valves for ensuring necessary functions (filling, operation, discharge, vapour- and/or liquid-flushing, decontamination). The extractors equipped in this way are used separately or in series (multi-stage extraction).
In other cases it is suitable to use an apparatus which has been designed in such a way that the solvent, after passing through the extracted material, is evaporated in a collecting flask and vapours flow via the distillation head to the condenser and from here back to the extracted material. Active substances

are thus concentrated in the collecting flask and the raw material is always in contact with a fresh solvent.
The information necessary for designing an extractor includes, in particular, data on volumes of raw materials and solvents, process temperatures, duration time of extraction, space for extractors and service areas, way of handling the raw materials, auxiliary devices such as cranes, way of closing the lid of the extraction vessel, etc. Moreover, the way of operation (manual or semi-automatic), measurement, control and heating should be specified.

7.3 REACTION APPARATUS

The apparatus for regular chemical processes almost always includes a mixed space with the possibility of heating and cooling. It can consist of a jacketed kettle with bottom closure, process kettle with heating coil, flask with bottom heating and/or non-glass kettle or boiler.
Gravity dosing of liquid components is realized in cylindrical kettles. The kettle or other boiling vessel can be fitted with a cooler of the required heat-exchange area which can serve either as a classic reflux condenser or, after the addition of a distilling head, the lower-boiling component can be taken off. The stirrer drive can be realized by an electric motor with a variator in a non-explosive variant. When a vacuum gland is used and the apparatus is completed with a vacuum receiver the process can run under reduced pressure. The apparatuses are mounted on assembled, individually designed supporting structures.
In case that standard apparatus parts are not sufficient for designing an individual apparatus, non-standard glass parts can be provided on demand.

