

# High-efficiency Circulator Pump

## Calio Z

### Type Series Booklet



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Type Series Booklet Calio Z

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## Building Services: Heating

### Variable Speed Circulator Pumps

# Calio Z



#### Main applications

Heating, ventilation, air-conditioning, cooling and circulation systems

- One-pipe systems and two-pipe systems
- Underfloor heating systems
- Boiler circuits or primary circuits
- Storage tank circuits
- Solar power systems
- Heat pumps

#### Fluids handled

- Heating water to VDI 2035
- Higher-viscosity fluids (water/glycol mixture up to a mixing ratio of 1:1)

#### Operating data

Operating properties

Characteristic		Value
Flow rate	Q [m <sup>3</sup> /h]	≤ 70
	Q [l/s]	≤ 19,4
Head	H [m]	≤ 18
Fluid temperature	T [°C]	≥ -10
		≤ +110
Ambient temperature	T [°C]	≥ 0
		≤ +40 <sup>1)</sup>
Operating pressure	p [bar]	≤ 16
Pressure class	PN [bar]	6/10/16
Average sound pressure level	[dB (A)]	≤ 45
Screw-ended	Rp	1 1/4
Flanged	DN	32 - 65

1) Ambient temperature ≤ + 30 °C at a fluid temperature > 90 °C

#### Design details

##### Design

- Maintenance-free high-efficiency wet rotor pump (glandless)
- Twin pump

##### Drive

- High-efficiency electric motor with continuously variable differential pressure control
- Electronically commutated synchronous motor with permanent magnet rotor
- Integrated motor protection
- 1~230 V AC +/- 10%
- Frequency 50 Hz/60 Hz
- Enclosure IPX4D
- Thermal class F
- Temperature class TF 110
- Energy efficiency index EEI ≤ 0.23
- Interference emissions EN 61000-6-3
- Interference immunity EN 61000-6-1

##### Bearings

- Product-lubricated special plain bearing

##### Connections

- Screw-ended or flanged

##### Operating modes

- Constant-pressure control
- Proportional-pressure control
- Temperature-governed differential pressure control (only with KSB-ServiceTool)
- Open-loop control via setpoint setting
- Eco Mode with dynamic differential pressure setpoint adjustment

##### Automatic functions

- Continuously variable speed adjustment depending on the mode of operation
- 0 - 10 V with external differential pressure/speed setpoint
- 0 - 10 V as input of the actual value of the temperature or actual value of the differential pressure
- Pump changeover after 24 hours runtime of a pump
- Redundancy by automatic start-up of the stand-by pump in the event of a duty pump failure
- Dual-pump operation
- Peak load operation
- Setback operation
- External start/stop
- Deblocking function
- Self-venting function
- Soft start
- Full motor protection with integrated trip electronics



### Manual functions

- Setting the operating mode
- Setting the differential pressure setpoint
- Setting the speed level
- Locking the control panel

### Signalling and display functions

- Periodically alternating display of flow rate, head and electrical input power
- Operating status shown on the display
- Error codes indicated on the display
- Configurable general fault messages and "in operation" messages (volt-free changeover contact)
- Serial digital Modbus RTU interface
- Service interface for KSB-ServiceTool

### Designation

#### Example: Calio Z 40-180

#### Designation key

Code	Description	
Calio Z	Type series	
40	Connection	
	30	Rp 1 1/4
	32	DN 32
	40	DN 40
	50	DN 50
180	65	DN 65
	Head H [m]	
	180	Head <sup>2)</sup> × 10 Example: 18 m × 10 = 180

### Materials

#### Overview of available materials

Component <sup>3)</sup>	Material
Volute casing	Grey cast iron with cathodic electrocoating (EN-GJL-200)
Shaft	Stainless steel 1.4034
Impeller	Plastic with glass fibre content (PSU-GF30)
Bearing	Ceramics/carbon
Can	Stainless steel 1.4301
Change-over flap	Plastic with glass fibre content/EPDM

### Product benefits

- Maximum savings of operating costs by high-efficiency technology combined with speed control
- Future-proof by maximum energy efficiency, exceeding future energy efficiency regulations such as ErP 2015 and 5-year warranty as per German trade seal "Handwerkermarke" (valid for Germany and Austria only)
- All-in concept saves investment costs and commissioning costs.
- Simple to set with press&turn dial combined with an integrated display and symbols indicating the operating mode
- High availability by dual-pump operation and integrated protective functions
- New Eco Mode enables additional savings of more than 40 % compared to proportional-pressure control. (⇒ Page 7)

### Certifications

#### Overview

Label	Effective in:	Comment
	Europe	EEl ≤0,23
	Germany	All sizes

2) At flow rate Q = 0 m<sup>3</sup>/h

3) The components are free from paint-wetting impairment substances.

## Selection information

### Minimum inlet pressure

The minimum inlet pressure  $p_{min}$  at the pump suction nozzle serves to avoid cavitation noises at an ambient temperature of +40 °C and the indicated fluid temperature  $T_{max}$ .

The indicated values are applicable up to 300 m above sea level. For installation at altitudes > 300 m, an allowance of 0.01 bar / 100 m must be added.

Minimum inlet pressure  $p_{min}$  specified for the fluid temperature

Fluid temperature [°C]	Minimum inlet pressure [bar]
≤ 80	0,5
81 to 95	1,5
96 to 110	2,5

### Permissible fluid temperature

Temperature limits of the fluid handled

Permissible fluid temperature	Value
Maximum	110 °C
Minimum	-10 °C

### Permissible ambient temperature

Permissible ambient temperatures specified for the fluid temperature

Fluid temperature	Permissible ambient temperature
≤ + 90 °C	+ 40 °C
> + 90 °C	+ 30 °C

### Description of the Modbus interface

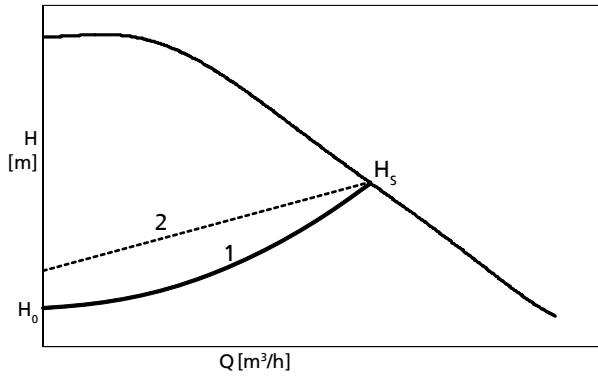
Technical data of the Modbus interface

Parameter	Description/value
Terminal cross-section	1,5 mm <sup>2</sup>
Interface	RS485 (TIA-485-A) optically isolated
Bus connection	0.5 mm <sup>2</sup> , shielded twisted pair bus cable
Cable length	<ul style="list-style-type: none"> <li>▪ 1000 m max.</li> <li>▪ Stub line impermissible</li> <li>▪ For cable lengths &gt; 30 m take suitable measures to ensure overvoltage protection.</li> </ul>
Wave impedance	120 Ω (cable type B to TIA-485-A)
Data rates [baud]	4800, 9600, 38,400, 57,600, 115,200 (19,200 = factory setting)
Protocol	Modbus RTU standard
Data format	<ul style="list-style-type: none"> <li>▪ 8 data bits</li> <li>▪ Parity EVEN / ODD / NONE</li> <li>▪ 1 stop bit</li> </ul>
Modbus address	ID #1 to #247 selectable (ID #17 = factory setting)

 Further description see operating manual of the pump set.

### Description of the Eco Mode

In Eco Mode, the pump characteristic curve (1) is quadratic. Starting at the discharge head setpoint  $H_s$ , the characteristic curve intersects the discharge head axis at  $H_0 = 1/4 \times H_s$ . By changing the differential pressure setpoint this pump characteristic curve can be adjusted to higher or lower differential pressures or discharge heads. Compared with the Proportional-pressure Control operating mode the Eco Mode can save more than 40 % in electrical input power. See below for an example of an Eco Mode characteristic curve.



