LENNOX
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APPLICATION GUIDE

AQUA4

AAH

Polyvalent air cooled heat pump

50 → 330 kW

AQUA4-AGU-1405-E

1 Table of Contents

CE

Déclaration de conformité

La déclaration de conformité accompagne chaque unité

2 MODEL NUMBER DESCRIPTION

The AQUA^4 units are identified by the following codes: Example AAH081MS

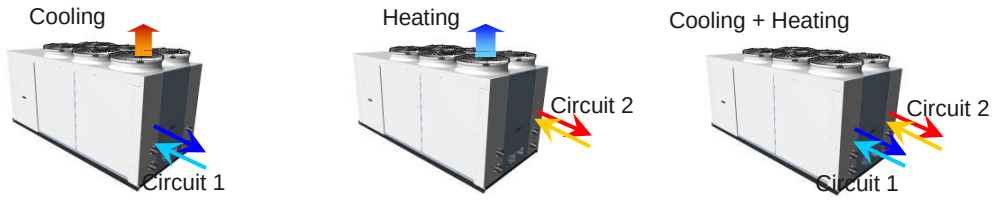
A	AQUA^4
A	Air Cooled
H	Heat Pump
08	Nominal Cooling capacity x10 [kW] (ex.: 08 = 80 kW)
1	1 = 2 compressors / 2 circuits 4 = 4 compressors / 2 circuits
M	M= 2 pipes P= 4 pipes
S	S= standard noise level L= Low noise level

3 KEY CUSTOMER BENEFITS

Nominal cooling capacity @ 12/7°C and 35°C air ambient: 50 to 330kW
Nominal heating capacity @ 40/45°C and 7°C air ambient: 50 to 340kW

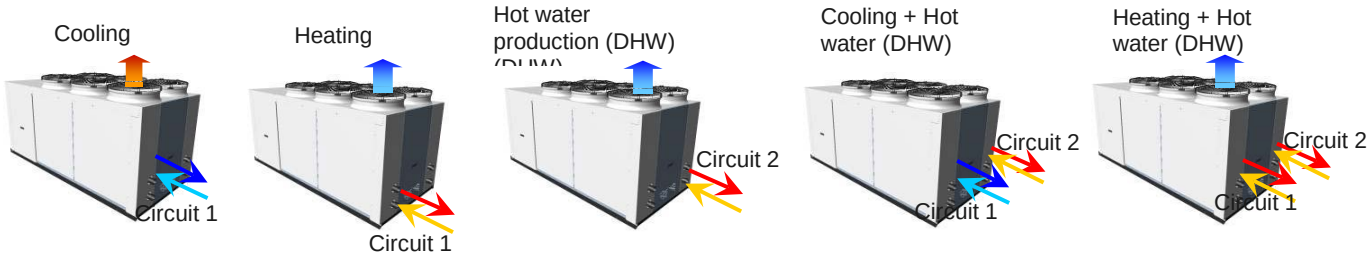
3.1 The AQUA^4 P: unique concept for thermal comfort with less energy consumption.

The polyvalent heat pump AQUA^4 P units are designed to meet the requirements of **simultaneous and independent** cooling and heating for air conditioning in the most efficient way. The AQUA^4 P units provide a hot water circuit and a cold water circuit to the entire building and are more commonly called 4 pipe system.



3.2 The AQUA^4 M: hot water all the year at a lower cost.

The polyvalent heat pump AQUA^4 M units are designed to meet the requirements of cooling **and / or** heating in the most efficient way. The units have the ability to provide hot water **simultaneously or independently** of cooling and heating needs. The AQUA^4 M units are generally called 2 pipe units because two hydraulic pipes are connected to the terminal building, the other two hydraulic pipes are generally dedicated to hot sanitary water.



3.3 Benefits :

Conserving and optimizing energy consumption

- High energy ratio at part load and full load (EER/COP/ESEER)
- Simultaneous or independent demands for heating and cooling
- Constantly balanced heating and cooling needs to obtain maximum Total Efficiency Ratio : TER*
- 100% heat recovery at any conditions
- Advanced programmable pCO1 with a local control interface PGD1

Secure operating map as standard

- Winter cooling operation down to -15°C ambient.
- Heating operation down to -10°C ambient with 45°C outlet water temperature
- Heat recovery or production of hot water temperature from 25°C to 55°C
- High ambient operating up to 45°C

Quieter unit

- -8 dB(A) noise level reduction vs traditional heat pump in standard
- Jump to -12dB(A) noise level reduction with low noise version
- Innovative hybrid structure of fan blades
- Unique sound proof cabinet enclosing all components to reduce radiated sound levels

Defrost without impacting comfort

- Hydrophilic treatment on coil
- Dynamic control on defrost
- Circuits defrost completely independently
- Integrated water tank up to 765 litres

(*) TER : Total Efficiency Ratio is the total energy efficiency of the units when there is a production of chilled water and hot water simultaneously. Cold water and hot water are valuated to the total power consumption of the unit: TER = (cooling capacity + recovered heating capacity) / total power consumption. Energy ratio TER of polyvalent heat pumps are significantly higher than the standard EER and COP demonstrating considerable energy savings during inter-season periods (version P) or domestic hot water production (M version).

4 FEATURES AND BENEFITS

4.1 Standard equipment

- R410A refrigerant
- Two refrigerant circuits
- ISO 9001 certification.
- Compliant with CE norms (PED directive 97'23)
- Galvanized steel base frame powder coated RAL7031
- Galvanized steel cabinet powder coated panels RAL9002
- Main disconnect switch with lock
- Ventilated electrical control panel
- High efficiency scroll compressors mounted in a closed technical box
- High efficiency braze plate heat exchangers insulated
- Thermostatic expansion valves
- Axial fans with innovative hybrid structure of blades
- Speed variation on ventilation, modulation phase cut out
- Copper tubes and aluminum fins coils with hydrophilic coating
- Grouved water connections (Victaulic type)
- Paddle water flow switch
- Low noise version: Low speed on fan with sound insulation of the entire technical box.
- Advanced control programmable pCO1 with local interface
    - PGD1 unit display
    - Scheduling
    - Defrost system independent of each circuit
    - Water set-point offset based on outdoor air temperature.
    - Operating time equalisation of the compressors and pumps
    - Master/slave or cascade control.
- Others components :
    - Filter driers molecular sieve
    - Liquid moisture indicator
    - Tanks and liquid separators with marking complies with EEC Directive 97/23 PED
    - High and low pressure switch
    - Solenoid valves
    - Schrader valves
- Note : the low noise versions have a fully soundproofed technical casing and include low fan speed

4.2 Innovations Product: solving the defrosting problems

Thanks to two independent thermodynamic circuits, the AQUA^4 unit is essential on the market as an exclusive solution that can continue to produce hot water for heating or sanitary uses while simultaneously performing a defrosting cycle.

During winter, especially in the -3°C - +3°C range, the high relative air humidity condenses water around the coil fins. Since the coil is at a lower temperature than the air, any water that touches it solidifies and blocks the exchange of heat necessary for the system to correctly operate. The defrost cycle is a temporary reversal of the thermodynamic cycle operating the appliance in cooling mode and is used to melt ice present between the fins. This phase is of course problematic but AQUA^4 system can mitigate this problem through the following innovations:

- Hydrophilic coils are installed. These reduce the size of the water drops along with ice blockage between fins. Due to the lower surface tension, water tends to slide away due to gravity, thus preventing the formation of frost at low temperatures.
- Software management minimises defrosting cycle time, allowing cycle operation only when necessary. Fans operate at maximum power only when the ice is no longer attached to the fins. It can then be pushed out from the coil.
- The two thermal circuits in AQUA^4 M and AQUA^4 P are completely independent. While one defrosts, the other keeps the machine operating, with basically no thermal discomfort for the user.

4.3 Structure

All AQUA^4 series units have a load bearing base and paneling in galvanized sheet metal painted with polyester powders and polymerized in the oven at 180°C. The unit is attractively designed and when all doors are closed all the components are inaccessible. This, along with the extensive use of soundproofing material inside the compartment and around the compressors (available for the low-noise version), reduces sound to exceptionally low levels. The water/cooler connections are on the back (when looking at the electric panel) reducing the space required for installation. The unit is fully accessible as all the panels can be removed (except the one with the water connections). Routine maintenance however only requires access from the front.

4.4 Refrigerant circuit.

The cooling circuit is manufactured in our factory, with top brand components by operatives trained, according to Directive 97/23, on all the brazing operations.

4.5 Compressors

Only top-quality Scroll compressors are used on AQUA^4 units. Scroll compressors are the best solution in terms of reliability and efficiency. They also provide the lowest amount of sound emissions. Process optimisation, along with a carefully selected intrinsic volumetric compression ratio (RVI), clearly improves the isentropic compression performance and reduces energy losses. The use of a scroll compressor allows low viscosity oils to be used. This, in comparison to higher viscosity oils, reduces thermal resistance at the evaporator. It also increases the evaporation temperature by over 1.5°C (EER increases by more than 5.5%) compared to other solutions.
Compressor motors are protected against overheating, overloads and high delivery gas temperatures. They are mounted on anti-vibration rubber, complete with oil charge and inserted in a soundproof compartment with sound-absorbing material. They are also equipped with an automatic crankcase heater that, when the compressor stops, prevents the oil from being diluted by the refrigerant.

4.6 Brazed plate heat exchangers

Only brazed plate heat exchangers are used, made of austenitic stainless steel AISI 316, with AISI 316L connections. These feature a reduced carbon content that favours brazing operations. The brazed plate heat exchanger represents state-of-the-art technology in terms of thermal exchange efficiency and allows a strong reduction of the refrigerant load compared to standard solutions. The high degree of turbulence generated by internal plate corrugation, along with plate smoothness, makes it difficult for dirt to accumulate or for limescale to build up on the condenser circuit. These heat exchangers also make it possible to use R410A fluid which, thanks to the high-level of its thermal conductivity in its liquid phase and to its azeotropic behaviour, enhances thermal exchange during evaporation. The performances are improved over other methane-derivative fluids of the HFC group.

- NOTE: due to thermal insulation the data plate (in compliance with PED CE 97/23) is not legible. However, the serial number of the heat exchanger and the declaration of conformity are both recorded during production and are an integral part of the company archive.

4.7 Control box

The electric panel is built and wired in accordance with standard EN 60204-1. The electric panel is accessed from the front of the machine. Before it can be accessed, the unit must be disconnected from the power supply using the mains disconnect switch, which also functions as a door-lock. All the remote controls are implemented with low voltage 24 V signals, powered by an isolation transformer inside the electric panel. All the control boards have an air circulation system with auxiliary fans. The position of the main switch makes wiring operations in the work site easier. This avoids several difficult operations as well as having to twist the power cords. All the utilities are protected against surges and short circuits. The circuit breaker set-up can be configured for any load

(optional). Thermal protection, however, is carried out by thermistor chains. These are set in the windings of each electric motor and are controlled by onboard electronics. All units are equipped as standard with a phase sequence relay which inhibits compressor operation if the phase sequence is not carried out: only one direction of rotation is possible for scroll compressors, as well as for the screw and Rotary compressors. The unit is suitable for outdoor installation.

4.8 Control and communication

The AQUA4 series units come complete with Advanced Carel, pCO series microprocessor control, in addition to the functions described below, it is possible to customise the software to meet all system requests. These include cascade management of the units with ''step-control'' or ''cascade'' logic. The microprocessor on board the unit controls the various operating parameters with an electric panel keypad:

- Compressor connection/disconnection to maintain the set-point of the chiller inlet water T
- Alarm management
  - High / low pressure
  - Anti-freeze
  - Flow switch
  - Pump alarm
- Alarm signals
- Display of operating parameters
- Evaporator anti-freeze protection
- Control of maximum number of compressor starts
- RS232, RS485 serial output control (optional)
- Incorrect phase sequence (not viewed on display, prevents the compressor from starting)

Concerning interface communication, Modbus ®, BacNET ® (RS485 or TCP / IP) or LonWorks ® (optional) interface communication cards are provided for connection to BMS systems as an option.

5 Options and Accessories

Options	Features and Benefits
Power supply	
Supply 400V / 3 ph / 50Hz with 230V transformer and fuses	Supply without neutral with a 230V transformer and fuses.
Supply 400V / 3 ph + Neutral / 50Hz with circuit breakers	Supply with neutral, the fuses have been replaced by thermomagnetic circuit breakers.
Supply 400V / 3 ph / 50Hz with 230V transformer and circuit breakers	Supply without neutral but with a 230V transformer and thermomagnetic circuit breakers.
Hydraulic module of both water circuits	
Hydraulic module with low-pressure single pump	Single pump providing low static pressure with expansion vessel and safety valve
Hydraulic module with high-pressure single pump	Single pump providing high static pressure with expansion vessel and safety valve
Hydraulic module with low-pressure twin pumps (parallel operating)	Dual pumps providing low static pressure with expansion vessel and safety valve. The two pumps operating simultaneously in parallel.
Hydraulic module with high-pressure twin pumps (parallel operating)	Dual pumps providing high static pressure with expansion vessel and safety valve. The two pumps operating simultaneously in parallel.
Hydraulic module with low-pressure twin pumps (normal/backup switching)	Double pumps providing low static pressure with expansion vessel and safety valve. One pump operates and the second pump is in backup with balancing operation time.
Hydraulic module with high-pressure twin pumps (normal/backup switching)	Double pumps providing high static pressure with expansion vessel and safety valve. One pump operates and the second pump is in backup with balancing operation time.
Water tank	
Water tank on cold use (4 pipes) / reversible use (2 pipes)	Water tank volume : - 200 litres for sizes 041-051 - 220 litres for sizes 061-071-081 - 340 litres for sizes 094-104 - 600 litres for sizes 124-144-164-194-214-244 - 765 litres for sizes 274-294-324
Water tank on hot use (4 pipes or 2 pipes)	

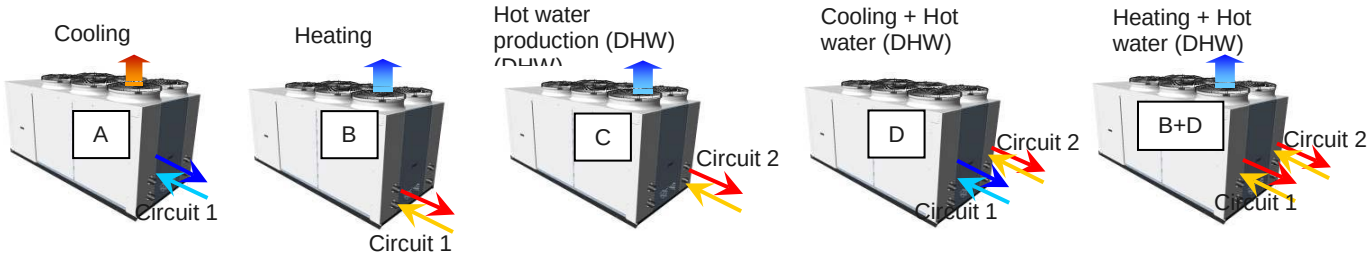
Options	Features and Benefits
Antifreeze protection	
Antifreeze protection on exchangers and pipes	Electrical trace heating and reinforced insulation on the both braze plate heat exchangers and pipes.
Antifreeze protection on exchangers, pipes, pump(s) and expansion vessel	Electrical trace heating and reinforced insulation on the brazed plate heat exchangers, pipess, pump(s) and the expansion vessel.
Antifreeze protection on exchangers, pipes, pump(s), expansion vessel and water tank	Electrical trace heating and reinforced insulation on the both brazed plate heat exchangers, pipes, pump(s), expansion vessel and the water tank.
Condensing control	
Electronically controlled modulating fan speed with EC motors	
Remote Control	
Remote display (supplied loose)	PGD1 user interface allows performance of all operations of the program, displaying the status of the unit and changing settings. It can be located up to a maximum of 50 meters from the unit with a standard telephone cable and up to a maximum of 200 meters from the unit with a shielded cable.
Control interface	
Modbus communication interface RS485	Communication card using ModBus or Carel protocol RS485. Communication interface with a building management system.
LonWorks® communication interface FTT10	Communication card using LonWorks® FTT10. Communication interface with a building management system.
pCOweb - Modbus/BACnet/SNMP communication interface TCP/IP	Communication card using Modbus/BACnet®/SNMP TCP/IP. Communication interface with a building management system.
Anti-vibration isolation	
Rubber anti-vibration mounts (supplied loose)	4 or 8 rubber anti-vibration isolators are supplied depending on the type of unit. They will be inserted between the floor and the unit to prevent vibration.
Spring anti-vibration mounts (supplied loose)	4 or 8 spring anti-vibration isolators are supplied depending on the type of unit. They will be inserted between the floor and the unit to prevent vibration.

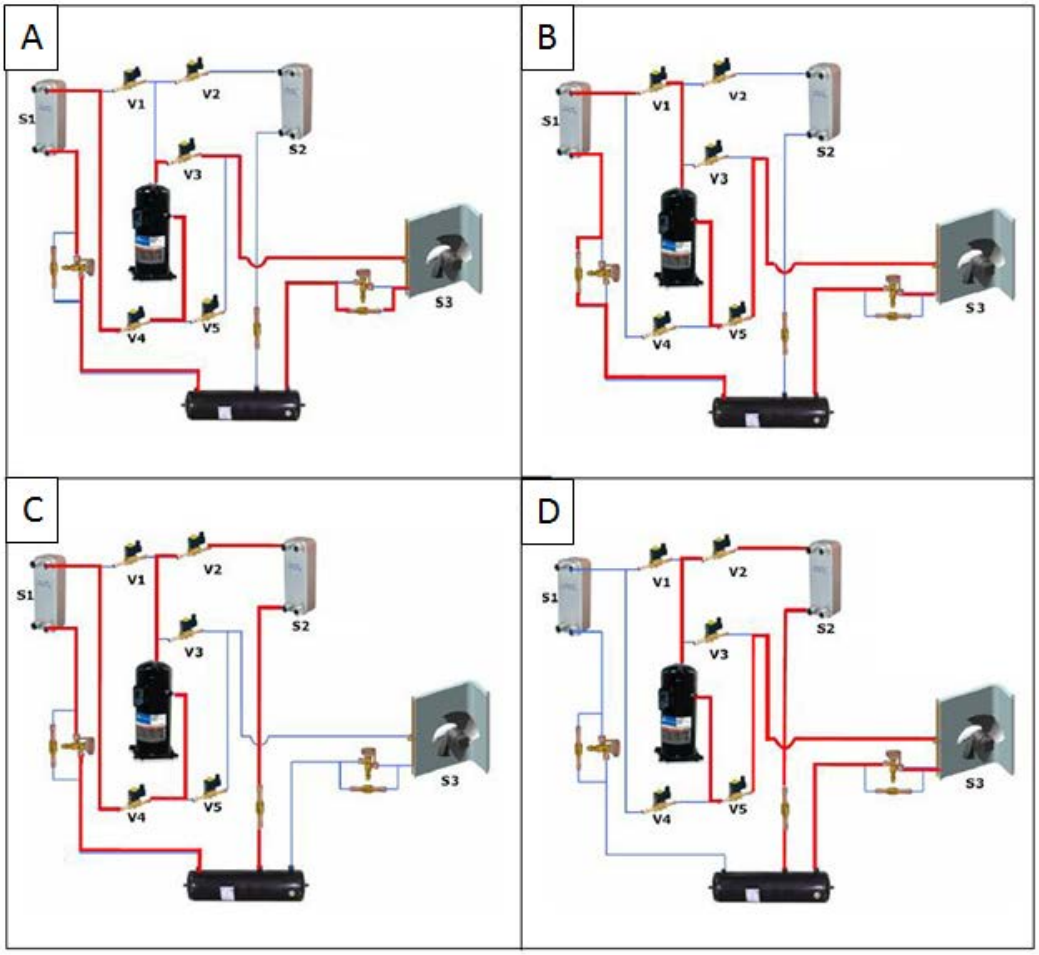
Accessories	Features and Benefits
Accessories	
Power factor Correction	Capacitors fitted into unit. Cos phi correction up to 0.95 to reduce current and energy consumption.
Soft starter	Electronic soft starter included in the control panel. Reduces the peak starting current by up to 40%. They also participate in the installation design optimization of the electrical cables and reduce the mechanical stresses on the compressors. In addition, they assure that the unit will not start operating in case of overvoltage, under voltage, phase reversal fault or phase failure.
Victaulic coupling parts (x4)	Four Victaulic couplings (supplied loose)
External temperature sensor for set point offset	Set point and temperature offset and display. Allows to offset chilled water set point temperature based on either outside air, chilled water return or zone temperature.
Pressure gauges LP / HP	Reading low and high pressures with gauges.
Filter dryer maintenance kit	This kit includes one solenoid valve and ball valve per circuit for maintenance of dryer filters.
Lifting tubes (x2)	Two lifting tubes are supplied to be inserted in the round holes on the base frame identified by stickers. - 2 x tubes Ø1"1/2 (38mm), thickness =2,9mm, Length=1370mm on size 041 to 104 - 2 x tubes Ø1"1/2 (38mm), thickness =2,9mm, Length=1840mm on size 124 to 324 + 4 x bolt M16 Inox (as stops at the end of the tube)
Coils protection guards	The condenser coil protection grills prevent light damage to the coil when shipping, installation and operation.
Water Y filters (x2) (supply loose)	This option includes two Y water filters supplied loose: - 2" GAS (screwed) on size 041 to 104 - 3" GAS (screwed) on size 124 to 194 - 4" Flange on size 214 to 324 Note that the connections of the units are victaulic. We can supply the adapters : Victaulic / Gas or Victaulic / Flange via a Non Standard Request

