

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 [m³/h]	≤ 70
	Q [l/s]	≤ 19,4
Head	H [m]	≤ 18
Fluid temperature	T [°C]	≥ -10
		≤ +110
Ambient temperature	T [°C]	≥ 0
		≤ +40 ¹⁾
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 permanent magnet synchronous motor, brushless, self-cooling, with continuously variable differential pressure control
- 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 (can only be activated with KSB ServiceTool)
- Open-loop control via setpoint setting
- Eco-Mode

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
- Dynamic Control
- Remote ON/OFF
- 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 functions 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 contacts)
- 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
	65 DN 65
180	Head H ²⁾ [m]
	180 Head × 10 Example: 18 m × 10 = 180

Materials

Overview of available materials

Part No.	Description	Material
102	Volute casing	Grey cast iron with cathodic electrocoating (EN-GJL-200)
210	Shaft	Stainless steel 1.4034
230	Impeller	Plastic with glass fibre content (PSU-GF30)
310	Bearing	Ceramics/carbon
746	Change-over flap	Plastic with glass fibre content/EPDM
817	Can	Stainless steel 1.4301

The casing parts of the pump set that are in contact with the atmosphere and the fluid handled are free from paint wetting impairment substances..

Product benefits

- Maximum savings of operating costs by high-efficiency technology combined with speed control
- Future-proof by maximum energy efficiency, exceeding current energy efficiency regulations such as ErP 2015.
- All-in concept saves investment costs and commissioning costs.
- Easy-to-use combination of controls, integrated display and symbols to show the operating status
- 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

2) At flow rate Q = 0 m³/h

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 T_{max} .

Fluid temperature	Minimum inlet pressure
[°C]	[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
[°C]	[°C]
≤ +90	+40
> +90	+30

Description of the Modbus interface

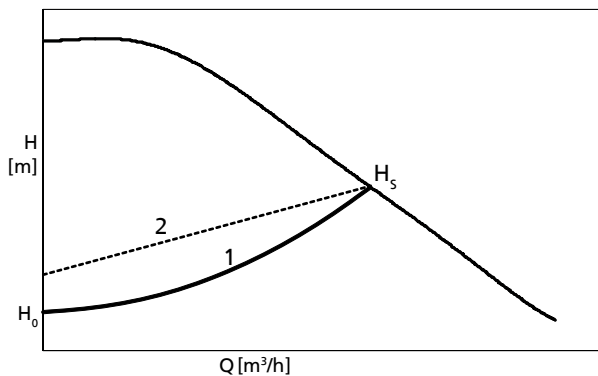
Technical data of the Modbus interface

Parameter	Description/value
Terminal cross-section	1,5 mm ²
Interface	RS485 (TIA-485-A) optically isolated
Bus connection	0.5 mm ² , shielded twisted pair bus cable
Cable length	1000 m max. - Stub line impermissible - For cable lengths > 30 m take suitable measures to ensure overvoltage protection.
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	8 data bits - Parity EVEN / ODD / NONE 1 stop bit
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

