

THE BENCHMARK OF MODERN REFRIGERATION

**The new generation of air-cooled
QUANTUM chillers**

Facts at a glance

Performance features

Efficiency values

Product features

Exploded view

Fast restart function

Free cooling

Contact and imprint

CONTENTS

ALWAYS THE RIGHT TYPE FOR YOUR REFRIGERATION NEEDS

-20 %



Operating weight [kg]**

-10 %



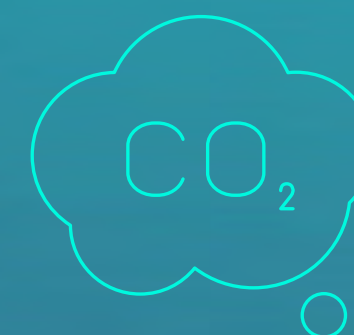
Installation space [m²]**

-20 %



Refrigerant filling capacity [kg]**

-10 %



Carbon footprint (TEWI value* [kg CO₂])**

** Compared to the previous 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.

FACTS AT 03
A GLANCE

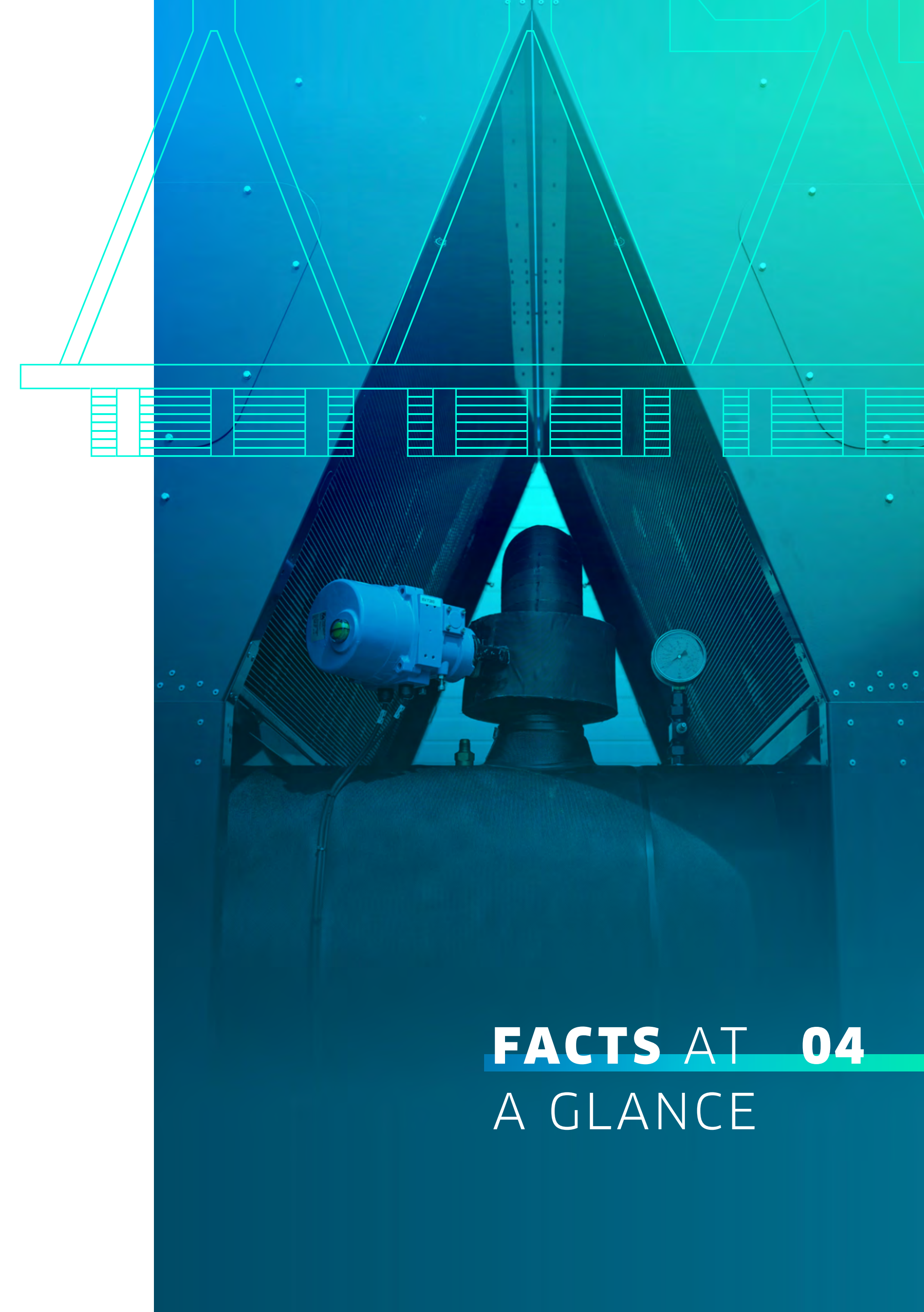
ENGIE REFRIGERATION: **HOME OF QUANTUM**

