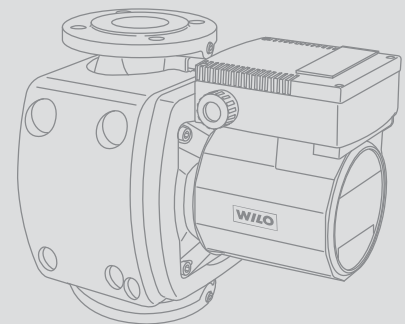
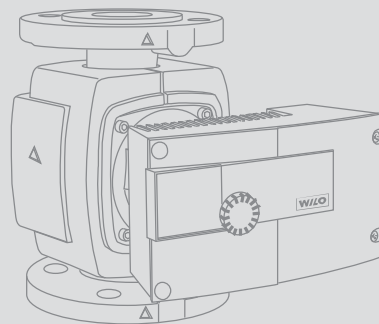
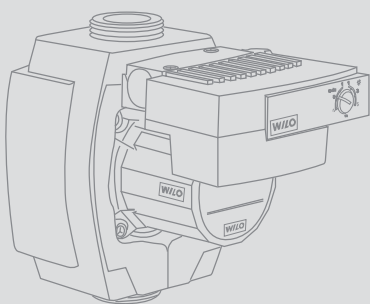


Catalogue Heating, Air-conditioning, Cooling

Circulating Pumps

Glandless Pumps
and Accessories,
Package Heat Exchanger Assembly













B1	B1	B1	B1	B1	B4	A1	A1	A1	C3	A1	C1	C3




C1	B1	B4	A1	A2	A1	A1	A3	C3	C3

Programme overview and fields of applications

Glandless pumps

Pump type		Main field of application							Page
									
Heating, air-conditioning, cooling									
High- efficiency pumps – Single pumps	Wilo- Stratos ECO	S/M	–	S/M	–	–	–	43	
	Wilo- Stratos	M/C	–	–	C	M/C	–	50	
– Double pumps	Wilo- Stratos- D	C	–	–	C	C	–	68	
Energy- saving pumps – Single pumps	Wilo- Star- E	S/M	–	S	–	–	–	86	
	Wilo- TOP- E	M/C	–	–	–	–	–	93	
– Double pumps	Wilo- TOP- ED	C	–	–	–	–	–	109	
Automatic pumps – Single pumps	Wilo- Smart	S/M	–	S/M	S	–	–	126	
Standard pumps – Single pumps	Wilo- Star- RS	S/M	–	–	S/M	–	–	144	
	Wilo- AXL (maximum 2440 1/min)	M/C	–	–	–	–	–	154	
	Wilo- TOP- RL (maximum 2660 1/min)	M/C	–	–	C	–	–	159	
	Wilo- SE (maximum 2880 1/min)	M/C	–	–	C	–	–	166	
	 Wilo- TOP- S (maximum 2880 1/min)	M/C	–	–	C	–	–	173	
	Wilo- TOP- D (maximum 1400 1/min)	M/C	–	–	C	–	–	199	
	– Double pumps	Wilo- Star- RSD	S/M	–	–	S/M	–	–	212
		 Wilo- TOP- SD (maximum 2850 1/min)	C	–	–	C	–	–	218
	Wilo- SE- TW (maximum 2880 1/min)	–	–	–	C	–	–	244	
Secondary hot water circulation									
High- efficiency pumps – Single pumps	Wilo- Stratos ECO- Z	–	M	–	–	–	–	257	
	Wilo- Stratos- Z	–	M/C	M/C	C	M/C	–	264	
– Double pumps	Wilo- Stratos- ZD	C	–	–	C	C	–	276	
Standard pumps – Single pumps	Wilo- Star- Z 15	–	S	–	–	–	–	289	
	Wilo- Star- Z 20/25	–	M	M	–	–	–	289	
	Wilo- TOP- Z (maximum 2850 1/min)	–	M/C	M/C	–	–	–	300	
- Special single pumps	Wilo- VeroLine- IP- Z	M/C	M/C	M/C	M/C	–	–	313	
Solar thermal, geothermal energy									
High- efficiency pumps – Single pumps	Wilo- Stratos ECO- ST	–	–	–	–	S/M	–	324	
Standard pumps – Single pumps	Wilo- Star- ST	–	–	–	–	S/M	–	336	
	Wilo- Star- RSG	–	–	–	–	–	S/M	344	

Key:

- Not applicable
- S Single- and two- family houses
- M Multi- family houses
- C Commercial
-  New in the programme or series extension or modification

Fields of application:



Heating



Secondary hot water circulation



Floor heating



Air- conditioning/cooling

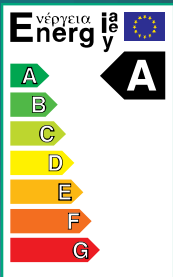


Solar thermal



Geothermal energy systems

Best in energy saving.*



Wilo- Stratos ECO high- efficiency pump.

- *With a grade of 1.3, the Wilo- Stratos ECO is even a test winner in terms of energy efficiency:
- 23% lower energy consumption than the runner-up.
- savings of up to 3,000 Euros in 20 years compared to uncontrolled heating pumps.

Very good? We call this Pumpen Intelligenz.



www.wilo.com



Pumpen Intelligenz.

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Wilo-Stratos ECO, Stratos, Stratos-D Wilo-Star-E Wilo-Star-RS, TOP-S, TOP-D Wilo-Star-RSD, TOP-SD	
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Wilo-Stratos ECO-Z, Stratos-Z Wilo-Star-Z, TOP-Z, Veroline-IP-Z	
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Wilo-Stratos-ECO-ST Wilo-Star-ST, Star-RSG	
Service/accessories systems	349
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Wilo-TOP motor technology, circuit diagrams Switching plugs, service units Pipe unions, adapter fittings Wilo-thermal insulation shells, ClimaForm Wilo-Safe-WS, DrainLift Con	
Switchgears and control devices Pump management Wilo-Control	371 435
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Wilo-S1.../S2..., SK, SD, VR- HVAC, CR, CRn, CC- HVAC Wilo-IF-Module Stratos IR- Modul, IR- Monitor, Protect- Modul- C Wilo- Control AnaCon/DigiCon/DigiCon- A Wilo- Control bus box, CAN bus line	