1	Eco Mode characteristic curve
2	Proportional-pressure Control characteristic curve for comparison

### Description of the characteristic curve

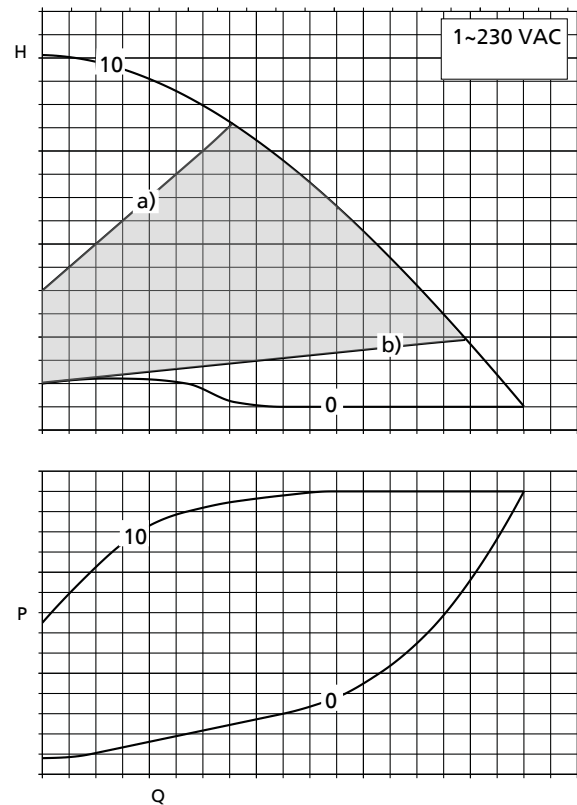


Fig. 1: Selection example

**i** The pump characteristic curve can be adjusted between a) and b) in increments of 1 % by turning the control element.

0	Level 0 = open-loop control, minimum speed (corresponds to a setting of 0 %)
10	Level 10 = open-loop control, maximum speed (corresponds to a setting of 100 %)
	Control range
a)	Control curve, maximum head
b)	Control curve, minimum head

**Technical data**

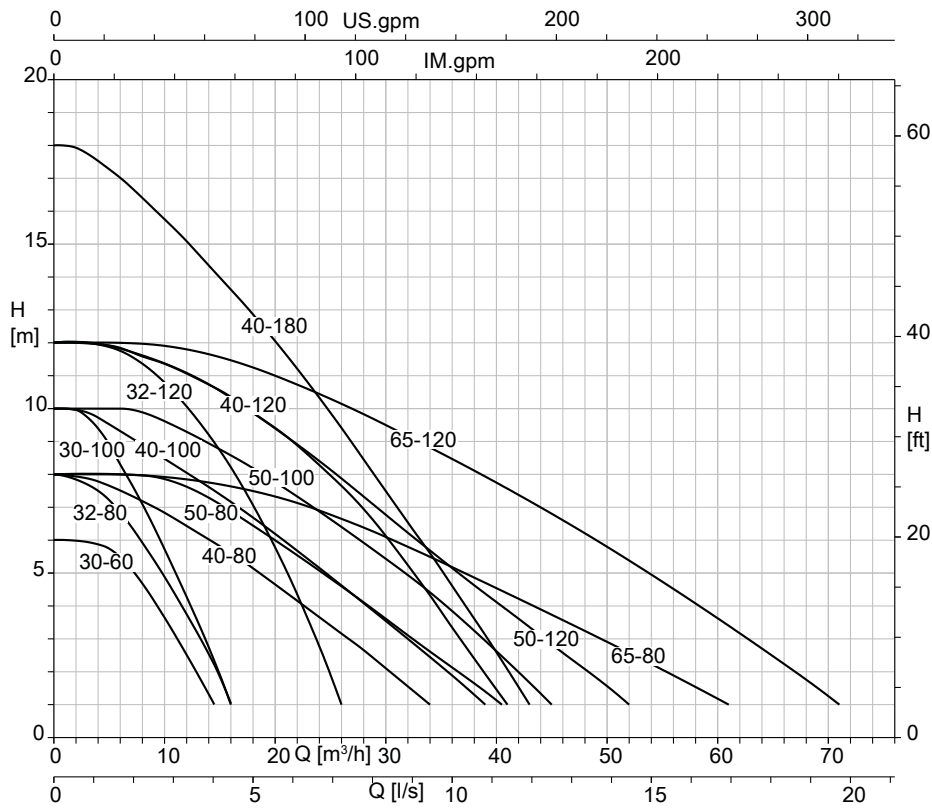
Calio Z selection table

Size	Connection		PN [bar]	Speed		P <sub>1</sub> <sup>4)</sup> [W]	I <sub>N</sub> <sup>4)</sup> 1~230 VAC, 50/60 Hz [A]	Mat. No.	[kg]
	Piping	Pump		Min.	Max.				
				[rpm]	[rpm]				
30-60	Rp 1 1/4	G 2	10	1000	3500	3,5 - 150 (300)	0,15 - 0,70 (1,40)	29134897	10,75
30-60	Rp 1 1/4	G 2	16	1000	3500	3,5 - 150 (300)	0,15 - 0,70 (1,40)	29134904	10,75
30-100	Rp 1 1/4	G 2	10	1000	4500	3,5 - 220 (440)	0,15 - 1,00 (2,00)	29134898	10,75
30-100	Rp 1 1/4	G 2	16	1000	4500	3,5 - 220 (440)	0,15 - 1,00 (2,00)	29134905	10,75
32-80	DN 32	DN 32	6/10	1000	4000	3,5 - 170 (340)	0,15 - 0,80 (1,60)	29134899	15,1
32-80	DN 32	DN 32	16	1000	4000	3,5 - 170 (340)	0,15 - 0,80 (1,60)	29134906	15,1
32-120	DN 32	DN 32	6/10	1000	4000	3,5 - 370 (740)	0,15 - 1,60 (3,20)	29134900	16,06
32-120	DN 32	DN 32	16	1000	4000	3,5 - 370 (740)	0,15 - 1,60 (3,20)	29134907	16,06
40-80	DN 40	DN 40	6/10	1000	3600	3,5 - 300 (600)	0,15 - 1,30 (2,60)	29134901	17,42
40-80	DN 40	DN 40	16	1000	3600	3,5 - 300 (600)	0,15 - 1,30 (2,60)	29134908	17,42
40-100	DN 40	DN 40	6/10	1000	4000	3,5 - 400 (800)	0,15 - 1,75 (3,50)	29134902	17,42
40-100	DN 40	DN 40	16	1000	4000	3,5 - 400 (800)	0,15 - 1,75 (3,50)	29134909	17,42
40-120	DN 40	DN 40	6/10	1000	2900	5 - 850 (1700)	0,32 - 3,90 (7,80)	29134873	28,61
40-120	DN 40	DN 40	16	1000	2900	5 - 850 (1700)	0,32 - 3,90 (7,80)	29134888	28,61
40-180	DN 40	DN 40	6/10	1000	3500	5 - 860 (1720)	0,32 - 3,95 (7,90)	29134874	28,61
40-180	DN 40	DN 40	16	1000	3500	5 - 860 (1720)	0,32 - 3,95 (7,90)	29134889	28,61
50-80	DN 50	DN 50	6/10	1000	3500	3,5 - 370 (740)	0,15 - 1,60 (3,20)	29134903	23,56
50-80	DN 50	DN 50	16	1000	3500	3,5 - 370 (740)	0,15 - 1,60 (3,20)	29134910	23,56
50-100	DN 50	DN 50	6/10	1000	2750	5 - 790 (1580)	0,32 - 3,60 (7,20)	29134875	31,71
50-100	DN 50	DN 50	16	1000	2750	5 - 790 (1580)	0,32 - 3,60 (7,20)	29134890	31,71
50-120	DN 50	DN 50	6/10	1000	2930	5 - 810 (1620)	0,32 - 3,70 (7,40)	29134876	31,71
50-120	DN 50	DN 50	16	1000	2930	5 - 810 (1620)	0,32 - 3,70 (7,40)	29134891	31,71
65-80	DN 65	DN 65	6/10	1000	2850	5 - 620 (1240)	0,32 - 2,90 (5,80)	29134877	39,39
65-80	DN 65	DN 65	16	1000	2850	5 - 620 (1240)	0,32 - 2,90 (5,80)	29134892	39,39
65-120	DN 65	DN 65	6/10	1000	3200	5 - 770 (1540)	0,32 - 3,50 (7,00)	29134878	39,39
65-120	DN 65	DN 65	16	1000	3200	5 - 770 (1540)	0,32 - 3,50 (7,00)	29134893	39,39

4) The value in parentheses applies to operation of both pump sets.

