DAT HD

THE FIRST
INTELLIGENT ANTENNA
FOR DTT & HDTV

with **automatic signal** balance

Catalogue **2010**

Televes®

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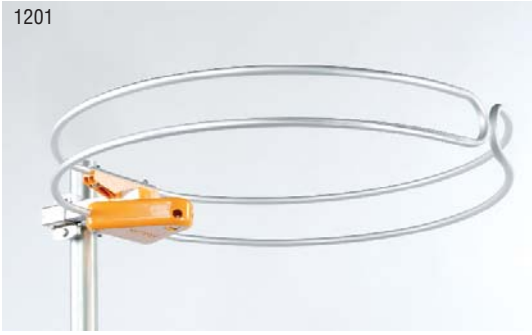
Antennas

Made of aluminium and ABS plastic, Televés line of antennas are constructed to resist the hardest climatic conditions such as UV radiation, drastic changes of temperature and rust.

Televes

Circular FM

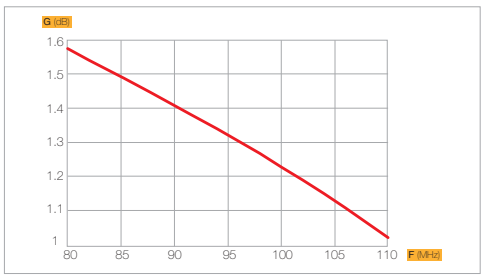
Dipole antenna folded in a circular shape to obtain an omnidirectional radiation pattern.



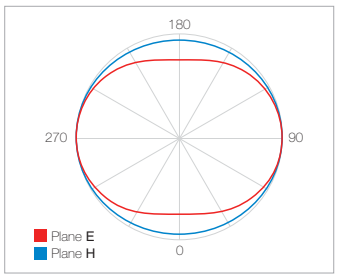
References			1201
Band			FM
Gain		dB	1
F/B ratio			0
Length		mm	500
Wind load	800 N/m²	N	27
	1100 N/m²		37

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



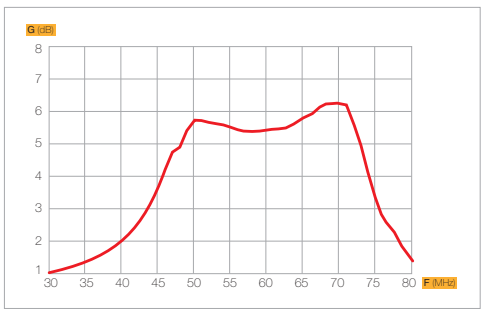
Band I multichannel

Three elements Yagi antenna for Band I reception.

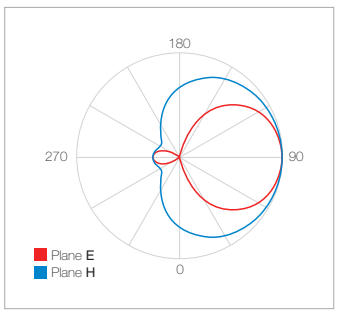
References			1012
Channel			2-4
Gain		dB	6
F/B ratio			18
Length		mm	1610
Wind load	800 N/m²	N	114.3
	1100 N/m²		157

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



Band III

PRODUCT RANGE	
REF.	DESCRIPTION
1065	5-12 ch., 7 elements
1048	9-10 ch., 7 elements
1291	5-12 ch., 9 elements

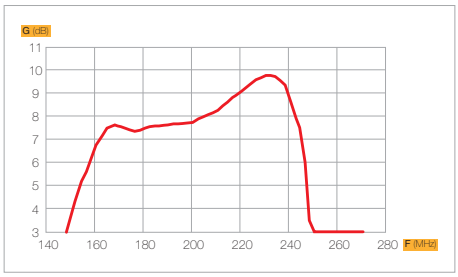
Yagi style Antennas for Band III reception, composed of a reflector, a folded dipole and directional elements.

The connection box includes the baloon between the dipole and the coaxial cable.

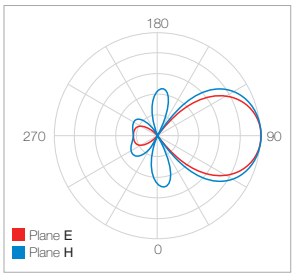
References			1065	1048	1291
Elements			7	7	9
Gain		dB	9.5	9.5	10
F/B ratio		dB	20	20	24
Length		mm	1460	1460	1650
Wind load	800 N/m²	N	71	69.1	80.6
Wind load	1100 N/m²	N	97.7	95	110.8

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



DAB

PRODUCT RANGE	
REF.	DESCRIPTION
1050	DAB, 3 elements

Specially designed for DAB reception *(Digital Audio Broadcasting)*.

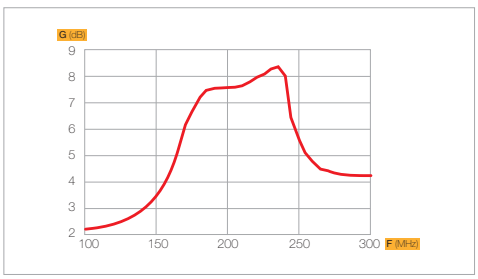
It is a three-element antenna (reflector, dipole and directive element) that covers the whole reserved band for DAB transmissions.

Includes the baloon in the connection box.

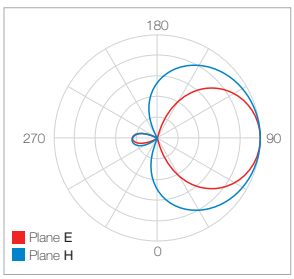
References			1050
Band			DAB/BIII 190-232 MHz
Gain		dB	8
F/B ratio		dB	>15
Length		mm	555
Wind load	800 N/m²	N	36.5
Wind load	1100 N/m²	N	50.2

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



DAT HD

Televes®

THE FIRST

INTELLIGENT ANTENNA

FOR DTT & HDTV

WITH BOSS TECH

BALANCED OUTPUT SIGNAL SYSTEM

with automatic signal balance

The exclusive BOSS-Tech functionality automatically adjusts the output signal to the correct margins.
You just need to aim the DAT HD antenna and forget about the installation.

w w w . d a t h d . c o m

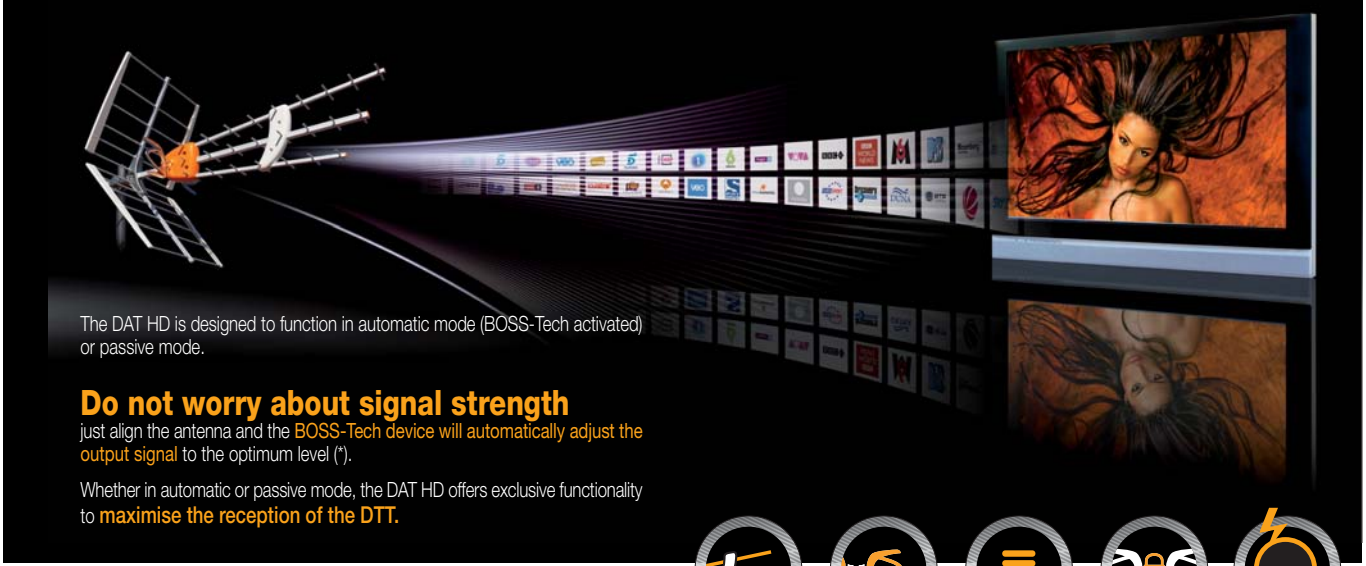
ANTENNA FOR TDT & HDTV

DAT HD

Televes®

WITH BOSS TECH
BALANCED OUTPUT SIGNAL SYSTEM

THE FIRST INTELLIGENT ANTENNA



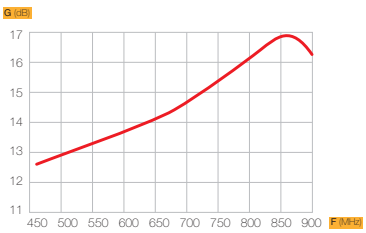
The DAT HD is designed to function in automatic mode (BOSS-Tech activated) or passive mode.

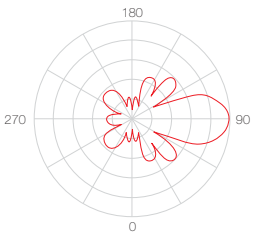
Do not worry about signal strength

just align the antenna and the BOSS-Tech device will automatically adjust the output signal to the optimum level (*).

Whether in automatic or passive mode, the DAT HD offers exclusive functionality to maximise the reception of the DTT.

PRODUCT RANGE	
REF.	DESCRIPTION
1495	DAT HD BOSS multipack
149501	DAT HD BOSS single pack





Reference	1495	
Mode	**Passive**	**Active**
Bands	UHF	
Gain	17 dB	29 dB máx.
Output Level	---	**Self-regulating**
Noise figure	-	2 dB tip.
Recommended signal level	> 75 dBµV	< 75 dBµV
Powering	0 Vcc	12-24 Vcc
Consumption	-	40 mA
Beamwidth	30º	
Windload	120N (130 Km/h)	165N (150 Km/h)

ADITIONAL FEATURES

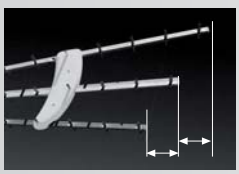
The asymmetrical directors provide **the perfect radiation diagram to reduce ECHOES**

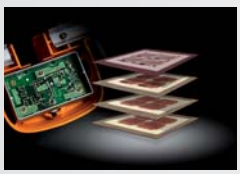
Fully shielded BOSS-Tech **enclosure to protect against impulsive noise**

State-of-the-art Multilayer technology providing highest stability and reliability

Newly patented dipole that greatly improves the reception margins throughout the complete terrestrial band

All the antenna's electronic elements are grounded, **giving unprecendented protection against electrostatic discharges**





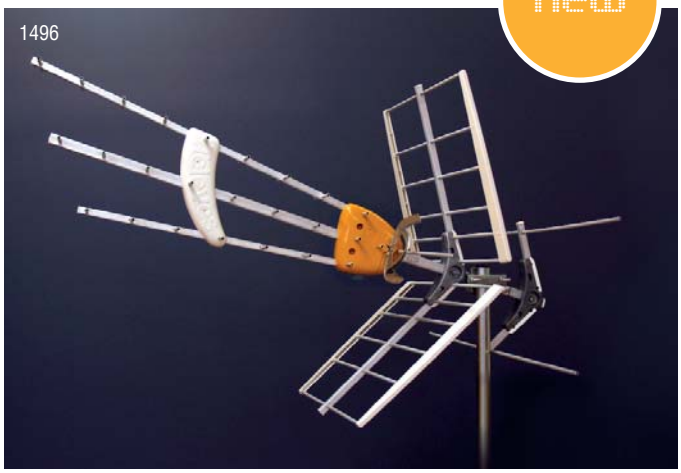
(*) The Automatic Mode is activated with a 12-24Vdc power supply, not included

Dat HD Boss Mix DTT ready

PRODUCT RANGE	
REF.	DESCRIPTION
1496	DAT HD BOSS Mix
149601	DAT HD BOSS Mix single pack

FULLY SHIELDED
F connector

new



- Mixed antenna for BIII (174-230) and UHF (470-862) reception.
- The UHF antenna is a Yagi style antenna of 39 elements, with 24 director elements distributed in a angled array of three rows, giving high directivity and balanced bandwidth.
- The part for the BIII is also a Yagi style antenna of 3 elements, with 1 dipole and 2 reflectors.
- The structure is based on the DAT HD antenna with additional BIII elements.
- The BossTech is activated or not depending on the power supply voltage. The gain regulation affects only to the UHF, allowing the BIII signals to pass through in any working mode.
- Read more about BOSS Tech on page 15.

References			1496/149601			
Band			Passive		Active	
			5-12	21-69	5-12	21-69
Gain		dB	8.5	16	8.5	28 max.
Output level		dBµV	-		Auto-regulated	
Noise figure		dB	-		2	
Powering voltage		Vcc	0		12-24	
Consumption		mA	-		45 max.	
Length		mm	1112			
Wind load	800 N/m²	N	135			
	1100 N/m²		185			

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

VHF/UHF DTT ready

PRODUCT RANGE	
REF.	DESCRIPTION
1030	Logaritmic BIII/UHF

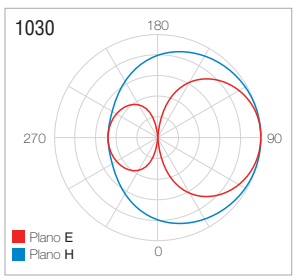
Designed for Band III and UHF reception.

The 1030 is a logaritmic antenna composed of a number of active dipoles, each of them tuned to a diferent frequency. The result is a broadband antenna.

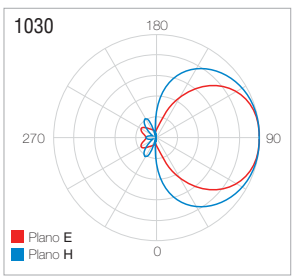
References			1030
Band			5-12/21-69
Gain		dB	8.5/10
Output level		dBµV	-
Noise figure		dB	-
Powering voltage		Vcc	-
Consumption		mA	-
Length		mm	900
Wind load	800 N/m²	N	33.6
	1100 N/m²		46.2

Radiation diagram

VHF



UHF



Monolithic Range DTT ready

PRODUCT RANGE	
REF.	DESCRIPTION
8024	10 Elem., ch. 21-69 (Black)
1108	13 Elem., ch. 21-37, 12 dB
1121	13 Elem., ch. 21-69, 12 dB
112101	13 Elem., ch. 21-69, 12 dB Black

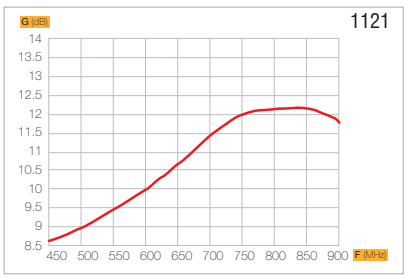
Yagi style antennas composed of 13 or 23 directive elements, triangular dipole and double V-reflector.

FULLY SHIELDED
F connector

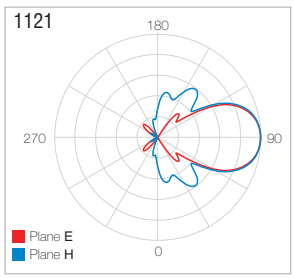
References			8024	1108	1121
Channel			21-69	21-37	21-69
Gain		dB	7	12	12
F/B ratio			15	28	26
Length		mm	757	1174	1180
Wind load	800 N/m²	N	27.8	73	73
	1100 N/m²		38.2	100.3	100.3

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



Infinito DTT ready

PRODUCT RANGE	
REF.	DESCRIPTION
1125	Infinito UHF antenna
1425	Infinito UHF antenna (Single Pack)

This antenna presents a double array configuration, in the horizontal plane, of circular elements made of aluminium thread.

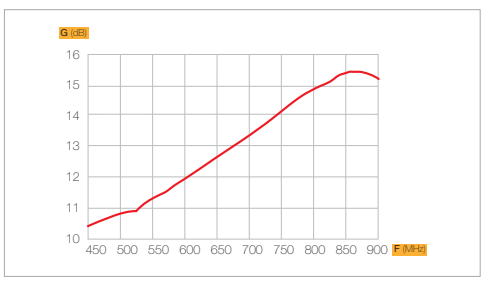
It shares the reflector of the V range antennas and a triangular type dipole in a junction box tested for outdoors.

It is as easy to install as the X-range antennas, simply by rotating its elements, which come folded.

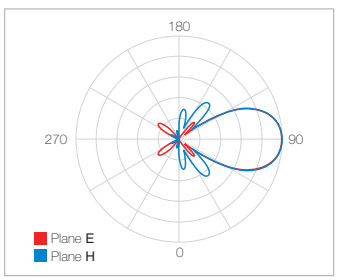
References			1125
Channel			21-69
Gain		dB	15.5
F/B ratio			>25
Length		mm	1044
Wind load	800 N/m²	N	67
	1100 N/m²		92

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



V HD

PRODUCT RANGE	
REF.	DESCRIPTION
1490	V-HD

- Yagi-type antenna made of a dipole, a corner-reflector antenna made up of two parts of five elements each and two grids of 7 director-elements disposed in angle and vertically stacked.
- Made of high quality aluminium. Without iron.
- Total quality guaranteed thanks to its automate manufacturing.
- Directive high-gain antenna and discrete size.
- Integrates an opened/closed dipole that supplies straightness to the answer in frequency.
- Equipped with shielded impedance matching that prevents form the effects of impulsive noise of DTT signals.

Director anchorage system

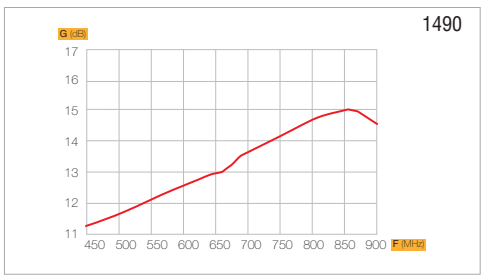
Reflector fixing system

Reflectors of manual insertion, with one single safety screw.

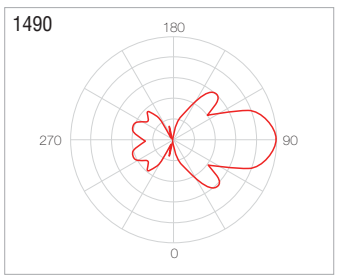
References			1490
Frequency range		Mhz	470-862
Gain		dB	15
F/B ratio			22
Length		mm	890
Wind load	800 N/m²	N	93
	1100 N/m²		128

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



Panel Antenna DTT ready

PRODUCT RANGE	
REF.	DESCRIPTION
1083	4 Dipoles, ch. 21-69, 14 dB

Antenna designed for those cases where the TV signal comes from several close transmitters especially suitable for over-water transmission.

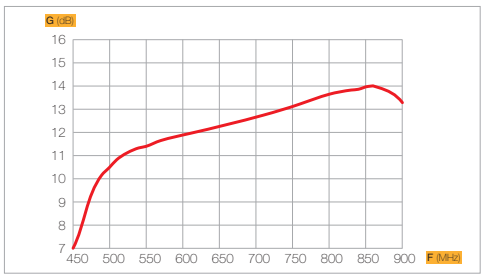
It is composed of 4 dipoles in a vertical pattern and a reflective panel. Dipoles are in phase across of the line that joins them.

FULLY SHIELDED
F connector

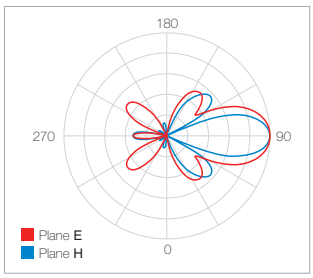
References			1083
Channel			21-69
Gain		dB	14
F/B ratio			20
Length		mm	860
Wind load	800 N/m²	N	139
	1100 N/m²		191.5

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



MRD DTT ready (Valid for Televes antennas, except DAT and Panel)

The MRD reduces impulsive noise and generates enough gain to permit coverage in fringe areas.

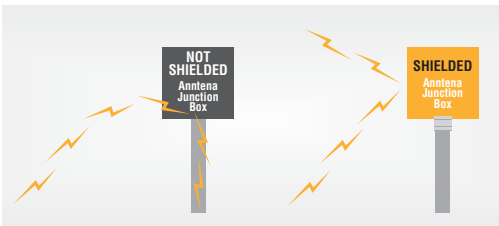
Because of its design, it is possible to install it in the antenna at any time, since:

- When it is not powered it works as an impedance adapter.
- When it is powered it constitutes an effective impulsive noise reducer and a preamplifier with a very low noise figure.

5550

UHF Antennas

References		5550
Frequency range	MHz	470-862
Gain	dB	13
Output level	dBµV	102[1]
Noise figure	dB	2
Powering	Vdc	12-24
Consumption	mA	40



UHF DAT 75 DTT ready

PRODUCT RANGE	
REF.	DESCRIPTION
1097	DAT 75

Very high and directive 75-element antennas for areas where reception conditions are bad.

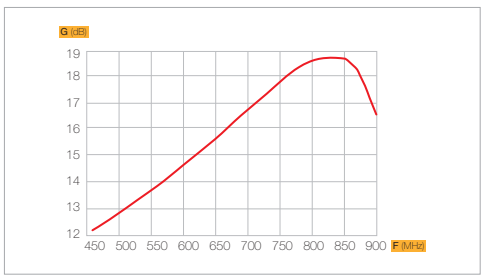
FULLY SHIELDED
F connector

1097

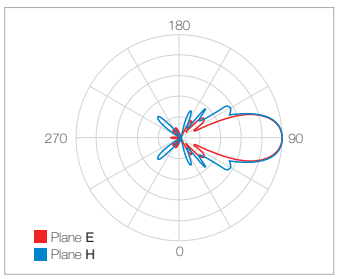
References			1097
Channel			21-69
Gain		dB	19
F/B ratio			32
Length		mm	1825
Wind load	800 N/m²	N	144
	1100 N/m²		198

Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

Frequency response



Radiation diagram



MRD DTT ready

The MRD reduces impulsive noise and generates enough gain to permit coverage in fringe areas.

Because of its design, it is possible to install it in the antenna at any time, since:

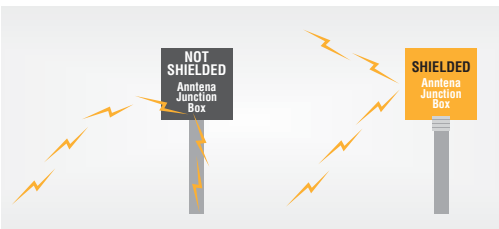
- When it is not powered it works as an impedance adapter.
- When it is powered it constitutes an effective impulsive noise reducer and a preamplifier with a very low noise figure.

5050

DAT Antennas

References		5050
Frequency range	MHz	470-862
Gain	dB	13
Output level	dBµV	102(1)
Noise figure	dB	2
Powering	Vdc	12-24
Consumption	mA	40

(1) DIN45004B



DIGINOVA

PRODUCT RANGE	
REF.	DESCRIPTION
144101	Diginova

Contents:

- 1 Antenna Diginova.
- 3 F-Type Connectors.
- 1 Connector Cap F.

DIGINOVA is a result of the experience acquired by Televes in manufacturing high quality aerials. It was preceded by the NOVA aerial and it is the first of a new generation.

DIGINOVA aerial has successfully passed the most demanding environmental testing: climate (temperature, humidity and radiation) plus vibration resistance tests getting the most important universal certifications.

Product description

DIGINOVA is classified as a high gain antenna. Its performance is due to a 10- element UHF Yagi configuration and a FM/BIII dipole.

Special features

It incorporates a special UHF/BIII **MRD Multiplexor.** This means that:

- If no additional amplification is needed, the aerial can operate in passive mode. Whilst working in passive mode the TV signal reception will not be influenced as the MRD will not attenuate signals.

- MRD couples the BIII+FM together. Additionally when the MRD becomes active it creates a UHF gain of 13dB, endowing it with great versatility.

Televes MRD amplifying concept is supplied with an F connector made with injected zamak. It also complies with the requirements of the Low Voltage Directives 72/23/CEE and EMC 89/336/CCE, modified by directive 93/68/CEE. The following standards have been applied for evaluation: EN 50083-1: 1933/A1: 97 and EN 50083-2: 2001.

Reflector and clamp integrally made in a single piece of zamak

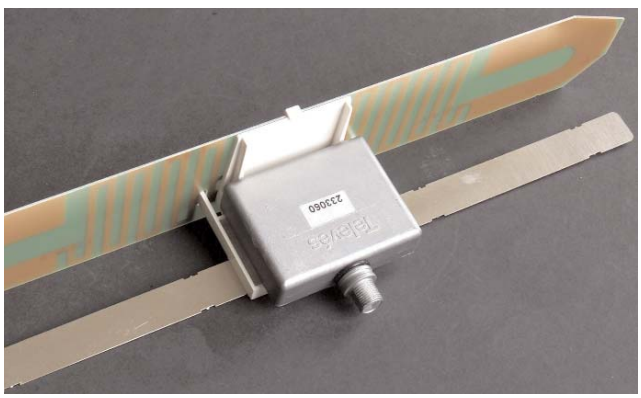
It incorporates a printed dipole, and the UHF aerial is incorporated within the casing in order to:

- Reduce the total size of the aerial, making it very easy to handle.
- Ease of mounting for the installer.

Adaptable to any requirement

A special element carries out the double function of clamp and reflector. Its design notably improves and eases the clamping system. It also enables the installation of vertical and horizontal polarizations.

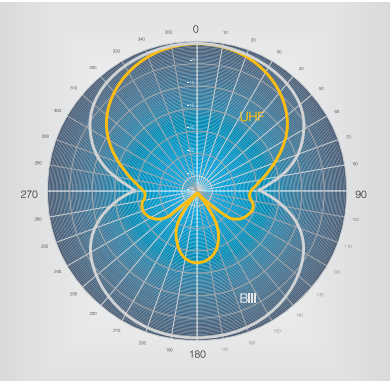
UHF Aerial.- The UHF aerial has a 10- element Yagi structure, consisting of a reflector, a dipole and 8 directors on a new-generation printed circuit board.



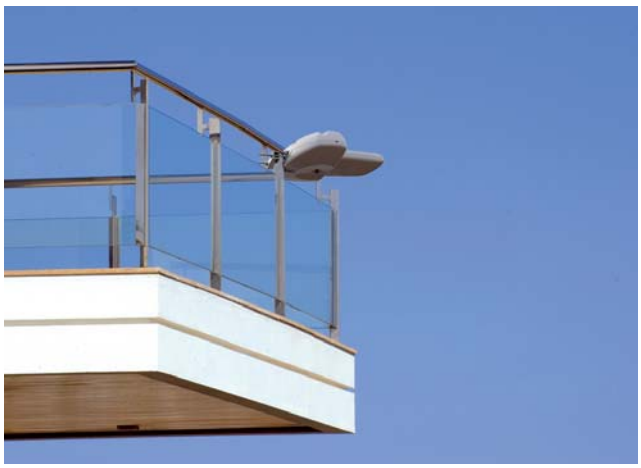
Printed dipole and shielded MRD

MRD.- The amplifier circuit is a mixed MRD. This circuit is characterized by allowing the UHF signal through in absence of voltage, whilst amplifying the signal by 13dB when it is fed with 12-24V(dc). This MRD also mixes FM/VHF signals with UHF channels.

Protection.- The protection "dome" is manufactured from a high U/V ray resistant ABS plastic. It consists of a base and cover joined together with each other and with the alloy clamp through 8 stainless self-adjusting screws that seal the set, protecting it from weather conditions with a protection coefficient of IP22.