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.

FACTS AT 04
A GLANCE



THERE ARE **MANY** **ADVANTAGES** WHEN YOU CHOOSE THE BEST

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.



PERFORMANCE 05
FEATURES

EXCELLENT PROPERTIES



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.



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.

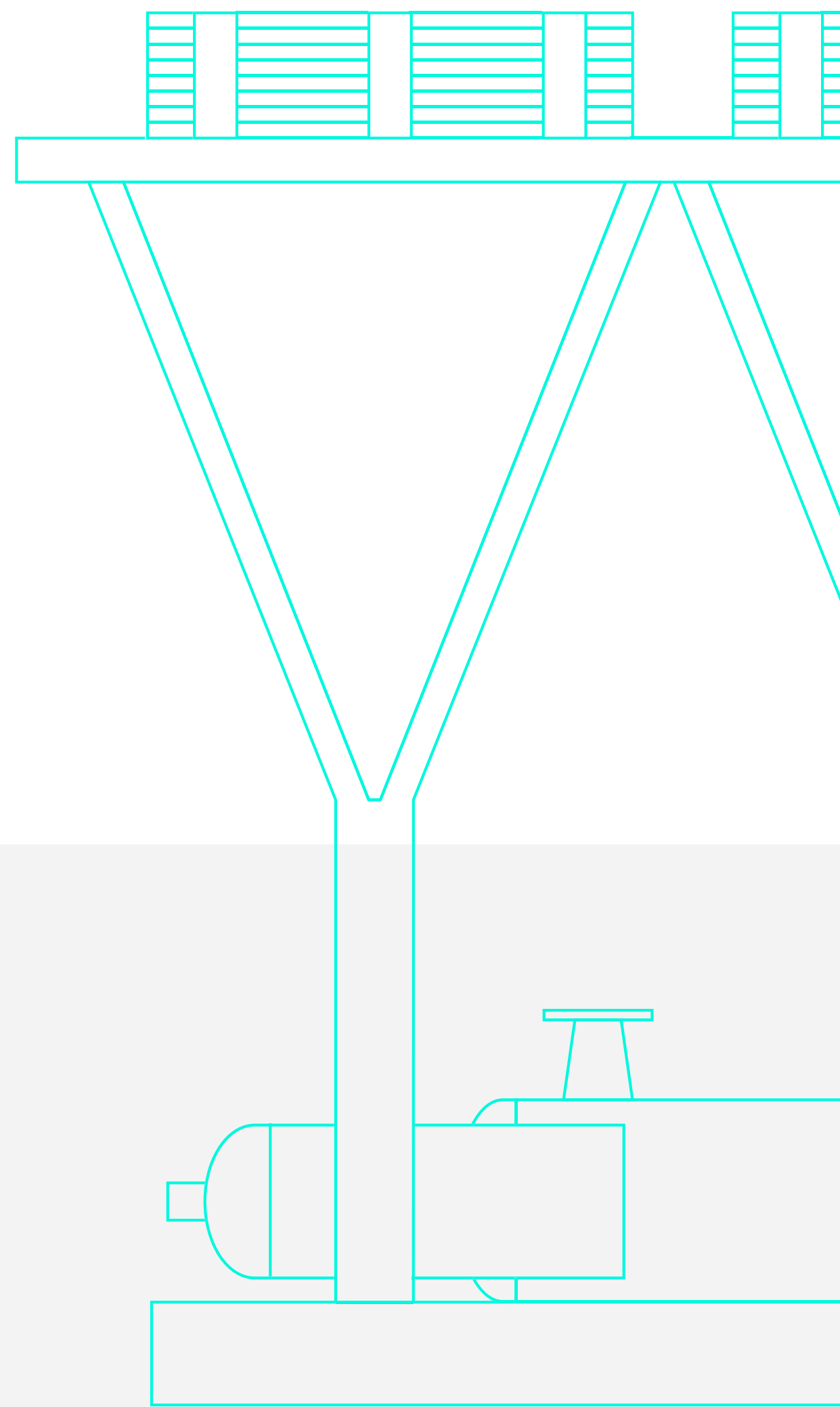


