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1996 February 21

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Dear Doug:

This letter is our response to the telephone communication (96/1/24) requesting additional information for the Device Application for Model 5321. Many of the questions were answered during the phone conversation so this will serve as our formal, written response.

- **Inner temperature of the O-frame**
  Discussion: In our device application, we described the gauge's environment as occasionally reaching subzero temperatures during plant outages. Our prototype testing completed at IMS was done only down to 0 C. Can we accept that the lowest operating temperature is 0 C, not subzero?
  Response: We confirm that the gauge would not be operated below 0 C. During plant outages it may experience exposure of subzero temperatures. The prototype for this gauge that has been in operation at the Mannesmann, Mülheim, Germany facility since 1988 has experienced exposures below 0 C without any negative effect to the gauge.

- **Cooling system**
  Discussion: Regarding the particulate filters, water purity, and capacity, is the cooling system the same as the 5245 device registration series?
  Response: The cooling system will meet the minimum requirements as stated in the similar device registrations for the 5245 series.

- **Galvanic corrosion**
  Discussion: We described the operating environment as being possibly 100% humidity. Per D. Broaddus, in this environment aluminum and stainless steel can cause some galvanic corrosion. Sometimes a barrier (paint) between the gauge and the labels would restrict this galvanic corrosion.
  Response: IMS has never had any galvanic corrosion problems with the materials selected. IMS commits to continuing use of these materials since they have demonstrated robust suitability to the environment in which the gauge will be used.

- **Cooling water temperature fault**
  Discussion: What happens when the cooling water goes over 100 C? Will the unit give a warning?
  Response: IMS confirms that the unit gives a warning (fatal fault) which is sent to the customer as an output signal and also displayed on the operators' interface.

- **Source position indicator (illuminated sign)**
  Discussion: If one source housings does not close, will it indicate open?
  Response: If even one of the source housings do not close, the source indicator shows "open".

- **Appendix G; P 10 of the application**
  Discussion: In the safety instructions section, should "cooling air" be replaced with "cooling water"?
  Response: IMS confirms that the term "cooling air" should be replaced with "cooling water."

- **November 20 response**
  Discussion: Regarding the permanent process formed in the base material for labeling, i.e., stamping, engraving, durable paints, etc., explain the "durable paints" reference.
  Response: The paint IMS was referring to was the yellow and magenta colors that are required by the federal code. The remaining the lettering would be a permanent process formed in the base material.

- **Signs**
  Discussion: IMS signs currently are worded "Serial Number xxxx" where xxxx was the combined model number and the serial number given.
  Response: IMS will modify new signs to specifically state "Model xxxx Serial Number yyyy."

- **Leak test following prototype testing**
  Discussion: ANSI N538 requires a leak test to follow all of the testing.
  Response: IMS confirms that the source holder successfully passed a leak test following the ANSI N538 test.

- **Air pressure variance**
  Discussion: IMS varied the pressure during the test between 4 - 8 bars. Why was this done?
  Response: This represents the range of working air pressure typically present in an industrial facility.

- **Prototype results**
  Discussion: On page 10, 3rd paragraph, should that have been 85 C instead of 0 C?
  Response: IMS confirms that 0 C should be replaced with 85 C.

- **Prototype classification**
  Discussion: The classification "S", i.e., "Special" was used instead of "4" yet classification "4" incorporates 85 C. Please explain.
  Response: Our photocopied version of the ANSI classification appeared to associate classification 4 with 35 C. IMS confirms that Classification 4, i.e., 85 C is correct and a revised page 12 of the test report is enclosed.

- **300 and 400 stainless steel**
  Response: IMS confirms that we will limit gauge housing construction materials to 300 and 400 stainless steel.

- **Source housing and bill of material**
  Discussion: George will provide a step-by-step walk through explaining the drawings, detailing the components, and how they fit together. This was also done during our visit in Washington with Steve Baggett.
  Response: The walk through was completed during the week of February 26, 1996. The "Answers to Mechanical Drawings Review (Part II)" will follow this week.

