STEINEL®

Manifold plates ST 8840

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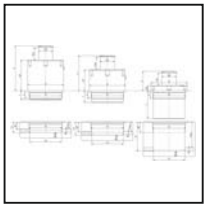
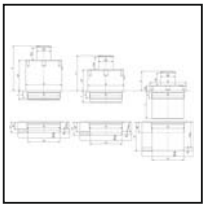


ST 8841-x-005 P. 5.166



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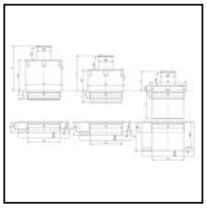

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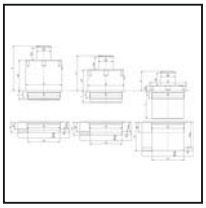

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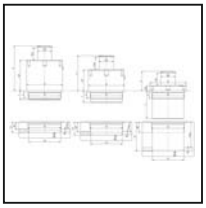

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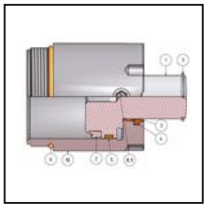
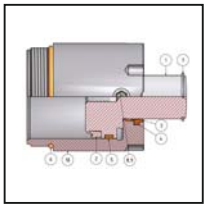
ST 8841-x-100 P. 5.176

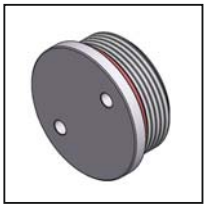


ST 8841-x-xxx-DS P. 5.178



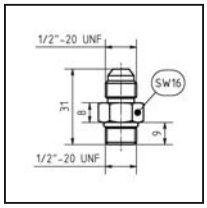
ST 8841-x-xxx-ZB P. 5.178

ST 8842 P. 5.179

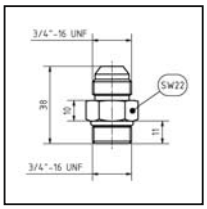


ST 8842 P. 5.179

ST 8841-WKZ P. 5.180

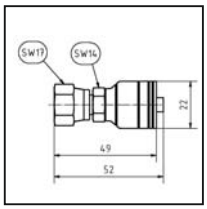


ST 8848-5 P. 5.181

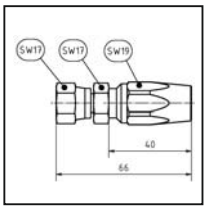


ST 8848-8 P. 5.182

ST 8849-SC P. 5.182

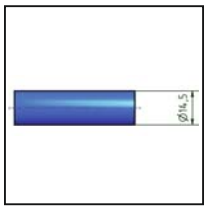


ST 8849-x-PA P. 5.183

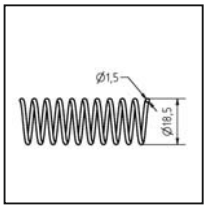


ST 8849-x-SA P. 5.183

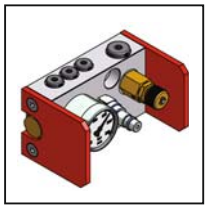
ST 8849-x-N P. 5.183



ST 8849-x-H P. 5.183



ST 8849-x-SS P. 5.183



ST 8845 P. 5.186

Manifold plates ST 8840

Use and function

The manifold plate is a complex component with a distinct elastic deformation ability for the generation of blank holder, scraper and ejector forces in the tool
- during sheet metal bending,
- cutting,
- forging
- and forming processes.

The influence of a compressive force causes a reversible deforming, which is most distinct for systems that realise energy preservation through the compression of gases. The manifold plate system from STEINEL, as an enclosed component, is based exactly on this mode of action.

A manifold plate consists of the following components:
01. Metal plate with volume boreholes
02. Pressure cylinder
03. Control panel(s)
04. Plug

The metal plate, which acts as a nitrogen buffer, contains boreholes for the fixture of pressure cylinders. The manifold is filled with nitrogen just like the pressure cylinders, which share the nitrogen reservoir within the manifold plate.

The pressure cylinders consist of the cylinder housing, a piston rod and various sealing and guide units. When the piston rod is pushed in through an external force component, e.g. a press ram, the rod displaces the gas contained in the cylinder housing, which reduces the existing gas volume of the system. The reaction force acting through the piston rod increases proportionally to the declining gas volume.

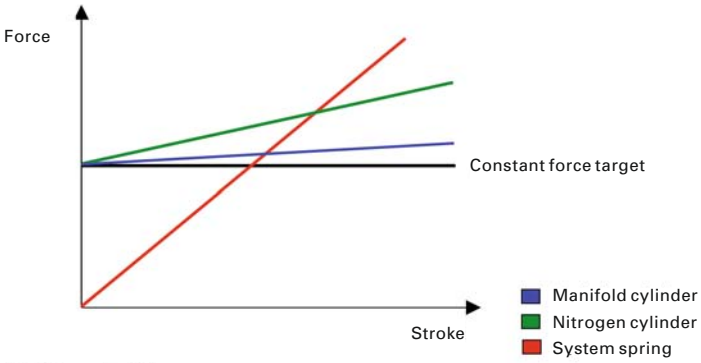
The positioning of the pressure cylinder depends on the application and where the piston force is supposed to be made available. A control panel enables the control of the system pressure. It is connected directly to the manifold plate through tubing. In this way, the manifold plate system can be filled and emptied in the tool and its readings can be taken there.

To provide for operational safety, burst protections are integrated into the control panel which prevent an unacceptable pressure increase. The system can be set as required by the part (material thickness, tensile strength, yield limit) that is to be produced. These settings can optionally be monitored with electrical or electronic pressure switches.

Manifold plates ST 8840

Advantages

- The manifold plate especially stands out because of the small pressure and force increase across the entire stroke range. That makes this system ideal for processes that require constant force. Ideally, the initial force only deviates from the end force by a factor of 1.1. This means that the force progression is almost constant throughout the entire stroke curve. In contrast, system springs, elastomer springs or disc springs have an enormously large force increase during compression.
- Manifold plate systems are robust and deliver constant force for an even production quality.



Force-stroke characteristic

- Manifold plates level out forces that are applied unevenly.
- In comparison to helical compression springs, manifold plates have greater forces and take up less space.
- Compared to nitrogen cylinders (up to 60 %), manifold plates (max. 20 %) have a smaller force increase factor.
- The smaller pressure increase within the system results in lower operating temperatures: This increases the life time of the system.
- The forces can be adjusted easily through pressure changes at the control panel.
- The control panel provides maximum operational safety through integrated burst protection, release valve and a manometer for visual pressure control.
- Complex tubing is generally unnecessary. The number of the required screw joint fittings is minimised and the system is much simpler and quicker than other solutions.

The reduced number of connecting points that need to be sealed increases the process reliability of the tool.

Buffer system

Should the volume of the nitrogen tank of a manifold plate not be **sufficient, it is possible to connect an external storage buffer.** For this you require:

- Manifold plate
- External storage buffer
- Connecting pieces
- High pressure tube
- Control panel

The external buffer is connected with high pressure tubes through boreholes in the manifold plate. The pressure can be set and controlled with the control panel: The pressure on all components within the system is the same everywhere.

Operating medium

Solely technical nitrogen may be used as operating medium. Nitrogen is a neutral, non-hazardous gas.

Filling pressure and cyclic load

A manifold plate is a piece of pressure equipment than can be used for cyclic load. That means that manifold plates can be operated under highly fluctuating operating pressure. The filling pressure can vary between 40 and 150 bar. A manifold plate is designed to limit the pressure increase to a maximum of 20 %. The maximum pressure within a manifold plate is therefore limited to 180 bar and secured via burst protection. The effective application field is displayed on an identification plate.

Because of the fluctuating operating pressure, manifold plates are subject to cyclic load. That is why the used parts are not critical in terms of fatigue.

The fluctuation in pressure between the minimum and maximum operating pressure is referred to as load cycle. The difference between the minimum and maximum operating pressure is referred to as pressure fluctuation range.

Pressure increase

Retraction of the pressure cylinders leads to a pressure increase. There is an appropriate pressure increase for each application. The pressure increase is defined as a percentage and can be calculated easily.

$p_1 \times V_1 = p_2 \times V_2$

Note:
The pressure increase should generally be as low as possible and ideally be 10 %.
Please note that a pressure increase that is too high has a negative effect on the life time.
We will be happy to assist you with the calculation.

Design

When it comes to the manifold plate design, nitrogen can be considered an ideal gas. Based on this assumption, the behaviour of the gas filling in the manifold plate can be described as follows:

- The state of a gas is determined by the three state parameters pressure, volume and temperature.
- Changes to two or all of the state parameters are referred to as change in state.
- An isothermal change in state of gases occurs when the change of the gas buffers in the buffer takes place so slowly that there is enough time for heat exchange and the temperature remains constant as a result.
- An adiabatic change in state of gases occurs when the change of the gas buffers in the buffer takes place rapidly and the temperature does not remain constant.

For determining the required manifold plate volume an isothermal change of state can be assumed for purposes of simplification:

$p_0 \times V_0 = p_1 \times V_1 = p_2 \times V_2$

Manifold plates ST 8840

Selection of the correct manifold plate

Initial questions:

1. How much entire force is needed?
2. How many pressure points should this force act on?
3. Which working stroke is required?
4. What are the maximum dimensions of the manifold plate?
5. Which additional milled cavities, boreholes or breakthroughs have to be integrated into the manifold plate?

Design of the manifold plate:

The displaced gas volume during one working stroke of the manifold cylinder is calculated by multiplying the piston active surface with the actual stroke and the number of manifold cylinders.

$$V_{zyl} = A_{zyl} \times H \times n$$

Example: 5 cylinders ST 8841.1.025x025,
plate size 700 mm x 500 mm x 80 mm
V_{zyl} = 5 x 22.8906 cm² x 2.5 cm = 286.1325 cm³

Determining the initial volume with pistons extended

$$V = \frac{V_{zyl}\ (100\ \% + \triangle p)}{\triangle p}$$

$$V = \frac{286.1325\ cm^3 \times (100\ \% + 10\ \%)}{10\ \%}$$

V = 3147.4575 cm³ = 3.1474575 l

Determining the manifold plate volume

$$V_{tpl} = V - V_{zyl}$$

V_{tpl} = 3147.4575 cm³–286.1325 cm³
= 2861.325 cm³
= 2,861325 l

Determining the maximum volume hole diameter

$$D = T_{PL} - (2 \times P_{min})$$

D = 80 mm–(2 x 10 mm) = 60 mm
Bore hole diameter according to table = 45 mm (see 5.179)
Circular area from the borehole according to table = 15.904 cm²

Determining the borehole length of the volume holes

$$L_b = \frac{V_{tpl}}{A_b}$$

$$L_b = \frac{2861.375\ cm^3}{15.904\ cm^2} = 180\ cm = 1800\ mm$$

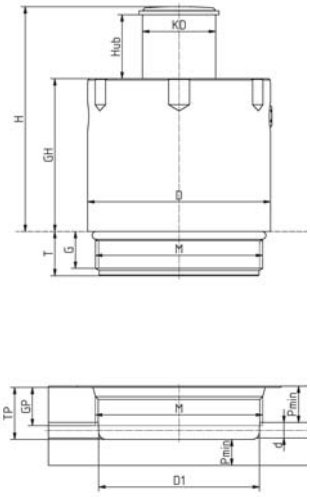
A borehole length of 1800 mm must be used for the manifold plate 700 x 500 x 80 mm, meaning that boreholes with Ø 45 mm require sealing plugs of the type ST 8842-048. These have an installation length of 20 mm. With a plate length of 700 mm and a through-hole, a storage length of 700 - 20 - 20 = 660 mm is achieved. With a total length of the volume hole of 1800 mm, 1800/660 = 2.7 through holes are required. This is rounded up to 3 through-holes. This reduces the pressure increase from 10 % to 9.1 % and therefore has a positive influence on the life time of the pressure cylinder.