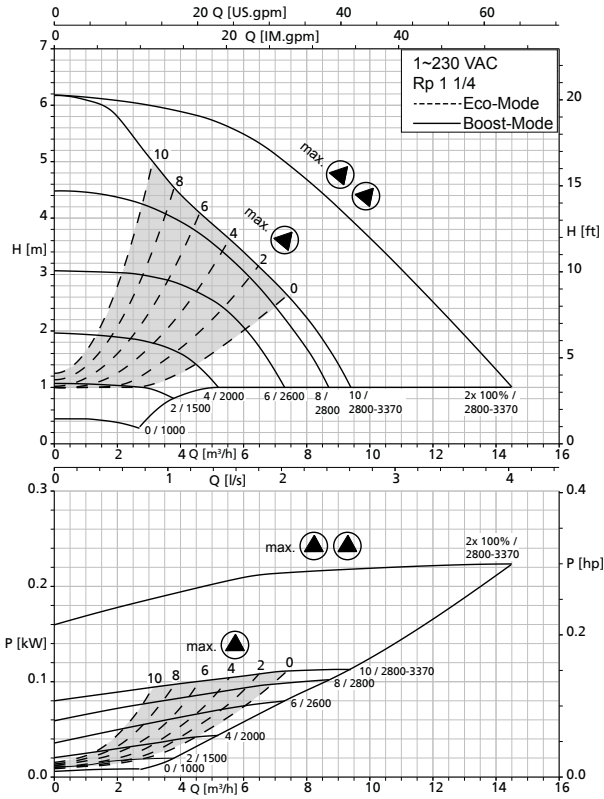
Selection chart

Calio Z (parallel operation)

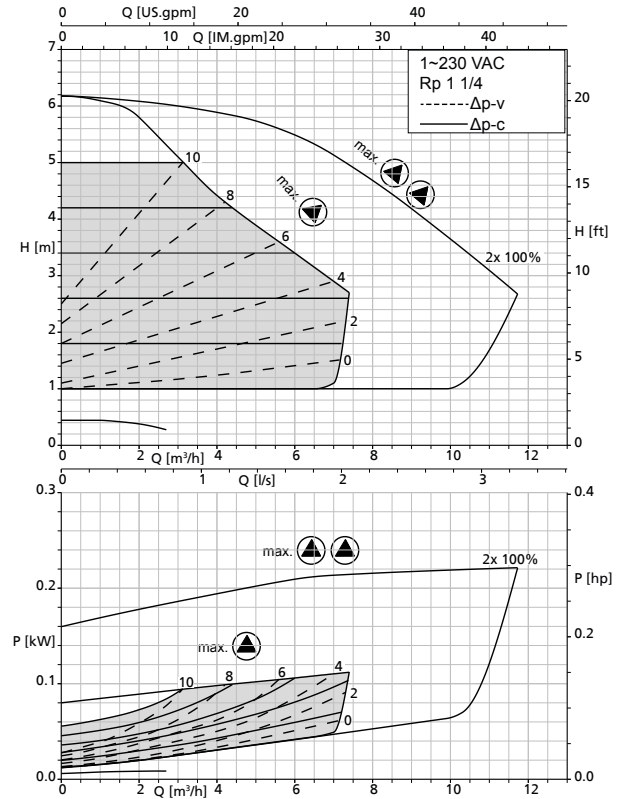


Characteristic curves

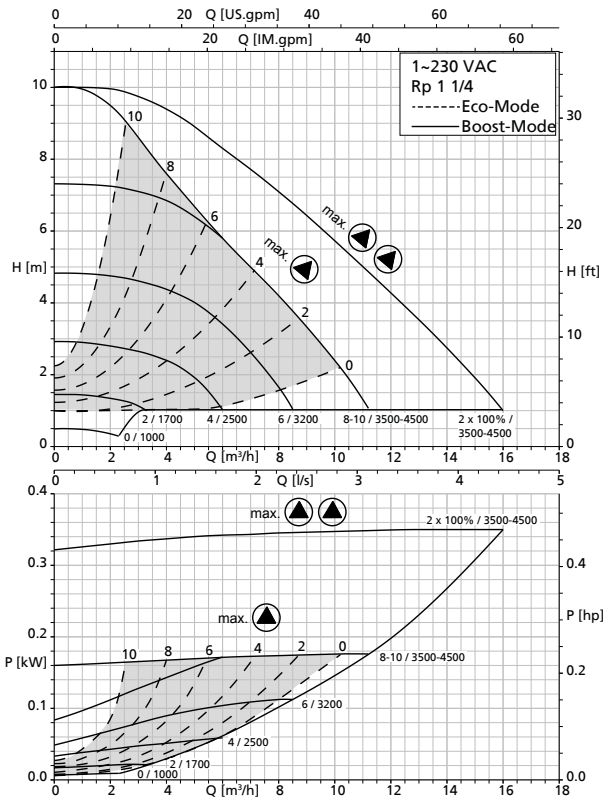
Calio Z 30-60 Boost Mode, Eco Mode



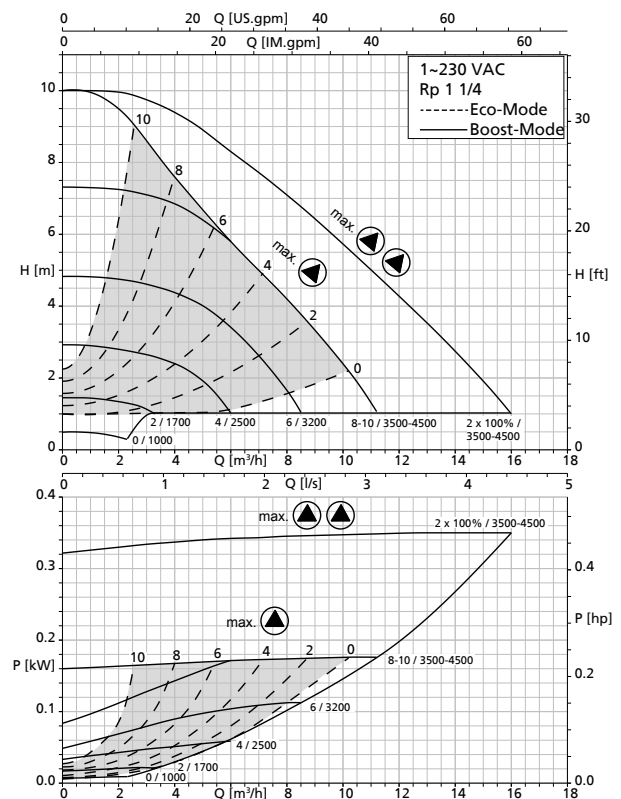
Calio Z 30-60  $\Delta p_v + \Delta p_c$



