ROEMHELD
HILMA ■ STARK

Threaded-Body Work Supports
with metallic wiper edge, optional contact control
double acting, max. operating pressure 500 bar

Advantages

- High process safety by double-acting function
- Space-saving threaded-body version
- 4 sizes available
- Load force up to 42 kN
- Workpiece contact by spring force
- Optional pneumatic contact control
- Metallic wiper edge
- Protected FKM wiper
- Protection cap available as accessory
- Inner parts protected against corrosion
- Venting of the spring area
- Connection of positive air pressure protection possible
- Installed orifice for flow rate limitation
- Mounting position: any

Metallic wiper edge for coarse and hot swarf

Application

Hydraulic work supports are used to provide a self-adjusting rest for workpieces and avoid their vibration and deflection under machining loads.

The threaded-body design allows for space-saving and direct installation into the fixture body. Hydraulic oil supply and venting are made via drilled channels.

In case of the double-acting version the return stroke of the support plunger is effected in a precisely defined time, that is above all advantageous in cycle-dependent installations.

Description

In the body of the threaded-body work support a thin-walled locking bush is integrated, which locks cylindrically around the freely-movable support plunger when pressurising the element with hydraulic oil.

The support plunger is extended and retracted by means of a small double-acting cylinder.

Contact to the workpiece is made by spring force. A pneumatic contact control is available as an option.

The body with metallic wiper edge protects the subjacent FKM wiper against coarse and hot swarf.

Important notes!

Work supports are not suitable to compensate side loads. The support plunger must not be stressed by tensile load.

The admissible load force as per diagram is valid for static and dynamic load.

Machining forces can generate vibrations, whose amplitude exceeds far the average value, and this can cause yielding of the support plunger.
Remedy: Increase the safety factor or the number of work supports.

In dry machining applications, with minimum quantity lubrication or in case of accumulation of very small swarf, there can be a swarf holdup in the area of the metallic wiper edge.
Remedy: Regular cleaning or mount protection cap (see page 2).

Operating conditions, tolerances and other data see data sheet A 0.100.

Function

The support plunger is retracted in off-position. When pressurised, the piston of the double-acting cylinder extends against an internal stop and the support plunger contacts the already clamped workpiece with spring force.

The support plunger will be radially locked by the thin-walled locking bush with increasing hydraulic pressure and can then compensate forces in axis direction.

For unclamping, the hydraulic pressure is decreased and the locking bush releases the support plunger. At the same time, the return line is pressurised and the piston retracts the support plunger back to the off-position.

Venting port

To guarantee safe functioning, a vent port is imperative. It is important that no liquids can penetrate into the venting system.

Positive air pressure connection

By connecting a slight overpressure of max. 0.2 bar to the venting system, the work support is effectively protected against the penetration of liquids.

If the support plunger is retracted, the positive air pressure connection can be switched off.

Pneumatic contact control

Description see page 4.

Combination with clamping elements

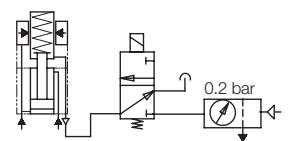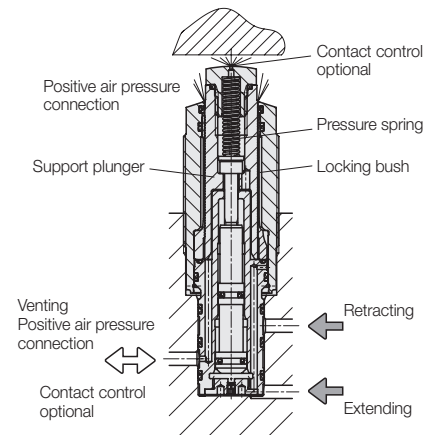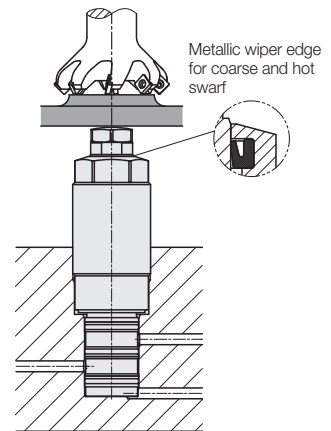With this combination, clamping and machining forces will add up:

      Clamping force
+   max. machining force
———————————————
=   minimum support force x safety factor

Rough calculation from practice:
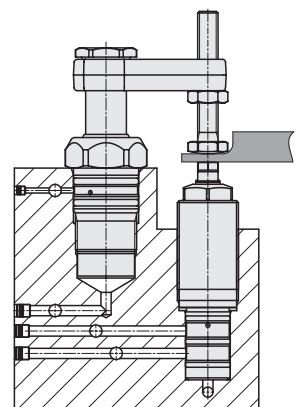**Required support force ≥ 2 x clamping force**

To increase the safety, a support force as high as possible should be achieved
- by using a larger work support
  or
- by using the max. operating pressure of 500 bar by installing a little intensifier (e.g. data sheet D 8.756), in the supply line of the work supports
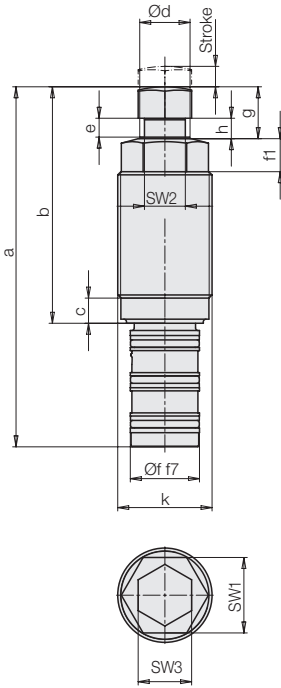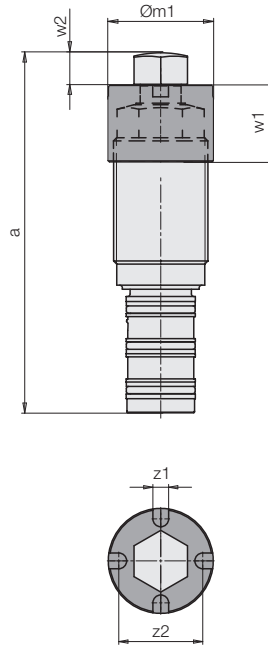

Positive air pressure connection

Support plunger

Venting Positive air pressure connection

Contact control optional

Contact control optional

Pressure spring

Locking bush

Retracting

Extending

0.2 bar

Important note

The positive air pressure must be free of oil and water.

Römheld GmbH · Postfach 1253 · 35317 Laubach, Germany · Tel.: +49 (0) 6405 / 89-0 · Fax: +49 (0) 6405 / 89-211 · info@roemheld.de

Actual issue see www.roemheld-group.com

Subject to modifications

Part no. 1942XXX

Protection cap (accessory)

The protection cap is fixed by means of the standard contact bolt to the support plunger.
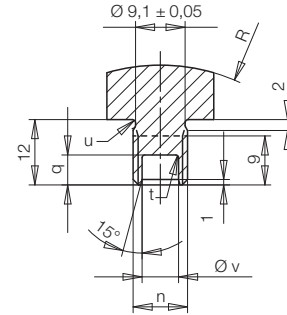It shall be used above all, if a strong coolant jet is directed onto the support plunger or the wiper edge.

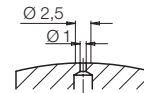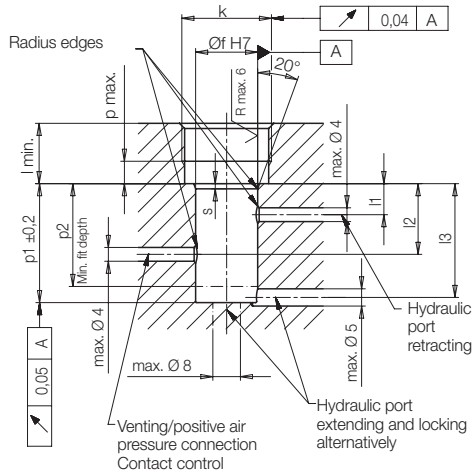### Dimensions for self-made contact bolts
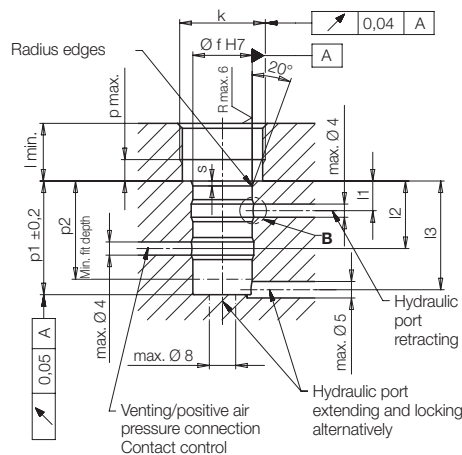
Valid for
1942310
1942410