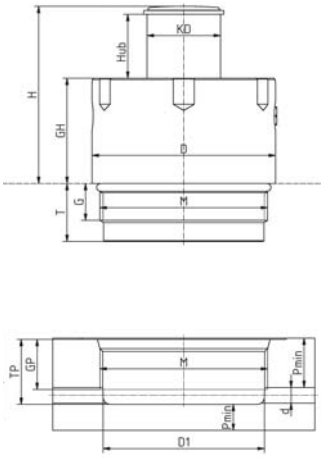
Explanation of the abbreviations:

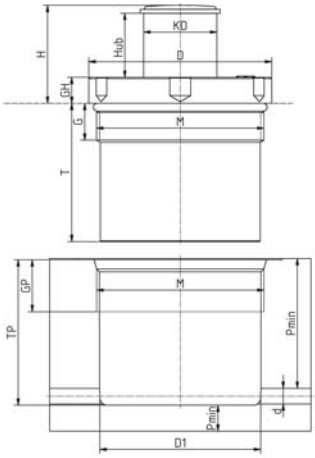
A_{zyl}	=	Piston active surface
A_b	=	Circular area of the volume hole
D	=	Diameter of the volume hole
H	=	Actual stroke moved by the Piston active surface of the cylinder
A_b	=	Length of the volume hole
n	=	Number of cylinders
$\triangle p$	=	Pressure increase
T_{PL}	=	Plate thickness
V	=	Volume of the manifold plate with piston extended
V_{tpl}	=	Volume of the manifold plate
V_{tpl}	=	Volume of the cylinders

Case height variants

ST 8841-1, ST 8841-2, ST 8841-3







Variant 1	Variant 2	Variant 3
High	Normal	Low
ST 8841-1	ST 8841-2	ST 8841-3
Variant 1 is used when the thickness of the backing plate is limited and the assembly height can be compensated.	Variant 2 is used when the assembly height is limited but the backing plate can be chosen with an appropriate thickness.	Variant 3 is used mainly for small strokes and wherever the smallest assembly heights are required.
Note: The case height changes with the stroke.	**Note:** The casing installation depth changes with the stroke.	**Note:** The casing installation depth changes with the stroke.
Available from 500 daN: Stroke 12.5–100 mm from 1000 daN: Stroke 25.0–150 mm	Available from 500 daN: Stroke 12.5–100 mm from 1000 daN: Stroke 25.0–150 mm	Available from 500–10000 daN: Stroke 6.0–25 mm

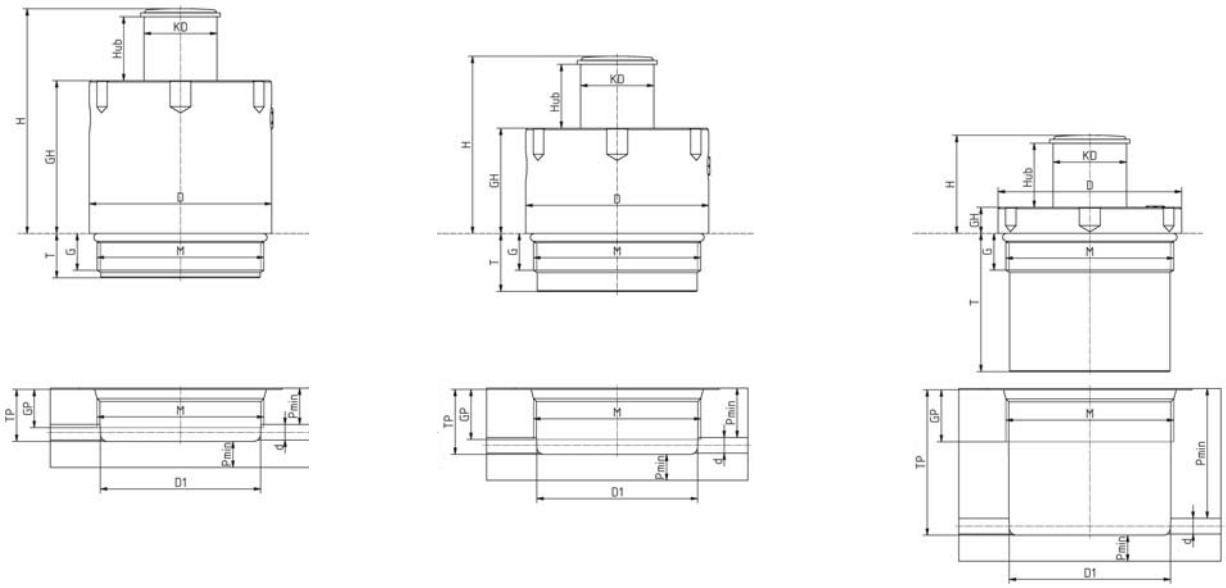
Safety regulations

Country-specific regulations must be observed when putting pressure equipment into circulation or operating it. In Germany they include:

- The currently valid standard DGRL for pressure equipment
- The currently valid operational safety directive (BetrSichV)

Cylinder 500 daN

ST 8841-1-005, ST 8841-2-005, ST 8841-3-005



		Order number **ST 8841-1-005**					Order number **ST 8841-2-005**					Order number **ST 8841-3-005**				
Designation	**Stroke mm**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**
006	6.0	–	–	–	–	–	–	–	–	–	–	10.0	33.3	36.3	19.8	18.0
010	10.0	–	–	–	–	–	–	–	–	–	–	10.0	37.3	40.3	23.8	18.0
012	12.5	31.3	15.0	18.0	45.5	18.0	40.5	14.5	17.5	54.5	18.0	–	–	–	–	–
015	15.0	–	–	–	–	–	–	–	–	–	–	10.0	42.3	45.3	28.8	18.0
020	20.0	–	–	–	–	–	–	–	–	–	–	10.0	47.3	50.3	33.8	18.0
025	25.0	43.8	15.0	18.0	70.5	18.0	40.5	18.3	21.0	67.0	18.0	10.0	52.3	55.3	38.8	18.0
038	38.0	56.8	15.0	18.0	96.5	18.0	40.5	31.3	34.0	80.0	18.0	–	–	–	–	–
050	50.0	68.8	15.0	18.0	120.5	18.0	40.5	43.3	46.0	92.0	18.0	–	–	–	–	–
075	75.0	93.8	15.0	18.0	170.5	18.0	40.5	68.3	71.0	117.0	18.0	–	–	–	–	–
100	100.0	118.8	15.0	18.0	220.5	18.0	40.5	93.3	96.0	142.0	18.0	–	–	–	–	–

Order example 1: Manifold cylinder variant 3
(500 daN) with a stroke of 25 mm.
Order number: **ST 8841-3-005 x 025**

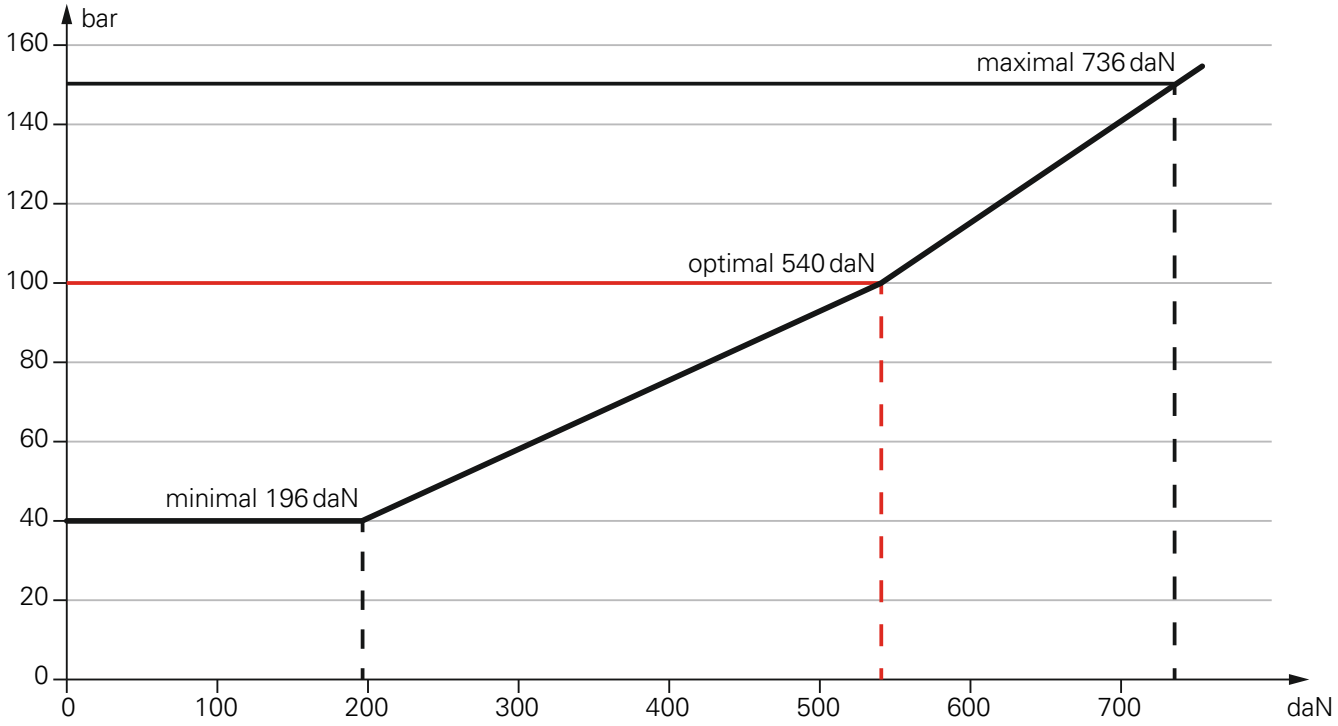
Further dimensions/details:
Housing outer diameter = 42 mm
Piston rod outer diameter = 12 mm
Screw-in thread = M36 x 2
Minimum bore Ø under M36 x 2 = 33.5 mm
d = 6 mm
P_{min} (Steel) = 10 mm P_{min} (Aluminium) = 10 mm
Piston active surface A_{zyl} = 4.90625 cm²
Minimum filling pressure = 40 bar
Maximum filling pressure = 150 bar

Key:
d = Minimum connecting hole diameter
D1 = Minimum bore Ø
G = Thread length housing
GH = Case height
GP = Minimum depth of thread cylinder mounting hole
H = Overall height, piston extended
Hub = Maximum usable stroke
KD = Piston rod outer diameter
P_{min} = Minimum distance to the next interfering contour
T = Installation depth housing
TP = Minimum borehole depth cylinder mounting hole

Cylinder 500 daN

ST 8841-1-005, ST 8841-2-005, ST 8841-3-005

Filing pressure-depending initial forces



The end forces are a maximum of 20 % higher, depending on the pressure increase and/or the available volume.

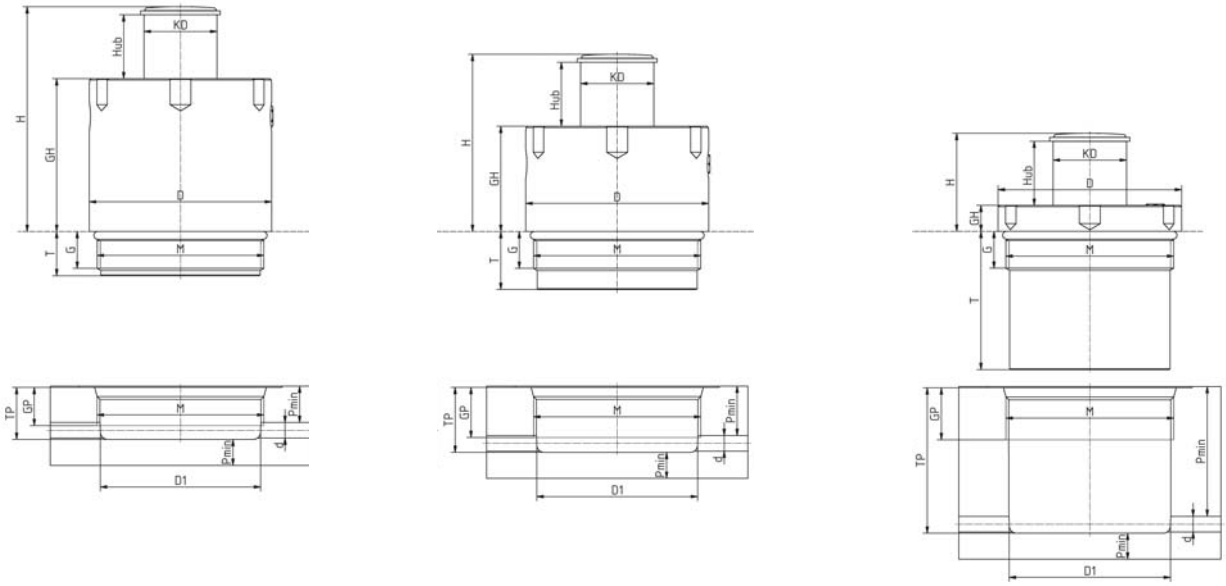
a) Required filling pressure
The required filling pressure is calculated as follows:
Filling pressure = Requested force ÷ Piston active surface
e.g. 400 daN ÷ 4.90625 cm² = 81.528662 bar ~ 81. 5 bar
These examples are based on one cylinder each of the type ST 8841-1-005, ST 8841-2-005 or ST 8841-3-005

b) Calculating initial force:
The initial force is calculated by multiplying the piston active surface (4.90625 cm²) with the filling pressure.
Initial force = Piston active surface x Filling pressure
e.g. 4.90625 cm² x 50 bar = 245.3 daN

Order example 2: Manifold cylinder variant 1 (500 daN) with a stroke of 12.5 mm.
Order number: **ST 8841-1-005 x 012**

Cylinder 1000 daN

ST 8841-1-010, ST 8841-2-010, ST 8841-3-010



		Order number **ST 8841-1-010**					Order number **ST 8841-2-010**					Order number **ST 8841-3-010**				
Designation	**Stroke mm**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**
006	6.0	–	–	–	–	–	–	–	–	–	–	10.0	33.3	36.3	17.0	18.5
010	10.0	–	–	–	–	–	–	–	–	–	–	10.0	37.3	40.3	21.0	18.5
015	15.0	–	–	–	–	–	–	–	–	–	–	10.0	42.3	45.3	26.0	18.5
020	20.0	–	–	–	–	–	–	–	–	–	–	10.0	47.3	50.3	31.0	18.5
025	25.0	46.8	15.5	18.5	73.5	18.5	40.5	21.8	24.8	67.0	18.5	10.0	52.3	55.3	36.0	18.5
038	38.0	59.8	15.5	18.5	99.5	18.5.	40.5	34.8	37.8	80.0	18.5	–	–	–	–	–
050	50.0	71.8	15.5	18.5	123.5	18.5	40.5	46.8	49.8	92.0	18.5	–	–	–	–	–
075	75.0	96.8	15.5	18.5	173.5	18.5	40.5	71.8	74.8	117.0	18.5	–	–	–	–	–
100	100.0	121.8	15.5	18.5	223.5	18.5	40.5	96.8	99.8	142.0	18.5	–	–	–	–	–
150	150.0	171.8	15.5	18.5	323.5	18.5	40.5	146.8	149.8	192.0	18.5	–	–	–	–	–

