

## PHP-C Pressureless Expansion System Overview

### Description:

The PHP-C balanced pressure expansion equipment is sized according to the total system volume and the boiler or chiller load. The PHP-C vessel is 80% efficient irrespective of the static height of the system. It is the ideal solution for large installations or tall installation where standard diaphragm expansion equipment is limited. The PHP-C is an advanced product that combines a balanced pressure system with an effective pressure step de-aerator function and an inter-link to a top up pressurisation unit. The real-time LCD display shows the status of the mechanical components while monitoring the vessel contents and the system pressure.

### Product Features:

- On/Off switch, with indicator neon
- Constructed as type AB air gap with weir overflow, fluid category 5
- Easy setup and commissioning
- Event logging for pump start, individual pump run hour's counter, electrical interruption and common alarm.
- Volt free contacts for common fault, high pressure, low pressure, pump fault, pressure transducer fault.
- 18 Litre break tank with type AB Air Gap Fluid Cat 5



### Certifications and Standards Applied:

- PED 97/23/EC Sound Engineering Practice
- IEE - Electrical Safety Guidance
- EMC 2004/108/EC
- BS7074 Parts 1 to 3
- Machine Directive 95/16/EC
- Electronic Components have been tested and comply with the EMC Directives
- EN61000-6-2: Generic Standards – Immunity standard for industrial environments
- EN61000-6-3: Generic Standards – Emission standard for residential, commercial and light industrial environment
- CE marked components, where applicable
- EN 13831/8 – Closed expansion vessels
- WRAS approved float valve to BS1212 part 2
- IP54 (BS EN60529) Rated Controller

## Maximum Operating Conditions:

- Maximum temperature on Bladder (EN 13831/8) 70°C
- Maximum temperature at (heating) outlet: 120°C

## Application of Use:

- Commercial,
- Industrial
- Residential

## Selection Details

Static Height of the building above the pressurisation unit (meters)

Systems content (litres) if unknown provide the boiler power (kW) which can be used to estimate the systems content

Flow and return temperatures

Glycol content (%) if required

Max working pressure

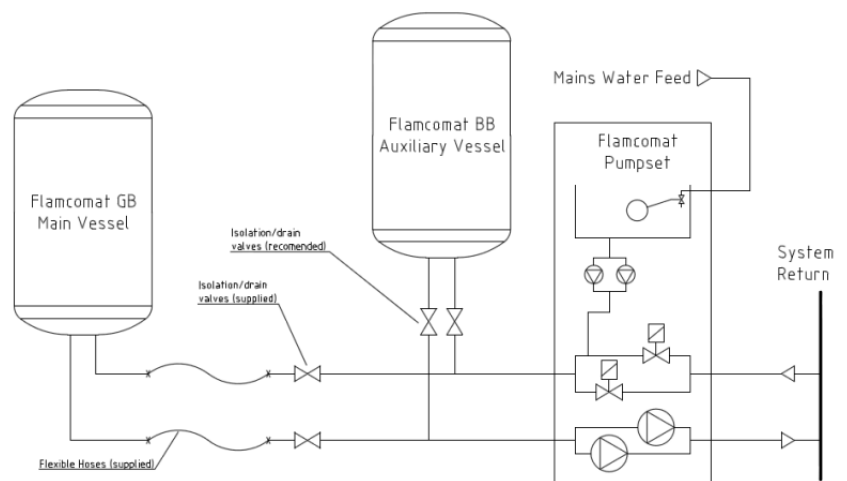
## Installation & Placement:

The PHP-C should be installed in a frost-free and humidity free area. All vessels must be installed at the same height.

The GB main vessel must be connected using the flexible hoses to give an accurate weight reading from the foot sensor.

Additional BB auxiliary vessels can be connected using hard pipe. Individual isolation and drain valve for each vessel are recommended.

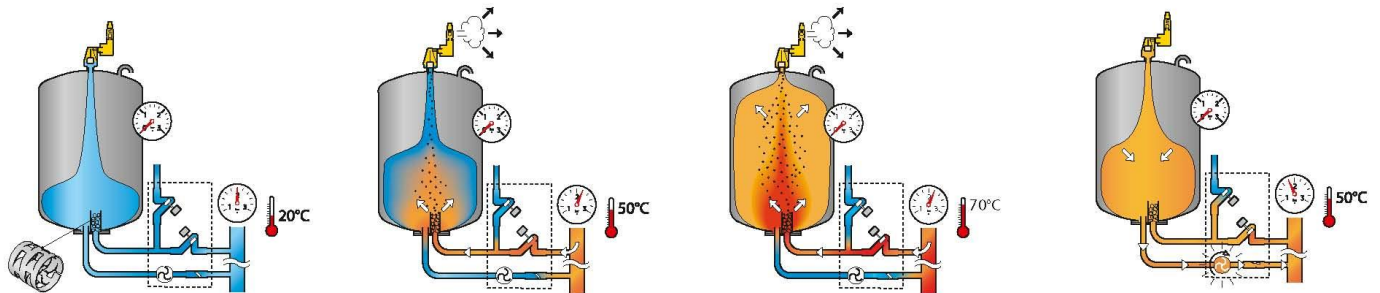
*Typical Installation Diagram  
(illustration purposes only)*



Note: Many internal components of the PHP-C pump set have been omitted

## Principle of Operations:

The PHP-C is designed to accurately balance system pressure to within (typically) 0.2 barg.



