

Internal distribution code:

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

**Datasheet for the decision
of 28 May 2025**

Case Number: T 0933/23 - 3.2.03

Application Number: 18214593.8

Publication Number: 3671073

IPC: F25B41/35

Language of the proceedings: EN

Title of invention:
ELECTRIC EXPANSION VALVE

Applicant:
Danfoss A/S

Relevant legal provisions:
EPC Art. 123(2), 84, 111(1)
RPBA 2020 Art. 13(2), 11

Keyword:
Main request - amendment after summons (yes) - exceptional
circumstances (yes) - admitted (yes)
Added subject-matter (no)
Claims - result-to-be-achieved (no) - functional features
(yes) - essential features (yes) - support in the description
(yes) - clarity (yes)
Remittal - (yes)

Decisions cited:

G 0001/24



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 0933/23 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 28 May 2025

Appellant: Danfoss A/S
(Applicant) Nordborgvej 81
6430 Nordborg (DK)

Representative: Keil & Schaafhausen Patentanwälte PartGmbH
Bockenheimer Landstraße 25
60325 Frankfurt am Main (DE)

Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 5 December 2022
refusing European patent application No.
18214593.8 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman C. Herberhold
Members: M. Olapinski
N. Obrovski

Summary of Facts and Submissions

- I. The appeal was filed by the applicant against the decision of the examining division refusing the patent application.
- II. The examining division was satisfied that the sole main request complied with the requirements of Article 123(2) EPC but decided that it infringed Article 84 EPC.
- III. In its communication under Article 15(1) RPBA, the Board raised objections under both Article 123(2) and Article 84 EPC against the main request on which the decision under appeal is based.
- IV. At the end of the oral proceedings before the Board, the appellant requested that the decision be set aside and that the case be remitted to the examining division for further prosecution on the basis of a new main request filed during the oral proceedings.
- V. Claim 1 of the new main request filed during the oral proceedings reads as follows (with feature denominations in square brackets added and with amendments with respect to a combination of the features of originally filed claims 1 and 2 highlighted by the Board).

"[a] Electric expansion valve (1) comprising: a valve housing (12), a valve seat (2), a valve element (3) cooperating with the valve seat (2), a drive driving the valve element (3) and comprising a rotary motor (4) having an axis (17) of rotation,

[b] wherein the rotary motor (4) comprises a rotor (6) which is fixed in an axial direction with respect to the valve housing (12),

[c] wherein the valve element (3) is connected to the motor (4), ~~characterized in that the valve element (3) is connected to the motor (4) having a possibility of a radial displacement between the rotor (6) and the valve element (3) with respect to the axis (17) of rotation~~

[d] via ~~wherein~~ a transmission (10, 11, 16) that is arranged between the rotor (6) and the valve element (3) and that translates a rotary movement of the rotor (6) into a translational movement of the valve element (3),

[e] wherein the transmission (10, 11, 16) comprises a shaft (7) comprising an outer thread forming a lead screw (10) and further comprises a lead nut (11), wherein the rotor (6) is operatively connected to the shaft (7) with the lead screw (10), and configured to drive the shaft (7) for rotating the shaft (7), and hence the lead screw (10), about the axis (17) of rotation, wherein the lead screw (10) is threadedly connected to the lead nut (11) and the lead nut (11) is rotatably fixed with respect to the valve housing (12), wherein the rotary movement of the rotor (6) and corresponding rotary movement of the lead screw (10) leads to translational movement of the lead nut (11),

characterized in that

[f] the valve element (3) is connected to the lead nut (11) by means of a spring element (16) fixing the valve element (3) to the lead nut (11) in the axial direction, this connection allowing a radial

displacement (28) of the shaft (7) and the lead nut (11) in a radial direction relative to the valve element (3), wherein the radial direction refers to the axis (17) of rotation".

VI. In the new main request, claims 2, 4, 9, 10 and 14 as originally filed have been deleted, claims 3, 5 to 8 and 11 to 13 have been renumbered (as claims 2 to 7, 10 and 11, respectively) and amended to refer to an "Electric expansion valve (1)", and references to "the housing (12)" in renumbered claims 3, 5 and 6 have been amended to read "the valve housing (12)".

VII. The new main request additionally contains new claims 8 and 9, which read as follows.

Claim 8:

"Electric expansion valve (1) according to claim 7, wherein the area (1) is an open area (19) and the elongated recess (22) is in the valve element (3), and wherein the frame (18) comprises two fingers (20, 21) protruding into the open area (19) and into the elongated recess (22)."