Heating, air- conditioning,
cooling

Secondary hot water circulation

Solar thermal, geothermal
energy systems

Service/accessories, systems

Switchgears and control devices
Pump management systems

Heating, air- conditioning, cooling

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Heating, air- conditioning, cooling

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Switchgears and control devices






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General notes and abbreviations

Abbreviations used and what they mean

Abbreviation	Meaning
1~	1- phase current
3~	3- phase current
Autopilot	Automatic adjustment of the pump output in set-back phases, e. g. boiler setback operation during the night
blsf	Blocking current- proof, no motor protection necessary
CAN	CAN (Controller Area Network) - Multi master bus system, in which several equal CAN- devices may communicate via a 2- core bus within very short cycle times. The Wilo- CAN bus includes a CANopen Standard (EN 50325- 4) which is independent of the supplier.
DM	Three- phase motor, 3~
DN	Nominal diameter of the flange connection
	Pressure loss
 - c	Control mode for constant differential pressure
 - T	Control mode for differential pressure control depending on the fluid temperature
 - v	Control mode for variable differential pressure
	Control mode for differential temperature
EBM	Individual run signal
EOM technology	Electronically commutated motor with new damp-room enclosure, newly developed glandless drive concept for high- efficiency pumps
EM	Single- phase motor, 1~
EnEV	German Energy Conservation Legislation
ESM	Individual fault signal
Ext. Off	"Overriding Off" control input
Ext. Min	Control input „Overriding Min“, e. g. for setback operation without Autopilot
FI	Residual current- operated protective device
BA	Building automation
GRD/GLRD	Mechanical seal
°dH	Degree of German water hardness; formerly used unit for assessing the water hardness. Is no longer used since the SI- unit mmol/l has been introduced. Conversion: 1 °dH= 0.1783 mmol/l
H	Delivery head
IF	Interface
Int. MS	Internal motor protection: Pumps with internal protection against unacceptably high winding temperatures
IR	Infrared interface

Abbreviation	Meaning
KDS	Capacitor
KLF	PTC thermistor sensor
KTL- coating	Electrophoretic painting (cataphoretic coating): Painting with high adhesive strength for long- lasting corrosion protection
KTW	Approval for products with plastics, for use in potable water applications
LON	Local Operating Network (open, standardised data bus system independent of manufacturer in LON- Works networks)
mmol/l	Millimol per litre; SI- unit for assessing the water hardness (total hardness or concentration of alkaline earth ions)
MOT	Motor module (drive motor + impeller+ terminal box/ electronic module) for replacement of TOP- ...- series
P ₁	Power consumption (power supplied from the grid)
PLR	Pump master computer, Wilo- specific data interface
Q (=V̇)	Volume flow
RMOT	Spare motor (drive motor + impeller + terminal box/ electronics module) for replacement
SBM	Run signal or collective run signal
SSM	Fault signal or collective fault signal
Control input 0 - 10 V	Analogue input for external activation of functions
TrinkwV 2001	German Drinking Water Ordinance of 2001 (valid from 01.01.2003)
VDI 2035	VDI guideline for preventing damage in hot- water heating installations
Wilo- Control	Building automation management with pumps and accessories
WRAS	Water Regulations Advisory Scheme (potable water approval for Great Britain and Northern Ireland)
WSK	Thermal winding contacts (in motor for monitoring the winding temperature, full motor protection by additional tripping unit)
	Operating mode of double pumps Individual operation of the relevant operating pump
	Operating mode of double pumps Parallel operation of both pumps
	Number of poles of electric motors 2- pole motor = approx. 2900 rpm at 50 Hz
	Number of poles of electric motors 4- pole motor = approx. 1450 rpm at 50 Hz
	Number of poles of electric motors 6- pole motor = approx. 950 rpm at 50 Hz

Material designations and their meaning

Material	Meaning
1.4021	Chrome steel X20Cr13
1.4034	Chrome steel X46Cr13
1.4057	Chrome steel X17CrNi16- 2
1.4122	Chrome steel X39CrMo17- 1
1.4301	Chromium nickel steel X5CrNi18- 10
1.4305	Chromium nickel steel X8CrNiS18- 9
1.4306	Chromium nickel steel X2CrNi19- 11
1.4401	Chromium nickel molybdenum steel X5CrNiMo17- 12- 2
1.4408	Chromium nickel molybdenum steel GX5CrNiMo19- 11- 2
1.4462	Chromium nickel molybdenum steel X2CrNiMoN22- 5- 3
1.4541	Chromium nickel steel with titanium addition X6CrNiTi18- 10
1.4542	Chromium nickel steel with copper and niobium addition X5CrNiCuNb16- 4
1.4571	Chromium nickel steel with titanium addition X6CrNiMoTi17- 12- 2
Abrasite	Chilled cast iron for use with heavily abrasive fluids
Al	Aluminium
Ceram	Liquid ceramic coating; coating with very high adhesive strength for long- lasting corrosion protection
COMPOSITE	High- strength plastic material
EN- GJL	Cast iron (with lamellar graphite)
EN- GJS	Cast iron (with spheroidal cast iron)
G- CuSn10	Zinc- free bronze
GfK	Glass fibre reinforced plastic
GG	see EN- GJL
GTW	Special cast iron: white malleable cast iron
GGG	see EN- GJS
Inox	stainless steel
NiAl- Bz	Nickel aluminium bronze
PPO	Trade name: Noryl, fibreglass- reinforced plastic
PP- GF30	Polypropylene, reinforced with 30% fibreglass
PUR	Polyurethane
SC	Silicon carbide
ST	Steel
V2A	Material group, e.g. 1.4301, 1.4306
V4A	Material group, e.g. 1.4404, 1.4571

Wear and tear

Pumps or parts of pumps are subject to wear in accordance with state- of- the- art technology (DIN 31051/DIN- EN 13306). This wear may vary depending on operating parameters (temperature, pressure, speed, water condition) and installation/usage situation and may result in the malfunction or failure at different times of the above- mentioned products/components including their electrical/electronic circuitry.

Wear parts are all components subject to rotary or dynamic strain including electronic components under tension, in particular:

- Seals (incl. mechanical seal), seal ring
- Stuffing box
- Bearing and shaft
- Impellers and pump part
- Ball race and wear ring
- Wear ring / wear plate
- Macerator
- Capacitor
- Relay / contactor / switch
- Electronic circuits, semiconductor components etc.

