International Standard 7342

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Road vehicles — Diagnostic systems — Equipment for ignition systems testing

Véhicules routiers — Système de diagnostic — Équipement pour contrôle des systèmes d'allumage

First edition — 1982-10-15

UDC 621.43.03 : 620.1.05 **Ref. No. ISO 7342-1982 (E)**

Descriptors : road vehicles, internal combustion engines, ignition systems, tests, test equipment, sensors.

Price based on 6 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 7342 was developed by Technical Committee ISO/TC 22, *Road vehicles*, and was circulated to the member bodies in January 1981.

It has been approved by the member bodies of the following countries:

Australia	Italy	Romania
Austria	Japan	South Africa, Rep. of
Belgium	Korea, Dem. P. Rep. of	Spain
China	Korea, Rep. of	Sweden
Egypt, Arab Rep. of	Mexico	United Kingdom
France	Netherlands	USSR
Germany, F.R.	New Zealand	
Iran	Poland	

The member body of the following country expressed disapproval of the document on technical grounds:

USA

Printed in Switzerland

Road vehicles — Diagnostic systems — Equipment for ignition systems testing

1 Scope

This International Standard defines devices for measuring parameters of ignition systems of internal combustion engines in road vehicles, and their possible methods of use.

2 Field of application

This International Standard applies to plug-in and built-in sensors for exclusively diagnostic purposes.

3 References

ISO 2542, *Internal combustion engines — Spark plug ignition — Terminology*.

ISO 3553, *Road vehicles — High tension connection for ignition coils and distributors*.

ISO 4092, *Road vehicles — Motor vehicles — Diagnostic systems — Terms and definitions*.

ISO 6518/1, *Ignition systems — Part 1 — Vocabulary*.

4 Engine functions to be tested

Where these are specified by the vehicle manufacturer, the tests shall be carried out in the manner prescribed in accordance with the following general principles.

It is recommended that the vehicle manufacturer's specifications shall include a check of battery condition since this component plays a vital part in the performance of the ignition system.

4.1 Ignition timing

4.1.1 Dwell ratio

This parameter shall be measured by connecting an appropriate measuring device to the primary terminal of the coil connected to the switching element, or to a point carrying the same signal.

4.1.2 Initial timing and advance

These parameters shall be checked by measuring the crankshaft position at the ignition point relative to TDC (top dead centre).

The crankshaft position may be established by a crankshaft position sensor or a stroboscope, the ignition point by the corresponding signal from primary or secondary of the ignition system.

4.2 Voltage across the switching element

This parameter shall be measured between the insulated terminal of the switching element or the coil primary terminal connected to it, and a point on the common return side as close as possible to the switching element.

4.3 Voltage between the supply terminal of the ignition coil and the common return

This parameter shall be measured between the supply point of the ignition equipment (including the additional resistance if any connected to the coil primary terminal) and the common return side of the switching element as described in 4.2.

4.4 Secondary voltage

To measure this parameter, an appropriate sensor is required, the characteristics of which and method of measurement being defined in 5.3.

5 Diagnostic sensors and electrical connectors for connecting the diagnostic tester

5.1 Built-in[1] reference cylinder sensors

In the case where the vehicle manufacturer provides a built-in reference cylinder sensor and a built-in connecting device, three contacts shall be reserved for such sensor at the connecting device, two contacts bearing the signal and one being provided for the screen.

In order to minimize disturbing effects on the output signal, the sensor shall be of a type responsive to ignition current rather than voltage.

The design of the sensor and its location shall be such as to achieve a minimum useful signal according to 5.1.1 when the sensor is used under normal operating conditions of the ignition system. Under those conditions, the noise level shall comply with the requirements of 5.1.2.

The useful signal and the noise level shall be measured with a load of 220 Ω with 1 nF capacity in parallel.

5.1.1 Useful signal (see figure 1)

5.1.2 Noise level

The noise level shall not exceed either 3 V or a time voltage product of 0,5 × 10^{-6} V·s.

5.1.3 Other requirements

The sensor shall be clearly marked, for example with an arrow which shall point towards the spark plug when the sensor is fitted to the high tension cable.

The output conductor bearing the positive first half-wave signal shall be marked red. The second conductor shall be marked with another colour.

