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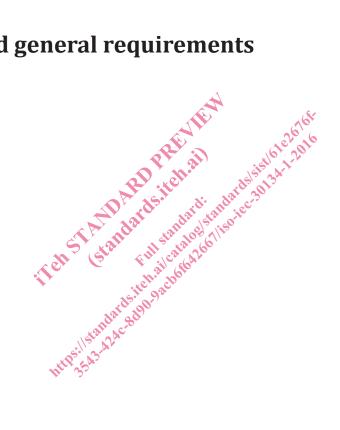ISO/IEC JTC **1**/SC **39**

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Information Technology — Data Centres — Key performance indicators —

Part 1:
Overview and general requirements

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Contents

109 # Information Technology- Data Centres – Key Performance
110 # Indicators- Part 1: Overview and General Requirements

111 # Introduction

112 The global economy is now reliant on information and communication technologies and the associated
113 generation, transmission, dissemination, computation and storage of digital data. All markets have
114 experienced exponential growth in that data, for social, educational and business sectors and, whilst the
115 internet backbone carries the traffic there are a wide variety of data centres at nodes and hubs within
116 both private enterprise and shared/collocation facilities.

117 The historical data generation growth rate exceeds the capacity growth rate of the information and
118 communications technology hardware and, with less than half (in 2014) of the world's population having
119 access to an internet connection, that growth in data can only accelerate. In addition, with many
120 governments having 'digital agendas' to provide both citizens and businesses with ever-faster broadband
121 access, the very increase in network speed and capacity will, by itself, generate ever more usage
122 (Jevons Paradox). Data generation and the consequential increase in data manipulation and storage are
123 directly linked to increasing power consumption.
124

125 With this background it is clear that data centre growth, and power consumption in particular, is an
126 inevitable consequence and that growth will demand increasing power consumption despite the most
127 stringent energy efficiency strategies. This makes the need for Key Performance Indicators (KPIs) that
128 cover the effective use of resources (including but not limited to energy) and the reduction of carbon
129 emissions essential.

130 Within the ISO/IEC 30134 series, the term "*resource usage effectiveness*" is more generally used for
131 KPIs in preference to "*resource usage efficiency*", which is restricted to situations where the input and
132 output parameters used to define the KPI have the same units.

133 In order to enable the optimum resource effectiveness of data centres a suite of effective KPI's is needed
134 to measure and report on resources consumed in order to develop an improvement roadmap.

135 These standards are intended to accelerate the provision of operational infrastructures with improved
136 resource usage effectiveness.

137 The common objective of the KPIs is the effective or efficient use of resources, for example

138 a)   the minimization of energy and other resource (e.g. water) consumption,
139 b)   task effectiveness of the IT load (data processing, storage and transport) within the data centre,
140   maximizing the IT output with the minimum energy consumption,
141 c)   energy reuse in the form of waste heat, if possible,
142 d)   the use of renewable energy, both imported and generated on site.

143 At the time of publication of this International Standard the ISO/IEC 30134 series comprises the
144 following

145 •   ISO/IEC 30134-1, *Information Technology - Data Centres - Key Performance Indicators - Part 1:*
146   *Overview and General Requirements*,
147 •   ISO/IEC 30134-2, *Information Technology - Data Centres - Key Performance Indicators - Part 2:*
148   *Power Usage Effectiveness (PUE)*[1],
149 •   ISO/IEC 30134-3, *Information Technology - Data Centres - Key Performance Indicators - Part 3:*
150   *Renewable Energy Factor (REF)*,
151 •   ISO/IEC 30134-4, *Information Technology - Data Centres - Key Performance Indicators - Part 4: IT*
152   *Equipment Energy Efficiency for Servers (ITEE$_{SV}$)*,
153 •   ISO/IEC 30134-5, *Information Technology - Data Centres - Key Performance Indicators - Part 5: IT*
154   *Equipment Utilization for Servers (ITEU$_{SV}$)*.

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[1] It is recognised that the term "efficiency" should be employed but "effectiveness" provides continuity with earlier market recognition of the term.

155 Additional standards in the series ISO/IEC 30134 will be developed, each describing a specific KPI for
156 resource usage effectiveness or efficiency.

