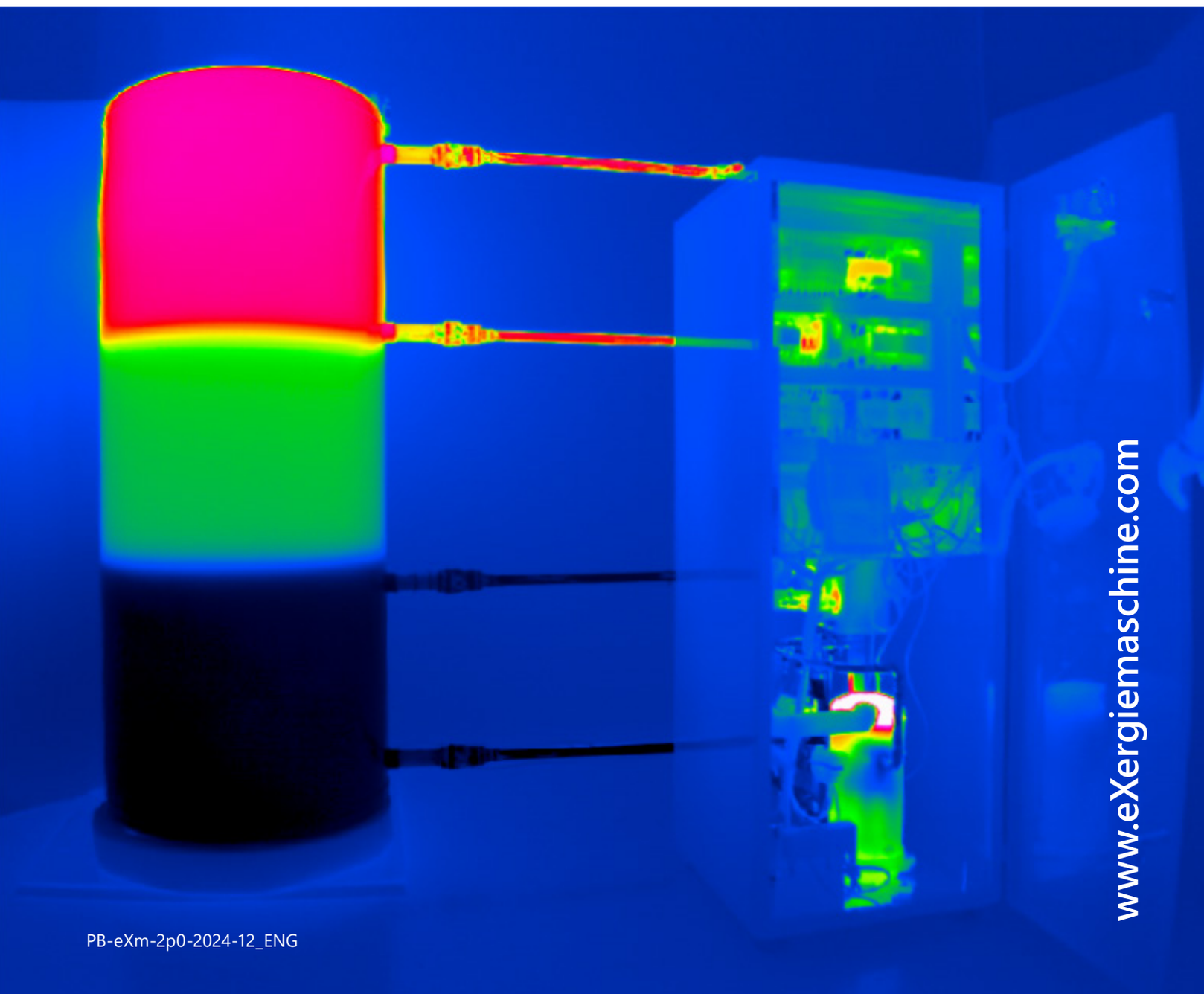
Efficient optimization of heating and hot water systems

Using heat more efficient. With the eXergy machine!



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The Idea

Dormant energy becomes eXergy – efficient usable heat.

For example, during circulation mode in domestic hot water networks, the return temperatures vary depending on the draw-off rate. Without any draw-off, the return temperature can rise to around 57–58 °C. This has a negative impact on the heat generator—whether it's a condensing boiler, a district heating system, a CHP unit or a solar thermal installation.

Conversely, heat is often available at a (still) unusable temperature level. This is frequently the case in waste heat recovery or with solar thermal systems operating at low efficiency — such as during transitional seasons.

