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1 **Draft (2nd) NIST Special Publication 800-140C**
2 **Revision 1**

3 **CMVP Approved Security Functions:**
4 *CMVP Validation Authority Updates to ISO/IEC 24759*

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102 guidelines, and outreach efforts in information system security, and its collaborative activities
103 with industry, government, and academic organizations.

104 **Abstract**

105 The approved security functions listed in this publication replace the ones listed in ISO/IEC
106 19790 Annex C and ISO/IEC 24759 6.15, within the context of the Cryptographic Module
107 Validation Program (CMVP). As a validation authority, the CMVP may supersede Annex C in
108 its entirety.

109 **Keywords**

110 Cryptographic Module Validation Program; CMVP; FIPS 140 testing; FIPS 140; ISO/IEC
111 19790; ISO/IEC 24759; testing requirement; vendor evidence; vendor documentation; security
112 policy.

113 **Audience**

114 This document is intended for use by vendors, testing labs, and the CMVP to address issues that
115 arise in cryptographic module testing.

116 **Supplemental Content**

117 Special Publication 800-140C, available at [https://csrc.nist.gov/publications/detail/sp/800-
118 140c/final](https://csrc.nist.gov/publications/detail/sp/800-140c/final), is the governing document until this revision is published as final. The updated final
119 may have minor changes, depending on comments received.

120 **Note to Readers**

121 Two changes were made to this document from the first draft of Revision 1 – both editorial. The
122 first was to section 6.2 (Approved security functions) where the security function subsections
123 were renamed, modified, and recategorized. The second was to include the following two
124 standards from SP 800-140D: SP 800-90A, SP 800-90B.

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145 **Document Revisions 7**

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149 **1 Scope**

150 This document specifies the Cryptographic Module Validation Program (CMVP) modifications
 151 of the methods to be used by a Cryptographic and Security Testing Laboratory (CSTL) to
 152 demonstrate conformance. This document also specifies the modification of methods for
 153 evidence that a vendor or testing laboratory provides to demonstrate conformity. The approved
 154 security functions specified in this document supersede those specified in ISO/IEC 19790 Annex
 155 C and ISO/IEC 24759 paragraph 6.15.

156 **2 Normative references**

157 This section identifies the normative references cited as ISO/IEC 19790 and ISO/IEC 24759. The
 158 specific editions to be used are ISO/IEC 19790:2012 and ISO/IEC 24759:2017. Please note that
 159 the version 19790:2012 referenced here includes the corrections made in 2015.

160 National Institute of Standards and Technology (2019) *Security Requirements for*
 161 *Cryptographic Modules*. (U.S. Department of Commerce, Washington, DC), Federal
 162 Information Processing Standards Publication (FIPS) 140-3.
 163 <https://doi.org/10.6028/NIST.FIPS.140-3>

164 **3 Terms and definitions**

165 The following terms and definitions supersede or are in addition to ISO/IEC 19790

166 *None at this time*

167 **4 Symbols and abbreviated terms**

168 The following symbols and abbreviated terms supersede or are in addition to ISO/IEC 19790
 169 throughout this document:

170	CCCS	Canadian Centre for Cyber Security
171	CMVP	Cryptographic Module Validation Program
172	CSD	Computer Security Division
173	CSTL	Cryptographic and Security Testing Laboratory
174	FIPS	Federal Information Processing Standard
175	FISMA	Federal Information Security Management/Modernization Act
176	NIST	National Institute of Standards and Technology
177	SP 800-XXX	NIST Special Publication 800 series document

178 **5 Document organization**

179 **5.1 General**

180 Section 6 of this document replaces the approved security functions of ISO/IEC 19790 Annex C
181 and ISO/IEC 24759 paragraph 6.15.

182 **5.2 Modifications**

183 Modifications will follow a similar format to that used in ISO/IEC 24759. For additions to test
184 requirements, new Test Evidence (TEs) or Vendor Evidence (VEs) will be listed by increasing
185 the “sequence_number.” Modifications can include a combination of additions using underline
186 and deletions using ~~striketrough~~. If no changes are required, the paragraph will indicate “No
187 change.”

