MAX.e POOL

Hybrid HVAC Solution

COP Net Beyond Ordinary

All climate zones and its future global changes

2-Stage Heat/Cool humidity recovery technology

Damvent

to reach...and exceed

MAX.e POOL

1 CONCEPTS

Take a look at the improved technology of max.e-POOL

max.e-pool is designed to maintain the indoor climate parameters (Temperature and Relative Humidity) in covered swimming pools.

3E - Concept

1e - Every Climate – from -20°C to +40°C

2e - Every Application – suitable for every application where 100% fresh air is needed, by means of covering all possible air treatment processes:

- Filtration
- Recirculation – 0÷100%
- Heat recovery
- Heating
- Cooling + Dehumidification
- Process Ventilation

3e - Every Installation – suitable for all types of mounting, indoor (machinery rooms, technical floors, etc.) and outdoor.

2-Stage Heat/Cool

Recovering up to 100% of the extract heating/cooling, achieved – "consecutively" in 2 stages:

1st stage - "passive heat recovery"
- using air-to-air plate heat exchanger to recover up to 65÷70% of the extract heat from the room.

2nd stage - "active heat recovery"
- using the evaporator of the air-to-air heat pump to recover from 65÷100% of the extract heat from the room.

100% Factory tested

High reliability and reduced installation costs, achieved by 100% factory tests – each unit is tested under factory conditions.

The test includes:

- Leakage check
- Vacuuming and loading the system with the exact refrigerant quantity
- Functional testing of all fans and compressors
- Vibrations
- Loading the controller's software
- Temperature and pressure checks
- Setting up the required air flow
- Recording all parameters of the unit on the test list.

100% Plug & Play

A standalone "one-piece" unit, which only needs a duct system and power supply for its start up.

All in 1

The **max.e-pool** is an autonomous module heat recovery ventilation unit containing an biult-in heat pump, automation, and a control system.

PROCESSES

in covered swimming pools

Each swimming pool has to offer optimal microclimate conditions of its visitors. The high relative humidity and condense in the rooms and especially in the halls of the covered swimming pools reduces significantly the comfort and, at the same time, leads to damaging of the building structure and the equipment within it. How to handle with these situations?

Achieving an optimal microclimate condition together with reducing the negative results due to the high humidity in the indoor swimming pools, is a process that requires a lot of energy and is quite expensive. Swimming pools consume disproportionately large amounts of energy compared to dry buildings. Water evaporation requires the supply of latent heat of vaporisation. This energy, contained in the water vapour, is lost from the building through ventilation. This form of energy loss far exceeds dry building losses through ventilation and conduction.

With the concept solution of Damvent for precise control of the microclimate in the covered swimming pools **max.e-pool,** these negative processes will be minimized and will be reached the optimal comfort for the visitors.

A conventional air-cooled heat pump uses the ambient air for the evaporation process, and during the winter, this air can reach temperatures of -10°C, -15°C or even -20°C. Extracting heat from the ambient air is an inefficient process. In comparison, **max.e-pool uses the extract air** from within the room. Under normal conditions, this air ranges in temperatures from **20÷24°C**. Firstly, **60÷65%** of the heat is recovered in the **plate heat exchanger**, and then at a temperature between **4÷10°C**, the air enters the evaporator of the **heat pump**, thus recovering the other **30÷35%.**

Using this method, we achieve a **COPsystem of 10** and avoid frost formation on the evaporator (which commonly occurs in all conventional heat pumps).

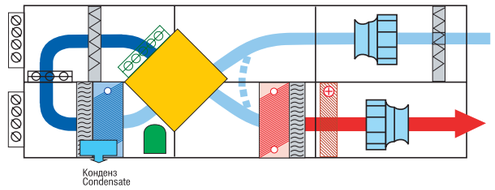
According to EN14825, the highest Energy Efficiency Class for Heat Pumps is A+++ with a SCOP = 3.75 (high temperature) / -4.38 (low temperature). With a **SCOP=3.8÷6.5** (of the refrigerant circuit) and a COPnet of the whole system **SCOPnet= 5÷15**, **max.e** is far ahead of the competition.

$$COPnet = \frac{Qplate\ heat\ exchanger + Qheat\ pump}{Nfans + Ncompressor}$$

Note:

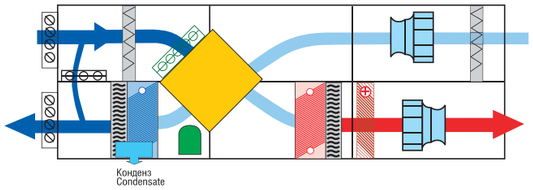
**SCOPnet - seasonal efficiency of the unit in heating mode, with no additional electric heaters, determined by the mandatory conditions laid down in this EU standard and used for marking, comparison and certification purposes.*