The compressors and fans are the main energy consumers and are attuned to each other in such a way that the overall energy consumption of the QUANTUM Air is optimised at every point of operation. This is evidenced by higher EER values, especially during the transition period with medium ambient temperatures (<math><20\text{ }^\circ\text{C}</math>) 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.

PERFORMANCE 06
FEATURES

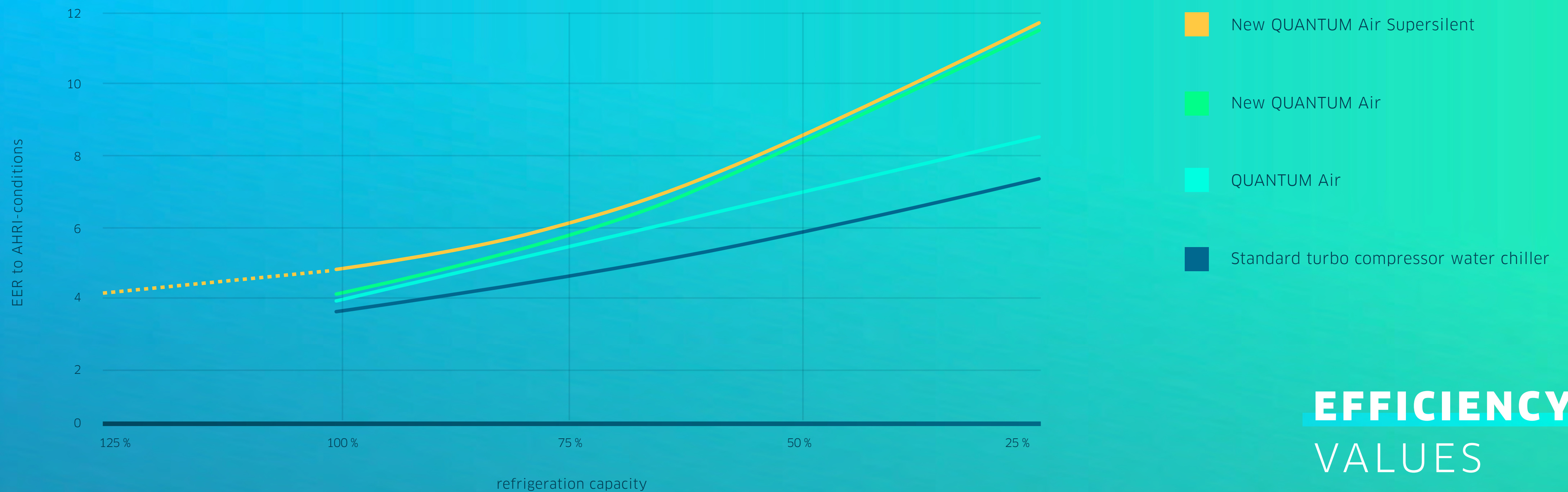
ENERGY EFFICIENCY COMPARISON AS PER AHRI