Claim 9:

"Electric expansion valve (1) according to claim 8, wherein the elongated recess (22) is a groove running in a circumferential direction."

VIII. The appellant's arguments can be summarised as follows.

Admittance

The new main request filed during the oral proceedings before the Board was a reaction to objections raised for the first time in the Board's communication and during the oral proceedings before the Board, which represented exceptional circumstances justifying the admittance of the request under Article 13(2) RPBA.

Article 123(2) EPC

The new main request was fully supported by the application as filed and did not extend beyond the content of the application as filed. It therefore met the requirements of Article 123(2) EPC.

Article 84 EPC

Claim 1 of the new main request met the requirements of Article 84 EPC because it overcame all of the issues raised in the Board's communication and, moreover, it contained all of the essential features of the invention, did not involve an unallowable result-to-be-achieved, contained allowable functional features and was supported by the description.

Remittal

As the decision under appeal did not deal with novelty or inventive step, the case should be remitted to the examining division for further prosecution on the basis of the new main request.

Reasons for the Decision

1. Admittance

In response to the Board's communication under Article 15(1) RPBA, the appellant filed with a letter dated 13 May 2025 new requests addressing the objections raised for the first time in the Board's communication. The Board agrees with the appellant that these new objections represent exceptional circumstances within the meaning of Article 13(2) RPBA for admitting the new requests, also taking into account that they were filed sufficiently far in advance of the oral proceedings.

During the oral proceedings, the Board raised further objections against the main request of 13 May 2025 which again justified, under Article 13(2) RPBA, the admittance of the new main request underlying this decision.

2. Article 123(2) EPC

2.1 Claim 1 of the new main request filed during the oral proceedings before the Board meets the requirements of Article 123(2) EPC.

It is based on claims 1 and 2 as originally filed. Further amendments with respect to the combination of features of these original claims are highlighted in section V. above.

Features [a] and [c] are literally taken from claim 1 as originally filed, wherein the characterising portion of the original claim 1, i.e. that the valve element is

connected to the motor "having a possibility of a radial displacement between the rotor (6) and the valve element (3) with respect to the axis (17) of rotation", has been deleted and replaced by a more specific definition of this connection and function in features [d], [e] and [f] (see below).

Features [b] and [d] correspond to claim 2 as originally filed, with minor linguistic amendments in feature [b] ("an" axial direction and "the valve housing (12)") that do not change the claimed subject-matter. Feature [d] specifies that the connection between the valve element and the motor is "via" the transmission defined in the original claim 2.

Feature [e] defines the structure and function of the transmission and feature [f] defines the connection between the valve element and the transmission as having the function of the deleted part of feature [c] of the original claim 1.

Feature [e] defines the constituents of the transmission as derivable from page 2, lines 24 to 27 (transmission comprising lead screw and lead nut) and page 5, lines 28 to 30 (shaft comprising an outer threading forming the lead nut, the lead screw being threadedly connected to the lead nut and the lead nut being rotatably fixed with respect to the housing). Feature [e] further defines that the rotor is operatively connected to the shaft and configured to drive the shaft for rotating the shaft (with the lead screw) around the axis of rotation, based on page 5, lines 22 to 26 ("operatively connected" and "drives the shaft"; the details of the specific mechanism are optional and "other connections are possible"), and on Figure 1 (disclosing the alignment of the shaft with

the axis of rotation). Feature [e] further specifies the function of the transmission such that the rotary movement of the rotor and corresponding rotary movement of the lead screw leads to a translational movement of the lead nut as disclosed on page 2, lines 24 to 27, and page 5, line 30, to page 6, line 2. Feature [e] thus specifies all of the components of the connection from the motor to the lead nut.

Feature [f] defines the connection between the valve element and the lead nut via the spring element, and the function of "this connection", based on page 6, line 29, to page 7, line 3. Hence, it replaces the characterising feature of the original claim 1 in a more specific way.

In particular, claim 1 of the new main request defines the functional requirement of "allowing a radial displacement [...]" in the characterising portion of claim 1 as being a function of the "connection" between the valve element and the lead nut via the spring element, as disclosed on page 2, lines 5 to 8, and page 4, lines 2 to 3, of the application as filed, not as a function of the spring element itself, and it specifies the "radial displacement" in line with the disclosure on page 6, line 29, to page 7, line 3.

Accordingly, the subject-matter of claim 1 does not extend beyond the content of the application as filed.

- 2.2 The Board has no objections against the linguistic amendments and adaptation of dependencies in claims 2 to 7, 10 and 11 (see section VI. above).