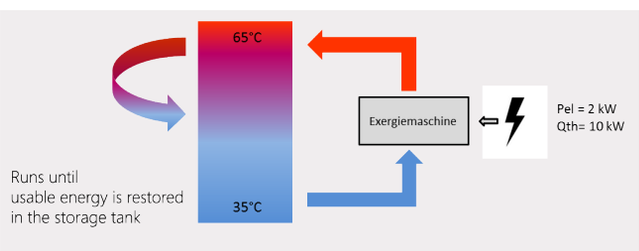
To avoid such inefficient usable temperature levels, BMS-Energietechnik AG and varmeco GmbH & Co. KG have developed the eXergy machine eXm.

The eXm enhances the performance of the heating system. It enables you to maintain the desired low return temperatures, sustain high supply temperatures, make use of waste heat, and operate sources such as local and district heating networks, boilers, heat pumps, solar collectors or CHP units in an optimal and low-wear manner.

eXm – the innovative solution to efficiency challenges.

Exergy is being destroyed

Exergy is being generated



Using heat more efficient

- Is the supply temperature too low?
- Is the return temperature not cold enough?
- Are the switching cycles of the heat generator too short?

The eXergy machine eXm raises the temperature level in the thermal storage tank independently of current consumption patterns, enhances the performance of conventional or hybrid systems, and minimizes switching cycles. To achieve this, the eXm increases the temperature differential.

Choosing the right exergy level in a given system is a challenge. With the eXm, you can achieve virtually any desired level across a broad range.

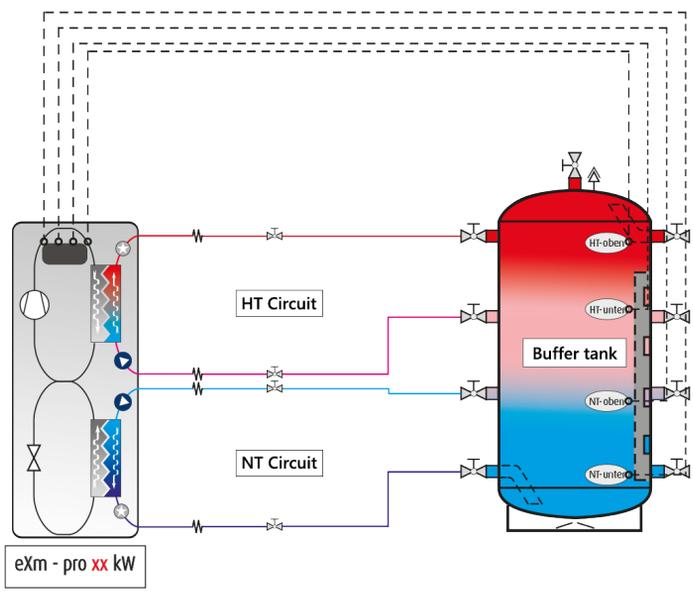
The only way to increase the amount of heat under given conditions is to widen the temperature difference (ΔT) between supply and return.

- **Higher energy transfer capacity!**
- **Smaller pipe dimensions possible!**

How the eXergy machine works

So how does the eXm work? It extracts heat from a thermal storage tank at a medium temperature level, raises the temperature, and feeds the heat back into the top of the tank. At the same time, the eXm generates cold and supplies it to the lower part of the storage tank. In other words, the eXm simultaneously produces both heat and cold.

With minimal energy input, the performance of the heating system can be significantly enhanced. The desired low return temperatures are maintained, high supply temperatures are ensured, waste heat is utilized, and sources such as local and district heating networks, solar thermal modules or CHP units are operated efficiently and with minimal wear.



The supply temperature rises, the return temperature drops.
And as the temperature spread ΔT increases, the thermal energy (Q=c*m*ΔT) increases proportionally.

In which applications is the use of an eXm beneficial?

The eXm is ideal wherever low return temperatures are required, supply temperatures need to be increased, switching cycles reduced, operating times extended or circulation losses are high.