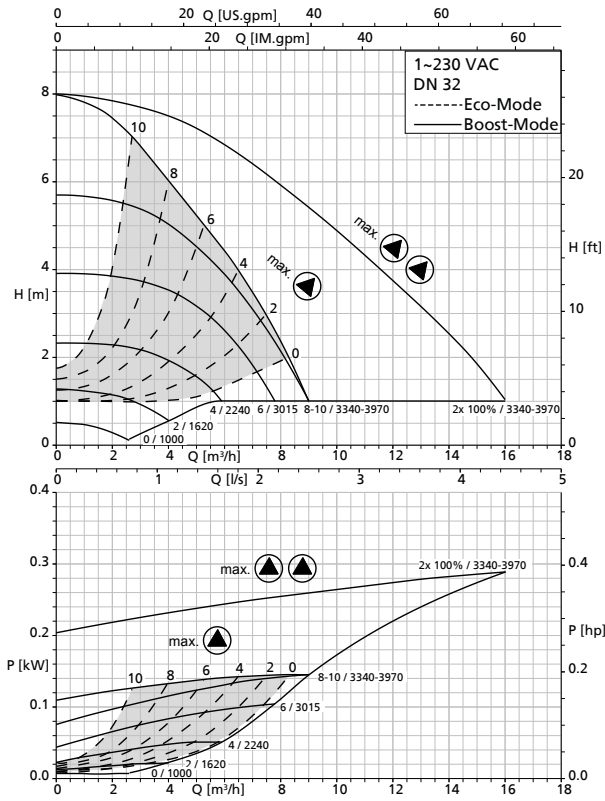
Calio Z 30-100 Boost Mode, Eco Mode



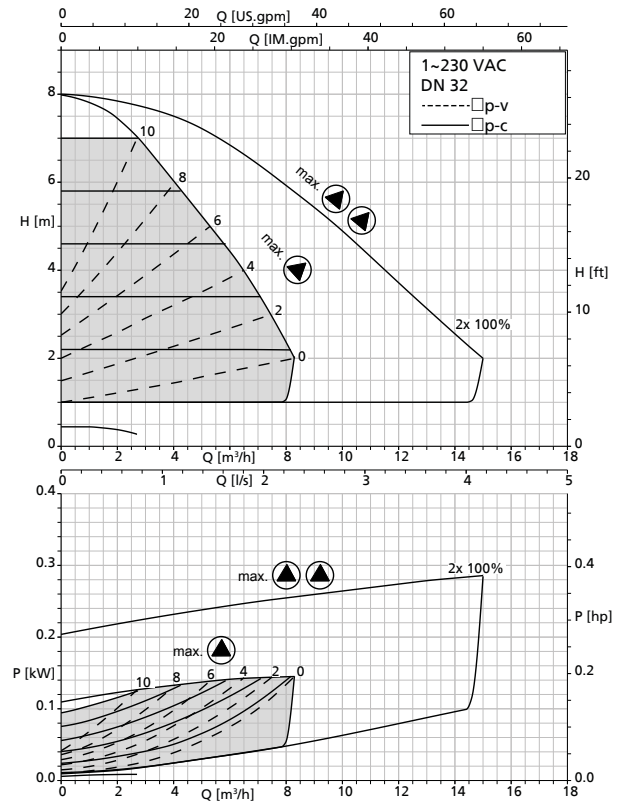
Calio Z 30-100  $\Delta p_v + \Delta p_c$



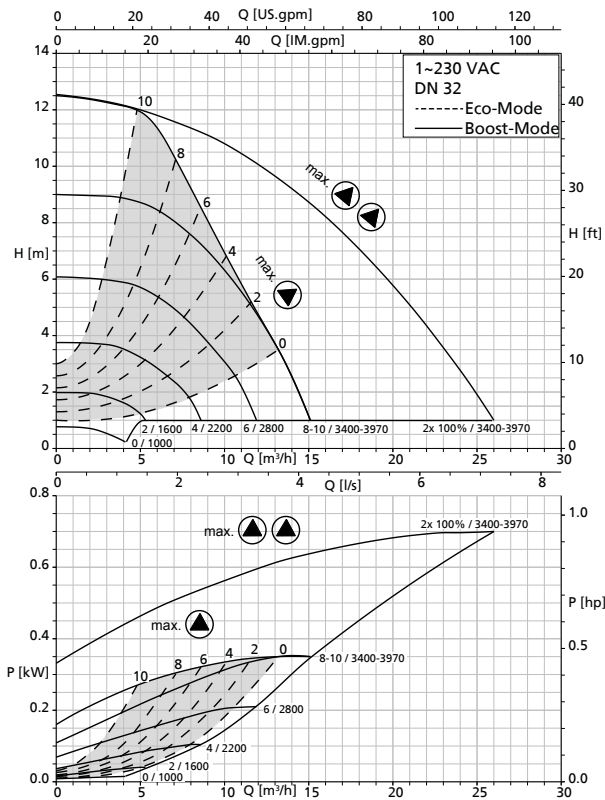
**Calio Z 32-80 Boost Mode, Eco Mode**



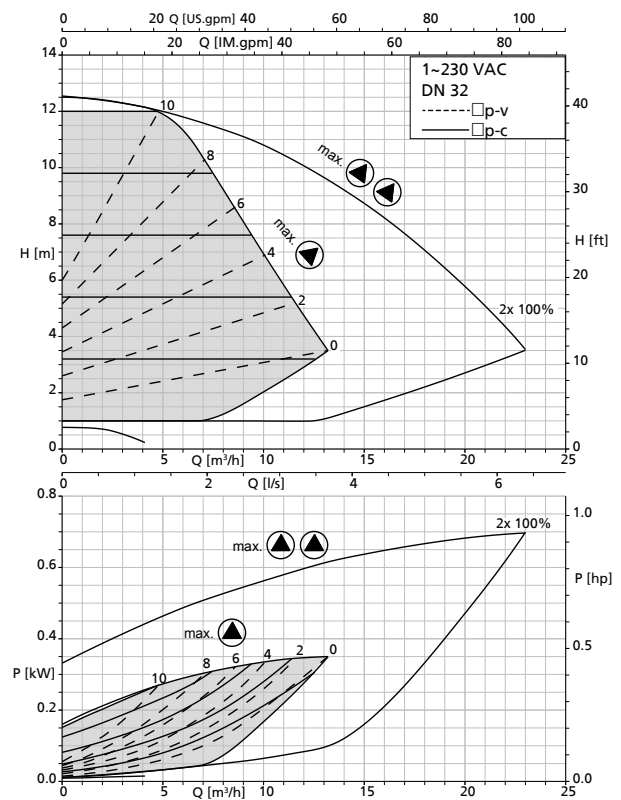
**Calio Z 32-80  $\Delta p_v + \Delta p_c$**



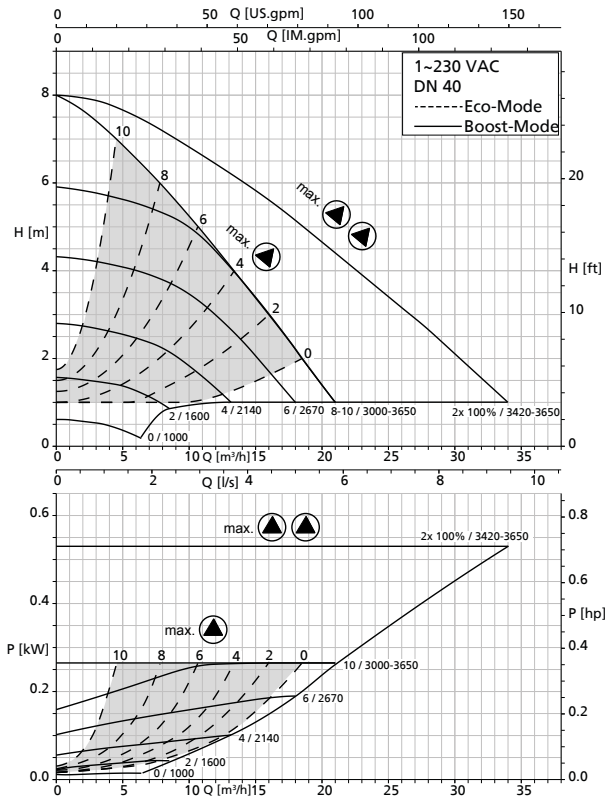
**Calio Z 32-120 Boost Mode, Eco Mode**



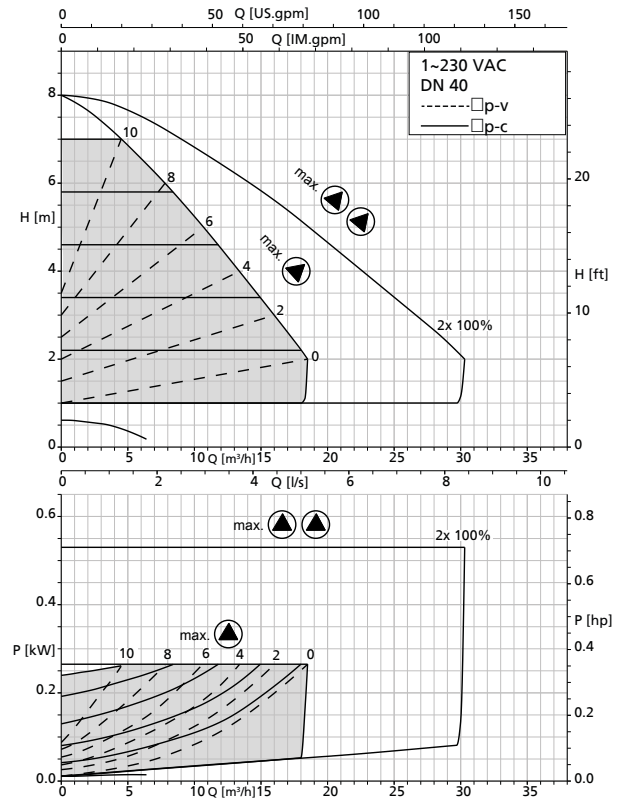
**Calio Z 32-120  $\Delta p_v + \Delta p_c$**



