

# TACOFLOW3

CIRCULATORS FOR HYDRONIC HEATING APPLICATIONS



R290



A family of products that offers various options to control the output in hydronic heating systems

## DESCRIPTION

All TacoFlow3 models are high-efficiency ECM circulation pumps. They are driven by unique hi-tech permanent magnet synchronous motors and comply with the latest ErP EU directives for energy efficiency. Each TacoFlow3 circulator incorporates inverter electronics with the unique two-phase TACO motors to deliver robust designs, with fewer components and lower power losses. These technological benefits result in maintenance-free ECM circulators that can adjust electronically to the needs of the installation while ensuring powerful performance, high efficiency and reliability with a minimal installation footprint.

## INSTALLATION POSITION

The pump can be installed both horizontally or vertically. An arrow indicates the flow direction.

## OPERATION

The circulators are of a glandless design. The rotating parts of the motor run inside the pumped medium. This provides lubrication for the motor and the rotating parts and eliminates the need for internal seals.

Each circulator is equipped with the unique "auto unblock" function for active protection against rotor jamming.

## ADVANTAGES

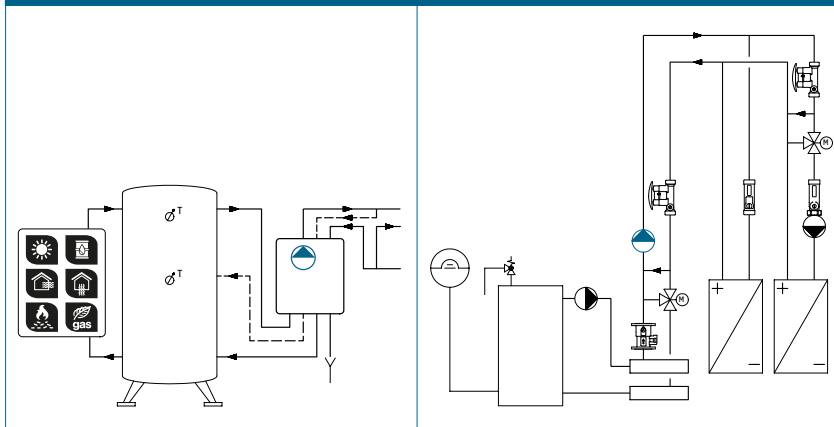
- Easy to install and precise output control through choice of operating modes, performance and connectivity options
- Flexible commissioning with internal ( $\Delta p-v$ ,  $\Delta p-c$ ) and/or external (PWM / LIN bus) control schemes
- Highly reliable and robust with superb anti-jamming protection against dry starts and dirt
- Exceptionally compact to fit in tightest spaces
- Reach comfort temperatures faster and save energy with the patented TacoAdapt™ function
- Special noise-reduction and energy-saving function for surface (e.g. underfloor) heating
- Pin-to-pin connection options to reduce supply chain complexity
- Compliance with flammable refrigerants (e.g., R290, R32)

The "auto unblock" function combines automatic torque boosting/swinging whenever a rotor jam is electronically detected with a unique design to: (a) protect the sensitive rotor chamber from dirt, and (b) reduce the magnetic attraction of any metallic particles contained in the heating water.

## APPLICATION CATEGORIES

Standalone and/or system-integrated circulators for hydronic space heating in residential, commercial and industrial buildings with moderate flow and head demands

## SYSTEM/BASIC DIAGRAM



# TACOFLOW3 | CIRCULATORS FOR HYDRONIC HEATING APPLICATIONS

## OVERVIEW (AVAILABLE STANDARD PLATFORM OPTIONS)

TacoFlow3 | A family of products that lets you choose the right circulator for each hydronic heating application. High efficiency circulators with a range of available options regarding operating modes, performance levels, and connectivity (hydraulic and electrical). Further customizations are available upon request.

					TacoFlow3				
Operating mode: Internal / self control <sup>1</sup>					(Standard)	ADAPT	SURFACE <sup>2</sup>	PWM <sup>5</sup>	LIN
Proportional pressure ( $\Delta p-v$ )					P1, P2, P3	P1, P2, P3	P2	X	X
Constant pressure ( $\Delta p-c$ )					CI, CII, CIII	CI, CII, CIII	$C_{min} \dots C_{max}$	X	X
Various constant speeds (Min-Max)					✓	✓	max	✓	✓
Automatic mode (TacoAdapt™ <sup>3</sup> )					X	✓	X	X	X
Operating mode: External control <sup>4</sup>									
PWM profile heating / solar (see penultimate page)					X	X	X	✓/✓	X
LIN bus (VDMA24226)					X	X	X	X	✓
Performance: Head									
6.0 m (44 W)					✓	✓	✓	✓	✓
8.5 m (63 W)					✓	✓	✓	✓	✓
					Weight <sup>6</sup>				
Connection	Centre distance	Material	6.0 m	8.5 m					
G 1" (DN15)	130 mm	Composite	1.01 kg	1.12 kg	✓	✓	✓	✓	✓
	130 mm	Cast iron	1.53 kg	1.64 kg	✓	✓	✓	✓	✓
G 1½" (DN 25)	130 mm	Cast iron	1.67 kg	1.78 kg	✓	✓	✓	✓	✓
	180 mm	Cast iron	1.79 kg	1.90 kg	✓	✓	✓	✓	✓
G 2" (DN 32)	180 mm	Cast iron	1.94 kg	2.05 kg	✓	✓	✓	✓	✓

<sup>1</sup> No external controller is required for operation. See curves for more information.

<sup>2</sup> SURFACE: Specifically designed for surface heating application, such as underfloor heating. Full range from  $C_{min}$  to  $C_{max}$

<sup>3</sup> Granted patent EP 2 910 788 B1

<sup>4</sup> An external controller is required for operation.