188 **6 CMVP-approved security function requirements**

189 **6.1 Purpose**

190 This document identifies CMVP-approved security functions. It supersedes security functions
191 identified in ISO/IEC 19790 and ISO/IEC 24759.

192 **6.2 Approved security functions**

193 The categories include transitions, symmetric key encryption and decryption, digital signatures,
194 hashing and message authentication.

195 **6.2.1 Transitions**

196 Barker EB, Roginsky AL (2019) *Transitioning the Use of Cryptographic Algorithms and*
197 *Key Lengths*. (National Institute of Standards and Technology, Gaithersburg, MD), NIST
198 Special Publication (SP) 800-131A, Rev. 2. <https://doi.org/10.6028/NIST.SP.800-131Ar2>

- 199 • Relevant Sections: 1, 2, 3, 9 and 10.

200 **6.2.2 Block Cipher**

201 **6.2.2.1 Advanced Encryption Standard (AES)**

202 National Institute of Standards and Technology (2001) *Advanced Encryption Standard*
203 *(AES)*. (U.S. Department of Commerce, Washington, DC), Federal Information
204 Processing Standards Publication (FIPS) 197. <https://doi.org/10.6028/NIST.FIPS.197>

205 Dworkin MJ (2001) *Recommendation for Block Cipher Modes of Operation: Methods*
206 *and Techniques*. (National Institute of Standards and Technology, Gaithersburg, MD),
207 NIST Special Publication (SP) 800-38A. <https://doi.org/10.6028/NIST.SP.800-38A>

208 Dworkin MJ (2010) *Recommendation for Block Cipher Modes of Operation: Three*
209 *Variants of Ciphertext Stealing for CBC Mode*. (National Institute of Standards and

210 Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-38A, Addendum.
 211 <https://doi.org/10.6028/NIST.SP.800-38A-Add>

212 Dworkin MJ (2004) *Recommendation for Block Cipher Modes of Operation: the CCM*
 213 *Mode for Authentication and Confidentiality*. (National Institute of Standards and
 214 Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-38C, Includes
 215 updates as of July 20, 2007. <https://doi.org/10.6028/NIST.SP.800-38C>

216 Dworkin MJ (2007) *Recommendation for Block Cipher Modes of Operation:*
 217 *Galois/Counter Mode (GCM) and GMAC*. (National Institute of Standards and
 218 Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-38D.
 219 <https://doi.org/10.6028/NIST.SP.800-38D>

220 Dworkin MJ (2010) *Recommendation for Block Cipher Modes of Operation: The XTS-*
 221 *AES Mode for Confidentiality on Storage Devices*. (National Institute of Standards and
 222 Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-38E.
 223 <https://doi.org/10.6028/NIST.SP.800-38E>

224 Dworkin MJ (2012) *Recommendation for Block Cipher Modes of Operation: Methods for*
 225 *Key Wrapping*. (National Institute of Standards and Technology, Gaithersburg, MD),
 226 NIST Special Publication (SP) 800-38F. <https://doi.org/10.6028/NIST.SP.800-38F>

227 IEEE Standards Association (2013) *IEEE 802.1AEbw-2013 – IEEE Standard for Local*
 228 *and metropolitan area networks—Media Access Control (MAC) Security Amendment 2:*
 229 *Extended Packet Numbering* (IEEE, Piscataway, NJ). Available at
 230 https://standards.ieee.org/standard/802_1AEbw-2013.html

231 Dworkin MJ (2016) *Recommendation for Block Cipher Modes of Operation: Methods for*
 232 *Format-Preserving Encryption*. (National Institute of Standards and Technology,
 233 Gaithersburg, MD), NIST Special Publication (SP) 800-38G.
 234 <https://doi.org/10.6028/NIST.SP.800-38G>

235 **6.2.2.2 Triple-DES Encryption Algorithm (TDEA)**

236 Barker EB, Mouha N (2017) *Recommendation for the Triple Data Encryption Algorithm*
 237 *(TDEA) Block Cipher*. (National Institute of Standards and Technology, Gaithersburg,
 238 MD), NIST Special Publication (SP) 800-67, Rev. 2.
 239 <https://doi.org/10.6028/NIST.SP.800-67r2>

240 Dworkin MJ (2001) *Recommendation for Block Cipher Modes of Operation: Methods*
 241 *and Techniques*. (National Institute of Standards and Technology, Gaithersburg, MD),
 242 NIST Special Publication (SP) 800-38A. <https://doi.org/10.6028/NIST.SP.800-38A>

243

- Appendix E references modes of the Triple-DES algorithm.

