ACcess Series

User Manual

Teleste Corporation

AC810

Optical node for FTTLA solutions

Contents

Introduction

AC810 is a dual active output node designed for FTTLA solutions. The output amplifier stages are based on the latest GaN technology to ensure highest possible signal quality and high output level. The platform and accessories of AC810 are fully functional up to 1.2 GHz.

Interstage gain can be controlled in two positions, which results in wide operational dynamic range. The first stage is adjusted by OLC function. The second slot(s) can be controlled with plug-in attenuator and equaliser modules.

The integrated microcontroller takes care of OLC and monitors RF levels, laser bias current, temperature and supply voltages and transmits alarm data to the head end. Status leds for optical power and RF levels provide status information for true plug-and-play installation.

Fibre organizing is made in the lid, which includes splice organizer with 12 holders, connector holders and fibre in/out ports.

Installation

Housing

The AC810 can be installed either into a street cabinet or to the outdoor environment. The fibre node should be installed vertically so that the external cable connectors and ventilation hole are underneath, securing the housing with three mounting brackets. Figure 1 depicts for the positions of mounting brackets as well as other installation dimensions.

The lid opens with the hinges to the left. The open cover can be removed by first opening the lid into a 90 degrees angle and the lifting it off the hinges.

Before closing the lid is should be checked that:

- nothing is trapped between the lid and the case
- all case gaskets are in their correct positions
- lid seats evenly on the rubber gasket

Using 4 mm Allen key, the lid retaining bolts are fasten in a diagonal sequence with a tightening torque of 3 Nm. The class of enclosure is IP54 when correctly installed and tightened.

Node housing should be grounded with at least 4 mm^2 grounding wire (Cu) from a proper earth to the grounding point.

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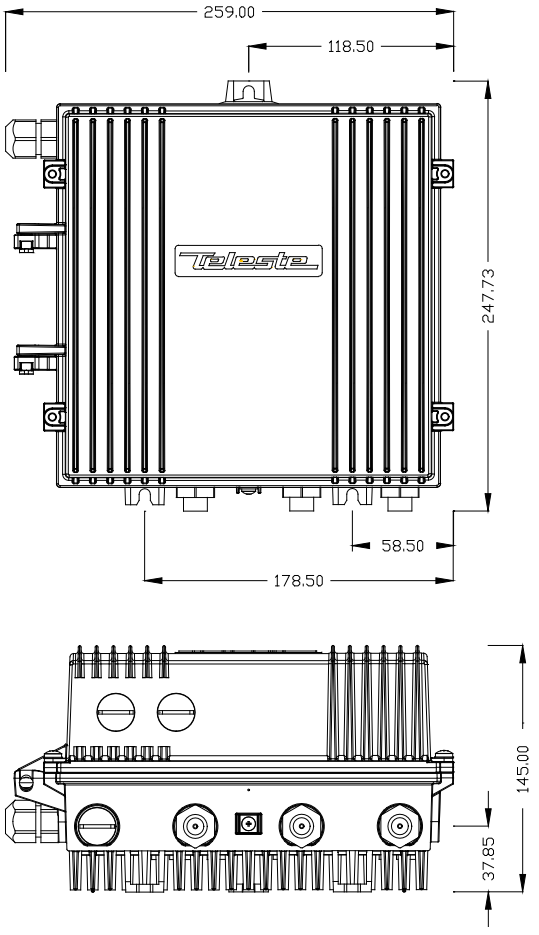

Figure 1. AC810 housing dimensions – top and side view

Interfaces

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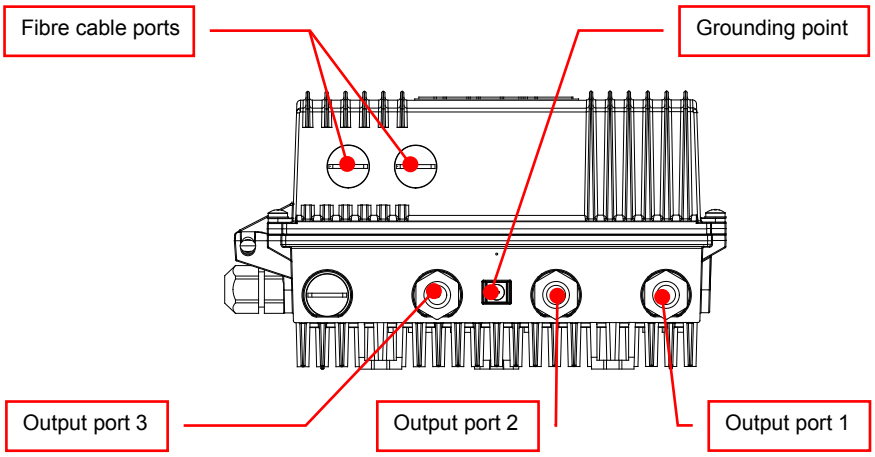

