





the Ultimate

Micro bubbles Separator

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SUMMARY:

Air in water causes a lot of problem in circulating cooling and heating systems. Until some years ago, this problem considered to be impossible to solve. But a gentleman from Holland pointed out a method.

As far as we know, there are still only three well working micro bubbles separators on the market. Two brands produced in Holland and **Nonair**[®] made in Sweden.

Why a micro bubbles separator

- Air in water, both as normal bubbles and as micro bubbles, is the condition for a corrosion process to take place. The air consists of about 20% oxygen and it is the oxygen together with water that feeds the corrosion process. If the air is removed no corrosion will occur.
- Micro bubbles will contribute towards cavitation erosion in pumps that will lead to wear out pump wheels and create noise in the pumps. The efficiency of the pumps will also be reduced. Removing of the micro bubbles will solve the problem.
- Micro bubbles in a circulating system will create disturbing noise. Removing of the micro bubbles will solve the problem.
- Micro bubbles will result in a reduction of heat transmission in boilers, heat- and cooling batteries and heat exchangers, as the micro bubbles will work as insulation on the heat-transferring surface. Removing of the micro bubbles will solve the problem.
- Micro bubbles will lead to poor circulation with increased problem with the regulating of the system. Removing of the micro bubbles will solve the problem.

But remember it is only a reel micro bubbles separator that separates micro bubbles. The ones that on the whole just are enlarged pipes are no micro bubbles separators.



Why Nonair[®]

Nonair[®] separates air and other gases from circulating water in heating and cooling system.

Nonair[®] is developed from a new patented principle and the advantages we use to call attention to are listed below:

- An efficient micro bubbles separator will solve the entire problem described above. **Nonair**[®] has a documented high efficiency of micro bubbles separation.
- **Nonair**[®] is made of stainless steel, which prevent it from all inside and outside corrosion. Inside corrosion is a case for separators of carbon steel as air is collected in top of the separator and air is the condition for corrosion.
- As the **Nonair**[®] is made of stainless steel it have been possible to reduce the thickness of material. The weight of the Nonair[®] is much less than all other types and this makes the transport and mounting work easier.
- **Nonair**[®] has full through flow and it could not get clogged up, even after long time.
- **Nonair**[®] has low pressure drop, even after long time, which will reduce need of pump capacity and cost for pump energy.
- **Nonair**[®] has no general limitation for the flow rate.
- **Nonair**[®] is designed to be supplied with a <u>detachable</u> automatic de-aerator. With built-in ones it is necessary to empty a great deal of the system if maintenance is needed with the automatic de-aerator. With the **Nonair**[®] this work is easily done.

Compare **Nonair**[®] with other brands for the parameters above and the advantages with **Nonair**[®] will be clear. If you value these advantages the choice is easy.



AIR IN WATER:

Air (e.g. different gases as oxygen, nitrogen, ...) is a normal component dissolved in fresh water. According to the law of physics, water with lower temperature can dissolve more air than water with higher temperature. When water is boiling you can se the air bubbles leaving the water. Water with higher pressure can dissolve more air than water with lover pressure.

Air in water has been a problem since water has been circulated in Heating and Cooling systems. In these systems undissolved air also causes problems. When the system is filled up with water, there will be some free air left. This air will travel around with the water because of the high velocity on the water in modern installations, and large air bubbles will be transformed to micro bubbles, which can't be removed without special equipment, e.g. **Nonair**[®]

Some of the problems related to air in water are

- Cavitation and noise in pumps and valves.
- Lower degree of efficiency in pumps, heat exchangers and boilers.
- Corrosion.

It has been accepted to have this problem because there haven't been any reel solution to the problem before short. The **Nonair**[®] Micro bubbles Separator is the solution.

The **Nonair**[®] Micro bubbles Separator should normally be installed where the water is at the highest temperature and the lowest available pressure. But, make notice to that 1 metre difference in pressure have the same effect as 4°C difference in temperature. Also, 1 metre less pressure is similar to 4°C higher temperature. Especial in Cooling system, it will normally be more efficient to take account to the pressure.

- Nonair[®] is simply installed. Just put the Nonair[®] in the pipe, similar to a valve.
- Nonair[®] has a straight free flowing path, no risk of clogging.
- **Nonair**[®] has minimal pressure drop (e.g. ~50 Pa at 1 m/s), and this minimal pressure drop will not change because there is no build up of particulate matter.
- **Nonair**[®] will work properly also with a high flow rate. Choose the same dimension for **Nonair**[®] as the pipe it is connected with.
- **Nonair**[®] has a separate air-vent. It is possible to service the air-vent without losing any water, if an intermediate valve is installed.
- Nonair[®] cannot cause any negative influence to the system.



