

# ENGIE chillers care for a reliable refrigeration

The QUANTUM is already in use in over 50 data centre and IT buildings – here is an excerpt from our project examples:

Project	Chillers	Cooling Capacity	Compressor Quantity	Country
Wien / E-Shelter	2 x QUANTUM A135-E3E-H10	700 kW	6 x TT350	Austria
Amadeus Data Processing Erding	2 x QUANTUM W165-P3G-HH	1,200 kW	6 x TT400	Germany
Dynamic Data Centre Biere	6 x QUANTUM X160-E4E-HH	1,400 kW	24 x TT350	Germany
Dynamic Data Centre Magdeburg	3 x QUANTUM X200-E5E-HH	1,750 kW	15 x TT350	Germany
Frankfurt / E-Shelter	4 x QUANTUM B120-P4C-LL	1,200 kW	16 x TT300	Germany
München / E-Shelter	2 x QUANTUM A135-E3E-82.154.2_10.S_5.0	1,050 MW	6 x TT350	Germany
Bonn / E-Shelter	4 x QUANTUM A135-E3E-82.154.2_10.S_5.0	1,050 MW	12 x TT350	Germany
DKRZ Rechenzentrum	2 x QUANTUM B120-P4C-LL Sonder	1,200 kW	8 x TT300	Germany
LVR Rechenzentrum Köln	1 x QUANTUM W025-P1A-LL	300 kW	1 x TT300	Germany
Rechenzentrum Krailenshalde	3 x QUANTUM X060-P2C-LL	600 kW	6 x TT300	Germany
DCE Bettembourg	1 x QUANTUM W090-P2F-HH	800 kW	2 x TT400	Luxemburg
DC Lytkarino	9 x QUANTUM X180-E4E-LH	1,400 kW	36 x TT350	Russia
DC Lytkarino II	3 x QUANTUM X180-E4E-LH	1,400 kW	12 x TT350	Russia
Swift Datencentre Diessenhofen	4 x QUANTUM B090-P3C-LL	900 kW	12 x TT300	Switzerland
DC Rümlang / E-Shelter	3 x QUANTUM A120-P4C-H8	1,200 kW	12 x TT300	Switzerland

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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Optimal use of energies.



# The path towards a reliable refrigeration

Energy efficient chillers for data centres and sensitive applications

Optimal use of energies.

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# The QUANTUM advantages at a glance

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## Service and maintenance

Simple design, less components, hardly any maintenance – affordable in the long run



## Continuous power control

Smaller memory dimensioning, less starts, better temperature consistency, quiet consumer network



## Highest energy efficiency

Best cooling efficiency – save up to 50 % on operating costs



## Low sound and vibration

No vibration damping, sound damping, leakage or vibration damage



## No reactive current compensation

Reduced costs – no power factor decrease in partial load



## Operational safety

No failure of the entire system, compressor change during operation



## Gentle start-up

Staggered start, no power peaks, stable supply network



## Reduced CO<sub>2</sub>-output

Best environmental balance, drastically reduced energy costs



## Fast Re-Start

The fast restart function enables a reduction of the restart time after a voltage drop (<25 sec) from 420 sec to 210 sec



## Oil free compressor and non-contact magnetic bearing

Sustainable cooling, no material wear, reduced maintenance costs, consideration of the water resources law is unnecessary



## Smart Grid

External signal for chiller maximum amperage limitation to make operation compatible with limited electrical power source capacity

#### Electromagnetic compatibility – a must-have for data centres and IT buildings

A high quality EMC solution is used to filter and shield effectively electromagnetic interferences generated by the refrigeration systems. That means that the QUANTUM chiller can be installed in all critical and sensitive areas.

#### Extremely low start up current below 5 A

The start up current of each QUANTUM chiller is less than 5 A. The stability of the electrical supply network is hence maintained and the availability of all power outlets in emergency backup supply mode is ensured.

#### Intrinsically safe chiller concept

With its heat exchanger design and oil-free turbo-compressor, the QUANTUM is designed in a way that prevents the system from exceeding the maximum allowable operating pressures of the heat exchangers, even at the highest operating temperatures.

