

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 18 December 2024**

**Case Number:** T 0832 / 22 - 3.2.03

**Application Number:** 18162445.3

**Publication Number:** 3388760

**IPC:** F25B49/00

**Language of the proceedings:** EN

**Title of invention:**

REGULATION METHOD FOR INVERTER COMPRESSORS IN REFRIGERATION  
FACILITIES

**Patent Proprietor:**

Nonwatio Technology Solutions, S.L.

**Opponent:**

Carel Industries S.p.A.

**Headword:**

**Relevant legal provisions:**

EPC Art. 54(2), 56

RPBA 2020 Art. 12(4), 12(6)

**Keyword:**

Evidence - standard of proof - degree of conviction  
Late-filed facts - admitted (yes)  
Novelty - internet disclosure  
Inventive step - (no)

**Decisions cited:**

G 0001/12, G 0002/21, T 2466/13, T 1138/20, T 1311/21

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0

Case Number: T 0832/22 - 3.2.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.03**  
**of 18 December 2024**

**Appellant:** Carel Industries S.p.A.  
(Opponent) Via dell'Industria 11  
35020 Brugine (PD) (IT)

**Representative:** Feltrinelli, Secondo Andrea  
APTA S.r.l.  
Patent Department  
Via Ca' di Cozzi, 41  
37124 Verona (IT)

**Respondent:** Nonwatio Technology Solutions, S.L.  
(Patent Proprietor) Charles Robert Darwin, 20  
Parque Tecnológico  
46980 Paterna Valencia (ES)

**Representative:** Ungria López, Javier  
Avda. Ramón y Cajal, 78  
28043 Madrid (ES)

**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 27 January 2022  
rejecting the opposition filed against European  
patent No. 3388760 pursuant to Article 101(2)  
EPC.**

**Composition of the Board:**

**Chairman** N. Obrovski  
**Members:** B. Goers  
R. Baltanás y Jorge

## **Summary of Facts and Submissions**

- I. European patent No. 3 388 760 relates to a regulation method for an inverter compressor in a refrigeration system.
- II. In the opposition proceedings, the grounds of opposition under Article 100(b), Article 100(c) EPC and Article 100(a) EPC in conjunction with Articles 54 and 56 EPC were considered. The opposition division decided to reject the opposition.
- III. This decision is being appealed by the opponent ("appellant").

The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

The patent proprietor ("respondent") requested that the appeal be dismissed, or, as an auxiliary measure, that the patent be maintained as amended according to either of auxiliary requests 1 and 2 filed during the opposition proceedings by letter dated 5 August 2021 and re-submitted with the reply to the statement of grounds of appeal.

- IV. The Board issued a communication under Article 15(1) RPBA including a preliminary opinion that none of the main request and auxiliary requests 1 and 2 was allowable.
- V. In response to this communication the respondent announced that it would not to attend oral proceedings and submitted additional arguments in writing.

VI. The Board then cancelled the oral proceedings.

VII. Documents and evidence relevant for this decision

- D9: Technical manual of HEOS device "CAREL" with version number "Heos+0300078EN rel. 1.0 - 30/10/14"
- D9': Temporal search result in Google, search term: "+0300078EN"
- D10: Heatcraft Tech·Topics, vol. 1, No. 2, pages 1, 2, 5 and 6, June 1993
- D11: Muvegi W, Lamanna B: "Integrated Control System with DC Inverter Technology for Heat Pumps" in "Sources/Sinks alternative to the outside Air for Heat Pump and Air-Conditioning Techniques (Alternative Sources - AS)", Padua, Italy, April 5-6-7, 2011
- D12: WO 2009/048578 A1
- D13: WO 2009/048566 A2

The following evidence was submitted to establish the publication date of D9:

- D30: affidavit by Mr Guzmán Fernández
- D31: affidavit by Mr Lamanna
- D32: affidavit by Mr Malimpensa
- D33: affidavit by Mr Marafin
- D34: affidavit by Ms Masullo
- D35: affidavit by Ms Milani
- D36: affidavit by Mr Pizzo
- D37: affidavit by Mr Spinello
- D38: affidavit by Ms Volpin
- D39: Digital forensics technical report, Bit4Law SRL, "Rev. 1-28 Dec 2020"
- D41: Toshiba compressor specification, model