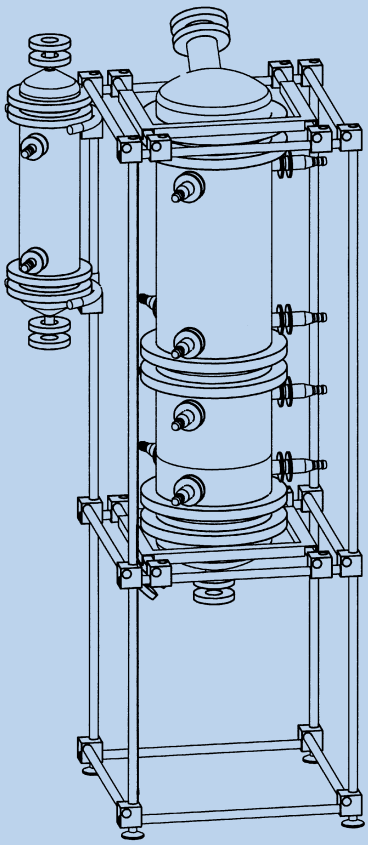


Jacketed kettle 50 l with coolers

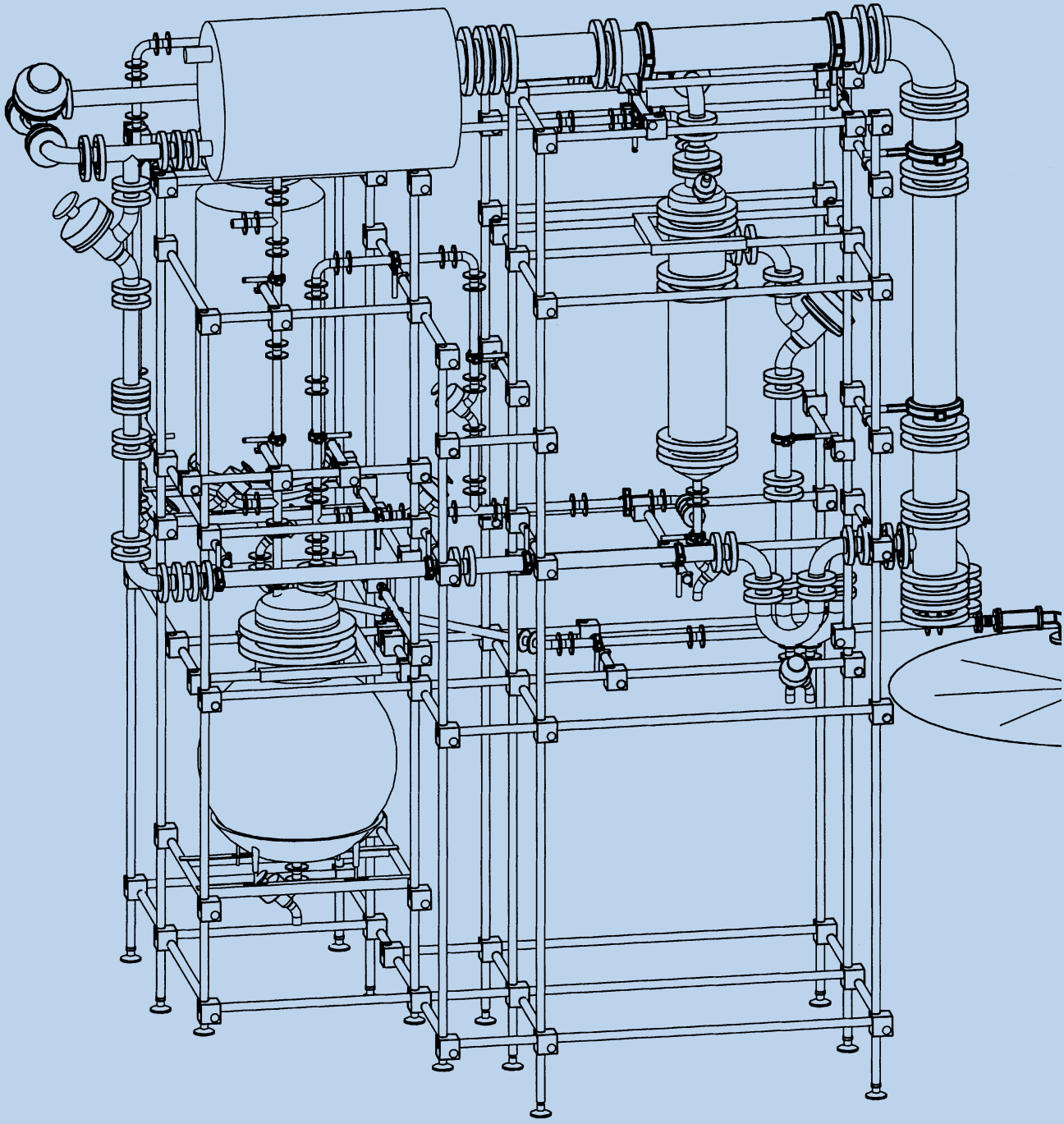
7.4 REGULATION AND CONTROL ELEMENTS

Operation of small assemblies or experimental apparatuses generally utilizes local measurement of temperature, pressure, flow rate, pH, conductivity, etc. and/or off-takes of samples for laboratory tests. Control is then realized by manual regulation of the flow rate of fluids by shut-off valves or cocks, and by switching electric elements (heating, stirring, vacuum, pumps).
Glass apparatuses intended for pilot-plant operations (verification of technologies) usually include higher comfort for the operator; the following components are at disposal for this purpose:
– sensors of temperature, pressure, conductivity, liquid level, pH built into glass parts (suppliers, assembly methods and connection should be chosen according to specific requirements of process substances and the environment),
– indicators and controllers according to process conditions and requirement of the customer (environment, precision, data transfer, etc.),
– actuators – control panels with the possibility of controlling glass valves (by compressed air), electric (hydraulic) drives of stirrers, switching, heating, pumps).

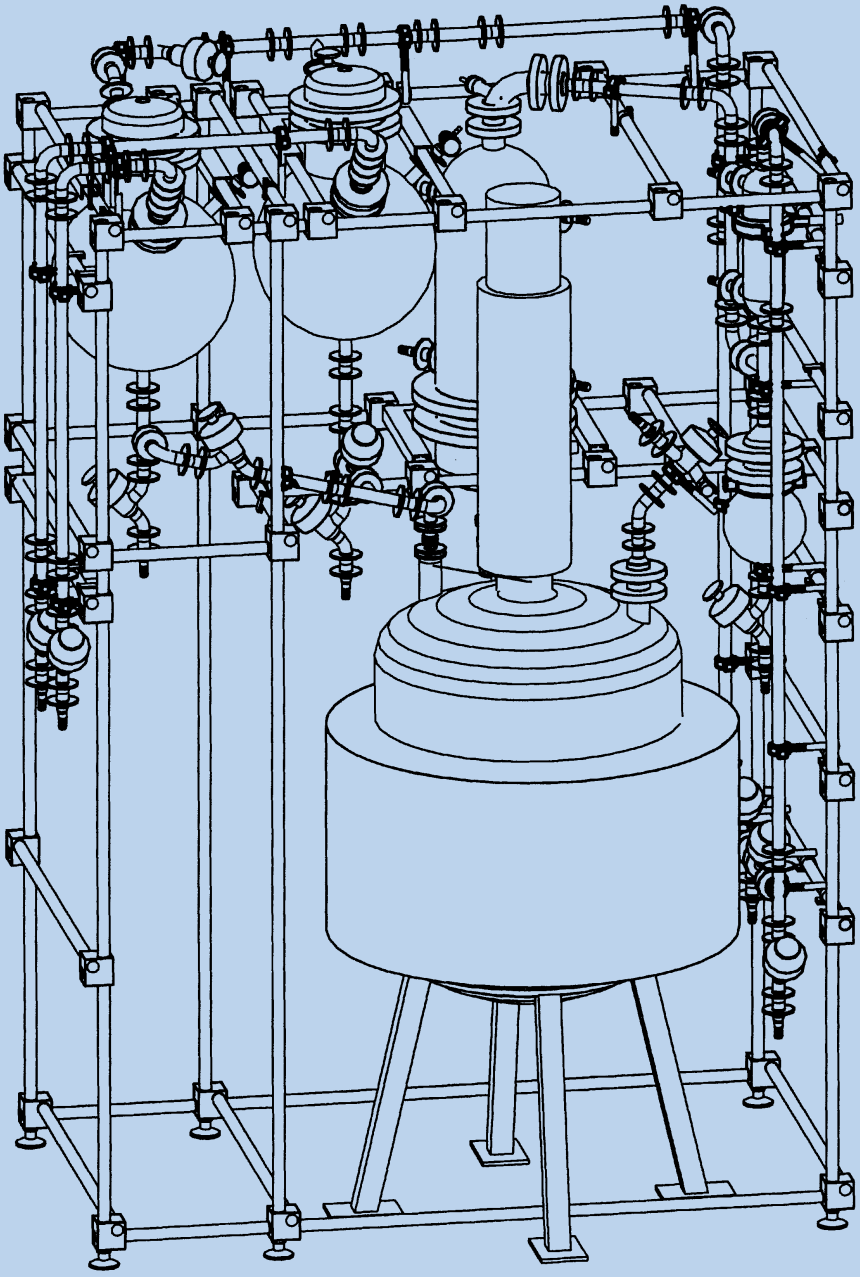
The technologies that have already been verified and are to be routinely applied according to an unchanged scheme can be completed with a control method in which controlling of respective steps and blocking of accidental conditions is given by a programmable solid-state matrix. Range and way of control, measurement, regulation and automation should be discussed for respective cases.