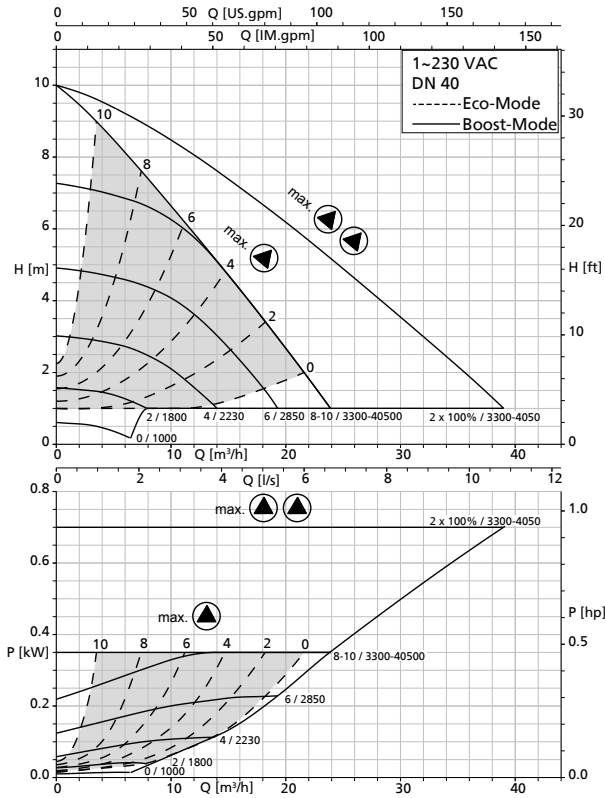
**Calio Z 40-80 Boost Mode, Eco Mode**



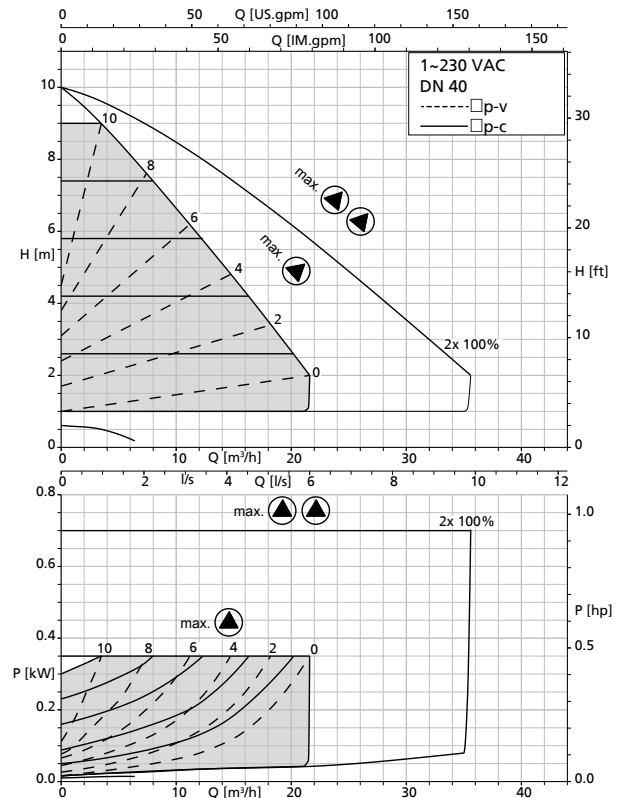
**Calio Z 40-80  $\Delta p_v + \Delta p_c$**