#### Uninterruptible cooling supply in case of power loss

QUANTUM chillers can be optionally equipped with an uninterruptible power supply. In case of a power loss, the unit maintains functionality switching over to an emergency operation mode. Cooling supply is assured depending on the project-specific design specifications and/or the capacity of the upstream UPS system.

#### Compressor speed control for stepless variable performance regulation

The stepless variable speed control and the possibility of individual compressor shut-offs lead to an optimal performance regulation and adjustment to meet the specific cooling requirement while reducing the number of motors starts. Through the speed control a cos phi of 0.98 is achieved, also under partial load conditions. An idle current compensation for the chiller is technically not required.

#### Quiet system operation, low sound levels

The chiller compressors are running with a contactless magnetic bearing and are characterized by an impressively low noise level. Additional noise isolation measures are generally not necessary.

#### Oil-free operation

Oil-free operation offers several advantages. First, the annual efficiency is better than the one of screw-type compressor units (without oil pump, see ESEER). Moreover, the maintenance costs are lower due to the absence of oil supply and recycling. Finally, there is no need to comply with the requirements related to the oil content in the current provisions of the Water Management Act.

#### Simple maintenance – compressor replacement during operation possible

The modular configuration of the unit makes it possible to replace the compressor during operation without interrupting the chiller refrigeration circuit, thereby ensuring continuous cooling.

#### System manager: standalone or integrated

The System Manager consists of a superior control system to operate the QUANTUM chillers with optimal efficiency as a network. In the standard standalone configuration, the optimal operation point and the most efficient operation are calculated based on internal control algorithms and adjusted to the external operating conditions. The high-end version of the System Manager also integrates the use of control instrumentation to acquire data from the peripheral elements of the unit for recooling, circulation of primary and secondary media, free cooling function, etc, for maximum energy efficiency.

#### Modular machine concept and commercially available standard components

Minimal spare parts inventory requirements, direct availability, short delivery lead times and simple installation – all this saves time and money.

#### Industrial PLC

The QUANTUM uses a PLC system adapted to industrial needs with freely programmable control. This enables us to match the cooling system precisely to project-specific requirements and conditions.

#### Opto-electronic refrigerant monitoring according to EN 842

Current legislation requires operators of chillers to check for leakage and verify leak-tightness at regular intervals depending on the quantity of refrigerant contained in the system (up to four times per year). Suitable leak detection systems can be used to reduce the frequency of these periodic checks. The use of these systems is obligatory for systems containing 300 kg of refrigerant or more, however. The air-cooled QUANTUM chiller disposes of an integrated leakage detection system as part of the standard equipment, so it not only guarantees the early recognition of leaks but also reduces the cost of the mandatory checks.

#### Made in Germany

“Made in Germany” stands for our high standards of engineering project work, vertical range of manufacture, production throughput, quality, performance and service as a guarantee of a high level of customer satisfaction.



QUANTUM, water-cooled, cooling capacity with 600 kW

## QUANTUM chillers made for data centre



QUANTUM chillers are cooling data centres and IT buildings worldwide: From 300 kW up to 10,500 kW.

ENGIE Refrigeration has more than

# 14

years of experience with QUANTUM chillers in data centres and IT buildings.

More than

# 50

data centres and IT buildings worldwide are using the QUANTUM chiller technology from ENGIE Refrigeration.

More than

# 138

QUANTUM chillers are on duty for data centres and IT buildings worldwide and are producing a cooling capacity of 137,400 kW.

