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BLÜCHER® Marine
Engineering Handbook

Installation · Maintenance · Material Properties

BLÜCHER®

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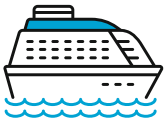


SELECTED REFERENCES

Vessels, hospitals, schools, commercial kitchens, the food and beverage industry and the pharmaceutical industry are among the customers that benefit from BLÜCHER® stainless steel drainage systems.

Marine

More than 3000 vessels in more than 30 countries since 1982.
For a complete list of references, please visit **www.blucher-marine.com**

REPRESENTATIVES

BLÜCHER is represented by local specialists within marine applications around the World. If a local specialist for your area is not listed below, please contact our HQ Marine Sales.

Country	Representative
Argentina	Ferreyra & Asociados S.H.
Australia	Galvin Marine Industrial
Chile	Maquinarias & Inv. Tecnicas S.A.
China	TECWAY International (Marine) Ltd
Croatia	CROCON d.o.o
Finland	Polarputki OY
Germany	EVAC Germany GmbH
Greece	EPE S.A.
India	VACman Sanitation Solutions Pvt. Ltd.
Italy	Stelio Bardi SRL
Japan	Harada Corporation
Netherlands	Nicoverken Marine Services B.V.
Poland	Altro Marine Sp.z.o.o.
Romania	Danube Rainbow Ltd
Russia	JAMA-Engineering
Singapore	Technique Marine Services Pte Ltd
South Korea	Jeitek Corporation
Spain/Portugal	Disolter, S.L.
Taiwan	Union Group
Turkey	DOP Ltd
UAE	Technology Ventures Middle East FZC
USA	EMS European Metric Steel
Vietnam	MTS International JSC

ABOUT US

Danish Design and Production

Founded in Denmark in 1965, BLÜCHER has developed into a leading manufacturer of stainless steel drainage systems. Today, BLÜCHER is an international company with subsidiaries and representations worldwide. The BLÜCHER Group employs more than 400 staff worldwide.

Customers all over the world appreciate our know-how, dedicated service and common sense.

Through quality stainless steel products and drainage solutions that lead waste water away, BLÜCHER is committed to the promise of keeping up the flow.

The BLÜCHER® drainage products are manufactured in Denmark using the most modern production methods and in accordance with the internationally recognised quality standards ISO 9001 and ISO 14001. Furthermore, the most respected classification societies endorse the BLÜCHER® drainage products worldwide.

Safe Solutions for Marine

Since the early 1980's, BLÜCHER's sanitary discharge system for marine applications has been the first choice sanitary discharge system for newbuilding and refitting of ships in Denmark, quickly followed by leading shipyards world-wide.

To date BLÜCHER® sanitary discharge system has been installed in more than 3000 vessels worldwide ranging from cruise liners, luxury yachts and ferries to merchant ships, naval vessels and off-shore facilities.

BLÜCHER is the preferred supplier to several of the largest shipyards worldwide, among them Meyer Group, Fincantieri, Chantiers de l'Atlantique, MV Werften, Daewoo.

Introduction to the Marine Engineering Handbook

Welcome to the BLÜCHER Marine Engineering Handbook for Marine Based Applications.
This guide will provide you with general information on BLÜCHER's system as well as a technical overview of the individual BLÜCHER® product groups for marine use. The guide also contains information on the installation, testing and maintenance of a BLÜCHER® system.

Terms and conditions
The BLÜCHER® Marine Engineering Handbook is a guideline only.
The guide is a reference tool for specifiers, engineers and various stakeholders to build knowledge about the BLÜCHER® system for marine applications and to ensure technically correct design and installation of the BLÜCHER® drainage system. BLÜCHER can not be held responsible for any malfunction of the system due to incorrect design or installation.

Disclaimer
BLÜCHER reserves the right to change or modify product design, construction, specifications or materials without prior notice and without incurring any obligations to make such changes and modifications on BLÜCHER® products previously or subsequently sold.

Support
Further information about the BLÜCHER® system and the individual BLÜCHER® product groups is available from BLÜCHER's brochures, installation instructions and websites.

BLÜCHER has a global network of agents and distributors who can offer guidance and advice in relation to your drainage project. Go to **www.blucher-marine.com** to find your local representative.

WHERE TO USE BLÜCHER

BLÜCHER® EuroPipe

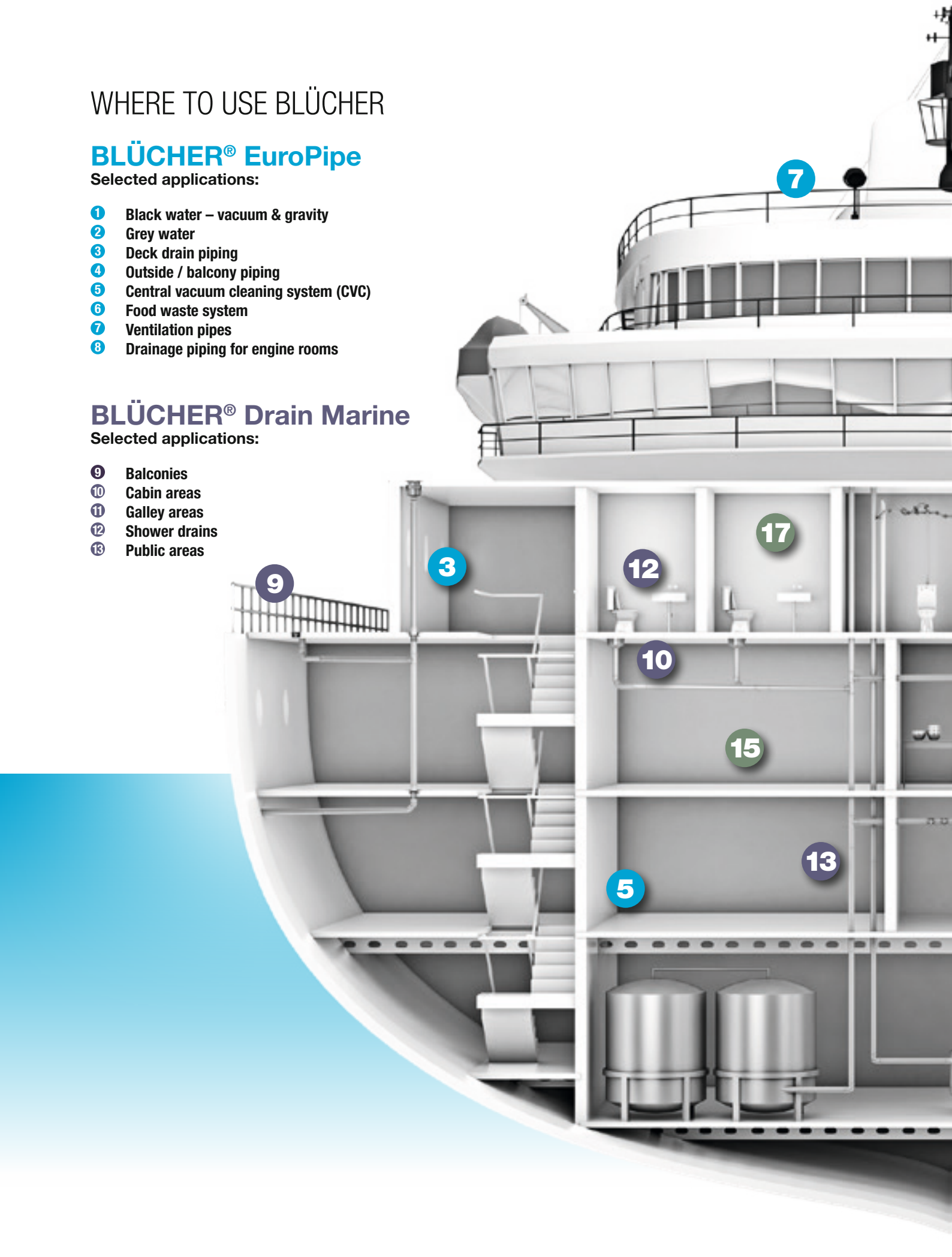
Selected applications:

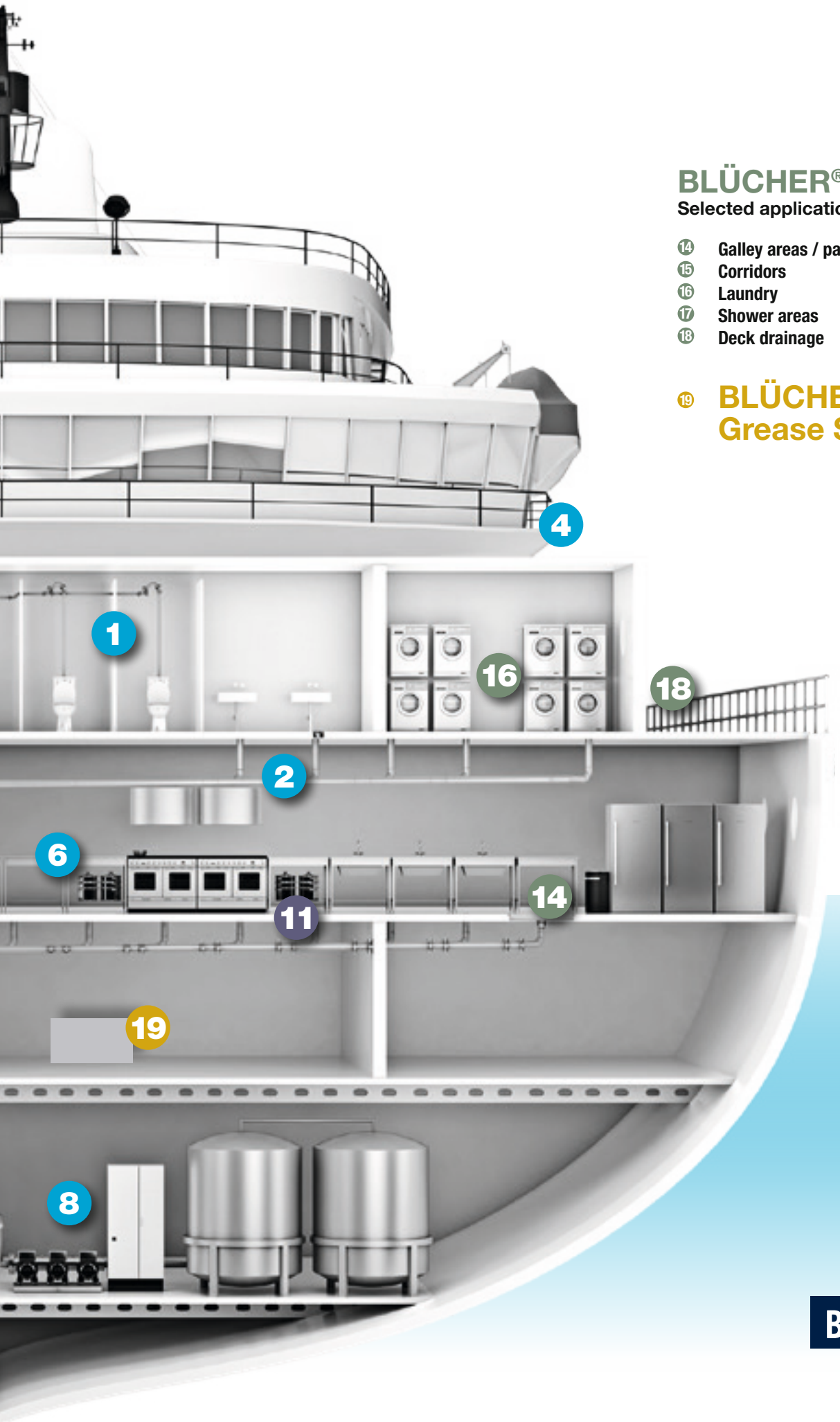
1. Black water – vacuum & gravity
2. Grey water
3. Deck drain piping
4. Outside / balcony piping
5. Central vacuum cleaning system (CVC)
6. Food waste system
7. Ventilation pipes
8. Drainage piping for engine rooms

BLÜCHER® Drain Marine

Selected applications:

9. Balconies
10. Cabin areas
11. Galley areas
12. Shower drains
13. Public areas





BLÜCHER® Channel

Selected applications:

⑭ Galley areas / pantries
⑮ Corridors
⑯ Laundry
⑰ Shower areas
⑱ Deck drainage

⑲ BLÜCHER® Grease Separator

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MATERIAL PROPERTIES

General advantages

The BLÜCHER® stainless steel drainage products offer numerous advantages:

- Ease and speed of installation
- Extensive standard product range
- Special articles available on request
- Hygienic, easy to clean
- Thoroughly tested high-quality products
- Capacity to supply
- Made in Denmark
- Customer-specific complete drainage installations
- Non combustible
- ISO 14001 certification
- ISO 9001 certification

STAINLESS STEEL

What is stainless steel?

The designation stainless steel covers a wide range of alloys with different properties. One property common to all stainless steels is that they contain at least 12% chromium. The stainless steels can be divided into three main groups and a few mixed types according to the structure of the steel:

- Austenitic stainless steel
- Ferritic stainless steel
- Martensitic stainless steel

Austenitic stainless steel is the most important, representing approx. 90% of total stainless steel consumption. Austenitic steel is also the only stainless steel suitable for drainage installations, and it is, of course, the type used by BLÜCHER.

Importance of alloying elements

Austenitic stainless steel contains at least 18% chromium and 8% nickel – thus the well-known designation »18/8« steel. Corrosion resistance generally increases with increasing content of chromium. In alloys with 12-13% chromium, the passive layer is strong enough to prevent the steel from corroding in normal or mildly aggressive media. The main effect of the alloying element nickel is on the structure of the steel and its mechanical properties. The steel's structure is austenitic with an adequate content of nickel. In contrast to the pure chromium steels (ferritic stainless steel), this results in significant changes in the mechanical properties, such as increased workability and ductility, better resistance to thermal stress and improved weldability. The austenitic structure also results in a change in the physical properties of the steel. For example, the steel is not magnetic and has higher thermal conductivity. Nickel also increases resistance to corrosion caused by certain media. Molybdenum has the same effect on the structure as chromium, but it also has a strongly positive influence on corrosion resistance. Molybdenum-containing steel is normally designated »acid-resistant« because of the resistance of these steels to certain types of acids. But acid-resistant stainless steel will also have limited resistance to some media such as chlorine-containing media (see table of resistance).

Why is steel "stainless"?

The addition of chromium to the steel results in the formation of a passivating oxide film with a high content of chromium oxides. This oxide film protects the surface of the steel against oxygen in air and water. An outstanding property of stainless steel is that the chromium oxide film automatically regenerates if the surface of the steel is exposed.
This restitution of the oxide film can only occur if the surface of the steel is completely clean and free of tempering agents and slag from welding processes and residues from tools made from ordinary carbon steel.
If this surface contamination is not removed, the steel may ultimately corrode. To prevent this, the steel surfaces should be cleaned after welding and processing, e.g. by means of so-called acid pickling of the stainless steel.
The pickling effectively removes all impurities from the surface of the steel and permits the reestablishment of a strong, uniform chromium oxide film.

Pickling process

The pickling bath normally consists of 0.5-5% v/v HF (hydrofluoric acid) and 8-20% v/v HNO^3 (nitric acid) at a temperature of 25-60° C. This acid bath removes residues, the existing chromium oxide film and traces of iron, leaving the clean steel surface. The restitution of a strong chromium oxide film starts in the subsequent rinsing in water.

Material Specification

Material	AISI 316 L 1.4404	AISI 304 1.4301
Analysis		
Carbon (C %)	Max. 0,03	Max. 0,07
Chromium (Cr %)	16,5 - 18,5	17,0 - 19,0
Nickel (Ni %)	11,0 - 14,0	8,5 - 10,5
Molybdenum (Mo %)	2,0 - 2,5	-
Manganese (Mn %)	Max. 2,0	Max. 2,0
Silicium (Si %)	Max. 1,0	Max. 1,0
Sulphur (S %)	Max. 0,030	Max. 0,030

Physical Properties

Structure	Austenitic (nonmagnetic)	Austenitic (nonmagnetic)
State	Non-annealed	
Specific gravity (g/cm³)	7,98	7,9
Melting point (°C)	Ca. 1400	Ca. 1400
Decortication temperature in air (°C)	800 - 860	800 - 860
Expansion coefficient 20 - 100 °C (m/m . °C)	16,5 x 10-6	16,5 x 10-6
Specific resistance (20° C) (Ohm . mm²/m)	0,75	0,73
Heat conductivity (20°C) (W/°C-m)	15	15
Specific heat (J/g . k)	0,5	0,5

Mechanical Properties

Ultimate tensile strength (Rm) (N/mm²)	490 - 690	500 - 700
Yield point (Rpo2) (N/mm²)	190	195
Modulus of elasticity (E) (20° C) (N/mm²)	2,0 x 105	2,0 x 105
Hardness Brinell (HB) (N/mm²)	120 - 180	130 - 180

Material certificate available on request

FACTS AND ADVANTAGES OF STAINLESS STEEL


NO CORROSION

Corrosion resistance

Austenitic chromium-nickel steel is resistant to many different chemical products and most detergents. BLÜCHER® drainage products are manufactured exclusively from this group and as such are suitable for use within the food, beverage, chemical, pharmaceutical, dairy, shipbuilding and commercial catering industries.
When increased acid-resistance is required, and spot and crevice corrosion may occur, or in general for marine/off-shore use, molybdenum alloyed chromium-nickel steels (AISI 316L) may be used. These acid-resistant steels resist a number of organic and inorganic acids.
However, acid-proof steels are only partially resistant to solutions containing chlorides.


FIRE RESISTANT

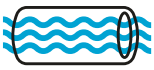
Fire resistance

Stainless steel is non-combustible material which means that BLÜCHER® pipes and drains made of stainless steel cannot burn and will not contribute to any fire.
Furthermore, no toxic fumes or substances are released from stainless steel in the event of fire.


100% RECYCLABLE

Environment

Environmentally friendly manufacture, long life and 100% recyclability. BLÜCHER® drainage products are part of the ecological cycle - up to 75% recycled material.


HIGH FLOW

Protection against blockages

The smooth surface of stainless steel and its accompanying excellent water-repellent properties are a major advantage in this situation:
- rapid discharge of water
- prevention of deposits

The smooth surface combined with the larger inside diameter due to the thin wall of piping gives better flow and less risk of clogging of the piping.

ONG PRODUCT LIFE

Life time

Life time expectancy of BLÜCHER® pipes is minimum 40-50 years, when installation work and maintenance is taken care of in a proper way and anti-scaling chemicals are used as recommended.


CUSTOMIZED

Customized solutions

In addition to the extensive standard product range, BLUCHER also offers purpose - made items on request to ensure that any drainage requirement can be satisfied.


HYGIENIC

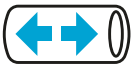
Hygiene

Hygiene is an important issue, on cruise vessels and in other Marine applications. From practical experience in hygienic installations (food preparation, health care etc.) it is documented that bacterial growth on stainless steel is significantly lower than on alternative materials (e.g. plastics). In addition an unused piece of stainless steel pipe has a very low surface roughness (K=0.00006 in. (0.0015 mm)). This low surface roughness minimises not only bacterial growth, but also the danger of sediments building up which may later lead to blockages.


ANDAL PROOF

Resistance to deformation

Resistance to deformation, that is the ability of the steel to resist impacts, is outstanding for austenitic stainless steel at all temperatures. This is also the case at temperatures substantially below zero. Powerful impacts may result in denting in certain cases, but the steel cannot be actually damaged without great difficulty.


LOW EXPANSION

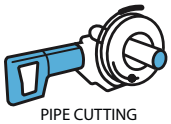
Resistance to thermal stress

Because of their low coefficient of expansion, stainless steel drainage products retain their shape perfectly at all normal temperatures in drainage installations. Stainless steel drainage products also do not have to be stored or installed at certain temperatures. The steel is not affected by neither heat nor cold.
In installations where expansion is not possible the logitudinal expansion must be taken into consideration (see table, p. 49).


LOW WEIGHT

Weight

BLÜCHER® drainage products are all produced in thin-walled stainless steel sheet making the most of the material's high strength to weight ratio.
This makes our product the superior choice when calculating the weight optimisation for the vessel or off-shore installation in question.


PIPE CUTTING

BLÜCHER® cutting tools

The BLUCHER® cutting tools have been specially developed to produce a bevelled leading edge to the cut ends to assure that the pipes can be installed without subsequent finishing and so that sealing ring will not be damaged by sharp edges.


FAST INSTALLATION

Fast installation time

- Push-fit connection system - a few seconds needed to connect pipes/fittings. A 2° flexibility in each connection. 16 - 35 mm flexibilty in insertion depts.

Other benefits of BLÜCHER® stainless steel pipes

STAINLESS STEEL – MARINE APPLICATIONS

Material choice for drainage applications

Stainless steel is a clean, durable, corrosion resistant material with a design life expectancy of over fifty years. The BLÜCHER® sanitary discharge system comes in 2 stainless steel grades, AISI 316L and AISI 304. BLÜCHER normally recommends the use of AISI 316L because the risk of corrosion, caused by an aggressive environment, is significantly reduced or eliminated entirely by choosing the molybdenum stainless steel type AISI 316L. Below are listed the recommended type of material for different applications.

In some products, in which part components are used that are not exposed to sewage water and consequently not affecting the functionality or lifetime of the product, these part components may be made from other materials or alloys than specified for the complete products.

During installation and until test/normal operation the sanitary discharge system is to be closed and not used in order to avoid contamination by corrosive substances.

Black water piping	Grey water piping	Grey water piping, Galleys	Deck drain piping	Outside piping visible	Food waste piping
AISI 316L (AISI 304 - Only if no aggresive cleaning agents are used)	AISI 316L (AISI 304 - Only if no aggresive cleaning agents are used)	AISI 316L	AISI 316L*	AISI 316L**	AISI 316L

* Pipes to be flushed regularly with fresh water

** Outside piping must be primed and painted

HOW TO DETERMINE MATERIAL QUALITY BY LABEL COLOUR

Example: AISI 316L - green label

Example: AISI 304 - red label

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CHEMICAL RESISTANCE TABLE

A = Very good service to operating limit of material B = Moderate service C = Limited or variable service D = Unsatisfactory	AISI 316 L Stainless	AISI 304 Stainless	EPDM	NBR	FPM	SI	CR
Acetone	A	A	A	D	D	D	D
Acetic acid (dilute.) 30% or 50%	A	A	A	B	B	B	-
Acetic acid 100%	A	A	A	C	C	B	-
Acetic anhydride	A	A	B	C	D	D	B
Aluminium chloride	D	D	A	A	A	A	-
Aluminium sulfate	A	D	A	A	A	A	-
Ammonium carbonate	A	A	A	D	A	B	A
Ammonium chloride/salmiac	B	C	A	A	-	B	-
Ammonium hydroxide	A	A	A	D	B	A	-
Amyl chloride	A	A	D	-	A	D	D
Aniline	A	A	B	D	C	A	D
Anilin hydrochloride	D	D	B	B	B	C	-
Barium chloride	B	B	A	A	A	A	A
Barium hydroxide	A	A	A	A	A	A	A
Benzaldehyde	A	A	A	D	D	A	D
Benzene	A	A	D	D	A	D	D
Benzoic acid	A	A	D	D	A	D	D
Borax/sodium borat	A	A	A	B	A	B	-
Boric acid	A	A	A	A	A	C	A
Bromine	D	D	D	D	A	D	D
Bromine chloride	D	D	A	B	A	-	-
Bromoethylene/vinyl bromide	A	A	-	-	-	-	-
Butanol	A	A	D	A	A	D	-
Butyl acetat	A	A	B	-	D	D	-
Butyric acid	A	A	B	D	B	B	D
Calcium bisulfate	A	A	D	A	A	A	-
Calcium chloride	B	B	A	A	A	A	A
Calcium hydroxide	A	A	A	A	A	A	A
Calcium hypochlorite	B	C	A	C	A	C	B
Carbon disulfide	A	A	-	-	-	D	-
Carbon tetrachloride	A	A	D	C	A	D	D
Chloroacetic acid (Mono)	D	D	B	-	-	D	-
Chlorine (dry)	A	A	-	-	A	D	D
Chlorobenzene	A	A	D	D	A	D	D
Chlorosulfonic acid	B	C	D	D	C	D	D
Copper chloride	B	B	A	A	A	A	B
Copper nitrate	A	A	B	B	-	A	-
Copper sulfate	A	A	A	A	A	A	A
Ether	A	A	-	-	-	D	-
Ethyl chloride	A	A	A	A	A	D	D
Fatty acid	A	A	D	B	A	C	-
Fluorine (dry)	A	A	-	-	-	D	-
Hydrofluoric acid	D	D	B	D	A	D	-
Formaldehyde	A	A	A	B	A	A	C
Formic acid	A	A	A	B	C	B	A
Furfural	A	A	B	D	D	D	-
Gallic acid	A	A	B	B	A	A	B
Hydrobromic acid	D	D	A	D	A	D	D
Hydrochloric acid	D	D	A	D	A	D	-
Hydrogen peroxide	A	A	C	D	B	A	A
Iodine (wet)	D	D	-	-	-	D	-
Kloroform	B	B	D	D	A	D	-
Lead acetate	A	A	A	B	D	D	B
Magnesium chloride	B	B	A	A	A	A	A
VALUES TO BE REGARDED AS FOR GUIDANCE ONLY							

A = Very good service to operating limit of material B = Moderate service C = Limited or variable service D = Unsatisfactory	AISI 316 L Stainless	AISI 304 Stainless	EPDM	NBR	FPM	SI	CR
Magnesium sulfate	A	A	A	A	A	A	-
Mercury	A	A	A	A	A	A	A
Methanol	A	A	A	A	C	A	D
Methyl chloride	A	A	C	D	A	D	A
Methylene chloride	B	B	D	D	B	D	B
Natphalene	A	A	D	D	A	D	-
Nickel chloride	B	B	A	A	A	A	A
Nickel sulfate	A	A	A	A	A	A	A
Nitric acid	C	C	C	D	A	D	-
Oxalic acid	C	C	A	B	A	B	A
Perchloric acid	D	D	B	-	A	D	-
Phorsphoric acid	A	A	B	D	A	D	-
Picric acid	A	A	B	B	A	D	-
Potassium bromide	A	A	A	C	-	B	C
Potassium carbonate	A	A	A	C	-	A	C
Potassium chlorate	A	A	A	C	-	B	C
Potassium cyanide	A	A	A	A	A	A	A
Potassium hydroxide	A	A	A	B	B	C	-
Potassium nitrate	A	A	A	A	A	A	A
Potassium permanganate	A	A	A	C	-	B	C
Potassium sulfate	A	A	A	A	A	A	A
Potassium sulfide	A	A	-	-	-	A	-
Potassium chloride	B	B	A	A	A	A	A
Prophylene dichloride	A	A	-	-	-	D	-
Silver nitrate	A	A	A	B	A	A	A
Soda (ash)/sodium	A	A	-	-	-	A	-
Sodium acetate	A	A	A	B	D	D	D
Sodium bicarbonate	A	A	A	A	A	A	-
Sodium bisulfate	A	C	-	-	-	A	-
Sodium bisulfite	A	A	A	A	A	A	-
Sodium bromide	B	B	A	C	-	B	C
Sodium chlorate	A	A	A	C	-	B	C
Sodium chloride	D	D	A	A	-	A	A
Sodium cyanide	A	A	A	A	A	A	-
Sodium fluoride	A	A	-	-	-	B	-
Sodium hydroxide	A	A	A	B	B	D	-
Sodium hypoklorite	D	D	B	B	A	B	-
Sodium nitrate	A	A	A	B	-	D	-
Sodium sulfate	A	A	A	A	A	A	A
Sodium sulfide	A	A	-	-	-	A	-
Sodium sulfite	A	A	-	-	-	A	-
Stannous chloride/tin chloride	B	C	B	A	A	B	-
Sulfur	A	A	A	D	A	-	A
Sulfur chloride	A	A	D	C	A	C	A
Sulfur dioxide	A	B	A	D	A	B	-
Sulfuric acid	D	D	B	D	A	D	-
Sulfurous acid	A	C	B	B	A	D	A
Thionyl chloride	A	A	D	B	A	D	A
Toluene/toluol	A	A	D	D	A	D	-
Trichloroethylene	A	A	D	C	A	D	A
Turpentine	A	A	D	A	A	D	A
Xylene/xylol	A	A	-	-	-	D	-
Zinc sulfate	A	A	A	A	-	A	A
VALUES TO BE REGARDED AS FOR GUIDANCE ONLY							

Assumptions: 20°C room temperature

References

Corrosion Data Survey, 1969 Edition, Nace
Corrosion Tables, Stainless Steels, 1979, Jernkontoret
Chemical Resistance of Plastic Piping Materials, Cabot Corporation, 1979

PLEASE NOTE !

