अनिवार्य आवश्यकताएं

संख्या: TEC

Essential Requirements

ER No.: TEC

Communication module for IoT/ M2M devices

MTCTE के तहत जारी:
Issued under MTCTE by:

दूरसंचार अभियांत्रिकी केंद्र
भारत सरकार
खुर्शीद लाल भवन, जनपथ, नई दिल्ली - 110001, भारत

Telecommunication Engineering Centre
Government of India
Khurshid Lal Bhawan, Janpath, New Delhi-110001, INDIA

Essential Requirements for:

Communication module for IoT/ M2M devices

Certification Scheme: **SCS** Product Fee Group: **C**

This ER covers all types of communication module for IoT/ M2M devices using having wired or wireless (cellular/ non cellular) communication technologies. A communication module is a unit that enables transmission and/or reception of any message by wired, radio, optical or other electromagnetic system.

This product has the following variants:

1. Standalone/Composite Communication module –

   It is standalone/ pluggable/ solderable/ composite (existing along with other functionalities) communication modules to be used in other devices/equipment for providing telecommunication connectivity and networking capabilities.

   Communication modules are device agnostic and connect the devices to the telecommunications network.

2. Standalone/Composite Communication module for Smart Electricity Meter

Note: Annexures referred to in this ER are Annexures as mentioned in "Annexures to ERs" No. TEC/TC/DD/TCP-222/2.28/ April 2025 as updated from time to time and available on MTCTE portal.

1. Variant 1 : Standalone/Composite Communication module

1.1 Parameters Linked with Product Variant

S.No.	Parameter Name	Standard Name
1.1.1	Radiated Emission -Class B	TEC EMI EMC Standard CISPR 32 EN55032. Class B
1.1.2	Dual IP Parameters	RFC 4213. Annex-P6
1.1.3	Immunity to Electrostatic Discharge	TEC EMI EMC Standard EN/IEC:61000-4-2. Annex-B *Note: It is applicable only in case of enclosure, so maybe applicable in case of composite module which can have enclosure.*
1.1.4	Immunity to Radiated RF	TEC EMI EMC Standard EN/IEC:61000-4-3. Annex-B
1.15	Energy Consumption Rating (ECR)	TEC 74046 Annex-R
1.1.6	IoT Dev - Non-0 IMEI or MEID or Unique MAC	Annex-M
1.1.7	IPV4 Parameters	RFC 791. Annex-P6
1.1.8	IPV6 Parameters	RFC 2460 / 8200. Annex-P7
1.1.9	IT Equipment Safety	IS 13252-1 or IEC:60950-1 or IEC 62368-1. Annex-A1
1.1.10	Security Requirements	As per applicable ITSAR

1.2 Interface 1 : 1 G Optical Ethernet

S.No.	Parameter Name	Standard Name
1.2.1	Average Launch power for 1 GE Opt	IEEE 802.3z Cl. 38. Annex-H
1.2.2	Receiver Sensitivity 1 GE Opt	IEEE 802.3z Cl. 38. Annex-H
1.2.3	Wavelength for 1 GE Opt	IEEE 802.3z Cl. 38. Annex-H

1.3 Interface 2 : 10 G Optical Ethernet

S.No.	Parameter Name	Standard Name
1.3.1	Average Launch power for 10 GE Opt	IEEE 802.3ae Cl. 52. Annex-H

1.3.2	Receiver Sensitivity 10 GE Opt	IEEE 802.3ae Cl. 52. Annex-H
1.3.3	Wavelength for 10 GE Opt	IEEE 802.3ae Cl. 52. Annex-H

1.4 Interface 3: 40 G Optical Ethernet

S.No.	Parameter Name	Standard Name
1.4.1	Average Launch power for 40 GE Opt	IEEE 802.3ba Cl. 86 87. Annex-H
1.4.2	Receiver Sensitivity 40 GE Opt	IEEE 802.3ba Cl. 86 87. Annex-H
1.4.3	Wavelength for 40 GE Opt	IEEE 802.3ba Cl. 86 87. Annex-H

