

**Internal distribution code:**

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

**Datasheet for the decision  
of 1 March 2019**

**Case Number:** T 1674/15 - 3.4.02

**Application Number:** 07836452.8

**Publication Number:** 2052223

**IPC:** G01F25/00, G01F15/00

**Language of the proceedings:** EN

**Title of invention:**  
FLOW MEASUREMENT DIAGNOSTICS

**Applicant:**  
Rosemount Inc.

**Headword:**

**Relevant legal provisions:**  
EPC 1973 Art. 54, 56

**Keyword:**  
Novelty and inventive step - after amendment - (yes)

**Decisions cited:**

**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  
Fax +49 (0)89 2399-4465

Case Number: T 1674/15 - 3.4.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.4.02**  
**of 1 March 2019**

**Appellant:** Rosemount Inc.  
(Applicant) 12001 Technology Drive  
Eden Prairie, MN 55344 (US)

**Representative:** Bohnenberger, Johannes  
Meissner Bolte Patentanwälte  
Rechtsanwälte Partnerschaft mbB  
Widenmayerstraße 47  
80538 München (DE)

**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 30 March 2015  
refusing European patent application No.  
07836452.8 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman** R. Bekkering  
**Members:** C. Kallinger  
T. Karamanli

## Summary of Facts and Submissions

- I. The appellant lodged an appeal against the decision of the examining division to refuse the European patent application No. 07 836 452.8.
- II. In its decision, the examining division referred to the following documents
- D1 WO 00/50851 A1  
D2 US 2005/8011278 A1  
D3 EP 0 827 096 A  
D4 US 2005/284237 A1,
- and decided that the subject-matter of claims 1 and 12 of the then main request and of the then first auxiliary request was not new with respect to document D1. A second auxiliary request, filed during oral proceedings before the examining division, was not admitted into the proceedings by the examining division in accordance with Rules 137(3) and 116(1) EPC.
- III. With the statement setting out the grounds of appeal, the appellant requested that the decision of the examining division be set aside and a patent be granted on the basis of the claims according to the main request or, in the alternative, according to the first or second auxiliary request, all filed with the statement of grounds of appeal. The appellant argued, in particular, that the subject-matter of claim 1 was novel and inventive over the disclosure of document D1.
- IV. In a communication under Article 15(1) RPBA annexed to a summons to oral proceedings, the board informed the appellant that, according to the board's preliminary

opinion, independent claims 1 and 12 of the main request lacked clarity but, if they were clarified, the claimed subject-matter would be novel and involve an inventive step over the available prior-art documents D1 to D4.

- V. With a letter dated 12 February 2019, the appellant filed amended claims 1-14 according to a new main request and amended description pages 2, 2a and 7.

It withdrew the first and second auxiliary requests and requested that the appeal proceedings be continued on the basis of the following main (and sole) request:

The appellant requested that the decision of the examining division be set aside and that a patent be granted in the following version:

Claims:

Nos. 1-14 filed with the letter dated 12 February 2019.

Description

Pages 1, 3-6 as originally filed;  
Pages 2, 2a and 7 filed with the letter dated 12 February 2019.

Drawings

Sheets 1/4-4/4 as originally filed.

- VI. Thereupon the oral proceedings were cancelled.

- VII. Independent claim 1 of the sole request reads:

*"1. A flow meter for measuring flow (14) of a process fluid, comprising:*

*a sensor (50) configured to provide a sensor output signal (78) related to flow (14) of the process fluid;*

*circuitry (77) configured to determine a statistical parameter related to the sensor output signal (78); and*

*diagnostic circuitry (76) configured to provide a diagnostic output (82) based upon the current value of the determined statistical parameter and the current value of the sensor output signal (78), wherein the apparatus includes a memory (72) configured to store a nominal relationship between the determined statistical parameter and the sensor output signal (78), the nominal relationship having been determined empirically by observing operation of the flow meter during normal conditions over a range of process fluid flow values, wherein the diagnostic output (82) is based upon a comparison between the current value of the statistical parameter and the current value of the sensor output signal (78) with the stored nominal relationship."*

Independent claim 12 of the sole request reads:

*"12. A method of diagnosing operation of a flow meter of the type used to measure flow (14) of process fluid, the method comprising:*

*obtaining a signal (78) related to flow (14) of the process fluid;*

*determining a statistical parameter related to the signal (78) related to flow (14) of the process fluid; and*

*providing a diagnostic output which is based upon the comparison of the current value of the signal (78)*

*related to flow (14) of the process fluid and the current value of the determined statistical parameter with a stored nominal relationship, wherein the nominal relationship is a relationship between the determined statistical parameter and the signal (78) related to the flow (14) of the process fluid, the nominal relationship having been determined empirically by observing operation of the flow meter during normal conditions over a range of process fluid flow values."*

### **Reasons for the Decision**

#### 1. Amendments

Independent claim 1 is based on a combination of originally filed claims 1, 8, 9 and 20 and independent claim 12 on a combination of originally filed claims 21, 25, 1, 8, 9 and 20. Further amendments to claims 1 and 12 are based on the description as originally filed, pages 4, lines 9-11, page 6, lines 25-29, page 6, line 29 to page 7, line 3, and figures 3 and 4.

