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Guidelines for implementation of statistical process control (SPC) — Part 5: Quality data exchange format for SPC software

Lignes directrices pour la mise en oeuvre de la maîtrise statistique des processus (MSP) — Partie 5: Format d'échange de jeux de données relatives à la qualité pour les logiciels MSP

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Contents

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO ~~documents~~document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see ~~www.iso.org/directives~~www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 4, *Applications of statistical methods in product and process management*.

A list of all parts in the ISO 11462 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at ~~www.iso.org/members.html~~www.iso.org/members.html.

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Introduction

Online data recording is becoming more and more important. A major advantage is the accurate and reliable recording of data within a minimum of time. It creates the foundation for fast and concise evaluations based on data collected online, and enables validated decision taking.

These possibilities help create more transparency and improve the analysis of internal and external procedures and processes. Thus, online data transfer helps to improve process quality and efficiency as well as to increase customer satisfaction. However, along with the growing possibilities, also the number of possibilities and variations for a multitude of solutions and the degree of complexity increases.

For this reason, the measuring values generating device manufacturers have to invest plenty of time and effort for customer specific adaptations, as well as during the specification and control phase at the customers and with regard to investment cost for implementation. To minimize this effort, a generally valid data format was developed for an exchange of quality data in industrial production that is independent of manufacturer and user.

With the objective to find a satisfactory solution for all parties involved, a number of users of the software function “Data Interface” from the automotive production and supplier industry joined forces to create a standardized and coordinated specification. The objective was to include a group of users in this work group as big as possible, in order to get a representative cross-section through the scope and interpretation of the key fields and their application. The result is a standardized catalogue of the data fields important to every user.

Guidelines for implementation of statistical process control (SPC) — Part 5: Quality data exchange format for SPC software

1 Scope

This document describes a data format for the exchange of quality information:

— ~~The~~the data format is distinguished by a transparent structure that is easy to edit;

— ~~It~~it is flexible, space saving and easily be copied and compacted;

All files are language independent because of the allocation of an explicit key to a language independent field, the content of which can be translated into any language required.

2 Normative references

~~There are no normative references in this document.~~

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 22514-2, *Statistical methods in process management — Capability and performance — Part 2: Process capability and performance of time-dependent process models*

3 Terms and definitions, and symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22514-2~~:2021~~ apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at ~~https://www.iso.org/obp~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

3.2 Symbols and abbreviated terms

3.2.1 Symbols

Symbols used in this ~~standard~~document are identical to symbols used in ISO 22514-2 and ISO 7870-2.

C_p	process capability index
C_{pk}	minimum process capability index
C_{pkU}	upper process capability index

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C_{pkL}	lower process capability index
U_{CL}	upper control limit
L_{CL}	lower control limit
m	the number of subgroups
n	sample size of each subgroup
P_p	process performance index
P_{pk}	minimum process performance index
P_{pkU}	upper process performance index
P_{pkL}	lower process performance index
U_{SL}	upper specification limit
L_{SL}	lower specification limit

3.2.2 Abbreviations

ELS	error log sheet
SPC	statistical Process Control
File type *.DFQ	a file which contains all needed information (part/characteristic/values)
File type *.DFD	a file which contains only header information (part/characteristics information)
File type *.DFX	a file which contains only value and additional information

4 Data model

4.1 Basic data model structure

A basic data model has been defined, which distinguishes between three main groups of data. The highest level contains parts data, the second level characteristics data and the third level are data related to the measured values. The characteristics data contain a voluntarily subgroup for quality control chart application. Furthermore, separately from the three groups there are some key fields for structure information.

This basic data model structure is illustrated in Figure 1.