157 These International Standards do not specify limits or targets for any KPI and do not describe or imply,
158 unless specifically stated, any form of aggregation of individual KPIs into a combined nor an overall KPI
159 for data centre resource usage effectiveness or efficiency.
160

161
1 Scope
163
164 This International Standard specifies the following for the other standards in the ISO/IEC 30134 series
165 a) a common structure,
166 b) definitions, terminology and boundary conditions for KPIs of data centre resource usage
167   effectiveness and efficiency,
168 c) common requirements for KPIs of data centre resource usage effectiveness and efficiency,
169 d) common objectives for KPIs of the data centre resource effectiveness and efficiency,
170 e) general information regarding the use of KPIs of data centre resource usage effectiveness and
171   efficiency.

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

176 Void.
177
3 Terms, definitions and abbreviations
179 ### 3.1 Terms and definitions
180 For the purposes of this document the following terms and definitions apply.

181 **3.1.1**
182 **building entrance facility**
183 facility that provides all necessary mechanical and electrical services for the entry of telecommunications
184 cables into a building and which may allow for transition from external to internal cable

185 **3.1.2**
186 **computer room space**
187 area within the data centre that accommodates the data processing, data storage and telecommunication
188 equipment that provides the primary function of the data centre

189 **3.1.3**
190 **control room space**
191 area within the data centre used to control the operation of the data centre and to act as a central point
192 for all control and monitoring functions

193 **3.1.4**
194 **data centre**
195 structure, or group of structures, dedicated to the centralized accommodation, interconnection and
196 operation of information technology and network telecommunications equipment providing data storage,
197 processing and transport services together with all the facilities and infrastructures for power distribution
198 and environmental control together with the necessary levels of resilience and security required to
199 provide the desired service availability.

200 Note 1 to entry: A structure can consist of multiple buildings and/or spaces with specific functions to support
201 the primary function.

202 Note 2 to entry: the boundaries of the structure or space considered the data centre which includes the
203 information and communication technology equipment and supporting environmental controls can be defined
204 within a larger structure or building.

205 **3.1.5**
206 **electrical distribution space**
207 area used for housing facilities to distribute electrical power between the transformer space and electrical
208 spaces within the data centre or elsewhere within the premises or individual buildings within the premises
209

210 **3.1.6**
211 **electrical space**
212 area within the data centre used for housing facilities to deliver and control electrical power to the data
213 centre spaces (including switchboards, batteries, uninterruptible power supplies (UPS) etc.)

214 **3.1.7**
215 **generator space**
216 area used for housing the installation of electrical power supply generation equipment together with
217 associated storage of fuels or energy conversion equipment

218 **3.1.8**
219 **holding space**
220 area within the data centre used for the holding of equipment prior to being brought into service or having
221 been taken out of service

222 **3.1.9**
223 **information technology equipment**
224 equipment providing data storage, processing and transport services together with the
225 telecommunications network equipment dedicated to providing direct connection to core and/or access
226 networks

227 **3.1.10**
228 **key performance indicator**
229 number representing the resource usage effectiveness or efficiency of the system

230 **3.1.11**
231 **mechanical space**
232 area that is used for housing mechanical equipment and infrastructure that provides environmental
233 control for the data centre spaces (including chillers and water treatment, air handling and fire
234 suppression systems)

235 **3.1.12**
236 **resource usage effectiveness**
237 ratio of resulting output to a resource consumed to produce that output when the input and output units
238 are not the same.

239 **3.1.13**
240 **resource usage efficiency**
241 ratio of output to the resource used by the device or system when the input and output units are the
242 same
243
244 Note 1 to entry: Resources in this context include, but are not limited to electricity and water, and each will be
245 defined within the same boundary conditions.
246
247 Note 2 to entry: The term is used generically to describe the conversion of a resource to an output or outcome,
248 such as miles of transit per litre of petroleum

249 **3.1.14**
250 **storage space**
251 secured area where general goods and/or data centre goods can be stored

252 **3.1.15**
253 **telecommunications space**
254 area which may house demarcation points and information technology equipment associated with the
255 building entrance facility and which may allow service providers restricted access to the data centre

256 **3.1.16**
257 **testing space**
258 area within the data centre used for the testing and configuring of equipment prior to being brought into
259 service

