Installation and maintenance instructions for contractors

Buffer cylinder for solar thermal systems

SP 400 SHU

6 720 641 803 (2009/12) EN

JUNKERS
Bosch Gruppe

Contents

1 Explanation of symbols and safety information

1.1 Explanation of symbols

Warning symbols

Safety instructions in this document are framed and identified by a warning triangle which is printed on a grey background.

Electrical hazards are identified by a lightning symbol surrounded by a warning triangle.

Signal words indicate the seriousness of the hazard in terms of the consequences of not following the safety instructions.

- **NOTICE** indicates possible damage to property or equipment, but where there is no risk of injury.
- **CAUTION** indicates possible injury.
- **WARNING** indicates possible severe injury.
- **DANGER** indicates possible risk to life.

Important information

Notes contain important information in cases where there is no risk of personal injury or material losses and are identified by the symbol shown on the left. They are bordered by horizontal lines above and below the text.

Additional symbols

Symbol	Meaning
▸	a step in an action sequence
→	a reference to a related part in the document or to other related documents
•	a list entry
–	a list entry (second level)

Tab. 1

1.2 Safety instructions

Positioning and conversion

- ▸ Only permit an authorised contractor to install or modify this cylinder.
- ▸ Only use this cylinder to heat up heating water.
- ▸ On the solar side, use ≥ 150 °C installation material resistant to heat and glycol.
- ▸ Use only materials on the heating water side that can withstand temperatures up to 110 °C.
- ▸ Prior to the cylinder installation:
  Isolate the boiler and all other BUS subscribers from the power supply (230 V AC).
- ▸ Purge and fill the solar thermal system only when the sun is not shining on the collectors and no frost is expected.

Function

- ▸ Observe these installation and maintenance instructions to ensure correct operation.
- ▸ Never change the system construction.
- ▸ Never close the outlet of the safety valves.
- ▸ Never close the cylinder ventilation slots.

Risk of scalding

- ▸ When the cylinder is in operation, temperatures in excess of 60 °C can occur. Therefore, allow the cylinder to cool down prior to any work on the solar or heating circuit.
- ▸ Activate the air vent valve only after the temperature of the heat transfer medium and the heating water has dropped below 60 °C.

Maintenance

- ▸ **Customer recommendation:** Arrange a maintenance and inspection contract with an approved contractor.
- ▸ Prior to a system service:
  Isolate the boiler and all other BUS subscribers from the power supply (230 V AC).
- ▸ Only use genuine spare parts!

2 Product information

SP 400 SHU are buffer cylinders with internal indirect coils and integral solar module for transferring the energy to the heating water.

In the following text, the buffer cylinder will be referred to as “cylinder”.

2.1 Intended use

Only use this cylinder for operation with solar thermal systems in conjunction with suitable heating controllers and boilers of the same manufacturer.

The internal indirect coil and the solar module for this cylinder are exclusively designed for operating solar thermal systems filled with propylene glycol: water mixtures (Tyfocor® L or Tyfocor® LS). The use of any other heat transfer medium is not permitted.

▶ Only use this cylinder to heat up heating water.

Any other use is deemed to be inappropriate. Any resulting damage is excluded from the manufacturer's warranty.

2.2 Standard package

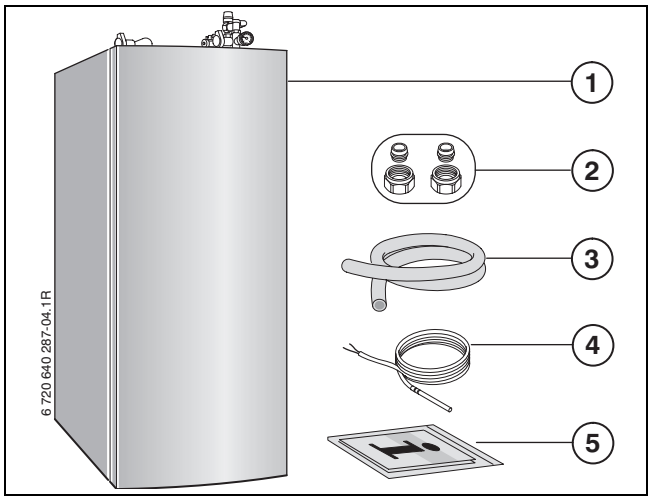

Fig. 1

1 Cylinder
2 Locking ring fittings Ø 15 mm (optional)
3 Drain for safety valve 2.3 m long
4 Collector temperature sensor (T_1)
5 Printed documents

2.3 Type plate

The type plate is fitted to the top cylinder cover (→ Fig. 2, [19], Page 5).

On the type plate you will find cylinder details, part number, approval data and the encoded date of manufacture (FD).

2.4 Product description

- Cylinder and casing:
  - All-round CFC and FC-free rigid foam insulation.
  - Internal indirect coil for solar heating.
  - Temperature-sensitive heating water stratification.
  - Drain tap for heating water
  - Manual air vent valve for heating water
  - Heating water temperature display
  - Height-adjustable feet for levelling the cylinder vertically.
  - The casing is made from coated sheet steel. With replaceable side parts and removable front cover.
- For connection to a suitable boiler:
  - Fitted cylinder temperature sensor (TS_3) with connecting cable and plug.
  - Power cable (230 V AC).
  - BUS connection (BUS).
- Solar control unit for regulating solar heating water heating.
- Fitted cylinder temperature sensor (T_2) connected to the solar control unit.
- Collector temperature sensor (T_1) for connection to the solar control unit.
- Insulated flow assembly of the solar module:
  - Locking ring fittings for 15 mm and 18 mm
  - Shut-off valve
  - Gravity brake
- Insulated return assembly of the solar module:
  - Locking ring fittings for 15 mm and 18 mm
  - Shut-off valves
  - Gravity brake
  - Three-stage solar circuit pump
  - Automatic air vent valve with locking cap
  - Drain & fill valves
  - Pressure gauge
  - Safety valve with drain hose
  - Flow meter with adjuster and display
  - Connection options for solar expansion vessel