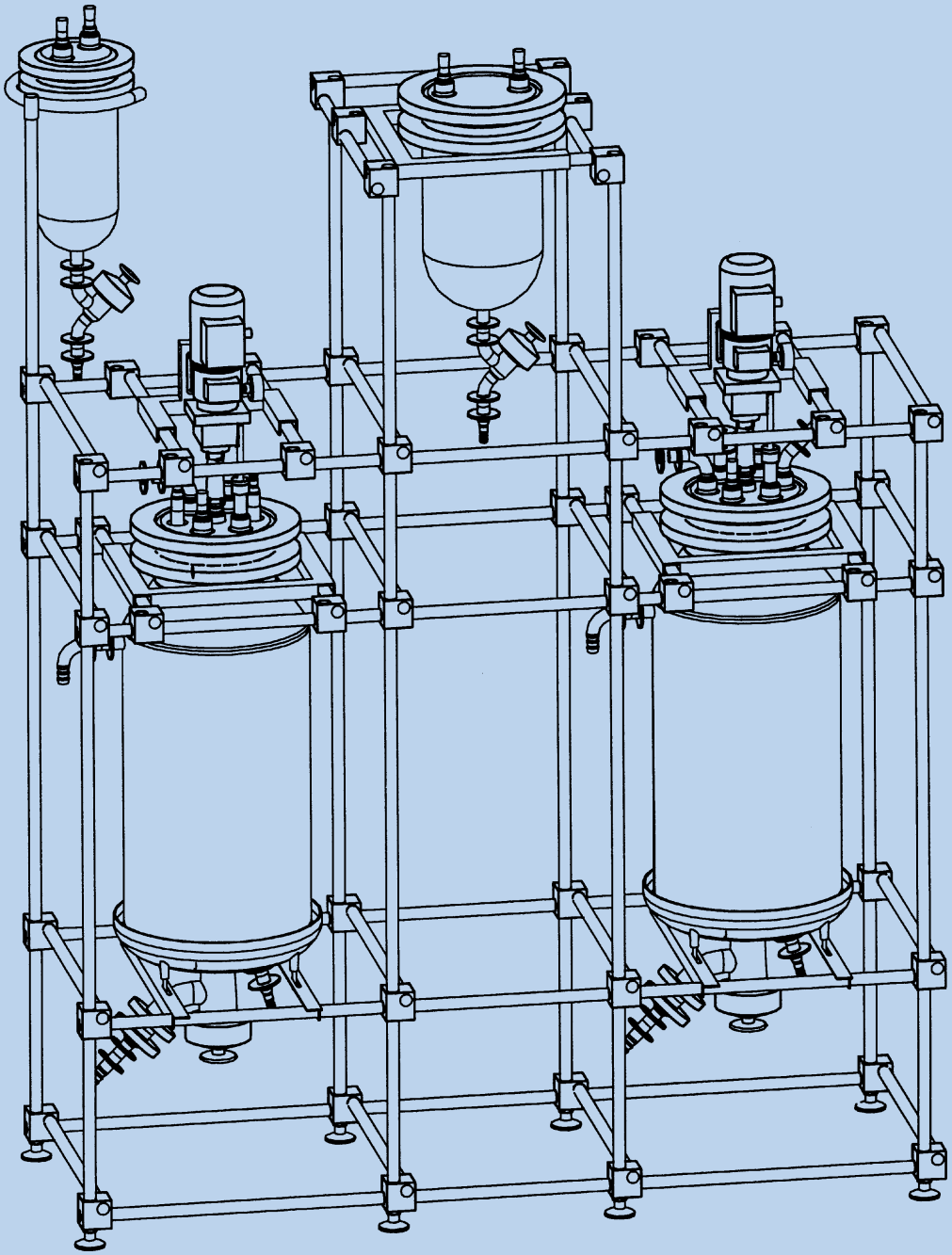
Cooler DN 150 and 400
in supporting structure.