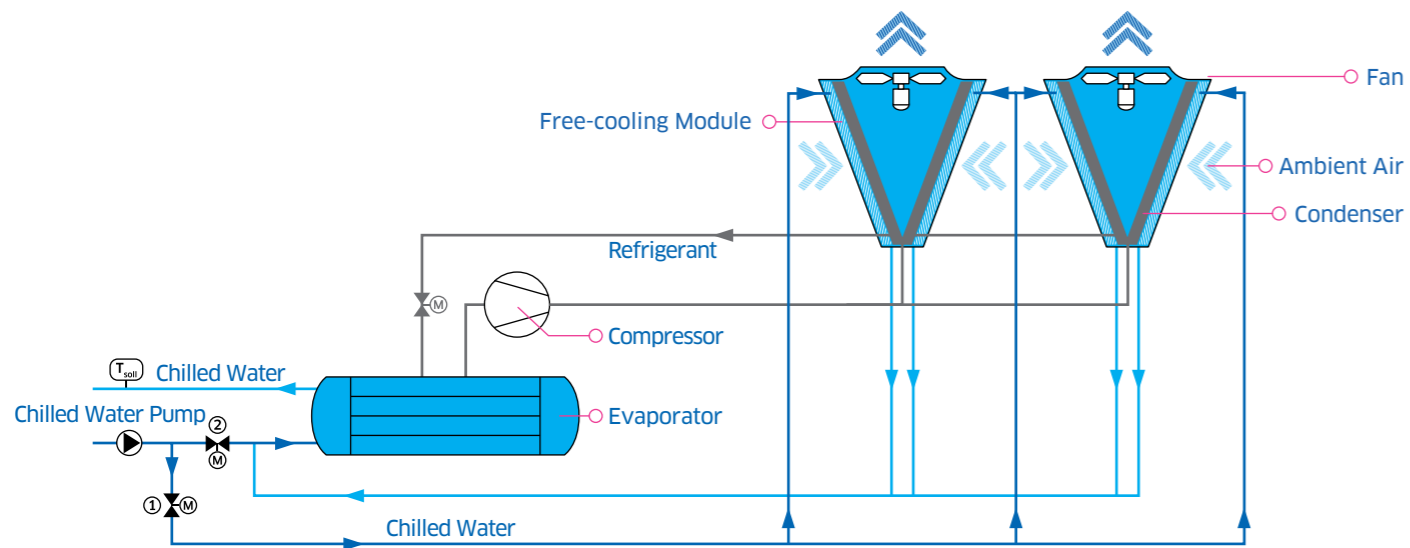
# The future is in the air: A special view on the air-cooled QUANTUM

A new design principle makes the air-cooled QUANTUM A series even more efficient and reduces space requirements even further: the free cooling modules of the chiller are integrated directly into the machine unit so that you no longer need to set them up as a separate unit. When outdoor temperatures are low, the chiller can provide cooling under part-load conditions without running compressors. The chiller fans have two tasks: they are used for re-cooling in normal cooling mode, and they cool down the chilled medium in free cooling mode. Thus, especially in transition mode, long use of free cooling is possible. The reason that an operator can also switch over to free cooling very early with a smooth transition is due to the outstanding heat transfer properties of the condenser and free cooling modules designed as micro-channel heat exchangers. All in all, a highly efficient, space-saving refrigeration solution with impressive measurement values: The QUANTUM A with integrated free cooling (Quantum A FK) can achieve EER values of up to 60. The control and regulating functions are an

integral component in this regard. When outdoor temperatures fall, the QUANTUM A FK automatically and smoothly transitions from compression cooling to mixed mode to fully free cooling, supplying cooling efficiently at all times.

QUANTUM A is an impressive series, thanks not only to the clever, high-quality and stylish machine design, but also because of the numerous options available. Thus, for example, the QUANTUM A offers refrigeration capacity of up to 1.6 megawatts, and is also available with an integrated pump module (option) with two speed-controlled pumps, which significantly improves system stability.

➤ **UPS-supported control**, a fast restart function for the compressors and remote maintenance are further options for tailoring a QUANTUM A to customer wishes and requirements.



## Scheme QUANTUM A with integrated free-cooling.

The plant hydraulics allow a free-cooling operation (valve 1 open, valve 2 closed), a normal compressor operation (valve 2 open, valve 1 closed) and a mixed operation (valve 1 open, valve 2 closed). In mixed operation the air flows through the free-cooling modules, at the same time performance is generated through the refrigeration components. Shifting between free-cooling operation, mixed operation and compressor operation through the QUANTUM control, while the requested coolant temperature is provided independent from operational mode. Integration of an optional pump in base frame is prepared.