The table is based on laboratory experiments with chemically pure substances.
The values should therefore be regarded as for guidance only.
Each application should be carefully reviewed to determine the suitability of stainless steel.
BLÜCHER can only provide statements regarding individual, pure chemicals. Some chemicals, which are basically harmless to stainless steel, can turn aggressive when mixed with other chemicals.Some chemicals are ”trade name chemicals” or ”factory made cleaning solutions” consisting of several different chemicals that again influence each other. Where ”factory made cleaning solutions” are used, we recommend that our customers contact the supplier of the cleaning agent for information about the specific content of the cleaning agent and how it will impact stainless steel and sealing rings. The supplier may have similar cases that can be used for reference and to obtain experience with the use of the specific cleaning agent in combination with stainless steel grade AISI 304 or AISI 316L.
In addition to the chemicals used, the chemical resistance is very much dependent on factors such as:

- Daily use (processes)
- Concentration level
- Operating temperatures
- Exposure time
- Cleaning procedures
- Chemicals used individually or mixed with other chemicals
- pH levels

In particular, be careful with the use of hydrous cleaning agents containing compounds of chlorine.
BLÜCHER always advises to flush the drainage system with clean cold water after discharge of aggressive fluid to reduce the contact time as much as possible.

Always contact the supplier of any detergent, cleaning agent or other chemical to ask for guidance in the use and disposal of the product.

MATERIAL PROPERTIES RUBBER SEALS

Rubber sealing rings for BLÜCHER® EuroPipe system are available in 3 different rubber qualities

EPDM
This sealing ring is black and made of ethylene propene rubber. This is BLÜCHER's standard sealing ring and it is suitable for all rainwater and waste water installations where there is no oil or no petrol residues in the waste water. The EPDM lip seal is a good all-round rubber quality suitable for a wide range of applications.

NBR
This sealing ring is black with a yellow spot and made from nitrile rubber and is the sealing ring to be used where there are petrol or oil residues in the waste water (e.g. in connection with oil and petrol separators at service stations, garages etc.).
The NBR lip seal should not be used where there is a risk of temperatures above 80°C. NBR is not resistant to solvents.

FPM
This sealing ring is green (until 2014: purple) and made from fluorine rubber (Viton®).
This is BLÜCHER's sealing ring for special applications.
The material is particularly heat-resistant and resistant to oil, solvents and strong acids. However, the FPM seal has only limited resistance to e.g. butyl acetate, acetone and methyl alcohol.

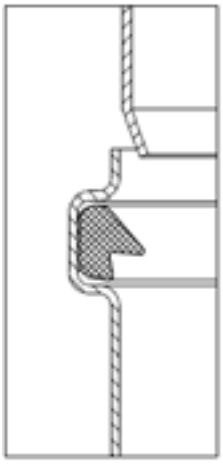
Rubber sealing rings Marine products

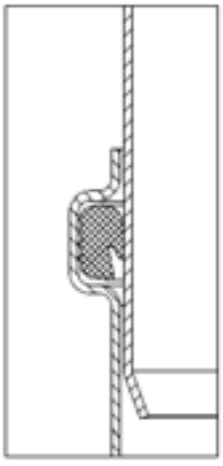
SI
This sealing ring is red and made from silicone rubber (VMQ). This is the BLÜCHER sealing ring used for fire safety. The SI sealing ring is only used in BLÜCHER´s special fire resistant pipe penetrations.

CR
This sealing ring is black and made from chloroprene rubber. This is the BLÜCHER standard sealing for Marine drains. The material is flame retardant and has good heat resistance, mechanical and abrasion properties.
It is resistant to most inorganic chemicals, except for oxidizing acids and halogens. Moderate resistance to oil residues.

For advice regarding the suitability of the different rubber qualities, consult BLÜCHER.

A lip sealing ring constitutes the seal between socket and spigot end. The lip sealing ring ensures quick and efficient jointing of the drain and pipe components while providing a tight seal. BLÜCHER® sealing rings are available in three different rubber qualities.





Rubber types

International designation	EPDM	NBR	FPM	SI	CR
Rubber type	Ethylene propylene	Nitrile	Fluorine (Viton®)	Silicone	Chloroprene
Nominal hardness IRHD	60 (+/-5)	60 (+/-5)	60(+/-5)	57(+/-5)	55 (+/-5)
Colour	Black	Black/yellow dot	Purple (new: green)	Red	Black
Tensile strength MPa	≥10 N/mm²	≥10 N/mm²	≥8 N/mm²	≥5,5 N/mm²	≥10 N/mm²
Elongation at rupture %	≥300%	≥300%	≥230%	≥250%	≥250%
Max. temperatur range	-40/+100° C -40/+212° F	-30/+80° C -22/+176° F	-25/+200° C -13/+392° F	-50/+230° C	-30/+110° C

Resistance

Wearability	2	2	2	2	3
Resistance to mineral oil	5	1	1	3	2
Resistance to vegetable oil	2	1	1	1	2
Resistance to gasoline	5	1	1	5	2
Resistance to aromatic compounds and hydrocarbons	5	2	1	3	3
Resistance to ketones	1	5	4	3	5
Resistance to ordinary diluted acids and alkalines	1	1	1	2	2
Resistance to ozone and weather stresses	1	3	1	1	1
Resistance to air diffusion	4	3	1	2	2

1 = Very good 2 = Good 3 = Moderate 4 = Limited service 5 = Low

MAINTENANCE

With the right choice of material, a BLÜCHER® sanitary discharge system can be used for most types of drainage installations requiring only limited maintenance, provided that a few precautions are taken during installation and operation.

DURING INSTALLATION

During installation care must be taken to prevent contamination of the stainless steel by carbon steel in tools or otherwise touching the stainless steel. In itself, carbon steel will not cause corrosion of the stainless steel surface, but the carbon steel particles adhering to the stainless steel will rust and cause discolourings. Always use clean tools suitable for stainless steel without any adhering iron shavings or particles of rust, stainless steel wool/brushes and stainless steel brackets, screws, bolts, nuts, etc. in the stainless steel drainage system.

If welding, or use of carbon steel tools or similar is to take place close to a stainless steel installation, the stainless steel surface is to be protected until the work has been completed.

To prevent construction waste or chemicals used in connection with other construction work from being admitted to the sanitary discharge system during installation and completing of other construction work, it is very important to keep the sanitary discharge system closed and unused until all construction work has been completed.

All BLÜCHER® Marine drains lower parts come with a welding cover to ensure protection of the drainage system during installation. The sanitary discharge system must also be thoroughly cleaned and flushed with freshwater on completion to ensure that any blockages or leaking joints are revealed before the sanitary system is put into use.

PREVENTIVE MAINTENANCE

Maintenance - generally

Maintenance comprises preventive maintenance and remedy of operational problems detected. Preventive maintenance can avert operational problems in a drainage installation. Below are a number of examples of how to maintain a drainage installation:

Floor drains

Floor drains with side inlets from showers and hand basins under the top grating are particularly likely to become blocked by hair etc. The drain should be cleaned regularly, including removal and thorough cleaning of the water trap.

Water traps

Water traps through which only small quantities of water containing relatively many solids are discharged, are likely to become blocked. A thorough flushing of the drain through the water trap with a large quantity of water should take place regularly. This problem is particularly likely to occur in connection with bottle water traps in drains from hand basins in separate toilet rooms.

Ventilating pipes

Blockages of ventilating pipes are often caused by birds' nests in the pipe. If birds' nests are found they should be removed to avoid odours as vacuum will form in the water traps and also because excess pressure in the ducting system will be balanced through covers in places where the odour can be very inconvenient. Birds' nests can be avoided by covering the ventilating pipe opening with wire netting.

Operating problems

Operating problems, especially blockages, may occur in any drainage installation and can often be repaired by cleaning the drain thoroughly. Recurrent blockages at the same location in a drainage installation should give rise to an investigation of the cause and repair if necessary.
Recurring blockages are usually caused by defects in the drainage installation, and most often they become apparent shortly after the system has been put into use. The defects may, for example, be insufficient falls, cavities in the pipes, poor joints or construction waste admitted to the system during the completion of construction work either through the sanitary units or through open pipe ends. Consequently, branches should be kept closed during completion of construction work. The drainage system must also be thoroughly cleaned and flushed immediately after completion in order to ensure that any defects are discovered before the drainage system is put into use.

Another frequent cause of recurring blockages is fat discharged through vertical pipes connected to kitchen sinks. This is not to say that the kitchen sink is used incorrectly as hot fat is flushed through the water trap and, when cooling, deposits on the internal pipe walls. Usually, such blockages will only become apparent long after the system has been installed. Consider installing a grease separator, e.g. for catering centres, restaurants and institutions where it is to be expected that fats will be discharged into the pipework system.

Rodding access

An appropriately designed drainage system has a number of integrated rodding accesses through which the pipes can be cleaned. Furthermore, drain fittings, water traps and gratings of sanitary units can also be removed to provide access to the pipework system.

PREVENTIVE ARRANGEMENTS

On delivery from the factory, all stainless steel surfaces have been passivated and are perfectly clean. In other words, the stainless steel has formed a corrosion-resistant oxide film over the entire surface.
To preserve the outstanding anti-corrosion properties of the stainless steel, especially if it is to be used outdoors, the following instructions should be followed with respect to design, manufacture and installation:

Choose the right material with respect to any impurities found in the surroundings such as soot, sulphur dioxide, salt water or road salt.
Choose the right design which will permit rainwater or rinsing water to remove all dust or dirt from the entire stainless steel surface.

N.B.!
Only substances to which stainless steel is resistant should be discharged into the BLÜCHER® EuroPipe system.
See table of resistance on page 14.
If there is a risk that aggressive substances have nevertheless been discharged, the system should be flushed with plenty of cold water.
Contact BLÜCHER if in doubt as to whether the stainless steel is resistant to the liquids/substances in question.

Stainless steel grade AISI 316L should be specified for components which are not exposed to rainwater or to components to be installed in geographic areas where it rarely rains.
Use stainless steel brackets, screws, bolts and nuts in the installation.
Avoid the risk of galvanic corrosion between stainless steel components and carbon steel items in places where the materials are exposed to moisture or water (i.e., establish electrical insulation).
Use clean tools which have no adhering iron shavings or particles of rust.
Never use steel brushes and steel wool made from ordinary carbon steel. Only stainless steel wool or brushes will not attack the surface.
Do not use hydrochloric acid to remove cement mortar residues from stainless steel surfaces. Use water to remove the mortar before it dries.

GUIDELINES & CONSIDERATIONS

Stainless steel is resistant to a wide range of chemicals and substances, but a few guidelines are to be observed as regards what substances can be discharged through the system:

- Waste water containing chemicals to which the stainless steel is not resistant, e.g. hydrochloric acid, may cause corrosion.
  Modern cleaning processes use many chemicals, but care should be taken to ensure that the cleaning agent is suitable for stainless steel. Mechanical cleaning might be used as well.
  Contact the manufacturer of the cleaning agent if in doubt.

- Prevent blockages by regularly flushing the drainage system through drains and water traps and through other rodding access. Blockages owing to fat discharged through kitchen sinks may be prevented by using a grease separator.

- Waste water containing substances that may cause deposits of sludge or solids such as sand, plaster or iron shavings which may cause damage to the drainage pipes, the waste water treatment plant or the recipient

- Waste water with substances which might be inflammable or explosive, rendering water treatment dangerous

- Waste water at temperatures exceeding the limit temperature of the pipes, the waste-water treatment plant or the recipient

- Waste water containing fats and oils, e.g. frying oils

- Waste water containing objects that might cause blockages. General information about what may be flushed in the toilet is particularly important. Sanitary napkins, paper nappies, cotton buds and cloths flushed down the toilet are a very common cause of blockages.
  A properly placed waste bin with a label clearly indicating what to dispose of in the waste bin and not in the toilet can prevent many problems.

DISCOLOURATION

Stainless steel can be discoloured by corrosion if exposed to a more aggressive environment than that for which is was designed, i.e.
- Highly polluted air: "maritime/industrial atmosphere"
- Salt solutions and hydrochloric acid
- Residual coatings from chlorine-containing cleaning agents
- Inappropriate design from the point of view of corrosion, i.e. designed with pockets or narrow crevices.
- Transfer of iron residues under the influence of moisture
- Steel packaging bands
- Fork-lift trucks
- Steel shelves which have not been surface-treated
- Steel tools
- Transport rollers
- Securing elements etc.

It is not the stainless steel surface which corrodes, but particles from the carbon steel adhering to the surface of the stainless steel. Under the influence of moisture, the corrosion will already be evident after a few days if the surface is attacked.

N.B.: The risk of corrosion is significantly reduced or eliminated entirely by choosing stainless steel grade 316L.

HOW TO REMOVE STAINS AND DISCOLOURATION FROM STAINLESS STEEL SURFACES

If the stains on or the discolouration of the stainless steel surface is so serious that it cannot be removed by ordinary rinsing with water, the following cleaning methods are recommended:

Problem	Cleaning agent and method
Fingerprints	Clean with rubbing alcohol, thinner or acetone, rinse with cold water, wipe dry.
Oil and grease	Clean with an organic solvent of the above type, then wash with soapy water or a mild cleaning agent. Rinse with cold water, wipe dry.
Difficult stains and discolouration	Clean with a mildly abrasive cleaning agent and rub along the surface structure. Rinse with clean cold water and wipe dry. Or: wash with a 10% phosphoric acid solution. Rinse with an ammonium solution, then with clean cold water, wipe dry.
Stickers	Stickers and labels can be removed with acetone or methyl ethyl ketone.
Plastic film	PVC film can adhere after a time. Use rubbing alcohol to remove.
Tarnishings and more difficult stains	Wash with an abrasive cleaning agent or: rub with a Scotchbrite sponge along the surface structure; rinse with clean cold water and wipe dry.
Discolouration from corrosion	Wet the surface with a solution of oxalic acid and let the solution sit for 15-20 minutes. Rinse with clean cold water and wipe dry. If necessary, wash with an abrasive cleaning agent as described above.
Paint	Clean with paint remover (or use a soft nylon brush or sponge). Rinse with clean cold water and wipe dry.
Scratches on polished or brushed surfaces	Polish with a rotating polishing pad (always use an iron-free polish). Polish along the surface structure, wash with soapy water or a mild cleaning agent, rinse with clean cold water, wipe dry. N.B.: this method cannot be used on smooth or rolled patterned surfaces without leaving visible traces.
Precautions • Use only acids if other methods have proved inadequate. • Follow the applicable safety provisions for such work and wear rubber gloves and proctive goggles. • Ensure proper ventilation. • When using acid take care to protect the gaskets from acid.	

PAINTED/COATED FINISH

Usually, BLÜCHER® EuroPipe stainless steel drainage pipes do not require any finishing treatment as this high-quality material complies with most requirements with regard to surface finish and maintenance. If an enhanced surface finish is nevertheless desired, e.g. if the pipes are to be painted, a good adhesion must be ensured to obtain an aesthetically pleasing result. This can be done as follows:

Prior conditions:

- The surface must be smooth, even and without any dents.
- The surface must be free from scratches and marks.

Example of finishing treatment

1) Degrease pipes and fittings to a pure oil- and grease-free surface. For instance, an ammonium cleaning agent or suitable basic cleaner may be used.
2) After degreasing, dry and rinse pipes and fittings with pure water.
3) When the surfaces have dried, sand pipes and fittings to a rough surface with sand paper no. 180.
4) After sanding, apply two undercoats of acrylic paint to provide a base coat to which the subsequent painting adheres well.
5) Finally, paint the pipes twice with an acrylic enamel (see type designation) suitable for outdoor use (moisture resistant).

Allways follow the paint manufacturer's guidelines.

SCALING

What is scaling/urine scaling

Urine scale is built by the reaction (crystallization) between urine and water. This reaction happens in drainage pipes – in grey- and in black-water systems (gravity and vacuum lines).
Most critical is urine scaling building in vacuum pipes because of the low amount of water and long residual time in the pipes compared to gravity lines.

The amount of calcium ions ($Ca^{2}+$) in the water determines how much urine scaling is produced.
"Soft water" (treated water) contains a lower concentration of calcium ions, meaning less urine scaling when "soft water" is used compared to when "hard" untreated water is used.
The second important component is urine. The main components of urine are water (95%) and urea, some salts, and urine acid.

Consequently, the amount of scaling will depend on the ratio of urine to water and on the water quality (calcium ions content). This means that if in a drainage pipe urine is present without water, e.g. in a waterless urinal, or if in a pipe from a pool area only water is present without urine, scaling will not occur.

Prevention – how to avoid or delay scaling

To avoid or to delay the scaling there are three important factors to be aware of:

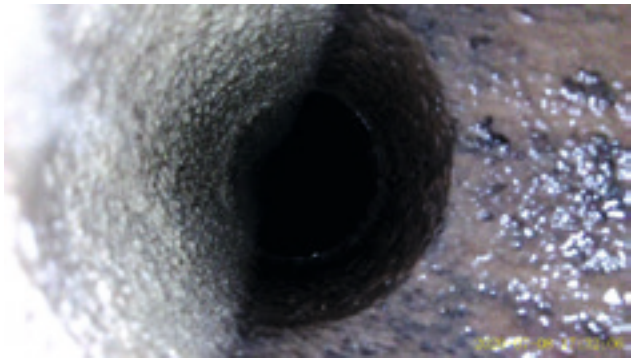
1. **The system layout:** less riser pipes, most piping as downwards piping, higher flow, the right amount of transport pockets, right dimension of the piping, not too large pipe dimension, large bends, pipe material with smooth surface. Clever design of vacuum pipe routing for example separate public toilets and urinals in separate line.
2. **The chemical composition of sewage water:** soft water (less water hardness), lower pH, low amount of urine will prevent scaling or delay it.
3. **Maintenance/observation of the system:** installation of enough observation points like access pipes, hatches and manometers so that for example obstacles and fast growing points for scaling can be identified early!

How to remove scaling from BLÜCHER® EuroPipe

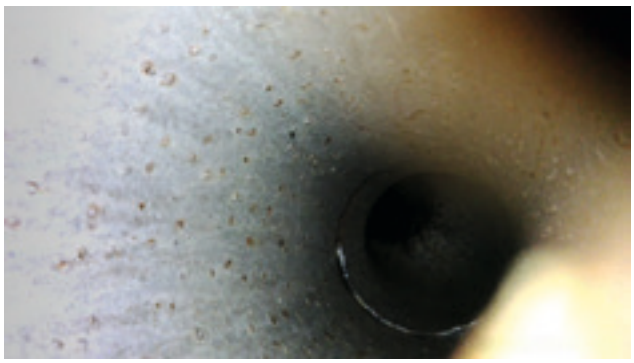
Once scaling in the pipe system has built, there are various ways to remove/reduce it.This can be done, for example, by either mechanical cleaning or chemical cleaning or biological cleaning. All 3 are known methods for cleaning/descaling pipe systems.
See the table below for more information about the 3 methods of descaling.

Method	Tools	Principle	Reaction time	Advantages	Disadvantages
Mechanical:	• Pipe/drain cleaning equipment (like e.g drum machines, water jetter or similar)	Mechanical removal the layer of the inner surface (scaling) of the pipes.	Fast	• Immediate success • Parts of pipe can be treated	• Special tool needed • Can create blockages at other parts of the piping • Limited length of the tools
	• Dry ice	In the vacuum pipe Small explosions	Fast	• Easy to do	• Is not reaching all parts of a pipe system • Need dry ice production
Chemical:	• Mineral acid	React direct with urine scale	Very fast	• Quick solution	• Creating gas pressure • Need proper ventilation • Solvent can destroy pipes • Bad for sewage plants
	• Organic acid	React direct with urine scale	Medium	• Less gas pressure • Less problems for sewage plants • No problem for piping	• Needs more time
Biological:	• Enzymes and bacteria	Cracking the urea in the urine scale and eating it	Slow	• Can be used continously to prevent scaling • No problem for biological sewage plants	• Not for fast emergency cases • Expensive • Needs dosing control • Some enzymes create fatty acids which react with calcium as soap and clog the pipes in sewage plants

Before



After



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PRESENTATION OF BLÜCHER® MARINE PRODUCTS

BLÜCHER® SANITARY DISCHARGE SYSTEMS FOR MARINE

The BLÜCHER® sanitary discharge system is a modular system providing numerous possible combinations and a solution for any deck or bulkhead construction.
In addition to the extensive standard product range, BLÜCHER also offers purpose-made items on request to ensure that any drainage requirement can be satisfied.

When it comes to the marine segment, BLÜCHER has several different types and groups of products that are specifically intended for this segment.
What characterizes products for the marine industry is, among other things, that they must be suitable for installation in a steel construction, and therefore many of the products are different from products for land-based projects.

In this chapter you will find products facts and benefits for product groups as follows:


BLÜCHER® Channel


BLÜCHER® EuroPipe / Pipe penetrations


BLÜCHER® Drain Marine


BLÜCHER® Special Marine products and Customized Solutions

BLÜCHER® EUROPIPE - THE ADVANTAGES AT A GLANCE

- All in stainless steel - AISI 316L/EN1.4404 or AISI 304/EN1.4301
- Available in OD 40, 50, 75, 110, 125, 160 and 200 mm in standard lengths from 0,15 to 6 meters
- Fast and simple installation due to push-fit socket and spigot end jointing
- Low weight of material (only 1-1,5 mm wall thickness), yet strong
- Completely interchangeable between vacuum and gravity installations
- 100% pressure tested from factory
- Non-combustible, classified as A1
- Complete range of approvals
- Fire tested A0-A60
- Long product-life expectancy
- Hygienic – low surface roughness, high flow capacity, no bacterial growth
- Recyclable
- Complete range of fittings
- Customized solutions available on request
- Easily combined with other pipe materials
- Easy maintenance
- One complete system from one supplier
- Shock and vibration tested

PUSH-FIT SYSTEM

The push-fit joint is completely interchangeable between either gravity or vacuum discharge systems. In addition to sanitary discharge it is also suitable for central vacuum cleaning systems, ventilation pipes, food waste systems, etc. The benefits of being able to use the same pipework system throughout the vessel, regardless of the type of system employed, can offer significant installation savings.