Order example 1: Manifold cylinder variant 3
(1000 daN) with a stroke of 50 mm
Order number: **ST 8841-3-010 x 050**

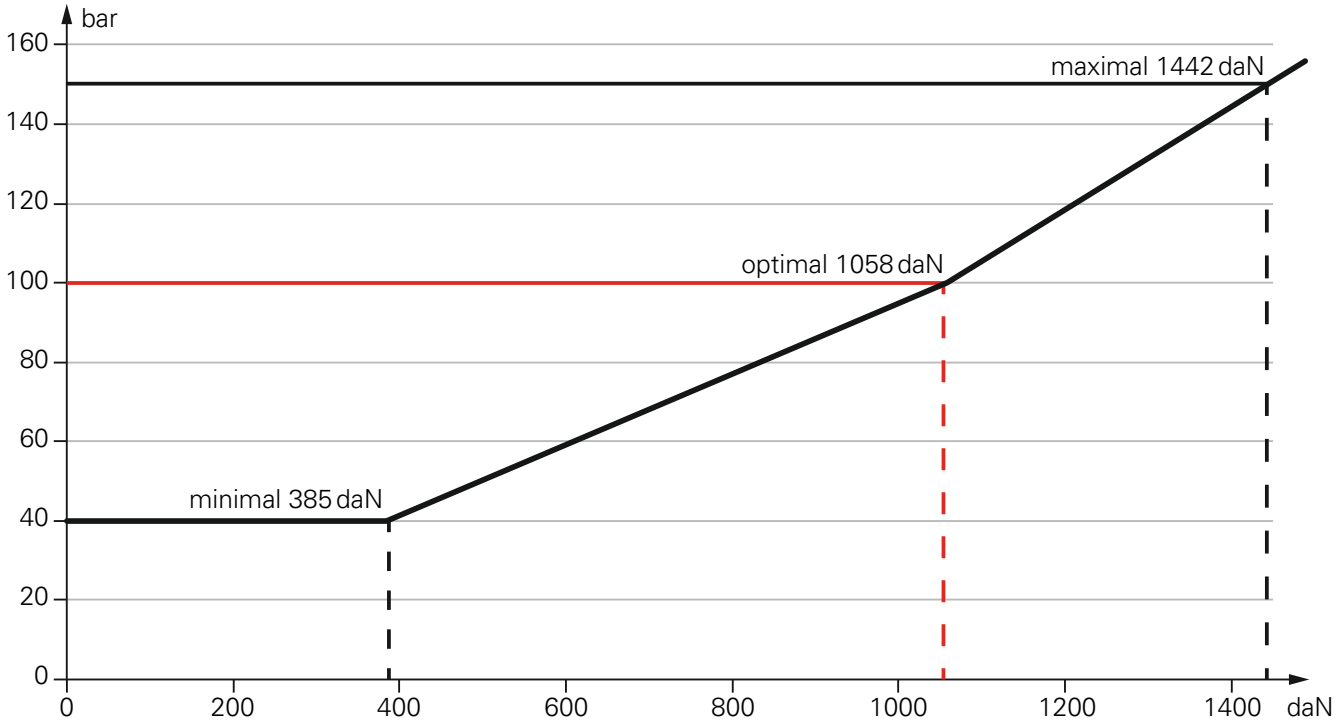
Further dimensions/details:
Housing outer diameter = 54 mm
Piston rod outer diameter = 22 mm
Screw-in thread = M48 x 2
Minimum bore Ø under M48 x 2 = 45 mm
d = 6 mm
P_{min} (Steel) = 10 mm P_{min} (Aluminium) = 10 mm
Piston active surface A_{zyl} = 9.61625 cm²
Minimum filling pressure = 40 bar
Maximum filling pressure = 150 bar

Key:
d = Minimum connecting hole diameter
D1 = Minimum bore Ø
G = Thread length housing
GH = Case height
GP = Minimum depth of thread cylinder mounting hole
H = Overall height, piston extended
Hub = Maximum usable stroke
KD = Piston rod outer diameter
P_{min} = Minimum distance to the next interfering contour
T = Installation depth housing
TP = Minimum borehole depth cylinder mounting hole

Cylinder 1000 daN

ST 8841-1-010, ST 8841-2-010, ST 8841-3-010

Filing pressure-depending initial forces



The end forces are a maximum of 20 % higher, depending on the pressure increase and/or the available volume.

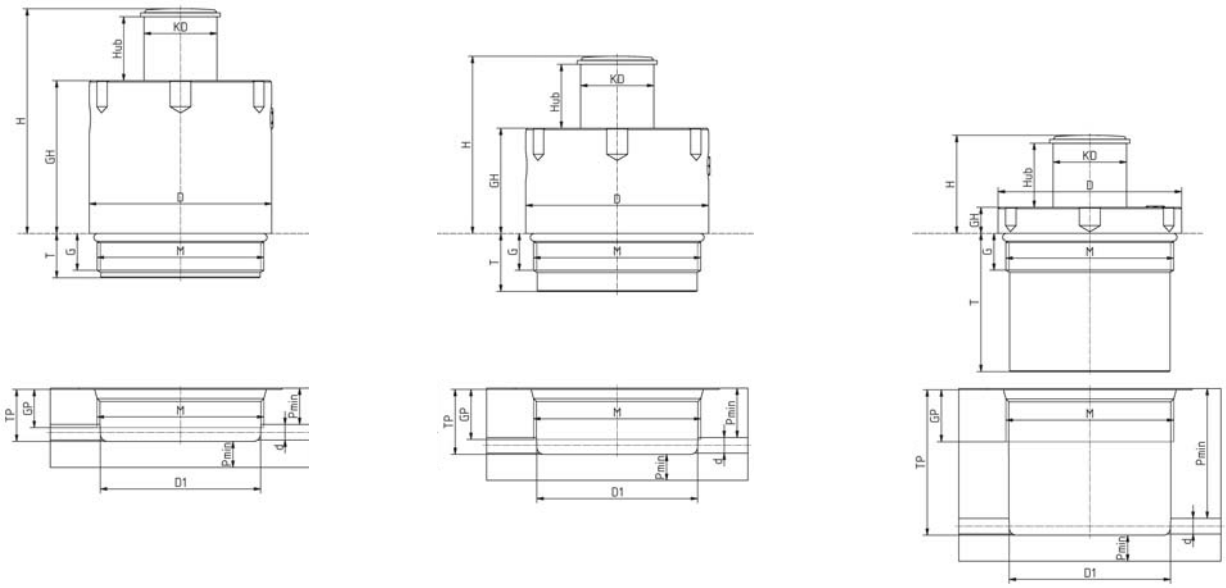
a) Required filling pressure:
The required filling pressure is calculated as follows:
Filling pressure = Requested force ÷ Piston active surface
e.g. 1250 daN ÷ 9.61625 cm² = 129.9883 bar ~ 130 bar
These examples are based on one cylinder each of the type ST 8841-1-010, ST 8841-2-010 or ST 8841-3-010

b) Calculating initial force:
The initial force is calculated by multiplying the piston active surface (9.61625 cm²) with the filling pressure.
Initial force = piston active surface x filling pressure
e.g. 9.61625 cm² x 120 bar = 1153.95 daN

Order example 2: Manifold cylinder variant 1 (1000 daN) with a stroke of 25 mm
Order number: **ST 8841-1-010 x 025**

Cylinder 2500 daN

ST 8841-1-025, ST 8841-2-025, ST 8841-3-025



		Order number **ST 8841-1-025**					Order number **ST 8841-2-025**					Order number **ST 8841-3-025**				
Designation	**Stroke mm**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**
006	6.0	–	–	–	–	–	–	–	–	–	–	10.0	34.0	37.0	18.0	18.0
010	10.0	–	–	–	–	–	–	–	–	–	–	10.0	38.0	41.0	22.0	18.0
015	15.0	–	–	–	–	–	–	–	–	–	–	10.0	43.0	46.0	27.0	18.0
020	20.0	–	–	–	–	–	–	–	–	–	–	10.0	48.0	51.0	32.0	18.0
025	25.0	45.8	17.0	20.0	73.5	18.0	40.5	22.3	25.3	67.0	18.0	10.0	53.0	56.0	37.0	18.0
038	38.0	58.8	17.0	20.0	99.5	18.0	40.5	35.3	38.3	80.0	18.0	–	–	–	–	–
050	50.0	70.8	17.0	20.0	123.5	18.0	40.5	47.3	50.3	92.0	18.0	–	–	–	–	–
075	75.0	95.8	17.0	20.0	173.5	18.0	40.5	72.3	75.3	117.0	18.0	–	–	–	–	–
100	100.0	120.8	17.0	20.0	223.5	18.0	40.5	97.3	100.3	142.0	18.0	–	–	–	–	–
150	150.0	170.8	17.0	20.0	323.5	18.0	40.5	147.3	150.3	192.0	18.0	–	–	–	–	–

Order example 1: Manifold cylinder variant 3
(2500 daN) with a stroke of 25 mm
Order number: **ST 8841-3-025 x 025**

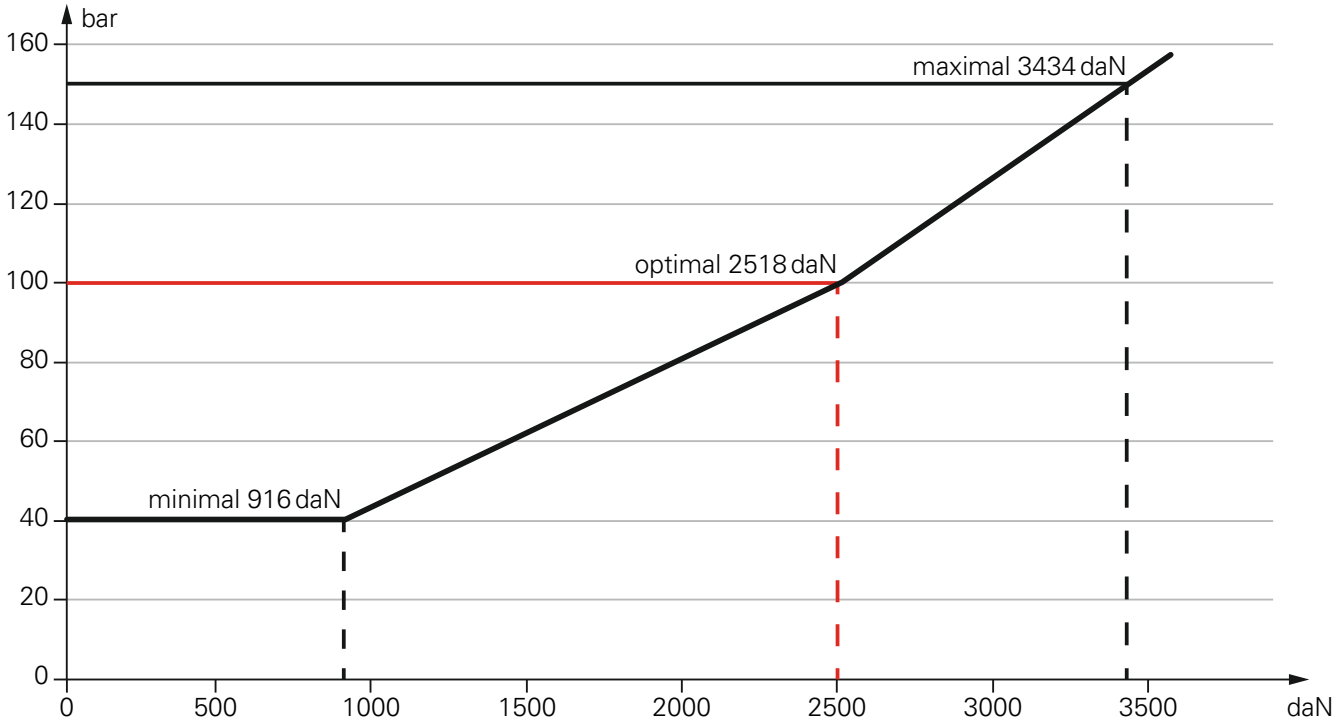
Further dimensions/details:
Housing outer diameter = 70 mm
Piston rod outer diameter = 28 mm
Screw-in thread = M64 x 2
Minimum bore Ø under M64 x 2 = 61 mm
d = 6 mm
P_{min} (Steel) = 10 mm P_{min} (Aluminium) = 12 mm
Piston active surface A_{zyl} = 22.8906 cm²
Minimum filling pressure = 40 bar
Maximum filling pressure = 150 bar

Key:
d = Minimum connecting hole diameter
D1 = Minimum bore Ø
G = Thread length housing
GH = Case height
GP = Minimum depth of thread cylinder mounting hole
H = Overall height, piston extended
Hub = Maximum usable stroke
KD = Piston rod outer diameter
P_{min} = Minimum distance to the next interfering contour
T = Installation depth housing
TP = Minimum borehole depth cylinder mounting hole

Cylinder 2500 daN

ST 8841-1-025, ST 8841-2-025, ST 8841-3-025

Filing pressure-depending initial forces



The end forces are a maximum of 20 % higher, depending on the pressure increase and/or the available volume.

