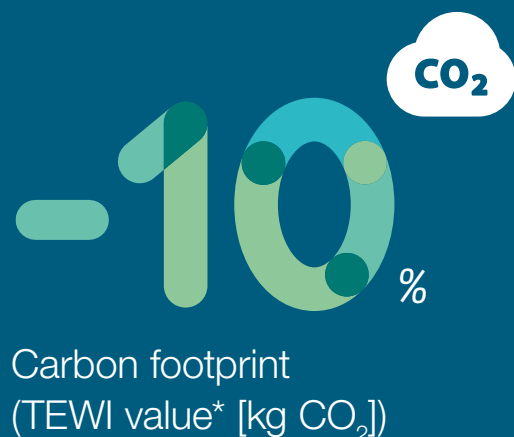
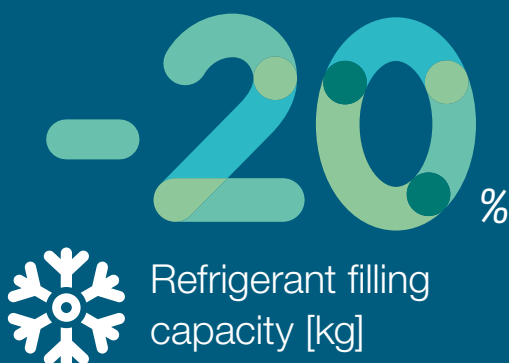
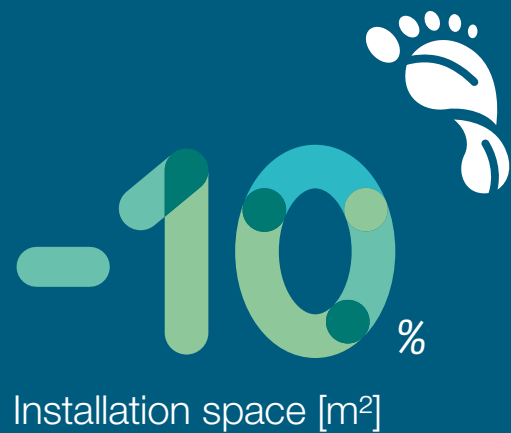




The benchmark of modern refrigeration

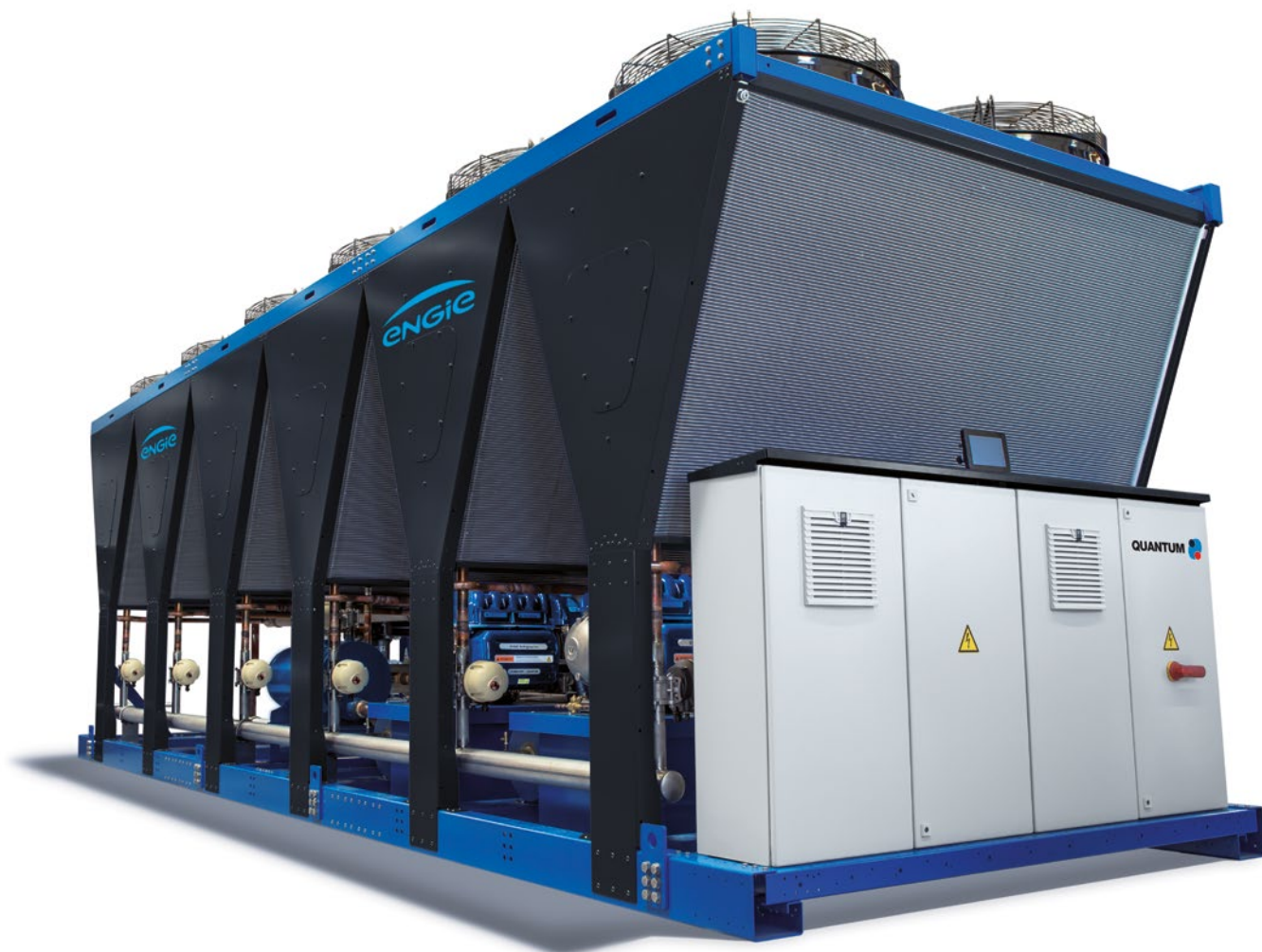
The new generation of air-cooled
QUANTUM chillers

