

## Installation and Operating Instructions

### Armex II

### Pressure Maintaining and Degassing Unit



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## General

### Overview

#### Armex II AM control unit

- 1 Cap ball valve Rp 1 (obscured) to the pump pressure line
- 2 Pressure transducer
- 3 Motorised ball valve (make up)
- 4 Dirt trap
- 5 Cap ball valve Rp 1 to the overflow line
- 6 Motorised ball valve
- 7 Non-return valve
- 8 Pump
- 9 Pump drain plug (out of shot)
- 10 Safety valve

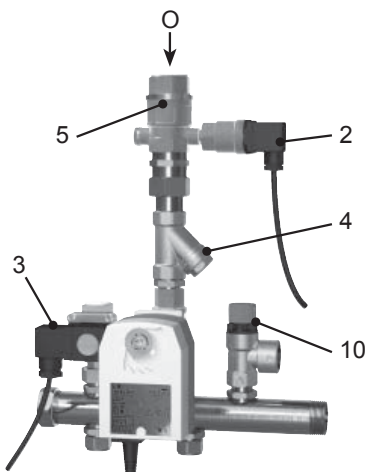
#### Armex II AM controller

- 11 Control box IP 54
- 12 Lockable power switch (only with 'AM 2')
- 13 Control panel

#### Armex II AM connection set

- 14 Cap ball valve
- 15 Flexible connection hoses

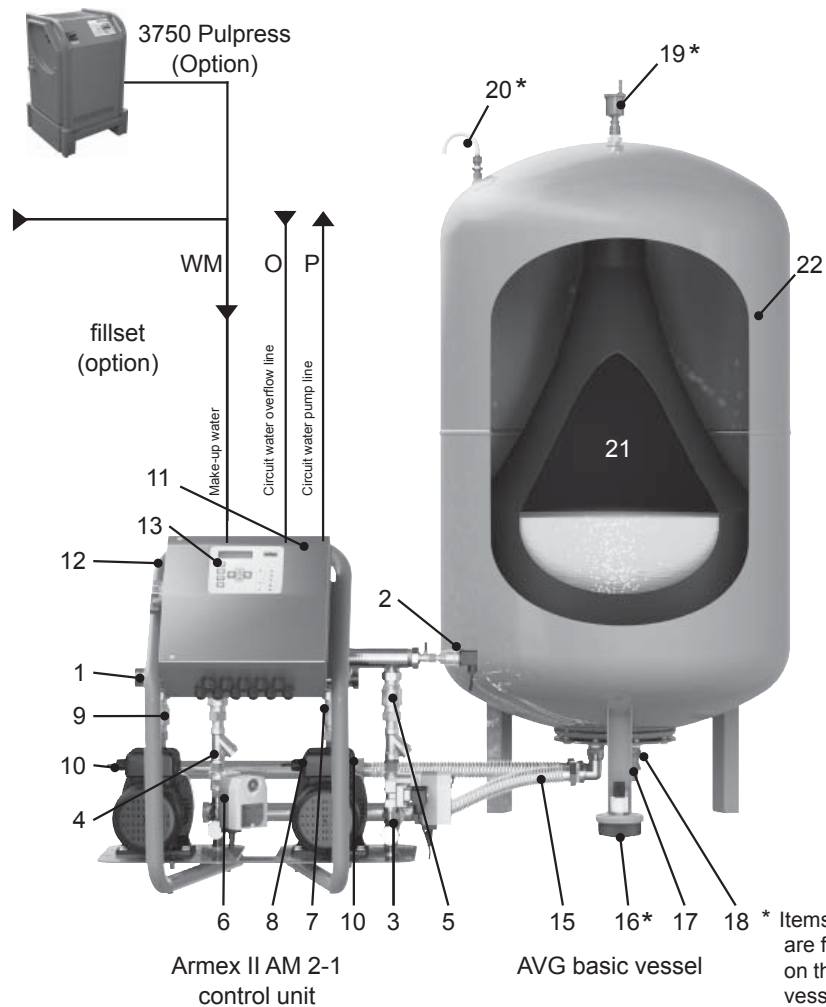
#### Escape line



Close-up of the Armex II

#### AVG basic vessel

- \* 16 Contents load cell
- 17 Filling and draining tap
- 18 Connection for AVF secondary vessel up to 1000 l  $\varnothing = 740$  mm
- \* 19 Dipstick-tube degassing unit
- \* 20 Opening for air compensation between vessel wall and diaphragm (compensating bend)
- 21 Diaphragm
- 22 AVG basic vessel

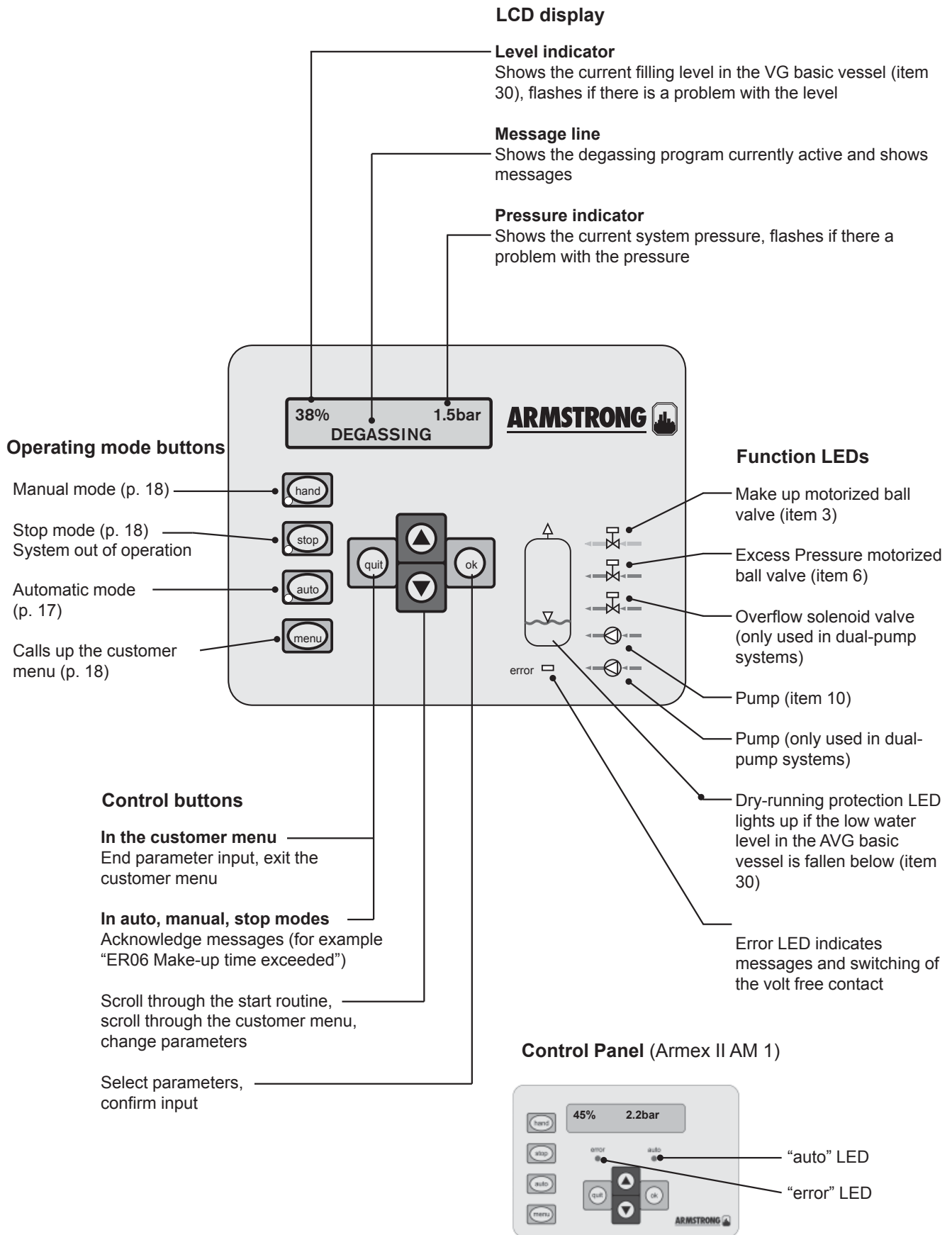


\* Items 17, 19 and 20 are factory installed on the AVG or AVF vessel


#### Type key for control unit

- Technical version
  - Number of pumps
  - Pump type
- Armex II 2 - 1/ 60  
 Armex II 2 - 2/ 75  
 Armex II 1 (only 1 pump and one type)

## Control Panel (Armex II AM 2)



**Note:**

 means "press button" throughout the rest of the assembly, operating and maintenance instructions

## **General Safety Instructions**

Armstrong Armex II is a pump-controlled pressure-maintaining, degassing and water make-up station essentially consisting of a AM control unit with pressure sensor, pump, overflow valve, make-up solenoid valve and safety valve and one or more AVG and AVF vessels.

A diaphragm divides the vessel into a water space and a gas space without a pressurised cushion of air.

The selected technical specification for fulfilment of the fundamental safety requirements outlined in Appendix I of the directive 97/23/EC can be found on the name plate or in the declaration of conformity.

The declaration of conformity in the appendix certifies compliance with the EU directives 97/23/EC on pressure equipment and 89/336/EC on electromagnetic compatibility.

## **Assembly, operation, inspection prior to start-up, periodic inspections**

Recommended inspection intervals according to § 15 (5) of the Ordinance on Industrial Safety and Health and classification of the AVG basic vessels and AVF secondary vessels in Table 2 of directive 97/23/EC, see the section "Inspection intervals". Only AVG basic vessels and AVF secondary vessels without visible external damage to the pressure vessel may be installed and operated. Tension-free (moment-free) installation is required. An additional load from pipelines or devices is not permitted.

## **Changes to the control unit or the Armex II AVG and AVF vessels**

such as welding work or adjustments to the circuitry, for instance, are not permitted. If parts are exchanged, only manufacturer's original parts may be used.

## **Adherence to parameters**

Details concerning the manufacturer, year of manufacture and serial number as well as the technical data are provided on the name plate on the Armex II AVG basic vessels and AVF secondary vessels. Suitable safety measures must be implemented to ensure adherence to the permissible maximum and minimum operating parameters (pressure, temperature, electrotechnical data) specified on p. 24. Violation of the permissible electrotechnical data and the permissible excess operating overpressure on the water side, both during operation and when filling, must be ruled out.

## **Corrosion, incrustation**

AVG and AVF vessels are made from steel and feature an external coating. Inside, a diaphragm prevents the expansion water coming into direct contact with the vessel walls. A corrosion allowance of 0.1 mm has been taken into consideration for the wall thicknesses of the vessels with technical specification AD 2000 (→ name plate). The vessel connections are raw inside. The vessels may only be used in atmospherically closed systems with non-corrosive and chemically non-aggressive and non-toxic waters. The ingress of atmospheric oxygen into the entire heating and cooling water system due to permeation, make-up water and so on is to be reliably minimised during operation. Water treatment systems are to be designed, installed and operated according to the state of the art.

## **Thermal protection**

In heating water systems, the operator must affix a warning notice near the Armex II system if there is a risk of injury from excessive surface temperatures.