2.5 Physical and connection dimensions

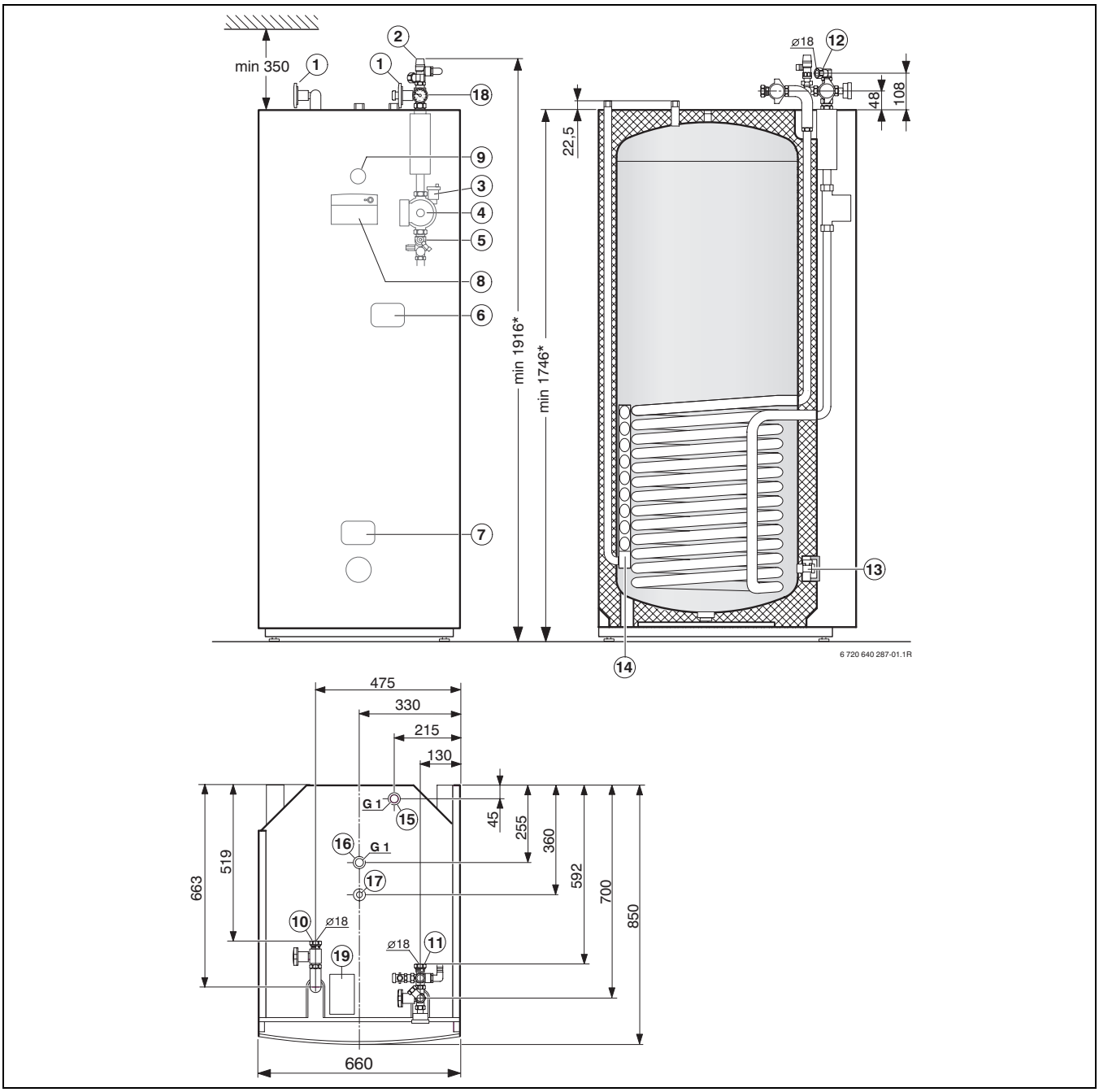

Fig. 2 Physical and connection dimensions SP 400 SHU

1 Shut-off valve with non-return valve
2 Safety valve
3 Automatic air vent valve with locking cap, solar circuit
4 Solar circuit pump (SP)
5 Flow meter with adjuster and display
6 Cylinder temperature sensor, top (TS_3)
7 Cylinder temperature sensor, bottom (T_2)
8 Solar control unit
9 Heating water temperature display
10 Solar flow (VS_{SP}) from the collector to the cylinder locking ring fitting Ø 18 mm (as option Ø 15 mm)
11 Solar return (RS_{SP}) from the collector to the cylinder locking ring fitting Ø 18 mm (as option Ø 15 mm)
12 Connection for solar expansion vessel locking ring fitting Ø 18 mm
13 Draining/filling (E) heating water
14 Temperature-sensitive stratification
15 Cylinder return (SE) from boiler to cylinder G 1"
16 Cylinder flow (SA) from cylinder to boiler G 1"
17 Manual air vent valve (EL) heating water
18 Pressure gauge
19 Type plate

***** The measurements apply with fully retracted adjustable feet. By turning the adjustable feet, these dimensions can be increased by a max. of 12 mm.

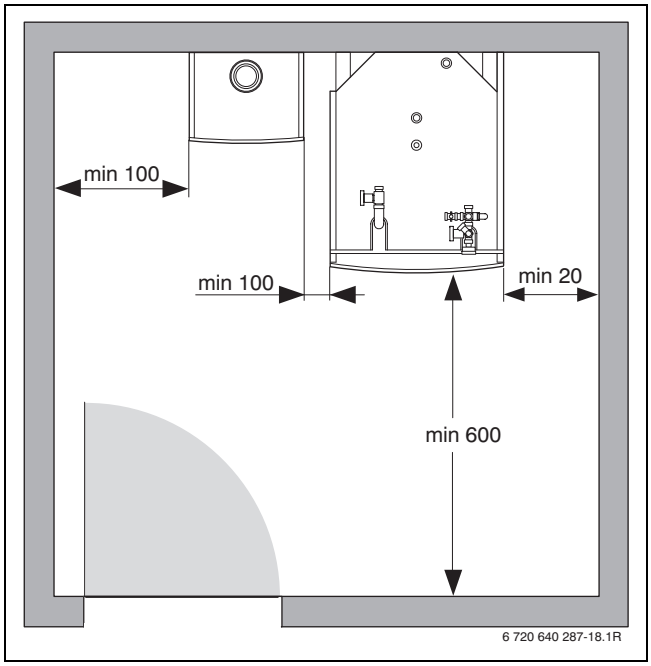

Fig. 3 Recommended wall clearances

2.6 Specification

Internal indirect coil pressure drop (in bar)

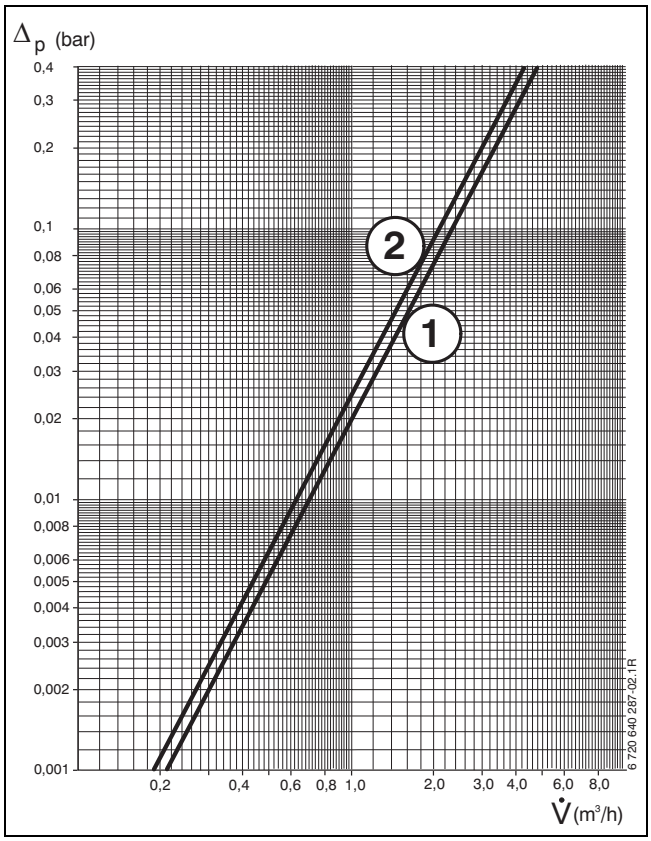

Fig. 4

1 Water
2 Tyfocor® L or Tyfocor® LS
Δ_p Pressure Drop
$\dot{V}$ Amount of heat transfer medium

When calculating the pressure drop in the solar circuit:

- Observe the influence of the heat transfer medium used (Tyfocor® L or Tyfocor® LS) and the manufacturer's details.

Example: with the heat transfer medium (Tyfocor® L) and a water/polypropylene:glycol mixture of 55/45 (frost protection down to approx. -30 °C), the pressure drop is approx. 1.2-fold the value for tap water.

Pressure drop values resulting from the network are not taken into account in the diagram.

Test values for the cylinder temperature sensors (T_2 ... TS_3)

[°C]	[Ω]	[°C]	[Ω]
20	13779 ... 14772	56	3534 ... 3723
26	10766 ... 11500	62	2855 ... 3032
32	8543 ... 9043	68	2346 ... 2488
38	6790 ... 7174	74	1941 ... 2053
44	5442 ... 5730	80	1589 ... 1704
50	4298 ... 4608	86	1327 ... 1421

Tab. 2

Test values for the collector temperature sensor (T_1)

[°C]	[Ω]	[°C]	[Ω]
-20	198400	60	4943
-10	112400	70	3478
0	66050	75	2900
5	50000	80	2492
10	40030	90	1816
15	32000	95	1500
20	25030	100	1344
25	20000	110	1009
30	16090	120	767
35	12800	130	591
40	10610	140	461
50	7166		

Tab. 3

Specification

Cylinder type		SP 400 SHU
Cylinder:		
Available cylinder capacity	l	412
Maximum operating temperature, heating water	°C	90
Maximum operating pressure, heating water	bar	3
Permissible ambient temperature	°C	10 ... 50
Solar circuit indirect coil:		
Number of windings	–	13
Heat transfer medium	l	12.5
Heat transfer surface area	m^2	1.8
Maximum operating temperature, solar circuit	°C	110
Maximum operating pressure	bar	6
Solar station:		
Maximum permissible operating temperature	°C	110
Safety valve response pressure	bar	6
Safety valve	mm	DN 15
Flow and return connection (locking ring fittings)	mm	15 or 18
Number of collectors	-	1 - 5
The number of collectors corresponds to		
- flat-plate collectors	m^2	approx. 2.3 ... 11.5
- vacuum tube collector area	m^2	approx. 1.8 ... 9.0
Solar circuit pump:		
- Voltage	V	230
- Frequency	Hz	50 - 60
- Maximum power consumption	W	75
Solar control unit:		
Rated voltage		
- BUS	V DC	15
- solar control unit	V AC	230
Maximum power consumption	A	4
Measuring range, cylinder temperature sensor T_2 and TS_3	°C	0 ... 99
Measuring range collector temperature sensor T_1	°C	-20 ... 140
IP rating	IP	44
		CE
Additional data:		
Standby heat loss (24 h) according to DIN 4753 part 8 [1)]	kWh/d	3.0
Dry weight (excl. packaging)	kg	165

Tab. 4 Specification

1) Standard comparison values, distribution losses outside the cylinder are not taken into account.