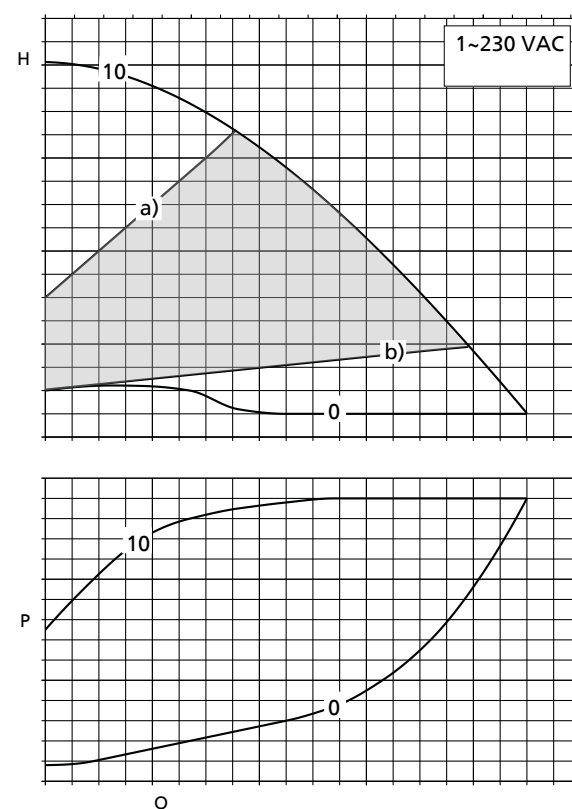


Fig. 1: Selection example

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

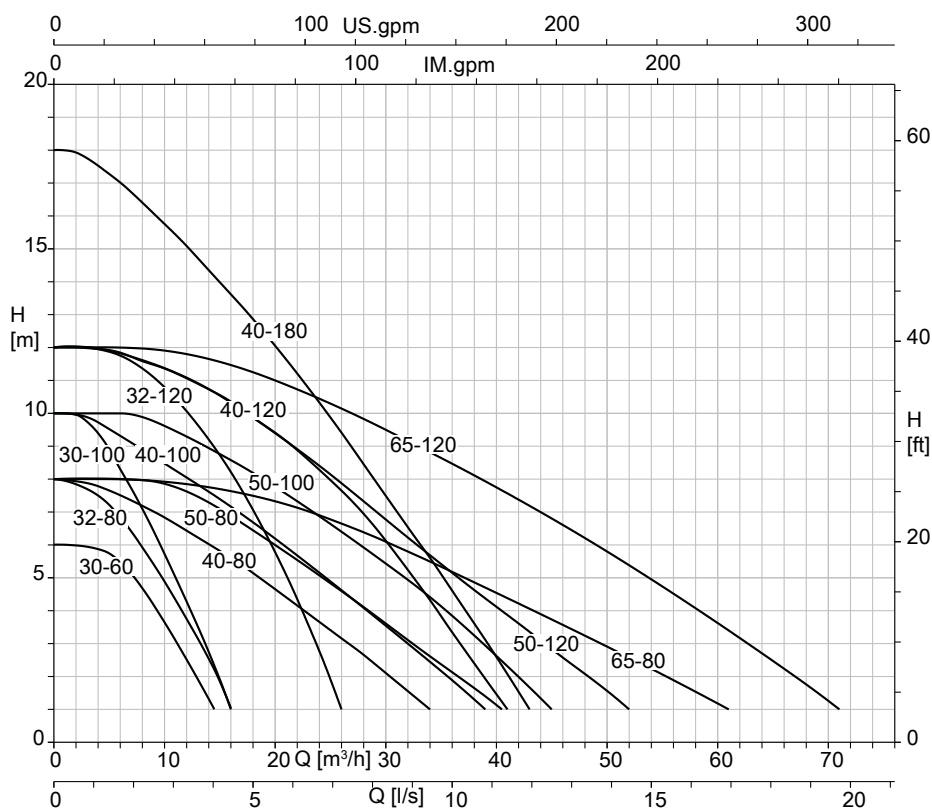
Calio Z

Technical data

Size	Connection		PN [bar]	Speed		P ₁ ³⁾ [W]	I _N ³⁾ 1~230 VAC, 50/60 Hz [A]	Mat. No.	[kg]
	Piping	Pump		Min.	Max.				
				[rpm]	[rpm]				
30-60	Rp 1 1/4	G 2	6/10/16	1000	3500	3,5 - 170 (320)	0,15 - 0,74 (1,40)	29134897	10,75
30-100	Rp 1 1/4	G 2	6/10/16	1000	4500	3,5 - 210 (410)	0,15 - 0,91 (1,80)	29134898	10,75
32-80	DN 32	DN 32	6/10/16	1000	4000	3,5 - 170 (340)	0,15 - 0,74 (1,50)	29134899	15,1
32-120	DN 32	DN 32	6/10/16	1000	4000	3,5 - 430 (780)	0,15 - 1,87 (3,40)	29134900	16,06
40-80	DN 40	DN 40	6/10/16	1000	3600	3,5 - 340 (700)	0,15 - 1,48 (3,00)	29134901	17,42
40-100	DN 40	DN 40	6/10/16	1000	4000	3,5 - 420 (850)	0,15 - 1,83 (3,70)	29134902	17,42
40-120	DN 40	DN 40	6/10/16	1000	2900	5 - 840 (1680)	0,32 - 3,65 (7,30)	29134873	28,61
40-180	DN 40	DN 40	6/10/16	1000	3500	5 - 770 (1460)	0,32 - 3,35 (6,40)	29134874	28,61
50-80	DN 50	DN 50	6/10/16	1000	3500	3,5 - 390 (660)	0,15 - 1,70 (2,90)	29134903	23,56
50-100	DN 50	DN 50	6/10/16	1000	2750	5 - 490 (960)	0,32 - 2,13 (4,20)	29134875	31,71
50-120	DN 50	DN 50	6/10/16	1000	2930	5 - 570 (1080)	0,32 - 2,48 (4,70)	29134876	31,71
65-80	DN 65	DN 65	6/10/16	1000	2850	3,5 - 590 (1100)	0,15 - 2,57 (4,80)	29134877	39,39
65-120	DN 65	DN 65	6/10/16	1000	3200	5 - 840 (1680)	0,32 - 3,65 (7,30)	29134878	39,39

Selection chart

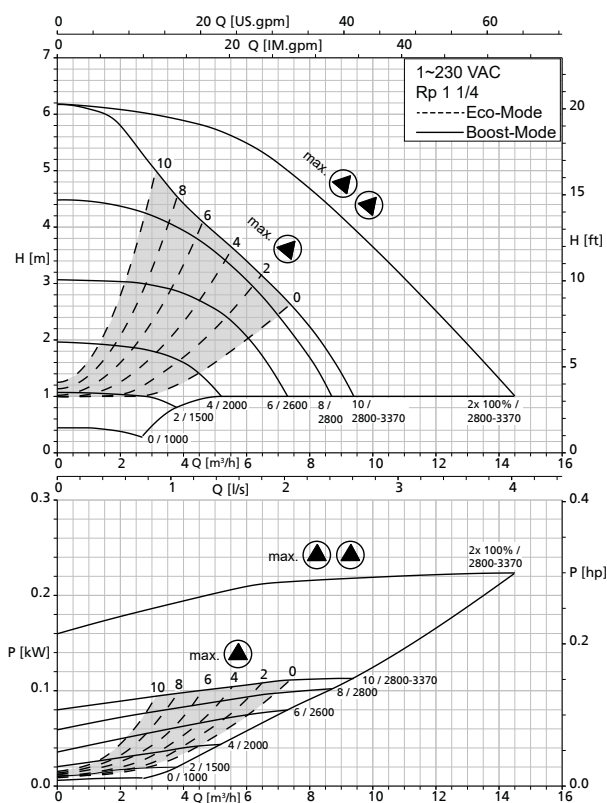
Calio Z (parallel operation)



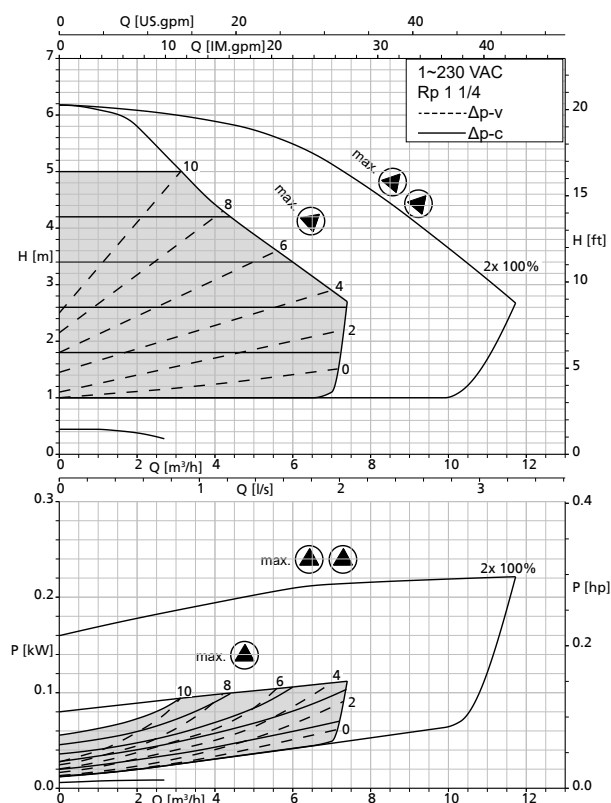
3) The value in parentheses applies to operation of both pump sets.

Characteristic curves

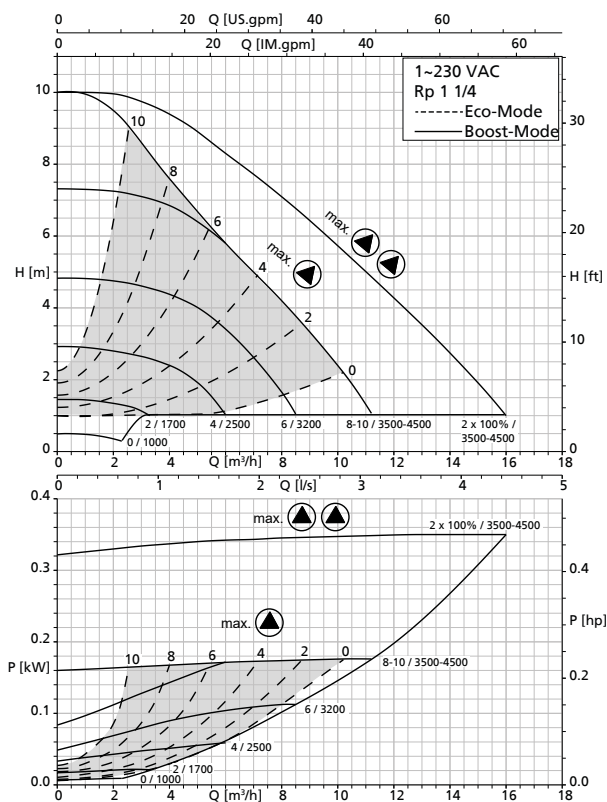
Calio Z 30-60 Open-loop Control, Eco Mode



