

# SVENSK STANDARD

## SS-ISO 23274-2:2012



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### **Hybrid-eldrivna vägfordon – Mätning av avgasutsläpp och bränsleförbrukning – Del 2: Fordon med extern laddning (ISO 23274-2:2012, IDT)**

### **Hybrid-electric road vehicles – Exhaust emissions and fuel consumption measurements – Part 2: Externally chargeable vehicles (ISO 23274-2:2012, IDT)**

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Den internationella standarden ISO 23274-2:2012 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 23274-2:2012.

Denna standard ersätter SS-ISO 23274:2007, utgåva 1.

The International Standard ISO 23274-2:2012 has the status of a Swedish Standard. This document contains the official version of ISO 23274-2:2012.

This standard supersedes the Swedish Standard SS-ISO 23274:2007, edition 1.

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Denna standard är framtagen av kommittén för EI- och hybridfordon, SIS/TK 517.

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23274-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 21, *Electrically propelled road vehicles*.

This first edition of ISO 23274-2, together with ISO 23274-1, cancels and replaces ISO 23274:2007, which has been technically revised.

ISO 23274 consists of the following parts, under the general title *Hybrid-electric road vehicles — Exhaust emissions and fuel consumption measurements*:

- *Part 1: Non-externally chargeable vehicles*
- *Part 2: Externally chargeable vehicles*

# Hybrid-electric road vehicles — Exhaust emissions and fuel consumption measurements —

## Part 2: Externally chargeable vehicles

### 1 Scope

This part of ISO 23274 specifies a chassis dynamometer test procedure to determine the end of CD (charge-depleting) state and consumed electric energy during CD state.

The identification of the end of CD state is an important step for procedures to determine exhaust emissions and fuel consumption. Final determination of exhaust emissions and fuel consumption is not included in this part of ISO 23274.

This part of ISO 23274 applies to vehicles with the following characteristics.

- The vehicles are hybrid-electric road vehicles (HEV) with an internal combustion engine (ICE) and the on-board rechargeable energy storage system (RESS) for vehicle propulsion which is supplied by electric energy from the stationary external power source.
- A CD state, in which the electric energy in RESS from the stationary external power source is consumed, is followed by a CS (charge-sustaining) state in which the fuel energy is consumed sustaining the electric energy of the RESS.
- Only batteries are assumed as the RESS of a vehicle.
- The RESS is not charged while driving unless by regenerative braking and/or by generating by ICE.

NOTE 1 Trolleybuses and solar powered vehicles are not included in the scope.

- The vehicle is classified as a passenger car or light duty truck, as defined in each regional annex.
- Only liquid fuels (for example, gasoline and diesel fuel) are used.

NOTE 2 In the case of vehicles with ICE using other fuel [for example, compressed natural gas (CNG), hydrogen (H<sub>2</sub>)], this part of ISO 23274 can apply except the measurement of consumed fuel; otherwise the measurement method for those using the corresponding fuel can apply.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TR 8713, *Electrically propelled road vehicles — Vocabulary*

ISO 23274-1, *Hybrid-electric road vehicles — Exhaust emissions and fuel consumption measurements — Part 1: Non-externally chargeable vehicles*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 8713 and the following apply.

**3.1**  
**applicable driving test**  
**ADT**

single driving test schedule which is specified for each region

EXAMPLE Chassis dynamometer test cycle for light-duty vehicles in Japan (JC08), New European Driving Cycle (NEDC), Urban Dynamometer Driving Schedule (UDDS)

**3.2**  
**charge balance of RESS**

change of charge in battery during fuel consumption measurement

NOTE Normally expressed in ampere hours (Ah).

**3.3**  
**charge-depleting state**  
**CD state**

operating mode of a HEV with ICE in which the vehicle runs by consuming mainly the electric energy from the stationary external power source or along with the fuel energy simultaneously or sequentially until CS state

**3.4**  
**charge-sustaining state**  
**CS state**

operating mode where the HEV runs by consuming the fuel energy while sustaining the electric energy of the RESS

**3.5**  
**energy balance of RESS**

$\Delta E_{\text{RESS}}$   
change of battery energy state during an applicable driving test

NOTE 1 Normally expressed in watt hours (Wh).

NOTE 2 For practical use, the energy balance of RESS is approximated by multiplying the charge balance of battery in ampere hours (Ah) by the nominal voltage in volts (V). Nominal voltage is defined in 9.4.2 of ISO 12405-1:2011.

**3.6**  
**externally chargeable HEV**

HEV with a rechargeable energy storage system (RESS) that is intended to be charged from an external electric energy source

NOTE 1 External charge for the purpose of conditioning of the RESS is not included.

NOTE 2 Externally chargeable HEVs are widely known as plug-in HEVs (PHEVs).