Always the right type for your refrigeration needs: The new QUANTUM Air series



* The TEWI value is a reference value for assessing the impact of an overall system on the greenhouse climate (carbon footprint).
The TEWI value takes into account both direct and indirect CO₂ emissions from the chiller during operation.

The data are mean values for the entire model series.



ENGIE Refrigeration: Home of QUANTUM

ENGIE Refrigeration has been making the highly efficient QUANTUM chillers for more than 15 years – and has constantly developed and improved them during this period.

At ENGIE Refrigeration, we aim to offer the most high-quality and efficient chillers, and the new QUANTUM Air is a further milestone in the refrigeration market: Even more efficient, even quieter, even more powerful, with even more precise controls, and, thanks to a new design principle, even more compact and easy to service.

Ahead of its time, and already available to you today:
The new QUANTUM Air from ENGIE Refrigeration.





There are many advantages when you choose the best: The performance features of the new QUANTUM Air series

The new QUANTUM Air is the current protagonist in the successful chiller series from ENGIE Refrigeration.

It retains all the advantages that characterised the previous QUANTUM models. With a novel design, an even more efficient use of operating fluids and a modified control system, ENGIE Refrigeration has managed to further improve the great performance characteristics of the QUANTUM.

Excellent properties that turn a chiller into an air-cooled QUANTUM



The new air-cooled QUANTUM is available with tight refrigeration grading in order to perfectly meet customer requirements.



Equipped with the latest communication technology and an intelligent control system, the air cooled QUANTUM is even more energy-efficient than its predecessor.

Highly efficient EC fans are actuated via Modbus and controlled to suit the required cold water temperature, load requirement and ambient air temperature.