## QUANTUM A for data centres

### A refrigeration solution that pays off:

- low operating costs thanks to
  - > high efficiency in part-load operation
  - > especially long use of the integrated free cooling in transition mode
- individually configurable and scalable
- fail-safe and with an extra fast restart function





# Amadeus Data Processing GmbH, Erding

QUANTUM chillers ensure smooth-running processes, safe operation and ultimate efficiency.

**Conclusion**  
Despite rising electricity costs and increasing power requirements, using QUANTUM chillers has enabled Amadeus to reduce its energy costs.

### Scope of the project

- Two water-cooled QUANTUM chillers (type W165) keep the data centre supplied with refrigeration
- Two water-cooled QUANTUM chillers (type X060) provide air conditioning for the data centre and office building
- The chillers were brought into the data centre by means of a duct in the ceiling (a data centre security concept)
- Integration of the chillers into the data centre's control concept
- Periodic cleaning of the chillers using a brush system

# Archimedes Facility-Management GmbH, Bad Salzflen

QUANTUM chillers and free cooling have helped the company achieve high savings potential and reliability:

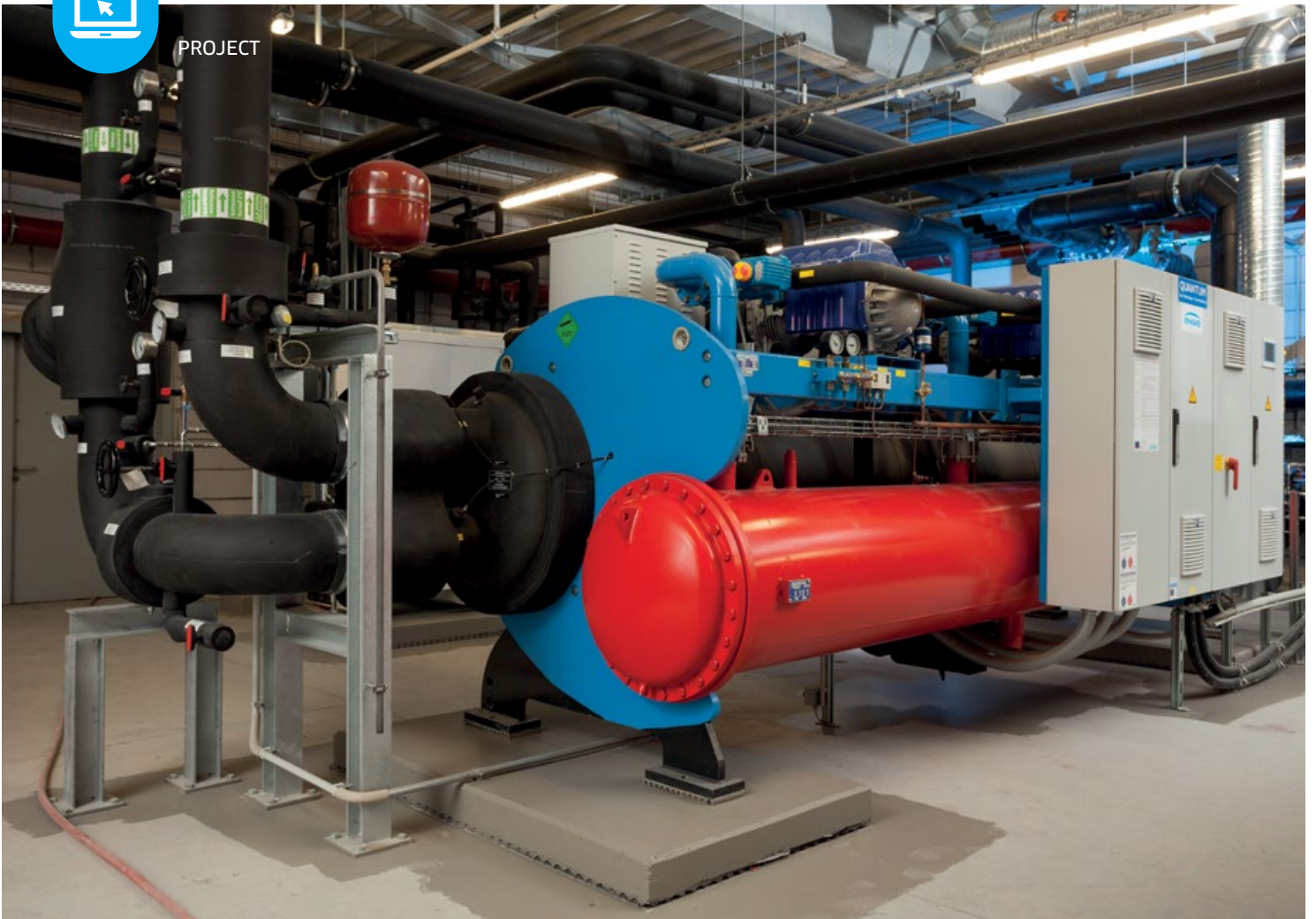
**Conclusion**  
Increasing the EER value from 3.3 to 4.5 is equivalent to energy savings of 20%. Climate cabinets with infinitely variable fans with EC direct-current motors represent an additional savings potential of 30%.

