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# AMONUM chillers

Eco-friendly cooling in compact packaging, easy maintenance and safe.

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Optimal use of energies.

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# AMONUM chillers are efficient, compact and natural

Ammonia is a refrigerant par excellence: it is environmentally friendly because it does not add to global warming, nor does it damage the ozone layer. Its excellent thermodynamic characteristics make it particularly cost-efficient. Moreover, its low energy costs and lower indirect CO<sub>2</sub> emissions enable up-to-date, sustainable refrigeration. Until now, the benefits of ammonia as a refrigerant have largely been utilised in large-scale industrial refrigeration systems.

AMONUM chillers are compact, low-maintenance and are delivered to the customer fully assembled. This keeps assembly costs down and ensures easy installation. The AMONUM has been designed for both indoor and outdoor installation, and its low refrigerant filling capacity of under 10 kg makes it suitable for universal use. This makes it easy for planners to integrate the AMONUM in new construction projects or as part of modernisation programmes for existing systems.

## Advantages of ammonia as a refrigerant

- Climate-neutral
- Reasonably priced
- High availability
- Low energy demand for refrigeration
- Low operating costs
- High specific refrigeration capacity
- It can be instantly located thanks to its characteristic odour





# Superior technology is the foundation of environmentally friendly efficiency

AMONUM chillers can be used for brine applications down to -21°C as well as for process cooling and climate control up to +16°C; heat recovery is feasible up to a condensation temperature of 53°C. The AMONUM operates with a speed-controlled reciprocating compressor in conjunction with a cylinder bench switch-off. This combination provides the ideal power adjustment for the required refrigeration capacity. The SIMATIC S7 controller ensures optimal energy efficiency. It goes without saying that AMONUM chillers have smart grid capability and provide future-proof refrigeration:

All models meet the ecodesign requirements for process coolers that will take effect on 01/07/2016 and 01/07/2018.

➤ Your purchase of an AMONUM from ENGIE Refrigeration means an all-inclusive package: the low refrigerant filling volume as well as the stable, compact housing ensure the greatest possible safety. An optional gas warning system may be integrated as well.

## AMONUM | Profile

- Water-cooled liquid chiller
- Construction: compact design in enclosed housing
- Especially maintenance-friendly thanks to its easily removable cladding elements
- Suitable for indoor and outdoor installation
- Available in four performance levels
- Speed-controlled open reciprocating compressor in combination with cylinder bench switch-off
- Ammonia refrigerant (NH<sub>3</sub>)
- Refrigerant charge < 10 kg
- Plate heat exchanger
- Oil and liquid separator
- Electronic expansion valve
- Controller with S7 touch panel
- All electrical components integrated in switch cabinet
- Switch cabinet hermetically (airtight) separated from the system section

## AMONUM | Applications



Brine applications

➤ down to -21°C



Chilled water for climate application

➤ up to +16°C



Heat pumps/hot-water production

➤ up to +53°C

## 4 AMONUM models for efficient refrigeration



Model



Refrigeration capacity

@ 1,450 min<sup>-1</sup>

@ 1,750 min<sup>-1</sup>

Model	@ 1,450 min <sup>-1</sup>	@ 1,750 min <sup>-1</sup>
AMONUM W009	60 kW	72 kW
AMONUM W011	87 kW	104 kW
AMONUM W013	107 kW	129 kW
AMONUM W016	130 kW	157 kW

# The AMONUM is all set for natural cooling

An AMONUM from ENGIE Refrigeration supplies you with environmentally friendly, efficient cooling – in a practical package: the housing and base plate are made of sturdy steel, with all connections located on the same side. Right or left? That depends entirely on you and the site conditions.