6 Application

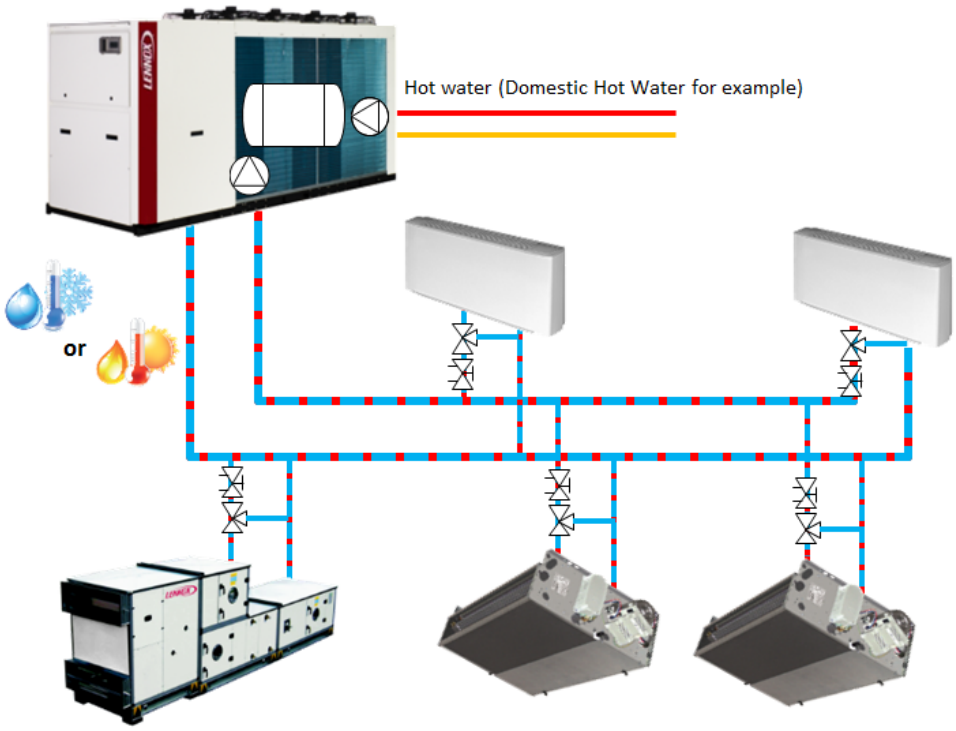
The AQUA^4 units allow creating installations with 2 or 4 pipes. The designation 2 or 4 pipe refers to the system of the water distribution for each building system.
A 2 pipe system comprises a single supply and a single hydraulic line back to the unit. The terminal units of a system to 2 pipes are characterized by a single exchanger having the coil function of heating or cooling depending on the operating mode.
The 4 pipe configuration includes hot water supply (with the corresponding return lines) and cold water (with the corresponding return lines) simultaneously.

Operating modes available for AQUA^4 M units can be mounted on a 2-pipe system:
- Circuit 1, reversible system: production of chilled water for cooling or hot water for heating.
- Circuit 2, hot water per production or total heat recovery for hot water sanitary type for example.

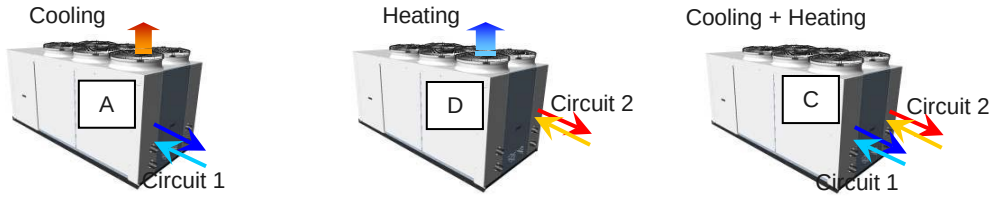


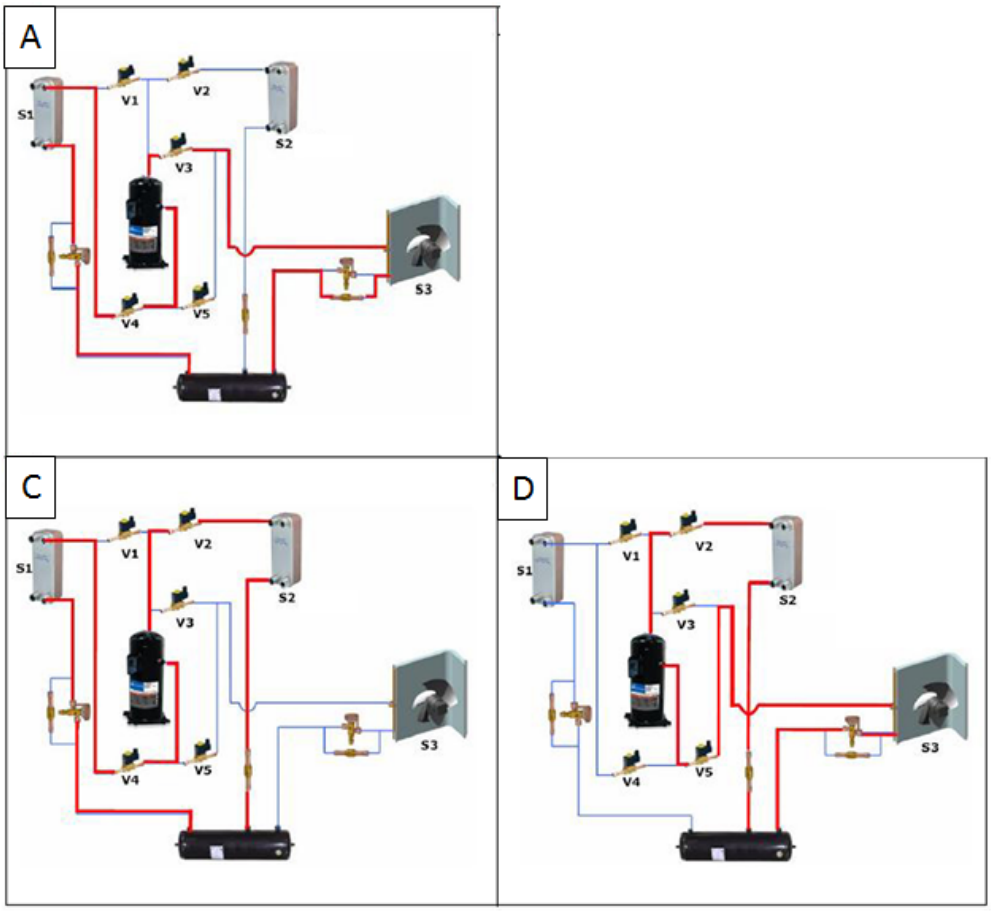


Example of 2 pipe installation for Hotel and Hospital:

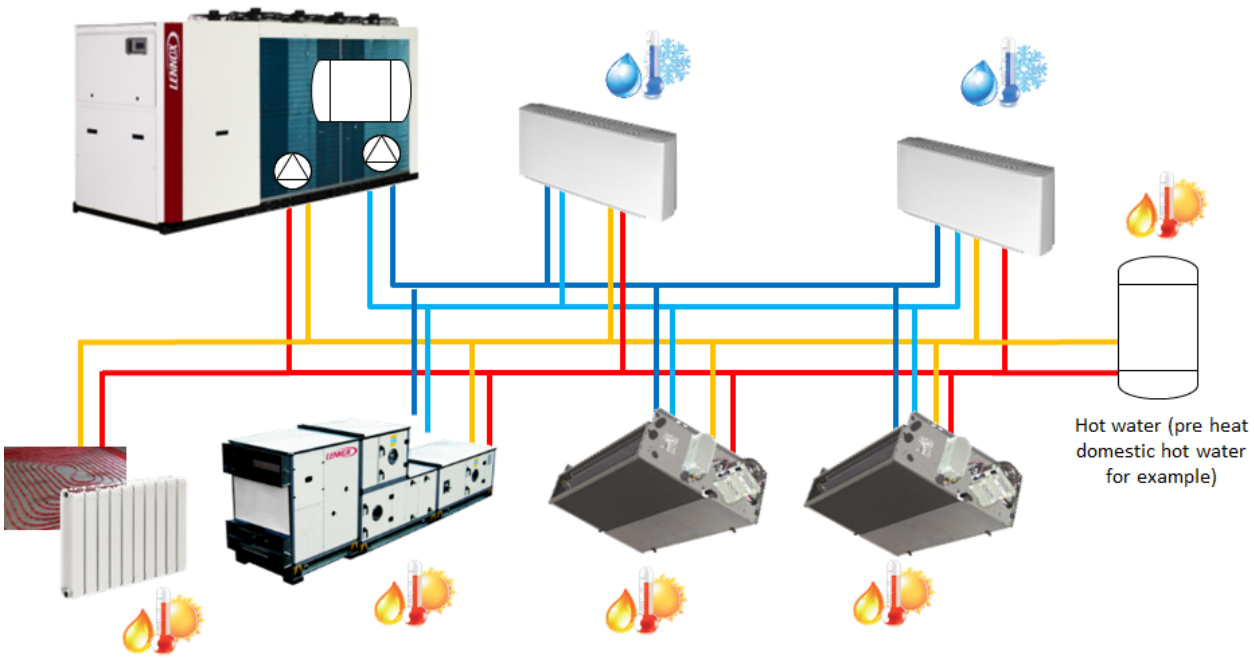


Operating modes available for AQUA^4 P units will allow provision of hot and cold water simultaneously.
- Circuit 1: Production of cold water for cooling
- Circuit 2: Hot water production or total heat recovery for heating or preheating hot water for example.

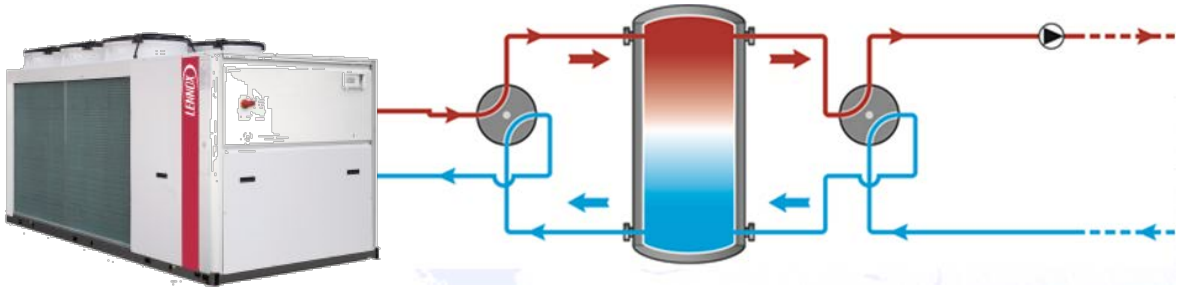




Example of 4 pipe installation for office or residential buildings:



Below is shown an example of an inertial tank with double cycle inversion (on demand) for winter and summer air conditioning, in combination with a 2-pipe heating system. The double cycle inversion valve (automatically controlled by onboard microprocessor) provides the best performance as it favours tank stratification in both summer and winter modes.



7 Operating combination depending on the thermal load:

The following tables show the possible operating regimes of the AQUA[4] units at partial loads. The units are equipped with two thermodynamic circuits and two or four compressors that combine their operations to meet the changing demands of the heating system. For example, in heating mode, the units AQUA[4] M (2 pipe) are able to share their heating capacity with 50% heating and 50% domestic hot water.

- AQUA M (2 pipe) units : 2 compressors / 2 thermodynamic circuits :

Summer: Cooling mode	Winter : Heating mode
o 100% Cooling o 50% Cooling	o 100% Heating o 50% Heating
o 100% Cooling + 50% to 100% DHW o 50% Cooling + 50% to 100% DHW	o 50% Heating + 50% DHW
o 100% DHW o 50% DHW	o 100% DHW o 50% DHW

- AQUA M (2 pipe) units: 4 compressors / 2 thermodynamic circuits :

Summer: Cooling mode	Winter : Heating mode
o 100% Cooling o 75% Cooling o 50% Cooling o 25% Cooling	o 100% Heating o 75% Heating o 50% Heating o 25% Heating
o 100% Cooling + 50% to 100% DHW o 75% Cooling + 25% to 75% DHW o 50% Cooling + 25% to 100% DHW o 25% Cooling + 25% to 75% DHW	o 25% Heating + 25% to 50% DHW o 50% Heating + 25% to 50% DHW
o 100% DHW o 75% DHW o 50% DHW o 25% DHW	o 100% DHW o 75% DHW o 50% DHW o 25% DHW

- AQUA P (2 pipe) units : 2 compressors / 2 thermodynamic circuits :

All the year : Summer to winter
o 100% Cooling o 50% Cooling
o 100% Cooling + 50% to 100% Heating o 50% Cooling + 50% to 100% Heating
o 100% Heating o 50% Heating

- AQUA P (2 pipe) units: 4 compressors / 2 thermodynamic circuits :

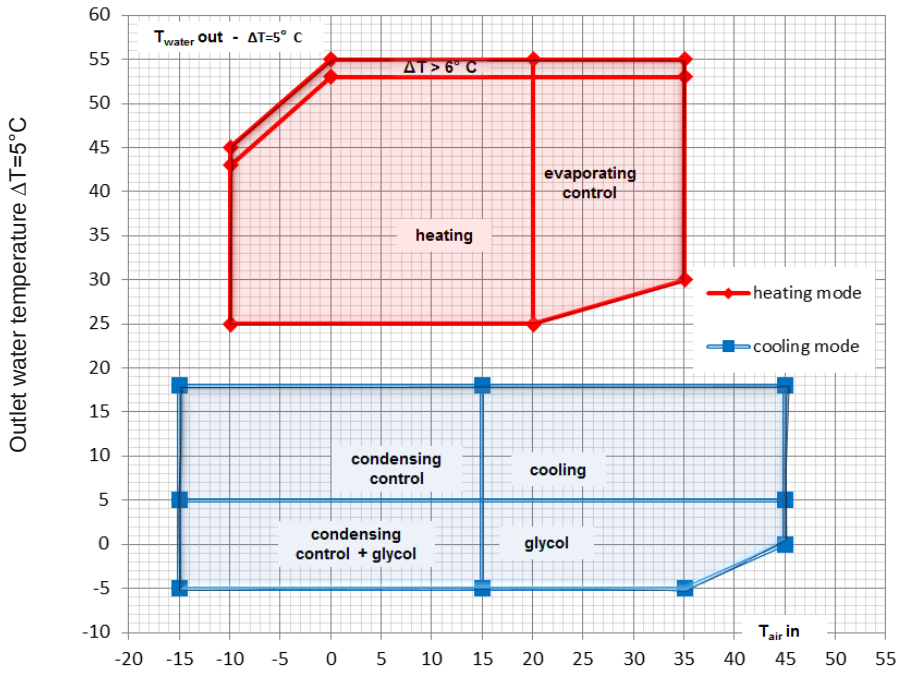
All the year : Summer to winter
o 100% Cooling o 75% Cooling o 50% Cooling o 25% Cooling
o 100% Cooling + 50% to 100% Heating o 75% Cooling + 25% to 75% Heating o 50% Cooling + 25% to 100% Heating o 25% Cooling + 25% to 75% Heating
o 100% Heating o 75% Heating o 50% Heating o 25% Heating

8 Operating Limits

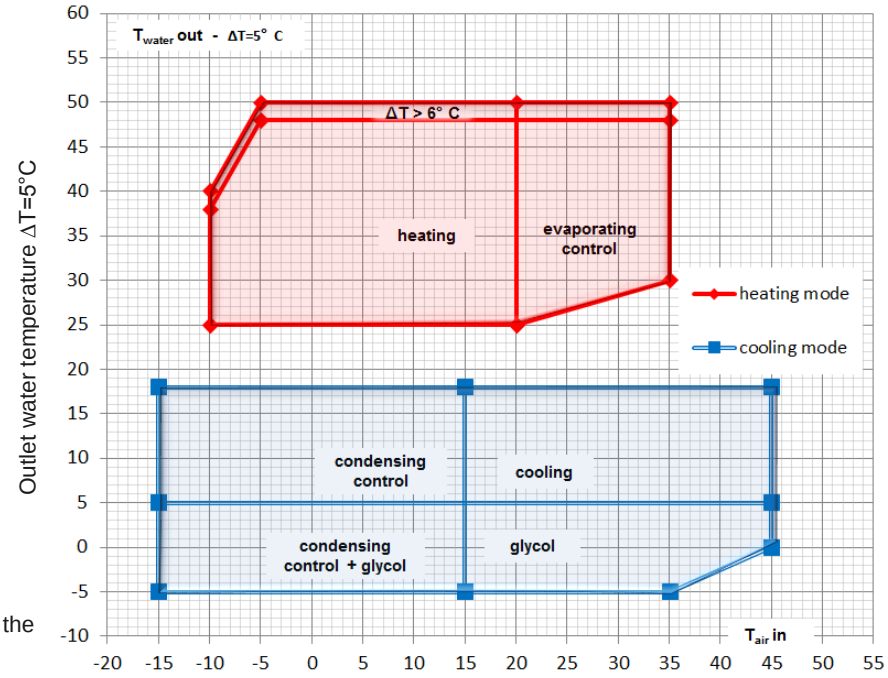
This paragraph lists the operating limits of the AQUA^{4}M and AQUA^4 P heat pumps, in relation to utility circuit water outlet temperature and air temperature.
The nominal flow rate refers to a temperature differential of 5° C between inlet and outlet water, in relation to the cooling capacity provided at nominal water temperatures. The maximum allowable flow rate is associated with a temperature differential of 3 °C. Higher flow rates cause unacceptable drops in pressure. The minimum allowable flow rate is achieved with a temperature differential of 8 °C. Lower flow rates may result in low evaporation temperatures, which could trigger the safety devices and stop the unit. They may also cause an incorrect distribution or heat transfer in a non-turbulent or not fully turbulent flow. For temperature differentials outside these limits contact the company's technical department for advise.
The AQUA^4 units are designed to exchange heat with water in countercurrent to the plate heat exchangers on the full recovery circuit. In cooling mode they are also in countercurrent on the heat exchanger (utility circuit). The AQUA^4 M unit can also generate heat on the utility circuit. In this case, select the supplied “water circuit cycle inversion valve” accessory to achieve countercurrent.

The use of units AQUA^4 series is possible within the operating limits shown in this document under penalty of discharge of the guarantee provided for in the terms and conditions of sale.