Push-Fit System

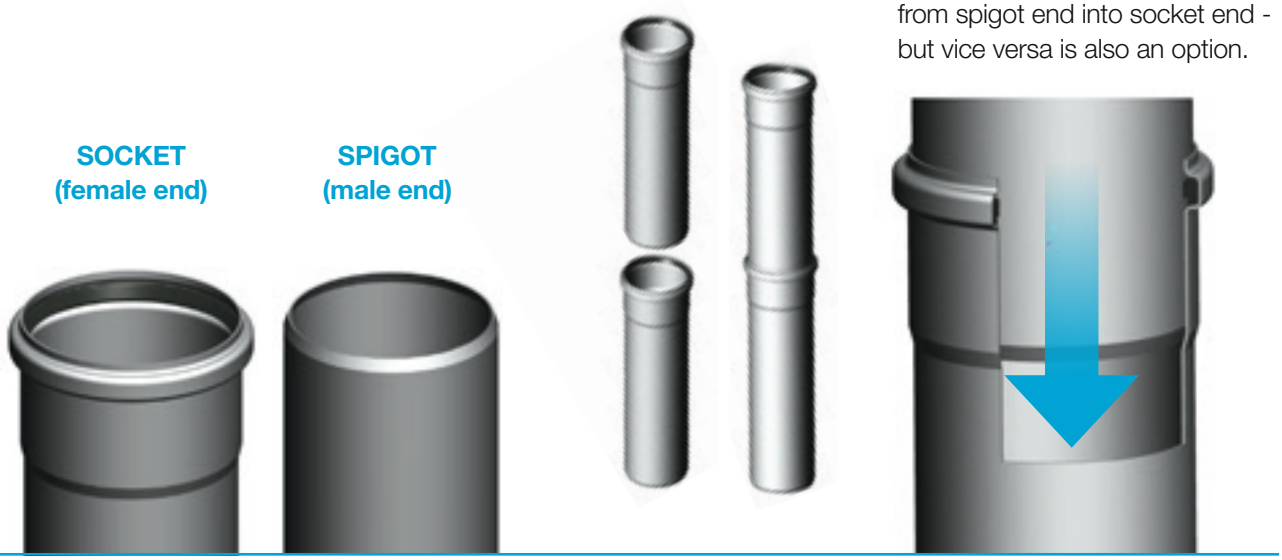
Socket (female end) and bevelled spigot end (male end)
Push-fit socket with replaceable sealing ring

Water Flow Direction

– from male end into female end.
Normal water flow direction is from spigot end into socket end - but vice versa is also an option.

SOCKET (female end)

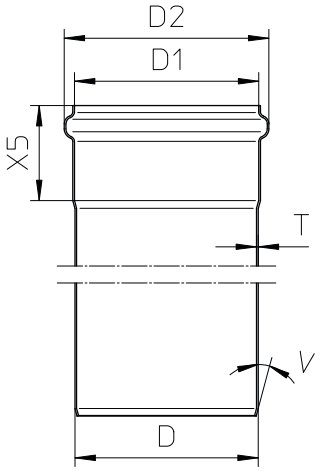
SPIGOT (male end)



The lip sealing ring forms the seal between the socket and spigot ends. The lip sealing ring ensures fast and efficient joining of the pipe components, and it is compressed to provide a tight seal (see example to the right).

Standard sealing ring for pipes and fittings is made of EPDM rubber (ex. penetrations - see chapter "BLÜCHER® Marine Products").

In addition it is also available in two other rubber qualities - see "Material Properties rubber seals".



DIMENSIONAL DRAWING, SOCKET AND SPIGOT END

Pipes and fittings

Type no.	D	D1	D2	X5	T	V(°)
811.XXX.040	40	41	52	41	1	20
811.XXX.050	50	51	61	42	1	20
811.XXX.075	75	76	87	50	1	20
811.XXX.110	110	111	123	57	1	20
811.XXX.125	125	126	140	60	1	20
811.XXX.160	160	161	177	72	1.25	20
811.XXX.200	200	201	219	90	1.5	20

PIPES – SIZES/LENGTHS

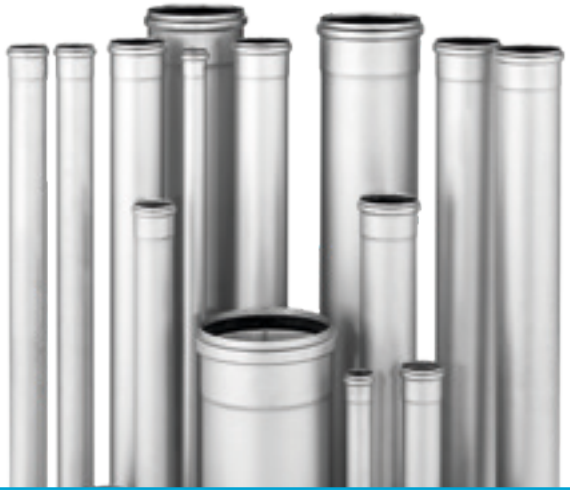
Pipe Sizes

OD 40 mm (1.5")
OD 50 mm (2")
OD 75 mm (3")
OD 110 mm (4")
OD 125 mm (5")
OD 160 mm (6")
OD 200 mm (8")

Standard Lengths

0.15 m., 0.25 m., 0.50 m.,
0.75 m., 1.0 m., 1.5 m.,
2.0 m., 3.0 m., 4.0 m.,
5.0 m., 6.0 m.

Please note - not all lengths are available in every dimension.

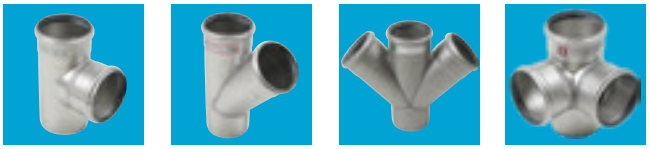


FITTINGS

Below find some examples of the wide range of the BLÜCHER® EuroPipe standard fittings.
More products and information can be found in the BLÜCHER® Marine Product catalogue.

Bends
15° 22.5° 30° 45° 87.5°

Branches
45° 87.5°
Single and double branches
With access door



Jointing sockets
Double ring-seal sockets
Sliding ring-seal sockets

MISCELLANEOUS FITTINGS
Access pipes
Expansion pipes
Reducers
Adaptors
Plugs
Flange connection
Pipe hangers/brackets

COSTUMER DESIGN SOLUTIONS
Examples:

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PIPE PENETRATIONS

■ **The BLÜCHER® EuroPipe penetrations** are a very important part of the BLÜCHER® EuroPipe system as they must meet the requirements regarding fire spreading on board ships.

Most of the BLÜCHER® EuroPipe penetrations are fire tested and marked with the MED (Marine Equipment Directive) Mark of Conformity.
Below you will find an overview of some of the different penetrations available.

Penetration for welding - for steel constructions

- Available the in following dimensions: Ø40, 50, 75, 110, 125, 160 and 200 mm
- Fire rating: A0 - A60 (MED certified)
- Sleeve or flange solution for welding – (thickness of 5 mm for both solutions)
- Easy installation
- Sealing material SI rubber (silicone) – alternative EPDM
- Different variants
- Customized solutions possible

PENETRATION TYPE 866
with sleeve for welding

FLANGED PENETRATION TYPE 868
with flange for welding

PENETRATION TYPE 870
with sleeve for welding

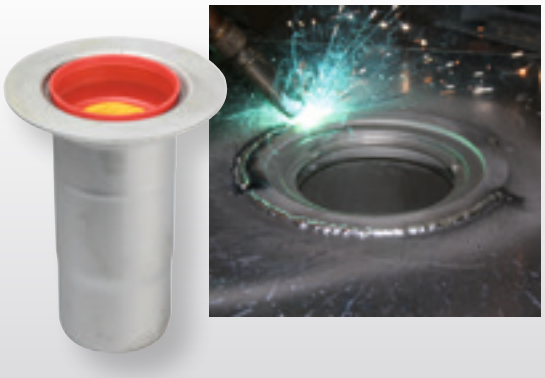
PENETRATION TYPE 872
with sleeve for welding

PENETRATION TYPE 875
with sleeve for welding

For steel deck/bulkhead

Plug&Play penetration - for steel and aluminium constructions

- Available in dimensions as follows: Ø50, 75, 110, 125 and 160 mm
- Fire rating: A0 - A60 (MED certified)
- With a flange solution for installation without welding
- Sealing material EPDM rubber
- No welding certificate or hot-work precautions required
- Quick installation (max. 60 sec. per penetration) requiring only a cordless drill driver
- For repair/refit



Penetration for welding - for aluminium constructions

- Available in dimensions as follows: Ø40, 50, 75 and 110 mm
- Fire-rated A0-A60 (MED certified)
- With a flange solution for welding into aluminium deck/bulkhead
- Flange is a combination of aluminium and stainless steel compressed to form a bimetal solution
- Easy installation
- Sealing material SI rubber (silicone) – alternative EPDM
- Must be coated after welding – see Installation Instructions

PENETRATION WASH BASIN TYPE 866.032
with sleeve for welding

TOILET PENETRATION FOR VACUUM SYSTEM TYPE 867
with sleeve for welding

FLANGED PENETRATION TYPE 868.9
non-welded

FLANGED PENETRATION TYPE 878
with bimetal flange for welding

For steel deck/bulkhead

For aluminium deck/bulkhead

BLÜCHER® DRAIN MARINE

BLÜCHER® Drain Marine have been developed in collaboration with leading shipyards worldwide. As a result, the product offering meets the specific demands of each individual installation regardless of the deck construction.
BLÜCHER® Marine drains are suitable for welding in the deck and some for non-welded installations, can be fitted with a removable water trap (providing full rodding access from above), and are available to suit any deck finish.

MULTI-ADJUSTABLE / FOR ANY DECK FINISH / MODULAR SYSTEM

Applications
- Showers, toilets, wet cabins, galleys, pantries, deck areas and workshop areas
- Cruise liners, ferries, yachts, commercial vessels, navy vessels and off-shore

Details
- Protective cover on all lower parts
- Low 6mm frame height
- Grating with screw lock
- Stainless steel AISI 316L/EN1.4404 or optionally AISI 304/EN1.4301
- Hygienic design

Variants
- Side inlets Ø32/Ø40 mm
- Vertical or horizontal outlet
- For welding into deck, with or without welding sleeve, or for installation without welding by means of screw-lock system

Options
- Removable water trap
- Filter plate
- Design gratings available

Series
- Series 47X for stainless steel deck
- Series 48X for aluminium deck

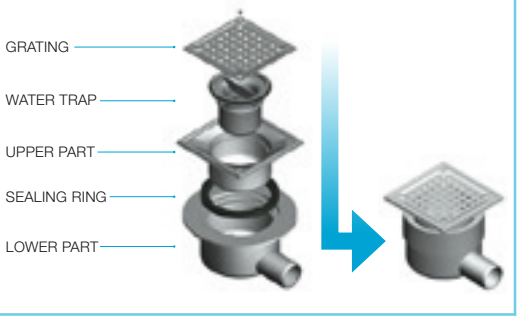
MARINE DRAINS OVERVIEW

Combinable drain parts

Removable two-part water trap type no. 502.050.110 MS
Multi water trap type no. 503.000.110 CR

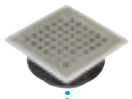
Filter plate
502.000.000 S

PART DESCRIPTION OF A DRAIN



Upper parts

Concrete/tiles
472.300.110 S



H = 10 - 40 mm*

Resin
472.320.110 S

H = 10 - 30 mm*

Vinyl
473.300.110 S

H = 20 - 50 mm*

Vinyl
473.301.110 S

H = 20 - 50 mm*

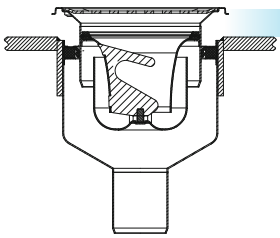
Concrete/tiles with side inlets
471.300.110 S

H = 72 - 122 mm*

Channels for various floor types

Steel deck, with supporting ring for remov. water trap
474.300.110 S

Steel deck
620.135.021 S



H = Hight adjustment upper parts

Extension pipe type 611.300.001 S

Lower parts

470.200.050 S
470.200.075 S
470.200.110 S

470.000.060 S
470.000.076 S
470.000.089 S
470.000.114 S

470.000.050 S
470.000.075 S
470.000.110 S

475.200.050 S
475.200.075 S

475.000.060 S
475.000.076 S
475.000.089 S
475.000.114 S

475.100.050 S

475.000.050 S
475.000.075 S

INSTALLATION WITHOUT WELDING

470.900.050 S
470.900.075 S
470.900.110 S

475.900.050 S
475.900.075 S

485.200.050 S
485.200.075 S

480.200.050 S
480.200.075 S
480.200.110 S

For steel deck/bulkhead

For aluminium deck/bulkhead

Optional gratings for marine drains

610.155.426

610.155.428

610.155.421

610.155.427

610.155.521

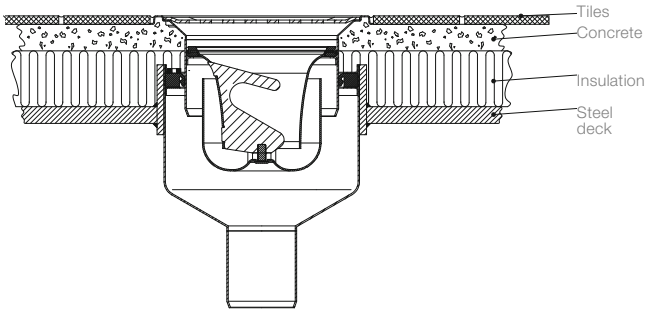
620.135.028

Cabin drain - complete

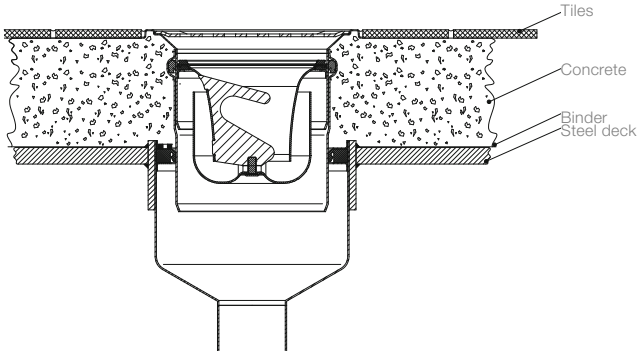
Cabin drain with water trap for steel decks
491.200.050 VS

INSTALLATION EXAMPLES

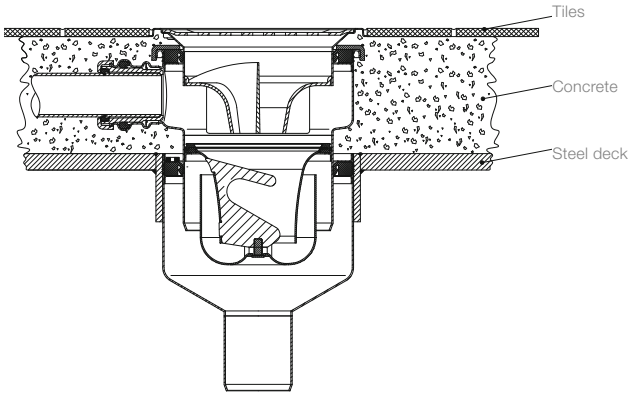
Tiled deck incl. water trap



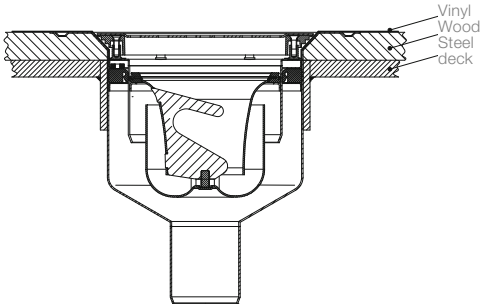
Tiled deck incl. water trap and extension pipe



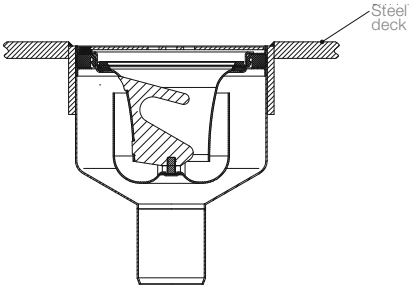
Tiled deck incl. water trap and side inlets



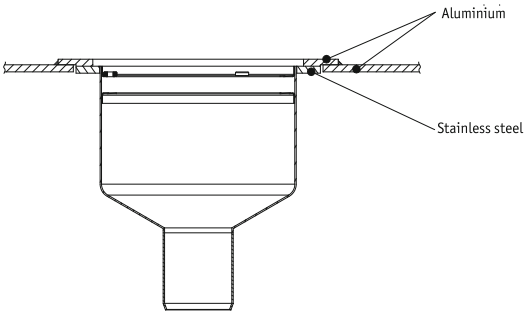
Vinyl deck incl. water trap



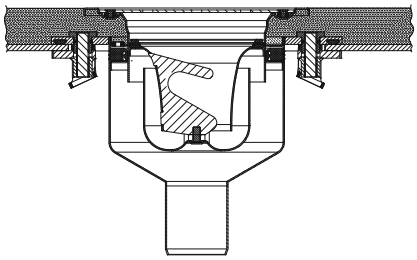
Steel deck



Aluminium deck



Epoxy resin on steel deck, installation without welding



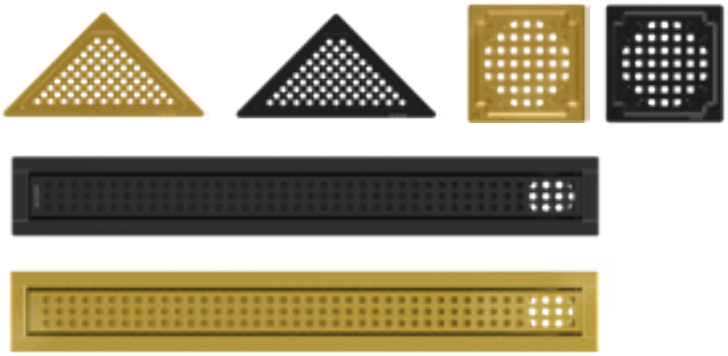
NEW TRENDY COLOURS FOR YOUR CABIN

New trendy colours for your cabin

Do you dream of adding a stylish and modern look to your cabin? Now you can choose drains in a range of colours that allow you to express your personal style.

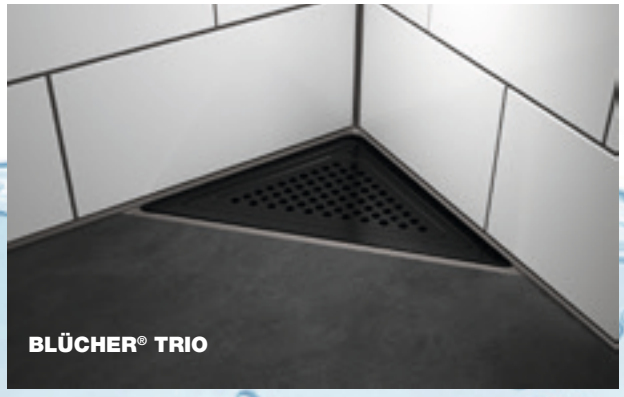
BLÜCHER launches a wide selection of shower drains in colours that fully meet the current demand for unique and trendy solutions.

All drains are suitable for newbuilding and renovation of yachts, cruise ships and ferries in suites and in public areas as such saunas and recreational rooms etc.



Well-known drains in new colours

You may already know our popular classic stainless-steel shower drains. The original **WaterLine** shower channels along with **triangular** and **square** floor drains now come also with a stylish black or a luxurious brass finish.
So now it is up to you to select your favourite shape and colour for your drainage solution.



CUSTOMISED GRATINGS

Design your personal grating

- Grating design to your individual specifications
- Logo, text or image
- Stylish triangles, elegant channels or classic squares

BLÜCHER OFFERS YOU THE OPPORTUNITY TO PERSONALIZE YOUR BATHROOM WITH A SHOWER GRATING DESIGNED TO YOUR INDIVIDUAL SPECIFICATIONS.

Stylish shapes and high quality

Choose your own design - from company logo to text.
The design can be laser cut in three different grating shapes: TRIO, SQUARE or LINE.
The gratings are in the renowned BLÜCHER® quality with brushed stainless steel finish.

Numerous applications

The customised BLÜCHER grating is suitable in particular for cruise-ships and ferries projects where the owner wants to add their individual mark to the project, for instance through a logo or a text.

Gratings with logo are also suitable in restaurants, hotels, etc. where they contribute to brand recognition and image in all details.

BLÜCHER® CHANNEL

■ **BLÜCHER® Channel** are modular deck drainage solutions for use in galleys, pantries, door openings, outside deck areas, etc.

Drainage channels are available to suit all deck finishes with a range of gratings developed to suit the varying load-bearing and flow demands.

Outlets are available with a removable water trap and, where applicable, a filter basket to prevent solids from from discharging into the drainage system.

Customized components are available on request.

- All in stainless steel AISI316L/EN 1.4404 or AISI304/EN 1.4301
- Modular system providing numerous possible combinations
- Multi-adjustable
- Excellent flow and self-cleansing properties
- Perfect hygiene
- Wide range of gratings for any purpose and load class (weight loads from 250 to 12000 kg)
- Several standard widths
- Combinable with BLÜCHER® Drain Marine accessories
- Between 2 - 5 mm material thickness (depending on type of channel)

BLÜCHER® Channel

Variants

5 different variants

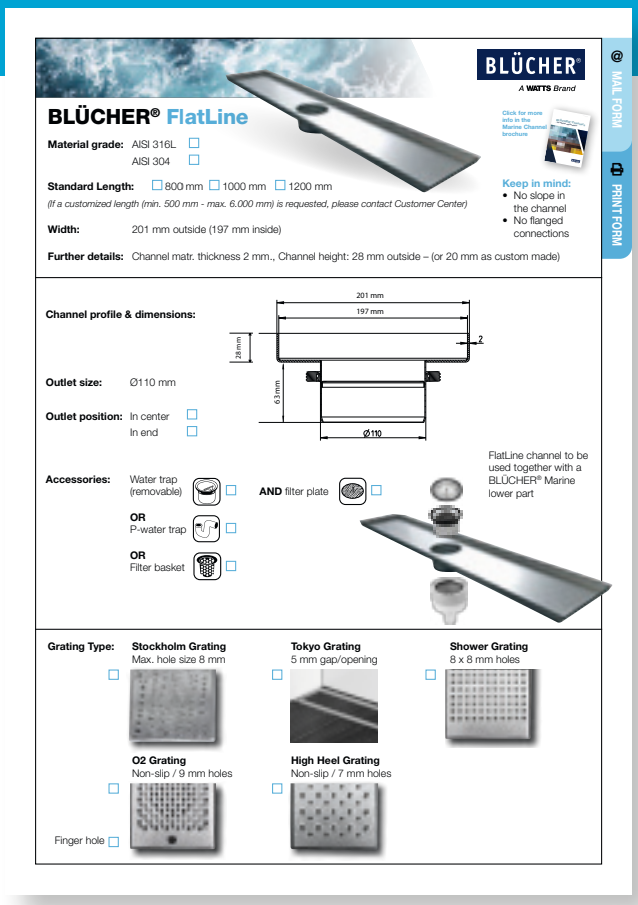
- OceanLine
- FlatLine
- MarineLine
- MultiLine
- WaterLine

Options

- Removable water trap or P-trap
- Filter basket or filter plate

Extras

- Reinforced frames for heavy weight loads
- Stabiliser angle and adjustable legs
- Protective strip and grating lock device



BLÜCHER®
A WATTS Brand

@ MAIL FORM
PRINT FORM

BLÜCHER® FlatLine

Material grade: AISI 316L ☐ AISI 304 ☐

Standard Length: ☐ 800 mm ☐ 1000 mm ☐ 1200 mm

(If a customized length (min. 500 mm - max. 6.000 mm) is requested, please contact Customer Center)

Width: 201 mm outside (197 mm inside)

Further details: Channel matr. thickness 2 mm., Channel height: 28 mm outside – (or 20 mm as custom made)

Click for more info in the Marine Channel brochure

Keep in mind:
- No slope in the channel
- No flanged connections

Channel profile & dimensions:

201 mm
197 mm
2
28 mm
63 mm
Ø110

Outlet size: Ø110 mm

Outlet position: In center ☐ In end ☐

Accessories: Water trap (removable) ☐ **AND** filter plate ☐

OR P-water trap ☐

OR Filter basket ☐

FlatLine channel to be used together with a BLÜCHER® Marine lower part

Grating Type:

Stockholm Grating ☐
Max. hole size 8 mm

Tokyo Grating ☐
5 mm gap/opening

Shower Grating ☐
8 x 8 mm holes

O2 Grating ☐
Non-slip / 9 mm holes

High Heel Grating ☐
Non-slip / 7 mm holes

Finger hole ☐

← To make it easy to specify your channel requests, BLÜCHER has made specification forms available at http://www.blucher-marine.com/technical/channel-specification-forms

With the new channel specification forms you get a clear overview of options, you can design your own channel and you get a fast and easy tool for completing your request.
You can fill in the relevant channel specification form and send it to BLÜCHER directly.