244 Dworkin MJ (2012) *Recommendation for Block Cipher Modes of Operation: Methods for*
 245 *Key Wrapping*. (National Institute of Standards and Technology, Gaithersburg, MD),
 246 NIST Special Publication (SP) 800-38F. <https://doi.org/10.6028/NIST.SP.800-38F>

247 **6.2.2.3 SKIPJACK**

248 **NOTE** The use of SKIPJACK is approved for decryption only. The SKIPJACK algorithm has
249 been documented in Federal Information Processing Standards Publication (FIPS)
250 185. This publication is obsolete and has been withdrawn.

251 **6.2.3 Digital Signature**

252 **6.2.3.1 Digital Signature Standard (DSS) (DSA, RSA, ECDSA)**

253 National Institute of Standards and Technology (2013) *Digital Signature Standard (DSS)*.
254 (U.S. Department of Commerce, Washington, DC), Federal Information Processing
255 Standards Publication (FIPS) 186-4. <https://doi.org/10.6028/NIST.FIPS.186-4>.

256 **6.2.3.2 Stateful Hash-Based Signature Schemes (LMS, HSS, XMSS, XMSS^{MT})**

257 Cooper DA, Apon DC, Dang QH, Davidson MS, Dworkin MJ, Miller CA (2020)
258 *Recommendation for Stateful Hash-Based Signature Schemes*. (National Institute of
259 Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-208.
260 <https://doi.org/10.6028/NIST.SP.800-208>

261 **6.2.4 Secure Hash**

262 **6.2.4.1 Secure Hash Standard (SHS) (SHA-1, SHA-224, SHA-256, SHA-384, SHA-512, 263 SHA-512/224, and SHA-512/256)**

264 National Institute of Standards and Technology (2015) *Secure Hash Standard (SHS)*.
265 (U.S. Department of Commerce, Washington, DC), Federal Information Processing
266 Standards Publication (FIPS) 180-4. <https://doi.org/10.6028/NIST.FIPS.180-4>

267 **6.2.4.2 SHA-3 Hash Algorithms (SHA3-224, SHA3-256, SHA3-384, SHA3-512)**

268 National Institute of Standards and Technology (2015) *SHA-3 Standard: Permutation-
269 Based Hash and Extendable-Output Functions*. (U.S. Department of Commerce,
270 Washington, DC), Federal Information Processing Standards Publication (FIPS) 202.
271 <https://doi.org/10.6028/NIST.FIPS.202>

272 **6.2.5 Extendable Output Functions**

273 **6.2.5.1 SHA-3 Extendable-Output Functions (XOF) (SHAKE128, SHAKE256)**

274 National Institute of Standards and Technology (2015) *SHA-3 Standard: Permutation-
275 Based Hash and Extendable-Output Functions*. (U.S. Department of Commerce,
276 Washington, DC), Federal Information Processing Standards Publication (FIPS) 202.
277 <https://doi.org/10.6028/NIST.FIPS.202>

278 **6.2.5.2 SHA-3 Derived Functions: cSHAKE, TupleHash, and ParallelHash**

279 Kelsey JM, Chang S-jH, Perlner RA (2016) *SHA-3 Derived Functions: cSHAKE, KMAC,*

280 *TupleHash, and ParallelHash*. (National Institute of Standards and Technology,
281 Gaithersburg, MD), NIST Special Publication (SP) 800-185.
282 <https://doi.org/10.6028/NIST.SP.800-185>