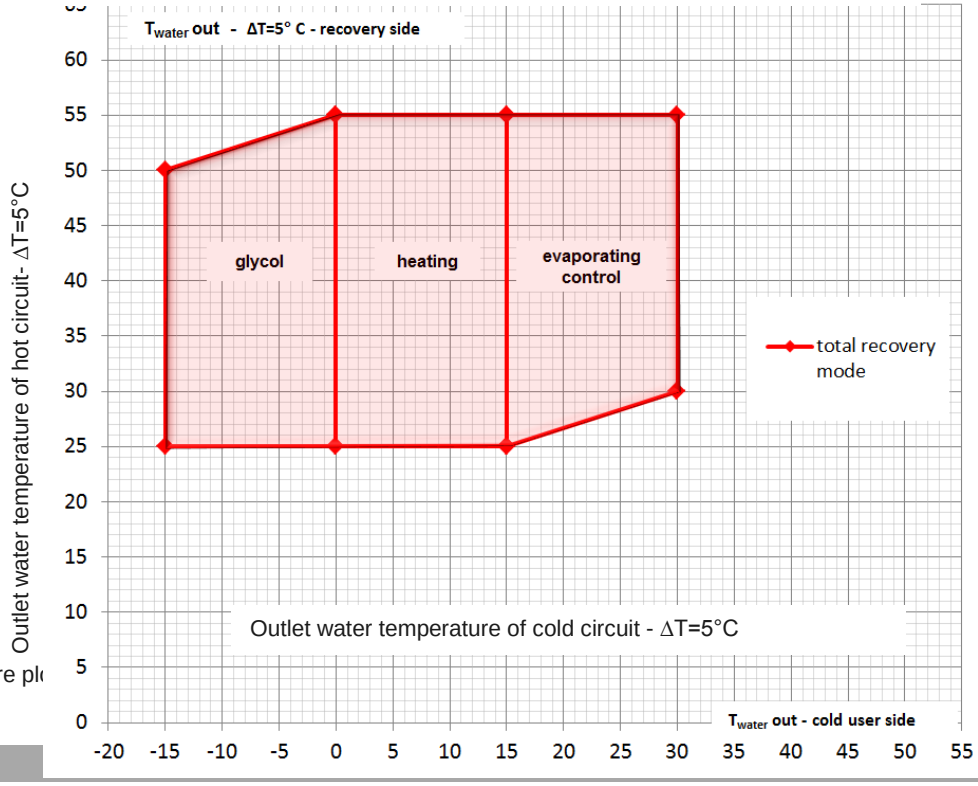
Operating range of the AQUA^4 units in cooling mode and with heat pump in countercurrent mode:



Operating range of the AQUA[4] units in cooling mode and with heat pump in concurrent mode:



Operating range of the



The diagrams were pl

Performance was calculated in countercurrent to the plate heat exchangers. Countercurrent can only be achieved for the LCP M unit in the utility circuit heat pump mode, by selecting the “Water circuit 4-way cycle inversion valve” or by modifying the system. If this can't be achieved, then calculate performances in the concurrent mode, referring to manual or selection software performances (all expressed in countercurrent), at a water temperature that is 3°C lower. For example, performances in countercurrent production of 45/50°C hot water approximates the concurrent performances of 42/47°C water

Refer to the chapter "Use of glycol solution" for the correction factors of performance when using glycol.

AQUA[4]	041	051	061	071	081	094	104	124	144	164	194	214	244	274	294	324
BOX	F1+	F1+	F2+	F2+	F2+	F3+	F3+	F4	F4	F4	F4	F5	F5	F6	F6	F6
Nb of circuit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Nb of compressor	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4

Table 1 – General data of AQUA^4 M and AQUA^4 P standard S version from AQUA^{4}041 to AQUA^{4}081 in nominal conditions :

Unit M (2 pipes) et P (4 pipes) version S		AAH041	AAH051	AAH061	AAH071	AAH081
Cooling at 12/7°C with air ambient at 35°C						
Cooling capacity	kW	49.7	54.3	65	71.3	81.4
Total absorbed power	kW	15.9	18	20.4	23	26.6
EER		3.13	3.02	3.19	3.10	3.06
ESEER		4.13	4.08	4.24	4.19	4.09
Water flow	l/h	8533	9324	11165	12243	13985
Total pressure drop	kPa	27	31	32	38	31
Available pressure head - Pump(s) LP single or normal/backup switching (option)	kPa	155	147	138	126	126
Available pressure head - Pump(s) HP single or normal/backup switching (option)	kPa	190	182	198	189	194
Available pressure head - Twin pumps LP parallel operating (option)	kPa	128	121	117	107	112
Available pressure head - Twin pumps HP parallel operating (option)	kPa	178	171	164	154	158
Heating at 40/45°C with air ambient at 7°C						
Heating capacity	kW	51.9	57.2	67.9	74.4	84.6
Total absorbed power	kW	16	17.8	20.8	23.2	26.1
COP		3.24	3.21	3.26	3.21	3.24
Water flow	l/h	9022	9945	11794	12930	14701
Total pressure drop	kPa	30	36	36	43	35
Available pressure head - Pump(s) LP single or normal/backup switching (option)	kPa	144	134	125	110	111
Available pressure head - Pump(s) HP single or normal/backup switching (option)	kPa	179	169	188	177	183
Available pressure head - Twin pumps LP parallel operating (option)	kPa	119	111	107	95	101
Available pressure head - Twin pumps HP parallel operating (option)	kPa	168	159	153	140	145
Cooling 12/7°C and Heating at 40/45°C						
Cooling capacity	kW	48.9	53.9	63.6	70.3	82.3
Heating capacity	kW	63.3	70	81.9	90.9	105.5
Total absorbed power	kW	15.1	16.9	19.3	21.7	24.4
TER		7.43	7.33	7.54	7.43	7.70
Water flow of cold circuit	l/h	8395	9259	10916	12077	14138
Water flow of hot circuit	l/h	10993	12168	14237	15798	18336
Available pressure head - Pump(s) LP single or normal/backup switching (option) - cold circuit	kPa	157	148	140	128	125
Available pressure head - Pump(s) HP single or normal/backup switching (option) - cold circuit	kPa	191	183	200	191	193
Available pressure head - Twin pumps LP parallel operating (option) - cold circuit	kPa	129	122	119	109	111
Available pressure head - Twin pumps HP parallel operating (option) - cold circuit	kPa	179	171	167	156	156
Available pressure head - Pump(s) LP single or normal/backup switching (option) - hot circuit	kPa	127	112	102	81	78
Available pressure head - Pump(s) HP single or normal/backup switching (option) - hot circuit	kPa	162	147	171	156	162
Available pressure head - Twin pumps LP parallel operating (option) - hot circuit	kPa	105	94	89	73	79
Available pressure head - Twin pumps HP parallel operating (option) - hot circuit	kPa	153	140	134	117	120

Power supply		400 / 3+N / 50				
Maximum absorbed current (FLA) [without options]	A	41	44	51	55	66
Start up current (LRA) [without options]	A	159	162	185	183	191
Start up current with soft starter [without options]	A	104	105	121	119	124
Number of fans		4	4	6	6	6
Air flow	m3/h	21379	21379	30913	30913	30913
Absorbed power of fans	kW	1.2	1.2	1.8	1.8	1.8
Absorbed current of fans	A	4.4	4.4	6.6	6.6	6.6
Sound power level Lw	db(A)	79	79	80	80	80
Sound pressure level Lp @ 10 m Q=2	db(A)	51	51	52	52	52
Compressors / Circuits		2/2	2/2	2/2	2/2	2/2
Water tank volume (option)	l	200		220		
Dimensions [LxWxH]	mm	2510 x 1183 x 1735		2862 x 1183 x 1735		
Weight [without options]	kg	680	690	800	810	850

Table 2 – General data of AQUA^4 M and AQUA^4 P standard S version from AQUA^{4}094 to AQUA^{4}194 in nominal conditions :

Unit M (2 pipe) and P (4 pipe) version S		AAH094	AAH104	AAH124	AAH144	AAH164	AAH194
Cooling at 12/7°C with air ambient at 35°C							
Cooling capacity	kW	98.4	107.5	129.5	142	161.6	180.2
Total absorbed power	kW	32.3	36.5	43.4	48.4	54.8	66.2
EER		3.05	2.95	2.98	2.93	2.95	2.72
ESEER		4.47	4.55	3.98	4.07	4.21	4.32
Water flow	l/h	16899	18461	22241	24394	27745	30947
Total pressure drop	kPa	35	40	42	50	46	41
Available pressure head - Pump(s) LP single or normal/backup switching (option)	kPa	124	114	102	145	140	138
Available pressure head - Pump(s) HP single or normal/backup switching (option)	kPa	182	172	182	166	161	260
Available pressure head - Twin pumps LP parallel operating (option)	kPa	148	138	128	114	110	134
Available pressure head - Twin pumps HP parallel operating (option)	kPa	182	173	188	177	179	198
Heating at 40/45°C with air ambient at 7°C							
Heating capacity	kW	102.9	112.8	135.7	150.3	169.8	195.6
Total absorbed power	kW	31.9	35.5	44.6	49.6	55.4	63.7
COP		3.23	3.18	3.04	3.03	3.06	3.07
Water flow	l/h	17885	19611	23577	26121	29508	33988
Total pressure drop	kPa	39	46	47	58	53	49
Available pressure head - Pump(s) LP single or normal/backup switching (option)	kPa	110	98	85	122	120	108
Available pressure head - Pump(s) HP single or normal/backup switching (option)	kPa	168	156	163	143	141	229
Available pressure head - Twin pumps LP parallel operating (option)	kPa	135	123	111	92	92	118
Available pressure head - Twin pumps HP parallel operating (option)	kPa	169	158	174	160	165	181
Cooling 12/7°C and Heating at 40/45°C							
Cooling capacity	kW	97.8	107.9	125.8	139	160.3	184.2
Heating capacity	kW	126.5	140.1	162.7	180.4	207	239.1
Total absorbed power	kW	30.2	33.9	38.8	43.5	49.2	57.8
TER		7.43	7.32	7.44	7.34	7.47	7.32
Water flow of cold circuit	l/h	16798	18522	21605	23879	27522	31637
Water flow of hot circuit	l/h	21991	24343	28272	31347	35974	41557
Available pressure head - Pump(s) LP single or normal/backup switching (option) - cold circuit	kPa	124	113	106	149	141	132
Available pressure head - Pump(s) HP single or normal/backup switching (option) - cold circuit	kPa	183	172	186	170	163	255
Available pressure head - Twin pumps LP parallel operating (option) - cold circuit	kPa	148	138	132	117	112	131
Available pressure head - Twin pumps HP parallel operating (option) - cold circuit	kPa	183	173	191	180	180	195
Available pressure head - Pump(s) LP single or normal/backup switching (option) - hot circuit	kPa	87	68	58	89	79	46
Available pressure head - Pump(s) HP single or normal/backup switching (option) - hot circuit	kPa	145	126	137	110	100	167
Available pressure head - Twin pumps LP parallel operating (option) - hot circuit	kPa	95	87	62	55	86	95
Available pressure head - Twin pumps HP parallel operating (option) - hot circuit	kPa	130	156	137	138	150	130

Power supply		400 / 3+N / 50					
Maximum absorbed current (FLA) [without options]	A	81	87	96	105	126	148
Start up current (LRA) [without options]	A	194	198	220	222	241	307
Start up current with soft starter [without options]	A	126	129	143	145	157	200
Number of fans		8	8	6	6	6	6
Air flow	m3/h	41340	41340	72700	72700	67672	67672
Absorbed power of fans	kW	2.3	2.3	6.3	6.3	6.3	6.3
Absorbed current of fans	A	8.8	8.8	15	15	15	15
Sound power level Lw	db(A)	81	81	81	82	83	86
Sound pressure level Lp @ 10 m Q=2	db(A)	53	53	53	54	55	58
Compressors / Circuits		4/2	4/2	4/2	4/2	4/2	4/2
Water tank volume (option)	l	340		600			
Dimensions [LxWxH]	mm	3610 x 1183 x 1679		3610 x 1654 x 1846			
Weight [without options]	kg	1190	1210	1530	1550	1690	1710

Table 3 – General data of AQUA^4 M and AQUA^4 P standard S version from AQUA^{4}214 to AQUA^{4}324 in nominal conditions :

Unit M (2 pipe) and P (4 pipe) version S		AAH214	AAH244	AAH274	AAH294	AAH324
Cooling at 12/7°C with air ambient at 35°C						
Cooling capacity	kW	216.3	236	258.6	295.8	313.8
Total absorbed power	kW	74.6	83.3	91.6	101.9	115.1
EER		2.90	2.83	2.82	2.90	2.73
ESEER		4.44	4.24	4.19	4.33	4.29
Water flow	l/h	37147	40528	44403	50805	53885
Total pressure drop	kPa	57	57	37	47	63
Available pressure head - Pump(s) LP single or normal/backup switching (option)	kPa	134	169	176	154	127
Available pressure head - Pump(s) HP single or normal/backup switching (option)	kPa	221	289	295	273	246
Available pressure head - Twin pumps LP parallel operating (option)	kPa	113	173	183	165	140
Available pressure head - Twin pumps HP parallel operating (option)	kPa	177	206	215	197	173
Heating at 40/45°C with air ambient at 7°C						
Heating capacity	kW	229.4	254.6	280.8	316.6	342.4
Total absorbed power	kW	73.1	78.5	87.5	97.3	108.2
COP		3.14	3.24	3.21	3.25	3.16
Water flow	l/h	39872	44244	48801	55013	59504
Total pressure drop	kPa	66	67	55	67	77
Available pressure head - Pump(s) LP single or normal/backup switching (option)	kPa	92	139	138	109	81
Available pressure head - Pump(s) HP single or normal/backup switching (option)	kPa	175	258	256	227	199
Available pressure head - Twin pumps LP parallel operating (option)	kPa	90	147	149	124	100
Available pressure head - Twin pumps HP parallel operating (option)	kPa	153	179	181	156	133
Cooling 12/7°C and Heating at 40/45°C						
Cooling capacity	kW	217.9	242.9	263.4	302.2	326.1
Heating capacity	kW	281.8	312.8	340.1	388.3	422.3
Total absorbed power	kW	67.2	73.6	80.7	90.6	101.2
TER		7.44	7.55	7.48	7.62	7.40
Water flow of cold circuit	l/h	37426	41722	45233	51902	56007
Water flow of hot circuit	l/h	48977	54367	59098	67488	73387
Available pressure head - Pump(s) LP single or normal/backup switching (option) - cold circuit	kPa	131	163	173	149	117
Available pressure head - Pump(s) HP single or normal/backup switching (option) - cold circuit	kPa	218	283	292	268	236
Available pressure head - Twin pumps LP parallel operating (option) - cold circuit	kPa	112	168	180	161	131
Available pressure head - Twin pumps HP parallel operating (option) - cold circuit	kPa	176	201	213	193	164
Available pressure head - Pump(s) LP single or normal/backup switching (option) - hot circuit	kPa	28	93	94	53	14
Available pressure head - Pump(s) HP single or normal/backup switching (option) - hot circuit	kPa	106	211	212	171	132
Available pressure head - Twin pumps LP parallel operating (option) - hot circuit	kPa	54	106	111	75	41
Available pressure head - Twin pumps HP parallel operating (option) - hot circuit	kPa	118	138	143	109	76

Power supply		400 / 3+N / 50				
Maximum absorbed current (FLA) [without options]	A	167	190	215	229	242
Start up current (LRA) [without options]	A	318	382	398	464	472
Start up current with soft starter [without options]	A	207	248	259	301	307
Number of fans		6	6	8	8	8
Air flow	m3/h	75478	75478	103511	97902	97902
Absorbed power of fans	kW	6.3	6.3	8.4	8.4	8.4
Absorbed current of fans	A	15	15	20	20	20
Sound power level Lw	db(A)	86	86	87	87	87
Sound pressure level Lp @ 10 m Q=2	db(A)	58	58	59	59	59
Compressors / Circuits		4/2	4/2	4/2	4/2	4/2
Water tank volume (option)	l	600		765		
Dimensions [LxWxH]	mm	3610 x 1654 x 2330		4276 x 1654 x 2330		
Weight [without options]	kg	1890	1910	2260	2290	2320

Performance for units AQUA[4] M and AQUA[4] P with version soundproofed are available from our selection software.

10 ACOUSTIC DATA

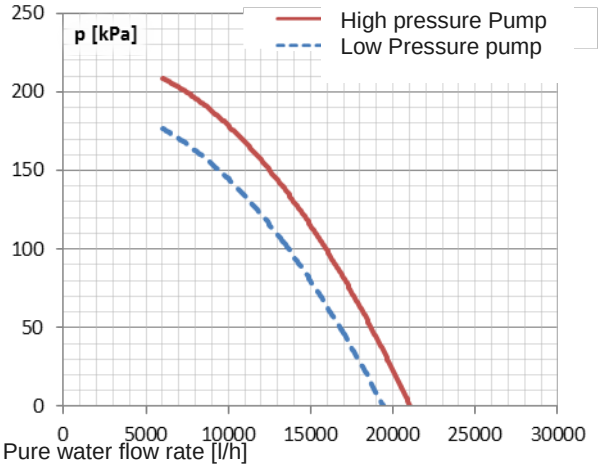
Spectrum per octave band dB(A)								Maximum global sound power.	Maximum sound pressure at 10 meters
AAH M & P	125	250	500	1,000	2,000	4,000	8,000	Lw	Lp
S Version	Hz	Hz	Hz	Hz	Hz	Hz	Hz	dB(A)	dB(A)
041	79	83	77	76	69	63	61	80	52
051	79	83	77	76	69	63	61	80	52
061	80	84	78	77	70	64	62	81	53
071	80	84	78	77	70	64	62	81	53
081	80	84	78	77	70	64	62	81	53
091	81	85	79	78	71	65	63	82	54
101	81	85	79	78	71	65	63	82	54
124	83	87	81	80	73	67	65	84	56
144	83	87	81	80	73	67	65	84	56
164	84	88	82	81	74	68	66	85	57
194	84	88	82	81	74	68	66	85	57
214	85	89	83	82	75	69	67	86	58
244	85	89	83	82	75	69	67	86	58
274	85	89	83	82	75	69	67	86	58
294	86	90	84	83	76	70	68	87	59
324	86	90	84	83	76	70	68	87	59

Spectrum per octave band dB(A)								Maximum global sound power.	Maximum sound pressure at 10 meters
AAH M & P	125	250	500	1,000	2,000	4,000	8,000	Lw	Lp
L Version	Hz	Hz	Hz	Hz	Hz	Hz	Hz	dB(A)	dB(A)
041	71	77	71	67	60	57	56	73	45
051	71	77	71	67	60	57	56	73	45
061	73	79	73	69	62	59	58	75	47
071	73	79	73	69	62	59	58	75	47
081	73	79	73	69	62	59	58	75	47
091	75	81	75	71	64	61	60	77	49
101	75	81	75	71	64	61	60	77	49
124	77	83	77	73	66	63	62	79	51
144	77	83	77	73	66	63	62	79	51
164	78	84	78	74	67	64	63	80	52
194	78	84	78	74	67	64	63	80	52
214	80	86	80	76	69	66	65	82	54
244	80	86	80	76	69	66	65	82	54
274	80	86	80	76	69	66	65	82	54
294	81	87	81	77	70	67	66	83	55
324	81	87	81	77	70	67	66	83	55

10.1 Characteristic curves of hydraulic pumps attached to units AQUA[4] M and AQUA[4] P with standard noise levels: Version S

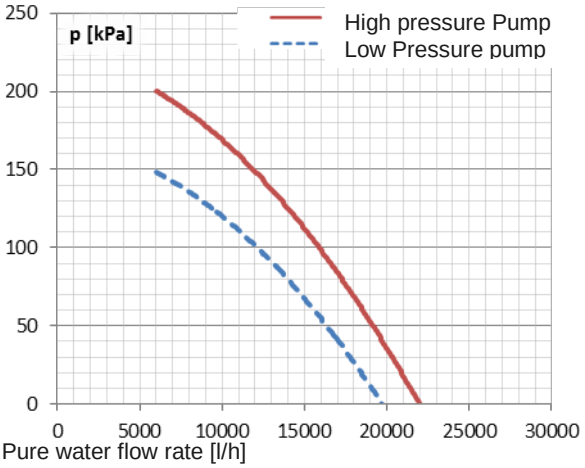
The graphs in these paragraphs express the available head pressure (net of the losses inside the units) of the high pressure (HP) and low pressure (LP) pumps available with these machine, both on the utility circuit and on the recovery circuit, in relation to water flow rate. Refer to the “Use of glycol solutions” paragraph to assess the effect of glycol on the useful head provided by the pumps. Below are the corrective coefficients to apply to the curves, calculated in pure water.