1.5 Interface 4 : 100 G Optical Ethernet

S.No.	Parameter Name	Standard Name
1.5.1	Average Launch power for 100 GE Opt	IEEE 802.3ba Cl. 86 88. Annex-H
1.5.2	Receiver Sensitivity 100 GE Opt	IEEE 802.3ba Cl. 86 88. Annex-H
1.5.3	Wavelength for 100 GE Opt	IEEE 802.3ba Cl. 86 88. Annex-H

1.6 Interface 5 : 200 G Optical Ethernet

S.No.	Parameter Name	Standard Name
1.6.1	Average Launch Power for 200 GE Opt	IEEE 802.3cn Cl 121 Cl 122
1.6.2	Receiver Sensitivity for 200 GE Opt	IEEE 802.3cn Cl 121 Cl 122
1.6.3	Wavelength for 200 GE Opt	IEEE 802.3cn Cl 121 Cl 122

1.7 Interface 6 : 400 G Optical Ethernet

S.No.	Parameter Name	Standard Name
1.7.1	Average Launch Power for 400 GE Opt	IEEE 802.3cn Cl 122 Cl 124
1.7.2	Receiver Sensitivity for 400 GE Opt	IEEE 802.3cn Cl 122 Cl 124
1.7.3	Wavelength for 400 GE Opt	IEEE 802.3cn Cl 122 Cl 124

1.8 Interface 7 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.8.1	Operating Frequency for 5G NR- FR1 and FR2	NFAP. Annex-F

1.8.2	5G NR- FR1 and FR2 interworking with other Radios	3GPP TS 38.521-3 Annex-F13

1.9 Interface 8: 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.9.1	Operating Frequency for 5G NR FR1	NFAP. Annex-F
1.9.2	5G NR FR1	3GPP TS 38.521-1 Annex-F14

1.10 Interface 9 : 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.10.1	Operating Frequency for 5G NR FR2	NFAP. Annex-F
1.10.2	5G NR FR2	3GPP TS 38.521-2 Annex-F15

1.11 Interface 10 : 6LoWPAN (2.4 GHz)

S.No.	Parameter Name	Standard Name
1.11.1	Basic RF Requirements for 6LowPAN Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328 V2.2.2.
1.11.2	EIRP for 6LowPAN Interface	WPC GSR 45(E). Annex-G4(4.2)
1.11.3	Frequency of operation for 6LowPAN Interface	Latest NFAP Annex-G4(4.1)
1.11.4	Maximum Transmitted Power for 6LowPAN Int	WPC GSR 45(E). Annex-G4 (4.3)

1.12 Interface 11 : 6LoWPAN (865 to 867 MHz)

S.No.	Parameter Name	Standard Name
1.12.1	Basic RF Requirements for 6LowPAN Interface	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2 V3.2.1
1.12.2	EIRP for 6LowPAN Interface	WPC GSR 564(E). Annex- G5(5.2)

1.12.3	Frequency of operation for 6LowPAN Interface	Latest NFAP. Annex- G5(5.1)
1.12.4	Maximum Transmitted Power for 6LowPAN Int	WPC GSR 564(E). Annex- G5(5.3).

1.13 Interface 12 : ADSLx

S.No.	Parameter Name	Standard Name
1.13.1	Bit Rate for ADSLx Int	Annex-J1
1.13.2	Impulse Noise Protection for ADSL Int	Annex-J1
1.13.3	Insulation Test for ADSL Int	Annex-J1
1.13.4	Line Port impedance for ADSLx Int	Annex-J1
1.13.5	Loop resistance for ADSLx	ETSI EN 300 001. Annex-J1
1.13.6	PSD for ADSLx Int	Annex-J1
1.13.7	Transmitted Power At ATU-C for ADSLx Int	Annex-J1