4. ANSI Classification

The IMS Device TIAS 211 Heavy Metal Shielding (with integral shutter mechanism) is used in the IMS Model 5321 series of multi-channel tube gauges. Based on the test procedure and results presented above, the IMS TIAS 211 and the IMS Gauge Model 5321 series have the ANSI N538 classification described below.

4.1 ANSI Standard N538

The American National Standard N538 was issued in October 1979 and is entitled **Classification of Industrial Ionizing Radiation Gauging Devices**. This standard applies to the radiation safety aspects of gauging devices.

4.1.1 For the TIAS 211 (Free Standing)

The ANSI classification for the free-standing Heavy Metal Shielding Device TIAS 211 is

ANSI - 43 - 538 - 565 - R1

4.1.2 For the IMS Model 5321 Gauge Series

The ANSI classification for the IMS Model 5321 multi-channel tube gauge with the TIAS 211 installed is

ANSI - 43 - 543 - 885 - R1

Note Regarding OFF position measurements for the Model 5321:

The 5 cm measurement position is in the measuring gap. The 30 cm and the 100 cm positions are outside the gap as required to achieve the proper measurement standoff distances. The measurement gap is this case is a circle with an inside diameter of about 300 mm. All measurements were taken from the nearest accessible surface.

Def. Call Between Doug Braddus & George Burnett 2/27/96

Drawings needed (or equivalent dimensional description)

- ~~Return Spring~~

P ✓ How Flange (#9) relates to device.

P ✓. Is a belliville Spring a lock washer?

P ✓. Pin (#19) and how it relates to the device. (Not shown on another drawing # 5321-025-02)

P ✓. Threaded Pin (#27) and how it relates.

P ✓. Bearing (#33) dimensions/specifications

P ✓. #30 (Circlip) and how it relates (is this a locking/slip ring)

P ✓. Disk (#31) and how it relates.

P ✓. Torsional Spring (#34) Is this the return spring? ✓es.
Specifications & dimensions are sufficient.

P ✓. Bearing (#35) dimensions/specifications

P ✓. Star Spring (#36) and how it relates.

P ✓ Proximity Switch (#41) How it operates.

P ✓. Is pneumatic cylinder a standard OTS item? Specifications?

NP ✓. #73 & #74. what are these? Proximity Switch Connection.

P ✓. #81 Screws => cannot read.

- ~~#83~~

P ✓. Where is #90 and what is it?

P ✓. How is unit mounted in the O-Frame?

P ✓. How is cooling water/air supplied?

P ✓. Part Drawing 5321-025-06 OS and is provided, but not shown on any other drawing.

P ✓. ~~#~~ Screw (#25) how does it relate to the device.

P ✓. Part Drawing 5321-025-03 (#6) => shouldn't this be threaded?
and what do the dashed lines represent?

P ✓. Unclear how part #4 locking bolt and #6 locking screw interact with each other.

All items needed to be addressed. (P means "will Provide", NP means "will not Provide." NP items were answered via phone.

Deficiency Call 1/24/96 1/22/96

Between Doug Broaddus & Susan Burnett, IMS

IMS Application: Model 5321

3/1/95 Application.

✓ • CDC.38210 Capsule X.38/4 => RC Model?

✓ • Max # of sources/housings => 13

✓ • Hot tubes pass that max. temp => Max temp at sources/housing.

✓ • Capsule ANSI Class. => C66646

✓* ✓ • Device cooled for inner frame temp. of 100°C.

✓* May also reach sub-freezing temps => Low temp min.?

✗✗ • Cooling system specifications => Same as 5301? or 5295

✗ • Labeling => Refers to Source or Device? (3.3.1)

✓* ? Material => Al => Reaction w/ SS, Galvanic Corrosion? ⇔ 100% RH?

