

INTERNATIONAL STANDARD

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**Fibre optic active components and devices – Package and interface standards –
Part 12: Laser transmitters with a coaxial RF connector**

**Composants et dispositifs actifs en fibres optiques – Normes de boîtier et
d'interface –**

Partie 12: Émetteurs à laser avec connecteur RF coaxial

IEC 62148-12:2004

62148-12-2004





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IEC 62148-12

Edition 1.1 2022-09
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.180.20

ISBN 978-2-8322-5740-1

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VERSION REDLINE



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES –
PACKAGE AND INTERFACE STANDARDS –**

Part 12: Laser transmitters with a coaxial RF connector

FOREWORD

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IEC 62148-12 edition 1.1 contains the first edition (2004-02) [documents 86C/581/FDIS and 86C/599/RVD] and its amendment 1 (2022-09) [documents 86C/1786/CDV and 86C/1812/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 62148-12 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard constitutes Part 12 of the IEC 62148 series, published under the general title *Fibre optic active components and devices – Package and interface standards*. This series consists of Part 1, devoted to general requirements, and various parts specific to individual module families.

~~Part 1: General and guidance~~

~~Part 2: SFF MT-RJ 10-pin transceivers~~

~~Part 3: SFF MT-RJ 20-pin transceivers~~

~~Part 4: PN 1x9 plastic optical fibres transceivers~~

~~Part 5: SC 1x9 fibre optic modules~~

~~Part 6: ATM-PON transceivers~~

~~Part 7: SFF LC 10-pin transceivers~~

~~Part 8: SFF LC 20-pin transceivers~~

~~Part 9: SFF MU duplex 10-pin transceivers~~

~~Part 10: SFF MU duplex 20-pin transceivers~~

~~Part 11: 14-pin modulator integrated laser diode transmitters~~

~~Part 12: Laser transmitters with a coaxial RF connector~~

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INTRODUCTION

Laser diode devices are used to convert electrical signals into optical signals. This standard covers the physical interface for the laser diode devices that are suitable for high bit rate optical transmission systems. These devices are designed as pigtailed packages with a 7-pin electrical connector and a coaxial RF connector and have a thermo-electric cooler.

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[IEC 62148-12:2004](https://standards.iteh.ai/catalog/standards/sist/20e5616c-5e6a-46d0-babe-a76feef5677b/iec-62148-12-2004)

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PACKAGE AND INTERFACE STANDARDS –

Part 12: Laser transmitter with a coaxial RF connector

1 Scope

This part of IEC 62148 covers physical interface specifications of laser diode devices for optical fibre communication.

The intent of this part of IEC 62148 is to adequately specify the physical requirements of an optical transmitter that will enable mechanical interchangeability of transmitters to this standard both at the printed circuit board and for any panel-mounting requirement.

2 Normative references

The following referenced documents are indispensable for the application 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.

~~IEC 60169-15, Radio-frequency connectors – Part 15: R.F. coaxial connectors with inner diameter of outer conductor 4,13 mm (0,163 in) with screw coupling – Characteristic impedance 50 ohms (type SMA)~~

~~IEC 60169-16, Radio-frequency connectors – Part 16: R.F. coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristic impedance 50 ohms (75 ohms) (type N)~~

IEC 60191 (all parts), *Mechanical standardization of semiconductor devices*

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60874 (all parts), *Connectors for optical fibres and cables*

IEC 61169-15, *Radio-frequency connectors – Part 15: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 4,13 mm (0,163 in) with threaded coupling – Characteristic impedance 50 Ω (type SMA)*

IEC 61169-16, *Radio-frequency connectors – Part 16: Sectional specification – RF coaxial connectors with inner diameter of outer conductor 7 mm (0,276 in) with screw coupling – Characteristics impedance 50 Ω (75 Ω) (type N)*

IEC 62148-1, *Fibre optic active components and devices – Package and interface standards – Part 1: General and guidance*

ITU-T Recommendation G.652: *Characteristics of a single-mode optical fibre and cable*

ITU-T Recommendation G.653: *Characteristics of a dispersion-shifted single-mode optical fibre cable*

3 Terms, definitions and abbreviations

For the purposes of this document, the definitions given in IEC 62148-1, where the terminology concerning the physical concepts, the types of devices, the general terms, and those related to ratings and characteristics can be found, as well as the following definitions apply.

3.1 photodiode PD

semiconductor chip used for a photo-detection. In this standard, a PD is installed in the package for monitoring the output power of laser diode

3.2 thermo-electric cooler TEC

device that controls the temperature of parts mounted on it. In this standard, the TEC is set in the package to control the laser diode temperature

3.3 radio frequency RF

frequency of the electro-magnetic wave that can be radiated to the air. In this standard, an RF corresponds to the frequencies from 10 kHz to 10 GHz

3.4 subminiature SMA

compact and coaxial electric connector for RF electric signal. The SMA connector is standardized in ~~IEC 60169-15~~ IEC 61169-15

3.5 electro-absorption modulator EA modulator

semiconductor optical amplitude modulator that uses the Franz-Keldysh effect and/or quantum confined Stark effect (QCSE) to convert the voltage amplitude modulation into the optical amplitude modulation

4 Classification

The laser transmitter modules described in this standard are classified as Type-5 7, according to the definitions of IEC 62148-1.

