KÄRCHER

Service Manual

IP 55

1.574-110.0

Foreword

Good service work requires comprehensive and practical training as well as clear documents.

We therefore provide regular basic training and further training courses for service technicians covering our whole range of products.

In addition, we produce service manuals for the most important units, which can initially be used as instructions and later for reference purposes.

Furthermore, we regularly provide service information about new product developments.

Should you have any additions, corrections or questions regarding this document, please send them to the following quoting the given subject:

international-service@de.kaercher.com

Subject: Fall 105626

The relevant product specialist will then deal with the matter.

ALFRED KÄRCHER GmbH & Co.
CUSTOMER SERVICE TRAINING
Postfach 160
D-71349 Winnenden
www.karcher.com

Dry ice basics

Hazards

The following must be noted and observed when operating the unit:

Risk of suffocation by carbon dioxide.

The dry ice pellets consist of solid carbon dioxide. During operation of the unit the carbon dioxide level in the workplace air rises. The workplace must therefore be adequately ventilated. A personal warning device should be used when working in rooms.

Indications of high carbon dioxide concentration in the inhaled air:

– 3..5%, headaches, high respiratory rate.
– 7..10%, headaches, nausea, possible unconsciousness.

If these symptoms occur, switch off the unit immediately and go out into the fresh air.

Before continuing the work, improve the ventilation measures or use respiratory equipment.

Note and observe the dry ice manufacturer's safety data sheet.

There is a risk of electric shocks.

Risk of injuries due to electrostatic discharges, risk of damage to electronic assemblies.

The system is pressurised.

Risk of cold burns.

Dry ice has a temperature of -79°C.

Never touch dry ice or cold parts of the unit without protection.

Wear safety gloves.

Risk of injury due to dry ice pellets flying about.

Wear tightly fitting safety goggles.

Wear safety gloves and long-sleeved protective clothing.

Risk of hearing damage.

Wear hearing protection.

Technical Features

General

– The unit is a dry ice pelletizer.
– Stainless steel housing.

How it works

The unit produces dry ice pellets from liquid carbon dioxide.

Liquid carbon dioxide flows into the cylinder and the pressure drop causes it to solidify, forming dry ice snow. The dry ice snow is compressed by a hydraulic cylinder and is pressed through the extruder plate. This creates cylindrical dry ice rods, which break into pellets.

Control panel with:

– Master switch.
– EMERGENCY STOP switch.
– Indicator light for oil temperature too high.
– Indicator light for motor overload.
– Indicator light for cycle time exceeded.
– Reset pushbutton.
– OFF pushbutton.
– ON pushbutton.
– Hours counter.
– Oil pressure indicator
– Pressure gauge, liquid CO_2 supply

Safety features

– EMERGENCY STOP switch in the control panel.
– Pressure relief valve, pump
– Pressure regulator, non-return valve and safety valve in the CO_2 supply system

Data

– Discharge pressure 13-21 bar (0.13-0.21 MPa)
– Pellet production, max. 55 kg/h
– Pellet diameter 3 mm
– Hydraulic oil according to DIN 51524, Part 2
– Hydraulic oil quality 16/13 in accordance with ISO 4406
– Viscosity ISO VG 32
– Oil quantity 6 litres
– Weight (without hydraulic oil) 141 kg
– Weight (with hydraulic oil) 147 kg
– Sound level (EN 60704-1) 85 dB(A)

Connection data

– Voltage 3~, 400V/50Hz
– Electric power 1.6 kW
– CO_2 supply G 1/2" BSP internal thread
– CO_2 source CO_2 storage tank, liquid phase (13-21 bar / 0.13-0.21 MPa)

View from the front

1 Housing cover
2 Side cover, RH
3 Unit connections
4 Unit frame
5 Control panel

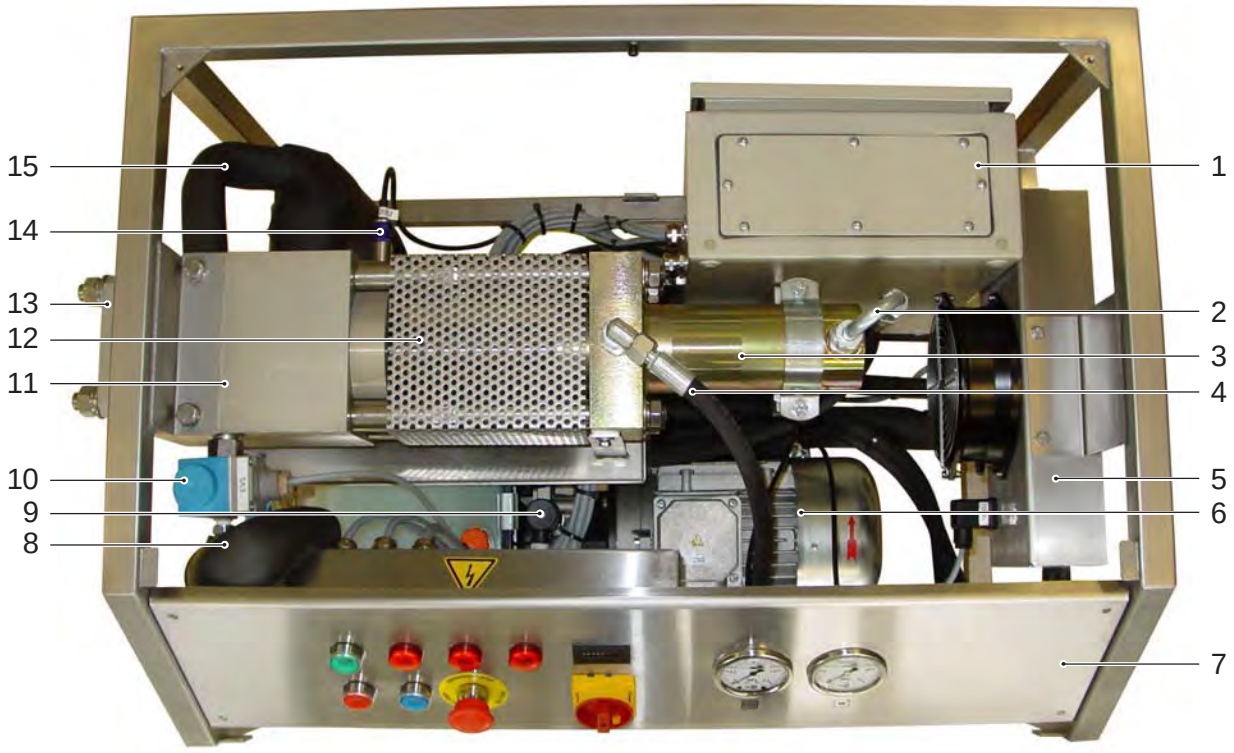
View from the right-hand side

1 Unit frame
2 Mains connection cable
3 Connection, CO_2 supply
4 Connection, condensate discharge
5 Connection, CO_2 removal
6 Side cover, RH

View from the left-hand side

1 Extruder plate
2 Discharge pipe
3 Side cover, LH
4 Unit frame
5 Housing cover, rear

View from above – housing cover removed

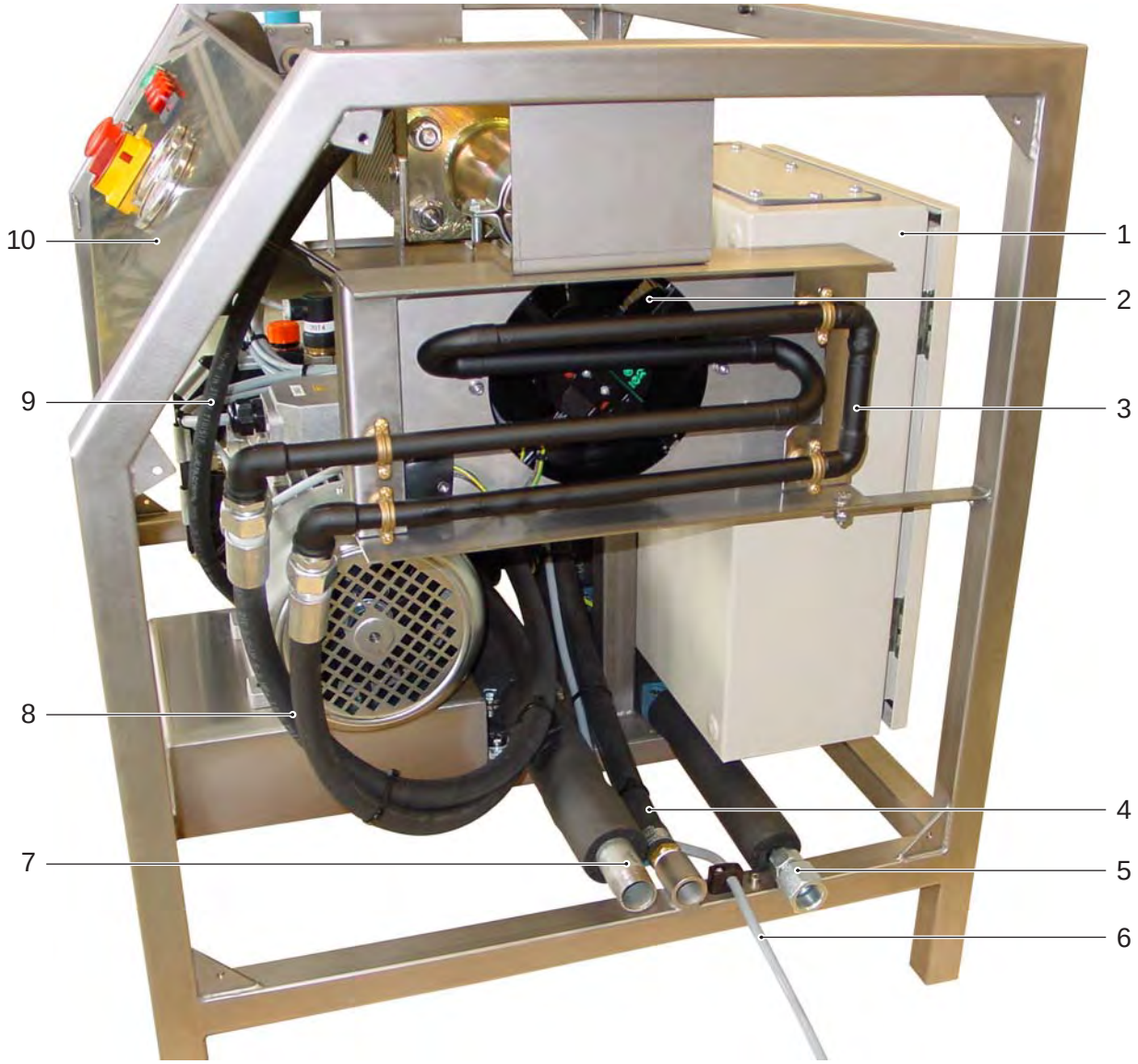


1 Switchbox
2 Hydraulic hose, extend
3 Hydraulic cylinder
4 Hydraulic hose, retract
5 Oil cooler with fan
6 Motor (10M3), hydraulic pump
7 Control panel
8 Pipe, CO_2 supply
9 Temperature switch, hydraulic oil
10 Solenoid valve (EV5), CO_2 injection nozzle
11 Housing, press cylinder
12 Protective cover, piston
13 Extruder plate
14 Limit switch (20S7), piston
15 Pipe, CO_2 exhaust