## **Installation site**

Adequate load-bearing capacity of the installation site must be ensured, taking into consideration the complete filling of the Armex II AVG basic vessels and AVF secondary vessels with water. Installation in earthquake zones is not permitted. The installation room must be frost-free. A drain is to be provided for the waste water. Provision is to be made for the addition of cold water if necessary.

## **Electrical connection**

Electrical wiring and connection must be performed by a qualified electrician according to the applicable local regulations (electricity board and EN). The system must be de-energised before any work is carried out on electrical components.

Failure to heed these instructions, in particular the safety instructions, may result in the destruction of and defects in the Armex II, personal injury and impaired operation. Any and all claims for warranty and liability are excluded if these instructions are violated.

## Assembly

### Scope of Supply

**Note:-** Please check the delivery for completeness and damage immediately upon receipt of the goods! Transport damage must be reported immediately!

The scope of supply is described on the delivery note and the contents indicated on the cardboard box.

**Main components required for proper functioning of the system** (→ see also p. 3)

- Armex II AM control unit } on pallet,  
connection set } connection set in separate cardboard box, foil pocket with operating instructions and electric circuit diagram
- AVG basic vessel with ancillary parts factory fitted
- DE Buffer vessel supplied loose

### Possible options

- Armex II AVF secondary vessel with flexible hose set and add-on parts in a foil bag on the vessel foot
- Armstrong 'fillset'
- Add-on module (attached and wired upto an controller)
- Bus module (attached and wired upto an controller)
- Communication module (control panel for remote control)
- Pulpres 3750 ,fillset with DE 60 Buffer vessel

### Installation Site

Choose the installation site. Please note that the control unit and the AVG/AVF vessels must be placed one next to the other on the same level.

Requirements for the installation room:

- Frost-free, well-ventilated room; room temperature > 0 to max. 45°C
- No unauthorised access
- Level floor with adequate load-bearing capacity and drainage facility
- Filling connection DN 15, according to DIN 1988 P 4; max. normal pressure 6.0 bar
- Electrical connection to 230 V~, 50 Hz, 16 A with upstream ground fault circuit interrupter: tripping current 0.03 A

The Armex II AM set manifolds are labelled as follows:

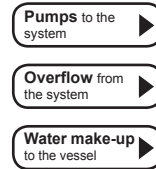
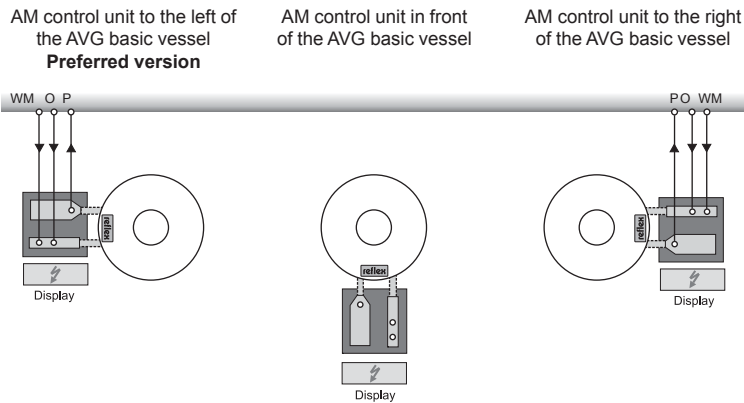
- Label "A" Connect to the mains water supply
- Label "B" Connect to the upstream system connection point
- Label "C" Connect to the downstream system connection point
- Label "D" Connect to AVG vessel
- Label "E" Connect to AVG vessel



## Installation of the Armex II AM control unit

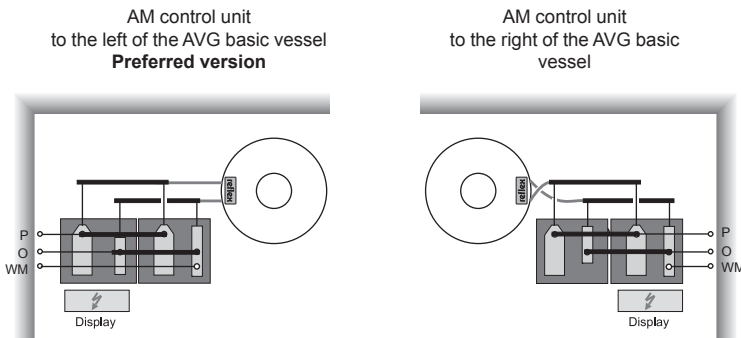
There are numerous installation variants for the control unit.

### AM1 and 2-1 single-pump system



Installation of a single-pump system

### AM 2-2 dual-pump system

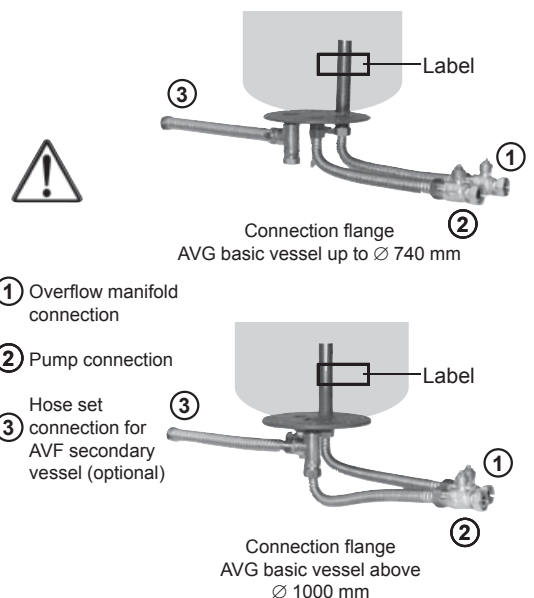


Installation of a dual-pump system

- Remove the control unit from the pallet.
- Transport to the installation site, making sure that the control unit is carried by the frame.
- When aligning the control unit, make sure that the valves and feed facilities of the connection lines can be operated. The base plate of the single-pump systems can be turned.
- Align the AM control unit and AVG basic vessel.
- Tension-free (moment-free) installation is required. An additional load from pipelines or devices is not permitted.
- The safety valve (27) on the control unit must be equipped with a blow-out line on site; this line must be laid in such a manner that any risk of injury from the escaping medium is ruled out.

### Installation of the AVG basic vessel

- Align the AVG basic vessel so that the label with the connection faces the connection points (2x external thread) of the control unit and the distance to the control unit corresponds to the length of the connection set.
- Assemble the level gauge (→ p. 9) and add-on parts (→ p. 8).
- Screw the connection set ① ② using the screw connections to the two free 1" pipe nipples on the lower vessel flange with seal.
- In the case of dual-pump systems it must be ensured that the longer hose is used for joining the pump suction side with the vessel.
- Ensure that the overflow manifold connection ① and the pump connection ② are not confused. If they are, there is a risk the pump may run dry.
- It is imperative that the control unit and the AVG and AVF vessels are installed at the same level. On no account should the control unit be higher than the vessels.



## Installation of the AVF secondary vessel

The hose set ③ enclosed with the AVF secondary vessel must be assembled at the outlet of the AVG basic vessel intended for this purpose and individually connected to the piping provided on site.

Only two R1 connection nipples are available on the flange of the AVG basic vessels above 1000 l Ø 1000 mm. In this case the hose set of the AVF secondary vessel has to be assembled at the connection ② using the T-piece. (Diagram on p. 7.)

## Assembly of the add-on parts for AVG and AVF vessels

Dipstick-tube degassing, venting of the diaphragm compartment (compensating bend)

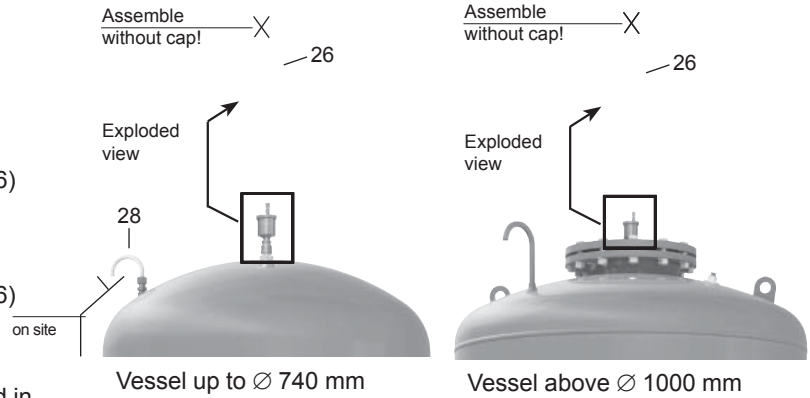
The add-on pieces are affixed to the vessel foot and packed in a PE bag.

With AVG and AVF vessels up to Ø 740 mm:

- Evacuation device with ventilation protection (26)
- Reducing sleeve Rp 1/2 x Rp 3/8

With AVG and AVF vessels above Ø 1000 mm:

- Evacuation device with ventilation protection (26)
- Reducing sleeve R 1 x Rp 3/8



These parts must be sealed, assembled and mounted in the middle vessel connection on the vessel. The plastic cap of the ventilation protection must be removed.

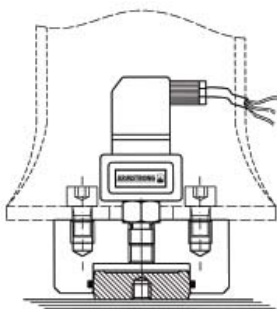
Assemble the supplied compensating bend (28) with the clamping ring connection at the vessel connector for evacuation and ventilation of the diaphragm compartment.

**Attention!** The compensating bend (28) must not be sealed! A draining facility must be provided on site, for example via a funnel.

## Assembly of the level gauge at the AVG basic vessel

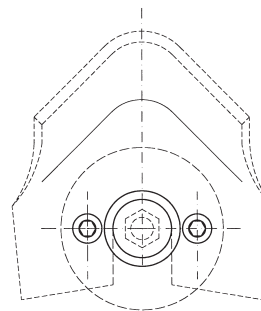
The level gauge should only be mounted when the AVG basic vessel is in its final position. The transport protection (wooden block) at the vessel foot of the basic vessel must be removed and replaced with the pressure cell (23). Above a vessel size of 1000 l (Ø 1000 mm), the level gauge must be mounted using the screws supplied.

Front view



- Make sure the system is freestanding!
- Do not tilt the pistons!

Top view



- Remove the transport protection
- Push the oil pressure cell underneath and bolt onto the foot in the case of vessels above 1000 l (Ø 1000 mm)

**Caution:**

The following points must be noted to ensure correct operation of the level gauge:

- The vessel must be freestanding and vertical on a stable and level surface (do not bolt down, set in concrete, and so on.).
- Auto-zeroing of the filling level may only be performed with the vessel aligned and empty.
- The vessel foot should not be subjected to any impact loads once the level gauge has been mounted (for example during installation/plumbing of the vessel).
- Always connect the AVG basic vessel and the first AVF secondary vessel flexibly using the connection sets supplied.