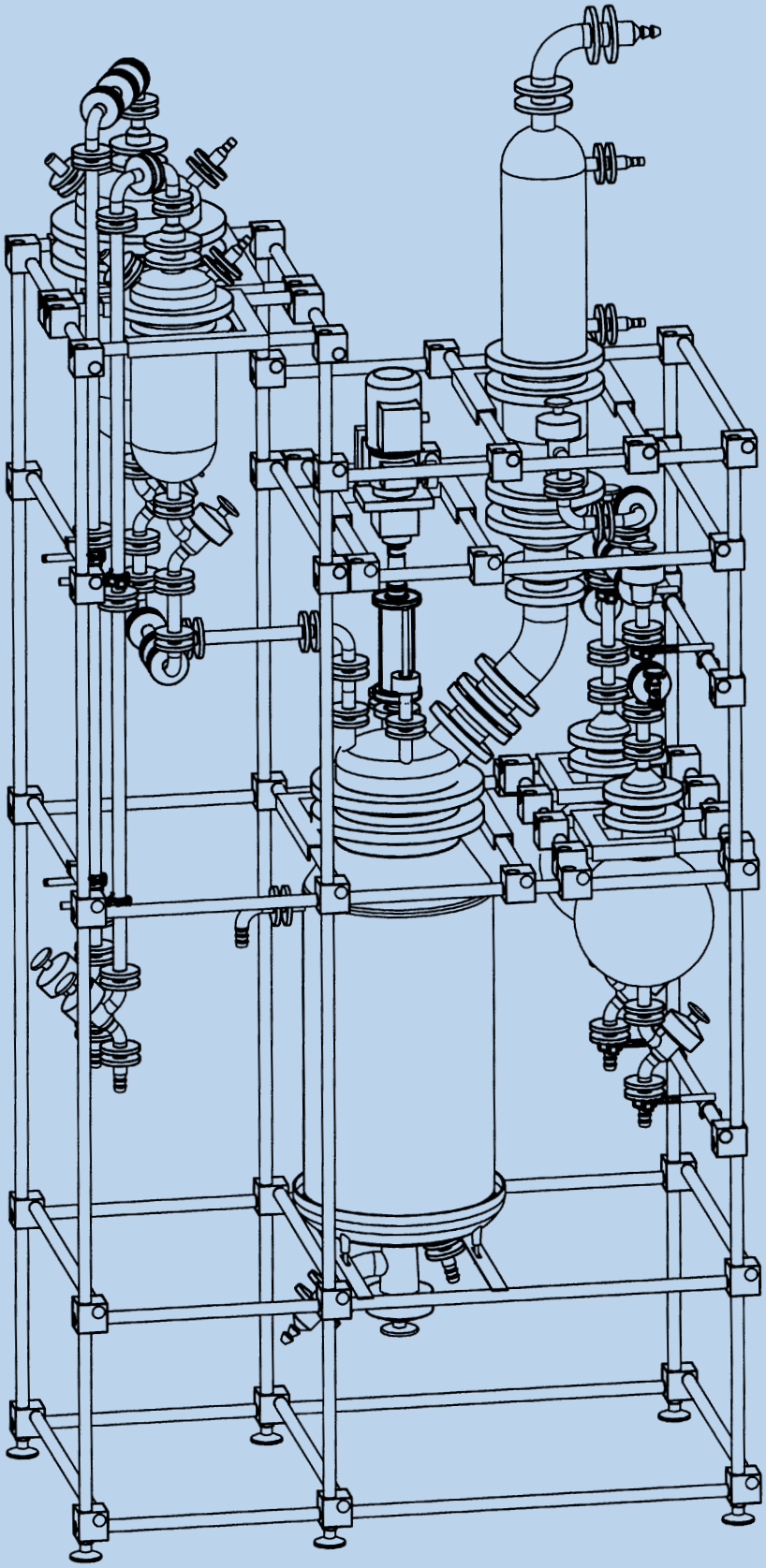
Superstructure of enamelled kettle with coolers and storage tanks designed for vacuum operation