View from the front – housing cover removed

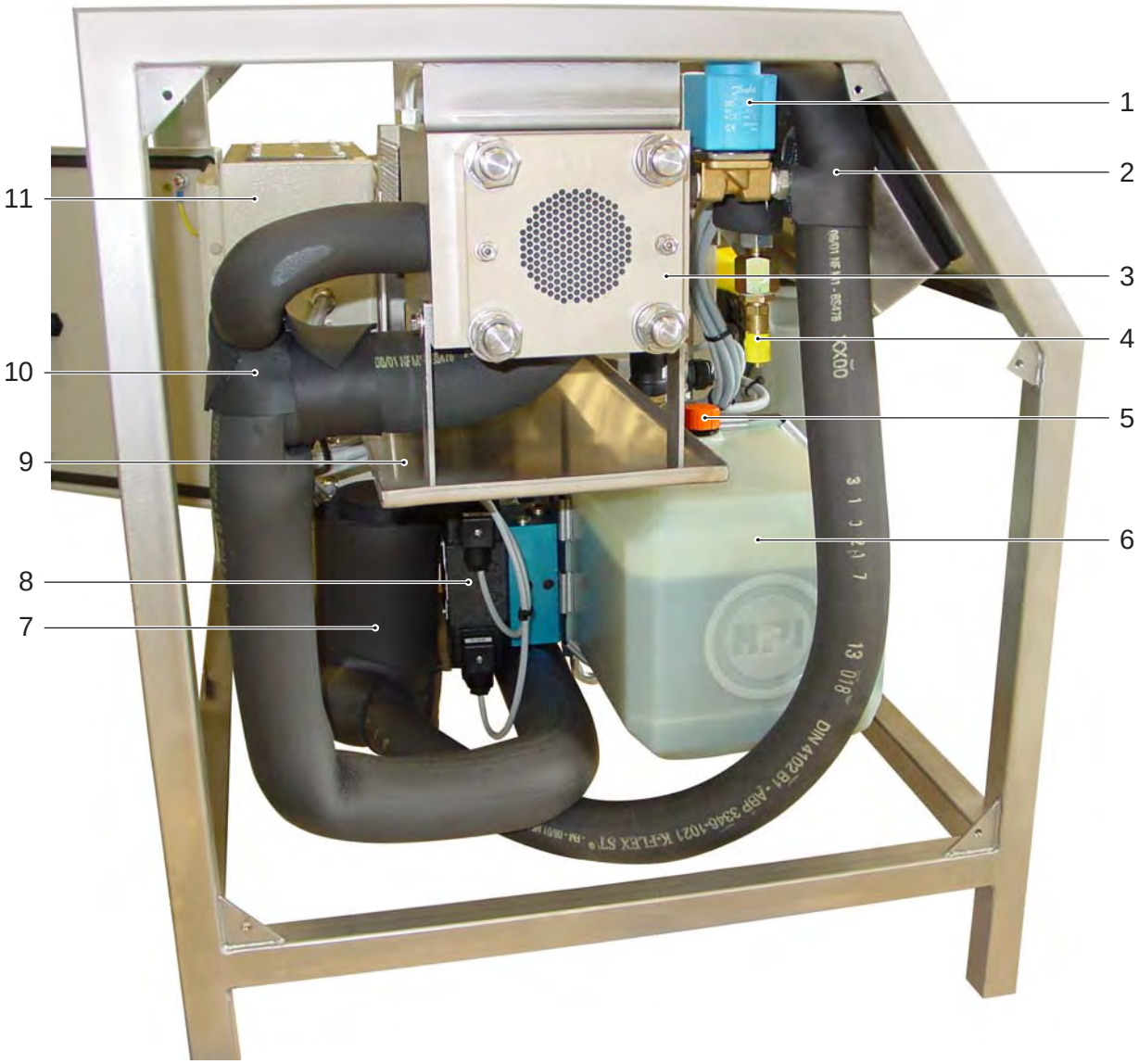
1 Control panel
2 Electrical connection, fan
3 Hydraulic hoses, oil cooler
4 Motor (10M3), hydraulic pump
5 Drain plug (1.03), hydraulic oil
6 Hydraulic pump (P1, P2)
7 Hydraulic oil tank (1.03)
8 Screw cap (1.04), hydraulic oil tank
9 Temperature switch (1.12), hydraulic oil
10 Condensate drip plate
11 Safety valve (1.10), CO_2 supply

View from the right – side cover removed



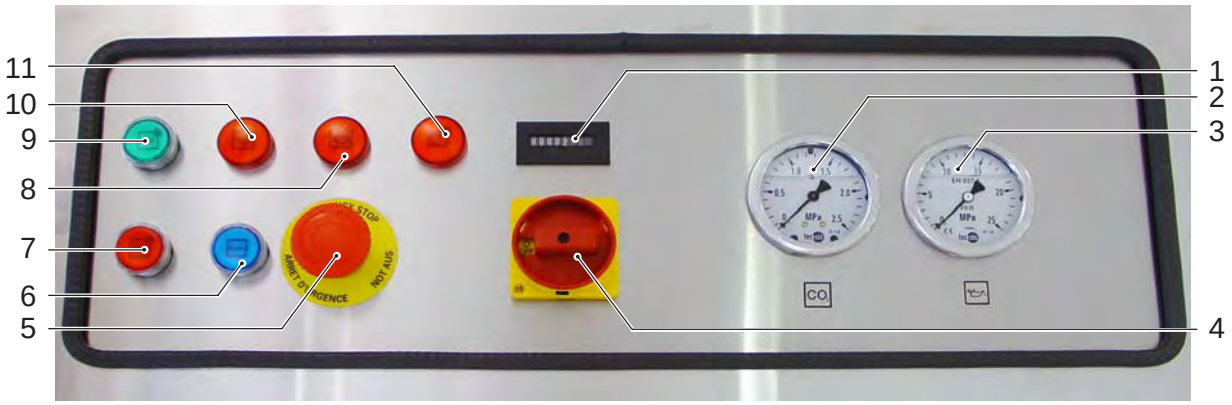
1 Switchbox
2 Fan (4.02), oil cooler
3 Oil cooler (4.01)
4 Connection, condensate discharge
5 Connection, CO_2 supply
6 Mains connection cable
7 Connection, CO_2 exhaust
8 Hydraulic hoses, oil cooler
9 Hydraulic hose, retract
10 Control panel

View from the left – side cover removed



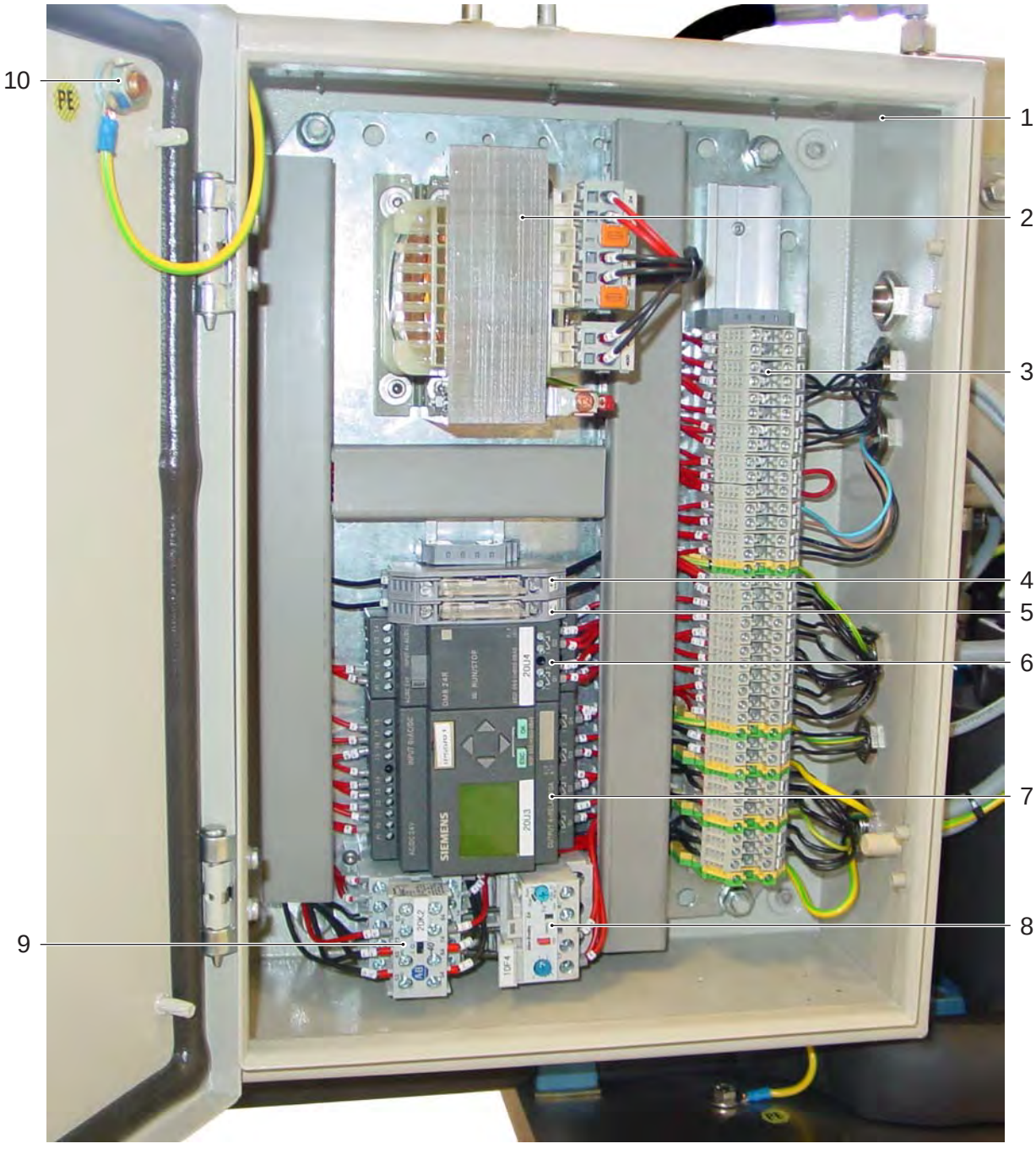
1 Solenoid valve (EV5), CO_2 injection nozzle
2 Pipe, CO_2 supply
3 Extruder plate
4 Safety valve (1.10), CO_2 supply
5 Screw cap (1.04), hydraulic oil tank
6 Hydraulic oil tank (1.01)
7 Pressure regulator, CO_2 supply
8 Control block, hydraulics
9 Condensate drip plate
10 Pipe, CO_2 exhaust
11 Switchbox