2.7 System diagram

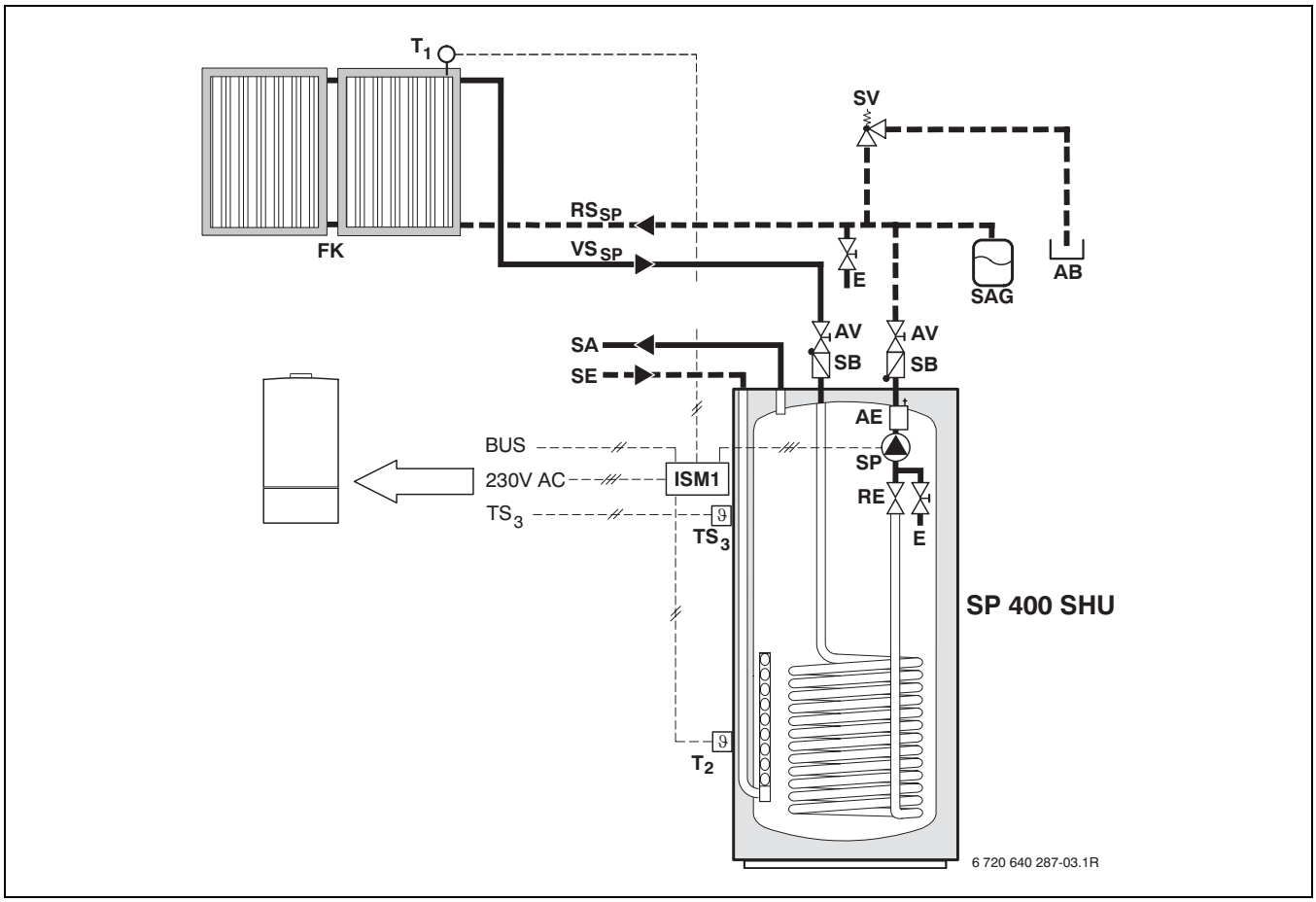

Fig. 5 Solar thermal system with SP 400 SHU. Simplified system diagram (see technical guides for installation illustration and further options)

230V AC	Power supply from the boiler to the solar control unit
AB	Collection container
AV	Shut-off valve
BUS	BUS connection, solar control unit to the boiler
E	Draining/filling
FK	Collector
AE	Automatic air vent valve with locking cap
RE	Flow meter with adjuster and display
RS_{SP}	Solar return from the cylinder to the collector
SA	Cylinder flow from the cylinder to the boiler
SAG	Solar expansion vessel
SB	Gravity brake
SE	Cylinder return from the boiler to the cylinder
SP	Solar circuit pump
SV	Safety valve
SP400SHU	Buffer cylinder for solar thermal systems
T_1	Collector temperature sensor
T_2	Cylinder temperature sensor, bottom
TS_3	Cylinder temperature sensor, top
ISM 1	Solar control unit
VS_{SP}	Solar flow from the collector to the cylinder

***** According to EN 12975, the blow-off and drain line must terminate in an open container that is capable of holding the entire content of the flat-plate collectors.

The hydraulic collector diagram shown corresponds to the FKT series.

- Connect the collectors diagonally for the FKC series.

2.8 Accessories

Comprehensive accessories for this cylinder can be found in our catalogue or our technical guides.

3 Installation

3.1 Regulations

Observe the relevant regulations, directives and standards regarding installation and operation:

- Local regulations
- **EnEG** (German Energy Saving Act)
- **EnEV** (German regulations on energy saving thermal insulation and energy saving building design)
- **DIN Standards**, Beuth-Verlag GmbH - Burggrafenstrasse 6 - 10787 Berlin
  - **EN 12975** (Solar thermal systems and their components)
  - **EN 12976** Solar thermal systems and their components (pre-assembled systems)
  - **ENV 12977** Solar thermal systems and their components (bespoke systems)
  - **DIN EN 1151**, part 1: Manual circulation pumps (to be observed when assessing the hydraulic performance of the solar module)
- VDE regulations

3.2 Handling

NOTICE: Damage through load having been inadequately secured for handling.

▶ Only use suitable means of transportation and suitable means of securing the objects.

▶ Remove the packaging.

▶ Remove the front cover.

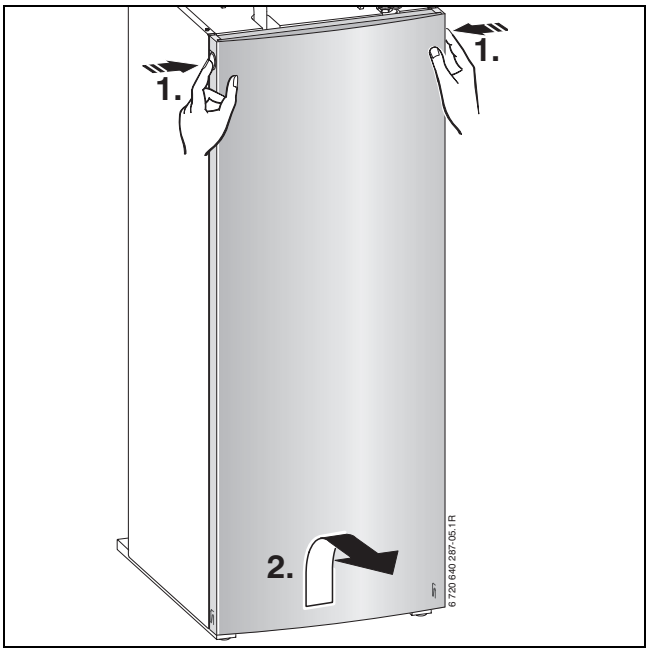

Fig. 6

▶ Remove the side panels on the right and the left.

▶ Remove the upper cover.

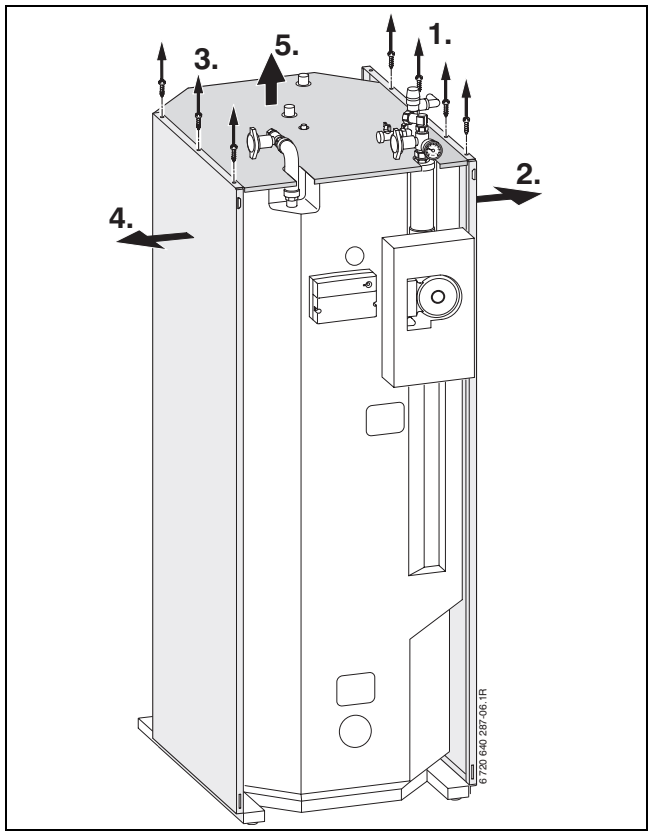

Fig. 7

▶ Secure the buffer cylinder against falling over and transport in an upright position to the installation location.

▶ The cylinder may also be transported into the installation room horizontally.

▶ Never set the cylinder down hard during handling.

3.3 Installation location

CAUTION: Damage through stress cracks.
- Install the cylinder in a room that is free from the risk of frost.

