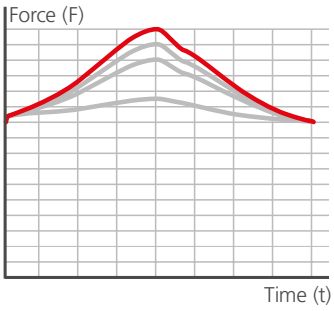
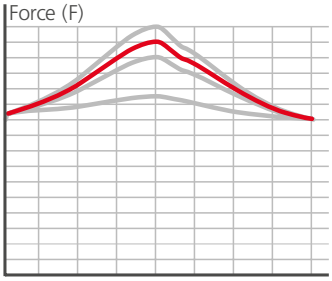
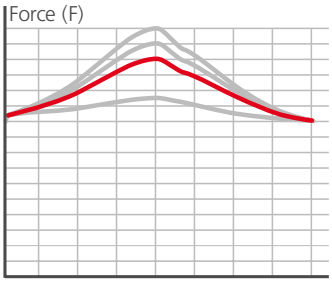
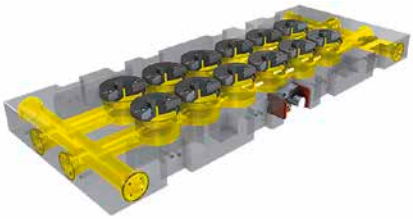
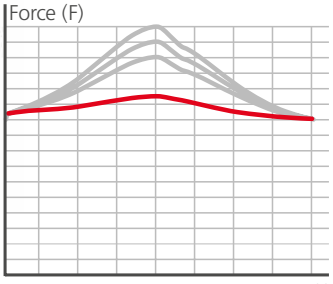
Nitrogen systems

Overview

Nitrogen systems are heavy-duty and flexible alternatives to mechanical spring elements. They provide optimal solutions for complex projects with various compressive forces and the same spring force. They are compact and require less installation space than mechanical spring elements. With nitrogen systems, the installation height of the tools can be reduced and the force progressions optimised. Whether it concerns the selection and design of the nitrogen cylinders, combined solutions or individual manifold plates – with STEINEL nitrogen systems, you will always have technically and economically optimal tools.

Systems	Force curves	Application
nitrogen cylinders 	steep force increase 	They are used as standardised spring elements when large forces are required within small spaces.
Composite tube systems 	levelled force increase 	They are used to ensure that the same pressure prevails for all nitrogen cylinders connected within the system. It can be adjusted using the control panel. The nitrogen volume increases through the tube connections, and this results in a levelled force increase. Composite tube systems are flexible and can also be retrofitted.
Composite plate systems 	low force increase 	They are used in customer-specific solutions and also effect a uniform pressure at the nitrogen cylinders, which can be adjusted using the control panel. In addition to the reduction of the sealing points with respect to the composite tube systems, a greater increase of the nitrogen volume is achieved through the connecting boreholes in the plate. This results in a low force increase.
Manifold plate systems 	very low force increase 	They are always developed according to customer specifications and also guarantee a uniform pressure at all cylinders, which can be adjusted using the control panel. Through the integrated nitrogen buffers (volume boreholes), manifold plate systems achieve an optimal use of space as well as a very low force increase.

The FEM-calculated and TUV-approved design provides the highest safety standards in accordance with the PED directives (Pressure Equipment Directive). Starting at a nitrogen volume of 1 litre, pressure equipment is subject to PED directives and must also be tested and have a CE mark. Additional regulations, installation instructions etc. for our products can be found under **www.steinel.com » Service » Operating instructions.**

Nitrogen cylinders

Nitrogen cylinders can be easily integrated into the tool and increase availability with regard to mechanical spring elements. Preloading is not needed, which facilitates improved handling.