1.14 Interface 13 : BLE/Bluetooth

S.No.	Parameter Name	Standard Name
1.14.1	Basic RF Requirements for BLE/ Bluetooth Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328 V2.2.2.
1.14.2	EIRP for BLE/ Bluetooth Interface	WPC GSR 45(E). Annex-G4 (4.2)
1.14.3	Frequency of Operation for BLE/ Bluetooth Interface	Latest NFAP. Annex-G4(4.1)
1.14.4	Maximum Transmitted Power for BLE/ Bluetooth Int	WPC GSR 45(E). Annex-G4 (4.3)

1.15 Interface 14 : Fast Ethernet Electrical

S.No.	Parameter Name	Standard Name
1.15.1	Link Speed and Autonegotiation Test FE	IEEE 802.3 Annex-H

1.16 Interface 15 : Fast Ethernet Optical

S.No.	Parameter Name	Standard Name
1.16.1	Average Launch power for FE Opt	IEEE 802.3u. Annex-H
1.16.2	Receiver Sensitivity for FE Opt	IEEE 802.3u. Annex-H

1.16.3	Wavelength for FE Opt	IEEE 802.3u. Annex-H

1.17 Interface 16 : Geolocation Navigation Interface

S.No.	Parameter Name	Standard Name
1.17.1	GPS	Annexure to ER for Tracking Device
1.17.2	NavIC	Annexure to ER for Tracking Device

1.18 Interface 17 : Gigabit Ethernet Electrical

S.No.	Parameter Name	Standard Name
1.18.1	Link Speed and Autonegotiation Test GE	IEEE 802.3. Annex-H

1.19 Interface 18 : GSM or GPRS or EDGE

S.No.	Parameter Name	Standard Name
1.19.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or ETSI EN 301 511. Annex-F10
1.19.2	Operating Frequency for GSM or GPRS or EDGE Int	NFAP. Annex-F

1.20 Interface 19 : LPWAN - LoRa

S.No.	Parameter Name	Standard Name
1.20.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2 V3.2.1
1.20.2	EIRP LoRa	WPC GSR 564(E). Annex- G5(5.2).
1.20.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
1.20.4	Maximum Transmit Power LoRa	WPC GSR 564(E). Annex- G5(5.3).

1.21 Interface 20 : LPWAN - SigFox

S.No.	Parameter Name	Standard Name
1.21.1	Basic RF Requirements for LPWAN - SigFox	Annex- G5(5.4 to 5.18). ETSI EN 300 220-2 V3.2.1.
1.21.2	EIRP SigFox	WPC GSR 564(E). Annex- G5(5.2).
1.21.3	Frequency of Operation for SigFox Int	Latest NFAP. Annex- G5(5.1)
1.21.4	Maximum Transmit Power SigFox	WPC GSR 564(E). Annex- G5(5.3).

1.22 Interface 21 : LTE or LTE-A

S.No.	Parameter Name	Standard Name
1.22.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or ETSI EN 301 908-13. Annex-F12
1.22.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

1.23 Interface 22 : NB-IOT

S.No.	Parameter Name	Standard Name
1.23.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
1.23.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
1.23.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
1.23.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
1.23.5	Receiver Adjacent Channel Selectivity (ACS) -NB-IOT	3GPP TS 36.521-1 Clause 7.5F

1.23.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
1.23.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
1.23.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F
1.23.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
1.23.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

1.24 Interface 23 : NFC

S.No.	Parameter Name	Standard Name
1.24.1	Basic RF Requirements for NFC - Int	Annex- G6 (6.2 to 6.13). ETSI EN 300 330 V2.1.1
1.24.2	Frequency of Operation for NFC Int	Latest NFAP. Annex-G6(6.1)

1.25 Interface 24 : SHDSL

S.No.	Parameter Name	Standard Name
1.25.1	Insulation Resistance for SHDSL int	G.991.2. Annex-J1
1.25.2	LCL for SHDSL Interface	G.991.2. Annex-J1
1.25.3	PSD for SHDSL Int	G.991.2. Annex-J1
1.25.4	Return Loss for SHDSL	G.991.2. Annex-J1
1.25.5	Throughput for SHDSL Interface	G.991.2. Annex-J1
1.25.6	Transmitted Power for SHDSL Int	G.991.2. Annex-J1