✓ • Prototype testing => Sufficient? (Appendix D)

✓ • Isodose => On & Off?

✓* • Locking bolt => does it press against the source? At what force? Pressure spring force (lbs) only? How is the force regulated?

✓* • Drawings => Need component drawings of the source housing!

✓ • Shutter return springs => How are they rated to infinite life and under what environmental conditions?

✓ • Isodose curves => 9 vs 13. We can only approve 9 unless you provide additional info. for others.

✓ • Temperature limitation => -20°C to 100°C due to shutter position sensor limitations!

And shutter actuator limitations!

✓* • Source shutter Drive Shaft Bearing specifications:

Temp. range; lubrication effect of radiation; humidity range?

Note: Items with a "2" were discussed as needing a response.

will

- What happens when the Cooling Water Temp gets too high or the inner frame exceeds 100°C? DOES THE UNIT SHUT DOWN?
  Put as a limitation that licensee must close shutter if temp. exceeds 100°C? DAB only.
- What is does the unit or licensee do if any of the following faults occur?
  1.1.3.8, 1.1.3.9, 1.1.3.10
- will the source position indicators show open if one or more shutters do not return to the fully closed position?

start

- Page 10 of Appendix G (Rad. Safety Instr.) indicates temperature circuits monitor for cooling AIR failure. All other references mention cooling water and not cooling air. Clarify!

11/20 response

1a) & 1b) OK ⇒ if we cannot also come to this conclusion.

2) OK.

3) a. OK., b. OK, c. 5 min automatic shutter closed, d. OK.

4) Not addressed

5) - Need a statement that the cooling system is the same requirements as the 5345 system.

- Source shutter springs temp. range is here indicated to be 0-100°C. Previously you indicated the devices could be used in sub-freezing temps. 0°C would be the new limitation!

- According to this info, device will experience ≈ 1,500,000 cycles in about 20 years (expected life). Is this OK?

7a) OK, b) OK for inside the measuring frame. c) O.K. note that aluminum and S.S. create a distructive galvanic cell when placed in a humid or reactive atmosphere. You had indicated that the gauge could be installed where 100% RH was possible.

Note. d) Permanent process = finish in the base model is OK. Note that some paints, while durable, can fade over time due to light, temp, radiation, etc.

e) Label indicates serial # is 5321 not the model #.

8) OK.

Note: 9) This is not a good description of a worst case scenario, as pertains to shielding criteria.

✓ 10) Site licensee must consider possibility of collisions.

✓ 11) Source model CDC. 711 m OK up to 10 Ci. ANSI C64444

(5) OK

Prototype testing

✓ - 0-85°C (This becomes the new limitation unless otherwise demonstrated). [Maybe not?]

- Was the device leak tested following testing?

(4) - Pressures were changed from 4 → 6 bars during the testing. Why, and what will the actual level be? First part of the testing indicates max. pressure would be 5.5 bar?

- Page 10 seems to have a typo in the 3rd paragraph. (0°C?)

- ANSI - S3 - 538 - 656 - R1 Housing } S=85°C

ANSI - S3 - 543 - 885 - R1 Gauge }

↑ Why was this not a 4 which corresponds to 85°C?

→ ANSI N538 requires a leak test for verification.

12/4 Response

1a) Check.

1b) OK.

Not. 1c). Measurement frame specification is important because it:

i) provides shielding

ii) provides security (integrity, mounting, access) for the housing.

iii) selection of material may cause galvanic cells with the housing.

IV) selection of steel properties may not be appropriate, i.e., brittle/impacts, low melting points, low yield strength, etc.

V) stainless steel (400 or 300 series) seems appropriate for this type of application.

1d) OK.

1e) O.K.

4a) OK.

4b) Check.

5) See previous statement.

6) See ..

12) OK.

13) See Question on faults

14) OK

Temp limitation 0°C -> 100°C