- District heating systems
- Heat pumps
- Waste heat utilization and heat recovery
- Solar thermal systems
- Condensing boiler systems
- Local heating networks
- Combined heat and power (CHP) units
- Biomass heating systems
- Solar cooling
- Adsorption chillers
- Hybrid solar collectors
- ...and many more

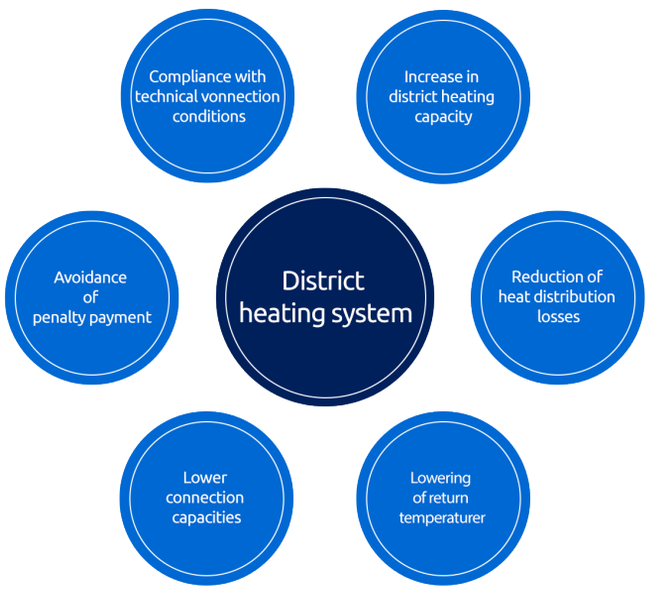
District heating systems

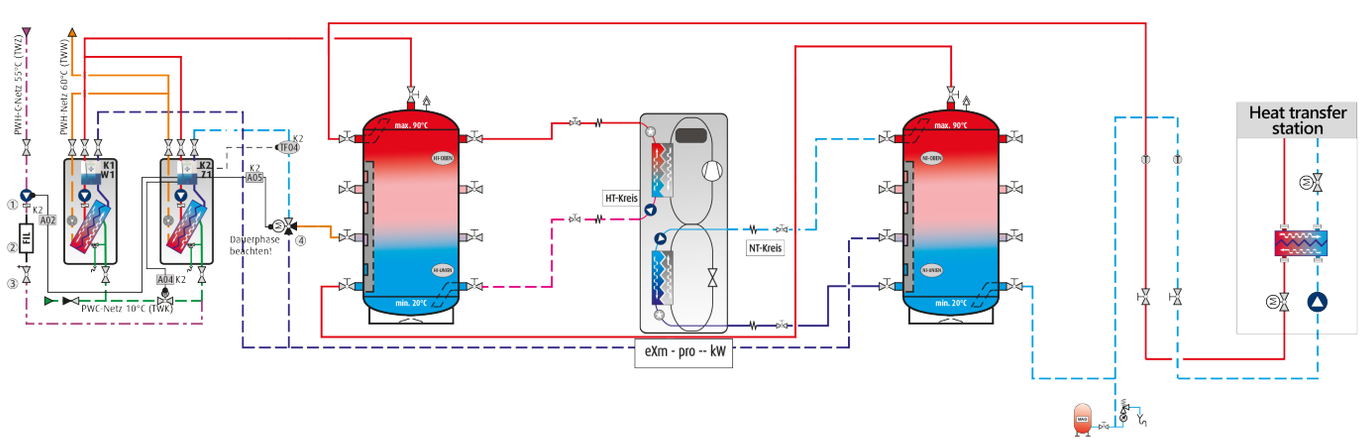
Lower return temperature and meeting connection requirements

For example, in residential and commercial buildings, hospitals, care facilities, military barracks, educational centers and more.

Many district heating providers require that the return temperature at the district heating station be significantly lower (e.g., 50 °C or even lower) than the supply temperature. This requirement is particularly difficult to meet during summer months when the heat demand is low — in the worst case, penalties may be imposed by the district heating operator.

The eXergy machine increases the temperature difference between supply and return. As a result, the return temperature can be lowered, allowing the system to reliably meet the target temperature specified in the connection requirements.





Heat pumps

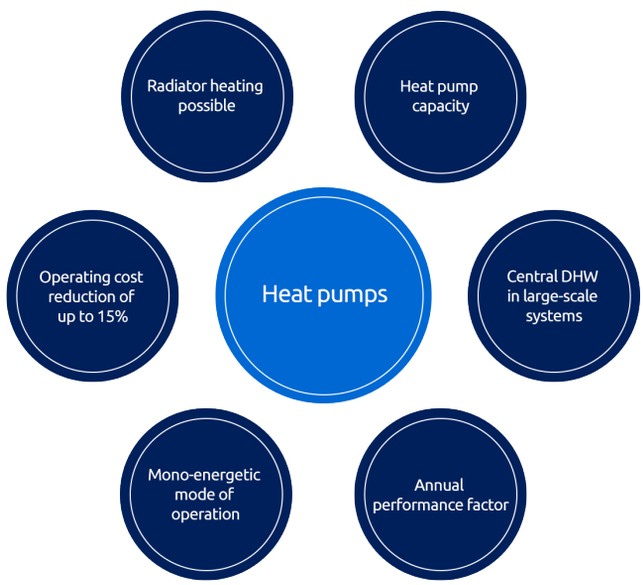
Increase supply temperature, reduce switching cycles, and extend operating times