<sup>5</sup> Three Max-PWM curves per profile for a specific head (e.g., head: 8.5 m / profile: heating, three Max-PWM curves at 4 m, 6 m and 8.5 m to choose from).

<sup>6</sup> Without connector and cable

## TECHNICAL DATA

### Circulator

- Ambient temperature: +0 °C to +55 °C
- Permissible fluid temperature\*: +2 °C to +95 °C (short term: 110 °C)
- Static pressure: Max. 0.6 MPa – 6 bar
- Minimum pressure at suction port:
  - 0.005 MPa (0.05 bar) at 75 °C
  - 0.025 MPa (0.25 bar) at 85 °C
  - 0.055 MPa (0.55 bar) at 95 °C
- Max. relative humidity: ≤ 95 %
- Sound pressure level: < 33 dB(A)
- Low Voltage Directive (2014/35/EC): Standards applied: EN 62233, EN 60335-1 and EN 60335-2-51
- EMC Directive (2014/30/EC); Standards applied: EN 61000-3-2, EN 61000-3-3, EN 55014-1 and EN 55014-2
- Ecodesign Directive (2009/125/EC); Standards applied: EN 16297-1 and EN 16297-2
- Approvals and labels: VDE, CE, GS, UKCA

- EN 60335-2-40:2014-01 clause 22.116 and clause 22.117 (all the refrigerants of Annex BB herein, including R290)

### Material

- Pump body:
  - Cast iron (CDP-coated [EN-GJL-200])
  - Composite plastic PA66 GF30
- Impeller: PP GF30 composite plastic
- Rotor shaft: Ceramic
- Rotor bear: Graphite
- Rotor housing: PA6T/6I GF40 composite plastic
- Motor: Composite plastic PA66/6 GF30, steel, copper, aluminium

### Motor and electronics

- Supply voltage: 1 x 230 V – 240 V (+10 % / -15 %)
- Power plugs: see "Type Key"
- Power rating (P1):
  - 6.0 m: min. 3 W – max. 44 W
  - 8.5 m: min. 3 W – max. 63 W
- Rated current (I1):
  - 6.0 m: min. 0.05 A – max. 0.45 A
  - 8.5 m: min. 0.05 A – max. 0.6 A

- Insulation class: H
- Protection rating: IP44
- Safety category: II
- Starting (inrush) current: < 9 A according to EN 61000-3-3 annex B or VDMA2425 (< 3 A upon request)

### Fluids

- Heating water (VDI 2035; SWKI BT 102-01; ÖNORM H 5195-1)
- Water and proprietary additives used against corrosion and freezing up to 40 %

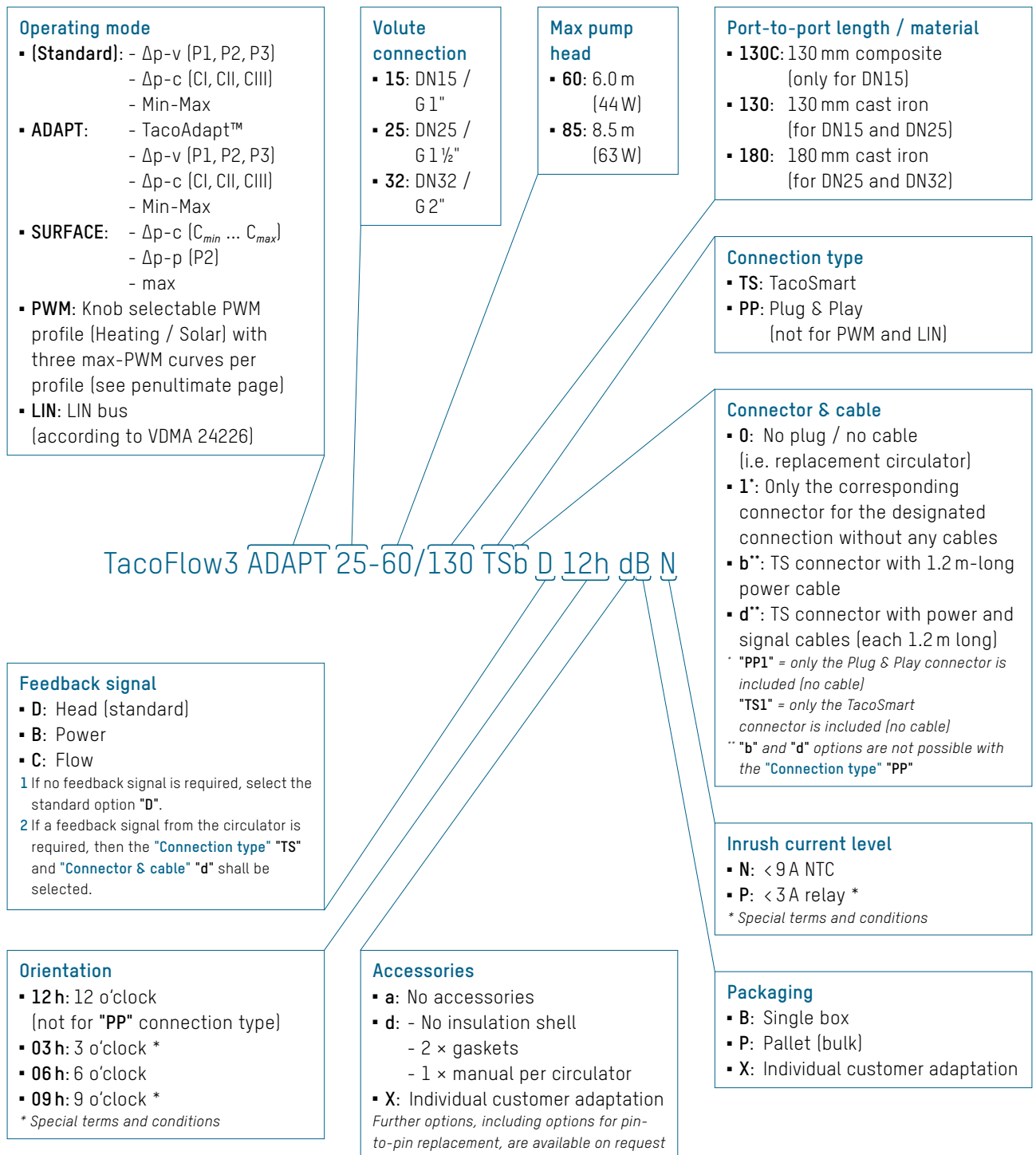
\* To prevent condensate in the motor and on the control electronics, the temperature of the pumped medium must always be higher than the ambient temperature.

