Armex II Series

ARMSTRONG

Transfer Expansion & Degassing Equipment

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DATE:	August 2010
SUPERSEDES:	8-2
DATE:	June 2010

High Volume Pressurisation and Degassing

Entrained air is often responsible for prolonged and troublesome commissioning periods and, if not effectively eliminated, can lead to premature system failure. The Armex II combines degassing with sealed system pressurisation and automatic water make-up to provide a cost effective and reliable solution.

▶Introduction

Armstrong has decades of experience in providing effective solutions for expansion, and has responded to the need for an effective solution for removing excess air entrained in hydronic systems. In developing Armex II, Armstrong has added an effective degassing function to solve the problem. The Armstrong Armex II solution includes an AVG sealed expansion vessel that works at atmospheric pressure with high acceptance factor, supported by AVF supplementary vessels where required. The expansion vessels are connected to an AM pump and a controller set that uniquely fitted with motorised pressure control valves, provides a tight working pressure bandwidth, automatic water make up and control of the degassing function.

The Armex II range is designed to offer all of these advantages for commercial projects within any reasonable budget. Typical applications involve boiler power of 500 kW or more, requiring an AVG vessel of at least 200 litres.

With the effective deaeration function, Armex II ensures that installations are air-free all the way to the top floor and into the farthest corners. Dedicated and costly air separators are made redundant.

▶Operating Parameters

Liquid Flow Temperature:	Max. 120°C	Min. 0°C
Degassing liquid temperature:	Max. 70°C	
Boiler Power:	Max. 8 MW	Min. 500 kW
Operating Pressure:	Max. 13.0 bar	Min. 1.0 bar
Glycol Systems:	Up to 50% by volume	

▶Armex II Boiler Power Capacity

Armex II AM1:	2 MW	One-pump set with direct on line starter
Armex II AM2-1:	4 MW	One-pump set with Soft Start and minimum pressure valve
Armex II AM2-2:	8 MW	Two-pump set with Soft Start and minimum pressure valves

▶Specifications

Armex II complies with:

- ▶ BS7074 and B4814
- ▶ Water Fittings Directory

OLD

NEW

▶The Armex II Deaeration Feature

Water expands from the pressurised heating or cooling circuit into the sealed rubber membrane in the AVG vessel. The AVG vessel stores liquid at atmospheric pressure. Hence, in line with Henry's Law, which states that the solubility of gas in water is lower at lower pressures, dissolved gases are released from the solution and escape via the air release valve.

The Armex II controller is programmed to pass an adjustable volume of water out of the pressurised heating/cooling circuit into the atmospheric pressure AVG vessel on a timed basis. Thus, the system is kept deaereated on an ongoing basis.

Several deaeration programmes are available to allow the start-up and operating conditions to be optimally adjusted to suit system requirements.

Deaeration Feature Function & Benefits

Conventional Installation:

Systems with unsatisfactory gas removal equipment can suffer repeated pump failures, cold radiators, noisy pipework, corroded heat exchangers. These issues can lead to time-consuming manual venting, tenant complaints and out-of-control maintenance budgets.

The Armex II Benefit:

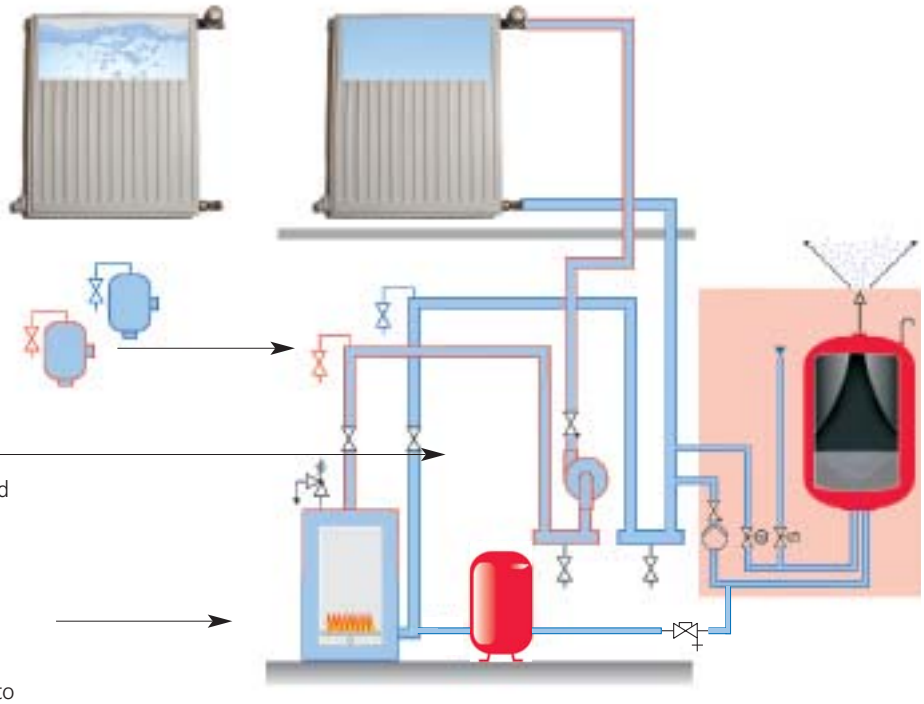
The system water is effectively degassed, removing all gas-related problems.

Armex II Advantages:

- No time-consuming venting of gas from multiple points
- No excessive water flow noise
- Full thermal output from heat/cooling emitters

- No need to fit in-line gas separators, saving cost
- No need to fit Sidestream gas separators, saving cost

- No cavitation or corrosion which leads to reduced repair costs
- Longer pump seal life leads to reduced repair costs
- No pump impeller hub damage leads to reduce repair costs
- No gas bubbles on the boiler heating surfaces means better heat transfer and less corrosion.
- More effective heat distribution leads to reduced tenant complaints and reduced energy costs



▶Technical Specifications

		Operation Parameters					Electro-technical data			
		Permitted operating pressure/bar	Permitted flow temp.(°C)	Permitted operating temp.(°C)	Permitted environment temp.(°C)	Approx. Noise level (dB)	Pump motor kW rating	Pump soft start	Protection type	Electrical supply
Armstrong 'Armex II' 1-pump system										
Armex II	AM1	10	100	> 0-70*	> 0-45	55	0.45	no	IP54	1/50/230
Armex II	AM2-1/60	10	120	> 0-70*	> 0-45	55	0.75	yes	IP54	1/50/230
	AM2-1/75	10	120	> 0-70*	> 0-45	55	1.10	yes	IP54	1/50/230
	AM2-1/95	10	120	> 0-70*	> 0-45	55	1.10	yes	IP54	1/50/230
	AM1-1/140	16	120	> 0-70*	> 0-45	55	2.20	no	IP54	3/50/400
Armstrong 'Armex II' 2-pump system										
Armex II	AM2-2/35	10	120	> 0-70*	> 0-45	55	0.45	yes	IP54	1/50/230
	AM2-2/60	10	120	> 0-70*	> 0-45	55	0.75	yes	IP54	1/50/230
	AM2-2/75	10	120	> 0-70*	> 0-45	55	1.10	yes	IP54	1/50/230
	AM2-2/95	10	120	> 0-70*	> 0-45	55	1.10	yes	IP54	1/50/230
	AM1-2/140	16	120	> 0-70*	> 0-45	55	2.20	no	IP54	3/50/400

→ Pump type
→ Pump amount
→ Technical design

* Mounted in system return line, diaphragm load of the expansion vessel maximum 70°C
Please contact Armstrong if there is an expected continuous temperature ≤ 0°C

▶Master Slave Operation

▶Data Center designs demand a high level of redundancy in their infrastructure, especially on the cooling system. This is translated into the design as 'N+1', where a complete standby unit is required. Often, on extremely critical applications, 'N+2' (two standby units) is specified

▶Where N+1 is specified, the one cooling system is fitted with two separate pressure units that have linked hydraulics and controls

▶The Armex II solution provides either 'Master Slave' or 'Parallel' control, when two such units are installed on one system and wired together using an RS485 interface

▶The two operating modes are:

▶Parallel Operation

- ▶The Master leads and the Slave follows the signals specified by the Master
- ▶If the Master fails, the Slave assumes the role of the Master
- ▶Parallel connection to ensure 100% capacity, with 100% capacity kept in reserve
- ▶The reserve 100% is automatically enabled in order to raise the total capacity to 200%. This keeps security of supply to 100%
- ▶Both Master and Slave operate in parallel to manage the pressure and expansion
- ▶Pumps on Master and Slave operate simultaneously, so that, in the event of pump failure, a pump is always enabled to maintain pressure
- ▶Pressure control valves on Master and Slave operate simultaneously. Therefore, in the event of pressure control valve failure, a pressure control valve is always enabled to maintain pressure
- ▶The pressure signal from the Master is communicated to the Slave by the RS485 link
- ▶Master and Slave operate in the same pressure range
- ▶Pressure fluctuations between the Master and Slave are managed as both units respond to the Master pressure signal
- ▶Both Master and Slave have an AVG vessel with a weight gauge on one foot. If the Master's weight gauge fails, the Slave weight gauge takes over for the Master
- ▶Armex II AVG expansion vessels (both Master and Slave) are hydraulically connected to the system through common flow and return headers

▶Master Slave Operation

- ▶The Master performs all the pressure maintenance
- ▶The Slaves are only used for volume compensation if there is a change of more than 8% in the content of the Master AVG vessel
- ▶The Slaves are set so that the Master maintains the pressure at all times
- ▶Only one pump or control valve is operated at any one time
- ▶If the Master fails, the Slave assumes the role of the Master
- ▶Master and Slave operate in the same pressure range
- ▶Both Master and Slave have an AVG vessel with a weight gauge on one foot. If the weight gauge fails in the Master, the Slave (with its own weight gauge) takes over as the Master
- ▶Armex II AVG expansion vessels, on Master and Slave, are not hydraulically connected to each other

▶Microprocessor Control CE

Feature	Function
Pressure pumps	Enable when pressure falls below P_i + 0.3 bar Disable at P_a + 0.2 bar. Armex AM2 models have soft start pumps.
Motorised pressure control ball valve(s)	Open when pressure rises above P_i + 0.3 bar and close when pressure falls below P_a -0.2 bar. Three deaeration operating modes: Continuous; occasional and top-up. AM2 models fitted with second Motorised pressure control ball valve
Water make-up solenoid valve	Automatic water make up when water level in AVG vessel falls below minimum value
Automatic cycling	Automatic cycling and changeover on failure of pumps and motorised pressure control ball valves on AM2 models
Display Text	Operating pressure, water level percentage, function operating e.g pressure min/max, low water level, time to next maintenance
LED messages	▶ Hand/off/auto ▶ Pump running ▶ System over pressure ▶ Water make-up operational ▶ Low water ▶ Volt free contact enabled
Volt free contact common alarm	Standard Programmable to another function
Volt free contact low water level.	Standard
Data output	RS485 serial link
Parameter setting (in customer menu)	Minimum operating pressure (P_i); deaeration mode; deaeration duration; date; time; language (choice of eight)
Queries (in customer menu)	Fault memory, stored in date order, with fault type specified. Operating pressure parameter memory, stored in date order

▶Inspection

Armex II is CE marked and inspected to DIN4751 T2 for heating systems.
AVG and **AVF vessels** are built and inspected as per EU pressure equipment directive 97/23/EU.

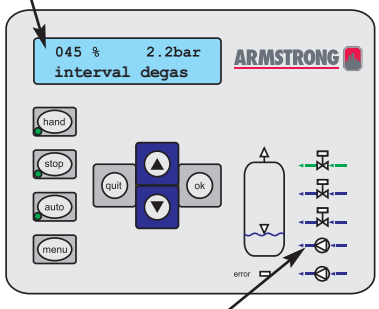
▶Control Options

BMS expansion module offers four additional programmable, volt-free contacts and six digital inputs.

Communication module for remote operation up to 1000m from the set

▶The Control Panel

Display with message lines using clear text LCD, multilingual



Function diagram using LED

▶Armex II Control Units

For cooling water systems up to 30°C only 50% of the nominal heating power should be considered when selecting the control unit.