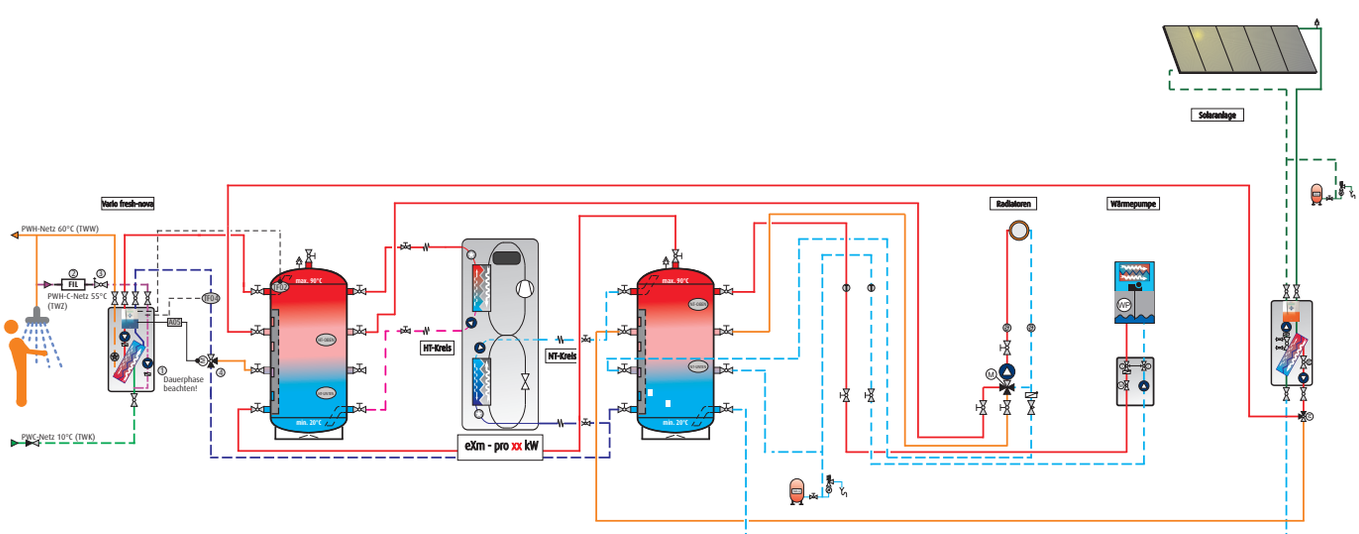
For example, in all types of residential and commercial buildings.

Many air-to-water heat pumps typically deliver supply temperatures of up to 50 °C. While this is sufficient for underfloor heating systems, it is not hot enough for hygienic domestic hot water generation.

The eXergy machine raises the temperature to 65 °C or higher, making the heat usable for high-temperature heating systems or domestic hot water supply.

This eliminates the need for additional reheating via electric immersion heaters or gas boilers. The run and pause cycles are extended, meaning the heat pump switches on significantly less frequently. On cold winter days, the heat pump can operate at a lower temperature level—and therefore more efficiently.





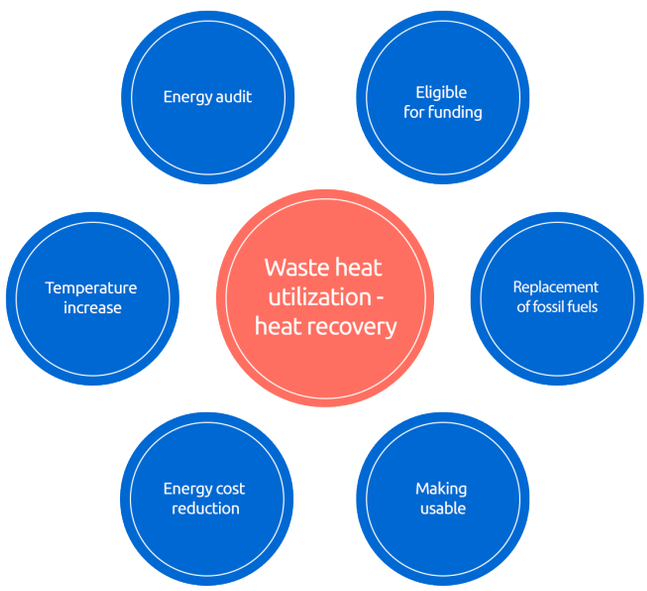
Waste heat utilization and heat recovery