Figure 2. Port locations

The AC810 node has five dedicated cable connection points: two inputs for fibre entries and three coaxial RF outputs.

All coaxial outputs have a standard PG11 thread and they accept any KDC type adapter or connector. A suitable length of the coaxial cable inner conductor exposed for the connectors is approximately 20 mm (Figure 3).

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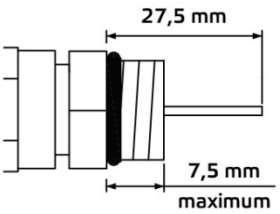

Figure 3. Centre conductor length

Powering

The supply voltage of the remote powered node (27...65 V AC or ±33...90 V DC) can be fed through either output ports (Figure 7 pos. 8, 11 and 12) fused with common blade-type 15 ampere fuse (Figure 7 pos. 16). When a cable connection is used for powering, the maximum supply current is 7.0 A.

The power intake of the remote powered amplifier may also be done externally via the cable feed-through that is located on the upper left corner of the amplifier. In this case the maximum supply current is 12.0 A.

External power can also be fed through the amplifier into the network. Maximum feed-through current is 7.0 A per port.

Cable gland at external input

The cable gland assembly provides the necessary protection against ingress of solid objects and moisture as well as providing cable retention.

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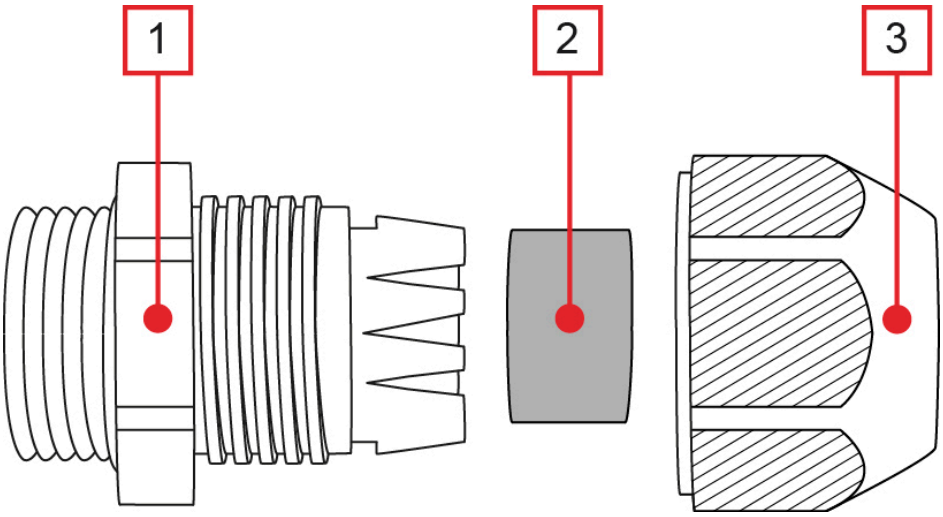

Figure 4. Cable gland components

Strip the cable sheath of the supply cord with a suitable length to suit the equipment and pass it through gland nut (3), seal (2) and plug body (1). Place appropriate conductors into plug pin housing assembly terminals and tighten screws to secure bared conductors and ensure good electrical contact. Screw the plug body tight onto the node housing to ensure that IP rating is maintained. Position the end of the cable sheath in line with the plug body and tighten the gland nut.

Fibre installation

Fibre installation is a critical procedure and it should be done with carefulness. Incorrect handling of the fibres can result in damage and degraded performance. Example of routing the fibres can be seen in Figure 5.