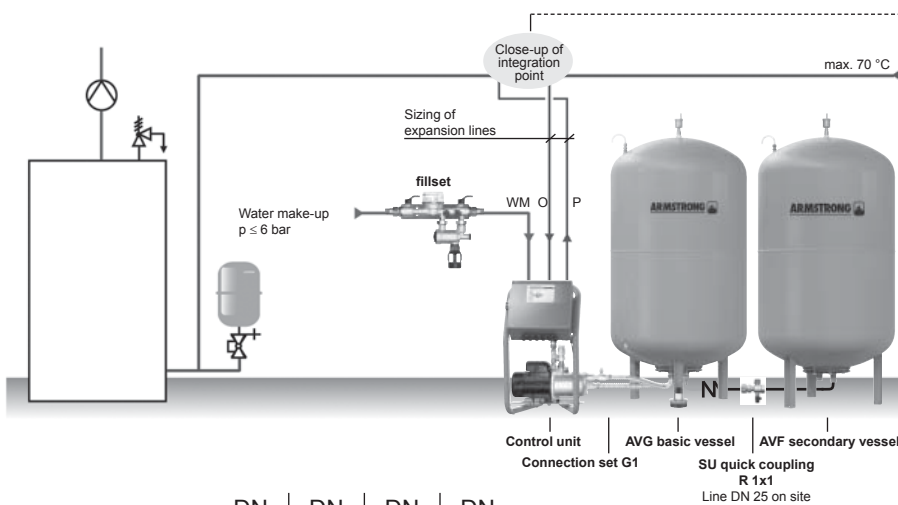
Non-compliance with these instructions may cause measuring errors as well as malfunctions of and damage to the level gauge.

Level gauge information:

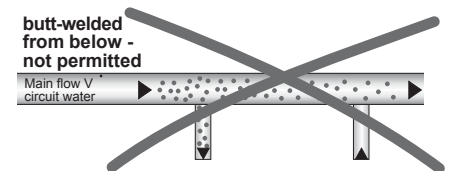
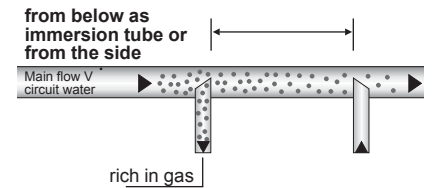
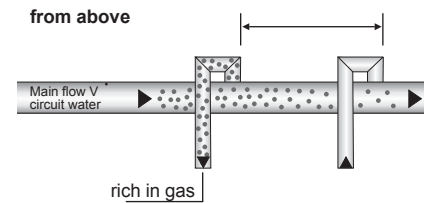
AVG	200 l	:	0 - 4 bar
AVG	300 - 500 l	:	0 - 10 bar
AVG	600 - 1000 l	:	0 - 25 bar
AVG	1500 - 2000 l	:	0 - 60 bar
AVG	3000 - 5000 l	:	0 - 100 bar



## Connection of the AM control unit, expansion lines



### Close-up of integration point



	DN 25	DN 32	DN 40	DN 50
AM 1	x			
AM 2-1/...		x		
AM 2-2		x		
AM 2-2 $p_0 \leq 3.5$ bar			x	
AM 2-2 $p_0 > 3.5$ bar				x

$p_0$  = minimum operating pressure, → p. 15  
expansion lines > 10 m length install one size larger

### Expansion lines (O, P)

The additional degassing function means that two expansion lines (O, P) must always be installed for the Armex II. Regardless of the Armex II nominal connection width, the size of the expansion lines must at least correspond to the values specified in the table.

Integrate the overflow line (O) ahead of the pump line (P) seen in the direction of flow of the system. Integrate the Armex II in a representative main flow of the system. Max. medium temperature at the integration point 70 °C, max. glycol content 50%.

To avoid coarse dirt entering and overloading the Armex II dirt trap, integration must be performed according to the above diagram (see "Close-up of integration point"). Flush the pipelines of the heating system and the potable water make-up unit prior to start-up.

In the case of water heating systems according to DIN 12828 (formerly DIN 4751 P2), it must be ensured that only protected shut-off facilities or none at all are installed between Armex II and the heat generators. Otherwise the heat generators must be individually protected (recommended for Armex II).

**Individual protection:** Owing to the sound degassing performance of the Armex II, it is recommended even with single boiler systems to install a diaphragm pressure expansion vessel (for instance DE) at the heat generator to minimise the switching frequency.

**Connection line for make-up:** If the make-up line is connected directly to a potable water system, 'fillset' (shut-offs, system separator, water meter, dirt trap) must be installed upstream. If reflex 'fillset' is not installed, a dirt trap with a mesh size  $\leq 0.25$  mm must at least be installed to protect the make-up solenoid valve. Keep the line between the dirt trap and the solenoid valve as short as possible and flush.

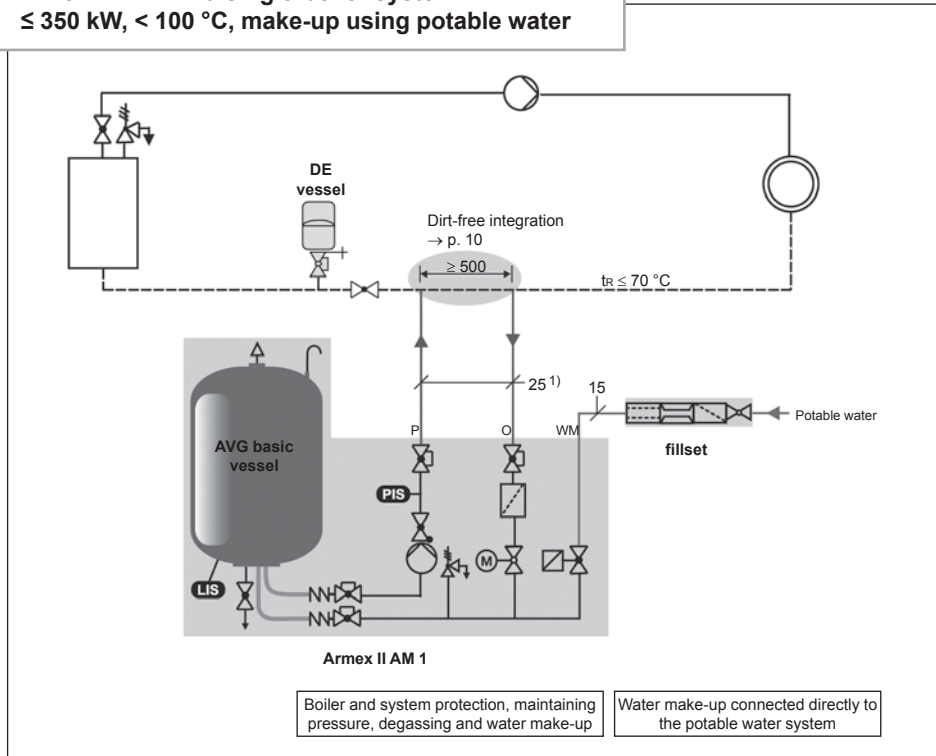
If the automatic make-up facility is not connected, the connection (WM) of the make-up line must be sealed with a R ½ plug.

**⚠ Note:** If manual make-up is not performed in time, the Armex II pressure-maintaining station will switch to an error.

The normal pressure at the Armex II make-up solenoid valve must not exceed 6.0 bar. Install a pressure reducer upstream if required.

## Assembly diagrams

### Armex II AM 1 in a single-boiler system ≤ 350 kW, < 100 °C, make-up using potable water



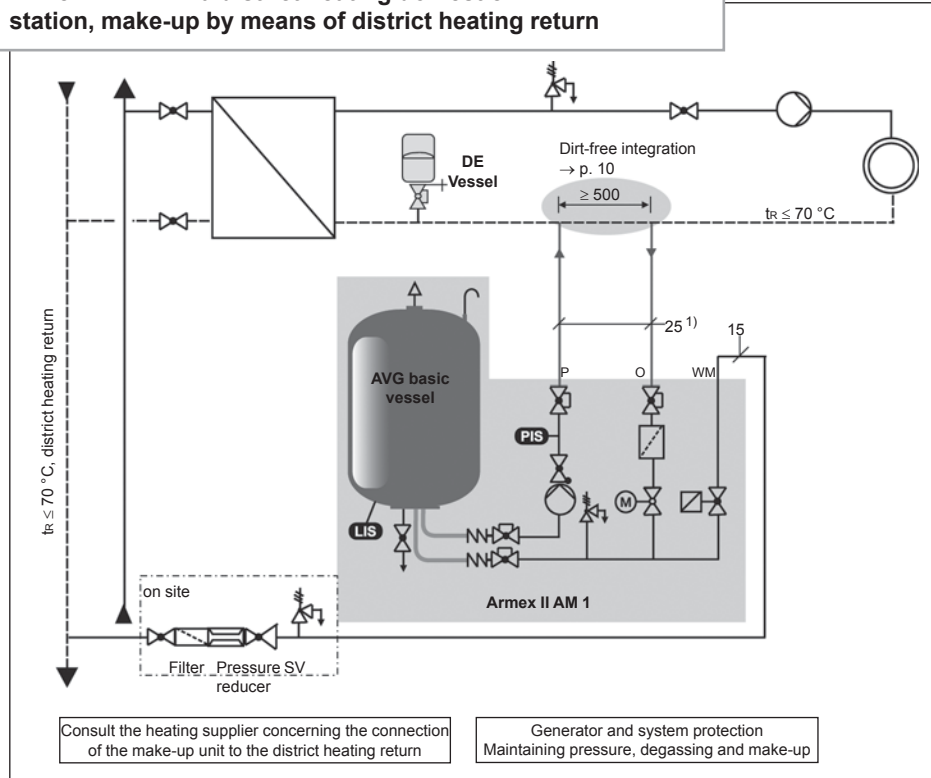
#### Notes for the installer

- ▶ You do not need to install any additional cap valves in the expansion line.
- ▶ fillset with integrated system separator must be installed upstream when connecting to the potable water system.

If fillset is not installed upstream, a filter for the make-up unit with a mesh size of ≤ 0.25 mm must be provided on site.

