

# ALPHA SOLAR

Model B

Circulator pumps

50/60 Hz



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## 1. Product introduction



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### Product description

ALPHA SOLAR is designed to be integrated in all kinds of thermal solar systems with either variable or constant flow rate. High-efficiency ECM (Electronically Commutated Motor) pumps, such as ALPHA SOLAR, must not be speed-controlled by an external speed controller varying or pulsing the supply voltage.

The speed can be controlled by a low-voltage PWM (Pulse Width Modulation) signal from a solar controller to optimise the solar harvesting and temperature of the system. As a result, the power consumption of the pump will be reduced considerably.

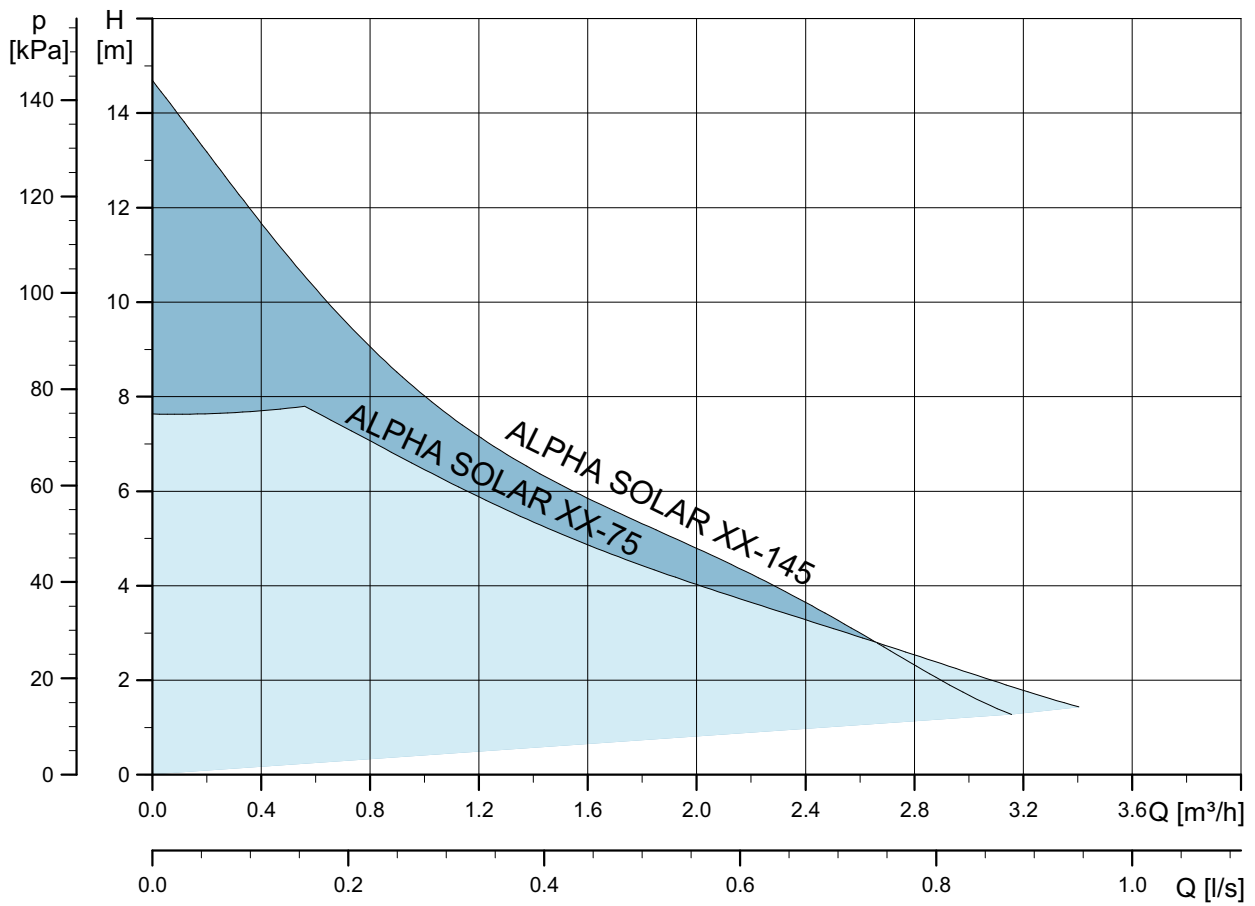
### Features and benefits

- Three different constant-speed settings
- PWM C profile. The PWM signal is a digital low-voltage control signal with pulse-width modulation for external control.
- Low EEI (Energy Efficiency Index),  $EEI \leq 0.20$
- Maintenance-free
- Low noise level
- Very simple installation
- Compact
- Deblocking screw
- High ambient temperature (70 °C).

### Type key

Example	ALPHA SOLAR	15	-75	130
Pump type				
Nominal diameter (DN) of inlet and outlet ports [mm]				
Maximum head [dm]				
[ ]: Cast-iron pump housing N: Stainless-steel pump housing				
Port-to-port length [mm]				

## ALPHA SOLAR performance



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## 2. Construction

ALPHA SOLAR pumps are of the canned-rotor type as pump and motor form an integral unit without shaft seal and with only one gasket for sealing and four screws for fastening the stator housing to the pump housing. The bearings are lubricated by the pumped liquid as the rotor can is filled with water. The focus has been on using ecofriendly materials as well as on limiting the number of materials.

These constructions ensure maintenance-free operation.