- 2.3 New claims 8 and 9 (see section VII. above) specify the frame, the area, the position of the elongated recess

and the at least one finger in claim 7 (original claim 11) in more detail according to the detailed embodiment of Figure 3 and the literal description on page 7, lines 10 to 17. As these details are presented in two stages, on page 7, lines 10 to 15, and on page 7, lines 15 to 17, the subject-matter of claims 8 and 9 and their dependencies on claims 7 and 8, respectively, are in line with the original disclosure.

2.4 Accordingly, the main request meets the requirements of Article 123(2) EPC.

3. Article 84 EPC

3.1 By expressly specifying the functional feature "allowing a radial displacement [...]" as being a function of "this connection" between the lead nut and the valve element via the spring, the new main request overcomes the objection of ambiguity in terms of the element to which this features applies, as set out in the Board's communication under Article 15(1) RPBA (point 6.3). Moreover, by explicitly defining all of the structural elements forming the transmission as part of the transmission, and by defining the radial direction based on page 7, lines 1 to 3, the new main request overcomes the respective objections under Article 84 EPC as raised in the Board's communication (cf. points 6.4 to 6.6).

3.2 In the decision under appeal, the examining division considered whether claim 1 of the main request then on file clearly defined the object of the invention, i.e. whether it contained all of the essential features of the invention and did not merely formulate the subject-matter for which protection is sought in terms of the effects or problem to be solved (the so-called "result-

to-be-achieved"). Moreover, it considered whether the claimed subject-matter was supported by the description. The Board appreciates the examining division's scrutiny and diligence in this regard (see G 1/24, Reasons 20).

- 3.2.1 The examining division came to the conclusion that claim 1 of the main request then on file was not in line with the requirements of Article 84 EPC, because it lacked the essential features of "a frame and two fingers" of the spring element and of "an elongated recess" in the valve element, because the spring element without these features lacked support in the description, and because the functional expression "allowing a radial displacement [...]" was an unallowable "result-to-be-achieved".

Although the characterising portion in the new main request is reformulated, it still contains the above-mentioned functional expression and still does not specify the essential features that are allegedly missing. Hence, the respective issues in the decision under appeal still apply to the current new main request.

In fact, the feature of "allowing a radial displacement" in the characterising portion of claim 1 is defined in terms of a function which is close to the technical effects the application seeks to provide. The current case thus concerns the boundary between allowable functional features (dealt with in the Guidelines, F-IV, 6.5, as referred to in the decision under appeal) and an unallowable definition of the invention in terms of a result-to-be-achieved, amounting in essence to the problem underlying the application (Guidelines, F-IV, 4.10, as referred to in

the decision under appeal), in which case essential features defining the invention are missing (Guidelines, F-IV, 4.5, as referred to in the decision under appeal).

3.2.2 However, in the case at hand, claim 1 of the new main request meets the requirements of Article 84 EPC for the reasons set out in the following.

3.2.3 Result-to-be-achieved

The Board firstly notes that the characterising feature does not relate solely to effects or results to be achieved, but specifies the structural feature of the connection, namely that "the valve element is fixed to the lead nut in axial direction" by a technical means, namely a "spring element". For this reason alone, the subject-matter of the invention in the characterising portion is not solely defined in terms of the problem to be solved.

Next, it is to be considered whether the expression "allowing a radial displacement" corresponds to the technical effects or problem underlying the invention or represents a feature of the solution to the problem.

In the Board's view, the problem of "ensuring a long lifetime with low production costs", as stated in the application (page 1, lines 25 to 26) and submitted by the appellant, is too broad. The Board agrees with the examining division that the problems in the prior art (wear due to radial displacement; high costs for precise alignment) are associated with a rigid connection between the drive (train) and the valve element for axial movement of the valve element. The proposed solution resides in the provision of a more

flexible connection that transmits axial movement while allowing some radial play (radial displacement). The technical effects of this solution include relaxed positioning demands at manufacture without increasing wear, and the problem could thus be considered to reside in the provision of these effects.

Hence, although the Board does not agree with the problem submitted by the appellant, the functional feature of the connection "allowing a radial displacement" is directed to an element of the solution (flexible connection), not to the technical effects or the problem underlying the solution, and is thus not defined in terms of an unallowable "result-to-be-achieved".

3.2.4 Functional features

It is generally accepted that the definition of a feature in terms of its function is acceptable, if a skilled person understands, without exceeding their normal skills and knowledge and without undue burden but if necessary with reasonable experiments, how to reduce it to practice and if it can be determined without ambiguity whether the claimed functional requirement is satisfied by a given prior art (Case Law of the Boards of Appeal, 10th edition, 2022, II.A.3.4).