Versatility.- This aerial is compatible with multiple configurations, as it does not need an exclusive voltage source. Among many other possible configurations, it can be used with an active source, with an electric current injector, or from a headend (AVANT, single-channel,....).



Ideal for balconies

References		144101		
Signal		FM	BIII	UHF
Antenna gain	dBi	-2		4-7
MRD gain (with external powering)	dB	-		13
Output level (1)	dBµV	-		102
Power supply	V	-	-	12-24
Max. current	mA	-	-	42
Protection index		IP22		

(1) DIN45004B

DIGINOVA

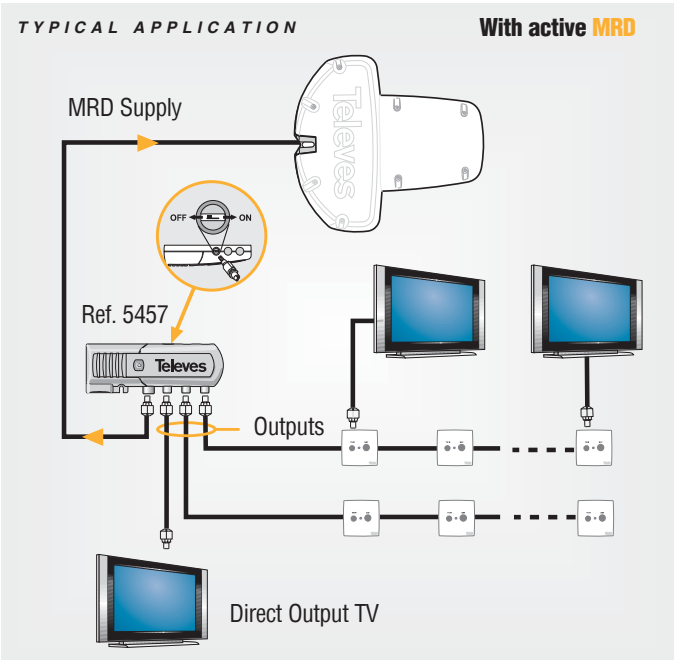
PRODUCT RANGE	
REF.	DESCRIPTION
1441	Diginova Kit

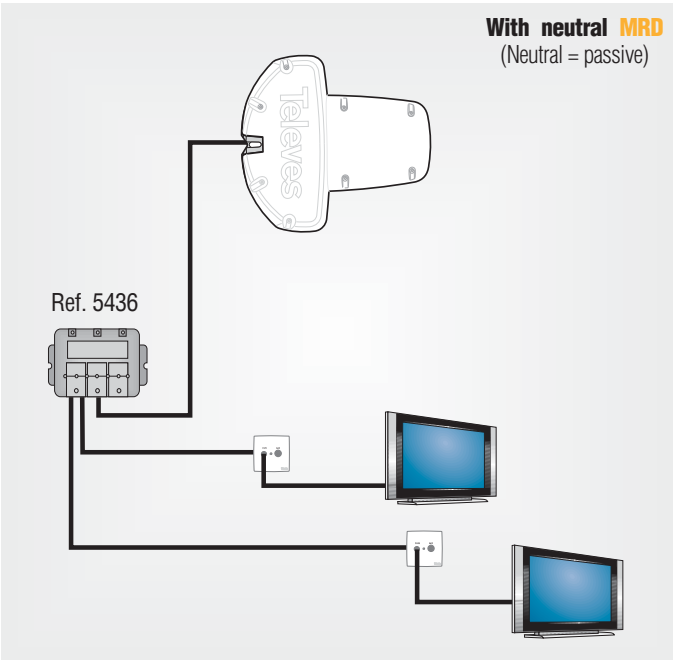
Diginova (Ref. 1441) is supplied together with accessories, among which is an active power supply Ref. 5457, that provides extra gain in UHF and BIII; at the same time allows to distribute the TV signal to several outlets, according to the needs of the house.

Contents of the Kit:

- 1 Antenna Diginova.
- 1 Domestic amplifier (ref. 5457)
- 1 "Current injector" for power supply connection. (ref. 7450)
- 1 Cable reel T-100 (14 meters).
- 1 Male/Female cable of 1,5 m.
- 1 Shielded IEC connector.
- 3 Connectors F-type.
- 1 Connector cap F.

Reference		1441		
Signal		FM	BIII	UHF
Antenna gain	dBi	-2		4-7
MRD gain	dB	-		13
Power supply gain	dB	20		
Power supply gain regulation	dB	12		
MRD ouput level	dBµV	-		102
Power supply output level	dBµV	106		
MRD consumption	mA	42		
MRD powering	V	12-24		





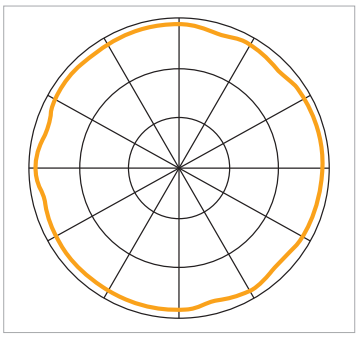
OMNI-NOVA

PRODUCT RANGE	
REF.	DESCRIPTION
1444	Omninova

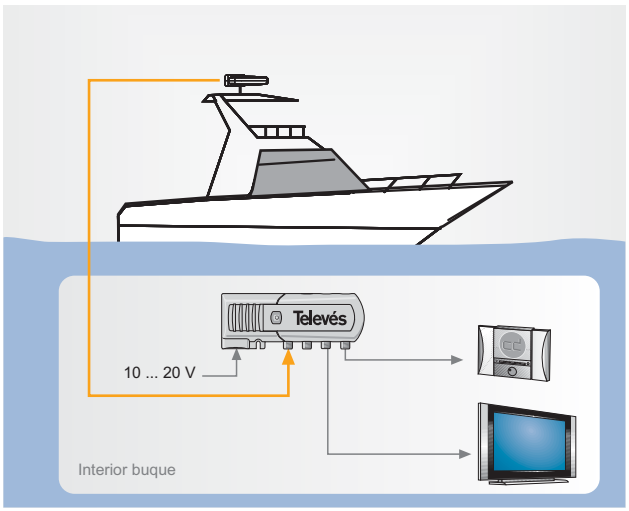
Omni-directional antenna that provides a stable reception in cases of swinging of ships, movement of caravans and other mobile installations.

- **3 Amplifiers**, one for each band (FM, BI-BIII, UHF), which avoid interferences, minimizing crossed modulation effects.
- Incorporates AM Antenna.
- Switching amplification (transparent / active functioning) by means of a switch in the power supply.
- Equipped with rejection-filters for out-band signals, specially for the marine telecommunication bands.
- **Protected from electric shocks**.
- Independent outputs for Radio and TV.
- Completely watertight.
- Made of high resistant materials to nitre, humidity and climatic elements in general.
- Special support that makes the installation easier.
- Complete kit that includes all necessary for installation:
  - Power supply.
  - with switch for active/transparent control
  - Shielded IEC connector.
  - F connector
  - Patch cable male / female 1.3m.
  - 12 Vcc Cable adaptador.

Radiation diagram



TYPICAL APPLICATION



Reference		1444
UHF		
Polarization		Horizontal Omnidireccional
Gain		30 dB
VHF		
Polarization		Horizontal Omnidireccional
Gain	BI	26 dB
	FM	20 dB
	BIII	28 dB
AM		
Polarization		Horizontal Omnidireccional
Gain		-1 dB
Protection index		IP 53
POWER SUPPLY		
Input		11...20 Vdc
Output		10 (ON) / 8 (OFF)
Attenuation	R	1,5 typ (3 máx)
	TV	
Max. current		100 mA
Protection index		IP 53

MIRA

The Indoor Mira Antenna has been especially designed for the reception of terrestrial digital signals.

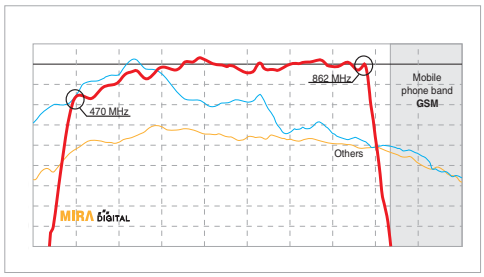
The new MIRA antenna provides:

- Protection against interfering signals from outside the UHF band (it has filters that reject the mobile phone bands).
- Better image quality in analog television.
- Digital TV reception in areas where other domestic antennas cannot guarantee reception.

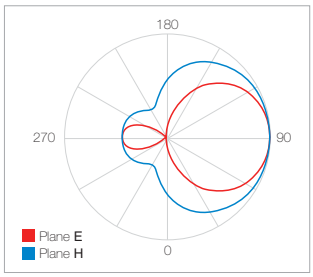
1301

References		1301
Bands	MHz	UHF
Gain	dB	25
Noise figure		2.5
DC Powering	V	12
AC Powering		230
Consumption	mA	75/8 (ON/OFF)

Frequency response



Radiation diagram



Active

PRODUCT RANGE	
REF.	DESCRIPTION
1331	V/U
1308	Lupa

Antennas to be installed indoors, with built-in amplifier.

1308

1331

References		1331	1308
Bands		V/UHF	V/UHF
Gain	dB	20/36	29/36
DC Powering	V	12	9
AC Powering		230	230

Satellite

Satellite dishes made of steel and finished with polyester paint.
Wide range of LNBs to cover any posible solution.

Televes

OFF-SET

PRODUCT RANGE

REF.	DESCRIPTION
	Single pack AL
7599	900 Orange
759901	900 White NEW
7573	1300 Orange
	Single pack iron
7535	650 Orange
7536	800 Orange
7538	800 White
7534	1000 Orange
7572	1100 Orange
7595	1100 White

	Multipack iron	(Units)
7529	600 White	10
7545	650 Orange	10
7546	800 Orange	5
754603	800 Orange	100
7548	800 White	5
754802	800 White	100
7543	1000 Orange	5
7544	1000 White	5
7571	1000 Orange	100
7569	1000 White	100
7570	1100 Orange	100
7568	1100 White	100

Made of steel and painted with polyester to avoid corrosion

Dish size (mm)			650	800	900	1000	1100
Gain at 11.7 GHz		dB	36.0	39.0	39.5	40.5	41.5
Bandwidth		GHz	10.7 a 12.75				
OFFSET angle		(º)	26.5		25	24	
Thickness		mm	1(AL); 0.65 (FE)	0.7	-	0.8	1
Elevation angle		(º)	10···60				
Wind load	800	N/m²	345.6	499.2	706.2	739.2	912
	1100		475.2	686.4	980.4	1016.4	1254

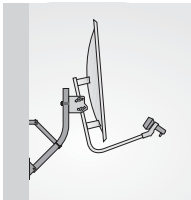
Wind pressure	N/m²	800	1100
Wind speed	Km/h	130	150

- **Aluminium dish**
- **Galvanized steel accessory**
- **Reinforced L-shape clamp**

Details

Supports

PRODUCT RANGE		
REF.	DESCRIPTION *(LENGTH, HEIGHT, DIAMETER)*	
7390	"Y" wall/ground support 294x294	Ø45X1,5
7393	"L" wall support offset 284x194	Ø35X1,5
7349	"L" support 380x350	Ø45X1,5
7371	"L" wall support 500x450	Ø45X2
7576	"T" ground base 750x200	Ø60X2,9
7409	Embedded base for 7392/7576 (325 high)	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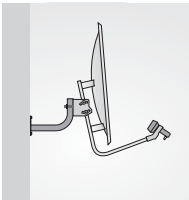
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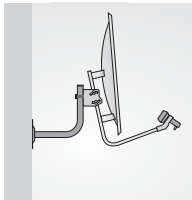
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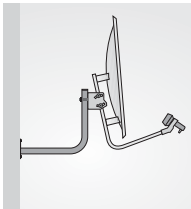
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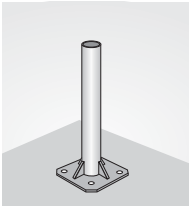
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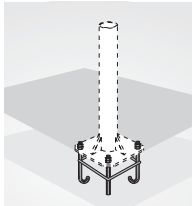

7409

Zinc plated surface as well as an special Reactive Sealing Treatment to increase its resistance against corrosion.

LNB

PRODUCT RANGE	
REF.	DESCRIPTION
7475	Universal single orange
747701	Universal QUATTRO orange
747702	Universal QUATTRO grey
747802	Universal TWIN grey
761001	Universal QUAD grey
7613	Universal OCTO grey
7611	Monoblock (2 LNB) offset dishes (80 cm) grey

7475

747701

Low noise figure and high gain LNBs.

747802

761001

7613

7611

References		7475	7477001/02	747802	761001	7611	7613
Input frequency	GHz	10.7-12.75					
Output frequency	MHz	950/1950 - 1100/2150					
No. of outputs		1 (H/V)	4 (Ha-Va-Hb-Vb)	2 (H/V - H/V)	4 (H/V-H/V-H/V-H/V)	1 (H/V)	8x (H/V- I/h)
Gain	dB	51	57	57	58	57	57
Noise figure	dB	0.5	0.5	0.5	0.5	0.7	
Local oscillator	GHz	9.75/10.6					
Powering	Vdc	12···20					
Max. consumption	mA	90	190	170	180	120	200
Operating temperature	ºC	-30···+60					

Single

PRODUCT RANGE	
REF.	DESCRIPTION
9344	Feedhorn prime focus

Waveguide to receive the electro-magnetic radiation and lead it to the LNB.

9344

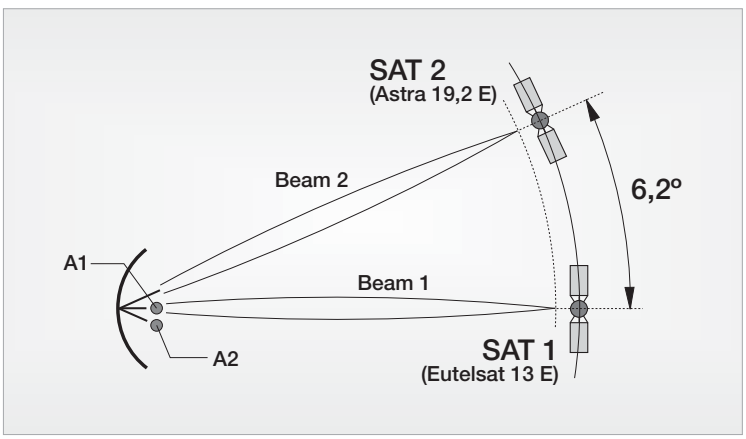
9344

Multisatellite

PRODUCT RANGE		
REF.	DESCRIPTION	
7508	For 800 mm offset antenna	6º
7592	For 1100 mm offset antenna	6º

A Televés patent that allows the user to receive signals from various satellites located in different orbital positions with a single dish.

7508



7592

Accessories

Current injector for LNB powering.

7450

References		7450
Max. input voltage	Vdc	24
Max. current	A	1
Frequency margin	MHz	10-2150
Through losses	dB	0.5
Return losses		>10

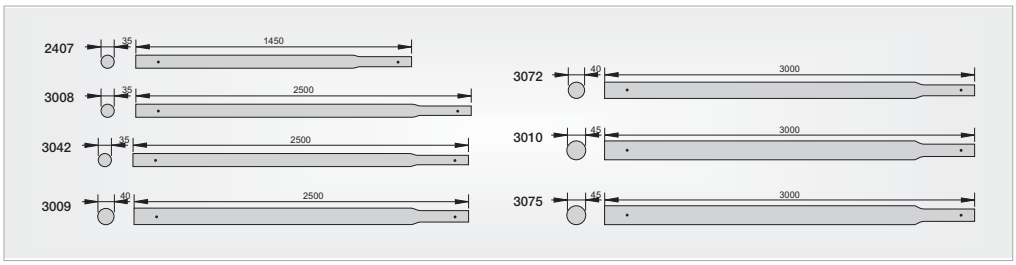
Mechanical accessories

The mechanical accessory line is treated with Reactive Sealing Coating, improving the zinc cover process already applied to every product by adding an extra protection against oxidation.

Televes

Masts

PRODUCT RANGE		
REF.	DESCRIPTION	
3008	35 mm	2,5 m
3009	40 mm	2,5 m
3010	45 mm	3 m
3072	40 mm	3 m
3042	35 mm	2,5 m
2407	35 mm	1,5 m
3075	45 mm	3 m red

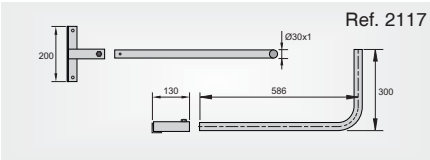


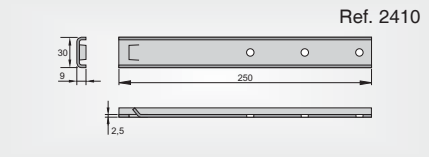
Referencias		3008	3009	3010	3072	3042	2407	3075[1]
Length	mm	2500		3000		2500	1450	3000
Diameter	mm	35	40	45	40	35	35	45
Thickness	mm	1,5	2	2	2	1	1,5	2
Bending moment	Nxm	299,70	508,75	656,75	508,75	207,20	299,70	656,75

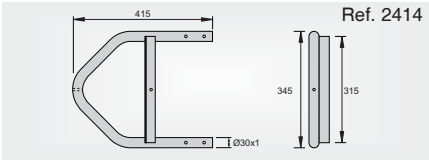
[1] Red

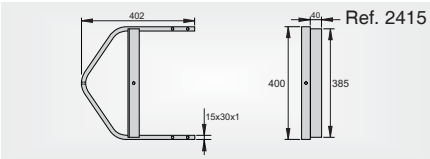
Supports and clamps for masts

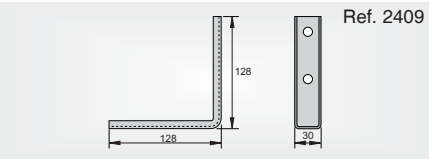
PRODUCT RANGE	
REF.	DESCRIPTION
	Mast clamps
2117	Window mast clamp
	For chimney
2414	Tubular
2415	Reinforced tubular
	For bolting
2409	L-Shape
2401	300 mm “L”
2403	“V” bracket
2404	500 mm “U”
	For embedding
2405	350 mm “I”
2406	500 mm “U” reinforced
2410	250 mm “I” reinforced

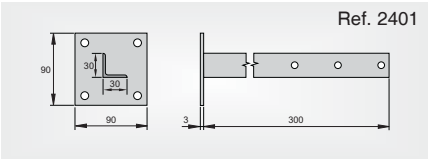


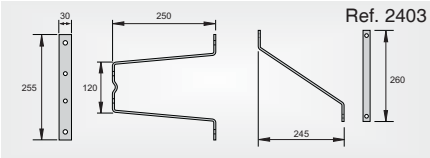


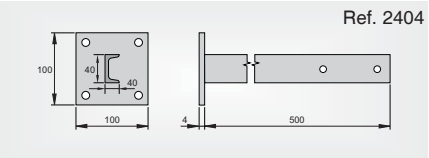


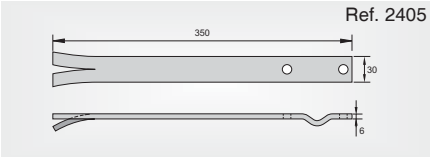


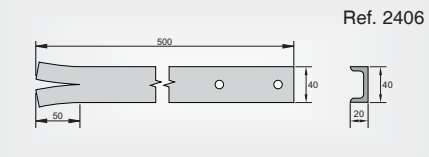












Cables

PRODUCT RANGE	
REF.	DESCRIPTION
	Steel cables
2043	2 mm
2044	2,5 mm
2045	3 mm
3034	4 mm
3059	5 mm

Accessories

PRODUCT RANGE	
REF.	DESCRIPTION
	Cable clips
2000	Opened
2011	Closed
	Accessories
2047	Jaw clamp for masts up Ø45
2408	Saddle & clamp
2412	Corner piece
2413	Mast clamp
4361	Guy wire mounting kit

2000/2011

2408

2412

4361

2413

2047

Towers

PRODUCT RANGE

REF.	DESCRIPTION	
	180 SE RPR (*)	
3014	Upper section	1,25 m
3015	Upper section w/ring	2,5 m
3017	Middle section	2,5 m
	180 RPR	
3022	Middle section	3 m
3021	Upper section	1 m
3023	Upper section	1 m
3051	Upper section	3 m
3052	Lower section	3 m

	360 RPR	
3085	Upper section	
3086	Lower section	
3087	Middle section	
	360 Colour	
308601	Lower section	red
308701	Middle section	red
308702	Middle section	white
308501	Upper section	red

(*) Spanish abbreviation for Reactive Sealing Treatment

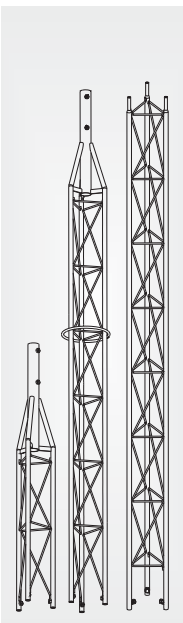
References		180 SE	180	360
Main stainless steel tubes	mm	20x1,5	20x2	30x2
Transversal stainless steel rods	mm	6	6	10
Max. height with mast 3m	m	7,5	20,5	50,5

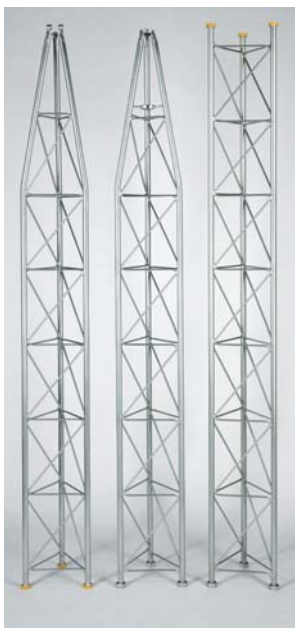
Types of finish

RPR	Red colour	White colour
Reactive Covering Coat	Lacquered in oven with electrostactic powder of Polyester	Lacquered in oven with electrostactic powder of Polyester

Modelos

180SE	180	360
3014, 3015, 3017	3022, 3051, 3052, 3023	3054, 3090, 3053, 3093, 3055, 3091, 3092





Made of steel with shiny zinc and bi-chrome coating, are supplied in two types of finish (RPR or poliester painting). They can be installed at heights from 1 to 50,5 m.

Depending on the model, they implement turned or plugged raccors (SE finishing) for its union.

Installation types (Mod. 180 y 360)

Section by section

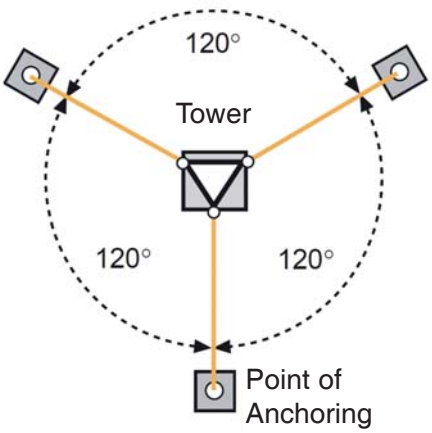
Fixing the lower section to the base in the proper vertical position, and then mounting the consecutive intermediate sections, which will be fixed with the corresponding guy-wire; the assembly is carried out by climbing the already placed sections and raising subsequently the section to be placed, using for it the adequate elevating tools.

The climbing has to be made with the appropiate safety conditions (safety-belt, anchoring, etc.); there won't be more than two sections without shoring up. In case of coinciding two sections without guy-wire, auxiliary guy-wire will be used for the bracing of the sections during the set-up. The tower will be balanced adjusting the tension of the guy-wire and the using of proper balance-appliances.

Complete tower

First assembling the tower over the ground and raising it, once mounted, by means of a crane.

This system can be used only with towers of heights lower than 18 meters in the model 180 and heights lower than 26 meters in the model 360.



Safety

If the installation of the tower is made on the roof, flat roof or other place of a building, the installer will take the necessary measures according to the indications of the architect responsible of the building, in order to know the mechanical resistance of these zones.

Towers (Recommended for special installations)

Model 450

new

PRODUCT RANGE		
REF.	DESCRIPTION	
	450 *(Sections of 3m.)*	
3130	Reinforced low-end	Red
3131	Intermediate	Red
313101	Intermediate	White
3132	Reinforced Intermediate	Red
313201	Reinforced Intermediate	White
3133	Upper	Red

Main characteristics:

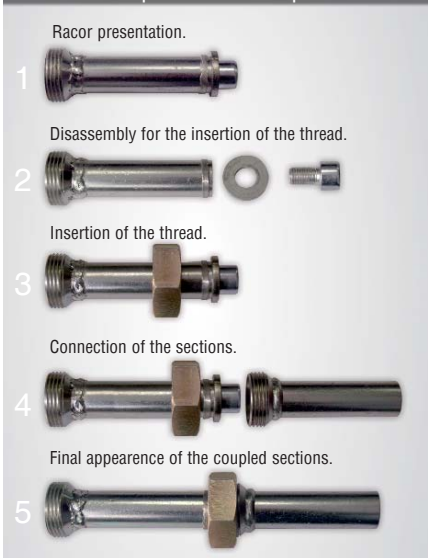
- Two new types of sections are available: reinforced sections (thicker lattice and walltube) and slight sections.
- The reinforced sections will be the ones situated in the lower part of the tower and the light ones will be installed in the higher part. With this is possible to mount higher towers (up to 81m).
- Ideal to assemble towers of a height of 57 till 81m.

These sections incorporate some improvements with regard to the previous range, consisting in:

- **New raccor: detachable element that makes the anticorrosive treatment of the whole section easier, getting a significant increase of the durability of the tower.**
- **New lattice: it increases the mechanical resistance to the torsion and it reduces its weight.**
- **New distribution of footing:**
  - Less number of footing for guy-wire.
  - Reduction of distance needed between the footing for guy-wire and the tower.

3130 | 3131 | 313101 | 3132 | 313201 | 3133

Raccor Improvements implemented



References		450	
		normal	**reinforced**
Main stainless steel tubes	mm	38x2,6	40x3
Transversal stainless steel rods		10	12
Max. height with mast 3m	m	81	

Types of finish

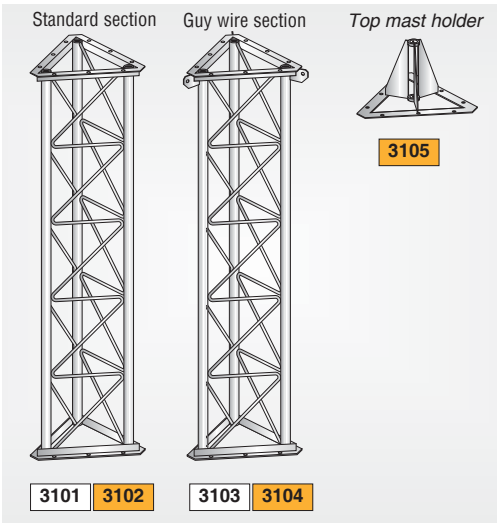
Red colour
Lacquered in oven with electrostatic powder of Polyester

White colour
Lacquered in oven with electrostatic powder of Polyester

Model 600

PRODUCT RANGE		
REF.	DESCRIPTION	
	600 Colour *(Tramos de 3m.)*	
3101	Standard section	white
3102	Standard section	red
3103	Guy wire section	white
3104	Guy wire section	red

Specially designed to achieve heights from 81 to 104 meters.