Control panel



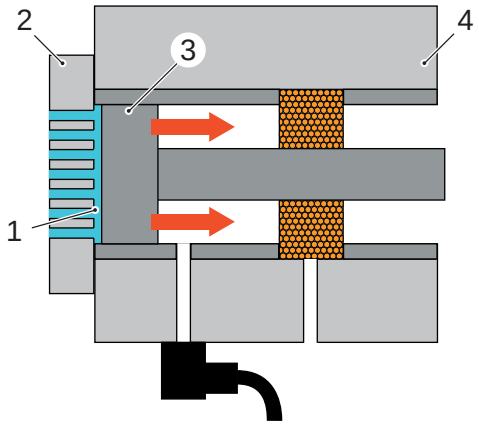
1 Operating hours counter (20P9)
2 Pressure gauge, liquid CO_2 supply
3 Oil pressure indicator
4 Master switch (10S1)
5 EMERGENCY-STOP switch (10S6)
6 Pushbutton (20S2), Reset
7 Pushbutton (20S4), OFF
8 Indicator light (20H8), motor overload
9 Pushbutton (20S3), ON and operation indicator light (20H5)
10 Indicator light (20H7), oil temperature too high
11 Indicator light (20H6), cycle time exceeded

Switchbox



1 Switchbox
2 Transformer (10T1)
3 Terminal connection strip
4 Fuse 2A (F2)
5 Fuse 2A (F1)
6 Add-on module (20U4), PCS
7 Control (20U3), PCS
8 Motor protection switch (10F4)
9 Contactor (20K2), hydraulic motor
10 Connection, earth conductor, switchbox door

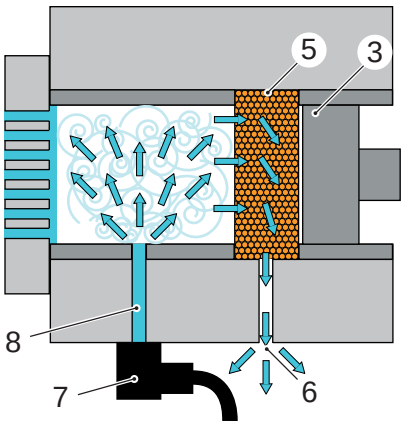
Pellet production flow diagram



Step 1

– Piston (3) moves quickly back.
– One snow plate (1) remains stopped at the extruder plate (2) (hydraulic flow diagram 2).

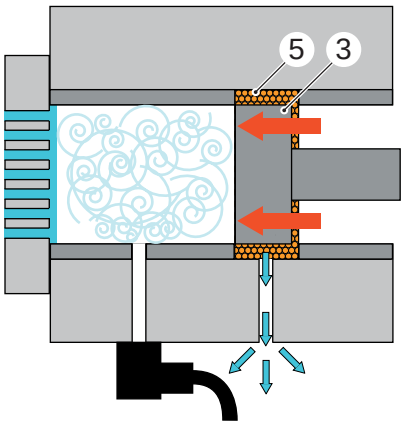
1 Snow plate
2 Extruder plate
3 Piston (3.01)
4 Press cylinder



Step 2

– Piston (3) is behind the exhaust bushing (5).
– CO_2 is injected (8).
– Part of the injected CO_2 becomes solid (CO_2 snow), gaseous CO_2 escapes via the exhaust bushing (5) through the exhaust pipe (6) into the open air (hydraulics diagram 3).

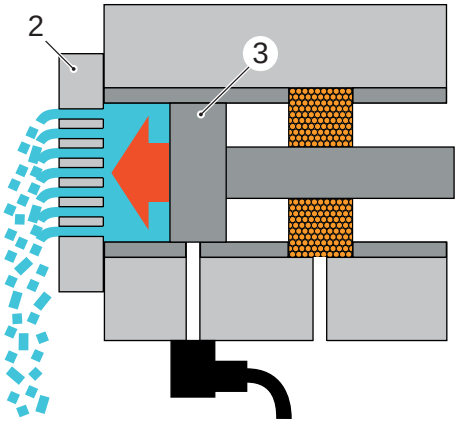
3 Piston (3.01)
5 Exhaust bushing
6 CO_2 exhaust pipe
7 Solenoid valve (EV5)
8 CO_2 injection nozzle



Step 3

– Piston (3) moves quickly forward, until the CO_2 snow is compressed. The compression begins approximately at the end of the exhaust bushing (5) (hydraulics diagram 4).

3 Piston (3.01)
5 Exhaust bushing

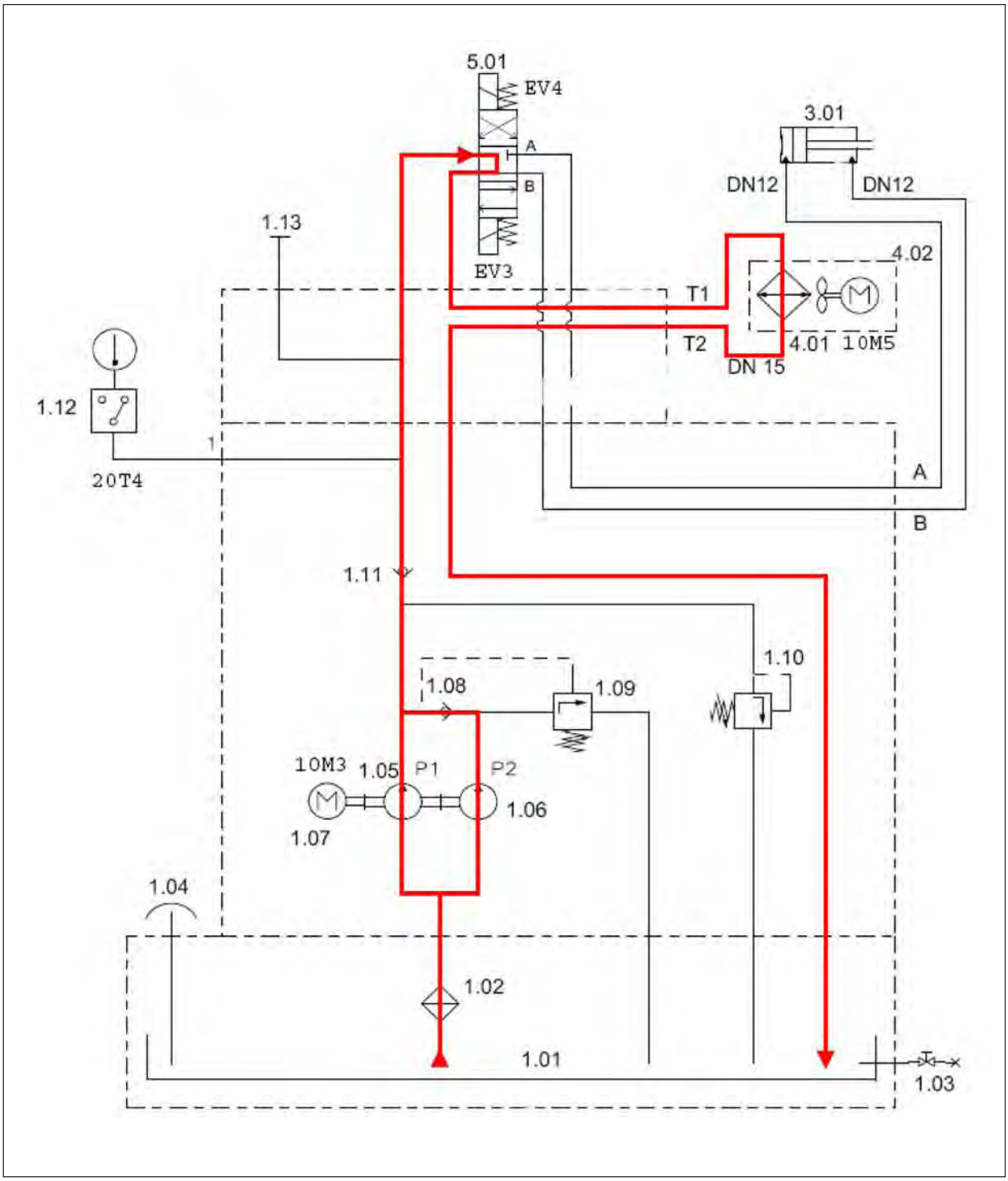


Step 4

– Piston (3) slowly moves further and compresses the CO_2 snow into dry ice.
– The dry ice is compressed by the extruder plate (2).
– The extruder plate (2) gives the dry ice its typical pellet form (hydraulics diagram 5).

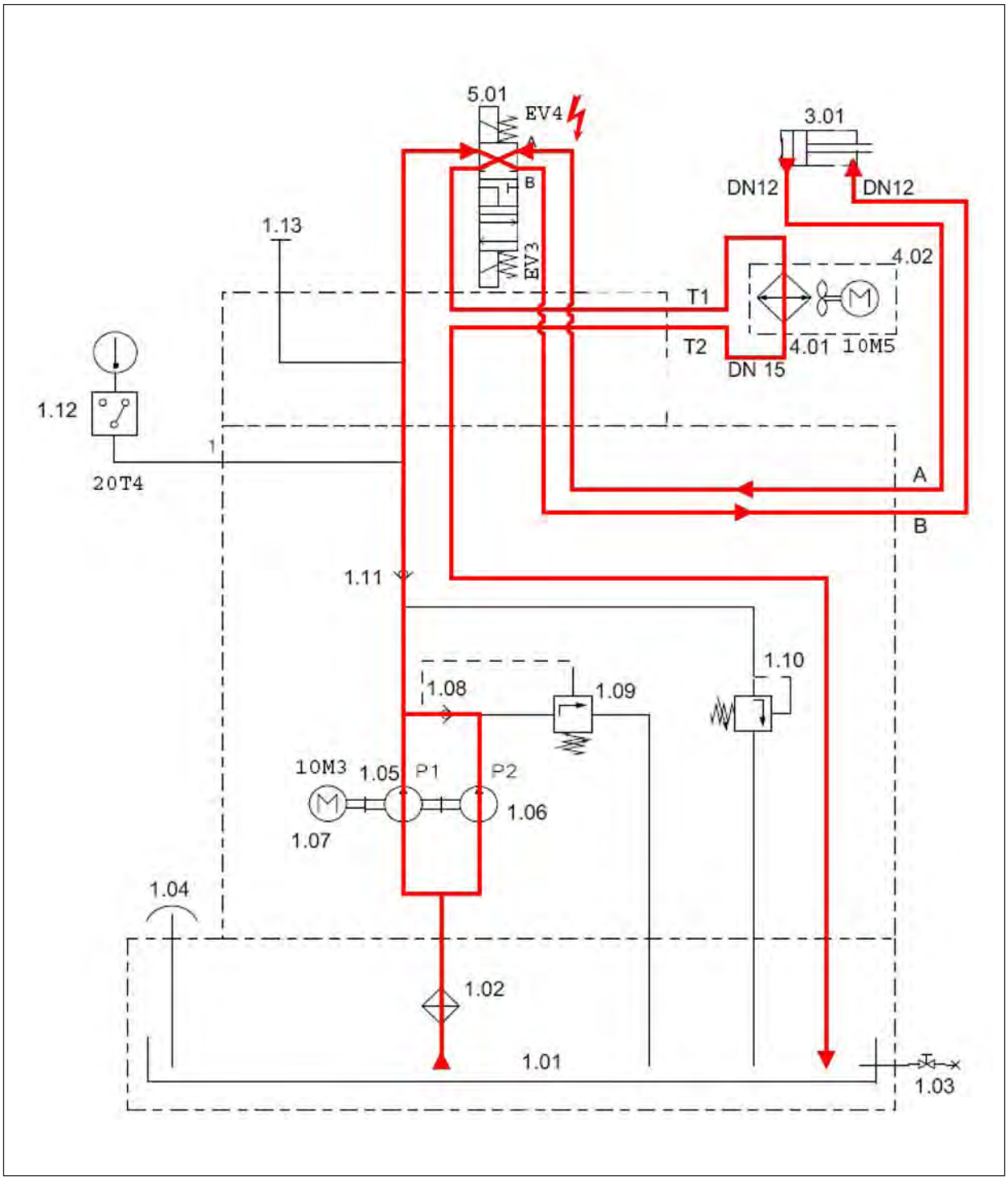
2 Extruder plate
3 Piston (3.01)