WORKING MODES



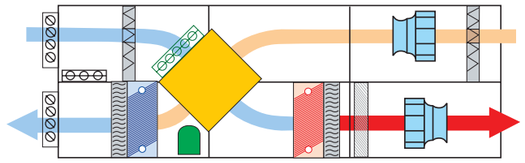
1. Operation in standstill mode (without swimmers)

The exhaust air from the pool is pre-cooled in the plate heat exchanger, than sub-cooled in the evaporator below the dew point temperature. The moisture in the form of condense is taken out. The dehumidified air is partially mixed with recirculation air. The so mixed air is heated within the condenser and then supplied to the pool. The plate heat exchanger is used as an economizer, reducing significantly the energy costs.



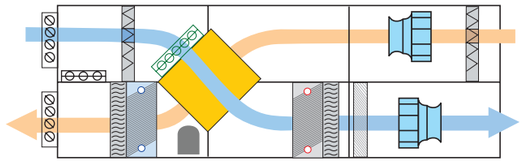
2. Operation in Winter - Dehumidification with Heat Pump

During the winter, water evaporation is much more intensive. Thus a dehumidification is needed. The exhaust air from the pool is precooled in the plate heat exchanger, than subcooled in the evaporator below the dew point temperature. The moisture in the form of condense is taken out. The necessary fresh air is partially mixed with dehumidified, recirculation air. The so mixed air is first pre-heated in the plate heat exchanger, then re-heated within the condenser and then supplied to the pool.



3. Operation in transitional periods - Ventilation and Heat Pump

The outside temperatures during the transitional periods are average and relatively high, max.e3-pool supply to the pool 100% fresh air. Thus a maximum comfort is achieved with minimum energy costs. The Heat Pump is switched on only if needed.



4. Operation in transitional periods - Ventilation and Heat Pump

During the summer the heat pump is switched off and only the exhaust and supply fan are operating. The bypass of the plate heat exchanger is open and the unit supply to the pool maximum quantity fresh air, achieving an optimum comfort.

4 ADVANTAGES

Learn more about what are the main advantages of our hybrids

1

FOR INVESTORS

- Initial investment cost reduction
- Installed electricity power reduction
- Lower operating (energy) costs
- Saves space
- Absence of “defrost” mode and maintains continuous working of the unit
- Easy maintenance – only one unit
- Internet monitoring
- 100% test in factory conditions
- Low sound parameters

2

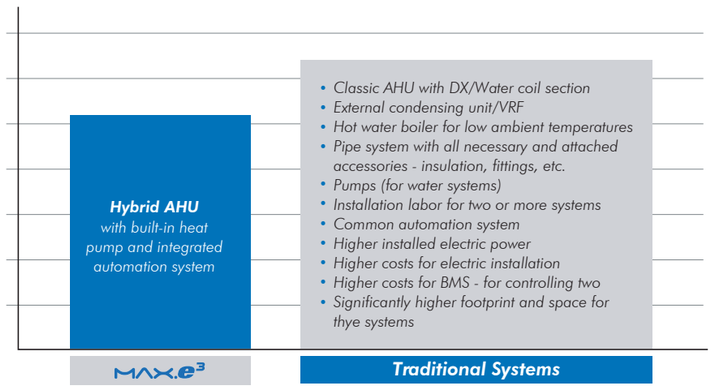
FOR DESIGNERS/CONSULTANTS

- Selection software is available
- Saving time during the process of design
- Flexibility when there is lack of space
- Fast and easy calculations for yearly operation (energy) costs
- Absence of “defrost” mode

3

FOR INSTALLING COMPANIES

- Easy installation (needs only duct connections and power supply)
- BMS connection via different protocols
- Settings via Internet
- No need for refrigeration work



5 SOFTWARE

DV_Select

The most important tool for any designer / consultant!

The Specialized hybrid selection software can calculate different modes (winter and summer) and provide extremely accurate calculations.

DV_Select is a technical simulation software for hybrid fresh air units and therefore, in the technical printout, every engineer (designer, consultant) can get acquainted with the air treatment processes, both in the rotary wheel (plate heat exchanger) and within the heat pump unit.

Friendly Interface

Light weight, fast and easy to operate with minimal time to enter the input data - from 30 to 90 sec for the calculation

Winter / Summer calculation modes

Ability to export all technical data to .pdf

Visualisation of all air treatment processes within the Mollier diagram

HARDWARE

Design

max.e-pool is designed as a system with the structure of the unit manufactured as a mono-block. The construction is manufactured from high-quality profiles made of extruded aluminium characterized by high strength and resistance to adverse weather conditions.