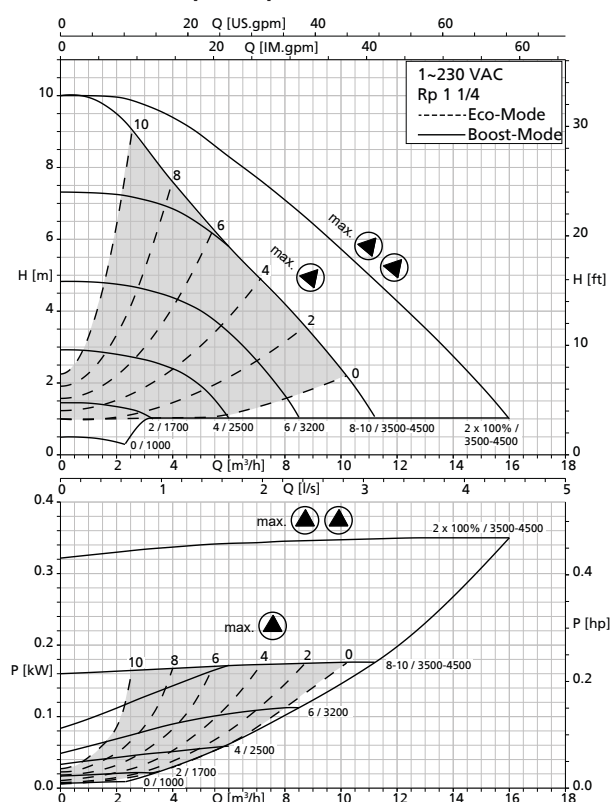
Calio Z 30-60 $\Delta p_v + \Delta p_c$



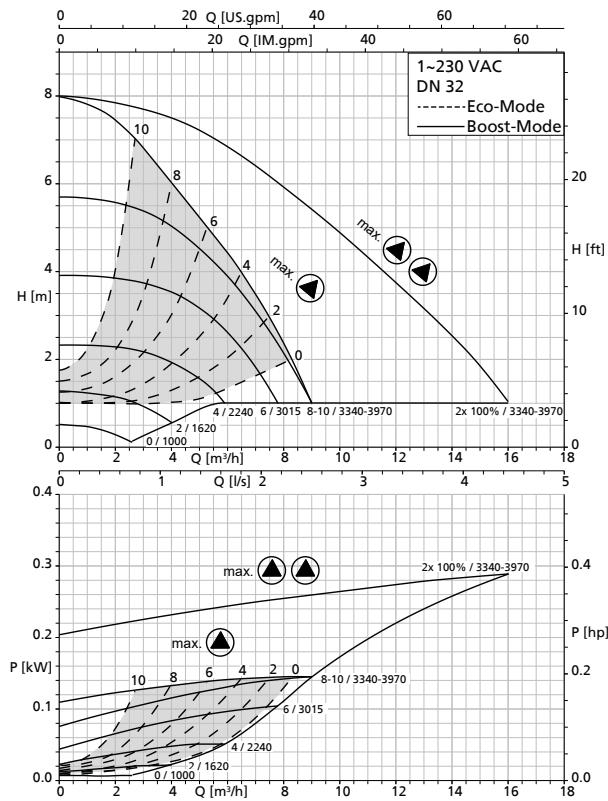
Calio Z 30-100 Open-loop Control, Eco Mode



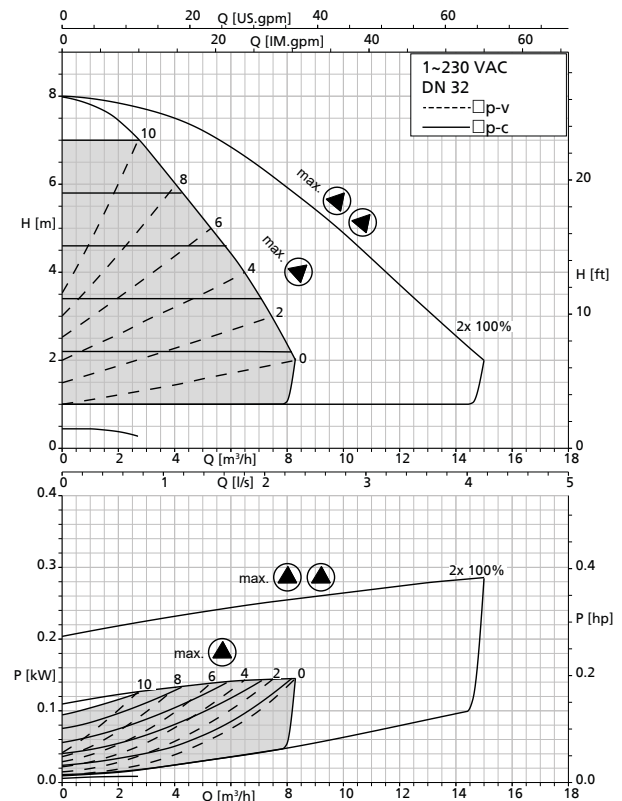
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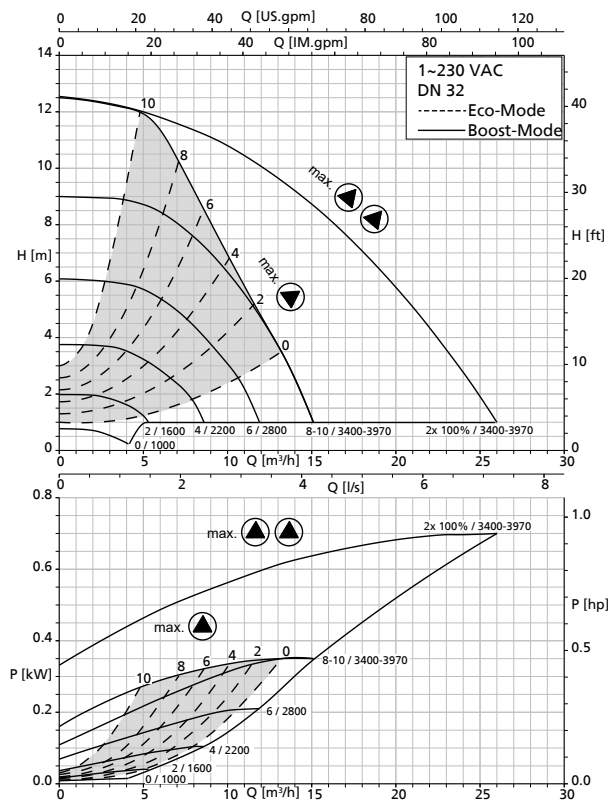
Calio Z 32-80 Open-loop Control, Eco Mode