BLÜCHER®
A WATTS Brand

MARINE CHANNEL OVERVIEW

OceanLine

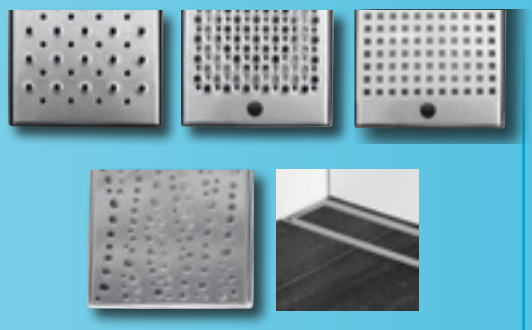
- For galleys, pantries, door openings, outside deck areas, etc.
- For painted deck and covered deck
- Length: From 400 mm up to 3000 mm (straight runs)
- Width: 208 mm outside /198 mm inside
- Height: 61 mm
- 5 mm material thickness - for welding directly into deck
- Stainless steel AISI 316L (EN 1.4404) & AISI 304 (EN 1.4301)
- Flat bottom
- Different variants of gratings
- Rounded corners

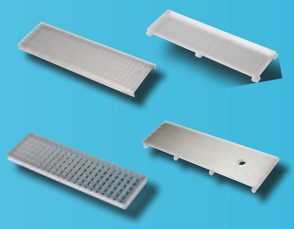
FlatLine

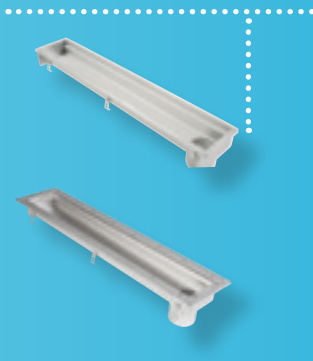
- For galleys, pantries, door openings, outside deck areas, bathroom, shower areas, luxury suites, etc.
- Available to suit most deck finishes
- Length: From 500 mm up to 6000 mm (straight runs)
- Width: 201 mm outside /197 mm inside
- Height: 28 mm outside – or 20 mm as a minimum
- 2 mm material thickness
- Stainless steel AISI 316L (EN 1.4404) & AISI 304 (EN 1.4301)
- Flat bottom
- Different variants of gratings
- To be used together with the BLÜCHER® Marine lower parts

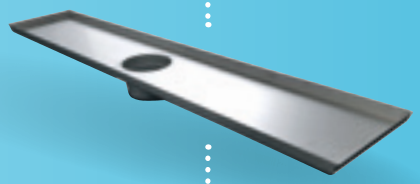
MarineLine

- For galleys, pantries, door openings, outside deck areas
- Available to suit most deck finishes
- Length: customized as per request
- Width: 150, 200, 300, 400, 500, 600, 700 and 800 mm
- Height: Minimum height 40 mm
- 2 mm material thickness
  Alternatively - can be supplied in 3-4 mm thickness for direct welding into deck









470.200.050 S
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470.000.110 S

475.200.050 S
475.200.075 S

475.000.050 S
475.000.075 S

475.100.050 S

Steel deck

- Stainless steel AISI 316L (EN 1.4404) & AISI 304 (EN 1.4301)
- All standard gratings can be installed
- Cross/longitudinal fall for high self cleaning
- Channels in custumized designs e.g. L, U and T shape
- To be used together with the BLÜCHER® Marine lower parts

MultiLine

- Inside door openings, bathroom, shower areas, luxury suites, etc.
- Low height
- With 2 mm frame width on all four sides
- Elegant design
- Length: standard length of 800, 900, 1000 and 1200 mm
- Width: 132 mm outside
- Height: 19 mm for type Stockholm, and 28 mm for type Tokyo
- 2 mm material thickness
- Stainless steel AISI 304/EN 1.4301
- Cross fall
- To be used together with the BLÜCHER Marine® lower parts

WaterLine

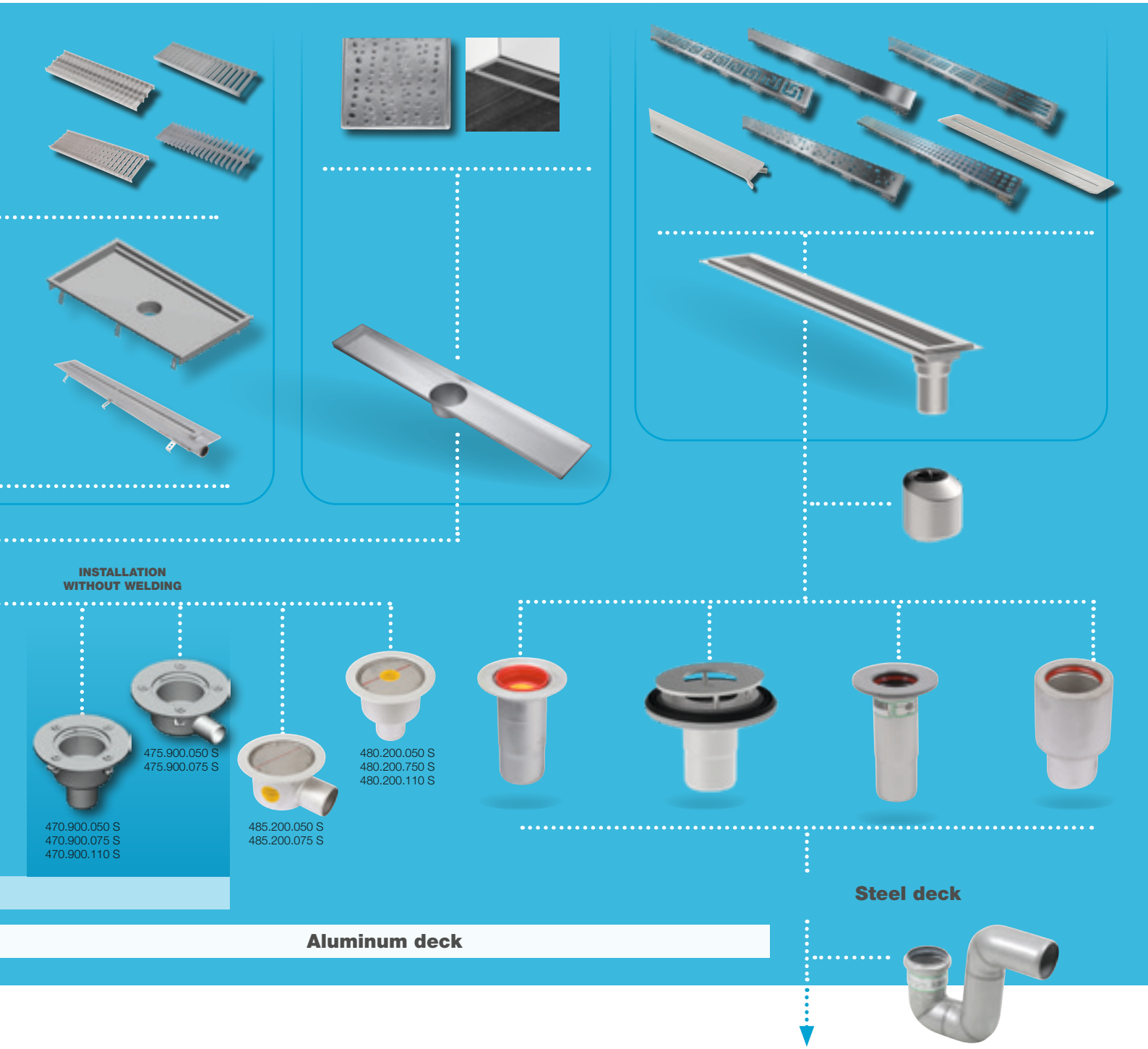
- For bathroom, shower areas, wet cabins, luxury suites, inside door openings, etc.
- Available to suit most deck finishes
- Elegant design
- Many different design gratings
- Full flexibility
- All in stainless steel AISI 304/EN 1.4301
- Brushed finish

For tiled floor - with or without liquid or sheet membrane

- Standard length of 300, 700, 800, 900 and 1000 mm
- Up to 2000 mm length as customized channel (Tokyo grating only 1000 mm)
- 20 mm frame width
- Adjustable frame height
- Can be installed with outlet left or right and against wall(s) or away from wall(s)

For vinyl floor

- Standard length of 700, 800, 900 and 1000 mm (customized length not possible)



BLÜCHER® GREASE SEPARATOR

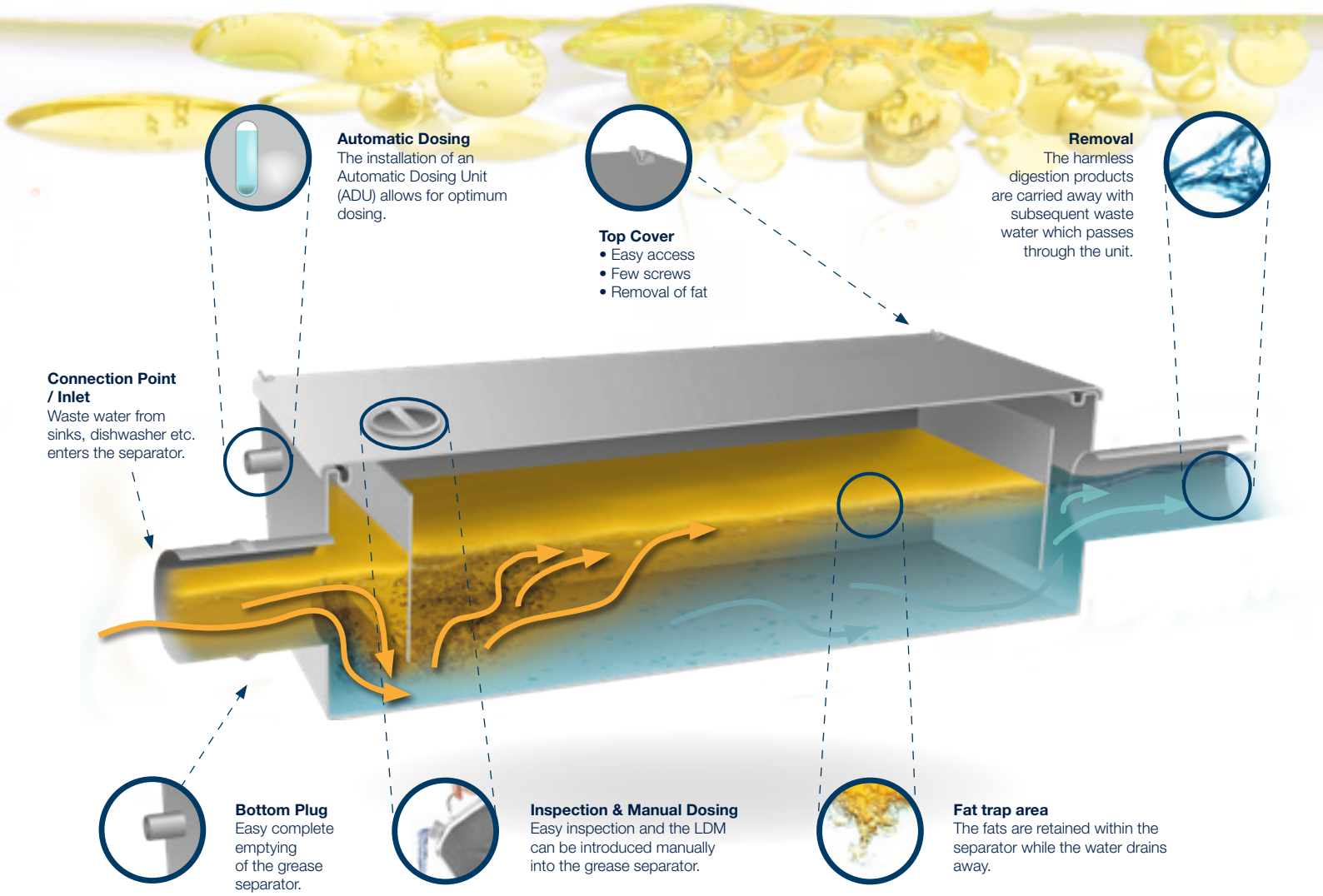
Waste water from food preparation contains greases and oils of animal or vegetable origin.
Greases are poorly biodegradable, they generate toxic gases and pose a higher risk of pipeline corrosion.
A study carried out by CNIDEP in 2007 states that in catering, restaurants and food-processing companies, the grease comes from mainly 3 processes: 54% from cooking, 30% from manual dish-washing and 7% originates from machine dish-washing.

A grease separator separates and retains the separated grease and fat residues within the unit before the wastewater enters the wastewater pipe system. This means that the buildup of grease deposits that would otherwise disturb the proper operation of the wastewater pipe system will be minimized, thus lowering maintenance costs significantly.

Efficient Grease Control
The BLÜCHER® Grease Separators are a modern evolution of the traditional grease/fat trap.
The BLÜCHER® Grease Separators act as a point of treatment for a liquid digestion media (LDM). The digestion media can be introduced either manually or automatically.

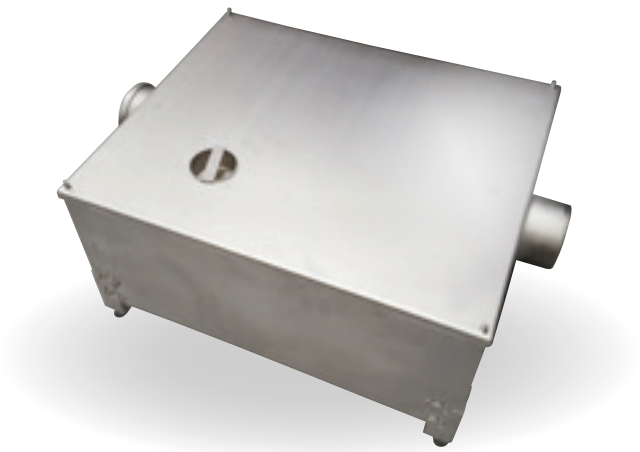
How it works
The illustration below shows how the Grease Separators work.
The wastewater enters into the first chamber and meets the first wall. This wall forces the flow down to the bottom of the separator and ensures that the surface is more stagnant so that grease rises to the surface due to the lower weight compared to water, and remains in the tank.
The second wall holds the grease and presses the wastewater underneath and out of the outlet pipe.

When the digestion media is added to the grease separator (either automatically with a dozing unit or manually), the enzymes start to "eat" the fat, thus ensuring longer intervals between emptying the Grease Separator of grease and fat.



BLÜCHER® GREASE SEPARATOR TYPE NOS. AND SIZES

In catering, restaurants, food-processing etc. the proper function of the grease separator depends mainly on the amount of fat residue and very little on the flow volume, therefore sizing according to EN 1825-2 standard, where using the number of meals served per day, will provide the most accurate sizing.



The formula used is the following:
NS = Number of meals × V meals × fd × ft × fr × fq (3600 x daily operating time)
fd: density factor; ft: temperature factor; fr: cleansing agent factor; fq: peak factor

The above formula has been used to determine the size/ dimensioning of the BLÜCHER® Grease Separators.

The BLÜCHER® Grease Separator comes in 4 sizes with capacity ranging from 35 to 210 meals per day. See the product range below.

Type number: 970-14155-01
Stainless steel Grease Separator Grade AISI 304
Size LxWxD: 684mm x 578mm x 289mm
Inlet and outlet: OD 110mm
Meals per day: 35
Recommended dosing media ml/day: 100*

Type number: 970-14155-03
Stainless steel Grease Separator Grade AISI 304
Size LxWxD: 756mm x 506mm x 502mm
Inlet and outlet: OD 110mm
Meals per day: 85
Recommended dosing media ml/day: 100*

Type number: 970-14155-07
Stainless steel Grease Separator Grade AISI 304
Size LxWxD: 1006mm x 506mm x 702mm
Inlet and outlet: OD 110mm
Meals per day: 210
Recommended dosing media ml/day: 200*

Type number: 970-14155-05
Stainless steel Grease Separator Grade AISI 304
Size LxWxD: 756mm x 506mm x 702mm
Inlet and outlet: OD 110mm
Meals per day: 160
Recommended dosing media ml/day: 150*

BLÜCHER® DOZING UNIT - COMPACT

The dozing unit is a programmable dosing system for grease separators, and housed in a wall mounted, stainless steel cabinet. The system comes with a 12.5 liter bottle of Bacti-G biological media and programmed for standard dose.
The Bacti-G is fully encased to minimize risk of accidental spillage.
Battery, mains operated and mains with BMS versions available to suit all situations. BMS version alerts power failure and liquid depletion.
The doser comes pre-programmed with all the necessary fittings required for installation.

MODD1/CABINET

MODD1

Type number: MODD1/CABINET
Stainless steel dosing unit and housing
The unit comes complete with pre-programmed mains operated peristaltic pump + 5 litres of dosing medium in a 12.5 litre bottle and all connecting tubes with 2 metres of cable to connect to the mains electricity supply (230 V)

Type number: MODD1
Only dosing unit without housing and Liquid Digestion Media

Liquid Digestion Media
Liquid type no. 691160 (12 litres bottle – for automatic dosing)
Powder type no. 691180 (18 kg comes in a pack of 24 numbers)

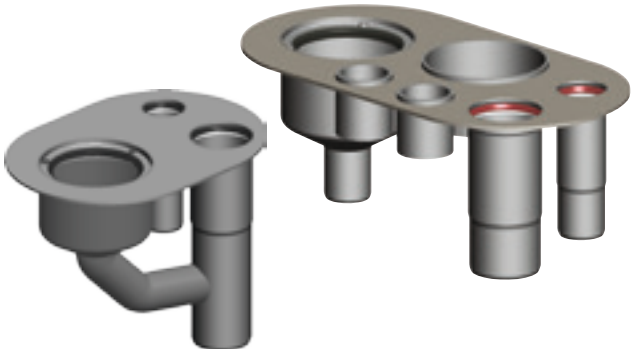
SPECIAL MARINE PRODUCTS AND CUSTOMIZED SOLUTIONS

SPECIAL MARINE PRODUCTS

Many of the BLÜCHER® products have been developed specifically for the Marine segment. Below are some **examples**

Group Penetration

- Ideal for use e.g. in service spaces near cabin modules for instance in cruise liners, allowing all sanitary units of the cabin to be connected to one fire-approved deck penetration.
- The jointing unit can be pre-installed in the deck before the cabin units are fitted, thus avoiding subsequent welding. With all penetrations for connections to and from the cabin in one place, the jointing unit contributes to making inspection and maintenance easy.

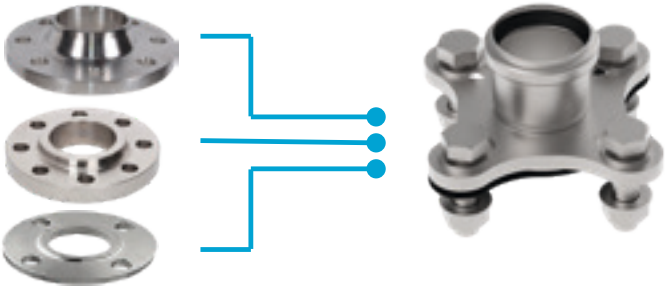


Cabin Drain

- Drain in 2 mm stainless steel for welding into steel floor/deck
- OD 50 mm horizontal outlet in 3 mm material for safe welding to pipe system or connection to standard BLÜCHER® EuroPipe push-fit pipe system
- Adjustable upper part with frame 97x97 mm for tiled or epoxy flooring.
- Grating included.
- 2-part water trap with 25,5 mm water seal height included
- Easy cleaning and hardly any maintenance

Universal Flange

- The all-in-one flange covers the needs according to both DIN, JIS & ANSI. This gives many advantages, e.g. easier and faster planning and installing.
- The weight is around 50% less than a standard flange solution.
- The universal flange comes with socket and spigot end.



For further details on these products, please contact BLÜCHER's Marine Team.

CUSTOMIZATION AND INSPIRATION

Customized marine drainage systems

In addition to the extensive standard product range, BLÜCHER also offers purpose-made items on request to ensure that any drainage requirement can be satisfied. With more than 55 years' experience in developing customized drainage solutions, our know-how enables us to provide extensive engineering assistance.

For instance:

- Customised Marine drains
- Customised fittings - e.g bends, T-pieces, flange connectors
- Special adaptors for other pipe systems
- Customized channels

Here are a few selected examples of different customised products. They come in all shapes and varieties.

Close co-operation through the entire process

In close co-operation with our customers, BLÜCHER manages the entire process from design and development to manufacturing and testing of the final product.
The production of customized drainage products is an integral part of our production process, ensuring short lead times and the same high quality as in standard products. Solutions adapted entirely to your specification.
BLÜCHER supplies customized solutions either as a combination of modular components or as specific components made to your specification.

Contact us to find a solution to your drainage project.

INSTALLATION GUIDELINES

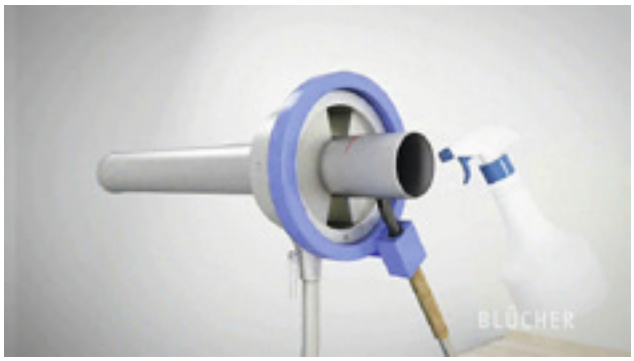
CUTTING OF BLÜCHER® EUROPIPE

Cutting

BLÜCHER recommends that cutting of the pipes should be carried out with a BLÜCHER® manual or electric cutting tool.
The BLÜCHER® cutting tools have been specially developed to produce a bevelled leading edge to the cut ends to assure that the pipes can be installed without subsequent finishing and so that the sealing ring will not be damaged by sharp edges.

Note!
When cutting and jointing BLÜCHER® EuroPipe care should be taken to wear personal protective equipment as required. Work gloves will protect against any potential sharp edges from the cutting process when handling and jointing.

Manual pipe cutter



Electrical pipe cutter

Cutting instruction videos and manuals available at **www.blucher-marine.com**

BLÜCHER® CUTTING TOOLS

Cutting quality:
The cutting motion has been developed to produce a bevelled leading edge to cut ends. As a result only the application of BLÜCHER® jointing lubricant is required prior to jointing cut ends.

Changeover time:
Changeover from one cutting disc to another can be done within a matter of seconds.

MANUAL PIPE CUTTER

Cutting is carried out by a special disc cutter, which cuts and grips at the same time.
N.B.: Do not cut fittings.

Type no.	EAN no.	Designation
006.050.110	5705499000061	Manual pipe cutter (40-110 mm)
006.125.200	5705499001020	Manual pipe cutter (110 - 200 mm)
006.000.005	5705499000023	Spindle for 006.050.110
006.000.000	5705499000016	Cutting disc for 006.050.110
006.000.001	5705499001068	Cutting disc for 006.125.200 & 006.200.315

ELECTRICAL PIPE CUTTER

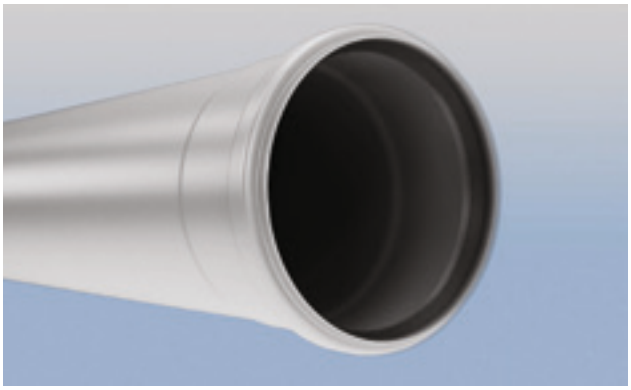
Cutting time: Ø50 mm. 10 sec. and Ø110 mm. 10-15 sec.
Power supply: 110 Volt/Min 2 kWA/60 Hz or 220 Volt/50 Hz.
Pipe diametres: 50-160 mm
N.B.: Do not cut fittings.

Type no.	EAN no.	Designation
800.050.160	5705499400021	Electrical pipe cutter 220 V
800.050.160 GB	5705499000184	Electrical pipe cutter 110 V, 16 A
800.050.160 US	5705499000191	Electrical pipe cutter 110 V, USA plug
800.030.006	5705499400014	Cutting disc
006.050.160	5705499124132	Support base for electrical pipe cutter

JOINTING OF BLÜCHER® EUROPIPE - STEP BY STEP

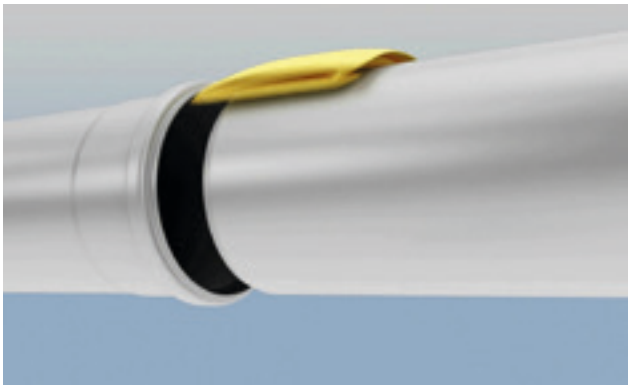
1. Check of lip seal

Check that the lip sealing ring is correctly installed in the socket



2. Cleaning

If necessary clean lip sealing ring, spigot end and socket before jointing



3. Mark insertion depth

Mark insertion depth on spigot end of pipe – see max. and min. insertion depth in table (figure 1).

A "Rule of thumb" is to insert the spigot end all the way in to the maxium depth, and then pull it a couple of mm. back again. This will ensure room for expansion in the pipe system.)