Recommended performance range is ≤ 500 kW and V_n <200 litres (green area).

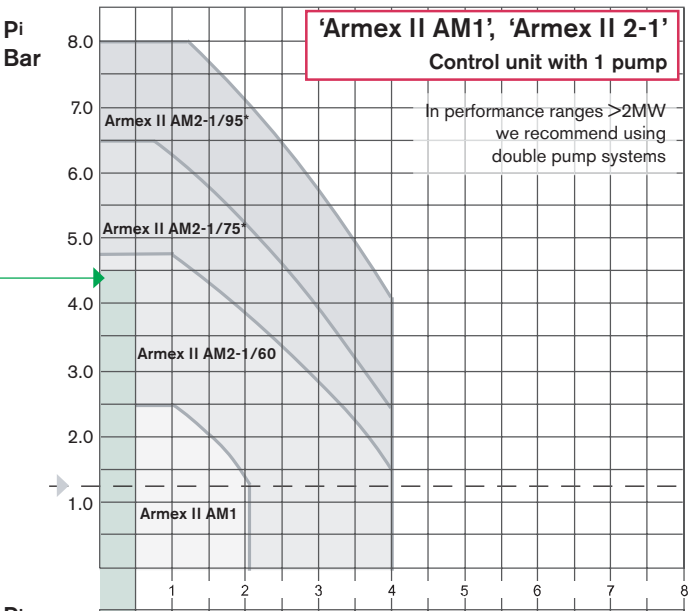
Armstrong recommends the use of 3750 Pulpress with DE range expansion vessel.

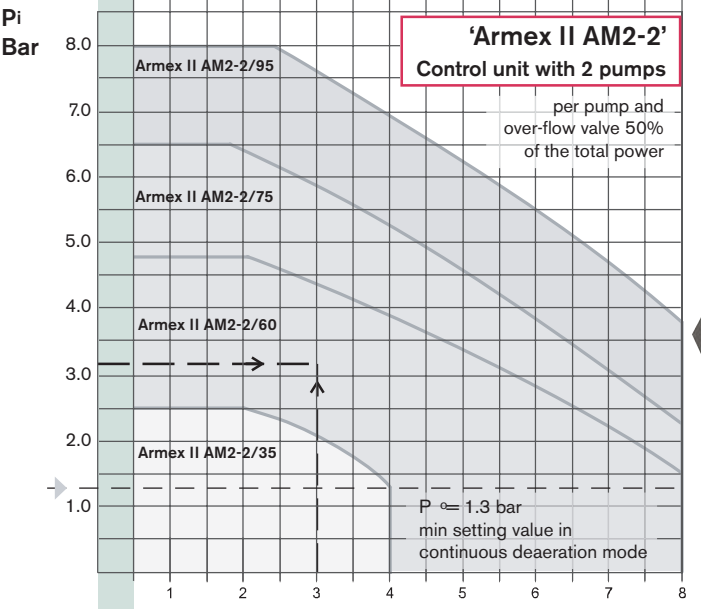
Minimum operating pressure P_i/bar

$$P_i \geq \frac{H[m]}{10} + \begin{matrix} 0.2 \text{ bar } [\leq 100°C] \\ 0.5 \text{ bar } [\leq 105°C] \\ 0.7 \text{ bar } [\leq 110°C] \\ 1.2 \text{ bar } [\leq 120°C] \end{matrix}$$

