



Operating instructions

including installation and assembly instructions
for incomplete machines as per Machinery Directive 2006/42/EC

Swing Clamp

Double acting Typ

2174-160 / 2174-200

2175-160 / 2175-200

2176-160 / 2176-200

2177-160-/.2177-200

Special types

8.217x.8xxx



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Please read the operating manual before installing the swing clamping cylinders and putting them into operation for the first time!

1 Safety information

1.1 General

The safety of Hilma-Roemheld swing clamping cylinders has been thoroughly checked. They are designed for use as specified in the technical data. If the technical data is not observed, there may be a danger to the operator and proper functioning of the machine may be put at risk. Unauthorised modification or alteration of Hilma-Römhheld pull clamping cylinders is prohibited for reasons of safety. If this instruction is not observed, our guarantee will be invalid.

1.2 Field of application

Hilma-Römhheld swing clamping elements are designed for a large number of clamping applications, in connection with screw or tie rods or T-bolt supports. Swing clamping cylinders type 2170 are particularly suited for the clamping of dies on presses when standardised dies with clamping slots or Hilma- clamping flanges are used.

1.3 Operating characteristics

The load values specified for Hilma Römhheld swing clamping cylinders must not be exceeded (see data sheets in the appendix).

Attention: Overloading the swing clamping cylinders may lead to failure of the elements or to their destruction.

1.4 Temperatures

The maximum operating temperature for the standard design is 70 °C. In case of higher temperatures special designs with high-temperature sealing must be used (special designs for max. temperatures of 230°C without prox switches)

1.5 Important safety information

- Depending on the installation, there may be pinch hazard between the swing clamping element and the clamping point
- Keep hands and tools away from the clamping range when operating the hollow piston cylinders.

Attention:

Before putting the swing clamping cylinders into operation, the operator must be fully trained. Young people less than 16 years old are not allowed to operate the clamps. Staff aged over 16 years are allowed to operate the clamps under supervision as part of their apprenticeship. The operating instructions must be readily accessible. The operator must inform third parties of any danger in the working area.

1.6 Declaration

Hilma- Römhheld swing clamping cylinders have been developed, designed and manufactured in accordance with the EC Directive 'Machinery' 2006/42/EC.

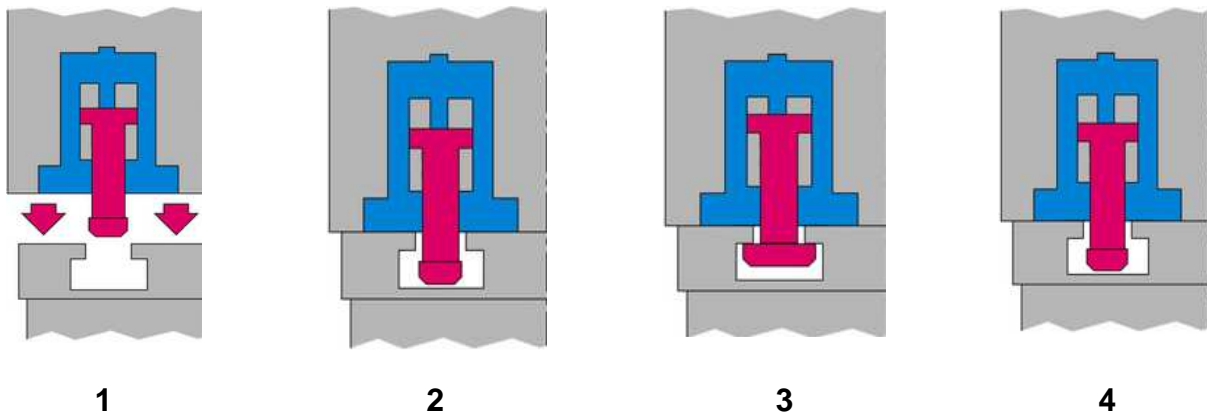
2 Design and function

2.1 Design

The swing sink clamping elements consist of the housing which accommodates the swing mechanism for the piston, inductive proximity switches for monitoring the unclamping, and clamping position and the piston with the tie rod.

The swing mechanism consists of a guide pin which guides the piston in such a manner that it rotates during part of the stroke. The rotating movement is carried out just before reaching or after leaving the extendet position (unclamping position).