Available Head pressure [kPa] for AAH041 S pumps (single or normal/backup switching operation)



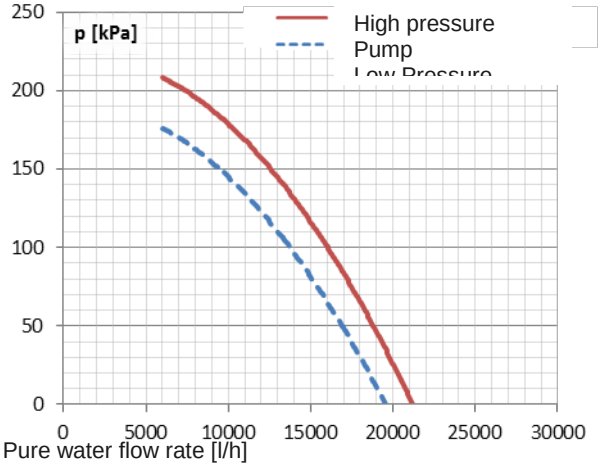
abs. nom. power LP: 1.1 [kW] / abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH041 S pumps (parallel operation)



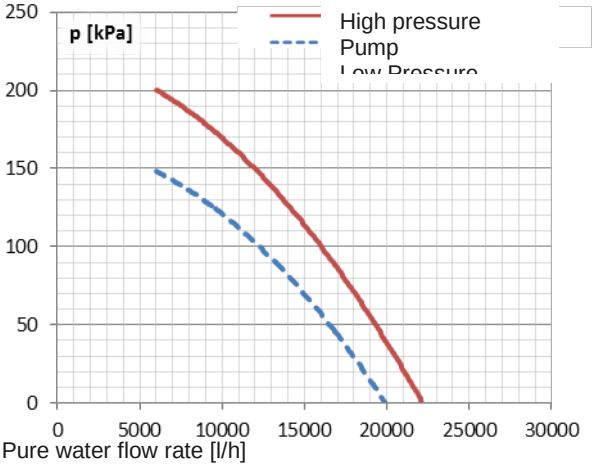
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH051 S pumps (single or normal/backup switching operation)



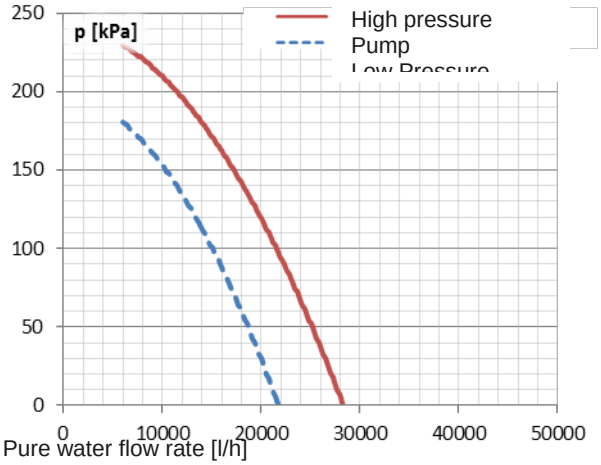
abs. nom. power LP: 1.1 [kW] / abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] / abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH051 S pumps (parallel operation)



abs. nom. power LP: 0.9 [kW] / abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] / abs. nom. current HP: 2.7 [A]

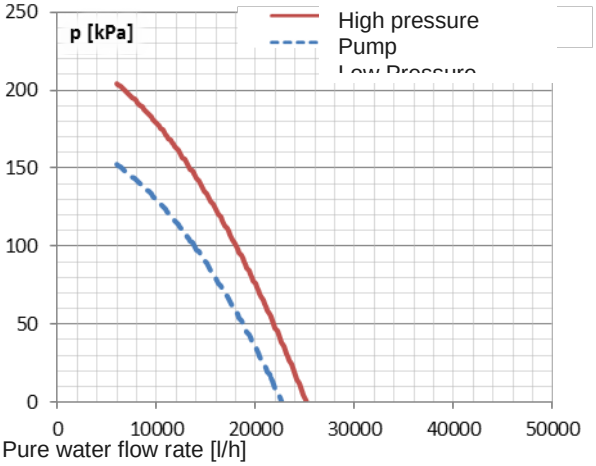
Available Head pressure [kPa] for AAH061 S pumps
(single or normal/backup switching operation)



Pure water flow rate [l/h]

abs. nom. power LP: 1.1 [kW] / abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] / abs. nom. current HP: 4.8 [A]

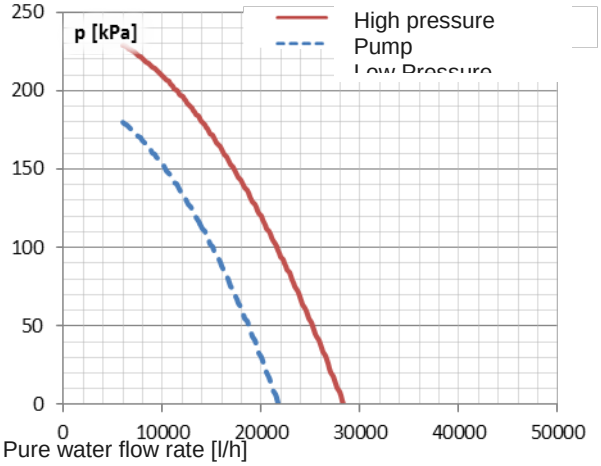
Available Head pressure [kPa] for AAH061 S pumps
(parallel operation)



Pure water flow rate [l/h]

abs. nom. power LP: 0.9 [kW] / abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] / abs. nom. current HP: 2.7 [A]

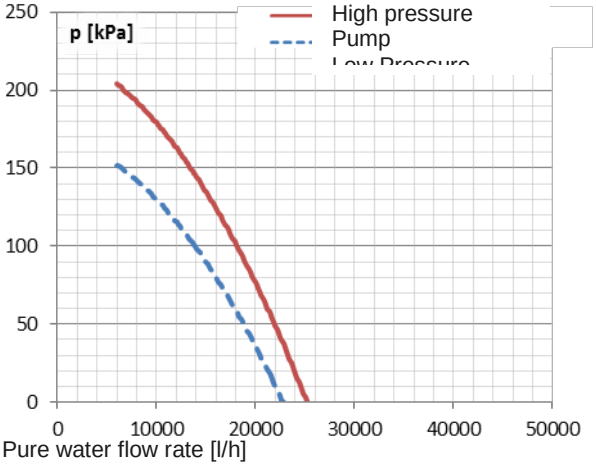
Available Head pressure [kPa] for AAH071 S pumps
(single or normal/backup switching operation)



Pure water flow rate [l/h]

abs. nom. power LP: 1.1 [kW] / abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] / abs. nom. current HP: 4.8 [A]

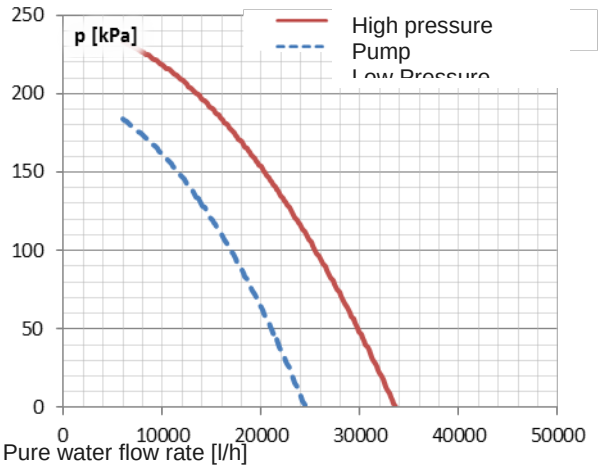
Available Head pressure [kPa] for AAH071 S pumps
(parallel operation)



Pure water flow rate [l/h]

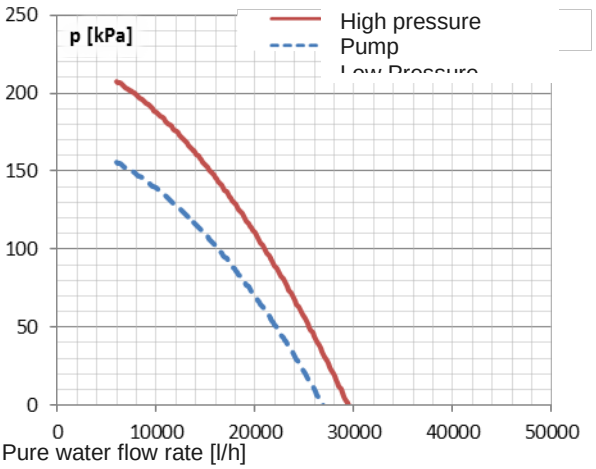
abs. nom. power LP: 0.9 [kW] / abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] / abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH081 S pumps
(single or normal/backup switching operation)



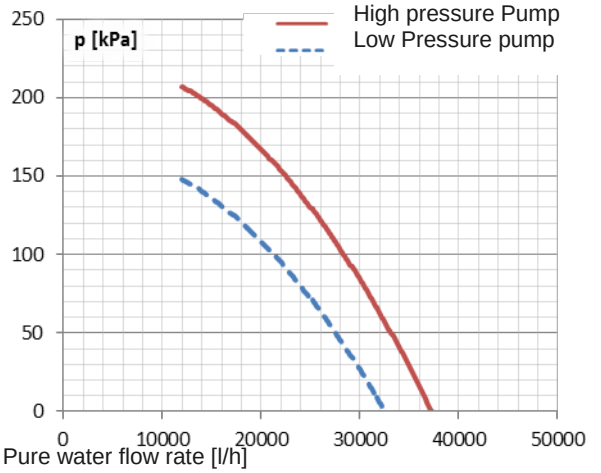
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH081 S pumps
(parallel operation)



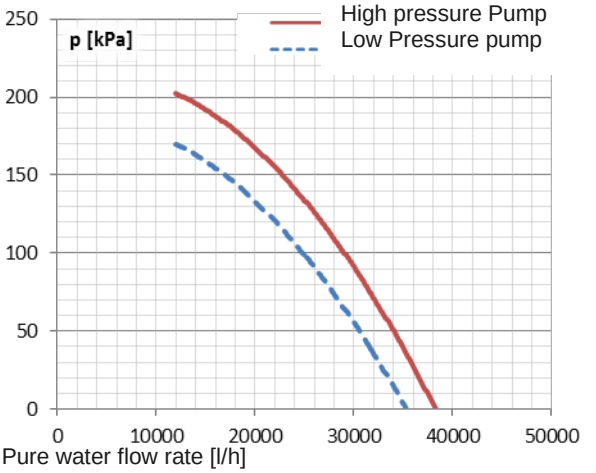
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH094 S pumps
(single or normal/backup switching operation)



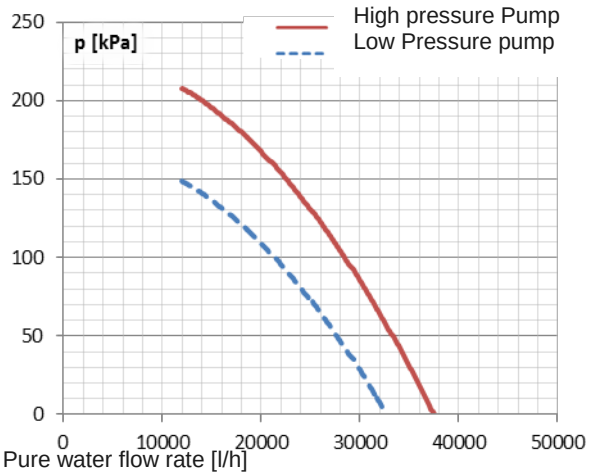
abs. nom. power LP: 1.5 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH94 S pumps
(parallel operation)



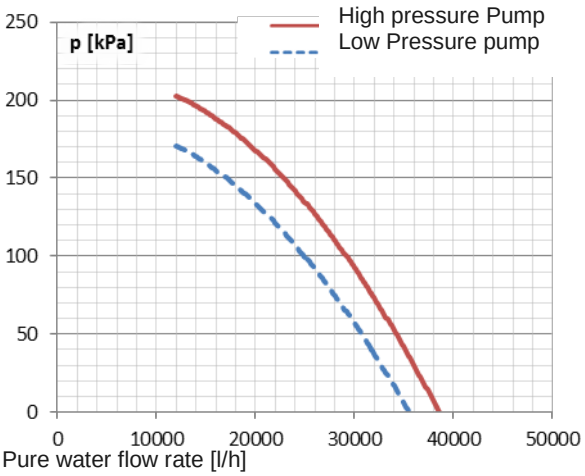
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH104 S pumps
(single or normal/backup switching operation)



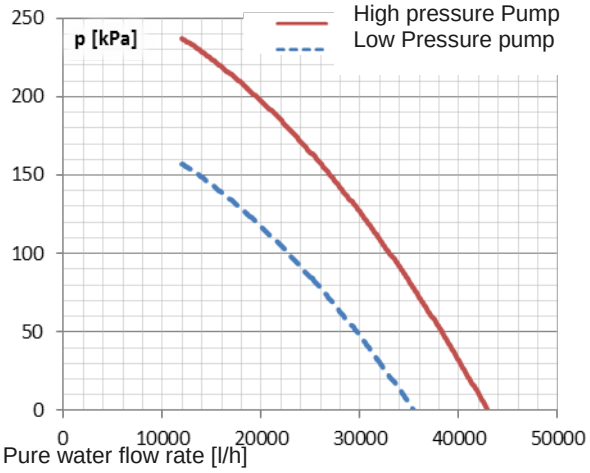
abs. nom. power LP: 1.5 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH104 S pumps
(parallel operation)



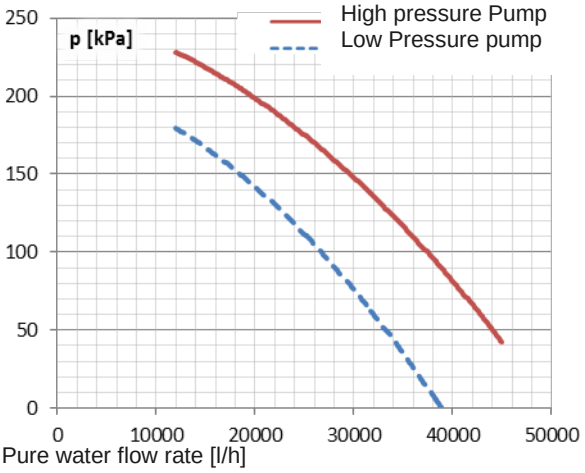
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH124 S pumps
(single or normal/backup switching operation)



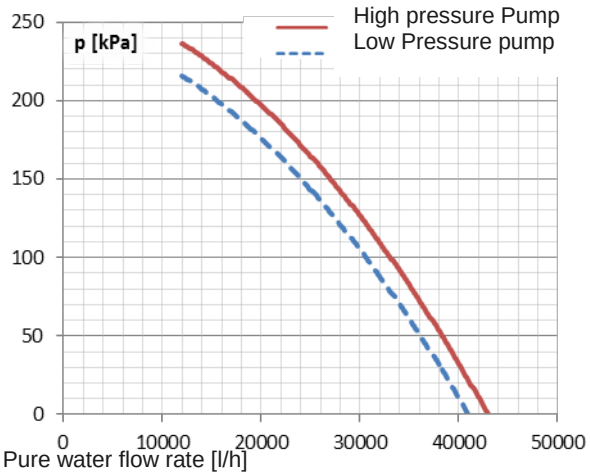
abs. nom. power LP: 1.5 [kW] abs. nom. power HP: 3 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 5.6 [A]

Available Head pressure [kPa] for AAH124 S pumps
(parallel operation)



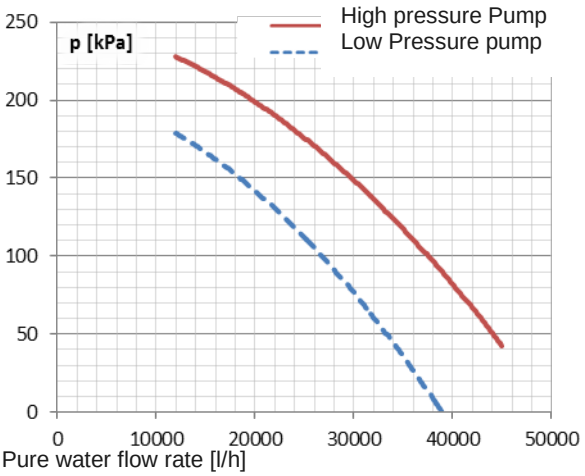
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH144 S pumps
(single or normal/backup switching operation)



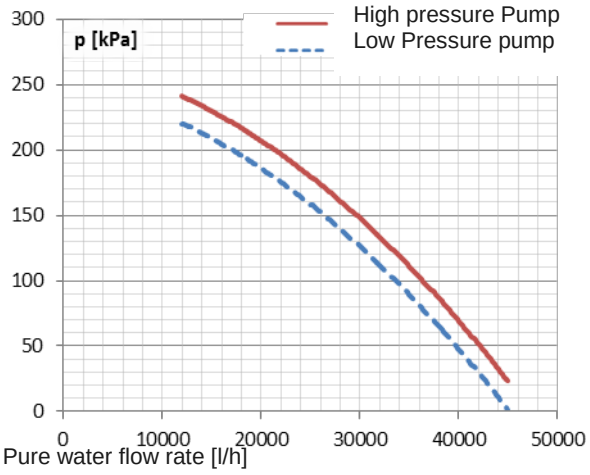
abs. nom. power LP: 2.2 [kW] abs. nom. power HP: 3 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 5.6 [A]

Available Head pressure [kPa] for AAH144 S pumps
(parallel operation)



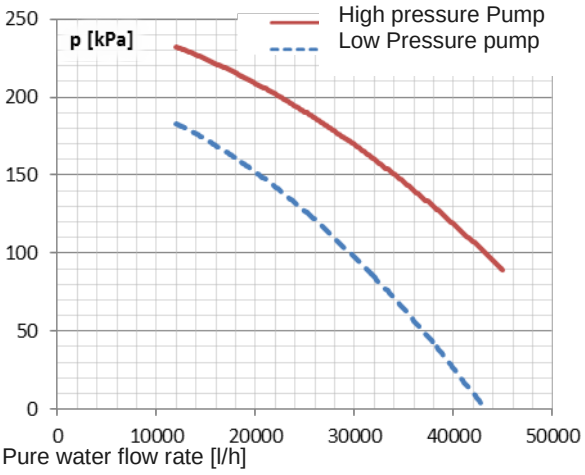
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH164 S pumps
(single or normal/backup switching operation)



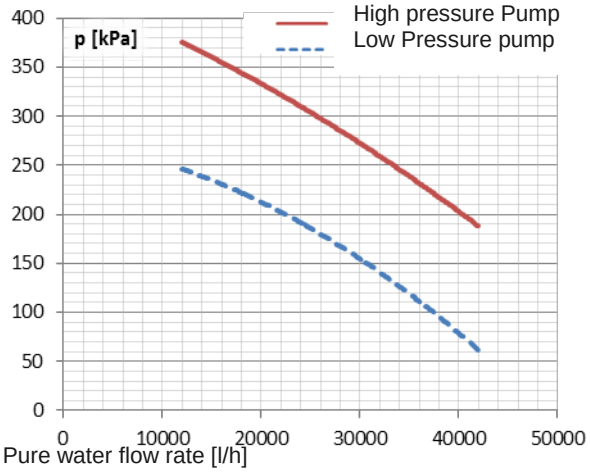
abs. nom. power LP: 2.2 [kW] abs. nom. power HP: 3 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 5.6 [A]