Cleaning fibre connectors

- For correct optical operation ensure that all optical connectors are cleaned immediately before mating using a suitable optical connector cleaning kit.
- If a cleaning kit is not available, wipe the end of the connector using pure isopropyl alcohol (99%) and a lint-free wipe. Dry it with filtered compressed air. Wait until dry to insert connector into the adapter.
- When fibre optic connectors are unmated, the optical fibre end faces must be protected from contamination using suitable dust caps. Contamination of fibre end faces will reduce the performance of the optical fibre and could ultimately cause failure of the system. Contamination could also damage the fibre end faces when the connectors are mated.

DANGER! Do not look into the optical connector of the return transmitter with power applied. Laser light, visible or invisible, can seriously injure eyes or even cause blindness.

Fibre management

The node contains an internal fibre organiser. The fibre organiser provides termination, splicing and storage functions for fibre cables. The cover of the node provides a protective enclosure for optical fibres and components. The fibre organiser consists of two functional parts: splice tray (Figure 6 pos. 1) and termination tray (Figure 6 pos. 2). The termination tray is hinged to the chassis of the fibre organiser and swings outwards to provide access for connecting installation fibre filaments (external fibre optic cables) and fibre pigtails (Access units).

The termination tray provides means for terminating outside plant cables and fibre optic terminal fibres. It provides up to four mounting points for fibre optic adapters. Connectors and adapters are held in place by universal holders, thus ensuring compatibility with variety of existing connectors and adapters. The termination tray may also be removed to provide additional access when outside plant cables are spliced to pigtails. When termination tray is removed the cover of the node can be detached and splices can be done in a separate, more convenient place. The splice tray holds a maximum of 12 splices.

Be sure to leave sufficient slack for the pigtails to permit closing or opening the termination tray without damaging fibres. Ensure that no fibres are pinched while the tray or lid is closed.