Advantages

- outstanding lifetimes due to innovative sealing materials, lifetime lubrication and two-point piston support
- large product range for each installation situation and application
- rapid availability of all products thanks to in-house production and extensive warehousing

Safety features

- maximum security thanks to FEM-calculated components
- application of PED directives (Pressure Equipment Directive DGRL)
- constant traceability of all materials and production stages
- all nitrogen cylinders available with diameters from 32 mm, also available with burst protection upon request
- all nitrogen cylinders come with complete documentation

Operating parameters	
pressure medium	gaseous nitrogen N_2 min. 2.8
permissible temperature (TS)	
min.	5°C
max.	80 °C
min. filling pressure	50 bar

Rod-sealed springs

For rod-sealed springs, the seal is firmly fixed in the housing and seals at the piston surface. During the stroke movement, nitrogen flows past the piston collar and into the resulting second pressure chamber. The pressure space is therefore not separated by the piston. When the piston is retracted, the nitrogen volume is reduced and the pressure consequently increases. When springing back, the nitrogen in the upper nitrogen cylinder space acts as a stop damper. The stressed sealing area is smaller in comparison with piston-sealed springs. The rod-sealed springs are suitable for high speeds and long stroke lengths.

Due to their characteristics, rod-sealed springs are available in most variants and designs. They are the most commonly used nitrogen cylinders in punching tools.

Piston-sealed springs

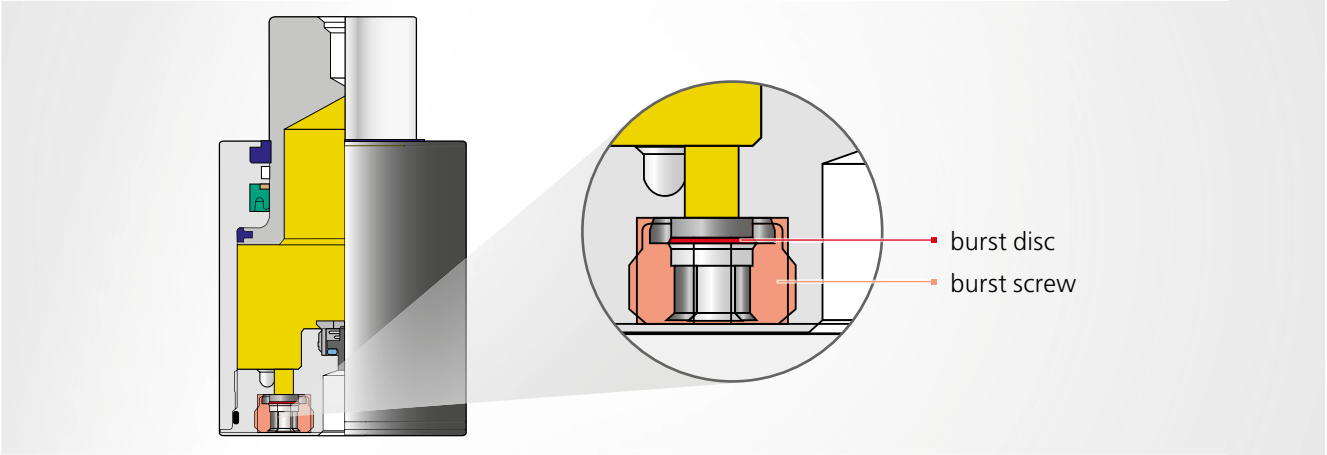
For piston-sealed springs, the seal is installed at the piston collar. When the piston is retracted, the entire nitrogen volume is compressed and the pressure consequently increases. They only have one pressure space. Springing back is not damped and has a direct effect. At the same stroke value and force curve, piston-sealed springs become larger than rod-sealed springs. Therefore, since the piston seal is located within the nitrogen cylinder, its sealing function is not affected by external influences. The larger sealing area limits the piston speed.

Due to their characteristics, piston-sealed springs are used with slowly-running punching tools or within dirty environments.

The nitrogen cylinders of the SZ8060.2 series are piston-sealed.

Nitrogen systems

Burst protection



All STEINEL nitrogen cylinders with outer diameters from 32 mm are available with burst protection, in the form of a burst screw with integrated burst disc, upon request. All STEINEL control panels are equipped with burst protection as standard.

The burst disc cracks when a specified pressure level has been exceeded, and the nitrogen can then immediately leak out. By using burst protection, the nitrogen cylinder is protected from overpressure damage.

Advantages

- prevents consequential damage to nitrogen systems and tool
- nitrogen systems are refillable and ready for operation following a technical test and replacement of the burst protection.
- burst protection integrated into the base of the nitrogen cylinder and the housing of the control panel
- burst protection for standard nitrogen cylinders retrofit-table through replacement of the base

Electronic pressure controller

The electronic pressure controller is used to monitor the pressure within the nitrogen systems. When the freely configurable limit is reached, corresponding signals are emitted by the machine controller and can be used, e.g., for warning messages or to switch off the machine.