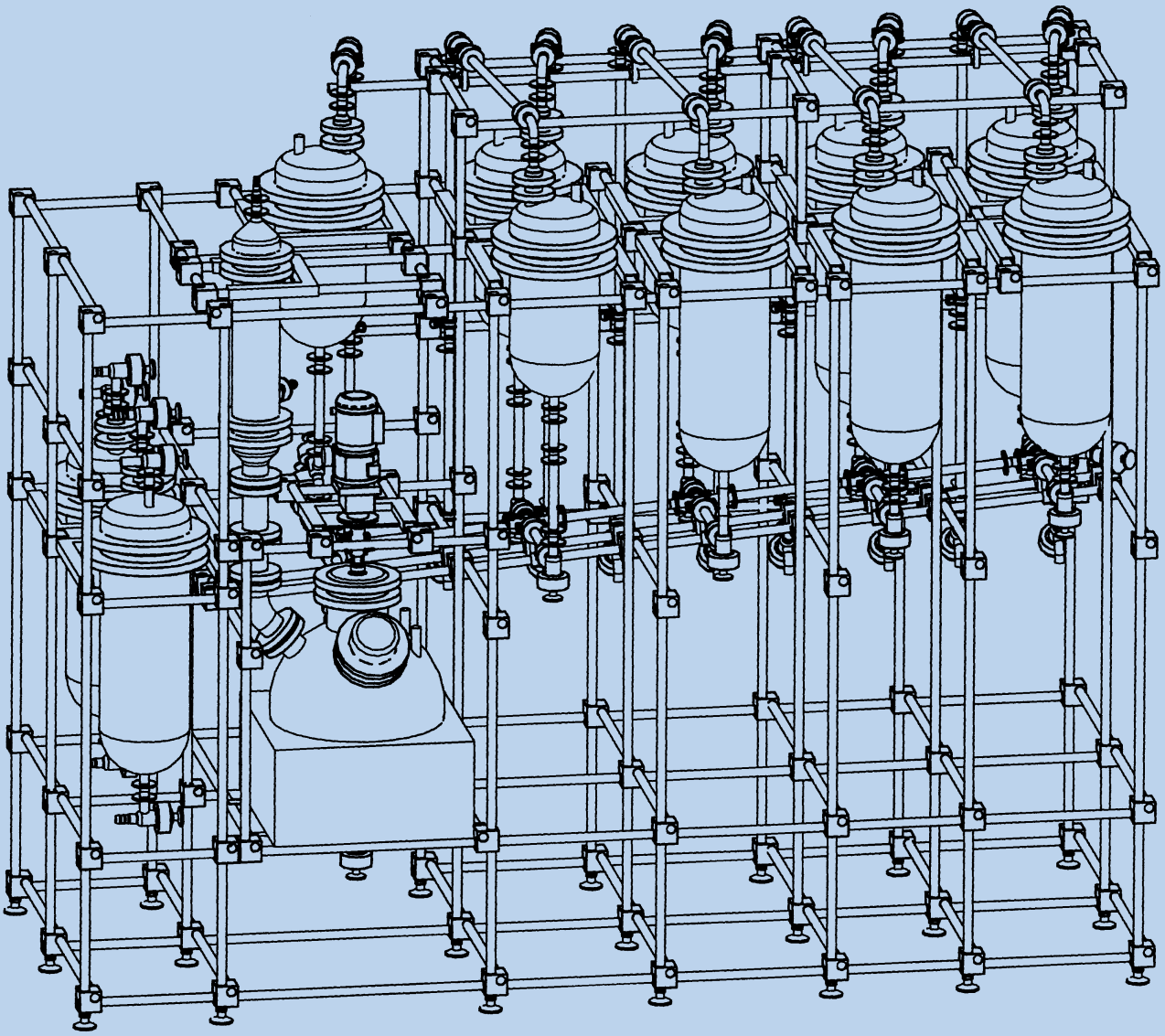
Superstructure of enamelled kettle with cooler and storage tanks destined for vacuum operation