The pump is characterised by the following:

- permanent-magnet/compact-stator motor which contributes to high efficiency
- ceramic shaft and radial bearings which contribute to long life
- carbon thrust bearing which contribute to long life
- stainless-steel rotor can, bearing plate and rotor cladding which contribute to corrosion-free long life
- composite impeller which contributes to corrosion-free long life
- stainless-steel or cast-iron pump housing which contributes to flexibility
- the pump is self-venting through the system for easy startup
- compact design featuring pump head with integrated power supply operating panel which fit into most common installations.

### Stainless-steel versions N

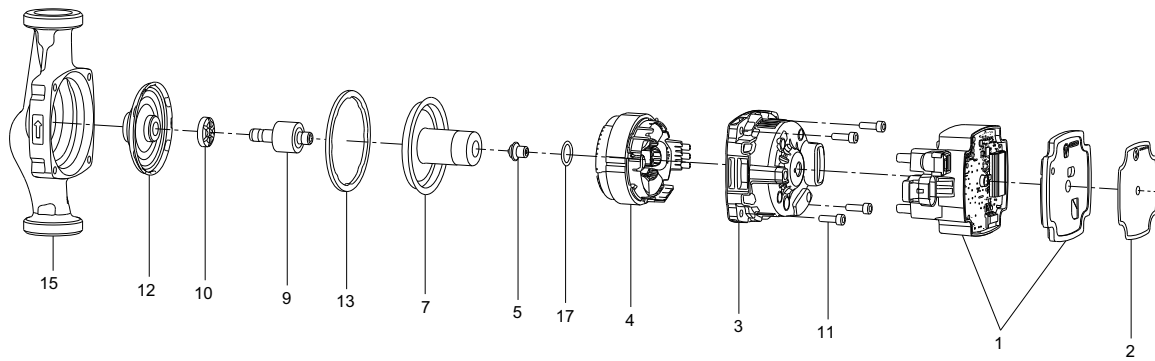
The pump housing of the stainless-steel versions is in stainless steel. The stainless-steel versions can be identified by the N in the type key or by the silver pump housing. See fig. 1.



Fig. 1 Stainless-steel version N

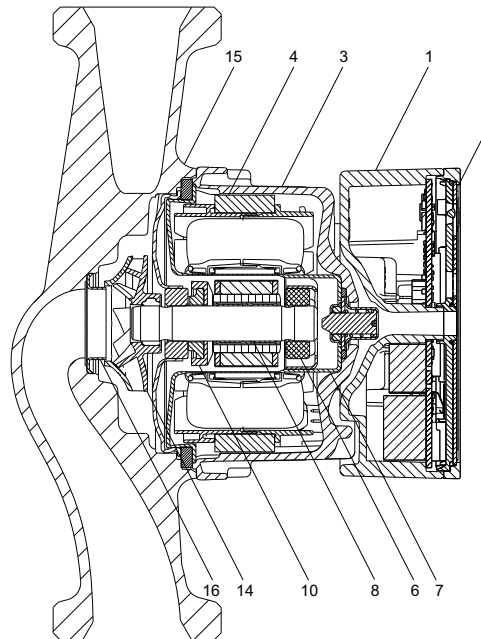
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## Exploded view and sectional view



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Fig. 2 ALPHA SOLAR exploded view



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Fig. 3 ALPHA SOLAR sectional view

## Material specification

Pos.	Component	Material	EN / DIN
1	Control box	Composite PC-GF10 FR	
	Control electronics	PCB with SMD components	
2	Front foil	LEXAN 8A13F	
3	Stator housing	Aluminium, silumin	
4	Stator	Copper wire	
	Stator lamination	Laminated iron	
5	Push deblocking device		
	Plunger	Stainless steel	1.4404
	Spring	Stainless steel	1.4310
	Housing for spring	Stainless steel	1.4401
10	Guide disc	Stainless steel	1.4401
	Housing for sealing	Stainless steel	1.4401
	Sealing	EPDM	

Pos.	Component	Material	EN / DIN
6	Radial bearing	Ceramics	
7	Rotor can	Stainless steel	1.4401
8	Shaft	Ceramics	
	Rotor	NdFeB	
9	Rotor tube	Stainless steel	1.4521
	Rotor cladding	Stainless steel	1.4401 / 1.4301
	Bush	Stainless steel	1.4301
10	Thrust bearing	Carbon	
	Thrust bearing retainer	EPDM	
11	Screws	Steel	
12	Bearing plate	Stainless steel	1.4301
13	Gasket	EPDM	
14	Impeller	Composite/PES 30 % GF	
		Cast iron GG15	EN-GJL-150
15	Pump housing	Stainless steel	1.4308
16	Neck ring	Stainless steel	1.4301
17	O-ring	EPDM	