- Maintain the minimum wall clearances (→ Fig. 3, page 6).
- Install the cylinder on a level floor with sufficient load-bearing capacity.
  Where the cylinder is installed, the floor must have a load-bearing capacity of ≥ 1000 kg/m^2.
- When installing the cylinder in wet rooms, position it on a suitable platform.
- Align the cylinder vertically by turning the adjustable feet. For this, wind out the adjustable feet up to 12 mm.

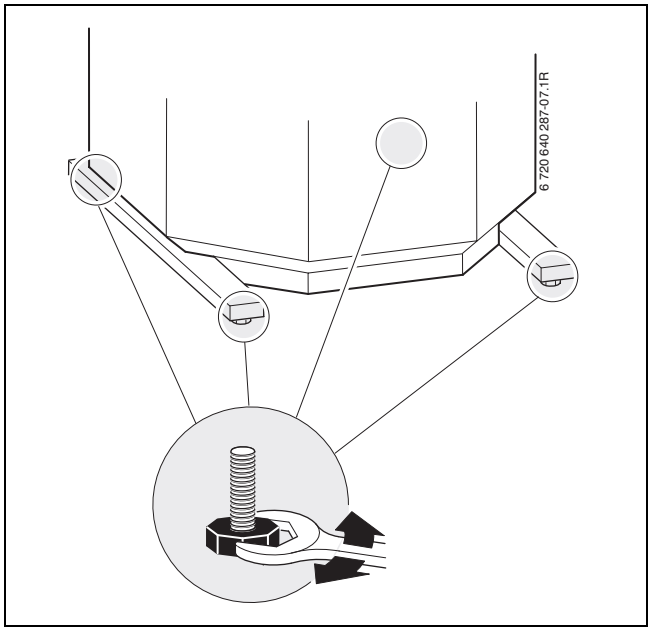

Fig. 8

3.4 Installation

NOTICE: Damage through leaking connections.
- Install the pipework free from stress.
- During commissioning, check the pipework and connections for leaks.

3.4.1 Fitting the side panels

Subject to the installation of the cylinder to the right or left of the boiler, fit the side panels accordingly.

- If the cylinder is **arranged to the left**, fit the side panels in accordance with Fig. 9.

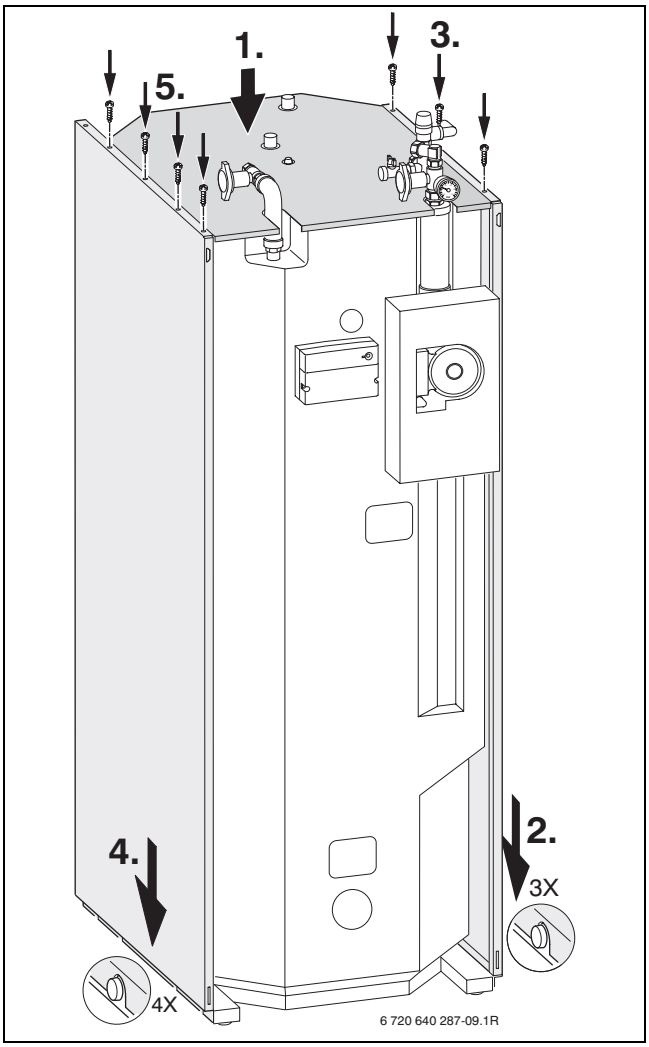

*Fig. 9 Example: Fitting the side panels for cylinder **arranged to the left**.*

- If the cylinder is **arranged to the right**, fit the large side panel on the right.

3.4.2 Important information regarding the solar thermal system

WARNING: Risk of injury through scalding when draining hot heat transfer medium.
- ▶ Use a suitable container for the safety valve drain.

NOTICE: Risk of damage to installation materials not resistant to heat (e. g. plastic pipes).
- ▶ On the solar side, use ≥ 150 °C installation material resistant to heat and glycol.

- Components that are firmly connected in the delivered condition are sealed in ready for installation.
- Never close the safety valve.
- To collect the heat transfer medium that may be expelled from the safety valve, we recommend the container we offer as an accessory.
- Never install any shut-off valves between the collectors, the safety valve and the solar expansion vessel.
- Prior to installation, the pre-charge pressure of the expansion vessel may need to be adjusted (→ “Adjusting the pre-charge pressure of the solar expansion vessel”, page 12).
- In attic centres, install an additional pre-cooling vessel between the collector array and the solar expansion vessel. This prevents an overheating of the diaphragm inside the solar expansion vessel when the solar circuit pump is not in operation.
- Temperatures up to approx. 175 °C can be reached for short periods of time in the pipework.Use only temperature-resistant materials.We recommend that pipe joints are hard-soldered.
- If the system is not filled with a solar filling pump, fit an additional air vent valve at the highest point of the pipework.
- To prevent air pockets, route the pipework from the cylinder to the collector with an incline.
- Install a drain valve at the lowest point in the pipework.
- Connect the pipework to the earthing system of the building.
- To prevent operational faults through air pockets, an automatic air vent valve is fitted to the return assembly of the solar module.

3.4.3 Connection on the solar side

The heat transfer medium used increases the pressure drop subject to its mixing ratio (→ Fig. 4, page 6).

- ▶ Connect both solar circuit connections to the cylinder.

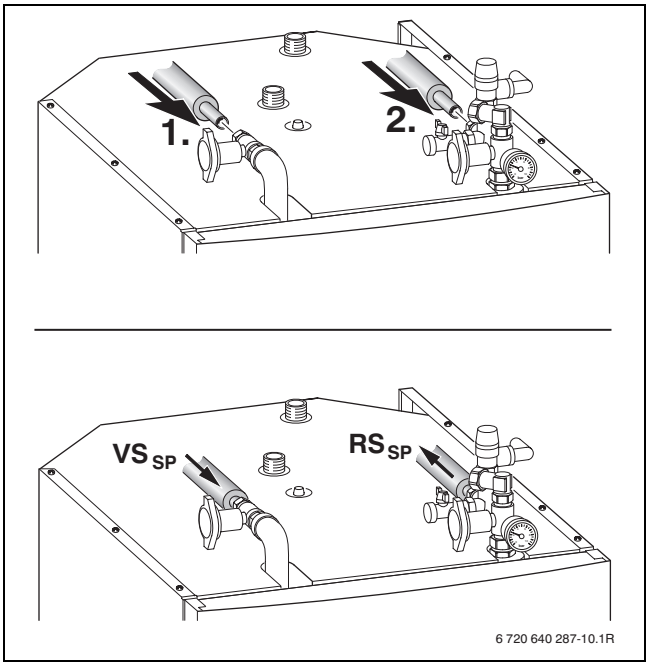

Fig. 10 Connection / flow direction

- ▶ Keep lines as short as possible and insulate them well.
  This prevents unnecessary pressure drops and the cooling down of the cylinder by water circulating through the pipework and similar.
- ▶ Connect the drain line to the safety valve.
- ▶ Terminate the drain line in the collection container and secure with a pipe clip.

NOTICE:
- ▶ Never modify or close the drain line.
- ▶ Route the drain line with a permanent slope.

- ▶ Secure the solar expansion vessel with suitable fixing materials.

- Connect the solar expansion vessel to the return assembly of the solar module.

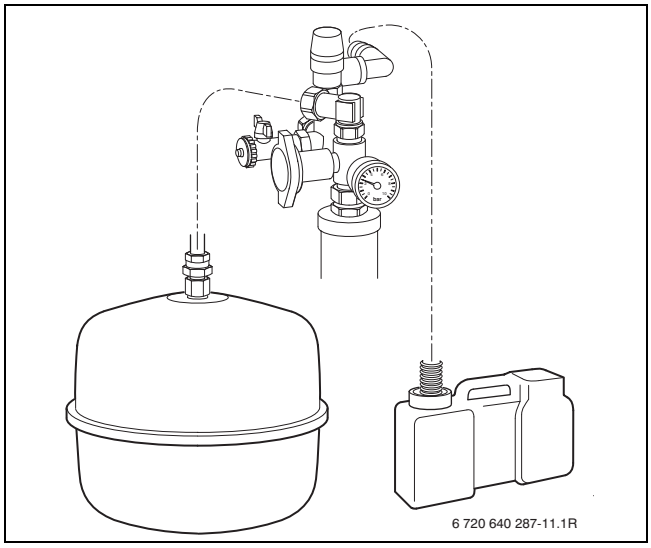

Fig. 11

Earthing pipes

- Fit one earthing clip each to the flow and return pipe.
- Connect the earthing clips via an earth cable type NYM with at least 6 mm^2 to the equipotential busbar of the building.