DA330A3FJH-10C, 1 June 2015, Carel Industries  
S.p.A. Headquarters

D46: affidavit by Mr Guzmán Fernández  
(indicated as "Doc. II" by the appellant)

VIII. Claim wording of the requests

(a) Independent method claim 1 of the main request  
(patent as granted) reads as follows (feature  
numbering added in "[ ]"):

"[1] *A regulation method for an inverter compressor (7)  
in a refrigeration system comprising an expansion valve  
(3) defined by an evaporation temperature  $T_e$ , a  
condensation temperature  $T_c$ , a compressor (7) speed  $v_c$   
and a compression ratio  $r_c$  said method comprising the  
following steps:*

- a) [1.1] establishing a working area with  
predetermined values for:*
  - [1.2] minimum and maximum evaporation  
temperatures  $T_e$ ,*
  - [1.3] minimum and maximum condensation  
temperatures  $T_c$ ,*
  - [1.4] minimum and maximum compressor (7) speeds  
 $v_c$ ,*
  - [1.5] a maximum compression ratio  $r_c$ , which  
defines the relationship between an evaporation  
temperature  $T_e$  and a condensation temperature  $T_c$ ,*
  - [1.6] a maximum reheat value,*
- b) [1.7] measuring the working values of the  
compressor (7) in terms of:*
  - [1.8] the evaporation temperature  $T_e$ ,*
  - [1.9] the condensation temperature  $T_c$  and*
  - [1.10] the compression ratio  $r_c$ ,*

*where,*

[1.11] *if the compressor (7) is operating on values outside the established working area, the method includes the additional step of:*

*c) [1.12] modifying the working parameters of the compressor (7) acting on elements to be selected between:*

- [1.13] the compressor (7) speed  $v_c$ ,*
- [1.14] the opening angle of the expansion valve (3), and*
- [1.15] a combination of the above,*

*[1.16] such that, if the compressor (7) does not go back to operating on values in the established working area within a certain time,*

*[1.17] the compressor (7) stops operating and*

*[1.18] triggers an alarm."*

(b) Independent method claim 1 of auxiliary request 1 has the following additional features compared with the main request (feature numbering added in "[ ]"):

*"[...] wherein, if the working condensation temperature  $T_c$  of the compressor (7) is higher than the established maximum condensation temperature  $T_c$ , step c) consists of lowering the compressor speed  $v_c$  to the established minimum, and*

*if the working condensation temperature  $T_c$  of the compressor (7) is higher than the established maximum condensation temperature  $T_c$ , claim 1 comprises the following additional step:*

*d) opening the expansion valve (3) until the predetermined maximum reheat value is reached."*

(c) Independent method claim 1 of auxiliary request 2 has the following additional features compared with the main request (feature numbering added in "[ ]"):

"[...] wherein, if the working evaporation temperature  $T_e$  of the compressor (7) is lower than the established minimum evaporation temperature  $T_e$ , step c) consists of increasing the compressor speed  $v_c$ , to the established minimum, and

if the working evaporation temperature  $T_e$  of the compressor (7) is lower than the established minimum evaporation temperature  $T_e$ , claim 1 comprises the following additional step:

d) opening the expansion valve (3) until the predetermined maximum reheat value is reached."

IX. The appellant's arguments, where relevant to the present decision, can be summarised as follows.

(a) Prior art status of D9

D9 was state of the art under Article 54(2) EPC. While the most important evidence of this was D39, the further evidence did not contradict D39.

(a) Main request - inventive step

The subject-matter of claim 1 of main request did not involve an inventive step. The sole distinguishing feature over D9 was the use of the reheat value to define the working area (feature [1.6]). This was obvious from common technical knowledge alone or from the teaching of either of D12 and D13.

(b) Auxiliary requests 1 and 2 - inventive step

The subject-matter of claim 1 of auxiliary requests 1 and 2 did not involve an inventive step. The control actions were ill-defined here and were not effective in



bringing the operation parameters back into the working area, and were therefore only an arbitrary choice.