## Compact + flexible

- One housing size for all performance variables
  - > Small installation space of only approx. 2.5 m<sup>2</sup>
  - > Easy placement (L x B x H = 2,797 x 908 x 1,881 mm)
- Standard design in IP54
  - > Waterproof and suitable for outdoor installation
- The use of plate heat exchangers results in a compact design
- Electric switch cabinet fully integrated into housing

## Fast + easy connection

- Clear pipeline routing, all brine/water connections on one side
- Feed can be selected for the left or right side
- Sound-absorbing insulation (optional)

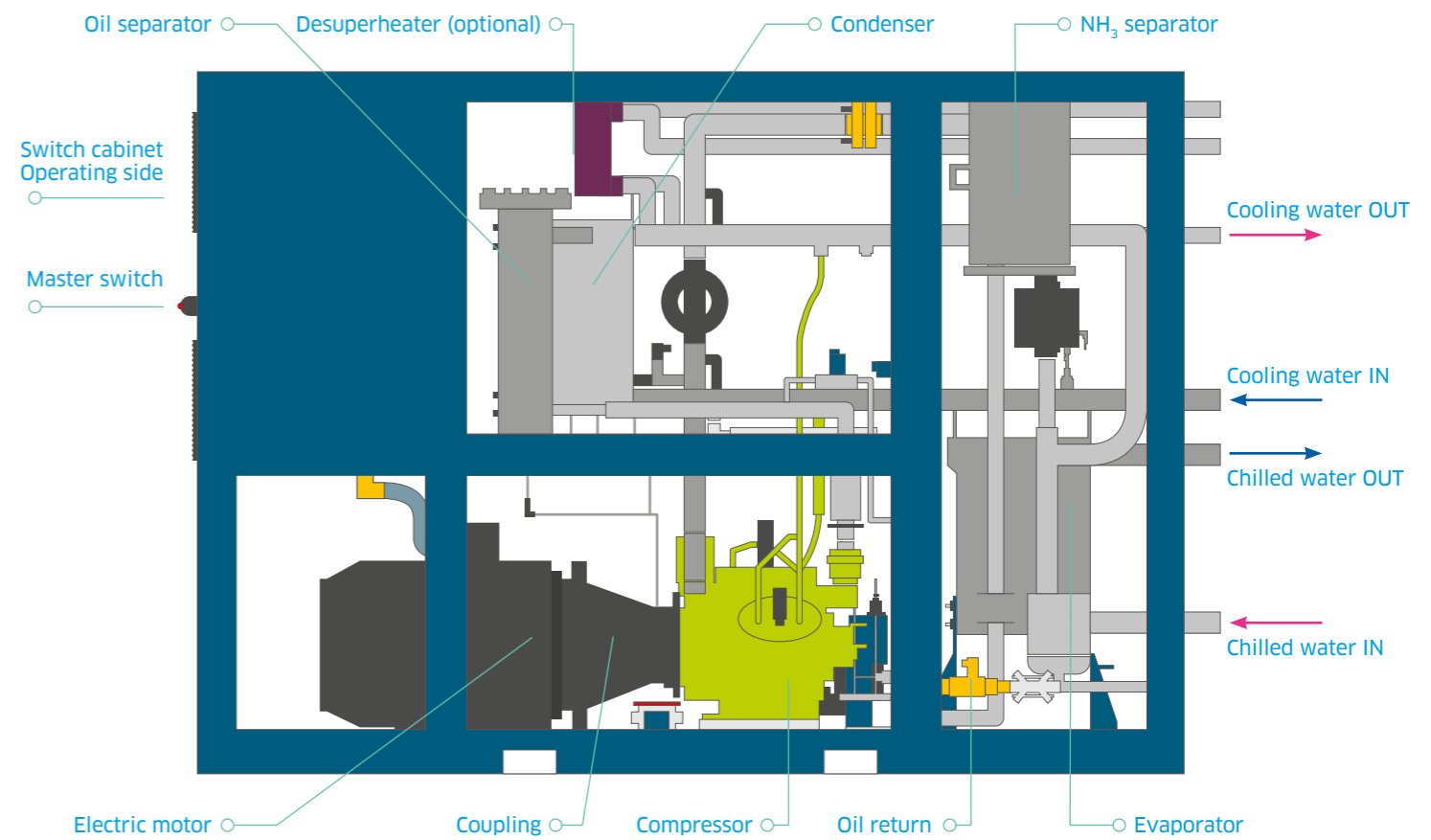
The switch cabinet is integrated in the housing, but is hermetically sealed off from the machine part. With an installation area of only approximately 2.5 m<sup>2</sup>, the AMONUM is at home in small spaces – even if you install it outside.