### Expansion Relief

As the system fluid heats up it expands, during expansion the system pressure attempts to rise. The PHP-C control equipment senses the pressure rise and opens the connection (solenoid) valve to the expansion vessel. The expanding fluid flows into the vessel, through an orifice (to restrict flow rates) and a system pressure rise is prevented.

### Contraction Compensation

As the system cools down, the system fluid contracts, during contraction the system pressure attempts to drop. The PHP-C control equipment senses the pressure drop and energizes the pumps. The fluid is actively pumped from the vessel back into the system, and a system pressure drop is prevented.

### Safeguards

Weight sensor to calculate water content of vessel at any one time. The weight sensor is calibrated in the factory with the system dry, this allows for accurate water measurement during normal operation.

Pressure sensor for monitoring system pressure.

Filling interlock for replenishment fluid. System fluid is lost through leaks and evaporation during air removal, fluid top up is required for maintaining the system content and integrity. This is automatically activated if the vessel volume drops below 12%.

PHP-C self-diagnostics. The system holds the last 50 alarm conditions in its memory, these can include water top up, excessive pump activation and high / low pressure alarms.

Cascade setting for pumps (twin pump version only), allowing second pump to energize in addition to the first, if faster fluid replenishment is required.

### Pressureless Vessel and PHP-C De-aeration

The water held in the vessel is at atmospheric pressure. The PHP-C effectively spills the expanded water into the PHP-C vessel. In accordance with Henry's law dissolved air can be released from the system water by increasing the temperature or dropping the pressure. The PHP-C system with its pressure drop design allows

This is enhanced by a cartridge of patented PALL rings in the inlet stream to the vessel. The released air is allowed to vent out of the vessel via an automatic air vent on the top. The air vent is also fitted with a non-return valve to prevent air being drawn back into the system.

When the PHP-C is in passive de-aeration mode air is released during the heating and cooling cycles only.

When the PHP-C is in turbo de-aeration mode the system water is continually being exchanged with the vessel water by cycling the solenoid and pumps on the skid. This turbo mode operates within the +/-0.2 bar tolerance on the system pressure setting



The system vessel. This action releases the vessel. released from pressure. dissolved air to be

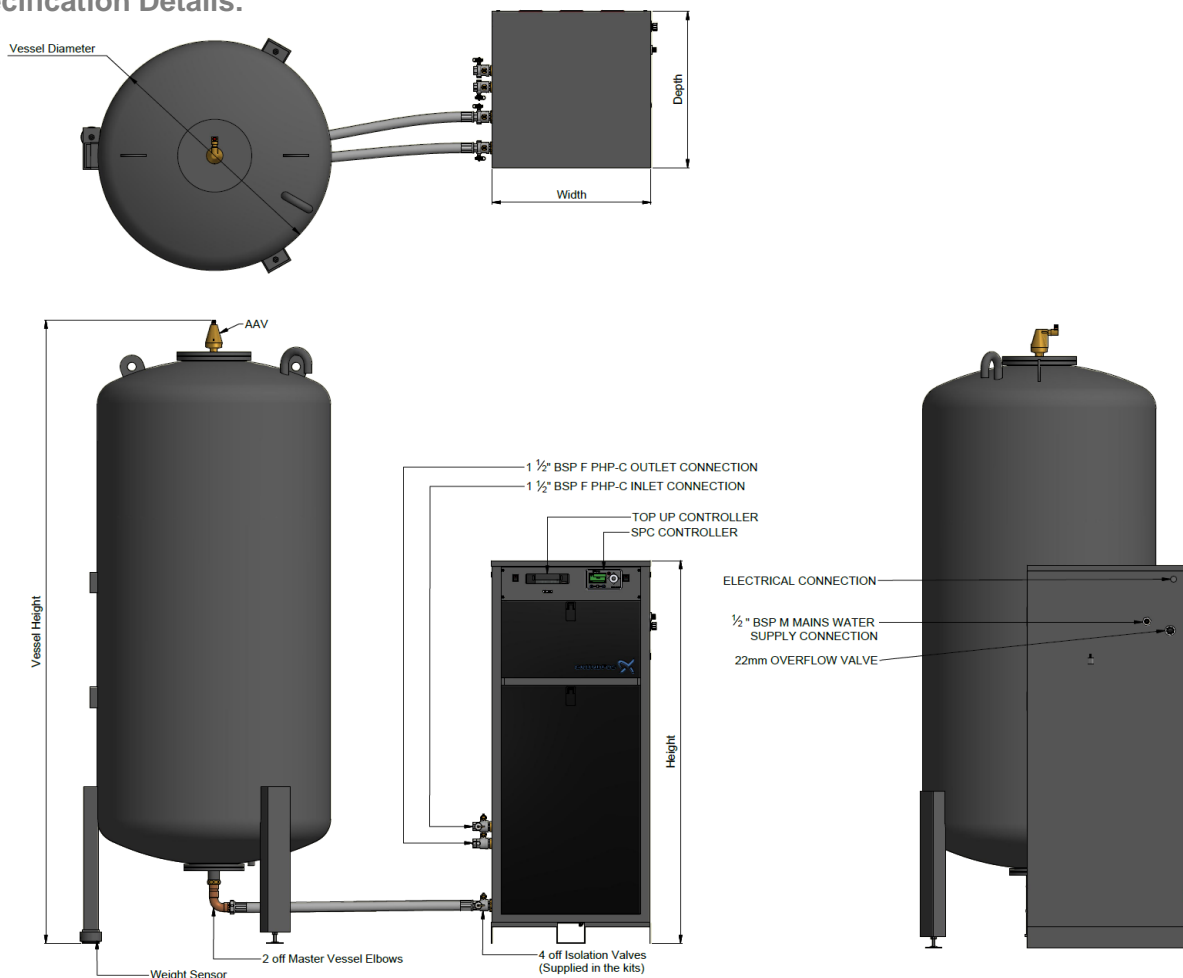
## Technical Data:

Break Tank Capacity	Dimensions			Connections		
	Width	Depth	Height	Vessel	System	Top-Up
18 Litres	470	320	800	1-1/2"	1-1/2"	1/2"

Pump set	Noise Rating (dBA)	Pump Model	Full Load Current (Amps)	Power Consumption (kW)	Required Supply Voltage
Top Up Equipment (Integral)	61	Pedrollollo PQA60	2.1	0.37	230V/1/50Hz

Pump set	Noise Rating (dBA)	Pump Model	Full Load Current (Amps)	Power Consumption (kW)	Required Supply Voltage	Nominal Weight [kg]
PHP 0	58	Grundfos CM1-4	6.2	1	230V/1/50Hz	105
PHP 1	58	Grundfos CM3-6	8.8	1.34	230V/1/50Hz	110
PHP 2	65	Grundfos CM5-6	10.6	2.6	415V/3/50Hz	115
PHP 3	52	Grundfos CR3-15	14.8	2.2	230V/1/50Hz	150
PHP 4	54	Grundfos CR3-17	6.4	3	415V/3/50Hz	215
PHP 5	54	Grundfos CR3-23	9	4.4	415V/3/50Hz	225
PHP 6	55	Grundfos CR3-31	12.6	6	415V/3/50Hz	240

## Specification Details:



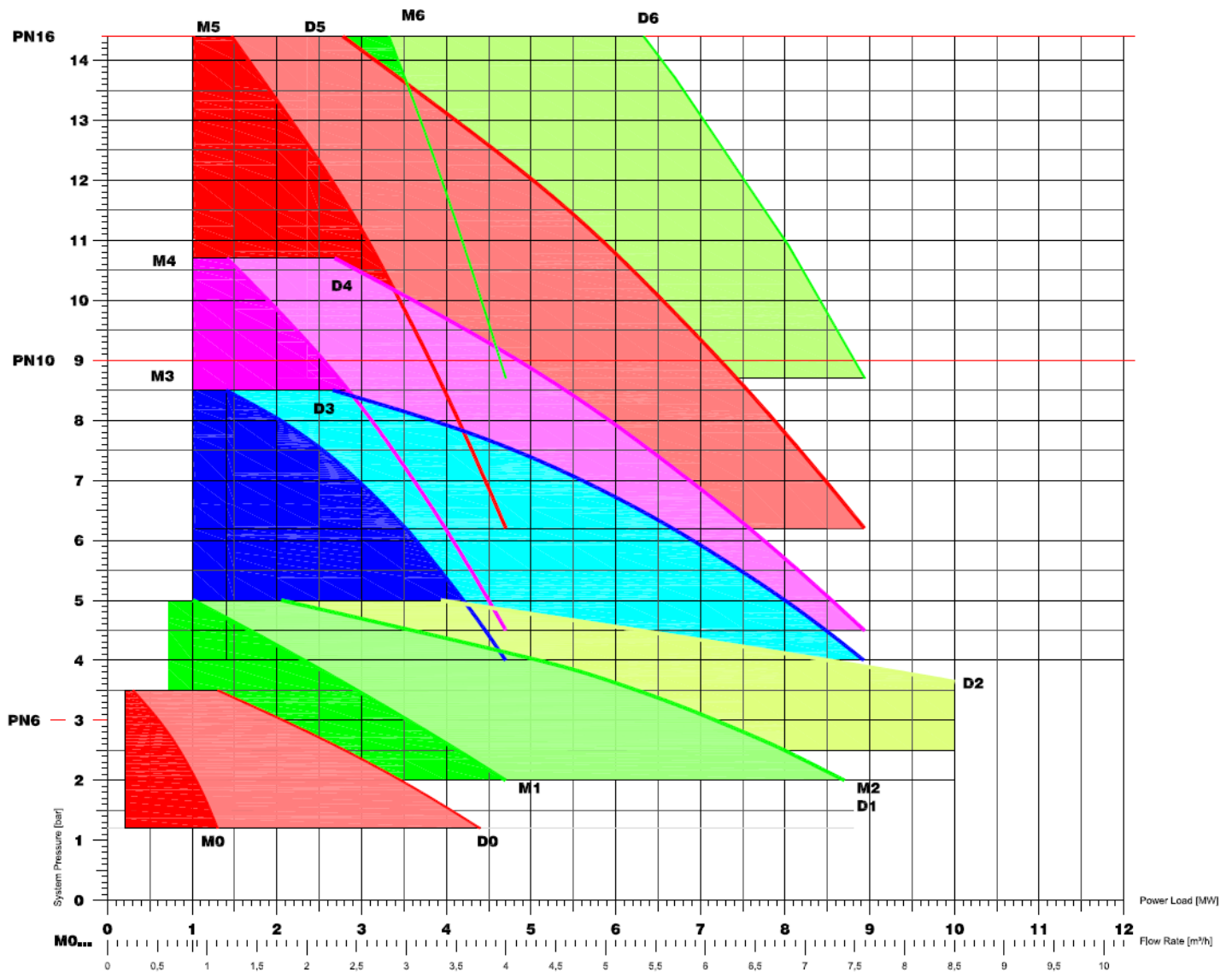
## Pump Curve:

Curve designated with a prefix of 'M' show the normal characteristics of the pump module running as a single pump, curves with a prefix of 'D' show the normal characteristics of the pump module with 2 pumps running in duty assist mode.

For system requirements outside the shaded areas please contact your technical advisor.

## Please Note:

The dimensions of the atmospheric expansion vessels are shown separately in this document. PHP-C Pump set D0-D6 FLCs stating the figures for both pumps running at the same time. FLC for Top up unit shows figure for single pump running only as far as duty/standby mode is applicable. Therefore the PHP-C unit Final Full Load Current will be sum up of the Main Pump set current draw + Top up unit current draw.