1.26 Interface 25 : VDSLx

S.No.	Parameter Name	Standard Name
1.26.1	Bit Rate for VDSLx Int	G.993.1 or G993.2. Annex-J1
1.26.2	Insulation Test for 2 wire Int	ETSI EN 300 001. Annex-D
1.26.3	Line Port impedance for VDSLx Int	G.993.1 or G.993.2 Annex-J1
1.26.4	Loop resistance for VDSLx	ETSI EN 300 001. Annex-J1
1.26.5	Profiles for VDSLx	G.993.1 or G.993.2 Annex-J1
1.26.6	PSD for VDSLx Int	G.993.1(cl 6.2). G.993.2(cl 7.2) Ann-A B C. Annex-J1
1.26.7	Return Loss for VDSLx	G.993.1 or G.993.2 Annex-J1
1.26.8	Transmitted Power At ATU-C for VDSLx Int	G.993.1 or G.993.2 Annex-J1

1.27 Interface 26 : WCDMA or HSPA

S.No.	Parameter Name	Standard Name
1.27.1	Operating Frequency for WCDMA or HSPA Int	NFAP. Annex-F
1.27.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or ETSI EN 301 908-2. Annex-F11

1.28 Interface 27 : WiFi

S.No.	Parameter Name	Standard Name
1.28.1	2.4 GHz WiFi Radio Conformance	ETSI EN 300 328 or FCC CFR47 pt 15.247 or FCC CFR47 pt 15.249. Annex-G3
1.28.2	5 GHz WiFi Radio Conformance	ETSI EN 301 893 and or ETSI EN 302 502 or FCC CFR47 pt 15.407 or FCC CFR47 pt 15.249. Annex-G3
1.28.3	EIRP for Wifi Interface	Latest NFAP and GSRs issued by DoT WPC. Annex-G2
1.28.4	Frequency for WiFi equipments	DoT WPC GSR No. 45(E) 1048(E). Annex-G1

1.29 Interface 28 : ZigBee

S.No.	Parameter Name	Standard Name
1.29.1	Basic RF Requirements for ZigBee Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328 V2.2.2.
1.29.2	EIRP for ZigBee Interface	WPC GSR 45(E). Annex-G4 (4.2)
1.29.3	Frequency of Operation for ZigBee Interface	Latest NFAP. Annex-G4(4.1)
1.29.4	Maximum Transmitted Power for ZigBee Int	WPC GSR 45(E). Annex-G4 (4.3)

1.30 Interface 29: RFID

S.No.	Parameter Name	Standard Name
1.30.1	Basic RF Requirement RFID	Annex G5 (5.4 to 5.18) and / or Annex G6 (6.2 to 6.13)
1.30.2	EIRP for RFID Interface	WPC GSR 564(E). Annex-G5 (5.2)
1.30.3	Frequency of Operation for RFID Int	NFAP. Annex G5(5.1) and / or Annex G6 (6.1)

1.30.4	Maximum Transmit Power RFID	WPC GSR 564(E). Annex G5 (5.3)

1.31 Interface: oneM2M

Note: Testing applicable as per available profile(s) in the device

S.No.	Profile Details	Standard Name
1.31.1	Constrained sensor as ADN with security	oneM2M TS-0025, v3.3.0, clause 5.10
1.31.2	Constrained actuator as ADN with security	oneM2M TS-0025, v3.3.0, clause 5.11

2. Variant 2 : Standalone/Composite Communication module for Smart Electricity Meter

2.1 Parameters Linked with Product Variant

S.No.	Parameter Name	Standard Name
2.1.1	EMI EMC compliance	As per related IS 16444 standard
2.1.2	Dual IP Parameters	RFC 4213, RFC 791 Annex-P6, RFC 8200. Annex- P7