X. The respondent's arguments, where relevant to the present decision, can be summarised as follows.

(a) Prior-art status of D9

It was not sufficiently proven that D9 had been published on the internet before the priority date of the patent. D9 thus could not be considered state of the art under Article 54(2) EPC. D9' was not suitable for providing evidence of the pre-publication of D9. The evidence (including D9' and D39) and affidavits presented were contradictory as to the publication date and only came from the sphere of the appellant. The evidence thus lacked credibility and was insufficient with respect to the required standard of proof, which was beyond any reasonable doubt.

(c) Main request - inventive step

The subject-matter of claim 1 did not involve an inventive step over the closest prior art D9. The minimum and maximum compressor speeds as limits of the working area (feature [1.4]) were not disclosed in D9. The inherent technical limits of the compressor in D9 did not correspond to the minimum and maximum compressor speed defining the working area according to claim 1 of the main request. This understanding was also supported by the description of D9. D9 also did not disclose using the maximum reheat value to define the working area (feature [1.6]). This was not obvious from D12 or D13 either. The new evidence for common general knowledge submitted by the appellant with

respect to feature [1.6] should not be admitted under Article 12(6) RPBA.

(d) Auxiliary requests 1 and 2 - inventive step

The subject-matter of claim 1 of auxiliary requests 1 and 2 involved an inventive step. The control actions defined here were not obvious from the prior art. No document in the state of the art, including D9, considered acting on the regulation of the speed of the compressor to modify the parameters in the refrigeration system.

## **Reasons for the Decision**

### 1. Decision in written proceedings

The case is ready for decision in written proceedings in accordance with Article 12(8) RPBA and Articles 113 and 116 EPC, on the basis of the contested decision to be reviewed and the parties' written submissions.

- 1.1 The respondent did not explicitly withdraw its request for oral proceedings submitted with the reply to the appeal. However, in response to the Board's communication under Article 15(1) RPBA the respondent stated in the submission dated 12 September 2024 that it "will not be attending the Oral Proceedings scheduled for 25.09.24 in the appeal case T 832/22-3.2.03". It also requested "that the decision be rendered based on the written case". By making these statements, the respondent unequivocally expressed that it was interested in an immediate decision on the file as it stands and that it did not wish to present its arguments orally at the oral proceedings (see Case Law of the Boards of Appeal, 10th edition, 2022, III.C. 4.3.2). The Board did not consider it expedient to hold oral proceedings of its own motion either.

### 2. Admittance of evidence D46

The affidavit D46 by Mr Guzmán was submitted for the first time with the statement of grounds of appeal. It is thus an amendment under Article 12(4) RPBA and its admittance is within the Board's discretion.

D46 relates to the issue of the contradictory publication date stated in D30 by clarifying that this is related not to D9 but to a draft version. D46 is thus *prima facie* relevant and essentially stays within the legal and factual framework underlying the decision under appeal.

The affidavit D46 is therefore admitted into the appeal proceedings.

3. Prior-art status of document D9 under Article 54(2) EPC

D9 is a user manual entitled "Heos - High efficiency showcase controller" issued by the opponent. It is considered to form part of the state of the art under Article 54(2) EPC.

The respondent's argument that it was not sufficiently established that D9 was published on the internet before the priority date of the patent is not persuasive for the following reasons.

3.1 Under Article 54(2) EPC, the state of the art comprises everything made available to the public by means of a written or oral description, by use, or in any other way, before the filing or priority date of the European patent application. According to established case law (cf. Case Law of the Boards of Appeal, 10th edition, 2022, I.C.3.2.3) disclosures on the internet, as one example of the "any other means" referred to in Article 54(2) EPC, are generally regarded as part of the state of the art within the meaning of Article 54(2) EPC, provided that their publication was sufficiently proven.

### 3.2 Standard of proof

The respondent argued that since the evidence of the public availability of D9 lay within the sphere of the opponent, it was not possible to "reduce the standard of proof to the balance of probability". Instead, the higher standard "beyond reasonable doubt" had to be applied, but that standard was not fulfilled due to the contradictions with respect to the publication date of D9 in the various pieces of evidence.

3.2.1 In G 1/12, point 2 of the order, the Enlarged Board held that proceedings before the EPO are conducted in accordance with the principle of free evaluation of evidence. As set out by the Enlarged Board in G 2/21, Reasons 30, the principle of free evaluation of evidence requires the assessment of evidence according to a judicial body's own conviction, without observing any formal rules. In G 2/21, Reasons 31, the Enlarged Board stated that the decisive factor for the evaluation of evidence is "whether the judge is personally convinced of the truth of the factual allegation, i.e. how credible the judge classifies a piece of evidence. To do this, the judge must put all the arguments for and against a factual statement in relation to the required standard of proof." In G 2/21, Reasons 33, the Enlarged Board made a link between its considerations on the principle of free evaluation of evidence and decisions taken by the administrative departments of the EPO.