In essence, the wording of claims 1 and 12 has been clarified to be consistent and claims 1 and 12 now define in particular that *"the nominal relationship having been determined empirically by observing operation of the flow meter during normal conditions over a range of process fluid flow values"*.

The board is satisfied that the amendments meet the requirements of Article 123(2) EPC.

2. Clarity

The board is satisfied that the claims of the sole request meet the requirements of Article 84 EPC.

3. Novelty and inventive step

3.1 The invention generally relates to the monitoring of a flow meter in order to detect problems, e.g. due to plugging of impulse lines. To this end, a current statistical parameter (e.g. the standard deviation) of the measured flow value is calculated and compared to a nominal value for the statistical parameter. This nominal value depends on the flow and stems from a previously determined "*nominal relationship*" between the flow and the respective statistical parameter (see figures 3 and 4 of the application). If a fault occurs in the system, the current value for the statistical value differs from the nominal value - thus allowing the fault to be detected.

3.2 Document D1

Document D1 (see figures 4 and 6 and pages 8-10) discloses the following features of claim 1:

- a flow meter (82) for measuring flow of a process fluid, comprising
- a sensor (31) configured to provide a sensor output signal (P) related to flow of the process fluid
- circuitry (46) configured to determine a statistical parameter (sample standard deviation  $s$ ) related to sensor output signal (P); and
- diagnostic circuitry (52) configured to provide a diagnostic output based upon comparing a current determined statistical parameter (sample standard



deviation  $s$ ) with a historical statistical parameter (standard deviation  $\sigma$ ) in order to detect e.g. clogging of the impulse lines (see page 10, lines 1-16).

### 3.3 Difference

The appellant argued that independent claims 1 and 12 differed in that a current determined statistical parameter and the current sensor signal relating to flow are compared with a stored nominal relationship between the statistical parameter and the sensor output which indicates the operation of the flow meter for a range of values of the process fluid flow under normal conditions.

The board agrees with the appellant's arguments, because D1 (see figures 4 and 6) discloses to evaluate the difference between an actual value and a stored moving average. This is different from comparing the current statistical value with a stored nominal relationship which has been predetermined empirically by observing operation of the flow meter during normal conditions over a range of process fluid flow values.

### 3.4 Effect and objective technical problem

Using the nominal relationship between the statistical parameter and the sensor output it is possible to identify sensor faults for a range of flow values by comparing a current statistical parameter with its nominal value only.

The objective technical problem to be solved is therefore to provide a simple and reliable detection of sensor faults, e.g. due to clogging of impulse lines.

### 3.5 Inventive step

Although D1 is directed to the same problem and uses a similar diagnostic circuit, it does not disclose the claimed nominal relationship. As can be seen in figures 4 and 6 of D1, a moving average is subtracted from the differential pressure value before this difference (44) enters the diagnostic circuit. The subsequently determined statistical parameter (standard deviation  $\sigma$ ) is therefore necessarily independent of the current flow value. Therefore the diagnosis in D1 is, contrary to the claimed invention, not based on a relationship between the statistical parameter and the sensor signal output related to flow of the process fluid.

D2 uses a similar approach as D1 but fails to disclose the use of a predetermined nominal relationship over a range of process fluid flow values and the subsequent comparison of the current value of the signal and the current value of the determined statistical parameter with the nominal relationship.

D3 and D4 fail to disclose the determination of a statistical parameter for the claimed comparison with a predetermined nominal relationship.

### 3.6 Conclusion

None of the cited prior-art documents D1, D2, D3 or D4 discloses or hints towards the use of the claimed relationship as e.g. shown in figures 3 and 4 of the description. The subject-matter of independent claims 1 and 12 is therefore new and involves an inventive step within the meaning of Articles 54(1) and 56 EPC 1973.

4. Dependent claims

Claims 2 to 11, and claims 13 and 14 are dependent on independent claims 1 and 12, respectively. Their subject-matter is therefore also new and involves an inventive step.

5. Description

The description has been amended to identify the closest prior art according to document D1 and has been adapted to the amended claims.

6. Conclusion

In view of the above, the board comes to the conclusion that the appellant's sole request is allowable.

## 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 with the order to grant a patent in the following version:

#### Claims:

Nos. 1-14 filed with the letter dated 12 February 2019.

#### Description

Pages 1, 3-6 as originally filed;  
Pages 2, 2a and 7 filed with the letter dated  
12 February 2019.

#### Drawings

Sheets 1/4-4/4 as originally filed.

The Registrar:

The Chairman:



M. Kiehl

R. Bekkering

Decision electronically authenticated