Available Head pressure [kPa] for AAH164 S pumps
(parallel operation)



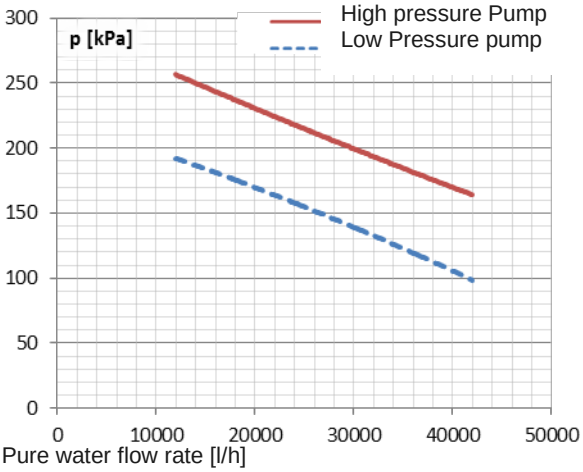
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH194 S pumps
(single or normal/backup switching operation)



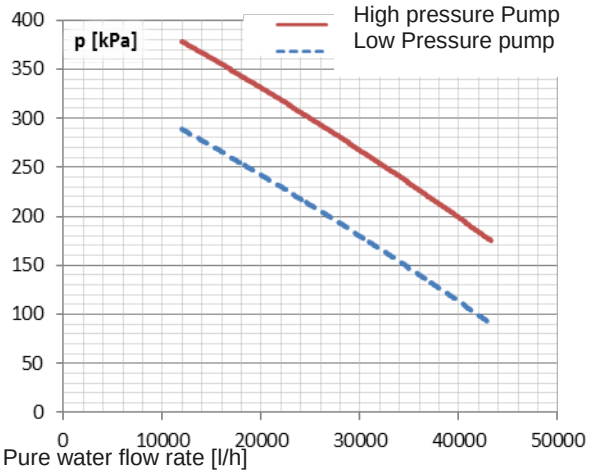
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 5.1 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 9.2 [A]

Available Head pressure [kPa] for AAH194 S pumps
(parallel operation)



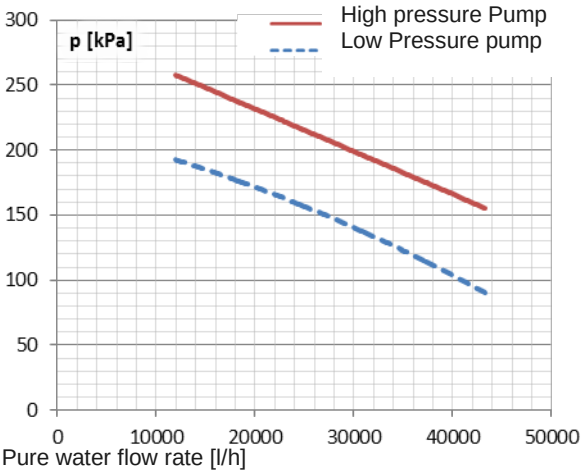
abs. nom. power LP: 2 [kW] abs. nom. power HP: 2.8 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH194 S pumps
(single or normal/backup switching operation)



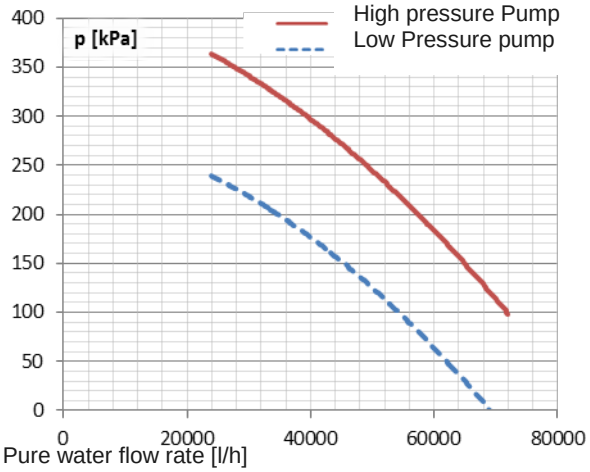
abs. nom. power LP: 3.7 [kW] abs. nom. power HP: 5.1 [kW]
abs. nom. current LP: 6.8 [A] abs. nom. current HP: 9.2 [A]

Available Head pressure [kPa] for AAH194 S pumps
(parallel operation)



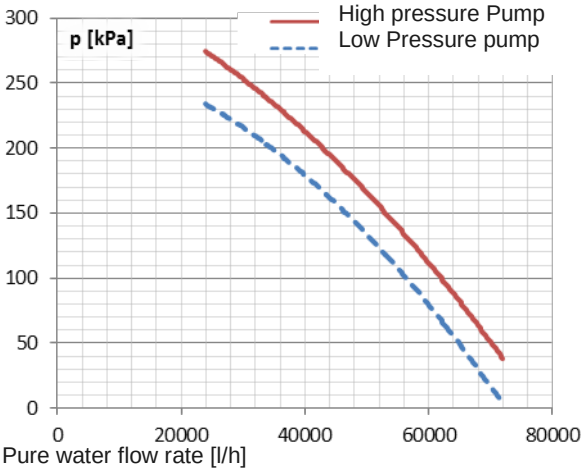
abs. nom. power LP: 2 [kW] abs. nom. power HP: 2.8 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH244 S pumps
(single or normal/backup switching operation)



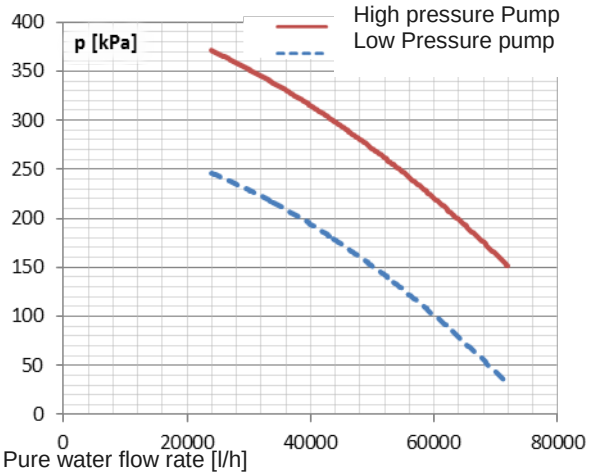
abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

Available Head pressure [kPa] for AAH244 S pumps
(parallel operation)



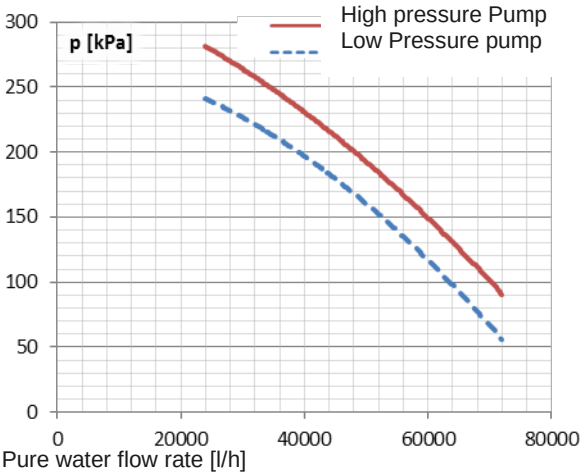
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

Available Head pressure [kPa] for AAH274 S pumps
(single or normal/backup switching operation)



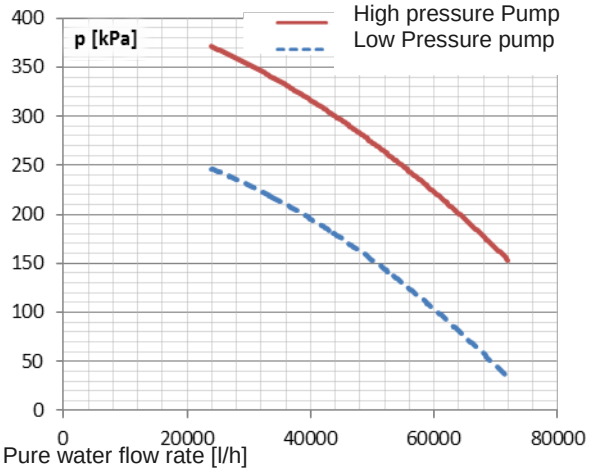
abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

Available Head pressure [kPa] for AAH274 S pumps
(parallel operation)



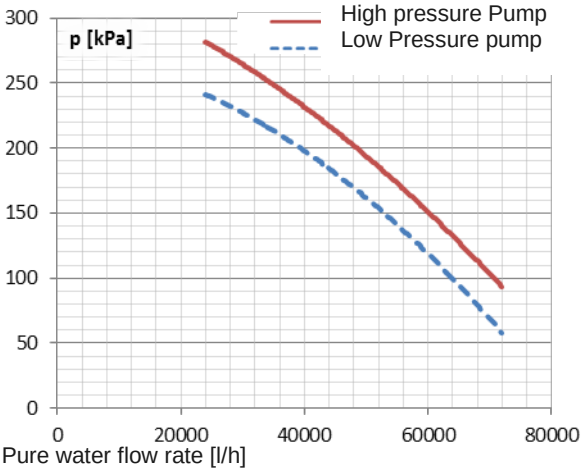
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

Available Head pressure [kPa] for AAH294 S pumps
(single or normal/backup switching operation)



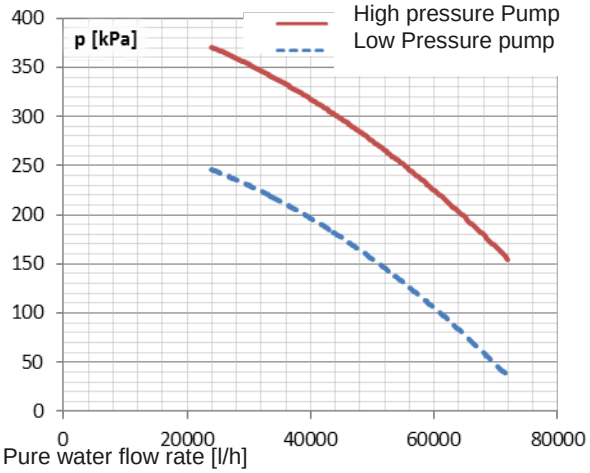
abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

Available Head pressure [kPa] for AAH294 S pumps
(parallel operation)



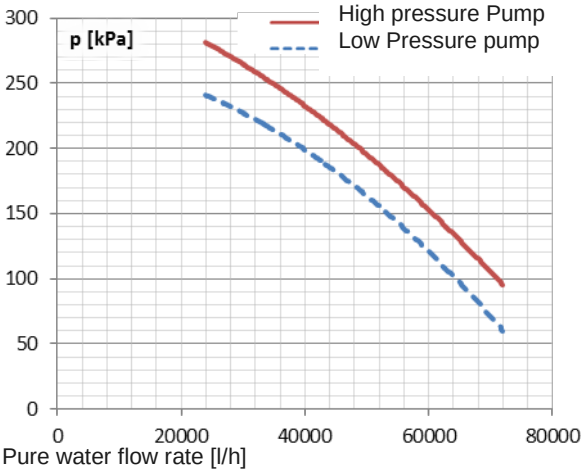
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

Available Head pressure [kPa] for AAH324 S pumps
(single or normal/backup switching operation)



abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

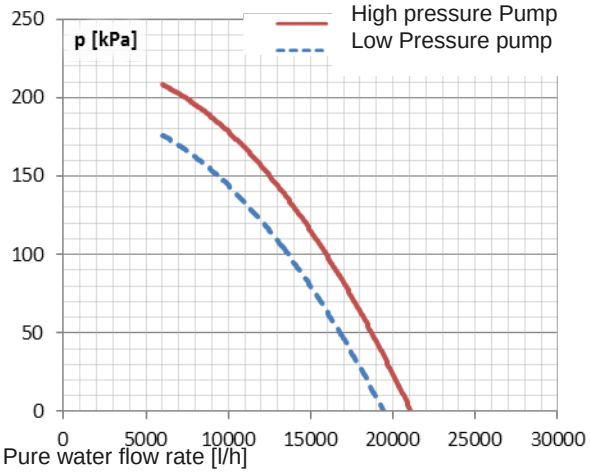
Available Head pressure [kPa] for AAH324 S pumps
(parallel operation)



abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

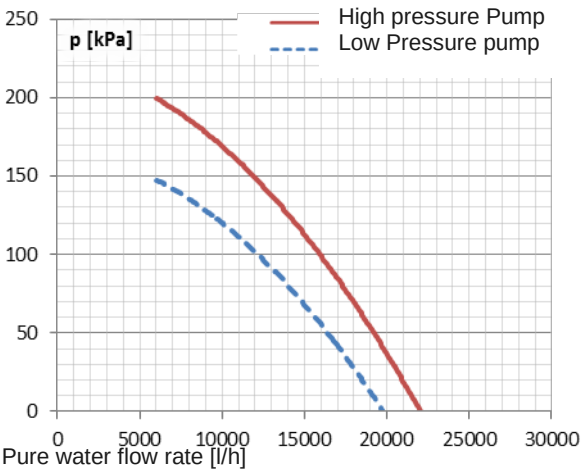
10.2 Characteristic curves of hydraulic pumps attached to units AQUA^4 M and AQUA^4 P with low sound levels: Version L

Available Head pressure [kPa] for AAH041 L pumps
(single or normal/backup switching operation)



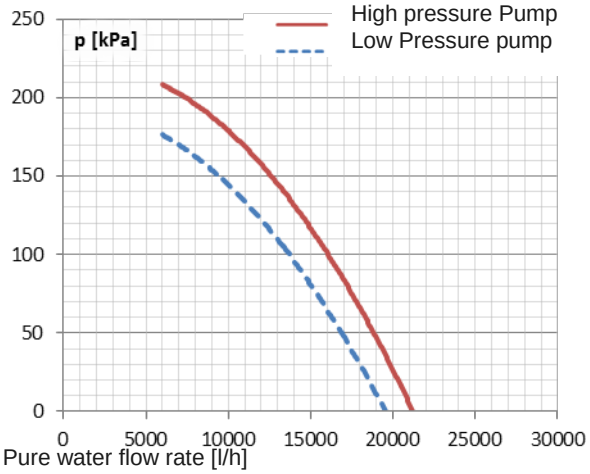
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH041 L pumps
(parallel operation)



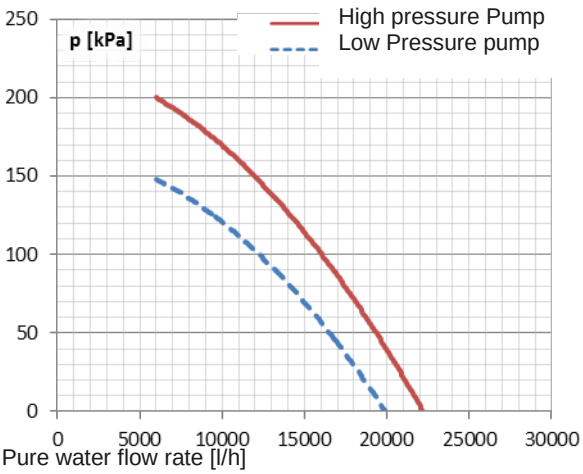
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH051 L pumps
(single or normal/backup switching operation)



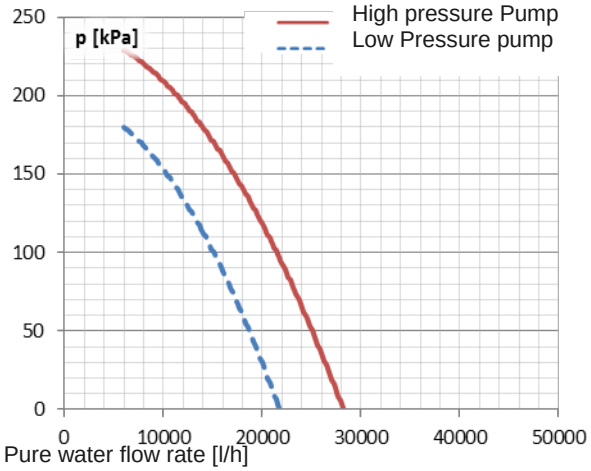
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH051 L pumps
(parallel operation)



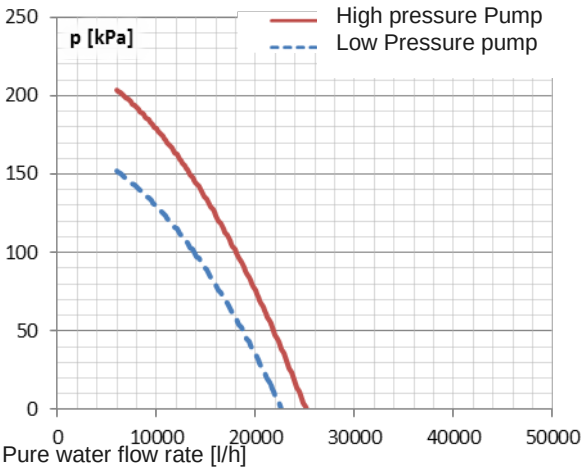
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH061 L pumps
(single or normal/backup switching operation)



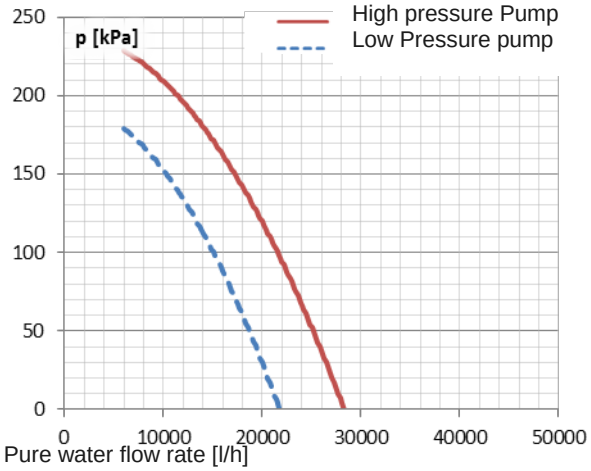
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH061 L pumps
(parallel operation)



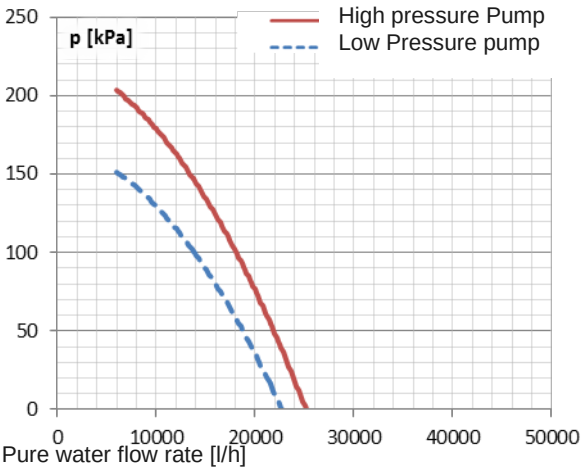
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH071 L pumps
(single or normal/backup switching operation)



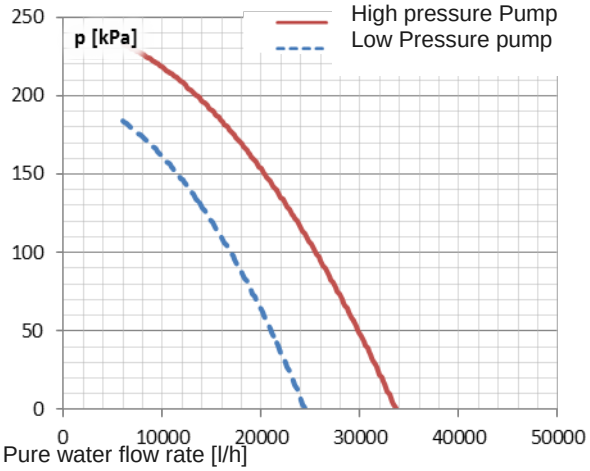
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH071 L pumps
(parallel operation)