### ENERGY EFFICIENCY INDEX

6.0 m: EEI ≤ 0.19 – Part 2 (Part 3 for the PWM version)  
8.5 m: EEI ≤ 0.20 – Part 2 (Part 3 for the PWM version)

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## TYPE KEY



### SELECTING THE RIGHT "OPERATING MODE"

- **(Standard):** Universal use - standard applications.
- **ADAPT:** With patented TacoAdapt™ intelligence for radiator systems to reach comfort room temperatures faster with lower overall power consumption.
- **SURFACE:** For surface heating (e.g., underfloor heating). Several  $\Delta p$ -c curves to continuously choose between  $C_{min}$  ...  $C_{max}$  for reducing noise and power consumption.
- **PWM:** When the circulator is to be controlled externally by a PWM signal.
- **LIN:** Digital data exchange to optimize the performance of heating systems.

### CONFIGURATION EXAMPLES

#### Example 1: TacoFlow3 PWM

- To configure a TacoFlow3 circulator, externally controlled by PWM (heating / solar profile), select "Operating Mode" = "PWM".

#### Example 2: TacoFlow3 SURFACE

- To configure a self-controlled TacoFlow3 circulator for reducing noise and power in surface heating applications, select "Operating mode" = "SURFACE".

# TACOFLOW3 | CIRCULATORS FOR HYDRONIC HEATING APPLICATIONS

## STANDARD CONFIGURATION (QUICK SELECTION)

- Connection type:** "PP": Plug & Play
- Connector & cable:** "1": No cable
- Orientation:** "06h": 6 o'clock
- Packaging:** "B": Single box
- Accessories:** "d": No Insulation shell, 2 x gaskets, 1 x Quick Guide
- Inrush current level:** "N": < 9A NTC



Order no.*	Operating Mode	Head	Connection	Port-to-port length	Short product name	
33 00G 0G 00 028 131	(Standard)	6.0 m	G 1" (DN15)	130 (mm)	TacoFlow3 15-60/130 PP	
33 00G 0J 00 028 131			G 1 1/2" (DN25)		TacoFlow3 25-60/130 PP	
33 00G 0L 00 028 131			G 1 1/2" (DN25)	180 (mm)	TacoFlow3 25-60/180 PP	
33 00G 0M 00 028 131			G 2" (DN32)		TacoFlow3 32-60/180 PP	
33 00M 0G 0G 028 131		8.5 m	8.5 m	G 1" (DN15)	130 (mm)	TacoFlow3 15-85/130 PP
33 00M 0J 0G 028 131				G 1 1/2" (DN25)		TacoFlow3 25-85/130 PP
33 00M 0L 0G 028 131				G 1 1/2" (DN25)	180 (mm)	TacoFlow3 25-85/180 PP
33 00M 0M 0G 028 131				G 2" (DN32)		TacoFlow3 32-85/180 PP
33 00G 0G 01 029 131	ADAPT	6.0 m	G 1" (DN15)	130 (mm)	TacoFlow3 ADAPT 15-60/130 PP	
33 00G 0J 01 029 131			G 1 1/2" (DN25)		TacoFlow3 ADAPT 25-60/130 PP	
33 00G 0L 01 029 131			G 1 1/2" (DN25)	180 (mm)	TacoFlow3 ADAPT 25-60/180 PP	
33 00G 0M 01 029 131			G 2" (DN32)		TacoFlow3 ADAPT 32-60/180 PP	
33 00M 0G 0H 029 131		8.5 m	8.5 m	G 1" (DN15)	130 (mm)	TacoFlow3 ADAPT 15-85/130 PP
33 00M 0J 0H 029 131				G 1 1/2" (DN25)		TacoFlow3 ADAPT 25-85/130 PP
33 00M 0L 0H 029 131				G 1 1/2" (DN25)	180 (mm)	TacoFlow3 ADAPT 25-85/180 PP
33 00M 0M 0H 029 131				G 2" (DN32)		TacoFlow3 ADAPT 32-85/180 PP