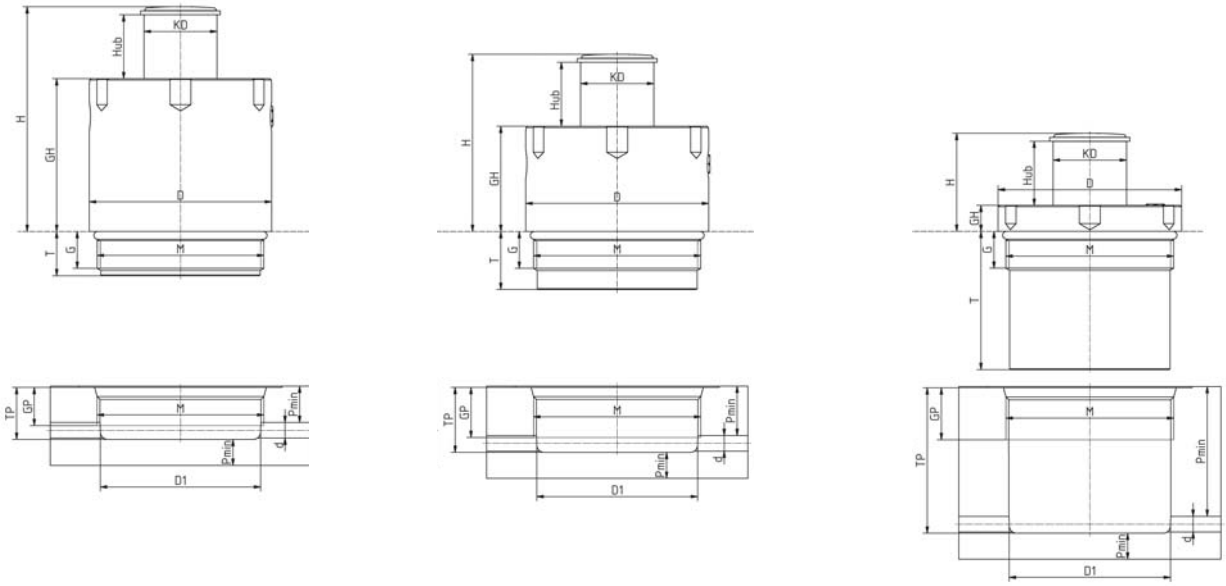
a) Required filling pressure:
The required filling pressure is calculated as follows:
Filling pressure = Requested force ÷ Piston active surface
e.g. 3000 daN ÷ 22.8906 cm² = 131.05816 bar ~ 131 bar
These examples are based on one cylinder each of the type ST 8841-1-025, ST 8841-2-025 or ST 8841-3-025

b) Calculating initial force:
The initial force is calculated by multiplying the piston active surface (22.8906 cm²) with the filling pressure.
Initial force = Piston active surface x Filling pressure
e.g. 22.8906 cm² x 120 bar = 2746.872 daN

Order example 2: Manifold cylinder variant 2 (2500 daN) with a stroke of 38 mm
Order number: **ST 8841-2-025 x 038**

Cylinder 3500 daN

ST 8841-1-035, ST 8841-2-035, ST 8841-3-035



		Order number **ST 8841-1-035**					Order number **ST 8841-2-035**					Order number **ST 8841-3-035**				
Designation	**Stroke mm**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**
006	6.0	–	–	–	–	–	–	–	–	–	–	14.0	38.0	41.0	22.0	21.0
010	10.0	–	–	–	–	–	–	–	–	–	–	14.0	42.0	45.0	26.0	21.0
015	15.0	–	–	–	–	–	–	–	–	–	–	14.0	47.0	50.0	31.0	21.0
020	20.0	–	–	–	–	–	–	–	–	–	–	14.0	52.0	55.0	36.0	21.0
025	25.0	56.5	19.5	22.5	83.5	21.0	49.5	26.5	29.5	76.5	21.0	14.0	57.0	60.0	41.0	21.0
038	38.0	69.5	19.5	22.5	109.5	21.0	49.5	39.5	42.5	89.5	21.0	–	–	–	–	–
050	50.0	81.5	19.5	22.5	133.5	21.0	49.5	51.5	54.5	101.5	21.0	–	–	–	–	–
075	75.0	106.5	19.5	22.5	183.5	21.0	49.5	76.5	79.5	126.5	21.0	–	–	–	–	–
100	100.0	131.5	19.5	22.5	233.5	21.0	49.5	101.5	104.5	151.5	21.0	–	–	–	–	–
150	150.0	181.5	19.5	22.5	333.5	21.0	49.5	151.5	154.5	201.5	21.0	–	–	–	–	–

Order example 1: Manifold cylinder variant 3
(3500 daN) with a stroke of 25 mm
Order number: **ST 8841-3-035 x 025**

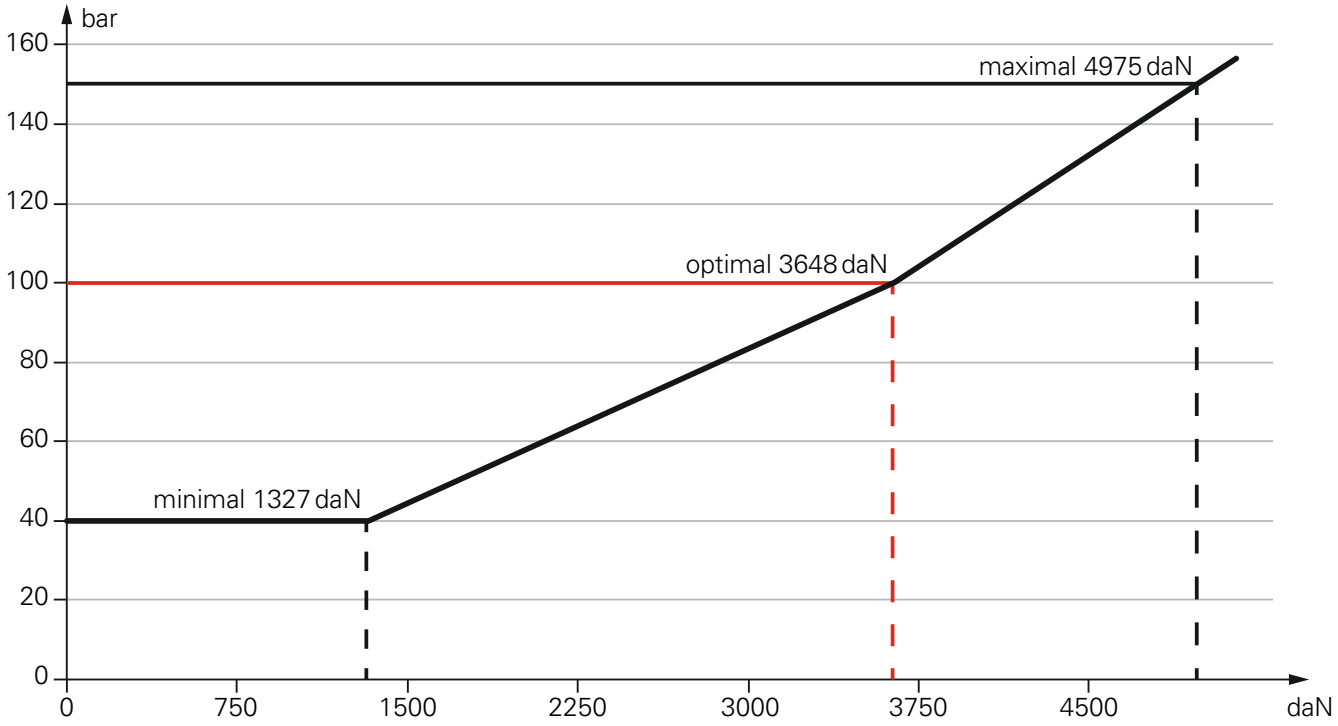
Further dimensions/details:
Housing outer diameter = 88 mm
Piston rod outer diameter = 28 mm
Screw-in thread = M80 x 2
Minimum bore Ø under M80 x 2 = 77 mm
d = 8 mm
P_{min} (Steel) = 10 mm P_{min} (Aluminium) = 12 mm
Piston active surface A_{zyl} = 33.16625 cm²
Minimum filling pressure = 40 bar
Maximum filling pressure = 150 bar

Key:
d = Minimum connecting hole diameter
D1 = Minimum bore Ø
G = Thread length housing
GH = Case height
GP = Minimum depth of thread cylinder mounting hole
H = Overall height, piston extended
Hub = Maximum usable stroke
KD = Piston rod outer diameter
P_{min} = Minimum distance to the next interfering contour
T = Installation depth housing
TP = Minimum borehole depth cylinder mounting hole

Cylinder 3500 daN

ST 8841-1-035, ST 8841-2-035, ST 8841-3-035

Filing pressure-depending initial forces



The end forces are a maximum of 20 % higher, depending on the pressure increase and/or the available volume.

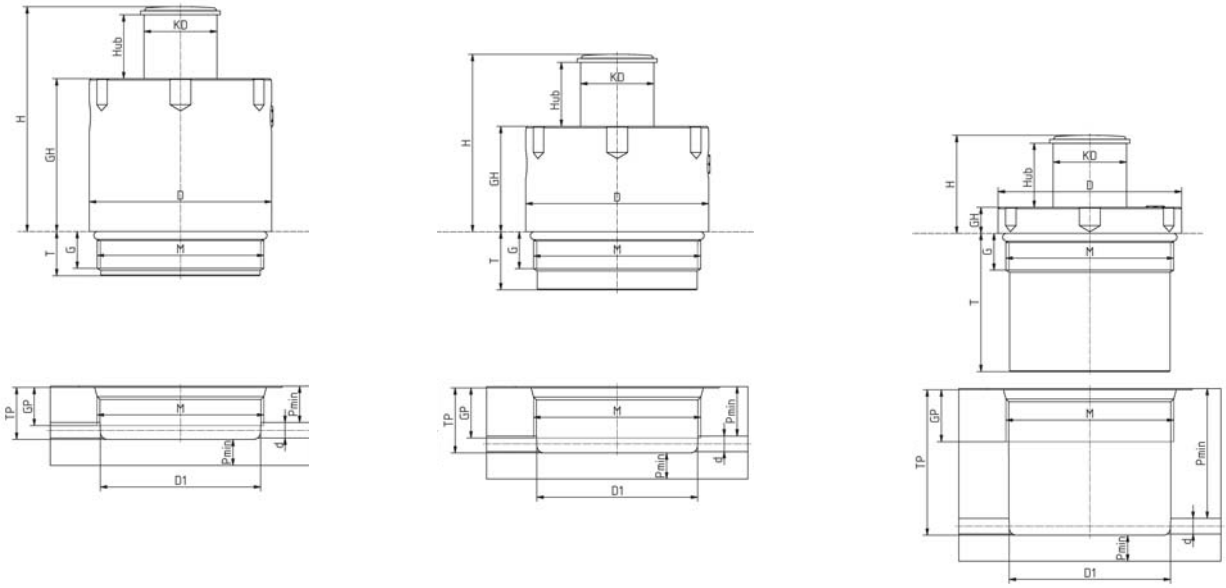
a) Required filling pressure:
The required filling pressure is calculated as follows:
Filling pressure = Requested force ÷ Piston active surface
e.g. 4000 daN ÷ 33.16625 cm² = 120.60453 bar ~ 121 bar
These examples are based on one cylinder each of the type ST 8841-1-035, ST 8841-2-035 or ST 8841-3-035

b) Calculating initial force:
The initial force is calculated by multiplying the piston active surface (33.16625 cm²) with the filling pressure.
Initial force = Piston active surface x Filling pressure
e.g. 33.16625 cm² x 120 bar = 3979.95 daN

Order example 2: Manifold cylinder variant 2 (3500 daN) with a stroke of 38 mm
Order number: **ST 8841-2-035 x 038**

Cylinder 5500 daN

ST 8841-1-055, ST 8841-2-055, ST 8841-3-055



		Order number **ST 8841-1-055**					Order number **ST 8841-2-055**					Order number **ST 8841-3-055**				
Designation	**Stroke mm**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**
006	6.0	–	–	–	–	–	–	–	–	–	–	14.0	39.5	42.5	22.0	23.0
010	10.0	–	–	–	–	–	–	–	–	–	–	14.0	43.5	46.5	26.0	23.0
015	15.0	–	–	–	–	–	–	–	–	–	–	14.0	48.5	51.5	31.0	23.0
020	20.0	–	–	–	–	–	–	–	–	–	–	14.0	53.5	56.5	36.0	23.0
025	25.0	61.5	25.0	28.0	88.5	23.0	52.5	34.0	37.0	79.5	23.0	14.0	58.5	61.5	41.0	23.0
038	38.0	86.5	25.0	28.0	114.5	23.0	52.5	47.0	50.0	92.5	23.0	–	–	–	–	–
050	50.0	86.5	25.0	28.0	138.5	23.0	52.5	59.0	62.0	104.5	23.0	–	–	–	–	–
075	75.0	111.5	25.0	28.0	188.5	23.0	52.5	84.0	87.0	129.5	23.0	–	–	–	–	–
100	100.0	136.5	25.0	28.0	238.5	23.0	52.5	109.0	112.0	154.5	23.0	–	–	–	–	–
150	150.0	186.5	25.0	28.0	338.5	23.0	52.5	159.0	162.0	204.5	23.0	–	–	–	–	–