**Calio Z 40-100 Boost Mode, Eco Mode**

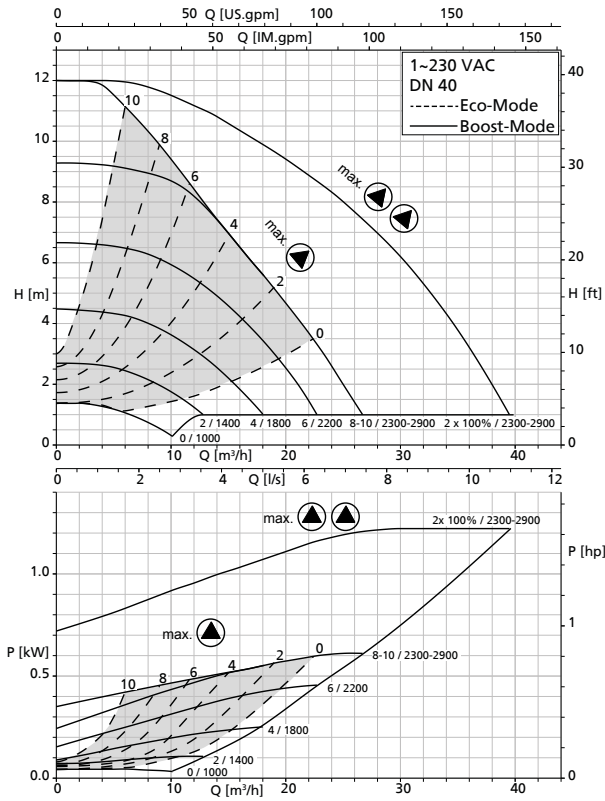


**Calio Z 40-100  $\Delta p_v + \Delta p_c$**

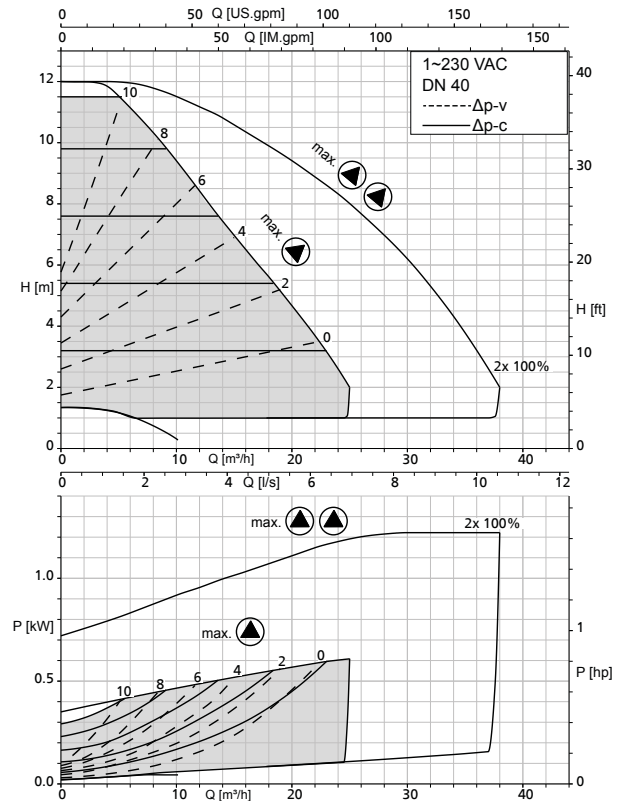




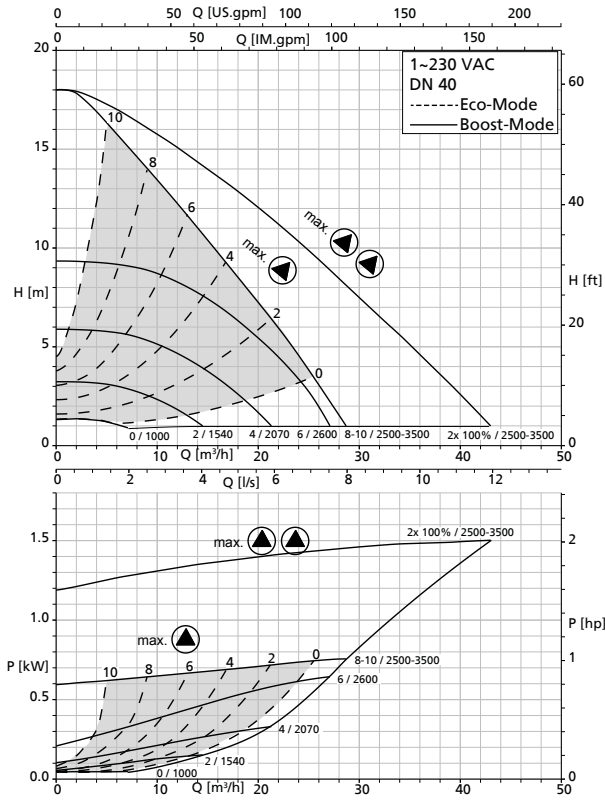
**Calio Z 40-120 Boost Mode, Eco Mode**



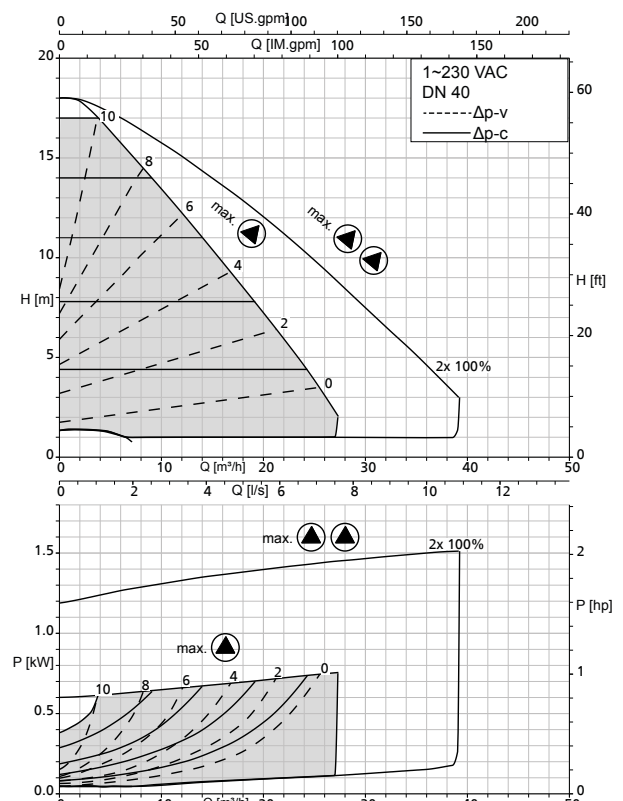
**Calio Z 40-120  $\Delta p_v + \Delta p_c$**



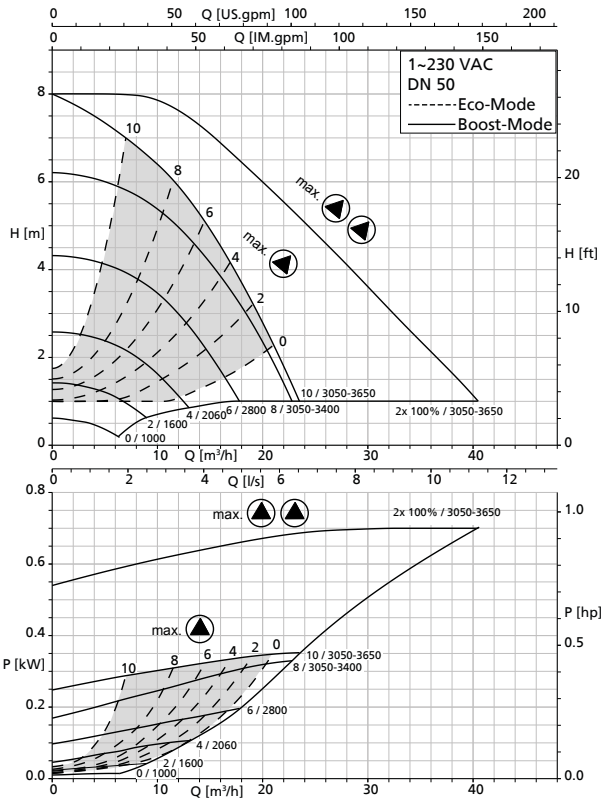
**Calio Z 40-180 Boost Mode, Eco Mode**



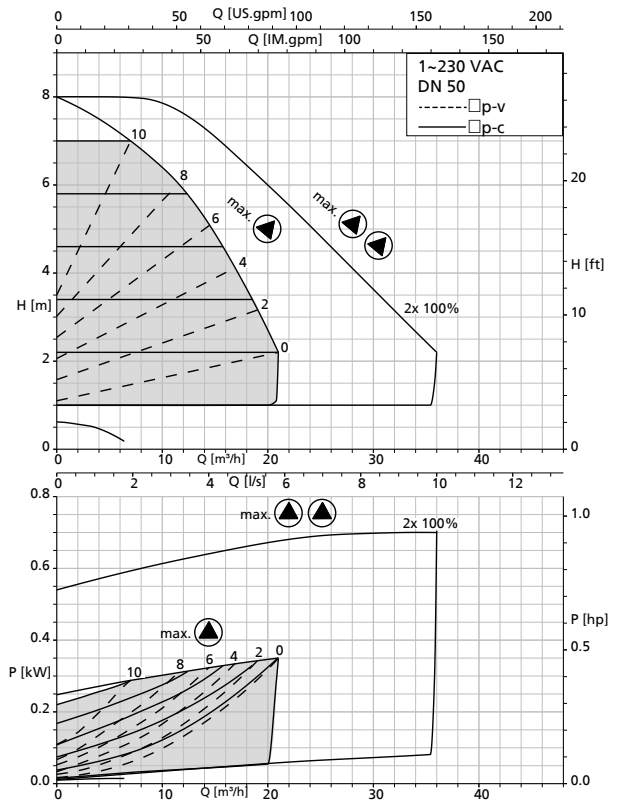
**Calio Z 40-180  $\Delta p_v + \Delta p_c$**



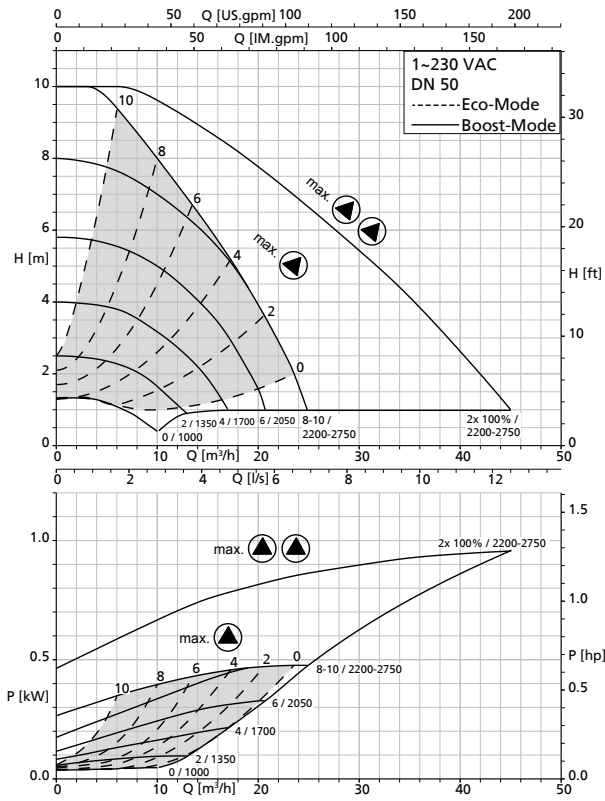
**Calio Z 50-80 Boost Mode, Eco Mode**



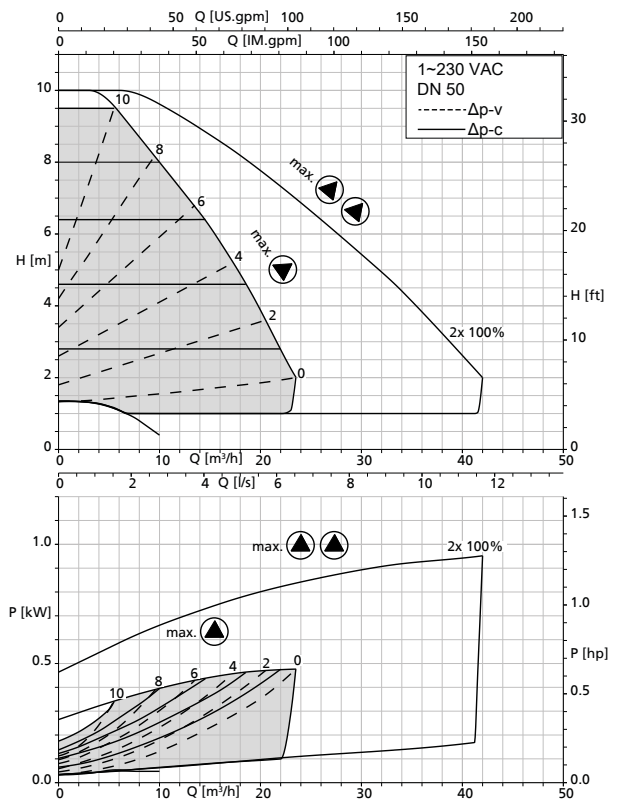
**Calio Z 50-80  $\Delta p_v + \Delta p_c$**



