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**Vzdrževanje - Ključni kazalniki učinkovitosti in uspešnosti vzdrževanja**

Maintenance - Maintenance Key Performance Indicators

Instandhaltung - Wesentliche Leistungskennzahlen für die Instandhaltung

Maintenance - Indicateurs de performance clés pour la maintenance

**Ta slovenski standard je istoveten z: prEN 15341**

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English Version

## Maintenance - Maintenance Key Performance Indicators

Maintenance - Indicateurs de performance clés pour la  
maintenance

Instandhaltung - Wesentliche Leistungskennzahlen für  
die Instandhaltung

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If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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<b>Contents</b>	<b>Page</b>
European foreword.....	3
Introduction .....	4
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions .....	5
4 Maintenance Function.....	6
5 KPIs and their objectives.....	6
5.1 General.....	6
5.2 Influencing Factors.....	7
5.3 Maintenance Resources.....	9
5.4 Maintenance processes.....	9
6 Maintenance KPIs Matrix .....	10
7 KPIs of “Maintenance within Physical Asset Management” .....	11
8 KPIs of Sub-function Health-Safety-Environment on Maintenance .....	15
9 KPIs of Sub-function “Maintenance Management” .....	18
10 KPIs of Sub-function “People Professionalism” .....	22
11 KPIs of Sub-function “Maintenance Engineering” .....	25
12 KPIs of Sub-function “Organization and Support” .....	27
13 KPIs of Sub-function “Administration and Supply” .....	33
14 KPIs of Sub-function Information Communication Technology.....	37
15 Process to improve maintenance performance.....	39
15.1 Identification and calculation of KPIs.....	39
15.2 Typologies of Maintenance Indicators .....	40
15.3 Steps for an Improvement Process.....	41
15.4 Comparing and Benchmarking .....	43
Bibliography.....	45

## European foreword

This document (prEN 15341:2017) has been prepared by Technical Committee CEN/TC 319 “Maintenance”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15341:2007.

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## Introduction

This draft European Standard provides Maintenance Key Performance Indicators to help management in achieving excellent performances, and in handling the Maintenance Function and Sub-function activities in order to utilize the physical assets in line with the objectives stated by the organization.

These indicators apply to all the physical assets either industrial, either infrastructures or civil buildings or transportation systems, etc.

These indicators should be used to:

- a) measure the status;
- b) compare (internal and external benchmarks);
- c) diagnose (analysis of strengths and weaknesses);
- d) identify objectives and define targets to be reached;
- e) plan improvement actions;
- f) continuously measure changes over time.

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## 1 Scope

This draft European standard lists some significant Key Performance Indicators (KPIs) of the Maintenance Function and gives guidelines to define a set of suitable indicators to appraise and to improve effectiveness, to appraise and to improve effectiveness, efficiency and sustainability in the maintenance of the existing physical assets, in the framework of the external and internal influencing factors.

## 2 Normative references

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

EN 13306:2010, *Maintenance — Maintenance terminology*

EN 15628:2014, *Maintenance — Qualification of maintenance personnel*

prEN 17007, *Maintenance process and associated indicators*

IEC 60050-192:2015, *International electrotechnical vocabulary — Part 192: Dependability*

## 3 Terms and definitions

For the purposes of this document the terms and definitions given in EN 13306:2010 and in IEC 60050-192:2015, together with the following apply.

### 3.1

#### item

part, component, device, subsystem, functional unit, equipment can be individually described and considered

[SOURCE: EN 13306:2010, 3.1]

### 3.2

#### physical asset

item having a potential or actual value for the organization

[SOURCE: EN 16646:2014, 3.1.12]

### 3.3

#### indicator

quantitative or qualitative measure of characteristic or a set of characteristics of a phenomenon or performance of activities, according to defined criteria or a given formula

Note 1 to entry: The indicator is a tool for development and implementation of a strategy for monitoring progress towards the goals outlined in the strategy.