Pumps and continuous- flow machines (lie submersible mixers and recirculation pumps), as well as their components with coatings (cathaphoresis coating, 2K- or Ceram- coating) are subject to constant wear due to the abrasive fluid contents. It is for that reason that the coating is also listed with the wearing parts contained in these units!

We do not accept liability for faults or defects arising from natural wear and tear.

Note

In accordance with **German Energy Saving Ordinance [Energieeinspar- Verordnung EnEV]** as of the 1.2.2002 at boiler outputs from 25 kW, heating pumps are to be equipped with switchgears for automatic performance control or **electronically controlled pumps** are to be installed.

In accordance with **TrinkwV 2001** and **DIN 50930- 6**, only circulating pumps with corrosion- resistant pump housings made of stainless steel or red brass (CC 499K) are to be utilised in secondary hot water circulation systems.

Pump replacement

Detailed information on the subject of "Replacing heating pumps" can be found in the current Wilo replacement guide for heating pumps.

Wilo – General terms of delivery and service

The latest version of our general terms of delivery and service can be found on the Internet at

www.wilo.com/agb

Pump selection: General remarks

Circulation pumps should always be selected so that the specified duty point is located at or as near as possible to the point of maximum efficiency (optimum volume flow) of the maximum speed H/Q pump curve.

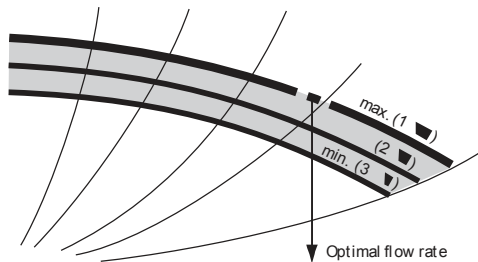


Fig.: Pump curve

If the specified duty point lies between two pump curves, then the smaller pump is always to be selected:

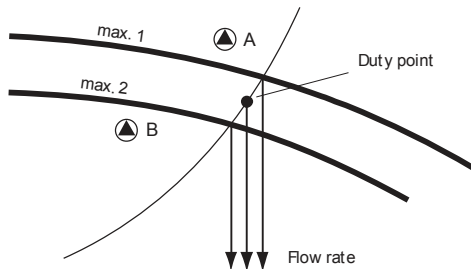


Fig.: Pump selection

The resulting volume flow reduction has no appreciable effect on the actual heating output in heating systems. This applies to pumps for cooling systems.

Pump selection: Secondary hot water circulation systems

Pump selection

- In order to ensure the correct configuration of the secondary hot water circulation system, the pipe system must be designed in accordance with DIN 1988 as well as DVGW worksheets W 551 to W 553.
- The volume flow should be determined according to the specifications in the standard and the DVGW guideline.
- If the hydraulic duty point is between two pump curves, then the next largest circulation pump or speed stage is to be selected in accordance with DVGW worksheet W 553.
- The heat losses in the ascending and circulation secondary hot water pipes are to be reduced to a minimum by appropriate insulation.

Since most secondary hot water circulation systems permit periodic circulation pump deactivation (as a rule at night), a clock timer should be included in the standard equipment for automatic ON/OFF operation.

The German energy savings ordinance (EnEV) demands periodic pump activation/deactivation. Legionellae switching of the heat generator or the heating controller are to be observed and taken into account during programming.

Maximum secondary hot water temperature

In view of the hardness-forming components contained in the water, secondary hot water circulation systems should not be operated at temperatures above 65 °C.

This limit is required to avoid the formation of lime deposits.

Circulation pipe

Wilo recommends the installation of a check valve in order to prevent faulty circulation and to prevent gravity circulation in pumps that have been shut down.

Controls for automatic time-dependent activation/deactivation: Wilo-SK 601 switchgear for pumps of the Wilo-TOP-Z series



Fig.: Wilo-SK 601 switchgear

- Wall-mounted installation version, protection class IP31
- Direct connection for single-phase pumps (EM) without thermal winding contact (WSK)
For three-phase pumps or for single-phase pumps with WSK, only in combination with Wilo-SK 602 or contactor
- Clock timer for On/Off day programme with 15-minute switching intervals
Clock timer in special version with day/week programme and battery backup (120 hours), with digital display

Variable speed control

Experience shows that variable speed control is only required in circulation pumps in secondary hot water circulation systems for the basic adjustment of the performance. An automatic speed control is not required. A time-dependent activation/deactivation should however be provided for each installation.

Motor protection

Blocking current-proof pumps and pumps with internal protection against unacceptably high winding temperatures do not require motor protection. All other pumps have integrated full motor protection, including trip electronics or full motor protection (WSK) in combination with the Wilo-SK 602/SK 622 tripping units.

Planning guide

Glandless pumps (general)

Pump duty splitting

General notes on double pumps

- Two pump heads mounted in a common housing, hydraulically separated by a switchover valve
- Specific design characteristics like with corresponding single pump series
- Replacement of an equally powerful single pump with identical installation dimensions
- Wide range of applications due to standard 3-stage switching

Pump duty splitting

Splitting the assigned maximum design output to a **double pump in parallel operation** enables - particularly in terms of heating - significantly improved **adaptability to partial-load conditions** and **optimum economic efficiency**. The partial-load pump output to be achieved on average during the season, i.e. for more than 85% of the heating season is sufficient for the operation of **one pump only**; **the second pump** is available for **parallel operation** for occasional full-load requirements.

Benefits of splitting the output between two pumps

- Reduction of the operating costs by between 50% and 70%
- Increased reliability due to the constant availability of a standby unit ready for operation

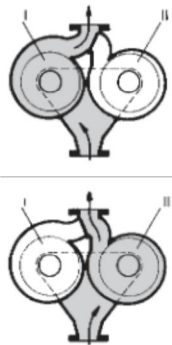
The individual performance maps for double pumps featured in the relevant chapters specify the hydraulic performance values for both individual and parallel operation.