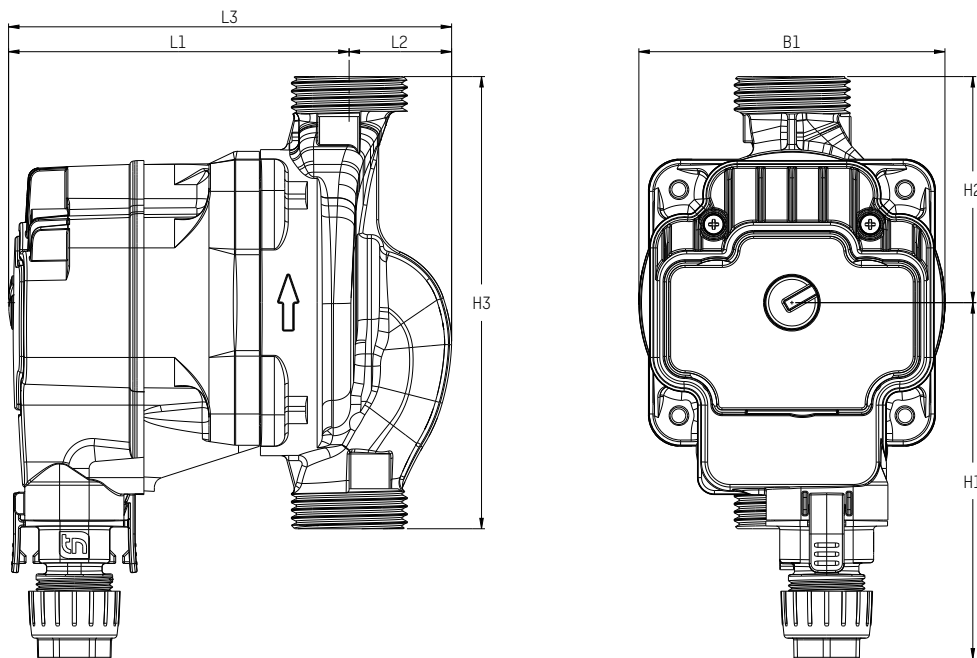
\* 0 = zero, 1 = one

**DIMENSIONAL DRAWING**

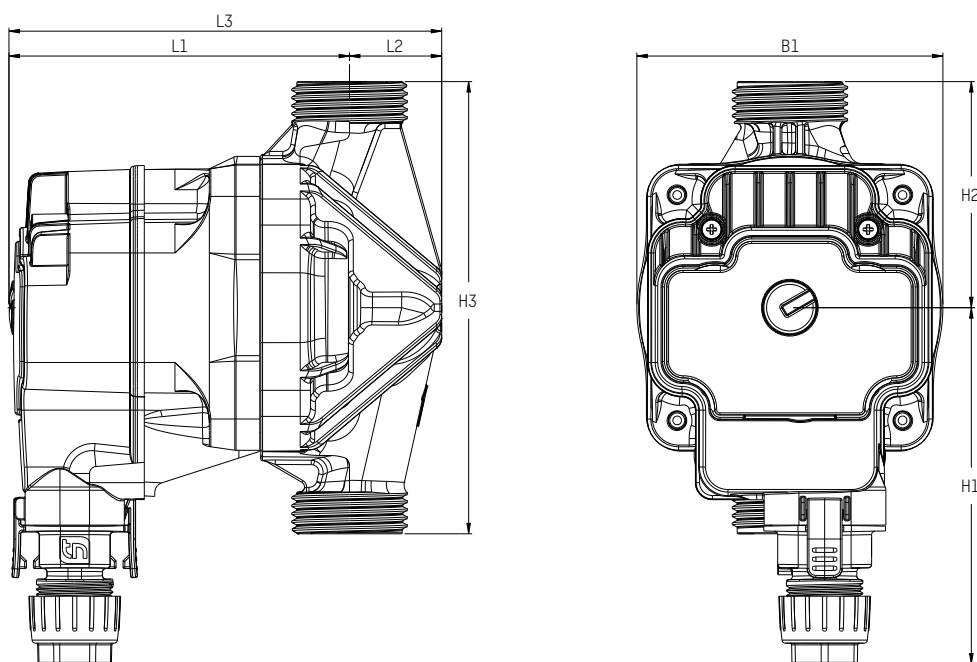
Version with "Connection type": "PP" (Plug & Play), "Connector & cable": "1", and "Orientation": "06h"

Designed for ease of installation when the distance from the power source location is not known prior to installation.

**Volute / pump body: Cast iron**



**Volute / pump body: Composite plastic**



**TABLE OF MEASUREMENTS**

**Product configurations**

- 6 o'clock orientation
- 6.0 m / 8.5 m
- Plug & Play connector
- For operating modes: Standard, ADAPT and SURFACE

Volute connection / height	Measurements (mm)						
	L1	L2	L3	B1	H1	H2	H3
DN15 / 130C	98	27	125	88	103	65	130
DN15 / 130	98	30	128	88	103	65	130
DN25 / 130	98	30	128	88	103	65	130
DN25 / 180	98	30	128	88	103	90	180
DN32 / 180	98	30	128	88	103	90	180

# TACOFLOW3 | CIRCULATORS FOR HYDRONIC HEATING APPLICATIONS

## STANDARD CONFIGURATION (QUICK SELECTION)

- Connection type:** "TS": TacoSmart
- Connector & cable:** "b": 1 × 1.2 m-long power cable
- Orientation:** "12h": 12 o'clock
- Packaging:** "B": Single box
- Accessories:** "d": No Insulation shell, 2 × gaskets, 1 × Quick Guide
- Inrush current level:** "N": < 9A NTC