**3.7**  
**hybrid-electric vehicle**  
**HEV**

vehicle with both a rechargeable energy storage system (RESS) and a fuelled power source for propulsion

EXAMPLE Internal combustion engine or fuel cell systems are typical types of fuelled power sources.

**3.8**  
**non-externally chargeable HEV**

HEV with a rechargeable energy storage system (RESS) that is not intended to be charged from an external electric energy source



### 3.9

#### **rated capacity**

supplier's specification of the total number of ampere hours that can be withdrawn from a fully charged battery pack or system for a specified set of test conditions such as discharge rate, temperature, discharge cut-off voltage, etc.

### 3.10

#### **rechargeable energy storage system**

##### **RESS**

system that stores energy for delivery of electric power and which is rechargeable

EXAMPLE batteries or capacitors

### 3.11

#### **regenerative braking**

braking with conversion of kinetic energy into electric energy for charging the RESS

### 3.12

#### **state of charge**

##### **SOC**

available capacity in a battery pack or system

NOTE Expressed as a percentage of rated capacity.

## **4 Symbols and abbreviated terms**

A/C	air-conditioning
ABS	antilock braking system
ADT	applicable driving test
BMD	bag mini-diluter
CD	charge-depleting
CFR	Code of Federal Regulations
CLA	chemiluminescent assay
CNG	compressed natural gas
CO	carbon oxide
CS	charge-sustaining
CVS	constant volume sampler, constant volume sampling
<i>E</i>	energy
ECE	Economic Commission for Europe
$E_{CF}$	energy of consumed fuel
EPA	Environmental Protection Agency
$E_{RESS}$	energy of RESS
<i>F</i>	consumed fuel
<i>FC</i>	fuel consumption

## SS-ISO 23274-2:2012 (E)

FCT	full charge test
FEC	full environmental chamber
FID	flame ionization detector
FTP	Federal Test Procedure
H <sub>2</sub>	hydrogen
HC	hydrocarbon
HEV	hybrid-electric vehicle
HFEDS	Highway Fuel Economy Driving Schedule
HFID	heated flame ionization detector
ICE	internal combustion engine
ISO	International Organization for Standardization
JC08	chassis dynamometer test cycle for light-duty vehicles in Japan
NDIR	non dispersive infrared
NDUVR	non dispersive ultraviolet resonance absorption
NEDC	New European Driving Cycle
NO <sub>x</sub>	nitrogen oxide
RESS	rechargeable energy storage system
SAE	Society of Automotive Engineers, Inc.
SC03	Speed Correction Driving Schedule
SOC	state of charge
TCS	traction control system
THC	total hydrocarbons
UDDS	Urban Dynamometer Driving Schedule
UN	United Nations
US-06	Supplemental FTP
$\rho$	density

## 5 Test conditions and instrumentation

### 5.1 Test conditions

For test conditions, ISO 23274-1 applies.

## 5.2 Test instrumentation

Test instrumentation shall have accuracy levels shown in Table 1, unless specified differently in Annex A, B or C.

**Table 1 — Accuracy of measured values**

Item	Unit	Accuracy of measurement
Time	s	$\pm 0,1$ s
Distance	m	$\pm 0,1$ %
Temperature	$^{\circ}\text{C}$	$\pm 1$ $^{\circ}\text{C}$
Speed	km/h	$\pm 1$ %
Mass	kg	$\pm 0,5$ %
Current	A	$\pm 0,5$ %
Electric energy	Wh	$\pm 0,5$ %

## 5.3 Charging of the RESS

### 5.3.1 Application of a normal charge

#### 5.3.1.1 Normal charging procedure

The charging of the RESS shall be carried out at an ambient temperature of  $(25 \pm 5)$   $^{\circ}\text{C}$ . The normal charging procedure shall be in accordance with the vehicle manufacturer's specification for normal operation.

For the normal charging procedure all types of special charging shall be excluded, for example RESS service charging.

#### 5.3.1.2 End-of-charge criteria

The end-of-charge criteria shall correspond to a charging time of 12 h except if a clear indication is given to the driver by the standard instrumentation that the RESS is not yet fully charged. In this case, the maximum charging time shall be in accordance with the manufacturer's specification. After charging, the vehicle shall not be conductively connected to the stationary external power source unless otherwise specified by the manufacturer.

#### 5.3.1.3 Fully charged RESS

A RESS is fully charged when charged according to the normal charging procedure (see 5.3.1.1) and the end-of-charge criteria (see 5.3.1.2).

### 5.3.2 Charging the RESS and measuring energy

The vehicle shall be physically reconnected to the stationary external power source within 2 h following completion of the appropriate test sequence unless otherwise specified by the regional standards or regulations.

The RESS shall then be fully charged in accordance with the normal charging procedure (see 5.3.1.1).

The energy,  $E$ , in a.c. Wh, delivered from the stationary external power source, as well as the charging time duration, shall be measured. The energy-measuring equipment shall be placed between the stationary external a.c. power source and the vehicle power inlet.