Machine	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 evapo-rator designed for maximum energy efficiency



EFFICIENCY 07
VALUES

ENERGY EFFICIENCY COMPARISON AS PER AHRI



EFFICIENCY 08
VALUES

6 INNOVATIONS THAT CHARACTERISE THE NEW QUANTUM AIR:

Sustainability ²

- 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%

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

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

3

* 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.

6 INNOVATIONS THAT CHARACTERISE THE NEW QUANTUM AIR:

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

4

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 energy efficiency

5

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

- Up to 2 MW of refrigeration capacity

6

OF COURSE, THE NEW
QUANTUM AIR ALSO **OFFERS**
ALL THE ADVANTAGES OF
THE PRECEDING SERIES:

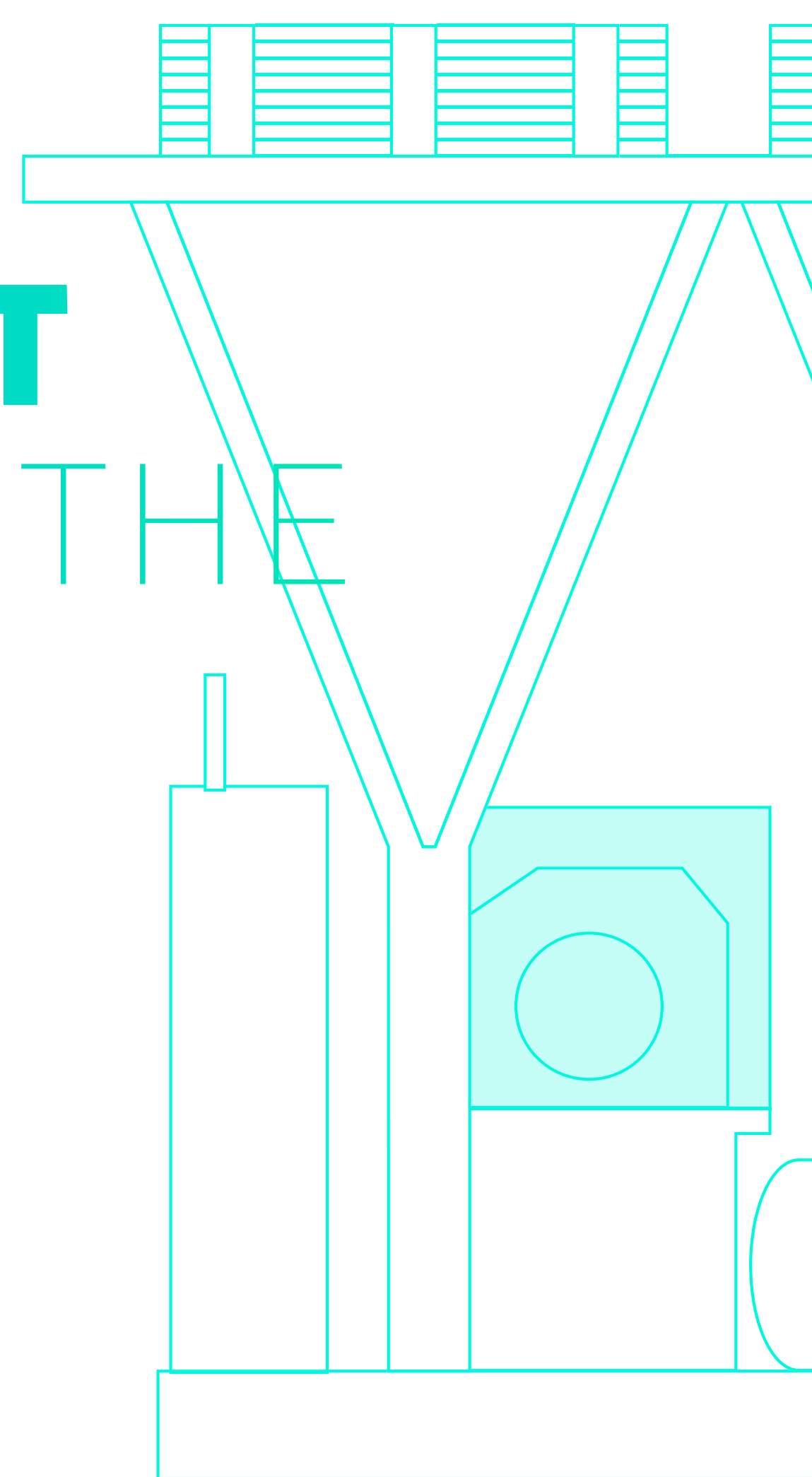
- ✓ **oil-free compressor**
- ✓ **contact-free magnetic bearing**
- ✓ **gentle starting behaviour**
- ✓ **high reliability**
- ✓ **smart-grid capability**