FUNCTION:

The kinetic energy in the water will like the water to pass through the **Nonair**[®] slide on the bottom of the through pipe (1). But, because there is a loss of guidance in the upper part of these pipe an appropriate amount of water leave this main stream and flow into the annular space (2), where the flow rate is lowered. The water gives the opportunity to get rid of the air contents. Water with big bubbles will go direct to the upper space (3). Water with small bubbles will pass through the gaps (4), down into the space (5). The water flowing into the space (5) is replaced, relative slowly, with fresh water containing air bubbles, and can be considered to be totally free of turbulence. The minute bubbles of air in the water present in the space (5) will rapidly fuse together to form separate, highly buoyant larger air bubbles, which float up through the gaps (6) and rises upwards externally of the water flow passing directly through the **Nonair**[®], and thus passes undisturbed upwards to the upper space (3) and the air outlet (7).

In order for the extremely small air bubbles present in the water, or in any other liquid used, to fuse together to form large air bubbles having sufficient buoyancy to rise up to the upper space (3) and the air outlet (7), it is necessary to drastically decrease the speed of the water and for turbulence to cease, or at least substantially cease. This being achieved by means of the flow retarding spaces (2) and (5).

The reason why the **Nonair**[®] is symmetrical is because the **Nonair**[®] shall also be capable to function if mounted in the opposite flow direction.

Numbers (1) - (7) according to sketches on next page.





Manufacturer:

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$\operatorname{NONAIR}^{ extsf{B}}$ Micro bubbles Separator	NONA Micro bubbles
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INSTALLATION:

The **Nonair**[®] Micro bubbles Separator should normally be installed where the water is at the highest temperature and the lowest *available* pressure. Hot water will according to the law of physics, absorb less air than colder water. In a heating system 'A' for that reason it is common to place the **Nonair**[®] Micro bubble Separator before the pump in the outlet pipe from the boiler or heat exchanger. In a cooling system 'B' the **Nonair**[®] Micro bubbles Separator should be placed in the return pipe. The **Nonair**[®] Micro bubbles Separator should be horizontally mounted. The direction of flow is optional.

Nonair[®] Micro bubbles Separator will remove a certain amount of air from the system per circuit, therefore should air be absorbed into the water at any other part of the system which may be at a lower temperature. This air will then be removed when it passes again through the **Nonair**[®] Micro bubbles Separator. This process will continue until the system is completely air free.

If in some other part of the system, there is a need to release air while the water is circulating, it is pointless installing an air container, air release valve or similar. The velocity of the water in a modern installations is too high. Large air bubbles will be transformed to micro bubbles, which will travel round with the water and not be removed. The only method of separating micro bubbles is to install a **Nonair**[®] Micro bubbles Separator at that point.

A **Nonair**[®] Micro bubbles Separator is supplied with either 1, 2 or 3 - $\frac{1}{2}$ " threaded connections at the top depending on the size of the **Nonair**[®] Micro bubbles Separator. These are for standard air vent valves, servicing of which will be simplified by insertion of a adequate servicing valve between the **Nonair**[®] Micro bubbles Separator and the air vent valve. The $\frac{1}{2}$ " (1" for DN 200 and bigger) threaded connection at the bottom of **Nonair**[®] Micro bubbles Separator is for discharge *to drain*.

NONAIR® Int. Paters



Cooling system Diagram 'B'

Heating system Diagram 'A'

Further mounting samples on next side:



MOUNTING SAMPLES:





or heatexchanger

or heatexchanger



The **Standard** model of **NONAIR**[®] Micro bubbles Separator is designed to remove air from circulating heating and chilled water systems



DESIGN

The socket at the top of the body, is for **air outlet**. Use a **reliable** Air-Vent with ball valve. The socket at the bottom of the body, is for **drainage**. Use a ball valve with corresponding size. Reduction and blanking plugs has O-ring sealing of EPDM/NBR-material

Design pressure: PN10, 10 bar Design temperature: 110°C

CONNECTIONS

Nonair[®] is mainly made of acid-resistant Stainless Steel material 316L The units are available with various connection alternatives:

- **SOCKET** connection with sockets made of Stainless Steel material 316L. Available with female and male threads. Is used at threaded pipe joint with Stainless or Carbon Steel pipes.
- WELDING ENDS 316L with welding ends made of Stainless Steel material 316L. Is used at welded pipe joint with Stainless Steel pipes.
- **WELDING ENDS Carbon Steel** with welding ends of Steel material acc. to DIN 171 75. Is used at welded pipe joint with Carbon Steel pipes.
- **FLANGE** connection with welding collars made of Stainless Steel material 316L and loose flanges of Silumin. Is used at flanged pipe joint with Stainless or Carbon Steel pipes.
- **GROOVED** connection with grooved ends of Steel material acc. to DIN 171 75. Is used at grooved pipe joint with Victualic[®], Grinnell[®] or similar couplings.