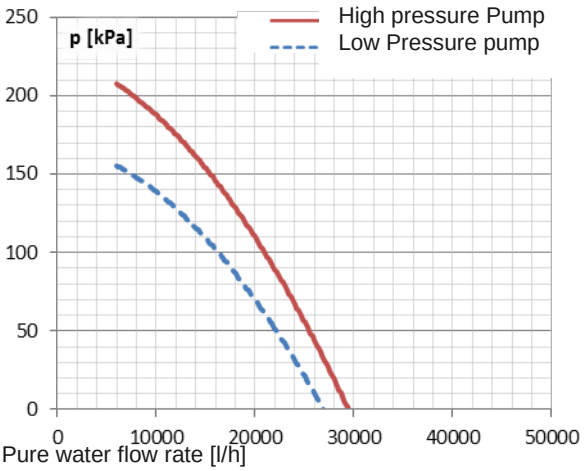
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH081 L pumps
(single or normal/backup switching operation)



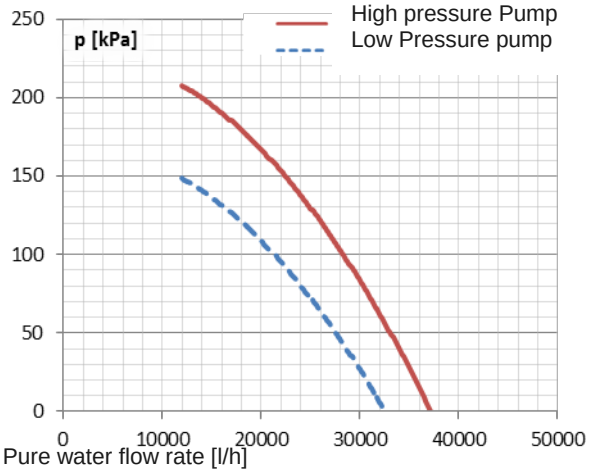
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH081 L pumps
(parallel operation)



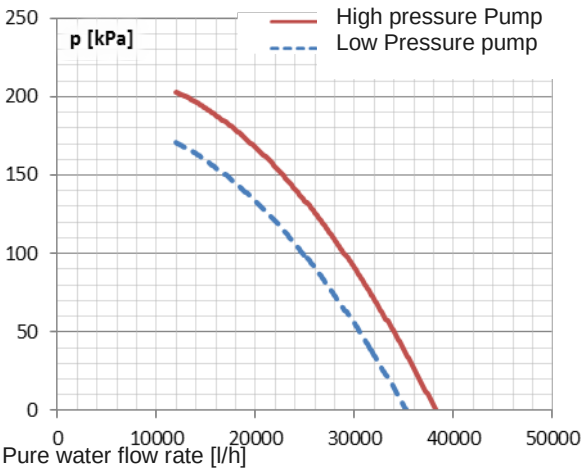
abs. nom. power LP: 0.9 [kW] abs. nom. power HP: 0.9 [kW]
abs. nom. current LP: 2.7 [A] abs. nom. current HP: 2.7 [A]

Available Head pressure [kPa] for AAH094 L pumps
(single or normal/backup switching operation)



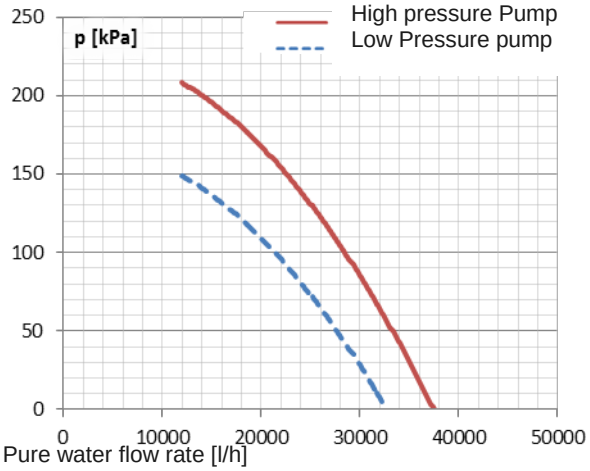
abs. nom. power LP: 1.5 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH094 L pumps
(parallel operation)



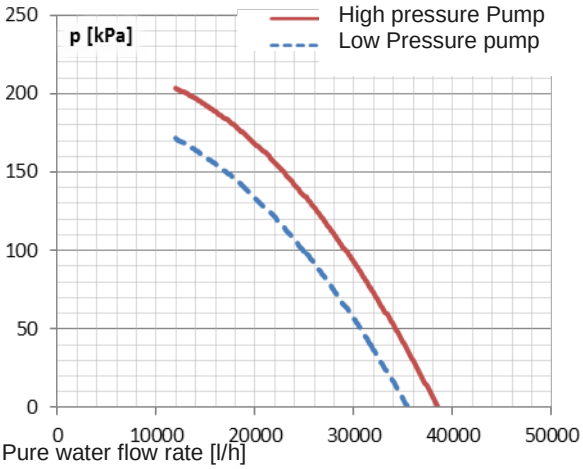
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH104 L pumps
(single or normal/backup switching operation)



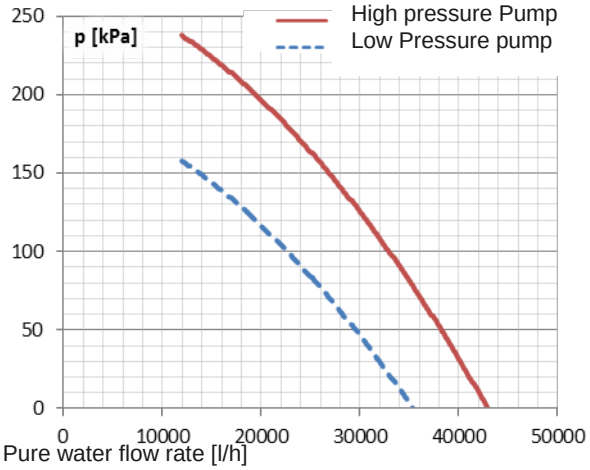
abs. nom. power LP: 1.5 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH104 L pumps
(parallel operation)



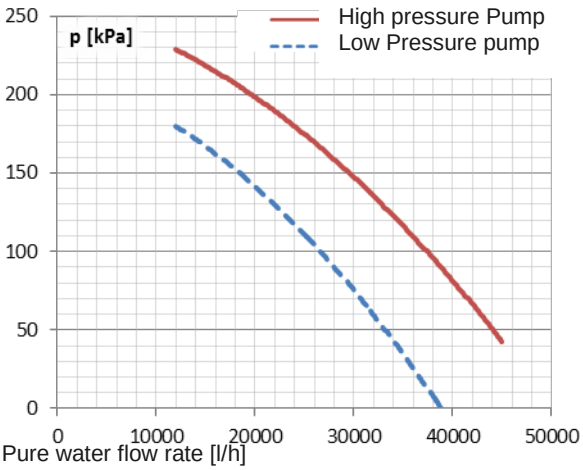
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 1.5 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 3.2 [A]

Available Head pressure [kPa] for AAH124 L pumps
(single or normal/backup switching operation)



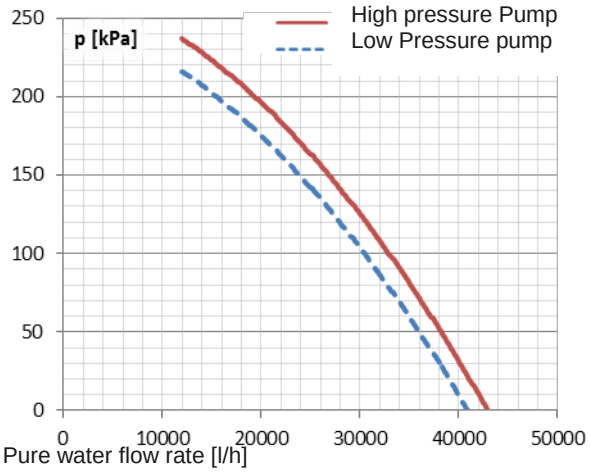
abs. nom. power LP: 1.5 [kW] abs. nom. power HP: 3 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 5.6 [A]

Available Head pressure [kPa] for AAH124 L pumps
(parallel operation)



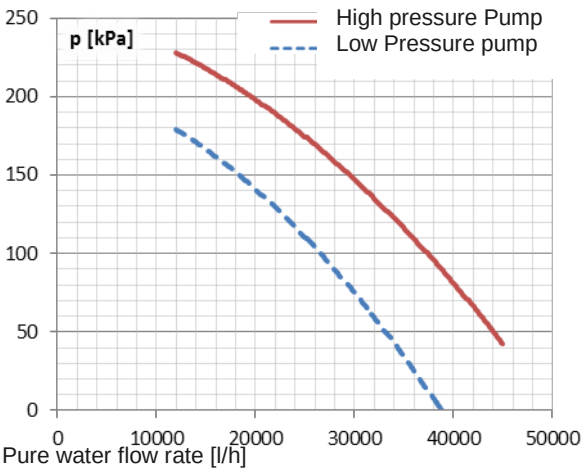
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH144 L pumps
(single or normal/backup switching operation)



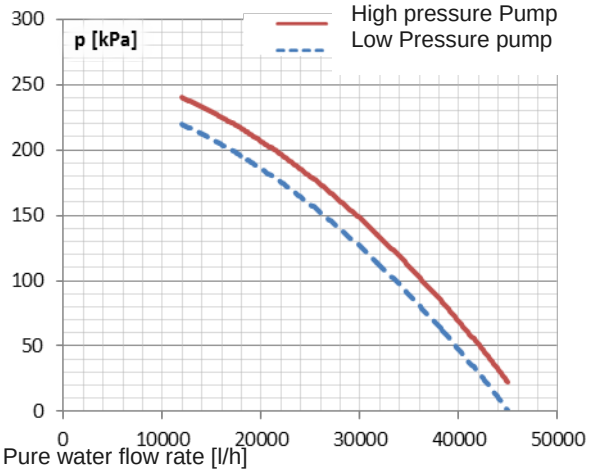
abs. nom. power LP: 2.2 [kW] abs. nom. power HP: 3 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 5.6 [A]

Available Head pressure [kPa] for AAH144 L pumps
(parallel operation)



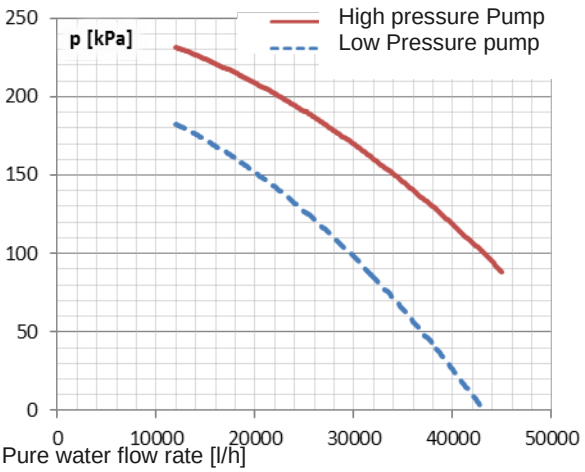
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH164 L pumps
(single or normal/backup switching operation)



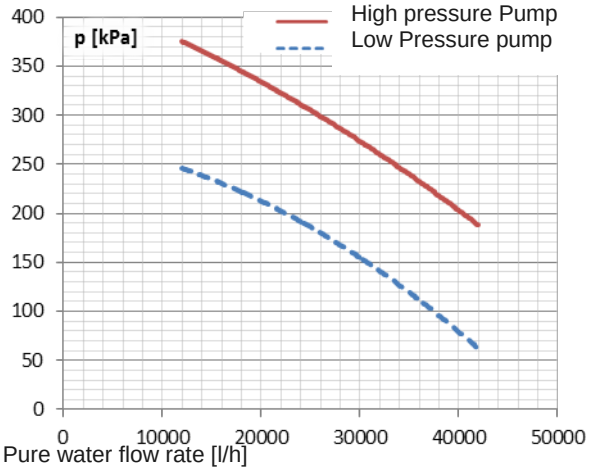
abs. nom. power LP: 2.2 [kW] abs. nom. power HP: 3 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 5.6 [A]

Available Head pressure [kPa] for AAH164 L pumps
(parallel operation)



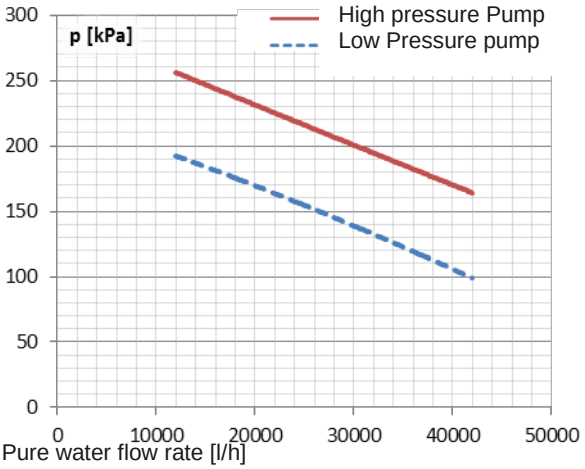
abs. nom. power LP: 1.1 [kW] abs. nom. power HP: 2.2 [kW]
abs. nom. current LP: 2.5 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH194 L pumps
(single or normal/backup switching operation)



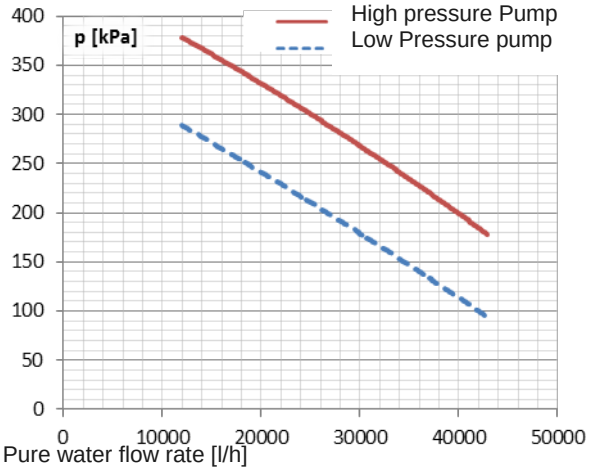
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 5.1 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 9.2 [A]

Available Head pressure [kPa] for AAH194 L pumps
(parallel operation)



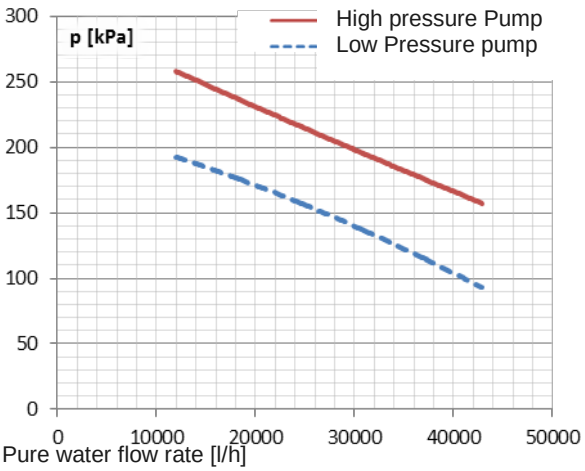
abs. nom. power LP: 2 [kW] abs. nom. power HP: 2.8 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH214 L pumps
(single or normal/backup switching operation)



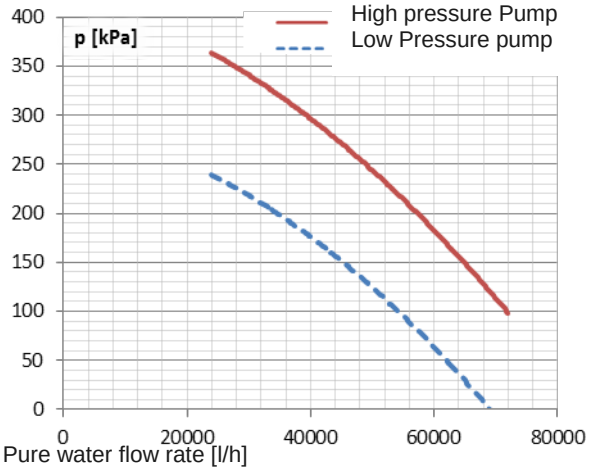
abs. nom. power LP: 3.7 [kW] abs. nom. power HP: 5.1 [kW]
abs. nom. current LP: 6.8 [A] abs. nom. current HP: 9.2 [A]

Available Head pressure [kPa] for AAH214 L pumps
(parallel operation)



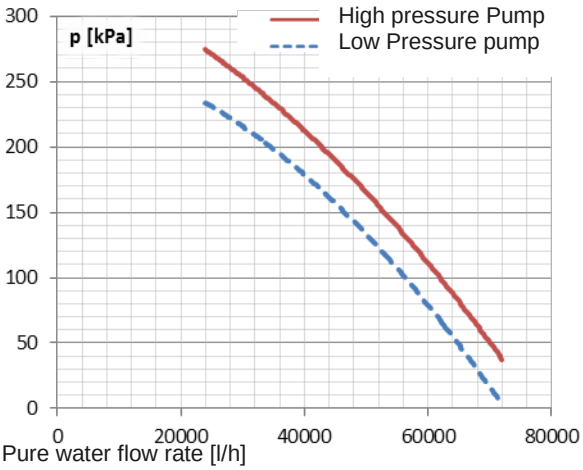
abs. nom. power LP: 2 [kW] abs. nom. power HP: 2.8 [kW]
abs. nom. current LP: 3.4 [A] abs. nom. current HP: 4.8 [A]

Available Head pressure [kPa] for AAH244 L pumps
(single or normal/backup switching operation)



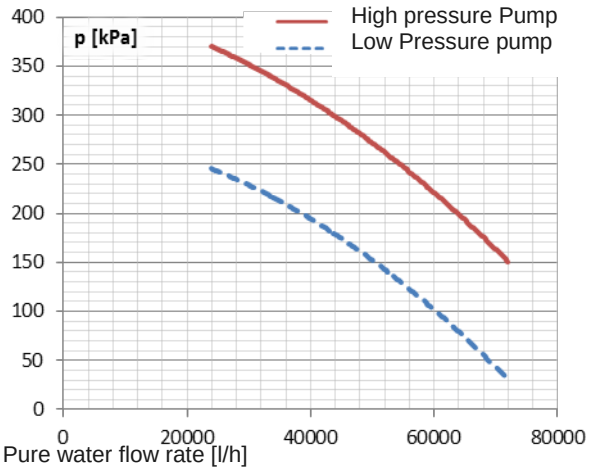
abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

Available Head pressure [kPa] for AAH244 L pumps
(parallel operation)



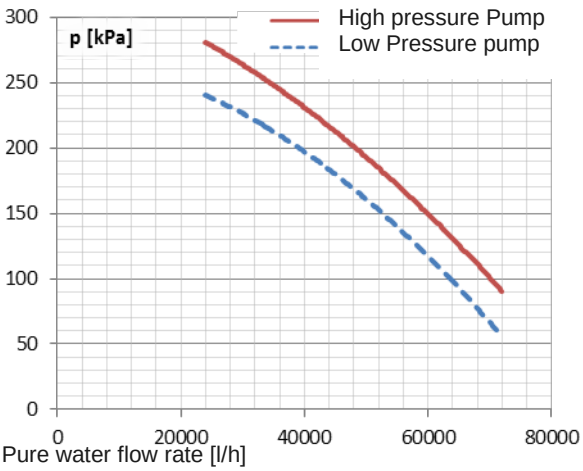
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

Available Head pressure [kPa] for AAH274 L pumps
(single or normal/backup switching operation)