PRODUCT 11
FEATURES

WELL THOUGHT OUT DOWN TO THE LAST DETAIL

Right down to the smallest detail.

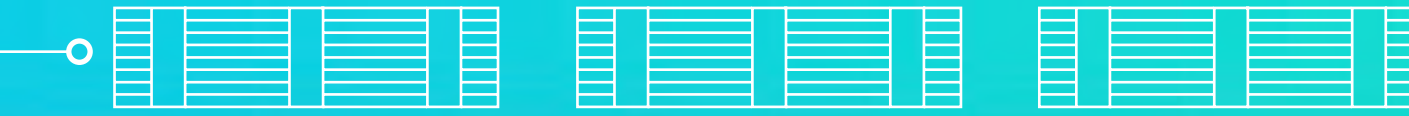
Because the QUANTUM Air chiller incorporates the concentrated expertise of our team of specialists. That's why the innovative design principle is unrivalled on the market.



EXPLODED **12**
VIEW

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



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

Optional free cooling modules can be integrated in the same device length

- ° more operating modes
- ° greater efficiency

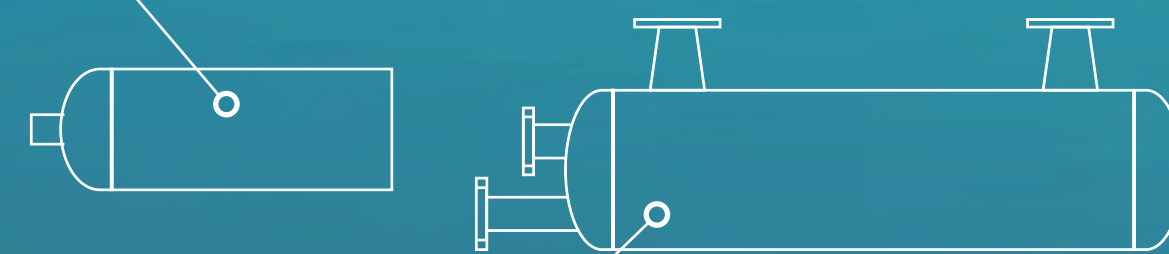
Reduced length



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)



Evaporator

Modular evaporator concept

- ° tailored assignment of efficient flooded evaporators
- ° maximum efficiency and optimised refrigerant filling capacity



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

EXPLODED VIEW 13

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.

FAST **14**
RESTART
FUNCTION



THE ENGIE REFRIGERATION **SOLUTION** CONSISTS OF **TWO COMPONENTS:**

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.

1

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.

2

FAST **15**
RESTART
FUNCTION

START-UP BEHAVIOR OF THE QUANTUM AFTER A POWER OUTAGE/ POWER FAILURE

Supply for critical components

- e.g. secure chiller controllers with UPS
- reduced reboot time

1

Use chillers with fast restart function

- reduced time until full refrigeration capacity is reached

2

Compensate restart time with thermal buffer

- adequate room temperature during transition period and until full refrigeration capacity is reached

3

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 are listed above.