Types of finish

Red colour
Lacquered in oven with electrostatic powder of Polyester

White colour
Lacquered in oven with electrostatic powder of Polyester

References		600
Main stainless steel tubes	mm	70x4
Transversal stainless steel rods		20
Max. height with mast 3m	m	104

Tower bases

PRODUCT RANGE	
REF.	DESCRIPTION
	180 SE
3019	Frame embedded base
3020	Solid base
	180
3026	Solid base + J-bolts
3038	Solid base + J-bolts
3029	Frame base embedded
3039	Frame base embedded
3056	Pivoting base embedded
	360
3056	Pivoting base embedded
3057	Frame base embedded
	450
3134	Pivoting base embedded
	600
3106	Pivot bearing support
3107	Guy wire base
3108	Tower base bracketry
3109	Guy wire bracketry

3019

3026

3056

3057

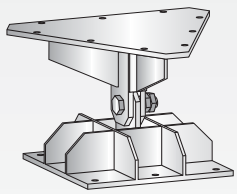
3020

3039

3134

Serie 600

3106



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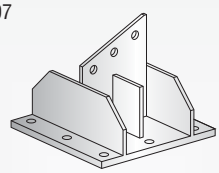
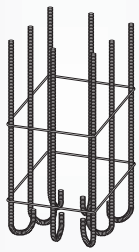


3109



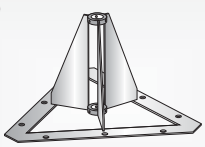
3108

Tower accessories

PRODUCT RANGE		
REF.	DESCRIPTION	
3034	Guy wire	Ø 4 mm
3059	Guy wire	Ø 5 mm
3058	Guy wire ring	(360)
3144	Guy wire ring	(450)
3105	Top mast holder	(600)

600 series

3105



3034

3059

3058

3144

Electronics

Our range of electronic products includes everything the installer may need. Innovative designs to make the job easier and using the most advanced technology to fulfill the Guidelines of the CE standards.

Televes

Mast mixers

Band mixers made of ABS plastic for outdoor use.

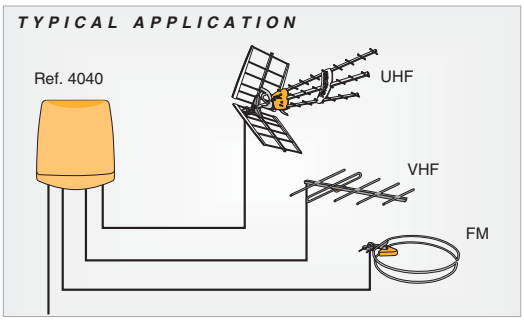
New easy F connectors.

4040

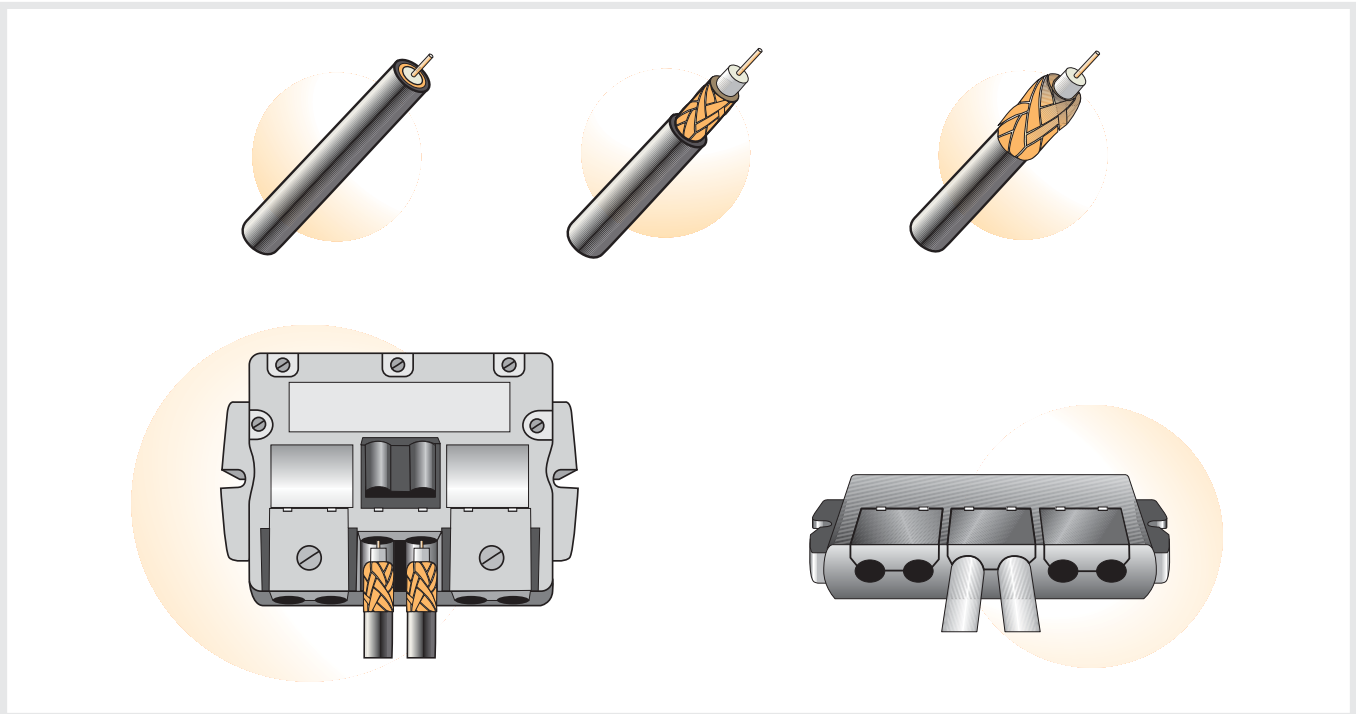
PRODUCT RANGE	
REF.	DESCRIPTION
	Terrestrial
4040	Universal FM-DAB-UHF (dc)
4041	Universal VHF-UHF-UHF (dc)
4334	4041 blister

References		4040			4041		
Mixed bands		BI/FM 47-108	BIII/DAB 174-254	UHF 470-862	VHF 47-254	UHF1 470-862	UHF2 470-862
Through losses	dB	1 typ.		1 typ.	1 typ.	5 typ.	
Return losses	dB	10					
Rejection bet. inputs	dB	>20			>40 (VHF-UHF) >18 (UHF1-UHF2)		
Max. DC bypass	mA	-		100	-	100	-
Protection index		IP 23					

TYPICAL APPLICATION



DETAIL OF THE CONNECTION EASY F



Mast amplifiers

PRODUCT RANGE	
REF.	DESCRIPTION
5356	1in/1out BI/FM/BIII/UHF
5357	3in/1out BI/BIII-FM-U
5358	4in/1out BI/BIII-FM-U-U
5360	3in/1out BI/BIII-UHF-UHF
5362	4in/1out BI-BIII-UHF1-UHF2
	Kits
5688	5356 +PSU 5495
5698	5358 +PSU 5495

Broadband amplifiers made of ABS plastic for outdoor use.

Easy F connector gives the advantages of both F connector and saddle & clamp.

5357

References		5356			5357			5358		
Inputs		BI/BIII/DAB	FM	UHF	BI/BIII	FM	UHF	BI/BIII	FM	UHF1 UHF2
Frequency range	MHz	47-68 175-254	88-108	470-862	47-68 175-254	88-108	470-862	47-68 175-254	88-108	470-862
Gain	dB	25/30	15	41	25/30	15	41	25/30	15	38
Gain regulation	dB	20		15	15	20	15	15	20	15
Noise figure	dB	4								7.5
Output level	dBµV	112		114	112		114	112		114
DC bypass	mA	40 automatic			-		40	-		40
Input rejection	dB	-								18
Powering	Vdc	24								
Consumption	mA	70								
Protection index		IP 23								

(1) According crossover channel: Higher crossover channel: 55 / Lower crossover channel: 30

References		5360			5362			
Inputs		BI/BIII+DAB	UHF1	UHF2	BI	BIII-DAB	UHF1*	UHF2*
Frequency range	MHz	47-68 175-254	470-862		47-68	175-254	470-..(1) .	...-862(1)
Gain	dB	23/27	27	27	24	27	23	23
Gain regulation	dB	20	15		20	15	15	15
Noise figure	dB	7	8		6		11	
Output level	dBµV	111	114		111		114	
DC bypass	mA	40			40			
Powering	Vdc	12						
Consumption	mA	100						
Protection index		IP 23						

1) Crossover channels, Min: 28, Max: 55 - Ref. 5362 Min: 25, Max: 55

Mast Amplifiers. IF Mix range

PRODUCT RANGE		
REF.	DESCRIPTION	
5354	2in/4out	U/Vmix-IF mix 4out
5350	3in/1out	U/Vmix-IF mix
5351	4in/1out	BI/BIII-FM-U-IF mix
5352	4in/1out	U-U-Vmix-IF mix
	Kits	
5696	5351 +PSU 5495	
5697	5352 +PSU 5495	
4386	5350 +PSU 5495 (blister)	
4388	5351 +PSU 5495 (blister)	
5678	535101(black) +PSU 5496	

Broadband amplifiers in a housing made of ABS plastic for outdoor use.

New fast F connector gives the advantages of both F connector and saddle & clamp.

Capable of mixing SAT signals.

5354

Referencias		5354			5350		
Inputs		VHF/UHF		FI	VHF	UHF	FI
Frequency range	MHz	47···254	470···862	950···2200	47···254	470···862	950···2150
Gain	dB	- 9	20	- 12	- 1.5	29	- 2
Gain regulation	dB	-	15	-	-	15	-
Output level DIN 45004-B	dBµV	-	93	-	-	103	-
Noise figure	dB	-	2.5	-	-	2.5	-
DC bypass	mA	-	40	350	-	-	350
Powering	Vdc	12···24					
Consumption	mA	40					
Protection index		IP 23					

References		5351				5352			
Inputs		BI/BIII	FM	UHF	IF	VHF	UHF1	UHF2	IF
Frequency range	MHz	47···68 175···254	88···108	470···862	950···2150	47···254	470···862		950···2150
Gain	dB	18	18	29	-2	-1	27		-2
Gain regulation	dB	15	20	15	-	-	15		-
Output level DIN 45004-B	dBµV	103			-	-	103		-
Noise figure	dB	4.5		2.5	-	-	6.5		-
DC bypass	mA	-			350	-	40	-	350
Powering	Vdc	12···24							
Consumption	mA	40							
Connection type		Easy-F							

(1) Please specify channel when ordering

Power supply units

PRODUCT RANGE	
REF.	DESCRIPTION
5501	130 mA 12 V F connectors
5504	130 mA 24 V F connectors
5495	100 mA 24 Vdc saddle & clamp
5496	150 mA 12 Vdc saddle & clamp

5504

5495/5496

References		5504	5495	5496
Bandwidth	MHz	47-860	5-860	5-2500
Mains voltage AC	V	230	230	230
Mains voltage		24	24	12
Output current	mA	130	110	150
Connection type		F	S&C	S&C
Dimensions	mm	145x45x35	143x75x50	143x75x50

Domestic amplifiers

PRODUCT RANGE	
REF.	DESCRIPTION
	DIGI AMPLIFIERS
5517	Dig-Setback 2 In-4 Out-DC
5514	Digi Ampl 4 Out DC Pass

References			5517	5514
Inputs		no.	2	1
Outputs		01-04	01-02-03-04	
Forward path				
Bandwidth		MHz	47···232 / 470···860	47··· 862
Gain		dB	16	5
VHF/UHF variable gain		dB	12	-
Output level DIN45004B	VHF	dBµV	108	>94
	UHF	dBµV	105	
Rejection between outputs		dB	>25	>25
Noise figure (typ.)		dB	5.5	3.5
Return path				
Bandwidth		MHz	5···30	
Gain		dB	6	8
Output level		dBµV	110	97
Noise figure		dB	16	12
Powering				
Input voltage		V/mA	230 Vac	jack:12Vdc/40mA I/P port: 9Vdc/30mA O/P ports: 8Vdc/10mA
Output line voltage		Vdc	11 (each O/P connector)	-
Max. output line current		mA	10	-

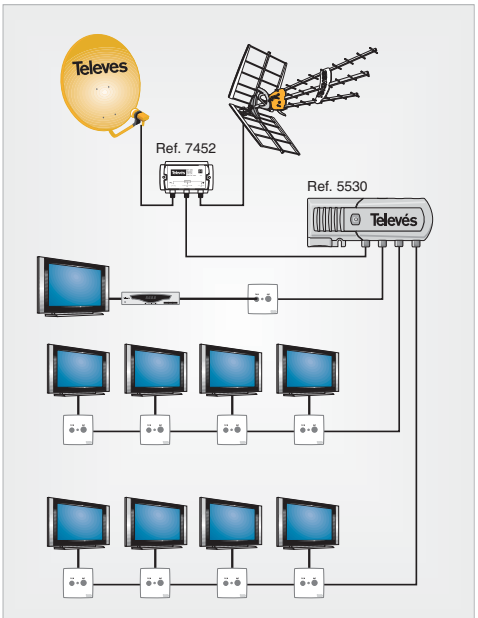
PRODUCT RANGE

REF.	DESCRIPTION
	MATV
5527	IEC, 1 In-1 Out
5528	IEC 1 In-2 Out + TV
5529	IEC 1 In- 4 Out + TV
5457	IEC 1 In- 2 Out + TV, DC 100 mA
5519	F 1 In-1 Out split-band
5522	F 1 In-2 Out + TV
5523	F 1 In-4 Out + TV
5531	F 1 In-6 Out
5530	IF+MATV 1 In-2 Out TV
	CATV
5520	1 In-2 Out + TV Passive Return
5526	1 In-2 Out + TV Active Return
5525	1 In-2 Out + TV Var. Equaliser
5533	1 In-1 Out Passive Return 5-30 MHz
5534	1 In-1 Out Active Return 5-65 MHz
5535	1 In-1 Out Passive Return 5-30 MHz
	SAT IF
5530	IF+MATV 1 In-2 Out TV

References			5527	5528	5529	5522	5523	5531	5519	5457
Bandwidth		MHz	47...862			47...862			47-320 470-862	47-862
Gain	01...06	dB	25	20	16	20	16	16	17 / 27	20
	TV		-	14	13	14	13	-	-3 / 7	14
Variable gain		dBµV	12							
Output level DIN45004B			112	106	102	106	102	103	105	106
Rejection between outputs		dB	-	>20	>25	>20	>25	>25	>25	>25
Noise figure (typ.)			5							4
Input line powering		V	-							12
Input line Max. Current		mA	-							100
Connectors		type	IEC			F				IEC

References				5533	5534	5535	5530	5520	5526	5525
Inputs			no.	1						
Outputs				1			3 (01-02-TV)			
Forward path										
Bandwidth	MATV		MHz	47...862	87,5...862	47...862	47...862	87,5...862	87,5...862	
	SAT IF		MHz	-			950...2400	-		
Gain	MATV	O1-O2	dB	24		34	18	20		18
		TV		-				13		12
	SAT IF		dB	-			19	-		
Output level DIN45004B	MATV	O1-O2	dBµV	112			105*	107		> 106
		TV		-				101		
	SAT IF		dBµV	-			110**	-		
Variable gain			dB	18			8	12		18
Variable equaliser				18			-	-		18
Rejection between outputs				-			>18	>20		
Noise figure (typ.)	MATV			7			5.5	5	5.5	6
	SAT IF			-			<4	-	-	-
Return path										
Bandwidth			MHz	5...30	5...65	5...30	5...30	5...65	5...65	
Gain			dB	-1	20	-1	-9	-7	9	- 7
Powering										
Mains voltage (jack)			Vac	230						
In-Out DC bypass			mA	-			300	-		

(*) DIN45004B (**) 2 tones @ -35dB



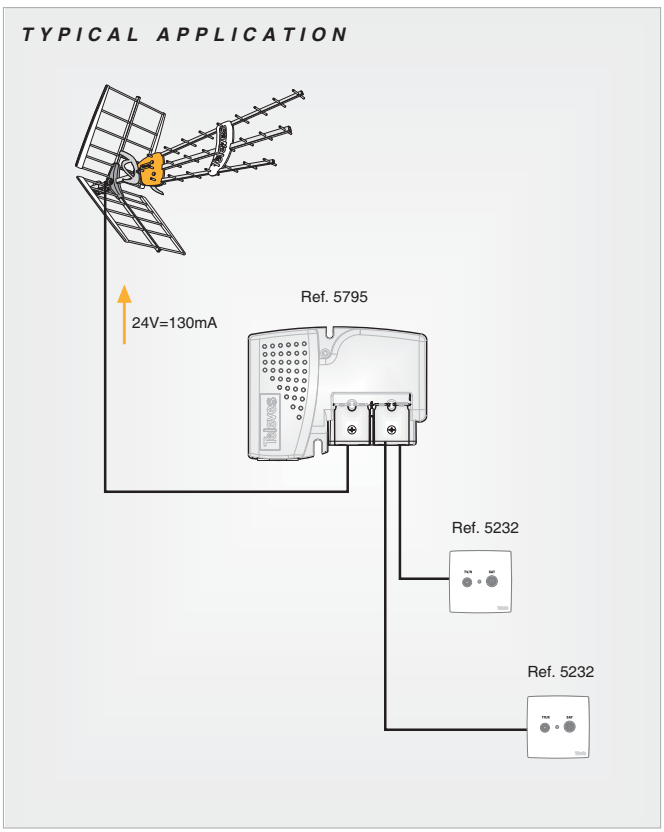
TYPICAL APPLICATION

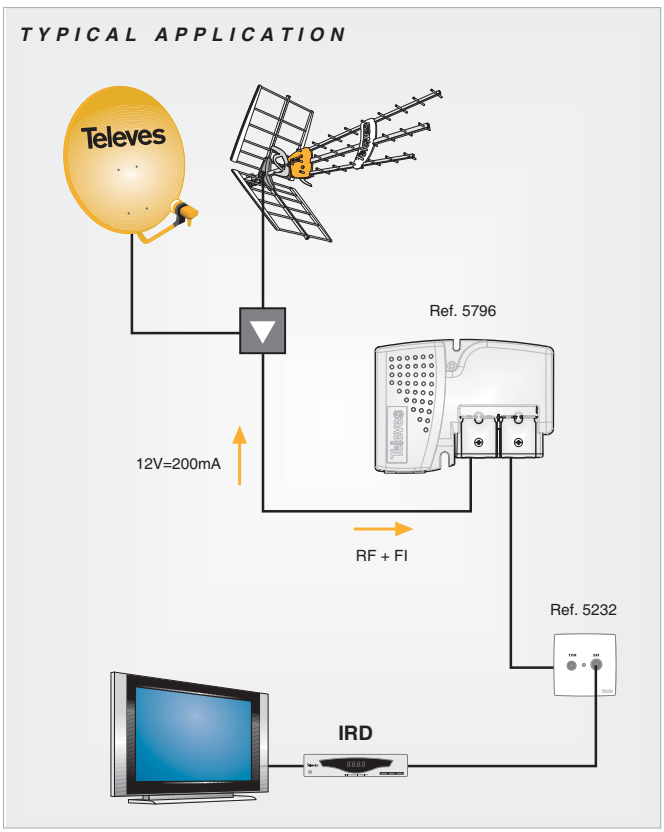
Picokom Series

PRODUCT RANGE	
REF.	DESCRIPTION
5795	130 mA 24 Vdc Picokom
5796	200 mA 12 Vdc Picokom FI-MIX

- High efficiency switched-mode power supply unit
- Ultra compact design
- 40 % lower power consumption

References		5795 / 5796
Frequency Margin	MHz	5-2500
Output voltage	V	12,5
Mains voltage		230
Max. Output current	mA	200
Min. Output current		30
Max. temp. operation		45º C
Protection level	IP	20
Drop out volt.	V	0,35 (typ) @1 50 mA





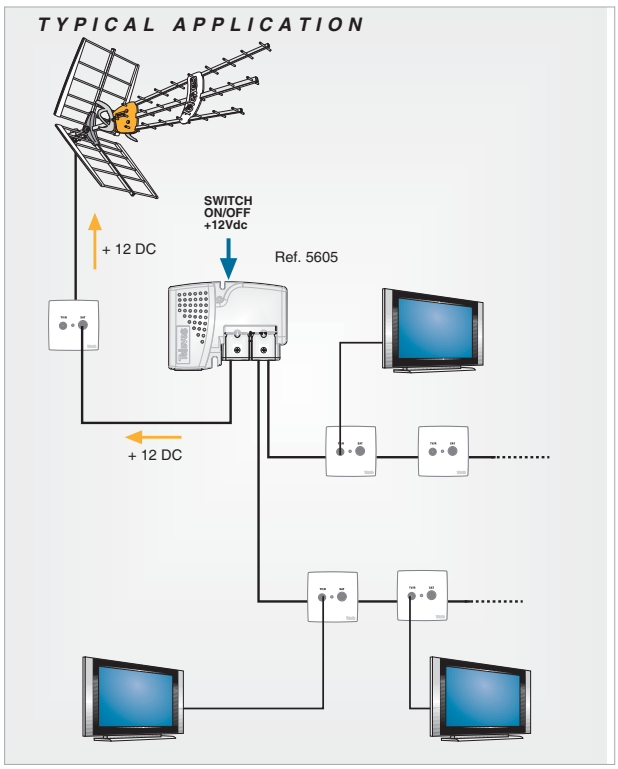
Picokom Series

PRODUCT RANGE	
REF.	DESCRIPTION
5605	Domestic amplifier Picokom 2 outputs

Picokom is a new amplifier design of splitband amplification VHF/UHF with a built-in switched power supply unit.

- 1 Input and 2 outputs
- The amplification is carried out in two independent stages, one for UHF and the other for VHF.
- The Amplifier is able to reach 100 dBuV in VHF and 105 dBuV in UHF.
- Automatic Control Gain (AGC)
- EasyF connectors give the advantages of both F connector and saddle & clamp.

References		5605
Frequency range VHF	Mhz	47-400
Frequency range UHF		470-862
Gain VHF	dB	12
Gain UHF		20
AGC V/UHF		0-20
Output level VHF DIN45004B EN 50083	dBµV	100 typ./min.98
IMD3 (2ch @ -60 dB)	dB	97
IMD2 (2ch @ -60 dB)		87
Output level UHF DIN45004B EN 50083	dBµV	105 typ./min.103
IMD3 (2ch @ -60 dB)	dB	102
Returnt losses I/O	dB	10 tip.
Noise figure **VHF**	dB	<5dBtip./max.6
Noise figure **UHF**	dB	<4,5dBtip./max.5
Mains voltage	Vac	230 ± 15 50Hz
Max power consumption preamplifiers 12Vdc.		150 mA
Amplification consumption V/UHF	Vdc	50 mA
Total max. consumption.	Vac	30 mA ~(2,5W)



Amplification accessories

Line amplifiers

PRODUCT RANGE	
REF.	DESCRIPTION
4006	UHF 13 dB
7485	IF 20 dB

Amplifier powered by means of coaxial cable to adapt the input level in the headend equipment.

The ref. 7485 also allows the powering bypass current for LNB conversor.

References		4006	7485
MATV			
Frequency range	MHz	470-862	
Gain	dB	13	- 2,5
Output level DIN 45004 B	dBµV	98	-
Noise figure	dB	< 4.5	-
IF			
Frequency range	MHz	-	950-2150
Gain	dB	-	20
Output level DIN VDE0855/12	dBµV	-	112,5
Noise figure	dB	-	< 5,5
General			
Consumption	mA	23 (24 Vdc)	60 (12···18Vdc)
Max. bypass current	mA	-	500 (OUT→IN)

4006

7485

Notch filters

PRODUCT RANGE	
REF.	DESCRIPTION
4162	2 ch. 2 adjustments
4007	1 ch. F connector
4163	ABS plastic case

References			4162		4007
Adjustments			2		1
Nº of channels			1	2	1
Insertion losses	UHF	dB	<1		<1
	BIII		<2		-
	FM		<10		-
	BI		<15		-
P_V* Attenuation	P_V n		>35	15-20	>15
	P_V n±1		-	<3	<5
	P_V n±2		<3	-	<1
Connectors			IEC		F
DC bypass			Yes		

(*) Video carrier
n: Tuned channel

4162

4007

Attenuators

PRODUCT RANGE	
REF.	DESCRIPTION
5165	Adjustable 20 dB
4005	0-20 dB adjustable, DC bypass

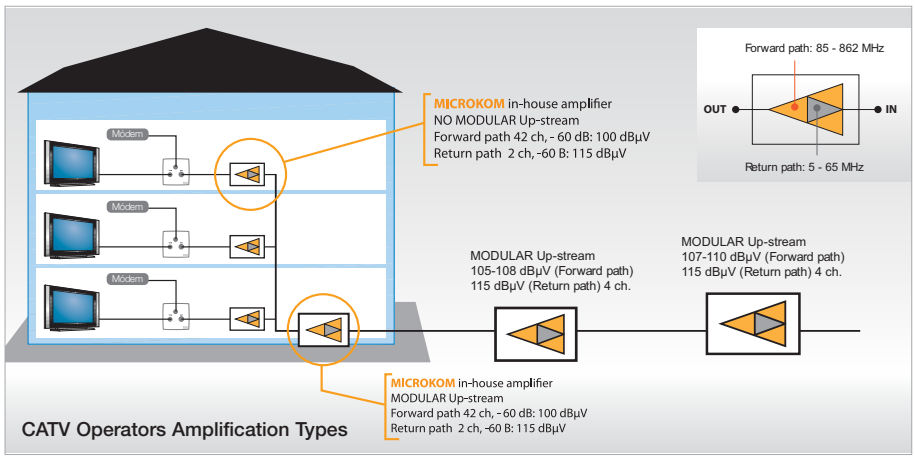
References		5165	4005
Range		adjustable	
Attenuation margin	dB	0-20	
Band	MHz	47-860	5-2200
DC bypass		Yes	

4005

MicroKom series Home applications for Cable Operators

PRODUCT RANGE	
REF.	DESCRIPTION
5342	Microkom 20/20 dB 5-65 MHz
5343	Microkom 30/25 dB 5-65 MHz
5344	Microkom 35/28 dB 5-65 MHz
	Modular Return Path 5-65 MHz
5346	Microkom 20/20
5347	Microkom 24/20
5366	Microkom 30/25
5367	Microkom 35/28

- Configuration by means of internal jumpers
- Feature both system and cable equalisers
- Input and Output -20 dB test connectors



References		5342	5343	5344	5346	5347	5366	5367
Forward path								
Frequency range	MHz	85 - 862						
Gain	dB	20	30	35	20	24	30	35
Noise figure	dB	7,5						
Vout DIN 45004B	dBµV	118						
Vout EN 50083-3 ***IMD3 (2 ch, -60 dB)***	dBµV	115						
Vout EN 50083-3 ***CTB, CSO, XMOD (42 ch, -60 dB)***	dBµV	100						
Gain/Slope Control	dB	18 (2 dB steps)						
In/Out Return Losses	dB	12						
Flatness	dB	±1						
Return path								
Frequency range	MHz	5 - 65						
Gain	dB	20	25	28	20	20	25	28
Noise figure	dB	6						
Slope Control	dB	0/3/6 (3 dB steps)						
In/Out Return Losses	dB	12						
Vout DIN 45004B	dBµV	118						
Vout EN 50083-3 ***IMD3 (2 ch, -60 dB)***	dBµV	115						
Gain Control	dB	18 (2 dB steps)						
Flatness	dB	±1						
General								
Test Attenuation	dB	-20						
Powering	Vac	230 ± 10%						
Max. current consuption	mA	55						
Power supply Type		switch-mode 320 @ 12 Vdc						