2.2 Functional description



Clamping

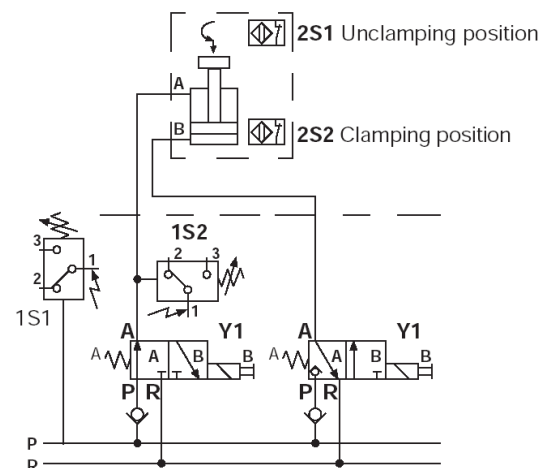
1. Push the die into the press with the swing clamping elements in the extendet (unclamping) Position.
2. Lower the press ram onto the upper part of the die. The tie rods of the swing clamping elements will pass through the clamping slots of the upper die.
3. The swing clamping elements are operated by means off a power unit. The tie rod rotates by 90° and is then in a transverse position to the clamping pont. The upper die is hydraulically clamped. Once the clamping pressunre has been reached the power unit will be switched off by the pressure switch 1S2

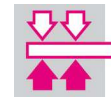
Unclamping

4. Move the die together and return the swing clamping elements into the unclamping position by means off energising the valves Y1 and Y2.
The tie rod moves out and rotates by 90° and can pass trough the clamping slot of the upper die.

Move the press ram upwards and take the die out.

Hydraulic schematics





2.2.1 Monitoring of tie rod position

In order to ensure safe functioning of the swing clamping elements it is necessary to monitor the unclamping, change-over and clamping position, so that signals for die change and machine operation are available and any malfunction is indicated immediately. For this purpose, inductive proximity switches are integrated in the cylinder housing. They react to switching positions of the piston rod. The signals for the clamping, change-over and unclamping positions can also be displayed on the control panel, in order to facilitate trouble shooting in the event of a failure. In the control system, the signals are required together with the signals emitted by the power unit pressure switches in order to ensure a trouble free cycle of the swing sink clamping elements.

When using distribution block 5700-015, failures are indicated by LEDs and can be localized.

(For a description of the distribution block, see chapter 4.3 'Electrical installation'.

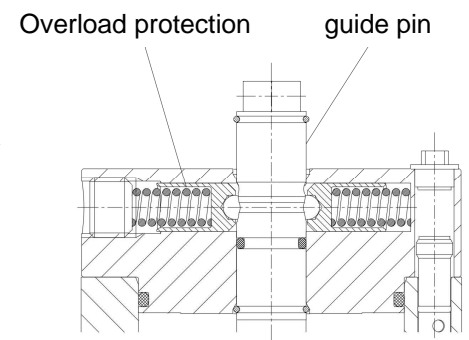
For functional dimensions for the tie rod position, see chapter 3.0 'Technical data, main dimensions'.)

2.2.2 Overload protection

Free swinging movement of the tie rod must be ensured.

If there is nevertheless an obstacle in the swinging range of the tie rod, the swing mechanism is protected by overload protection. In the case of a failure, the guide pin which is kept in position by spring-loaded balls will disengage.

(For repositioning the guide pin, see chapter 2.2.3, emergency hand control and chapter 5.0 'Trouble shooting')



2.2.3 Emergency manual control

When the overload protection has tripped or the swing sink clamping elements have fallen out of step, the guide pin can be repositioned and the tie rods can be reset to give uniform movement by manually rotating the guide pin.

An external hexagon on the guide pin at the rear of the clamping element and an internal hexagon on the clamping head of the tie rod provide for manual resetting.



Free access to one of the two hexagons for emergency manual control must be ensured!

Access may be achieved by a firmly installed extension to the external hexagon on the guide pin (e.g. by a rod assembly with reversal of the direction or by a cardan joint)

Only apply emergency manual control in a depressurized condition!