Operating modes for double pumps

Double pumps are suitable for operation in either of two basically different operating modes:

- Main/standby mode
- Parallel operation

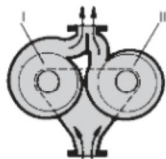
Main/standby mode (RESERVE)



Pump I or Pump II in operation

The version-specific pump output is provided by whichever one of the two pumps is acting as the main pump; the second pump remains on standby, ready for time- or fault-actuated switchover.

Parallel operation (ADDITION)



Both pumps in operation

The version-specific pump output is provided by both pumps operating in parallel. One pump can be switched off during partial-load operation.

Flow rates in pipe and pump

The flow rate of the fluid in the pipework is determined by the cross-section sizes. The values listed below should not be exceeded:

Nominal connection diameter DN [Ø mm]	Flow rate v [m/s]
In building installations	
Up to Rp 1¼ or DN 32	Up to 1.2
DN 40 and DN 50	Up to 1.5
DN 65 and DN 80	Up to 1.8
DN 100 and greater	Up to 2.0
In long-distance heating pipes	
	2.5 to a maximum of 3.5

The flow rates [m/s] in the pump are specified in all duty charts for Wilo pumps as a function of the pump output.

Viscous fluids

All pump curves included in the catalogue apply to the pumping of water (kinematic viscosity = 1 mm²/s). If fluids of different density and/or viscosity are pumped (e.g. water-glycol mixtures), the hydraulic values of the pump and the pipe system will deviate. Documents on the **calculation of the correction values for the selection of the pumps** can be obtained from Wilo.

Correction values for the pipe system (increased pressure loss, specific thermal output deficit) cannot be provided by the pump manufacturer. They must be calculated by the planning engineer in cooperation with the chemical additive suppliers and the manufacturers of the valves.

Minimum intake pressure for the prevention of cavitation

To prevent cavitation (vapour bubble formation within the pump), it is necessary to maintain a sufficiently high over pressure (suction head) at the pump suction port in relation to the vapour pressure of the fluid being pumped.

The minimum suction heads are listed in the respective tables for all glandless pumps. These reference values apply to heating systems up to 130 °C feed temperature and installation locations up to 300 m above sea level. Addition for higher altitudes: 0.1 m/100 m height increase.

The values must be increased accordingly when pumping fluids of higher temperatures or lower densities, where there is greater flow resistance on the pump suction side, and in regions of lower atmospheric pressures.

Notes on installation and operation

Permitted ambient temperature: 0 °C to +40 °C

Installation

Installation inside a building

Glandless pumps must be installed in dry, well-ventilated, frost-free rooms.

Installation outside a building (outdoor installation)

The glandless pumps of the following series are suitable for outdoor installation:

- Wilo Stratos/-D
- Wilo TOP-S/-SD
- Wilo TOP-RL
- Wilo SE/SE-TW

The following conditions must be complied with:

- Installation of the pump in a sump (e.g. light sump, ring sump) with cover or in a cabinet/housing for protection against the weather
- Avoidance of direct sunlight on the pump
- Protection of the pump against rain Dripping water from above is permitted provided that the electrical connection has been established in accordance with the installation and operating instructions and the terminal box has been properly sealed
- Provide adequate ventilation/heating in situations where the permitted ambient temperature is exceeded or fallen short of
- Permissible ambient temperature for outdoor installation:

Stratos/-D: -10 °C to +40 °C

TOP-S/-SD: -20 °C to +40 °C

TOP-RL: -20 °C to +40 °C

Wilo-SE/SE-TW: -20 °C to +40 °C

Condensation water

All standard pumps for cold water operation that are intended for applications up to -10 °C/-20 °C are fully condensation-proof. The grey cast iron pump housing of the following series is used for surface finishing:

- Stratos/Stratos-D
- TOP-E/-ED
- TOP-S/-SD
- TOP-D
- TOP-RL
- AXL/SE/SE-TW

with a special coating: (cathodoretic coating).
The benefits of this coating are:

- Optimum corrosion protection against condensation formation on the pump housings in cold-water installations
 - Very high scratch and impact resistance
- With Wilo- TOP-E/-ED pumps, the fluid temperature must always be the same as or higher than the ambient temperature to prevent condensation water formation.

Intermittent operation

The series

- Stratos/Stratos-D/Stratos-Z/Stratos-ZD
 - Star-RS/RSD
 - TOP-S/-SD
 - TOP-D
 - TOP-Z
 - TOP-RL
 - AXL/SE/SE-TW
- can also be used for intermittent operation.

Operating pressure

The maximum system pressure (operating pressure) and the flange versions for the pumps are listed in the relevant tables. All flanges on glandless pumps (except Stratos, Stratos-Z, Stratos-D and Stratos-ZD) have pressure-measurement connections R $\frac{1}{8}$

Connections

Screw-end pumps

Screw-end pumps are equipped with connecting threads in accordance with DIN EN ISO 228, Part 1. Seals are included in the scope of delivery.

Pipe unions with pipe thread in accordance with DIN EN 10226-1 must be ordered separately.

DIN 2999 (pipe thread sealing in the thread)	DIN EN ISO 228/1 (sealing pipe thread with flat gasket on longitudinal side)
Female pipe thread Rp 1½	Female pipe thread G1½
Male pipe thread R 1½	Male pipe thread G1½

Flange-end pumps

The pump flanges are designed in accordance with DIN 2531, DIN 2533 or DIN EN 1092-2. Detailed information is provided for the respective pump series.

Combination flange pumps

Flange-end pumps with combination flanges can be mounted with counter flanges PN 6 and PN 16 in accordance with DIN or DIN EN up to and including DN 65. The installation of a combination flange with a combination flange is not permitted. Screws with a tensile strength class of 4.6 or higher must be used for the flanged connections. The washers included in the scope of delivery must be fitted between heads of the screws/nuts and the combination flange. Recommended screw lengths:

Thread	Tightening torque	Minimum screw length	
		DN 32/DN 40	DN 50/DN 65
Flange connection PN 6			
M12	40 Nm	55 mm	60 mm
Flange connection PN 10			
M16	95 Nm	60 mm	65 mm

Motor

Glandless pump motors with protection class

- Wilo-Stratos series IP44
- Wilo-EasyStar series IP42
- Wilo-ClassicStar series IP44
- Wilo-TOP range IP44
- Remaining pump range IP42
- Insulation class F/H
- Emitted interference EN 61000-6-3
- Interference resistance EN 61000-6-2

Electrical connection

- All Wilo pumps are made for a voltage of 230 V or 400 V (tolerance $\pm 10\%$) in accordance with DIN IEC 60038.
- All Wilo pumps made after 01. January 1995 have been labelled with the CE marking in accordance with the EU Machinery Directive.
- When pumps are used in systems with fluid temperatures above 90 °C, a suitably heat-resistant connecting pipe must be used.