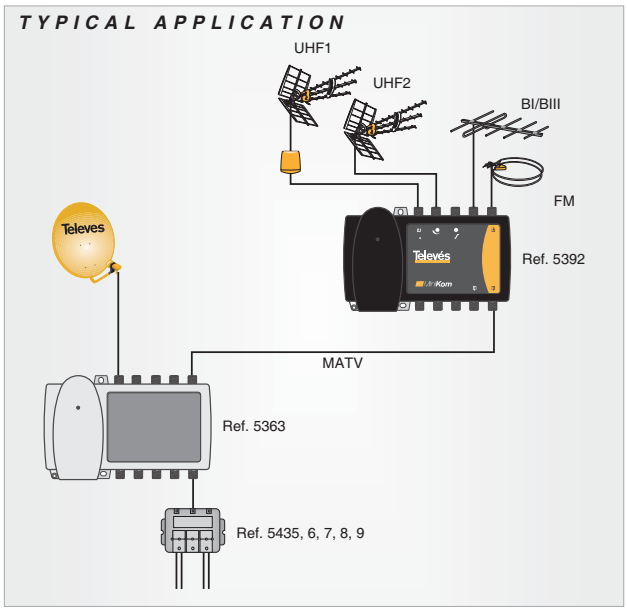
Minikom series - Splitband Amplification

PRODUCT RANGE	
REF.	DESCRIPTION
Terrestrial	
5373	1 input V/U
5392	4 inputs U-V-BI/BIII-FM
5395	5 inputs UHF-BV-BIV-BIII/DAB-BI/FM
5312	3 inputs FM-BI/BIII-UHF
5372	2 inputs V-U (7+1 outs.)+R5-7MHz (UK plug)
537201	2 inputs V-U (7+1 outs.)+R5-7MHz

PRODUCT RANGE	
REF.	DESCRIPTION
5399	2 inputs V-U (swithchable DC bypass, interstage attenuation)
5391	5 in (BI-BIII-BIV-BV-UHF)
IF	
5363	2 inputs (IF + mixed MATV) incudes a 22 KHz switch (0.6 ±1 Vpp)
5317	IF launch amplifier 2 IF inputs + MATV

5317

References		5363	5317
Inputs		IF -MATV	IF1/MATV - IF2
Outputs		IF/MATV	IF1/MATV -IF2/MATV
IF path			
Frequency range	MHz	950-2150	
Attenuator	dB	0-20	0-20
Equaliser	dB	0-12	0-15
Gain	dB	35-45	35-40
Output level DIN VDE 0855/12	dBµV	124	123
Noise figure	dB	<9	10
MATV path			
Frequency range	MHz	47-862	
Attenuator	dB	-	0-15
Equaliser	dB	-	0-20
Gain	dB	-1.5	30-35
IMD 3	dB	-	113
IMD 2	dB	-	112
CSB/CSO/XMOD	dB	-	96
Output level DIN 45004 B	dB	-	117
Noise figure	dB	-	-
Return path	MHz	-	5-30 passive
General			
Powering voltage	Vac	230	230
Max. power consumption	W	14	12
22 KHz tone amplitude	Vpp	0.6±1	-
Max. DC current for LNB	mA	300 (13/17Vdc)	-
Dimensions	mm	180x110x55	180x110x55



References			5373	5392	5395	5312	5372 /01	5399	5391
Inputs			1	4	4	3	1	2	5
Amplified bands			VHF (47-454) / UHF	FM- BI/BIII-UHF1-UHF2	UHF-BV-BIV-BIII/DAB-BI/FM	FM BS/BIII UHF	VHF(47-230)/ UHF	VHF(47-232)- UHF	BI-BIII/DAB - BIV - BV- UHF
Gain	VHF	dB	33	33	24	33	5 (16 - 0+1)	35	35
	UHF	dB	34...43	39	26	43	15 (27 - 0+1)	40	37
Output level DIN 45004-B	VHF	dBµV	115	115	113	115	88 101 (Out +1) 108 (Ret. P.)	117	117
	UHF	dBµV	116	116	117	116			114
Noise figure	VHF	dB	< 6	< 6	6	< 6	2.5	<6	< 6
	UHF	dB	< 6.5	< 8.5	9.5	< 6		<4	< 10
Variable gain	VHF	dB	20	20	18	20	-	20	20
	UHF	dB	15	15		15	-	15	
Max. preamp current		mA	60	60 (UHF1)	40	60 (UHF)	30 (UHF)	60(24Vdc)	60
Dimensions		mm	180x110x55						

Kompact series - Headend amplifiers

PRODUCT RANGE	
REF.	DESCRIPTION
	Multiple input (High or medium power)
5384	HP Kompact 5in/1out FM-BI/BIII-U-BIV-BV
5310	HP Kompact 3in/1out BI/BIII-FM-UHF

5384

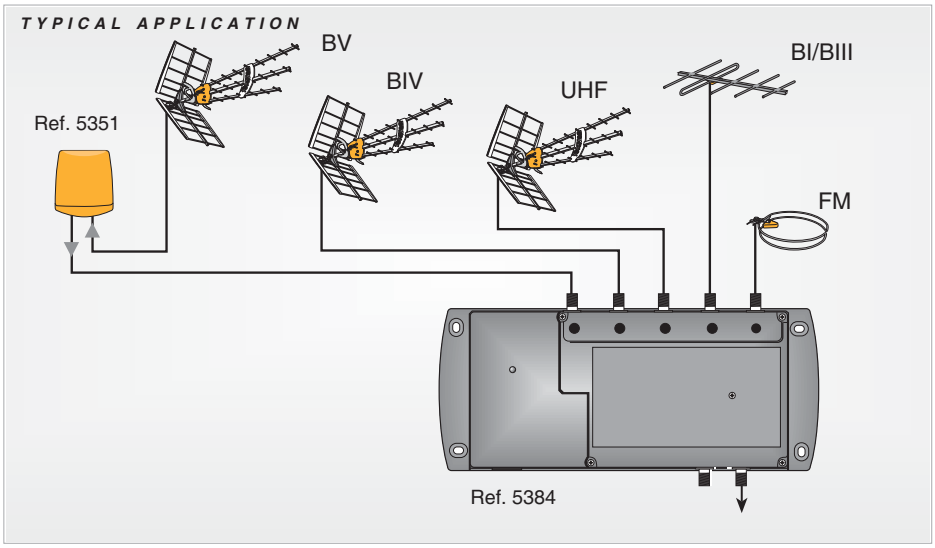
Kompact amplifiers placed in a chassis made of zamak with F connectors.

The amplification is carried out in two independent stages, one for UHF and the other for VHF

Includes a test output and a power supply unit, which has a very low consumption level.

Inputs are provided with attenuators and very selective filters.

References			5384	5310
Inputs			5	3
Amplified band			BI/BIII - FM - BIV - BV - UHF	FM - BI/BIII - UHF
Gain	VHF	dB	49	49
	UHF		53	55
Output level DIN 45004-B	VHF	dBµV	118	118
	UHF		122	122
Noise figure	VHF	dB	< 6	<6
	UHF		< 8	<8
Variable gain		dB	20	20
Max. preamp current		mA	50 (BIV-BV-U) 50 (BI/BIII)	50 (BI/BIII + UHF)
Power consumption		W	30	13
Dimensions		mm	293x147x48	



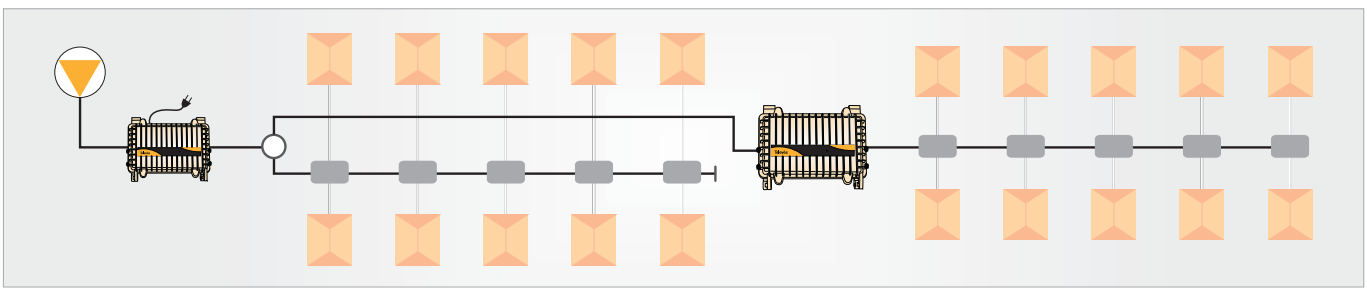
Kompact series - Line amplifiers

PRODUCT RANGE	
REF.	DESCRIPTION
5385	HP. 1in /1out VHF/UHF SPLIT BAND
5308	HP. 1in /1out VHF/UHF BROADBAND
5383	MATV + R5-65 MHz
4510	Hybrid. MATV + R5-30MHz DC line powered
4513	Outdoor R5-65 MHz hybrid AC line powered
4512	Hybrid. MATV + R5-65MHz
4514	Hybrid. MATV + R5-65MHz 120V

4510

References			5308	5385	5383	4510	4513	4512	4514
MATV path									
Frequency range		MHz	47-862	47-422/470-862	86-862	47-862	86-862	87-862	47-862
Attenuator		dB	0-20	0-20	0-20	0-20			
Equaliser		dB	0-18	-	0-6	0-20			
Cable equaliser		dB	-	-	0-13	0-20			
Gain		dB	35-45	49/54	37 (1)	44 (2)	36 (2)	44 (2)	44 (2)
Output level	DIN 45004-B	dBµV	>120	115/121	>114	> 120			
	IMD3 (-60 dB, 2p)	dBµV	117	112/118	111	117			
	IMD2 (-60 dB, 2p)	dBµV	95	96/-	105	111			
	CTB (-60 dB, 42p)	dBµV	88	-	95	104			
	CSO (-60 dB, 42p)	dBµV	88	-	95	104			
	XMOD (-60 dB, 42p)	dBµV	88	-	95	104			
Flatness		dB	3	3	± 0.9	±1			
Noise figure		dB	8	<5.5/<6.5	7.5 typ	<8	<8	<8	<8
Return path									
Frequency range		MHz	-	-	5-65	5-30	5-65	5-65	5-30
Attenuator		dB	-	-	0-20	0-20			
Gain		dB	-	-	12	12			
Output level	DIN 45004-B	dBµV	-	-	115	115			
	IMD3 (-60 dB, 2p)	dBµV	-	-	112	112			
	IMD2 (-60 dB, 2p)	dBµV	-	-	103	103			
Flatness		dB	-	-	±1	±1			
General									
Powering voltage		Vac	230			230	40-60	230	120
Max. power consumption		W	14	23	30	30	15	30	30
Current bypass		A (V)	0.25(Vdc)	-	1 (Vdc)	2 (Vdc)	5 (48 Vac)	2 (Vdc)	2 (Vdc)
Consumption 24 Vdc		mA	220	-	300(3)	430			
Nº. of powered amps		nº (mA)	1 (250)	(50)	2 (600)	1 (450)	-	1 (450)	1 (450)
Dimensions		mm	293x147x48				278x217x100	293x147x48	

(1) with amplifier module, 29 dB without it. (2) with amplifier module, 26 dB without it. (3) with amplifier module, 250 mA without it.



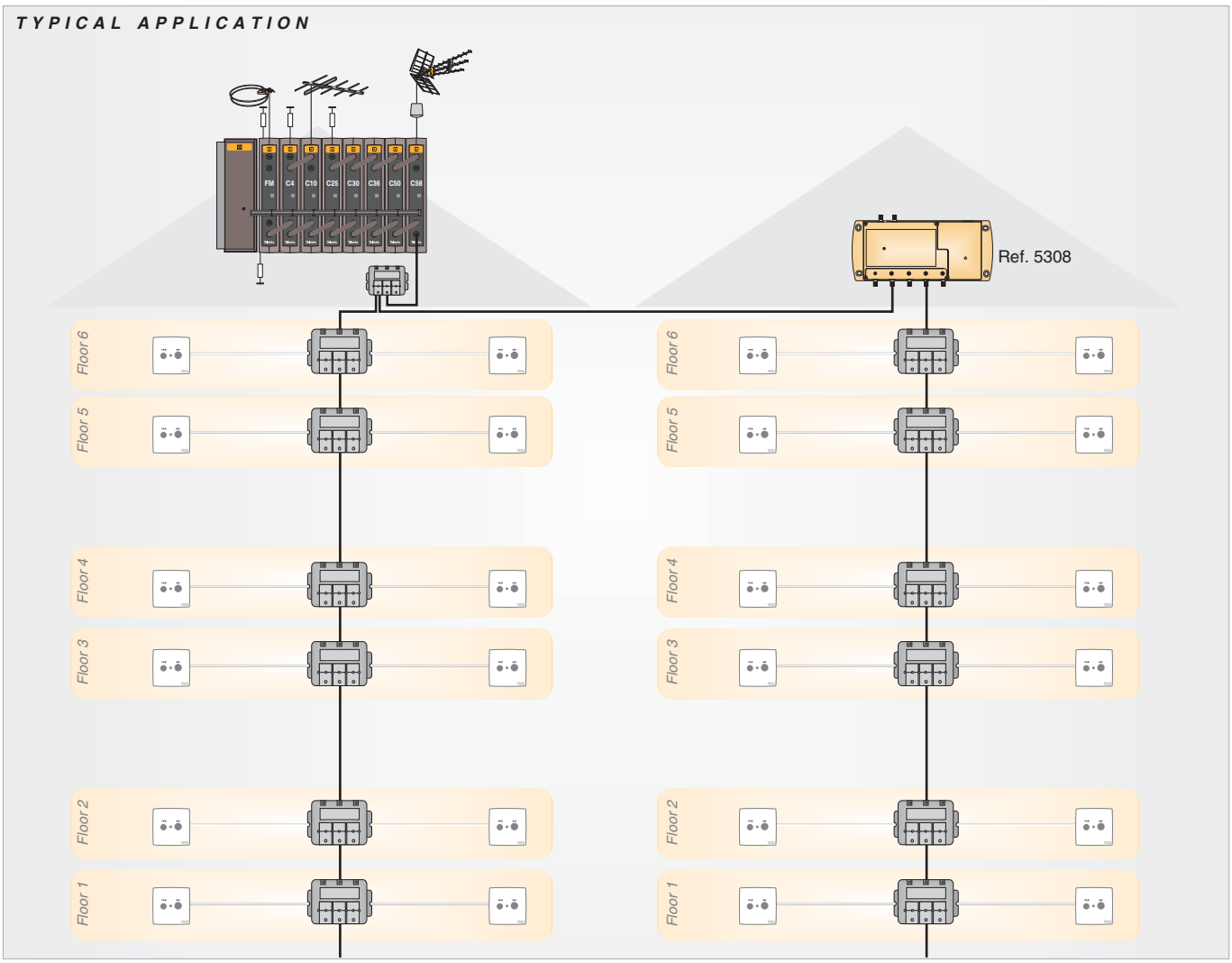
System accessories

5456 AC Outdoor power supply unit

5456

References		5456
Mains voltage	Vac FIC	230±15
Output voltage		57
Max. output current	A	5
Max. power consumption	W	375
Frequency range	MHz	5-860
Dimensions	mm	278x217x100

TYPICAL APPLICATION



Kompact series - Line amplifiers IF

PRODUCT RANGE		
REF.	DESCRIPTION	
5305	LP. Push-Pull.	MATV + IF+ R5-30MHz
5737	LP. Hybrid.	120 Vac - MATV + IF+ R5-30MHz
5398	LP. Hybrid.	MATV + IF+ R5-30MHz
5365	Hybrid. MATV + IF + R5-65 MHz	

* HP - High Power, LP - Low Power

5398

References			5305	5398	5365
IF path					
Frequency range		MHz	950-2150		
Attenuator		dB	0-20		
Equaliser		dB	0-12		
Gain		dB	35-40	38	38
Output level		dBµV	118	121	121
Noise figure		dB	12		
MATV path					
Frequency range		MHz	47-862		87-862
Attenuator		dB	0-20		
Equaliser		dB	0-20		
Cable equaliser		dB	0-20		
Gain		dB	37[1]	36[2]	36[2]
Output level	DIN 45004-B	dBµV	>114	>119	>119
	IMD3 (-60 dB, 2p)	dBµV	111	116	119
	IMD2 (-60 dB, 2p)	dBµV	105	110	110
	CTB (-60 dB, 42p)	dBµV	90	100	100
	CSO (-60 dB, 42p)	dBµV	90	100	100
	XMOD (-60 dB, 42p)	dBµV	90	100	100
Flatness		dB	±2	±1	±1
Noise figure		dB	<10		
Return path					
Frequency range		MHz	5-30		5-65
Attenuator		dB	0-20		
Gain		dB	15	20	20
Output level	DIN 45004-B	dBµV	115	115	115
	IMD3 (-60 dB, 2p)	dBµV	112		
	IMD2 (-60 dB, 2p)	dBµV	103		
Flatness		dB	±1		
General					
Powering voltage		Vac	230		
Max. power consumption		W	23	30	30
Current bypass		A	0.4(VdC)	1.5	1.5
Consumption 24 Vdc		mA	350	600	600
Nº. of powered amps			1 (400 mA)	1 (350 mA)	1 (350 mA)

[1] 27 without amplifier [2] 28 without amplifier [3] 30 without amplifier

DT Kom

PRODUCT RANGE	
REF.	DESCRIPTION
5340	U-III-I/FM
5341	U-V-IV-III-I/FM
	Power Doubling
451201	5-30 / 47-862
451202	5-65 / 87-862
	Push Pull
5335	5-30 / 47-862 + FI
533501	5-65 / 87-862 + FI
5337	5-30 / 47-862 + FI1 / FI2
5338	47-862
5339	5-30 / 47-862
533901	5-65 / 87-862

- User friendly design
- Input signal detector
- LED for each band
- All controls accessible from outside

POWER DOUBLING RANGE

- up to 121 dBµV for both VHF & UHF
- up to 120 dBµV for 2xIF amplifiers with input equaliser
- High/Low selectable gain
- Active/passive selectable return channel

PUSH-PULL RANGE

- up to 120 dBµV for 2xIF amplifiers with input equaliser
- Active/passive selectable return channel
- High/Low selectable gain
- Line powered (switchable)

MULTI-INPUT RANGE

- 122 dBµV for both VHF & UHF
- High/Low selectable gain
- Selectable input line power: 12/24/OFF
- Input signal detector LED

References	5340	5341
Inputs	UHF-BIII-FM/BI	UHF-BV-BIV-BIII-FM/BI
Output level UHF/VHF dBuV	122 / 118	
Output level RF (42 Ch. CENELEC)	101	103
Gain dB	43-53/43-53	
Connector type	F - Connector	
Power supply	230 Vac	

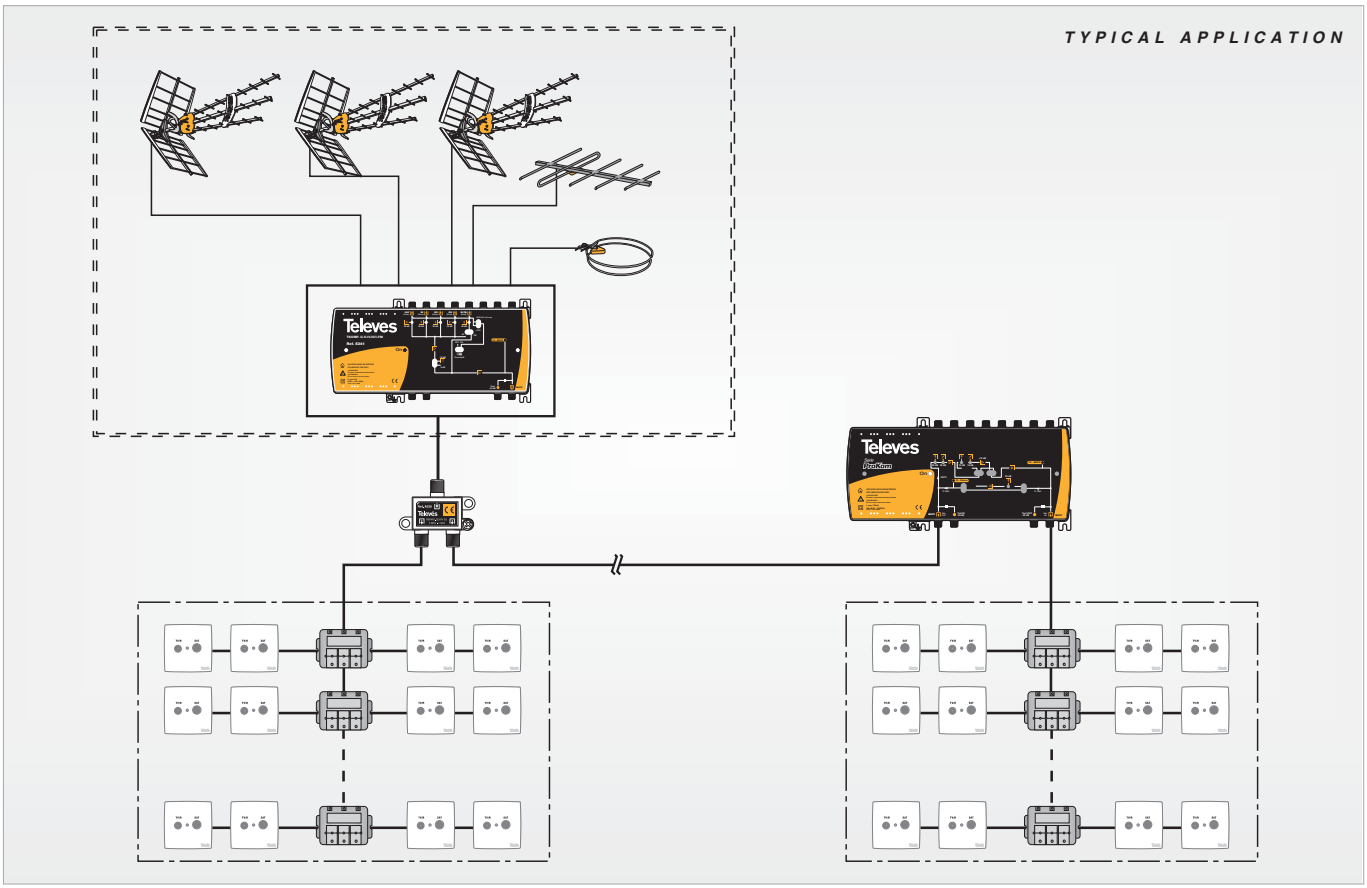
References	451201	451202
MATV		
Frequency range (MHz)	47-862	87-862
Gain (dB)	40-53	
Output level (DIN 45004B) dBµV	129	
Return Path		
Frequency range (MHz)	5-30	5-65
Gain active/passive (dB)	20/-3	
Output level (DIN 45004B) dBµV	116	
Powering (Vac)	196-264	

References	5339	533901
MATV		
Frequency range (MHz)	47-862	87-862
Gain (dB)	41-53	
Output level (DIN 45004B) dBµV	122	
Return Path		
Frequency range (MHz)	5-30	5-65
Gain active/passive (dB)	20/-4	
Output level (DIN 45004B) dBµV	115	
Powering (Vac)	196-264	

References	5338
MATV	
Frequency range (MHz)	47-862
Gain (dB)	41-53
Output level (DIN 45004B) dBµV	123
Powering (Vac)	196-264

References	5335	533501
MATV		
Frequency range (MHz)	47-862	87-862
Gain (dB)	40-53	
Output level (DIN 45004B) dBµV	124	
FI		
Frequency range (MHz)	950-2150	
Gain (dB)	42	
Output level (EN50083)) dBµV	121	
Return Path		
Frequency range (MHz)	5-30	5-65
Gain active/passive (dB)	20/-4	
Output level (DIN 45004B) dBµV	115	
Powering (Vac)	196-264	

References	5337
MATV	
Frequency range (MHz)	47-862
Gain (dB)	34-47
Output level (DIN 45004B) dBµV	123
FI 1 / FI 2	
Frequency range (MHz)	950-2150
Gain (dB)	42
Output level (EN50083)) dBµV	120
Return Path	
Frequency range (MHz)	5-30
Gain active/passive (dB)	17/-5
Output level (DIN 45004B) dBµV	116
Powering (Vac)	196-264



Programmable headend

Avant

CONTROL MODE via modem PC

new

PRODUCT RANGE	
REF.	DESCRIPTION
5328	Avant HD BI/III/DAB-FM-10 UHF-SAT

System accessories	
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit

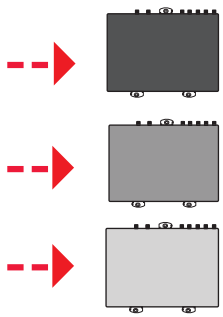
Copy & Paste any configuration with the new Intelligent Handset