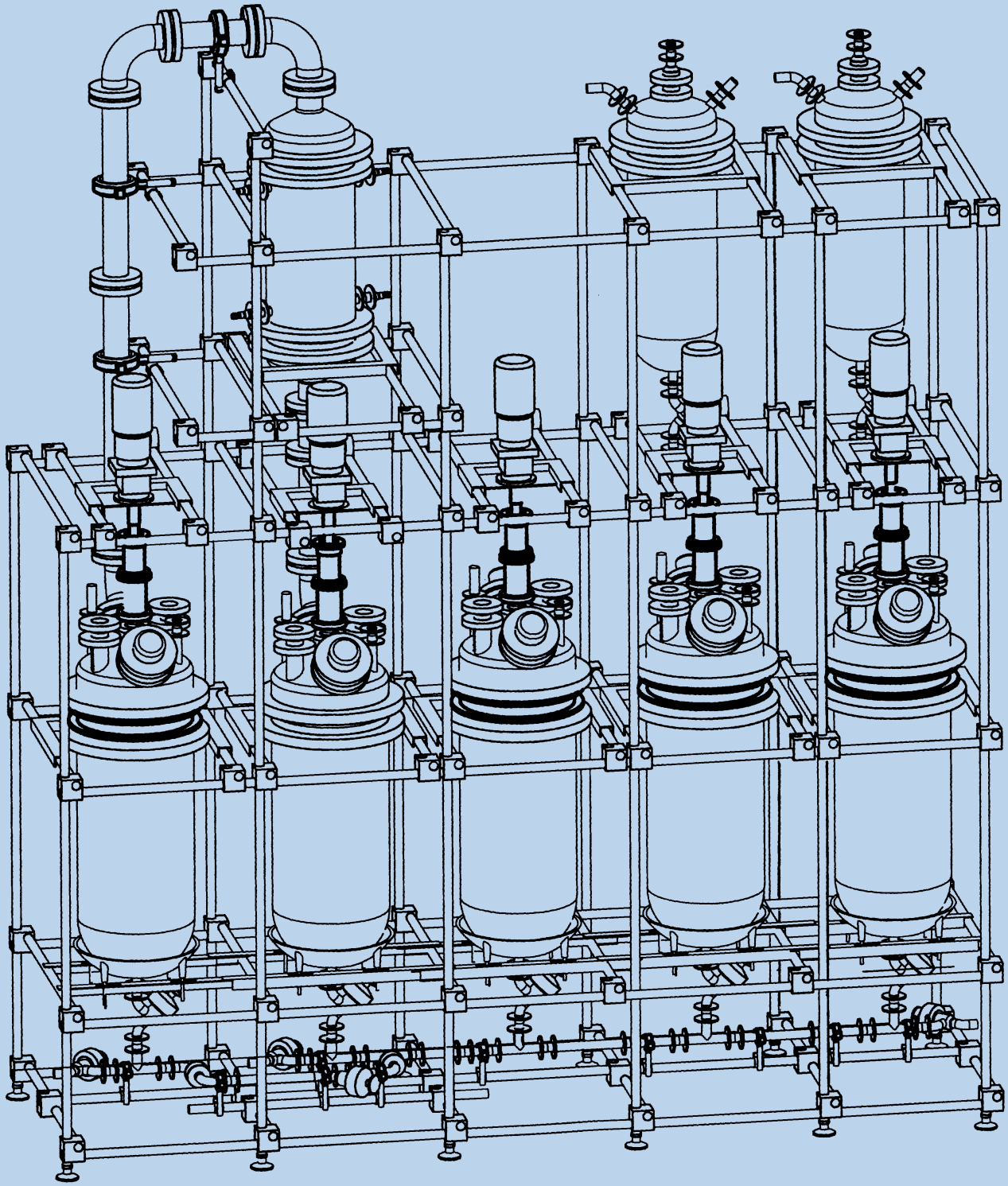
Assembly of 100 l kettles with storage tanks



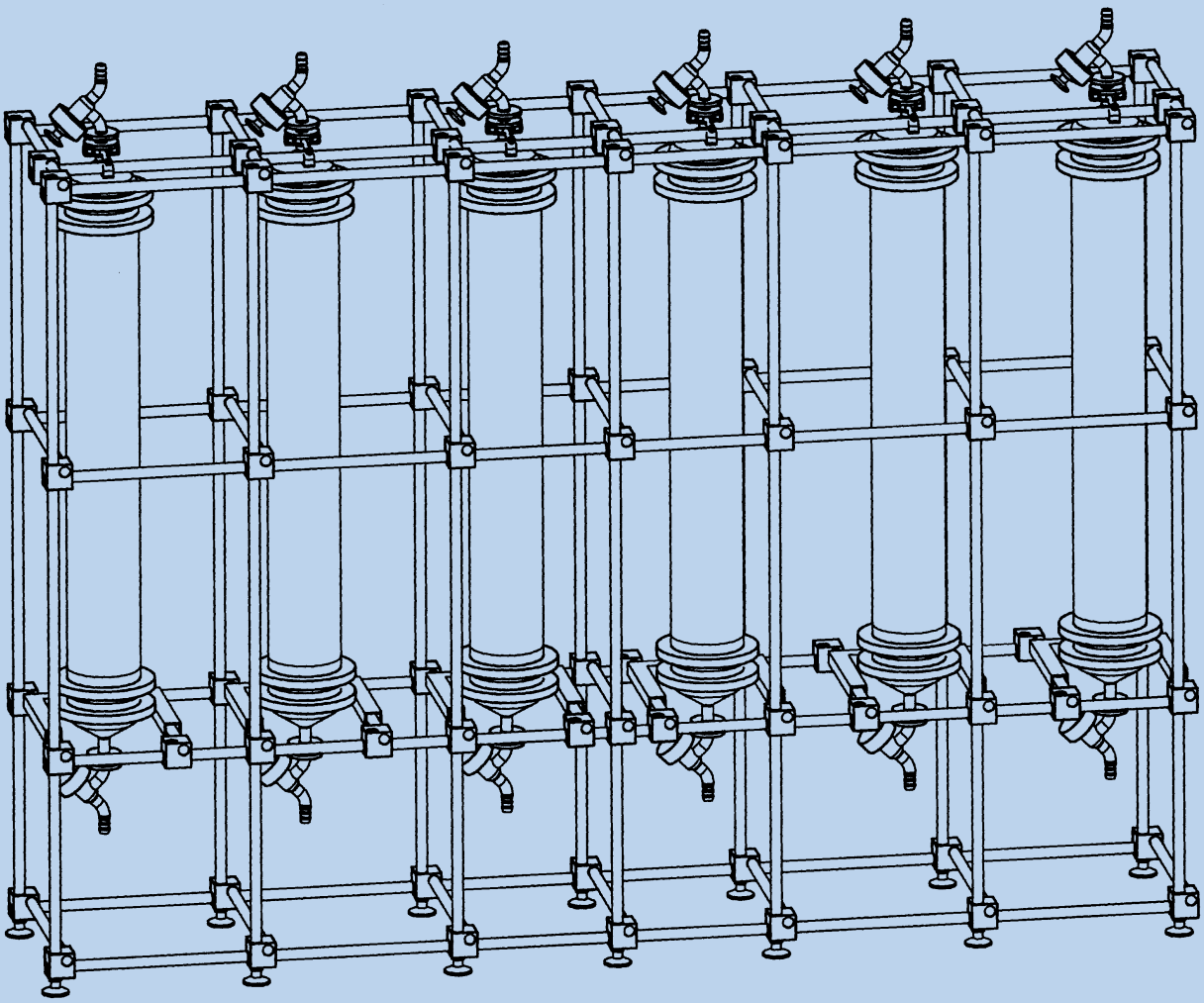
Jacketed kettle 100 l with storage tanks and cooler designed for vacuum operation.