The output characteristics specified shall be met over a sensor temperature range of − 20 to + 100 °C. After a recovery time of at least 6 h at an ambient temperature of 23 ± 5 °C, the sensor shall furthermore comply with the requirements after exposure for 1 h at each of the following temperatures: − 40 °C and + 140 °C.

5.2 Crankshaft position sensor

In the case where the vehicle manufacturer provides a built-in crankshaft position sensor and a built-in connecting device, three contacts shall be reserved for such sensor at the connecting device, two contacts bearing the signal and one being provided for the screen.

The excitation of the sensor shall occur at 20° after the TDC of the reference cylinder(s) specified whilst another excitation may occur at 12° before TDC.[2]

Such sensor, whether plug-in or built-in, should be of the inductive current-fed type without permanent magnet working in conjunction with a functionally compatible component in the engine.[3]

5.2.1 Electrical characteristics of the crankshaft position sensor (see figures 2 and 3)

The signal from the crankshaft position sensor shall correspond to the curve in figure 2 and specifications :

The first halfwave of the signal $u(t)$ may cause either an increase or a decrease of the voltage across the terminals of the sensor, according to whether a pin or a slot is used.

Intersection point C is defined as the zero cross-over point of the useful signal superposed to the excitation voltage U_e.

When fed with a supply current of 70 mA, the output signal voltages U_{1-2} shall be between 30 mV and 40 V over the engine speed range specified by the vehicle manufacturer in his diagnostic procedure.

A plug-in sensor shall be tested in a test rig[4] having an iron pin, in accordance with following composition: [C (carbon) ⩽ 0,03 %, Si (silicon) = traces, Mn (manganese) ⩽ 0,03 %, P (phosphorus) ⩽ 0,010 %, S (sulphur) ⩽ 0,035 %, Al (aluminium) = traces][5] , mounted in a mild steel disc according to the following conditions, and the output signal shall meet the specifications 5.2.1.1 and 5.2.1.2. The pin shall be a flat-topped solid cylinder of diameter 5 ± 0,1 mm projecting 3 ± 0,1 mm radially from the circumferential surface of the disc and mounted symmetrically across it. The method of retention of the pin shall have negligible effect on the reluctance of the system.

The disc shall have a nominal diameter of 160 mm and a nominal thickness of 10 mm.

---

1) Electrical characteristics for clip-on and plug-in reference cylinder sensors are not specified as diagnostic equipment manufacturers have the responsibility for ensuring compatibility of such sensors with the measuring equipment.

2) An angle of 9,5° after TDC currently being used by many vehicle manufacturers is permitted, but these manufacturers are encouraged to adopt the 20° after TDC angle.

3) For sensors of other types, particularly plug-in, the diagnostic equipment manufacturers shall be responsible for the corresponding interface characteristics in cooperation with engine makers but such sensors should conform to the accuracy and dimensional requirements of 5.2.1, 5.2.2, 5.2.3 and 5.2.4, where applicable.

4) In view of the high rotational speed of the test rig, disc protection, such as a cover, should be provided.

5) Corresponds to the specifications of 1.1003 DIN 43720 (1963).