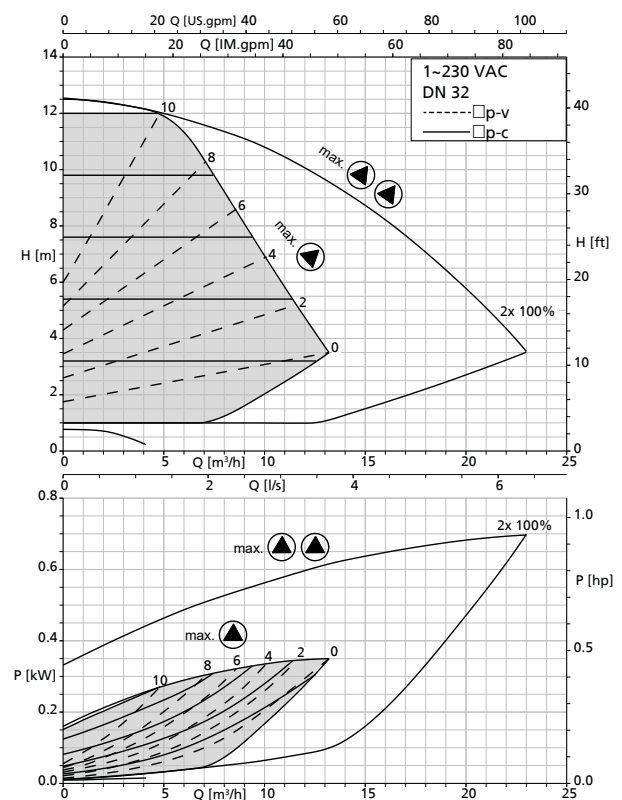
Calio Z 32-80 $\Delta p_v + \Delta p_c$



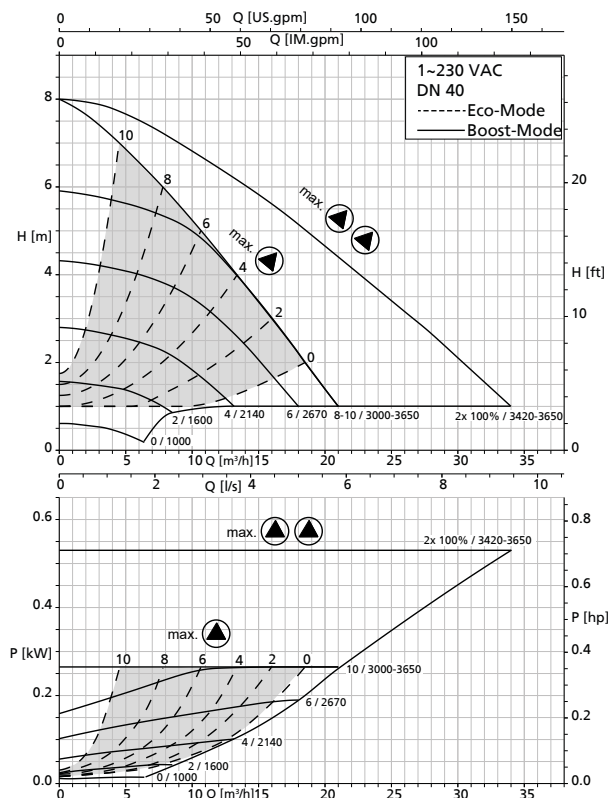
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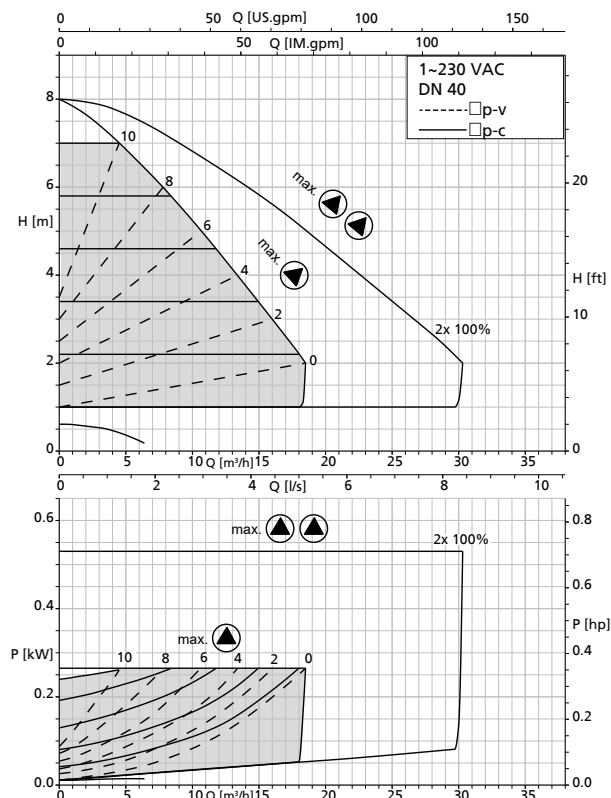
Calio Z 32-120 $\Delta p_v + \Delta p_c$



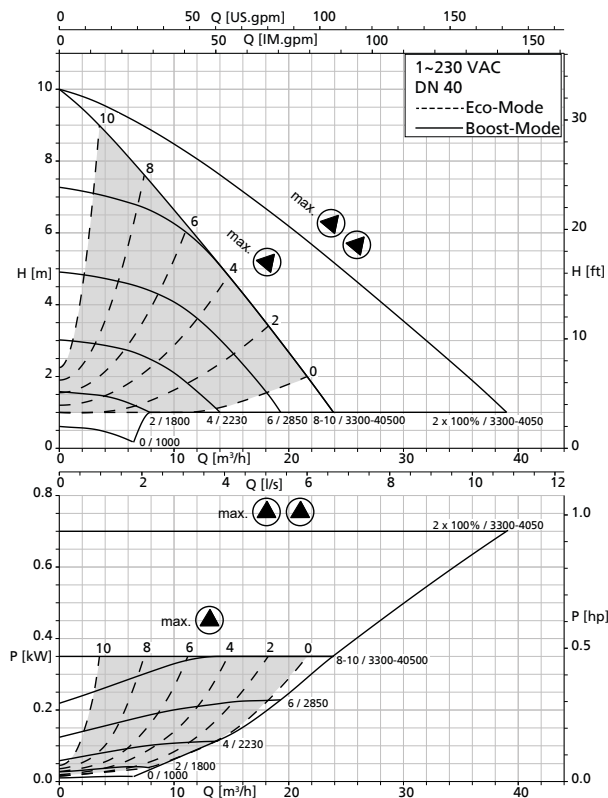
Calio Z 40-80 Open-loop Control, Eco Mode