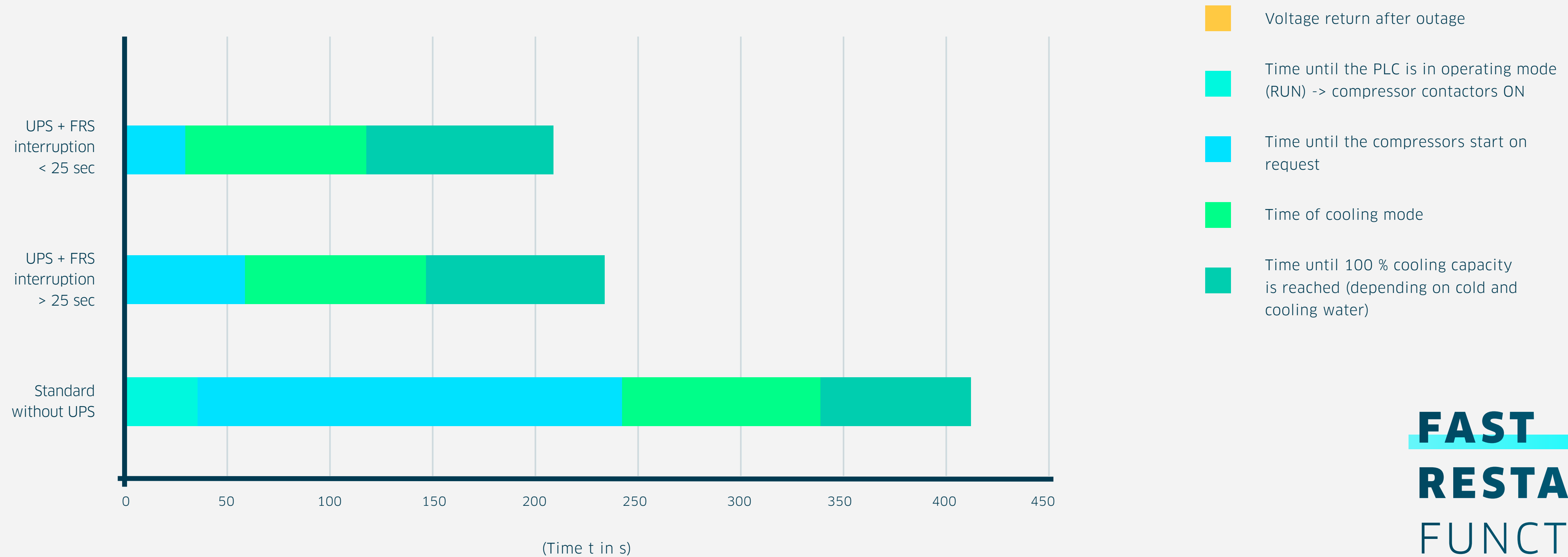
FAST **16**
RESTART
FUNCTION

RESTART IN **RECORD TIME**

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

FAST **17**
RESTART
 FUNCTION

RESTART IN **RECORD TIME**



FAST **18**
RESTART
FUNCTION

A **FAST RESTART** OF THE CHILLER OFFERS DECISIVE ADVANTAGES:



More safety



Optimised equipment rooms, lower construction costs



Reduction of buffer volume (thermal storage)