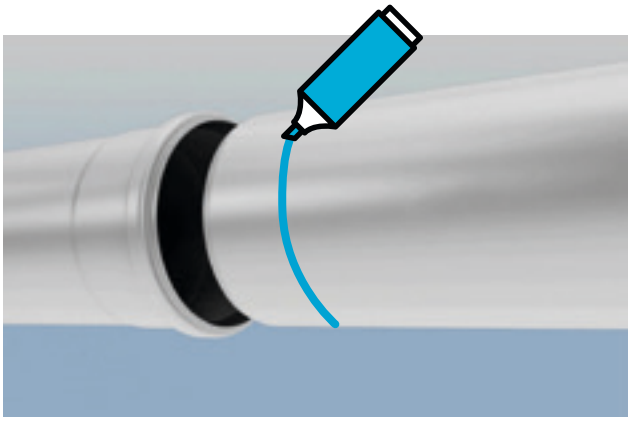
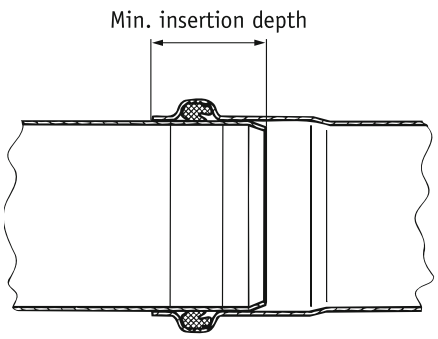


Figure 1 **INSERTION DEPTH**

Pipe dimension in mm	Max. insertion depth from end of socket to spigot end	Min. insertion depth from end of socket to spigot end
OD 40 mm	46 mm	30 mm
OD 50 mm	47 mm	30 mm
OD 75 mm	55 mm	35 mm
OD110 mm	62 mm	40 mm
OD125 mm	65 mm	47 mm
OD160 mm	76 mm	50 mm
OD200 mm	98 mm	63 mm



Installation videos available at www.blucher-marine.com

4. Apply Lubricant

Apply standard soap based lubricant for normal use (type no. 007.100.050) or silicone based lubricant (type no. 007.200.040) if there may be a requirement to demount the joints at a later date. *(See figure 2)*.

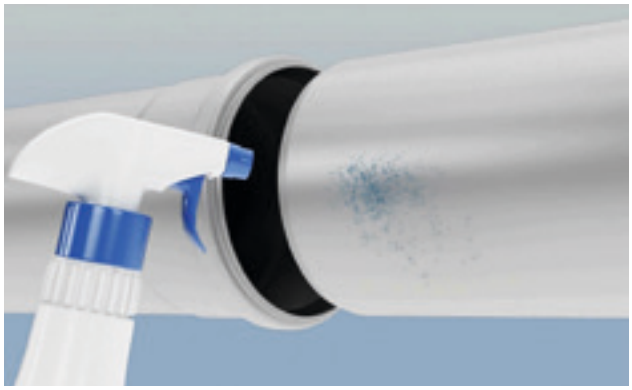


Figure 2 Lubricant and Cutting oil

BLÜCHER® Lubricant:

Type No. 007.100.050	1/2 litre soap lubricant
Type No. 007.200.040	400 ml silicon lubricant

BLÜCHER® Cutting oil:

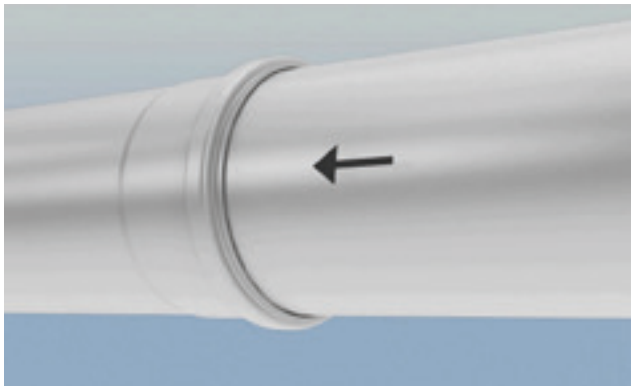
Type No. 007.500.050	Cutting oil 0.5 L.
Type No. 007.000.000	Atomizer

5. Jointing

Joint the pipes with a slightly turning movement

Flexibility

BLÜCHER® EuroPipe joints are flexible up to 2° without this affecting the leakage tightness. This means that the pipework system will remain tight despite minor vibrations, while on the other hand the flexibility in the pipe joints makes pipe installation easy.



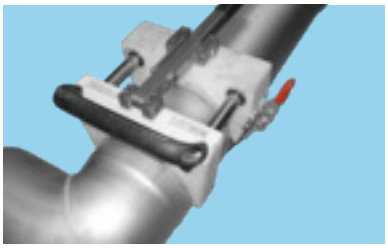
Direction of flow

Direction of flow should be from spigot into socket to ensure the correct use of the built-in fall in the fittings. Couplings may be used to fit cut pipe lengths.
Normal water flow direction is from spigot end into socket end - but vice versa is also an option.

BLÜCHER® assembly tool

For pipe dimensions Ø160 and Ø200 mm assembly tools are available for easy jointing.

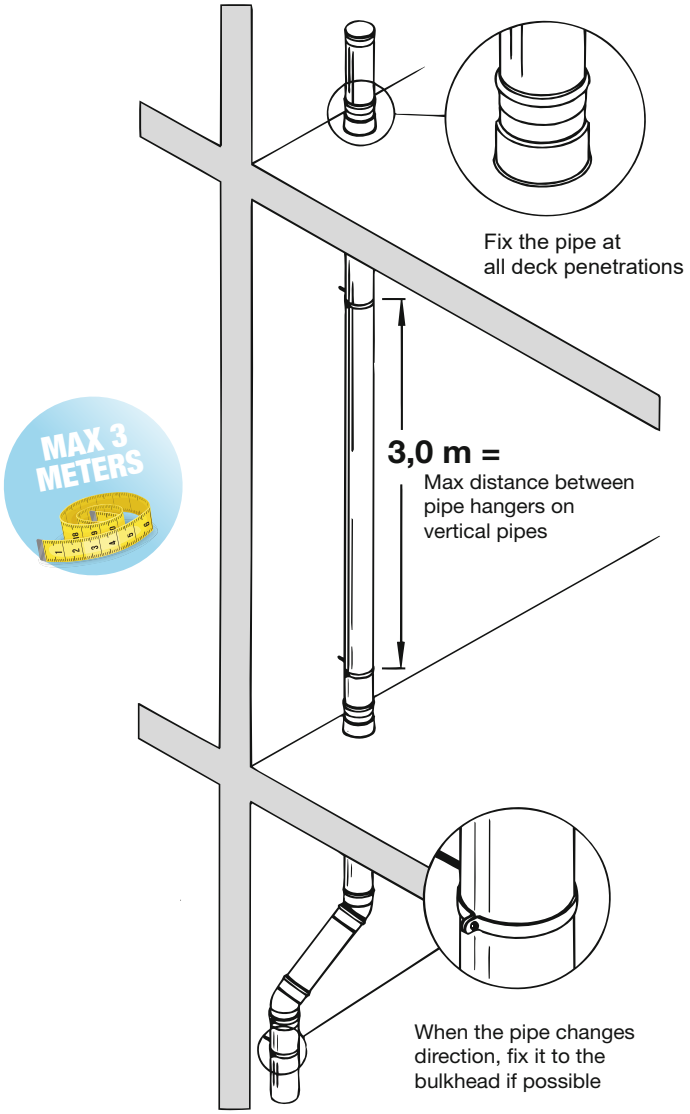
Type no.	EAN no.	Designation
806.000.160	5705499124149	For pipes D = 160 mm
806.000.200	5705499123500	For pipes D = 200 mm



SUSPENSION OF BLÜCHER® DRAINAGE PIPES

The following section describes the fixing of BLÜCHER® EuroPipe for vertical and horizontal pipe runs.

VERTICAL PIPING

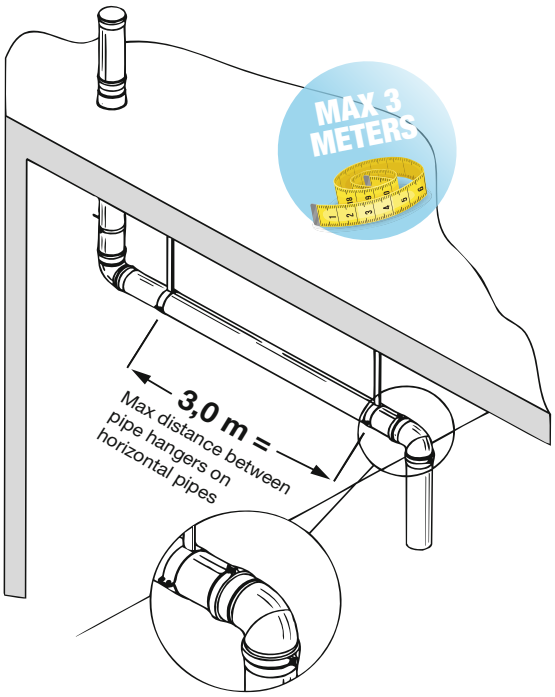


Usually one fixing point per deck is sufficient. As opposed to plastic pipes, stainless steel pipes require only one pipe hanger per 3 metres, resulting in less sound and faster installation.

Where larger inlets are connected, the downpipe must be secured immediately below the inlet.

THE PIPEWORK SYSTEM MUST BE PROPERLY SUPPORTED AND FIXED TO PREVENT THE SOCKET AND THE SPIGOT END FROM SLIDING APART UNDER ALL ANTICIPATED CONDITIONS.

HORIZONTAL PIPING



1) *Applies to straight horizontal pipelines. If there are fittings or connections in the suspended pipe run (between two hangers), you may need to adjust and reduce the distance to ensure a rigid installation and that the fittings/connections are fully aligned in the center of the pipe run. As an alternative, safety clamps may be installed for added stability.*

Horizontal pipe runs are always to be installed with a gradient. If no self-cleansing calculation is available, a gradient of 20 ‰ is recommended in gravity systems.

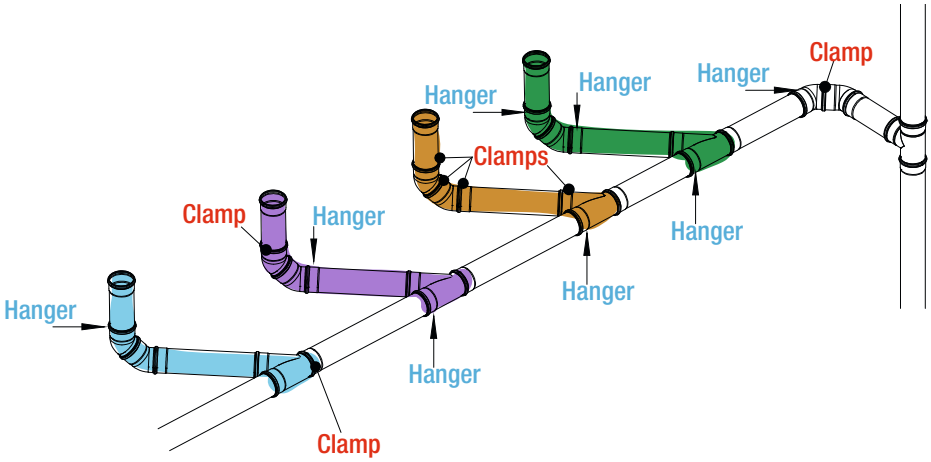
Horizontal pipe runs in vacuum systems are to be installed in accordance with the recommendations of the vacuum system supplier.

ADDITIONAL PIPE HANGERS ARE REQUIRED AT CHANGE OF DIRECTION I.E. BENDS & BRANCHES TO ANCHOR THE INSTALLATION TO THE STRUCTURE.

Examples with joint clamp and pipe hanger

The drawings below illustrate a random pipework system and are examples to be used as a guideline for installation of BLÜCHER® pipe hangers and BLÜCHER® joint clamps.

Each colour indicates different use of pipe hangers and joint clamps on the same type of pipe installation. This is to illustrate that there are several ways to support/fix a pipe installation.
Be aware of any local rules/standards that must be complied with.



There are also other right ways of supporting/fixing a BLÜCHER pipe system than the above examples.
The most important thing to have in mind is the ”rule of thumb”:

Pipe clamps/pipe hangers should be used in all places where you can pull the parts apart "by hand"

BLÜCHER® Joint Clamps

PIPE JOINT CLAMP
TYPE 847

PRESSURE PEAK PIPE JOINT CLAMP
TYPE 847.001

BLÜCHER® Pipe hangers

BLÜCHER offers different types of pipe hangers - see the range in the BLÜCHER® Marine Product Catalog.

Note! If other brackets are used, always use liner, i.e. rubber, between pipe and bracket.

PIPE HANGER WITH
EPDM RUBBER TYPE 895.401
IN GALVANIZED STEEL

PIPE HANGER WITH
EPDM RUBBER TYPE 895.012
IN STAINLESS STEEL

PIPE HANGER WITH
EPDM RUBBER TYPE 895.300
IN STAINLESS STEEL

PIPE HANGER WITH
EPDM RUBBER TYPE 895.403
IN STAINLESS STEEL

PIPE HANGER WITH
EPDM RUBBER TYPE 895.200
IN STAINLESS STEEL

PIPE LAYOUT - VACUUM SYSTEM

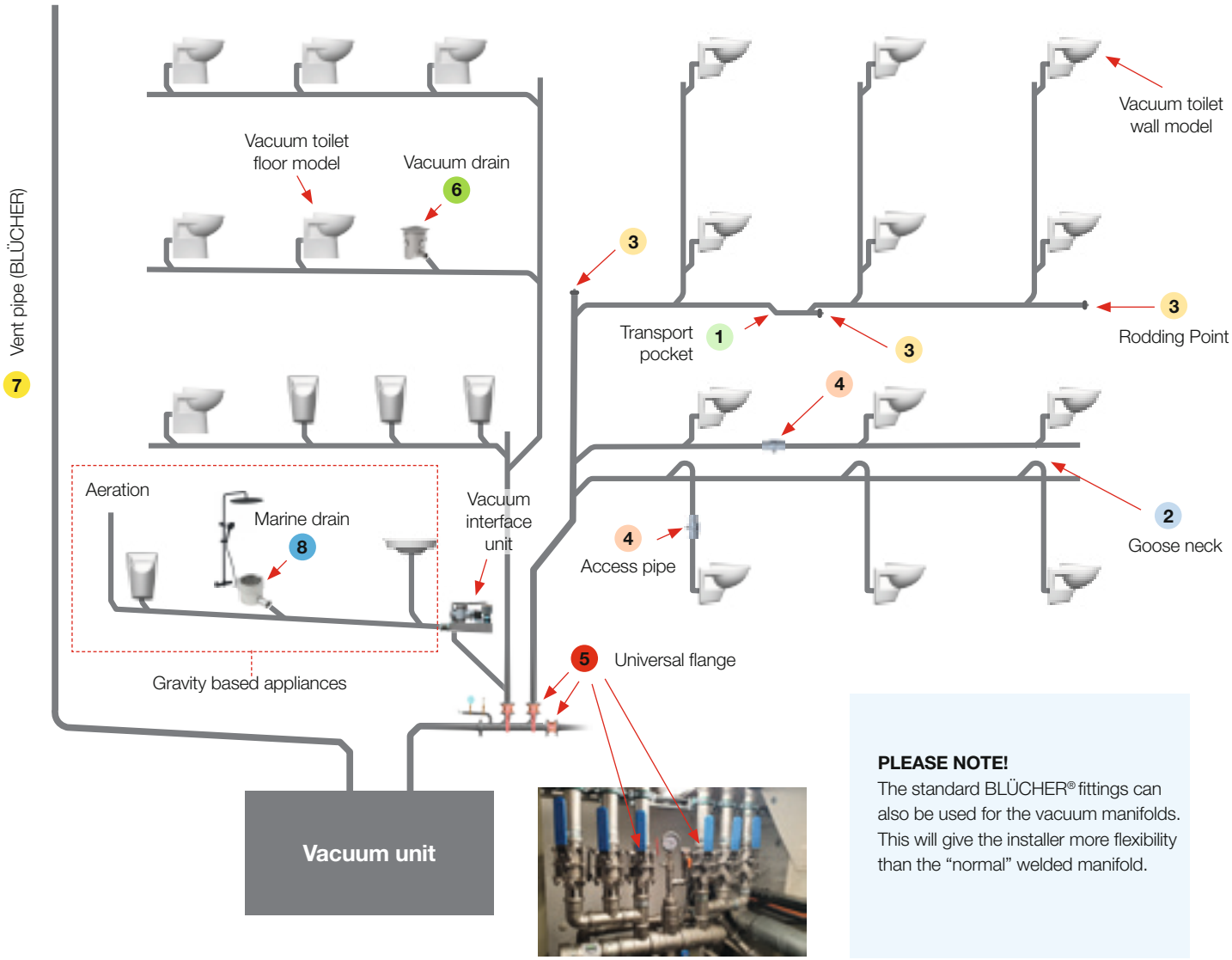
The BLÜCHER® EuroPipe system is extremely suitable and approved for use in vacuum systems.
The sealings in the pipes and fittings (which are pre-assembled from factory) are approved for vacuum and gravity systems. This means that there is no risk of mixing or using the wrong pipes, fittings and gaskets - these are the same products for both systems.
The vacuum pressure performance of the BLÜCHER® EuroPipe system is as follows:

- OD40, 50 & 75 mm = -0.85 bar (vacuum)
- OD110, 125, 160 & 200 mm = -0.60 bar (vacuum)

Vacuum transport is based on the pressure difference between atmosphere and vacuum unit. Typical operating range is -0.6 – 0.4 bar.
Compared to gravity lines the pipes can be directed not only downwards but also upwards or horizontally within certain limits.

See below a typical overview diagram.

PLEASE NOTE!
When designing the piping system make sure to:
- Always follow the relevant vacuum system supplier's guidelines and instructions.
- Relevant requirements of authorities and classification societies must be followed.
- Observe local shipyard standards for vacuum toilet systems.



PLEASE NOTE!
The standard BLÜCHER® fittings can also be used for the vacuum manifolds. This will give the installer more flexibility than the "normal" welded manifold.

BLÜCHER PARTS FOR VACUUM SYSTEMS

1 Transport Pocket type 873
A transport pocket is a part of the vacuum pipe to re-form a slug.
When a toilet in a pipeline is flushed, the pressure difference in front of and behind the slug pushes the slug from one transport pocket to the next. There is a cleaning access on the transport pocket. Available in dimensions OD50 & 75 mm.

2 Goose Neck type 874
A goose neck is used for preventing backflow when connecting toilet risers (upwards piping) to a horizontal line. The goose neck is connected to the upper side of the horizontal pipe at a 45° angle in the flow direction.
Available in the dimension OD50 & 75 mm.

3 Plugs type 844 – for rodding access (further information on page 63)
Access points in the piping are used for unblocking and descaling the pipeline. Rodding points should be located to make it possible to reach any clogging in the piping at all points. Easy access to the rodding point must be arranged.

4 Access Pipe type 840 – for rodding access
The access pipe is a piece of pipe with a hinged hatch that fixed with one screw. This opening gives an easy access into the piping system to check for and remove any blockages and scaling.
Available in dimensions OD50 & 75 mm (also OD110, 125, 160 & 200 mm mainly for gravity system).

5 Universal Flange type 854.5
The All-In-One flange covers the needs according to DIN, JIS & ANSI.
It is available in dimension OD40, 50, 75, 110, 125 & 160 mm).

6 Vacuum Drain type 480 – with 4 side inlets 1 ¼”
This vacuum drain works by waste water entering the housing through the grating or pipe inlet. As soon as the water level reaches a certain point, the ball lifts and thereby opens the outlet nozzle.
As the water is evacuated into the vacuum system and the water level falls, the ball/float shuts the outlet again.

7 Vent Pipes
The BLÜCHER® EuroPipe system can, in addition to being used for the vacuum pipe system itself, also be used as vent pipes. The BLÜCHER® EuroPipe system is available up to the size OD200 mm, which should be able to cover most requirements.

8 Marine Drains
The BLÜCHER® Drain Marine products can, together with the installation of a vacuum interface unit, also be installed for a vacuum pipe system.

PIPE LAYOUT - GRAVITY SYSTEM changes of direction

Changes in direction in a BLÜCHER® EuroPipe drainage pipework system must be established with prefabricated fittings causing the least possible flow resistance.

Below are BLÜCHER's recommendations for changes of direction in pipework installations. Please note that under all circumstances are any local regulations to be observed.

Change of direction from vertical to horizontal

If a toilet is connected to the drainage pipework more than 10 m from the change of direction, no sanitary units should be connected closer than 1 m from the change of direction.

The change of direction can be effected with a short 87°-88° bend provided that:

- Sanitary units are connected to the vertical pipe at least 2 m over the change of direction and to the horizontal pipe at least 1 m from the change of direction.
- The drop from the uppermost water trap to the change of direction does not exeed 10 m.
- A maximum of 3 toilets is connected to the vertical pipe.

If these conditions cannot be fulfilled, the change in direction should be carried out by means of two 45° bends or a 87°-90° bend with a large radius or an approved duckfoot bend.
In buildings with more than 8 storeys above the bend, a straight pipe section of at least 0.3 m should be inserted between the bends.

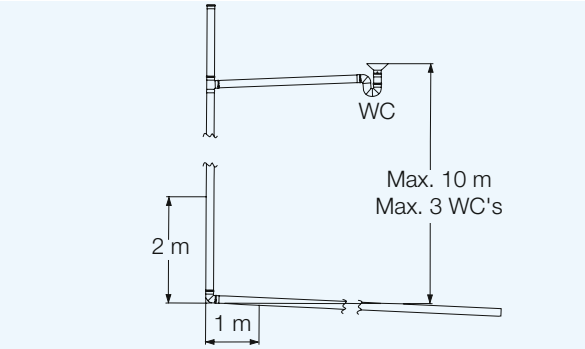


Fig. 1. *Requirements for using a short 87°-88° bend for change from vertical to horizontal pipe run.*

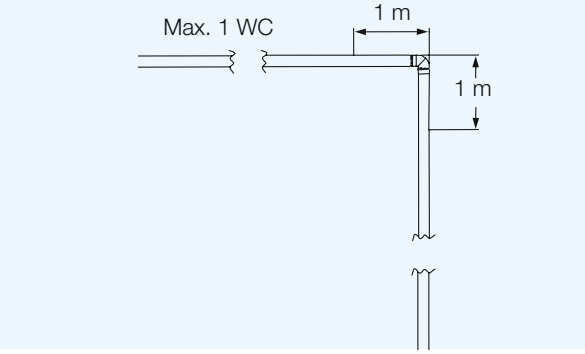


Fig. 2. *Requirements for using a short 87°-88° bend for change from horizontal to vertical pipe run.*

Change in direction from horizontal to vertical

As shown in Fig. 2, the change in direction can be carried out be means of a short 87°-88° bend provided that:

- Sanitary units are connected to the horizontal pipe at least 1 m from the change in direction and to the vertical pipe at least 1 m from the change in direction.
- A maximum of 1 toilet is connected.

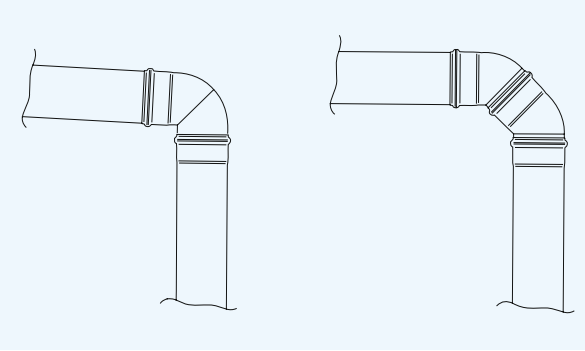


Fig. 3. *88° changes in direction can be used in pipe runs to which only one unit is connected.*

Changes of direction in horizontal lines

Fittings with a max. 87° change of direction (see Fig. 3) can be used in pipe runs to which only one sanitary unit is connected.
As sharp changes of direction increase the risk of blockages, special attention should be paid to pipe runs particularly exposed to blockages, e.g. pipes from toilets and kitchen sinks.
The larger the radius of the bend, the lower the risk of blockage. Consequently 87° bends with a short radius should only be used for changes in direction in connection pipes.

Bends with a maximum of 45° should be used in pipe lines to which more than one sanitary unit is connected.
For 90° changes in direction a straight pipe section of at least 0.3 m should be inserted between the two bends (see Fig. 4).

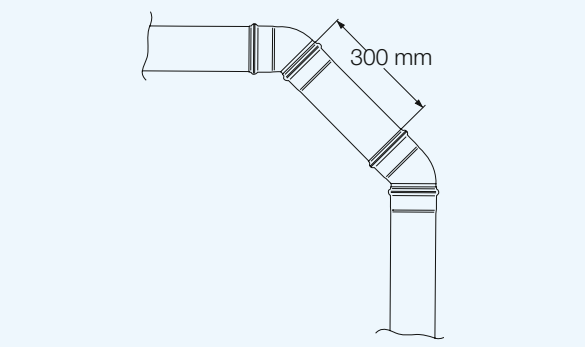


Fig. 4. *Two 45° bends with a straight pipe section of at least 0.3 m between the bends should be used for 90° changes in direction.*

Connection of drainage pipes - BLÜCHER® EuroPipe must be established in such a way that:

- **no deposits occur which may lead to blockages**
- **no overflows can occur which may cause problems with and damage to sanitary units connected to the pipework system**
- **ventilation/pressure equalisation is within acceptable limits**
- **adequate access is provided**

Connections to stacks

The vertical distance between the water surface of the water trap connected to a branch pipe and the bottom of the branch at the junction to the vertical pipe should be at least 100 mm (see Fig. 1). This will prevent overflows from the vertical pipe to the water trap.

Non-ventilated side pipes should be connected to a vertical pipe using 87°-88° branch pipes, and the side pipes should be installed with smallest possible fall (see Fig. 2).

The distance between two side pipes on the same stack should be at least 100 mm (see Fig. 3).

When using double branch pipes with connecting angles larger than 45°, no sanitary units should be connected to the side pipes closer than 700 mm from the vertical pipe (see Fig. 4).