2 Easy steps

1 **Copy** configuration into handset

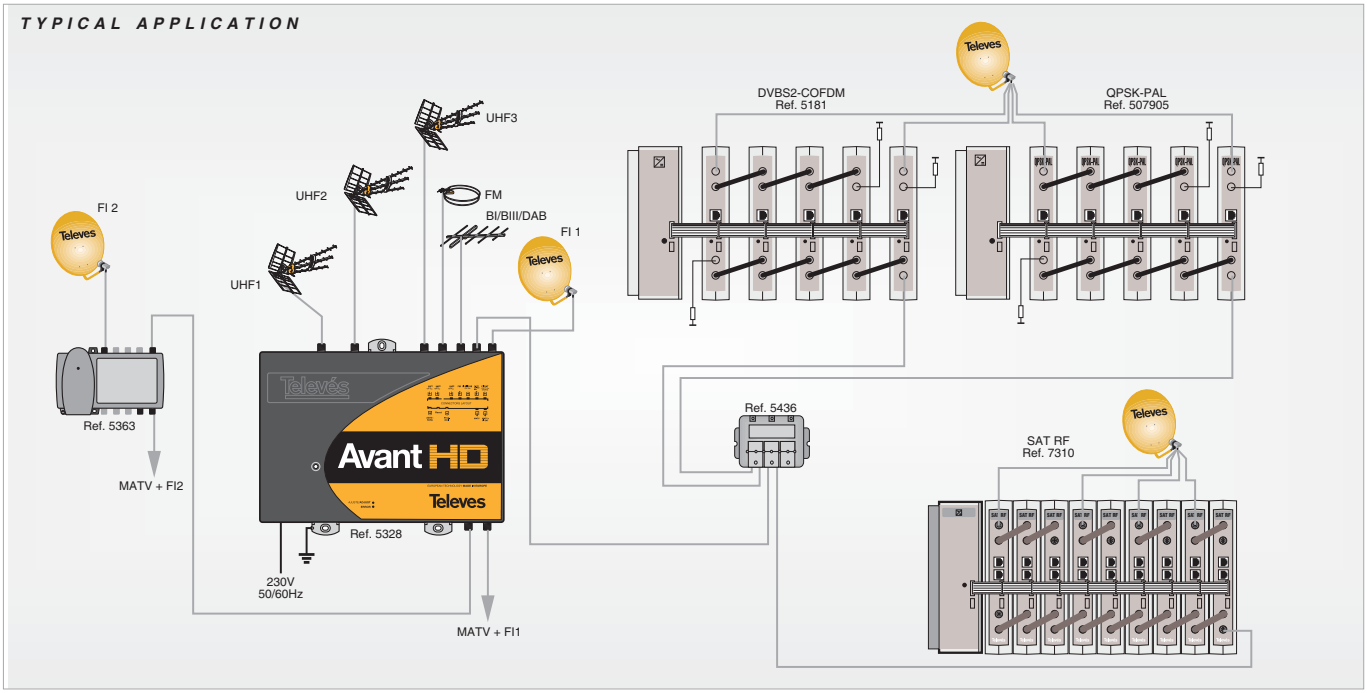
2 **Paste it** to any unit

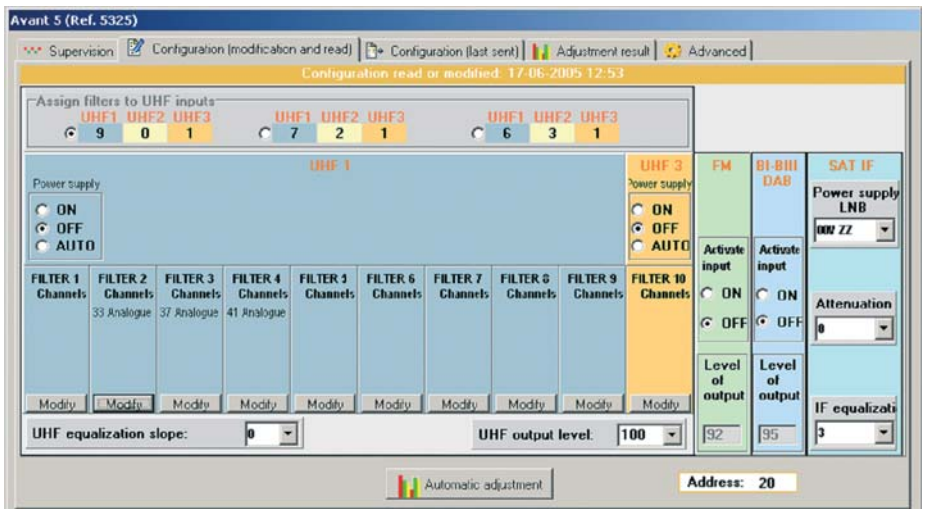
up to 30



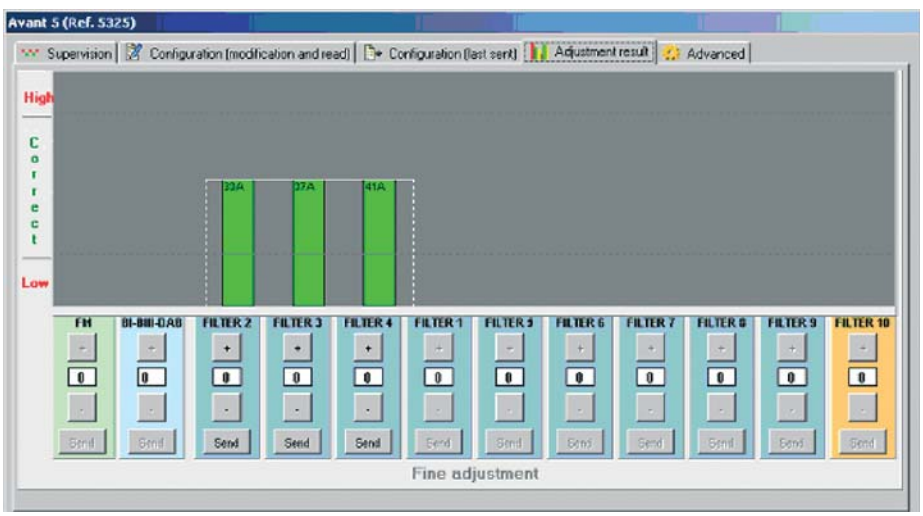
References		5328							
Inputs		**UHF 1**	**UHF 2**	**UHF3**	**FM**	**BI/BIII/DAB**	**VHF/UHF**		**IF/SAT**
Frequency bands	MHz	470-862			87-108	47-68/174-230	47-430	470-862	950-2150
Filters configuration		10	0	0	-	-	-	-	-
		9	0	1	-	-	-	-	-
		7	2	1	-	-	-	-	-
		6	3	1	-	-	-	-	-
		5	3	2	-	-	-	-	-
Nº channels per filter		0-5[2]			-	-	-	-	-
Gain	dB	Automatic							42···45
Gain regulation		0-20[1]			0-25 - OFF[1]		-	-	0-12 - OFF[2]
Optimum input margin	dBµV	60-105			60-85	62-87	69-73	70-74	-
Manual reg. gain	dB	±9 (by single channel)			±9	±9	-	-	-
Slope adjustment		0-9			-	-	-	-	0-12[2]
Output level	dBµV	117[3]			111[3]			117[3]	123
Regulation Output level		96-111			76-101	91-106		96-111	-
Noise figure	dB	9 tip			10		-		9
Rejection		20 (±16 MHz)			20 (±16 MHz)		-		40 (862 MHz)
Input line powering [5]	Vdc	24			-	24	-	-	13/17 (22 kHz)
(Automatic) I max. [4]	mA	60			-	60	-	-	300
Mains voltage	Vac	230±15% - 50/60 Hz							
Consumption	w	30							
Protection index		IP 20							
Dimensions	mm	320x250x60							

[1] Automatic regulation / [2] Programmable / [3] The output level depends of the number of channels / [4] Available current / [5] ON - OFF - AUTO





Avant HD configuration



Avant HD adjustement result

Programmable amplifier

Avant 3

PRODUCT RANGE	
REF.	DESCRIPTION
5326	Avant 3
5327	Avant 3 (Broadband VHF)

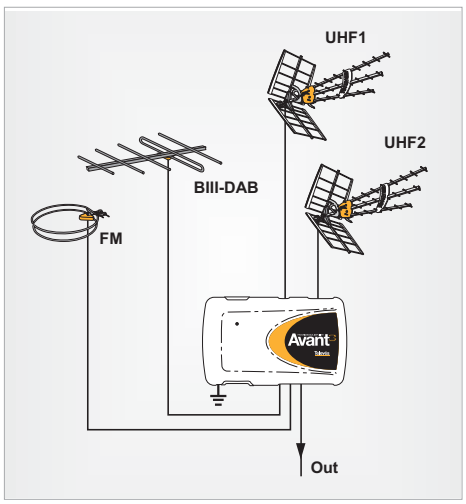
Accesories	
7234	Universal Programming Unit

Main features

- 5 UHF filters and 1 VHF filter
- 2 UHF inputs with two possible filter assigments (2-3 or 5-0); each filter can cluster up to 7 channels.
- VHF input that can cluster up to 4 channels (7-28 MHz) (only 5326)
- Input loopthru to mix the output of another AVANT3
- Broadband output to another AVANT3
- Split-band amplification
- FM/BI input

Ref. 7234 PCT 4.0.

Reference		5326 /5327					
Inputs		**UHF 1**	**UHF 2**	**FM/BI**	**BIII (ref. 5326)**	**VHF (ref. 5327)**	**IN/MIX**
Bandwidth	MHz	CCIR Ch. 21-Ch. 69		47-68 87-108	CCIR Ch. 5-Ch. 12 Ch. S11-Ch. S20	47-406/ 470-862	174-300 470-862
Number of filters/output		2/5	3/0	-	1	-	-
Number of channels/filter		1-5(B.IV) /1-7(B.V)		-	1-4	-	-
General attenuation	dB	0-20					
Filter attenuation	dB	0-15		-	0-15	-	-
Input level	dBµV	60-80		65-90	65-90	-	-
Output level	dBµV	117		-	115	113/116	-
Output level IMD3	dBµV	114		-	112	110/113	-
Rejection	dB	20 (±16 MHz)		20 (±16 MHz)	20 (±8 MHz)	-	-
Noise figure	dB	9 typ / 7 typ		9 typ / 7 typ			-
Input powering (12 dB)	Vac	50 mA	50 mA	-	50 mA	-	-
Powering voltage	Vac	230±20% - 50/60 Hz					



Stand Alone Modulator

PRODUCT RANGE	
REF.	DESCRIPTION
5804	Modulator

Accesories	
5174	Modulator Support 19

The modulator accepts audio and video inputs and it modulates them, according to the standard, to IF 38.9 MHz.

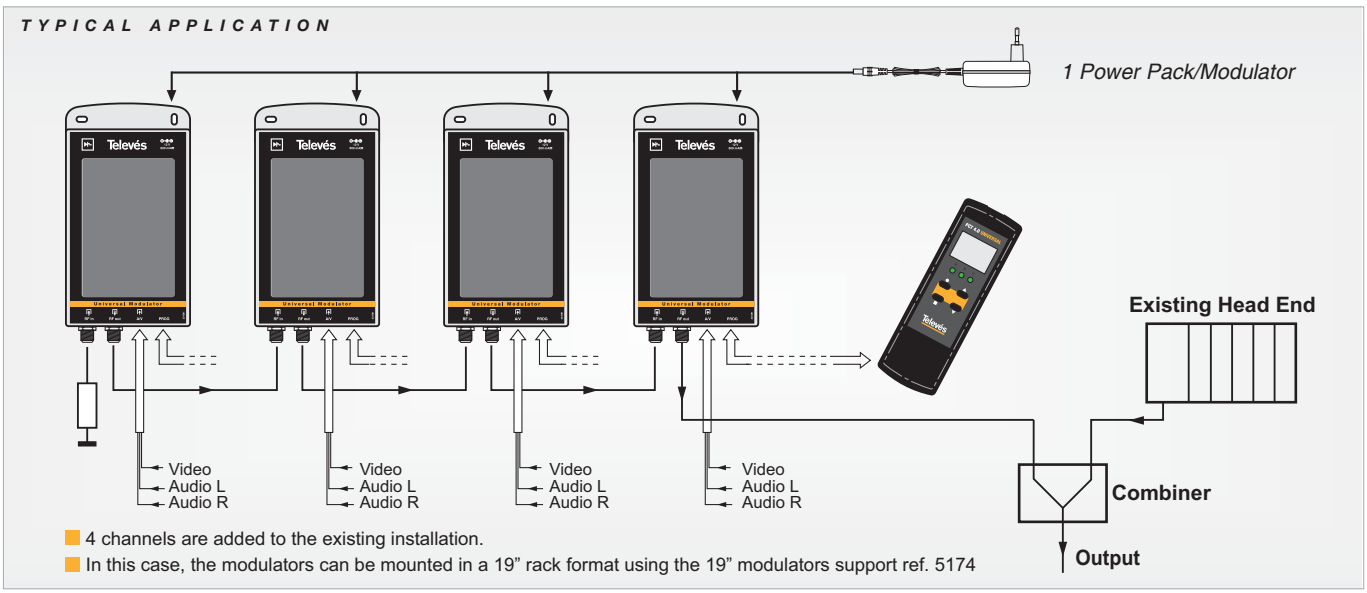
The modulated IF signal converts to any channel or frequency bewteen 46 and 862 MHz and after being filtered, it is amplified to obtain the specified output level.

The different configurable parameters of the modulator, as well as the output level and frequency, are controlled by the universal programmer ref. 7234.

5804

5174

Reference		5804
Video		
Bandwidth	MHz	5
Input level (75Ω)	Vpp	1
Modulation depth	%	73···86
Differential gain	%	-5%(min). 5%(max.)
Differencial phase	(º)	-5º (min). 5º (max.)
Group delay	ns	<100
S/N Ratio	dB	>53
Flatness	dB	<±1
Audio		
Bandwidth	KHz	0,04 ... 15
Impedance	W	10000
Pre-emphasis	µs	50
Deviation (1KHz/1.7Vpp input)	%	programmable
Distortion (1KHz dev.–30 KHz)	%	<1
S/N Ratio	dB	>45
Input level	dBm	>-15···<7
RF Output		
Output frequency	MHz	46-862 (progr.)
Output level (2 ch. and intermodulation at 52 dB)	dBµV	6 dBm (115)
Variable out level	dB	>15
Adjustable Vc/Ac ratio	dB	-11···-18 (progr.)
Loop-through losses	dB	±2.5 (46-862 MHz)
Adjustable Vc/Ac spacing	MHz	4.5 (B/G)
		5.5 (M/N)
		6 (I)
		6.5 (L)
Spurious band level	dBc	<60 typ.
C/N (5 MHz)	dB	>56
General		
Powering	V	12
Max. Consumption	mA	600
Output connectors		F
Dimensions	mm	35x197x163



Single channel amplification

T03 System

PRODUCT RANGE	
REF.	DESCRIPTION
	Amplifiers
5081	BI
5082	FM
5099	DAB
5087	S Low band
5083	BIII
5088	S High band
5089	Hyperband
5086	UHF multichannel DTT
5097	UHF w/AGC
5098	UHF High selectivity
5100	UHF selective
5080	Satellite IF

	Power supply units
5498	T03 PSU 24V/60 W
502905	T03/T05 PSU
	Mounting
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19” Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
	Various
4221	Current injector
5074	F connector Link push fit type
4061	Terminal load F connector 75Ω
5073	Blank plate
4071	F type DC blocker terminal load

5094

References		5081	5082	5083	5085	5086	5087	5088	5089
Bandwidth	MHz	7	20.5	7	32	16/24/32/40	7	7	8
Frequency range	MHz	47-88	87.5-108	174-230	830-862	470-862(1) / 470-862(2)	104-174	230-300	302-470
Gain	dB	50	35	50	57	50	58	58	58
Output level	dBµV	123	114	123	106	111/109/108/108	125	124	125
Standard		EN 50083-5							
Noise figure	dB	<9			<8	<9			
Regulation margin	dB	35	35	35	30				
Rejection between channels	dB	40 (n±2)	30(3)	30 (n±2)	22 (ch.65)	20 (ch.65)	30 (n±2)	30 (n±2)	30 (n±2)
Flatness	dB	<1	<3	<1	<3	<3	<1	<1	<1
Consumption at 24 Vdc	mA	65			90	70	90		
Preamp. max. current (24Vdc)	mA	100							
Dimensions	mm	35x197x83							

References		5097	5098	5100	5099
Bandwidth	MHz	8			37
Frequency range	MHz	470-862			195-232
Gain	dB	57	55	48	45
Output level	dBµV	125/118(4)		120/113(4)	114
Standard		EN 50083-5			di=50dB (2ch 4MHz)
Noise figure	dB	<9	<11	<11	<9
Regulation margin	dB	20	30	30	35
AGC margin	dB	30	-	-	-
Rejection between channels	dB	50 (n±3)	18 (n±1) 50 (n±2)	15 (n±1) 50 (n±2)	20 (n±2)
Flatness	dB	<1	<2	<2	<3
Consumption at 24 Vdc	mA	90			
Preamp. max. current (24Vdc)	mA	100			
Dimensions	mm	35x197x83			

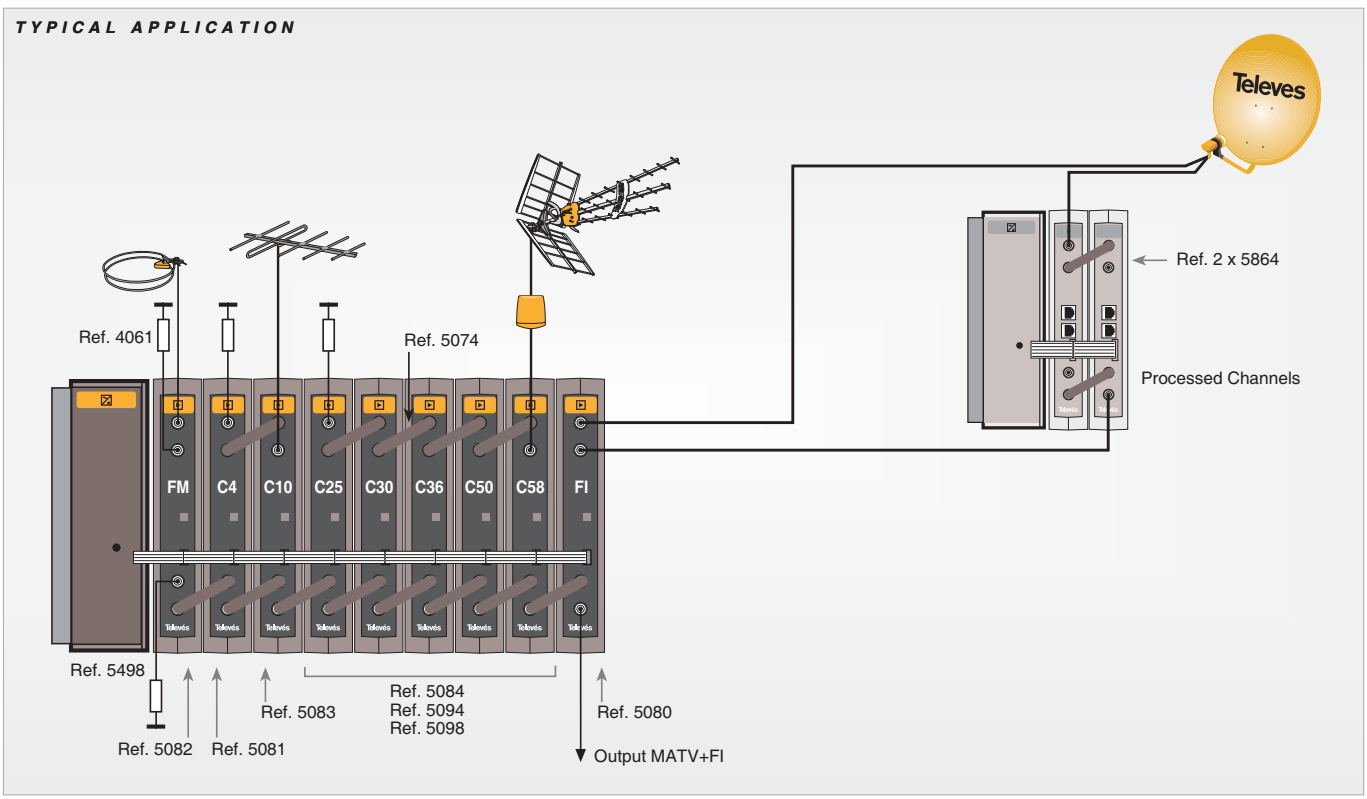
(1) 2, 3 or 4 UHF channels
(2) 5 UHF channels
(3) Rejection at 77 (MHz) and 120 (MHz)
(4) Analog/Digital

Satellite band amplification

T03 System

References		5080
Inputs/outputs		2-1
SAT IF		
Frequency range	MHz	950-2150
Gain	dB	35···50
Equaliser		0-12
Attenuator		0-20
Output level DIN VDE0855/12	dBµV	124
Noise figure	dB	<12.5
MATV		
Frequency range	MHz	47-862
Through losses	dB	1.5
General		
Consumption (24 Vdc)	mA	130
LNB Power supply		400
Dimensions	mm	35x197x83

5080



CDC system

Remote headend controller

PRODUCT RANGE	
REF.	DESCRIPTION
5059	Headend controller CDC

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

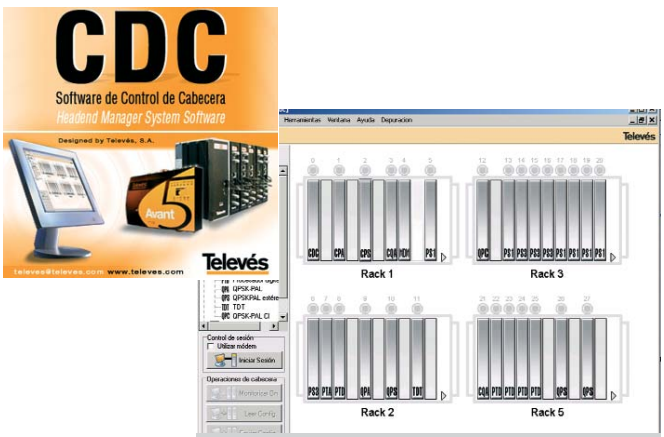
5059

The headend controller allows remote control of a headend by using an external modem connected to the phone line or local control by connecting a PC directly to the headend controller.

The offered services are:

- Remote programming of devices.
- Headend's state monitorization
- Upload the configuration of the headend from a PC.
- Generate a private TV channel.
- State screen information of the headend devices.

References		5059
Devices management		
Max. number of devices in the bus		254
Bus control		RS485, 3 thread
OSD Management		
Headend information screen		4 screen max.
Programmable data screen		4 screen max.
Delay between sreens		programmable
Modem connection		
External modem		serie, compatible AT 9600 baud
Transmition speed		9600 baud
RF VSB Output		
Output frequency	MHz	46-862 (or list of channels)
Frequency steps	kHz	250
Max. output level	dBµV	80±5 (programmable)
Regulation margin	dB	15
USWR Output	dB	14 typ.
Bypass losses	dB	<1.5
Spurious	dBc	60 typ.
TV standard		PAL / NTSC
General		
Consumption	A (Vdc)	0.6 (5); 0.2 (15)



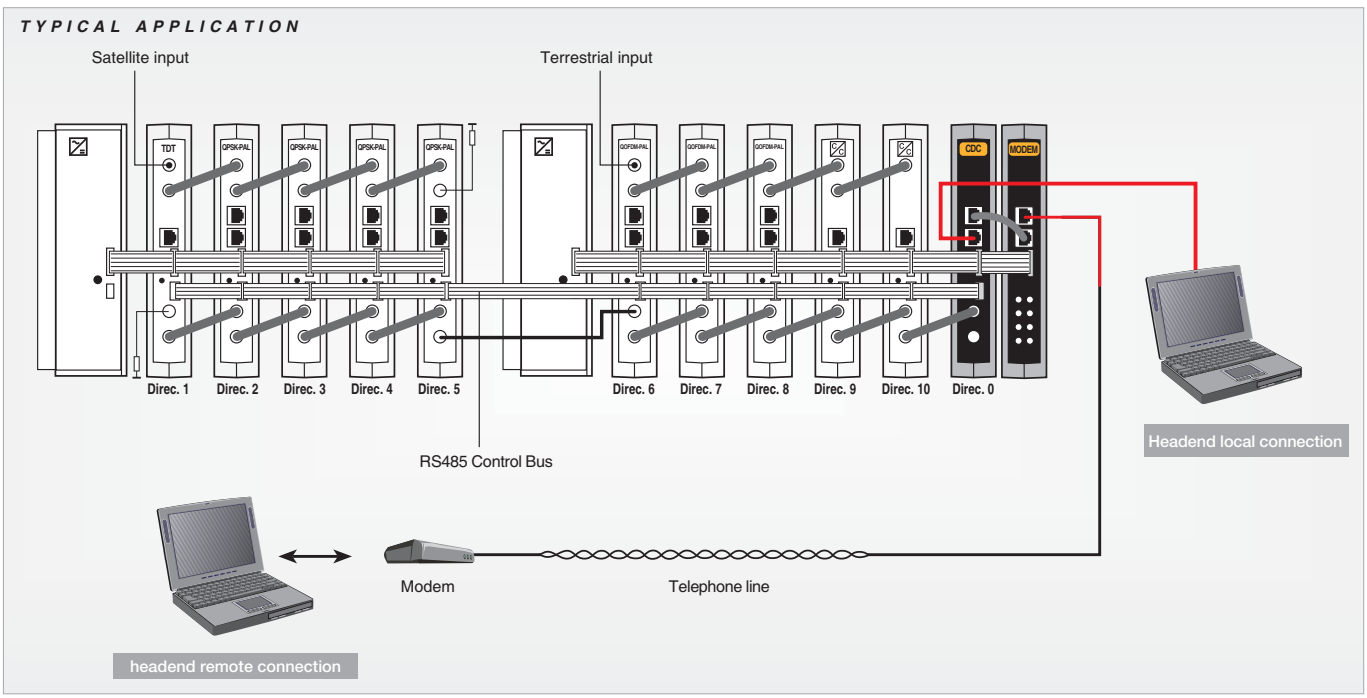
Device management CDC

CDC System – Modem

PRODUCT RANGE	
REF.	DESCRIPTION
5837	IP Modem

5837

References		5837
Serial Interface		RS232 (TX/RX)
Routing Buffer		12 Kbytes x 2
Ethernet Connection		10/100 BaseT
CDC Communication		RJ45 (RS232, TX/RX)
Consumption (5V)	mA	500



Universal modulators

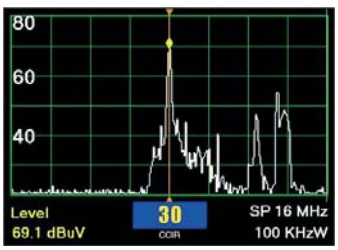
CONTROL MODE
via modem | PC

PRODUCT RANGE	
REF.	DESCRIPTION
5802	Stereo VHF/UHF

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

References		5802
Video		
Bandwidth	MHz	5
Input level (75Ω)	Vpp	1
Modulation depth	%	72.5···90
Differential gain	%	<4
Differencial phase	(º)	<4
Group delay	ns	<100
S/N Ratio	dB	>52
Flatness	dB	<±1
Audio		
Bandwidth	KHz	15
Impedance	Ω	10000
Pre-emphasis	µs	50
Deviation (1KHz/1.7 Vpp input)	%	programmable
Distortion (1KHz desv.±30 KHz)	%	<1
S/N Ratio	dB	>45
Input level	dBµV	>94···<115
RF VSB Output		
Output frequency	MHz	46-862 (progr.)
Output level	dBµV	80±5 (progr.)
Ratio margin	dB	>15
Carrier ratio	dB	-11···-18 (progr.)
Loop-through losses	dB	<1.5
Return losses	dB	>10
V_C / A_C spacing (programmable in ref. 5801)	MHz	5.5
Spurious band level	dBc	<60 typ.
C/N (5 MHz)	dB	>56
General		
Consumption	mA	225(5V) 230(15V)
Dimensions	mm	35x197x163

5802



Output spectrum

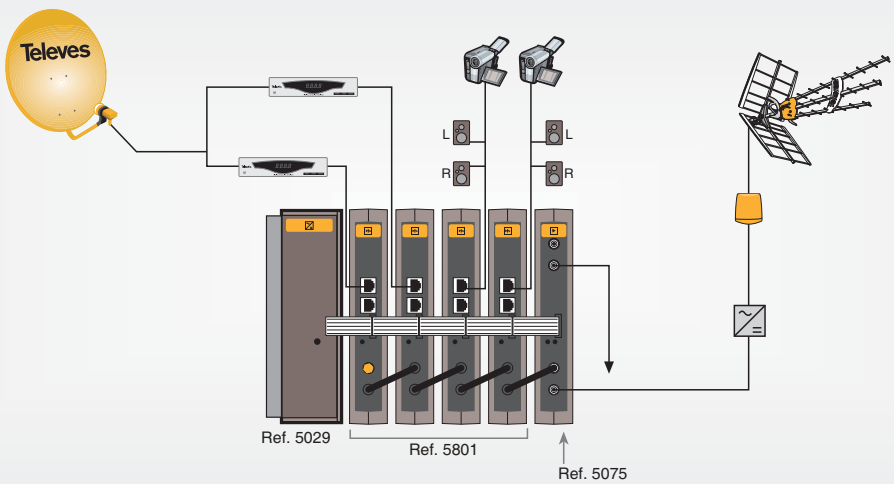
The modulator accepts audio and video inputs and modulates them, according to the standard, in an IF of 38,9 MHz.

The modulated IF signal is up-converted to any channel or frequency between 46 y 862 MHz and, once filtered, is amplified to obtain the desired Output Level.

Programmable parameters:

- Output freq. or channel.
- Output level.
- Audio and video levels.
- Carrier ratio A/V.
- Audio freq. subcarrier.
- Audio selection 1 or 2 .
- Selection signal test.
- Device address.
- Remotely controllable via the CDC.

TYPICAL APPLICATION



A/V - COFDM Modulator

PRODUCT RANGE	
REF.	DESCRIPTION
5540	ASI - COFDM
5541	MPEG-2 QUAD encoder

Generates a DTT multiplex (COFDM) from 4 analog A/V signals.