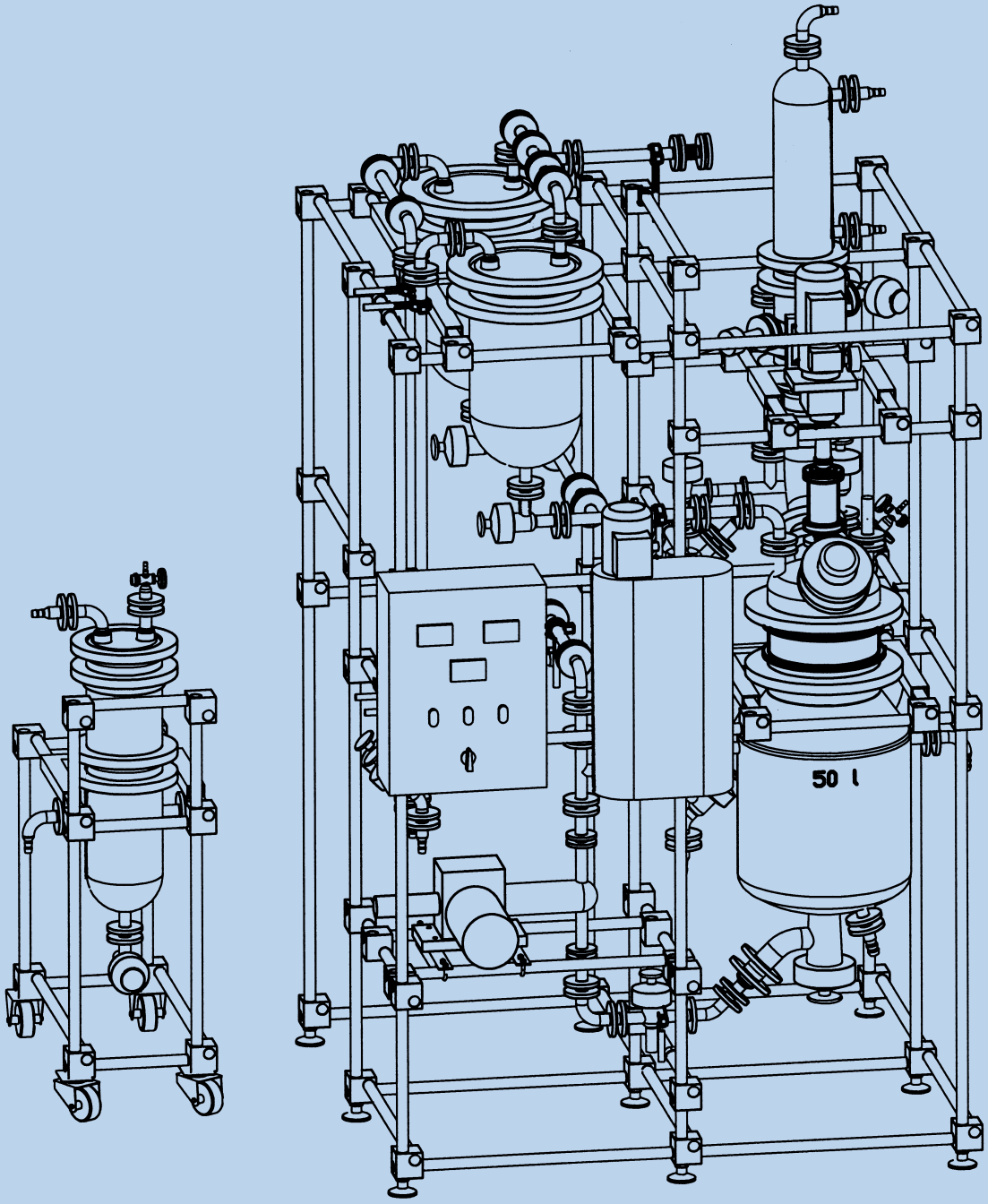
Flask 50 l in electric heating mantle with storage tanks.