Adjusting the pre-charge pressure of the solar expansion vessel

The pre-charge pressure of the solar expansion vessel is calculated from the static system head plus 0.4 bar. One metre height differential represents 0.1 bar.

Example: System with 10 m height differential equals 1.0 bar + 0.4 bar = 1.4 bar required pre-charge pressure in the solar expansion vessel.

If the calculated pre-charge pressure is different from that set at the factory:

- Set the required pre-charge pressure when the vessel is not subjected to load (i.e. no liquid pressure). This makes the maximum possible volume available.

3.4.4 Connection on the heating water side

NOTICE: Risk of damage to installation materials not resistant to heat (e. g. plastic pipes).

- Use only installation materials on the heating water side that are resistant to ≥ 90 °C.

NOTICE: Risk of corrosion damage through pipework that is not diffusion-proof.

- Separate the boiler and the cylinder via a plate heat exchanger from the system parts that are not diffusion-proof, i.e. an underfloor heating system.

For the connection on the heating water side, we recommend the installation set from our accessory range, which includes pre-assembled components.

If you do not use the installation set from our accessory range:

- Use copper pipes with at least Ø 22 mm for the connection. You can check the maximum permissible pressure drop in the boiler installation instructions.

- Connect both connections at the heating water side of the cylinder.

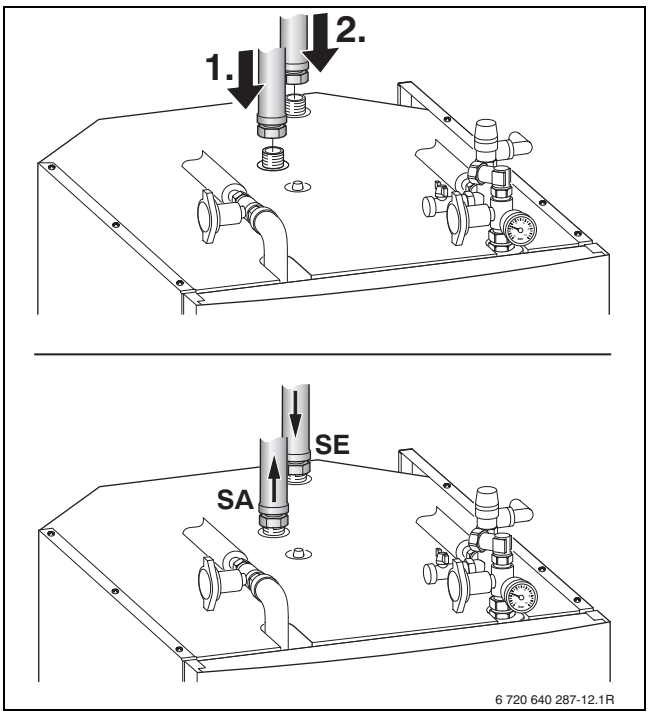

Fig. 12 Connection / flow direction

Expansion vessel

For the connection on the heating water side of the system, we recommend the expansion vessel from our accessory range.

- Taking into account the cylinder contents (412 l heating water), determine the size of the expansion vessel accurately to EN 12 828.
- Connect the expansion vessel directly to the boiler (→ boiler installation instructions).
- Where required, install an additional expansion vessel.

3.5 Electrical connections

DANGER: Risk of electric shock
- Before making any electrical connections, disconnect the power supply (230 V AC) to the heating system.

All control and safety equipment for the cylinder are fully wired and tested.

Observe safety precautions as per VDE Requirements 0100 and special regulations (TAB) of the local electricity suppliers.

For a detailed description of electrical connection, see the installation instructions for the boiler and the collector.

- To avoid inductive interference, lay all bus cables seperately to lines of 230 V or 400 V (minimum spacing 100 mm).

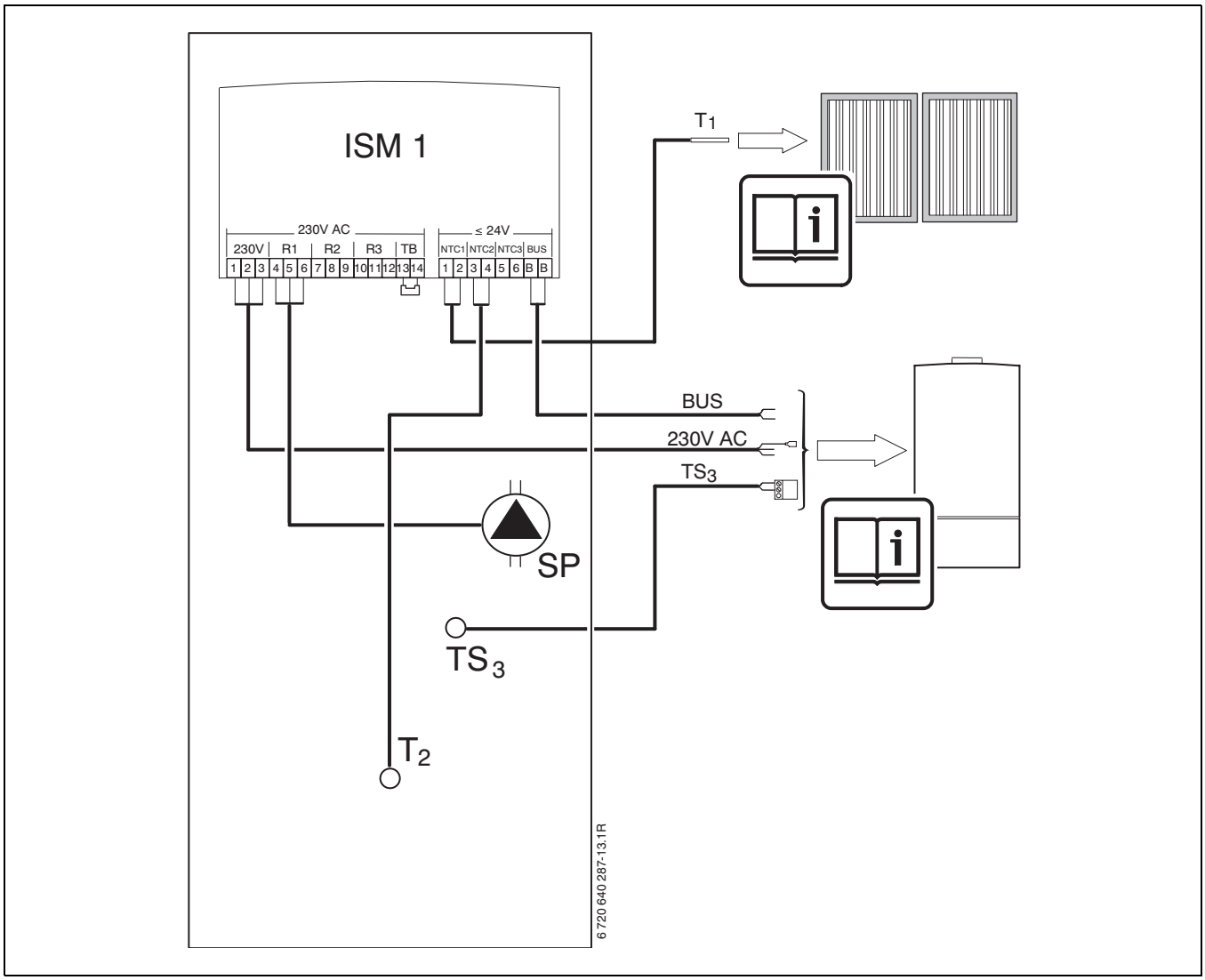

Fig. 13

If no solar twin pipe is used, and the sensor lead of collector temperature sensor T_1 needs to be extended, use the following cable cross-sections:

Lead length	Cross-section
≤ 50 m	0.75 mm^2
≤ 100 m	1.50 mm^2

Tab. 5 Permissible lead lengths for T_1

- In case of external inductive interference, shield the cables.
  This ensures that the cables are shielded from external interference (e.g. heavy current cables, overhead wires, transformer stations, radio and television set, amateur radio stations, microwave ovens etc).

4 Commissioning

4.1 User information from the system installer

Explain to the customer how the boiler and the cylinder work and how to operate them.

- Advise the user regarding the need for regular maintenance, on which function and service life depend. The cylinder itself is maintenance-free.
- When there is a risk of frost and the cylinder is taken out of use, drain the cylinder completely, including its lower section.
- Give the user all the documents supplied with the controller.

4.2 Preparing for use

4.2.1 General

Fault function through time-offset commissioning.