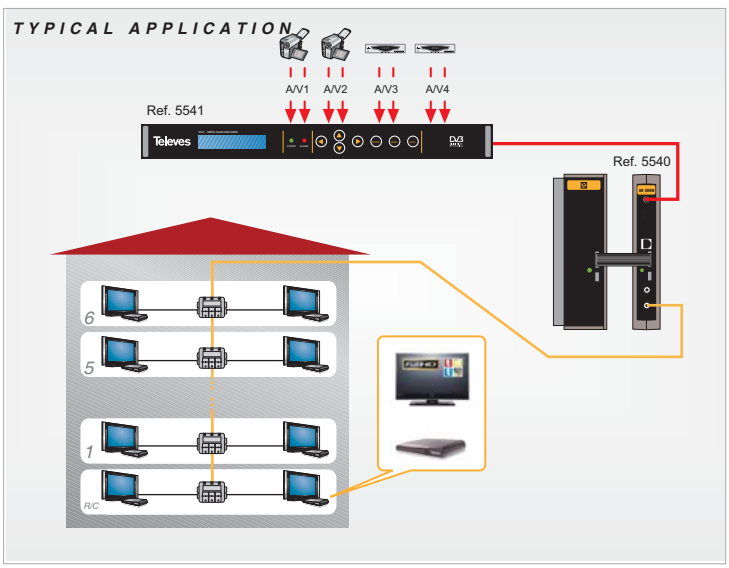
5541

5540

Reference			5540
Standard			EN 50083-9
COFDM Modulation	Bandwidth	MHz	7-8
	Modulation		QPSK, 16QAM O 16 QAM
	IG	µS	1/4, 1/8, 1/16, 1/32
	FEC		1/2, 2/3, 3/4, 5/6, 7/8
Output	Frequency	MHz	117,5-226,5 / 474-858
	Offset	KHz	125 - 166
Power Supply	Powering	Vdc	5 - 15 - 18
	Consumption	mA	350(5V)-175(15V)-70 (18V)

- Adapts analog signals to DTT receiver/tv sets.
- Control of the input signals degree of compression using the MPEG2 encoder (ref. 5541).
- The A/V inputs are fully independent, allowing for different degrees of quality depending on the service (sports, news, etc)
- Locally (front panel) or remotely (IP protocol) configurable.
- All-band output.

Reference			5541
Standard			ISO/ICE11172
			ISO/ICE13818
Video	Codification		MPEG-2 MP@ML (4:2:0)
	Input		CVBS, S-VIDEO
	Bit Rate	Mbps	1,5 - 15
Audio	Codification		MPEG-1 Layer 1
	S.R.	KHz	32, 44.1, 48
Control			LCD + frontal keyboard
			Remote control SMNP
MPEG Output	ASI Bit Rate	Mbps	170
	Package		188/204
Power Supply	Powering	Vac	90-260
	Consumption	W	350(5V)-175(15V)-70 (18V)

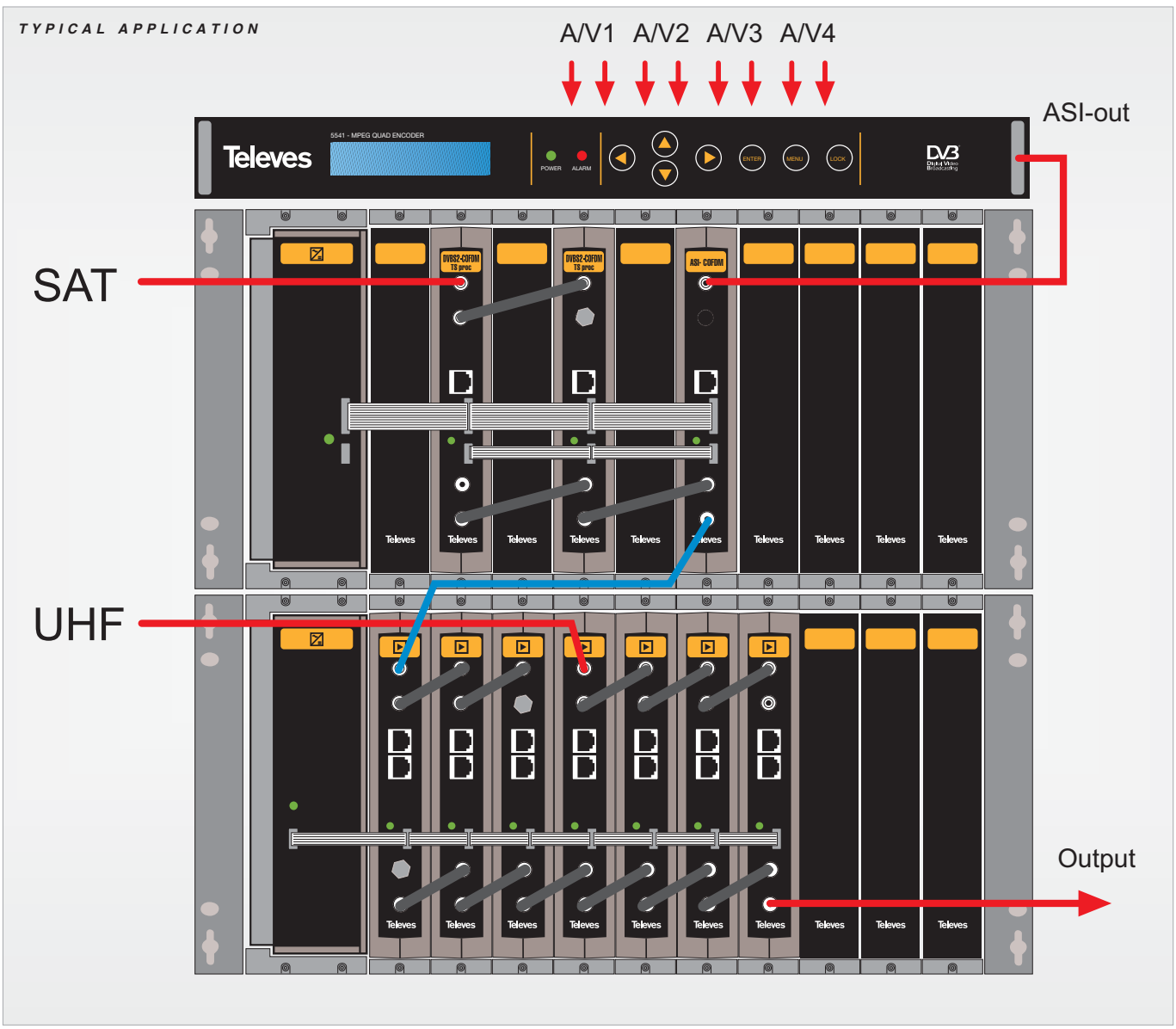


A/V - COFDM Modulator

new

Application example where 4 A/V analog sources (cameras, DVD players...) are converted to a DTT multiplex that is then mixed with two additional TVSAT content multiplexes (DVB/S2-COFDM transmodulator ref. 5181).

These three COFDM multiplexes are amplified with T03 units and then mixed with the DTT signal received in the antenna resulting in a headend that permits the reception of analog services and digital satellite contents in our DTT adapters/receivers.



Analog / Digital Channel Processor

PRODUCT RANGE	
REF.	DESCRIPTION
5179	A/D Channel Processor

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

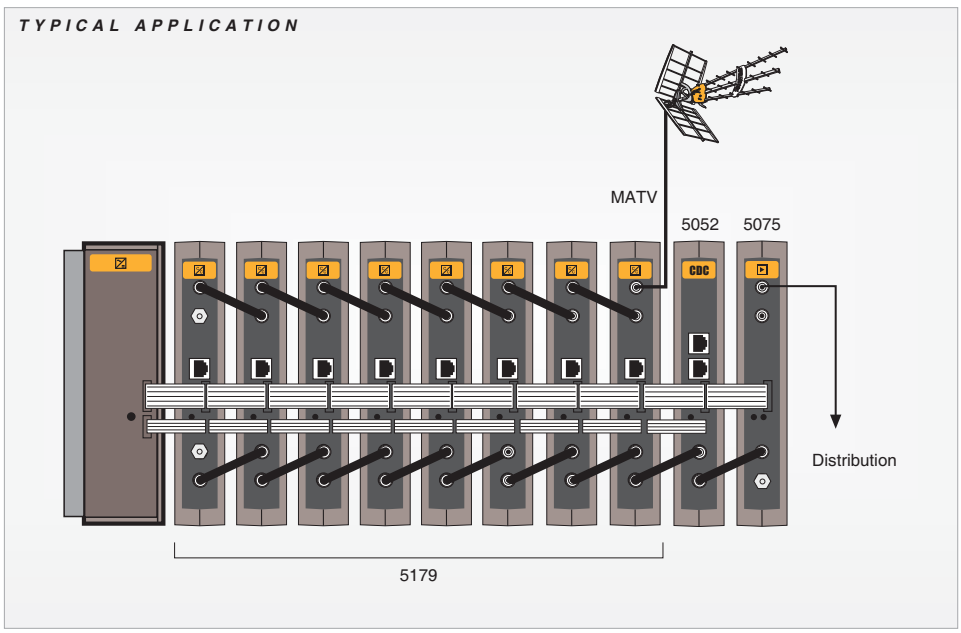
References		5179
Input		
Input frequency range	MHz	46...862
Frequency steps	KHz	D:166.66/125 A:250
Input level	dBµV	50-82 (AGC)
Input loop-through loss	dB	0±3
Output		
Output frequency range	MHz	46...862
Frequency steps	KHz	D:166.66/125 A: 250
Max. output level	dBµV	80±5
Regulation margin	dB	15
Return loss		>10
Slope adjustment		±3
Output Loop-through loss		<1.5
Equivalent noise degradation (END)		<2
General		
Consumption	mA (Vdc)	500 (5); 150 (15)
Preamplifier power	Vdc	12/24 (UHF in)
Dimensions	mm	35x197x163

5179

Analog & digital channel processor allowing the conversion or just processing of both digital & analog channels. Fully input/output agile through the full VHF & UHF band. The product can also be used as channel processor using same input/output channel. The input AGC guarantees a stable output level.

Programmable parameters:

- Freq./Channel (Input / output).
- Output level
- Converter/Amplifier
- Channel slope.
- Analog/Digital mode.
- Input bandwidth 7/8 MHz
- Remotely controllable via CDC



QPSK-FM

PRODUCT RANGE	
REF.	DESCRIPTION
5579	QPSK-FM

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

Reference		5579
QPSK Demodulator		
LNB powering	Vdc	Selec. 13/17 OFF 22 KHz (selec. ON/OFF)
Input loop-through loss	dB	<1.5
Input frequency	MHz	950···2150
Frequency steps	MHz	1
PLL Lock margin	MHz	±5
Input level	dBµV	44···84
Return loss	dB	>7
Input simbol rate	Kbaud	3-45
Roll-off	%	35
Convolucional code		1/2;2/3;3/4;5/6;7/8
Block code		RS (204;188)
Audio		
FM deviation	KHz	75
RDS Freq. Subcarrier	KHz	57
Distorsion	%	<1
Isolation	dB	35
RDS encoding		EN5007/EBV-SPB490
Stereo encoding		Multiplex CCIR
RF Output		
Output frequency range	MHz	87,5 ... 108
Frequency steps	KHz	100
Max. Output level	dBµV	75±5
Output level adjustment	dB	15
Output return loss	dB	14 tip.
Output loop-through loss	dB	1.5
Output spurious	dBc	60 tip.
General		
Consumption	mA	5 Vdc: 450 / 15 Vdc: 300 18 Vdc: 300.
Dimensions	mm	35x97x63

5579

The QPSK/FM transmodulator can modulate in an FM carrier 88-108 MHz the digital audio stream from a DVB-S transponder.

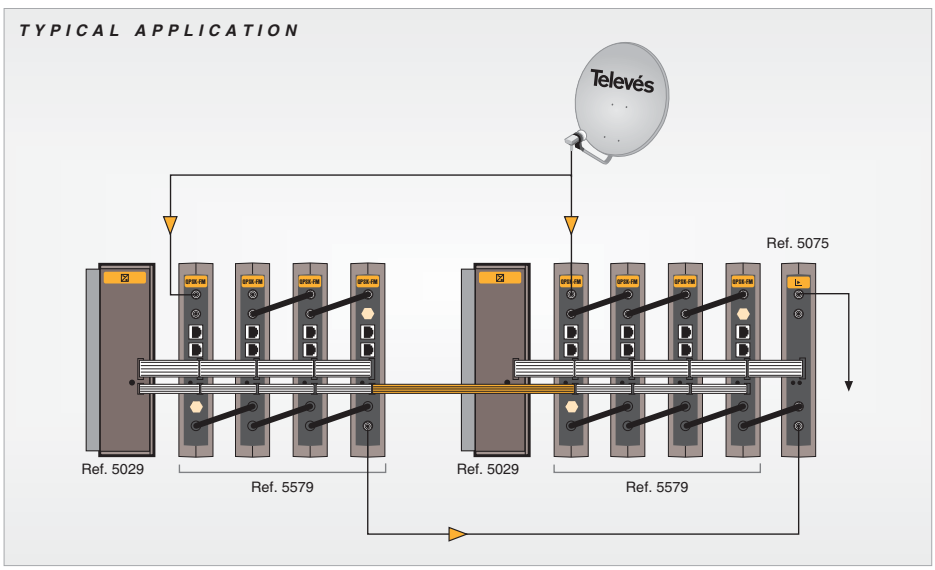
The DVB channel identifier will be inserted as RDS information.

It can also be used as FM modulator by means of the L & R Audio input on the RJ45 Input conector.

Programmable parameters:

- Input parameters
- Output parameters.
- Remotely controllable via CDC

TYPICAL APPLICATION



QPSK-PAL

CONTROL MODE
via modem | PC

PRODUCT RANGE	
REF.	DESCRIPTION
507905	QPSK-PAL (CDC)
503704	QPSK-PAL (CDC) stereo
5000	QPSK-PAL(CDC) stereo w/ C.I.

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

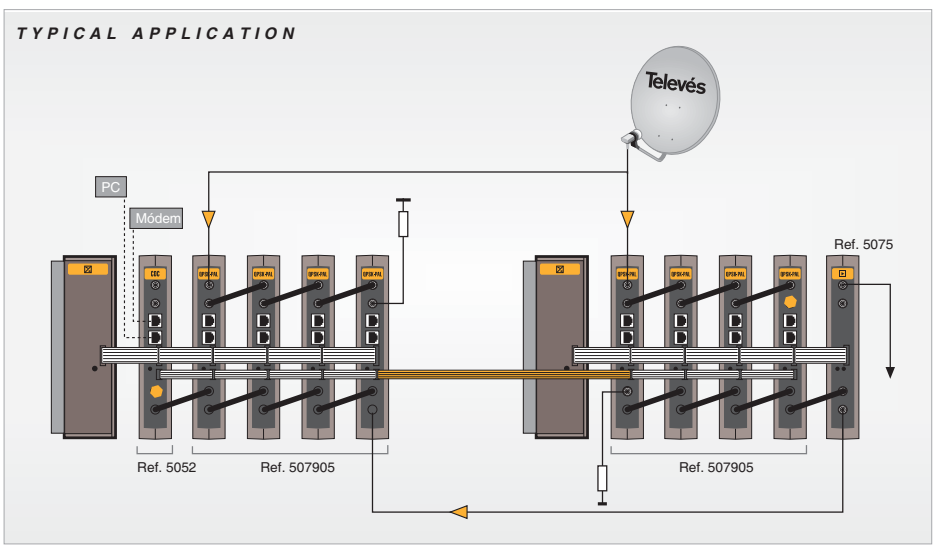
References		507905 / 503704 / 5000	
QPSK Demodulator			
Powering LNB	Vdc	13/17/-; 22 KHz/-	
Input through losses	dB	<1.5	
Input frequency	MHz	950-2150	
Frequency steps	MHz	1	
Locking margin	MHz	±5	
Input level	dBµV	44-84	
Return losses	dB	>7	
Input SR	Mbaud	3-45	
Capture margin	Mbaud	±960ppm	
Roll-off	%	35	
FEC		1/2;2/3;3/4;5/6;7/8	
Block code		RS (204;188)	
MPEG-2 Decoder			
Input format		TS MPEG-2 / DVB	
Decodification		MP@ML	
Input rate	Mbps	TS Max. 60	
Video rate	Mbps	1.5-15	
Video resolution		Max. 720x576	
Video output		PAL Composite video	
RF VSB Output			
Output frequency	MHz	46-862	
Frequency steps	KHz	250	
Max. output level	dBµV	80±5	
Regulation margin	dB	15	
Return losses	dB	14 typ.	
Output through losses	dB	1.5	
Spurious	dBc	60 typ.	
General		**5079/5037**	**5000**
Consumption	A(Vdc)	1.2 (5) 0.5 (15) 0.3 max. for LNB (18)	1.3 (5) 0.37 (15) 0.5 max. for LNB (18)
Dimensions	mm	35x197x163	

5000

Transforms a digital satellite channel to a VHF or UHF analog channel.

Programmable parameters:

- Output channel.
- Output level.
- Input frequency.
- A/V programme selection.
- SR (symbol rate).
- Video modulation index.
- Audio deviation.
- Audio carrier frequency.
- A/V Ratio.
- LNB powering parameters.
- Remotely controllable via the CDC.



DVB S2-QAM

CONTROL MODE
via modem | PC

PRODUCT RANGE	
REF.	DESCRIPTION
5180	DVB S2-QAM

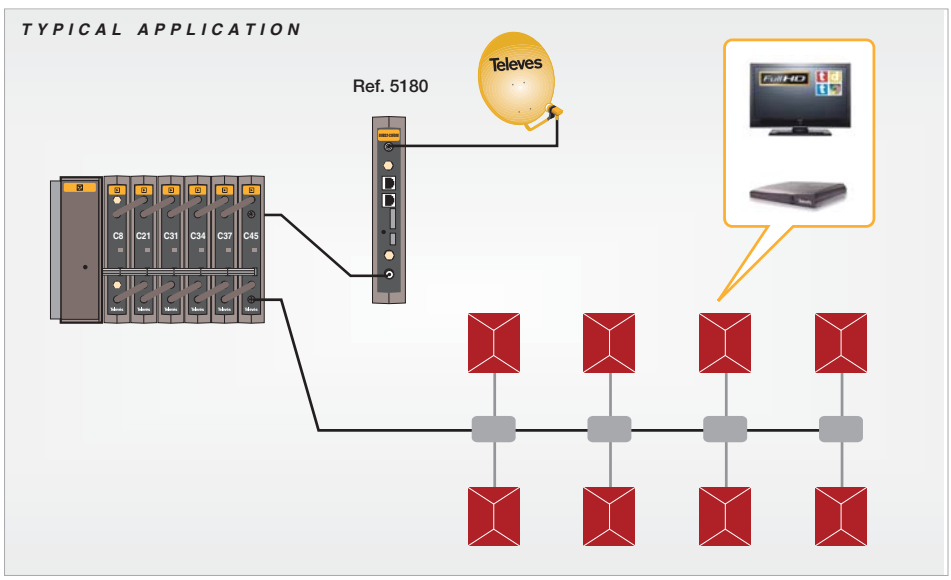
System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

References	5180
Input frequency	950..2150 Mhz
Input level	-60..-25 dBm
Lock range	± 5 MHz
Through losses	≤1.5 dB
LNB Powering	17/13/OFF Vdc (22 Khz ON/OFF)
Input Modulation	QPSK/8PSK
Symbol rate	10-30 Mbaud
Input FEC	LDPC (9/10,8/9,5/6,4/5,3/4,2/3,3/5,1/2,1/4,1/3,2/5)
Output FEC	BCH (Bose-Chauduri-Hocquenghem)
Filtering	Square Root Raised Cosine
Roll-off	20%,25%,35%
Output Modulation	16,32,64,128,256 QAM
Symbol rate	6,9 Mbaud
PCR Correction	Yes
PID Filtering	Yes
Op ID Filtering	Yes
Roll-off	15%
Output C/N	> 50 dB
MER	>39 dB
Output Frequency	46..862 Mhz
Frequency deviation	500 kHz
Output level	80 dBµV
Regulation margin	15 dB

Trasnsmodulates a DVB-S2/ DVB-S transponder to QAM.

Programmable parameters:

- Input frequency, modulation standard DVBS2 or DVB-S, input baud rate, LNB power.
- Output QAM modulation format
- Output channel / frequency
- I/Q modulation format



DVB S2- COFDM

CONTROL MODE
via modem | PC

PRODUCT RANGE	
REF.	DESCRIPTION
5181	DVB S2-COFDM

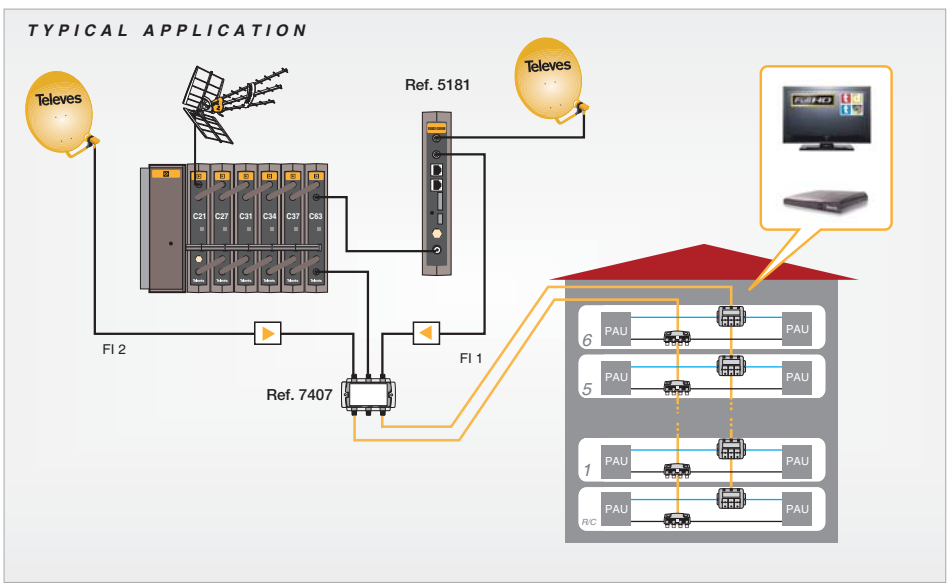
System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

References	5181
Input frequency	950..2150 Mhz
Input level	-60..-25 dBm
Lock range	± 5 MHz
Through losses	≤1.5 dB
LNB Powering	17/13/OFF Vdc (22 Khz ON/OFF)
Input Modulation	QPSK/8PSK
Symbol rate	10-30 Mbaud
Input FEC	LDPC (9/10,8/9,5/6,4/5,3/4,2/3,3/5,1/2,1/4,1/3,2/5)
Output FEC	BCH (Bose-Chauduri-Hocquenghem)
Filtering	Square Root Raised Cosine
Roll -off	20%,25%,35%
Output Modulation	COFDM EN300744
COFDM	8K FFT, 1/32, 64 QAM, 7/8
Bandwidth	7/8 MHz
Output Frequency	46..862 Mhz
Output level	80 dBµV
Regulation margin	15 dB

Trasnsmodulates a DVB-S2/ DVB-S transponder to COFDM limited by the output maximum bit rate. Output channel can be in VHF or UHF.

Programmable parameters:

- Input frequency, modulation standard DVBS2 or DVB-S, input baud rate, LNB power.
- COFDM Bandwidth, modulation type, guard interval, FEC.
- List of services translated to the output.



COFDM-PAL

CONTROL MODE
via modem | PC

PRODUCT RANGE	
REF.	DESCRIPTION
505403	COFDM-PAL
504403	COFDM-PAL stereo
555401	COFDM-PAL Nicam

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

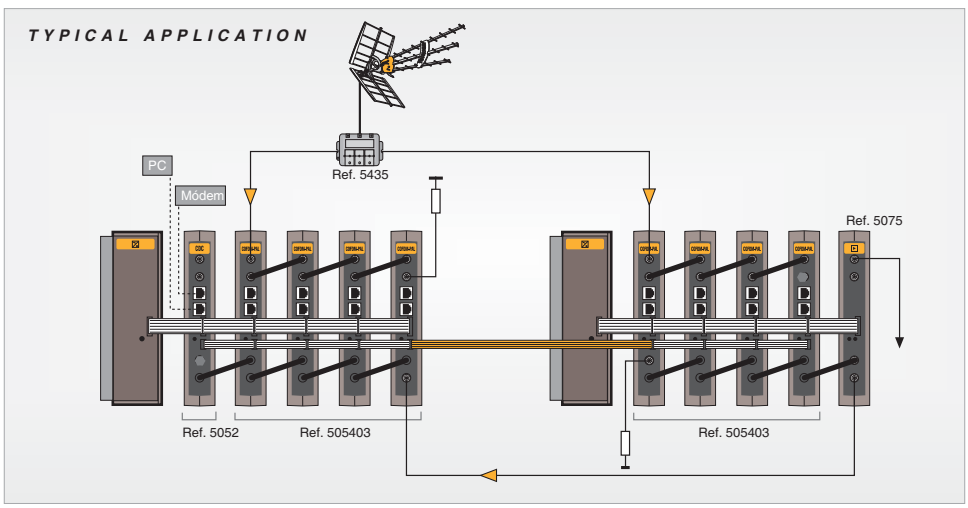
References		505403 / 504403 / 555401
COFDM demodulator		
Input through losses	dB	1,2
Input frequency	MHz	174-230 / 474-858 (or channel tables)
Frequency steps	MHz	1
Locking margin	MHz	±3
Input level	dBµV	49 to 89 (8k; 64 QAM;FEC 2/3)
Return losses	dB	>12 (46-862 MHz)
Bandwidth filter SAW	MHz	7 - 8 programmable
FFT		2k; 8k
Constellation		QPSK; 16QAM; 64 QAM
Guard interval		1/4; 1/8; 1/16; 1/32
Viterbi rate		1/2; 2/3; 3/4; 5/6; 7/8
Max. symbol rate	Mbaud	31.67
MPEG Decoder		
Input format		TS MPEG-2/DVB
Decoding		MP@ML
TS input rate	Mbps	60 max.
Video rate	Mbps	1.5 to 15
Video resolution		Max. 720x576
Video output		composite PAL
RF VSB Output		
Output frequency	MHz	46-862 (or channel tables)
Frequency steps	KHz	250
Max. Output level	dBµV	80±5
Variable gain	dB	15
Return losses	dB	14 typ.
Through losses	dB	<1.5
Spurious band level	dBc	60 typ.
General		
Consumption	A (Vdc)	1.2 (5) / 0.4 (15)
Preamplifier PSU	mA	50 (0-12-24Vdc, prog.)
Dimensions	mm	35x197x163

505403

Transforms a terrestrial digital channel to an analog channel either in VHF or UHF.

Programmables parameters:

- Input and output channel.
- Output level.
- Video and Audio program selection.
- Video modulation index.
- Audio deviation.
- Audio carrier frequency.
- A/V ratio
- Remotely controllable via the CDC.



COFDM-PAL Common Interface

CONTROL MODE
via modem | PC

PRODUCT RANGE	
REF.	DESCRIPTION
5544	COFDM-PAL CI

Main features

- Transmodulator with slot for CAM module.
- Generates an analog channel from a scrambled MPEG2 DVBT service.
- The generated channel is single side band, allowing the configuration of adjacent channels within 46 and 862 MHz.
- Generates DVB and teletext subtitles.
- Both local and remote configuration & control capability.
- Monitor menu with quality measures (CBER) of the input signal.