5 Specification of fibre optic transceiver module

5.1 Pigtail interface

All optical fibres which are defined in IEC 60793-2-50 and ITU-T Recommendations G. 652, G. 653, and G. 654 are applicable.

All optical connectors which are defined in IEC 60874 are applicable, if a pigtail is to be terminated with an optical connector.

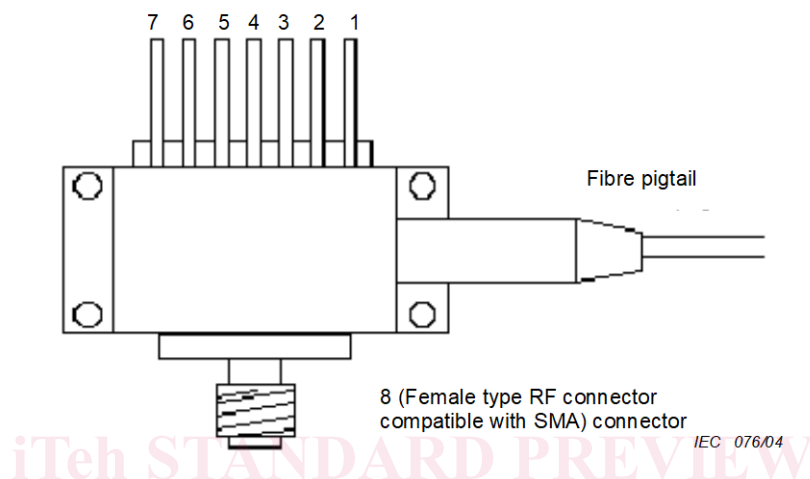
5.2 Electrical interface

5.2.1 General

The electrical interface in this standard defines the basic functionality of each terminal.

5.2.2 Numbering of electrical terminals

Terminal numbering assignments are shown in Figure 1 (viewed from the top of the device case).



**Figure 1 – Electrical terminal numbering assignments
(viewed from the top of the device case)**

5.2.3 Coaxial connector

The transmitter has a female type coaxial connector as a number 8 terminal. The connector can handle an RF electrical signal and is compatible with the SMA connector which is defined in ~~IEC 60169-16 and IEC 60169-15~~ IEC 61169-16 and IEC 61169-15.

5.2.4 Pin function definition

The basic functionalities of each pin for direct modulation laser transmitter modules and modulator integrated laser transmitter modules are defined in Tables 1 and 2, respectively.

Table 1 – Pin function definitions for direct modulation laser diode devices

Number	Terminal identification	Functional description
1 ^a		Thermistor-1
2 ^a		Thermistor-2
3 ^b	LD bias	Laser diode bias
4	PD _A	Monitor PD anode
5	PD _K	Monitor PD cathode
6 ^c	TEC _A	Thermo-electric cooler anode
7 ^c	TEC _K	Thermo-electric cooler cathode
8	RF	RF signal input

NOTE The case has to be grounded.

^a Resistance between these two terminals indicates the laser submount temperature.

^b Polarity of LD bias voltage shall be specified by each vender.

^c Thermo-electric coolers act as LD-chip-coolers in the bias direction described here. If they are biased reversely, their functions are changed into warming.

Table 2 – Pin function definitions for EA modulator integrated laser diode device

Pin number	Terminal identification	Functional description
1 ^a		Thermistor-1
2 ^a		Thermistor-2
3	LD _A	Laser diode anode
4	PD _A	Monitor PD anode
5	PD _K	Monitor PD cathode
6 ^b	TEC _A	Thermo-electric cooler anode
7 ^b	TEC _K	Thermo-electric cooler cathode
8	RF	RF signal input

NOTE Case has to be grounded.