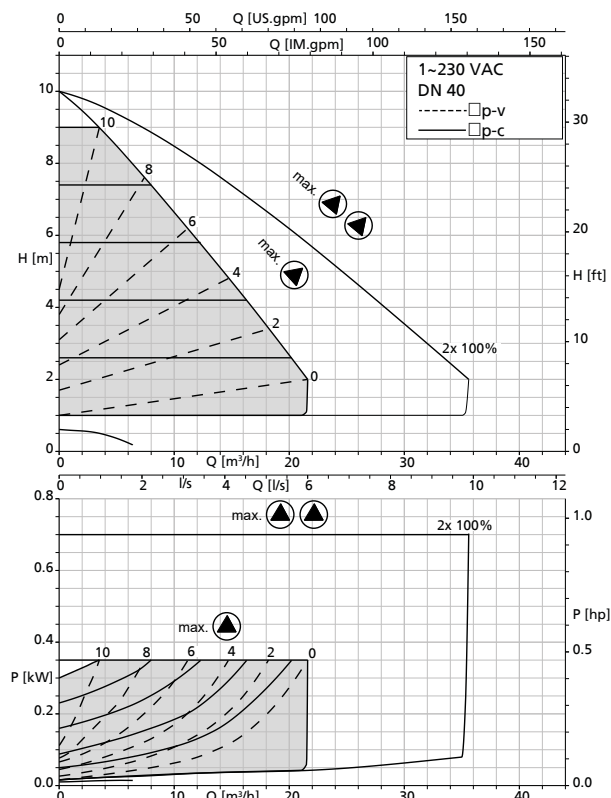
Calio Z 40-80 $\Delta p_v + \Delta p_c$



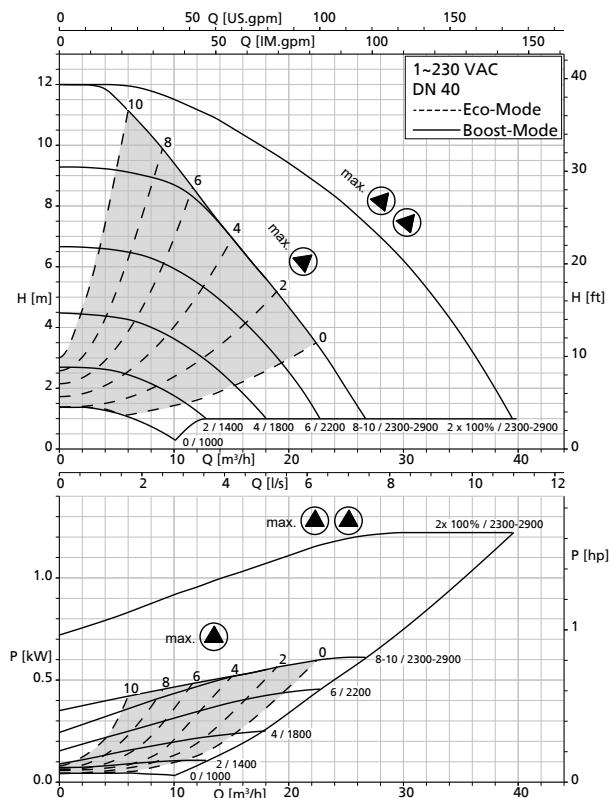
Calio Z 40-100 Open-loop Control, Eco Mode



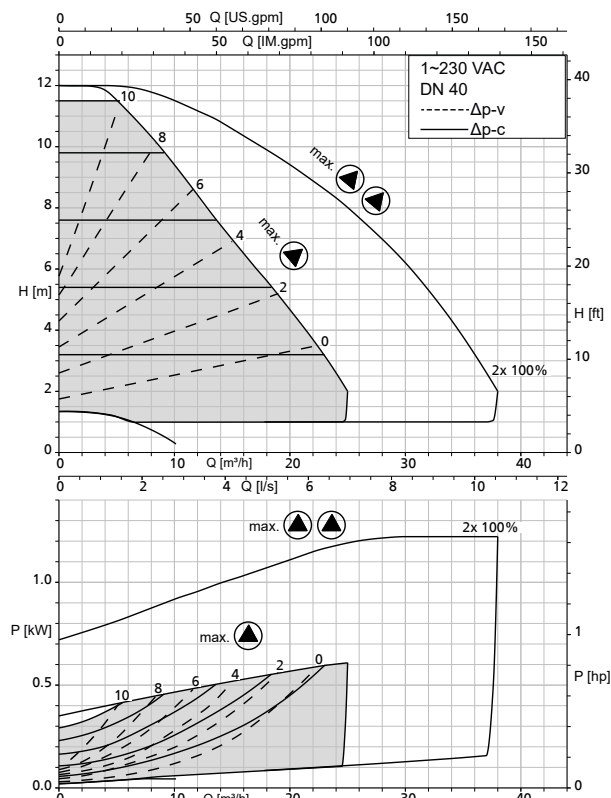
Calio Z 40-100 $\Delta p_v + \Delta p_c$



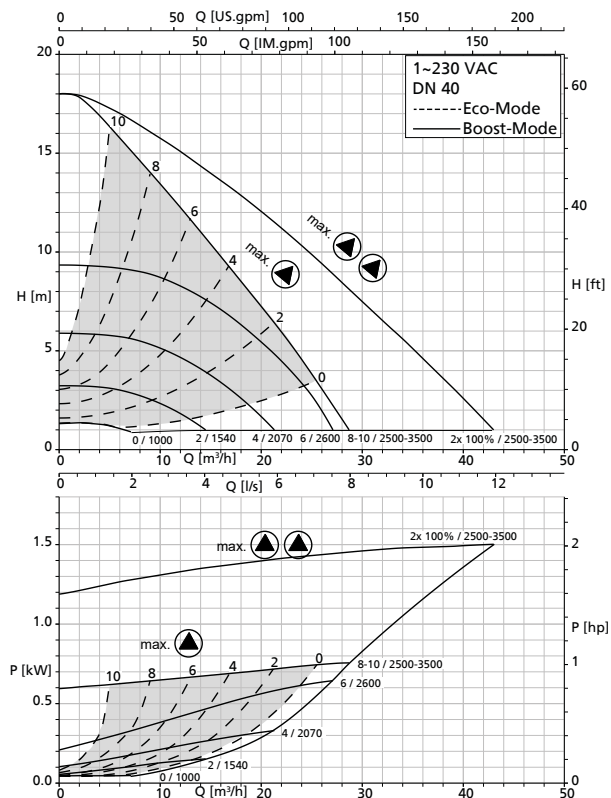
Calio Z 40-120 Open-loop Control, Eco Mode