References		5544
COFDM demodulator		
Input through losses	dB	1,2
Input frequency	MHz	174-230 / 474-858 (or channel tables)
Frequency steps	MHz	1
Locking margin	MHz	±3
Input level	dBµV	49 to 89 (8k; 64 QAM;FEC 2/3)
Return losses	dB	>12 (46-862 MHz)
Bandwidth filter SAW	MHz	7 - 8 programmable
FFT		2k; 8k
Constellation		QPSK; 16QAM; 64 QAM
Guard interval		1/4; 1/8; 1/16; 1/32
Viterbi rate		1/2; 2/3; 3/4; 5/6; 7/8
Max. symbol rate	Mbaud	31.67
MPEG Decoder		
Input format		TS MPEG-2/DVB
Decoding		MP@ML
TS input rate	Mbps	90 max.
Video rate	Mbps	1.5 to 15
Video resolution		Max. 720x576
Video output		composite PAL
RF VSB Output		
Output frequency	MHz	46-862 (or channel tables)
Frequency steps	KHz	250
Max. Output level	dBµV	80±5
Variable gain	dB	15
Return losses	dB	10 min. 14 typ.
Through losses	dB	<1.5
Spurious band level	dBc	60 typ.
General		
Consumption	A (Vdc)	0.7 (5)w/o CAM/0.95 (15)w/CAM
Preamplifier PSU	mA	50 (0-12-24Vdc, prog.)
Dimensions	mm	35x197x163

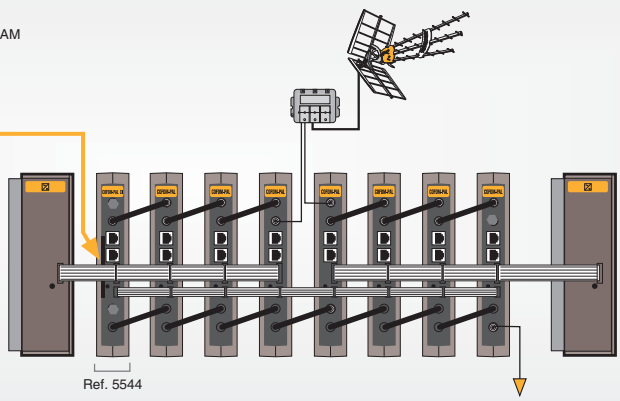
5544

Advantages

The COFDM-PAL transmodulator with Common Interface allows to:

- Integrate paid-tv services in a free-tv headend, making both free and paid DTT compatible with every television so it is not necessary to replace the analog TV sets.
- Used in headend for hotels, hospitals, etc... allows to keep the current CRT TV sets already installed.
- Protects of possible robberies of flat TV sets
- Only one remote control, same TV and same channel list than before the analog switch off. Very suitable in installations where the service is provided to elderly or handicapped people

TYPICAL APPLICATION



COFDM-QAM

CONTROL MODE
via modem | PC

PRODUCT RANGE		
REF.	DESCRIPTION	
5556	COFDM-QAM	TS-Proc

System accessories	
502905	PSU
5075	Hybrid amplifier MATV
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

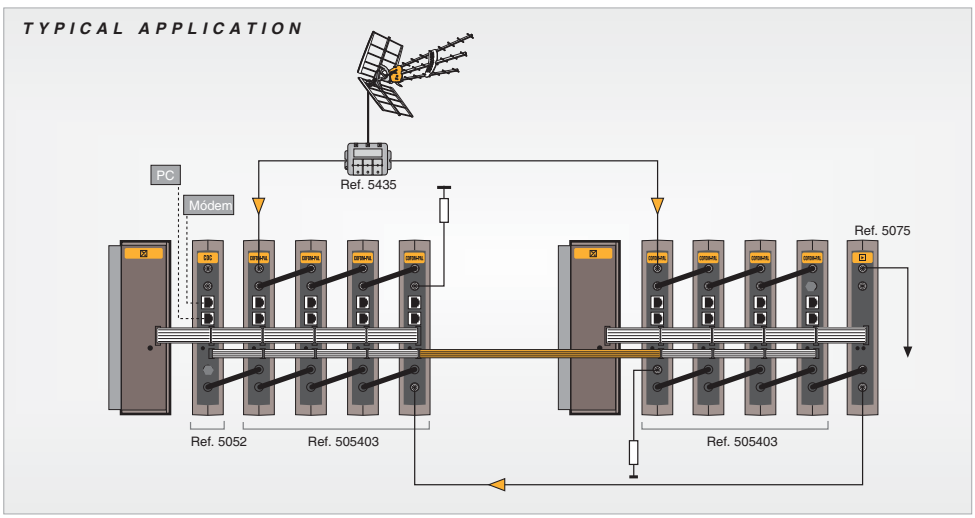
References		5556
COFDM demodulator		
Input through losses	dB	1,2
Input frequency	MHz	174-230 / 474-858
Frequency steps	MHz	1
Locking margin	MHz	±0.5
Input level	dBµV	49 a 89 (8k; 64 QAM;FEC 2/3)
Return losses	dB	>12 (46-862 MHz)
Bandwidth filter SAW	MHz	7 - 8 programmable
FFT		2k; 8k
Constellation		QPSK; 16QAM; 64 QAM
Guard interval		1/4; 1/8; 1/16; 1/32
Viterbi rate		1/2; 2/3; 3/4; 5/6; 7/8
QAM Modulator		
Modulation format	QAM	16, 32, 64, 128, 256
Symbol rate	Mbaud	7.2 máx.
Roll-off factor	%	15
Block code		RS (188, 204)
Output spectrum		Normal / Inverted
RF VSB Output		
Output frequency	MHz	46-862
Frequency steps	KHz	250
Output level	dBµV	80±5
Variable gain	dB	15
Return losses	dB	14 typ.
Through losses	dB	<1.5
Spurious band level	dBc	60 typ.
General		
Consumption	A (Vdc)	0.7 (5) / 0.32 (15)
Preamplifier PSU	mA	60 (0-12-24Vdc, prog.)
Dimensions	mm	35x197x163

5556

Transforms a terrestrial digital channel to a digital QAM channel either in VHF or UHF.

Programmable parameters:

- Input and output channel
- Output level.
- Remotely controllable via the CDC.



IF / IF processors

CONTROL MODE
via modem PC

PRODUCT RANGE	
REF.	DESCRIPTION
586301	Single IF processor DVBS2
586401	Triple IF processor DVBS2

System accessories	
502905	PSU
5865	IF amplifier
2168	PC programming Sw. + Accs.
7234	Universal Programming Unit
5837	Modem IP
	Mounting & accessories
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19" Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5073	Blank plate
4061	F-Type 75Ω load DC blocked

References		586301	586401
Input freq. margin	MHz	950-2150	
Output freq. margin	MHz	950-2150	
Frequency steps	MHz	1	
Output impedance	Ω	75	
Input return losses	dB	>10	
Output return losses	dB	>10	
BW of the selected channel	MHz	10 a 72 (2 MHz steps)	
Input level	dBµV	60 - 88	
Output level	dBµV	75±5	
Level regulator		Yes	
Powering LNB	Vdc	13/17 / OFF 22 KHz / OFF	
General			
Max. consumption	mA	5V:550 15V:50	5V:1100 15V:50
Protection index		IP 20	

586301

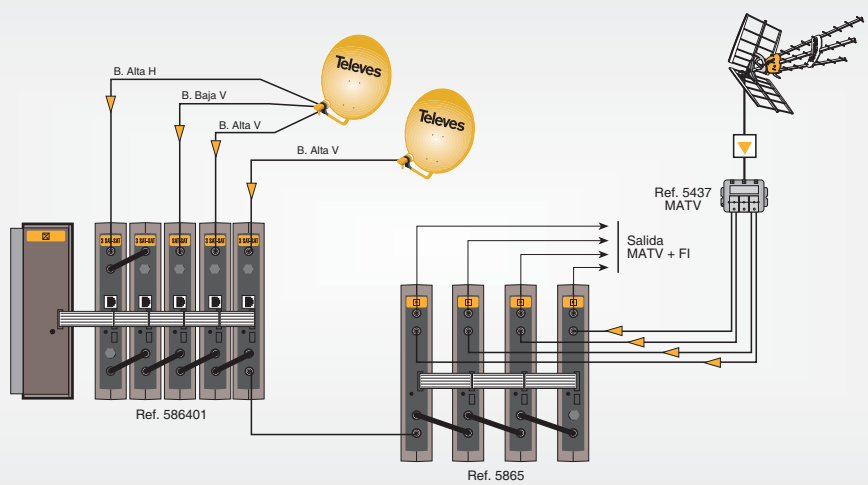
IF AMPLIFIER

References		5865
Frequency range	MHz	950···2150
Gain (950 MHz)	dB	35±2
Gain (2150 MHz)	dB	40±3
Adjustable margin	dB	20
Output voltage (2 tones -35dB)	dBµV	>123
Connector		"F"
Powering	Vdc	15
Consumption	mA(vdc)	200(15)

Programmable parameters:

- Modular and programmable satellite system.
- Allows the selection of any channel in the IFband to be shifted into another channel inside the band.
- Remotely controllable via the CDC.

TYPICAL APPLICATION



MATV Hybrid amplifier

PRODUCT RANGE	
REF.	DESCRIPTION
5075	MATV Hybrid amplifier

Hybrid amplifier for headend equipment. Provided with 2 inputs to mix its output with channels comming from different systems.

References			5075
Frequency range		MHz	47-862
Gain		dB	45±2
Gain regulation			20
Output level	DIN 45004-B	dBµV	120
	IMD3 (-60 dB, 2c)		117
	IMD2 (-60 dB, 2c)		111
	CTB (-60 dB, 42c)		105
	CSO (-60 dB, 42c)		105
	XMOD (-60 dB, 42c)		105
Noise figure		dB	<10
General			
Powering voltage		Vdc	15
Consumption		A	0.8
Dimensions		mm	35x197x163

5075

PSU

PRODUCT RANGE	
REF.	DESCRIPTION
502905	Switched PSU T-03/T-05
5030	Switched PSU T-03 / T-05 110 Vac UL
5498	Switched PSU T-03

Switched PSU for the T03 and T05 range.

502905

References		502905 / 5030 *				5498
Mains voltage	Vac	230±15				
Frequency	Hz	50/60				
Output voltage	Vdc	24	18	15	5	24
Max. output current	A	0.55	0.8	4.2 (*)	6.6	2.5
Max. output powering	W	13.2	14.4	63 (*)	33	60
Dimensions	mm	56x197x163				55x197x83

*24 and/or 18V voltage are obteined from 63W (15V) PSU

Accessories

Cabinets and supports

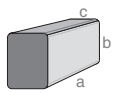
PRODUCT RANGE	
REF.	DESCRIPTION
5071	Wall mount (10M+PSU)
5239	Wall mount (12M+PSU)
5301	19” Rack frame (10M+PSU)
5072	Lockable cabinet (10M+PSU)
5069	Lockable cabinet (14M+PSU)
5235	Lockable cabinet (22M+PSU)
5334	T03/T05 Ventilation system

5071/5239

5334

5069/5235/5072

5301

References		5072	5069	5235
	a	610	760	1060
	b	295		
	c	235		

Various

PRODUCT RANGE	
REF.	DESCRIPTION
5073	Blank plate
4061	F-Type 75Ω load DC blocked
5074	Link F connector
4221	Power injector
7234	Universal programmer

5073

4061

5074

4221

7234

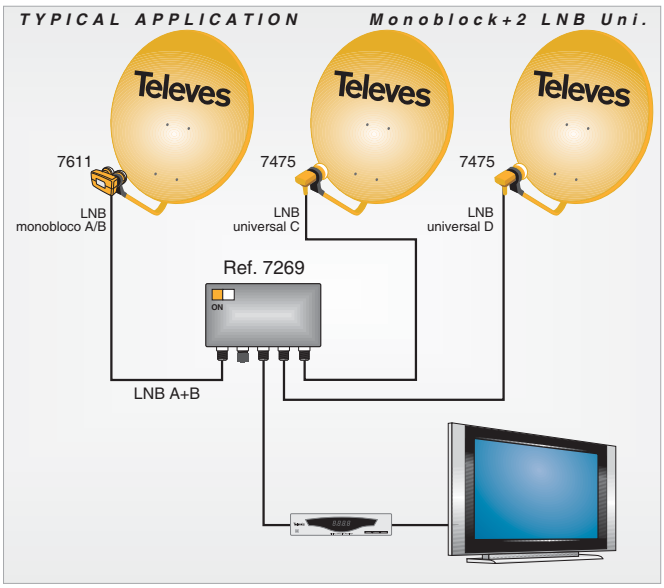
Splitters and LNB switches

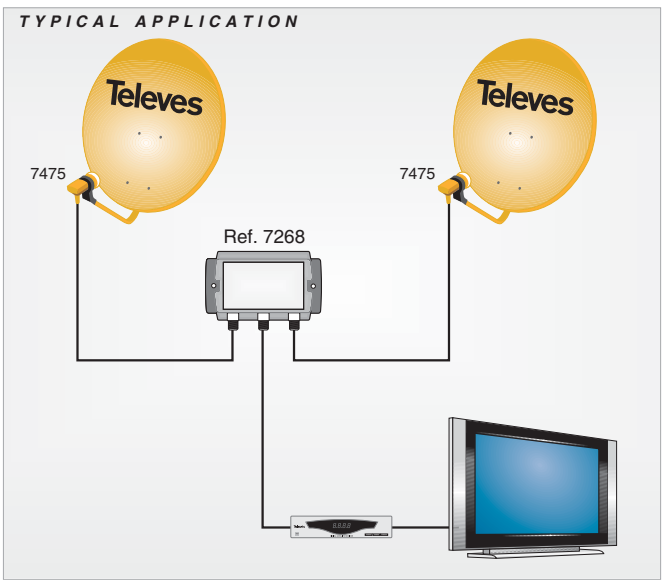
PRODUCT RANGE	
REF.	DESCRIPTION
7268	DiSEqC 2in/1out switch
7269	DiSEqC 4in/1out switch

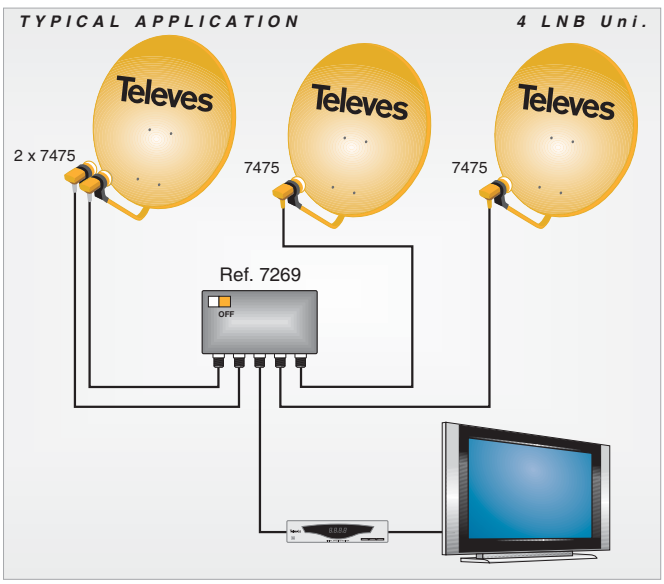
7268

7269

References		7268	7269
Bandwidth	MHz	0···2400	5···2150
Switching type		DiSEqC 2.0	DiSEqC 2.0
IF through losses	dB	<1.5	<6
RF through losses	dB	<1.5	<6
Input rejection	dB	>20	>20
Max. current bypass	mA	250	290
Powering	Vdc	12-20	12-20
Dimensions	mm	95x75x26	137x130x56





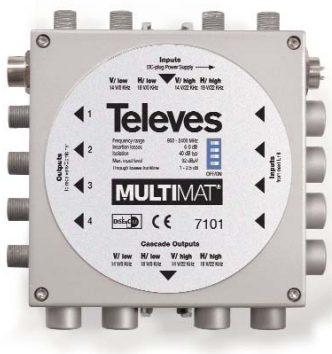


Universal Multimat System

new

PRODUCT RANGE	
REF.	DESCRIPTION
7101	Main multiswitch
7102	MATV/IF passive combiner 13 dB
7108	MATV/IF passive combiner 9 dB
7109	MATV/IF passive combiner 17 dB
7110	MATV/IF passive combiner 21 dB
7103	Multimat PSU
7104	Multimat IF amplifier
7105	F terminal load block
7106	F connector block
7107	F terminal load DC block

7101



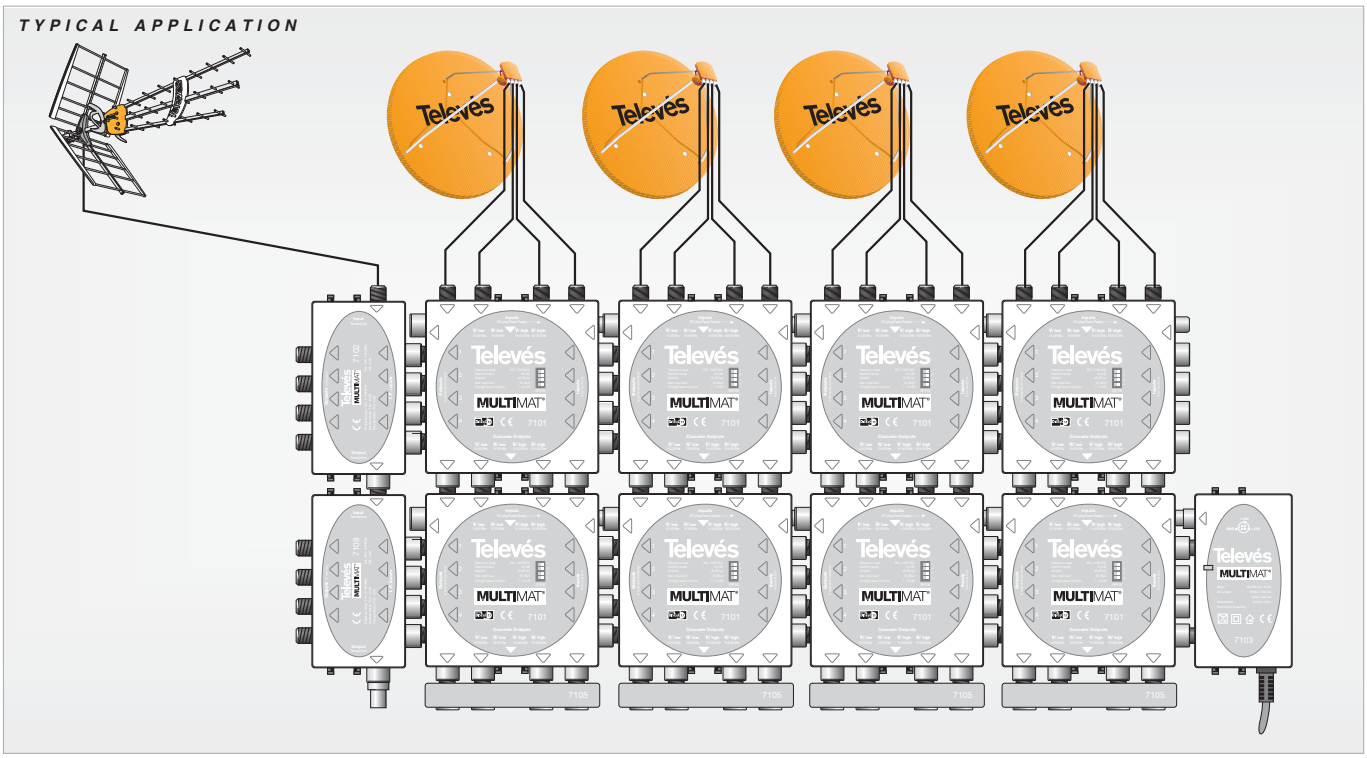
7107

7105

7106

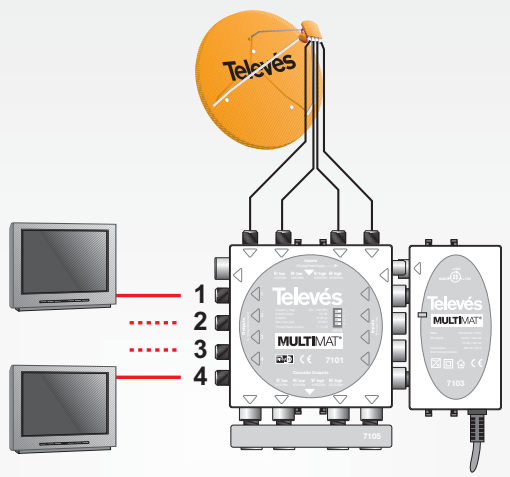
7104

TYPICAL APPLICATION



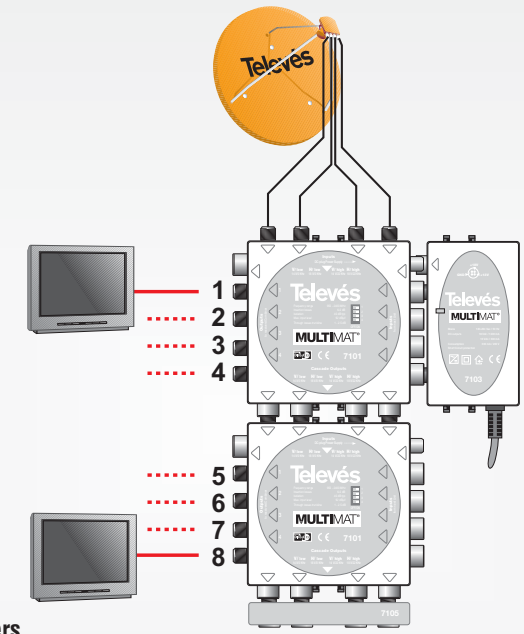
Star distribution

TYPICAL APPLICATION



4 Users

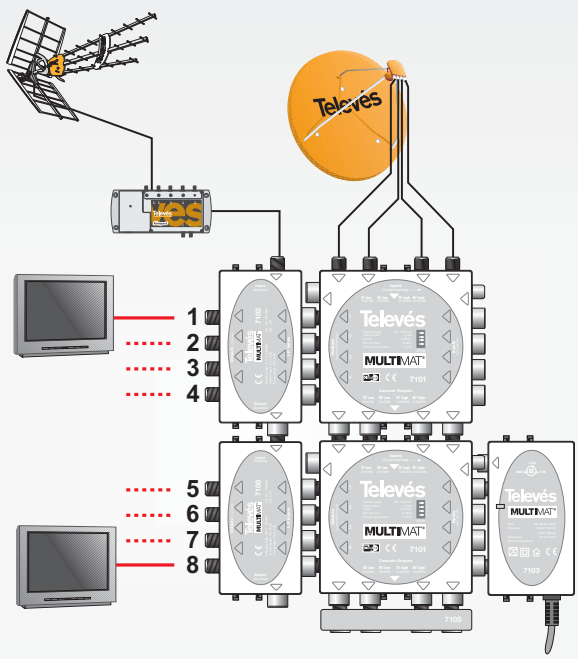
TYPICAL APPLICATION



8 Users

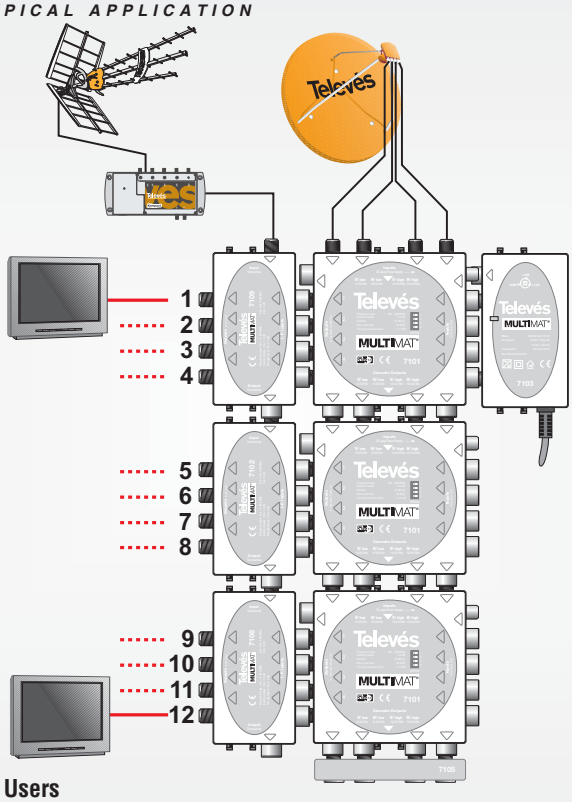
Star distribution + MATV

TYPICAL APPLICATION

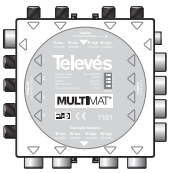


8 Users

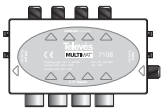
TYPICAL APPLICATION



12 Users



References			7101
No. inputs (SAT)		No	4
No. outputs	for receivers		4
	for cascading		4
	for expansion		4
Frequency range		MHz	950
Through losses	Receiver output	dB	< 6
	Cascade output		< 2
	Expansion output		< 1
Isolation	Between inputs		35
	High band - Low band		35
Input return losses			8
Max. input level		dBµV	92
Max. output level for receiver			89
Max. DC current consumption for receiver		mA	65
Max. DC bypass current			1200
Switching selection voltage V/H		Vdc	15.5
Switching voltage selection high band		22 KHz	
Selection inputs from extension		DiSEqC 1.1	
Max. No. of connected extensions		No	4
Max. No. of inputs			16
LNB powering mode			External
Recommended PSU (switched-mode)		Vdc/A	18 / 1.2 13 / 0.3
Dimensions		mm	115x115x33



References			7108	7102	7109	7110
No. inputs VHF/UHF passive		No	1	1	1	1
No. outputs	for receivers		4	4	4	4
	for cascading		1	1	1	1
	for expansion		4	4	4	4
Frequency range		MHz	5 - 860			
Through-Loss Cascade output	MATV	dB	< 3			
	SAT		< 2			
Isolation	SAT - TV	dB	> 30			
	TV - SAT		> 35			
Tap losses for receiver		dB	9	13	17	21
Dimensions		mm	115x70x33			

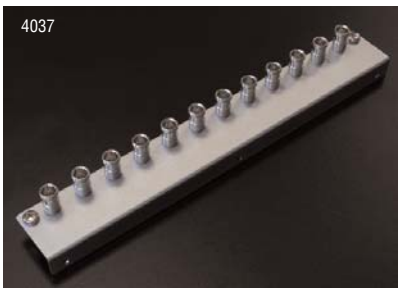
References			7104
Nº de inputs SAT		Nº	4
Nº de outputs			4
Frequency range		MHz	950 - 2400
Gain	@ 950 MHz	dB	3.5 ± 0.5
	@ 2000 MHz		8.5 ± 0.5
	@ 2400 MHz		9.5 ± 0.5
Isolation trunkline			>45
Return-loss inputs			>10
Return-loss outputs			>10
Max. input level		dBµV	95
Max. output level			105
Max. current consumption (from SMPS)		mA	4 x 25
Max. bypass current		A	1.2
Dimensions		mm	97x70x33

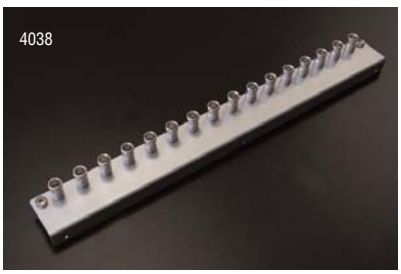
References		7103
Mains voltage	Vac	180 - 264
Output voltage	Vdc	18 ± 5%
		13 ± 5%
Current	A(Vdc)	1.2 (18)
		0.3 (13)
Maximum power consumption	W	30
Max. short-circuit current	A(Vdc)	2 (18)
		1 (13)
EMI/EMC standard		EN55022 (B)
Safety standard		EN60950
Temperature range	ºC	-20···+60
Dimensions	mm	105x65x33

5 input stand alone

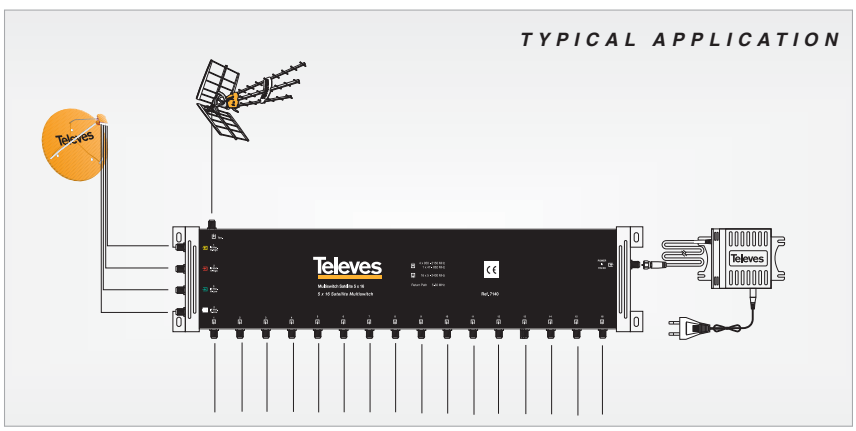
PRODUCT RANGE	
REF.	DESCRIPTION
7138	5x8 Multiswitch
7139	5x12 Multiswitch
7140	5x16 Multiswitch
4036	8 Way ground Bar
4037	12 Way ground Bar
4038	16 Way ground Bar
7321	PSU 1.6A
7328	PSU 3A