3.2.2 The Enlarged Board's reference in G 2/21 to a judge's personal conviction makes clear that it is the state of mind of the members of the fact finding body which is decisive in the evaluation of evidence. This is always the case, regardless of which standard of proof is to

be applied. In other words, referring to the deciding body's conviction that an alleged fact occurred (see T 1138/20, Reasons 1.2.1, last paragraph, and T 1311/21, Reasons 3.2.1(d) (vi)), does, strictly speaking, not yet say anything about which standard of proof should be applied by the deciding body to arrive at this conviction.

- 3.2.3 As to "the required standard of proof" referred to by the Enlarged Board in G 2/21, different concepts have been developed in the case law of the Boards of Appeal. The EPO standard of proof is generally the balance of probabilities. By way of exception, the standard of proof is that of beyond reasonable doubt, mainly in opposition proceedings where only the opponent has access to evidence concerning, usually, an alleged public prior use (Case Law of the Boards of Appeal, 10th edition 2022, III.G.4.3).
- 3.2.4 The standard of proof refers to the nature or degree of personal conviction that the members of the deciding body must have in order to be satisfied that an alleged fact occurred. If the applicable standard of proof is what has been termed "the balance of probabilities", an alleged fact is proven as soon as the members of the deciding body are convinced that the occurrence of that fact is more likely than not. If the applicable standard of proof is what has been termed "beyond reasonable doubt", the required degree of personal conviction of the members of the deciding body is higher.
- 3.2.5 As stated above, standards of proof relate, in legal systems based on the principle of free evaluation of evidence, necessarily to a mental state, namely to the nature or degree of conviction of the members of the

fact finding body. Accordingly, it is difficult to quantify the difference in the required degree of conviction between "the balance of probabilities" standard and the "beyond reasonable doubt" standard. In fact, attempting to describe this difference in the form of numerical thresholds, for example as a certain percentage of likelihood that an alleged fact occurred, can even be misleading. In regard to the "beyond reasonable doubt" standard, it thus seems more expedient to focus on the term "reasonable". In the present Board's view, this expresses that the "beyond reasonable doubt" standard does not require absolute certainty, and that it is sufficient if the (majority of the) members of the deciding body have no reasonable doubt that an alleged fact occurred. In other words, even if there is some remaining doubt, the "beyond reasonable doubt" standard of proof can be met as long as the remaining doubt is not reasonable, which can be understood as overall insubstantial in view of the entirety of the available evidence.

3.2.6 In any case, if the higher one of two disputed standards of proof is met, it can be left open which of these standards must be applied when assessing the evidence in question. Hence, if the deciding body is convinced beyond reasonable doubt that an alleged fact occurred, there is no need to decide which standard of proof is applicable (see, for example, T 2466/13, Reasons, 2.1.1). For the reasons given below, this is the situation in the present case.

3.3 Evidence D39

In the case at hand, the Board considers that D39 - a document only cursorily mentioned in the appealed decision and not considered in substance - establishes

that D9 was publicly available on the internet at least on 19 November 2014, i.e. well before the priority date of the patent (29 March 2017).

3.3.1 D39 is a digital forensic report by the company BIT4LAW SRL created "in the interest of" the opponent (see D39, page 1, and chapter 2, page 4: "Introduction". D39 establishes, *inter alia*, the upload dates of certain documents from the opponent's computer system to a public web server (see chapter 5 starting on page 13).

3.3.2 The Board sees no reason to question the conclusions in the report D39 with respect to the upload date 19 November 2014. The credibility of the report D39 and the methodology applied was as such not challenged by the respondent either, neither in the reply to the statement of grounds of appeal nor in the submission dated 12 September 2024. The fact that D39 was commissioned by the appellant and is based on digital evidence from the appellant has, in the absence of any inconsistencies or other counter-evidence, no negative impact on its credibility.