Valid for
1942510
1942610

Contact bolt for contact control

Ø 2,5
Ø 1

Porting details
with radiused connecting bores

Porting details
with entering slopes

Detail "B"

Edges without burr
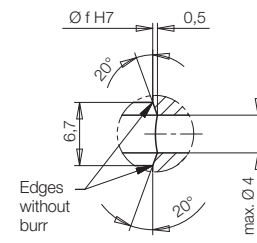
Pay attention when mounting:
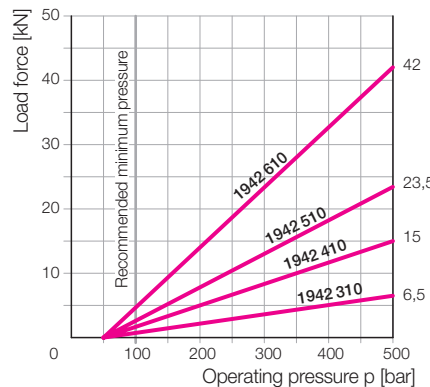The location hole must be dry and oil-free to ensure that no liquids penetrate into the spring area of the work supports.

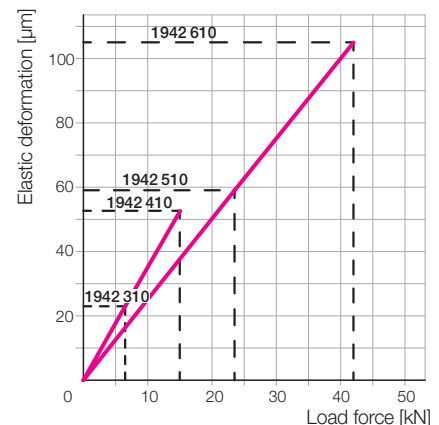**When exchanging work supports:**
To get a dry location hole, the hydraulic oil in drilled channels must be removed.

Adm. load force F
as a function of the operating pressure p

Elastic deformation with load force F and operating pressure 500 bar

Technical data

Adm. load force (500 bar)	[kN]	6.5	15	23.5	42
Support plunger Ød	[mm]	16	20	28	32
Stroke	[mm]	8	10	10	16
Oil volume extending	[cm³]	0.63	1.13	1.13	3.22
retracting	[cm³]	0.12	0.35	0.35	0.75
Recommended minimum pressure (support)	[bar]	100	100	100	100
Minimum pressure retracting	[bar]	20	20	20	20
Max. air pressure for positive air pressure connection	[bar]	0.2	0.2	0.2	0.2
Spring contact force min./max.	[N]	10/13	14/25	22/35	32/61
Elastic deformation with load and 500 bar	[µm/kN]	3.5	3.5	2.5	2.5
Operating temperature	[°C]	0…70	0…70	0…70	0…70
Tightening torque	[Nm]	60	100	200	400
a	[mm]	114.5	124.5	131.5	158
b	[mm]	75.2	85.7	89.7	114.6
c	[mm]	8	17	20	20
e	[mm]	6	5.6	3	4
Øf H7/f7	[mm]	22	25	30	35
f1	[mm]	10.5	12	12	18
g	[mm]	16.5	13.5	12	12.5
h	[mm]	6.5	6.5	4	4.5
k	[mm]	M30 x 1.5	M36 x 1.5	M48 x 1.5	M60 x 1.5
l min.	[mm]	21	31	39	40
l1	[mm]	11.5	11.5	12.5	13
l2	[mm]	24	24	26	26.5
l3	[mm]	37	36.5	39.5	40
Øm1	[mm]	35	40	52	65
n	[mm]	M10	M12	M12	M12
p max.	[mm]	8	12	18	16
p1 ±0.2	[mm]	38.5	38	41	42.5
p2	[mm]	35	34.5	37.5	38.5
q	[mm]	19	15	6.5	–
s	[mm]	1.5	2	2	2
t	[mm]	R 0.5	R 0.2	R 0.5	–
u	[mm]	R 0.6	R 0.3	R 0.3	R 0.3
Øv	[mm]	6	6.9	7	–
w1	[mm]	28	30	30	43
w2	[mm]	10	7	6.4	6.4
z1	[mm]	5	6	8	8
z2	[mm]	28	32	43	53
SW1	[mm]	24	30	41	50
SW2	[mm]	13	17	22	27
SW3	[mm]	17	19	22	22
R	[mm]	35	45	45	45
Weight, approx.	[kg]	0.47	0.68	1.23	2.45
Part no.		**1942310**	**1942410**	**1942510**	**1942610**
Part no. with contact control (see also page 4)		**1942310P**	**1942410P**	**1942510P**	**1942610P**
Contact bolt for contact control		**3614390**	**3614389**	**3614391**	**3614418**
Protection cap		**3546110**	**3546111**	**3546112**	**3546113**
Weight protection cap	[kg]	0.023	0.025	0.032	0.062