- Connect all BUS subscribers to the BUS prior to supplying the BUS with power.

The heating system installer or an authorised contractor must commission the system.

- Commission the boiler and solar collectors in accordance with manufacturer's instructions and/or the appropriate installation and operating instructions.
- Commission the cylinder and solar circuit in accordance with these installation instructions.
- To store as much solar energy as possible, set the heating controller to a maximum cylinder temperature of 90 °C (→ heating controller operating instructions).

4.2.2 Filling the cylinder on the heating water side

- Vent the heating water side of the cylinder during filling via the manual air vent valve at the top of the cylinder.

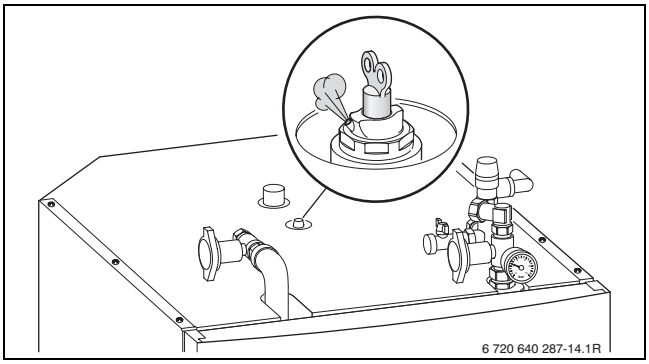

Fig. 14

4.2.3 Filling the solar thermal system

NOTICE: Damage through unsuitable heat transfer media.

- Only fill the system with approved heat transfer medium.

NOTICE: Risk of collector damage through pressure testing with water.

- Only fill vacuum tube collectors with a solar filling pump.

CAUTION: Risk of injury through contact with heat transfer medium.

- Always wear protective gloves and goggles when handling heat transfer medium.
- If heat transfer medium comes into contact with skin, wash the heat transfer medium off with water and soap.
- If heat transfer medium comes into contact with eyes: hold eyelids wide open and thoroughly rinse eyes with running water.

The heat transfer medium is ready mixed. It guarantees safe operation within the specified temperature range, protects the system from frost damage and minimises risk of vaporisation.

The heat transfer medium is biodegradable. A safety datasheet with further information regarding the heat transfer medium can be requested from the manufacturer (TYFOROP Chemie GmbH, Anton-Rèe-Weg 7, D-20537 Hamburg).

Operate the collectors only with the following heat transfer medium (porpylene-glycol:water mixture):

	Heat transfer medium	Frost protection down to
Flat-plate collector	Tyfocor® L	– 30 °C
Vacuum tube collector	Tyfocor® LS	– 28 °C

Tab. 6 Tyfocor type subject to collector design

- Flush the system with heat transfer medium in accordance with the circulation direction of the solar circuit pump.

Collectors must not be excessively hot to prevent the heat transfer medium evaporating.

- Where possible, cover the collectors and fill the system early in the morning.

Filling with a solar filling pump

Fill the system in accordance with the operating instructions of the solar filling pump.

The connections and shut-off valves required for filling are located at the cylinder flow and return assembly. These components are described in chapter “Filling with a manual pump”.

Filling with a manual pump

- Connect the filling hoses.
- Open the shut-off valves.

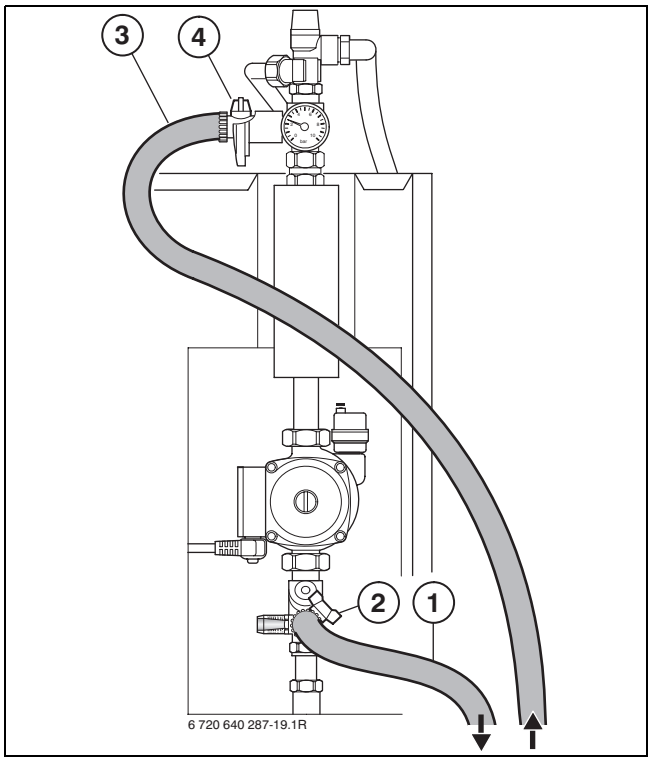

Fig. 15

1 Return hose
2 Return hose shut-off valve
3 Filling hose in collector direction
4 Filling hose shut-off valve

The operating position of the gravity brake must only be changed during the draining and filling process.

- Open the gravity brake in the flow.

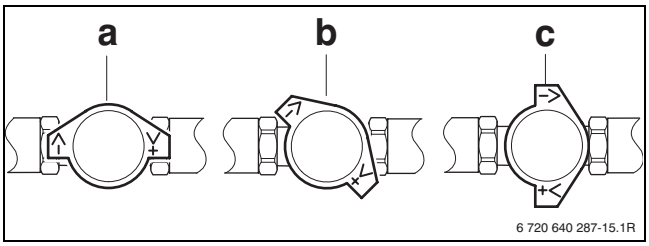

Fig. 16 Shut-off valve with gravity brake in the flow

a Operating position
b Gravity brake open (position for draining and filling)
c Pipework isolated

- Close the shut-off valve in the return.

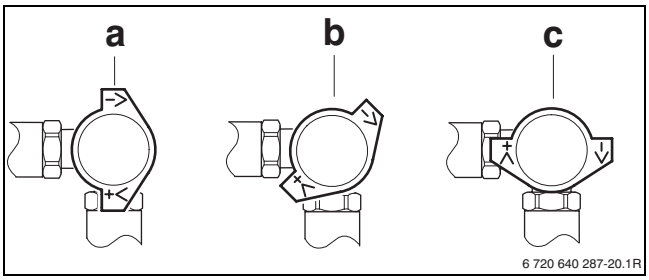

Fig. 17 Shut-off valve with gravity brake in the return

a Operating position
b Gravity brake open (drain position)
c Pipework isolated (filling position)

- Open the locking cap at the automatic air vent valve.

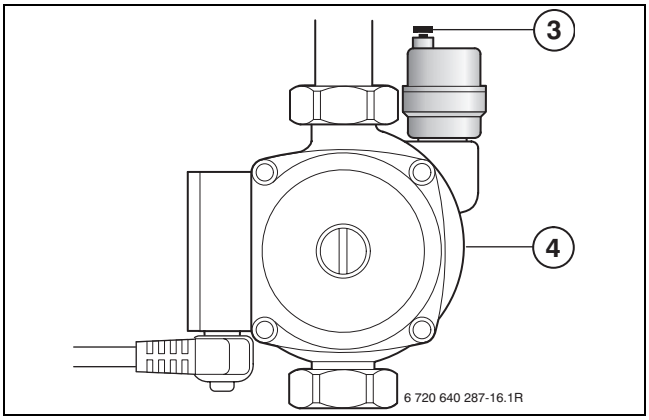

Fig. 18

3 Automatic air vent valve with locking cap, solar circuit
4 Solar circuit pump (SP)

- Filling and venting the solar thermal system.
- To purge any residual air from the solar circuit, switch the shut-off valve in the return several times briefly between the “gravity brake open (b)” and the “pipework isolated (c)” positions.
- Turn the gravity brakes in the flow and return back into their operating positions.
- Close the bottom shut-off valve (→ Fig. 15, [2], page 16).

- Close the top shut-off valve (→ Fig. 15, [4]) once the operating pressure has been reached.
- Close the locking cap at the automatic air vent valve again.

Adjusting the solar thermal system operating pressure

The pre-charge pressure of the solar expansion vessel must be adjusted correctly (→ chapter “Adjusting the pre-charge pressure of the solar expansion vessel”, page 12).

The operating pressure is calculated from the static system head plus 0.7 bar. One metre height differential represents 0.1 bar.

Example: System with 10 m height differential equals 1.0 bar + 0.7 bar = 1.7 bar required operating pressure.

- If the pressure is inadequate, pump in additional heat transfer medium.
- Once the venting process has been completed, close the locking cap of the air vent valve again.

Pressure compensation via the solar expansion vessel only occurs when heat transfer medium evaporates inside the collector and the air vent valve is closed.