### 3. Operating conditions

#### Technical data

Operating conditions		
Sound pressure level	The sound pressure level of the pump is lower than 32 dB(A).	
Relative humidity	Maximum 95 %, non-condensing environment	
System pressure	Maximum 1 MPa (10 bar)	
Inlet pressure	<b>Liquid temperature</b>	<b>Pressure</b>
	75 °C	0.005 MPa (0.05 bar)
	95 °C	0.05 MPa (0.5 bar)
	110 °C	0.108 MPa [1.08 bar]
Maximum inlet pressure	1 MPa (10 bar)	
Liquid temperature	<b>Ambient temperature</b>	<b>Maximum liquid temperature</b>
	60 °C	2-130 °C
	70 °C	2-110 °C
Liquid	Maximum water/propylene glycol mixture is 50 % Note: The water/propylene glycol mixture reduces the performance due to higher viscosity.	
Viscosity	Maximum 10 mm <sup>2</sup> /s	
Maximum altitude of installation	2000 m above sea level	
Electrical data		
Supply voltage	1 × 230 V - 15 %/+ 10 %, 50/60 Hz, PE	
Insulation class	F (EN 60335-1)	
Standby power consumption	< 1 W	
Inrush current	< 4 A	
Minimum switching time power on/off	No specific requirements	
Miscellaneous data		
Motor protection	The pump requires no external motor protection.	
Enclosure class	IPX4D (with drain holes)	
Temperature class (TF)	TF110 at 70 °C ambient temperature	
Specific EEI values	ALPHA Solar 25-145 180 ALPHA Solar 15-75 130 ALPHA Solar 25-75 130 ALPHA Solar 25-75 180	≤ 0.20 Part 3
	ALPHA Solar 25-145 N 180 ALPHA Solar 25-75 N 180	≤ 0.23 Part 3

## Pumped liquids

The pump is suitable for the following:

- Clean, thin, non-aggressive and non-explosive liquids, not containing solid particles or fibres.
- In heating systems, the water must meet the requirements of accepted standards on water quality in heating systems, for example the German standard VDI 2035.
- The pH must be between 8.2 and 9.5. The minimum value depends on the water hardness and must not be below 7.4 at 4 °dH (0.712 mmol/l).
- The electrical conductivity at 25 °C must be  $\geq 10$  microS/cm.
- Mixtures of water with antifreeze media such as glycol with a kinematic viscosity lower than 10 mm<sup>2</sup>/s (10 cSt). When selecting a pump, the viscosity of the pumped liquid must be taken into consideration. If the pump is used for a liquid with a higher viscosity, the hydraulic performance of the pump is reduced.
- Solar media as used in typical solar thermal systems containing up to 50 Vol % of antifreeze media.

In domestic hot-water systems, the pump must be used only for water with a degree of temporary hardness of less than 3 mmol/l CaCO<sub>3</sub> (16.8 °dH). To avoid lime problems in hard waters, the medium temperature must not exceed 65 °C.

## Liquid temperature

Ambient temperature [°C]	Max. liquid temperature [°C]
60	2-130
70	2-110

## Inlet pressure

To avoid cavitation noise and damage to the pump bearings, the following minimum pressures are required at the inlet port.

Liquid temperature	75 °C	95 °C	110 °C
Inlet pressure	0.005 MPa 0.05 bar	0.05 MPa 0.5 bar	0.108 MPa 1.08 bar

## Electrical data

### Reduced supply voltage

The pump operation is ensured above 160 VAC with reduced performance.

If the voltage falls below 190 VAC, a low-voltage warning is sent via the PWM signal.

If the voltage falls below 150 VAC, the pump stops and shows an alarm.

### Additional protection

In case of an insulation fault, the fault current may be a pulsating DC. Observe national legislation about requirements for and selection of Residual Current Device (RCD) when installing the pump.



## 4. Installation and startup

### Pump positions

Always install the pump with a horizontal motor shaft.  
Do not install the pump with a vertical motor shaft.  
See fig. 4, bottom row.

- Pump installed correctly in a vertical pipe.  
See fig. 4, top row, left.
- Pump installed correctly in a horizontal pipe.  
See fig. 4, top row, right.

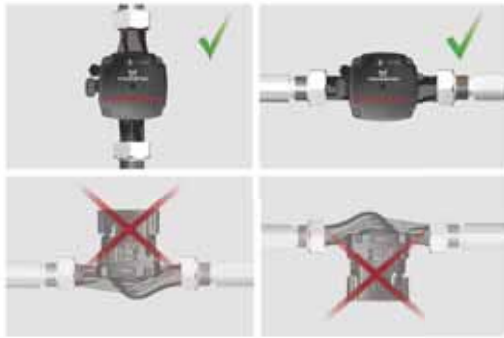


Fig. 4 Pump positions

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### Control box positions

Always install the pump with a horizontal motor shaft.  
Position the control box in position 9 o'clock. The drain hole must point downwards after installation.  
You can turn the control box in steps of 90 °.



Fig. 5 Control box positions

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### Power supply connection

The pump must be connected to the power supply with the enclosed Superseal connector plug.

#### Superseal power connector



Fig. 6 Superseal power connector

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#### Reliability

- Temperature-proof and fireproof wire
- waterproof.

#### Startup

The pump must not be started until the system has been filled with liquid and vented. Furthermore, the required minimum inlet pressure must be available at the pump inlet. The system cannot be vented through the pump. The pump is self-venting and does not have to be vented before startup. Air inside the pump is transported by the liquid into the system shortly after startup.

## 5. Operating the product

### Operating panel

The user interface is designed with a single button, one red and green LED and four yellow LEDs.



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**Fig. 7** User interface with one button and five LEDs

Pos.	Description
1	Button for setting the product.
2	LEDs showing: <ul style="list-style-type: none"> <li>• Control mode</li> <li>• Alarm or warning</li> </ul>

### Alarm status

If the pump has detected one or more alarms, the first LED switches from green to red. When an alarm is active, the LEDs indicate the type of alarm or warning.