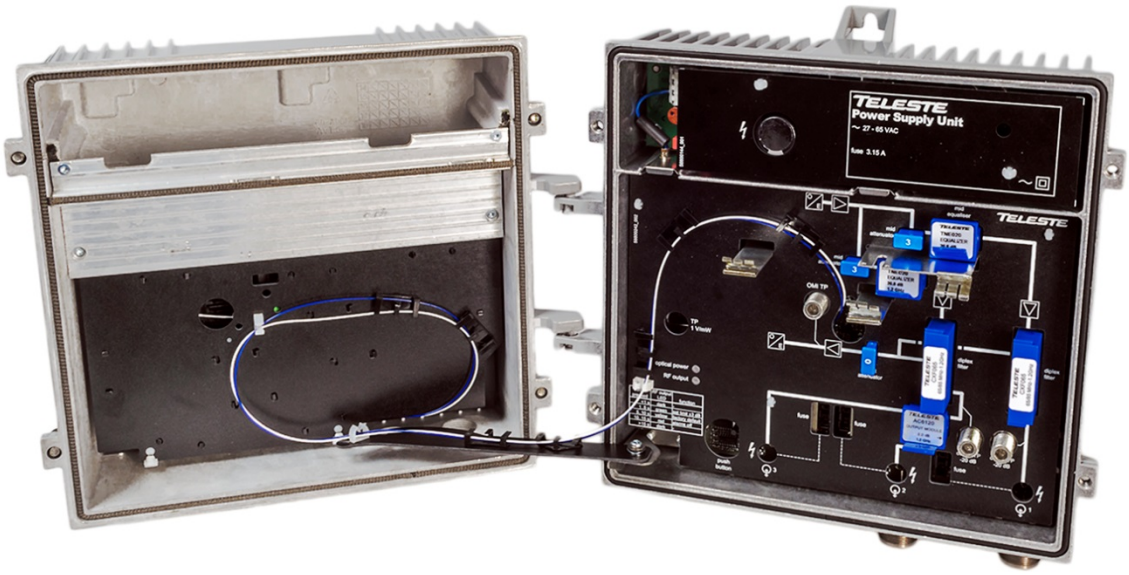

Figure 5. Routing fibres – typical configuration

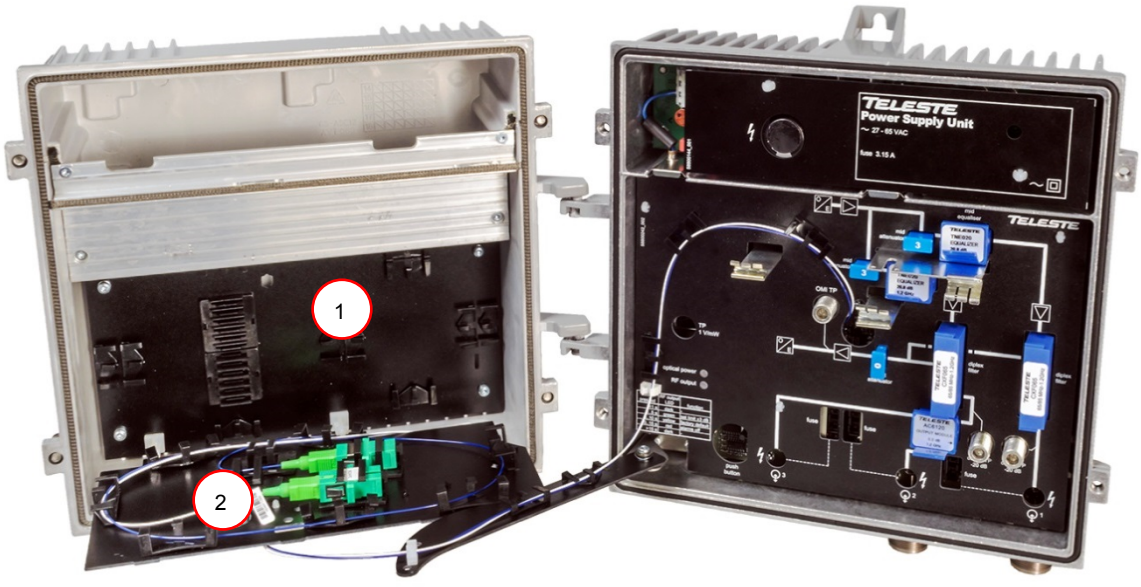

Figure 6. Routing fibres – typical configuration

Front panel

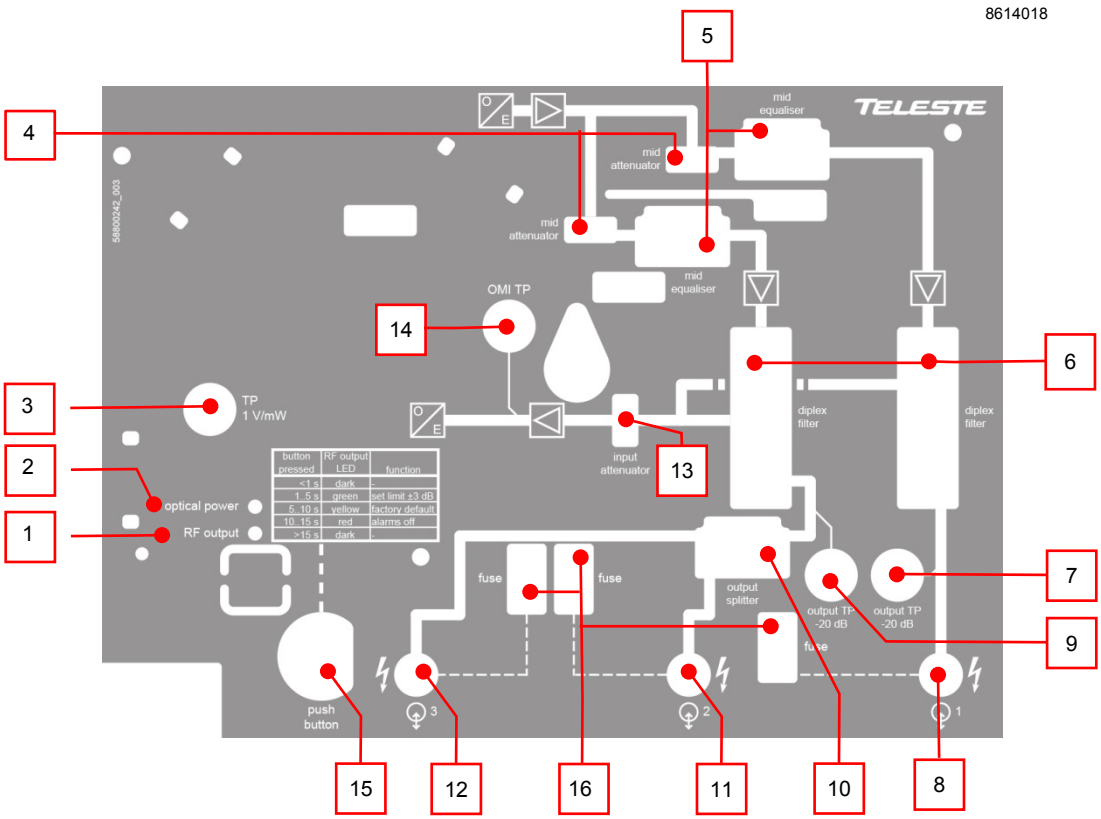

Figure 7. AC810 front panel

1) Indicator for RF output power
2) Indicator for optical input power
3) Optical power DC voltage test point
4) Interstage attenuator(s)
5) Interstage equaliser(s)
6) Output diplex filter(s)
7) Output 1 test point, -20 dB directional
8) RF output 1
9) Output 2 test point, -20 dB directional
10) Output 2 module
11) RF output 2
12) RF output 3
13) Return path input attenuator
14) OMI test point for optical transmitter
15) Push button
16) Fuse(s)

Features

Local user interface

The AC810 microcontroller continuously measures node optical input power, RF power of both outputs, temperature, local PSU voltages and return transmitter laser bias current. Only the two first mentioned parameters are monitored with leds.

HDO203 and HDO206 return path receivers have an integrated 10.7 MHz data receiver. They are able to receive the AC810 node data carrier and extract node status information from it. This status information, together with signal missing / corrupted data, is presented with HDO203/206's flags.

Optical input power led	Description
red	Optical power < -8.5 dBm
green	Optical power -8.0…-2.0 dBm
yellow	Optical power -1.5…+1.0 dBm
red blink	Optical power > +1.5 dBm

RF output power led	Description
green	RF output power > ~+6 dBm (factory setting) or within ±2 dB from stored value (user setting)
red	RF output power < ~+5 dBm (factory setting) or not within ±3 dB from stored value (user setting)
dark	RF output power measurement disabled

If needed, the RF output power alarm limits can be set to match measured RF output power with > 2 s pushbutton (Figure 7 pos. 15) press. Factory default alarm limits can be restored with > 5 s pushbutton press. RF output measurement can be disabled with >10 s pushbutton press.

Button pressed	RF output LED	Action when released
<1 s	dark	–
1…5 s	green	Set RF output power limits to ±3 dB
5...10 s	yellow	Set factory RF output power limits