2.1.3	IoT Dev-Non-0 IMEI or MEID or Unique MAC	Annex-M
2.1.4	IPV6 Parameters	RFC 2460/ 8200. Annex-P7
2.1.5	Safety compliance	As per related IS 16444 standard

2.2 Interface 1 : GSM or GPRS or EDGE

S.No.	Parameter Name	Standard Name
2.2.1	Int Parameters for GSM or GPRS or EDGE	3GPP TS 51 010-1 or EN 301 511. Annex-F10
2.2.2	Operating Frequency for GSM or GPRS or EDGE Int	NFAP. Annex-F

2.3 Interface 2 : LPWAN – LoRa

S.No.	Parameter Name	Standard Name
2.3.1	Basic RF Requirements for LPWAN-LoRA	Annex- G5(5.4 to 5.20). ETSI EN 300 220-2 V3.2.1
2.3.2	EIRP LoRa	WPC GSR 853(E). Annex- G5(5.2).
2.3.3	Frequency of Operation for LoRa Int	Latest NFAP. Annex- G5(5.1)
2.3.4	Maximum Transmit Power LoRa	WPC GSR 853(E). Annex- G5(5.3).

2.4 Interface 3 : LTE or LTE-A

S.No.	Parameter Name	Standard Name
2.4.1	Int Parameters for LTE or LTE-A	3GPP TS 36.521-1 or EN 301 908-13. Annex-F12
2.4.2	Operating Frequency for LTE or LTE-A Int	NFAP. Annex-F

2.5 Interface 4 : 5G NR- FR1 and FR2 interworking with other Radios

S.No.	Parameter Name	Standard Name
1.8.1	Operating Frequency for 5G NR- FR1 and FR2	NFAP. Annex-F
1.8.2	5G NR- FR1 and FR2 interworking with other Radios	3GPP TS 38.521-3 Annex-F13

2.6 Interface 5: 5G NR (FR1)

S.No.	Parameter Name	Standard Name
1.9.1	Operating Frequency for 5G NR FR1	NFAP. Annex-F
1.9.2	5G NR FR1	3GPP TS 38.521-1 Annex-F14

2.7 Interface 6: 5G NR (FR2)

S.No.	Parameter Name	Standard Name
1.10.1	Operating Frequency for 5G NR FR2	NFAP. Annex-F
1.10.2	5G NR FR2	3GPP TS 38.521-2 Annex-F15

2.8 Interface 7 : WCDMA or HSPA

S.No.	Parameter Name	Standard Name
2.5.1	Operating Frequency for WCDMA or HSPA Int	NFAP. Annex-F
2.5.2	WCDMA or HSPA Int Parameters	3GPP TS 34.121-1 or EN 301 908-2. Annex-F11

2.9 Interface 8: 6LoWPAN (2.4 GHz)

S.No.	Parameter Name	Standard Name
2.6.1	Basic RF Requirements for 6LowPAN Interface	Annex G4 (4.4 to 4.15). ETSI EN 300 328 V2.2.2.
2.6.2	EIRP for 6LowPAN Interface	WPC GSR 45(E). Annex-G4(4.2)
2.6.3	Frequency of operation for 6LowPAN Interface	Latest NFAP Annex-G4(4.1)
2.6.4	Maximum Transmitted Power for 6LowPAN Int	WPC GSR 45(E). Annex-G4 (4.3)

2.10 Interface 6 : 6LoWPAN (865 to 868 MHz)

S.No.	Parameter Name	Standard Name
2.7.1	Basic RF Requirements for 6LowPAN Interface	Annex- G5(5.4 to 5.20). ETSI EN 300 220-2 V3.2.1
2.7.2	EIRP for 6LoWPAN Interface	WPC GSR 853(E). Annex- G5(5.2)
2.7.3	Frequency of operation for 6LowPAN Interface	Latest NFAP. Annex- G5(5.1)
2.7.4	Maximum Transmitted Power for 6LowPAN Int	WPC GSR 853(E). Annex- G5(5.3).