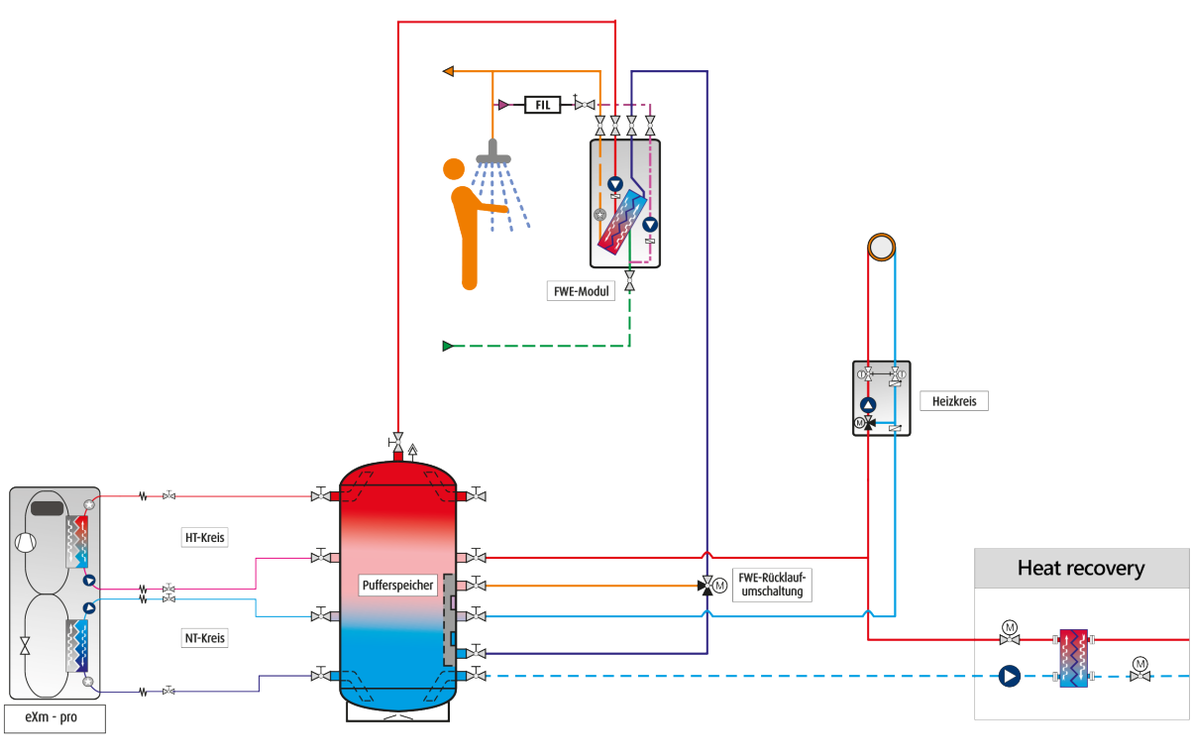
Raising supply temperature to a usable level

For example, in industrial facilities or commercial operations with refrigeration, air conditioning systems or process cooling.

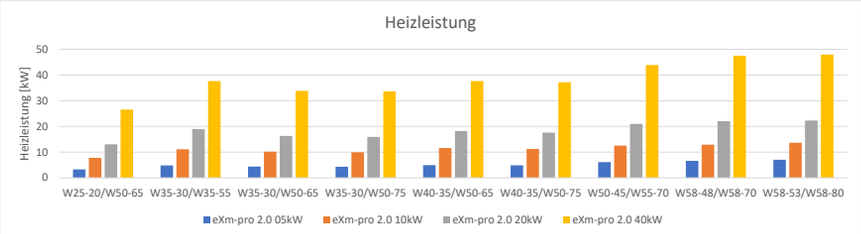
Refrigeration systems - such as those used for cold storage or deep-freeze warehouses - generate waste heat at a temperature level of around 30 °C to 40 °C. This is too low to be effectively used for space heating or hygienic domestic hot water production.

The eXergy machine can raise this heat to a higher supply temperature, making it usable for process heating, space heating or hot water generation. Lower return temperatures further improve the ability to harness this waste heat. Using the eXm helps conserve resources and contributes to reducing operating costs.