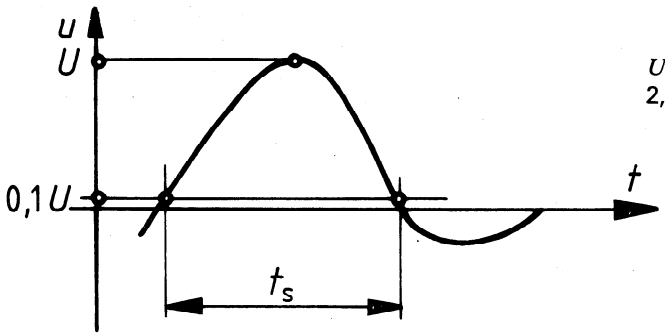

Figure 1 — Useful signal of the reference cylinder sensor

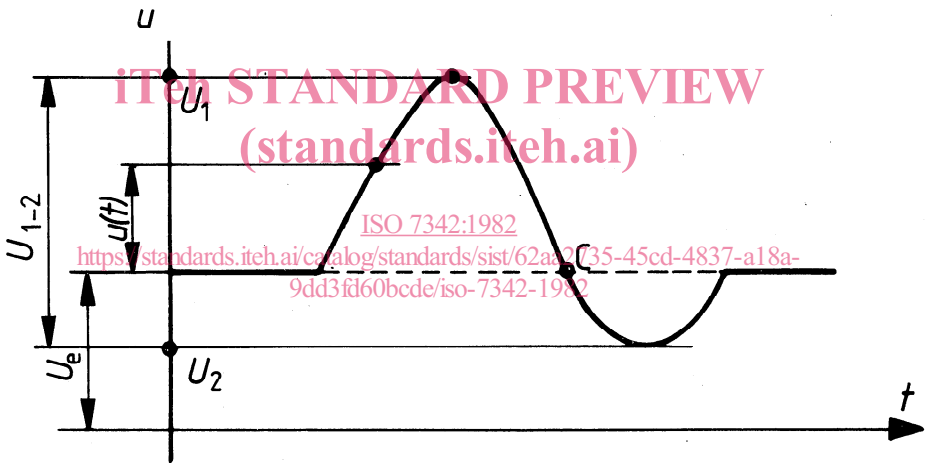

Figure 2 — Useful signal of the crankshaft position sensor

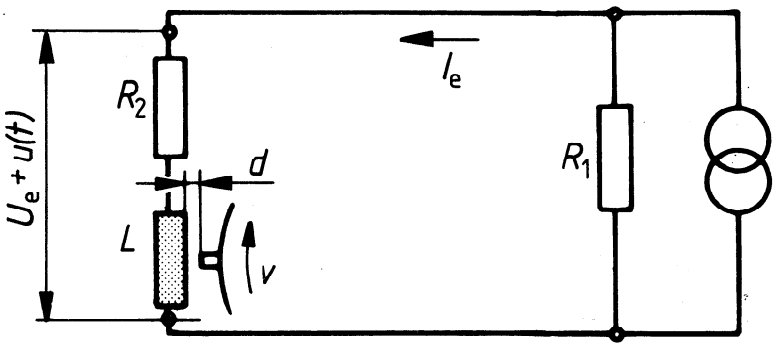

Figure 3 — Schematic equivalent wiring diagram for a crankshaft position sensor

The signal-to-noise ratio, whether one or more signals are obtained, shall not be less than 8 dB; the off-vehicle equipment shall not introduce significant deterioration of this value.

5.2.1.1 $U_{1\text{-}2} \geqslant 30$ mV for a relative velocity of $v = 0{,}9$ m/s, a pin gap of $d = 2$ mm and a supply current of $I_e = 70$ mA.

5.2.1.2 $U_{1\text{-}2} \leqslant 40$ V for a relative velocity of $v = 60$ m/s, a pin gap of $d = 0{,}2$ mm and a supply current of $I_e = 70$ mA.

5.2.2 Over the engine speed range specified by the vehicle manufacturer in his diagnostic procedure, the cross-over (point C) of the signal curve of a built-in or a standard plug-in crankshaft position sensor shall occur between the geometrical crankshaft position as specified and 2 ° after this position.

5.2.3 The characteristics specified shall be met over a sensor temperature range of − 20 to + 100 °C. After an exposure time of 1 h to temperatures of − 40 °C and + 140 °C and a recovery time of 6 h in each case, the sensor shall continue to comply with the specified characterisitics.

5.2.4 Dimensions (plug in type only)

5.2.4.1 Sensor with shoulder

See figure 4.

5.2.4.2 Sensor without shoulder

The sensor shall be designed such that it will fit in a gauge shown in figure 5, which represents a suitable mounting hole with respect to the diameter.