3.3.3 The report concludes, *inter alia*, based on different digital evidence provided by the appellant (see chapter 3) that a document "named +0300078EN" was "uploaded to the management system (therefore to Internet)" in the "version 1.0" on 19 November 2014 at 13:00 (see page 24). According to the appellant, this document +0300078EN in the version 1.0 and uploaded on 19 November 2014 at 13:00 corresponds to D9. This was not challenged by the respondent, either.

On page 21 of D39 the following data concerning a document +0300078EN (Version 1.0) are mentioned:



- title: Heos High efficiency showcase controller
- release: 1.0
- date: 30/10/2014

These data are consistent with the information also found at D9 on the bottom of page 3:

"Heos +0300078EN rel. 1.0 - 30/10/14".

The title on page 21 of D39 coincides as well with the title on page 1 of D9. Also the image associated to the document +0300078EN in page 21 of D39, which - as far as it can be appreciated - is a representation of the first page of D9.

The data on page 21 of D39 also contain the information that version 1.0 of the document in question was last updated by Daniela Volpin on 19 November 2014. Ms Volpin confirmed in her affidavit (D38) that on 19 November 2014 she "personally uploaded on the Carel website the release 1.0 dated 30/10/2014 of the Technical Manual of the Heos device". The information in D38 is thus consistent with that in the report D39.

#### 3.4 Further pieces of evidence

Contrary to the respondent's opinion, the further pieces of evidence D9' and D30 to D37 do not contradict the conclusions on the publication date based on D39.

- 3.4.1 In the affidavit D30 Mr Guzmán Fernández solely states that an email with "an entire copy of the release 1.0 dated 11/07/2014 of the Technical Manual of the Heos device" was sent "to Mr. Francisco Mazarias Castro, at the time Technical Director of the company INNOHVACR HISPANA, S.L." on 4 September 2014. D30 thus does not

claim any publication date of D9 and is not in conflict with the conclusions in D39. With the affidavit D46 Mr Guzmán Fernández clarified that the copy mentioned in D30 was an intermediate draft version. This is consistent with the later date of publication (19 November 2014) proved by D39.

- 3.4.2 It is true that, with the affidavits D31 to D37, further persons involved in the drafting of D9 state that the 30 October 2014 was the publication date on the internet, contrary to the later date mentioned in D39 (19 November 2014). However, this inconsistency is not suitable for casting doubts on the validity of the conclusions based in D39. The authors of D31 to D37 state that they "participated to the drafting of the release 1.0 dated 30/10/2014 of the Technical Manual of the Heos device" (D31 to D34, D36 and D37) and/or are "personally and directly aware that the release 1.0 dated 30 October 2014" was publicly available in the internet as from this date; however, they did not state that they had been responsible for its upload to the internet. This is consistent with D38 and D39, according to which Ms Volpin carried out this upload.
- 3.4.3 In addition, the fact that the events at issue took place a long time ago readily explains some inaccuracies in the witnesses' testimonies (like the confusion of the date of finalisation of D9 as printed on page 3 with its upload date to the internet: "aware that [D9] was publicly available on the Carel website [...] from such date") without calling into question the overall credibility of their statements.
- 3.4.4 The contradictions between the alleged publication dates of the pieces of evidence D9' (5 June 2014) and D39 (19 November 2014) cannot cast doubt on the above

conclusions with respect to the publication date of D9 on the basis of D39 either.

D9' and D39 are independent pieces of evidence for the publication date of D9. In addition to the alleged contradictions between D9' and D39 the respondent has also challenged the testimonial value of D9' as such, i.e. with respect to the methodology applied herein (for example the pre-set time frame searched). The appellant itself argued that the results of D9' were unreliable and should be set aside. The Board thus sees no reason to consider D9' in addition to D39.

Even if - for the sake of the argument - it had to be considered which of the contradicting publication dates in D9' or D39 was the correct one, both of them are well before the priority date of the patent.

#### 4. Main request - inventive step

The subject-matter of claim 1 of the main request does not involve an inventive step starting from document D9 in combination with common general knowledge.

It was common ground among the parties that D9 represents the closest prior art.