Anti-flash margin
H = static height

* Please note the different P_i values when placing an order





▶Armex II AVG, AVF Vessels

Nominal volumes V_n
Approximate value from the diagram opposite

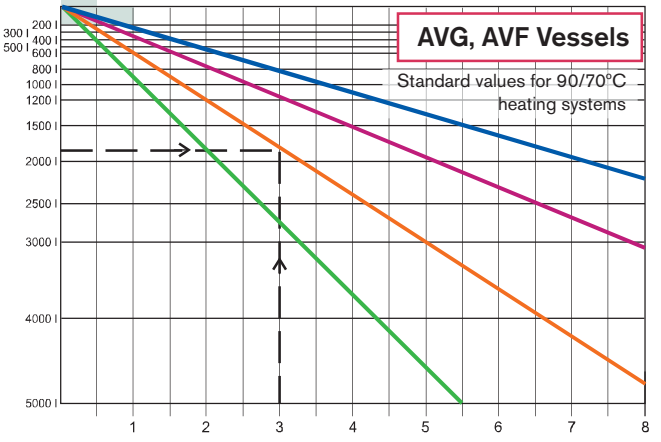
or

calculate according to the formula below

$$V_n \geq V_A \times \begin{matrix} 0.031 & [\ 70°C] \\ 0.045 & [\ 90°C] \\ 0.054 & [100°C] \\ 0.063 & [110°C] \end{matrix}$$

Setting temperature
V_n = Nominal volumes
V_A = System water contents

The nominal volumes can be distributed to several vessels (AVG primary vessel and AVF secondary vessel).

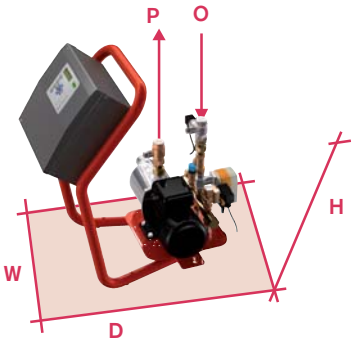


6.0 litre/kW convectors
13.5 litre/kW radiators
8.5 litre/kW flat/ventilation
20.0 litre/kW

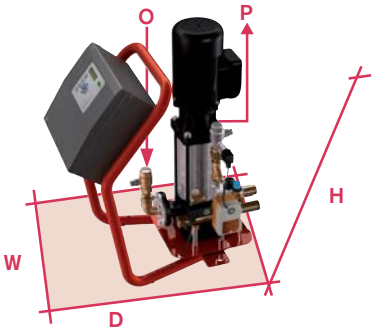
▶Dimensions - Fill Set

▶Armex II AM1, Armex II AM2-1 Control Unit With 1 Pump

Type	P_i	H	W	D	Connection				Weight
	bar	mm	mm	mm	P	O	W	AVG	kg
Armex AM1	≤ 2.5	680	530	550	Rp 1	Rp 1	Rp ½	2 x G 1	25
Armex AM2-1/60	≤ 4.8	680	530	630	Rp 1	Rp 1	Rp ½	2 x G 1	28
Armex AM2-1/75	> 4.8-6.5	750	530	630	Rp 1	Rp 1	Rp ½	2 x G 1	35
Armex AM2-1/95	> 4.8-80	800	530	630	Rp 1	Rp 1	Rp ½	2 x G 1	37
Armex AM1-1/140	> 13.0	770	530	540	Rp 1	Rp 1	Rp ½	2 x G 1	47



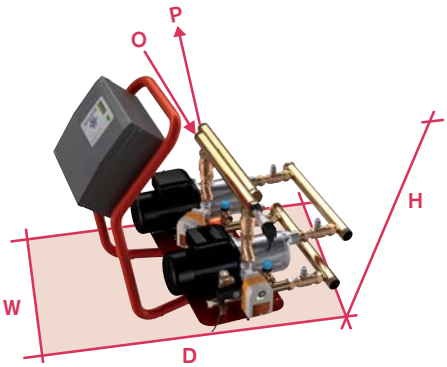
Armex AM1
Armex AM2-1/60



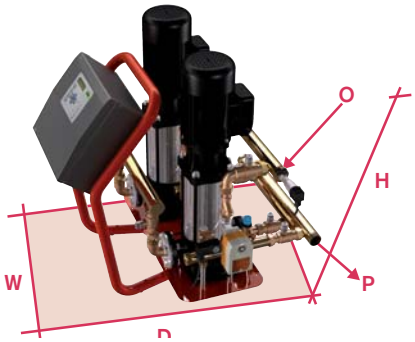
Armex AM2-1/75
Armex AM2-1/95

▶Armex II AM2-2 Control Unit With 2 Pumps

Type	P_i	H	W	D	Connection				Weight
	bar	mm	mm	mm	P	O	W	AVG	kg
Armex AM2-2/35	≤ 2.5	680	700	780	G 1¼	G 1¼	Rp ½	2 x G 1¼	25
Armex AM2-2/60	≤ 4.8	680	700	780	G 1¼	G 1¼	Rp ½	2 x G 1¼	28
Armex AM2-2/75	> 4.8-6.5	750	700	780	G 1¼	G 1¼	Rp ½	2 x G 1¼	35
Armex AM2-2/95	> 4.8-80	800	700	780	G 1¼	G 1¼	Rp ½	2 x G 1¼	37
Armex AM1-2/140	> 13.0	760	700	730	G 1¼	G 1¼	Rp ½	2 x G 1¼	96