Operating panel	Description
	Blocked
	Supply voltage low
	Electrical error

**Fig. 8** LEDs on the operating panel showing the alarm or warning

### Setting the pump

The pump can be set to run according to three constant-curve or constant-speed curves or an external control mode (PWM profile C). Use the button on the operating panel to switch between control modes.

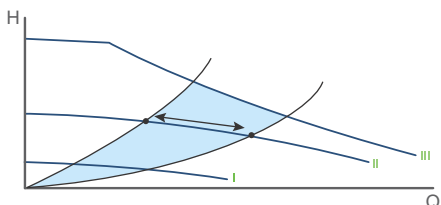
Operating panel	Control mode
	Constant curve 1
	Constant curve 2
	Constant curve 3
	PWM profile C Signal off: 1 green flash per second Signal on: 12 green flashes per second

**Fig. 9** LEDs on the operating panel showing the control mode

## 6. Control modes

### Constant curve or constant speed

At constant-curve or constant-speed operation, the pump runs at a constant curve. The pump performance follows the selected performance curve, I, II or III. See fig. 15 where II has been selected.



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Fig. 10 Constant-curve/-speed curve

The selection of the constant-curve or constant-speed setting depends on the characteristics of the heating system in question.

### Control signal

The pump can be controlled via a digital low-voltage pulse-width modulation (PWM) signal.

The square-wave PWM signal is designed for a 100 to 4,000 Hz frequency range. The PWM signal is used to select the speed (speed command) and as feedback signal. The PWM frequency on the feedback signal is fixed at 75 Hz in the pump.

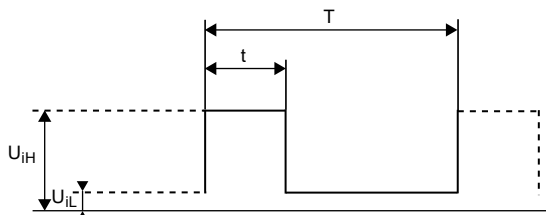
For instructions on how to set the connection, see *Setting the pump*, page 10.

#### Duty cycle

$$d \% = 100 \times t/T$$

Example	Rating
$T = 2 \text{ ms (500 Hz)}$	$U_{iH} = 4\text{-}24 \text{ V}$
$t = 0.6 \text{ ms}$	$U_{iL} \leq 1 \text{ V}$
$d \% = 100 \times 0.6 / 2 = 30 \%$	$I_{iH} \leq 10 \text{ mA (depending on } U_{iH})$

#### Example



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Fig. 11 PWM signal

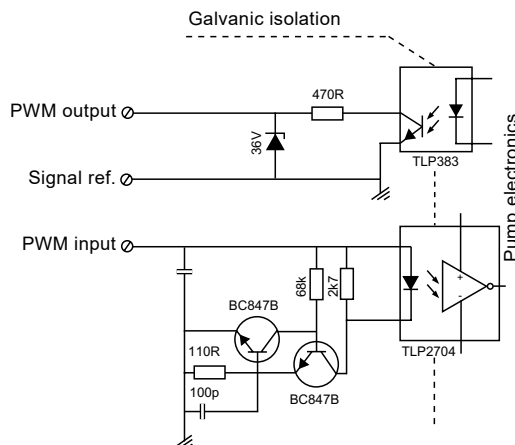
Abbreviation	Description
T	Period of time [sec.]
d	Duty cycle [t/T]
$U_{iH}$	High-level input voltage
$U_{iL}$	Low-level input voltage
$I_{iH}$	High-level input current

### Interface

The pump's interface consists of an electronic part connecting the external control signal to the pump. The interface translates the external signal into a signal type that the microprocessor can understand.

In addition, the interface ensures that the user cannot get into contact with dangerous voltage if touching the signal wires when power is connected to the pump.

**Note:** "Signal ref." is a signal reference with no connection to protective earth.

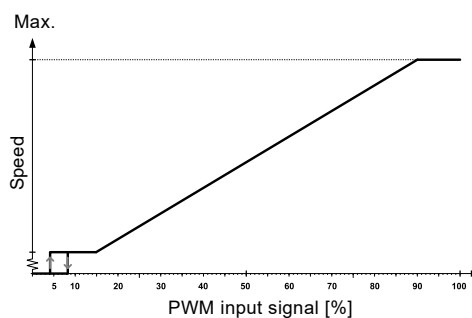


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Fig. 12 Schematic drawing, interface

### PWM profile C input signal (solar)

At low PWM signal percentages (duty cycles), a hysteresis prevents the pump from starting and stopping if the input signal fluctuates around the shifting point. Without PWM signal percentages, the pump will stop for safety reasons. If a signal is missing, for example due to a cable breakage, the pump will stop to avoid overheating of the solar thermal system.



TM05 1575 3211

Fig. 13 PWM input profile C

PWM input signal [%]	Pump status
$\leq 5$	Standby mode: off
$> 5 / \leq 8$	Hysteresis area: on/off.
$> 8 / \leq 15$	Minimum speed: IN
$> 15/90$	Variable speed: min. to max.
$> 90 / \leq 100$	Maximum speed: max.