Hydraulic flow diagram 1 from Hydraulics plan 0.089-080.0



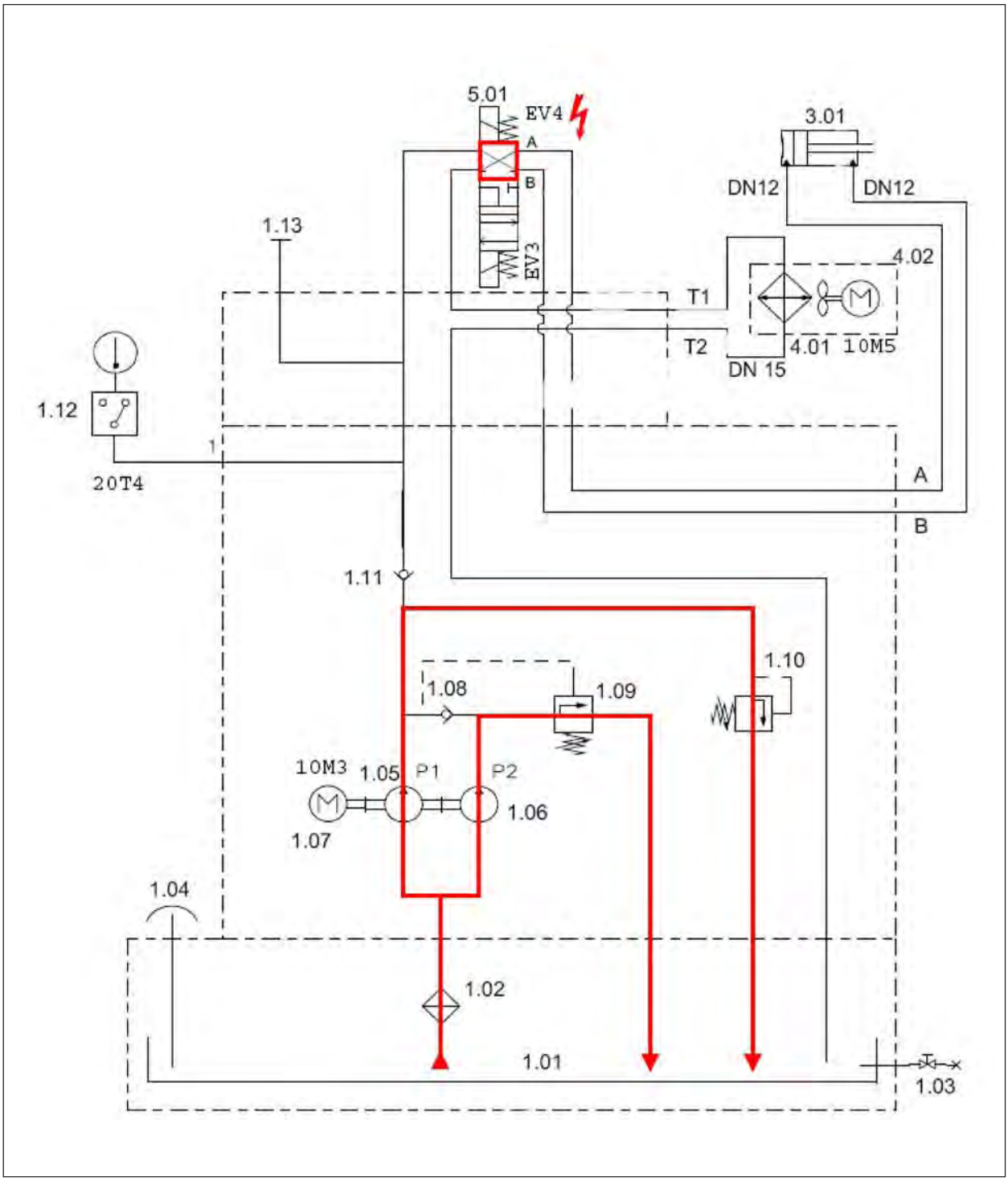
The unit is switched on, no production takes place. There is no current supply to solenoid valves (EV3) and (EV4). The piston (3.01) does not move. The complete oil quantity is pumped directly via the cooler (4.01) back into the hydraulic oil reservoir (1.01).

Hydraulic flow diagram 2 from Hydraulics plan 0.089-080.0



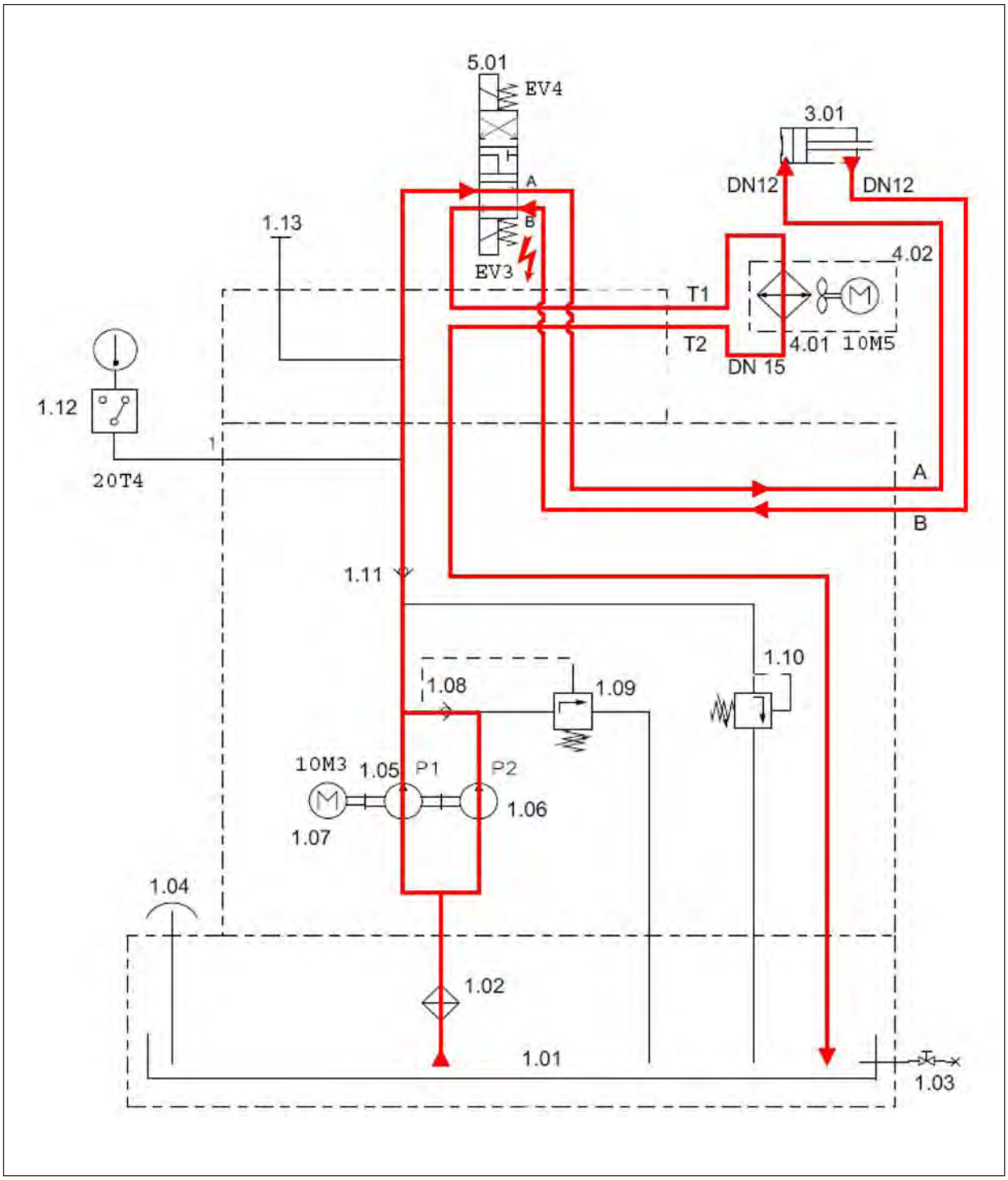
Current is supplied to solenoid valve (EV4), the piston (3.01) moves quickly back. Then CO_2 is injected into the press cylinder.