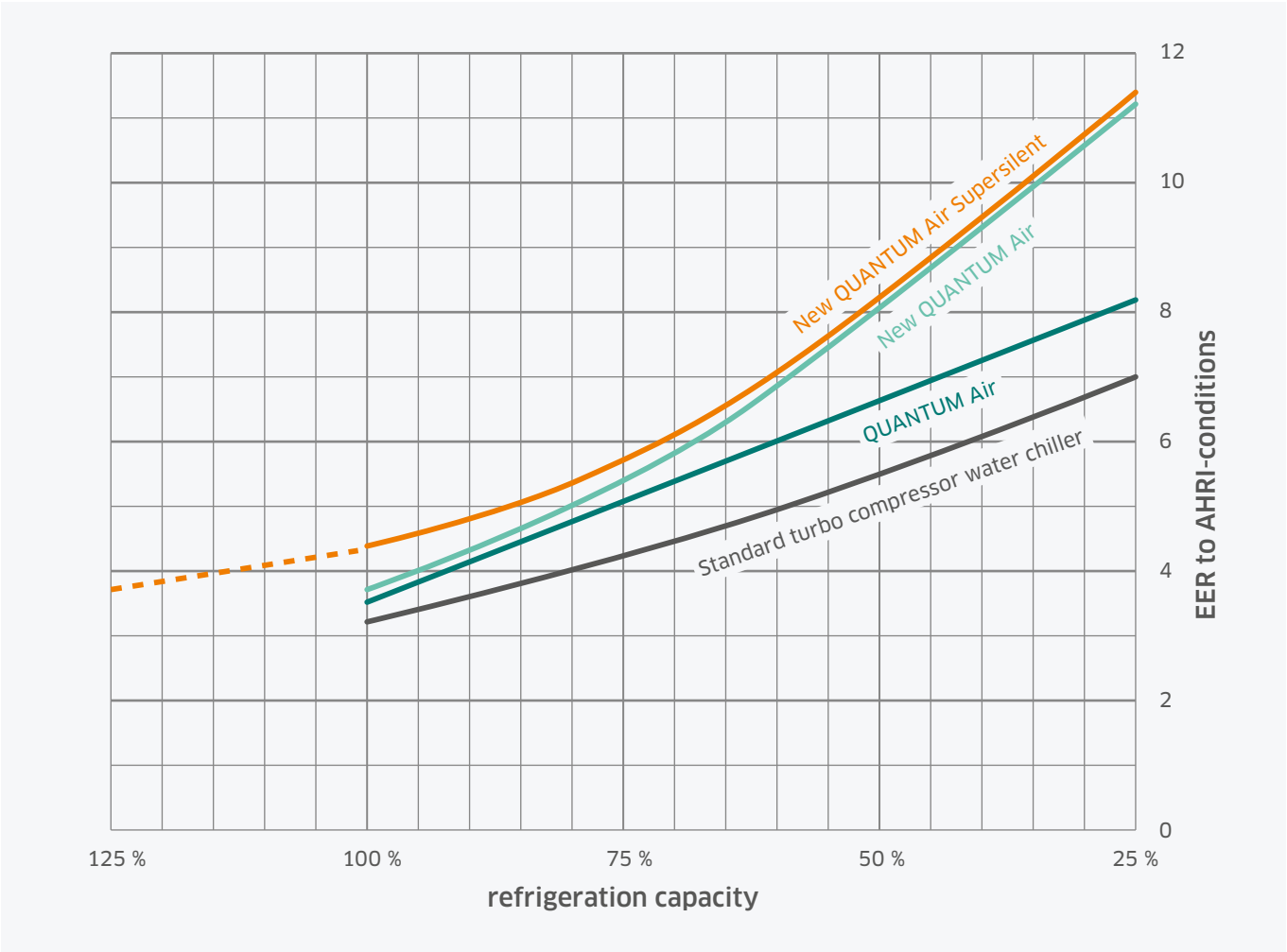


The compressors and fans are the main energy consumers and are attuned to each other in such a way that the overall energy consumption of the QUANTUM Air is optimised at every point of operation. This is evidenced by higher EER values, especially during the transition period with medium ambient temperatures ($<20^{\circ}\text{C}$) and under partial loads. The IPLV value as per AHRI (and/or the ESEER value as per the Eurovent conditions) is also increased as a result.



It is also possible to reduce the maximum performance of the QUANTUM Air in order to meet noise requirements, for example; one method of doing this is to limit the fan speed and refrigeration capacity to the maximum value permitted by the noise specifications (Supersilent). This limitation ensures that the QUANTUM can operate additionally at a more efficient point of operation. It also further increases the EER value at the 100 % point of operation and at the partial load points.

Energy efficiency comparison as per AHRI



	Design
Standard turbo compressor water chiller	<ul style="list-style-type: none"> • Magnetic bearing turbo compressor • Standard fan
QUANTUM Air	<ul style="list-style-type: none"> • Magnetic bearing turbo compressor • EC fans with speed adjustment
New QUANTUM Air	<ul style="list-style-type: none"> • Magnetic bearing turbo compressor • EC fans with Modbus actuation and speed adjustment • PLC with control system optimisation including optimised fan control
New QUANTUM Air Supersilent	<ul style="list-style-type: none"> • Magnetic bearing turbo compressor • EC fans with Modbus actuation and speed adjustment • PLC with control system optimisation including optimised fan control for operation at optimal efficiency • Generously dimensioned condenser and evaporator designed for maximum energy efficiency



6 innovations that characterise

1

More efficient and quiet due to new machine design


- Excellent efficiency in operation due to intelligent connections between various components
- Integrated free cooling modules optionally available for all models
- Quieter due to additional condenser
- Noise-optimised basic model, optional super-silent design available:
 - > Fan speed and refrigeration capacity limited to the maximum value permitted by noise specifications
 - > Even more efficiency: EER value at the 100 % point of operation and at the partial load points is further increased

2

Sustainability²

- Significantly reduced refrigerant filling capacity (-20 % refrigerant filling capacity [kg] = mean value for all series) and therefore sustainable in the use of operating fluids
- Carbon footprint is also reduced: TEWI value* [kg CO₂]: -10 %

*The TEWI value is a reference value for assessing the impact of an overall system on the greenhouse climate (carbon footprint). The TEWI value takes into account both direct and indirect CO₂ emissions from the chiller during operation.