## Service-friendly


- Cover panels on all sides
  - > All panels are removable
  - > Friction-weld seals for fast and easy opening
  - > All components are easily accessible for service and maintenance work
- Use of multiple shut-off valves in the refrigerant circuit
  - > Service-friendly charging and draining
  - > Easy-maintenance oil changes on the compressor
- Modular design for simple retrofitting of options and accessories

## Stable + safe at all times

- Multiple canted steel housing panels
- Warp-resistant floor construction (honeycomb shape)
- Optimal weight distribution on the floor
- Fork lift pockets for loading and transport







# The AMONUM brings together first-class components into an highly effective refrigeration system

## 1. Compressor

- 4 compressor model with 4/6 cylinders
- Open reciprocating compressor with cylinder bench switch-off for power control (33/66/100%)
- Speed control and current limiting by means of frequency converter
- Liquid-cooled cylinder heads

## 2. Electric motor and coupling

- Highest efficiency class IE4
  - > Highly efficient standard motor of efficiency class IE3 (premium efficiency)
  - > Monitored winding temperature
  - > Robust industrial design
- Compressor motor connection by means of elastomer coupling and clutch casing
- Easy to assemble thanks to custom-fit clutch casing
- Quick alignment of the compressor motor unit
- Handle protection provided by solid clutch casing

## 3. Condenser and evaporator

- Soldered plate heat exchanger free of non-ferrous metal
  - > Entirely in stainless steel
  - > Suitable for highly corrosive media
  - > Maximum positive operating pressure PS 22 bar (refrigerant and water side)
- Evaporator
  - > Minimal pressure loss
  - > Vent and drain nozzle on water side
  - > Extremely compact, low temperature approach
  - > Flow monitor for frost protection monitoring
  - > Completely insulated against condensation

## 4. Switch cabinet

- Switch cabinet protection class IP 54
  - > Hermetically sealed against system section
  - > Corner design with extra space for additional options
  - > Aeration and ventilation from outside, temperature monitoring
  - > Ergonomic operating height
  - > Surge protection (optional)

## 5. Controller

- SIMATIC controller with touch panel
  - > Self-explanatory, clearly arranged menu navigation
  - > Indication and reading of all measurement data
  - > A variety of BUS connections are possible
  - > Remote servicing/monitoring ENGIE COOLCARE (optional)

## 6. Frequency converter

- Frequency converter integrated in switch cabinet
  - > Infinite power control through speed control
  - > Soft start of motor/compressor
  - > With LCD display for monitoring
  - > Shielded power cables
  - > In conformity with the EMC Directive

## 7. Oil management

- System side:
  - > Separate oil separator with coalescence filter in the compressed gas line
  - > Cyclically controlled oil return
- Compressor interior:
  - > Inspection glass for checking oil level
  - > Oil pump (rotary piston) with oil differential pressure monitoring
  - > Oil heater in crankcase bottom
  - > Oil strainer to protect the oil pump in the crankcase; removable from the outside
- Mineral chiller oil type KC 68 (ammonia-insoluble)

## 8. Controller options

- Potential-free messages
  - > Individual operating messages compressor
- Power indicators for
  - > Volume flow
  - > EER
- Various operating modes, e.g. switching from chiller to heat pump
- Miscellaneous control options
  - > Control of condensation pressure control valve
- Integrated pump power unit (chilled medium/heating medium)
- The AMONUM PLC controller has smart grid capability:
  - > Transmission of the effective operating current via bus to the AMONUM controller



# AMONUM in container format means the greatest flexibility straight from the factory

By deciding on one or more AMONUM models in a container, you significantly reduce your time, effort and expense as an operator: thanks to the safety devices integrated in the container, e.g. the gas warning system and escape route markings, the AMONUM meets all safety requirements set out in DIN EN 378 for use of ammonia as a refrigerant when it leaves the factory. Moreover, upon request ENGIE Refrigeration offers training of service and operating personnel, thus helping ensure that operators work safely with the refrigerant.