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(K1*xxx*)

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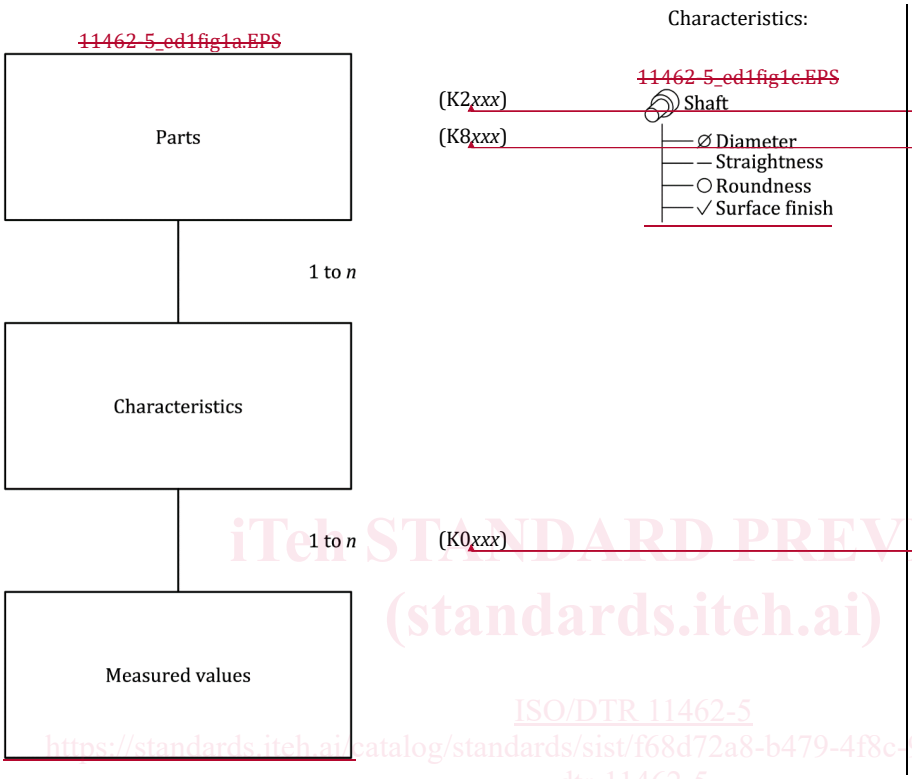

Figure 1 — Data model

Every data group (level) contains a large number of defined so called key fields, which describe the properties of the individual elements of the data model. The names of these key fields consist of an upper case "K", followed by a four digit number. These numbers are based on a general key structure as listed below:

K1000	...	K1999	parts data describing the part type, a component of a product
K2000	...	K2999	characteristics data containing characteristic-specific information
K0001	...	K0999	description of value formats /measured values
K8000	...	K8999	quality control chart information
K5000	...	K5999	structure information (not shown in figure 1)

The so called k field lists in ~~clause~~Clause 5 shows the keys supported by this data model.

4.2 Types of data

The data format consists of two different types of data

— descriptive data, and

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— value data

They are contained either in two separate files or in a common file. All three files have the same file name but different file extensions. The file extensions are as follows:

— descriptive file: *.DFD;

— value file: *.DFX;

— shared file: *.DFQ.

4.3 General notation regulations

Key number and field contents are separated by a space.

One field is written per line.

As line-end identification, apply the combination of <CR> and <LF> (hexadecimal $0D $0A), (decimal #13 #10).

If several elements (parts or characteristics) are entered in one file, the distinction is made by extending the applicable K-field number with "/" and a sequence number *i* = 1 to *n*, where *n* corresponds to the number in field K0100.

An example is

K0100 3

K1*xxx*/1 any part information

K2002/1 characteristic 1

K2002/2 characteristic 2

K2002/3 characteristic 3

Characteristics information that applies globally to all characteristics can be assigned to all characteristics simultaneously with the assignment "/0".

As an example the number of decimal places is set “2” for all values in this file:

K2022/0 2

Mandatory fields:

The following fields are absolutely necessary to be included in the data format to allow unique identification of the records.

— K0100 total number of characteristics in the file (characteristics of all parts concerned); for technical reasons this K field is in the first line of the file header.

— At least one field out of the parts group (1*xxx*) and one field out of characteristics group (2*xxx*) are necessary for the identification of the part. It is recommend to use two fields per group (K1001 – part number, K1002 – part name, K2001 – characteristic number and K2002 – characteristic name). As soon as a key for characteristic data appears, the part header is considered as completed and no more ~~K 1xxx~~K1*xxx* fields may follow. For examples see Annex A.