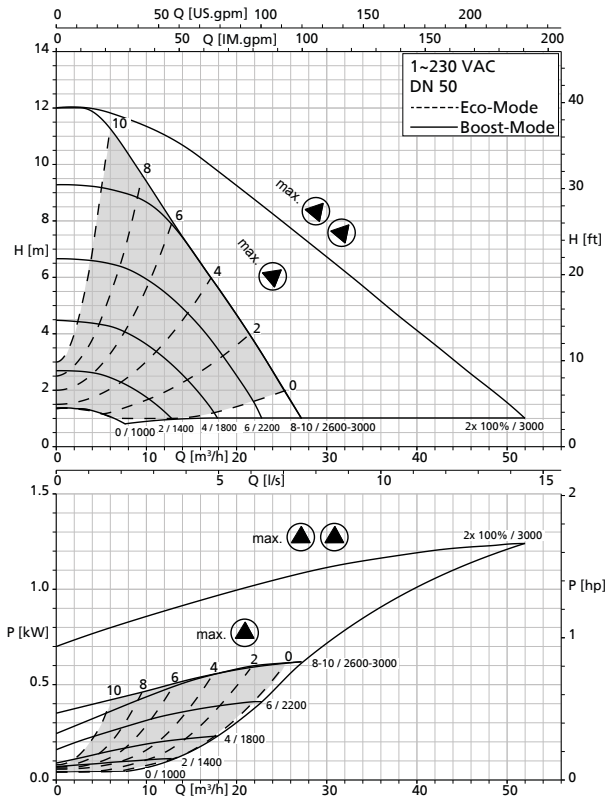
**Calio Z 50-100 Boost Mode, Eco Mode**



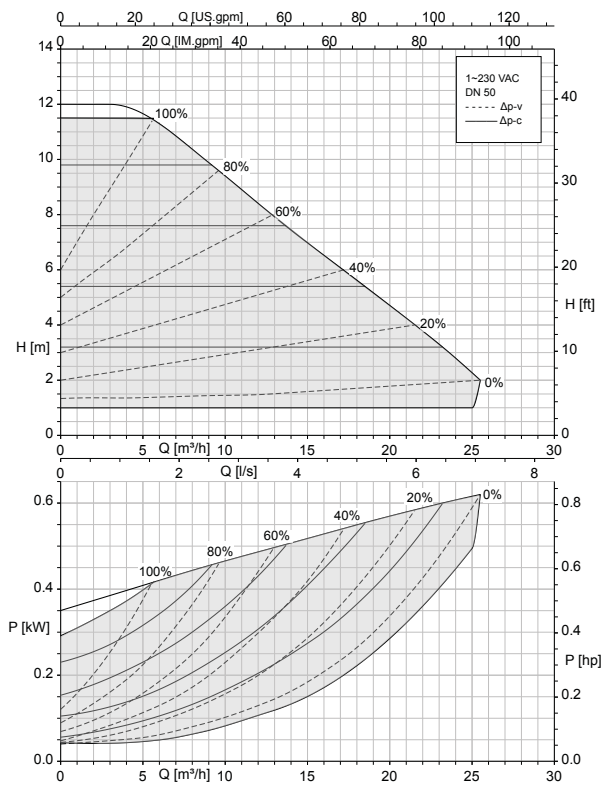
**Calio Z 50-100  $\Delta p_v + \Delta p_c$**



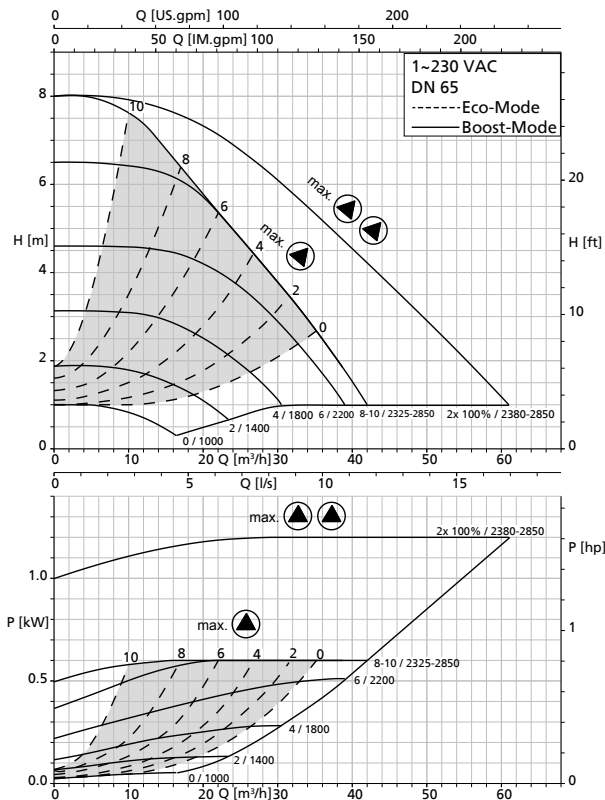
**Calio Z 50-120 Boost Mode, Eco Mode**



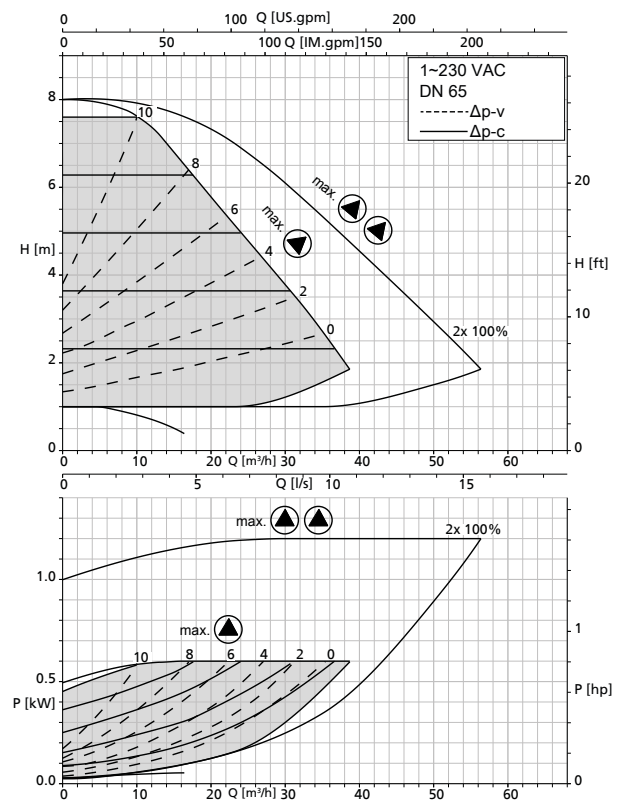
**Calio Z 50-120  $\Delta p_v + \Delta p_c$**