Of course, the new QUANTUM Air also offers all the advantages of the preceding series: oil-free compressor | contact-free magnetic bearing | gentle starting behaviour | high reliability | smart-grid capability

the new QUANTUM Air

3

Lighter and more compact due to new modular design

- More performance/kg: smaller roof load due to reduced weight with increased stability
- More performance/m²: smaller machine footprint, compact construction
- Increased performance, identical length: 2 MW QUANTUM has normal truck transport size

4

Available more quickly and more maintenance-friendly due to smart modular design principle

- New components, new combination of individual machine components
- Machine interior more easily accessible, maintenance simplified

5

Special options become standard in the new air-cooled QUANTUM

- Preconfigured hydraulic modules (pump unit with frequency converter)
- Integrated free cooling modules for free cooling, combined mode or compression mode for increased

6

The most powerful air-cooled chiller with magnetic-bearing compressor technology

- Up to 2 MW of refrigeration capacity

Well-thought-out down to the smallest detail: The innovative design principle of the new QUANTUM Air

CONDENSER MODULES

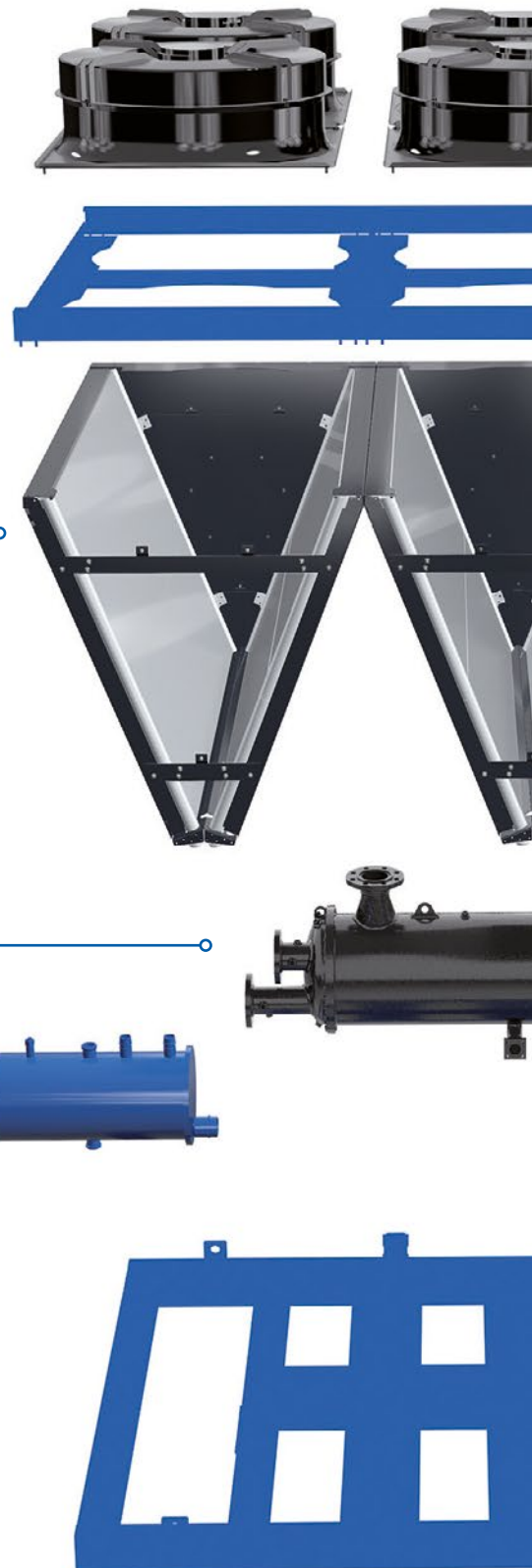
- New micro-channel design ensures
 - > improved aerodynamics
 - > larger heat exchanger surface
 - > higher re-cooling output per m² of footprint
 - > significantly smaller refrigerant filling capacity
- Reduced length
- Optional free cooling modules can be integrated in the same device length
 - > more operating modes
 - > greater efficiency

EVAPORATOR

- Modular evaporator concept
 - > tailored assignment of efficient flooded evaporators
 - > maximum efficiency and optimised refrigerant filling capacity