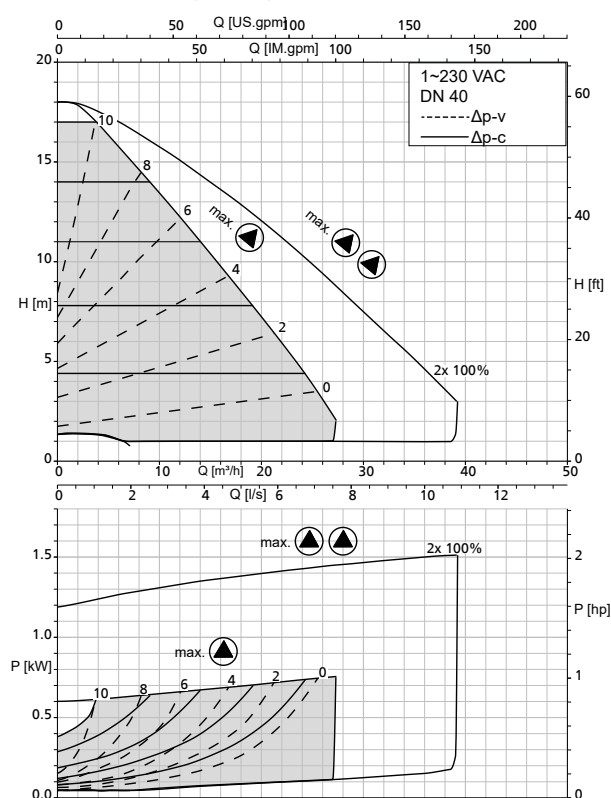
Calio Z 40-120 $\Delta p_v + \Delta p_c$



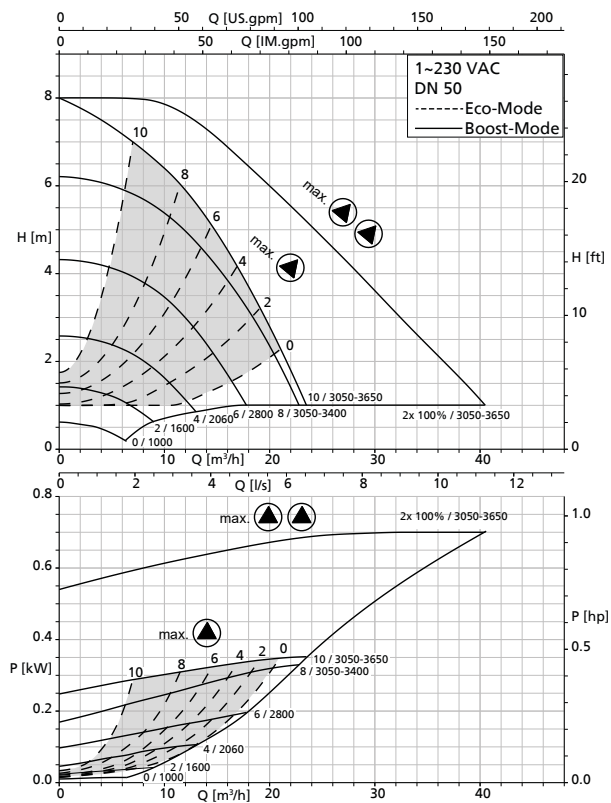
Calio Z 40-180 Open-loop Control, Eco Mode



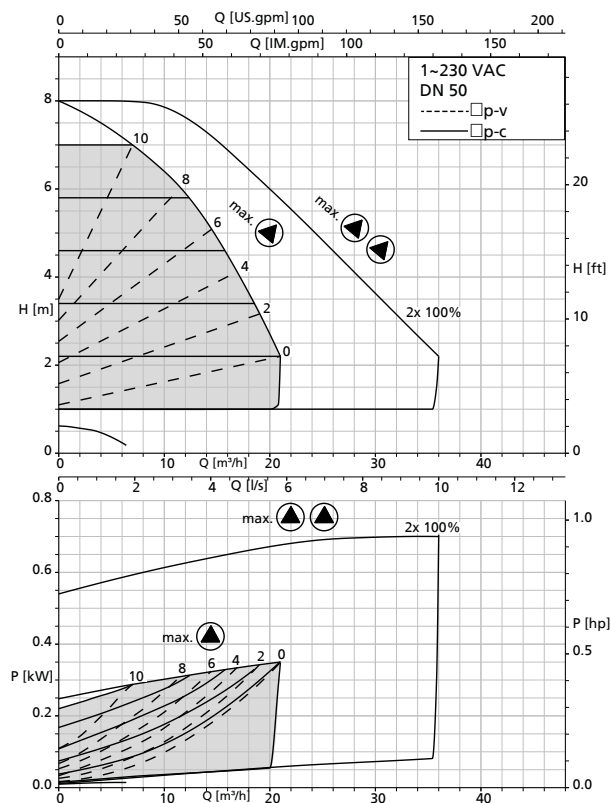
Calio Z 40-180 $\Delta p_v + \Delta p_c$



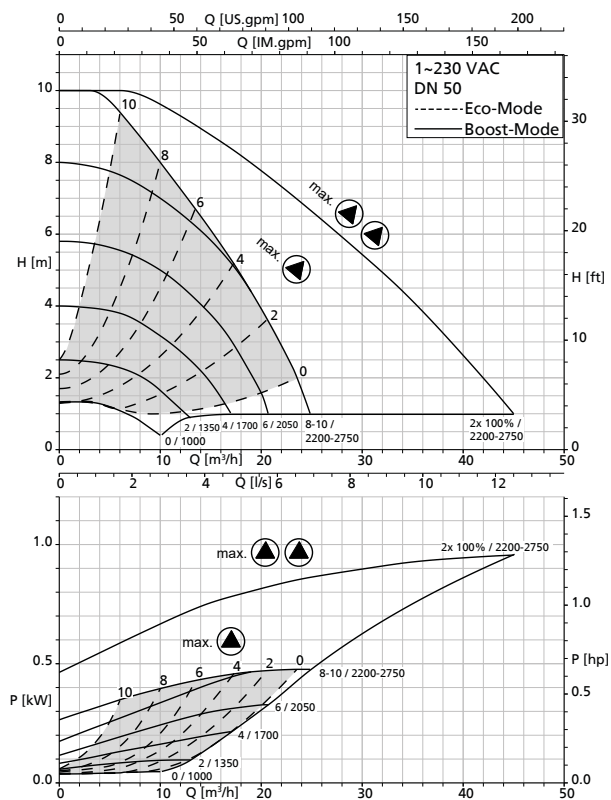
Calio Z 50-80 Open-loop Control, Eco Mode