Armex AM2-2/35
Armex AM2-2/60



Armex AM2-2/75
Armex AM2-2/95

▶Expansion module (optional)

Additional isolating amplifier in the controller for pressure and level as well as six digital inputs and four volt free outputs.

▶Communication module (optional)

For the external operation of the control unit using a twin-core cable up to 1000m

▶Dimensions - Expansion Vessel

Type	ØD mm	H mm	h mm	Connection Size	Weight kg
200	634	1060	146	G1	37
300	634	1360	146	G1	54
400	740	1350	133	G1	65
500	740	1570	133	G1	78
600	740	1790	133	G1	94
800	740	2240	133	G1	149
1000	740	2690	133	G1	156
1000	1000	2060	289	G1	320
1500	1200	2150	368	G1	465
2000	1200	2610	368	G1	565
3000	1500	2610	393	G1	795
4000	1500	3180	393	G1	1080
5000	1500	3720	393	individual	1115

V_n Normal volumes/litre

▶Armstrong Fill Units

- ▶ WRAS approved RPZ valve, specified for type BA separation for wholesome water, protecting against Category 4 fluids. (default option)
- ▶ WRAS approved 3750 Pulpress 2SL, specified for type AB separation for wholesome water, protecting against Category 5 fluids. (at extra charge)
- ▶ WRAS approved 3750 Pulpress 2VL, specified for type AB separation for wholesome water, protecting against Category 5 fluids (at extra charge)

▶See leaflet 8-1 for 3750 Pulpress data

▶Connection Set G 1

For the connection of Armex II single pump systems to AVG primary vessels with secured shut-offs and screw connections

AVG vessel ø/mm	Weight kg
480 - 740	2
1000 - 740	3

▶Connection Set G 1¼

For the connection of Armex II double pump systems to AVG primary vessels

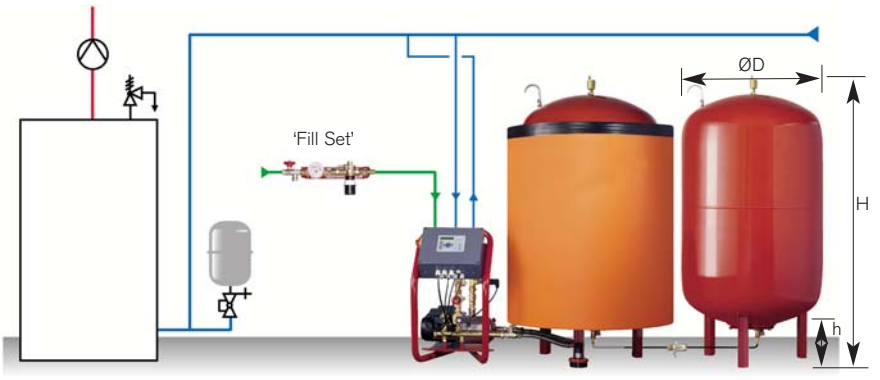
AVG vessel ø/mm	Weight kg
480 - 740	2
1000 - 1500	3

▶Commissioning

System commissioning by qualified Armstrong personnel is available. The service ensures that the unit is fully functional and adjusted to match system requirements.

▶Fully Packaged

Armex II is available in fully packaged format with up to two number 1000 (740D) vessels.