- 1) Install expansion lines over 10 m in length in DN 32. → page 11

### Armex II AM 1 in a district heating domestic station, make-up by means of district heating return



#### Notes for the installer

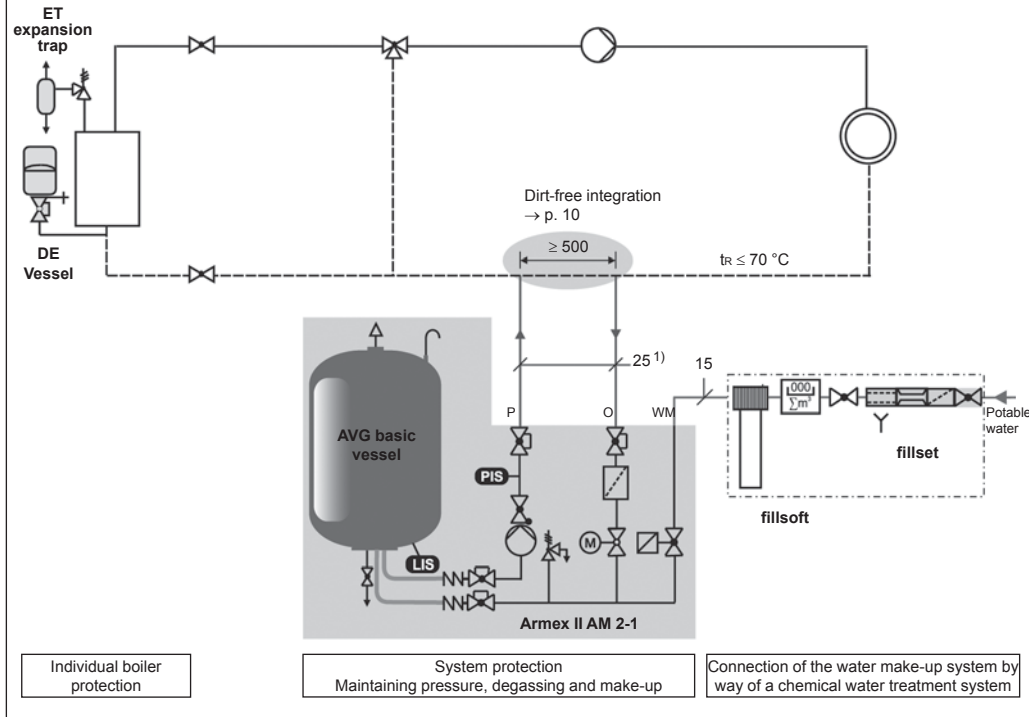
- ▶ District heating water is generally highly suitable as make-up water. Water treatment is not required.
- ▶ The agreement of the heating supplier is required! Note the connection conditions.

- 1) Install expansion lines over 10 m in length in DN 32. → page 12

- ▶ **Armex II AM 2:**  
An optional board with 6 digital input and 6 floating output contacts and pressure and level outputs by means of isolation amplifiers is available for special requirements, for instance in connection with district heating. Please contact us for more information..

The circuits must be adjusted to suit local conditions.

## Armex II AM 2-1 in a system with central return admixture, make-up using softening system



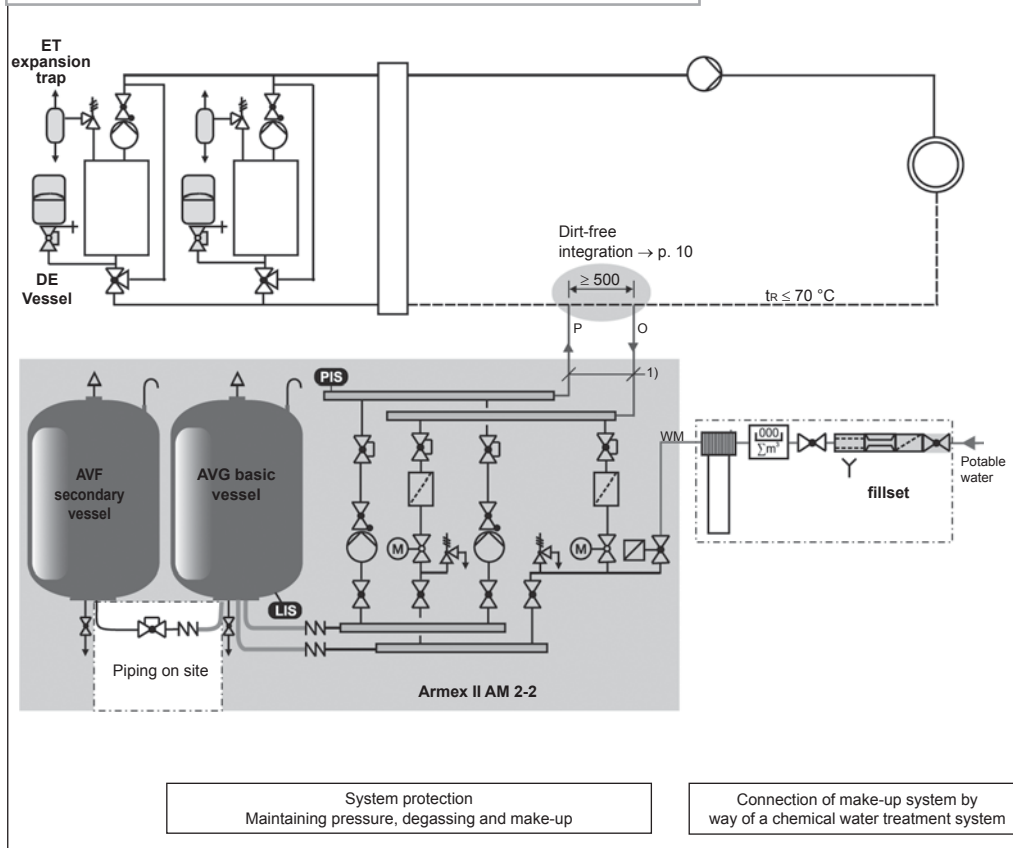
### Notes for the installer

► Armex II must always be integrated in the main flow in order to be able to degas a representative partial flow. In the case of central return admixture, this is the system side. The boiler will then be individually protected.

► If the capacity of 'fillset' is exceeded ( $k_{vs} = 1 \text{ m}^3/\text{h}$ ), a suitable connection group must be provided on site as an alternative in the make-up line. The filter may have a maximum mesh size of 0.25 mm.

1) Sizing of the expansion lines → check list for pressure-maintaining systems, see page 11

## Armex II AM 2-2 in a multi-boiler system, advance $> 100 \text{ }^\circ\text{C}$ , make-up by way of softening system



### Notes for the installer

► In the case of water treatment systems, fillset with system separator and water meter is installed upstream of the softening system.


► Provide individual protection with in the case of multiple boiler systems.

► Several AVF secondary vessels can be connected.

1) Sizing of the expansion lines → check list for pressure-maintaining systems Page 11

The circuits must be adjusted to suit local conditions.

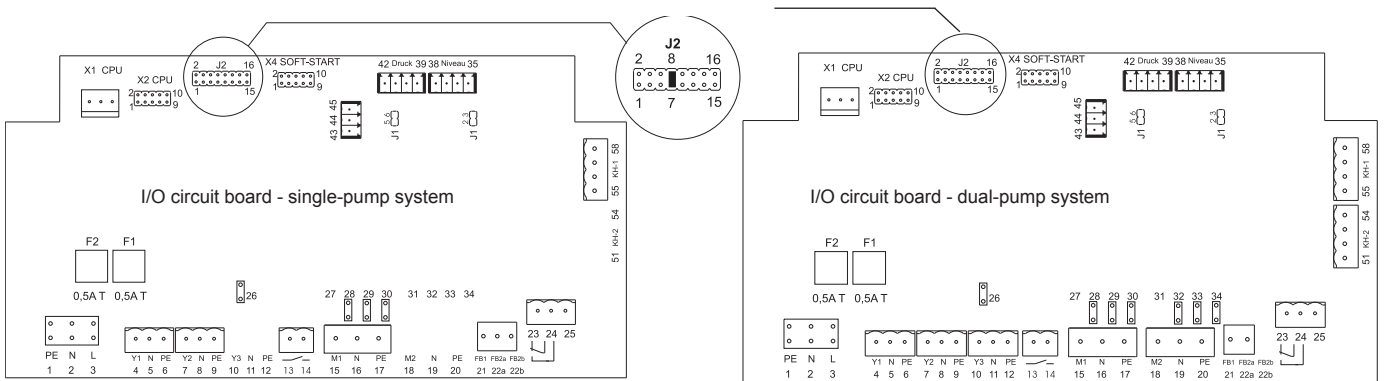
## Electrical connection

 Electrical wiring and connection must be performed by a qualified electrician according to the applicable local (electricity board) regulations and VDE regulations. The system must be de-energised before any work is carried out on electrical components. Comprehensive electrical connection diagrams are enclosed with these instructions and must be adhered to.

The following information applies only to standard systems and is largely restricted to the connections required on site.

- Loosen the 2 recessed head screws on the control box (13).
- Open the cover.
- Pass all the cables to be installed through the cable conduit fitting.  
Important: Use only cable conduit fittings suitable for the respective cable.
- Connect all cables (refer to the following and electrical circuit diagram).
- Note the connected loads on p. 24 for on-site fuse protection.

Overview of the wiring diagram on the circuit board - Armex II AM 2



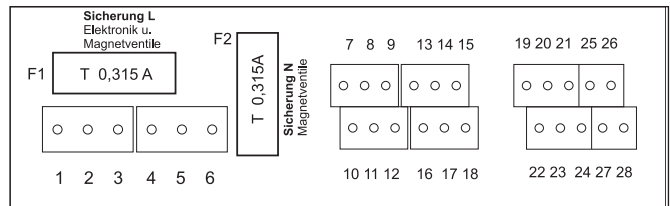
J2 7/8 (fourth from left) occupied  
→ Contact water meter can be evaluated

Designation	Terminal	Signal	Remarks
Supply (230 V)	X0 / 1	L	Wiring at the terminal block next to the fuses, pre-wired with a shock-proof plug
	X0 / 2	N	
	X0 / 3	PE	
Supply (400 V)	X0 / 1	L1	Wiring at the terminal block next to the contactors - wire Armex II AM 2 on site
	X0 / 2	L2	
	X0 / 3	L3	
	X0 / 4	N	
	X0 / 5	PE	
Make-up (4) (230 V)	4	Y1	Wire on site, optional
	5	N	
	6	PE	
Dry-running protection message (floating)	13		Wire on site, optional
	14		
Common message (floating)	23	NC	Wire on site, optional
	24	COM	
	25	NO	
Level gauge (pressure cell) (8)	35	+18 V	Is connected in the control box, put the plug on the pressure cell on site and screw on tightly
	36	GND	
	37	AE	
	38	PE (screen)	
Contact water meter (optional)	43	+24 V DC	Wire on site, additionally connect the pins 7/8 on the jumper block J2 (see above figure)
	44	E1	
Pressure transducer (4)	39	+18 V	Is connected
	40	GND	
	41	AE	
	42	PE (screen)	
Pump 1 (2) (230 V)	15	M1	Is connected
	16	N	
	17	PE	



Designation	Terminal	Contact terminal	Signal	Remarks
Pump 2 (230 V)	18 19 20		M2 N PE	If fitted
Pump 1 (2) (400 V)	X0 / 6	6K1 / 2 6K1 / 4 6K1 / 6	U V W PE	
Pump 2 (400 V)	X0 / 7	6K5 / 2 6K5 / 4 6K5 / 6	U V W PE	
Excess pressure motorized ball valve 1 (5)	7 8 9		Y2 N PE	If fitted
Excess pressure motorized ball valve 2	10 11 12		Y3 N PE	If fitted
Motorised ball valve 1	55 56 57 58		GND +24 V 0 - 10 V 0 - 10 V	Supply Manipulated variable Feedback
Motorised ball valve 2	51 52 53 54		GND +24 V 0 - 10 V 0 - 10 V	Supply Manipulated variable Feedback
RS-485 interface	The interface is positioned at the display board in the bottom left corner of the control box door. Description → p. 21			

Overview of the wiring diagram on the circuit board - Armex II AM 1



Designation	Terminal	Signal	Remarks
Supply (230 V)	1 2 3	PE N L	Armex II AM 1 line wired with a shock-proof plug
Make-up (4) (230 V)	10 11 12	Y1 N PE	
Common message (floating)	13 14 15	COM NC NO	
Level gauge (pressure cell) (8)	19 20 21	PE - level + level	Screen Signal + 18 V
Pressure transducer (4)	22 23 24	PE - pressure + pressure	Screen Signal + 18 V
Pump 1 (2) (230 V)	4 5 6	PE N M1	
Excess pressure motorized ball valve 1 (5)	7 8 9	Y2 N PE	If fitted
Motorised ball valve 1	25 26 27 28	0 - 10 V 0 - 10 V GND +24 V	Manipulated variable Feedback Supply
RS-485 interface	In the case of Armex II AM 1, the interface is provided for updating the program only. With Armex II AM 1, the external fuse must not exceed A.		