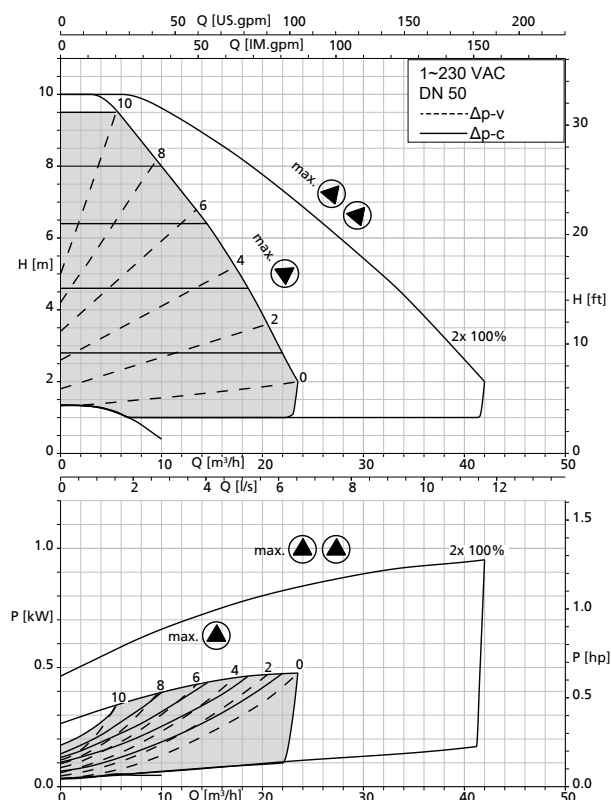
Calio Z 50-80 $\Delta p_v + \Delta p_c$



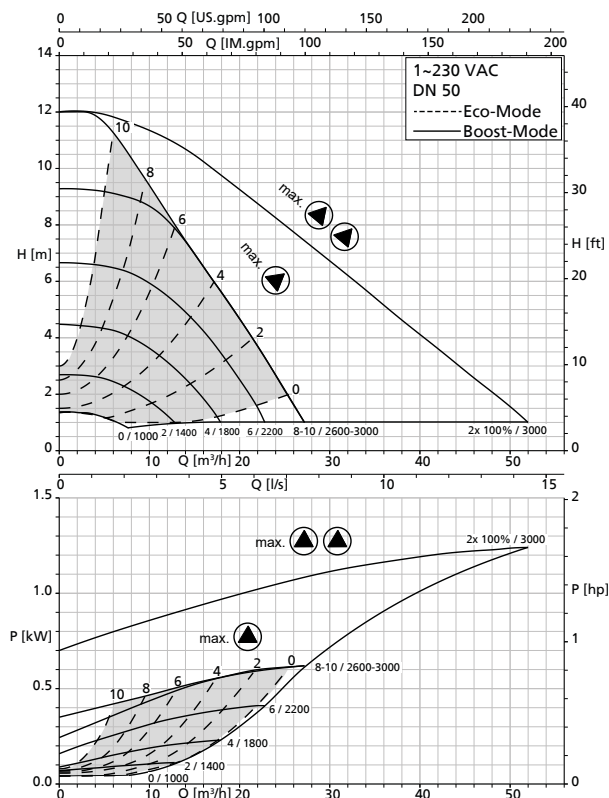
Calio Z 50-100 Open-loop Control, Eco Mode



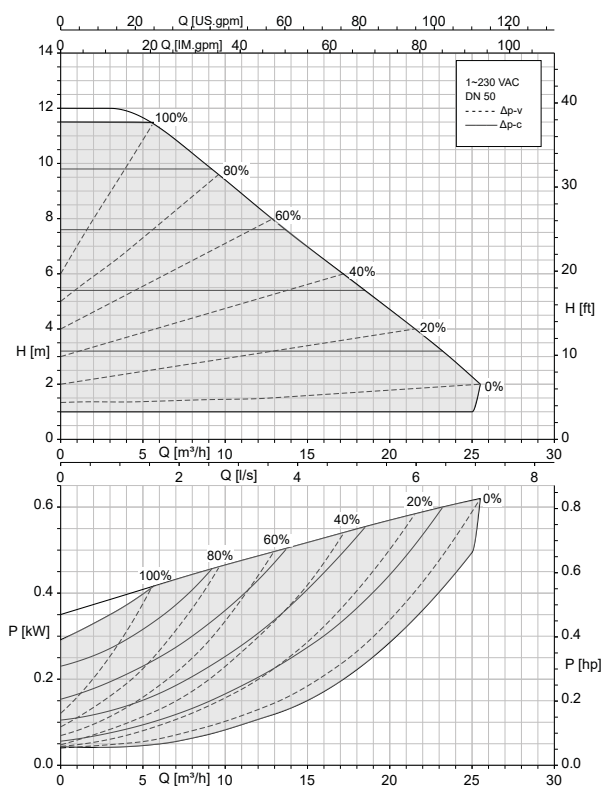
Calio Z 50-100 $\Delta p_v + \Delta p_c$



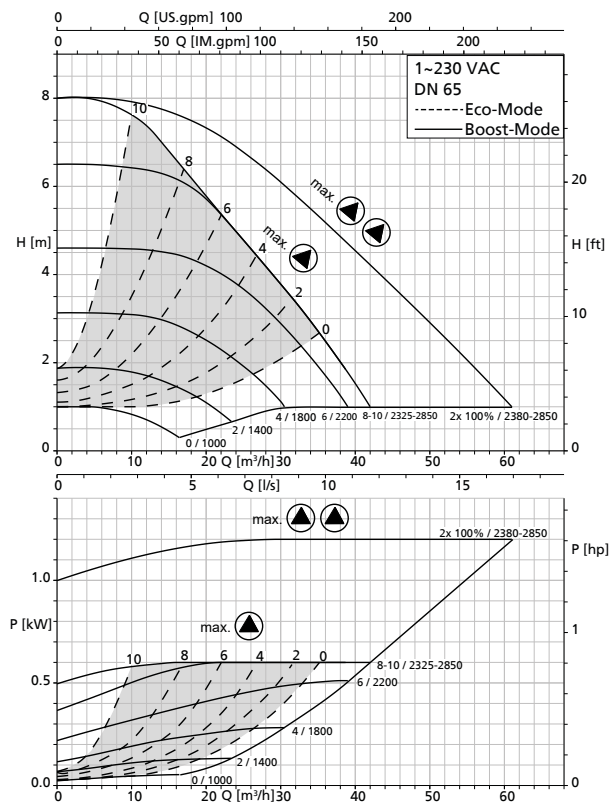
Calio Z 50-120 Open-loop Control, Eco Mode