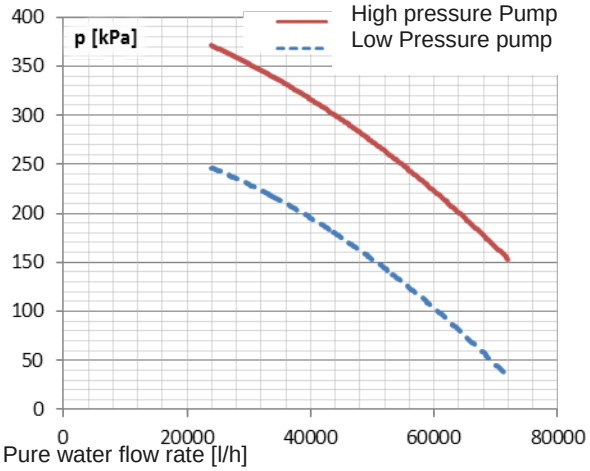
abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

Available Head pressure [kPa] for AAH274 L pumps
(parallel operation)



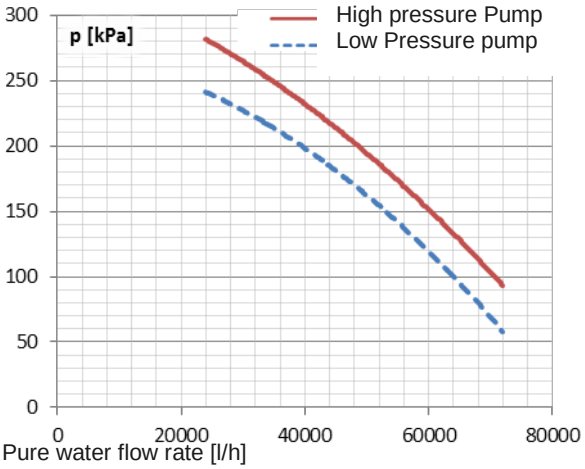
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

Available Head pressure [kPa] for AAH294 L pumps
(single or normal/backup switching operation)



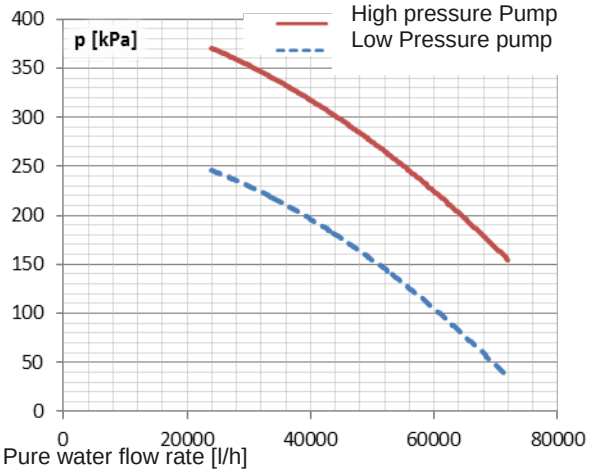
abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

Available Head pressure [kPa] for AAH294 L pumps
(parallel operation)



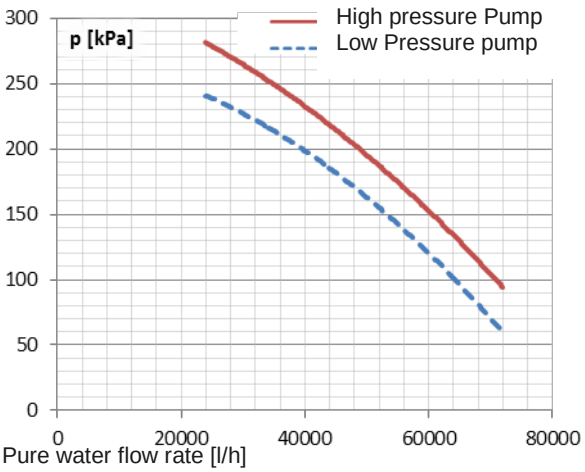
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

Available Head pressure [kPa] for AAH324 L pumps
(single or normal/backup switching operation)



abs. nom. power LP: 4 [kW] abs. nom. power HP: 7.5 [kW]
abs. nom. current LP: 9.2 [A] abs. nom. current HP: 12.5 [A]

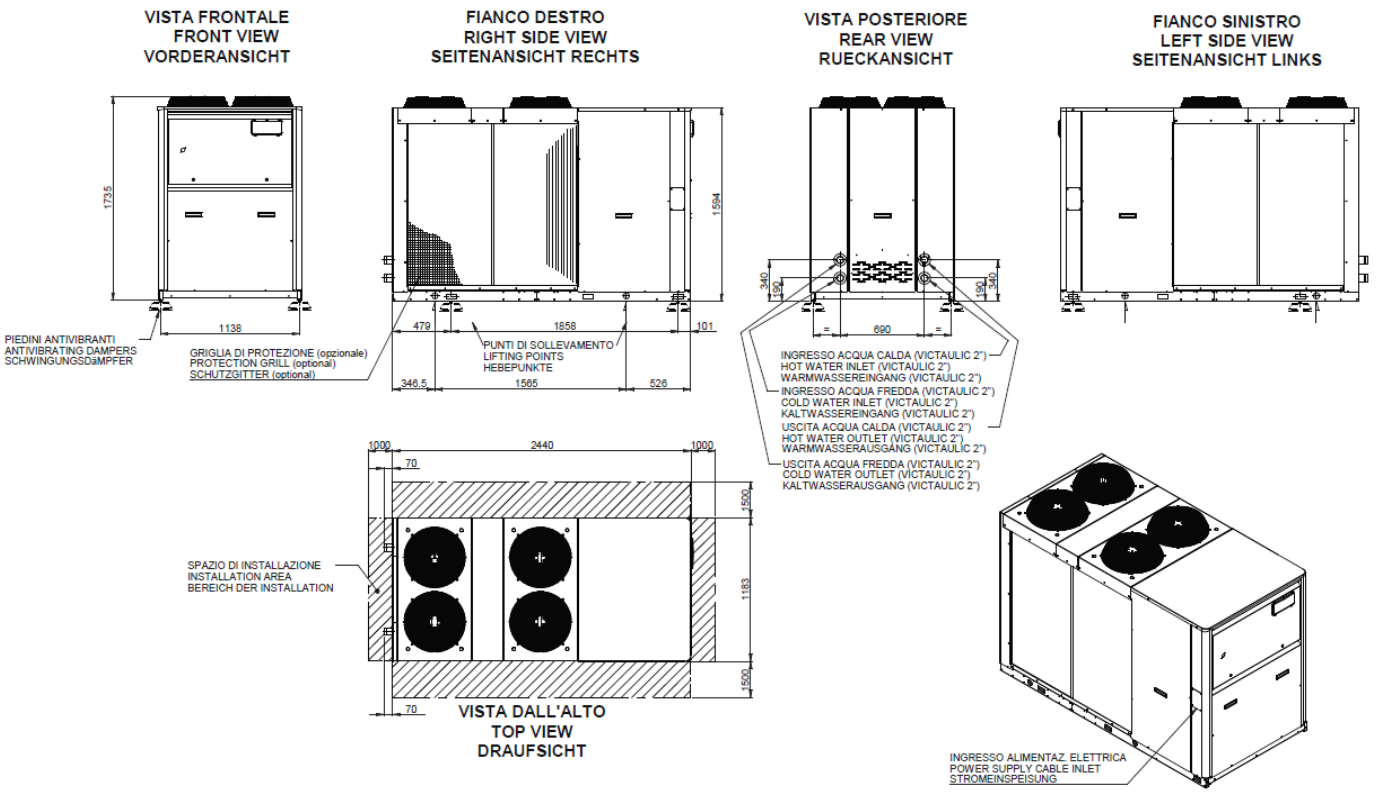
Available Head pressure [kPa] for AAH324 L pumps
(parallel operation)



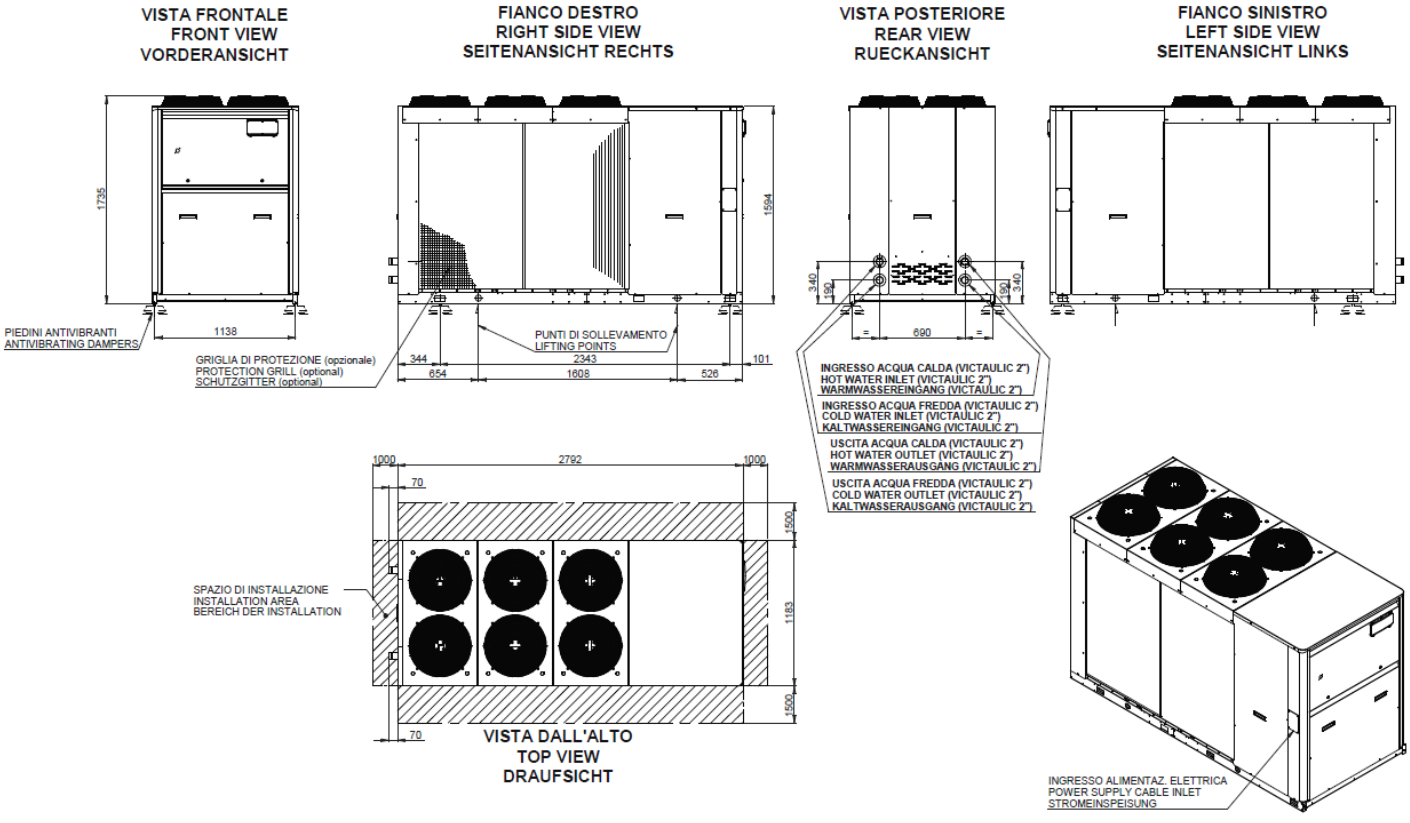
abs. nom. power LP: 2.8 [kW] abs. nom. power HP: 3.7 [kW]
abs. nom. current LP: 4.8 [A] abs. nom. current HP: 6.8 [A]

11 Overview Diagrams

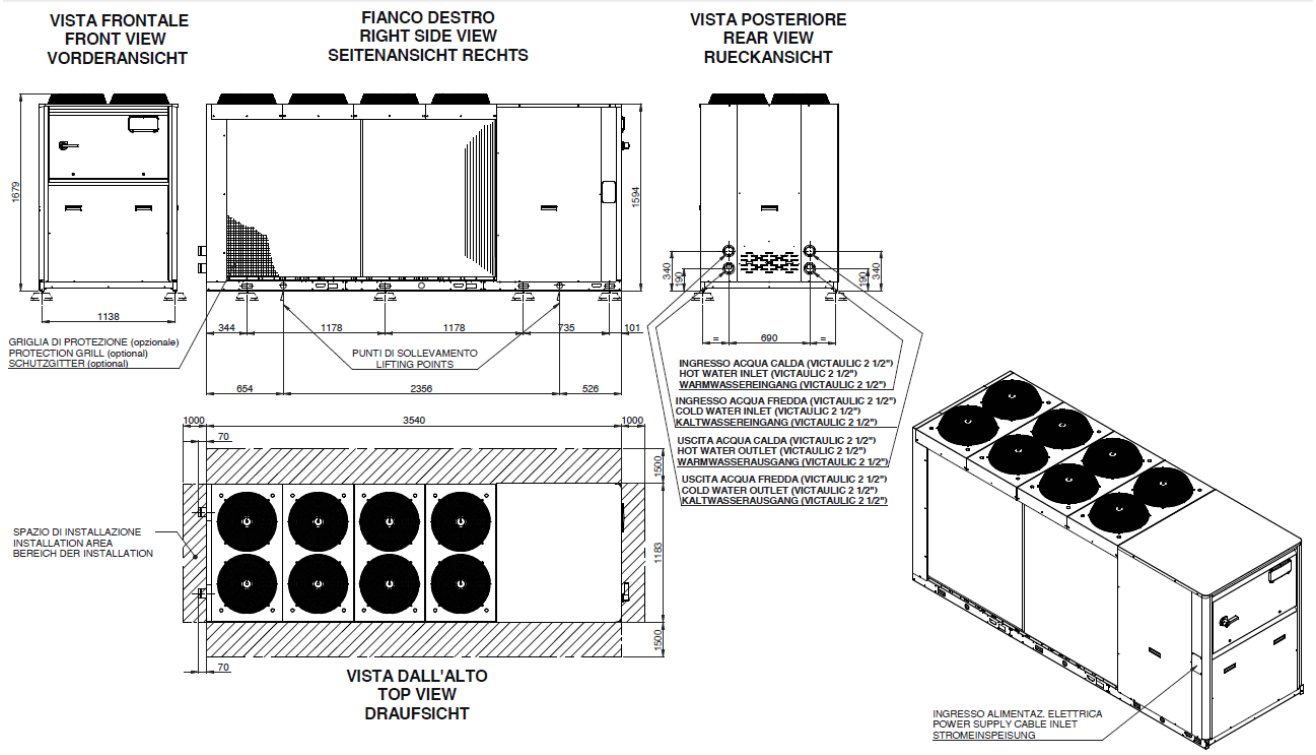
AAH PS PL MS ML 041 and 051 ➔ Box F1+



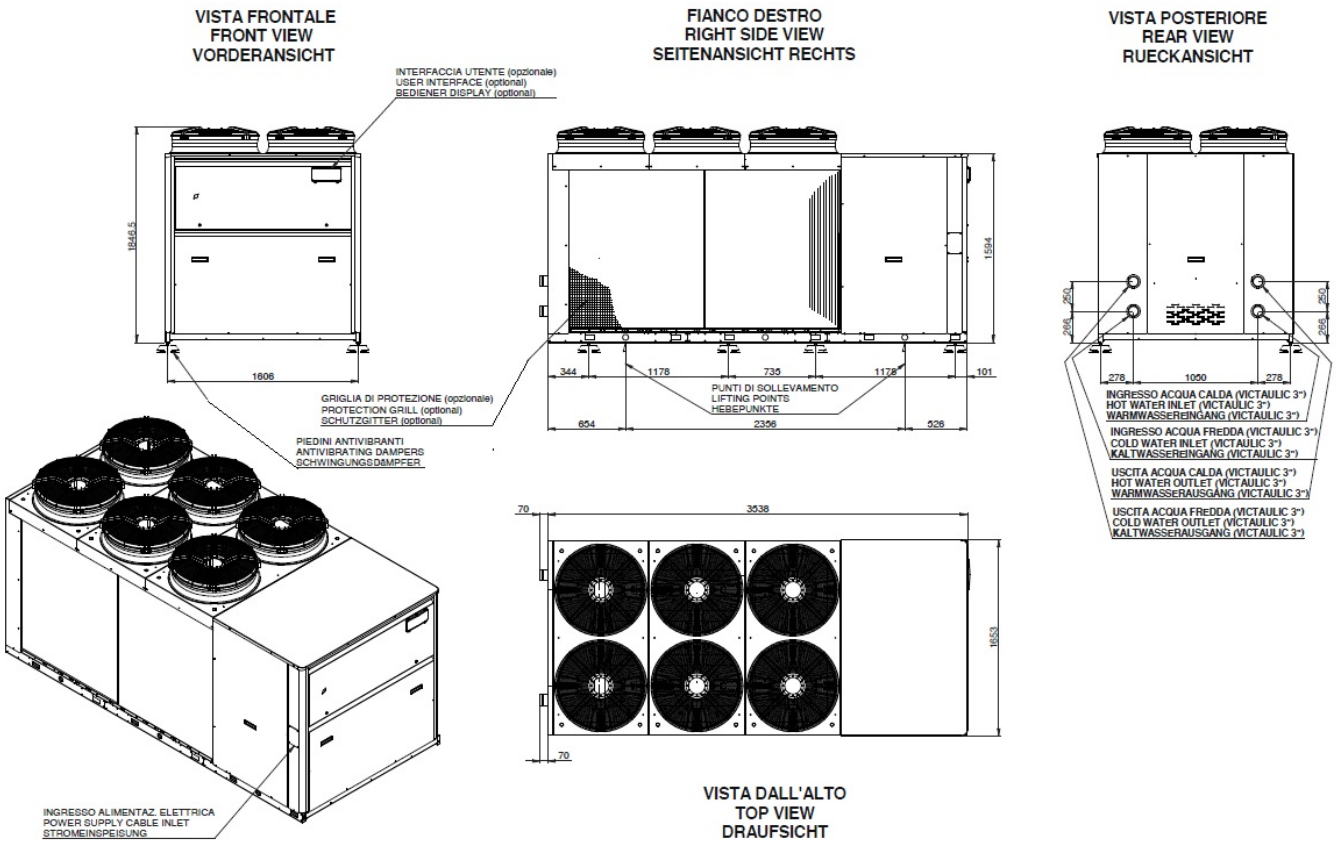
AAH PS PL MS ML 061, 071 and 081 ➔ Box F2+