Order example 1: Manifold cylinder variant 3
(5500 daN) with a stroke of 6 mm
Order number: **ST 8841-3-055 x 006**

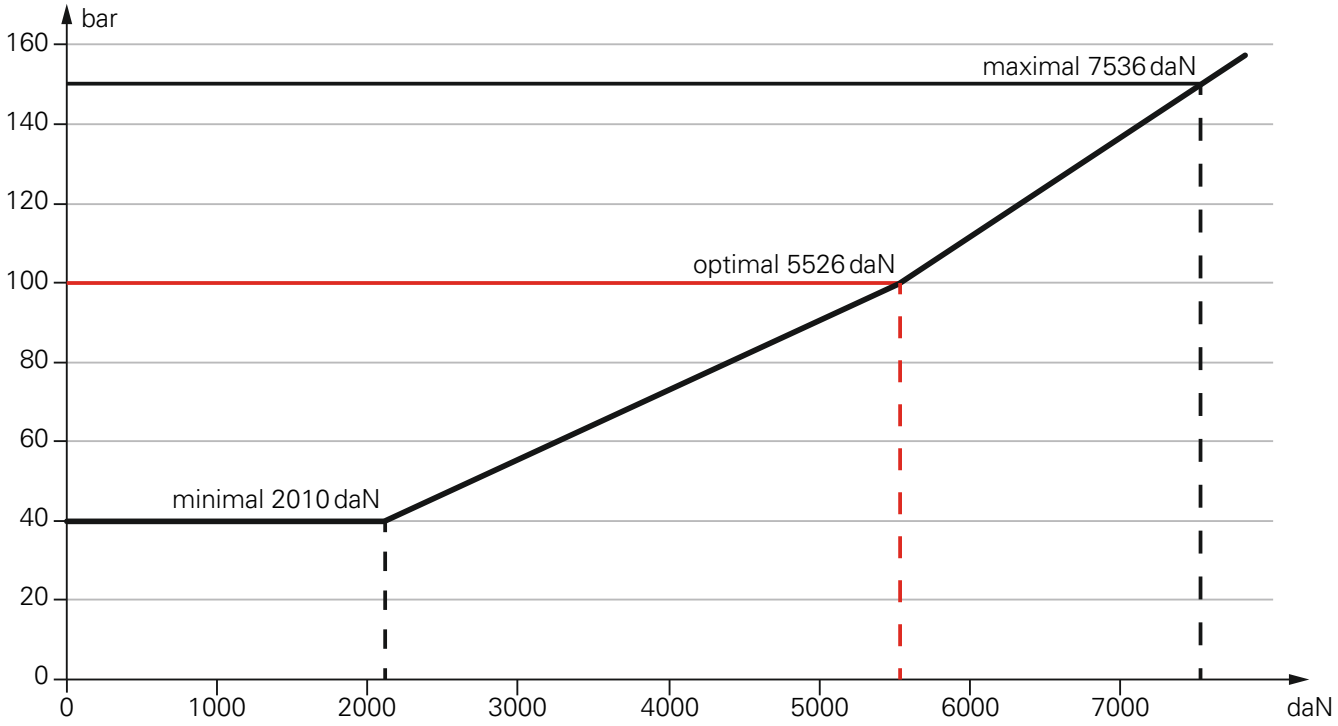
Further dimensions/details:
Housing outer diameter = 108 mm
Piston rod outer diameter = 40 mm
Screw-in thread = M100 x 2
Minimum bore Ø under M100 x 2 = 97 mm
d = 12 mm
P_{min} (Steel) = 13 mm P_{min} (Aluminium) = 15 mm
Piston active surface A_{zyl} = 50.24 cm²
Minimum filling pressure = 40 bar
Maximum filling pressure = 150 bar

Key:
d = Minimum connecting hole diameter
D1 = Minimum bore Ø
G = Thread length housing
GH = Case height
GP = Minimum depth of thread cylinder mounting hole
H = Overall height, piston extended
Hub = Maximum usable stroke
KD = Piston rod outer diameter
P_{min} = Minimum distance to the next interfering contour
T = Installation depth housing
TP = Minimum borehole depth cylinder mounting hole

Cylinder 5500 daN

ST 8841-1-055, ST 8841-2-055, ST 8841-3-055

Filing pressure-depending initial forces



The end forces are a maximum of 20 % higher, depending on the pressure increase and/or the available volume.

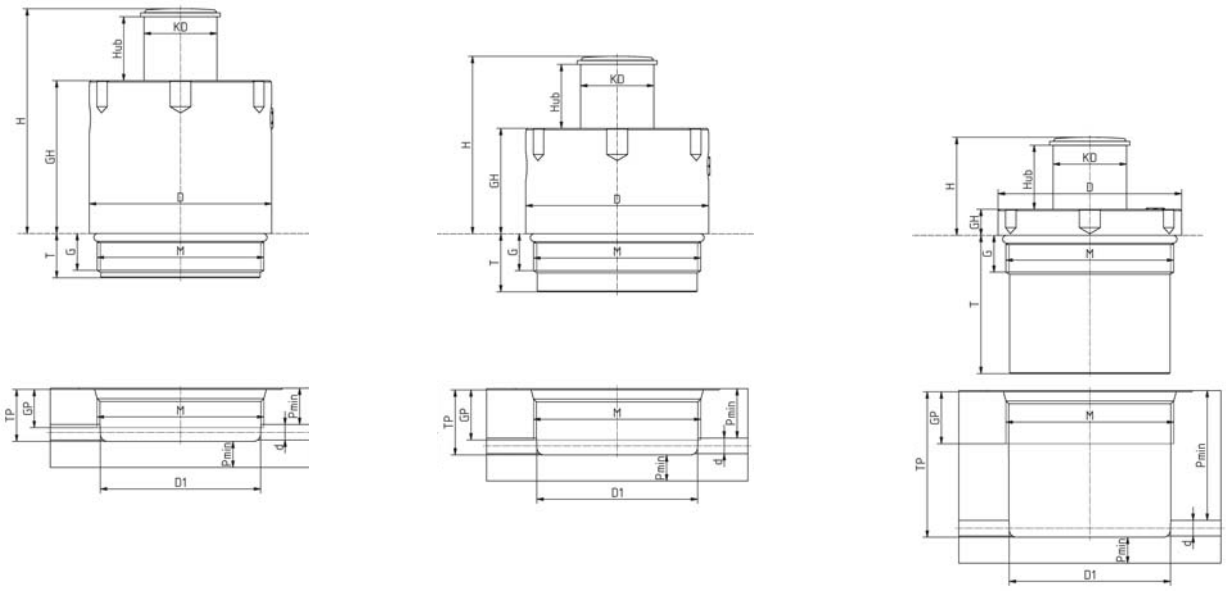
a) Required filling pressure:
The required filling pressure is calculated as follows:
Filling pressure = Requested force ÷ Piston active surface
e.g. 5000 daN ÷ 50.24 cm² = 99.522293 bar ~ 99.5 bar
These examples are based on one cylinder each of the type ST 8841-1-055, ST 8841-2-055 or ST 8841-3-055

b) Calculating initial force:
The initial force is calculated by multiplying the piston active surface (50.24 cm²) with the filling pressure.
Initial force = Piston active surface x Filling pressure
e.g. 50.24 cm² x 120 bar = 6028.8 daN

Order example 2: Manifold cylinder variant 1 (5500 daN) with a stroke of 100 mm
Order number: **ST 8841-1-055 x 100**

Cylinder 10000 daN

ST 8841-1-100, ST 8841-2-100, ST 8841-3-100



		Order number **ST 8841-1-100**					Order number **ST 8841-2-100**					Order number **ST 8841-3-100**				
Designation	**Stroke mm**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**	**GH**	**T**	**TP**	**H**	**GP**
006	6.0	–	–	–	–	–	–	–	–	–	–	20.0	54.5	57.5	28.0	27.0
010	10.0	–	–	–	–	–	–	–	–	–	–	20.0	58.5	61.5	32.0	27.0
015	15.0	–	–	–	–	–	–	–	–	–	–	20.0	63.5	66.5	37.0	27.0
020	20.0	–	–	–	–	–	–	–	–	–	–	20.0	68.5	71.5	42.0	27.0
025	25.0	66.5	27.0	30.0	93.5	30.0	62.5	31.0	34.0	89.5	30.0	20.0	73.5	76.5	47.0	27.0
038	38.0	79.5	27.0	30.0	119.5	30.0	62.5	44.0	47.0	102.5	30.0	–	–	–	–	–
050	50.0	91.5	27.0	30.0	143.5	30.0	62.5	56.0	59.0	114.5	30.0	–	–	–	–	–
075	75.0	116.5	27.0	30.0	193.5	30.0	62.5	81.0	84.0	139.5	30.0	–	–	–	–	–
100	100.0	141.5	27.0	30.0	243.5	30.0	62.5	106.0	109.0	164.5	30.0	–	–	–	–	–
150	150.0	191.5	27.0	30.0	343.5	30.0	62.5	156.0	159.0	214.5	30.0	–	–	–	–	–

Order example 1: Manifold cylinder variant 2
(10000 daN) with a stroke of 100 mm
Order number: **ST 8841-2-100 x 100**

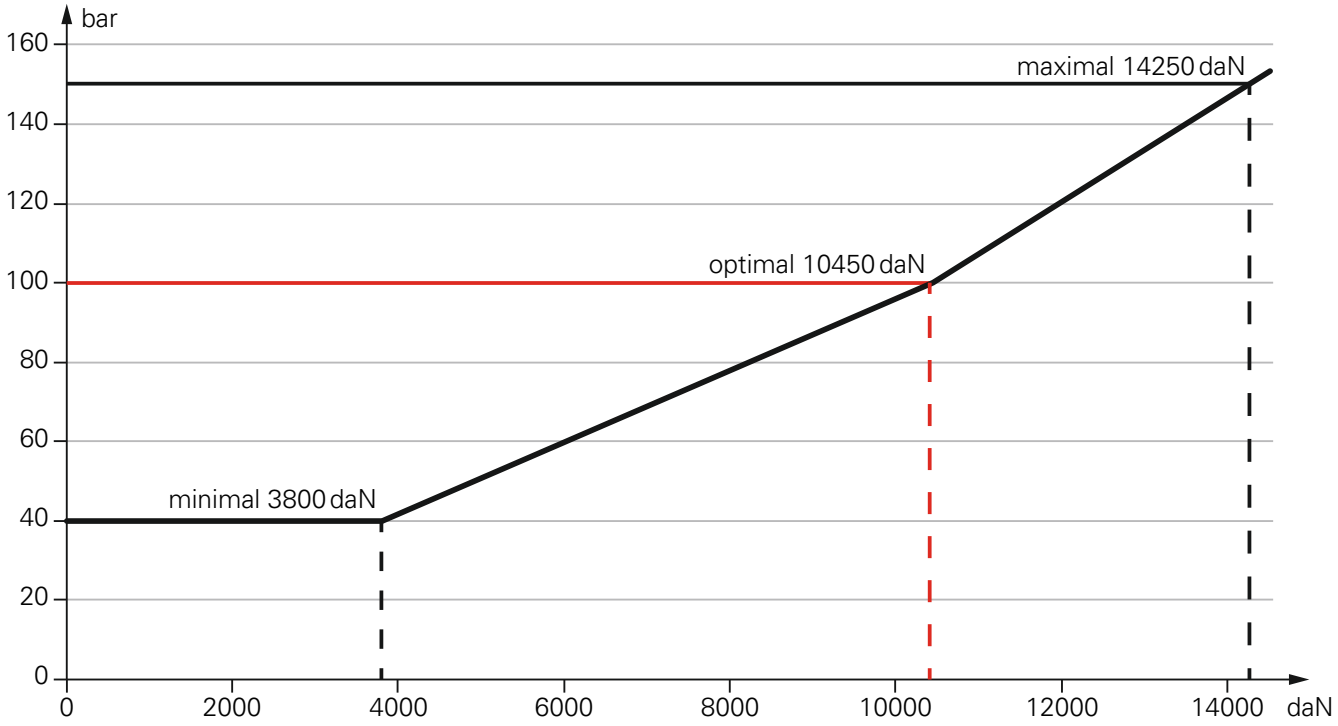
Further dimensions/details:
Housing outer diameter = 146 mm
Piston rod outer diameter = 50 mm
Screw-in thread = M130 x 2
Minimum bore Ø under M130 x 2 = 127 mm
d = 12 mm
P_{min} (Steel) = 16 mm P_{min} (Aluminium) = 18 mm
Piston active surface = 94.98 cm²
Minimum filling pressure = 40 bar
Maximum filling pressure = 150 bar

Key:
d = Minimum connecting hole diameter
D1 = Minimum bore Ø
G = Thread length housing
GH = Case height
GP = Minimum depth of thread cylinder mounting hole
H = Overall height, piston extended
Hub = Maximum usable stroke
KD = Piston rod outer diameter
P_{min} = Minimum distance to the next interfering contour
T = Installation depth housing
TP = Minimum borehole depth cylinder mounting hole

Cylinder 10000 daN

ST 8841-1-100, ST 8841-2-100, ST 8841-3-100

Filing pressure-depending initial forces



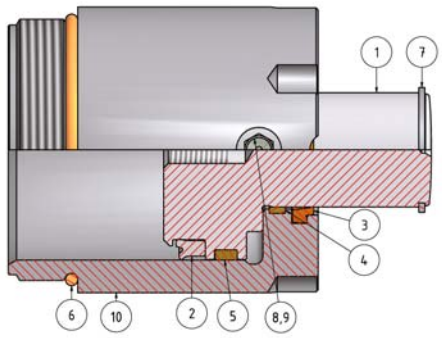
The end forces are a maximum of 20 % higher, depending on the pressure increase and/or the available volume.