2.11 Interface 9: RF Mesh

S.No.	Parameter Name	Standard Name
2.8.1	Basic RF Requirements for RF Mesh	Annex- G5(5.4 to 5.20). ETSI EN 300 220-2 V3.2.1
2.8.2	EIRP RF Mesh	WPC GSR 853(E). Annex- G5(5.2).
2.8.3	Frequency of Operation for RF Mesh Int	Latest NFAP. Annex- G5(5.1)
2.8.4	Maximum Transmit Power RF Mesh	WPC GSR 853(E). Annex- G5(5.3).

2.12 Interface 11 : NB-IoT

S.No.	Parameter Name	Standard Name
2.12.1	Frequency Stability-NB-IOT	3GPP TS 36.521-1 Clause 6.5.1F
2.12.2	Maximum output power-NB-IOT	3GPP TS 36.521-1 Clause 6.2.2F
2.12.3	Operating Frequency-NB-IOT-Device Equp. shall be capable of operating in at least one of the frequency bands as per the National Freq. Allocation plan	National Frequency Allocation Plan- 2018 Frequency Allocation Table (IND 16)
2.12.4	Power Control Absolute Power Tolerance-NB-IOT	3GPP TS 36.521-1 Clause 6.3.5F.1
2.12.5	Receiver Adjacent Channel Selectivity (ACS) - NB-IOT	3GPP TS 36.521-1 Clause 7.5F
2.12.6	Receiver In-band blocking-NB-IOT	3GPP TS 36.521-1 Clause 7.6.1F
2.12.7	Receiver Reference Sensitivity level-NB-IOT	3GPP TS 36.521-1 Clause 7.3F
2.12.8	Receiver spurious emission-NB-IOT	3GPP TS 36.521-1 Clause 7.9F

2.12.9	Spectrum emissions mask-NB-IOT	3GPP TS 36.521-1 Clause 6.6.2.1F
2.12.10	Spurious emissions-NB-IOT	3GPP TS 36.521-1 Clause 6.6.3F.1-6.6.3F.2

2.13 Interface: Wi-SUN (865 to 868 MHz)

S.No.	Parameter Name	Standard Name
2.13.1	Basic RF Requirements for Wi-SUN Interface	Annex- G5(5.4 to 5.20). ETSI EN 300 220-2 V3.2.1
2.13.2	EIRP for Wi-SUN Interface	WPC GSR 853 (E)Annex- G5(5.2)
2.13.3	Frequency of operation for Wi-SUN Interface	Latest NFAP. Annex- G5(5.1)
2.13.4	Maximum Transmitted Power for Wi-SUN Int	WPC GSR 853 (E)Annex- G5(5.3).

2.14 Interface : Fast Ethernet Optical

S.No.	Parameter Name	Standard Name
2.14.1	Average Launch power for FE Opt	IEEE 802.3u. Annex-H
2.14.2	Receiver Sensitivity for FE Opt	IEEE 802.3u. Annex-H
2.14.3	Wavelength for FE Opt	IEEE 802.3u. Annex-H

2.15 Interface : 1G Optical Ethernet

S. No	Parameter Name	Standard Name
2.15.1	Average Launch power for 1 GE Opt	IEEE 802.3z Cl. 38. Annex-H
2.15.2	Receiver Sensitivity 1 GE Opt	IEEE 802.3z Cl. 38. Annex-H
2.15.3	Wavelength for 1 GE Opt	IEEE 802.3z Cl. 38. Annex-H

2.16 Interface: oneM2M

Note: Testing applicable as per available profile(s) in the device

S.No.	Profile Details	Standard Name
2.16.1	Constrained sensor as ADN with security	oneM2M TS-0025, v3.3.0, clause 5.10
2.16.2	Constrained actuator as ADN with security	oneM2M TS-0025, v3.3.0, clause 5.11