ECONOMIZER

- Original ENGIE Refrigeration open-flash economizer
 - > increased EER value
 - > increased maximum refrigeration capacity at all points of operation
 - > lower operating costs
 - > lower specific investment costs (€/kW)



FANS

- Maximum efficiency due to EC fans
- Optimised speed adjustment at every point of operation
- Compact and quiet

FRAME

- Base frame in modular design
- Simplified integration of various options
- Simplified adaptation to all performance variables
- Shorter delivery times
- Weight reduction with unchanged stability

CONTROL PANEL

- PCAP multi-touch TFT display
- Improved ease of operation, even with gloves
- Outdoor screen on swivel arm
- Optimal visibility from extreme perspectives
- Brightness up to 600 cd/m²

SWITCH CABINET

- Quality "made in Germany"
- Standard size, standardisation
- Functional modules
- Shorter delivery times

COMPRESSOR

- Tried-and-tested compressor technology
- Intelligent connection
- Finely graded capacity range



Up and running in no time: QUANTUM Air with fast restart function

What happens when the power fails?

In the first few minutes after a power failure, the thermal storage (buffer storage) ensures that the required temperature is maintained in rooms, production sites, for specific devices or for servers in a data centre.

However, it can take chillers with turbo compressors 10 minutes to perform a restart and reach their full refrigeration capacity. This may be too long for the capacity of the integrated thermal storage.

The ENGIE Refrigeration solution consists of two components:

1.

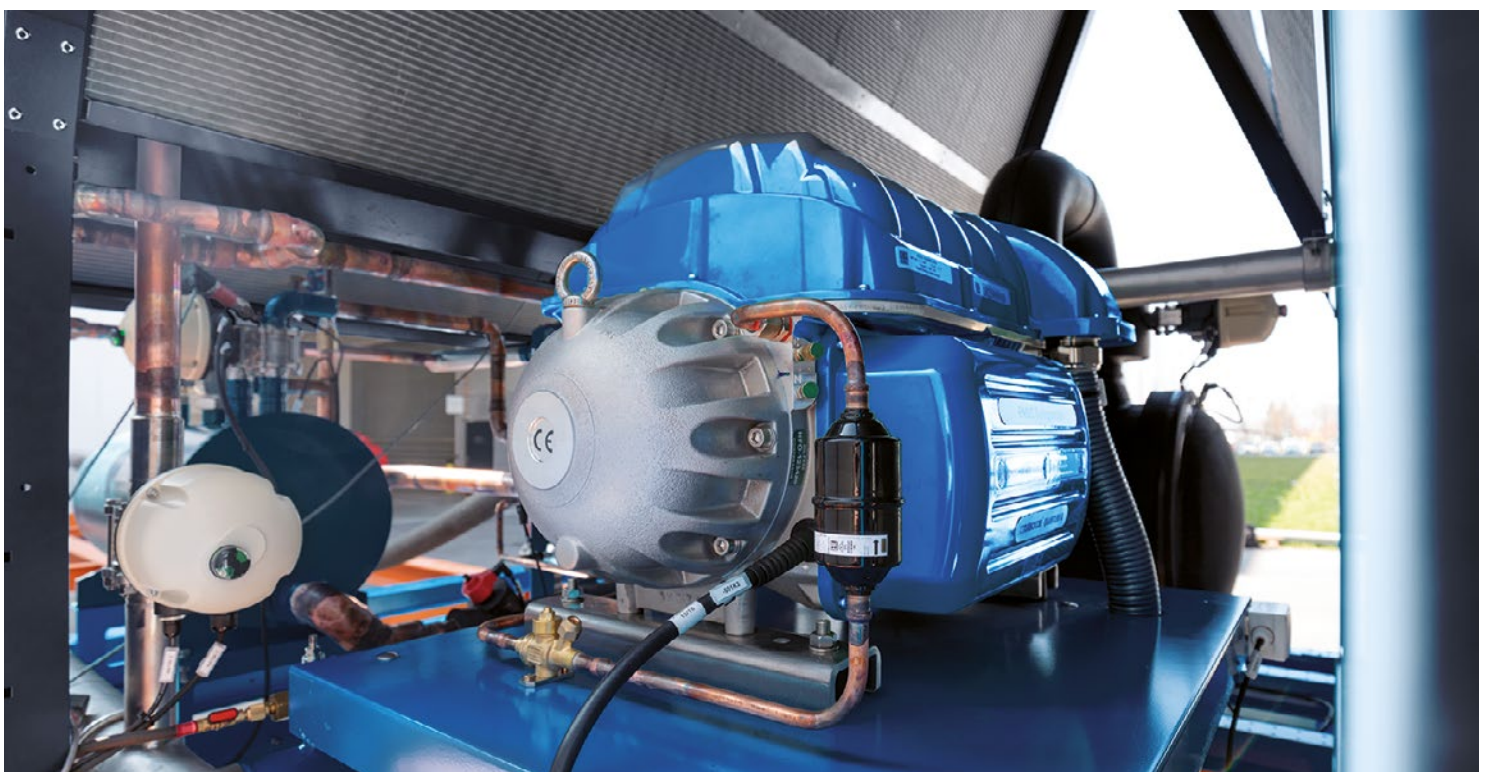
A software function integrated in the chiller controller that