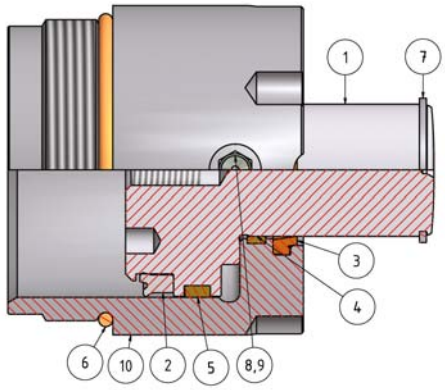
a) Required filling pressure:
The required filling pressure is calculated as follows:
Filling pressure = Requested force x Piston active surface
e.g. 6000 daN ÷ 94.98 cm² = 63.171194 bar ~ 63.0 bar
These examples are based on one cylinder each of the type ST 8841-1-100, ST 8841-2-100 or ST 8841-3-100

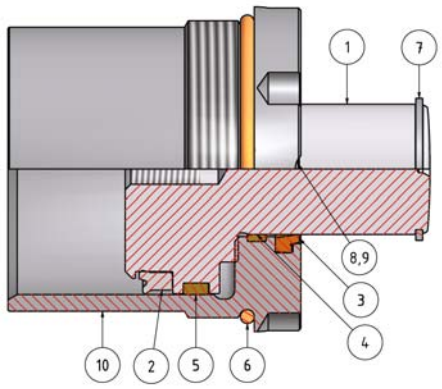
b) Calculating initial force:
The initial force is calculated by multiplying the piston active surface (94.98 cm²) with the filling pressure.
Initial force = Piston active surface x Filling pressure
e.g. 94.98 cm² x 120 bar = 11397.6 daN

Order example 2: Manifold cylinder variant 3 (10000 daN) with a stroke of 20 mm
Order number: **ST 8841-3-100 x 020**

Spare parts cylinder ST 8841





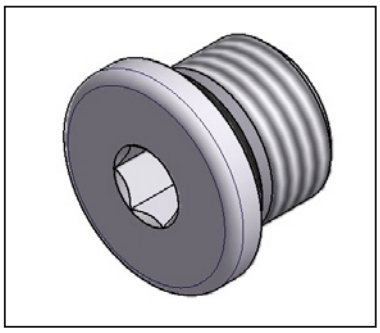


Pos.	Designation	Included in the gasket kit	Included in the accessory kit
1	Piston		
2	Piston seal	x	
3	Scraper	x	
4	Rod guide	x	
5	Piston guide	x	
6	O-ring	x	
7	Lock ring		x
8	Lubricating nipple		x
9	Bleed valve		x
10	Housing		

Order number **ST 8841-** -□-▭-▭

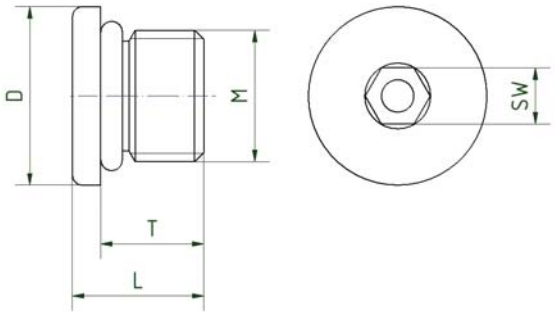
Cylinder type	Order number gasket kit	Order number accessory kit
ST 8841-1-003	ST8841-003-DS	ST 8841-1-003-ZB
ST 8841-2-003	ST 8841-003-DS	ST 8841-1-003-ZB
ST 8841-3-003	ST 8841-003-DS	ST 8841-3-003-ZB
ST 8841-1-005	ST 8841-005-DS	ST 8841-1-005-ZB
ST 8841-2-005	ST 8841-005-DS	ST 8841-1-005-ZB
ST 8841-3-005	ST 8841-005-DS	ST 8841-3-005-ZB
ST 8841-1-010	ST 8841-010-DS	ST 8841-1-010-ZB
ST 8841-2-010	ST 8841-010-DS	ST 8841-1-010-ZB
ST 8841-3-010	ST 8841-010-DS	ST 8841-3-010-ZB
ST 8841-1-025	ST 8841-025-DS	ST 8841-1-025-ZB
ST 8841-2-025	ST 8841-025-DS	ST 8841-1-025-ZB
ST 8841-3-025	ST 8841-025-DS	ST 8841-3-025-ZB
ST 8841-1-035	ST 8841-035-DS	ST 8841-1-035-ZB
ST 8841-2-035	ST 8841-035-DS	ST 8841-1-035-ZB
ST 8841-3-035	ST 8841-035-DS	ST 8841-3-035-ZB
ST 8841-1-055	ST 8841-055-DS	ST 8841-1-055-ZB
ST 8841-2-055	ST 8841-055-DS	ST 8841-1-055-ZB
ST 8841-3-055	ST 8841-055-DS	ST 8841-3-055-ZB
ST 8841-1-100	ST 8841-100-DS	ST 8841-1-100-ZB
ST 8841-2-100	ST 8841-100-DS	ST 8841-1-100-ZB
ST 8841-3-100	ST 8841-100-DS	ST 8841-3-100-ZB

Sealing plug ST 8842

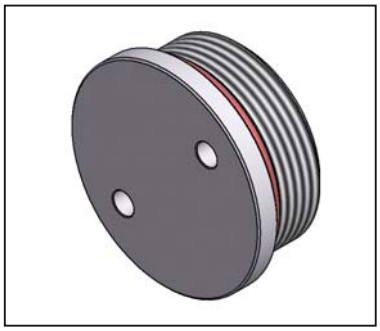


Volume or connecting holes are sealed with the sealing plug

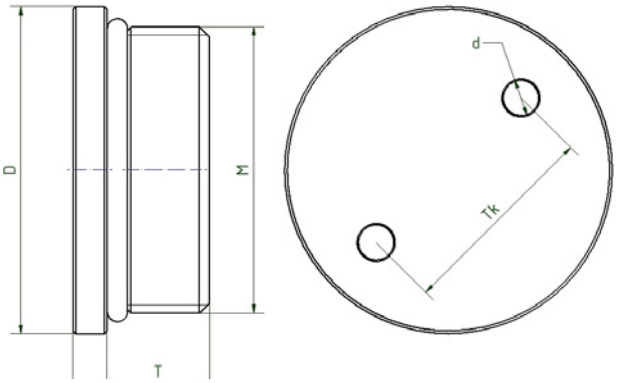
Order number	M	D	L	T	SW	Clamping torque	for Bore Ø	Circular area from [cm²]
ST 8842-012	1/2"-20 UNF	16	12	9	5	40 Nm	10	0.785
ST 8842-014	M14 x 1.5	19	14	11	6	45 Nm	12	2.011
ST 8842-016	3/4"-16 UNF	22	15	12	8	55 Nm	16	1.131
ST 8842-020	M20 x 1.5	27	18	14	10	70 Nm	18	2.545
ST 8842-027	M27 x 2	32	22.5	18.5	12	160 Nm	24	4.524



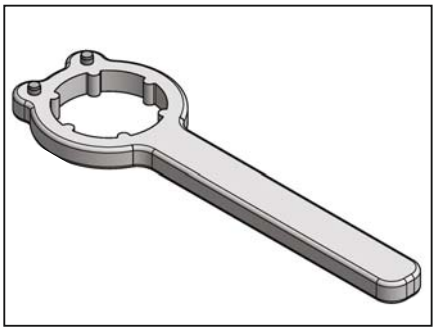
Sealing plug ST 8842

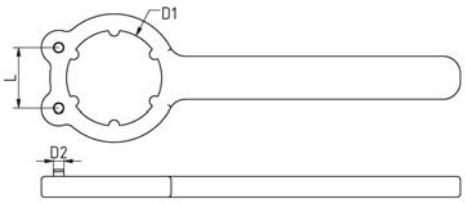


Order number	M	D	L	T	Tk	d	Clamping torque	for Bore Ø	Circular area from [cm²]
ST 8842-036	M36 x 2	42	20	15	25	5.2	300 Nm	33	8.553
ST 8842-042	M42 x 2	48	20	15	30	5.2	330 Nm	39	11.946
ST 8842-048	M48 x 2	54	20	15	35	6.2	420 Nm	45	15.904
ST 8842-064	M64 x 2	70	20	15	45	6.2	440 Nm	61	28.274
ST 8842-080	M80 x 2	88	30	20	55	8.2	800 Nm	77	45.365
ST 8842-100	M100 x 2	108	30	20	70	8.2	1000 Nm	97	72.382
ST 8842-130	M130 x 2	145	30	20	90	8.2	1200 Nm	127	124.69



Assembly tool ST 8841





The assembly tool is used for tightening the cylinders and sealing plugs. It is used primarily for replacing the gasket kits.

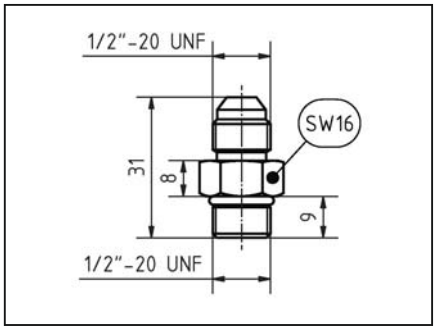
Order example:
Required tool for cylinders:
ST 8841-2-025 x 025

Order number: **ST 8841-WKZ-1-025**

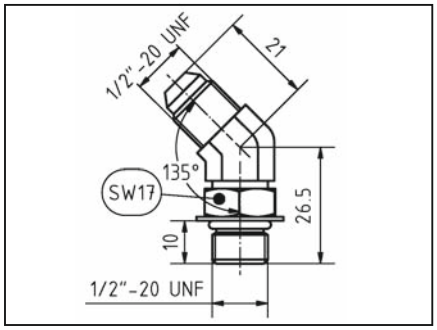
Order number	D1	D2	L	is used for:
ST 8841-WKZ-1-005	43	5	25 + 30	ST 8841-1-005, ST 8841-2-005, ST 8841-3-005, ST 8842-036, ST 8842-042
ST 8841-WKZ-1-010	55	6	35	ST 8841-1-010, ST 8841-2-010, ST 8841-3-010, ST 8842-048
ST 8841-WKZ-1-025	71	6	45	ST 8841-1-025, ST 8841-2-025, ST 8841-3-025, ST 8842-064
ST 8841-WKZ-1-035	89	8	55	ST 8841-1-035, ST 8841-2-035, ST 8841-3-035, ST 8842-080
ST 8841-WKZ-1-055	109	8	70	ST 8841-1-055, ST 8841-2-025, ST 8841-3-055, ST 8842-100
ST 8841-WKZ-1-100	147	8	90	ST 8841-1-100, ST 8841-2-100, ST 8841-3-100, ST 8842-130

Tube connectors ST 8848-5

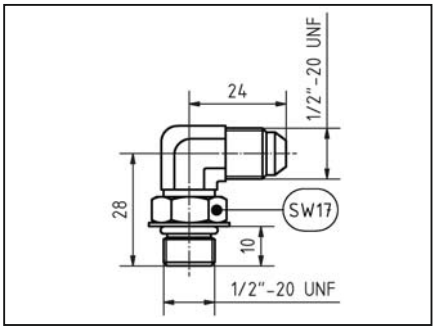
Tube connectors are used for connecting an external nitrogen tank or with the manifold plate.



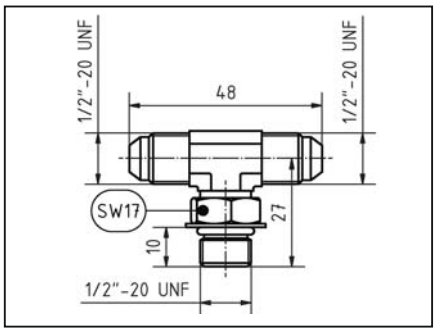
Tube connection for manifold plate
ST 8848-5-G



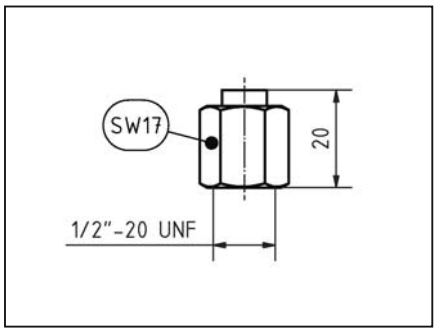
Tube connection for manifold plate 45°, adjustable
ST 8848-5-45



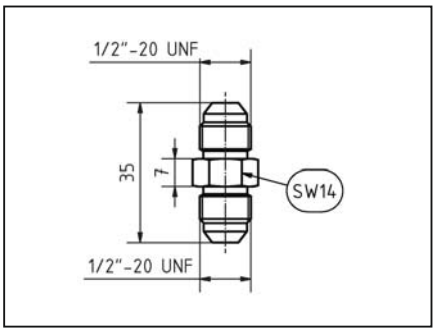
Tube connection for manifold plate 90°, adjustable
ST 8848-5-90



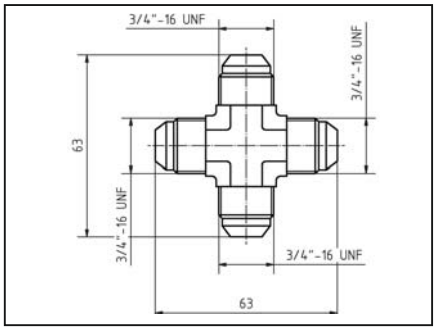
1 Connection for manifold plate
2 Tube connections
Adjustable
ST 8848-5-T



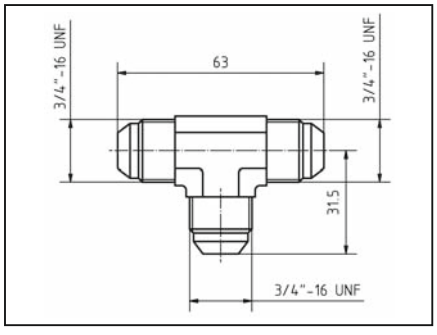
Sealing plug for tube connector
ST 8848-5-V



Coupling element for tubes
ST 8848-5-SV



4 Tube connections
ST 8848-5-XV



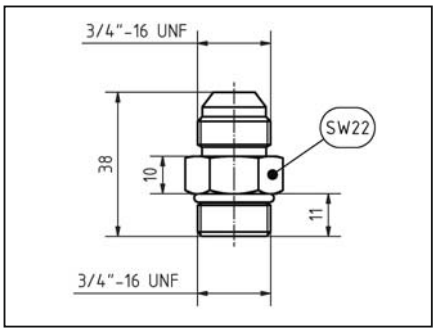
T-connector for 3 tube connections
ST 8848-5-TV

All dimensions are approximate!