Hydraulic flow diagram 3 from Hydraulics plan 0.089-080.0



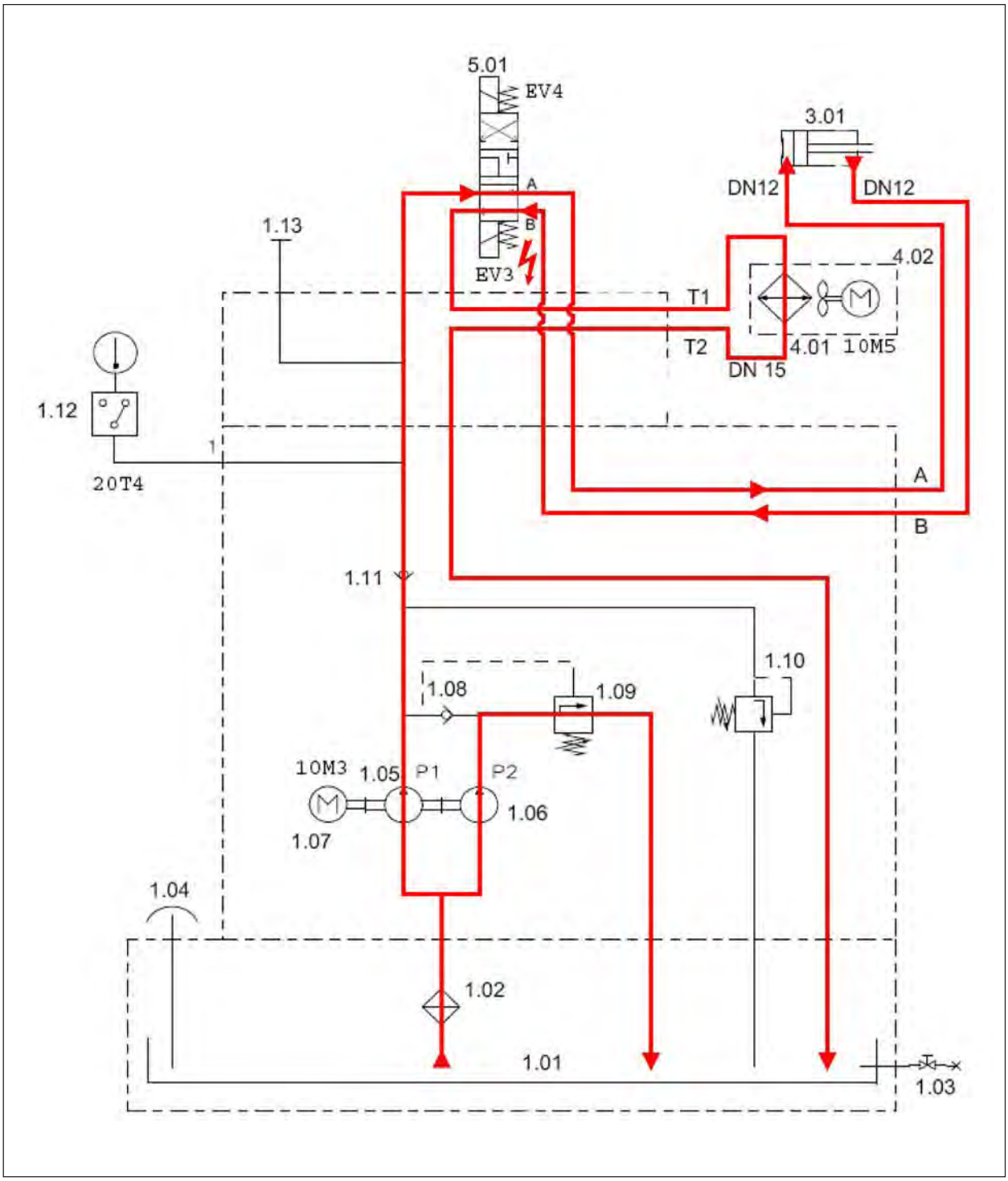
Piston (3.01) has been completely returned and
is mechanically at the limit stop position.

Hydraulic flow diagram 4 from Hydraulics plan 0.089-080.0



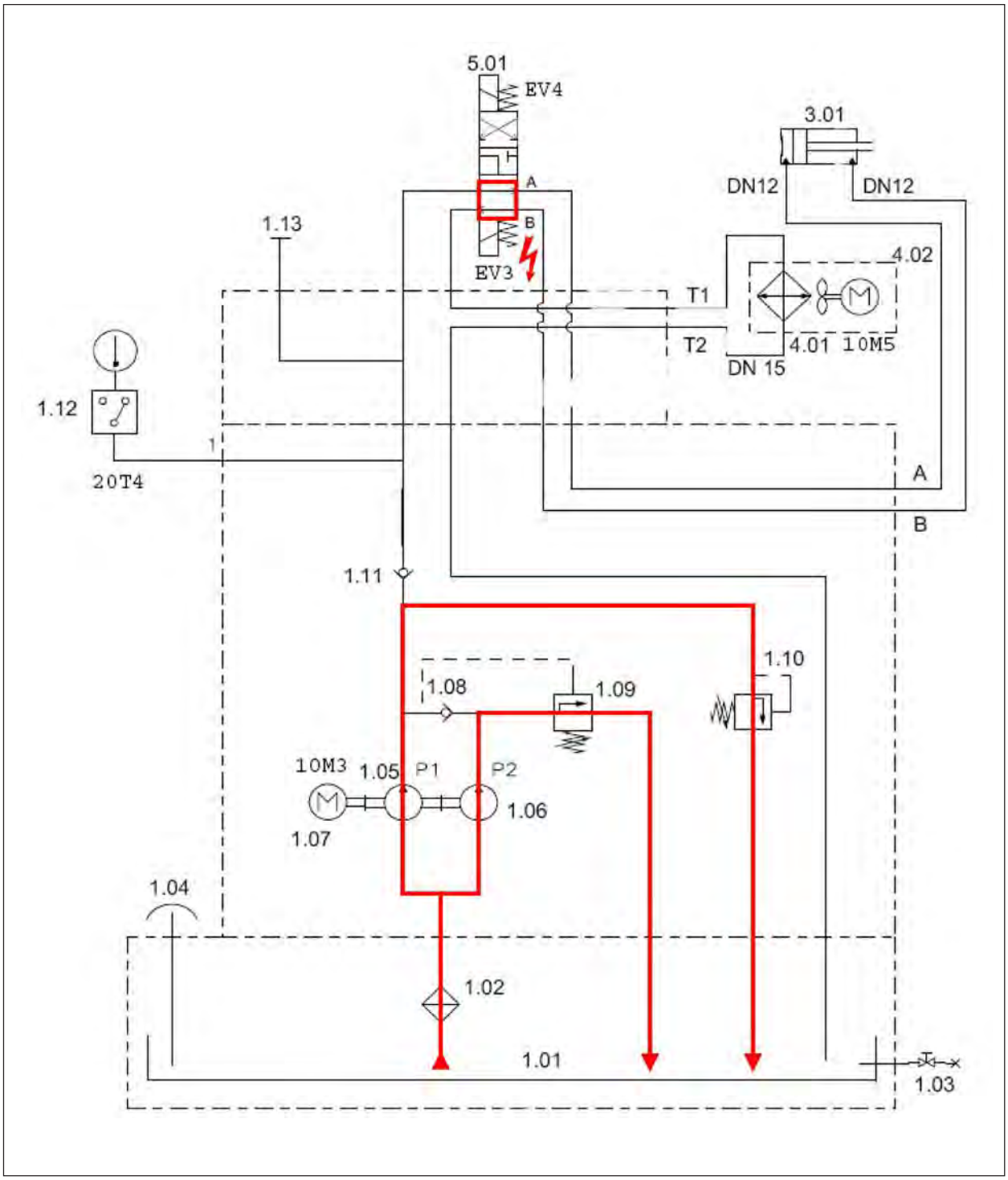
Production is active, current is supplied to solenoid valve (EV3), the piston (3.01) quickly extends (moves outwards). The hydraulic pressure is low.

Hydraulic flow diagram 5 from Hydraulics plan 0.089-080.0



Production is active, the piston (3.01) slowly extends (moves outwards). The hydraulic pressure is high. The CO_2 snow is compressed and is pressed through the extruder plate as dry ice.

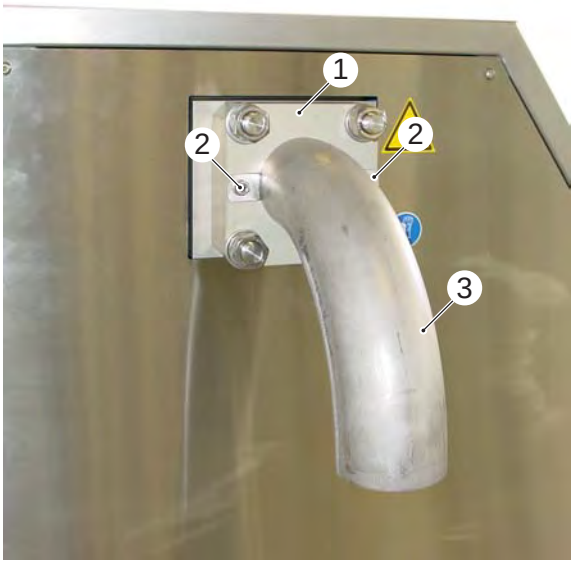
Hydraulic flow diagram 6 from Hydraulics plan 0.089-080.0



Piston (3.01) has been completely extended and is mechanically at the limit stop position.

Note:
A production cycle extends from hydraulics diagram 2 to 5. This is constantly repeated during production. If the Stop button is pressed the cycle is completed up to and including hydraulics diagram 5, then the residual quantity of dry ice is pressed out of the press chamber until hydraulic diagram 6 is active.

Dismantling the extruder plate



Discharge pipe

Extruder plate

Extruder plate dismantled

Dismantling the extruder plate

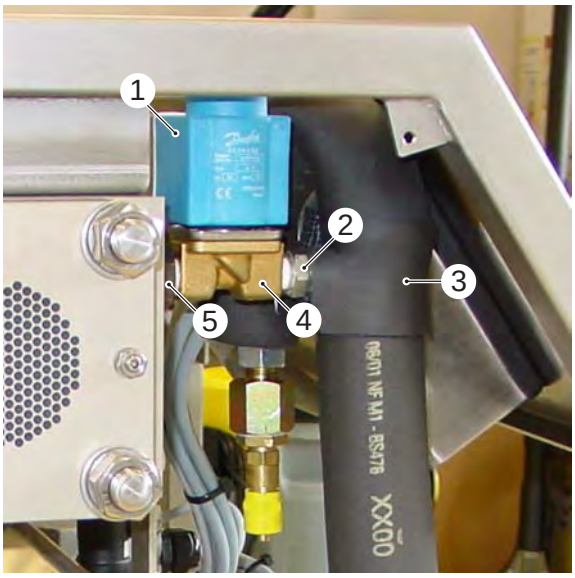
To dismantle the extruder plate (1), the discharge pipe (3) must be removed first.

– Remove the nuts (2) and then remove the discharge pipe (3).
– Remove the nuts (4) and then remove the extruder plate (1).

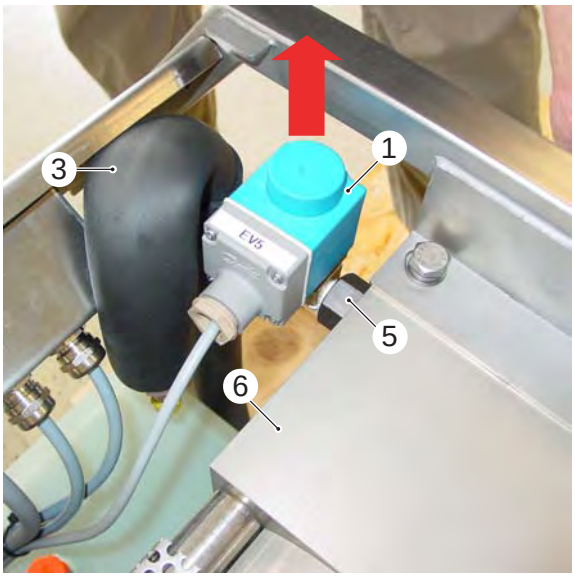
Note:
During installation, ensure that the extruder plate is installed with the „EXIT“ lettering facing upwards and legible from the outside.