Fans

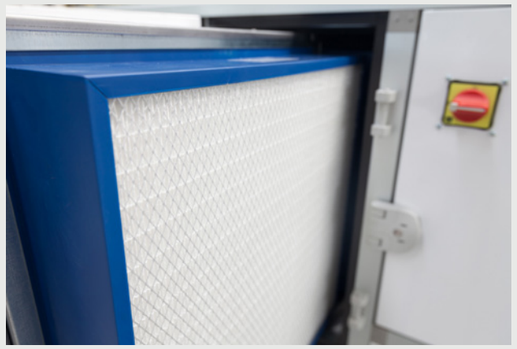
max.e-pool uses ZAbluefin plug fans with latest EC Blue (Electronically Commutated) from the company Ziehl-Abegg. Fan wheel statically and dynamically balanced on the axis of the direct-driven motor. Fan wheel, together with the motor, is mounted on a common base frame with vibration dampers.

Automation System

max.e-pool is fully equipped with all necessary automation and all executive mechanisms. The electric switchboard is integrated into the unit and located on the operation side. The “Brain” of max.e-pool is its specially designed by Damvent controller, which controls and manages all processes and protects the unit from eventual cut-offs.

Plate Heat Exchanger

For all of the units of the type max.e-pool are used plate air-to-air heat exchangers, made from aluminium fins - “epoxy” coated, with condensate drain pan. This special cover of the plate heat exchanger allows extending their useful life and also their best levels of performance for a long time.

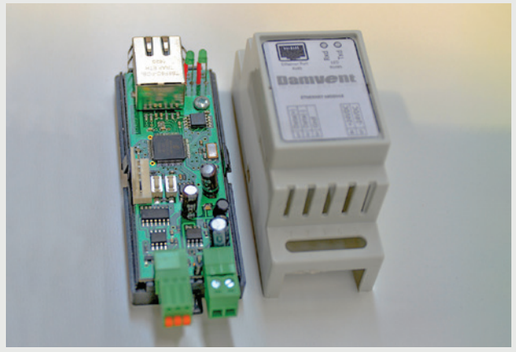


Filters

Filters are installed at the entrance of the unit to ensure the normal operation of the AHU and to prevent contamination of the components.
Microcell filters are used in the units max.e-pool. These filters are made of plated micro-glass paper and spaced with hot melt adhesive beads, which are uniformly positioned to deliver optimum airflow.

Heat Pump

100% DX unit
No additional water, electric or DX heating/cooling coils are needed in the max.e-pool, which makes it independent of other additional heating/cooling sources (boilers, chillers, VRF systems, etc.)



Connectivity and mobility

All hybrid units allow into the corresponding connector of the ICB controller to be mounted specialized internet circuit board for internet connection. The built-in circuit board allows a permanent internet connection to max.e from any location in the world. This option helps you/us to make adequate reaction to situations requiring fast and accurate solutions to the problem.

FACTORY TEST

How to overcome the lack of a Dedicated Standard for Hybrids?

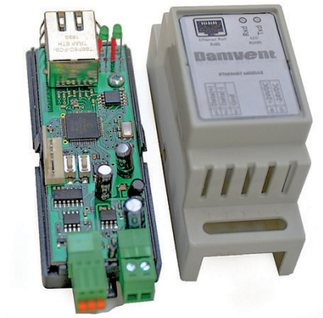
There is only one way...

With the Ultimate Factory Test (FT).
Every single Hybrid that we produce goes through a full Factory Test in factory conditions and Ready-to-Work.

It includes the following features:

- Vacuuming of the refrigerant circuit and filling up the exact quantity of refrigerant, without extra activity on site
- Functional checks of all executive mechanisms and sensors
- Setting up the exact airflow (CAV), or pressure (VAV) required by the customer EEV fine settings
- Measuring and recording all air and refrigerant temperatures (°C) and pressures (bar), voltage (V), currents (A) and power input (kW) of the different components and the unit as a whole
- Simulation of heating/cooling, ventilation or dehumidification modes
- Tsupply control simulation
- Capacity control adjustments (compressors and additional heaters if available)
- LCD display User settings and connectivity
- Fine adjustments of frequency inverters of: fans, compressors, rotary wheel
- Filter settings
- Alarm checks
- Remote control check
- BMS settings
- Labeling of the unit
- Final internal cleaning
- Providing the necessary documentation (manuals, declarations of conformity etc.), plus additional accessories
- Packaging
- ...last but not least, comparison between the theoretical performance in the selection software printout and the real measured values during the FT

MOBILITY



Permanent internet connection

All hybrid units allow an internet circuit board to be connected to the ICB controller for Internet connection. The built-in circuit board allows for a permanent Internet connection to each max.e from any location in the world. This option helps you/us react to situations that require fast and accurate solutions to the problem.