### 3.4

#### key performance indicator

#### KPI

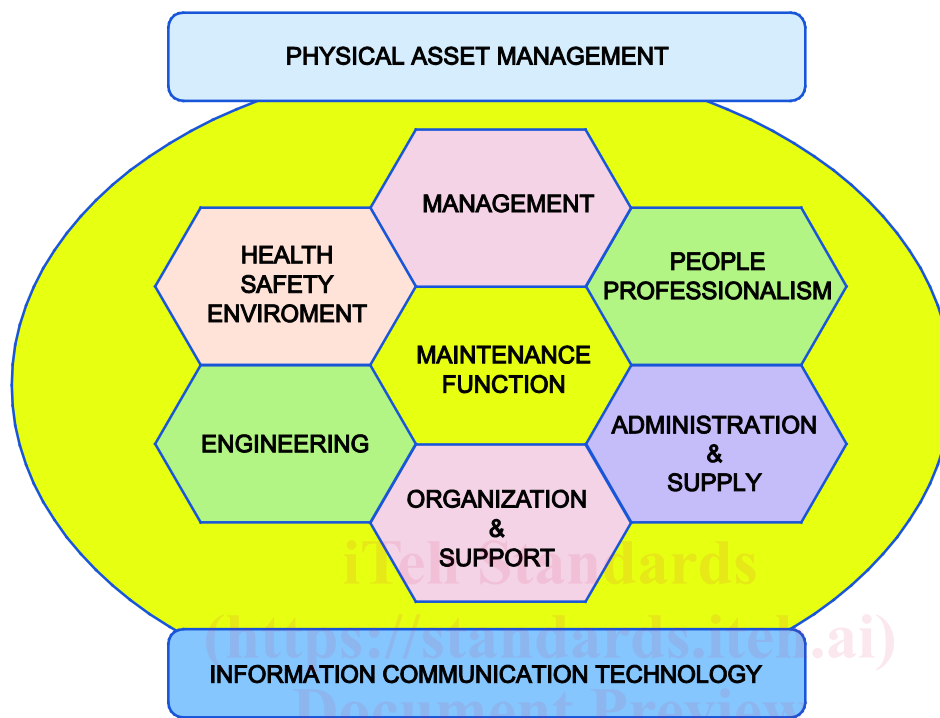
indicator considered significant

### 3.5 scorecard

set of associated, consistent and complementary indicators providing synthetic and global information

## 4 Maintenance Function

The maintenance function is an integration of 8 sub-functions with the methodology of physical asset management and the information communication technology (hardware and software), see Figure 1.



**Figure 1 — Maintenance function and core framework**

In this maintenance core framework it is necessary to develop all the contents of each sub-functions in an integrated maintenance system in order to achieve the objectives assigned to the Maintenance Function to take care, at the best, of H.S.E, integrity and competitiveness of the physical assets, balancing productivity, costs and service level of maintenance.

During the life of each physical asset and its components, it is advisable to perform appropriate analysis in order to know the conditions of it and be able to take suitable decisions and meet the required level of performance.

As consequence, in order to cover all the major aspects, related with the content of each sub-function, physical assets management and ICT, the key performance indicators are structured into eight groups, six for maintenance sub-functions, one for physical asset management and the last one for the ICT.

## 5 KPIs and their objectives

### 5.1 General

When the actual or expected performance is not satisfactory, management is encouraged to define objectives and strategies to improve the resources utilization of involved sub-functions using the KPIs, allowing the organization to:

- a) define the targets;



- b) measure the performance;
- c) compare the performance versus the historical value of benchmarks;
- d) identify strengths and weaknesses;
- e) control progress and changes;
- f) define plan of improvements;
- g) continuously measure changes over time.

Measurement and analysis of these indicators can help management to:

- h) set objectives;
- i) plan strategies and actions;
- j) share the results in order to inform.

These indicators can be used:

- k) on a periodic basis, for instance by preparing and following-up a budget, during performance assessment, comparing results in many ways: budgeted, expected, predicted, planned, actual, etc.;
- l) on a spot basis, for instance within the framework of specific audits, studies and/or benchmarking;
- m) as we are in the age of Industry 4.0, the implementation of big data and machine-to-machine methods and the continuous usage of KPIs, should be suitable.

The period of time to be considered for measurement depends on the organization policy and management approach and aims; it can be: day, week, month, quarter, semester, year, etc.

The KPIs are indicators of the measurable values of the performances developed by the activities of each sub-function.

The proposed indicators can be calculated as a ratio between factors (numerator and denominator) measuring the activities, resources or events, according to a given formula quantitative or qualitative.

The numerical values, qualitative and quantitative data, to calculate each KPI shall be collected and elaborated based on available methods and procedures of general industrial accounting and specific management accounting rules, applied to the maintenance function.

These indicators are used to measure any qualitative and quantitative aspect or characteristic of an indenture level to create an homogeneous base to compare and to set objectives to improve.

In some cases it is suitable to use specific questionnaire pre-prepared to give to the managers and experts the possibility to evaluate the qualitative status in simple and efficient way.

## 5.2 Influencing Factors

Figure 2 outlines the process to measure the Maintenance KPIs of single Sub-function in a framework of influencing factors, in order to achieve significance and homogeneity.

The influencing factors are variable conditions outside of maintenance management can be external or internal, general or specific, controllable or non-controllable.

Examples of external influencing factors are:

- location,

**prEN 15341:2017 (E)**

- society culture,
- national labour policies and costs,
- market and economy,
- laws and regulations,
- sector / Branches,
- stakeholders,
- technology.

Examples of internal Influencing factors, are:

- organization culture,
- organization scale,
- organization objectives,
- criticality of the physical asset;
- severity of the process,
- product mix,
- physical Assets Scale and Complexity,
- utilization rate,
- age of physical asset.

It is fundamental to have these factors as reference conditions to understand the framework where maintenance is operating. It is necessary to consider the influence of factors, in the best way, in order to achieve homogeneous and appropriate evaluations, without misunderstandings and misleading.