10...15 s	red	Disable RF output power alarm
>15 s	dark	–

Forward path / Optical receiver

The optical receiver is integrated within the AC810 and will accept both 1310 and 1550 nm wavelength optical inputs. Throughout this manual, any mention of a procedure or specification is valid only with 1310 nm optical receivers.

The optical receiver provides both led indicator and DC voltage test point for received optical power to quickly determine operation of the unit.

The output stages use GaN hybrids to improve RF performance over the entire 85 to 1218 MHz passband. A diplex filter is selected during configuration according to the preferred frequency split.

The distribution path, through the use of plug-in output modules, can be set up for a variety of output configurations. Refer to the *'Table 1. Output modules'*.

Output module	Description	Output 2	Output 3
AC6120	0 dB output module	0 dB	not used
AC6124	Two way splitter	-4 dB	-4 dB

Table. 1. Output modules

Optical input power

Optical input power can be measured from the optical power DC voltage test point (Figure 7 pos. 3). The test point DC voltage is directly proportional to optical input power in mW e.g. 1.0 V corresponds to 1.0 mW average optical power. In case of 1310 nm wavelength selection the input power in dBm (W) can be calculated by the following formula. Subtract 0.5 dBm from the result in case of 1550 nm.

Pin (dBm) = 10*log (U_{TP}[V])

Operating wavelength 1310 nm		Operating wavelength 1550 nm	
TP / V DC	Input / dBm	TP / V DC	Input / dBm
1.00	0	1.12	0
0.79	-1	0.89	-1
0.63	-2	0.71	-2
0.50	-3	0.56	-3
0.40	-4	0.45	-4
0.32	-5	0.35	-5
0.25	-6	0.28	-6
0.20	-7	0.22	-7
0.16	-8	0.18	-8

Table. 2. AC810 optical receiver, expected input power levels

Do not connect any voltage to the test point or short circuit it to ground. Use a voltage meter with an input resistance higher than 100 kohms.

Gain control

The node features an OLC function which ensures that the output level is constant even if the optical input level is varying. The specified operation range for OLC is -8...-2 dBm, but it will typically operate up to ~0 dBm.