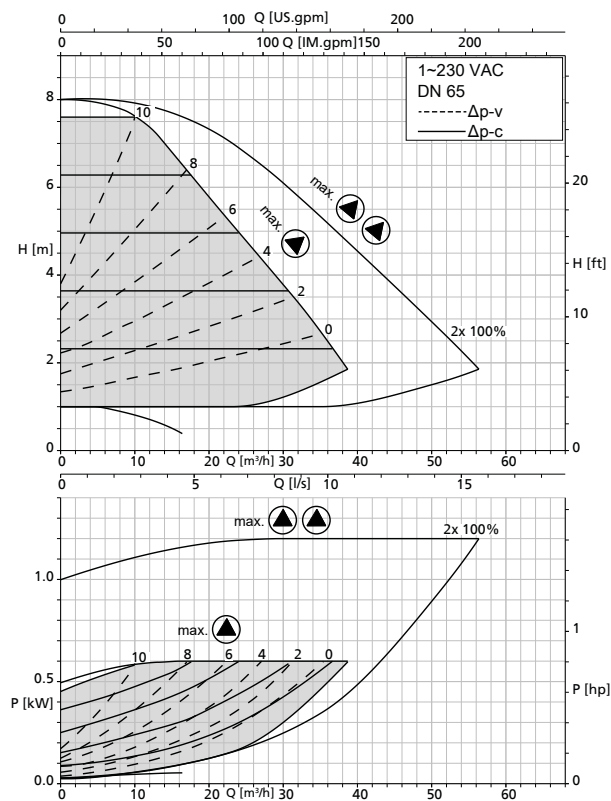
Calio Z 50-120 $\Delta p_v + \Delta p_c$



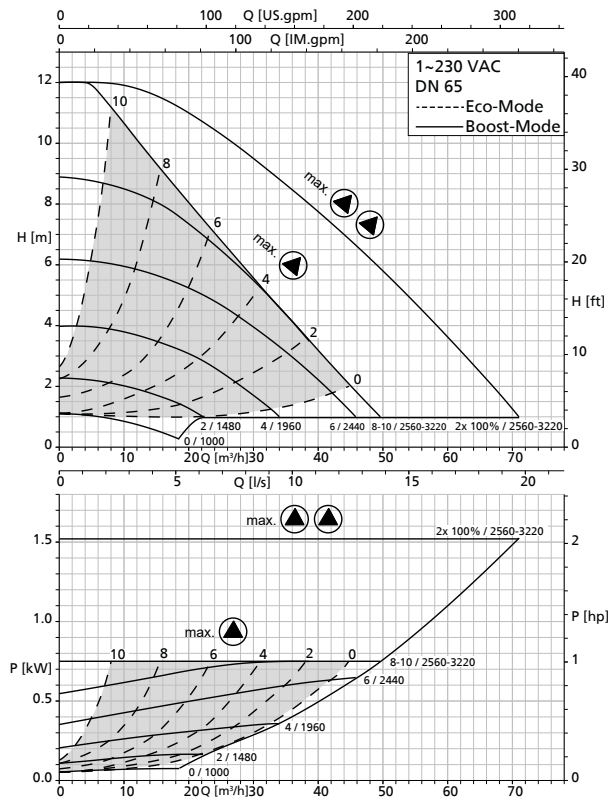
Calio Z 65-80 Open-loop Control, Eco Mode



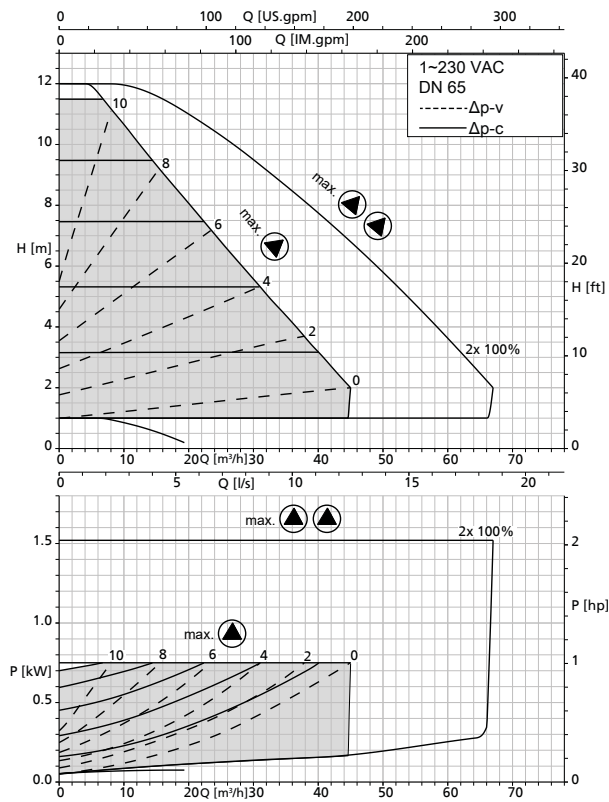
Calio Z 65-80 $\Delta p_v + \Delta p_c$



Calio Z 65-120 Open-loop Control, Eco Mode



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



Dimensions

Pump set dimensions

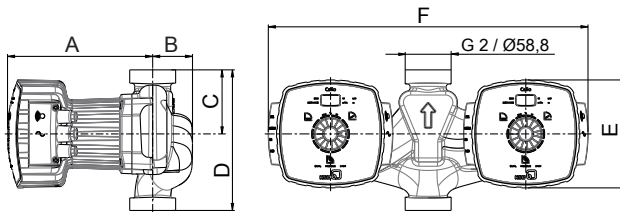


Fig. 2: Screw-ended pump set

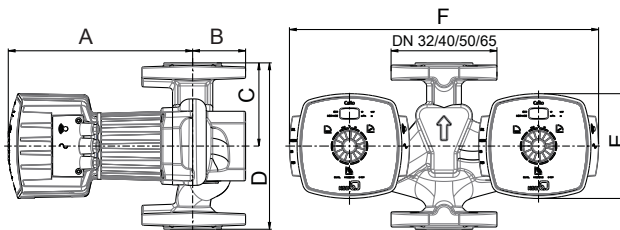


Fig. 3: Flanged pump set

Pump set dimensions

Size	Connection			A	B	C	D	E	F
	Rp	G	DN	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
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

Size	PN 6			PN 10, PN 16			Outline drawing
	Ø D	Ø k	n × Ø d ₂	Ø D	Ø k	n × Ø d ₂	
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
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

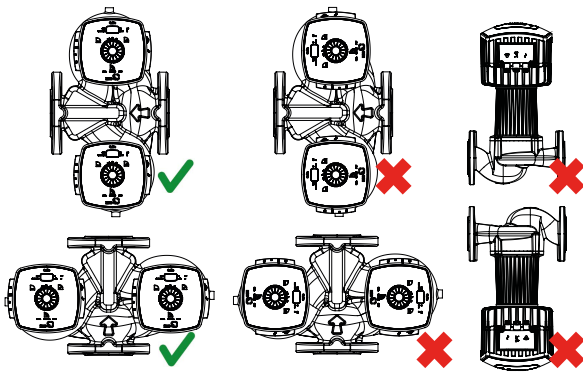


Fig. 4: Permissible installation positions

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 ⁴⁾	24	L	18041730	0,1
	-	USB-RS485 parameterisation cable	D6	-	48014073	0,3

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	10/16	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	

4) 2 units required per Calio Z pump



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