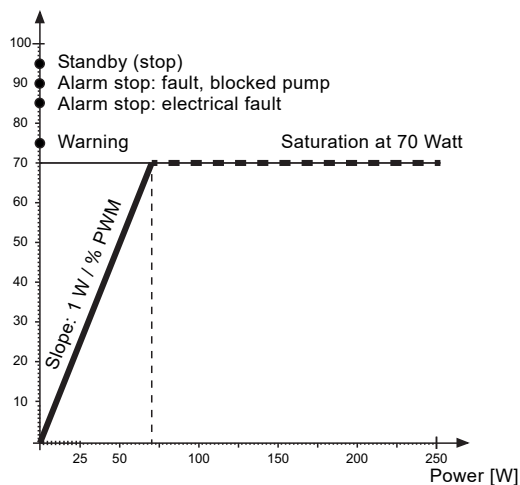
## PWM feedback signal

The PWM feedback signal offers pump information like in bus systems:

- current power consumption (accuracy  $\pm 2\%$  of PWM signal)
- warning
- alarm.

### Alarms

Alarm output signals are available because some PWM output signals are dedicated to alarm information. If a supply voltage is measured below the specified supply voltage range, the output signal is set to 75%. If the rotor is locked due to deposits in the hydraulics, the output signal is set to 90% because this alarm has a higher priority. See fig. 14.



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Fig. 14 PWM feedback signal - power consumption

### Data

Maximum rating	Symbol	Value
PWM frequency input with high-speed optocoupler	f	100-4000 Hz
Guaranteed standby power consumption		< 1 W
Rated input voltage - high level	$U_{iH}$	4-24 V
Rated input voltage - low level	$U_{iL}$	< 1 V
High-level input current	$I_{iH}$	< 10 mA
Input duty cycle	PWM	0-100 %
PWM frequency output, open collector	f	75 Hz $\pm 5\%$
Accuracy of output signal regarding power consumption	-	$\pm 2\%$ (of PWM signal)
Output duty cycle	PWM	0-100 %
Collector emitter breakdown voltage on output transistor	$U_c$	< 70 V
Collector current on output transistor	$I_c$	< 50 mA
Maximum power dissipation on output resistor	$P_R$	125 mW
Zener diode working voltage	$U_z$	36 V
Maximum power dissipation in Zener diode	$P_z$	300 mW

## Digital signal converter

To replace UPS SOLAR with a new ALPHA SOLAR which fulfils the ErP requirements, we offer two solutions:

- Exchange the existing SOLAR controller to a controller suitable for high-efficiency pumps.
- Keep the old controller, and use the phase control. Use a signal converter, SIKON HE, which can convert the existing phase control to a PWM signal for the ALPHA SOLAR.

When you use SIKON HE, you can replace the conventional 230 V UPS SOLAR pumps with Grundfos ALPHA SOLAR pumps without having to change the controller. The function of the performance control of the pump is maintained.



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Fig. 15 Digital signal converter (SIKON HE)

For further information about the controller, see [www.prozeda.de](http://www.prozeda.de).

## 7. Curve conditions

### Guide to performance curves

Each pump setting has its own performance curve.

A power curve, P1, belongs to each performance curve. The power curve shows the pump power consumption in watt at a given performance curve.

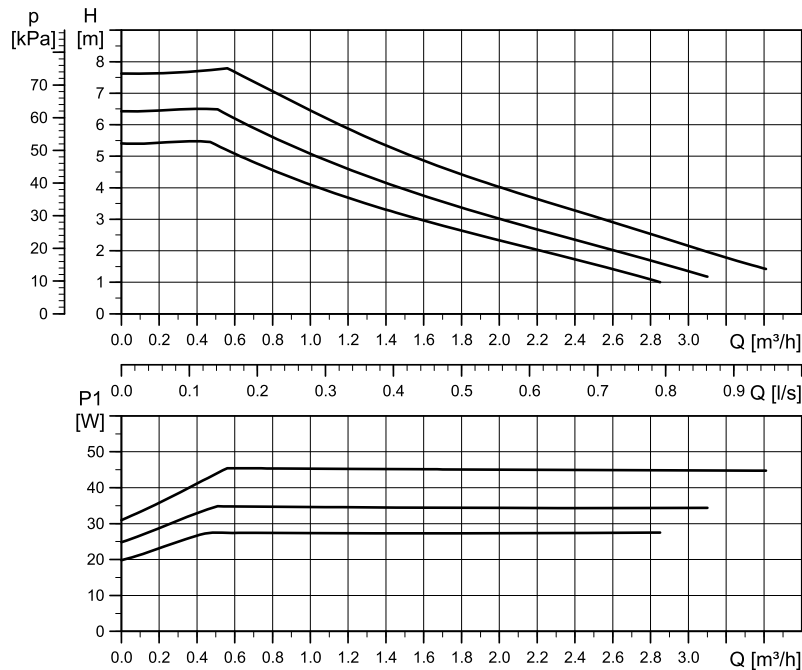
### Curve conditions

The guidelines below apply to the performance curves on the following pages:

- Test liquid: airless water.
- The curves apply to a density of  $983.2 \text{ kg/m}^3$  and a liquid temperature of  $20 \text{ }^\circ\text{C}$ .
- All curves show average values and must not be used as guarantee curves. If a specific minimum performance is required, individual measurements must be made.
- The curves apply to a kinematic viscosity of  $0.474 \text{ mm}^2/\text{s}$  ( $0.474 \text{ cSt}$ ).
- The conversion between head  $H$  [m] and pressure  $p$  [kPa] has been made for water with a density of  $1000 \text{ kg/m}^3$ . For liquids with other densities, for example hot water, the outlet pressure is proportional to the density.
- Curves are obtained according to EN 16297.
- It is not obligatory to show PL, Avg, but it gives an indication on the yearly expectable average power consumption.
- Maximum curves are limited by speed and power.