Product features

- pressure range from 0 to 600 bar
- configurable switching point, reset point and switching function (NO/NC)
- scalable analogue outlet
- LED display and operating buttons on the device
- password-protected configuration menu
- display and connection rotatable
- housing and medium-contacting parts made from stainless steel

Nitrogen systems

Composite tube systems

In composite tube systems, multiple nitrogen cylinders and a control panel are connected using tube lines in order to standardise system pressure. Compared to nitrogen cylinders, the total volume of nitrogen in the system is easily increased through the tube lines, which leads to a flattening of both the pressure increase and the force curve. All of the nitrogen cylinders within a pressure cycle have a standardised pressure level, which means that the force ratio between them is constant. This lowers the risk of tilting, reduces the lateral forces in the guide units and thus guarantees effective tool protection.

Advantages

- The integration of a control panel means that system pressure can be reliably monitored at any time and optimised in line with the production process.
- It is possible to temporarily compensate for a small pressure drop by replenishing nitrogen levels without having to interrupt the production process.
- One or multiple pressure cycles can be installed in a tool.
- One of the burst protection systems integrated within the control panel provides maximum safety. Individual nitrogen cylinders can also be equipped with burst protection.
- The use of a pressure controller is optional.
- If the force increase has to be further reduced, the nitrogen volume can be increased via the connection of an external storage buffer.

STEINEL will happily support you from the design phase right through to commissioning and maintenance of your composite tube systems.

Operating parameters	
pressure medium	gaseous nitrogen N_2 min. 2.8
permissible temperature (TS)	
min.	5°C
max.	80 °C
min. filling pressure	50 bar

Nitrogen systems

Composite plate systems

Composite plate systems consist of several nitrogen cylinders, a control panels and the composite plate. All components are connected to one another via boreholes in the composite plate. As with composite tube systems, this ensures standardised system pressure and a larger nitrogen volume, resulting in a flatter force curve.

The standardised pressure and therefore the uniform force ratio lowers the risk of tilting, reduces the lateral forces in the guide units and thus guarantees effective tool protection. The direct nitrogen supply via the lower plate reduces the sealing points in comparison with the composite tube systems, therefore increasing system availability. Composite plate systems are particularly compact and safe to operate.

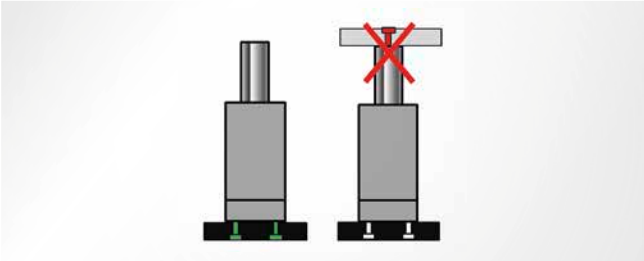
Advantages

- No additional space is required in the tool for external tube lines, as all of the connecting boreholes are in the interior of the composite plate.
- It is possible to temporarily compensate for a small pressure drop by replenishing nitrogen levels without having to interrupt the production process.
- The number of sealing points is reduced to a minimum in order to prevent the risk of tool failure due to leaks in the system.
- The integration of a control panel means that system pressure can be reliably monitored at any time and optimised in line with the production process.
- A composite plate system can include several pressure cycles.
- One of the burst protection systems integrated within the control panel provides maximum safety. Individual nitrogen cylinders can also be equipped with burst protection.
- The use of a pressure controller is optional.
- If the force increase has to be further reduced, the nitrogen volume can be increased via the connection of an external storage buffer.

Operating parameters	
pressure medium	gaseous nitrogen N_2 min. 2.8
permissible temperature (TS)	
min.	5 °C
max.	75 °C
min. filling pressure	50 bar