Planning guide

Glandless pumps (general)

Electronic performance control

Heating pumps are, due to their high annual operating hours, among the largest power-consuming appliances in buildings.

Automatic pump performance control helps drastically to reduce power consumption in heating pumps. Reductions of up to 50% can thus be achieved. Compared to standard pumps, high-efficiency pumps can even save up to 80% electricity costs.

All operating states, in particular in the partial load range that is typical for heating systems, can be optimised hydraulically by means of automatic pump performance control.

A further significant effect connected with the prevention of a rise in pump pressure is the avoidance of flow noise in thermostatic valves.

German Energy Savings Ordinance, EnEV

In the context of the legal measures for the reduction of CO₂ emissions, with regard to the electricity consumption of heating circulation pumps, the legislator has stipulated in the EnEV that circulation pumps installed after 1. February 2002 with a nominal thermal output exceeding 25 kW must be equipped in such a way that the electrical power consumption is automatically adjusted to the specific pumping operation requirements in at least three stages.

Even though the EnEV does not demand the use of an automatic pump output controller for pumps with a nominal thermal output below 25 kW, it is nevertheless the case that by far the greater potential savings in terms of electricity and CO₂ are to be found in the one- and two-family house sector, i.e. with installations below 25 kW.

The pump output controller does not replace the need for the correct dimensioning of the circulation pump. The installed pump output must also be checked when the pump is replaced. Controlled pumps that are slightly oversized do not pose any risk if they are correctly set to the nominal load requirement.

Standards/directives

- CE marking (all Wilo pumps)
- Certification according to:
 - ISO 9001,
 - ISO 14001,
 - VDA 6.4

Pump curves

The pump curves apply to water at +20°C and a kinematic viscosity of 1 mm²/s.

The pump curves take the European voltages of 230 V and 400 V into account.

Pump control

When Wilo pumps are operated with control devices or module accessories, the electrical operating conditions in accordance with VDE 0160 are to be complied with.

When operating glandless and glanded pumps with brands of frequency converters other than those supplied by Wilo, output filters for reducing motor noise and for preventing harmful voltage peaks are to be used and the following limit values are to be complied with:

- Glandless pumps with P₂ ≤ 2.2 kW and glanded pumps with P₂ ≤ 1.1 kW

rate of voltage rise $du/dt < 500 \text{ V}/\mu\text{s}$

voltage peaks $\hat{u} < 650 \text{ V}$

For glandless pump motors, sine filters (LC filters) are recommended for noise reduction instead of du/dt filters (RC filters).

- Glanded pumps with P₂ > 1.1 kW
- rate of voltage rise $du/dt < 500 \text{ V}/\mu\text{s}$
- voltage peaks $\hat{u} < 850 \text{ V}$

Installations with long cable lengths ($l > 10 \text{ m}$) between converter and motor may increase the du/dt and \hat{u} levels (resonance). The same applies to operation with more than 4 units using a common power supply. The output filters must be designed by the manufacturer of

the frequency converter or the filter supplier. If losses in the motor are caused by the frequency converter, the pumps are to be run at a maximum of 95 % of their nominal speed. If glandless pumps of the TOP-S/-SD, TOP-D and TOP-Z series are operated on one frequency converter, the following limit values at the connection terminals of the pumps must not be fallen short of:

$$U_{\min} = 150 \text{ V}$$

$$f_{\min} = 30 \text{ Hz}$$

Minimum volume flow

Larger pumps require a minimum flow rate to ensure trouble-free operation. Operating against a closed slide valve, volume flow $Q = 0 \text{ m}^3/\text{h}$, can lead to overheating inside the pump.

- Limit conditions for pump operation at $Q = 0 \text{ m}^3/\text{h}$:
 - up to P₂ = 1 kW are unproblematic if the fluid temperature is 10 K below the maximum permissible fluid temperature.
 - Above P₂ > 1 kW permanent operation, a minimum volume flow of $Q = 10 \% Q_{\text{nominal}}$ is required
- For the limit ranges, please consult Wilo.

Motor protection

The selection of the right motor protection is a decisive factor for the service life and operational reliability of a circulation pump. Motor protection switches are no longer suitable for pumps with selectable speeds, since their motors have deviating nominal currents in the different stages, which require fuses for each of these stages.

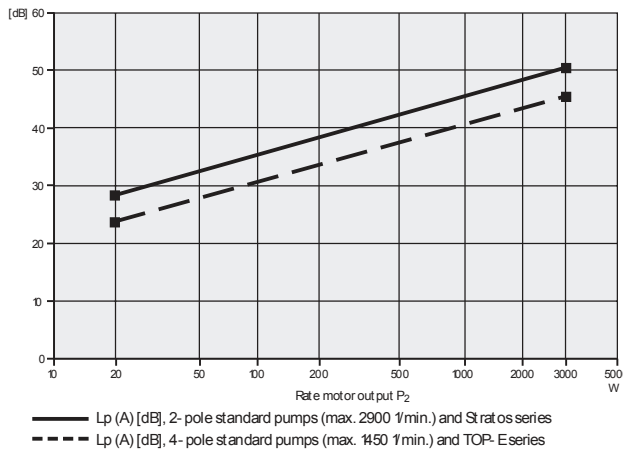
All circulation pumps are either

- blocking current-proof
 - provided with internal protection against unacceptably high winding temperatures
 - with full motor protection by thermal winding contacts (WSK) and separate Wilo tripping unit (e.g. Wilo-SK 602/SK 622)
 - with full motor protection by an integrated tripping mechanism
- For the exact equipment, see the "Motor data" table.

No other motor protection is required by the customer, unless demanded by the regional electricity supply company.

Sound pressure level

Glandless pumps are low-noise due to their design. Their air-borne noise values with measuring-surface sound pressure level $L_p(A)$ [dB] depend on the motor power output, and are determined under normal operating conditions.