## Soft start

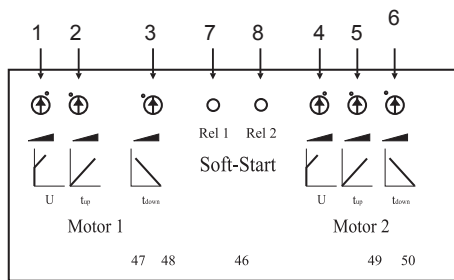
The following information need only be noted in the case of special settings and problems with the soft start.

All AM 2 pressure-maintaining systems are fitted with a soft start and stop facility for the pump as standard. The starting and stopping times and the motor start moments can be set using the potentiometers (1-6) on the circuit board in the control box. By default, the starting ( $t_{up}$ ) and stopping ( $t_{down}$ ) times are set to approx. 3 seconds. You should not change these settings. The default settings of the potentiometers are indicated by a dot. The operating power for the pump is only passed through the soft start during the starting or stopping times. After that, the power is switched over to the main relay. This is indicated by the LEDs 7 and 8. The soft start for the AM 1 and 2-1 is only equipped for one pump (motor 1).

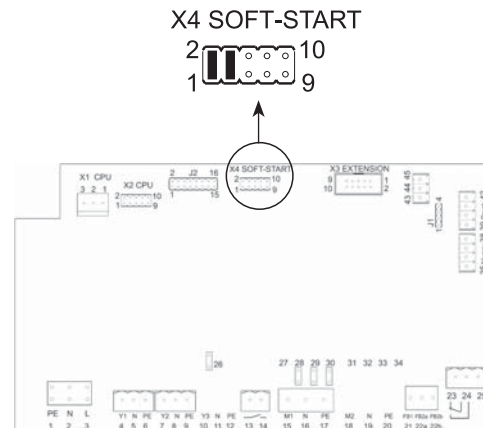
If the soft start board is defective it can be removed and the motors can be switched directly using the relay on the I/O base board. Two additional jumpers must be present for this to be possible. If the “contact water meter” function is not used, the corresponding jumpers on terminal strip J2 can be used.

**Caution:** If the soft start fails, the pump must be checked for stiffness, blocking, or other failures.

- For AM 2-1 remove three cables and for AM 2-2 five cables with flat plugs leading to the soft start from the I/O base board.
- Remove the 10-pin plug of the flat cable.
- Release the two fastening clips that lock the cover of the soft start board into place and remove the cover plate.
- Unscrew the four M4 plastic nuts and remove the soft start board. The plastic spacers can remain on the base board.
- On the I/O base board, 2 jumpers must be placed on the pin strip X4 SOFT-START at the positions 1-2 and 3-4.
- Close the control box door once all the connections have been established.
- Tighten the 2 screws on the control box door.
- Establish the power supply.
- The system version appears in the display of the controller.



Cover plate of the soft start board



I/O circuit board

The Armex II AM controller is now ready for initial start-up.

## Initial start-up

### Prerequisites for start-up

- The AVG and AVF vessels have been installed and the Armex II AM control unit assembled.
- The water connection to the system has been established.
- The connection system must be at least roughly bled.
- The vessel(s) must not be filled with water.
- The system has been connected to the electrical mains system according to the applicable VDE and local electricity board regulations.

### Start routine

The start routine commences when the controller is switched on for the first time. Its purpose is to set the parameters required for operation of the Armex II AM unit. If you enter an incorrect value, you can restart the routine by pressing the “quit” button.

**Caution:** The start routine can only be run through once; any subsequent parameter modifications have to be performed in the customer menu (→ p. 18).

**Armex II AM**

The start routine of the Armex II is automatically called up when the controller is switched on for the first time.



Press "ok" to get to the language selection:

**Country: GB**  
D GB F NL PL

Select the language using the country code, for instance "GB" for the English language, and confirm with "ok".



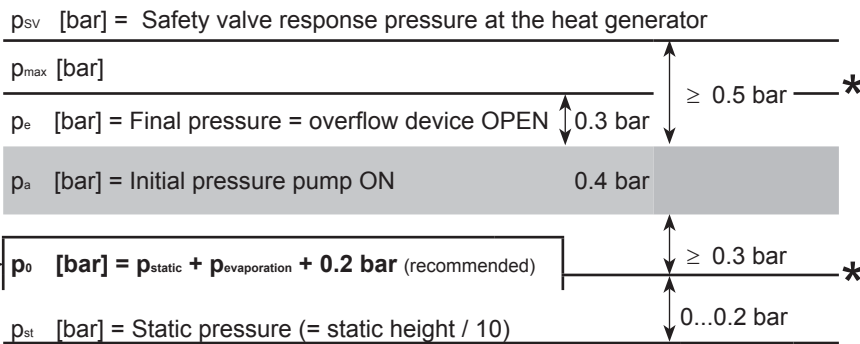
**Read operating instructions!**

A message to read these operating instructions appears. Confirm with "ok".



**Min.oper.press.**  
**P0 = 1.5 bar**

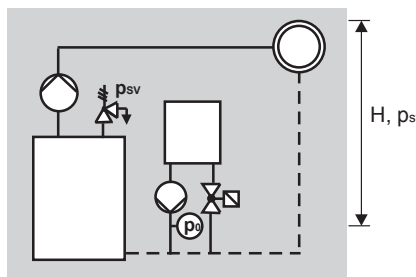
Set the minimum operating pressure  $p_0$  according to the static height of your system (refer also to the diagram below) and confirm with "ok".



\* Error message if pressure is exceeded or fallen below; with Armex II AM 2, the mechanical overflow valve also closes if  $p_0$  is fallen below.

The value set for the minimum operating pressure  $p_0$  may not drop below 1.3 bar, hydraulic balancing is otherwise not guaranteed and stable degassing operation is not possible.

**$p_0 \geq 1.3$  bar**



**Time:**  
**18:46:29**

Start by setting the current hour (in this case: 18) with the arrow buttons and confirm with "ok". Continue with the minutes (in this case: 46) and the seconds (in this case: 29).



**Date:**  
**29.11.01**

Start by setting the current day (in this case: 29) with the arrow buttons and confirm with "ok". Continue with the month (in this case: 11) and the year (in this case: 01).



**2% 2.1 bar**  
**Auto-zero**

**Important: The AVG basic vessel must be empty.**

A check is performed as to whether the signal issued by the level gauge (oil cell) at the foot of the AVG basic vessel corresponds to the factory-set vessel in the controller. Proper assembly of the Armex II system according to these instructions is absolutely necessary for correct balancing (→ see also p. 9).



**00800 I 740 mm**  
**Weight = 0149 kg**

The vessel type can be balanced here (see name plate on the AVG basic vessel).

**0% 2.1 bar**  
**Auto-zero successfully**

If auto-zeroing has been successfully performed, this is indicated as scrolling text. The message "**Auto-zero successfully executed!**" is displayed. In this case, the following 2 paragraphs are skipped.



0%      2.1 bar  
**Empty vessel +**

If the controller detects a value that is not plausible, the message "Empty container + repeat balancing!" is displayed.



**Abort auto-zero? No**

If auto-zeroing cannot be performed despite verification of the above points, it can be cancelled. To do so, confirm the message "Empty container + repeat balancing!" using "ok". The question "Abort auto-zero? Yes/No" is displayed. Select your answer using the arrow keys. If you choose "Yes", the correct vessel must be selected in the service menu after the start routine is completed (please notify Armstrong Service).



**Exit routine? Yes**

At the end of the start routine you will be asked whether you wish to exit the start routine. If you choose "Yes" and confirm with "ok", the system automatically switches to stop mode. It should be left in stop mode in order to undertake additional start-up measures. If you choose "No", the start routine is repeated.



0%      2.1 bar  
**Stop**

**You are now in stop mode.**

 **Important:** Do not switch to automatic mode yet.

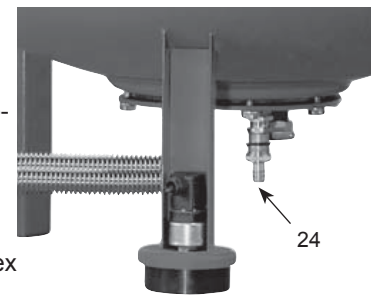
## Filling the vessels and control unit

The following information applies to all Armex II systems with AVG basic vessel and/or one or more AVF secondary vessels (expansion vessels).

**Important:** The AVG and AVF vessels must be empty for setting of the Armex II controller. Auto-zeroing of the level gauge must therefore be performed before the vessels are filled (see start routine/customer menu).

- Filling with a hose using the filling and draining tap (17) on the vessel.  
This variant is recommended and useful if the automatic water make-up facility of the Armex II has not yet been connected on the water side.

To do this, connect a water hose from the water supply to the filling and draining tap (17) on the vessel. Open the protected shut-offs between the control unit and the vessel (factory setting: open).



0%      2.1 bar  
**Stop**

Switch on the controller (→ p. 15) and set it to "Stop" operating mode. (This is used to show the water level in the vessel.) The display should now be showing "0%".



30%      2.,1 bar  
**Stop**

Open the filling and draining tap (24) and fill the vessel:

- Heating system      approx. 30%
- Cooling and air conditioning system      approx. 50%

- Filling with the water make-up solenoid valve

Open the water make-up solenoid valve in manual mode and fill the vessel (→ p. 18).




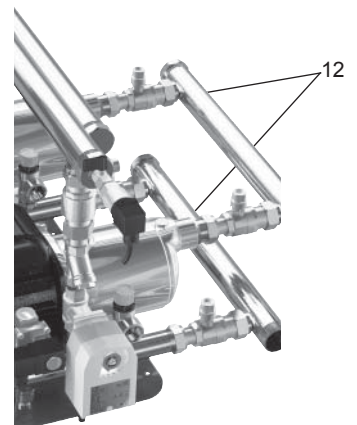
## Bleeding the pumps

Prerequisite: The AVG basic vessel of the Armex II is filled (see abovementioned point) and protected ball valves (21) are open (factory setting: open).

Loosen the bleed screw (9) of the pressure-maintaining pump and bleed the pump until water containing no bubbles runs out. Tighten the bleed screw again and check for watertightness. For Armex II AM 2-2, repeat procedure for second pump.

It may be necessary to repeat this process several times if the delivery performance of the pump/pumps remains poor.