Opportunities provided by WEB communicator

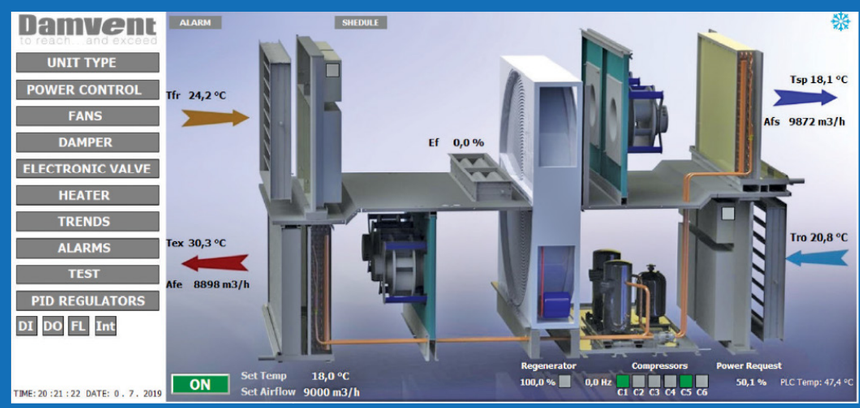
Possibility for remote start-up and 72 hours monitoring period
The air-handling unit can be started and adjusted via the Internet, it would be monitored until it reaches and maintains the set parameters.

Software updates
Updates are possible for the controller's software, if the customer requires additional settings or parameter adjustment. These additional settings and updates would be managed/performed over the Internet.

Archive (history) of working and service parameters
This option would create History logs/archives containing data about the operation of the AHU, using the Supervisory Control and Data Acquisition (SCADA).

Monitoring of the variables, working parameters
Monitoring the status of all variables accessible to the client and the unit's display.

Diagnosis of problems, arising during the operation of the air-handling unit
By analysing the information and data from the history menu, the source of the issue or the reason which triggered it can be found. The problem is solved via the Internet when physical access to the AHU is not required.



Functional diagram

Take a detailed look how the unit is connected with all its components. It is fascinating how such a little technology can have such a big impact on the performance and maintenance of the complete system.

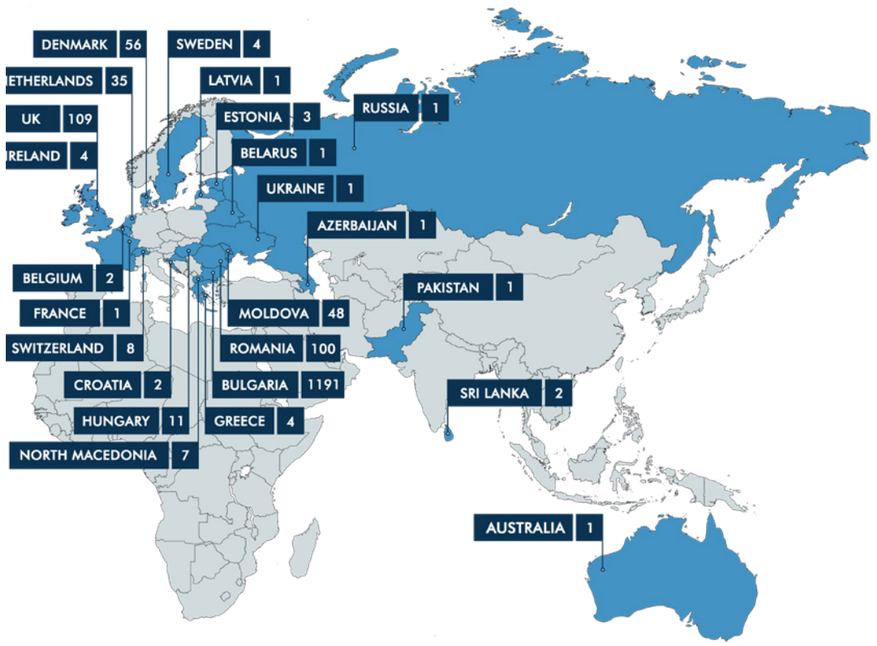
Damvent

to reach...and exceed

We are Damvent - A Bulgarian technology company,

100% privately owned, with more than 30 years of experience in the field, specialized in production of the highest/premium class energy – efficient /saving solutions for ventilation and air conditioning.

More than 1600 Hybrids delivered, installed and commissioned in 24 countries across the EU, Asia and Australia.



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