### Scope of the project

- Two redundantly designed water-cooled QUANTUM chillers with 440 kW each
- Replacement of two chilled water units with 130 kW and 160 kW
- Adjustment of flow and return temperatures from 6°C and 12°C to 12°C and 18°C
- Significant reduction in maintenance costs due to wear-free magnetic bearings
- Upgrade of the climate cabinets from three cabinets with 10 kW each to nine, with a total of 900 kW



PROJECT





Reliable, sustainable and cost effective refrigeration for data centres and sensitive applications

QUANTUM chillers present the following qualities, which are relevant for data centres in particular: reliability, scalability and cost-effectiveness in refrigeration. QUANTUM chillers can be perfectly integrated into existing systems. No matter whether you chose the air-cooled QUANTUM or the water-cooled models, no matter whether you chose it with refrigerant R-134a or the green version with R-1234ze – you get sustainable quality and energy efficient, eco-friendly technology focussed on customer needs, along with first class, international service from ENGIE Refrigeration.



## Data Centre Operator, Frankfurt

ENGIE Refrigeration supplies 6 MW cooling power for the data centre:

### Scope of the project

- 6 x water cooled QUANTUM-chillers Type B120-P4C-LL
- Cooling capacity: 1 MW per chiller
- Highly efficient turbocompression technology, especially in partial load
- Partial load controllability 10 – 100 %
- Connection and monitoring from the e-shelter-control centre
- UPS-supply to the controller
- Double control cabinet feed
- Pump load part and pump control integrated in the cooling cabinet

### Customer Benefit

QUANTUM chillers are particularly space-saving and low-maintenance. The integrated Open-Flash Economizer ensures maximum energy efficiency. The QUANTUM is characterized by a high degree of running stability and high operating safety.

Future fills the air: QUANTUM A.

### Scope of the project

- 12 x air-cooled QUANTUM chillers type A135-E3E-H10
- Refrigeration capacity: 15 MW
- Low operational costs, due to
- High efficiency in part load operation
- Particularly long operational periods in free cooling modus during the transitional phases
- Individually configurable and scalable
- Fail-safe and with extra fast restart function
- For QUANTUM A with a refrigeration capacity of up to 1.6 MW integrated pump modules with two speed-controlled pumps are available

### Advantages

The QUANTUM A range convinces not only with a clever high-quality and well styled machine design, it also offers a wide range of options.



## Data Centre, Moscow

This data centre is one of the largest data centres in Russia with more than 2.000 servers being hosted:

### Scope of the project

- 6 x QUANTUM chillers of type X180-E4E-LH
- Total refrigeration capacity 9,6 MW
- Setpoint: 15 °C
- EER= 4,67 (100 %) up to 7,66 (part load)

### Customer Benefit

Best energy efficiency in the market with very low start-up current and superior reliability of operation convinced this data centre customer – and many others before.