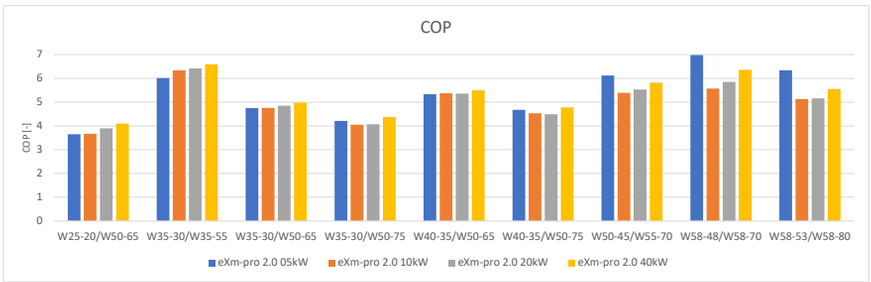




Performance range



Heating Capacity [kW]				
Test Condition	Type			
	eXm-pro 2.0 05 kW	eXm-pro 2.0 10 kW	eXm-pro 2.0 20 kW	eXm-pro 2.0 40 kW
W25-20/W50-65	3.27	7.78	13.03	26.52
W35-30/W35-55	4.82	11.10	18.93	37.66
W35-30/W50-65	4.34	10.16	16.29	33.84
W35-30/W50-75	4.32	9.93	15.91	33.64
W40-35/W50-65	4.94	11.59	18.18	37.67
W40-35/W50-75	4.86	11.23	17.56	37.19
W50-45/W55-70	6.10	12.52	20.96	43.89
W58-48/W58-70	6.59	12.92	22.05	47.54
W58-53/W58-80	7.03	13.65	22.25	47.98
Source: Heat Pump Test Center (WPZ), Test Numbers WW-276-24-04, WW-277-24-05, WW-278-24-06, WW-279-24-07 von 05/06-2024				

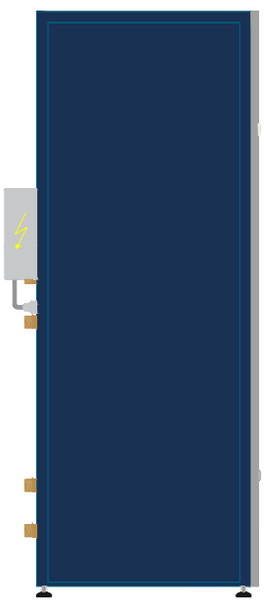


COP				
Test Condition	Type			
	eXm-pro 2.0 05 kW	eXm-pro 2.0 10 kW	eXm-pro 2.0 20 kW	eXm-pro 2.0 40 kW
W25-20/W50-65	3.65	3.67	3.90	4.10
W35-30/W35-55	6.01	6.34	6.42	6.59
W35-30/W50-65	4.75	4.76	4.85	4.98
W35-30/W50-75	4.21	4.05	4.07	4.37
W40-35/W50-65	5.33	5.37	5.36	5.50
W40-35/W50-75	4.68	4.53	4.49	4.78
W50-45/W55-70	6.12	5.39	5.53	5.82
W58-48/W58-70	6.98	5.57	5.85	6.36
W58-53/W58-80	6.34	5.13	5.16	5.55
Source: Heat Pump Test Center (WPZ), Test Numbers WW-276-24-04, WW-277-24-05, WW-278-24-06, WW-279-24-07 von 05/06-2024				