After filling

- Switch the solar circuit pump manually on and off (→ heating controller operating instructions). Whilst the solar circuit pump is switched manually, the pressure gauge needle must not indicate any pressure fluctuations (→ Fig. 2, [18], page 5).
- Vent the solar circuit if pressure fluctuations are noticed.
- Check the operating pressure and top up with heat transfer medium, if required.
- Let the solar circuit pump run for approx. 10 minutes. Check the circulation at the flow meter.
- Vent again and check whether the operating pressure is at the calculated value (→ chapter “Adjusting the operating pressure of the solar thermal system”).
- Check the flow rate at the flow meter and compare the actual value with the required flow rate in table 7.

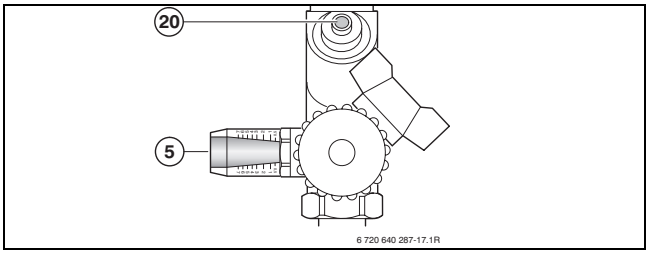

Fig. 19

5 Flow meter with display
20 Flow rate adjuster

Number of collectors	Flow rate in l/min (at 30...40 °C in the return)	Flow rate in l/h
1	1	50
2	1.5...2	100
3	2.5...3	150
4	3...4	200
5	4...5	250

Tab. 7 Overview of flow rates

Adjusting the required flow rate:

- Open the flow rate adjuster fully.
- Set the lowest pump stage.
- If the required flow rate cannot be achieved, select the next higher pump stage.
- If the required flow rate is exceeded, reduce the flow rate at the adjuster.

-or-

- Select the next higher pump stage and reduce the flow rate at the adjuster.

After four weeks:

- Vent the system again at the automatic air vent valve at the solar circuit pump (→ Fig. 18, [3], page 16).

4.2.4 Draining the solar thermal system

- Connect the drain hose.
- Open the shut-off valve.

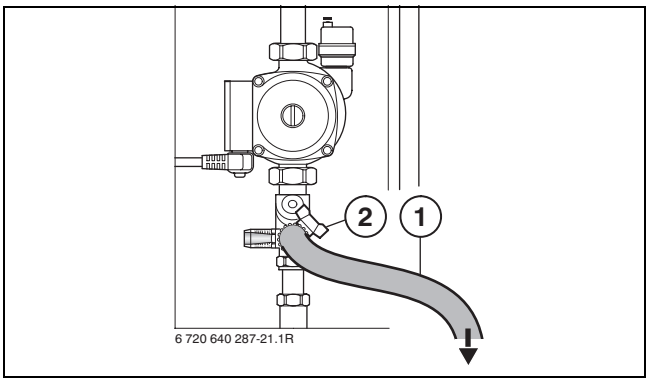

Fig. 20

1 Drain hose
2 Isolating valve

- Open the gravity brakes in the flow and return (→ Fig. 16 and 17, page 16).

4.3 Commissioning report for the solar thermal system

▶ Complete the report and tick off the tasks performed.

Customer/System user:	
Name, first name	Street, house number
Telephone/fax	Postcode, town
Commissioning date:	

Commissioning tasks	Description page	Completed/ Comments
General	–	–
Flow and return lines installed and earthed.	12	☐
Pre-charge pressure in the solar expansion vessel tested.	12	_____ bar
Solar thermal system filled and checked that it is free of air.	15, 17	☐
Air vent valve closed.	17	☐
Solar circuit	–	–
Operating pressure checked in the cold state of the solar thermal system and entered. Solar temperature at the solar return RS_{SP}.	17	_____bar _____ °C
Flow rate checked in the cold state of the system.	17	_____ l/min
Pump stage selected at the solar circuit pump (1/2/3).	17	
Gravity brake in operating position.	17	☐
Collector array	–	–
Collectors checked visually.	1)	☐
Collector temperature sensor pushed fully into the sensor well and secured.	1)	☐
Installation system checked visually.	1)	☐
Joints between the installation system and the roof cover checked visually for tightness.	1)	☐
Pipework insulation checked.	1)	☐
If required: collectors cleaned wet without cleaning agents.	1)	☐
Cylinder	–	–
Cylinder filled with heating water and heat transfer medium and vented.	15, 17	☐
Control	–	–
Colar thermal system commissioned.	2)	☐
Solar circuit pump operation (manual on / manual off / automatic mode) checked.	2)	☐
Start/stop temperature differential of the solar circuit pump ΔT checked and entered.	2)	____ K/____ K
Maximum solar cylinder temperature T_2 set to 90 °C.	2)	_____ °C
Company stamp / date / signature		

1) → Collector installation instructions

2) → Heating controller installation and operating instructions

5 Shutting down

Shutting down the heating system when there is a risk of frost

- Shut down the heating system in accordance with the boiler operating instructions.
- When there is a risk of frost and the cylinder is taken out of use, drain the cylinder completely, including its lower section.

6 Environmental protection

Environmental protection is a fundamental corporate strategy of the Bosch Group.
The quality of our products, their economy and environmental safety are all of equal importance to us and all environmental protection legislation and regulations are strictly observed.
We use the best possible technology and materials for protecting the environment taking account of economic considerations.

Packaging

We participate in the recycling programmes of the countries in which our products are sold to ensure optimum recycling.
All of our packaging materials are environmentally compatible and can be recycled.

Used appliances

Used appliances contain valuable materials that should be recycled.
The various assemblies can be easily dismantled and synthetic materials are marked accordingly. Assemblies can therefore be sorted by composition and passed on for recycling or disposal.

7 Inspection/Maintenance

The cylinder itself is maintenance-free.

We recommend conducting the first inspection and maintenance of the solar thermal system after approx. 500 operating hours, and then at intervals of 2 – 3 years.

7.1 Spare parts

- Only use genuine spare parts!
- Refer to the spare parts catalogue when ordering spare parts.
- Replace removed gaskets and O-rings with new parts that are resistant to very high temperatures (at least 200 °C) and to heat transfer medium.

7.2 Checking the heating system operating pressure

Check the heating system operating pressure and adjust, if required (→ boiler installation instructions).

7.3 Checking the operating pressure of the solar thermal system

WARNING: Risk of scalding throughhot heat transfer medium!

- Only if the heat transfer medium temperature < 60 °C, open the locking cap on the automatic air vent valve (→ Fig. 18, [3], page 16).

Prior to topping up, fill the hose with heat transfer medium. This prevents air entering the solar circuit.

- Venting and adjusting the operating pressure to the calculated value (→ chapter “Adjusting the operating pressure of the solar thermal system”, page 17).

7.4 Checking the heat transfer medium

NOTICE: Frost damage

- Check every two years that the required frost protection is still being provided.

In addition to checking the frost protection level, we recommend the following: every 2 years check the corrosion protection level (pH value) of the heat transfer medium.

Frost protection of the Tyfocor® L heat transfer medium

Set frost protection level: approx. -30 °C

- Check the frost protection level with the antifreeze tester supplied as part of our accessory range.
- Replace the heat transfer medium if the limit ≥ -26 °C has been exceeded.

-or-

- Correct the frost protection level by topping up with heat transfer medium (→ chapter “Correcting the frost protection level”, page 22).

Frost protection level of the Tyfocor® LS heat transfer medium

Set frost protection level: approx. -28 °C

- Check the frost protection level with the antifreeze tester supplied as part of our accessory range.
- Convert the actual frost protection level according to table 8.
- Replace the heat transfer medium if the limit ≥ -26 °C has been exceeded.

-or-

- Correct the frost protection level by topping up with heat transfer medium (→ chapter “Correcting the frost protection level”, page 22).

Actual frost protection level check with the antifreeze tester for Tyfocor® L (concentrate)	Frost protection level for Tyfocor® LS
– 23 °C (39 %)	– 28 °C
– 20 °C (36 %)	– 25 °C
– 18 °C (34 %)	– 23 °C
– 16 °C (31 %)	– 21 °C
– 14 °C (29 %)	– 19 °C
– 11 °C (24 %)	– 16 °C
– 10 °C (23 %)	– 15 °C
– 8 °C (19 %)	– 13 °C
– 6 °C (15 %)	– 11 °C
– 5 °C (13 %)	– 10 °C
– 3 °C (8 %)	– 8 °C

Tab. 8 Frost protection conversion for Tyfocor LS

Corrosion protection of the heat transfer medium

Set value for the corrosion protection:

- For Tyfocor® L pH approx. 7.5
- For Tyfocor® LS pH approx. 7.5...10

▶ Check the corrosion protection level with a pH indicator strip.

▶ Replace the heat transfer medium if actual value does not reach ≤ pH 7.

Correcting frost protection

Top up with concentrated heat transfer medium if that level of frost protection is not maintained.

▶ Calculate the system volume in line with table 9 to determine the precise top-up amount.