Contact force of the support plunger
Pneumatic contact control

The double-acting work support is equipped with a venting port, that can also be pressurised with positive air pressure as described on page 1. This port can also be used for the installation of a workpiece contact control for the support plunger.
Prerequisite is a small sensor hole in the hardened contact bolt. There are 2 possibilities:

1. When placing a new order
Order work supports with contact control as per chart on page 3:
Part no. 1942X10P

2. Exchange of the contact bolts
The contact bolts with and without sensor hole are dimensionally identical and therefore also replaceable on site.
The part nos. are indicated in the chart on page 3.

Important note!
The pneumatic contact control can only be used if
- the contact surface at the workpiece is square to the axis of the work support.
- the contact surface is machined.
- the air is free of oil and water.

Contact force of the support plunger
The contact force depends on the spring contact force (see diagram) and the pneumatic contact force (see diagram) when using positive air pressure connection or contact control.
In the case of vertical mounting position, the weight force can be deduced from the support plunger + contact bolt and the optional protection cap.

$$F_{An} = F_F + F_p - (F_{Sb} + F_{Sk})* \qquad [N]$$
( )* only vertical installation

1. Spring contact force

$$F_F = F_{max} - (R*h) \qquad [N]$$

2. Pneumatic contact force**

$$F_p = A*p \qquad [N]$$

3. Weight force support plunger + contact bolt

$$F_{Sb} \text{ see constant} \qquad [N]$$

4. Weight force protection cap (accessory)

$$F_{Sk} \text{ see constant} \qquad [N]$$

F_{max} = max. spring force (h = 0) [N]
  R = Spring constant [N/mm]
  A = Constant for bolt surface [–]
  p = Pneumatic pressure [bar]
   (positive air pressure connection or contact control)

Constant

| 1942		310	410	510	610
Fmax	[N]	13.6	25.9	35.2	60
R	[N/mm]	0.364	1.103	1.34	1.82
A	[–]	20.1	31.4	61.5	80
FSb	[N]	0.5	1.3	2.5	3.9
FSk	[N]	0.23	0.25	0.32	0.62

Before unclamping, switch off the pneumatic pressure for contact control or reduce the positive air pressure to 0.2 bar.
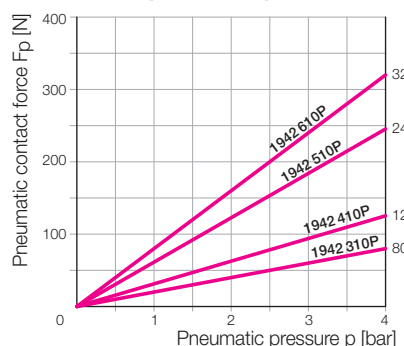
** Is only considered, if the pneumatic pressure is switched on before locking the support plunger.
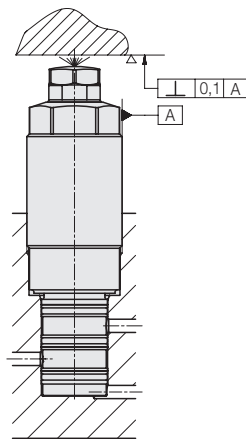
Spring contact force as a function of the support plunger stroke
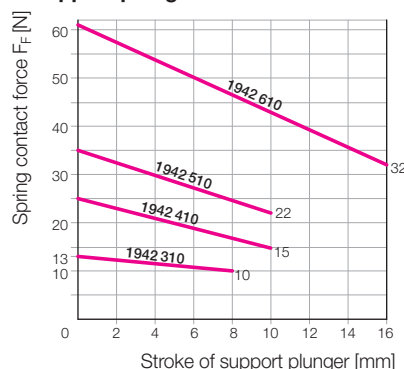
Pneumatic spring contact force as a function of the pneumatic pressure