3. Technical data, main dimensions

Swing clamping element

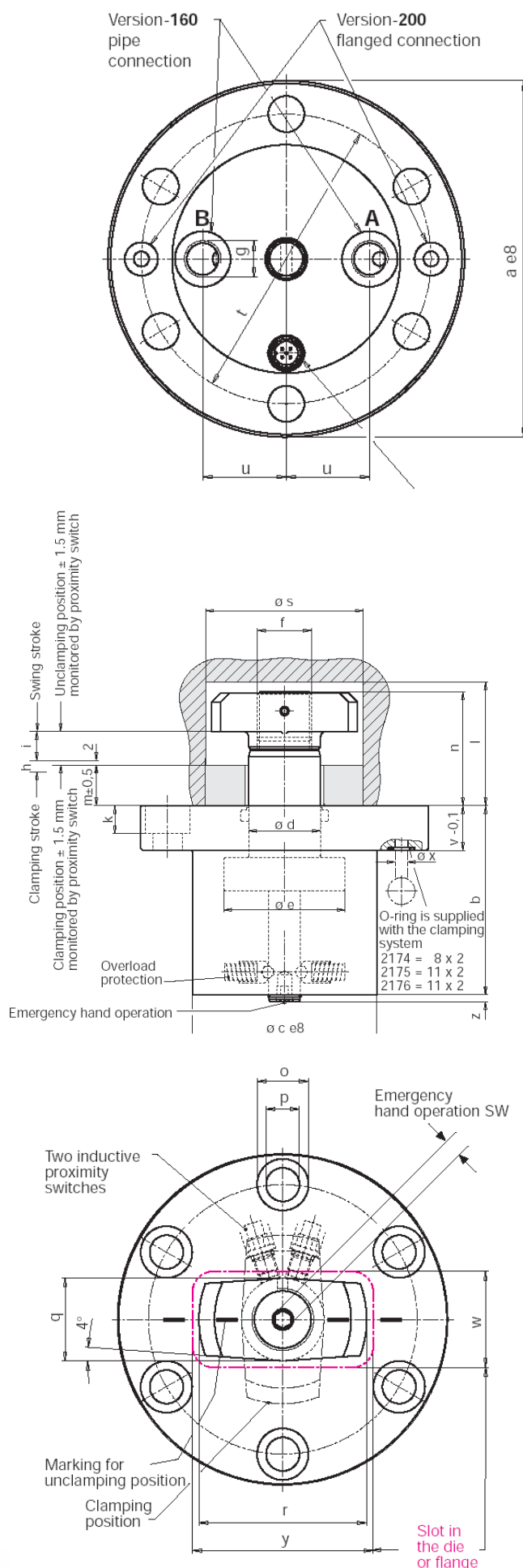
Clamping force at 400 bar (kN)	60	104	164
Clamping force at 100 bar (kN)	15	26	41
Piston-Ø e (mm)	54	70	88
Piston rod-Ø d (mm)	32	40	50
Swing stroke i (mm)	13	18	24
Clamping stroke h (mm)	5	6	6
Oil consumption clamping (cm ³)	22	52	107
Oil consumption unclamping (cm ³)	34	77	158
Max. volume flow (cm ³ /s)	10	16	25
a (mm)	128	160	192
b (mm)	84	104	122
c (mm)	82	104	126
f (mm)	M24x1,5	M30x1,5	M36x1,5
g (mm)	G 1/4	G 3/8	G 3/8
k (mm)	13	17	21
l (mm)	55	70	87
m (mm)	18	23	28
n (mm)	51	68	85
o (mm)	20	26	33
p (mm)	13	18	22
q (mm)	34	42	52
r (mm)	65	80	95
s (mm)	70	86	103
t (mm)	104	130	156
u (mm)	30	38	45
v (mm)	20	28	35
w (mm)	38	47	59
x (mm)	5,5	8	8
y (mm)	70	86	103
z (mm)	4	5	6
Emergency hand operation SW(mm)	6	8	10
Weight (kg)	4,2	8,6	15
Part no.			
with pipe connection	2174-160	2175-160	2176-160
with flanged connection	2174-200	2175-200	2176-200

Max. operating pressure 400 bar

Other sizes and special versions are available on request.

Please note!

Access to one of the two emergency hand controls is essential.



4 Installation, connection and putting into operation

4.1 Storage and transport

During transportation, clamping elements must be protected against mechanical damage. For medium term storage, they should be kept in a closed dry space. Even for short-time storage in the open air they should be protected against harmful environmental influences.

4.2 Installation

- Installation work must only be carried out when the system is in an unpressurised condition.
- Prepare the bore pattern according to the drawing / data sheet in the catalogue.