Order no.*	Operating Mode	Head	Connection	Port-to-port length	Short product name
33 00C 02 00 01S 431	(Standard)	6.0 m	G 1" (DN15)	130 (mm)	TacoFlow3 15-60/130 TS
33 00C 05 00 01S 431			G 1 ½" (DN25)		TacoFlow3 25-60/130 TS
33 00C 07 00 01S 431			G 1 ½" (DN25)	180 (mm)	TacoFlow3 25-60/180 TS
33 00C 08 00 01S 431			G 2" (DN32)		TacoFlow3 32-60/180 TS
33 00P 02 06 01S 431		8.5 m	130 (mm)	G 1" (DN15)	TacoFlow3 15-85/130 TS
33 00P 05 06 01S 431				G 1 ½" (DN25)	TacoFlow3 25-85/130 TS
33 00P 07 06 01S 431			180 (mm)	G 1 ½" (DN25)	TacoFlow3 25-85/180 TS
33 00P 08 06 01S 431				G 2" (DN32)	TacoFlow3 32-85/180 TS
33 00C 02 01 01T 431	ADAPT	6.0 m	G 1" (DN15)	130 (mm)	TacoFlow3 ADAPT 15-60/130 TS
33 00C 05 01 01T 431			G 1 ½" (DN25)		TacoFlow3 ADAPT 25-60/130 TS
33 00C 07 01 01T 431			G 1 ½" (DN25)	180 (mm)	TacoFlow3 ADAPT 25-60/180 TS
33 00C 08 01 01T 431			G 2" (DN32)		TacoFlow3 ADAPT 32-60/180 TS
33 00P 02 0H 01T 431		8.5 m	130 (mm)	G 1" (DN15)	TacoFlow3 ADAPT 15-85/130 TS
33 00P 05 0H 01T 431				G 1 ½" (DN25)	TacoFlow3 ADAPT 25-85/130 TS
33 00P 07 0H 01T 431			180 (mm)	G 1 ½" (DN25)	TacoFlow3 ADAPT 25-85/180 TS
33 00P 08 0H 01T 431				G 2" (DN32)	TacoFlow3 ADAPT 32-85/180 TS

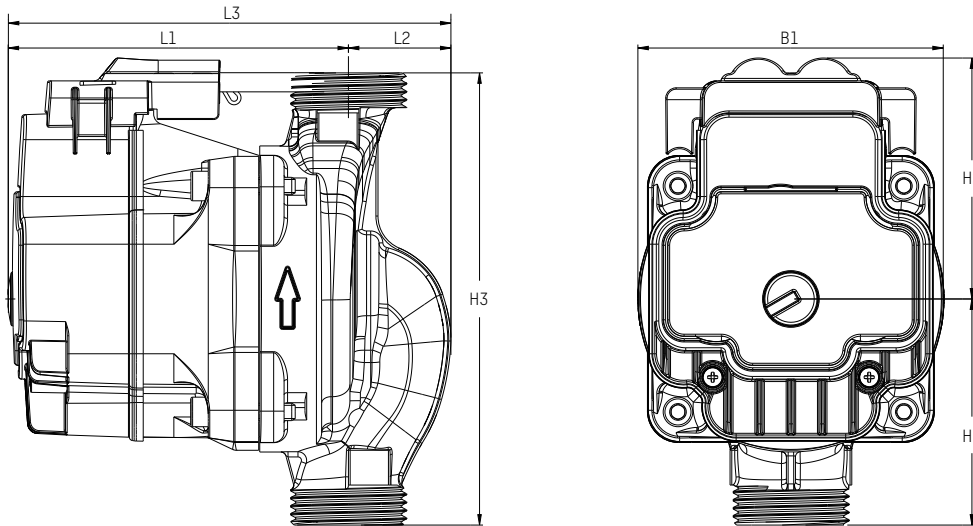
\* 0 = zero, 1 = one

**DIMENSIONAL DRAWING**

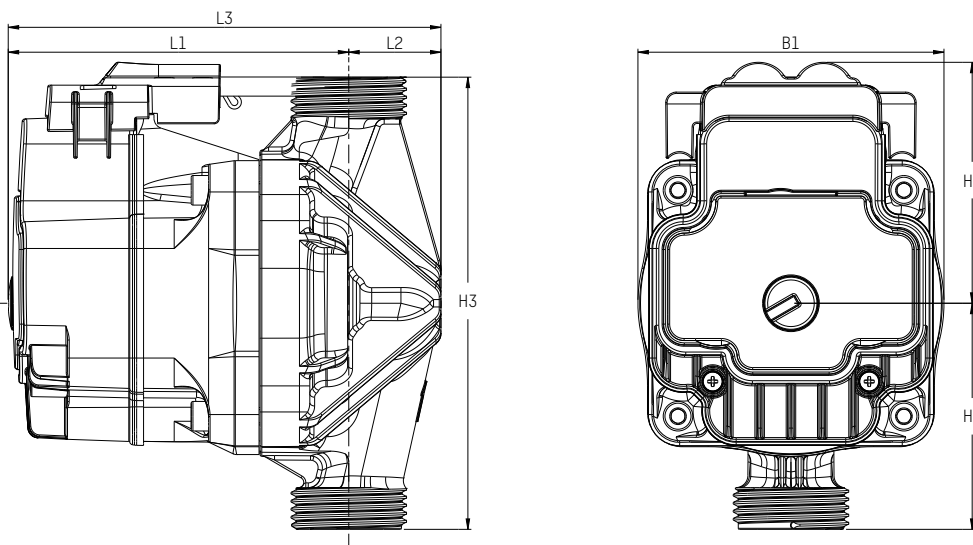
Version with "Connection type": "TS" (TacoSmart), "Connector & cable": "1", and "Orientation": "12h"

Designed for maximum compactness and minimal installation footprint, ideal to fit into the tightest spaces and eliminate the need to change the orientation.

