SAE Aerospace
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AEROSPACE STANDARD

AS 8004
Supersedes AS 395 and 438

Issued 1975-09
Reaffirmed 2008-02

# MINIMUM PERFORMANCE STANDARD FOR TURN AND SLIP INSTRUMENT

## 1. PURPOSE

This standard establishes the minimum performance standards for turn and slip instruments for aircraft use.

## 2. SCOPE

2.1 This standard covers Turn and Slip Instruments which measure and display the rate of turn about the vertical axis and incorporate an integral slip indicator.

2.2 Applicable Documents: The following document shall form a part of this specification to the extent specified herein:

Radio Technical Commission for Aeronautics (RTCA) Document DO-138 dated 27 June 1968, on Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments. (Copies may be obtained from RTCA Secretariat, Suite 302, 2000 K Street, N. W., Washington, D. C. 20006).

## 3. GENERAL STANDARDS

3.1 This standard covers three basic types of turn and slip instruments:

Type I - Driven by air pressure.
Type II - Driven electrically by direct current.
Type III - Driven electrically by alternating current.

3.2 Operation of Controls: The design of the instrument must be such that any controls intended for use during flight cannot be operated in any possible position combinations or sequences that would result in a condition detrimental to the continued performance of the instrument.

3.3 Accessibility of Controls: Controls which are not normally adjusted in flight must not be readily accessible to flight personnel.

3.4 Effect of Tests: Unless otherwise stated, the application of the specified tests must not produce a subsequently discernible condition which would be detrimental to the continued performance of the instrument.

3.5 Fire Resistance: Except for small parts (such as knobs, fasteners, seals, grommets, and small electrical parts) that would not contribute significantly to the propagation of a fire, all materials used must be self-extinguishing when tested in accordance with the requirements of Federal Aviation Regulation 25.1359 (d) and Appendix F thereto, with the exception that materials tested may be configured in accordance with paragraph (b) of Appendix F or may be configured as used.

3.6 Indicating Means: Rate-of-turn may be indicated by means of a pointer, deflecting in the direction of turn, or by any other means conforming to these standards. The rate-of-turn pointer may be remotely located from the rate-of-turn gyro. Slip may be indicated by means of a ball, free to move in a curved transparent tube, or by any other means conforming to these standards.

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3.7 Visibility: Turn and slip indications must be visible from any point within the frustum of a cone the side of which makes an angle of at least 30 degrees with the perpendicular to the dial and the small diameter of which is the aperture of the instrument case.

3.8 Power Malfunction Indication: For Types II and III instruments, means must be incorporated in the instrument to indicate the loss of adequate power to the rate-of-turn gyro and primary signal voltages to the pointer in remote instruments. The indicating means must indicate a failure or malfunction in a positive manner.

3.9 Reflectance, Cover Glass: The total reflectance of the instrument cover glass including the integral lighting wedge, if applicable, shall not exceed 10% of the incident light. This reflectance applies over the visible light spectrum from 450 milli-microns to 600 milli-microns, and over an incident solid angle of 60º perpendicular to the viewing plane.

## 4. PERFORMANCE STANDARDS UNDER STANDARD CONDITIONS

The test conditions applicable to a determination of the performance of turn and slip instruments are set forth in Appendix A of this standard. All instruments shall be tested in accordance with the manufacturers recommendations. The manufacturer shall conduct sufficient tests to prove compliance with these Minimum Performance Standards.

4.1 Turn Indicator Starting: Instrument performance must be achieved within three (3) minutes after normal rated power is applied for both air and electric operated instruments. By application of 50% of rated suction of air operated indicators and 80% of rated voltage for electrically operated indicators, the gyro must start, continue to rotate, and provide an adequate indication of turning motions. However, under the reduced power conditions, the turn indicator sensitivity and damping requirements do not apply. If the instrument incorporates a gyro speed monitoring device which provides a positive indication when the gyro speed is below that necessary to meet instrument performance, the starting time may exceed three minutes.

4.2 Turn Indicator Characteristics:

(a) Sensitivity When the instrument is operating under rated power and subjected to the turning rates specified about the vertical axis, the turn instrument deflection, in inches or millimetres, must be within the limits of either Column A or B. The indicator movement must be smooth.

| Rate of Turn (Degrees per Minute) | Deflection of Indicator | | | |
|---|---|---|---|---|
| | Column A | | Column B | |
| | Inches | mm | Inches | mm |
| 0 | 0 ± 0.015 | 0 ± 0.4 | 0 ± 0.015 | 0 ± 0.4 |
| 36 | 1/32 ± 1/64 | 0.8 ± 0.4 | 1/16 ± 1/64 | 1.6 ± 0.4 |
| 90 | 5/64 ± 1/32 | 2.0 ± 0.8 | 5/32 ± 1/32 | 4.0 ± 0.8 |
| 180 | 5/32 ± 1/32 | 4.0 ± 0.8 | 5/16 ± 1/16 | 7.9 ± 1.6 |
| 360 | 5/16 ± 1/16 | 7.9 ± 1.6 | 9/16 ± 1/8 | 14.3 ± 3.2 |

Column A values pertain to instruments set to indicate a standard rate of turn (180º per minute) with one indicator unit deflection. Column B provides double this displacement for indicators providing increased sensitivity.

For instruments possessing display features such that the dimensional characteristics prescribed by Columns A and B do not apply, the applicant may demonstrate that the indicator can reliably indicate the prescribed rates of turn with clarity and accuracy equivalent to that specified in Column A or B.

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