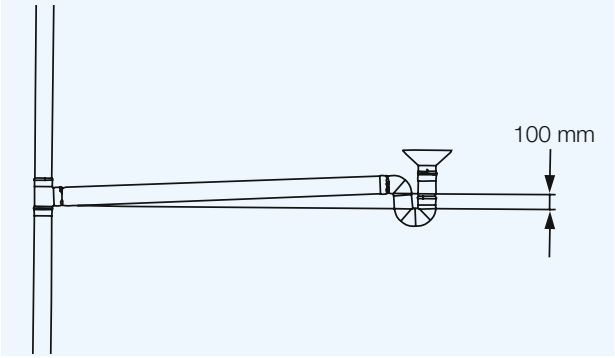


Fig. 1. *The vertical distance between water surface in the water trap and bottom of the side pipe should be at least 100 mm.*

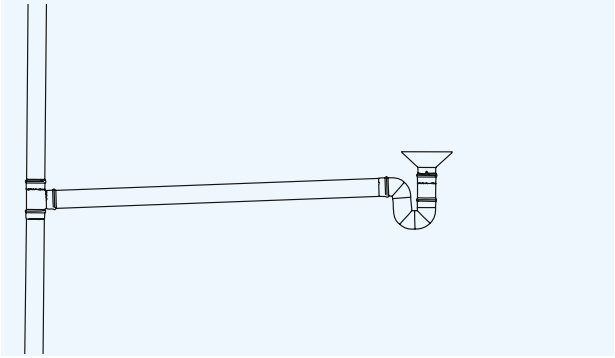


Fig. 2. *Non-ventilated pipes should be connected to vertical pipes with 87°-88° branch pipes and the side pipe should have the smallest possible fall.*

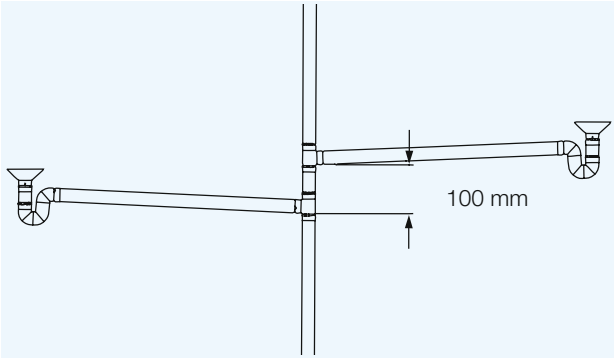


Fig. 3. *The distance between two side pipes on the same stack should be at least 100 mm.*

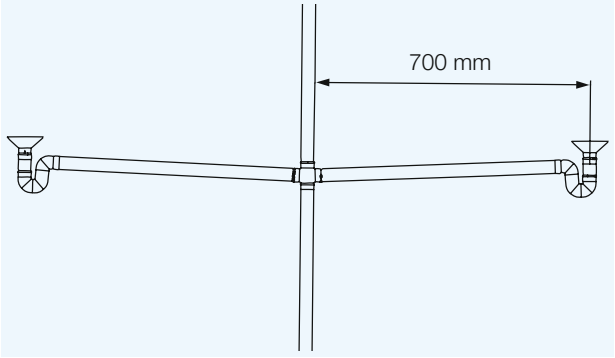


Fig. 4. *When using double branch pipes with connecting angles larger than 45°, no sanitary units should be connected to the side pipes closer than 700 mm to the vertical pipe.*

PIPE LAYOUT - connections

Branch pipes with a minimum connecting angle of 45° (see Fig. 5) can be used when connecting ventilated side pipes.

If toilets are connected more than 10 m above a change in direction from vertical to horizontal pipe run, sanitary units should be connected at least 1 m from the change in direction (see Fig. 6).

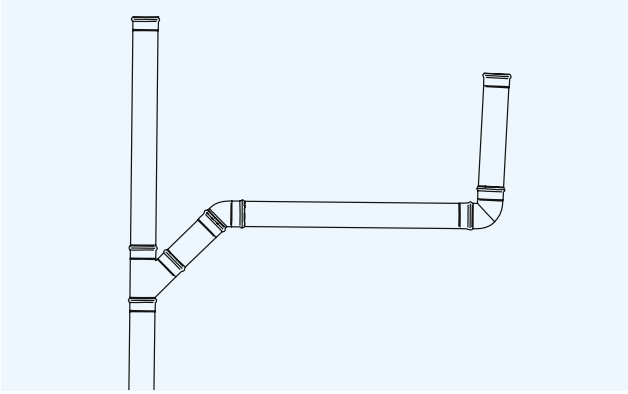


Fig. 5. *Branch pipes with a minimum connection angle of 45° can be used when connecting ventilated side pipes.*

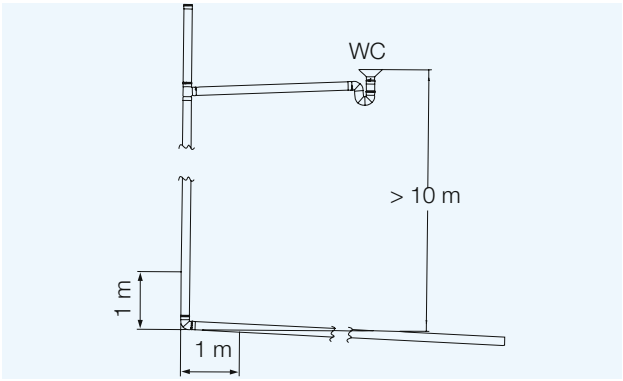


Fig. 6. *No sanitary units should be connected closer than 1 m from the change of direction from vertical to horizontal pipes if a toilet is connected more than 10 m above the change in direction.*

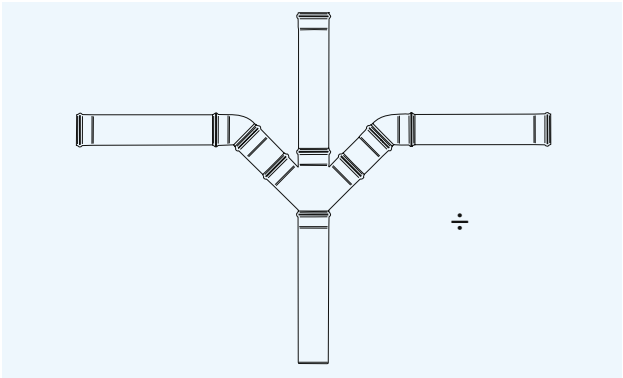


Fig. 7. *Double branch pipes should not be used in horizontal lines.*

Connection to horizontal pipes

Connecting horizontal pipes to horizontal pipes

These connections are made mainly in cleaning and inspection wells or in manholes.

Double branch pipes are not suitable (see Fig. 7).

Connection of vertical pipes to horizontal pipes

If the height of fall from the water trap in the uppermost connected toilet is max. 9.5 m and max. three toilets are connected, the top connection can be a fitting with an angle of connection of max. 45° (see Fig. 8). If the fall of height or the loading is greater, junctions should be used, i.e. a straight horizontal pipe section of at least 0.3 m should be inserted between the vertical and the horizontal pipe (see Fig. 9).

Of these the side connection ensures the better flow, and it should be used as far as practically possible.

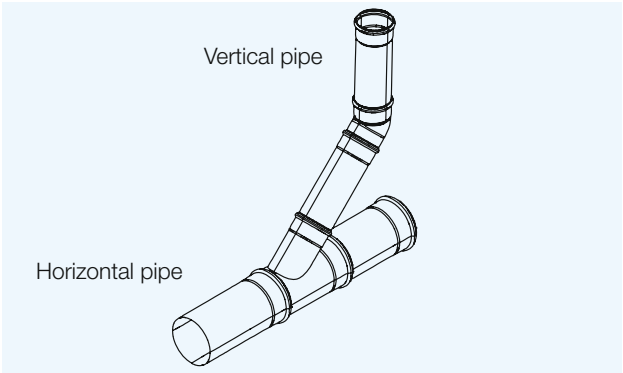


Fig. 8. *A top connection can be used if the height of fall from the upper-most connected toilet is max. 9.5 m and max. three toilets are connected, but the arrangement shown in Fig. 9 is preferable.*

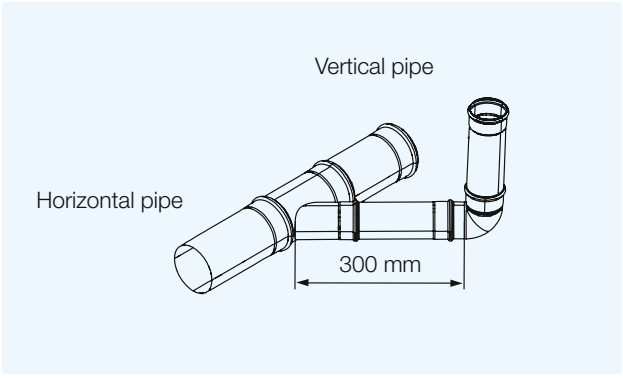


Fig. 9. *For greater heights of fall and loadings, the vertical pipe should be connected via a straight horizontal pipe with a length of at least 0.3 m (side connection).*

LONGITUDINAL EXPANSION OF BLÜCHER® STAINLESS STEEL PIPES

The figure below shows the relationship between pipe length L in m and longitudinal expansion Δl in mm for various temperature differences Δt.

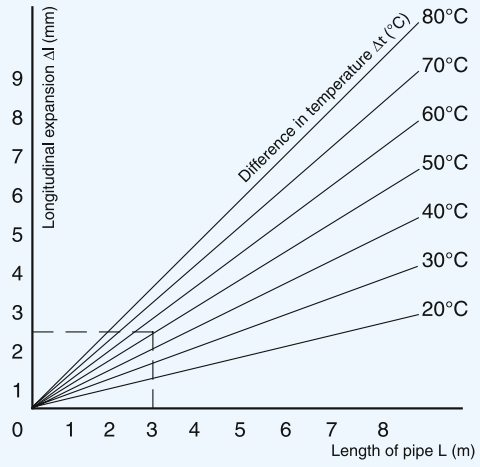
Example: A 3 m pipe will expand by 2,5 mm at a temperature difference of 50°C.

The longitudinal expansion can usually be absorbed in the socket joint.
The increase in length for a given pipe length can also be calculated from the following formula.

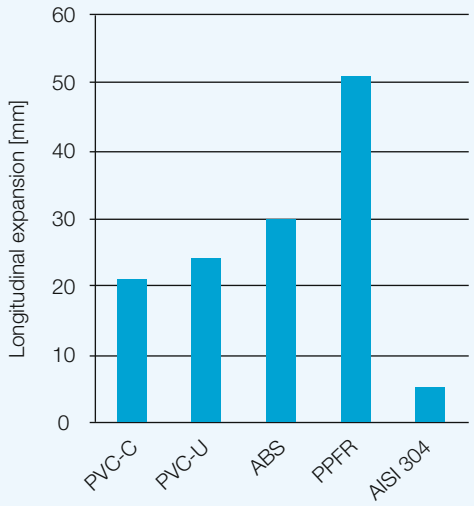
Δl	= 0,0165 x Δt x L
where	
Δl	= longitudinal expansion in mm
0,0165	= coefficient of expansion in mm/m/°C
Δt	= temperature difference in °C (Δt = max. temp. in the pipe system – temperature when pipe system installed)
L	= length of the pipe system in m.

Longitudinal expansion diagram

The below graphs demonstrate the relationship between pipe length (l) and longitudinal expansion Δl) at various temperature differences (Δt.)



Example: A pipe of 3 m expands longitudinally by approx. 2,5 mm at a temperature difference of 50° C.



Example: Temperature difference of 30°C – Pipe length 10 meter

MEASURE CONVERSION TABLE

The below table states the general dimensions etc. of the BLÜCHER® sanitary discharge system converted into inch/ft.

Pipe sizes											
mm	040	050	075	110	125	160	200				
inch	1"	2"	3"	4"	5"	6"	8"				

Pipe lengths											
mm	150	250	500	750	1000	1500	2000	3000	4000	5000	6000
ft.	0,5	0,8	1,6	2,5	3,3	4,9	6,6	9,9	13,0	16,4	19,7

1 mm	=	0,03937	inch
1 m	=	3,281	ft.
1 bar	=	14,504	psi
°C	=	°F=°Cx1,8+32	

BLÜCHER®
A WATTS Brand

INSTALLATION BETWEEN 2 FIXED POINTS

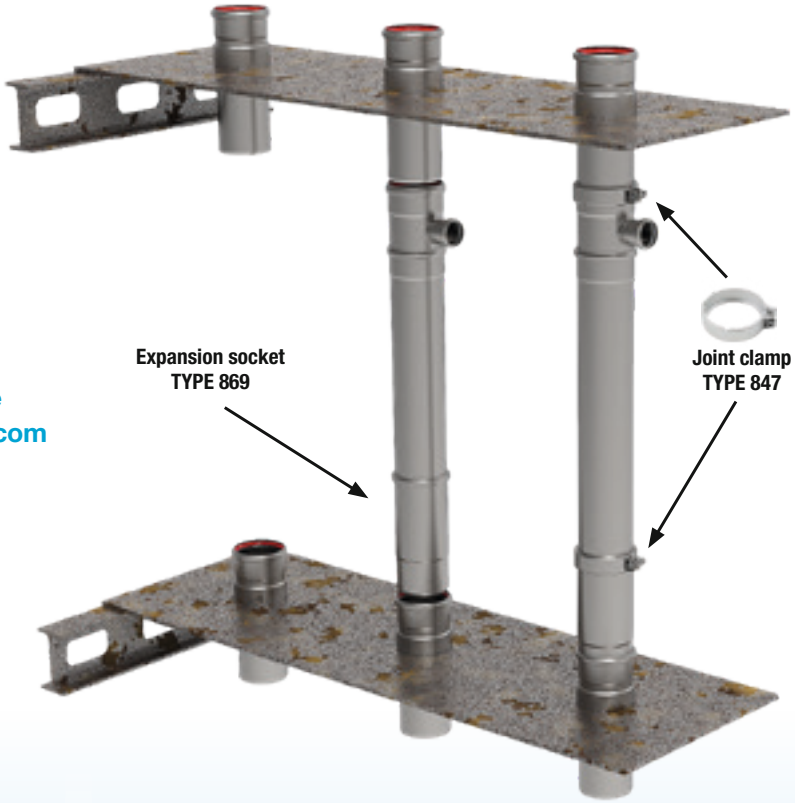
For installation of BLÜCHER® components (pipes and fittings) between 2 fixed points (e.g. between two deck penetrations) an expansion socket can be used.

The calculation of the pipe length (L) is made by means of the following formulas.

L = X – X1 – 5

(All measures in mm.)

The X1 and other dimensions of the different pipes and fittings can be found in the **BLÜCHER Marine Product Catalogue** or at **www.blucher-marine.com**



Expansion socket, long model TYPE 869

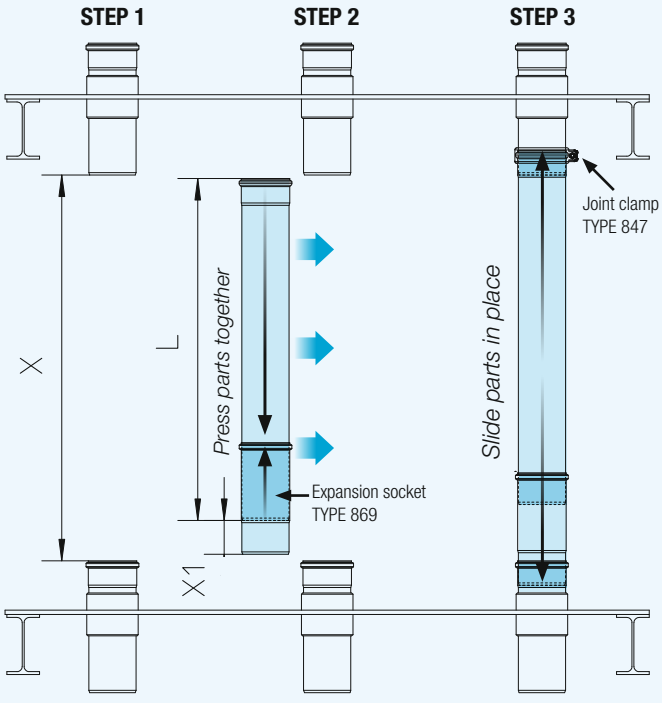


Figure 1

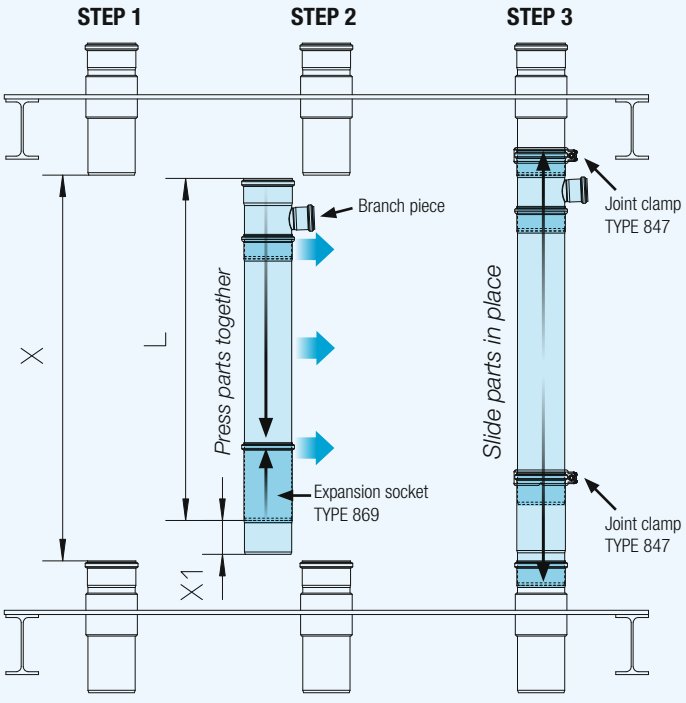


Figure 2

INSTALLATION OF BLÜCHER® PENETRATIONS AND DRAINS

When installing a drainage system (pipes and drains/ scuppers) onboard ships, the penetration of a deck or bulkhead is a very important part of the system as they must meet the requirements regarding fire spreading on board ships.

All of the standard BLÜCHER® pipe penetrations are fire tested and marked with the MED (Marine Equipment Directive) Mark of Conformity.

BLÜCHER has approved pipe penetrations and drains/ scuppers which can be used for welding in both steel and aluminum structures.
In addition to the traditional solutions for welding, BLÜCHER has also developed new types of approved pipe penetrations and drains/scuppers which instead of welding are installed with a screw-lock solution.

This chapter describes how to install the different types of penetrations in the different types of structures.

BLÜCHER®
A WATTS Brand

WELDING PRECAUTIONS - PREPARATION

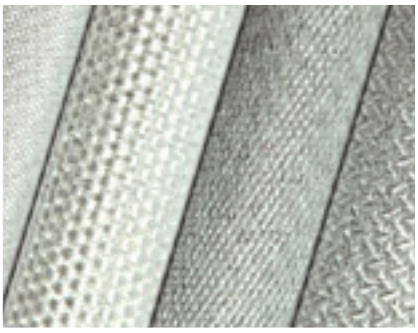
Before welding:

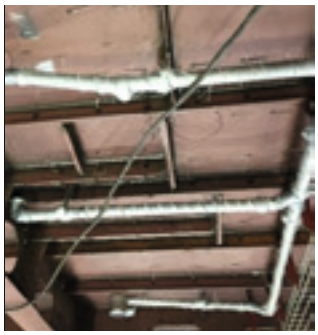
Before you start welding BLÜCHER® pipe penetrations or drains in the ship structure, please take precautions as described below:

Protection:

If welding, grinding or use of carbon steel tools or similar is to take place close to a stainless steel installation, BLÜCHER recommends that the stainless steel surface is protected until the work has been completed. This can e.g be done by using heat/temperature resistant glass fabrics to cover the pipe installation or by spraying the pipe installation with suitable welding spray.

Heat resistant glass fabrics (heat blankets)





Welding spray / anti-spatter spray

Sealings:

BLÜCHER recommend that sealing rings are removed from the penetrations before welding to ensure that the heat from welding does not damage the sealing ring.

1) Remove sealing ring before welding

2) Weld the penetration/ drain to the deck/bulkhead

3) Check and clean the sealing groove if necessary

4) Insert sealing ring - be sure to turn it the right way

PENETRATIONS/DRAINS FOR STEEL STRUCTURES – WELDING

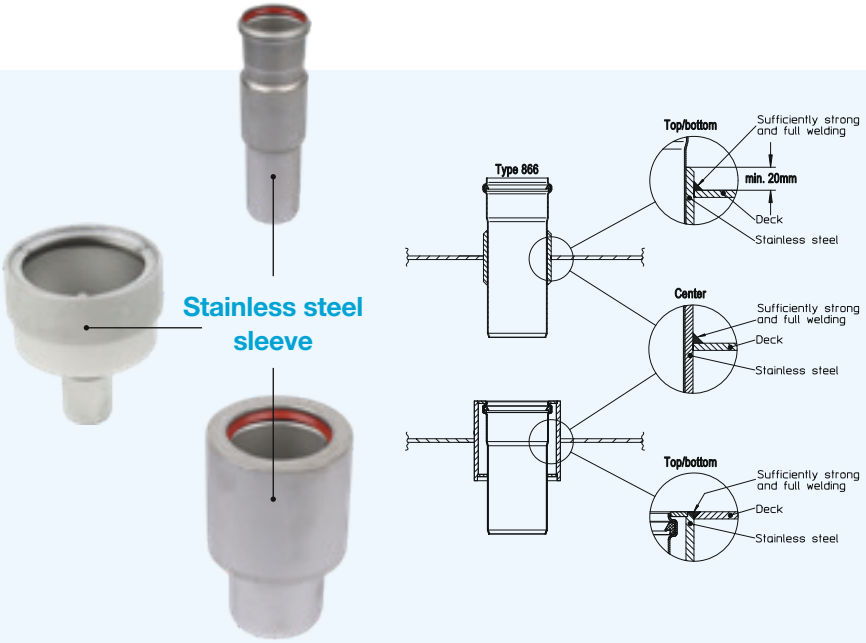
The BLÜCHER® pipe penetrations and drains for welding into steel structures are designed in two different ways.
One solution is a so-called **sleeve solution,**
the other solution is a **flange solution.**
These two solutions ensure that a certain material thickness is available for welding into the steel structures.

Sleeve solution – for pipe and drain penetration

The sleeve solution consists of a piece of thick-walled pipe (typically 4-5 mm thickness) welded to the pipe penetration or drain.

The penetration/drain is welded into the steel structure by welding to the sleeve piece.
It can be welded throughout the entire length of the sleeve which gives some flexibility.

Note: For the type 866 penetrations at least 20 mm of sleeve shall protrude on both sides.



Flange solution – for pipe and drain penetration

The flange solution consists of a stainless steel flange/plate (typically with a thickness of 5 mm) welded to the pipe penetration or drain.

The penetration/drain is welded into the steel structure by welding to the steel flange/plate.

The penetration/drain can be welded to the deck/ bulkhead in three different ways:

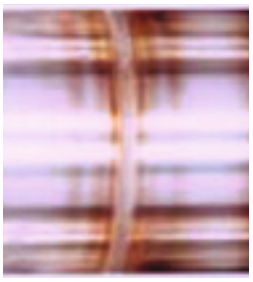
1. *Either the flange is welded to the top of the deck, or*
2. *It is welded in level with the deck, or*
3. *The flange is welded under the deck.*

When welding the BLÜCHER® pipe penetrations and drains in the deck or bulkhead, it is important to follow the applicable instructions from the welding equipment supplier.
This applies to the choice of welding rod or wire and to how much heat/power to use.
It is difficult to say precisely when or if the heat tint discoloration in the heat-affected zone of a stainless steel weld should be removed inside the penetration.
The welding examples below have been made in different ways – with different welding power, different welding speed etc. Here there are obvious differences in the heat colors/heat tint.

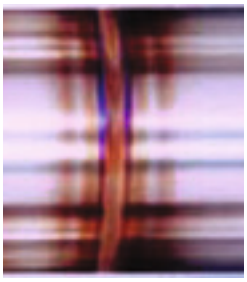
The pictures below can be used as guidelines as to whether treatment is necessary or not.

If treatment is necessary, the removal of heat tint from stainless steel can e.g be done by using brush-on pastes or gels, spray or immersion acid pickling or electrolytic methods - this will normally be sufficient.
It is important to follow the preparation supplier's instructions, as excessive contact times with these hydrofluoric acid containing products can result in pitting damage to the stainless steel.

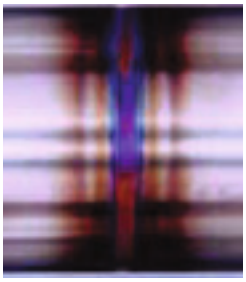
Welding 1:
OK



Welding 2:
Acceptable



Welding 3:
Not acceptable
needs treatment



Welding 4:
Not acceptable
needs treatment

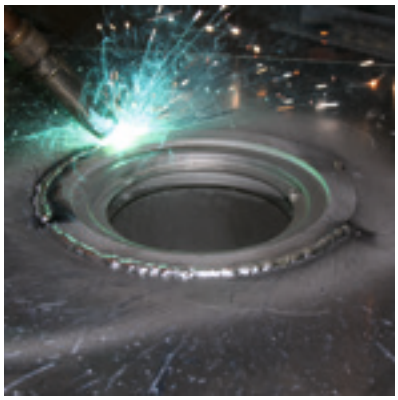
General recommendations:
All welding work to be carried out by suitably competent personnel, and to be closely supervised to ensure satisfactory results.
BLÜCHER recommends considering the welding power input to avoid heavy heat zones inside the pipe penetration. See welding example 3 and 4 above.