260 **3.1.17**
261 **transformer space**
262 area used for housing equipment necessary to convert primary electrical circuits to levels appropriate for
263 connection to the equipment within the premises or individual buildings within the premises
264

265 **3.2 Abbreviations**

266 For the purposes of this document the following abbreviations apply:

267 AC   Alternative Current

268 DC   Direct Current

269 IT   Information Technology

270 KPI   Key Performance Indicator

271 SLA   Service Level Agreement

272 UPS   Uninterruptible Power Supply

273

274 # 4 Conformance

275 In order for a KPI of data centre resource usage effectiveness or efficiency to be included in the
276 ISO/IEC 30134 series it shall

277 a)   meet the common objectives outlined in 5.2,

278 b)   meet the requirements of 5.3,

279 c)   meet the structure requirements of 5.4,

280 d)   meet the use requirements of 5.5.

281

282 # 5 Key Performance Indicators (KPIs)

283 **5.1 General**

284 The ISO/IEC 30134 series defines requirements for the KPIs that are used to address aspects of data
285 centre resource usage effectiveness or efficiency.

286 Due to the variable nature of type, size, purpose and geographical location of data centres and in order
287 to meet the common objectives defined in 5.2, it is not possible to define a single, universally relevant,
288 KPI for resource usage effectiveness or efficiency. As a result, the ISO/IEC 30134 series specifies a
289 suite of KPIs, each of which may be used to measure and report different, and relevant, aspects of
290 resource usage effectiveness or efficiency.

291 This clause defines

292 a)   common objectives for KPIs (see 5.2),
293 b)   the general requirements for a KPI to be included within the ISO/IEC 30134 series (see 5.3),
294 c)   a common structure within the ISO/IEC 30134 series (see 5.4),
295 d)   rules for the use of KPIs (see 5.5).

296 **5.2 Common Objectives for KPIs**

297 The common objective of the KPIs of ISO/IEC 30134 series is the efficient or effective use or utilization of
298 resources, for example

299 a)   minimization of energy and other resource consumption,

300 b)   effectiveness of the IT load (processing, storage and transport) within the data centre, maximizing
301   the IT output with the minimum energy consumption,

302 c)   reuse of unused resources (e.g. energy reuse in the form of waste heat),

303 d) utilization of renewable energy, both imported and generated on site, if possible.

304

305 The KPIs of the ISO/IEC 30134 series are designed and intended to allow an individual facility to
306 measure and monitor progress in each individual area so as to justify investment in resource usage
307 effectiveness or efficiency measures and plan further improvements.

308

309 The KPIs of the ISO/IEC 30134 series shall be

310

311 1) applicable to all types of data centres,
312 2) technology neutral,
313 3) geographically neutral.

5.3   Requirements for KPIs

5.3.1   General

316 In order for a KPI to be included in the ISO/IEC 30134 series the KPI shall meet the requirements of
317 5.3.2 to 5.3.9.

5.3.2   Scale

319 Data centres vary widely in terms of scale (i.e. the maximum design service implementation). KPIs shall
320 be valid for all scales of data centres.

5.3.3   Evolution

322 Data centres

323 a) generally do not go from 'zero' to full utilization on day one,

324 b) tend to feature power demands that grow from day one moving towards the maximum design load
325   and at any point strategic changes may take place (such as the procurement of more efficient IT
326   equipment) which may reduce the load before once again beginning to grow towards the maximum
327   design load.

328 KPIs shall be valid for all 'states of evolution' of an operational infrastructure.

5.3.4   Formulae

330 Each KPI shall be defined in clear and unambiguous mathematical terms.

5.3.5   Definition of boundaries

332 Each KPI shall define the boundaries of the elements of the data centre infrastructure to be included in
333 any measurements or calculations (see Clause 6).

334 Each KPI shall define the reporting requirements for resources relevant to the determination of the KPI.

5.3.6   Definition of terms

336 Each KPI shall clearly define all terms relevant to its application.

5.3.7   Measurement points and procedures

338 Each KPI shall be based upon parameters that are measureable in an unambiguous manner. The
339 measurement points shall be included for each KPI. The following procedures shall be followed

340 a) each KPI shall be assessed over a defined period of time,

341 b) all parameters relevant to the assessment of the KPI shall be measured over a period not exceeding
342   a specified time,

9