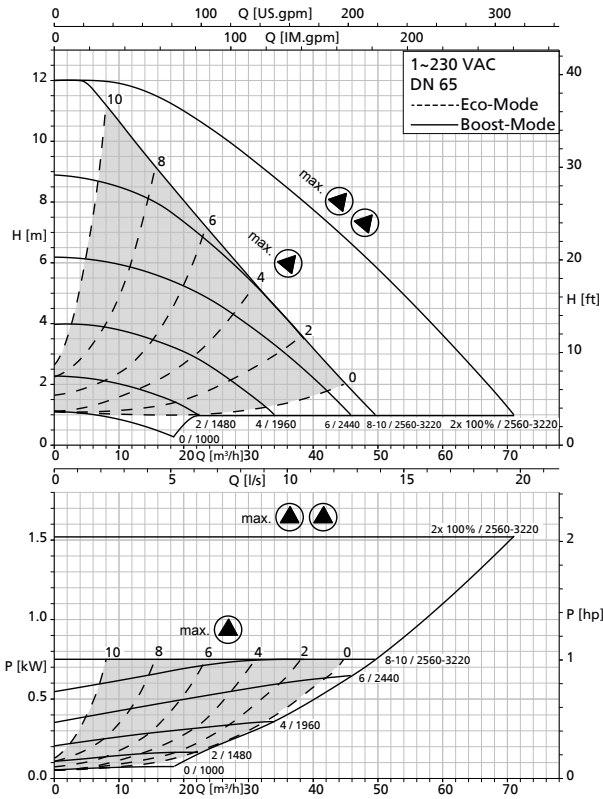
**Calio Z 65-80 Boost Mode, Eco Mode**



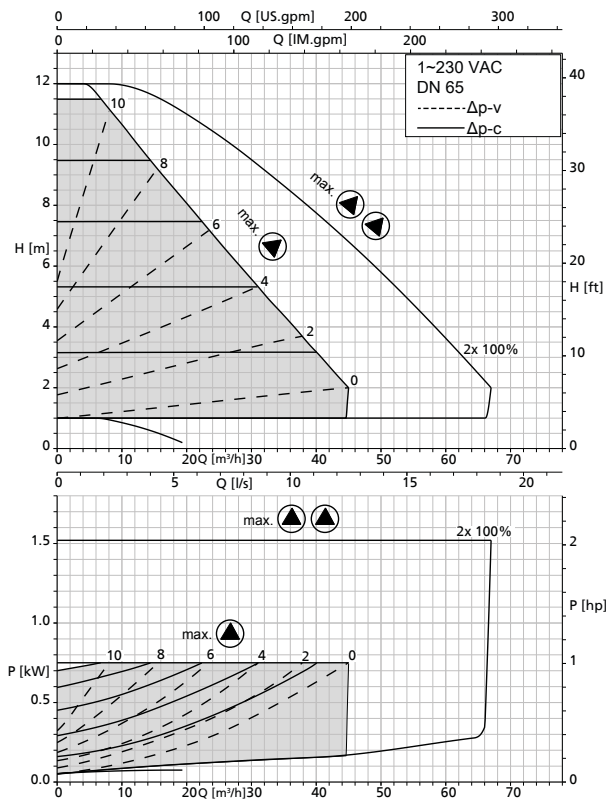
**Calio Z 65-80  $\Delta p_v + \Delta p_c$**



### Calio Z 65-120 Boost Mode, Eco Mode



### Calio Z 65-120 $\Delta p_v + \Delta p_c$



## Dimensions

### Pump set dimensions

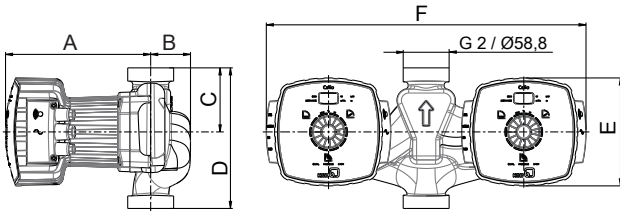


Fig. 2: Screw-ended pump set

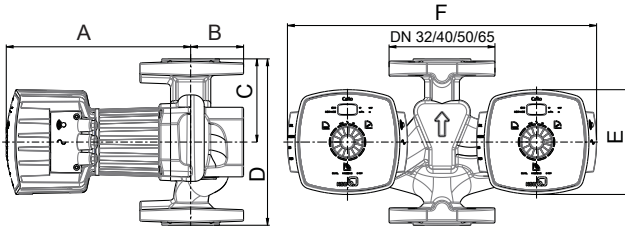


Fig. 3: Flanged pump set

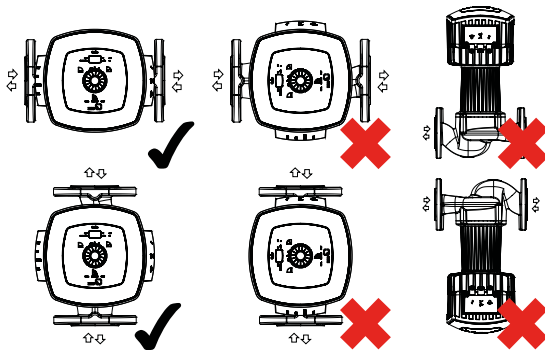
Pump set dimensions [mm]

Size	Rp	G	DN	A	B	C	D	E	F
30-60	1 1/4	2	-	212	51	82	180	137	418
30-100	1 1/4	2	-	212	51	82	180	137	418
32-80	-	-	32	212	70	110	220	137	418
32-120	-	-	32	232	70	110	220	137	418
40-80	-	-	40	239	75	121	220	137	418
40-100	-	-	40	239	75	121	220	137	418
40-120	-	-	40	239	75	102	250	209	560
40-180	-	-	40	239	75	102	250	209	560
50-80	-	-	50	244	83	126	240	137	418
50-100	-	-	50	390	83	140	280	209	560
50-120	-	-	50	390	83	140	280	209	560
65-80	-	-	65	400	93	180	340	209	560
65-120	-	-	65	400	93	180	340	209	560

### Flange dimensions

Flange dimensions [mm]


Size	PN 6			PN 10, PN 16			Outline drawing
	Ø D	Ø k	n × Ø d <sub>2</sub>	Ø D	Ø k	n × Ø d <sub>2</sub>	
DN 32	120	90	4 × Ø 14	140	100	4 × Ø 19	
DN 40	130	100	4 × Ø 14	150	110	4 × Ø 19	
DN 50	140	110	4 × Ø 14	165	125	4 × Ø 19	
DN 65	160	130	4 × Ø 14	185	145	4 × Ø 19	

**Installation information**
**Calio Z**

**Fig. 4: Permissible installation positions**
**Scope of supply**


Depending on the model, the following items are included in the scope of supply:

- Pump set
- Pre-configured dual connection cable
- 2 gaskets
- Installation/operating manual


**Accessories**
**Electrical accessories**

	Item	Description	MPG	L	Mat. No.	[kg]
	-	BACnet MS/TP communication module Suitable for mounting in a control cabinet, for connection to 1 Calio Z pump <sup>5)</sup>	24	-	18041730	0,1

**Pipe unions**

	Description	Mat. No.	[kg]
	2 pipe unions with G 2 union nut and insert with Rp 1 1/4 internal thread, steel for pumps with G 2 external thread / Rp 1 1/4 pipe connection	19075562	0,2

**Spacers (flange)**

	Description	Connection	PN	Length	Mat. No.	[kg]
		Flange		[mm]		
	Spacer F16	DN 40	6/10	30	19075991	2
	Spacer F0	DN 40	6/10	70	19075566	2
	Spacer F1	DN 50	6/10	10	19075567	2
	Spacer F2	DN 50	6/10	20	19075568	2
	Spacer F3	DN 50	6/10	50	19075569	2
	Spacer F4	DN 50	6/10	60	19075570	2
	Spacer F5	DN 65	6/10	10	19075571	2
	Spacer F6	DN 65	6/10	25	19075572	2
	Spacer F7	DN 65	6/10	30	19075573	2
	Spacer F8	DN 80	6/10	10	19075574	2
	Spacer F9	DN 80	6/10	15	19075575	2
	Spacer F10	DN 80	6/10	20	19075576	2
	Spacer F11	DN 80	6/10	25	19075577	2
	Spacer F12	DN 80	6/10	30	19075578	2
	Spacer F13	DN 80	6/10	40	19075579	2
Spacer F14	DN 80	6/10	50	19075580	2	
Spacer F15	DN 80	6/10	80	19075581	2	

<sup>5)</sup> 2 units required per Calio Z pump



Your local KSB representative:

 **sukmatirta**

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