OPERATION FIGURES

Dimensioning: Choose the same dimension as the pipe it is connected with. Capacity: No particular limitation. Pressure drop: Minimal (~5 mm water column/~50 Pa at 1 m/s).





Table for weight, length etc.

	SOCKET						
					female	male	all
DIM	Dy	volume	soc	kets	len	weight	
	mm	litre	air	drain	mm		kg
R 20 (¾'')	70	0,5	1x 3/8"	1x 3/8"	140		0,6
R 25 (1")	70	0,5	1x 3/8"	1x 3/8"	145	145	0,6
R 32 (1¼")	90	0,8	1x 3/8"	1x 3/8"	180		1,0
R 40 (1 ¹ /2")	90	0,8	1x 3/8"	1x 3/8"	180	180	1,0
R 50 (2")	129	3	1x 1/2"	1x 1/2"	330	370	1,9

W							WELDING ENDS				GROOVED	
					31	6L	carbo	n steel				
DIM	Dy	volume	soc	kets	length	weight	length	weight	length	weight	length	weight
	mm	litre	air	drain	mm	kg	mm	kg	mm	kg	mm	kg
DN 50 (60,3)	129	3	1x 1/2"	1x 1/2"	280	1,5	330	1,7	305	3,3	370	1,7
DN 65 (76,1)	154	5	1x 1/2"	1x 1/2"	340	1,8	390	2,1	365	4,2	430	2,1
DN 80 (88,9)	168	6	1x 1/2"	1x 1/2"	380	3,5	430	3,8	405	6,5	470	3,8
DN 100 (114,3)	204	8	1x 1/2"	1x 1/2"	420	5,1	480	5,6	455	8,7	520	5,6
DN 125 (139,7)	256	16	2x 1/2"	1x 1/2"	470	8,1	530	8,8	505	13	570	8,8
DN 150 (168,3)	306	25	2x 1/2"	1x 1/2"	520	10	580	11	555	16	620	11
DN 200 (219,1)	406	56	2x 1/2"	1x 1"	620	26	680	28	660	35	730	28
DN 250 (273,0)	456	103	2x 1/2"	1x 1"	880	44	940	50	920	60	990	50
DN 300 (323,9)	550	165	3x 1/2"	1x 1"	920	68	980	77	965	112	1030	77
DN 350 (355,6)	608	225	3x 1/2"	1x 1"	1050	86	1110	97	1095	147	1180	97
DN 400 (406,4)	700	329	3x 1/2"	1x 1"	1140	122	1200	135	1185	195	1270	135



Diagram of the pressure drop through Nonair[®] as a function of the flow rate





The **Strainer** model of **NONAIR**[®] Micro bubbles Separator is designed to remove both air and dirt from circulating heating and chilled water systems. Floating particles will be trapped in the Strainer. Dirt, sludge and solid particles are collected in the sediment chamber.



DESIGN

One/two socket at the top of the body, is for air outlet. Use a reliable Air-Vent with ball valve.

Two sockets at the top of the body and at the outlet, is for **pressure gauge**.

One socket at the top of the body is for an optional Magnet rod.

The thread in the cover plate for the strainer insert, is for **drainage**. Use a ball valve with corresponding size. Reduction and blanking plugs has O-ring sealing of EPDM/NBR-material

Strainer insert have 0,6 mm mesh as standard.

Strainer area is 8 times the area of the connecting pipe.

Design pressure: PN10, 10 bar. Design temperature: 110°C

CONNECTIONS

Nonair[®] is solely made of acid-resistant Stainless Steel material 316L The units are available with various connection alternatives:

- **SOCKET** connection with sockets made of Stainless Steel material 316L. Available with female and male threads. Is used at threaded pipe joint with Stainless or Carbon Steel pipes.
- **WELDING ENDS 316L** with welding ends made of Stainless Steel material 316L. Is used at welded pipe joint with Stainless Steel pipes.
- WELDING ENDS Carbon Steel with welding ends of Steel material acc. to DIN 171 75. Is used at welded pipe joint with Carbon Steel pipes.
- **FLANGE** connection with welding collars made of Stainless Steel material 316L and loose flanges of Silumin. Is used at flanged pipe joint with Stainless or Carbon Steel pipes.
- **GROOVED** connection with grooved ends of Steel material acc. to DIN 171 75. Is used at grooved pipe joint with Victualic[®], Grinnell[®] or similar couplings.

OPERATION FIGURES

Dimensioning: Choose the same dimension as the pipe it is connected with. Pressure drop, Start: For clean strainer insert according to diagram on next page.. Pressure drop, Final: This is the level when cleaning of the strainer insert is needed. Due to the great active strainer area there will be long interval before cleaning is needed.