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 %



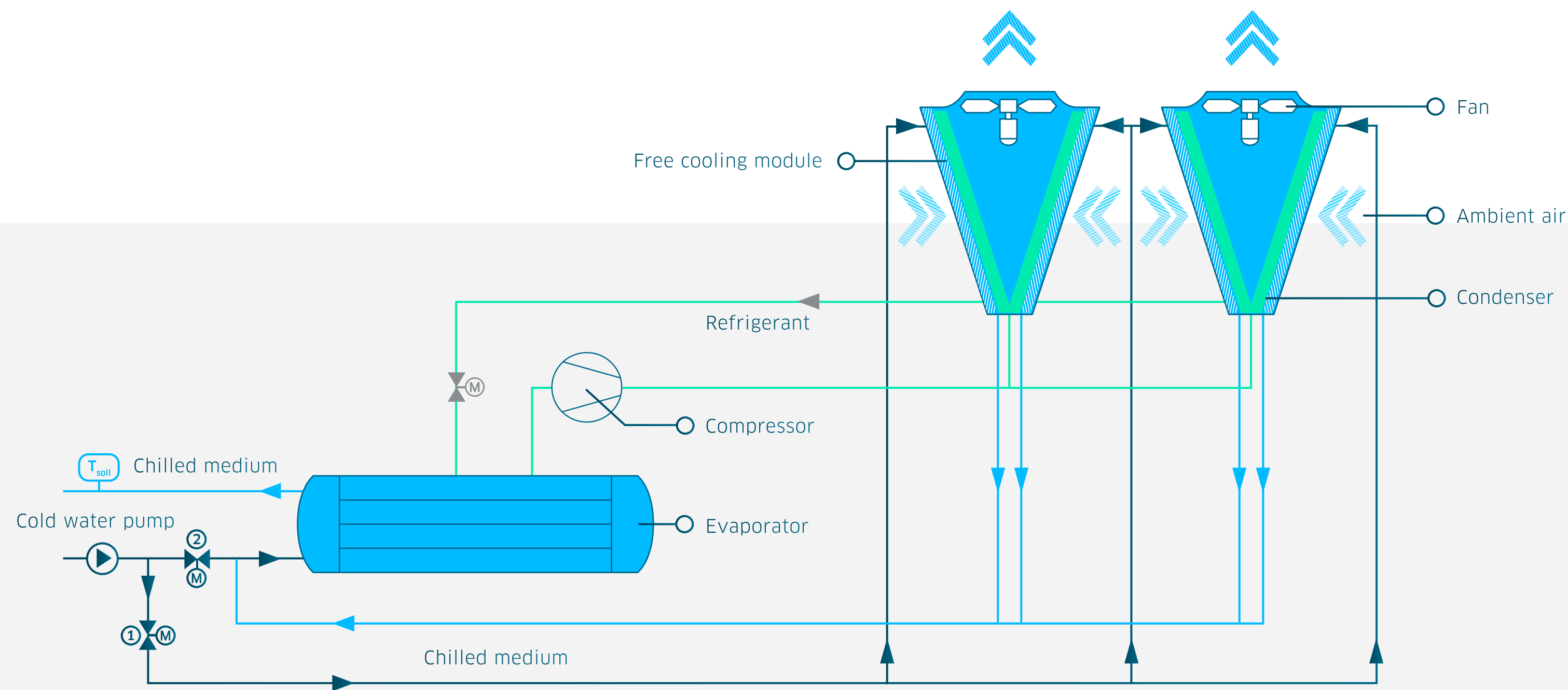
FAST **19**
RESTART
FUNCTION

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.



FREE **20**
COOLING

CALCULATION EXAMPLE FOR A QUANTUM CHILLED WATER SET*

REFRIGERATION CAPACITY

1.000 kW

(assuming a constant course of the year)

CHILLED WATER OUTLET TEMPERATURE

18 °C

(assuming a constant course of the year)