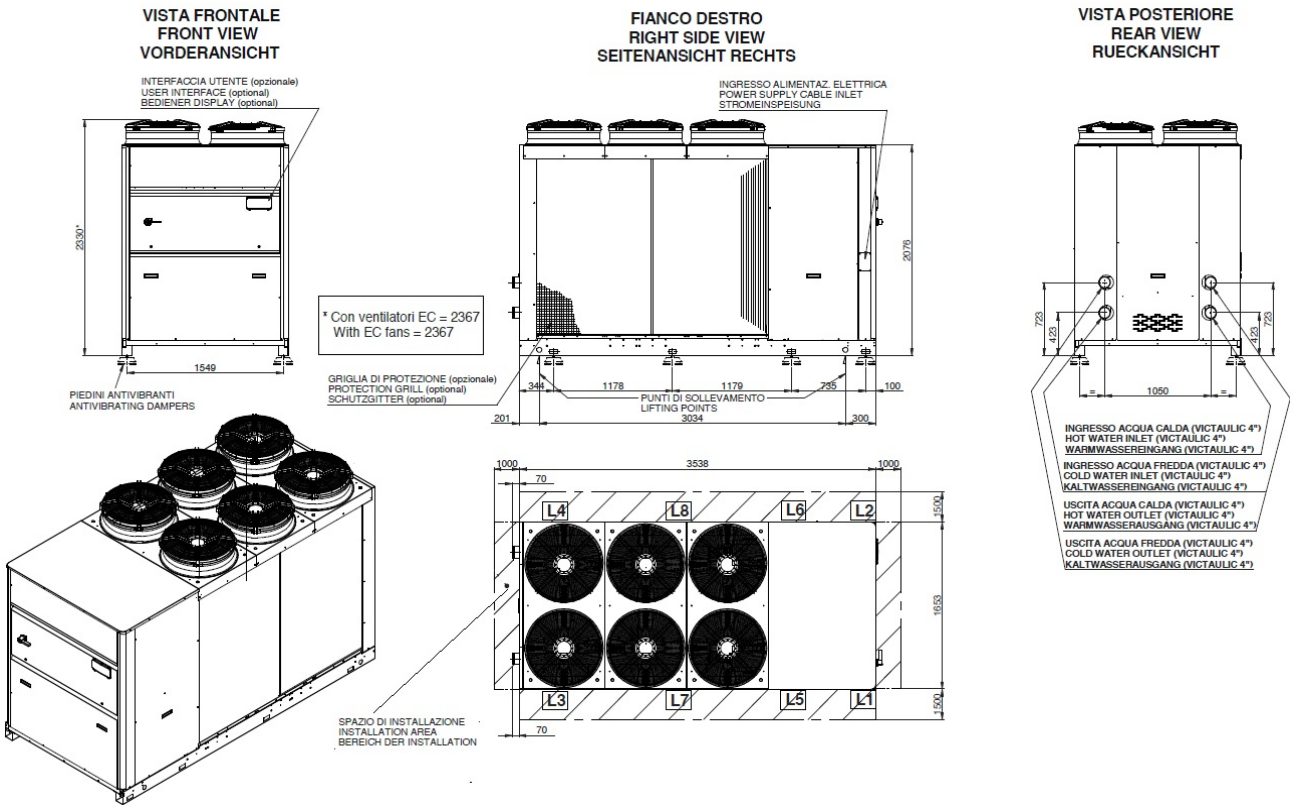
AAH PS PL MS ML 094 and 104 ➔ Box F3+



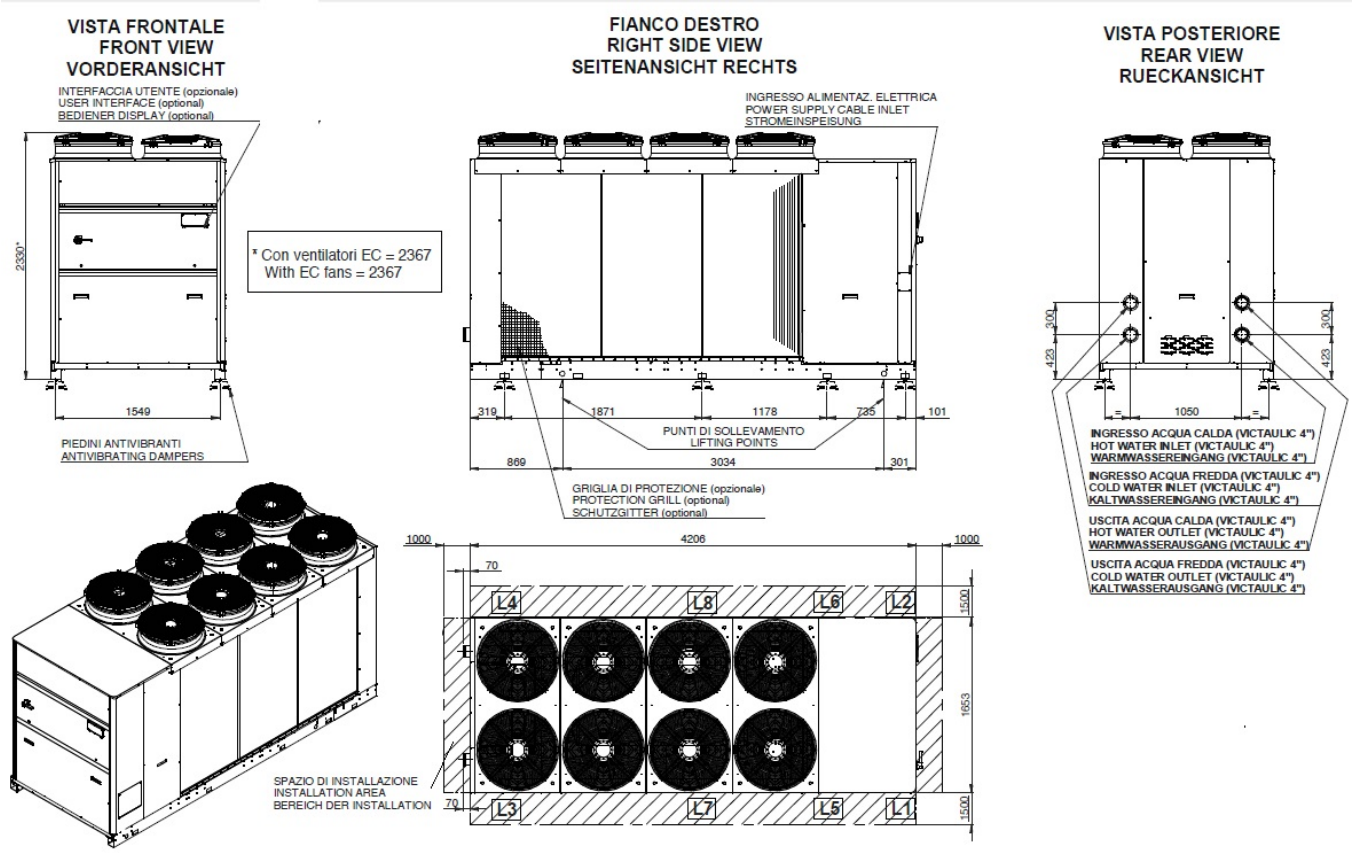
AAH PS PL MS ML 124, 144, 164 and 194 ➔ Box F4



AAH PS PL MS ML 214 and 244 ➔ Box F5



AAH PS PL MS ML 274, 294 and 324 ➔ Box F6



12 Installation

12.1 For further information see the installation, operating and maintenance manual: IOM

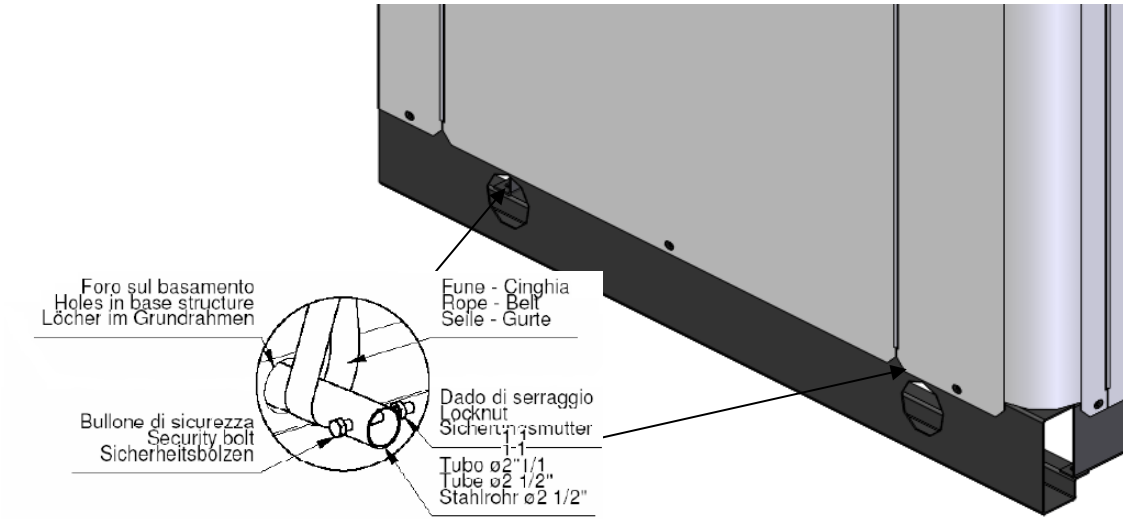
12.2 Preliminary procedures

The machine left the factory in perfect conditions, however when receiving the unit verify its integrity. Immediately report any damage to the carrier and write it down on the Delivery Note before signing it.
LENNOX or its commercial reference must be promptly notified regarding the extent and type of damage. The Customer must submit a written report describing any significant damage.

Lifting and transport

While the unit is being unloaded and positioned, utmost care must be taken to avoid abrupt or violent manoeuvres. Be very careful when transporting it inside rooms. Do not use the unit components as anchors.
The unit should be lifted with Ø1½" GAS steel pipes at least 3 mm thick. Insert them, on the base side members (see fig. below), into the holes marked with stickers. The pipes, which should protrude by at least 300 mm from all sides, must be secured with ropes of equal length to the lifting hook (provide stops at the ends of the pipes to prevent the ropes from slipping off because of the weight). Use ropes or belts long enough to extend beyond the height of the machine. Place spacer bars and boards on top of the unit to avoid damaging the sides and the top of the unit.

Warning: During all lifting operations make sure the unit is firmly anchored, to prevent it from tilting or falling.



Unpacking

Carefully remove any packaging to avoid damaging the machine. Different packaging materials are used: wood, cardboard, nylon etc. Keep them separate and dispose of them at appropriate waste disposal or recycling facilities in order to minimise the environmental impact.
Once the machine is positioned, loosen the bolts to remove the pallet. Then push the unit from below and slide it to its proper position.

Siting

Bear in mind the following when choosing the best site for installing the unit and the connections:
- Size and origin of water pipes;
- Location of power supply;
- Access for maintenance or repairs;
- Stability of the supporting surface.

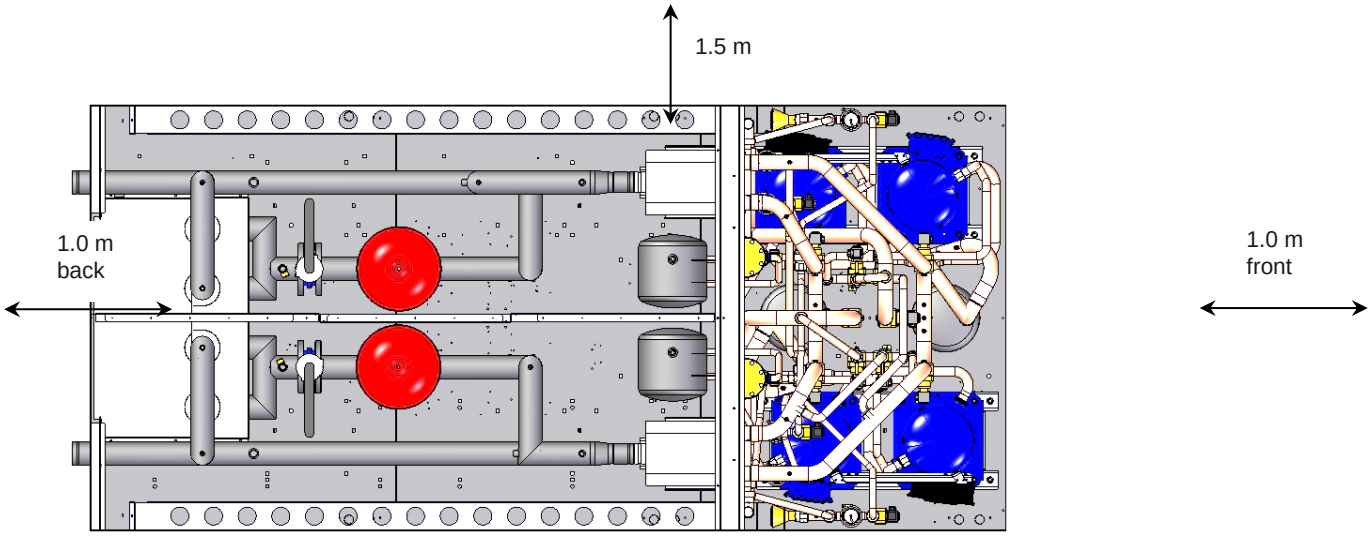
All the models of the AQUA[4] series have been designed and built for outdoor installations. Since soundproofing and protections of components and hot parts are specially designed, the AQUA[4] series models do not need to be kept inside.
It is advisable to place a vibration damping system between the base frame and the supporting surface.

Should refrigerant leak in the vicinity of open flames or in a room without sufficient ventilation, it could catch fire and the combustion by products could be harmful to people.

Installation clearance requirements

It is important to provide an adequate volume of air on the intake and delivery sides of the condensing/evaporating finned coils. It is essential to prevent air recirculation between intake and delivery, as this may affect unit performance or interrupt normal operation. For this reason provide the following clearances (see figure on this page):

- hydraulic connections/back side: at least 1 meter to provide room for water connections and/or maintenance to the flow switch expansion vessel tank pump unit.
- electric panel side: at least 1 meter to guarantee access for inspections and/or for maintenance of cooling components
- finned-pack condenser side: at least 1.5 meters to ensure proper air circulation as well as access (even from the side) to the compressor compartment
- upper side: during expulsion there must be no obstacles.



Top view of the unit

1.5 m

When installing the unit, for safety purposes, make sure that the room temperature does not exceed 50°C (with unit on or off).

12.3 Water connections

When setting up the water circuits for the evaporator follow the instructions below and comply with national or local standards (use the diagrams attached to this document as reference). **Fit the piping to the cooler with flexible joints to dampen vibrations and to compensate for thermal expansion.** Refer to the technical data table for the type and dimensions of the hydraulic connections.
It is recommended to install the following components on the piping:

- temperature and pressure indicators for routine maintenance and inspections of the unit. Pressure control on the water side allows expansion vessel operation to be checked and any water leaks in the system to be detected in advance.
- Sumps on inlet and outlet piping for measuring temperatures, and for directly viewing the operating temperatures. They can also be viewed on the display on board the unit (if pCO).
- Shut-off valves (gate valves) to isolate the unit from the water circuit for maintenance.
- Air vent valves, placed on the higher parts of the water circuit, that bleed the air. The internal pipes of the machine are fitted with manual air vent valves to bleed the unit: **this operation can only be carried out when the unit is disconnected from the power supply**
- discharge cock and, if necessary, drain tank to empty the system for maintenance or seasonal stops
- For process applications, it is recommended to install a decoupling heat exchanger, which avoids the fouling of the heat exchangers
- It is mandatory to install a metal net filter (inlet pipe), with a mesh not above 1 mm, to protect the heat exchanger from slag or impurities inside the pipes. This is especially important during commissioning.

Water connection to evaporator

It is extremely important that the water inlet is connected at the height of the “Water Inlet” sign.

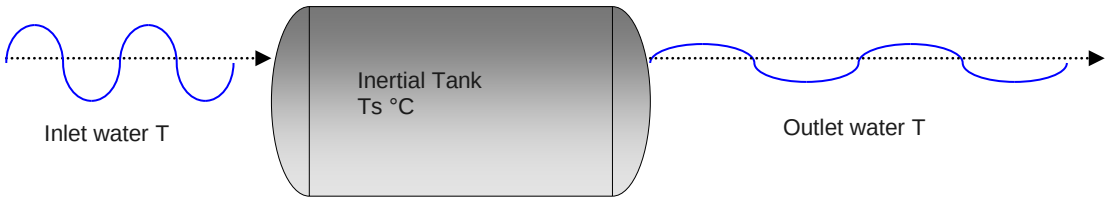
If not, the evaporator would be exposed to the risk of freezing, since the anti-freeze thermostat would not be able to perform its function. Furthermore, in the cooling mode, countercurrent circulation would not be activated. Additionally, this position does not enable consent of the water flow control device.
The dimensions and position of the water connections are provided in the dimensional tables and overall drawings.

The water circuit must guarantee a constant nominal flow rate of water (+/- 15%) to the evaporator in all operating conditions.

The ON/OFF-type compressors work intermittently, since the cooling power required by the utility is not generally the same as that supplied by the compressor. In systems containing little water, in which the thermal inertia is low, verify that the water content of the delivery section (to users) satisfies the equation below:

$$V = \frac{Cc \times \Delta\tau}{\rho \times Sh \times \Delta T \times Ns}$$

V	= water content in user section	[m3]		
Sh	= specific heat of fluid	[J/(kg/°C)]	e.g. 2090 [J/(kg/°C)]	for water
ρ	= density of fluid	[kg/m3]	e.g. 1000 [kg/m3]	for water
Dτ	= minimum time between 2 compressor restarts	[s]	[s]	e.g. 120
DT	= admissible differential on water T	[°C]	e.g. 4 [°C]	
Cc	= Cooling Capacity	[W]		
Ns	= N° of capacity control steps			



The AQUA[4] units are supplied as **standard** with a device that controls the water flow (paddle flow switch supplied on board the machine).
Any tampering with this device will immediately invalidate the warranty.
It is mandatory to install a metal net filter on the water inlet piping.

Warning: Never perform hydraulic connection operations with open flames near or inside the unit.

How to fill up the tank and/or the pumps *(if required by the system)*

The tank is not designed to withstand **vacuum pressures** greater than 0.15 bar. For this reason, make sure that the pressure on the pump intake side, where the expansion vessel is positioned, is always above 0.5 bar with pump running. This helps reduce the risk of cavitation.

It is extremely important that the installer follow and verify this procedure step-by-step to prevent the risk of tank implosion or pump cavitation:

- Drain the expansion vessel until the pressure reaches 0.5 bar
- Fill the system and pressurise it to approximately + 1 bar in pump suction (pump stopped)
- Bleed the system
- Check the pump suction pressure (approximately 1 bar) and start up the system
- Stop the pump after 15-30 minutes. Repeat the procedure from step 3 until no more air system noise can be heard.

12.4 Electrical connections

Before carrying out any operation on electrical parts, make sure that the power supply is disconnected.

Check that the mains electricity supply is compatible with the specifications (voltage, number of phases, frequency) shown on the unit rating plate.

The size of the cable and line protections must conform to the specifications provided in the wiring diagram.

The supply voltage must not fluctuate more than ±5% and the imbalance between phases must always be below 2%.

The machine must operate within the above values, or the warranty will be invalidated.

Cary out the electrical connections following the wiring diagram provided with the unit, as well as current regulations.
An earth connection is **mandatory**: The installer must connect the earth wire to the earth terminal on the electrical panel (yellow and green wire).
The power supply to the control circuit is shunted from the power line through an electric panel transformer.
The control circuit is protected by fuses or automatic switches, depending on the size of the unit.

12.5 Electric connections of the circulation pump

All the units of the LER series are provided with a voltage-free contact on the electrical panel that powers the pump start consent.

The pump, when an integral part of the supply, must be started before the cooler starts and stopped after it stops (minimum recommended start delay: 60 seconds). If it is connected to the electric panel terminal, this function is already performed by the onboard microprocessor

Remote Controls

To remotely switch on and switch off the unit, remove the jumper between the contacts and connect the remote control to the terminals (see attached wiring diagram). Enable the “REMOTE” function with the electric panel switch.

Remote Summer-Winter switching (AQUA^4 M Versions)

To remotely switch the unit from the summer to the winter modes, remove the jumper between the contacts and connect the remote control to the terminals (see attached wiring diagram). Enable the “REMOTE” function with the electric panel switch.

The diagrams were plotted with a temperature differential at the plate exchangers (water circuit) of 5°C

12.6 Use of glycol solutions

Water can be produced at temperatures below 5°C (up to -10°C) using glycol solutions. This lowers the freezing point as shown in the following table:

Minimum temperature of produced water	5 °C	2°C	-1 °C	-5°C	-10 °C
Percentage in weight of ethylene glycol	0 %	10 %	15%	25 %	30 %
Freezing temperature of mixture	0 °C	-4 °C	- 8 °C	-14 °C	-18 °C

For solution concentrations up to 30% in volume of glycol, the drop in thermodynamic circuit performance is minor.
The AQUA^4 units are not guaranteed for applications in circuits with propylene glycol mixtures.

12.7 Operating and storage limits

- Heat transfer fluid: water or mixtures of water and ethylene glycol (max. 30% in volume)

- Maximum water side pressure: = 3 bar
- Maximum pressure on high pressure circuit R410A = 42 bar-r
- Maximum pressure on low pressure circuit R410A = 29 bar-r (*)
- Power supply voltage: = +/- 10% compared to plate voltage
- Maximum storage T = + 50 °C
- Minimum storage T = - 20 °C (limit set by on-board electronics)

(*) this value can only be reached during storage and determines the saturation pressure of 29 bar-r of the refrigerant on the low pressure side of the circuit (value which determines its limits).

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SALES OFFICES :

BELGIUM AND LUXEMBOURG
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GERMANY
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