Dimensions in millimetres

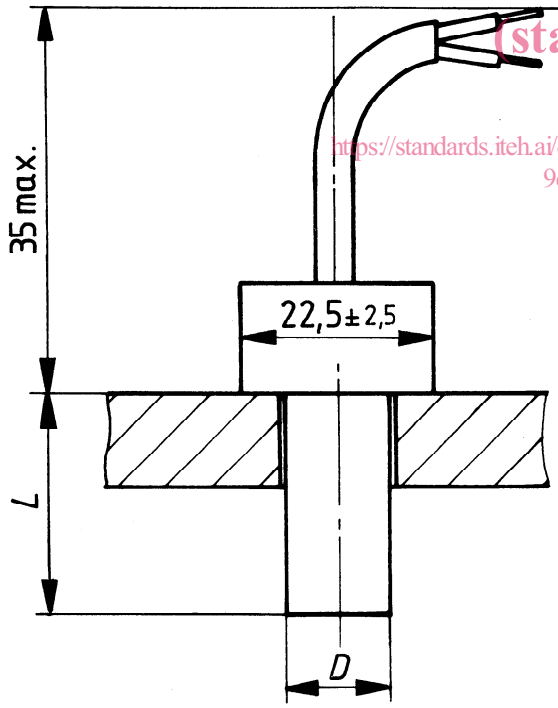

Figure 4 — Crankshaft position sensor with shoulder

Type	D h13	L $^{0}_{-0,2}$
A	14	25
B	9,6	45

Dimensions in millimetres

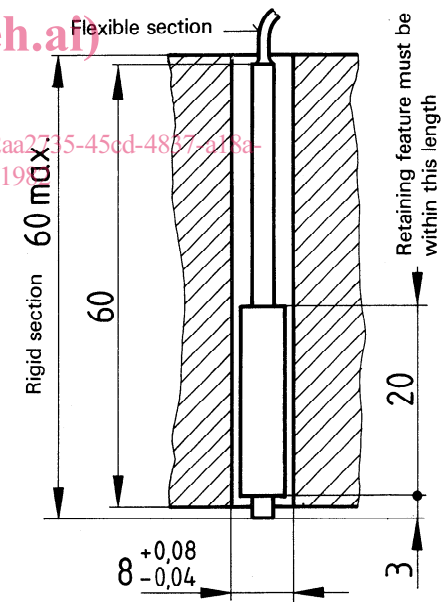

Figure 5 — Gauge

5.3 High voltage sensor[1)]

To measure high tension voltage for diagnostic purposes, an appropriate sensor is required. In the case where the vehicle manufacturer provides a built-in sensor and a built-in connecting device, two contacts shall be reserved for such a sensor at the connecting device, one carrying the signal, and one acting as both signal return and screen if required.

5.3.1 Electrical characteristics of built-in sensors[2)]

The measuring voltage shall extend to at least 40 kV.

5.3.1.1 Accuracy of the sensor (see figures 6 and 7)

The basic dividing ratio error shall be kept within limits of ± 7 % up to 15 kV applied voltage and ± 10 % beyond, with the frequency range defined below.

The frequency range shall be 10 Hz to 130 kHz and the maximum attenuation at these frequencies shall be 5 % with an applied sinusoidal waveform. This response shall be met by the sensor over a temperature range of + 20 to + 80 °C when it is terminated by diagnostic tester.

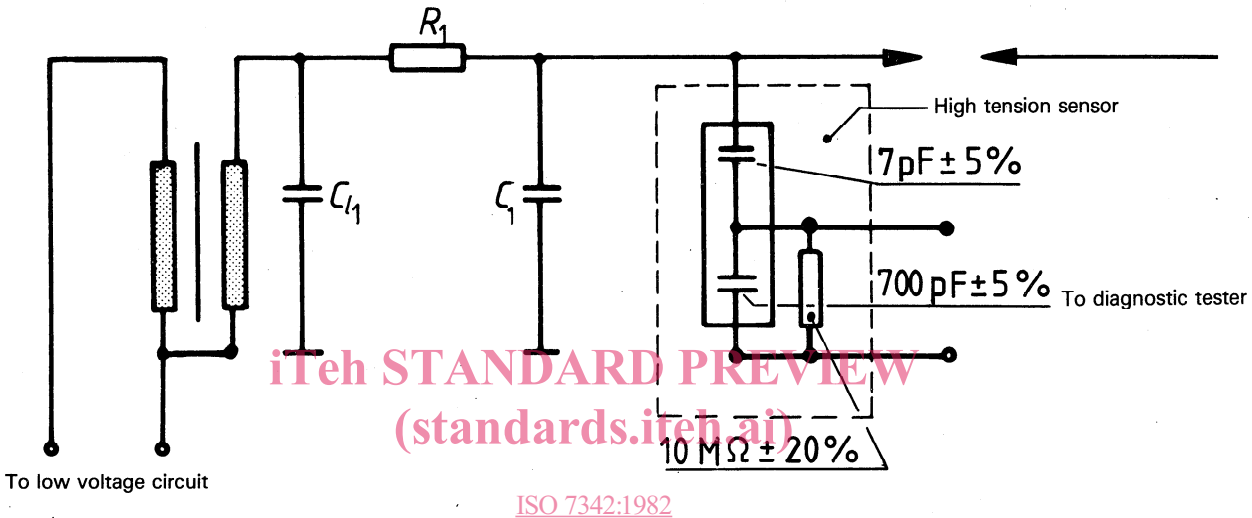

Figure 6 — Schematic equivalent wiring diagram for a high voltage sensor of built-in type