#### 4.2 Common and distinguishing features

##### 4.2.1 D9 discloses a controller and a regulation method for an inverter compressor of a refrigeration system. According to page 22 a working area ("envelope") is defined, *inter alia*, for the compressor by the following parameters in accordance with features [1.1] to [1.3] and [1.5] (see Figure 6d):

- minimum and maximum evaporation temperature,
- minimum and maximum condensing temperature and
- (minimum and) maximum compression ratio (CR).

The working values of these parameters are measured (features [1.7] to [1.10]), since according to D9 they are controlled. For this D9 discloses a controller configured to maintain the compressor within the working area according to features [1.11] to [1.15] by modifying the following control variables:

- the compressor speed and
- the expansion valve opening.

This is described on page 22, right-hand column, penultimate paragraph. Features [1.16] to [1.18] ("*if the compressor does not go back to operating on values in the established working area within a certain time, the compressor stops operating and triggers an alarm*") are also disclosed with respect to these parameters (see page 22, right-hand column, last sentence).

4.2.2 The only features under dispute with respect to the disclosure of D9 were whether the working area in D9 is also established by

- a minimum and maximum compressor speed (feature [1.4]) and
- a maximum reheat value (feature [1.6]),

in particular also with the control criteria defined in accordance with features [1.16] to [1.18].

4.2.3 Feature [1.4] - minimum and maximum compressor speed

Every compressor has a minimum and maximum speed as an implicit technical limitation, as is also discussed at least for the minimum speed in the patent (see paragraph [0050]). This is also apparent from D9 (see page 23, left column, chapter "On/Off": "The compressor starts whenever the request is equal to the minimum speed in the allowed range" and Figure 6.g: "min rps"), or from D41 (see page 5, point 3).

The respondent argued that these technical limits of the given compressor in D9 did not correspond to the minimum and maximum compressor speed defining the working area. The minimum and maximum speed addressed by feature [1.4] were "specifically selected and defined" to establish the working area, and were not simply the operational limits (reference was made to paragraph [0087], *inter alia*,: "... limits on compressor (7) speed are not considered when the compressor (7) operates outside the OPTIMAL area").

However, the claim wording does not provide a basis for such a restrictive understanding of feature [1.4], excluding technical limits of a compressor as the preselected minimum and maximum values. Claim 1 does not define how the values are pre-selected and the pre-selection is also not related to specific functions of the compressor.

The fact that the technical compressor speed limits have an impact on the definition of the working area is also apparent from the graphical representation of the working area in Figure 6.d of D9 (see D9, page 22, right-hand column, third paragraph from the bottom: "[t]he form of the envelope may change according to compressor speed...", i.e. within the technical limits of it).

As these are technical limits of the compressor, features [1.16] to [1.18] are still complied with in this context.

Therefore, feature [1.4] is not a distinguishing feature over D9.

#### 4.2.4 Feature [1.6] - maximum reheat value

The term "reheat value" used in the patent is defined as "the difference between the temperature at the evaporator outlet and the evaporation temperature at the evaporator inlet" (paragraph [0068]), a term referred to in D9 as the "superheat value". This value is usually kept above zero, since (slight) superheating of the vapour avoids the formation of liquid droplets at the compressor inlet.

D9 discloses the compressor discharge temperature (DLT) as a parameter defining the working area (page 22, right-hand column: "normal operating conditions"). The reheat value is determined by measuring the evaporation temperature and the saturation pressure at the evaporator outlet (see page 28, right-hand column, middle paragraph).

D9 describes that this value is controlled to a set point by manipulating the opening of the electronic expansion valve (page 29, left-hand column, first paragraph). According to this passage, in case the "superheat value read by the probes is greater than the set point, the valve is opened proportionally to the difference between the values".

It is also defined on page 30 ("high superheat") that an alarm can be triggered when the reheat value is not back within its working area within a "certain period" (feature [1.18]). For this reason, D9 also discloses that the working area of the inverter compressor is established by a (minimum and) maximum reheat value according to features [1.6], [1.16] and [1.18].

The respondent's request not to admit new evidence for common general knowledge with respect to feature [1.6] referred to by the appellant is thus not relevant for this decision.

- 4.2.5 The disclosure related to the control of the reheat value in D9 on page 28 and 29 is not interrelated with the shut-off criteria for the compressor defined for the "normal operation conditions" disclosed on page 22. The distinguishing feature compared to the process defined by claim 1 is thus that the compressor is stopped if the control actions are incapable to resolve the violation of the maximum reheat value (features [1.6] and [1.17] in combination).