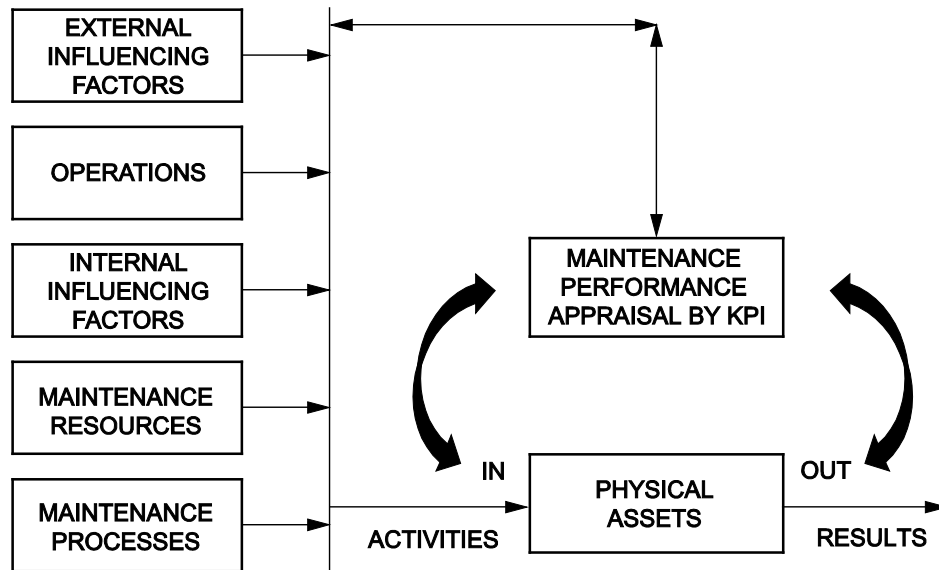


Figure 2 — Maintenance function and framework to measure KPIs

### 5.3 Maintenance Resources

The maintenance resources are:

- professional staff people;
- labour internal and external;
- spare parts and materials;
- maintenance tools and equipments;
- engineering knowledge;
- good maintenance practices to repair and to restore;
- information technology systems: hardware and software;
- supply and supporting services.

The capability of the management is to achieve the best maintenance performance, using and dosing the appropriate resources optimizing all the management, organizational and administrative aspects with an integrated information system, to achieve the best performances in line with the stated company objectives.

### 5.4 Maintenance processes

The Maintenance processes are the various peculiar methodologies used by each sub-function to implement the activities to achieve the best competitiveness and suitable results according the stated aim of the organization (see prEN 17007).

## 6 Maintenance KPIs Matrix

Table 1 represents the maintenance KPIs matrix for the methodology maintenance within a physical asset management, the 6 maintenance sub-functions and the information communication technology.

The KPIs reported in the matrix are shared in 4 driven areas, representing the main topics content of each topic in order to evaluate the existing status and follow the evolution.

Most indicators can be used at different asset levels depending on whether they are used to measure the performance of physical assets, production lines, given equipment, item, etc.

The indicators can be split by professional levels in relation with the organizational structure established by each organization. The term “time” is generally used to describe time units related to the physical assets -equipment and its performance. The term “man-hours” points the hours of labour spent in delivering maintenance activities. The term “cost” includes all the expenditures related to the resources used to achieve the results.

**Table 1— Maintenance KPIs matrix**

Topic subjects	KPIs	Main Driven Areas			
Maintenance within physical asset management	PHA <sub>i</sub>	Sustainability i = 1 to 3	Capacity Effectiveness Integrity i = 4 to 11	Service Level i = 12 to 13	Economics i = 14 to 20
Sub-function 1 Health - Safety Environment	HSE <sub>i</sub>	Laws- Rules conformity i = 1 to 3	Statistical Records i = 4 to 12	Safe Practice i = 13 to 17	Prevention and Improvements i = 18 to 20
Sub-function 2 Maintenance Management	M <sub>i</sub>	Strategy i = 1 to 3	Function i = 4 to 10	Technical Assessment i = 11 to 16	Continuous Improvement i = 17 to 20
Sub-function 3 People Professionalism	P <sub>i</sub>	Manager i = 1 to 3	Engineer/Works Supervisor i = 4 to 9	Technical Specialist i = 10 to 12	Education i = 13 to 20
Sub-function 4 Maintenance Engineering	E <sub>i</sub>	Capability Criticality i = 1 to 3	Durability i = 4 to 9	Preventive Maintenance i = 10 to 16	Engineering Improvements i = 17 to 20
Sub-function 5 Organization and Support	O&S <sub>i</sub>	Structure and Support i = 1 to 8	Planning and Control i = 9 to 22	Productivity Effectiveness i = 23 to 28	Quality i = 29 to 30
Sub-function 6 Administration and Supply	A&S <sub>i</sub>	Economics i = 1 to 6	Budget & Control i = 7 to 19	Outsourcing services i = 20 to 25	Materials spare parts i = 26 to 30
Information Communication Technology	ICT <sub>i</sub>	Management i = 1 to 6	Administration and Supply i = 7 to 10	Organization and Support i = 11 to 13	Engineering i = 14 to 20