4.2.1 Hydraulic installation

Connect the swing clamping elements using DIN 2353 screw fittings (heavy design) (for connections, see chapter 3 'Technical data, main dimensions').

The hydraulic pipework on the machine side must be of sufficient size (type 2174: 8x2 DIN 2391-St35 NBK or larger; types 2175, 2176, : 12x2.5 DIN 2391-St35 NBK or larger) must be installed in accordance with the specifications (DIN EN 982) and must conform to up-to-date practice for high-pressure hydraulics.

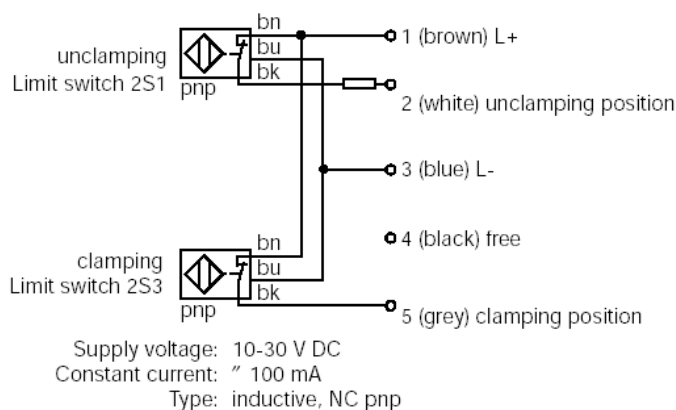
- Pipes should be as short as possible; pipe bends should have a large radius.
- Neat installation is essential for trouble-free operation of the system.
- Make sure that the pipe ends are free from burrs and that pipes, high-pressure hoses and screw fittings are cleaned and blown through.
- Protective plugs should only be removed immediately before connecting the hydraulic system.
- Swing clamps that belong together should be connected to manifold blocks, series connection should be avoided.
- Pipes leading to the power unit should be of sufficient diameter to avoid back pressure.
- Area ratio $A : B = 1 : 1,5$; **max. back pressure to connection $B = 50 \text{ bar}$**
- Provide each hydraulic port with a pressure gauge connection to enable check and adjustment of operational data. This allows the locality of functional errors to be established quickly
- Pipes should be fastened using pipe clamps.
- When using hoses, keep the minimum bending radius

4.3 Electrical installation, plug assignment

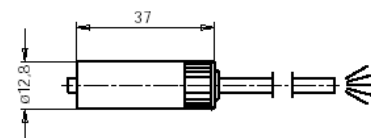
Each swing clamping element is provided with 2 proximity switches for monitoring the clamping, and unclamping position.

Clear, easy-to-maintain installation is achieved when the connecting cables are connected to a distributor block on the bed or on the ram. From here, the cables of all connected swing sink clamping elements are bundled and connected to the control cubicle in the form of 16-wire cables.

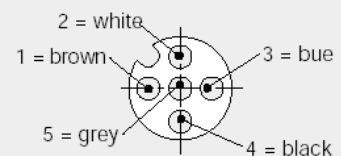
Pin assignment for three-wire proximity switches



5-pole connecting lead with screw coupling



Cable length 5 m **Part no. 5700-013**
Cable length 10 m **Part no. 5700-014**





Distribution block with LED display for connecting 4 clamping elements

Easy installation!

LED display of the unclamping, change-over and clamping position of each clamping element.

Scope of delivery: 1 distribution block

4 coupler plugs, 5 poles

1 coupler plug, 16 poles

Wiring of output plug:

Pin 1 = L+

Pin 2 = L-

Pin 3 = 1L

Pin 4 = 1U

Pin 5 = 1S

Pin 6 = 2L

Pin 7 = 2U

Pin 8 = 2S

Pin 9 = 3L

Pin 10 = 3U

Pin 11 = 3S

Pin 12 = 4L

Pin 13 = 4U

Pin 14 = 4S

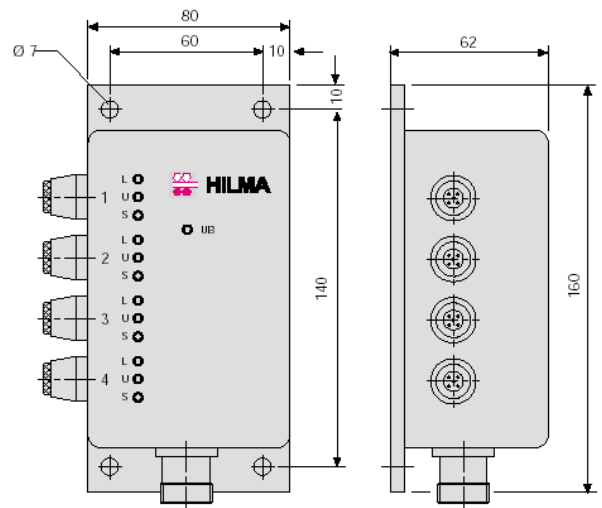
Pin 15 = free

Pin 16 = free

L = Unclamping position

U = not assigned

S = Clamping position



Part no. 5700-015

4.4 Controls

4.4.1 Hydraulic and electrical controls

The swing clamping elements are controlled by a power unit which, for reasons of safety, is completely separated from the hydraulic system of the machine.

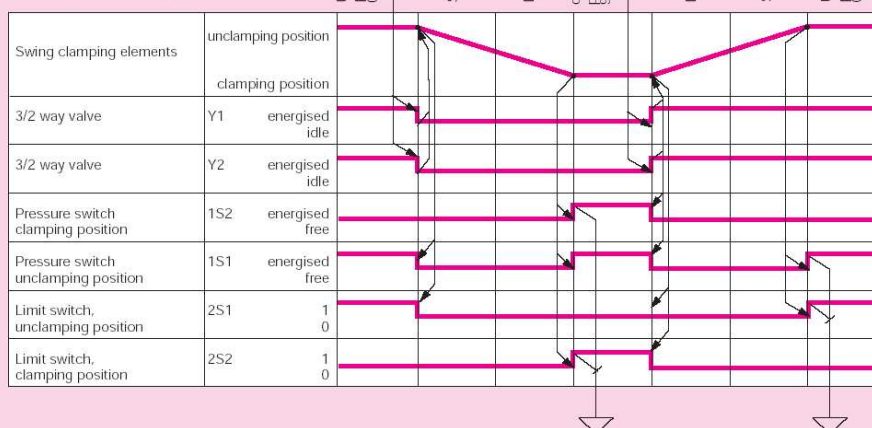
As oil is only required for clamping and unclamping, the power unit operates intermittently. A pressure relief valve protects the hydraulic systems against overpressure. When the operating pressure (max. 400 bar) is reached, a pressure switch switches the motor off. If pressure drops 10% below the set value same pressure switch causes the motor to start again.

The valves are of the seat valve type. The 24V solenoids are designed for 100% duty and deenergized when the swing clamping elements are clamped. This ensures a long service life and furthermore, the clamping force is maintained even in the event of power failure.

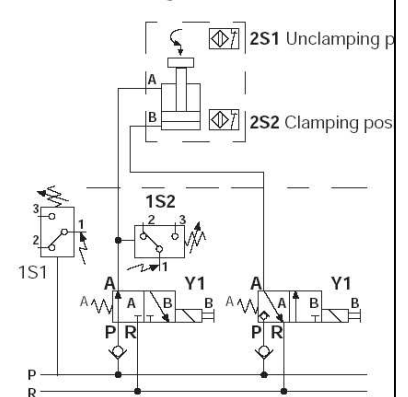
4.4.2 Hydraulic schematics, flow chart

Swing clamping element type 217x

Functional diagram



Hydraulic schematic



4.4.3 Clamping and unclamping time

When changing dies, the time required for hydraulic clamping and unclamping is rather short. The capacity of the power unit must be designed so that the clamping and unclamping cycle takes between 10 and 30 seconds. Shorter cycles are not recommended for the reason of functional safety.

Clamping and unclamping cycle:

$$Q_p = (V * z * 60) / (t * 1000) \text{ in sec}$$

t = Clamping / unclamping cycle (s)

V = Oil consumption / swing sink clamp (cm³)

z = Number of swing sink clamps

Q_p = Pump capacity (l/min)

4.4.3 Safety levels

Although malfunctions seldom occur on hydraulic quick clamping systems, failure of a component cannot be completely excluded.

In order to avoid the consequences of such a failure having an impact on the clamping safety, three safety levels are provided, and at least two of them should be installed.