Technical data

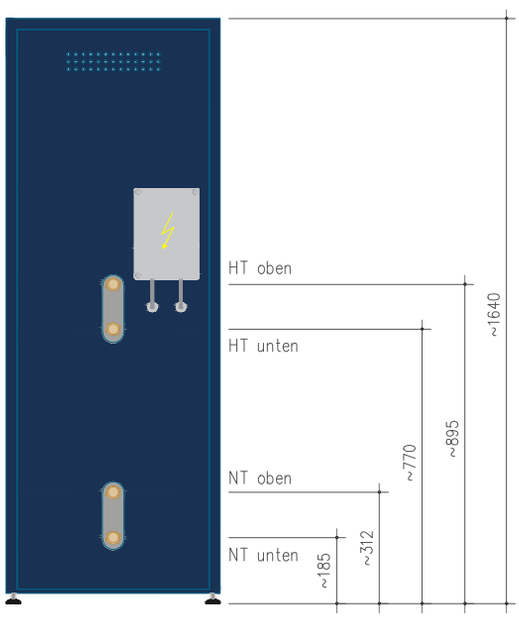
Technical data	eXm-pro 2.0 05 kW	eXm-pro 2.0 10 kW	eXm-pro 2.0 20 kW	eXm-pro 2.0 40 kW
Nominal Heating Capacity (kW) at W40-35 / W50-65	4.9	11.6	18.2	37.7
Electric Power Input (kW)	0.9	2.2	3.4	6.9
COP Value (W40-35/W50-65)	5.3	5.4	5.4	5.5
Application Fields				
Inlet Temperature – LT Side (°C) (min–max)	25-60			
Outlet Temperature – HT Side (°C) (min–max)	45-80			
Maximum operating pressure on the heating side (bar)	6			
Permissible ambient temperature (installation room) (°C)	40			
Refrigerant	R 513a			
GWP (Global Warming Potential)	631			
Safety class	A1			
Practical limit (kg/m³)	0.32			
LFL (Lower Flammability Limit)	NF (non-flammable)			
Water hazard class (WGK)	1 (slightly hazardous)			
Refrigerant charge (kg)	0.85	1.50	1.78	3.47
Power supply / upstream fuse	230V/16A Type C	400V/16A Type C		400V/32A Type C
Maximum operating current (MCC) in A	10	13.4	17.3	30.4
Operating current per phase in A	3.6	4.9	7.0	11.0
Starting current (locked rotor LRA) in A	26.0	66.0	73.0	111.0
Pipe connections (4 pieces)	1" external thread or 3/4" internal thread	1 1/4" external thread or 1" internal thread		
Housing dimensions W/D/H (mm)	622 / 600 / 1700			
Weight (kg)	137	170	190	225
Sound power level LW (dB/A) at 1 m distance	52	54	56	59
Footprint for maintenance work approx.	Approximately 50 cm clearance around the unit / 100 cm at the front			
Hydraulic key parameters				
HT volume flow rate in [m³/h]	0.29	0.59	1.17	2.34
HT residual pump head in [kPa]	79	75	66	39
NT volume flow rate in [m³/h]	0.7	1.38	2.94	2.95
NT residual pump head in [kPa]	65	53	13	13
Legend: HT = High temperature / condenser side, NT = Low temperature / evaporator side				

Dimensions/Connection Dimensions – eXm-pro 2.0 05 kW



Seite A

Front (Tür)



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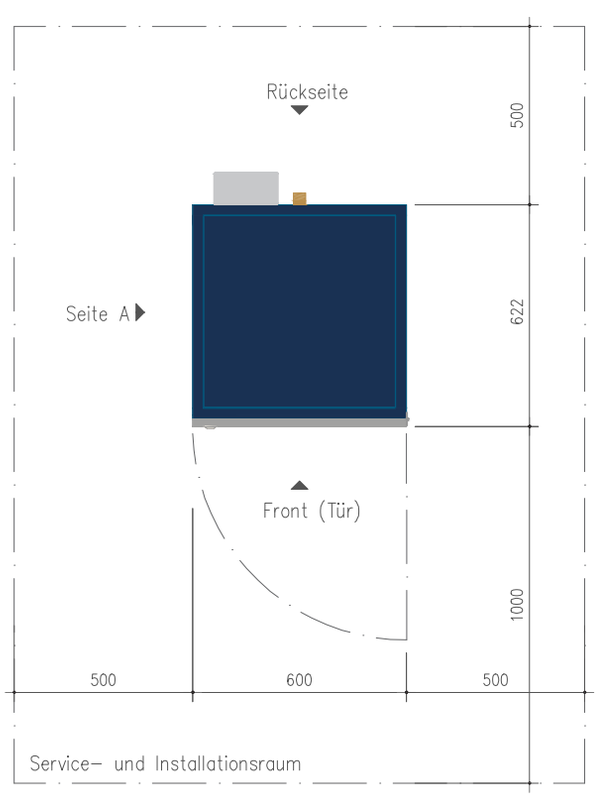


Note on connections

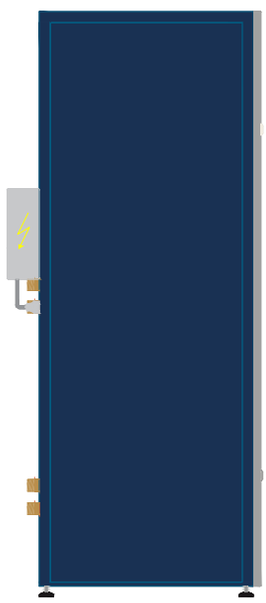
All connection heights refer to the minimum position of the machine feet (30 mm). The feet can be adjusted upward by 30 mm to compensate for unevenness at the installation site.