In the present case, how a spring element can be used for "fixing the valve element to the lead nut in axial direction" - namely by applying a compressive force in the axial direction that holds together the valve element and the lead nut - is part of the common general knowledge of a skilled person. For this purpose, the spring element must be attached at corresponding features of these elements, e.g. a recess

or protrusion or other abutment surfaces of the valve element and of the lead nut. It is also already known to the skilled person how this connection can, at the same time, "allow a radial displacement" between the valve element and the lead nut - namely in that the connection allows some lateral play, i.e. at least one of the elements can be shifted laterally with respect to the spring element - be it at the connection between the spring element and the valve element or between the spring element and the lead nut. This is in accordance with the particular embodiment in the description and the drawings, which exemplifies one way of putting such lateral play into practice. In view of common general knowledge, however, the skilled person has at their disposal alternative (mechanical) means of allowing such lateral play, see point 3.2.5 below.

Hence, the skilled person knows how to put the functional feature into practice. Moreover, the Board has no doubt that it can also be determined without ambiguity whether a given construction fulfils the claimed function. It is thus not decisive whether the functional expression can or could have been formulated differently, e.g. in structural terms.

The functional feature is thus allowable.

3.2.5 Essential features

Essential features are those features which are constitutive for the definition of the invention, that is, all features which are necessary for solving the technical problem with which the application and the claim is concerned. In this regard, Article 84 EPC not only requires that the claimed subject-matter is comprehensible, but also that it contains a clear

definition of the object of the invention by defining all essential features thereof (Case Law of the Boards of Appeal, 10th edition, 2022, II.A.3.2).

The examining division argued that the more specific "form and constructional details" of the spring element were crucial for the invention. In particular, the features that *the spring element includes "a frame and two fingers", wherein said fingers interact with (protrude into) an "elongated recess" formed on the valve element* were missing essential features.

However, in the Board's view, the features in the characterising portion are sufficient for defining the invention and for solving the stated problem discussed in point 3.2.3. It is not necessary to further define the structure of the spring element and the connection, i.e. the frame, the fingers and the cooperating elongated recess. As set out above, the example of fingers of the spring element protruding into an elongated recess of the valve element is not the only way a connection allowing lateral play can be realised. For example, the spring element could alternatively engage with a *protrusion* on the valve element instead of a *recess*, *without requiring fingers*. Moreover, the spring element could alternatively be *fixed* to the *valve element* and instead allow radial play between the spring element and the lead nut. Such alternative connections with play are readily available to the skilled person, in particular in view of their knowledge of the embodiment with finger(s) protruding into an elongated recess as disclosed in the application. Hence, the specific way of connecting the spring element to the valve element is not essential for the claimed function of the connection.

Moreover, as submitted by the appellant, the passage in the last paragraph on page 3 in the general part of the description already discloses an embodiment of a connection by means of a spring element with similar functions but *without* the specific connection between finger(s) and an elongated recess, which is only defined as a different optional aspect "in an embodiment" according to the next paragraph. That is to say, the application discloses that the specific details of how the connection can be realised are not inextricably linked to the function of the connection of allowing radial displacement. The application therefore does not convey the impression that the invention is to be carried out exclusively in a particular way involving these features.

Accordingly, the features of the "frame comprising two fingers" protruding into a corresponding "elongated recess" in the valve element are not essential features.

3.2.6 Support in the description

Considering that the *general part* of the description provides support on page 3, last paragraph, for a connection between the motor and the valve element by means of a spring element *without* requiring a frame and two fingers protruding into an elongated recess in the valve element, there is also support in the description for the claimed subject-matter, as required by Article 84 EPC.

3.3 Accordingly, the new main request meets the requirements of Article 84.

4. Remittal

The new main request thus solves all of the issues under Articles 84 and 123(2) EPC and thereby overcomes all of the grounds for refusal in the decision under appeal.

Since the examining division has not acknowledged novelty and inventive step for a claim with a spring element without being limited to a frame and two fingers protruding into an elongated recess in the valve element, it is not clear whether such a subject-matter has been covered by the search in view of the examining division's understanding that the aforementioned features were essential for the invention. Moreover, novelty and inventive step were not dealt with in the decision under appeal.

For these reasons, and in view of the primary object of the appeal proceedings being to review the decision under appeal according to Article 12(2) RPBA, special reasons for a remittal according to Article 11 RPBA present themselves. The Board thus agrees to the appellant's request that the case be remitted to the examining division for further prosecution under Article 111(1) EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division for further prosecution.

The Registrar:

The Chairman:



C. Spira

C. Herberhold

Decision electronically authenticated