System part	Fill volume
FKC collector, vertical	0.86 l
FKC collector, horizontal	1.25 l
FKT collector, vertical	1.43 l
FKT collector, horizontal	1.76 l
Solar module	0.50 l
Internal indirect coil inside the cylinder	12.5 l
1 m Cu pipe Ø 15 mm	0.13 l
1 m Cu pipe Ø 18 mm	0.20 l
1 m Cu pipe Ø 22 mm	0.31 l
1 m Cu pipe Ø 28 mm	0.53 l
1 m Cu pipe Ø 35 mm	0.86 l
1 m Cu pipe Ø 42 mm	1.26 l
1 m steel pipe R ¾	0.37 l
1 m steel pipe R 1	0.58 l
1 m steel pipe R 1¼	1.01 l
1 m steel pipe R 1½	1.37 l

Tab. 9 Volume of the separate system parts

▶ Calculate the concentrate top-up amount ($V_{replacement}$) with a water/polypropylene: glycol mixing ratio of 55/45 using the following formula:

$$V_{replacement} = V_{tot} \times \frac{45 - C_{concentration}}{100 - C_{concentration}}$$

Fig. 21 Formula for calculating the top-up amount

Example for Tyfocor® L:

- System volume (V_{total}) = 22 l
- Frost protection (actual value): – 14 °C
- Equals a concentration (→ Tab. 8) of 29% (C = 29)
- Result: $V_{replace}$ = 4.96 l

▶ Drain the calculated amount to be topped up ($V_{replacement}$) and add the same mount of concentrated heat transfer medium.

7.5 Checking electrical wiring

▶ Check electrical wiring for physical damage and replace faulty leads.

7.6 After inspection/maintenance

▶ Retighten all loosened threaded fittings.

▶ Return the cylinder into use (→ chapter 4, page 15).

▶ Check all connections for leaks.

7.7 Checklist for inspection/maintenance (Inspection/Maintenance report)

▶ Complete the report and tick off the tasks performed.

Date								
1	Heating system operating pressure checked (→ boiler installation instructions).	bar						
2	Solar thermal system operating pressure checked (→ page 17).	bar						
3	Heat transfer medium checked (→ page 21).							
4	Wiring checked (→ 22 page).							
5	All joints checked (→ 22 page).							
6	Return the cylinder into use (→ page 15).							

Tab. 10

8 Faults

For further troubleshooting information, see the installation instructions for the boiler and the heating controller.

Problem	Cause	Remedy
Solar circuit pump not running even though starting conditions are met.	The solar circuit pump is not being switched by the heating controller.	Remedy the fault at the heating controller (→ Installation and operating instructions of the heating controller).
	The solar circuit pump is mechanically blocked.	Undo the slotted screw at the pump head and release the pump shaft with a screwdriver. Do NOT strike the pump shaft with the screwdriver.
	The solar circuit pump is faulty.	Check and, if required, replace the solar circuit pump.
Solar yield too low. The solar circuit pump constantly cycles.	Inadequate differential between the start and stop temperature.	Check the settings at the heating controller.
	Excessively high flow rate.	Check and adjust the flow rate.
	Incorrectly positioned temperature sensor (T_1 and/or T_2) or poor heat transfer.	Check the position and heat transfer of the temperature sensors (T_1 and T_2).
Heat is being transferred out of the storage cylinder. The solar circuit pump never switches off.	Incorrectly positioned temperature sensor (T_1 and/or $_{T2}$), poor heat transfer or temperature sensors faulty.	Check the position, heat transfer and actual values captured by the temperature sensors (T_1 and T_2).
	Faulty heating controller.	Replace the faulty heating controller.
Solar yield too low or system damage. Excessive temperature differential in the solar circuit. Excessive flow temperature. The collector temperature rises too quickly.	The heating controller is incorrectly adjusted.	Check the settings at the heating controller.
	Incorrectly positioned temperature sensor (T_1 and/or T_2), poor heat transfer or temperature sensors faulty.	Check the position, heat transfer and actual values captured by the temperature sensors (T_1 and T_2).
	Air in the solar circuit.	Vent the solar circuit.
	The flow rate is inadequate.	Check and adjust the flow rate.
	Lines are blocked.	Check and flush the lines.
Solar yield too low. Pressure drop in the solar circuit.	Loss of heat transfer medium through open safety valve.	Check solar expansion vessel, pre-charge pressure and size.
	Steam escapes during operation through the opened air vent valve.	Close the locking cap on the automatic air vent valve.
	Loss of heat transfer medium at joints.	Hard solder leaking joints, replace leaking gaskets/seals and re-tighten fittings.
	Solar circuit leaking through frost effect.	Check frost protection level of the heat transfer medium and hard solder leaking points.

Tab. 11

Problem	Cause	Remedy
Solar yield too low. The solar circuit pump is running, but no flow is discernible at the flow meter.	The shut-off valves are closed.	Open the shut-off valves.
	Air in the solar circuit.	Vent the solar circuit.
	The flow meter indicator catches.	Clean the flow meter.
Solar circuit leaking. Noises in the collector array at high levels of solar irradiation (vapour knocking).	The collector with the collector temperature sensor is under shade.	Remove shading.
	Air in the solar circuit.	Vent the solar circuit and check pipework for slope.
	Even flow through the collector arrays is not possible.	Check the pipework.
	The pump rate of the solar circuit pump is inadequate.	Check and, if required, replace the solar circuit pump.
	The solar expansion vessel is faulty or too small.	Check the sizing and pre-charge pressure of the solar expansion vessel as well as the operating pressure.
Excessive heat loss. The cylinder cools down excessively.	Gravity circulation across the collector array.	Check the gravity brakes.
	Natural circulation (micro circulation inside the pipework).	Install pipework runs immediately at the cylinder connections so that natural circulation is prevented.
	Faulty cylinder insulation.	Check the cylinder insulation. Insulate cylinder connections.
Condensation water in the collector. When sun is shining on collectors, the collector glass is fogged for a long period of time.	In case of vented collectors: collector inadequately vented.	Clean ventilation apertures.
Solar yield too low. Diminishing performance of the solar thermal system.	Collectors are under shade.	Remove shading.
	Air in the solar circuit.	Vent the solar circuit.
	The pump rate of the solar circuit pump is inadequate.	Check and, if required, replace the solar circuit pump.
	Indirect coil contaminated / scaled up.	Flush / descale the internal indirect coil.
	Collector glazing severely contaminated.	Clean the collector glazing with a glass-cleaning agent. Never use acetone.

Tab. 11

Solar control unit faults

Faults are displayed at the heating controller display or the relevant remote control.

- Open the front cover of the cylinder.
  The solar control unit display indicates the current operating state.

Operating display	Solar control unit response	Fault/Remedy
constantly OFF	–	Switch on the power supply.
		Replace the fuse (→ Fig. 23).
flashing	Controlled emergency mode: The solar control unit tries to respond to the fault with an alternative control strategy.	The solar thermal system yield is largely maintained. Nevertheless, the fault should be remedied, not later than during the next service.
constantly ON	Standard operating mode	No faults

Tab. 12

Replace fuse:

- Open the front cover of the cylinder.
- Remove the cover from the solar control unit.

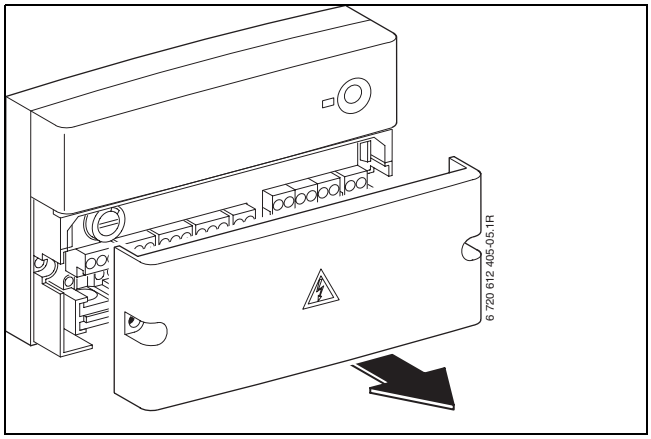

Fig. 22

- Replace the 4 A (slow) (230 V AC) fuse. A replacement fuse is located inside the cover of the solar control unit.

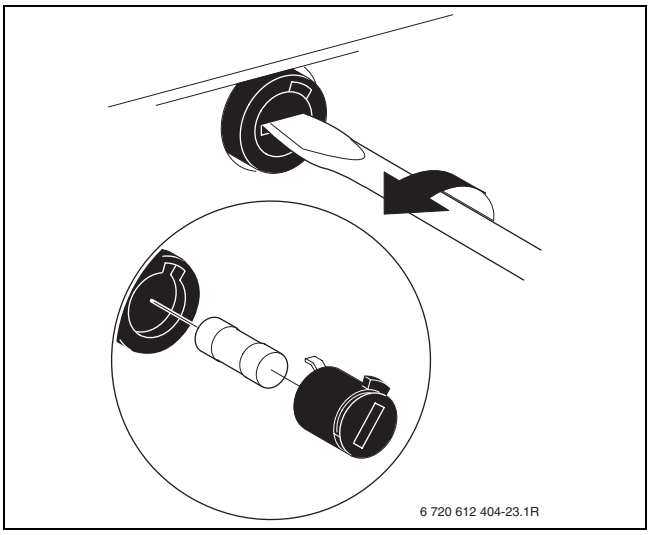

Fig. 23 9

Notes

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