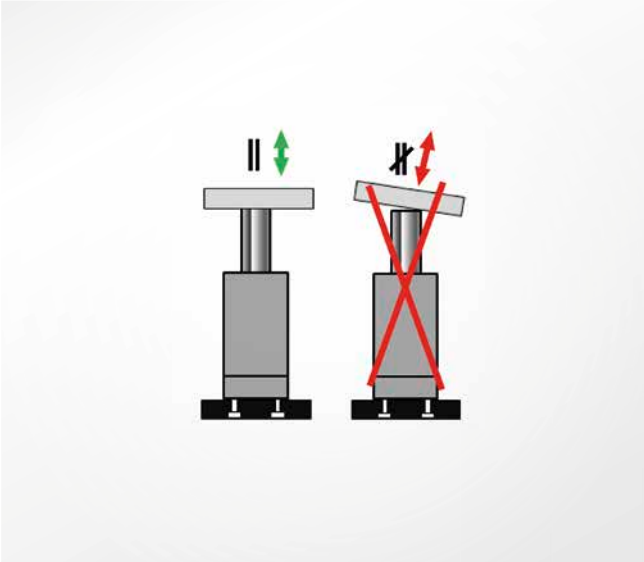
Nitrogen systems

Installation instructions



Nitrogen cylinders must be screwed via the mounting threads on the housing base, and never on the piston.

The thread in the piston surface is only meant for nitrogen cylinder assembly and no other parts may be screwed on to it.

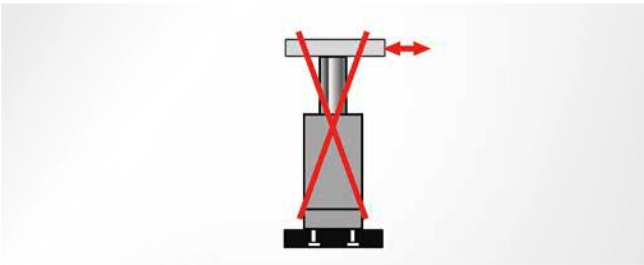


The nitrogen cylinders must be installed coaxial to the acting force.

The piston rod surface must be completely impinged. The contact surface should be suitably hardened.

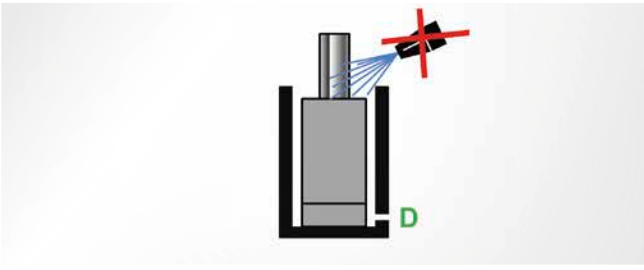
The screw-on surface must be flat and parallel to the pressure surface.

The nitrogen cylinders must not be preloaded in the tool. If preloaded nitrogen cylinders are installed in a tool, the nitrogen cylinders must not be preloaded more than 0.2 mm. In this case, an appropriate warning sign must be posted at the installation site.

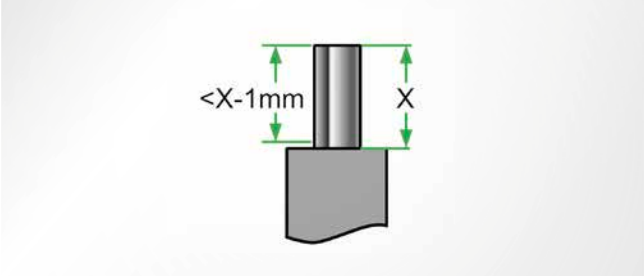


Lateral forces should be avoided.

Transverse forces on the piston rod can damage the nitrogen cylinders.



When installed in counterbores, the nitrogen cylinders must be provided with a circumferential gap of at least 1.5 mm between the nitrogen cylinder and the walls. The release of liquid by means of a drainage bore (D) must be possible. The piston rod must be protected from contact with liquids and mechanical damage.