## 8. Performance curves and technical data

### ALPHA SOLAR 15-75 130, 25-75 130, 25-75 180 (N)



**Note:** PWM speed curves on request.

Setting	Max. head <sub>nom</sub>	Max. P <sub>1</sub> nom
Curve 1	5.5 m	28 W
Curve 2	6.5 m	35 W
Curve 3	7.5 m	45 W

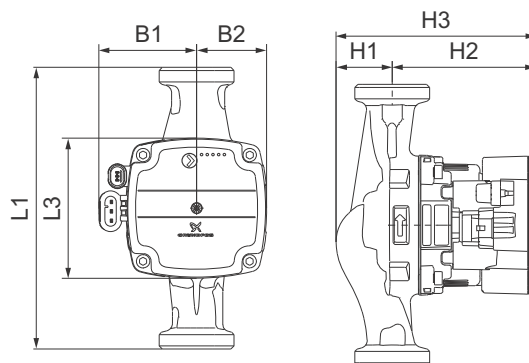
Electrical data, 1 × 230 V, + 10 / - 15 %, 50/60 Hz

Speed	P <sub>1</sub> [W]	I <sub>1/1</sub> [A]
Min.	2*	0.04
Max.	45	0.48

\* Only in PWM minimum speed operation.

ALPHA SOLAR XX-XX EEI ≤ 0.20 Part 3  
 ALPHA SOLAR XX-XX N EEI ≤ 0.23 Part 3  
 P<sub>L,avg</sub> ≤ 20 W

Settings			
PWM C	PP	CP	CC
1	-	-	3

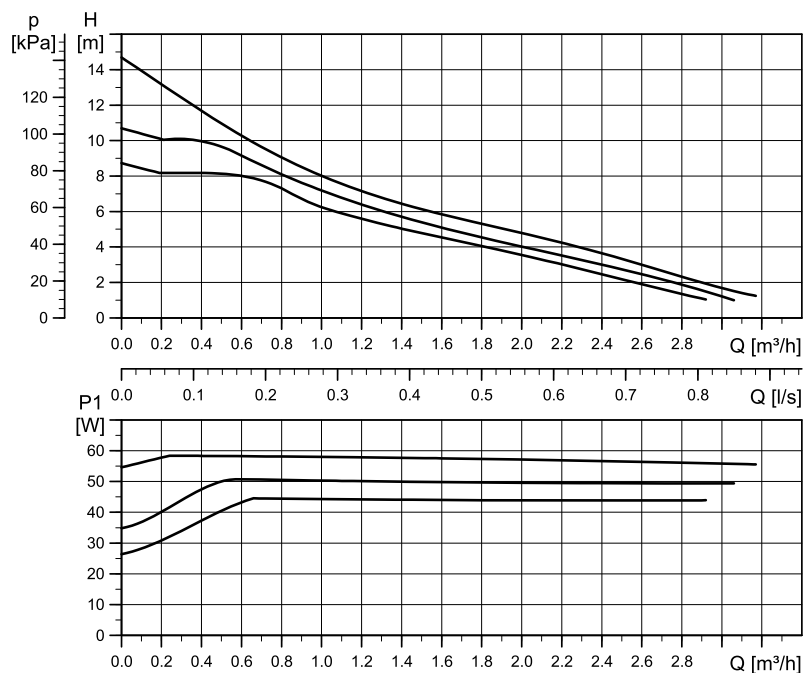


Pump type	Dimensions [mm]							Connections	Weight [kg]
	L1	L3	B1	B2	H1	H2	H3		
ALPHA SOLAR 15-75 130	130	90	64	45	36	92	128	G 1	1.8
ALPHA SOLAR 25-75 130	130	90	64	45	36	92	128	G 1 1/2	1.9
ALPHA SOLAR 25-75 180	180	90	64	45	36	92	128	G 1 1/2	2.0
ALPHA SOLAR 25-75 180 N	180	90	64	45	37	92	129	G 1 1/2	2.5

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## ALPHA SOLAR 25-145 180 (N)



TM06 3652 0815

**Note:** PWM speed curves on request.

Setting	Max. head <sub>nom</sub>	Max. P <sub>1</sub> nom
Curve 1	8.5 m	45 W
Curve 2	10.5 m	52 W
Curve 3	14.5 m	60 W

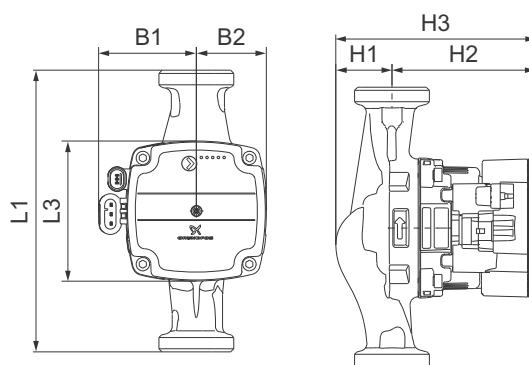
Electrical data, 1 × 230 V, +10/-15 %, 50/60 Hz

Speed	P <sub>1</sub> [W]	I <sub>1/1</sub> [A]
Min.	2*	0.04
Max.	60	0.58

\* Only in PWM minimum speed operation.