- reduces the time it takes to complete control circuit checks,
- overwrites the default load control of the chiller in response to demand and thereby
- enables all compressors to start and reach their full capacity situation more quickly

2.

the connection of the chiller controller to an uninterrupted power supply (UPS).

- on-site external uninterrupted power supply (UPS) 400 V AC is provided only for the control system, including undervoltage monitoring for the 400 V AC side.



Start-up behaviour of the QUANTUM after a power outage/power failure

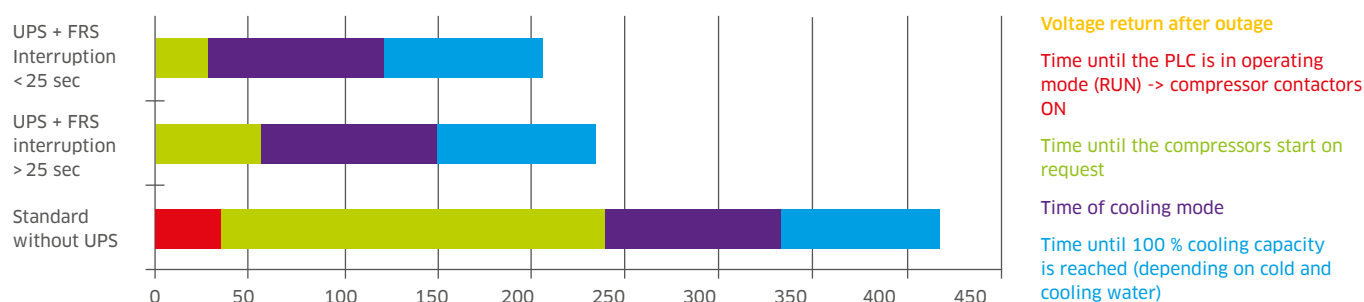
The combination of various strategies to handle major power failures always depends on the individual situation and the needs of the customer. Important measures for chillers and refrigeration systems:

1. Supply for critical components,
e.g. secure chiller controllers with UPS
> reduced reboot time

2. Use chillers with fast restart function
> reduced time until full refrigeration capacity is reached

3. Compensate restart time with thermal buffer
> adequate room temperature during transition period and until full refrigeration capacity is reached

Variant	Short description	Voltage return after outage	Time until the PLC is in operating mode (RUN) -> compressor contactors ON	Time until the compressors start on request	Time of cooling mode	Time until 100% cooling capacity is reached (depending on cold and cooling water)	Total time
Standard without UPS	Power supply 400 V AC without undervoltage monitoring, without external UPS (230 V AC - control voltage), interruption time until return of voltage 0 to ∞ seconds	0	35	205	90	90	420
UPS + fast restart (FRS) interruption > 25 seconds	Power supply 400 V AC with undervoltage monitoring, with external UPS (230 V AC - control voltage), with FRS software function, interruption time until return of voltage > 25 s	0	0	60	90	90	240
UPS + fast restart (FRS) interruption < 25 seconds	Power supply 400 V AC with undervoltage monitoring, with external UPS (230 V AC - control voltage), with FRS software function, interruption time until return of voltage < 25 s	0	0	30	90	90	210



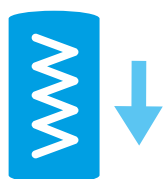
A fast restart of the chiller offers decisive advantages

The fast restart function of the new QUANTUM Air reduces the time it takes to provide full load capacity after a major power failure by up to

50%



More safety



Reduction of buffer volume (thermal storage)