Welding Electrode/rod between mild steel and stainless steel

Below are some examples of various welding electrode/rods that can be used for welding between mild steel and stainless steel.
For sufficient recommendations – please contact your local supplier of welding equipment

Migatronic	=	**MIGA 312**	MIGATRONIC
AWS	=	**E312-16**	AWS
ESAB	=	**OK 68.81**	ESAB
Thyssen	=	**Thermanit 30/10 W**	THYSSEN
Filarc	=	**Filarc RM 312**	FILARC

PENETRATIONS/DRAINS FOR ALUMINIUM STRUCTURES – WELDING AND COATING



The BLÜCHER® pipe penetrations and drains for welding into aluminium structures are designed with a flange combined of pressed aluminium and stainless steel welded to the pipe penetration or drain. This combination makes it possible to weld stainless steel directly into aluminium decks/bulkheads onboard ships. The products are suitable in particular for cruise liners, luxury yachts, ferries and other maritime vessels, where high strength combined with low weight is essential.

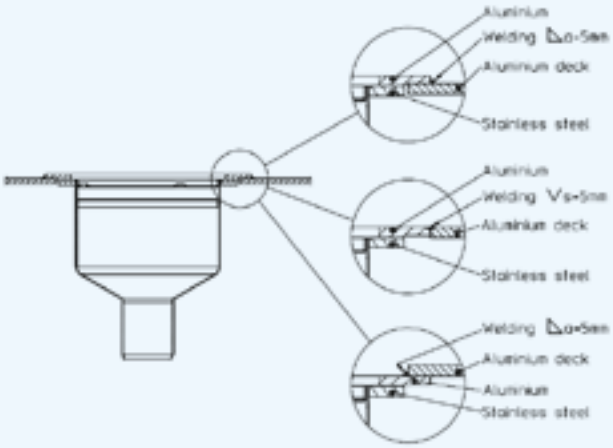
The product range has been tested at the Danish Force Institute.

Flange solution – for pipe/ drain penetration

The penetration/drain is welded into the aluminium structure (deck or bulkhead) by welding to the aluminium/steel flange.

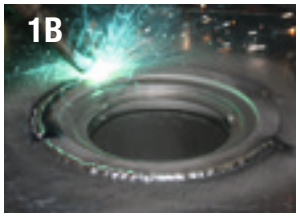
The penetration/drain can be welded to the deck/ bulkhead in three different ways:

1. *Either the flange is welded above the aluminium deck/ bulkhead, or*
2. *It is welded in level with the aluminium deck/bulkhead, or*
3. *The flange is welded under the aluminium deck/bulkhead.*



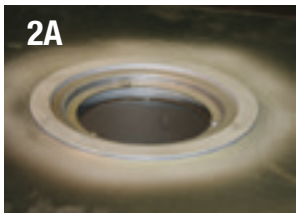
These installation instructions must be followed in every particular to ensure a safe and durable Installation.

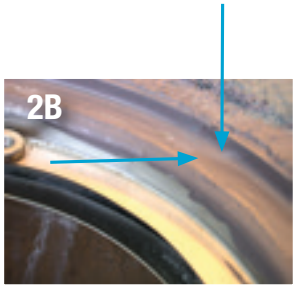
IMPORTANT! The use of coating appropriate for application onto aluminium is essential to the functionality of the product.

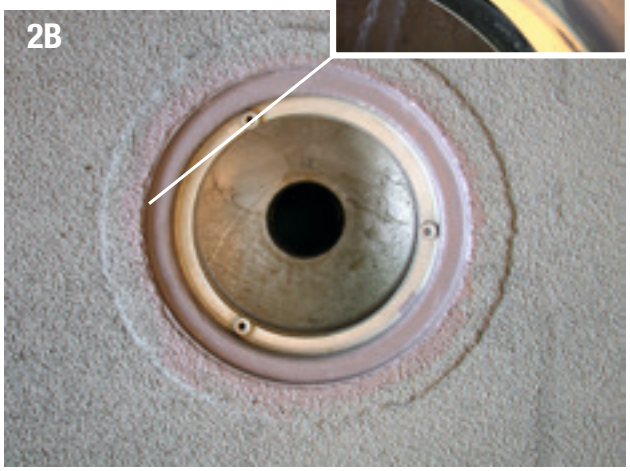


1. WELDING

The products can be installed using either TIG or MIC/MAC welding, following the normal procedures for welding.
IMPORTANT! It is important to achieve full weld penetration, good surface finish and a tight weld while welding at the lowest possible temperature.







2. COATING

2.A Preparation

1. Even out the weld, removing burrs, splashes and other defects
2. Degrease and clean the surface thoroughly
3. Sand the surface to make it rough, and subsequently remove all abrasive dust

2.B Coating

4. Apply 3 layers of coating in accordance with the coating supplier's instructions
5. **IMPORTANT!** While applying the coating make sure that the interface between aluminium and stainless steel is completely covered. See illustration.

BLÜCHER does not accept any responsibility in connection with coating and refers only to the coating supplier's instructions and recommendations.

Non-welded pipe penetrations
- Installation without welding

NO MORE WELDING!

BLÜCHER has developed a new solution for installing flanged drains and penetrations in steel or aluminium structures **WITHOUT** welding.
The drains and penetrations are instead installed by using a screw system.

BLÜCHER® Plug & Play Penetration
- Save 30 minutes per installation

HOW IT WORKS

- The oval-shaped flange is passed through the round hole.
- The oval-shaped flange has a larger diameter (major axis) than the cut-out hole. This is to fix and secure the penetration.
- The penetration is centered in the hole by means of the gasket, and the 4 screws are tightened - first with a cordless screwdriver and then with a torque wrench to the right torque according to the Installation Instruction.

All this is done in less than 60 seconds.

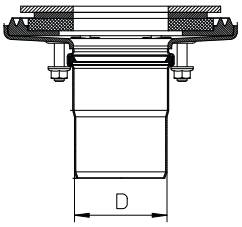




Below some facts and advantages of this solution:

- Quick and easy to install - fast and simple
- Fully approved and tested: Fire test A0-A60 - Vibration test - Tightness test
- Perfect solution for panel line production
- No skilled workers required
- Installation at a late stage of the project
- For all your projects: New build and refit

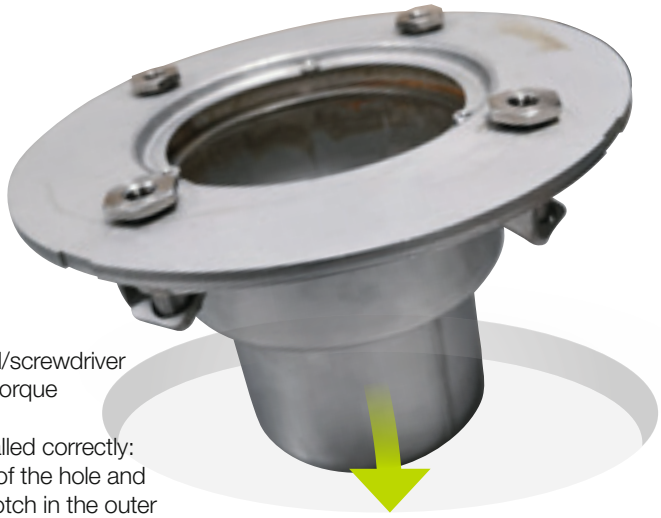
PLUG & PLAY PENETRATION TYPE 868.910



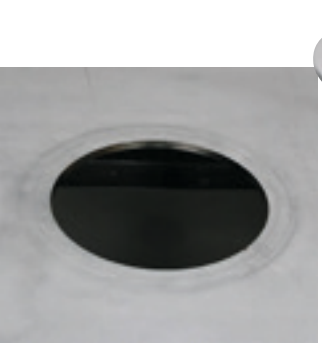
Type no.	D
868.910.050	50
868.910.075	75
868.910.110	110
868 910.125	125
868 910.160	160

Below is a quick guideline on how to install the non-welded drains.
Detailed **Installations video** and **Installation instructions** can be found at www.blucher-marine.com

Non-welded Drain
- Huge time saving



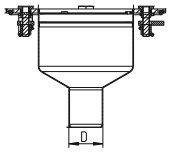
1. Mark up the hole to be cut in the deck with diameter as specified in the Installation Instruction.
2. Cut the hole either by laser-cutting (recommended), a hole saw kit, flame cutting or a reciprocating saw.
3. Clean the edge of the hole to remove dirt and burrs from top and bottom surfaces.
4. Place the penetration in the centre of the cut-out hole and fasten all fixings (cross tightening recommended) by using an electric drill/screwdriver and/or a torque wrench. The screws must be fixed with the right torque according to the Installation Instruction.
5. Use visual inspection to check that the penetration has been installed correctly: The slot on top of the screw head must point towards the centre of the hole and the outer edge of the flange within the tolerance marked by the notch in the outer edge of the flange.





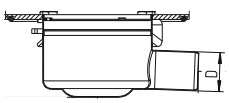
NON-WELDED DRAINS TYPE 470.900 AND TYPE 475.900

470.900



Type no.	D
470.900.050 S	50
470.900.075 S	75
470.900.110 S	110

475.900



475.900.050 S	50
475.900.075 S	75

CONNECTION TO OTHER PIPE SYSTEMS/MATERIALS

The BLÜCHER® EuroPipe system can easily be connected to other pipe systems/materials, being either compatible or by using adaptors.
Here you will find examples of different types of adaptors for different systems. Customized adaptors can also be use.

Additional detailed information about the adaptors like dimensions, measures, weight type nos. etc. can be found in the BLÜCHER Marine catalogue or at **www.blucher-marine.com**

Adaptors for threaded connections

Adaptors are available with male and a female threads. NPT and BSP threads are options.
The adapters comes with a BLÜCHER® spigot or socket end.

Adaptors for flange connections

The universal flange adaptor fits most standards – DIN, JIS & ANSI.
The flange adapter comes with a BLÜCHER® spigot or socket end.
Flange adaptors with normal standard flanges can also be used.

Adaptors for welded connections

When connecting the BLÜCHER® EuroPipe system to a thick-walled pipe system by welding, a certain material thickness is needed.
BLÜCHER offers adaptors in different sizes, dimensions, length, thicknesses etc. These types of adaptors are often customized solutions.
Contact the BLÜCHER Customer Center to request a proposal for a solution.

Rubber adaptors/reducers for plastic, copper, stainless steel etc

Rubber adaptors/reducers for various pipe materials are available.
The adapters fit into a BLÜCHER® socket end and reduce, for example, from a 50 mm BLÜCHER® socket to an OD 32 or 40 mm pipe.

Adaptors for other steel/stainless steel piping systems

Adaptors between the BLÜCHER® EuroPipe system and other steel/ stainless steel piping systems (e.g. Loro, Chibro STECKDRAIN, RM Drain etc.) are available.
The adapters are available in different variants and sizes.

Adaptors for plastic piping systems

Adaptors between the BLÜCHER® EuroPipe system and various plastic piping systems are available. The adapters are available in different variants and sizes.

Other Adaptors

The BLÜCHER® EuroPipe can also be connected to other piping materials/sizes by means of pipe couplings – e.g. like Teekay, Flexseal couplers or similar.
Details on request

PRESSURE PERFORMANCE

BLÜCHER® EuroPipe is designed and manufactured in accordance with European standard EN1124, following which it is a vacuum and/or gravity system, not considered a pressure-carrying system.
Due to the fact that BLÜCHER® EuroPipe pipes and fittings have push-fit joints, these may potentially slide apart if the system is pressurized.

To prevent such incidents from happening, BLÜCHER offers a range of pipe clamps, all of which are physical restraints designed to keep the pipe joints in place during normal operation and/or to prevent the pipe joints from sliding apart even if an unexpected pressure increase caused by a blockage, for instance from pipe clogging, should result in a temporary pressurization of the system.

The below table states the pressure performance of the BLÜCHER® EuroPipe system.

BLÜCHER® EuroPipe – pressure performance table

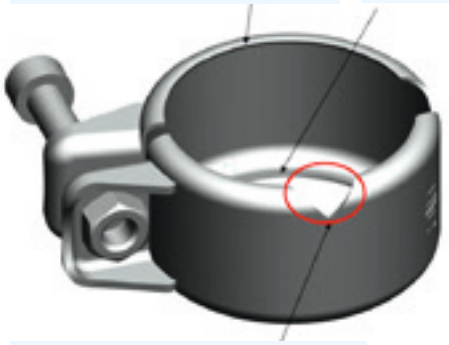
Pipe Size	GRAVITY SYSTEM				VACUUM-SYSTEM
	No * clamp	Pipe Joint Clamp Type 847.XXX.XXX	Pressure Peak Clamp Type 847.001.XXX		
			Permanent design pressure	Pressure Peak	
Ø 40	0,5 bar	2,0 bar	3,0 bar	10,0 bar	-0,85 bar
Ø 50	0,5 bar	2,0 bar	3,0 bar	10,0 bar	-0,85 bar
Ø 75	0,5 bar	2,0 bar	3,0 bar	10,0 bar	-0,85 bar
Ø 110	0,5 bar	2,0 bar	3,0 bar	7,5 bar	-0,60 bar
Ø 125	0,5 bar	1,0 bar	3,0 bar	6,0 bar	-0,60 bar
Ø 160	0,5 bar	1,0 bar	3,0 bar	5,0 bar	-0,60 bar
Ø 200	0,2 bar	0,5 bar	2,5 bar	4,0 bar	-0,60 bar

** Depending on fixation*

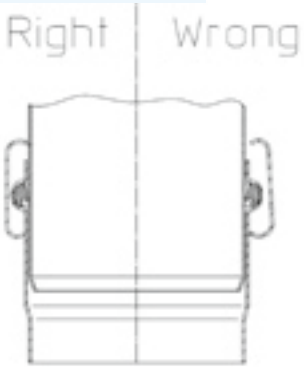
Pipe Joint Clamp Type 847.XXX.XXX - How to Install

Diameter A: This diameter is bigger than diameter B - fits to the socket end

Diameter B: This diameter is smaller than diameter A - fits to the spigot end



Normally this notch should be facing the socket end



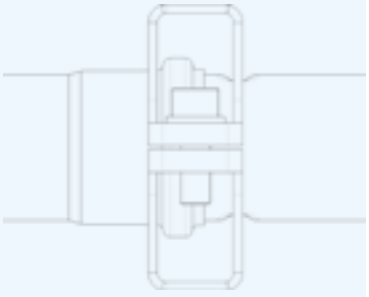
Pressure Peak Joint Clamp Type 847.001.XXX - How to Install

The application of the pressure peak clamp is to safeguard the BLÜCHER® EuroPipe pipework system against short time overpressure in the event of an unexpected pressure build-up (inside or outside the pipeline) in the system or during testing of the system. The pressure peak pipe joint clamp is tested in 60 second pressure intervals.

Installation

- One part of the pressure peak pipe joint clamp can be fitted directly to wall or ceiling. Use the OD 8 mm hole either with a screw directly into wall/ceiling or with a threaded rod between wall/ceiling and the fixing part for alignment.
- It will not be possible to fit the pressure peak joint clamp in the wrong direction in the installation.
- The two parts of the pressure peak pipe joint clamp are assembled by means of the screws supplied with the clamp
- The projections on the pressure peak pipe joint clamp will make a slight indent on the pipe.
- The pressure peak pipe joint clamp secures the pipe joint up to the pressure peaks stated in the table

The projections on the pressure peak pipe joint clamp will make a slight indent on the pipe.



PRESSURE / LEAKAGE TEST

General test conditions:

For safety reasons, pipe systems can be tested with pressurized water. Plug the system and fill it with water - use water to pressurize.
Prior to testing, it must be ensured that the system is properly fixed and that joints will not slide apart.
Check carefully for leaks when filling the system with water and stop the test if the pressure drops significantly.
Plug the pipes at each end of the test run and at all connections. All seals must be designed in such a way that they will not become dislocated during the test.
BLÜCHER® plugs and clamps can be used.

BLÜCHER® Guidelines:

The test pressure can be maintained at 50 kPa (0.5 bar) for 15 minutes without any leakage. The test should be carried out at a constant temperature. Avoid direct sunshine on the pipes during the test.
Please consult your vacuum system supplier before starting the test, as they might have other demands.

Pressure testing with compressed air is a possibility, but still BLÜCHER recommends pressure testing with water for safety reasons, as testing with compressed air may result in a dangerous situation and cause "flying" parts. When pressure rises inside the pipe system, there will be a potential risk of parts sliding apart (or failure in the plugs) and when compressed air is released, it will happen very quickly and in an uncontrolled manner.
Water is more controllable, much more safe and you can see the visible leakages. It can be difficult to locate a potential leak when testing with air.
Please note that systems without sufficient pipe support in terms of safety clamps or pipe hangers may start to slide apart even at the smallest pressure increase.

BLÜCHER does not recommend testing with air.
If pressure testing with compressed air, BLÜCHER recommend a much lower pressure e.g. 0.03 bar (from a Danish standard).

Vacuum Test:

Vacuum Pipes Only

- The leakage test to be carried out on the complete vacuum pipes, without any component (toilets, grey water interfaces, vacuum unit etc.) connected.
- All pipe ends to be blinded.
- The maximum accepted leakage is: Vacuum drop from -0.55 bar to -0.45 bar during one hour.

Complete Vacuum System

- The leakage test to be carried out on the complete vacuum system, with all components (toilets, grey water interfaces, vacuum unit etc.) connected.
- The maximum accepted leakage is: Vacuum drop from -0.55 bar to -0.40 bar over 20 minutes.
- Pipework installations to be tested in accordance with the recommendations of the vacuum system supplier.
- BLÜCHER recommends maximum -0.85 bar vacuum for OD 40 – 75 mm and maximum -0.6 bar vacuum for pipe sizes larger than OD 75 mm.

Gravity Test:

- Pipe work installations to be tested at maximum 0.5 bar, e.g. by blocking the installations on each deck and filling with water.

Plugs for testing

When pressure testing a piping system, it is necessary to plug the open ends, not only to prevent the water from flowing out, but also to be able to apply pressure to the piping system.

BLÜCHER offers a range of plugs for this purpose as shown below.
Customized plugs are also available.

Type 844.000.xxx

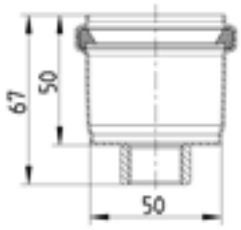
Available in sizes: Ø40, 50, 75, 110, 125, 160 and 200 mm

Type 844.xxx.xxx - Plug with threaded ½" BSP socket

Available in sizes: Ø50, 75 and 110 mm.

Type 844.100.xxx S

Available in sizes: Ø50, 75 and 110 mm.



Product information / instruction for plug type 844.100.xxx S

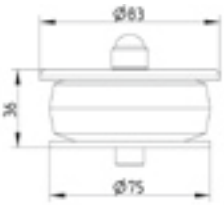
This plug is to be fixed into a BLÜCHER® pipe socket end (female end) **without** the lip-sealing ring, i.e. the lip seling ring must be removed - see pictures below.

Remove sealing ring before installation of the plug

Insert the plug into the socket end without the sealing ring

For fixing the plug in the socket, a M8 nut is used. When the nut is tightened, the special EPDM rubber sealing is pressed against the socket walls fixing the plug in the socket groove.

Remove the black plastic cover and tighten in place the nut until the plug is fixed



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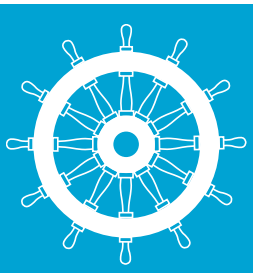
FIRE PERFORMANCE

Thousands of cables, pipes and wires penetrate decks and bulkheads all over a vessel.
All these penetrations weaken the overall fire integrity of the decks/bulkheads, which can lead to a potential risk of fire spread from one compartment to another.

That's why all these seals/penetrations have to bear the approval mark…this steering wheel. But before we can wheel mark products, we have to carry out fire testings.



It is important for us to ensure our customers safety at sea and deliver approved and well documented products - that is why we constantly strive to optimize and develop the best solutions to maximize the performance of our products **and with this in mind we test our products regularly.**

Spread of fire:
BLÜCHER has conducted fire testings for pipe penetrations in sizes from Ø40 to Ø200mm and for the BLÜCHER® Marine drains.
The fire test of the BLÜCHER® pipe penetrations and drains are made according to IMO 2010 FTP Code* part 3: "Fire resistance tests for "A", "B" and "F" class divisions".

FTP Code** - International Code for Fire Test Procedures (ships and off shore) published by **IMO – International Maritime Organization

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BLÜCHER® EuroPipe – A non-combustible system

Product standard EN1124-1 determines that pipes made from stainless steel are to be considered "Non-combustible" and will NOT contribute to a fire. BLÜCHER® EuroPipe drainage pipes and fittings are in stainless steel which is rated class A1 – meaning:

- No flames
- No toxic gasses
- No burning droplets

A- class fire ratings:

- BLÜCHER offers A0, A30 and A60 fire rated penetrations.
- All A-class fire testings have a duration of 60 minutes.
- It is essential and required that the penetrations retain their integrity throughout the complete fire test of 60 minutes.
- For the A30 and A60 ratings there is also a requirement for a maximum of 180°C heat transmission.

Approval criteria in short terms:

- Integrity of the penetration should remain (no flames on unexposed side) (A0, A30, A60)
- Heat transmission must not exceed 180°C (A30 and A60)

Insulation:

BLÜCHER® pipe and drain penetrations are to be insulated with marine approved insulation with a minimum density of 100kg/m^3

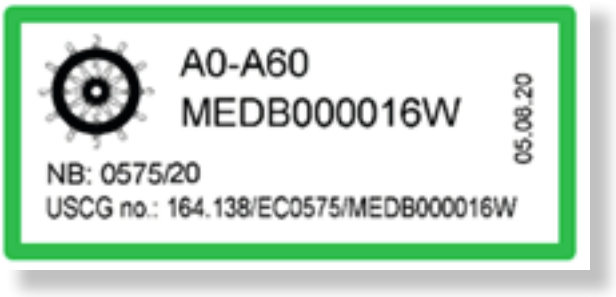
All insulation details and dimensions are available in the appendices of each fire certificate.

Please note that any deviation from the insulation details and densities must be approved by with the local surveyor responsible for the ship as they have the final authority.

Mark of Conformity:

In general, all seals/penetrations installed onboard a vessel, must bear the steering wheel approval mark.
In addition to the normal product labelling, all fire approved products from BLÜCHER are labelled with a special approval label with the following information:

- The steering wheel
- 0575 – stating that the certificates have been issued by DNVGL
- 164.138/EC0575/*MEDB000016W* US Coast Guard approval number
- A0-A60 – stating that the product has been approved in fire classes A0 – A60
- MEDB000016W (example) – the certificate number



Appendices:

For each certificate there are two sets of appendices

- Insulation details
- Approved products

Where to find the approvals:

All certificates are available at **(www.blucher-marine.com)**
Please contact our sales representatives to get access to the appendices or for any additional clarifications.

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ACOUSTICS IN SANITARY DRAINAGE

The Sound of Silence

Where there is trickling water, there is sound. It may be peaceful and delightful to listen to when walking on the beach, but inside the cabin we don't really want to hear the noise of water splashing in the pipes.

BLÜCHER® EuroPipe is more silent than several other drainage pipe systems.

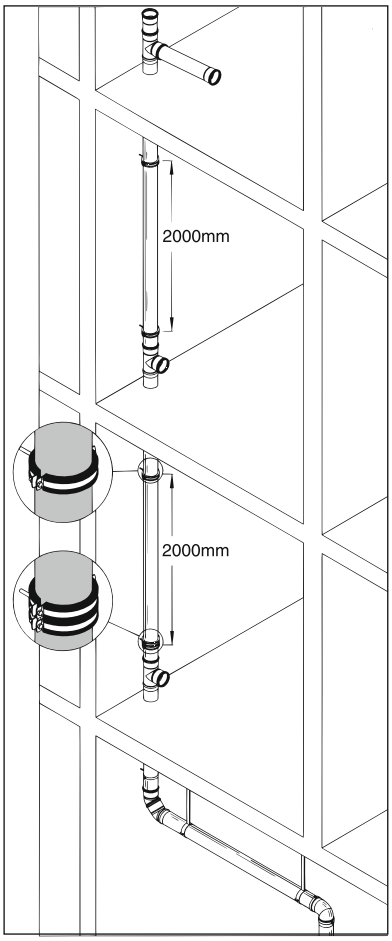
Sound from drainage systems occurs when water passes through the pipes and causes movements in the pipework system and sometimes also in the building structure. The movements are transferred to the air in the room, causing sound. To be able to give the best possible advice regarding sound from drainage systems we have carried out measurements at the internationally recognized independent acoustics institute Fraunhofer Institut in Stuttgart.

Fraunhofer Institut in Stuttgart

Legislation

- The in Europe commonly used standard DIN 4109 states requirements of maximum 30 dB(A) through wall to adjoining rooms. In comparison the sound level in a library is 30 dB(A). BLÜCHER® EuroPipe complies with DIN 4109.
- EN 14366 states requirements for the test installation, but not any sound level requirements. BLÜCHER® EuroPipe has been tested in accordance with EN 14366 test requirements and complies with this standard.
- All materials have been tested in accordance with DIN 4109 and these results are shown in the diagrams page 70. Compared to EN14366 the results are approximately 3 dB(A) higher.

Tests have been carried out using Walraven SL simple two part pipe hanger when measuring sound from pipes and using BISMAT 1000 sound improved hanger in accordance with recommendations from Walraven when measuring sound to adjoining rooms.