Thermal insulation for heating applications

All Wilo-Stratos/Stratos-Z, Wilo-TOP-E/-S/-Z/-D and Stratos ECO single pumps are standard-equipped with insulation shells to prevent any loss of heat at the pump housing.

Material: EPP, polypropylene foam

Thermal conductivity: 0.04 W/m K in accordance with DIN 26 12

Flammability: Class B2 in accordance with DIN 4 102; FMVSS 302

When insulating the pump onsite, care must be taken to cover the pump up to the top edge of the pump housing only (the motor must be left uncovered).

Insulation for air-conditioning/cooling applications

If pumps from the series

- Stratos, Stratos-D, Stratos-Z
- TOP-S/-SD
- TOP-D
- TOP-Z
- TOP-RL
- SE/SE-TW

are used in air-conditioning/cooling applications, no diffusion-proof insulation is permitted to cover the drain labyrinth between the pump housing and the motor. That ensures that any condensate having possibly accumulated in the motor can drain off freely through the condensate drain openings in the motor housing.

The Wilo-ClimaForm diffusion-proof insulation available as accessory for the Stratos, TOP-S, TOP-RL and SE series for the insulation of pump housings in cold water applications ensures this automatically due to its specific design.

Wilo-ClimaForm:

- Water vapour diffusion resistance $\mu > 7000$
- Normal flammability, in accordance with DIN 4 102-B2
- Part 1 Quality monitoring in accordance with DIN 18 200

Quality and safety marks



For pump types

- Star-E25/..., -E30/...,
- Stratos ECOStar-RS 25/..., -RS 30/...,
- RSD 30/...,
- Star-Z 20/1, -Z 25/6

Certificate of conformity

Available on request at additional charge for all glandless circulation pumps of the series

- Stratos, Stratos-D, Stratos-Z, Stratos-ZD
- TOP-E/-ED
- TOP-S/-SD
- TOP-D
- TOP-Z
- TOP-RL
- SE/SE-TW

• Certificate of conformity 2.1

Content: Certification that the supplied product complies with the order, without details of test results.

• Certificate of conformity 2.2

Content: Certification that the supplied product complies with the order, with details of series test results.

• Acceptance test certificate 3.1B

Content: Certification that the supplied product complies with the order, with details of test results actually measured on the product. The required test scope must be specified in advance.

Planning guide

Glandless pumps (general)

Special versions

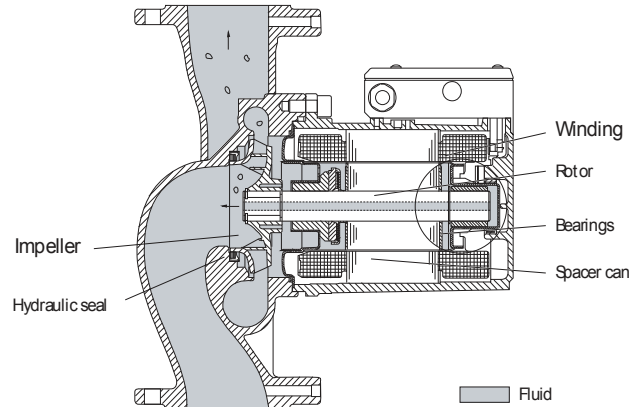
Pumps for other voltages or 60 Hz frequency possible on request (at additional charge).

Other materials and versions (RG, FN 16) for pumps are listed in the pump tables.

The glandless circulation pump

With this design, all rotating components inside the canned motor run in the pumped fluid. The required shaft seal in conventional pump types achieved by the use of stuffing boxes or mechanical seals is omitted. The pumped fluid lubricates the shaft bearings and cools the components of the electric motor.

The electrical part of the pump motor (stator with winding) is separated from the encapsulated rotor compartment by means of an encapsulated motor cartridge (with the TOPWilo series) and/or by a can sealed off with O-rings.



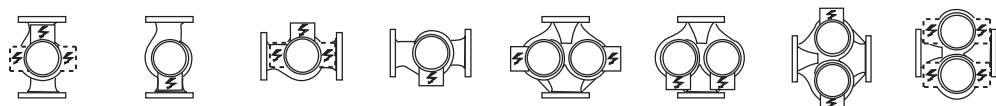
Installation positions for glandless pumps¹⁾

Installation positions not permitted	Permitted without restrictions All energy-saving pumps, infinitely variable control	Permitted without restrictions All standard and secondary hot water circulation pumps, 1 or 3 speed stages

¹⁾ Installation positions for Wilo-Stratos/-Stratos-Z/-Stratos-D/-Stratos-ZD see "High-efficiency pump planning guide"

Additional terminal box positions for single and double pumps

Pump types



Energy-saving pumps

Star-E20 (25, 30)	•	-	•	-				
TOP-E25 (30)/1-7 TOP-E30/1-10 TOP-E40/1-4 TOP-E50/1-6	•	-	•	-				
TOP-ED 32/1-7 TOP-ED 40/1-7 TOP-ED 50/1-6	-	-	-	-	•	-	-	•
Standard and secondary hot water circulation pumps								
Star-RS, Star-Z	•	•	•	•	-	-	-	-
Stratos ECO-Z	•	-	•	-	-	-	-	-
Star-RSD	-	-	-	-	•	•	•	•

Install pumps under stress-free conditions. Applicable to all operating conditions.

TOP-ED double pumps cannot be used for additional installation positions due to the inclined arrangement of the terminal boxes.

Please consult Wilo.