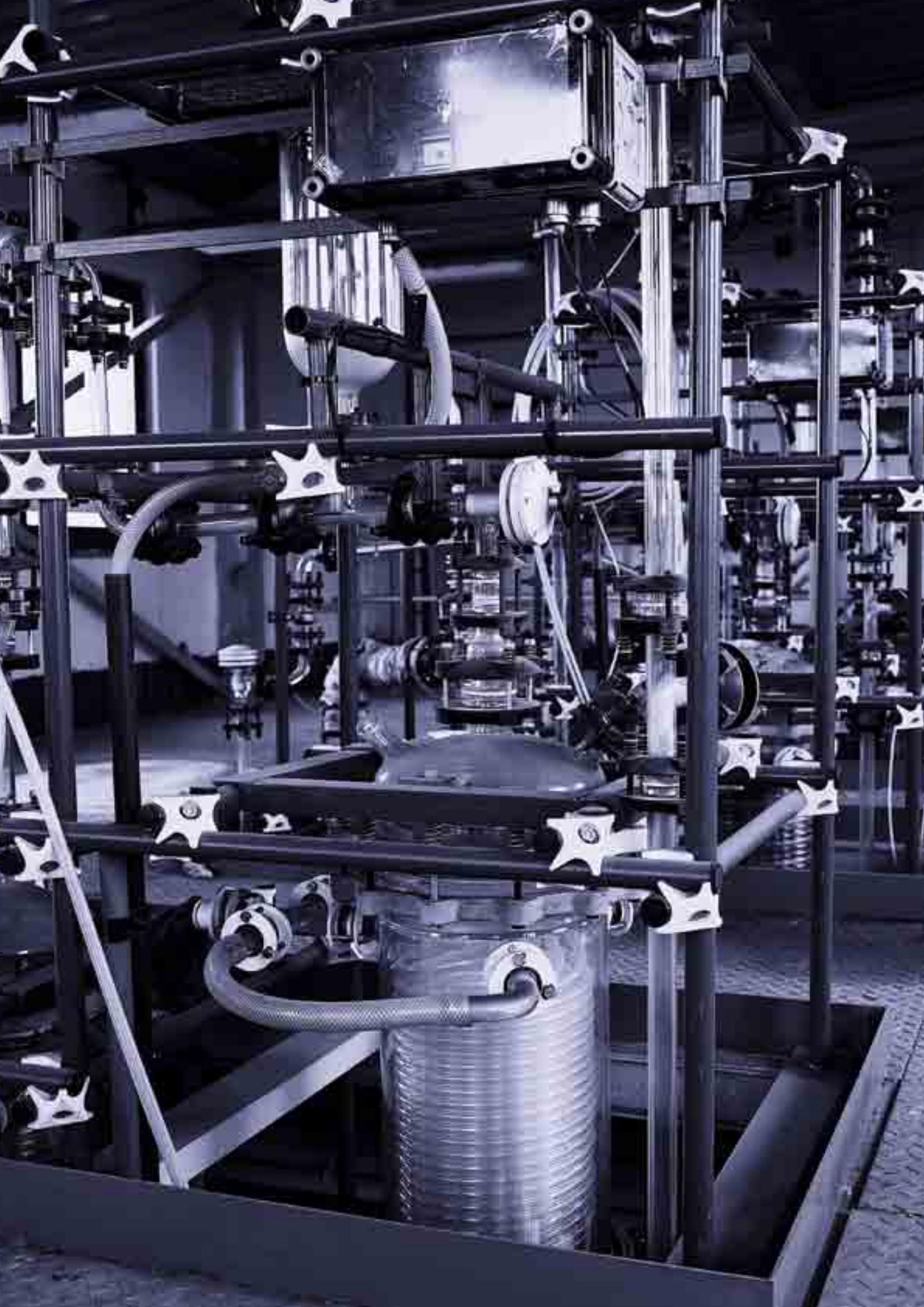
Assembly of 100 l kettles with stainless steel heating coils designed for vacuum operation.



Assembly of fraction cylinders DN 150.



Jacketed kettle 50 l with storage tanks, cooler and filtration nutch completed with thermostat and switchboard.



ALPHABETICAL INDEX

The products listed in the catalogue do not represent a binding production programme; the manufacturer reserves the right to modifications. Conditions of deliveries will be agreed on conclusion of contracts.

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