#### 4.3 Objective technical problem

According to the respondent (and the *obiter dictum* in the appealed decision) the technical problem to be solved by the invention was to maintain the reliability of the refrigeration system while improving the energy efficiency of the system.

However, in view of the distinguishing feature, such a generic technical problem is not convincing. The patent does not disclose any specific effect with respect to

the stop of the compressor if the maximum reheat value is exceeded.

However, one of the objectives of the patent is to prevent the compressor from overheating (see paragraph [0056]). In the Board's view the reheat value is a suitable parameter indicative of this, even if the appellant's considerations that there was no single feasible maximum reheat value as an indirect indication of the discharge temperature suitable for protecting the compressor from overheating might be correct.

Therefore, the objective technical problem is to protect the compressor from overheating.

#### 4.4 Obviousness

4.4.1 Given the fact that the starting-point document D9 already includes a function to stop the compressor in the event of undesired operating conditions, the inclusion of the stop function for the parameter "maximum reheat values" is already obvious from D9 alone in combination with common general knowledge.

4.4.2 Furthermore, document D13 also discloses using the reheat value ("suction superheat") as an indirect control variable for avoiding compressor overheat (see D13: claim 1; similar teaching can also be found in D12, claim 3 and paragraph [0030]). D13 further teaches stopping the compressor in the event that the maximum reheat value is exceeded (e.g. claim 2), which points the skilled person towards also implementing such a function in the process disclosed in D9.

#### 5. Auxiliary requests 1 and 2



The subject-matter of claim 1 of auxiliary requests 1 and 2 does not involve an inventive step either.

5.1 In the respondent's view the control actions defined in auxiliary requests 1 and 2 were not made obvious by the prior art. The defined control actions would be an attempt to react on a situation in which parameters leave the operating range "due to causes that are not obvious". In any case the system was stopped and an alarm was triggered if the corrective actions were not successful within a given time.

5.2 The additional features of claim 1 of auxiliary requests 1 and 2 define specific control actions by adjusting the expansion valve opening angle and the compressor speed. D9 also already discloses that the inverter compressor operating conditions can be controlled to be maintained in the working area using these actuators (see page 22, right-hand column, sixth paragraph). What is not disclosed in D9 are the specific directions of the control actions in response to the specific operating states now defined in claim 1 of auxiliary requests 1 and 2 in terms of an "if...then" logic.

5.3 The appellant argued that the control actions defined by the additional features in auxiliary requests 1 and 2 were ill-defined as the claimed measures were not effective in bringing the compressor back into the working area. The appellant's arguments can be summarised as follows:

- Claim 1 of auxiliary request 1 defined that the expansion valve is opened in addition to lowering the compressor speed to the minimum when the

condensation temperature is above the working area, limited by the maximum reheat; however, opening of the expansion valve did not result in lowering the condensation temperature and in increasing the reheat value but the opposite.

- Claim 1 of auxiliary request 2 defined that the compressor speed is increased when the evaporation temperature is below the working area; however, increasing the compressor speed does not result in an increase but in a decrease of the evaporation temperature.
- Claim 1 of auxiliary request 2 additionally defined that the expansion valve is opened when the evaporation temperature is below the working area, limited by the maximum reheat; however, opening the expansion valve does not result in an increase of but in a decrease in the evaporation temperature and the reheat value.

This assessment was not commented by the respondent in substance. The Board considers the appellant's assessment persuasive.

5.4 According to claim 1 the compressor is stopped in line with features features [1.16] and [1.17] in case the control measures are ineffective in bringing the inverter compressor back into the established working area in accordance with feature [1.11].

The selection of the control measures as according to the added features of claim 1 of auxiliary requests 1 and 2 which are ineffective of bringing the compressor back into the working area for the reasons explained above is an arbitrary and non-functional choice from possible interventions for the two well-known manipulating variables of "compressor speed" and

"expansion valve opening angle". An inventive step cannot be acknowledged on the basis of such a non-functional modification to the closest prior art (see also Case Law of the Boards of Appeal, 10th edition, 2010, I.D.9.21.1).

6. Since none of the respondent's claim requests is allowable, the appeal is successful.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



D. Grundner

N. Obrovski

Decision electronically authenticated