Connection of Wilo-TOP... and -Stratos... to Wilo switchgear provided onsite

Connection of Wilo-TOP... and -Stratos... to Wilo switchgear provided onsite

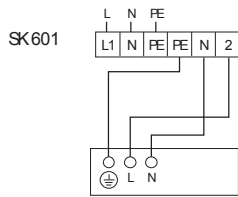
Available Wilo switchgear	New pump type													Accessories Modules		
	Switchgear connection possible according to wiring diagram													Wilo-IF-Module alternating current		
	Wilo-TOP-S Wilo-TOP-Z Wilo-TOP-RL Wilo-SE				Wilo-TOP-SD Wilo-SE-TW or 2 x Wilo-TOP-S 2 x Wilo-TOP-Z 2 x Wilo-TOP-RL 2 x Wilo-SE				Wilo TOP-D				Wilo-TOP-E Stratos Stratos-Z	Wilo-TOP-ED Stratos-D Stratos-ZD or 2 x TOP-E 2 x Stratos 2 x Stratos-Z	Wilo-TOP-E Stratos Stratos-Z	Wilo-TOP-ED Stratos-D Stratos-ZD or 2 x TOP-E 2 x Stratos 2 x Stratos-Z
	1~		3~		1~		3~		1~		3~		1~	1~	1~	1~
IP	WSK SSM	IP	SSM	IP	WSK SSM	IP	SSM	IP	WSK	IP	WSK					
SK 601	A	B	C ¹⁾	D ¹⁾	A	B	C ¹⁾	D ¹⁾	T	V	X ¹⁾	Y	E	E	Yes	Yes
SK 602/622	F	G	H	I	F	G	H	I	U	W	X1	Y1	J	J	Yes	Yes
SK 632	-	-	K	L	-	-	K	L	-	-	K	L	-	-	Yes	Yes
S2R 3D	-	-	-	-	M	N	O	P	-	-	-	-	-	Q or R	Yes	Yes
AR/DR/CR	-	-	-	S	-	-	-	S	-	-	-	-	-	-	-	-

IP: Internal protection against unacceptably high winding temperatures, WSK: Thermal winding contacts SSM: Collective fault signal

- = connection not possible,

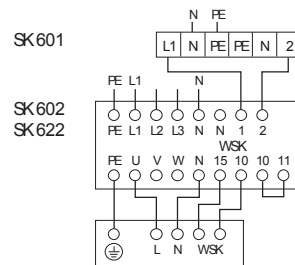
¹⁾ Only in conjunction with contactor and/or Wilo-SK 602/622: SK602/622 can also be used as On/Off switch or contactor

Wiring diagram A
power supply 1~230 V/N/50 Hz



1) Wilo-TOP-S/-Z/-SD/-RL

Wiring diagram B
power supply 1~230 V/N/50 Hz



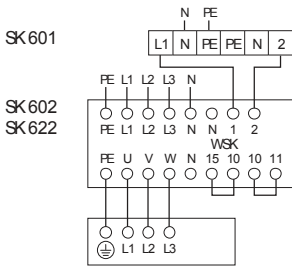
1) 3) Wilo-TOP-S/-Z/-SD

Planning guide

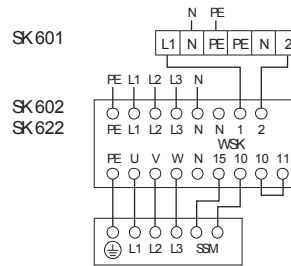
Connection information for Wilo-TOP and Wilo Stratos

Connection of Wilo-TOP... and -Stratos... to Wilo switchgear provided onsite

Wiring diagram C
power supply 3~400 V/N/50 Hz

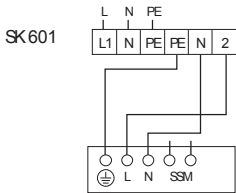


Wiring diagram D
power supply 3~400 V/N/50 Hz



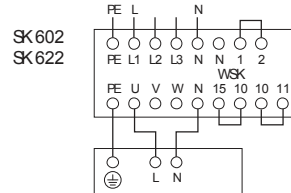
1) 3) Wilo-TOP-S/-Z/-SD

Wiring diagram E
power supply 1~230 V/N/50 Hz



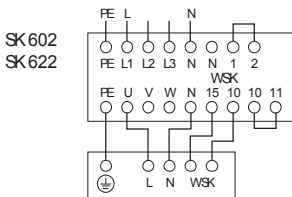
1) 2) 3) Wilo-TOP-S/-Z/-SD

Wiring diagram F
power supply 1~230 V/N/50 Hz



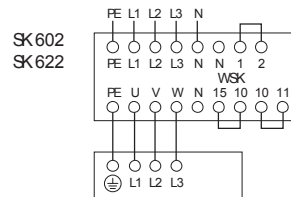
1) Wilo-TOP-E/-ED

Wiring diagram G
power supply 3~400 V/N/50 Hz



1) Wilo-TOP-S/-Z/-SD/-RL

Wiring diagram H
power supply 3~400 V/N/50 Hz



1) 3) Wilo-TOP-S/-Z/-SD

1) Wilo-TOP-S/-Z/-SD

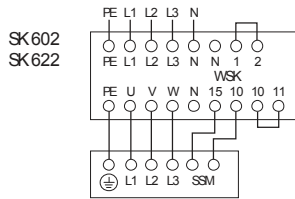
Planning guide

Connection information for Wilo-TOP and Wilo Stratos



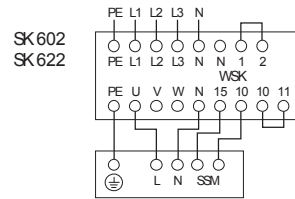
Connection of Wilo-TOP... and -Stratos... to Wilo switchgear provided onsite

Wiring diagram I
power supply 3~400 V/N/50 Hz



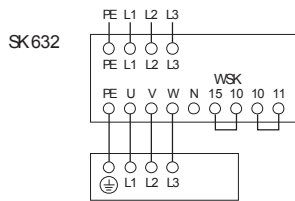
1) 2) 3) Wilo-TOP-S/-Z/-SD

Wiring diagram J
power supply 3~400 V/N/50 Hz or 1~230 V/N/50 Hz



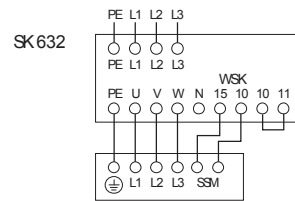
1) 2) 3) Wilo-TOP-E/-ED
Wilo-Stratos/-Z/-D/-ZD