ALPHA SOLAR XX-XX EEI ≤ 0.20 Part 3  
 ALPHA SOLAR XX-XX N EEI ≤ 0.23 Part 3  
 P<sub>L,avg</sub> ≤ 25 W

Settings			
PWM C	PP	CP	CC
1	-	-	3



TM06 6493 1516

Pump type	Dimensions [mm]							Connections	Weight [kg]
	L1	L3	B1	B2	H1	H2	H3		
ALPHA SOLAR 25-145 180	180	90	64	46	25	102	127	G 1 1/2	2.0
ALPHA SOLAR 25-145 N 180	180	90	64	45	27	102	129	G 1 1/2	2.5

# 9. Accessories

## Unions and valve kits

The accessory is used to connect the pump to the pipes. The union nut must be fitted to the pump while the union tail is connected to the pipes.

The accessory set includes everything you need for installation.

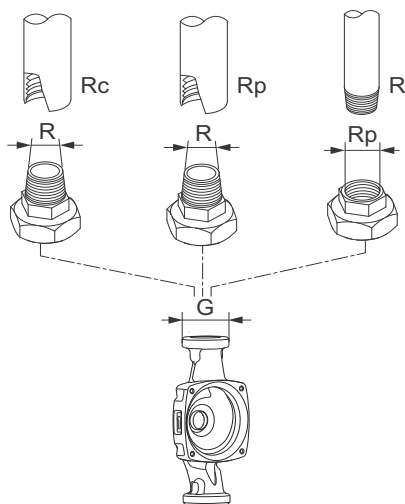
The accessory set includes everything you need for installation.

		Product numbers, unions															
ALPHA SOLAR	Connection	Rp			R		Rp			mm		mm					
		3/4	1	1 1/4	1	1 1/4	3/4	1	1 1/4	Ø22	Ø28	Ø15	Ø18	Ø22	Ø28	Ø42	
25-xx	G 1 1/2	529921	529922	529821	529925	529924											
25-xx N	G 1 1/2	529971	529972				519805	519806	519807	519808	519809			529977	529978	529979	
32-xx	G 2	509921	509922														

G-threads have a cylindrical form in accordance with the EN ISO 228-1 standard and are not sealing the thread. It requires a flat gasket. You can only screw male G-threads (cylindrical) into female G-threads. The G-threads are standard thread on the pump housing.

R-threads are tapered external threads in accordance with the EN 10226-2 standard.

Rc- or Rp-threads are internal threads with either tapered or cylindrical (parallel) threads. You can screw male R-threads (conical) into female Rc- or Rp-threads. See fig. 16.



TM07 7426 3820

Fig. 16 Thread types and combinations (examples)



## Insulating shells

The insulating shells, which are tailored to the individual pump type, can be ordered as accessories. It is easy to fit the insulating shells around the pump.

Pump type	Product number
ALPHA SOLAR XX-XX (N)	99270706

## Control box connections

### Power supply connection

A power cable is both supplied with the pump and available as an accessory.

Power cable adapters are also available as accessories.

### Control signal connection

The control signal cable connection has three conductors: the signal input, the signal output and the signal reference. Connect the cable to the control box by a mini superseal plug.

An optional signal cable is available as an accessory. The cable length must not exceed 3 metres.

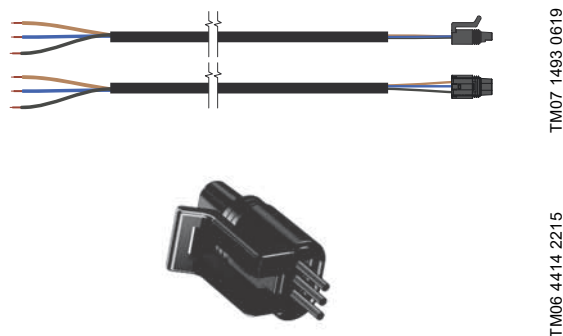

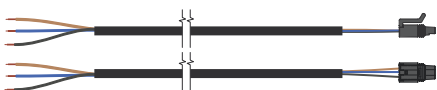
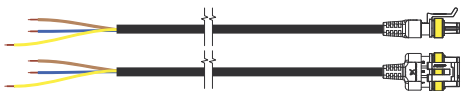


Fig. 17 Mini superseal plug

Conductor	Colour
Signal input	Brown
Signal reference	Blue
Signal output	Black

Product	Product description	Length [mm]	Product number
	Installer plug		99439948
	Mini superseal signal cable (PWM input signal)	2000	99165309
	Superseal power cable	2000	99198990

## 10. Product numbers

Pump type	Port-to-port length [mm]	Connection	Product number	Data sheet page
ALPHA SOLAR 15-75	130	G 1	98989298	14
ALPHA SOLAR 25-75	130	G 1 1/2	98989299	14
ALPHA SOLAR 25-75	180	G 1 1/2	98989300	14
ALPHA SOLAR 25-75 N	180	G 1 1/2	99206629	14
ALPHA SOLAR 25-145	180	G 1 1/2	98989297	15
ALPHA SOLAR 25-145 N	180	G 1 1/2	99206628	15