Safety level no. 1:

Preferably for presses with column-guided dies:

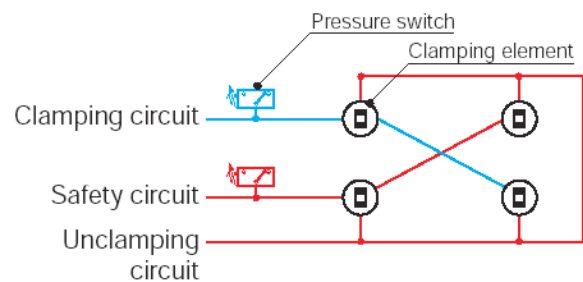
Pressure switches in every clamping circuit for controlling the clamping force, used for machine safety.

Two independent hydraulic circuits.

Clamping circuit = 50% of the clamping elements in bed and slide

Safety circuit = 50% of the clamping elements in bed and slide

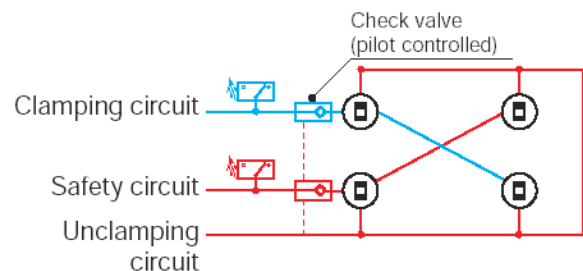
If one circuit fails, the upper or lower die is still clamped with 50% of the total clamping power.



Safety level no. 2:

For presses with dies which are not column-guided

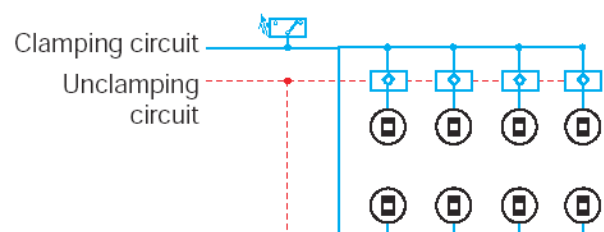
A check valve (pilot controlled) maintains pressure in the clamping and safety circuits even when the pressure drops in the remaining systems

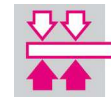


Safety level no. 3:

For power presses and car body presses with dies which are not column-guided.

All clamping elements are secured by pilot controlled check valves. If pressure drops by more than 20% of the operating pressure, the pressure switch stops the press. The check valves maintain the clamping





4.4.4 Position monitoring, die and ram

In order to protect the dies and the swing clamping elements, the correct die position must be monitored by a proximity switch.

Only once the die is correctly centred can clamping be carried out.

The ram, too, must be provided with a proximity switch which permits clamping after the ram is in contact with the die surface.

4.5 Putting into operation

Read the operating manual before putting the system into operation!

When all hydraulic and electrical connections have been checked the system can be put into operation.

Make a test run with or without a die. If you make the test run without the die, the proximity switches do not monitor the clamping position.

In the test run / manual operation the position monitoring of die and ram must be circumvented (selector switch).

In the operating position of the selector switch (no test run) clamping and unclamping is initiated by a push-button and will then take place automatically.



ATTENTION: During all the time that the die is clamped, the pump unit must not be switched off. This also applies to week-ends. Exception: the die is closed, or the upper half of the die is mechanically locked!

4.5.1 Filling with oil

Only use clean, new hydraulic oil HLP 32 DIN 51524, viscosity 150 VG 32 as per DIN 51519.

4.5.2 Starting and bleeding

Bleed the complete system with the pump running at low pressure (=20 bar, in the case of back pressure possibly higher) at the highest point. In order to achieve this, slightly open a screw fitting until the oil emerging is free from bubbles.

Operate all swing clamping elements several times until all movements are free from jerks and are completed in the calculated time.

Check the hydraulic installation for tightness. Visually check all pressurized pipes, hoses, screw fittings and clamping elements.

Check the oil level when the swing sink clamps are in an unclamped position. Refill with hydraulic oil, if necessary.



ATTENTION: When clamping and unclamping operations are carried out, keep your hands well away from the moving range of the swing sink elements.
DANGER OF INJURY!

4.5.3 Setting the operating pressure

- Set the pressure switch for pump control to the highest value.
- Switch on the pump.
- Set the operating pressure on the pressure relief valve approx. 10% above the desired operating pressure.
- Reset the pressure switch for pump until the pump switches off. Switch the pump on and off several times, thereby setting the pressure switch to the desired operating pressure.