**Volute / pump body: Cast iron**



**Volute / pump body: Composite plastic**



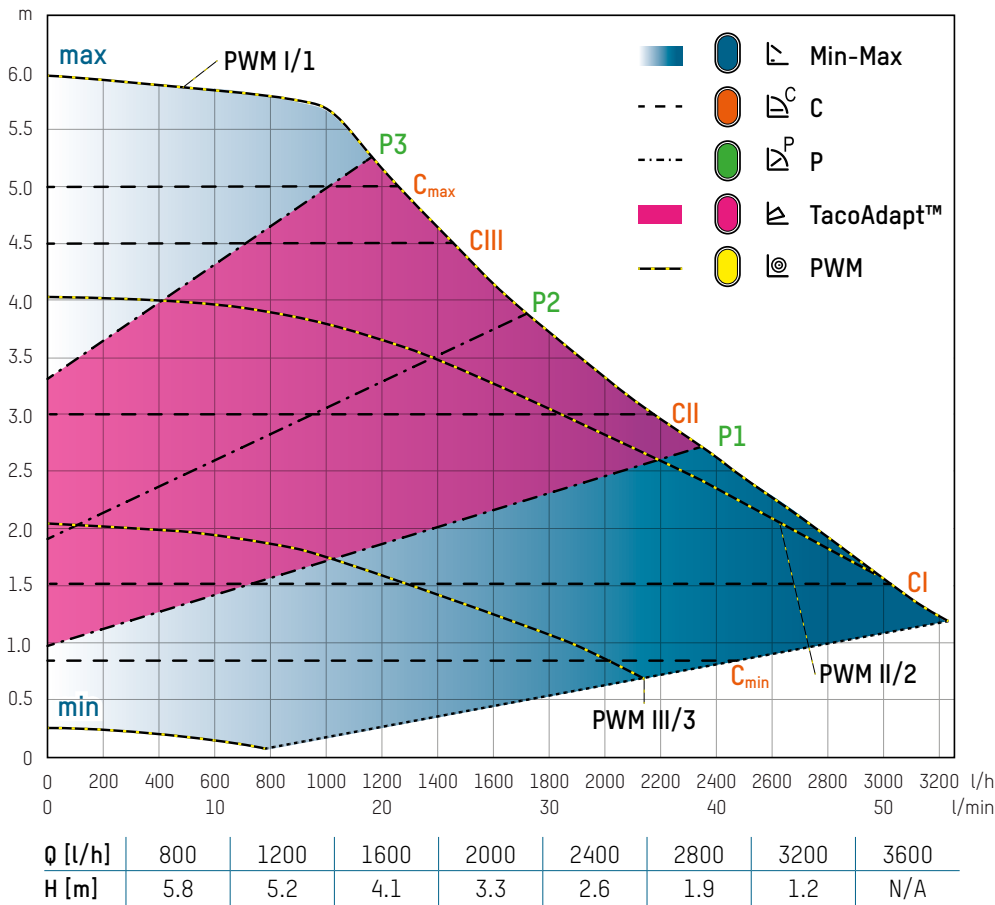
**TABLE OF MEASUREMENTS**

**Product configurations**

- 12 o'clock orientation
- 6.0m / 8.5m
- TacoSmart connector
- For all operating modes:  
Standard, ADAPT, SURFACE, PWM and LIN

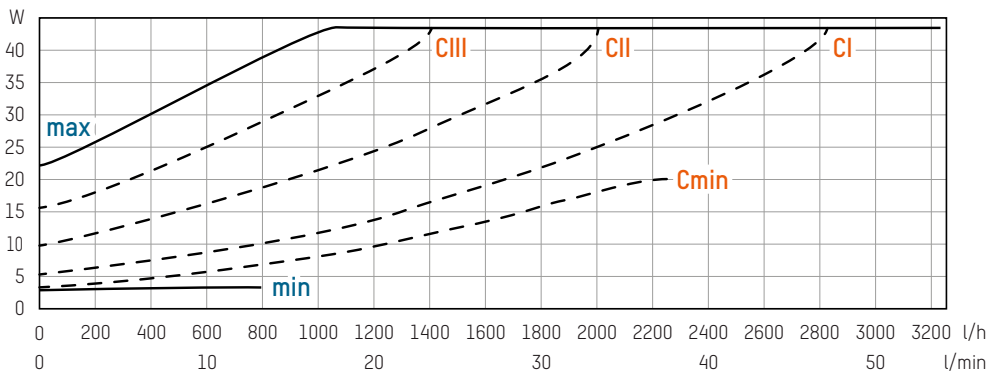
Volute connection / height	Measurements (mm)						
	L1	L2	L3	B1	H1	H2	H3
DN15 / 130C	98	27	125	88	65	70	130
DN15 / 130	98	30	128	88	65	70	130
DN25 / 130	98	30	128	88	65	70	130
DN25 / 180	98	30	128	88	90	70	180
DN32 / 180	98	30	128	88	90	70	180

PERFORMANCE CURVES (6.0 M)

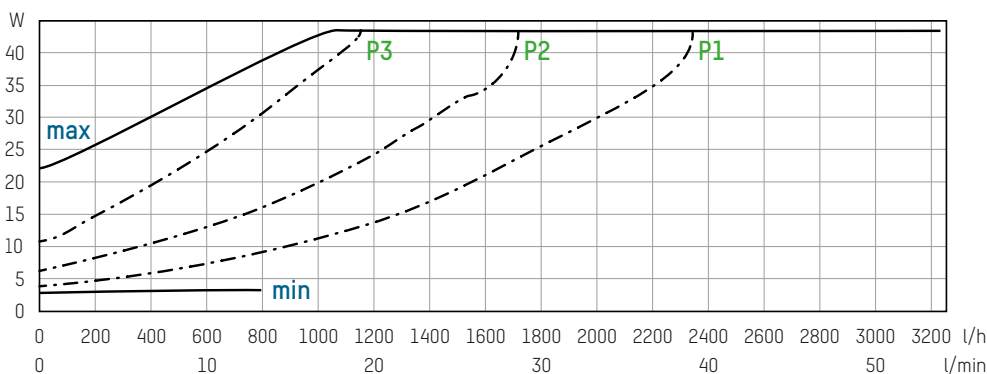


POWER CURVES (6.0 M)