1 Extruder plate
2 Nuts, discharge pipe
3 Discharge pipe
4 Nuts, extruder plate (SW24)

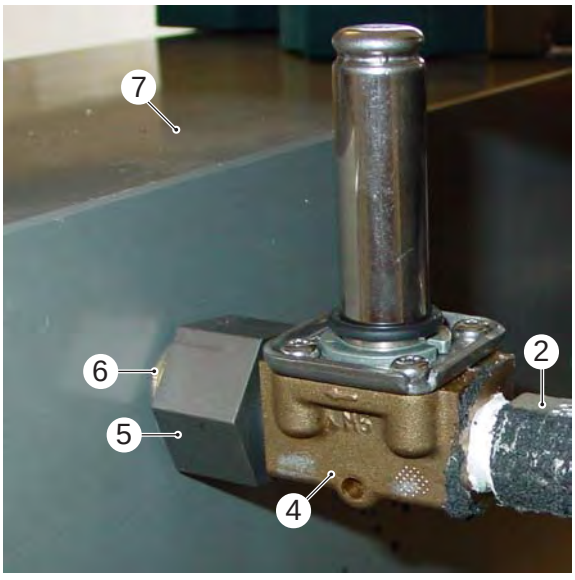
Solenoid valve (EV5) / CO_2 - dismantle injection nozzle



Position of the solenoid valve



Pull off the solenoid valve



Solenoid valve removed

Solenoid valve (EV5) / CO_2 - dismantling the injection nozzle

Before dismantling the CO_2 injection nozzle (5), the magnet coil (1) must be pulled off the solenoid valve (4) and the CO_2 supply pipe (3) removed.

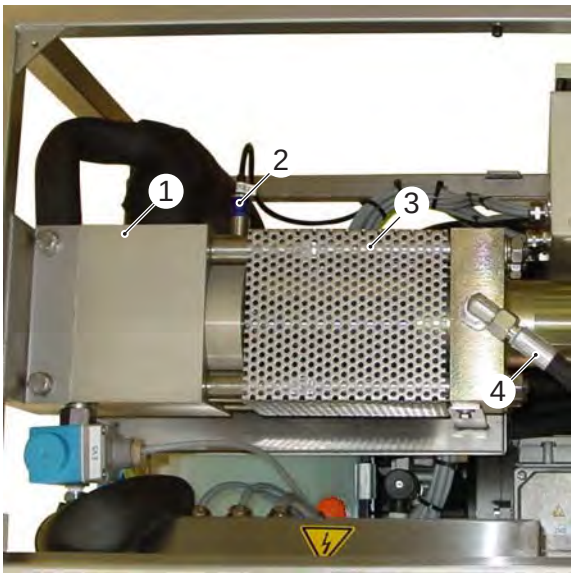
– To do this, remove the magnet coil (1) from the solenoid valve (4) by pulling it off in the direction of the arrow (red).
– Loosen the union nut from the valve housing (2) and remove the pipe (3).
– Remove the CO_2 injection nozzle (5) from the housing (7) of the press cylinder and remove the CO_2 injection nozzle together with the sealing ring (6).

Important:
The pipes are pressurised. Close the CO_2 shut-off valve. Switch unit to production until no more pellets are produced. To be safe, allow it to run for a further 2 production cycles.

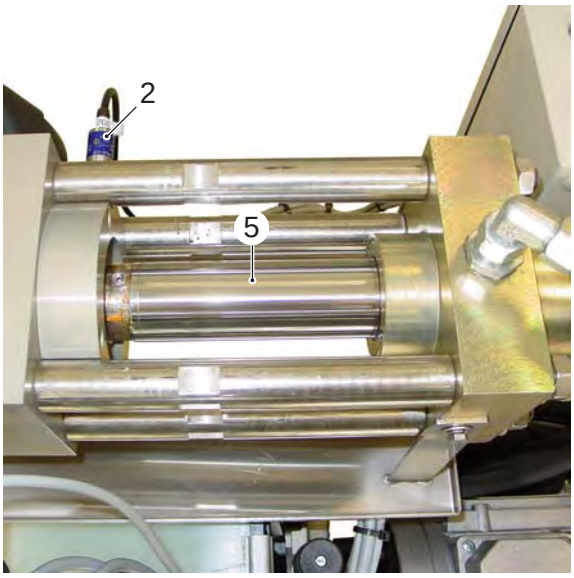
Note:
If the injection valve is dismantled or a threaded connection in pipes is opened, it must always be sealed with Teflon tape on assembly. Otherwise leaks could occur.

1 Magnet coil, solenoid valve (EV5)
2 Valve housing
3 Pipe, CO_2 supply
4 Solenoid valve (EV5)
5 CO_2 injection nozzle
6 Sealing ring, CO_2 injection nozzle
7 Housing, press cylinder

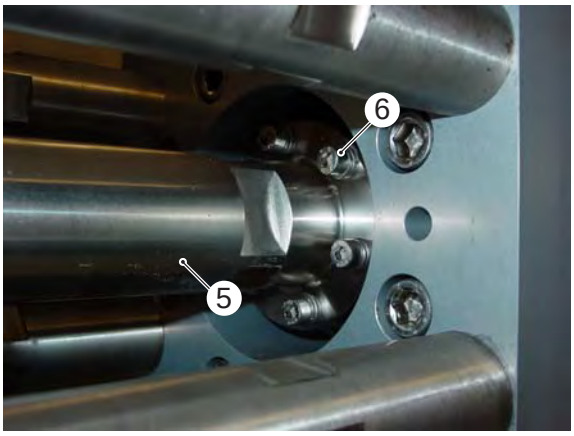
Dismantling the piston / exhaust bushings



Protective cover



Piston rod without protective cover



Piston fastening

Dismantling the piston / exhaust bushings

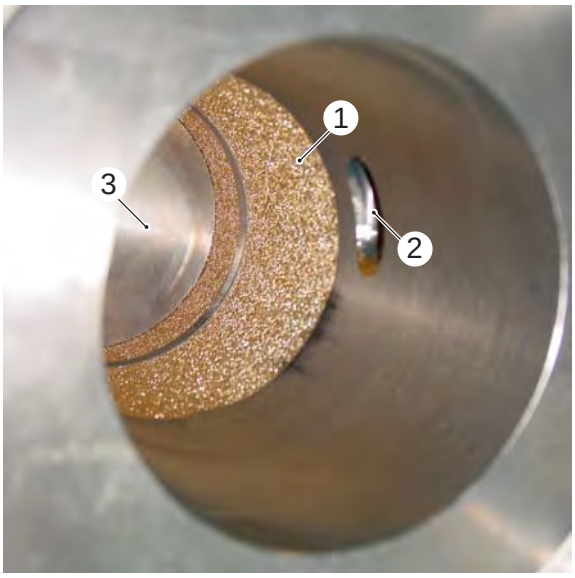
Before dismantling the piston, (see page 18), the extruder plate and the injection nozzle (see page 21 and 22) must be dismantled.

– Use master switch to switch on the hydraulics.
– Retract piston until the retaining screws (6) are easily accessible.
– Use master switch to switch off the hydraulics.
– Remove the protective cover (3) from above.
– Remove retaining screws (6), at the same time, use a suitable tool to firmly grip the piston rod (5); if necessary use it to turn the piston rod.

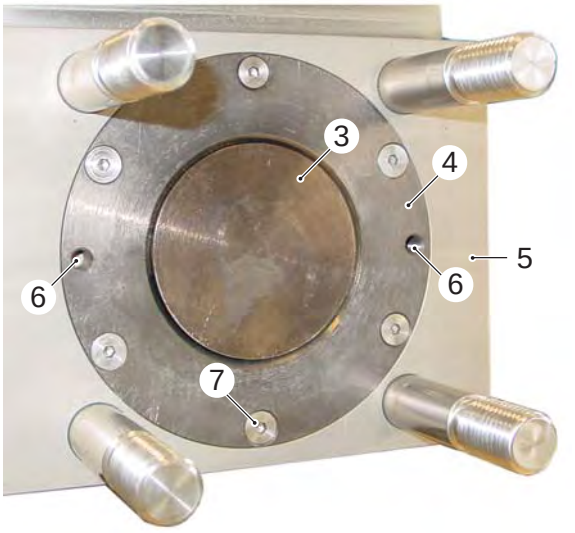
Note:
The hydraulics must always be disconnected from the pressure supply and depressurised before carrying out any work on them. Switch master switch to OFF.

1 Housing, press cylinder
2 Limit switch (20S7), piston
3 Protective cover, piston rod
4 Hydraulic hose, retract
5 Piston rod
6 Retaining screws, piston

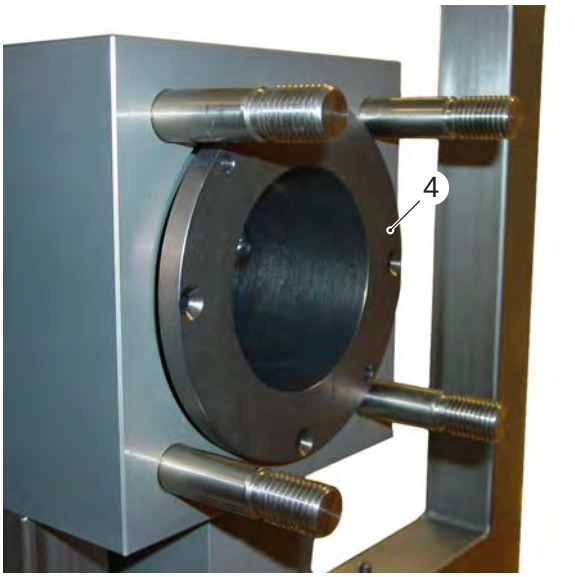
Dismantling the piston / exhaust bushings



Exhaust bushing



Removing the piston



Removing the press cylinder

Dismantling the piston / exhaust bushings

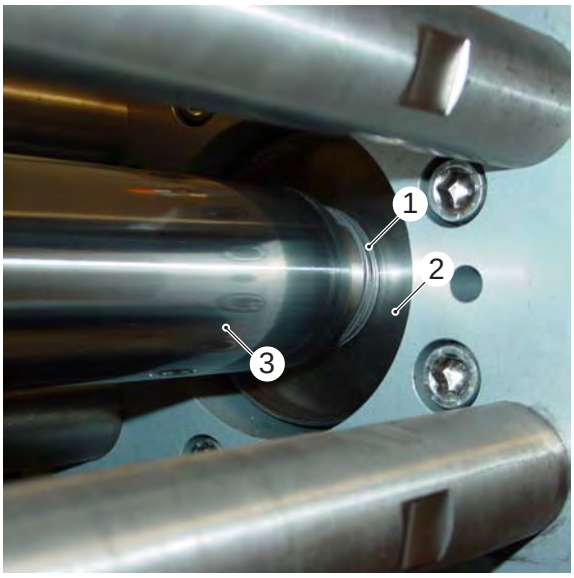
Note:
The injection nozzle (see page 22) must be dismantled before removing the press cylinder (4).

– Remove the retaining screws (7) and press cylinder (4) from the housing (5) from the front.
– If the press cylinder (4) is stuck, it can be „pressed out“ by pushing suitable screws through the threaded holes (6).
– Remove the exhaust bushing (1) from the housing tube (5) from the front.
– Remove the piston (3) from the housing (5) of the press cylinder (4) from the front.