 **Caution** must be exercised at high temperatures!  
**Note** the general safety instructions!



Example: Bleed screws  
Armex II AM 2-2/60



## Automatic mode

You can change to automatic mode once the settings have been made and the entire system filled and bled. The Armex II will now be in the continuous degassing program for 12 h (this time can be set in the customer menu) and will then automatically switch to the “follow-up degassing” program.



**The Armex II is now in operation.**

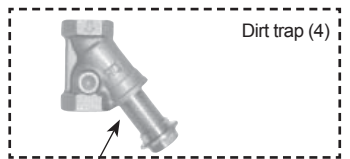
**The initial start-up services to be provided by Armstrong Service are now complete.**

## Cleaning the dirt traps

**! Important:** Please note the general safety instructions.

The dirt traps must be cleaned after expiry of the continuous degassing time at the latest.

**30%      2.1 bar**  
**Stop**

Set the system to stop mode.


Dirt trap insert

- Close the ball valve (6) on the Armex II.
- Twist off the cap on the dirt trap (4) (open slowly to reduce the excess pressure in the pipeline). Remove together with the dirt trap insert.
- Remove the strainer from the cap and rinse under clean water. Brush with a soft brush.
- Replace the strainer in the cap, check the seal for damage and screw back into the dirt trap housing.
- Open the ball valve.
- Bleed the pump (10) by means of the bleed screw (12).
- Close the bleed screw (12).

**Initial start-up is now complete!**

## Operation

### Automatic mode

#### General

Automatic mode may only be started after initial start-up has been successfully completed. The function to maintain pressure, compensate the expansion volume, degas and automatically make-up water is then active.



The pump and overflow motorised ball valve are actuated so that the pressure remains constant within the limits  $\pm 0.2$  bar. The electronic controller monitors the functions. Faults are displayed and evaluated. If the default setting is not changed, after initial start-up the Armex II will operate in the “continuous degassing” program for the time set in the customer menu.

#### Degassing program variants

##### Continuous degassing

Intensive degassing following start-up and repairs to the connected pipe network. The degassing cycles are executed successively for the set continuous degassing time (12 h basic setting). The controller then automatically proceeds with follow-up degassing.

**30%      2.1 bar**  
**Continuous deg.**

##### Interval degassing – Economy mode in automatic mode

Is executed according to a defined schedule. Degassing takes place at defined intervals for a defined time. The necessary specifications can be made in the service menu. The option is also provided of allowing interval degassing within a specific time window only. (Service menu.)

**30%      2.1 bar**  
**Interval deg.**

##### Follow-up degassing

Takes place automatically each time the pump starts. (The corresponding overflow motorised ball valve opens following the switch-off signal for the pump.) The pump and the valve keep working simultaneously for a time defined in the service menu.

**30%      2.1 bar**  
**Follow-up deg.**

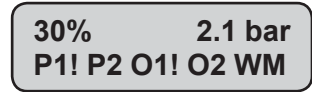
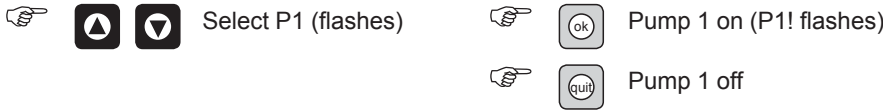
**The selected degassing program is shown in the message line during execution of the respective program only.**

## Manual mode

In manual mode all pumps or solenoid valves can be turned on or off. To activate manual mode, press the “hand” operating mode button. The adjacent display appears. All pumps or solenoid valves in operation will be switched off.



Example: Turning on and off pump 1



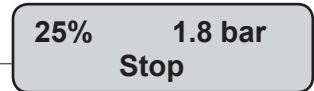
Example:  
Pump 1 and overflow valve 1 are turned on.  
P1 is selected and can be switched by pressing the “ok” button.

Several devices can be turned on at once. Devices that are turned on are indicated by an exclamation mark.

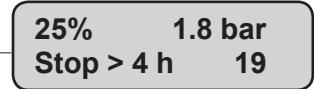
The function of the pumps and overflow valves is monitored for safety-relevant parameters. If several devices are turned on, they are turned off in reverse order by repeatedly pressing the “quit” button. Once all devices are turned off, you are in stop mode.

## Stop mode

Only the display of the Armex II is operational in stop mode. Operation monitoring does not take place. All pumps, motorised ball valves or solenoid valves are switched off. The adjacent display appears when the “stop” button is pressed.



A message will be output if stop mode is active for more than 4 hours.

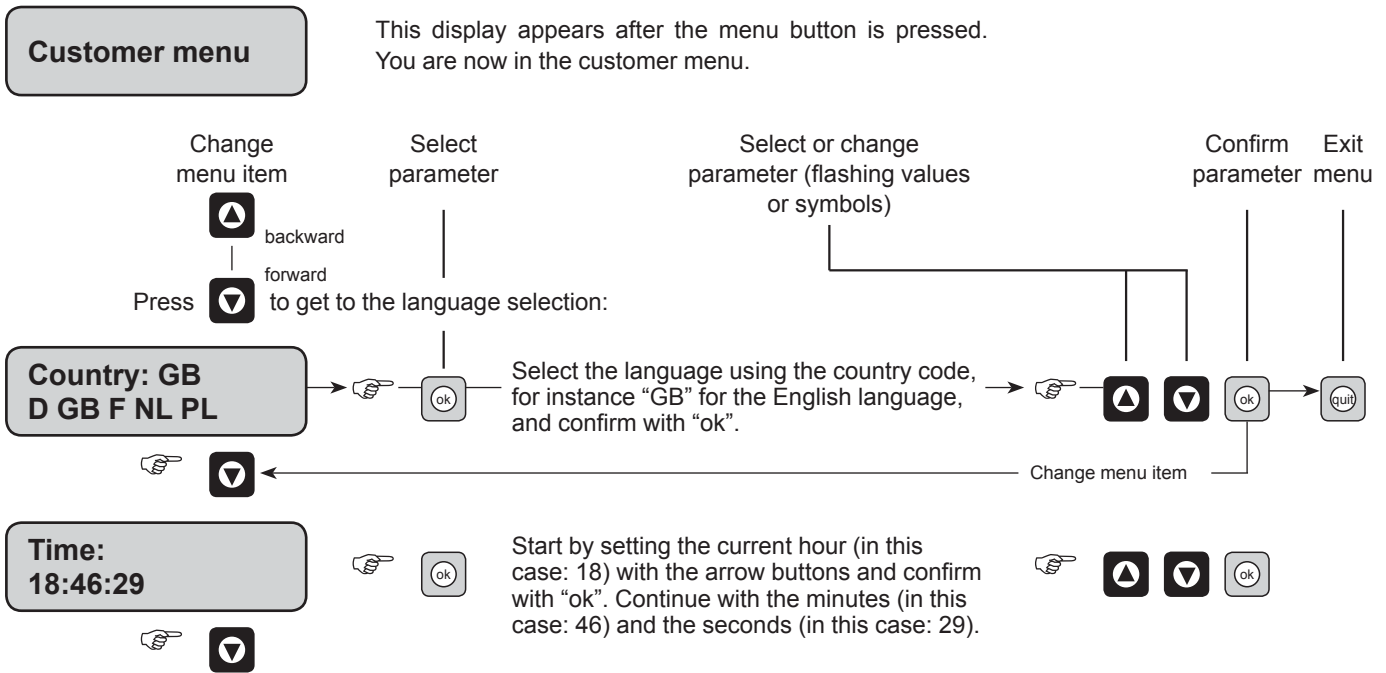


## Customer menu



### General

The purpose of the customer menu is to enter and change the key Armex II operating parameters. Some of these will already have been processed within the start routine during initial start-up. Further parameter changes are possible here. Press the “menu” button to get to the customer menu. Here you can change operating parameters or view current statuses. Press the “menu” button to access the customer menu. Press the “quit” button to exit the customer menu immediately.



**Date:**  
29.11.01



Start by setting the current day (in this case: 29) with the arrow buttons and confirm with "ok". Continue with the month (in this case: 11) and the year (in this case: 01).



**00% 2.1 bar**  
**Auto-zero?**



A check is performed as to whether the signal issued by the level gauge at the foot of the AVG basic vessel corresponds to the vessel set in the controller (→ p. 9).



**Min.oper.press.**  
**P0 = 1.8 bar**



Set the minimum operating pressure according to the static height of your system (→ chart on p. 14) and confirm with "ok".



**Degassing prog.**  
**Continuous deg.**



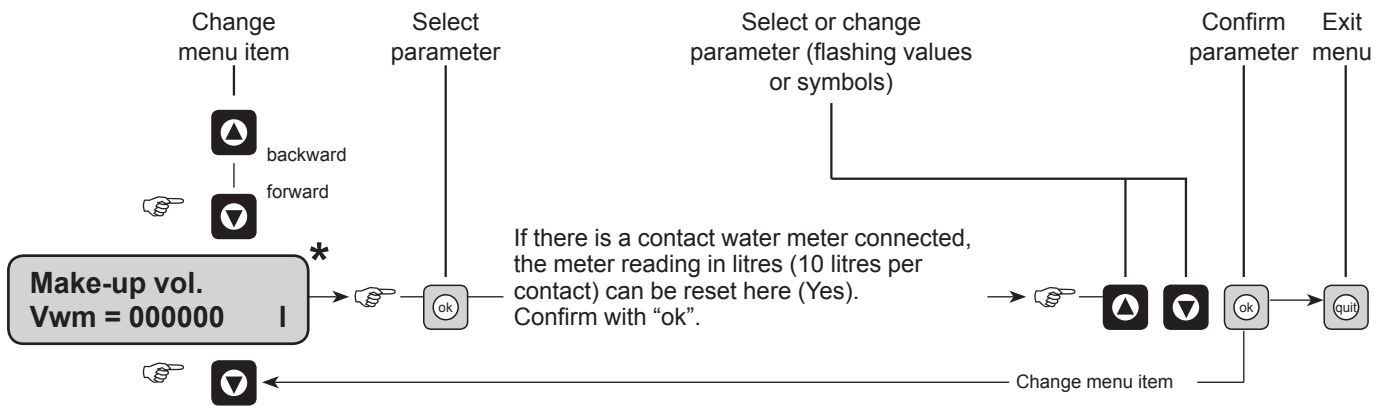
Select the degassing program here (→ p. 18) and confirm with "ok".



**Cont. degas time**  
**ED = 012.0 h**



Select the time for continuous degassing. Recommended: 12 h with system capacities ≤ 20 m³/h, 24 h with system capacities > 20 m³/h. Confirm with "ok".



**Max. make-up vol.**  
**Vmax = 005000**



In this menu item you can set the total make-up volume above which an alarm message will be triggered (in this case if more than 5000 litres are made-up).



**Next maintenance**  
**TY = 12 months**



Here you set when the message "Maint. recomm." is triggered. The timer counts backwards, i.e. when displaying 10 months the next maintenance will be due in 10 months' time. Maintenance monitoring can be switched off.



**All messages PFK**  
**Yes**



Here you can select whether all faults that occur should switch the volt free contact (pfK). If you select "No" here, only the messages identified as "alarms" in the message list on p. 21-23 will result in the volt free contact being switched.