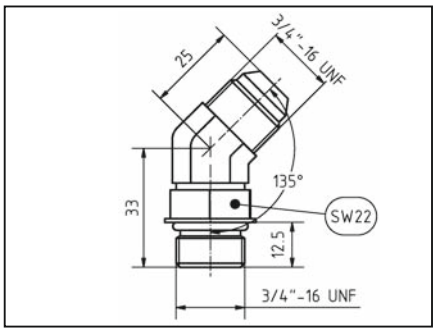
Tube connectors ST 8848-8 and tube attachments

Tube connectors are used for connecting an external nitrogen tank or with the manifold plate.

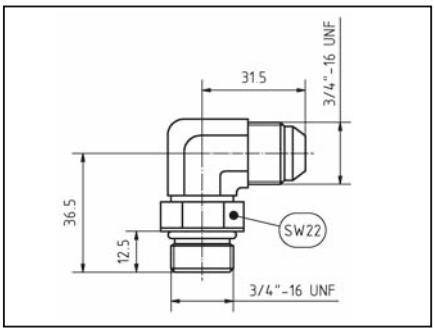
Tube connector



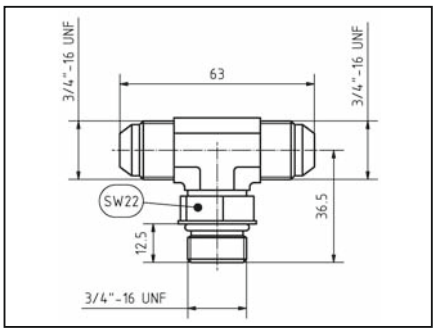
ST 8848-8-G



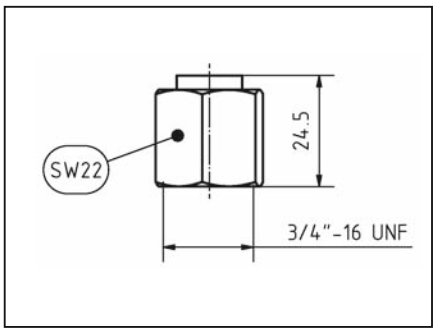
ST 8848-8-45



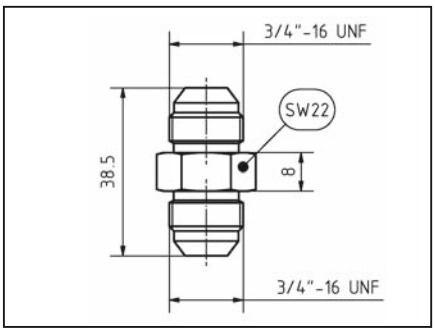
ST 8848-8-90



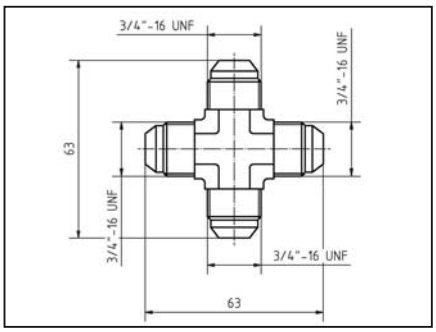
ST 8848-8-T



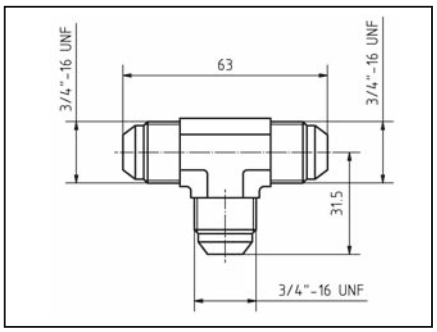
ST 8848-8-V



ST 8848-8-SV



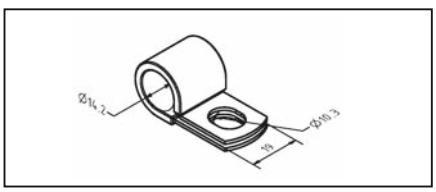
ST 8848-8-XV



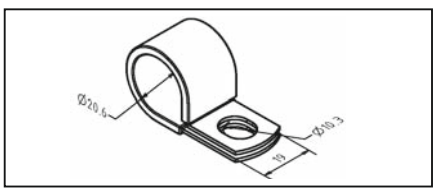
ST 8848-8-TV

All dimensions are approximate!

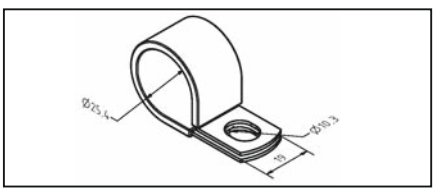
Tube attachment



ST 8849-SC1
for ST 8849-5-N, ST 8849-5-H



ST 8849-SC2
for ST 8849-8-N, ST 8849-8-H and ST 8849-5-SS

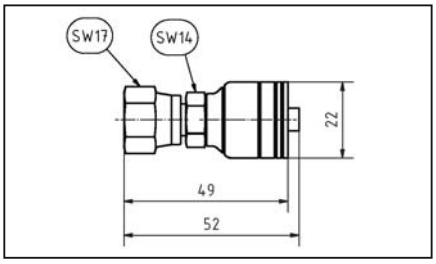


ST 8849-SC3
for ST 8849-8-SS

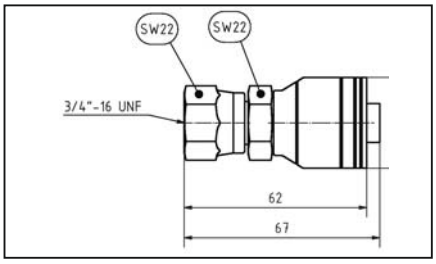
Tubes, tube fittings and tube protection

Tube fittings
The press-type tube fittings and the tube screw fittings are used for normal and extra versions of tubes.

Press-type tube fittings

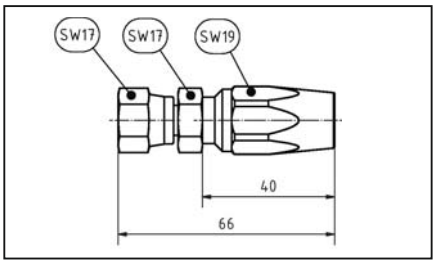


ST 8849-5-PA

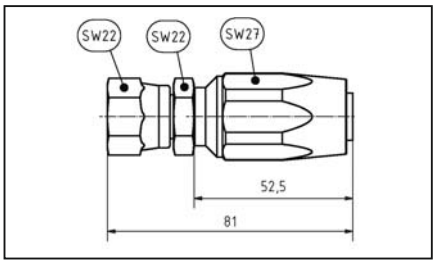


ST 8849-8-PA

Tube screw fittings



ST 8849-5-SA

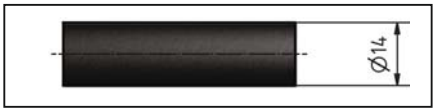


ST 8849-8-SA

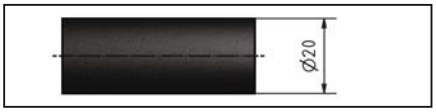
Tubes
The pressure tubes connect control panels, pressure cylinders and external storage buffers.

Order example:
Special version tube
Nominal width 5
Length 1200 mm
Order number: **ST 8849-5-H x 1200**

Standard version tube suitable for up to 70 °C

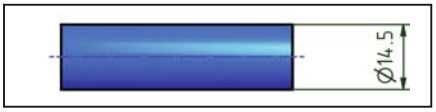


ST 8849-5-N
Minimum bending radius = 50 mm

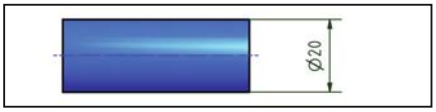


ST 8849-8-N
Minimum bending radius = 90 mm

Special version tube suitable for up to 100 °C



ST 8849-5-H
Minimum bending radius = 50 mm

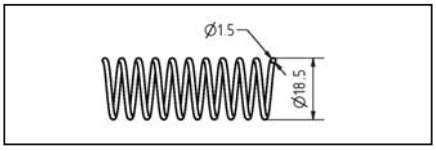


ST 8849-8-H
Minimum bending radius = 90 mm

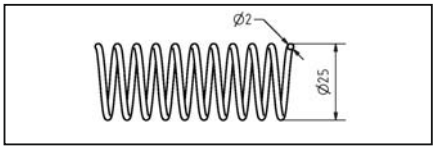
Tube protection
Since the tube pulsates, ST 8849-5-SS and ST 8849-8-SS are used for tube protection.

Order example:
Tube protection ST 8849-5-SS
Length 900 mm
Order number: **ST 8849-5-SSx0900**

Tube protection



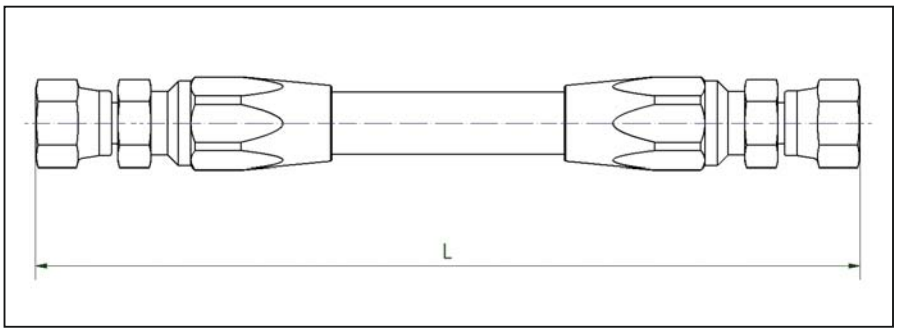
ST 8849-5-SS



ST 8849-8-SS

Order example

for pre-fitted tube

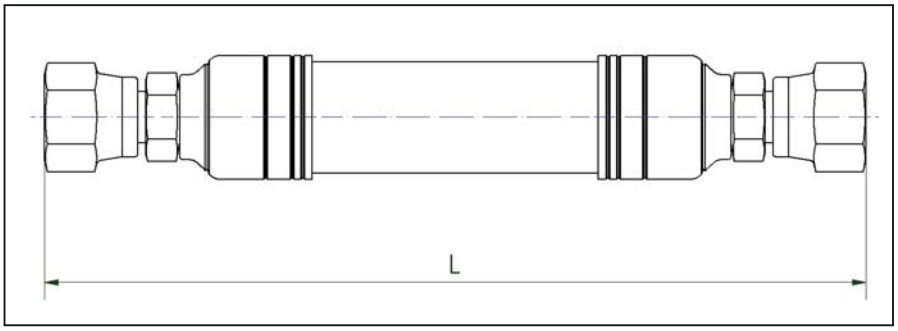


Screw fitting

Order example:
1 tube in standard version size 5
with 2 tube screw fittings
without tube protection spiral
Length L = 1500 mm
Order number: **ST 8849-5NSAXX01500**

The identical tube
with tube protection
Order number: **ST 8849-5NSASS01500**

For tubes with size 8
with tube protection
Order number: **ST 8849-8NSASS01500**



Press-type fitting

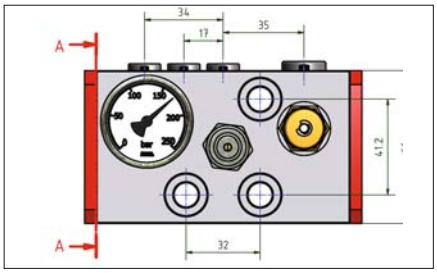
Order example:
1 tube in standard version size 5
with 2 press-type tube fittings
without tube protection spiral
Length L = 1200 mm
Order number: **ST 8849-5NPAXX01200**