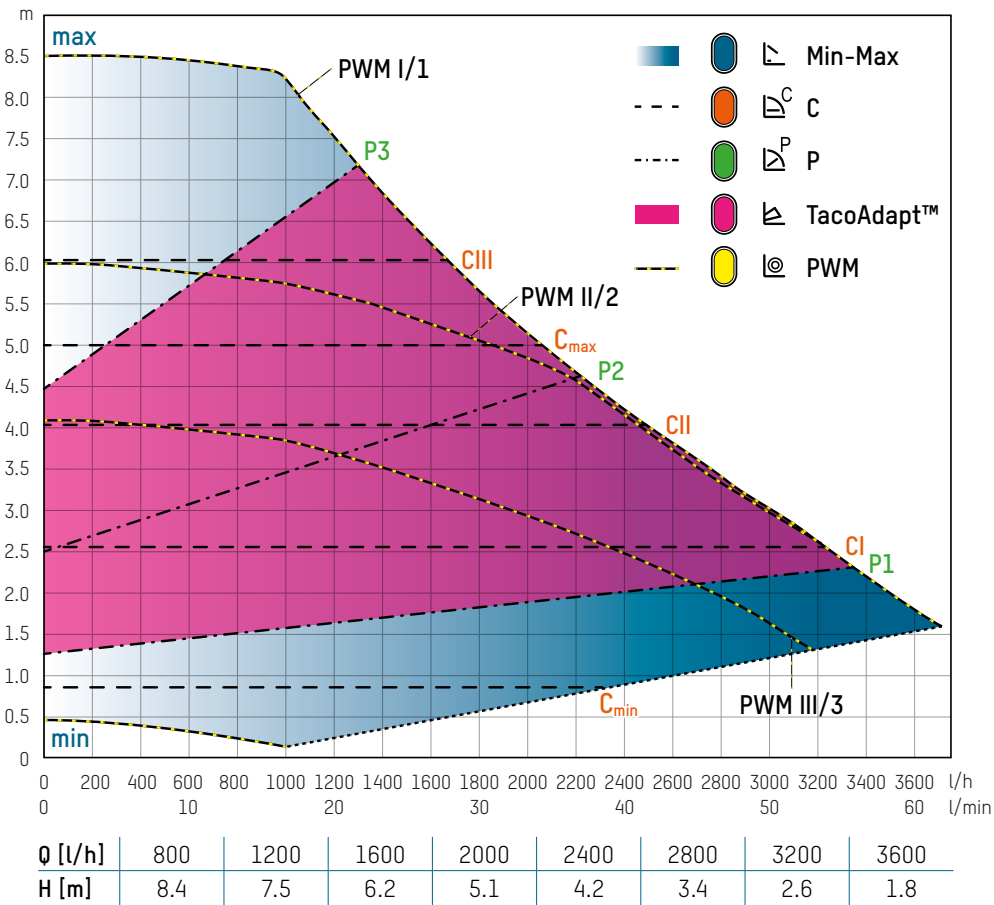
Operating mode: Constant pressure ( $\Delta p-c$ )



Operating mode: Proportional pressure ( $\Delta p-v$ )

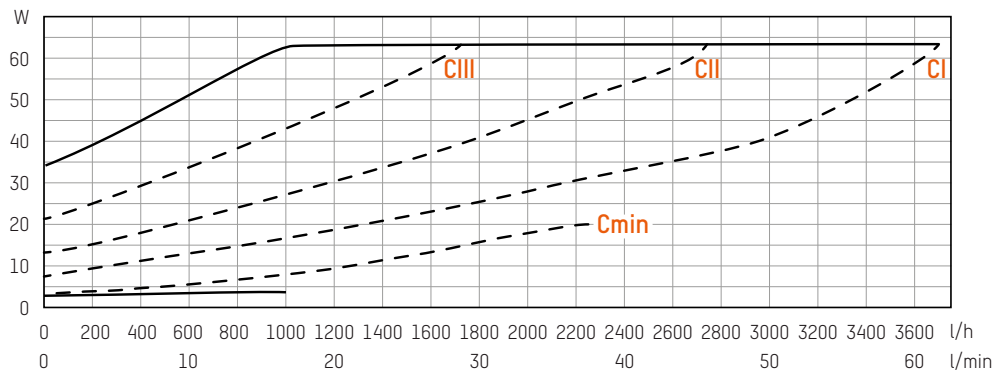


PERFORMANCE CURVES (8.5 M)

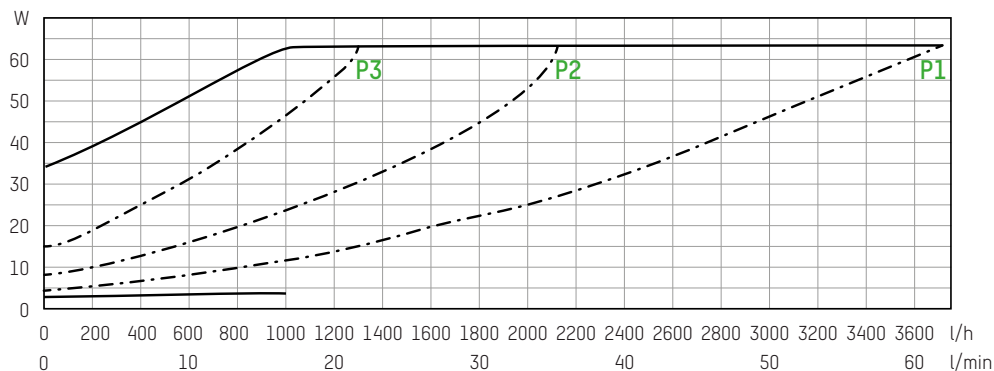


POWER CURVES (8.5 M)

Operating mode: Constant pressure ( $\Delta p-c$ )



Operating mode: Proportional pressure ( $\Delta p-v$ )

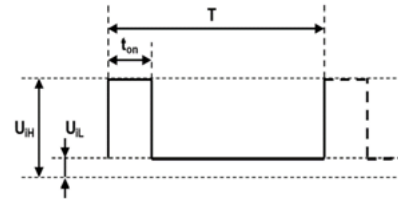


**PWM control signal**

The TacoFlow3 circulators can be driven by an external controller via a Pulse Width Modulation (PWM) signal. To exchange information with the controller, the circulator needs the two-cable (power and signal) version of the TacoSmart connector.