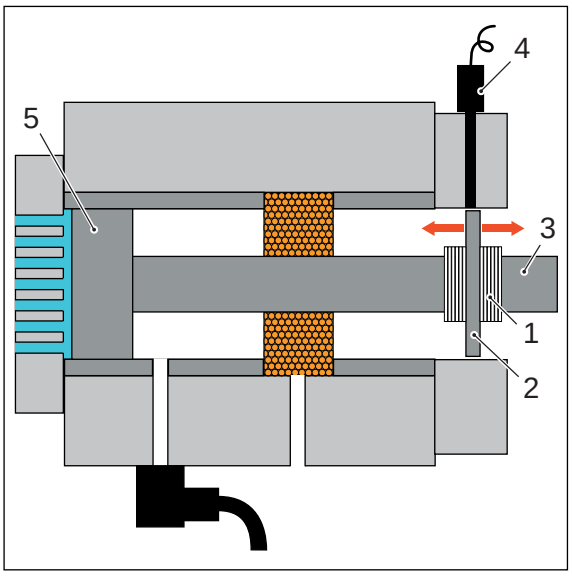
Note:
The hydraulics must always be disconnected from the pressure supply and depressurised before carrying out any work on them. Switch master switch (10S1) to OFF.

1 Exhaust bushing
2 Inlet opening, CO_2 injection nozzle
3 Piston
4 Press cylinder
5 Housing, press cylinder
6 Threaded holes, press cylinder removal aid
7 6x retaining screws, press cylinder

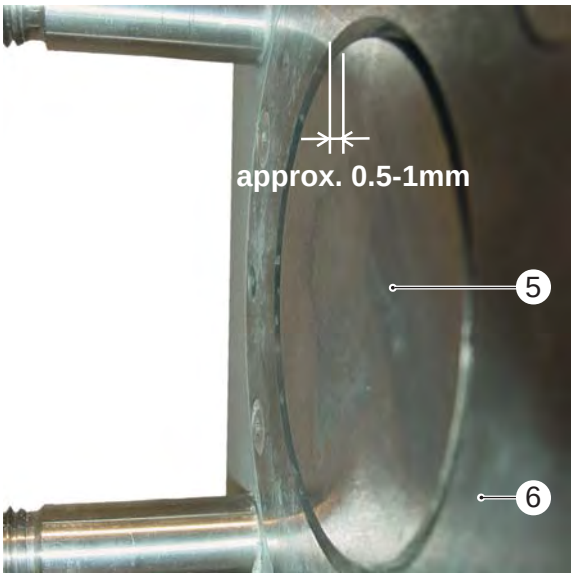
Installing the piston



Spacer washers



Disc setting, limit switch



Distance between piston and press cylinder

Installing the piston

The following must be noted and observed when installing the piston (5).

– The installed, extended piston (5) must be positioned approx. 1mm behind the front, flat surface of the press cylinder (6). The piston (5) may not protrude beyond the press cylinder (6), as otherwise the extruder plate will be damaged or destroyed.

– To establish the correct spacing, a certain number of spacer washers (1) must be installed in front of the disc (2) for actuation of the limit switch. The total number of spacer washers gives the piston setback when the piston is completely extended. The setback should be approx. 0.5-1mm.

– To do this, completely extend the installed piston (5) and measure the distance from the front, flat surface of the press cylinder (6), e.g. using a depth gauge.

– Remove the disc (2) from the piston rod (3) and fit an appropriate number of spacer washers (1) to establish the required spacing.

  The disc (2) covers the limit switch (4). As soon as the limit switch (4) is covered during production the piston moves back. This means, the position of the disc (2) within the spacer washers (1) gives the thickness of the dry ice disc. The dry ice disc is required to seal the matrix in the extruder plate during injection of the CO_2. The gaseous CO_2 should ideally escape through the exhaust pipe only.

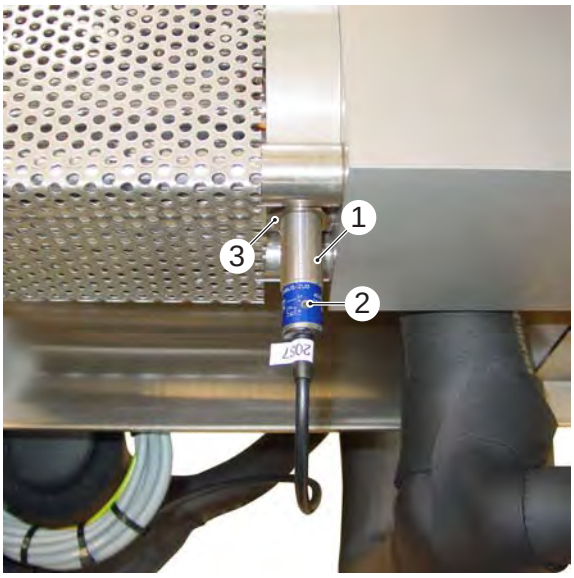
Note:
The hydraulics must always be disconnected from the pressure supply and depressurised before carrying out any work on them. Switch master switch (10S1) to OFF.

1 Spacer washers, piston
2 Disc, limit switch
3 Piston rod
4 Limit switch (20S7)
5 Piston
6 Press cylinder

Exhaust bushings

1 Exhaust bushing
2 Opening for injection nozzle
3 Press cylinder

Dismantling the limit switch



Limit switch.

1 Limit switch (20S7)
2 Indicator light, limit switch
3 Lock nut, limit switch

Dismantling the limit switch

The following work must be carried out to dismantle the limit switch.

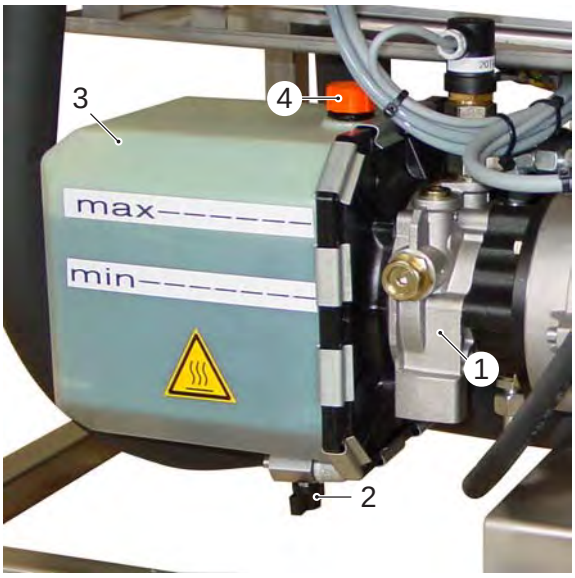
– Loosen the lock nut (3) and remove the limit switch (1).

Note:
During assembly ensure that the disc for querying the end position on the piston rod (see page 25, Item 2) is positioned at the level of the drillhole for the limit switch. Screw in the limit switch (1) until the indicator light (2) lights up when the control voltage is applied to the limit switch (1).

Do not screw in the limit switch too far; the limit switch can be sheared off by the disc on the piston rod.

Important:
Do not screw the limit switch in too far. The limit switch can be sheared off by the disc on the piston rod.

Oil change



Oil change

1 Hydraulic pump (P1, P2)
2 Drain plug (1.03), hydraulic oil
3 Hydraulic oil tank (1.01)
4 Screw cap (1.04), hydraulic oil tank

Oil change

Change the oil only if the oil is hot.

– Undo the screw cap (4) of the hydraulic oil tank (3).
– Place a suitable oil drip pan under the drain plug (2).
– Open the drain plug (2) and let the oil drain.
– Close the drain plug (2) and fill the tank with new hydraulic oil until the oil level is between the „MIN“and „MAX“ marking.
– Replace the screw cap (4) of the hydraulic oil tank (3).
– Start the unit and check the oil level in the hydraulic oil tank (3). If necessary, top up the hydraulic oil.

Note:
The hydraulics must always be disconnected from the pressure supply and depressurised before carrying out any work on them. Switch master switch to OFF.

Caution when handling hot oil. It can cause severe burns or result in blindness if it comes into contact with the eyes!

Fire risk!

The old hydraulic oil must be collected and disposed of according to the local regulations.

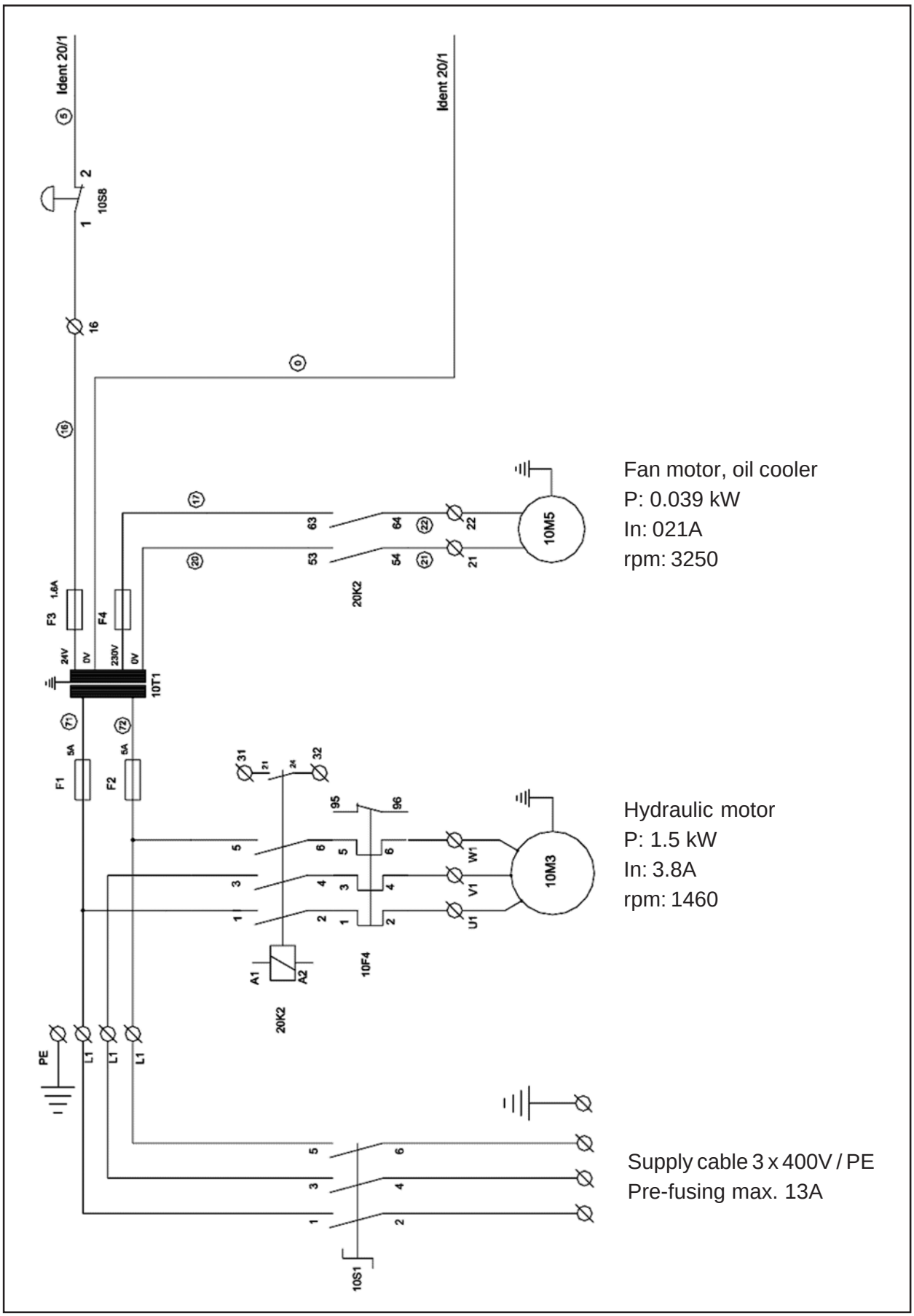
Troubleshooting

Faults with display	Solution
„Oil temperature too high“ indicator light lights up	– Check/clean/replace oil cooler fan (4.02). – Check/replace temperature switch (20T4).
„Motor overload“ indicator light	– Press the Reset pushbutton (20S2). – Restart the unit. – Check/reset motor protection switch 10F4.
„Cycle time exceeded“ indicator light	– Check/replace the extruder plate and piston. – Check/replace limit switch (20S7). – Check the electrical connection of the hydraulic pump (P1, P2). – Check/replace solenoid valves (EV3 and EV4).