ATTENTION: In order to prevent continuous running of the pump which might cause damage, the pressure relief valve must be set to a value which is approx. 10% above the tripping point of the pressure switch!

- Set the pressure switch for the machine controls approx. 15% below the operating pressure.



5 Trouble shooting

The swing clamping elements have left our premises in perfect condition. All functions have been tested, and necessary adjustments have been made.

If any malfunction should occur even though the conditions stipulated in chapter 4.0 (Installation and putting into operation) have been duly observed, please try to establish the cause using the table below.



ATTENTION: Only carry out repairs on the hydraulic system when no die is in the machine, the system is switched off and all circuits have been depressurized by manually operating the directional valves. Install the dies once all functions have been tested and they perform impeccably!

Failure 1 The clamping pressure is not maintained. The pump is running frequently.

Cause Loose screw fitting.

Remedial action Find leakage. Tighten the screw fitting in a depressurized condition.

Cause Loose, dirty directional valve. Leakage from P to R.

Remedial action Check in which circuit pressure falls. Dismantle the directional seat valve and clean or replace it.

Cause Seals in the swing sink element, in the pressure switch or the directional seat valve are worn out.

Remedial action Have seals replaced by qualified personnel or send clamping element for repair.

Cause Check valve in the valve block is loose.

Remedial action Flush the check valve. To do this, manually actuate the directional seat valve (clamping circuit P) while the pump is switched on. If still loose, replace the check valve.

Failure 2 Tie rod position monitoring with permanent signal or without a signal.

ATTENTION: In the case of malfunction of the tie rod position check the function of the proximity switches using an initiator testing device on the terminal box (see chapter 4.3 'Electrical installation'). Then check the evaluation electronics.

Cause for a permanent signal Short circuit in the control line, proximity switch defective or switching interval too long.

Cause for no signal Control line interrupted, proximity switch defective or guide pin disengaged.

Remedial action Check the electrical installation and the swing sink clamping element, have it repaired by HILMA experts, if necessary
If the guide pin has disengaged, take a hexagon tool to turn it in the correct position. (see chapter 2.2.2)

6. Maintenance and repair

Under normal conditions, swing clamping elements do not need special maintenance. However, a visual check of the swing clamping elements and any hoses used should be carried out once a week.

In the case of frequent clamping cycles or in a dirty environment along with high temperatures, the checking frequency should be increased.

Hydraulic valves are very sensitive to dirt. Make sure that no impurities get into the hydraulic fluid. We recommend that the oil is changed once a year.

When carrying out routine maintenance work on the press:

- inspect the hydraulic system
- check the hydraulic system for tightness.



Note: The hydraulic system is designed to **DIN EN ISO 4413** "Safety-related requirements on hydraulic systems and their components".

For the list of spare parts and installation drawings, please refer to chapter 7 (Technical appendix) and note the general information of the Hilma Katalog and the details of the swing clamping element data sheet.

After replacing a clamping element, move the new element several times in order to bleed the system through the pump unit (the same applies if hydraulic connections have been disconnected).

For putting the system into operation, see chapter 4.0 (Installation, connection and putting into operation).

7 Technical appendix, list of spare parts

When ordering spare parts, please indicate the type number engraved on the cylinder, the number and the designation of the component which are specified in the spare parts lists.



Declaration of incorporation

as per

Machinery Directive EC-RL 2006/42/EC
dated June 9, 2006.

We,

Hilma- Römheld
Schützenstrasse 74
57271 Hilchenbach,

declare, that the incomplete machine and its variants:

Swing Clamps

Part no.	2174-160 / 2174-200
	2175-160 / 2175-200
	2176-160 / 2176-200
	2177-160 / 2177-200

Special Types 8.217x.8xxx

as supplied by us has been specifically designed for incorporation into a machine, taking full account of DIN-EN ISO 12100 and 13587. The documentation has been prepared in conformity with appendix VII B. If required, the national authority may receive the documentation as a hard copy by post or by e-mail as a PDF format file. The machine into which the parts are to be integrated must only be put into operation after the conformity of the machine with the above EC directive has been demonstrated.

The design of our products is in accordance with DIN EN ISO 4413 and EN 60204-1.

Responsible for the document:
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Hilchenbach August 19, 2010
H.- J. Molka
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