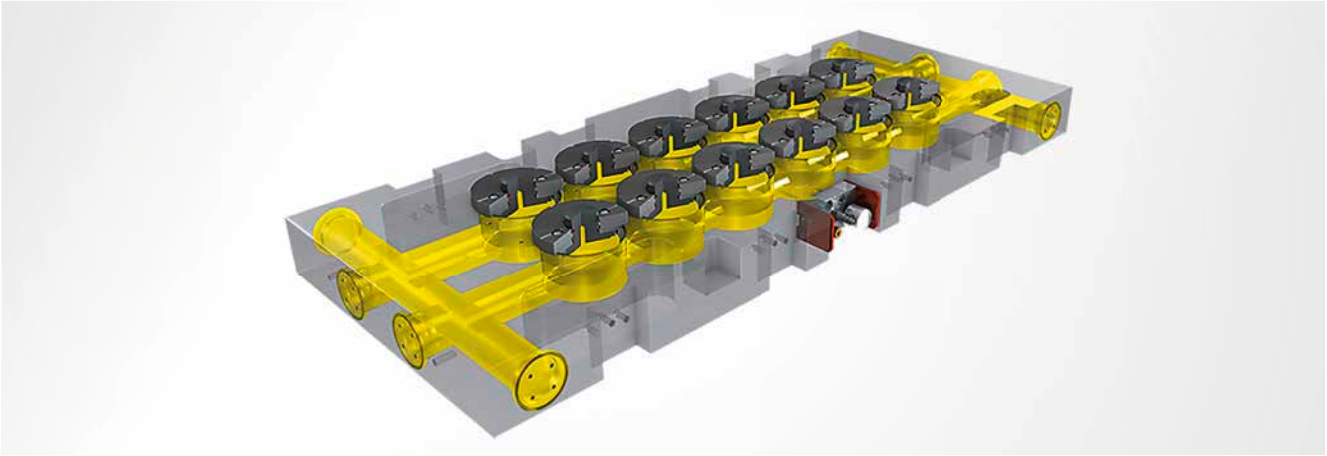


A stroke reserve of at least 1 mm must be provided.

X = maximum stroke

Nitrogen systems

Manifold plate systems



Manifold plates are constructed and manufactured according to customer specifications. They consist of a metal plate with volume boreholes as an integrated nitrogen buffer, space-saving manifold cylinders and control panels. The nitrogen buffer's large volume allows for a very low force increase.

Drawing cushion

STEINEL also provides machine-bound drawing cushions as a special form of manifold plate. The spring forces are transmitted through guide pins to the correct location in the tool. With phenomenal lifetimes, a high number of cycles and a very low mass to be moved, nitrogen drawing cushions from STEINEL are clearly superior to conventional pneumatic drawing cushions in terms of dynamics, durability and heat generation.

Advantages

- Manifold plates are distinguished by an extremely flat force curve in comparison to other nitrogen systems.
- The standardised system pressure guarantees a uniform force at all manifold cylinders.
- Manifold plates are distinguished by a low temperature increase.
- The maximum filling pressure of 150 bar and the permissible pressure increase of a maximum of 20 % ensure a flexible, tool-friendly production process.
- Control panels, burst protection and pressure controllers are also possible, just like for the composite systems.
- One of the burst protection systems integrated within the control panel provides maximum safety. Individual nitrogen cylinders can also be equipped with burst protection.
- The use of a pressure controller is optional.
- If the force increase has to be further reduced, the nitrogen volume can be increased via the connection of an external storage buffer.

Specific customer requirements are already the main focus with regard to individually designed manifold plate systems and drawing cushions. If testing or repeat testing by a certified entity is required before commissioning, STEINEL will happily provide support for the organising it. If testing by a person qualified in accordance with the operational safety directive (BetrSichV) is required, it can be carried out by STEINEL employees upon request.