## Additional advantages of the AMONUM in a container

- A heated and illuminated machine room is already at hand, which means cost savings
- Ready for connection upon delivery, which means quick availability
- Foundation for re-cooling
- Minimal space requirement
- Flexible relocation
- System protection from environmental influences or a hostile environment



# Handling ammonia as a refrigerant is a learning process

Ammonia offers many advantages when used as a refrigerant, but it is still a hazardous substance and thus entails certain risks.  $\text{NH}_3$  is classified as a Water Hazard Class 2 substance, and can pose a hazard to the immediate surroundings if it is released. For this reason, ammonia systems may only be operated by specially trained personnel. With this in mind, ENGIE Refrigeration supports operators with professional training sessions and prepares them for working with natural cooling.

However, the dka Refrigeration Academy trains not only future operators about  $\text{NH}_3$  refrigeration systems that utilise piston compressor and screw compressor technology. Our course offerings are also designed for planners, engineering offices, decision-makers, employees in the public sector and anyone with a fundamental interest in refrigeration technology.

The courses generally last two days and include instruction materials and meals.

➤ **Current course offerings and registration information:**  
[www.engie-refrigeration.de/de/services/dka](http://www.engie-refrigeration.de/de/services/dka)

## Natural cooling with ammonia | Course contents

- Basic knowledge of refrigeration
- $\text{NH}_3$  – a natural refrigerant
- Handling  $\text{NH}_3$ , first aid and safety data sheet
- Compressor versions used with  $\text{NH}_3$
- Evaporator versions used with  $\text{NH}_3$
- Use of  $\text{NH}_3$  refrigeration systems in industry
- AMONUM – the compact chilled water unit from ENGIE Refrigeration
- AMONUM container systems: compact, individual installation, safe
- Control and hydraulic integration of  $\text{NH}_3$  systems
- Operating the display using the Siemens SIMATIC S7
- Safety devices, maintenance and service tasks
- Current laws and regulations as well as duties of the operator