Table for weight, length etc

	S	OCKE	ET					
DIM	Dy	volume	soc	kets	thread	female male		all
	body					len	weight	
	mm	litre	air	gauge	drain	m	m	kg
R 50 (2")	129	4	1x 1/2"	2x3/8"	1x1/2"	480	520	4,6

					WELDING ENDS				FLANGE		GRO	OVED	
DIM	Dy	volume	soc	kets	thread	31	316L		carbon steel				
	body			-		length	weight	length	weight	length	weight	length	weight
	mm	litre	air	gauge	drain	mm	kg	mm	kg	mm	kg	mm	kg
DN 40 (48,3)	129	4	1x 1/2"	2x3/8"	1x1/2"	485	4,2	-	-	515	5,9	-	-
DN 50 (60,3)	129	4	1x 1/2"	2x3/8"	1x1/2"	430	4,2	480	4,4	460	5,9	520	4,4
DN 65 (76,1)	154	7	1x 1/2"	2x3/8"	1x1/2"	500	5,5	550	5,8	530	7,9	590	5,8
DN 80 (88,9)	168	9	1x 1/2"	2x3/8"	1x1/2"	560	9,1	610	9,4	590	12	650	9,4
DN 100 (114,3)	204	15	1x 1/2"	2x3/8"	1x1/2"	635	13	695	14	675	17	735	14
DN 125 (139,7)	256	28	2x 1/2"	2x3/8"	1x1/2"	720	15	720	16	760	20	820	16
DN 150 (168,3)	306	46	2x 1/2"	2x3/8"	1x1/2"	815	20	875	21	855	26	915	21

		socket		
DIM	sediment	clearance for	clearance for	for optional
	chamber	Strainer insert	M agnet rod	Magnet rod
DN 40 (48,3)	95	250	140	1 x 3/4"
DN 50 (60,3)	95	250	140	1 x 3/4"
DN 65 (76,1)	95	270	140	1 x 3/4"
DN 80 (88,9)	95	285	185	1 x 1"
DN 100 (114,3)	115	360	185	1 x 1"
DN 125 (139,7)	115	395	270	1 x 1"
DN 150 (168,3)	115	440	270	1 x 1"

Manufacturer:



Diagram for pressure drop over the Strainer insert



The diagram shows the pressure drop over a clean strainer insert with mesh size 0,6 mm. Valid for water without additives.

$\mathbb{NONAIR}^{\mathbb{R}}$ Micro bubbles Separator





The **NONAIR**[®] **Magnet rod** is a complement to the **NONAIR**[®] Strainer model. The feature is to separate all kind of magnetic particles that of later years has been addressed to many problems in pump systems. Modern circulating pumps has very low energy consumption but it is a reality that even the smallest particles like magnetite or other kind of dirt can be hazardous for a reliable pump function.

The **NONAIR®** Magnet rod is designed with powerful NeoDym magnets placed inside of a Stainless Steel pipe with a screw adapter in one of the ends. The Magnet rod can be mounted into the intended socket on top of the **NONAIR®** Strainer model. The Magnet rod will then be positioned right in the centre of the flow and flushed by the fluid the Magnet rod will now be able to separate all the magnetic particles. Accordingly they cannot cause any further problems or damage in the system.

After a period of operation the **Magnet rod** can simply be unscrewed and taken out for manually cleaning. At the time of cleaning can the observed amount of collected dirt on the Magnet rod give an indication of the necessary interval of cleansing.

Design

- Magnets of powerful NeoDym material
- Poles of magnetic material
- Ends of non magnetic material
- Rod pipe of acid proof Stainless Steel, 316L
- Square screw adapter in one end
- Screw connecting sealed to socket by O-ring of EPDM.
- Design temperature for magnetic NeoDym material 120°C
- The strength of the Magnet rod correspond to about 8000 Gauss

Operation

Unscrew the plug in the socket for **Magnet rod** on top of **NONAIR**[®] and inscrew the **Magnet rod** to tight mode. For cleaning, simply unscrew the magnet rod and take it out and manually clean the surface of the **Magnet rod**. Repeat the cleaning procedure on intervals with regarding of the collected dirt on the surface of the **Magnet rod**.

Table of	dimensions
----------	------------

Art no.	40050-065		4008	0-100	40125-150	
For Nonair DN	50 60		80	80 100		150
Diam of rod pipe	16 mm		25 mm		25 mm	
Length of rod pipe	120		160		250	
Screw connection	3/4"		1"		1"	
Square head	16 mm		19 mm		19 mm	
Weight	0,3 kg		0,8 kg		1,1 kg	



18(18) JAIR® Micro bubbles Separator

EXAMPLES OF NONAIR®:



Fig 1: Nonair® with various dimension and connections.



Fig 2: Nonair[®] with flange connections

Fig 3: Nonair® with welding ends

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