Wiring diagram K
power supply 3~400 V/N/50 Hz



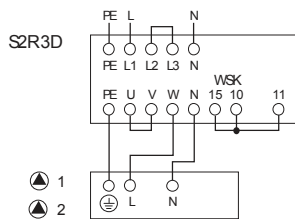
1) Wilo-TOP-S/-Z/-SD

Wiring diagram L
power supply 3~400 V/N/50 Hz



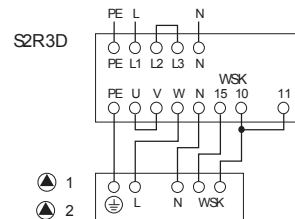
1) 2) Wilo-TOP-S/-Z/-SD

Wiring diagram M
power supply 1~230 V/N/50 Hz



1) 3) Wilo-TOP-S/-Z/-SD/-RL

Wiring diagram N
power supply 1~230 V/N/50 Hz



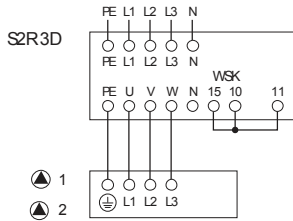
1) Wilo-TOP-S/-Z/-SD

Planning guide

Connection information for Wilo-TOP and Wilo Stratos

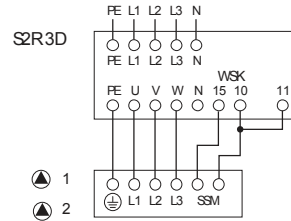
Connection of Wilo-TOP... and -Stratos... to Wilo switchgear provided onsite

Wiring diagram O
power supply 3~400 V/N/50 Hz



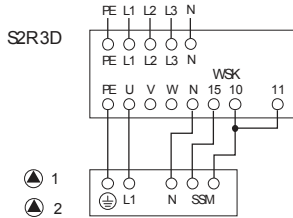
1) Wilo-TOP-S/-Z/-SD

Wiring diagram P
power supply 3~400 V/N/50 Hz



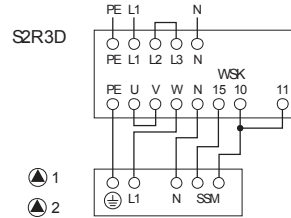
1) 2) Wilo-TOP-S/-Z/-SD

Wiring diagram Q
power supply 3~400 V/N/50 Hz



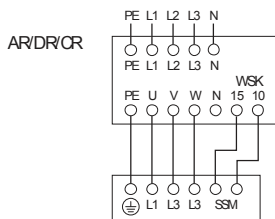
1) 2) Wilo-TOP-E/-ED
Wilo-Stratos/-Z/-D/-ZD

Wiring diagram R
power supply 1~230 V/N/50 Hz



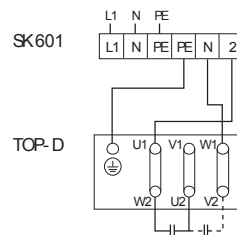
1) 2) Wilo-TOP-E/-ED
Wilo-Stratos/-Z/-D/-ZD

Wiring diagram S
power supply 3~400 V/N/50 Hz



1) Wilo-TOP-S/-Z/-SD

Wiring diagram T
power supply 1~230 V/N/50 Hz



1)

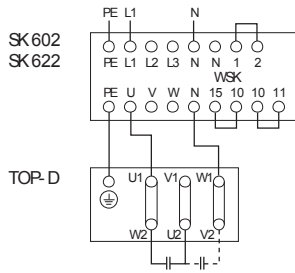
Planning guide

Connection information for Wilo-TOP and Wilo Stratos



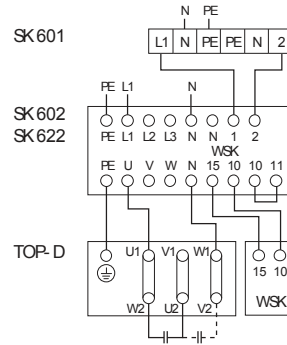
Connection of Wilo-TOP... and -Stratos... to Wilo switchgear provided onsite

Wiring diagram U
power supply 1~230 V/N/50 Hz



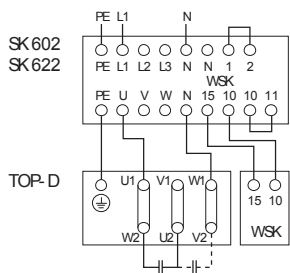
1)

Wiring diagram V
power supply 1~230 V/N/50 Hz



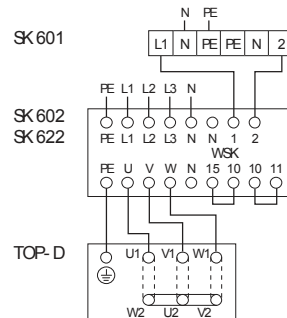
1) 3)

Wiring diagram W
power supply 1~230 V/N/50 Hz



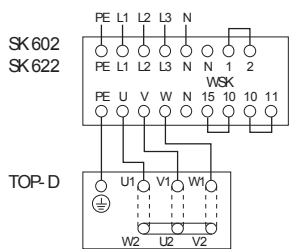
1) 3)

Wiring diagram X
power supply 3~400 V/N/50 Hz



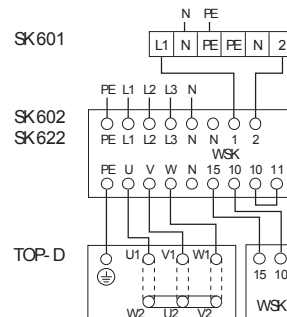
1) 3)

Wiring diagram X1
power supply 3~400 V/N/50 Hz



1)

Wiring diagram Y
power supply 3~400 V/N/50 Hz



1) 3)

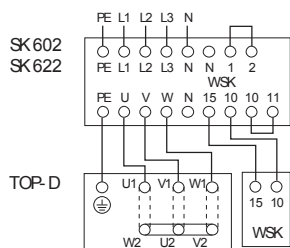
Planning guide

Connection information for Wilo- TOP and Wilo Stratos

Connection of Wilo- TOP... and - Stratos ... to Wilo switchgear provided onsite

Wiring diagram Y1

power supply 3~400 V/N/50 Hz



1) 3)

- 1) Automatic restart after a power failure
 - 2) After an overload fault trip of the pump (TOP or Stratos), acknowledge the fault first at the pump, then at the switchgear
 - 3) SK 622 additionally with terminals for collective run signals and collective fault signals
- On replacing a three-phase pump (3~400 V) with a single-phase pump (1~230 V) ensure protective multiple earthing.

Consultation with Wilo is required when installing Wilo pumps in conjunction with Wilo switchgears not listed or with switchgears not supplied by Wilo. For terminal circuit diagrams for Wilo circulation pumps, see the "Service/accessories" chapter or the pump data.