### Replacement table

Old existing products		Replaced by	
96817710	SOLAR 15-45 130	98989298	ALPHA SOLAR 15-75 130
96705819	SOLAR 15-60 130	98989298	ALPHA SOLAR 15-75 130
96817649	SOLAR 15-65 130	98989298	ALPHA SOLAR 15-75 130
59508500	SOLAR 15-80 130	98989298	ALPHA SOLAR 15-75 130
59544183	SOLAR 25-40 180	98989300	ALPHA SOLAR 25-75 180
96817722	SOLAR 25-45 130	98989299	ALPHA SOLAR 25-75 130
96817725	SOLAR 25-45 180	98989300	ALPHA SOLAR 25-75 180
59546639	SOLAR 25-60 180	98989300	ALPHA SOLAR 25-75 180
96817652	SOLAR 25-65 130	98989299	ALPHA SOLAR 25-75 130
96817707	SOLAR 25-65 180	98989300	ALPHA SOLAR 25-75 180
52588352	SOLAR 25-120 180	98989297	ALPHA SOLAR 25-145 180

# 11. Grundfos Product Center

Online search and sizing tool to help you make the right choice.

<http://product-selection.grundfos.com>

### All the information you need in one place

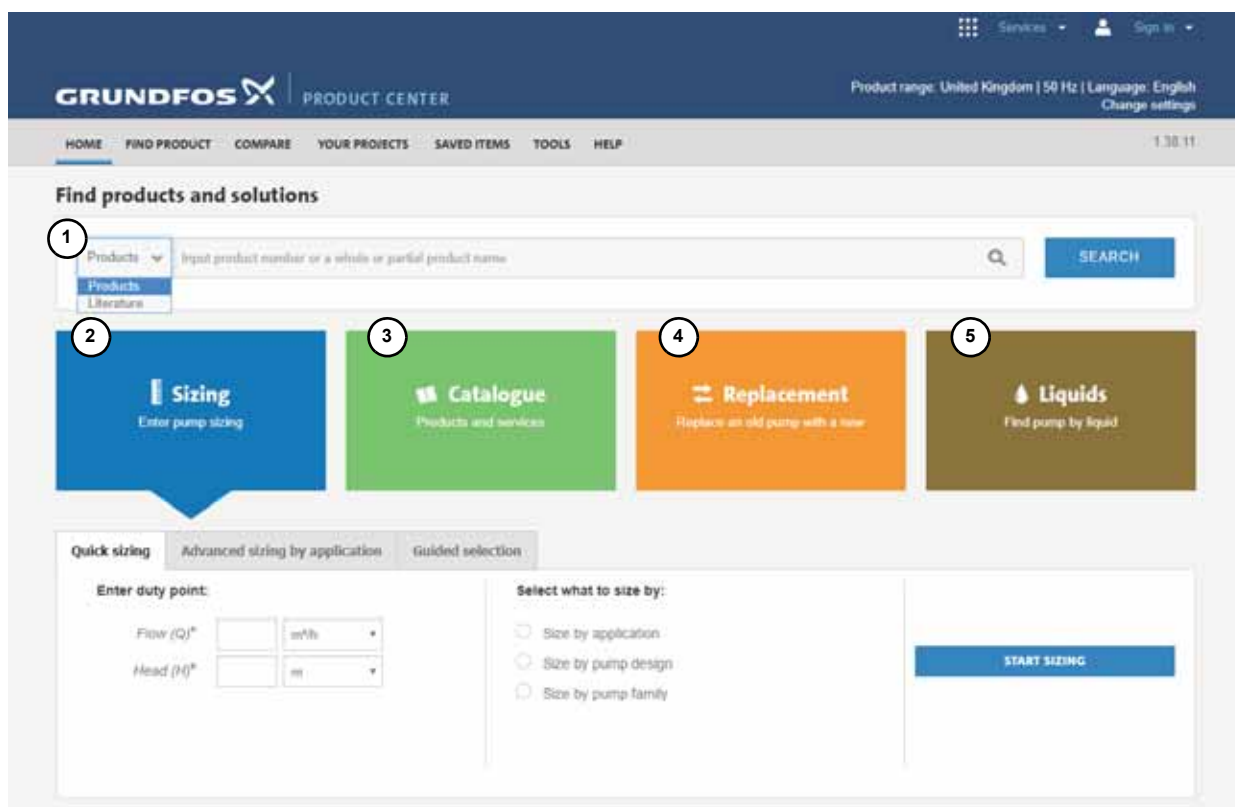
Performance curves, technical specifications, pictures, dimensional drawings, motor curves, wiring diagrams, spare parts, service kits, 3D drawings, documents, system parts. The Product Center displays any recent and saved items - including complete projects - right on the main page.

### Downloads

On the product pages, you can download installation and operating instructions, data booklets, service instructions, etc. in PDF format.



TM07 2384



TM07 2383

**Pos. Description**

- |   |                                                                                                                                                                                     |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | This drop-down menu enables you to set the search function to "Products" or "Literature".                                                                                           |
| 2 | <b>SIZING</b> enables you to size a pump based on entered data and selection choices.                                                                                               |
| 3 | <b>CATALOGUE</b> gives you access to the Grundfos product catalogue.<br><b>REPLACEMENT</b> enables you to find a replacement product.<br>Search results will include information on |
| 4 | <ul style="list-style-type: none"> <li>the lowest purchase price</li> <li>the lowest energy consumption</li> <li>the lowest total life cycle cost.</li> </ul>                       |
| 5 | <b>LIQUIDS</b> enables you to find pumps designed for aggressive, flammable or other special liquids.                                                                               |

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