Faults without display	Solution
No dry ice snow production	– Wait until liquid carbon dioxide has displaced the gas from the pipe. – Check/replace solenoid valve (EV5).
Too much dry ice snow in the exhaust pipe	– Check/replace solenoid valve (EV5). – Check/replace exhaust bushings.
Water drips from the unit	– Check/clean condensate drip plate. – Check/clean condensate pipe.

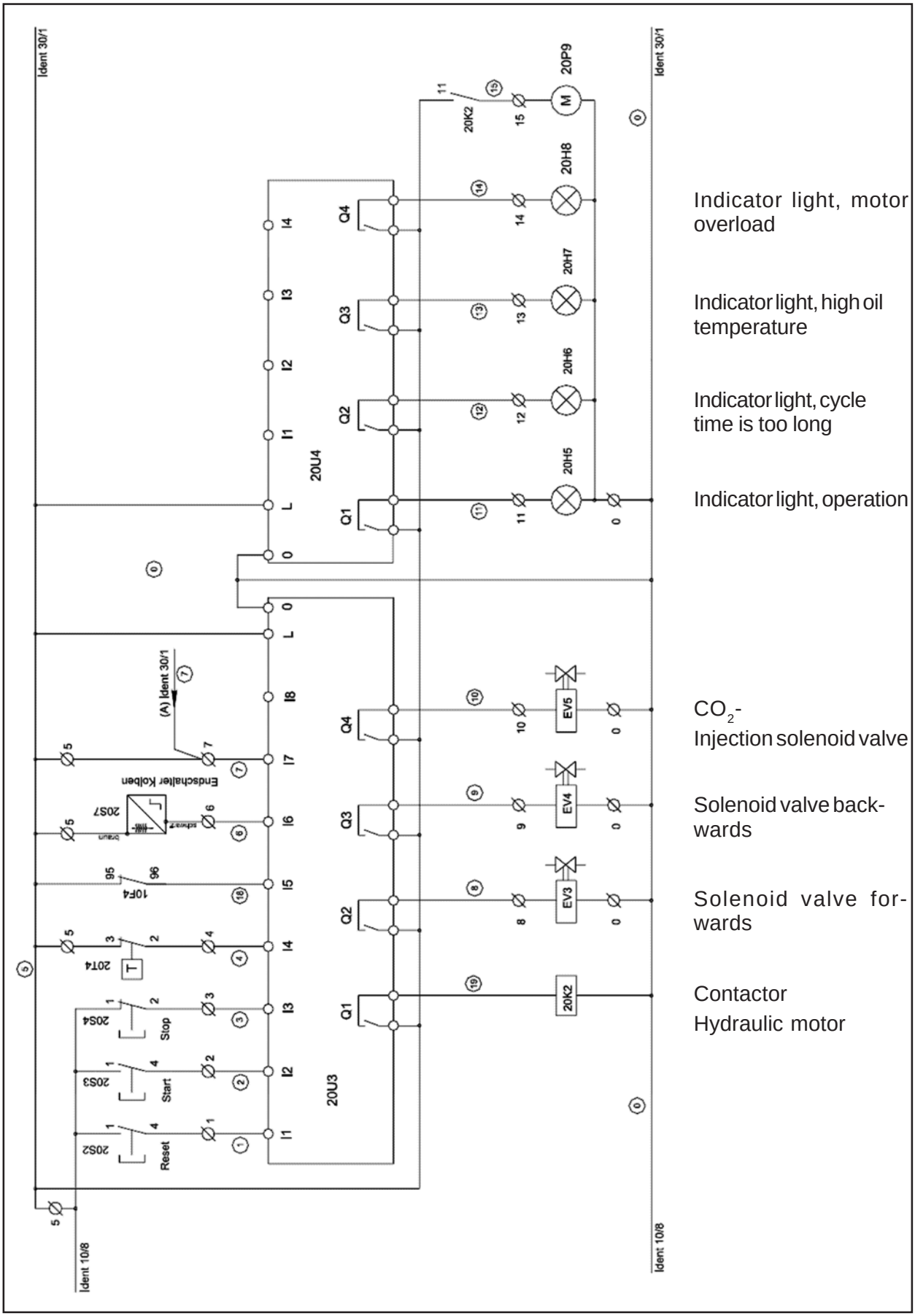
Extract from circuit diagram 0.089-010.0

Please always use the circuit diagram revision status applicable to the unit version!

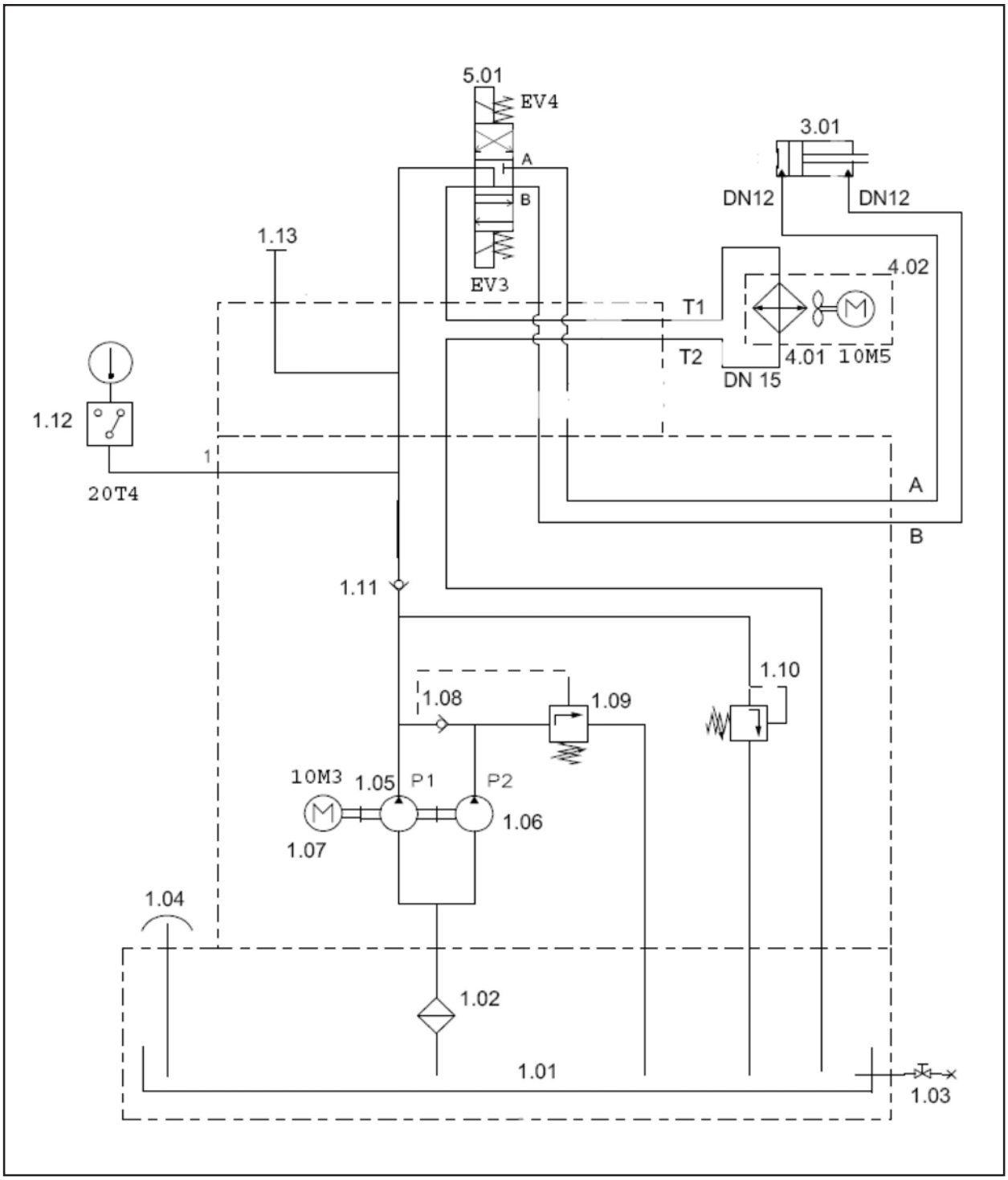


Extract from circuit diagram 0.089-010.0

Please always use the circuit diagram revision status applicable to the unit version!



Hydraulics plan 0.089-080.0



1.01 Hydraulic oil tank, 7 litres
1.02 Intake filter
1.03 Oil drain tap, R1/4''
1.04 Oil filler neck and venting
1.05 Hydraulic pump (P1)
1.06 Hydraulic pump (P2)
1.07 Electric motor (10M3)
1.08 Non-return valve
1.09 Overflow valve, 5 MPa
1.10 Safety valve, 22 MPa
1.11 Non-return valve
1.12 Oil temperature switch (20T4)
1.13 Measuring point
3.01 Hydraulic cylinder
4.01 Oil cooler
4.02 Fan (10M5)
5.01 Solenoid valve (EV3/EV4), 24 VAC

Technical specifications

Unit type	Unit No.	Circuit Diagram	Hydraulics plan	Operating instructions	Spare parts list
IP 55	1.574-110.0	0.089-010.0	0.089-080.0	5.962-284.0	5.962-287.0

The technical data sheet and the circuit diagram will be included in the next issue of the spare parts CD-ROM (DISIS) and are also available in kaercher-inside (https://kaercher-inside.com).

If required, the operating instructions and the spare parts lists can be ordered as a paper copy from the spare parts service by quoting the relevant part number.

Special Tools

No details.

Tightening torque

M3	1.1 Nm
M4	2.5 Nm
M5	5.1 Nm
M6	8.8 Nm
M8	21.4 Nm
M10	44 Nm
M12	88 Nm
M14	119 Nm
M16	183 Nm
M20	224 Nm