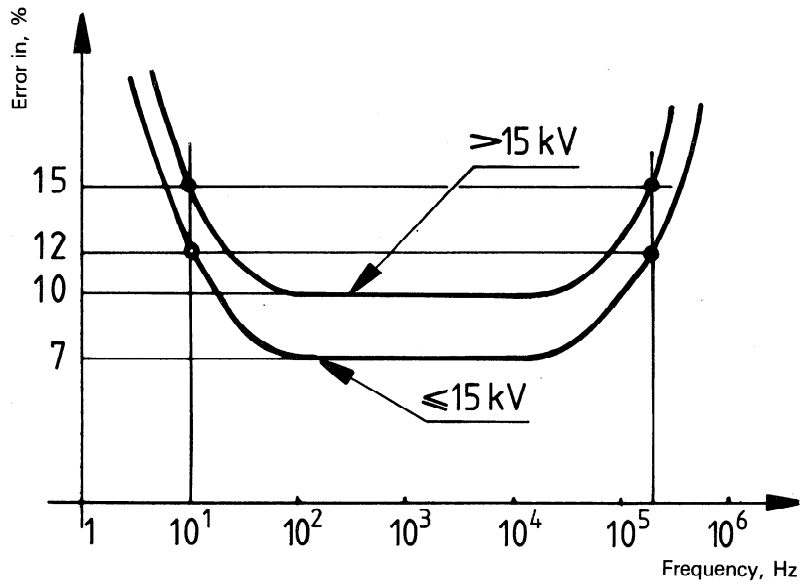

Figure 7 — Accuracy diagram

1) Capacitive discharge ignition systems are excluded from the scope of this International Standard, but transistorized inductive systems are included.

2) Electrical characteristics for clip-on high voltage sensors, including those inserted in coil or distributor towers, are not specified, as diagnostic equipment manufacturers have the responsibility for ensuring compatibility of such sensors with the measuring equipment.

5.3.2 Dimensions — Clip-on type

When this is intended for insertion in coil or distributor tower it is the responsibility of the equipment manufacturer to ensure compliance with ISO 3553.

5.3.3 Measuring procedure (Example)[1)]

5.3.3.1 Coil connected to distributor by a cable (king lead).

5.3.3.1.1 A sensor shall be attached to the king lead for the purpose of carrying the signal for measurement to a suitable signal displaying or analyzing device whilst the engine is running.

5.3.3.1.2 The sensor shall be attached to one or more spark plug lead(s), one after the other, as necessary. Measurements may then be taken as in 5.3.3.1.1.

5.3.3.1.3 The king lead shall be detached from the high tension outlet of the ignition coil to which an artificial load conforming to 6.3 is then attached, the sensor now being fitted to the high voltage connecting cable of the artificial load. Measurements may then be taken as in 5.3.3.1.1, but by cranking the engine by the starter motor.

NOTE — The sequence in which the tests are carried out may be varied according to practical convenience.

5.3.3.2 Coil integral with distributor

The procedure shall be as in 5.3.3.1.2.

6 Measuring instrument specifications

6.1 Low tension measurement

Voltmeters shall have a minimum resistance of 1 kΩ per volt of full range, and maximum capacitance of 20 nF.

6.2 Dwell angle measurement

The equipment shall have a minimum resistance of 10 kΩ and a minimum impedance of 1 kΩ at 10 kHz.

6.3 High tension measurement

The artificial load shall have a resistance of 1 MΩ ± 10 % in parallel with a capacitance of 50 pF ± 20 % including the connecting cable which shall be fitted to the outlet of the ignition coil when taking measurements, both in parallel with a safety spark gap open to ambient air and set to break down between 25 and 33 kV at sea-level.

1) This procedure is given as an example since many other procedures may be specified by vehicle manufacturers.