Connections: 1" external thread or 3/4" internal thread
Connection dimension tolerance: ±10 mm

Colors

Front (door): RAL 9006 (White aluminium)
Housing: RAL 5013 (Cobalt blue)

Dimensions/Connection Dimensions - eXm-pro 2.0 10/20/40 kW



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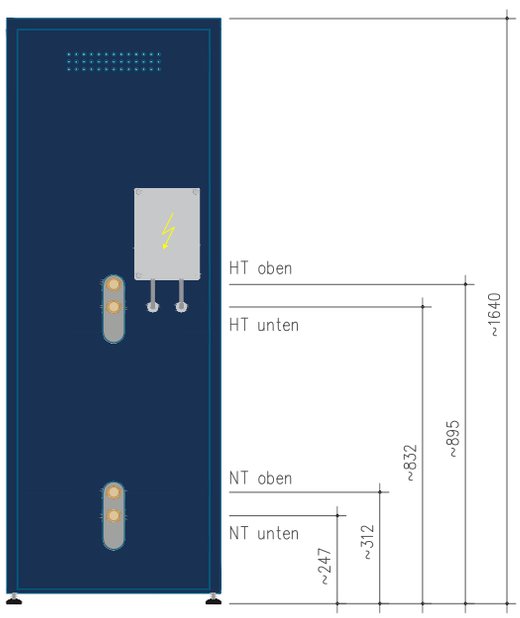
Front (Tür)



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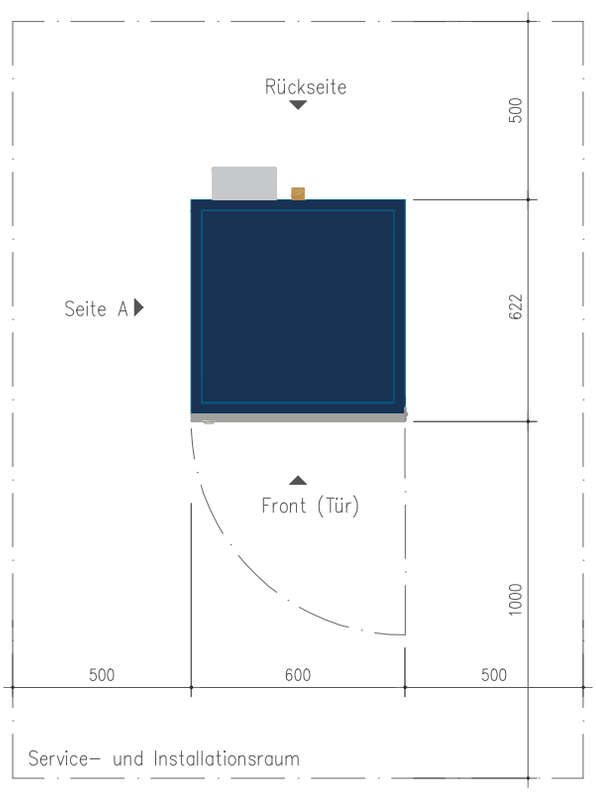

Note on connections

All connection heights refer to the minimum position of the machine feet (30 mm). The feet can be adjusted upward by 30 mm to compensate for unevenness at the installation site.

Connections: 1 1/4" external thread or 1" internal thread
Connection dimension tolerance: ±10 mm

Colors

Front (door): RAL 9006 (White aluminium)
Housing: RAL 5013 (Cobalt blue)

What are the advantages of the eXergie machine?

In principle, the overall system is improved and the efficiency of your heating system is significantly increased.

The eXm...

- ... establishes defined operating conditions – regardless of how much energy is currently being added to or drawn from the system
- ... makes the system independent of user behavior
- ... raises heat to a higher, more usable temperature level (exergy)
- ... ensures low return temperatures
- ... increases operational reliability
- ... improves the efficiency of heat generators
- ... minimizes wear on heat generators by enabling longer operating time

About the developers and manufacturers of the eXergie machine

The long-standing partnership between the companies varmeco and BMS, along with their teams of experts, made this development possible.

Since 1983, **varmeco** has been a pioneer in efficient and renewable heating system technology with hygienic domestic hot water preparation. As specialists in intelligent heat management, we offer control and system technology, self-learning control components, hygienic fresh water systems, solar heating solutions with highly efficient solar collectors and patented stratified storage tanks.

As a provider of system solutions, **BMS-Energietechnik** has evolved into a market leader. The company is a frontrunner in Switzerland in several fields, including heat exchange, waste heat recovery from refrigeration systems, fresh water technology and heat recovery from wastewater. Another core business is the patented BMS Power Module technology for cooling, air conditioning and heat generation.

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