283 **6.2.6 Message Authentication**

284 **6.2.6.1 Triple-DES**

285 Dworkin MJ (2005) *Recommendation for Block Cipher Modes of Operation: The CMAC*
286 *Mode for Authentication*. (National Institute of Standards and Technology, Gaithersburg,
287 MD), NIST Special Publication (SP) 800-38B, Includes updates as of October 6, 2016.
288 <https://doi.org/10.6028/NIST.SP.800-38B>

289 **6.2.6.2 AES**

290 Dworkin MJ (2005) *Recommendation for Block Cipher Modes of Operation: The CMAC*
291 *Mode for Authentication*. (National Institute of Standards and Technology, Gaithersburg,
292 MD), NIST Special Publication (SP) 800-38B, Includes updates as of October 6, 2016.
293 <https://doi.org/10.6028/NIST.SP.800-38B>

294 Dworkin MJ (2004) *Recommendation for Block Cipher Modes of Operation: The CCM*
295 *Mode for Authentication and Confidentiality*. (National Institute of Standards and
296 Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-38C, Includes
297 updates as of July 20, 2007. <https://doi.org/10.6028/NIST.SP.800-38C>

298 Dworkin MJ (2007) *Recommendation for Block Cipher Modes of Operation:*
299 *Galois/Counter Mode (GCM) and GMAC*. (National Institute of Standards and
300 Technology, Gaithersburg, MD), NIST Special Publication (SP) 800-38D.
301 <https://doi.org/10.6028/NIST.SP.800-38D>

302 **6.2.6.3 HMAC**

303 National Institute of Standards and Technology (2008) *The Keyed-Hash Message*
304 *Authentication Code (HMAC)*. (U.S. Department of Commerce, Washington, DC),
305 Federal Information Processing Standards Publication (FIPS) 198-1.
306 <https://doi.org/10.6028/NIST.FIPS.198-1>

307 Dang QH (2012) *Recommendation for Applications Using Approved Hash Algorithms*.
308 (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special
309 Publication (SP) 800-107, Rev. 1. <https://doi.org/10.6028/NIST.SP.800-107r1>

310 **6.2.6.4 KMAC**

311 Kelsey JM, Chang S-jH, Perlner RA (2016) *SHA-3 Derived Functions: cSHAKE, KMAC,*
312 *TupleHash, and ParallelHash*. (National Institute of Standards and Technology,
313 Gaithersburg, MD), NIST Special Publication (SP) 800-185.
314 <https://doi.org/10.6028/NIST.SP.800-185>

315 **6.2.7 Entropy Source**

316 Sonmez Turan M, Barker EB, Kelsey J, McKay KA, Baish, ML, Boyle M (2018)
317 *Recommendation for Entropy Sources Used for Random Number Generation*. (National
318 Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication
319 (SP) 800-90B. <https://doi.org/10.6028/NIST.SP.800-90B>

320 **6.2.8 Deterministic Random Bit Generator (DRBG)**

321 Barker EB, Kelsey J (2015) *Recommendation for Random Number Generation Using*
322 *Deterministic Random Bit Generators*. (National Institute of Standards and Technology,
323 Gaithersburg, MD), NIST Special Publication (SP) 800-90A, Rev. 1.
324 <https://doi.org/10.6028/NIST.SP.800-90Ar1>

325 **6.2.9 Other Security Functions**

326 Kim Schaffer (2020) CMVP Approved Sensitive Security Parameter Generation and
327 Establishment Methods. (National Institute of Standards and Technology, Gaithersburg,
328 MD), NIST Special Publication (SP) 800-140D, as amended.
329 <https://doi.org/10.6028/NIST.SP.800-140D>

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331 **Document Revisions**

Edition	Date	Change
Revision 1	[date]	<p>6.2 Approved security functions Added/Modified: Security function subsection headers. Moved: SP 800-90A and SP 800-90B from SP 800-140D into this document.</p> <p>6.2.3 Digital Signature Added: SP 800-208, October 2020</p> <p>6.2.9 Other Security Functions Added: SP 800-140D, September 2020</p>

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