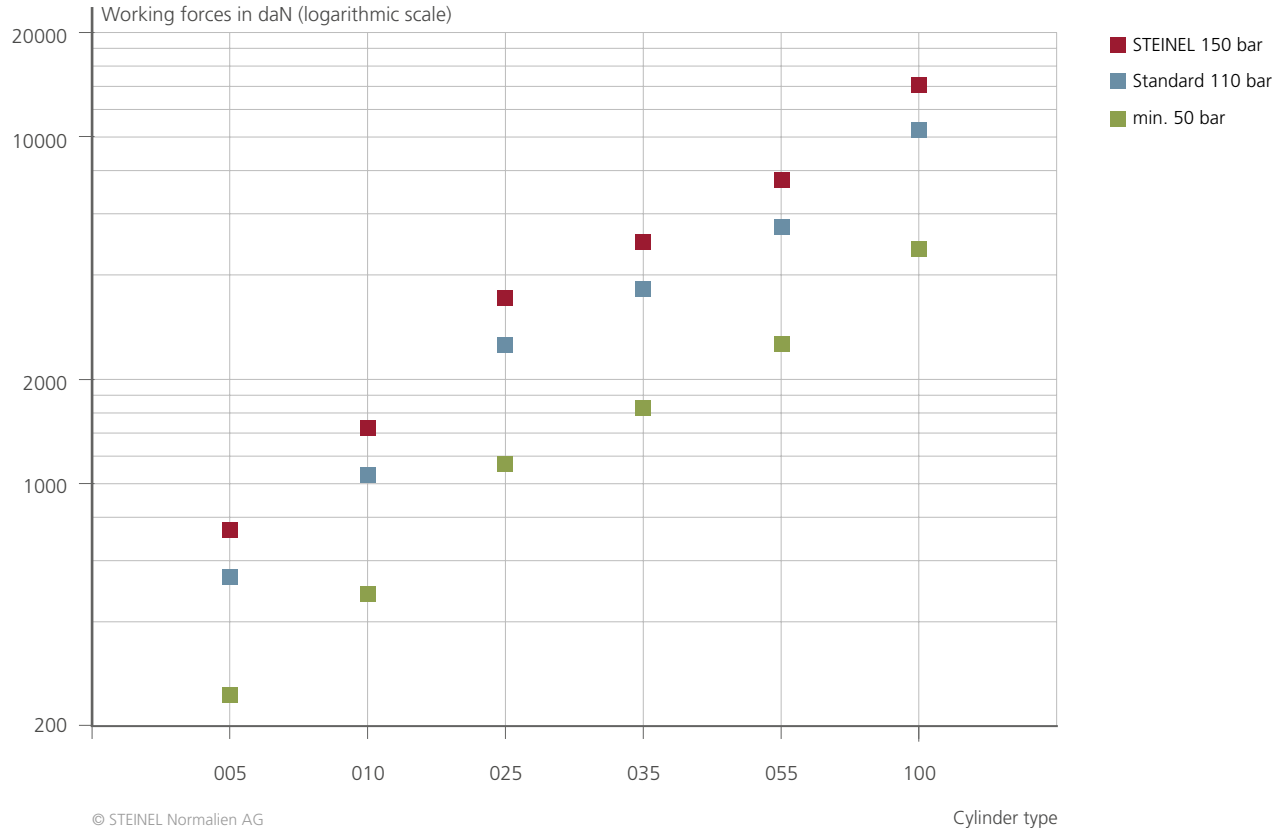
Please observe the respective national regulations for the operation of pressure equipment.

Operating parameters	
pressure medium	gaseous nitrogen N_2 min. 2.8
permissible temperature (TS)	
min.	5°C
max.	75 °C
Filling pressure	
min.	50 bar
max.	150 bar
max. permissible pressure (PS)	180 bar

Manifold cylinders

STEINEL manifold cylinders are available in three variants (high, normal, low) and in six different cylinder types each.

Manifold cylinder ST8841 – filling pressure-dependent working forces



Operating parameters	
pressure medium	gaseous nitrogen N_2 min. 2.8
permissible temperature (TS)	
min.	5°C
max.	75 °C
Filling pressure	
min.	50 bar
max.	150 bar
max. permissible pressure (PS)	180 bar

The components are to be used in accordance with the Pressure Equipment Directive (PED). Starting at a volume of 1 litre, pressure equipment in which manifold plate components are integrated must be tested and have a CE mark.

Control panels

Standard version

Mini version

Maxi version

Type	Version	Burst pressure bar	Connection possibilities				
			G 1/8" Tube system	G 1/4" universal	Connec-tions for composite plate	Connec-tions for manifold plate	Remarks
ST8845-01-01	standard	180	3	2	–	–	▪ with tube connection to manifold plate ▪ both rear boreholes with sealing plugs
ST8845-32-01	standard	180	3	2	–	1	▪ Direct installation at manifold plates from 32 mm width possible ▪ rear upper borehole with sealing plug ▪ Connection possibility via rear lower borehole
ST8845-80-01	standard	180	3	2	–	1	▪ Direct installation at manifold plates from 80 mm width possible ▪ rear lower borehole with sealing plug ▪ Connection possibility via rear upper borehole
ST8845-8	mini	180	3	2	–	1	▪ only for direct installation at manifold plates
ST8845-02-01	standard	450	3	2	2	–	▪ for all composite systems
ST8845-9	mini	450	3	1	1	–	▪ for all composite systems
ST8845-444	maxi	450	12	1	–	–	▪ only for composite tube systems