The interstage attenuators (Figure 7 pos. 4) and equalisers (Figure 7 pos. 5) should be selected according to a network plan and desired output levels.

Forward path adjustment

The AC810 node features a modular, plug-and-play architecture eliminating the need for any user adjustments assuming the following parameters are fulfilled:

1. Optical input level is between -8…-2 dBm.
2. Optical modulation index (OMI) of incoming signal is 4.0%.
3. Desired output level is 117.5 dBµV at 1.2 GHz with slope 15.5 dB between 1.2 GHz and 85 MHz. If different output levels are desired, the plug-in attenuators and equalisers should be adjusted accordingly. Refer to the Figure 8 and Table 2.

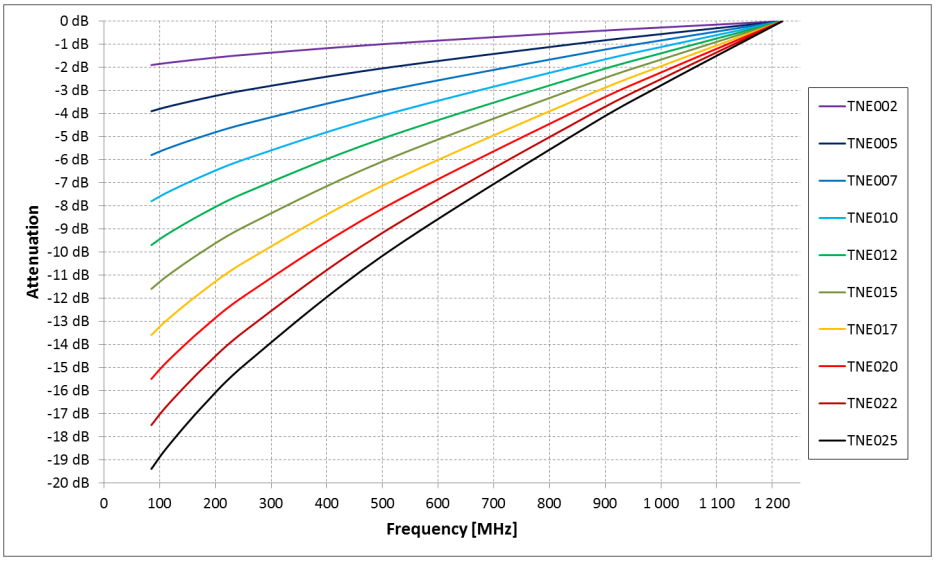

Figure 8. TNExxx equaliser curves

Level at 90 MHz (dBµV)	Level at 862 MHz (dBµV)	Level at 1218 MHz (dBµV)	Interstage attenuator	Interstage equaliser
102	114	117.5	JDA900	TNE020
99	111	114.5	JDA903	TNE020

Table. 3. Interstage attenuator / equaliser selection guide

Return path / Optical return transmitters

A diplex filter (Figure 7 pos. 6) is selected during configuration according to the preferred frequency split.

The AC810 platform is equipped either with a 1310 nm Fabry-Perot transmitter or with a CWDM transmitter. The CWDM lasers deploy eight wavelengths in range of 1470…1610 nm.

Return path adjustments

The return transmitter is aligned in production eliminating the need for any user adjustments. The level of return signal can be measured from the optical transmitter's OMI test point (Figure 7 pos. 14). The return signal level should be adjusted to match wanted level. Table below shows the RF drive levels for different OMIs. The signal level is adjusted with the return path attenuator (Figure 7 pos. 13).

OMI (%)	RFlevel (dBµV) at OMI test point
3.2	52
3.6	53
4.0	54
4.5	55
5.0	56
5.6	57
6.3	58
7.1	59
8 (default value)	**60**
9.0	61
10.0	62

For other OMI values the needed adjustment setting can be calculated from the formula: Drive level = 60 dBµV + 20 * log (Desired_OMI / 8 %)

Depending on the nature of the return signal, the input level can be measured as follows:

- When using a reference or test signal the level of the carrier is measured from the test point and adjusted to a value shown in the table above.
- When using a digital noise like signal a spectrum analyser's noise marker is set to the same bandwidth as the digital signal has and the level is adjusted to the value shown in the table above.

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European Conformity

This equipment conforms to all applicable regulations and directives of European Union which concern it and has gone through relevant conformity assessment procedures.

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