## Error memory



**Error memory display.** The last 20 errors including error code (for instance ER 24, → p. 21-23) are shown here chronologically together with the time and date of occurrence. 01 is the most recent error, 20 the oldest.



## Parameter memory



**The parameter memory** stores the last 10 changes of the minimum operating pressure  $p_0$  together with the time and date of the change. 01 is the most recent change, 10 the oldest.



## Container info 00800 l 0740 mm

For information only:

Here you can query the vessel size for which the system has been parameterised (nominal volume/litre, Ø/mm). The vessel size can only be set in the service menu by Armstrong Service.



## Position motor- b.valve 1: ... %



For information only:

This item shows the position (opening) of motorised ball valve 1 in ... %.

## Position motor- b.valve 2: ... %



For information only:

This item shows the position (opening) of motorised ball valve 2 in ... %.

## Armex II V ...



For information only:

This window shows the installed software version (for example V1.10).

## Customer menu

For information only:

You have run through the entire customer menu once. You can now switch to the desired operating mode.



or



or



\* only if using a contact water meter

## Service menu

A password-protected service level in which internal data can be changed is installed in all Armex II AM controllers. If you want to make changes beyond the scope of the customer menu, please contact ArmstrongService (tel. +44 1737 378110). You will find a partial overview of the parameters stored in the service menu in the following table.

## Default setting

The following default values are set in the Armex II on delivery. The values marked with an 'x' under "Customer menu" can be changed. A vessel size of 800 l is set if no AVG basic vessel size was specified when ordering.

Parameter	Setting	Remark	Customer menu	Service menu
Customer menu				
Language	D		x	
Minimum operating pressure	1.8 bar	$p_0$ (min. operating pressure → p. 14)	x	
Degassing program	Continuous degassing		x	
Continuous degassing time	12 h		x	
Max. make-up volume	0	Only activated if the controller is set to contact water meter (p. 11)	x	
Next maintenance	12 months		x	
All messages PFK	No		x	

Parameter	Setting	Remark	Customer menu	Service menu
Pressure parameters				
Pressure differential for pump ON	$p_0 + 0.3$	Differential pressures (added up) with respect to minimum operating pressure $p_0$ (for example $p_0 = 1.8$ then pump on if 2.1 bar is fallen below)		X
Pressure differential for pump OFF	$p_0 + 0.5$			X
Pressure differential for sol. valve CLOSED	$p_0 + 0.5$			X
Pressure differential for sol. valve OPEN	$p_0 + 0.7$			X
Pressure differential for max. pressure	$p_0 + 0.9$			X
Time parameters				
Forced pump start	24 h	A forced pump start (approx. 3 seconds) is executed after a downtime of 24 h		X
Pump runtime exceeded message	30 min			X
Max. make-up time	20 min			X
Max. make-up cycles	3/2 h			X
Filling levels				
Dry-running protection ON	6%			X
Dry-running protection OFF	12%			X
Make-up ON	20%			X
Make-up OFF	25%			X
High water ON	90%			
High water OFF	85%			

## RS-485 interface

The following information is made available using this interface:

- Continuous information about pressure and level
- Information about the operating statuses of the pumps
- Information about the operating status of the excess pressure motorized ball valve
- Information about the operating status of the make-up solenoid valve
- Information about the aggregated value of the contact water meter
- Information about all messages
- Information from the error memory

Connection of the interface with the primary control centre or similar

- The interface is positioned at the display board in the bottom left corner of the control box door. A four-pin plug (plug-type PCB terminal, grid 3.81 mm, 4-pin, type 8813B/04OB) is required for connecting the interface. The plug can be obtained from Armstrong Service.
- The interface should be connected using a screened cable twisted or stranded together in pairs, for example LJYCY (TP), 4 x 2 x 0.8 (max. overall bus length = 1000 m).
- When using a control centre or similar equipped with an RS-232 interface and not an RS-485 interface, an appropriate interface converter must be used.
- When using the communication module (optional) the interface is used to connect the communication module.

The protocol for the RS-485 interface can be requested from Armstrong Service if required.

## Messages

Messages are shown as clear text in the message line of the display using the codes specified below. If there are a number of messages you can use the “up”/“down” control buttons to scroll through them.

All messages/faults are automatically reset if they can be resolved. They are, however, recorded in the error memory and can be retrieved from there (→ p. 20).

The messages Er 01, Er 04, Er 08, Er 09 and all errors related to water make-up must be acknowledged manually using the “quit” button since the error cause needs to be examined in these cases.

The messages can only be acknowledged if the error is no longer present.

4%
1.6 bar

Water def. 02.1



7%
1.6 bar

Make-up time 06











ER code	Type of error	Cause of error	Troubleshooting/ remedy
01	Min. pressure $p_0$ fallen below (alarm)	<ul style="list-style-type: none"> <li>Water loss in the system</li> <li>Pump fault, for example pump motor protection triggered</li> </ul>	<ul style="list-style-type: none"> <li>Fix leak</li> <li>Acknowledge error ("quit" button)</li> </ul>
02.1 02.2	Dry-running protection during operation of pump 1 of pump 2 only with AM 2-2/...	<ul style="list-style-type: none"> <li>Water make-up not connected</li> <li>Dirt trap in make-up line blocked</li> <li>Make-up solenoid valve not opening</li> <li>Large amounts of gas in the system</li> </ul>	<ul style="list-style-type: none"> <li>Manually make-up water into AVG basic vessel through the hose</li> <li>Clean dirt traps</li> <li>Check the WM solenoid valve via "hand"</li> <li>Bleed the system manually</li> </ul>
03	Max. water level exceeded	<ul style="list-style-type: none"> <li>Water make-up defective</li> <li>Make-up water manually</li> <li>Leak in on-site heat exchanger</li> <li>AVG basic vessel too small</li> </ul>	<ul style="list-style-type: none"> <li>Release water</li> <li>Check heat exchanger</li> <li>Check vessel size</li> </ul>
04.1 04.2	Pump/pumps fault for example motor protection triggered Fault in pump 1 Fault in pump 2 only with AM 2-2/... (alarm)	<ul style="list-style-type: none"> <li>Pump/pumps stuck</li> <li>Motor/motors defective</li> <li>10 A screw fuse defective</li> <li>Motor protection (Klixon) triggered if connected</li> </ul>	<ul style="list-style-type: none"> <li>Use a screwdriver to crank the motor axle via the fan wheel (required after a lengthy downtime)</li> <li>Acknowledge error ("quit" button)</li> <li>Notify Armstrong Service</li> </ul>
05	Pump runtime exceeded Default: 30 min	<ul style="list-style-type: none"> <li>Water loss in the system</li> <li>Cap valve closed on the suction side</li> <li>Air in the pump</li> <li>Overflow solenoid valve not closing</li> </ul>	<ul style="list-style-type: none"> <li>Fix leak</li> <li>Check shut-offs</li> <li>Check pump</li> <li>Check the OV solenoid valve via "hand"</li> </ul>
06	Make-up time exceeded Default: 20 min	<ul style="list-style-type: none"> <li>Water loss in the system</li> <li>Water make-up not connected</li> <li>Insufficient water volume from the make-up line</li> </ul>	<ul style="list-style-type: none"> <li>Fix leak</li> <li>Manually make-up water through hose into the AVG basic vessel</li> <li>Acknowledge error ("quit" button)</li> </ul>
07	Make-up cycles exceeded Default: 3 every 2 h	<ul style="list-style-type: none"> <li>Leak in the system</li> </ul>	<ul style="list-style-type: none"> <li>Fix leak</li> <li>Acknowledge error ("quit" button)</li> </ul>
08	Pressure gauge fault (pressure transducer on the pressure side) (alarm)	<ul style="list-style-type: none"> <li>Pressure transducer defective, wire break, wiring fault</li> </ul>	<ul style="list-style-type: none"> <li>Check wiring</li> <li>Notify Armstrong Service</li> <li>Acknowledge error ("quit" button)</li> </ul>
09	Level gauge fault (pressure transducer oil cell) (alarm)	<ul style="list-style-type: none"> <li>Pressure transducer defective, wire break, wiring fault</li> </ul>	<ul style="list-style-type: none"> <li>Check wiring</li> <li>Notify Armstrong Service</li> <li>Acknowledge error ("quit" button)</li> </ul>
10	Max. pressure $p_{max}$ exceeded	<ul style="list-style-type: none"> <li>Excess pressure motorized ball valve not opening</li> <li>Excess pressure motorized ball valve defective</li> <li>Dirt trap (strainer) dirty</li> </ul>	<ul style="list-style-type: none"> <li>Notify Armstrong Service</li> <li>Clean dirt trap (strainer)</li> </ul>
11*	Make-up volume within a make-up cycle exceeded	<ul style="list-style-type: none"> <li>Major leak in the system</li> <li>Make-up volume insufficient for connected AVG/AVF vessels</li> </ul>	<ul style="list-style-type: none"> <li>Fix leak, acknowledge error message</li> <li>Reduce make-up hysteresis, increase make-up capacity</li> </ul>
15*	Make-up solenoid valve monitoring	<ul style="list-style-type: none"> <li>Contact water meter metering even though make-up has not been requested</li> </ul>	<ul style="list-style-type: none"> <li>Check the make-up valve for watertightness</li> </ul>
16	Voltage failure		<ul style="list-style-type: none"> <li>Check the voltage supply</li> </ul>
19	Stop > 4 h	<ul style="list-style-type: none"> <li>Armex II has been in stop mode for more than 4 h</li> </ul>	<ul style="list-style-type: none"> <li>Set to automatic operation if required</li> </ul>
20*	Max. make-up volume exceeded (added)	<ul style="list-style-type: none"> <li>The maximum overall make-up volume set in the customer menu has been exceeded (→ p. 20)</li> </ul>	<ul style="list-style-type: none"> <li>Reset internal counter</li> <li>Acknowledge message</li> </ul>
Maint. recomm.	Maintenance interval up	<ul style="list-style-type: none"> <li>Reminder of at least annual maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Perform maintenance</li> <li>Acknowledge message</li> </ul>
30	EEPROM defective (alarm)	<ul style="list-style-type: none"> <li>EEPROM exhibiting internal calculation errors</li> </ul>	<ul style="list-style-type: none"> <li>Notify Armstrong Service</li> <li>Change CPU board</li> </ul>
31	I/O module fault	<ul style="list-style-type: none"> <li>Connection between optional board and controller faulty</li> </ul>	<ul style="list-style-type: none"> <li>Notify Armstrong Service</li> <li>Check plug-in connection</li> </ul>

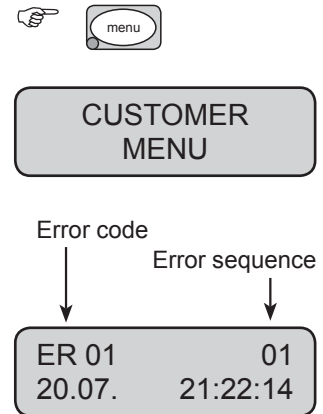
\* Only if a contact water meter is connected and activated in the controller (→ p. 12 and 20)

It is often very useful to know the message sequence when trying to evaluate a message and determine its cause. The information in the error memory is used for this purpose. (→ see also customer menu).