## PHP M & PHP A - Atmospheric expansion vessels

PHP M & A (Main & Auxiliary) vessels are manufactured to DIN 4807. The vessel includes a de-aeration cartridge containing Flamco patented Pall ring technology

### PHP M (Main) Vessels (Control Vessel)

Type	Capacity (l)	Dimensions		Dry Weight (Kg)
		Ø (mm)	Height (mm)	
PHP M1.5	150	550	1350	55
PHP M2	200	550	1530	70
PHP M3	300	550	2030	90
PHP M4	400	750	1535	130
PHP M5	500	750	1760	151
PHP M6	600	750	1955	160
PHP M8	800	750	2355	195
PHP M10	1000	750	2855	226
PHP M12	1200	1000	2210	290
PHP M16	1600	1000	2710	345
PHP M20	2000	1200	2440	430
PHP M28	2800	1200	3040	515
PHP M35	3500	1200	3840	625
PHP M50	5000	1500	3570	1240
PHP M65	6500	1800	3500	1710
PHP M80	8000	1900	3650	1830
PHP M100	10000	2000	4050	2025

### PHP A (Auxiliary) Vessels

Type	Capacity (l)	Dimensions		Dry Weight (Kg)
		Ø (mm)	Height (mm)	
PHP A1.5	150	550	1350	55
PHP A2	200	550	1530	70
PHP A3	300	550	2030	90
PHP A4	400	750	1535	130
PHP A5	500	750	1760	150
PHP A6	600	750	1955	160
PHP A8	800	750	2355	195
PHP A10	1000	750	2855	226
PHP A12	1200	1000	2210	290
PHP A16	1600	1000	2710	345
PHP A20	2000	1200	2440	430
PHP A28	2800	1200	3040	515
PHP A35	3500	1200	3840	625
PHP A50	5000	1500	3570	1240
PHP A65	6500	1800	3500	1710
PHP A80	8000	1900	3650	1830
PHP A100	10000	2000	4050	2025



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