**Communication**

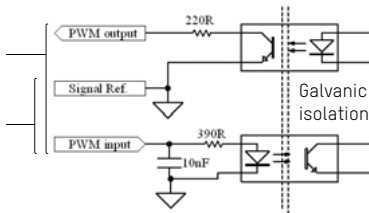
The PWM communication is standardized in accordance with VDMA 24224 "Wet runner circulating pumps - Specification of PWM control signals". Customer-specific versions are available on request.



d= duty cycle [%]  
 T = period [s]  
 UIH=Input voltage higher value  
 UIL=Input voltage lower value

**PWM input profile**

The PWM interface can be 1-way or 2-way and is galvanically isolated to ensure that the user does not come into contact with high voltage.



**PWM interface electrical specification**

PWM input frequency	100 – 4000Hz
Input voltage upper value UiH	4 – 24V
Input voltage lower value UiL	<1 V
Input current at UiH	<15 mA
PWM input operating range	0-100 %
PWM output frequency	75Hz ±5%
Accuracy of output signal	±2 %
Output duty cycle	0 – 100%
Output transistor collector voltage	<70 V
Output transistor collector current	<25 mA
Power dissipation on output resistor	<250 mW
Insulation voltage	3750 V
Sensitive to polarity change	Coded connector

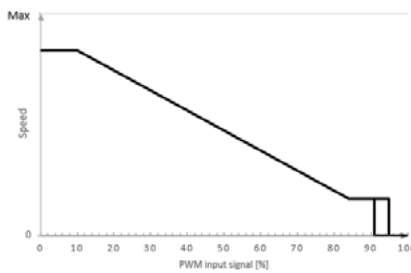
**PWM input signal**

According to VDMA 24224 the input signal can have a Heating or Solar profile.

**Heating profile**

In the event of cable breakage in a gas boiler system, the circulator continues to work at maximum speed to guarantee the transfer of heat to the primary exchanger.

**PWM Heating profile (PWH[H])**

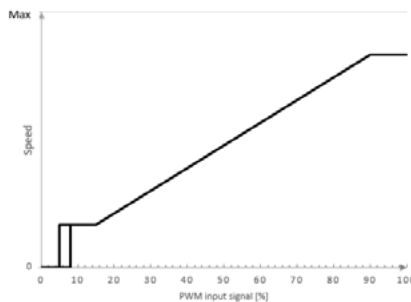


Pump status	PWM input signal
Maximum speed (Max)	≤10 %
Variable speed (Min-Max)	>10 ... ≤84 %
Minimum speed (Min)	>84 ... ≤91 %
Hysteresis range (On/Off)	>91 ... ≤95 %
Standby mode (Off)	>95 ... ≤100 %

**Solar profile**

In the event of cable breakage, the circulator stops to avoid overheating of the solar thermal system.

**PWM Solar profile (PWH[S])**

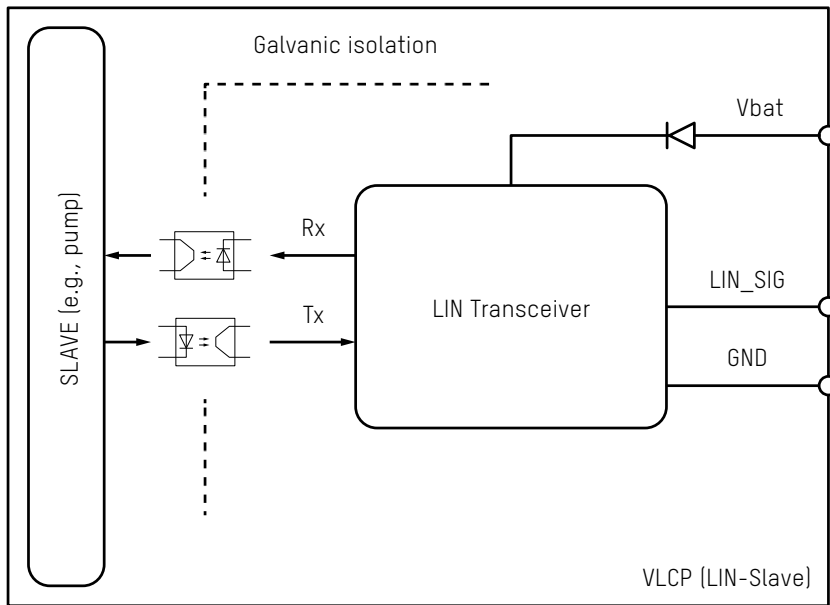


Pump status	PWM input signal
Maximum speed (Max)	>90 ... ≤100 %
Variable speed (Min-Max)	>15 ... ≤90 %
Minimum speed (Min)	>8 ... ≤15 %
Hysteresis range (On/Off)	>5 ... ≤8 %
Standby mode (Off)	≤5 %

**LIN bus: Explanation**

The TacoFlow3 circulators can be driven by an external controller with the LIN bus technology. The LIN bus interface used is based on the VDMA LIN Circulator Profile (VLCP) as described in VDMA 24226. Herein, the VLCP pump is defined as Slave.

The VLCP interface is galvanically insulated to guarantee the SELV level (IEC 60335 "safety extra low voltage"). For the circulator to exchange information with the controller, the circulator needs the two-cable (power and signal) version of the TacoSmart connector.



**VLCP LIN BUS ELECTRICAL SPECIFICATION**

VLCP power supply	Provided externally (e.g., master)
Power for LIN bus (Vbat)	8 - 27 V
Max current consumption of VLCP	25 mA
LIN speed slave	19.2 Kbps