Scroll to the error memory display  


The last 20 errors are displayed together with the error code (for example Er 01), the error sequence, the date and the time. Error sequence 01 indicates the most recent error, 20 the oldest.

Call up the error memory    
 The most recent error (01) is displayed      
 Scroll through the error memory using  



## Maintenance, Inspection, Disassembly

### Maintenance instructions

 **Attention!** Note the general safety instructions (→ p. 5)!

The Armex II must be maintained annually. Maintenance work should only be carried out by specialists. We recommend that you have this done by your Armstrong Service.

As a reminder of the maintenance to be performed annually, the “Maint. recomm.” message appears once the set operating time is up; this message can be acknowledged with the “quit” button.



### Leak test

- Check for external leaks, in particular the pump and screw connections
- Check the non-return valve (7) for direct closing (flow noises, frequent switching of the pump)

### Clean dirt traps

- Pull the power supply plug (AM 1), power switch off (AM 2).
- Shut-off the overflow line with cap ball valves towards the system and the AVG basic vessel.
- Clean the dirt trap (4) in the overflow line (→ p. 17).
- Clean the dirt trap in the water make-up line ('fillset') if present.

### De-sludge the AVG basic vessel and the AVF secondary vessel

- Empty completely using the draining tap on the bottom vessel cover. Loosen the hose connection to the Armex II control unit, unscrew the lower vessel lid and clean, check the diaphragm/container compartment, re-establish all connections.

### Function test

Plug AM1 power supply plug into socket.  
 Switch on AM 2 power switch.

### Check the switching points of the water make-up facility

Set the controller to “Auto”, fill the AVG basic vessel using automatic water make-up, check the switching points for low water and WM on/WM off, manually increase the filling level to the previously noted value (if required using the filling and draining tap). The switching point can also be checked by loading and relieving the level gauge (oil cell).

### Check the switching points for automatic operation

- Manually set the pump to over the response pressure for the overflow valve and switch to “Auto”; the overflow valve must open and close again at the set value.
- Manually set the overflow valve to below the switch-on pressure for the pump and switch to “Auto”; the pump must turn on and turn off again at the set value.

### Disassembly

Before inspection or disassembly of the Armex II system or pressurised parts, these must be depressurised.

1. Shut-off the control unit on the vessel side at the cap ball valves (21).
2. Shut-off the AVF vessels (if available) on the water side.
3. Drain the AVG and AVF vessels.

Refilling → Initial start-up p. 16

## Inspection prior to start-up

The respective national regulations governing the operation of pressure equipment must be observed.

## Inspection intervals

The respective national regulations governing the operation of pressure equipment must be observed.

The actual intervals must be laid down by the operator on the basis of a safety evaluation, taking due account of the actual operating conditions, experience with operational modes and feeds and the applicable national regulations on the operation of pressurised equipment.

## General Description

### Mode of operation

#### General description

Armex II is a pump-controlled pressure-maintaining station with integrated functions for degassing and automatic make-up of system water.

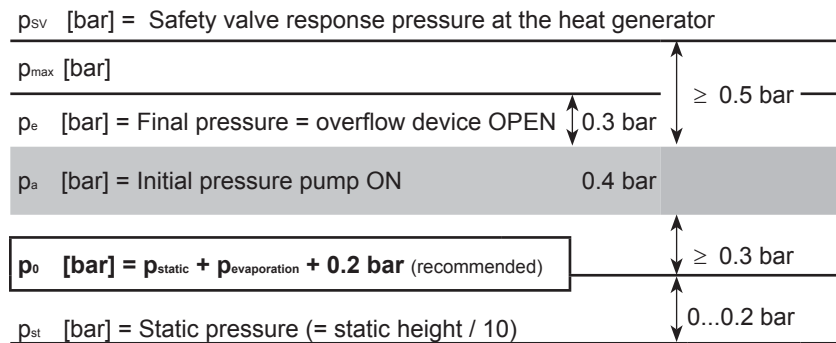
Its main application is in closed heating and cooling water circuits. Armex II keeps the system pressure within predefined limits to prevent the formation of a vacuum, evaporation, or cavitation in all system sections. The unpressurised diaphragm expansion vessel that is closed to the atmosphere serves for the absorption, storage and delivery of system water. Armex II monitors its function and the corresponding network parameters and documents the system parameters assigned to it using its controller.

In order to remove air and gas accumulated in the system, Armex II has been equipped with a degassing function. As a result, no air or gas bubbles whatsoever occur in the system during operation. Noise in heating elements, circulation problems and so on are avoided in this way. Armex II can make-up low system water in a targeted and controlled way.

#### Pressure maintenance

If the pressure in the system increases (for example due to heating), the Armex II directs system water through its overflow device(s) into the AVG basic vessel(s) or the AVF secondary vessel(s) until the desired system pressure is achieved again.

If the pressure in the system drops (for example due to cooling down, temperature reduction), the pressure-maintaining pump(s) pump water from the expansion vessel into the system until the desired pressure is achieved again.



#### Degassing

In order to remove free and dissolved gases from the system water, these are directed in the partial flow across the Armex II unpressurised diaphragm expansion vessel (AVG basic vessel). Here gases (air) are eliminated from the water as a result of the physical conditions.

During the degassing process, the pressure-maintaining pump and overflow device are working simultaneously. Different variants of this process can be applied. A distinction is therefore made between continuous, interval and follow-up degassing.

#### Water make-up

The Armex II detects a lack of system water by means of the water level in the AVG basic vessel. If the adjustable minimum water level is fallen below, the water make-up device (solenoid valve) opens until the desired level is achieved again in the expansion vessel. During water make-up, the number of requests/time and the water make-up time during a cycle are monitored. If there is a contact water meter installed, the individual and overall water make-up quantity can also be monitored.

#### Options

AM 2 can be optionally extended. Various messages and signals can be prepared in addition to the default messages using a retrofit add-on module. A communication module for remote control of the Armex II controller can also be provided as of 03/2002 (cable connection up to 1000 m). Bus modules (Lon...are available for linking up to the RS-485. This option must be ordered separately as an accessory.



## Operating parameters

AM 1	Operating parameters					Electrical data				
	Perm. excess op. press./ bar	Perm. adv. temp./ °C	Perm. operating temperature/°C	Perm. amb. temperature/°C	Noise level approx. dB	Electrical output kW	Soft start	Degree of protection	230 V 50 Hz connection	
<b>Armex II single-pump system</b>										
AM 1	10	120*	> 0 - 70**	> 0 - 45	55	0.75	No	IP 54	Shock-proof plug, 5 m cable	
AM 2 - 1/60	10	120*	> 0 - 70**	> 0 - 45	55	1.10	Yes	IP 54	Power switch, fixed connection on terminal strip	
AM 2 - 1/75	10	120*	> 0 - 70**	> 0 - 45	55	1.10	Yes	IP 54		
AM 2 - 1/95	10	120*	> 0 - 70**	> 0 - 45	55	1.10	Yes	IP 54		
<b>Armex II dual-pump system</b>										
AM 2 - 2/35	10	120*	> 0 - 70**	> 0 - 45	55	1.50	Yes	IP 54		
AM 2 - 2/60	10	120*	> 0 - 70**	> 0 - 45	55	2.20	Yes	IP 54		
AM 2 - 2/75	10	120*	> 0 - 70**	> 0 - 45	55	2.20	Yes	IP 54		
AM 2 - 2/95	10	120*	> 0 - 70**	> 0 - 45	55	2.20	Yes	IP 54		

- Pump type
- Number of pumps
- Technical design

\* In accordance with maximum possible setting value - temperature controller 105°C, as per DIN EN 12828

\*\* Installation in the system return, diaphragm load of the expansion vessels max. 70 °C; for continuous temperatures ≤ 0 °C we ask that you consult us

## Technical data for the AVG basic vessel/ AVF secondary vessel

Perm. advance temperature of the supply system:	$t_{\text{Advance max.}} + 120 \text{ °C}$
Min. operating temperature: (only with appropriate anti-freeze additive)	$t_{\text{min}} - 10 \text{ °C}$
Max. continuous operating temperature of the diaphragm:	$t_{\text{max}} + 70 \text{ °C}$
Min. excess operating pressure:	$p_{\text{min}} 0 \text{ bar}$
Max. excess operating pressure (depending on type):	$p_{\text{max}} \rightarrow \text{name plate}$
Test pressure (prEN 13831):	TP 1.43 x $p_{\text{max}}$
(AD 2000):	TP $\rightarrow$ design test report or name plate
Diaphragm type:	Bladder diaphragm
Gas space:	Air (fluid group 2 according to directive 97/23/EC)
Water space:	Water, water/glycol mixture with max. 50% glycol (fluid group 2 according to directive 97/23/EC)
Classification according to:	Directive 97/23/EC Appendix II, Chart 2

## Dimensions, weights

### AM 1, AM 2-1 Control unit with 1 pump

Type	p. bar	H mm	W mm	D mm	p	Connection			Weight kg
						O	WM	VG	
AM 1	≤ 2.5	680	530	580	Rp 1	Rp 1	Rp 1/2	2 x G1	25
AM 2-1/60	≤ 4.8	680	530	670	Rp 1	Rp 1	Rp 1/2	2 x G1	28
AM 2-1/75	≤ 6.5	770	530	630	Rp 1	Rp 1	Rp 1/2	2 x G1	35
AM 2-1/95	≤ 8.0	770	530	540	Rp 1	Rp 1	Rp 1/2	2 x G1	37

### AM 2-2 Control unit with 2 pump

Type	p. bar	H mm	W mm	D mm	p	Connection			Weight kg
						O	WM	VG	
AM 2-2/35	≤ 2.5	680	700	780	G1 1/4	G1 1/4	Rp 1/2	2 x G1 1/4	54
AM 2-2/60	≤ 4.8	680	700	780	G1 1/4	G1 1/4	Rp 1/2	2 x G1 1/4	58
AM 2-2/75	≤ 6.5	760	700	730	G1 1/4	G1 1/4	Rp 1/2	2 x G1 1/4	72
AM 2-2/95	≤ 8.0	760	700	730	G1 1/4	G1 1/4	Rp 1/2	2 x G1 1/4	76

## AVG, AVF Vessel

Type	ØD mm	H mm	h mm	A	Weight kg
200	634	1060	146	G1	37
300	634	1360	146	G1	54
400	740	1345	133	G1	65
500	740	1560	133	G1	78
600	740	1810	133	G1	94
800	740	2275	133	G1	149
1000	740	2685	133	G1	156
1000	1000	2130	350	G1	320
1500	1200	2130	350	G1	465
2000	1200	2590	350	G1	565
3000	1500	2590	380	G1	795
4000	1500	3160	380	G1	1080
5000	1500	3695	380	G1	1115

↑ V<sub>n</sub> nominal volume / litre

## Declaration of Conformity

Armstrong confirms that the Armex II conforms with the following EC requirements:

89/336/EEC

EN 50 081 – 1 (March 1993)

EN 61000 – 6- 2 (March 2000)

Low voltage directive 73/23/EEC

Pressure Equipment Directive 97/23/EC

Pressure Equipment Directive prEN 13831:2000

Signed,

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