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— After blocks 1 and 2 are written, measured values and additional data can be written into the fields K0*xxx*.

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5 Description and listing of the key fields

5.1 General

The following tables contain the respective designations of key fields (K*xxxx*) for a part, the characteristics and the corresponding measured values. They also specify the field type and the maximum field length.

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The "Misc." column shows the following additional information:

~~1.~~a) Fields marked with an "o" have a field content which is meaningfully to be clarified with the statistical evaluation software supplier. Examples can be found in clause 8.

~~2.~~b) The catalogue for catalogue fields is specified under "Remarks" (marked with a "K").

Legend of the tables

Field type	Character set	*Explanation*
A	Alpha numeric	
D	Date / time format	
F	Floating point	
I3	Integer (1 Byte)	*Signed positive integer value range 1-127*
I5	Integer (2 Byte)	*Signed positive integer value range 1-32767*
I10	Integer (4 Byte)	*Signed positive integer value range 1-2147483647*
S	Special coding	

Miscellaneous	Meaning
o	Defined field content
K	Catalogue reference / transferred from catalogue

5.2 List of key fields for parts data

Table 1 lists the defined key fields for the description of the part.

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It can be seen from the K-field numbers listed here that numerous theoretically available numbers have not been filled, so that if additional K-fields are required, they can be placed in the appropriate subject group.

Table 1 — List of key fields for parts data

Key	Field type	Max. number of characters	Field name
K1001	A	30	Part number
K1002	A	80	Part description
K1003	A	20	Part abbreviation
K1004	A	20	Part amendment status
K1005	A	40	Product
K1007	A	20	Part number abbreviated
K1008	A	20	Part type
K1009	A	20	Part code
K1011	A	20	Variant
K1022	A	80	Manufacturer name
K1041	A	30	Drawing number
K1042	A	20	Drawing amendment
K1053	A	40	Contract
K1072	A	40	Supplier description
K1081	A	24	Machine number
K1082	A	40	Machine description
K1083	I5	5	Machine number
K1085	A	40	Machine location
K1086	A	40	Work cycle / operation
K1087	A	40	Work cycle description
K1100	A	40	Plant sector
K1101	A	40	Department
K1102	A	40	Workshop
K1103	A	40	Cost centre
K1110	A	20	Order number
K1201	A	24	Test facility number
K1202	A	40	Test facility description
K1203	A	80	Reason for test
K1206	A	40	Test location
K1209	A	20	Inspection type
K1230	A	40	Gage room
K1231	A	20	Measuring program number

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Key	Field type	Max. number of characters	Field name
K1232	A	20	Measuring program version
K1303	A	40	Plant
K1343	A	20	Test plan development date
K1344	A	40	Test plan developer
K1802	A	255	User field content 1
K1900	A	255	Remark

5.3 List of key fields for characteristics data

Table 2 lists the defined key fields for the description of the characteristics.

Table 2 — List of key fields for characteristics data

Key	Field type	~~Max.~~ Maximum number of characteristics	Field name	Misc.	Remarks
K2001	A	20	Characteristic number		
K2002	A	80	Characteristic description		
K2003	A	20	Characteristic abbreviation		
K2004	I5	5	Characteristic type	o	System hastoge

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Key	Field type	~~Max.~~Maximum number of characteristics	Field name	Misc.	Remarks
					nerateitautomaticaly
K2005	I5	5	Characteristics class	o	
K2006	I5	5	Control item	o	
K2007	I5	5	Control type	o	
K2008	I5	5	Group type	o	Systemhastogenerat

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Key	Field type	~~Max.~~ Maximum number of characteristics	Field name	Misc.	Remarks
					e i t a u t o m a t i c a l l y
K 2 0 0 9	I5	5	Measured quantity	o	
K 2 0 1 5	I3	3	Tool wear type (trend)	o	
K 2 0 1 6	I3	3	100 % measurement	o	
K 2 0 1 9	I3	3	Ordinal classes catalogue		R e q u i r e d w i t h t h e u s e o f o r d i

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