



SURFACE VEHICLE STANDARD

J1810™

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Electrical Indicating System Specification

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE

This SAE Standard describes those factors which affect the accuracy and reliability of voltage indicating units and electrical indicating and sending units for fuel level, pressure, and temperature suitable for off-road, self-propelled work machines as described in SAE J1116 and agricultural tractors as defined in ASAE S390. Indicating units are divided into two groups, fully sealed and partially sealed. Serviceable lighting is not covered by this document unless otherwise specified. No ISO document has been found to be compatible.

1.1 Purpose

This SAE document is to provide a set of specifications as a guideline in order to specify the performance requirements in the design goals of an electrical indicating system.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1116	Categories of Off-Road Self-Propelled Work Machines
SAE J1362	Graphical Symbols for Operator Controls and Displays on Off-Road Self-Propelled Work Machines
SAE J1455	Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications

SAE J2020 Accelerated Exposure of Automotive Exterior Materials Using a Fluorescent UV and Condensation Apparatus

Copeland, L.H. and Nock, S.E., "The Analysis and Testing of Gauge Fogging," SAE Technical Paper 941803, 1994

2.1.2 ASTM Publication

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 117-73 Salt Spray (Fog) Testing

2.1.3 ASABE Publication

Available from ASABE, 2950 Niles Road, St. Joseph, MI 49085-9659.

ANSI/ASAE S390 Definitions and Classifications of Agricultural Equipment

3. DEFINITIONS

3.1 System

A typical electrical indicating system consists of an indicating unit (sometimes called a receiver or gauge) and a sending unit (or sender). The indicating unit responds to a resistance presented by a sending unit which varies in proportion to parameters such as temperatures, levels, and pressures. A voltage indicating unit responds directly to the system voltage without input from a specific sending unit.

3.2 Indicating Unit

The indicating unit typically consists of a graduated dial, a pointer attached to a spindle with a magnetized armature, two or more electrical coils wound on perpendicular axes surrounding the armature, a lens, and an enclosing housing. The resistive load of the sending unit varies the relative strength of the magnetic fields of the coils. The armature rotates to align with the resultant magnetic field of the coils and the pointer position indicates the measured value on the dial graduations. In some cases a stationary magnet is provided to move the pointer below the beginning of the graduated scale when the unit is not energized. In a voltage indicating unit the input voltage varies the relative strength of the magnetic field of a coil used in conjunction with reference/fixed magnet(s). A voltage indicating unit is also referred to as a voltmeter.

3.3 Sending Unit

The sending unit usually consists of a variable resistance and a suitable mechanical linkage or, in the case of temperature sending units, a thermistor in a housing.

It is important that the sender is compatible with the indicating unit since there is more than one relation of sending unit resistance to measured parameter.

4. CALIBRATION

4.1 Indicating Unit

Accuracy is normally expressed in angular tolerance of pointer position but the indicating unit manufacturer should also provide the equivalent error expressed in units of the measured parameter.

Unless otherwise specified, the indicating unit shall be accurate to within ± 1.5 angular degrees at the primary calibration point and ± 3.0 angular degrees at the secondary calibration point. Light vibration or three light taps shall be used before taking readings. The indicating unit is to be checked under the following conditions:

- a. Voltage: 28.00 VDC $\pm$ 0.01 VDC for 24 VDC nominal systems 14.00 VDC $\pm$ 0.01 VDC for 12 VDC nominal systems
- b. Position: Dial face oriented 30 angular degrees back from the vertical
- c. Ambient temperature: 25 °C $\pm$ 3 °C

The primary and secondary calibration points shall be checked with the direction of pointer motion as follows in Table 1:

TABLE 1 - INDICATING UNIT PRIMARY AND SECONDARY CALIBRATION POINTS

Type of Sending Unit	Calibration Point (Units of measured parameter) Primary	Calibration Point (Units of measured parameter) Secondary
Liquid level	Descending level	Ascending level (i.e., "full")
Pressure	Descending pressure	Descending pressure
Temperature	Ascending temperature	Ascending temperature
Voltage	Descending voltage	Ascending voltage

4.2 Sending Unit

It will be necessary to evaluate the specified range of operating resistance in order to specify calibration points with associated tolerance. The calibration points shall be defined by the manufacturer in terms of sending unit resistance tolerance and measured parameter tolerance at the primary and secondary calibration points. See Table 2 for values.