Technical data

		Operating temperatures									
		Evaporator Inlet/outlet	Condenser Inlet/outlet								
					W009-E1V-11	W009-F1V-11	W011-E1W-22	W011-F1W-22	W013-G1X-33	W016-G1Y-44	W016-H1Y-44
Operating conditions at cold water temperatures < 0°C <sup>1,2</sup>	-2 °C/-8 °C	30 °C/35 °C	Maximum cooling capacity	kW	31.00	31.00	54.00	54.00	67.00	82.00	82.00
			Total electrical power consumption	kW	12.51	12.84	20.22	20.53	24.75	29.20	29.36
			EER (Energy Efficiency Ratio)	-	2.48	2.41	2.67	2.63	2.71	2.81	2.79
			Flow rate evaporator	m <sup>3</sup> /h	5	5	8	8	11	13	13
			Pressure drop evaporator	kPa	18	18	17	17	13	12	12
			Flow rate condenser	m <sup>3</sup> /h	8	8	13	13	16	19	19
			Pressure drop condenser	kPa	32	32	27	27	23	23	23
Operating conditions acc. to Eurovent	12 °C/7 °C	30 °C/35 °C	Maximum cooling capacity	kW	72.00	72.00	95.00	104.00	129.00	157.00	157.00
			Total electrical power consumption	kW	18.80	19.12	21.76	24.68	29.30	34.62	34.85
			EER (Energy Efficiency Ratio)	-	3.83	3.77	4.37	4.21	4.40	4.53	4.51
			EER (EN 14511)	-	3.55	3.49	4.15	4.00	4.22	4.35	4.32
			ESEER (European Seasonal Energy Efficiency Ratio)	-	5.98	5.62	4.69	5.52	5.68	6.25	6.24
			ESEER (EN 14511)	-	4.69	4.48	4.12	4.81	5.07	5.50	5.48
			Flow rate evaporator	m <sup>3</sup> /h	12	12	16	18	22	27	27
			Pressure drop evaporator	kPa	42	42	22	27	18	15	15
			Flow rate condenser	m <sup>3</sup> /h	16	16	20	22	27	33	33
			Pressure drop condenser	kPa	134	134	66	80	68	69	69
Operating conditions acc. to AHRI 550-590	54 °F (12.2 °C)/ 44 °F (6.7 °C)	85 °F (29.4 °C)/ 94.30 °F (34.6 °C)	Cooling capacity	kW	71.00	71.00	92.00	102.00	127.00	156.00	156.00
			AHRI IPLV (Integrated Part Load Value) 550-590	-	6.40	6.05	6.01	6.24	6.31	6.56	6.54
Operating conditions acc. to AHRI 551-591	12 °C/7 °C	30 °C/35 °C	Cooling capacity	kW	72.00	72.00	92.00	104.00	128.00	156.00	157.00
			AHRI IPLV (Integrated Part Load Value) 551-591	-	6.37	6.02	5.99	6.11	6.28	6.52	6.45
Operating conditions heat pump <sup>1,2</sup>	12 °C/7 °C	43 °C/47 °C	Maximum heating capacity	kW	58.00	58.00	72.00	92.00	112.00	112.00	112.00
			Total electrical power consumption	kW	19.85	20.16	20.98	29.35	34.18	30.96	31.14
			COP	-	2.92	2.88	3.43	3.13	3.28	3.62	3.60
Operating conditions heat pump <sup>1,2</sup>	6 °C/3 °C	40 °C/45 °C	Maximum heating capacity	kW	42.00	42.00	66.00	77.00	96.00	112.00	112.00
			Total electrical power consumption	kW	14.67	15.01	21.76	26.69	31.99	35.40	35.64
			COP	-	2.86	2.80	3.03	2.88	3.00	3.16	3.14
Open reciprocating compressor (stepless power control)				No.	1						
Supply voltage					400 V/3p/50 Hz						
Maximum electrical power consumption				kW	22	30	22	30	37	37	45
Sound power				dB(A)	91	95	91	95	95	96	96
Sound pressure <sup>3</sup>				dB(A)	73	77	73	77	77	79	79
Evaporator /condenser				Type	Plate heat exchanger						
Water connection (Victaulic) Ø				DN	65						
				Inch	2 1/2						
Length x width x height				mm	2,797 x 908 x 1,881						
				Inch	110 x 36 x 75						
Refrigerant filling ammonia (R-717)				kg	5	5	6	6	8	10	10
Transport weight (approx.)				kg	1,520	1,610	1,660	1,500	1,810	1,990	1,990
Operation weight (approx.)				kg	1,540	1,630	1,690	1,530	1,850	2,030	2,030
GWP				-	0						
CO <sub>2</sub> equivalent				1,000 kg	0						
Annual COP in accordance with (EU) Regulation 2015/1095					3.84	3.78	3.68	3.59	3.95	4.51	4.26

<sup>1</sup> Cold water medium antifrogen N 25 %  
<sup>2</sup> Fouling factor evaporator and condenser = 0 m<sup>2</sup> K/W  
<sup>3</sup> Sound pressure in 1 m distance



ENGIE Refrigeration supplies the right cooling for every process: from efficient chillers, environmentally friendly heat pumps and modular re-cooling systems to turnkey solutions such as refrigeration containers or modules. Efficiency, sustainability, cost effectiveness and first-class expertise in technical solutions are hallmarks of every ENGIE Refrigeration project. Our individualised advice and comprehensive services are centred around our customers and their requirements. As a member of the worldwide ENGIE Group, we have a global network of specialists at our disposal and can realise our refrigeration solutions both at home and abroad.

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