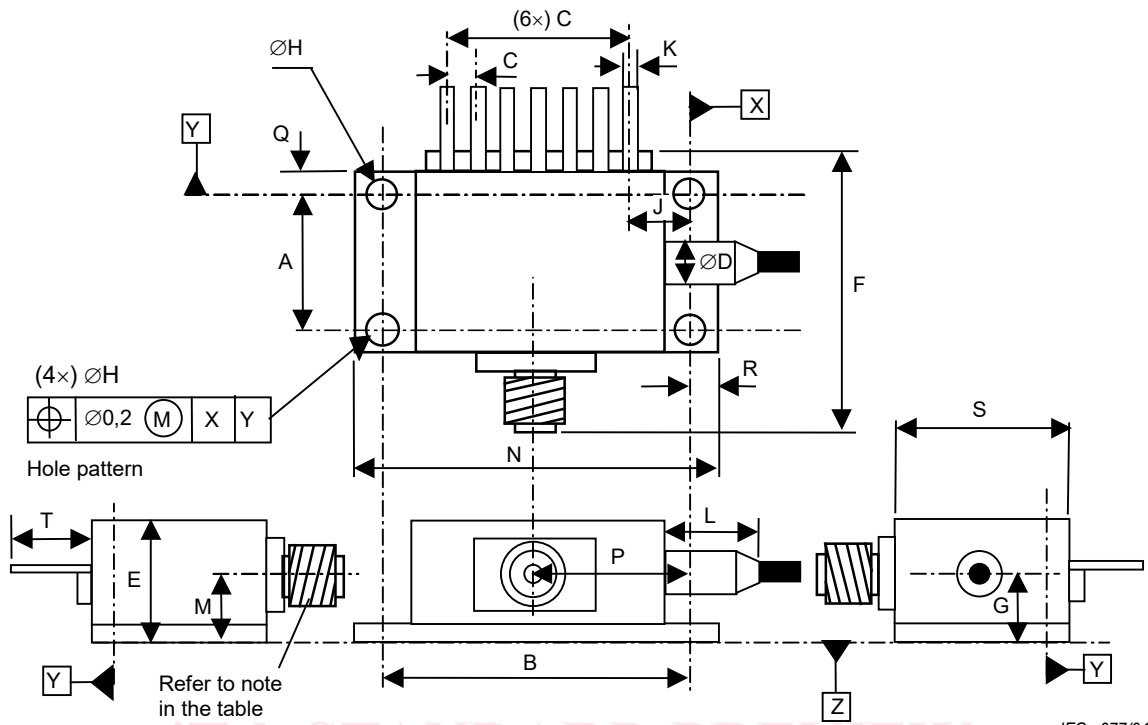
^a Resistance between these two terminals indicates the laser submount temperature.

^b Thermo-electric coolers act as LD-chip-coolers in the bias direction described here. If they are biased reversely, their functions are changed into heating.

6 Outline and footprint of fibre-optic transmitter module

6.1 Drawing of case outline

A drawing of the case outline as well as the dimensions is given in Figure 2.



IEC 077/04

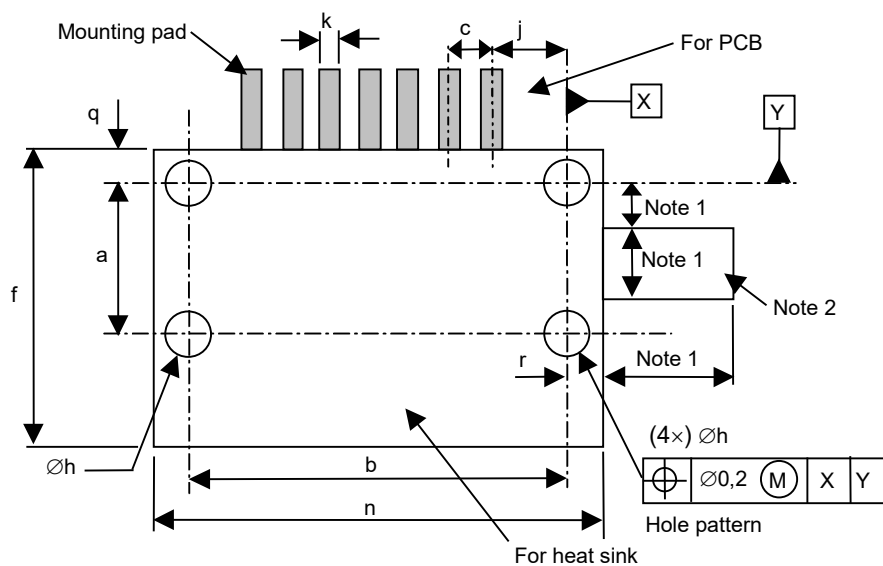
Reference	Minimum mm	Maximum mm	Notes
A	8,90	12,00	Basic dimension
B	26,0	26,0	Basic dimension
C	15,24	15,24	Basic dimension
D		7,0	
E		10,0	
F	23,0	24,0	
G	4,3	5,2	
H	2,62	2,72	
J	5,2	5,6	
K	0,3	0,7	
L		35,0	Strain relief
M	4,8	5,2	
N		31,0	
P	10,5	14,0	
Q		2,0	
R		2,50	
S		12,9	
T	6,0	12,5	

NOTE Thread dimension is 1/4-36 UNS-2A. The details of the RF connector are found in IEC 60169-15 IEC 61169-15.

Figure 2 – Case outline

6.2 Drawing of case footprint

A drawing of the case footprint as well as the dimensions is given in Figure 3.



IEC 078/04

Reference	Minimum mm	Maximum mm	Notes
a		8,90	Basic dimension
b		26,0	Basic dimension
f	24,0		
h		2,67	Basic dimension
n	31,0		
q	2,0		
r	2,50		
NOTE 1 These dimensions are specified by each vender.			
NOTE 2 Reserved area for pigtail fibre treatment.			

Figure 3 – Case footprint