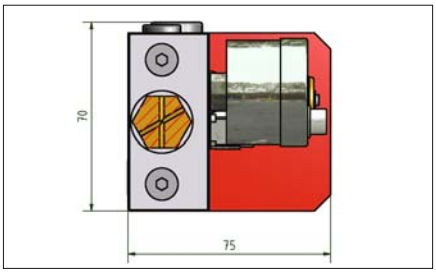
The identical tube
with tube protection
Order number: **ST 8849-5NPASS01200**

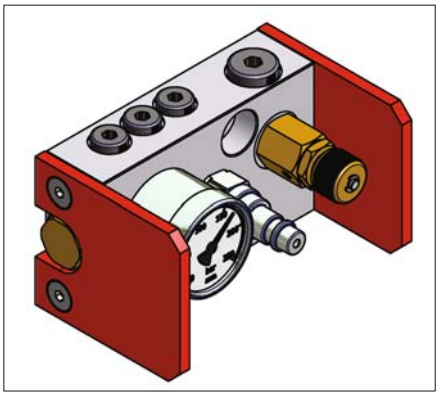
For tubes with size 8
with tube protection
Order number: **ST 8849-8NPASS01200**

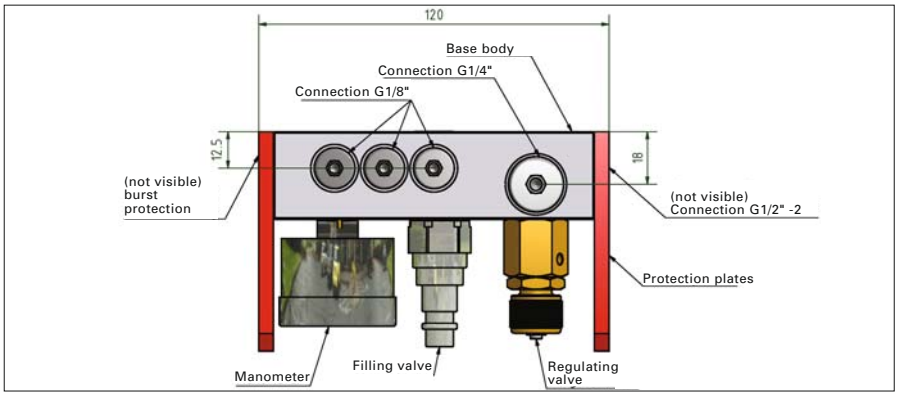
Control panel ST 8845

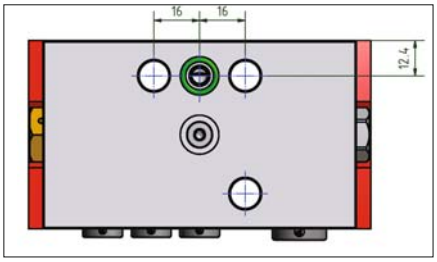
The control panel is used for:
- Loading
- Releasing pressure
- Monitoring the total pressure

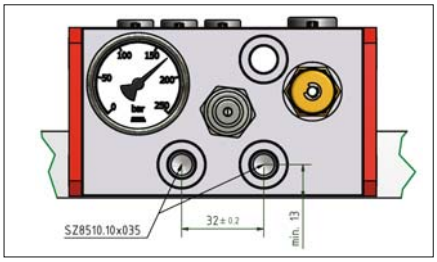




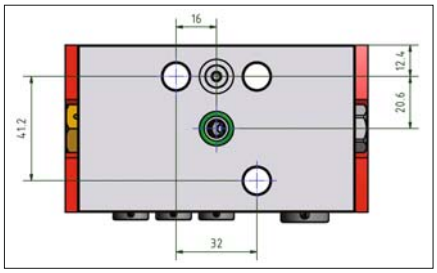


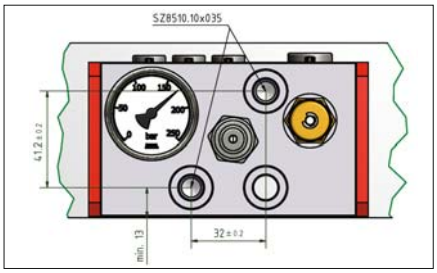




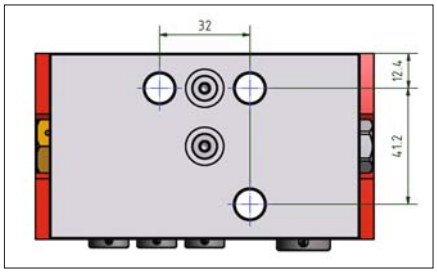


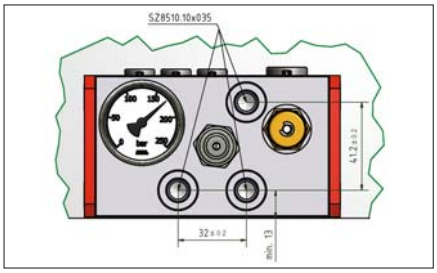
ST 8845-32 View of screw-on surface for attachment to manifold plates = 32 mm
Working pressure up to 180 bar
Mounting hole: 2 x M10 x 18





ST 8845-80 View of screw-on surface for attachment to manifold plates = 80 mm
Working pressure up to 180 bar
Mounting hole: 2 x M10 x 18

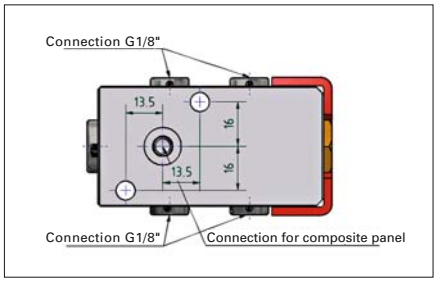


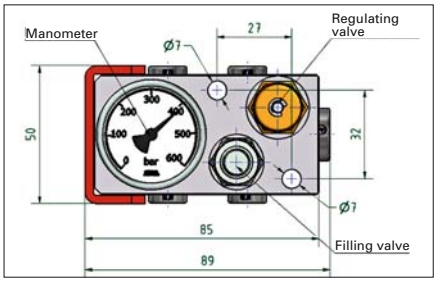


ST 8845-01 View of screw-on surface for connection through tubing
Working pressure up to 180 bar

ST 8845-02 is identical apart from the manometer and the burst protection. It is designed for working pressures of up to 450 bar and is used with tube-connected nitrogen cylinders.

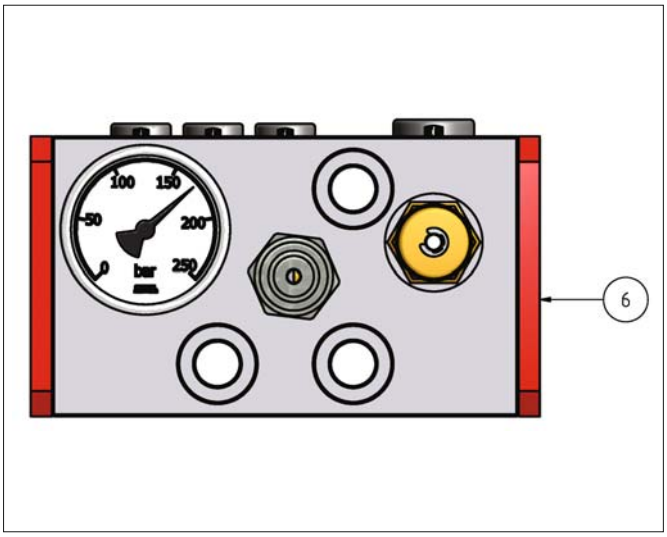
Mounting hole: 2 x M10 x 18

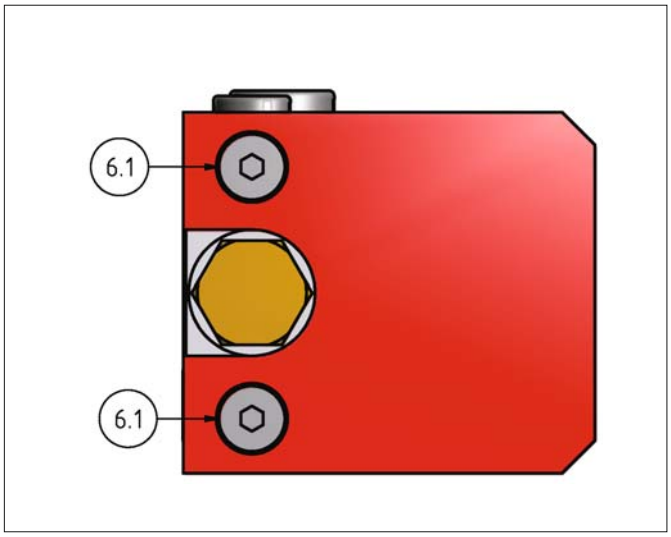


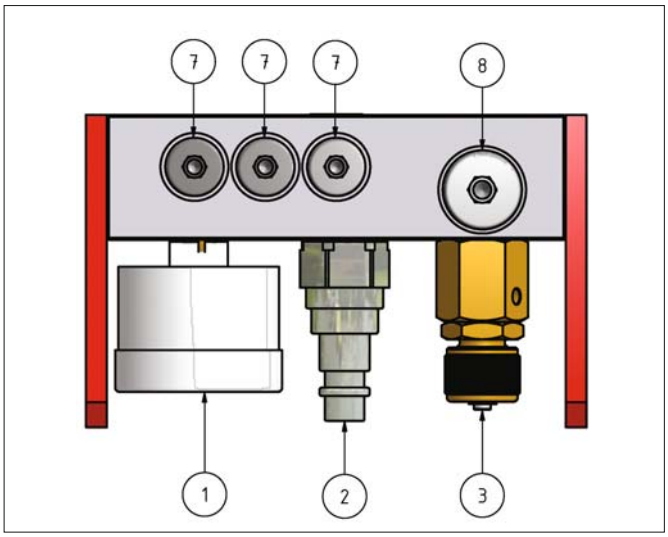


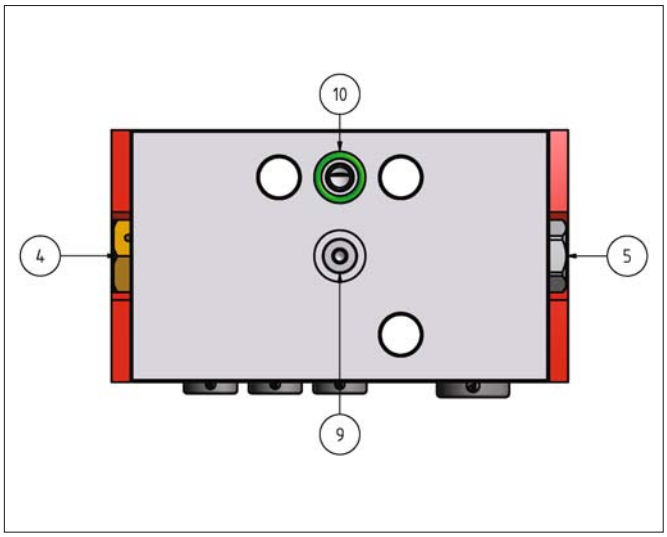
ST 8845-99 (Control panel mini)
- Four tube connections G1/8"
- A connection G1/4" (pressure control switch)
- Ø5 direct connection bore for composite panels (remove lock)
- Burst protection: 450 bar
- Fixing: 2x M6x40

Spare parts and accessory parts ST 8845









Pos.	Designation	Order number	Designation	Order number
	valid for ST 8845-01 / ST 8845-32 / ST 8845-80		optionally deviating for ST 8845-02	
1	Manometer 250 bar	ST 8848-M250	Manometer 600 bar	ST 8845-M600
2	Inlet valve	ST 8845-EVG18		
3	Outlet valve	ST 8090.5		
4	Burst protection	ST 8844-180	Burst protection	ST 8844-450
5	Locking screw 1/2"-20 UNF	ST 8842-012		
6	Protection plate incl. 2 x Pos. 6.1	ST 8845-SP		
7	Locking screw G1/8	ST 8842-G18		
8	Locking screw G1/4	ST 8842-G14		

Reply by fax
Manifold plate ST 8840

Technical data
Reply by fax +49 7720 6928-970

Company: _____

Street: _____

Postal code, city: _____

Contact person: _____

Phone: _____

Fax: _____

Date: _____

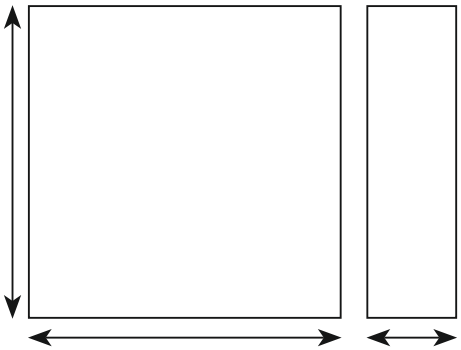
Area sales service visit requested: ☐ yes ☐ no

Required entire force: _____ Number of pressure points: _____

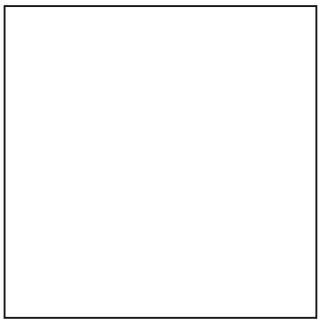
Required working stroke: _____ Cylinder size: _____

Cylinder version: _____

Max. dimensions of the manifold plate:



Further geometry in the manifold plate:



External tank possible: ☐ yes ☐ no

If you have the CAD data, it would reduce the process time significantly.
In that case, please send the data to **info@steinel-normalien.de**

Contact

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