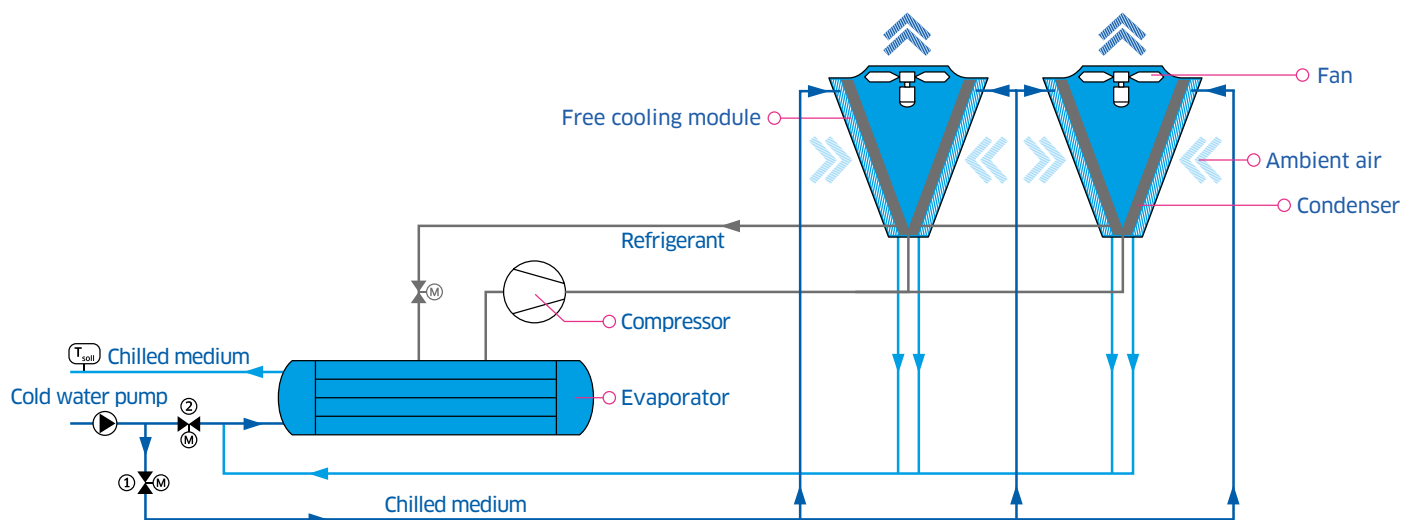
Optimised equipment rooms, lower construction costs



A fresh breeze for maximum energy efficiency: QUANTUM Air with free cooling

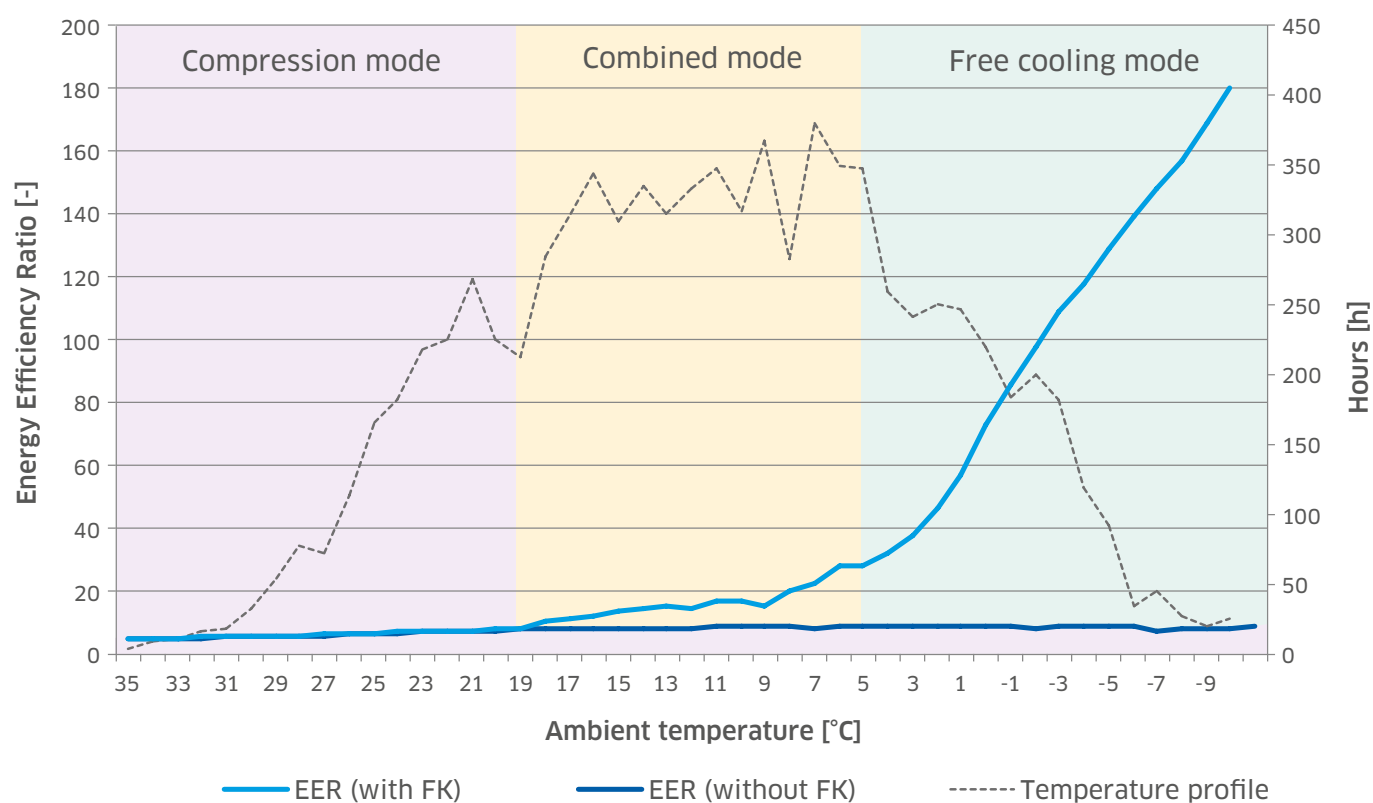
Nothing is cheaper than the things we get for free: When outside temperatures drop, it makes sense to use them for refrigeration. All new QUANTUM Air models are therefore available with an integrated free cooling register.