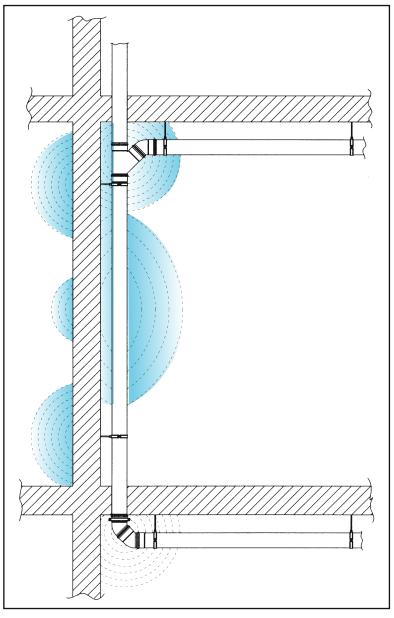
Test installation in accordance with EN 14366. Top: SL simple two part hanger. Bottom: BISMAT 1000 sound improved pipe hanger.

Sound from drainage systems

Sound from drainage systems is influenced by a range of parameters. The acoustics of the surroundings, the water flow and the material used for the drainage system.

Sound from the pipes is created when:
- water and air meet
- water passes through a pipe branch, a bend or a reducer

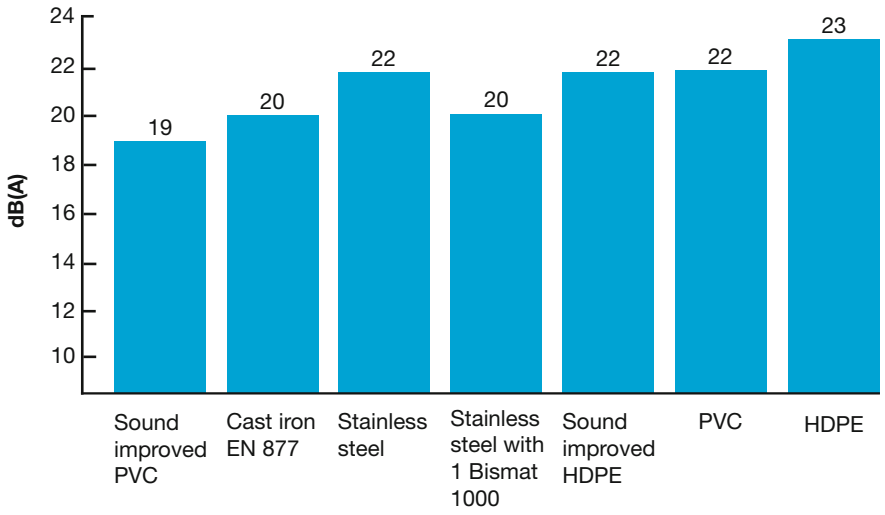
Sound spreads through the wall to adjoining rooms through:
- water
- pipe walls and pipe bends
- walls, floors and ceilings in constructions
- pipe hangers



Sound dispersion

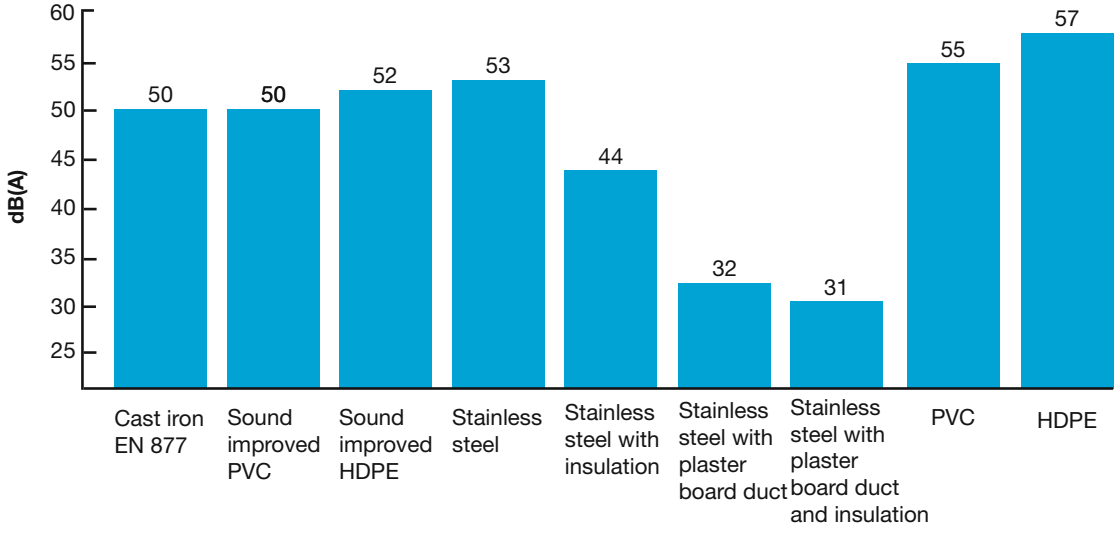
Sound through wall to adjoining rooms

Sound through wall is measured in an adjoining room to the drainage installation. The tests were carried out using Walraven Bismat 1000 pipe hangers.



Sound from pipe

The below graph shows the sound level of various materials directly from the pipe at a water flow of 4 l/s, which is the highest flow tested and the most common flow in drainage installations. The tests were carried out using Walraven SL pipe hangers.



Sound reduction

Sound from pipes
If a reduction of sound from the pipes is requested, the best result is achieved by insulation. Either by insulating all pipes and bends or by building a duct around the pipes. The higher the density, the better reduction.

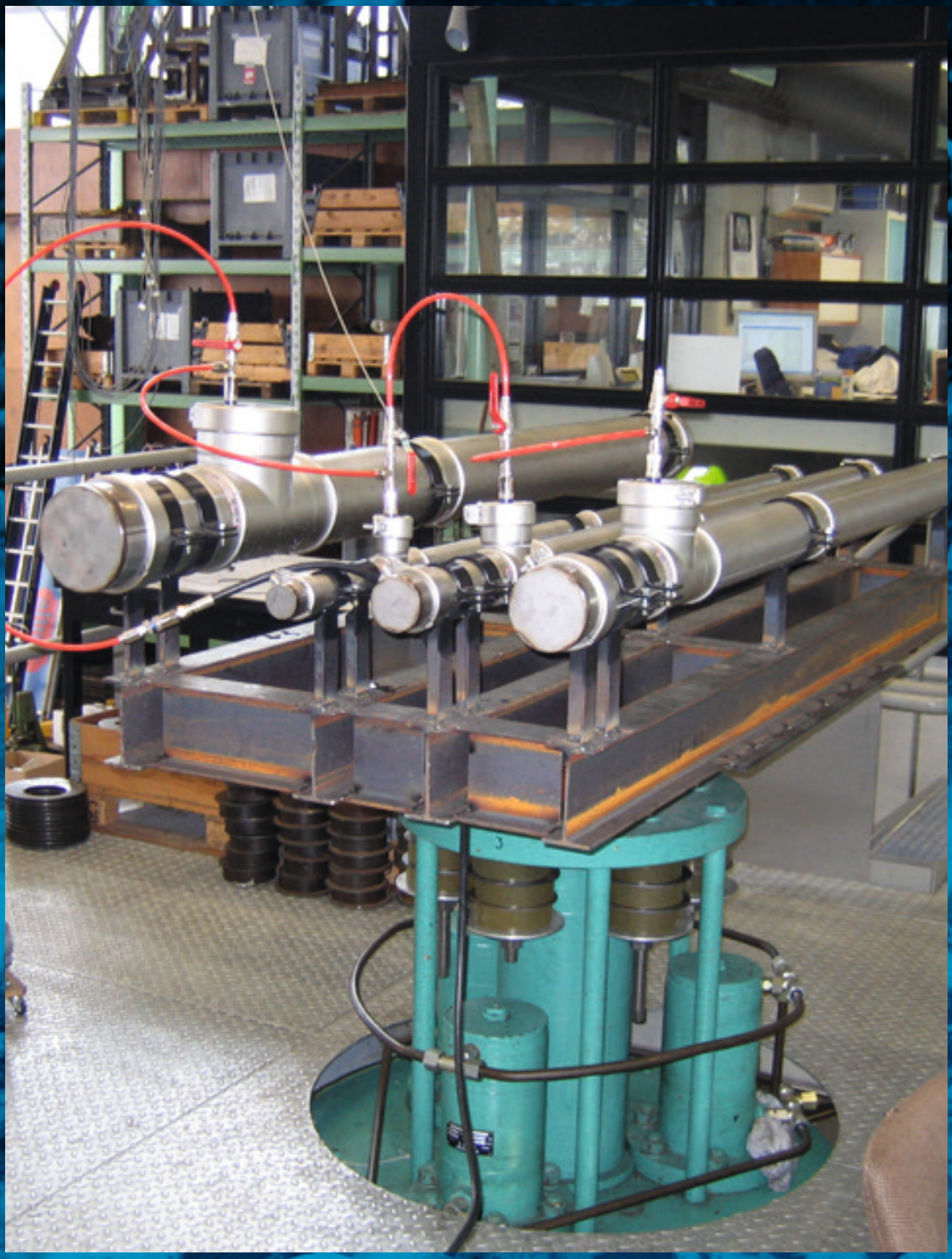
Sound through wall
If a reduction of sound to the adjoining rooms is requested, the type of pipe hanger and the quantity used is crucial. The less pipe hangers to transfer vibrations, the better reduction.

Sound from pipes - reduc. dB(A)*	0.5 l/sek.	4.0 l/sek.
Bismat 1000 2 pcs. per storey	0	0
Bismat 1000 1 pcs. per storey	0	0
Bismat 1000 and SL	1	0
Insulation	12	9
Plaster board duct, two layers	23	21
Plaster board duct, two layers with insulation	27	22

Sound through wall - reduc. dB(A)*	0.5 l/sek.	4.0 l/sek.
Bismat 1000 2 pcs. per storey	3	3
Bismat 1000 1 pcs. per storey	11	10
Bismat 1000 and SL	7	8
Insulation	4	3
Plaster board duct, two layers with insulation	1	0

* *SL pipe hangers are comparable with standard pipe hangers with rubber inlay. Bismat 1000 pipe hangers are sound-improved pipe hangers.*

SHOCK & VIBRATION



Despite the fact that BLÜCHER® EuroPipe is a light-weight stainless steel pipework system (wall thickness 1-1.5 mm) and that the joints are a push-fit system, it is a very strong and rigid pipe system.
As a further support BLÜCHER has carried out a shock and a vibration test made at TNO (Center for Maritime Constructions) in the Netherlands.
These tests, with the positive results, indicate that the BLÜCHER® EuroPipe system is extremely suitable for all types of marine and offshore projects, and not least for navy vessels. These tests are important when choosing the right pipe system.

The tests at TNO were carried out according to the following standards:
- Shock tests: Shock Standard BR8470 grade C as well as NATO STANAG 4549.
- Vibration tests: NATO STANAG 4138.

The pipes were completely filled with water during the tests, thus simulating the worst loading situation



Test set up for the shock test


Test set up for the vibration test

TNO innovation for life

After the shock and vibration tests the pipes were subjected to a vacuum tightness test at -0.85 bar and a water tightness test at 0.5 bar, and these tightness tests showed no leakages.
The conclusion was that the piping passed all the tests very successfully.

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HANDLING

TRANSPORT, UNLOADING AND STORAGE

All pipe shipments from BLUCHER are cradled and packed on pallets. Fittings are packed in cardboard boxes and stacked on pallets. All goods are carefully packed to avoid damage during transport.

Storage
To avoid deformation of, or serious damage to, pipes and fittings, we recommend storing the products in their original packaging until they are to be used. Store products so that they do not come into contact with carbon steel, which can leave traces of corrosion on the stainless steel. Products must also be stored in a safe distance from sparks and spray from e.g. grinding and welding machines.

RIGHT HANDELING


Pipes and fittings should be securely stored on pallets or packed to ensure that they do not rest on their sockets.


Pipes and fittings should be unloaded by forklift, alternatively by crane.


Support straps for loading and moving bundles of pipes by crane must be made of textile, canvas or similar material.


Pipes can often be handled by one man alone. However, please observe national guidelines on manual handling.


Pipe bundles and loose pipes should be stored on a flat surface and supported so that the pipes do not rest on their sockets.

WRONG HANDELING


Pipes and fittings must not be dumped off trucks.


Pipes and fittings must not be dragged along the ground or other surfaces which could damage them.


Do not store the pipes so that they come into contact with carbon steel which can leave traces of corrosion on stainless steel.

STANDARDS, LABELLING & APPROVALS

Standards

The BLÜCHER® EuroPipe system (pipes and fittings) is made, tested and approved according to the EN standards **EN 1124-1**, **EN 1124-2** and **EN 1124-4**.

These three standards cover the following:

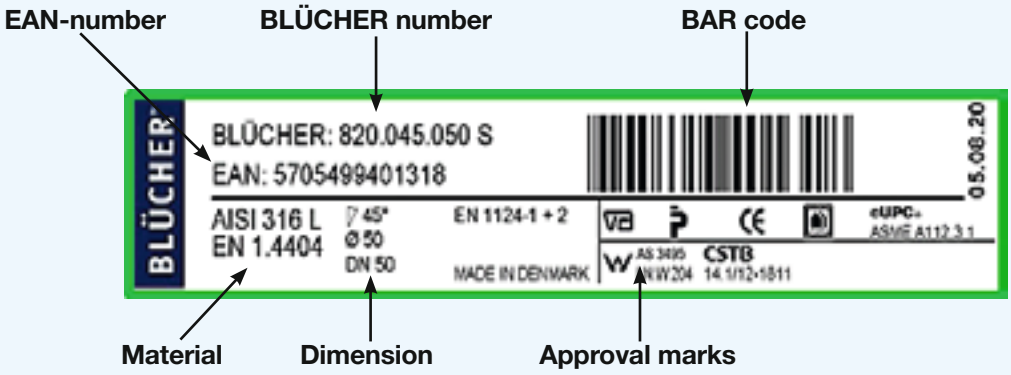
- **EN 1124-1** specifies requirements, tests and quality controls applying to pipes and fittings.
- **EN 1124-2** specifies requirements applying to pipe dimensions and dimensional tolerances for various fittings and pipes.
- **EN 1124-4** specifies requirements applying to components for vacuum drainage systems and for drainage systems on ships.

The above EN standards were prepared by the European standardization organisation CEN.
The BLÜCHER® EuroPipe system has thus obtained the recognized CE approval (CE marking).

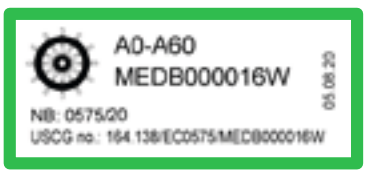
These approvals serve as documentation that the approved product complies with all specified requirements.

Labelling – pipes and fittings

All BLÜCHER® products have a label attached. This label contains various information about the specific product such as type number, dimension, material quality and other useful information.
Below is an example of a standard label highlighting what information can be found on it.



Green label = AISI 316L, EN 1.4404
Red label = AISI 304, EN 1.4301



Labelling of fire-approved standard products:

In addition to the common product labelling, all fire approved products are labelled with a special MED approval label – see example.
More details about this label can be found in the chapter ”Fire Performance”.

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Approvals and certificates

BLÜCHER® sanitary discharge system meets the highest demands within testing and approvals. BLÜCHER® holds the MED certification and type approvals of the leading classification authorities. See which ones below.
The certificates can be found and downloaded at **www.blucher-marine.com**

MARINE EQUIPMENT DIRECTIVE DNV·GL 2014/90/EU

TYPE APPROVED PRODUCT DNV·GL DNVGL.COM/AF

ABS

Lloyd's Register

BUREAU VERITAS 1828

BUREAU VERITAS

RINA 1861

Achilles JQS
empowered by Achilles
Qualified

BLÜCHER® EuroPipe are shock and vibration tested by:

TNO Built Environment and Geosciences

KR KOREAN REGISTER

TÜRK LOYDU 1962 İSTANBUL

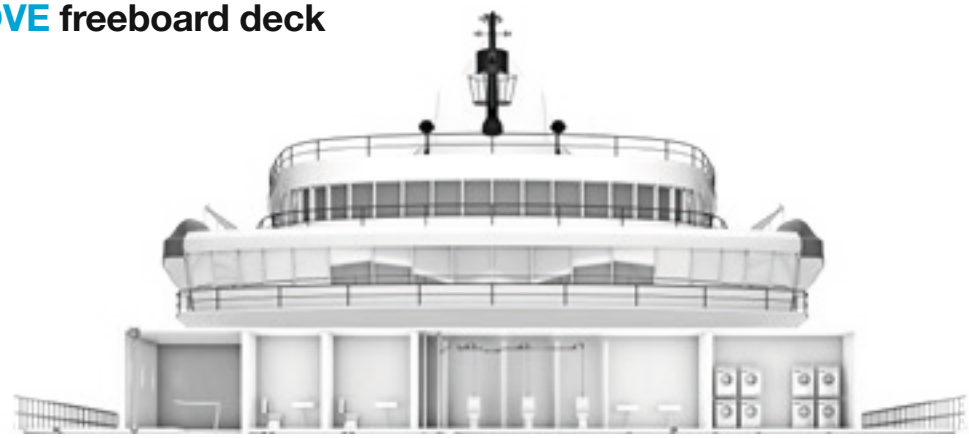
ClassNK

APPLICATION & LIMITATION

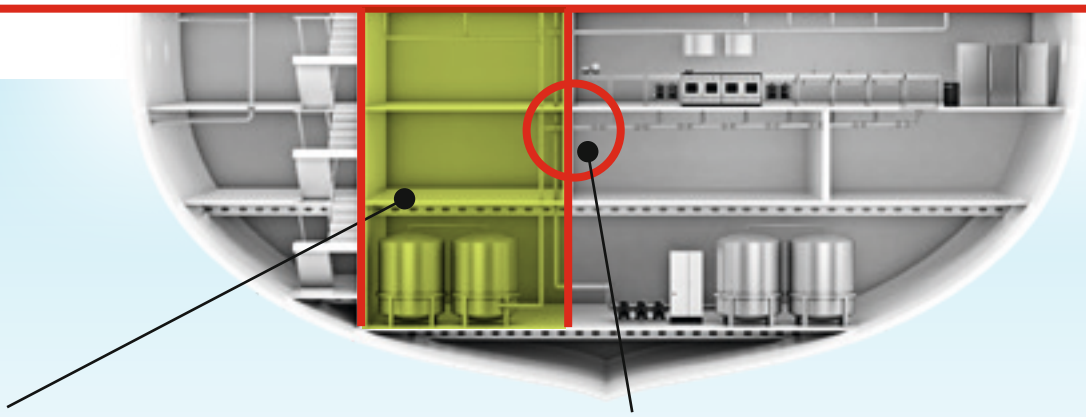
Illustrations below indicates the general use of the BLÜCHER® EuroPipe system installed above- and below freeboard deck.

BLÜCHER recommends always to check the valid type approval from current class and other rules/ requirements from relevant authorities (e.g. USPH Guidelines).

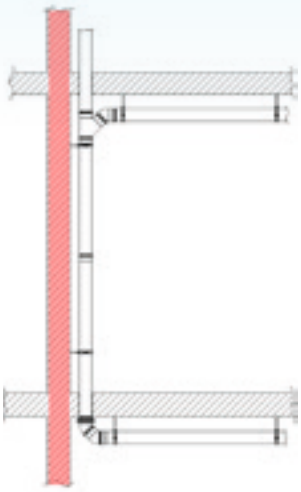
ABOVE freeboard deck



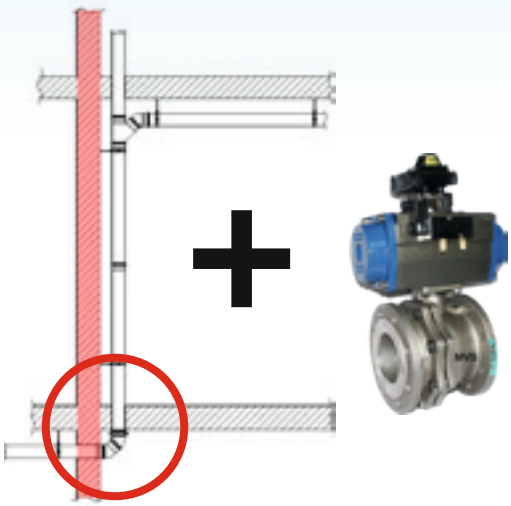
BELOW freeboard deck



Pipe installations
inside watertight sections
(Not crossing watertight bulkhead)



When a pipe installation
penetrates a watertight section
a “remotely operated valve” must be installed.



QUALITY ASSURANCE & TESTING AT BLÜCHER

QUALITY ASSURANCE

In the more than 55 years during which we at BLÜCHER have been developing and manufacturing stainless steel drainage systems, we have always done our best to make quality products, not merely from a design perspective, but equally from the perspective of function and durability. BLÜCHER gives high priority to quality assurance, and all our production and quality assurance are in accordance with the internationally recognised ISO 9001 standard. We operate with external and internal quality assurance.

ISO 9001 standard:
The ISO 9001 standard requires the provision of documentation that controls are exercised at the level of administrative systems, development and design, purchasing, acceptance inspection, production, inspection of finished goods, stocks, sales, quality assurance and training.

ISO 14001 standard:
BLÜCHER has been ISO 14001 enviromental management certified since 2014. This standard certifies that we follow all rules and laws regarding the company and the surrounding society. Implemented in this is also an obligation to reduce the impact on the surrounding environment by our existing processes and the development of new products. To witness that we fulfill this certification standard, we are audited by an external certification body twice a every year.

External quality assurance

Several times a year, we receive unannounced visits from representatives of Danish and foreign control bodies. The auditors take a number of randomly selected pipes and fittings from our stocks or production and test them in accordance with the standards and approval criteria of the individual countries. All control bodies are certified by the relevant national authorities to audit BLÜCHER's products.

INTERNAL QUALITY ASSURANCE

1	**Supplier**	Internal quality control at BLÜCHER starts in the selection of our suppliers. All suppliers must be able to document their compliance with our requirements of quality and supply efficiency.
2	**Delivery**	Every single delivery of stainless steel is accompanied by a material certificate, documenting the compliance of the stainless steel with the requirements specified by BLÜCHER.
3	**Admission Checks**	All materials delivered to BLÜCHER must undergo admission checks. Only if the material delivered is in compliance with the requirements specified can it be passed on for production.
4	**Pipe Welding Line**	The stainless pipes are produced in a fully automated pipe mill. The sheet material, in the shape of coils, is introduced into the pipe mill, in which it is shaped by means of rollers into a pipe profile. The pipe is then welded with a longitudinal seam.
5	**Sockets/Spigot ends**	Upon welding, the longitudinal seam is checked with a circulating current device for detection of welding faults. In case of faults, the computer-controlled pipe mill automatically takes care of sawing out the defective pipe section and descarding it.
6	**Acid-pickling**	From the production department, all pipes and fittings proceed to the final surface treatment in the pickling plant.
7	**Inspection**	During production of pipes and fittings, quality control takes place, which is registered in control journals. Before the fittings leave the production department, all elements are pressure-tested.
8	**Finishing**	After the pickling, pipes and fittings proceed to the finishing department, where lip seals, among other things, are installed in the socket groove. At the same time, the elements are marked with approval markings, so that the elements may be identified at all times.
9	**Storage**	After finishing, pipes and fittings proceed to the central storage department. Here, the individual orders are packaged safely, in order to reach the customer undamaged.

CUSTOMER

TESTING AT BLÜCHER

Checking and tracing of material quality

BLÜCHER stainless steel drainage products are made from either grade AISI 304 or grade AISI 316L. The stainless steel sheets and coils are purchased from major international stainless steel suppliers approved by BLÜCHER, and all stainless steel supplies are accompanied by a material certificate from the producer. The stainless steel grade of all incoming goods is double-checked before it is used in products. Through the production, all material and parts are marked in order to separate and identify the stainless steel grades AISI 304 and AISI 316L all the way through production and warehouse.
All production orders are accompanied through the production process by production journals, job cards and bar codes that describe the material type and are used for production reporting.

Testing in production

Pipes are rolled and TIG welded on a pipe mill line. All pipes are tested during the manufacturing process to check welding quality and dimensions.
All pipes are ink-jet marked in the pipe mill lines with time, date, material type and pipe mill number.
Parts for fittings are shaped with spigot and socket ends, as bends, etc. They are either welded manually or by use of robot welders.
After welding, fittings are inspected and eventually, the weldings are grinded to ensure smooth surfaces inside.
All products are acid-pickled to provide a uniform and aesthetically pleasing surface and optimal resistance to corrosion.

Leakage testing

All products are tested at BLÜCHER before leaving the factory. The test is carried out with an air pressure of 0.5 bar. Any leak will then be immediately evident. Products are also tested at regular intervals with water pressure and vacuum by BLÜCHER and by independent approval authorities.

Testing and labelling after acid-pickling

After acid-pickling, products are inspected visually and labelled with red-framed product labels for material grade AISI 304 or green-framed product labels for material grade AISI 316L. The product label shows product type number in figures and as bar code, approvals and production date.

Testing before dispatch from the factory

When products are packed from stock, the operator follows a packing instruction for the specific customer, controlled by a bar code. All products and locations are controlled by bar codes, and the operators use these in the packaging process to register all information for transportation and documents.

Load class testing of gratings
All types of gratings are load class tested in accordance with the regulations described in product standard EN1253, Gullies for Buildings. The standard comprises the load classes H 1.5 and K 3 (barefoot areas), L 15 (pedestrian and light traffic), R 50 (light traffic and light industrial areas) and M 125 (heavy traffic and industrial areas). The gratings are tested at 2/3 of the load class value 5 times following which the permanent set is not allowed to exceed 0,4% of the clear opening, i.e. the largest unsupported area of the grating, or maximum 2 mm. Finally, the gratings are tested once at the maximum load of the load class following which the gratings are checked for cracks and fractures.

Non-slip testing of gratings

Gratings are non-slip tested according to DIN 51130.

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