DE range buffer vessel | AM Control Unit | AVG primary vessel with flexible hose connections | AVF secondary vessel

▶General Information

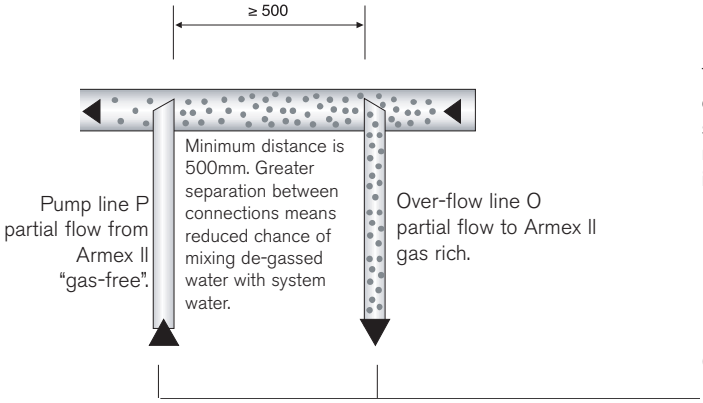
▶ Key Instructions for Installation, Operating and Maintenance

- ▶ Install the system vertically in a frost-free ventilated room with water drainage facilities
- ▶ Install the control unit and the vessels, preferably at the same level. The control unit must not be mounted higher than the vessels. Install the vessels vertically
- ▶ Connect the pumps and the over-flow lines in the system so no coarse dirt can ingress
- ▶ The pressure cell for the level measurement must be mounted on the appropriate foot of the AVG primary vessel. The AVG primary vessel and the first secondary vessel must always be flexibly connected with the supplied connection set to ensure that the level measuring is not impaired.
- ▶ No fixed fastening of the AVG primary vessel to the floor.
- ▶ VW thermal insulation for the AVG primary vessel is recommended for heating systems.
- ▶ Rinse the connection lines prior to installation

▶ Key Instructions for Connecting

The function of the Armex II deaeration is only ensured when the connection of the Armex II has been performed in a representative main flow of the installed system. The following minimum volume flows V must be maintained during the operation. With an inclination of $\Delta t = 20K$ this reflects a minimum performance setting of the accepting system of Q.

	Armex II 1	Armex II 2-1	Armex II 2-2/35	Armex II 2-2/60-95
V	2 m³/h	4 m³/h	2 m³/h	4 m³/h
Q	47kW	94kW	47kW	94kW



The connection lines should be connected from the top or, as shown, as immersion lines in the main line in order to avoid direct ingress of coarse dirt in the Armex II.

Check Operation and Maintenance Manual for instructions on sizing expansion lines correctly.

- ▶ **Individual Protection:** Due to the high deaeration performance of Armex II, an DE range expansion vessel will be supplied, to be installed on the heating circuit. The S range vessel minimises the operating cycles of Armex II.
- ▶ **Connection to the System:** System connection to be made as indicated above in order to reduce ingress of dirt into Armex II.
- ▶ **Water Make-Up Connection:** The solenoid valve that operates the water make up device must be protected from dirt ingress. We recommend either the "Fill Set" (an RPZ valve based device which contains a filter) or a 3750 Pulpress make-up unit.

▶Typical Specification

- ▶ Type AM sealed system pressure control and degassing unit with automatic water make up. Duty and standby pump with soft start. Motorised pressure control ball valves for each pump operated pressure control valves for each pump. Automatic degassing on a programmable and timed basis. IP54 enclosure control panel incorporating two programmable volt free contacts and an RS485 serial link, LED read out of pressure and vessel % full in clear text. Graphical display of water make up, overflow and pump operation. Hand /off/auto switch. Fault memory in chronological order. Parameter setting. Eight languages. Suitable for glycol solutions up to 50% concentration. Wired for a 1/50/230 supply
- ▶ Type AVG steel expansion tank fitted with replaceable EPDM diaphragm, load pressure cell, air release valve to release free air from within the diaphragm and air vent to allow the vessel to remain at atmospheric pressure.
- ▶ BMS compatibility provided with two volt free contacts (common alarm and low water level in AVG vessel)
- ▶ Fill set with RPZ valve ensuring category BA separation from category 4 fluids. WRAS approved.
- ▶ DE60 10 bar rated WRAS approved buffer vessel, supplied loose.

We reserve the right to alter dimensions and specifications without notice.

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