TEMPERATURE CURVE

example for Central Europe

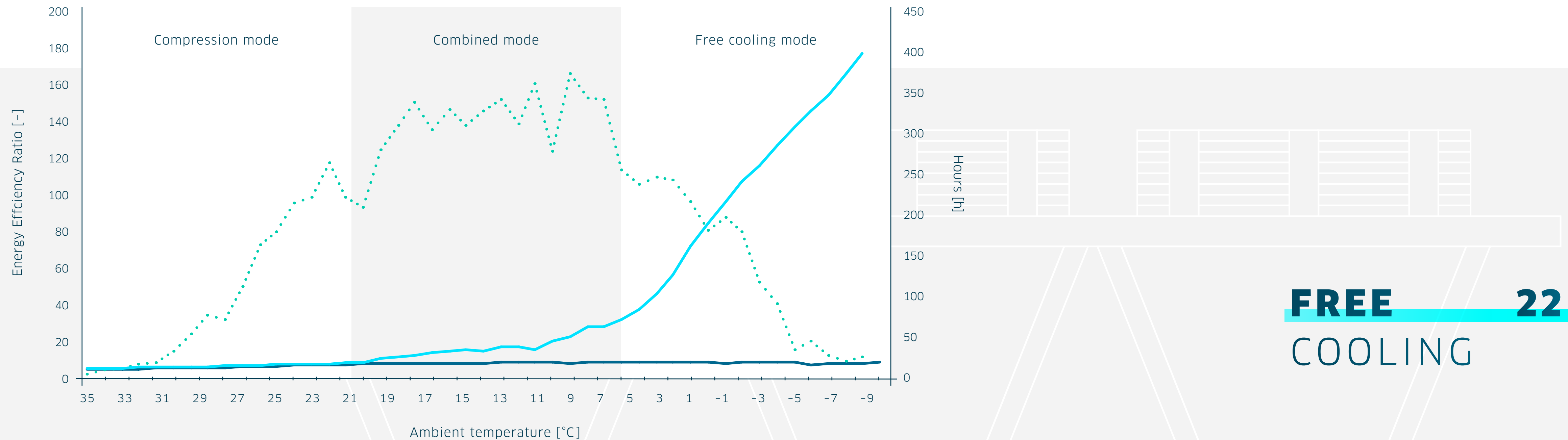
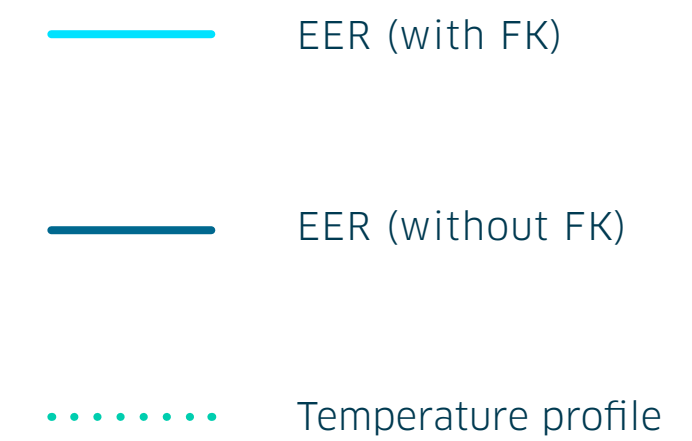
CONCLUSION:

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 approximately 40 %!

FREE **21**
COOLING

* with and without FC in the data centre area)

EFFICIENCY ADVANTAGE: QUANTUM AIR IN **FREE COOLING DESIGN** (FC)



FREE **22**
COOLING

READY FOR THE **COOLING** OF THE **FUTURE?**

ENGIE Refrigeration ensures the right temperature for every process. Around the world, our heat pumps and chillers stand for maximum technical expertise, economy, efficiency and sustainability.

Our aim: to provide our customers with the best solutions for their path towards climate neutrality. To achieve this, we rely on individual consultation, customised concepts and comprehensive services.

As a member of the worldwide ENGIE Group, we have a global network of specialists at our disposal and can realise our refrigeration and heating solutions for you, both at home and abroad.

The experts at ENGIE Refrigeration are here for you:

National/International Service

National/International Sales

With eleven branch offices and around 130 service employees, we are always nearby and available around the clock, anywhere in Germany:

ENGIE Refrigeration GmbH | Josephine-Hirner-Str. 1 & 3, 88131 Lindau am Bodensee, Germany | T + 49 8382 706-1 | F + 49 8382 706-410

We are happy to
ADVISE YOU!