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Example 1 Work support 1942 410
Protection cap 3546 111
Vertical upward installation
Support plunger stroke 5 mm
Positive air press. connection 0.2 bar**

Spring force	$F_F = F_{max} - (R*h)$		
	$F_F = 25 - (1{,}103 * 5)$	=	19.4 N
+ Pos. air press. con.	$F_p = A*p = 31.4*0.2$	=	6.3 N
- Weight force support plunger		=	1.3 N
- Weight force protection cap		=	0.25 N
Contact force		=	24.15 N

Example 2 Work support 1942 510P
Vertical upward installation
Support plunger stroke 7 mm
Pneumatic pressure 3 bar**

Spring force	$F_F = F_{max} - (R*h)$		
	$F_F = 35 - (1{,}34 * 7)$	=	25.6 N
+ Pneumatics	$F_p = A*p = 61.5*3$	=	184.5 N
- Weight force support plunger		=	2.5 N
Contact force		=	207.6 N

Signal conversion: Pneumatic - electric
If the contact bolt is in contact with the workpiece, the little nozzle will be closed.
An electro-pneumatic measuring device can either measure the pressure increase or a drop of the air flow rate.

1. Pressure switch
Advantage
Easy adjustment.
Disadvantage
When contacting the workpiece, the tightness of the nozzle depends on the surface quality of the contact surface and depending on the workpiece more or less large changes in air pressure are possible. With an increasing number of work supports, the pressure differences will decrease and this makes the process-safe setting of a pressure switch more difficult.
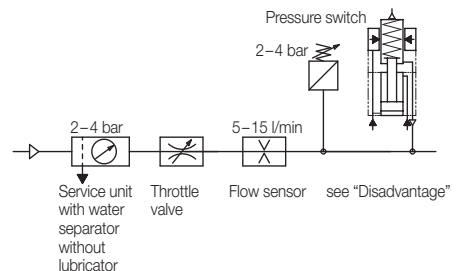
Recommendation
If several work supports have to be controlled, a flow measurement is preferable.

2. Flow meter
The flow meter should have a digital display and at least one adjustable limit switch with a binary output (e.g. type SFAB of FESTO).
#### Advantages
For the flow measurement, an air pressure of 2 to 4 bar is sufficient so that the support plunger contact force at the workpiece is still relatively low.
Simple adjustment of the switching point:
1. Measure the flow rate (Qmin) when all support plungers are in contact with the workpiece.
2. Repeat the measurement if 1 support plunger has no contact (Qmax).
3. Enter and save the switching threshold = 0.5 x (Qmin + qmax).
Disadvantages
If the difference (Qmax – Qmin) is too small, increase the flow rate or reduce the number of support points per sensor.
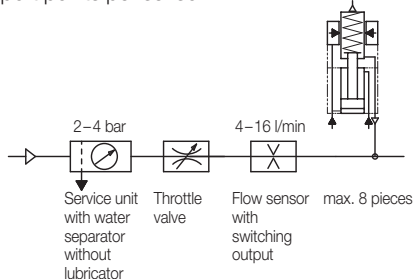
Alternatives
The air gap sensor SOPA from FESTO has an integrated compressed air preparation, as well as two solenoid valves for measuring air and positive air pressure connection.
The device can be expanded to 4 measuring circuits.

3. Differential pressure switch
Differential pressure switches (e.g. PEL-System) require only 0.5 to 1.5 bar working pressure.
The exact adjustment of a setting nozzle under practical conditions is required.