This means that three different operating modes can be combined with each other at any time and in response to the ambient temperature – for maximum energy efficiency and minimal costs.





Efficiency advantage: QUANTUM Air in free cooling design (FC)



Calculation example for a QUANTUM chilled water set (with and without FC in the data centre area)

Refrigeration capacity

1.000 kw

(assuming a constant course of the year)

Chilled water outlet temp.

18 °C

Temperature curve

Example for central Europe

CONCLUSION: When you compare the power consumption of a QUANTUM chilled water set with and without free cooling modules, you can see that, in the conditions described, power consumption is reduced by approx. 40%!

ENGIE Refrigeration offers the right refrigeration for every process: from efficient chillers and eco-friendly heat pumps to modular re-cooling systems and turnkey solutions such as refrigeration containers or modules. Efficiency, sustainability, cost efficiency 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.

Hamburg branch office

Grüner Deich 15
D-20097 Hamburg
Phone +49 40 730800-300
Fax +49 40 730800-349
Service number 01805 294622*

Hanover branch office

Werner-von-Siemens-Straße 11
D-31515 Wunstorf
Phone +49 5031 5182-10
Fax +49 5031 5182-29
Service number 01805 294623*

Berlin branch office

Pascalstraße 10 f
D-10587 Berlin
T +49 30 398366-850
F +49 30 398366-855
Service number 01805 294621*

Essen branch office

Theodor-Althoff-Straße 41
D-45133 Essen
Phone +49 201 36588-0
Fax +49 201 36588-29
Service number 01805 294624*

Leipzig branch office

Gletschersteinstraße 28
D-04299 Leipzig
Phone +49 341 86978-310
Fax +49 341 86978-350
Service number 01805 294620*

Dresden branch office

Jakobsdorfer Straße 4/6
D-01458 Ottendorf-Okrilla
Phone +49 35205 4744-0
Fax +49 35205 4744-44
Service number 035205 4744-30

Frankfurt a. M. branch office

Hanauer Landstraße 328-330
D-60314 Frankfurt a. M.
Phone +49 69 904753-10
Fax +49 69 415132
Service number 01805 294625*

Branch office Mannheim

Traunstraße 1
D-68199 Mannheim
Phone +49 621 84257-10
Fax +49 621 84257-29
Service number 01805 294626*

Nuremberg branch office

Marienstraße 8
D-90402 Nürnberg
Phone +49 911 214423-22
Fax +49 911 214423-50
Service number 01805 294629*

Stuttgart branch office

Heßbrühlstraße 51
D-70565 Stuttgart
Phone +49 711 781939-10
Fax +49 711 781939-22
Service number 01805 294627*

Munich branch office

Landsberger Straße 368
D-80687 München
Phone +49 89 747146-0
Fax +49 89 747146-50
Service number 01805 294628*

Lindau branch office

Josephine-Hirner-Straße 1 & 3
D-88131 Lindau
Phone +49 8382 706-1
Fax +49 8382 706-410
Service number 01805 294630*

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ENGIE Refrigeration GmbH
Josephine-Hirner-Straße 1 & 3 | 88131 Lindau | Germany
Phone: + 49 8382 706-1 | Fax: + 49 8382 706-410

refrigeration@de.engie.com
engie-refrigeration.de