Power Supply Units			
References		7321	7328
Input voltage	Vac	180-264	
Mains frequency	Hz	47-63	
Output voltage	Vdc	12	
Max. out. current	mA	1600	3000





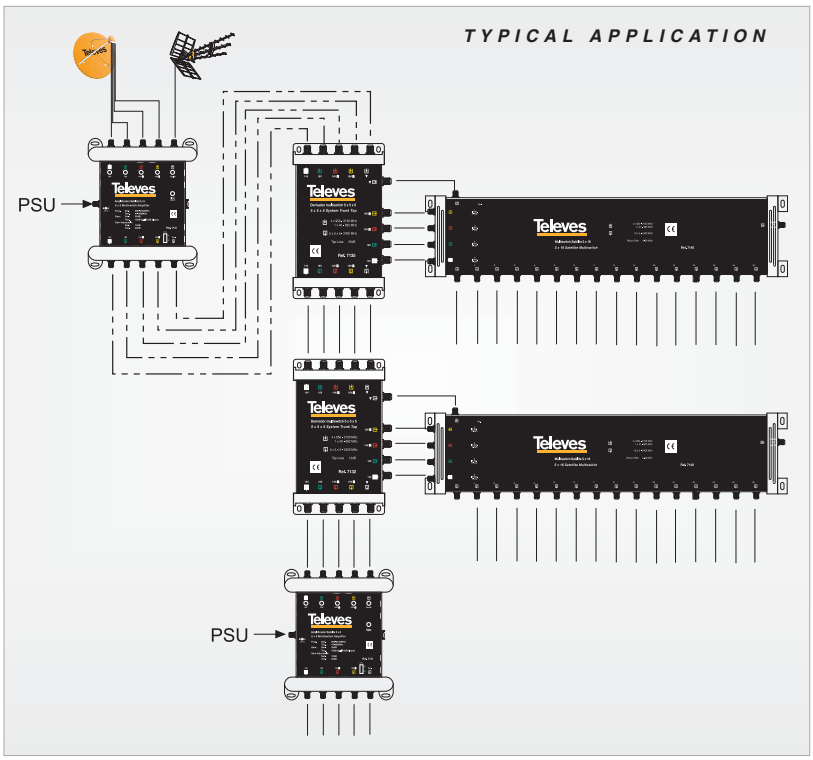
Multiswitch specs			5×4	5×6	5×8	5×12	5×16
References			7136	7137	7138	7139	7140
Frequency range	SAT	MHz	950 - 2400				
	TER		47 - 862				
SAT input level		dBµV	100				
TER input level			100				
Output level			100				
SAT gain		dB	5±5	6±4	6±4	7±3	3.5±4.5
Tap losses TER (typ.)			3±3	1±4	1.25±3	1±3	3±3
Isolation between inputs			60	40	30	45	35
Isolation between outputs			20	20	30	25	25
LNB powering		mA	1200		1200	1200	1200
Powering voltage		Vac / Vdc	230 / 12				
Maximum consumption	PSU	mA	40	40	40	120	110
	Rcvr		45	45	45	28	57
	Trunk		50	60	80	110	110
Protection index		IP	20				



5 input cascade

PRODUCT RANGE	
REF.	DESCRIPTION
7132	12 dB Tap
7133	15 dB Tap
7134	20 dB Tap
7135	25 dB Tap
7131	5×5 Amplifier
7321	PSU 1.6A
7328	PSU 3A

- 4 to 16 Outputs
- Inputs labeled by colors
- Flexible and easy to install
- High input level
- Easy expansion via 4 outputs
- 5 Inputs with high ouput level
- Controllable gain
- Several powering options



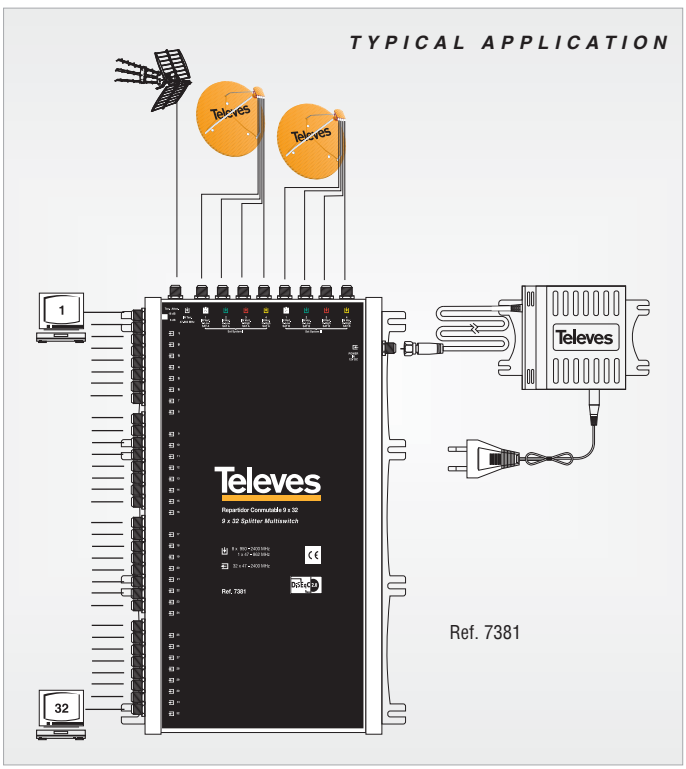
Ref. 7131 - Amplifier 5x5			
Band		**Satellite**	**Terrestrial**
Freq. range	MHz	950-2400	47-862
Gain	dB	25±3	21.5±2
Regulation	dB	10	20
Slope	dB	-	7±3
Max. output level	dBµV	105	
Mains voltage	105	-	105
Consumption	105	-	300

Trunk Tap Specs			12 dB	15 dB	20 dB	25 dB
References			7132	7133	7134	7135
Frequency range	SAT	MHz	950 - 2400			
	TER		47 - 862			
Thru losses (typ.)	SAT	dB	1.5±1.5	1.5±1.5	2±2	1±1
	TER		4±4	2.5±2.5	3±3	3±2
Tap losses (typ.)	SAT		12±3	15±3	20±3	25±3
	TER		12±1	15±3	20±3	25±3
Isolation between inputs			30	20	20	20
Isolation between outputs			30	20	20	20
LNB powering		mA	300			
Protection index		IP	20			

9 input stand alone

PRODUCT RANGE	
REF.	DESCRIPTION
7438	9×8 multiswitch
7430	9×12 multiswitch
7439	9×16 multiswitch
7379	9×24 multiswitch
7381	9×32 multiswitch
7321	PSU 1.6A
7328	PSU 3A

Multiswitches			9×8	9×12	9×16	9×24	9×32
References			7438	7430	7439	7379	7381
Frequency range	SAT	MHz	950 - 2400				
	TER		5 - 862			47- 862	
Input level	SAT	dBµV	95				
	TER		89				
Tap output level	SAT		95				
	TER		89				
Tap losses	SAT	dB	3±2	2±2	4±4	1±9	
	TER		2±3	3±4	5±2	SW P0: 16±5 SW P1: 6±4	
Isolation between inputs			35	30	40	30	35
Isolation between outputs			35	25	30	25	25
LNB powering		mA	300/input; 1200 total				
Powering voltage		Vac/Vdc	230 / 12				
DC pass		mA	In - LNB			-	-
Max. consumption			50			60	
Protection index		IP	20				

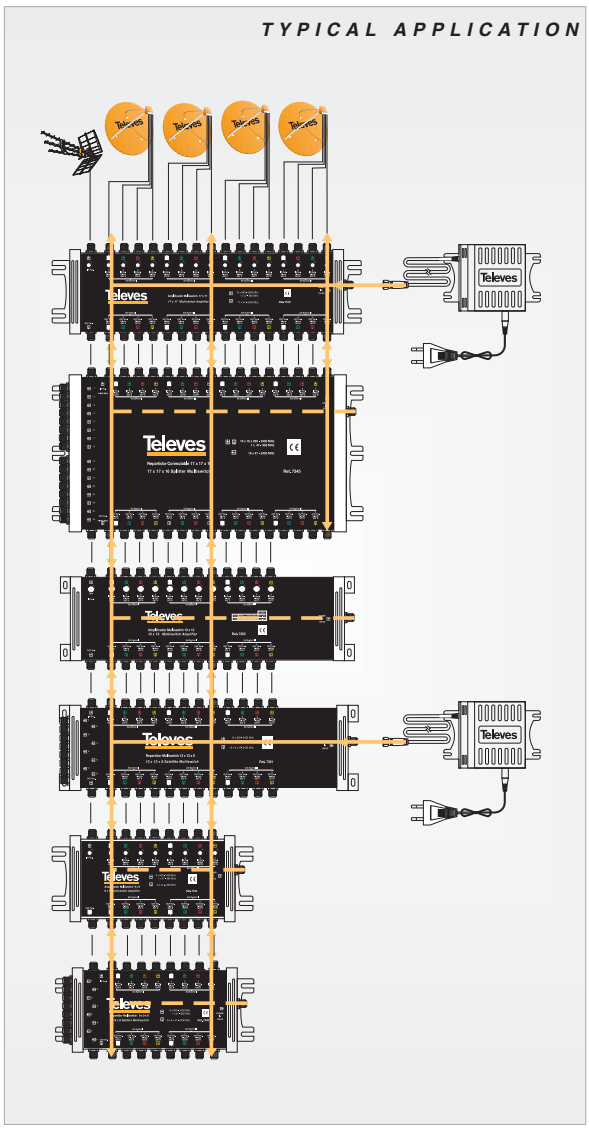


9 input cascade

PRODUCT RANGE	
REF.	DESCRIPTION
7340	9×9×8 Multiswitch
7382	9×9×12 Multiswitch
7341	9×9×16 Multiswitch
7344	9×9 Amplifier
7321	Power Supply Unit
7328	Power Supply Unit

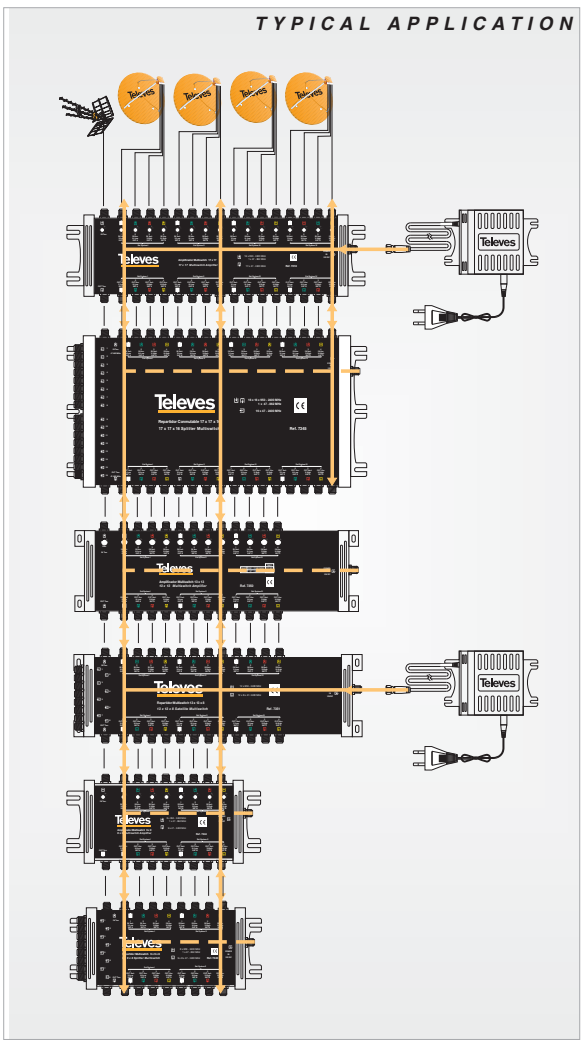
Amplifier 9×9			
Reference		**7344**	
Frequency range	MHz	SAT	TER
		950 - 2400	88 - 862
Gain	dB	13/23	20/30
Regulation		9	7
Max. output level	dBµV	105	
Max. consumption	mA	500 (15 Vdc)	
Protection index	IP	20	

Multiswitch specs			9×9×8	9×9×12	9×9×16
References			**7340**	**7382**	**7341**
Frequency range	SAT	MHz	950 - 2400		
	TER		47 - 862		
	Return		5 - 30		
Input level	SAT	dBµV	95	95	95
	TER		89	89	89
Thru Output Level	SAT		95	95	95
	TER		89	86	89
Tap Output Level	SAT		100	95	95
	TER		94	86	89
Thru Losses	SAT	dB	3±4	4±3	4±3
	TER		3±1	4±2	4±2
Tap Losses	SAT		1±6	2±9	2±9
	TER		6±3	8±3	10±3
Isolation between inputs			35	50	30
Isolation between outputs			35	-	30
LNB powering		mA	300/in; 1200 total		
Powering voltage		Vdc	12		
DC pass	SAT	-	LNB out	-	4±2
	TER	-	In-Out / Out-In		
Consumption		mA	50	30	50



13 input stand alone

PRODUCT RANGE	
REF.	DESCRIPTION
7358	13x8 Multiswitch
7354	13x12 Multiswitch
7360	13x16 Multiswitch
7321	PSU 1.6A
7328	PSU 3A



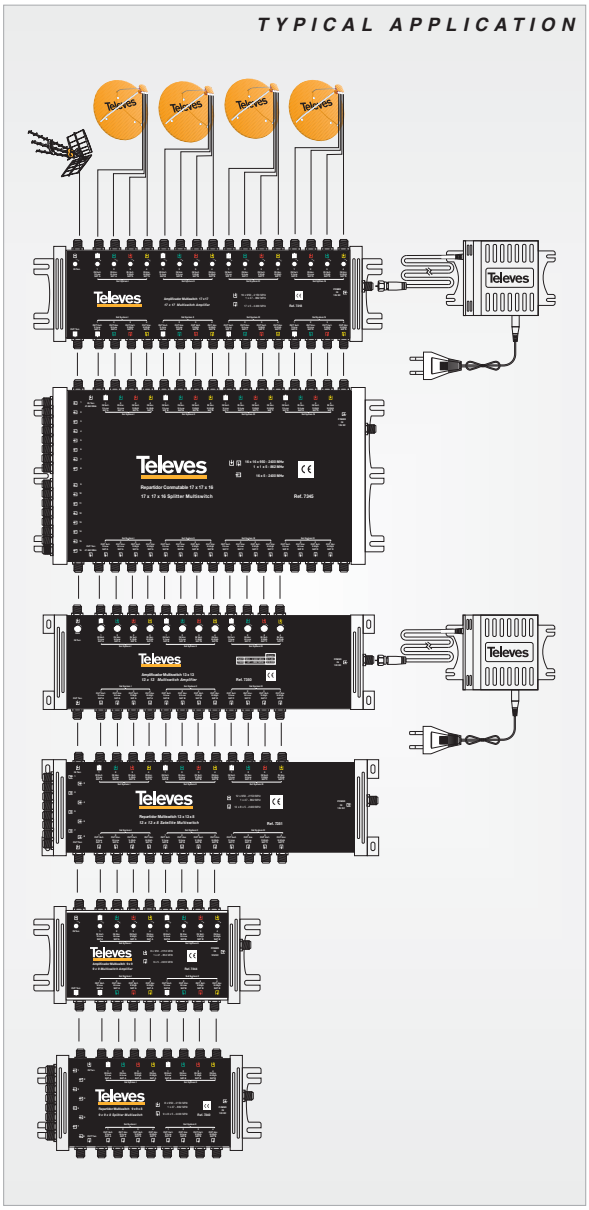
Multiswitch specs			13x8	13x12	13x16
References			7358	7354	7360
Frequency range	SAT	MHz	950 - 2400		
	TER		30 - 862		
Input level	SAT	dBµV	95		
	TER		89		
Tap output level	SAT		95		
	TER		89		
Tap losses	SAT	dB	1±6	2±2	4±4
	TER		3±4	3±4	5±2
Isolation between inputs			40	30	40
Isolation between outputs			-	25	30
LNB powering		mA	300/input; 1200 total		
Powering voltage		Vac/Vdc	230 / 12		
Max. consumption		mA	50		
Protection index		IP	20		

13 input cascade

PRODUCT RANGE	
REF.	DESCRIPTION
7351	13x8 Multiswitch
7369	13x12 Multiswitch
7370	13x16 Multiswitch
7350	13x13 Amplifier
7321	Power Supply Unit
7328	Power Supply Unit

Amplifier 13x13			
Reference		**7350**	
Frequency range	MHz	SAT	TER
		950 - 2400	47 - 862
Gain	dB	27/30	24/30
Regulation	dB	10	7
Slope	dB	-	10
Max. output level	dBµV	105	
Max. consumption	mA	560 (15 Vdc)	
Protection index	IP	20	

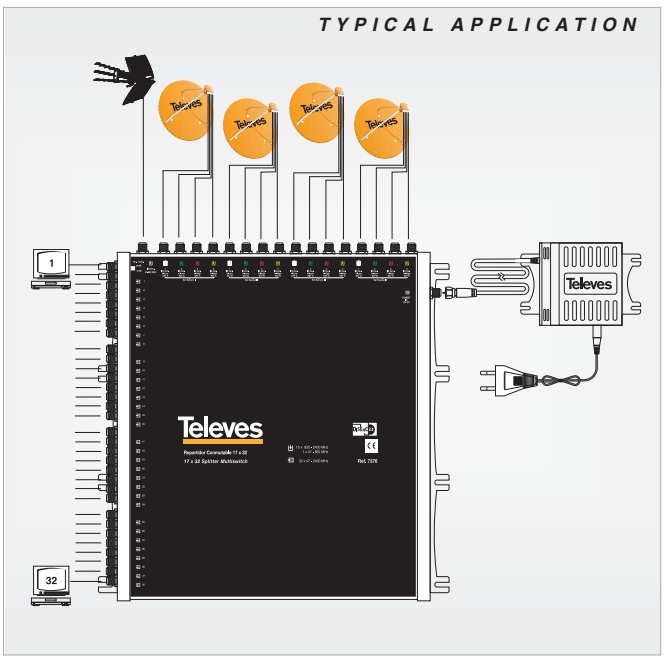
Multiswitch specs			**13x8**	**13x12**	**13x16**
References			**7351**	**7369**	**7370**
Frequency range	SAT	MHz	950 - 2400		
	TER	MHz	5 - 862	30-862	
Input level	SAT	dBµV	95		
	TER	dBµV	89		
Thru output level	SAT	dBµV	100	95	
	TER	dBµV	100	89	
Tap output level	SAT	dBµV	100	95	
	TER	dBµV	100	89	
Tap losses (typ.)	SAT	dB	6	2±7	2±7
	TER	dB	0	8±3	8±2
Thru losses (typ.)	SAT	dB	1	4±2	4±2
	TER	dB	3	5±2	5±2
Isolation between inputs		dB	50	40	50
Isolation between outputs		dB	-		
LNB powering		mA	300/inpit; 1200 total		
Powering voltage		Vac/Vdc	230 / 12		
DC pass		-	In - Out		
Max. consumption		mA	50		
Protection index		IP	20		



17 input stand alone

PRODUCT RANGE	
REF.	DESCRIPTION
7311	17×8 Multiswitch
7372	17×12 Multiswitch
7335	17×16 Multiswitch
7375	17×24 Multiswitch
7376	17×32 Multiswitch
7321	PSU 1.6A
7328	PSU 3A

Multiswitches			17×8	17×12	17×16	17×24	17×32
References			7311	7372	7335	7375	7376
Frequency range	SAT	MHz	950 - 2400				
	TER		48 - 862	30-862	5-862	47-862	
Input level	SAT	dBµV	95				
	TER		89				
Tap output level	SAT		95				
	TER		89				
Tap losses	SAT	dB	1±8	3±6	2±7	1±9	
	TER		1±3	6±4	4±3	SW P0: 16±5 SWP1: 6±4	
Isolation between inputs			40	30	30	30	
Isolation between outputs			30	25	30	25	
LNB powering		mA	300/input; 1200 total				
Powering voltage		Vac/Vdc	230 / 12				
Max. consumption		mA	60	50	50	60	
Protection index		IP	20				

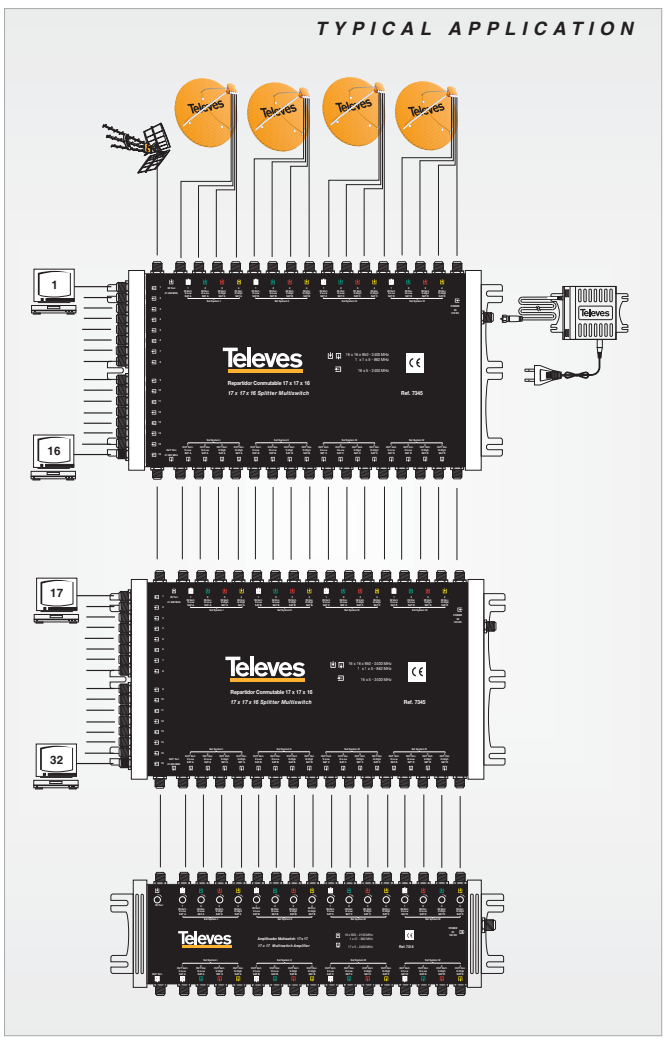


17 input cascade

PRODUCT RANGE	
REF.	DESCRIPTION
7323	17x17x8 Multiswitch
7373	17x17x12 Multiswitch
7345	17x17x16 Multiswitch
7318	17x17 Amplifier
7321	PSU 1.6A
7328	PSU 3A

Amplifier 17×17			
References		**7318**	
Frequency range	MHz	SAT	TER
		950 - 2400	88 - 862
Gain	dB	12/21	24/32
Regulation		9	8
Max. output level	dBµV	105	
Max. consumption	mA	560 (15 Vdc)	
Protection inex	IP	20	

Multiswitches			17x17x8	17x17x12	17x17x16
References			**7323**	**7373**	**7345**
Frequency range	SAT	MHz	950 - 2400		
	TER		5 - 862		
Thru output level	SAT	dBµV	95		
	TER		89		
Tap output level	SAT		95		
	TER		89		
Thru losses	SAT	dB	4±7	4±7	7±4
	TER		3±6	3±1	3±1
Tap losses	SAT		3±1	3±6	3±6
	TER		5±3	5±3	7±2
Isolation between inputs			30	30	50
Isolation between outputs			30	30	-
LNB powering		mA	300/input; 1200 total		
DC pass		-	In - Out		
Powering voltage		Vac/Vdc	230 / 12		
Max. consumption		mA	50		
Protection index		IP	20		



Tools

PRODUCT RANGE	
REF.	DESCRIPTION
2145	Coaxial cable stripper
7301	Satfinder
4008	IF simulator
7637	Return channel simulator

2145

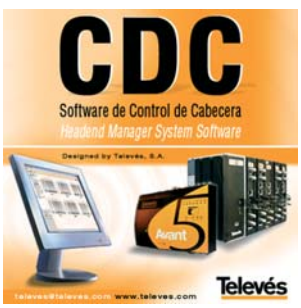
7301

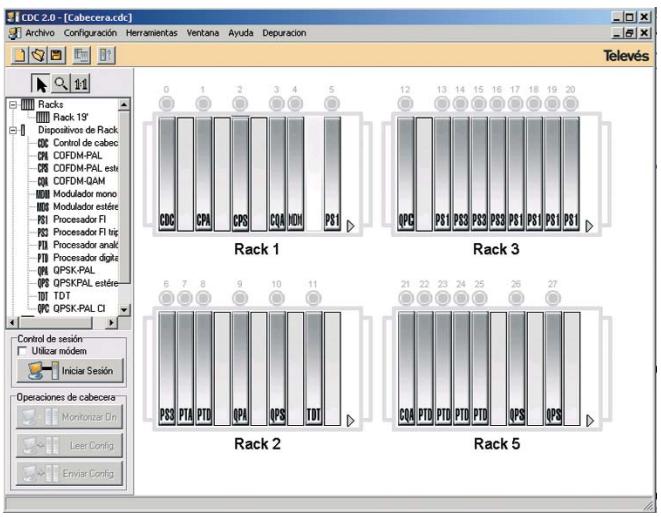
References		4008	7637
Powering	Vdc	12...18	12...15
Consumption	W	<2	<1.5
Input connector		"F" female	
Frequency range	MHz	960-1550-2140	7.5-14.75-22.65
Accuracy	KHz	±200	-
Spurious	dBc	> 20	> 40
Protection index		IP 20	IP 30

4008/7637

Software

PRODUCT RANGE	
REF.	DESCRIPTION
2168	PC programming Sw. + Accs.





Optical Fiber

Full range of products to deploy optical fiber networks capable of distributing television signals in the VHF, UHF & satellite bands.

These products have been designed simplify the installation procedure and guarantee compatibility with the Televes range.

Televes

Optical Output LNB and Optical Converters

PRODUCT RANGE	
REF.	DESCRIPTION
2350	Quattro MDU
2351	Quad MDU
2352	Twin MDU
2353	LNOC optical LNB
	Optical Splitters
2357	Split 2OF
2358	Split 3OF
2359	Split 4OF
2360	Split 8OF
	Optical Fibers
2361	FC/PC F 3m
236101	FC/PC F 5m
236102	FC/PC F 10m
236103	FC/PC F 20m
236104	FC/PC F 30m
236105	FC/PC F 40m
236106	FC/PC F 50m
236107	FC/PC F 75m
236108	FC/PC 100m reel
236109	FC/PC 200m reel
	Optical Accessories
2354	FC/PC Connector
2355	SC/PC Connector
2356	FC/SC Adaptor
2362	F Pen Light

This innovative design stacks both horizontal and vertical polarities, creating a single IF frequency ranging from 950 to 5,45 GHz. This new single band is then optically frequency modulated and sent to the LNOC optical output connector by using a 1310 nm internal laser.

Each converter receives the optically modulated frequency stacked signals from the Optical LNB or PON, typically via a 3mm fibre optic cable, utilising the FC/PC connector.

The optical signals are then converted back to their original IF format and output to the receiver via standard F connections.

2353

LNB Optical Output

- Converts all 4 Universal IF bands to a single optical output.

  (H/H-H/L-V/H-V/L=Single Optical Output)
- Capable of suppyling all converted signal to 32 distribution points spread over a 10 Km radius.
- 40mm Feed Horn

2351

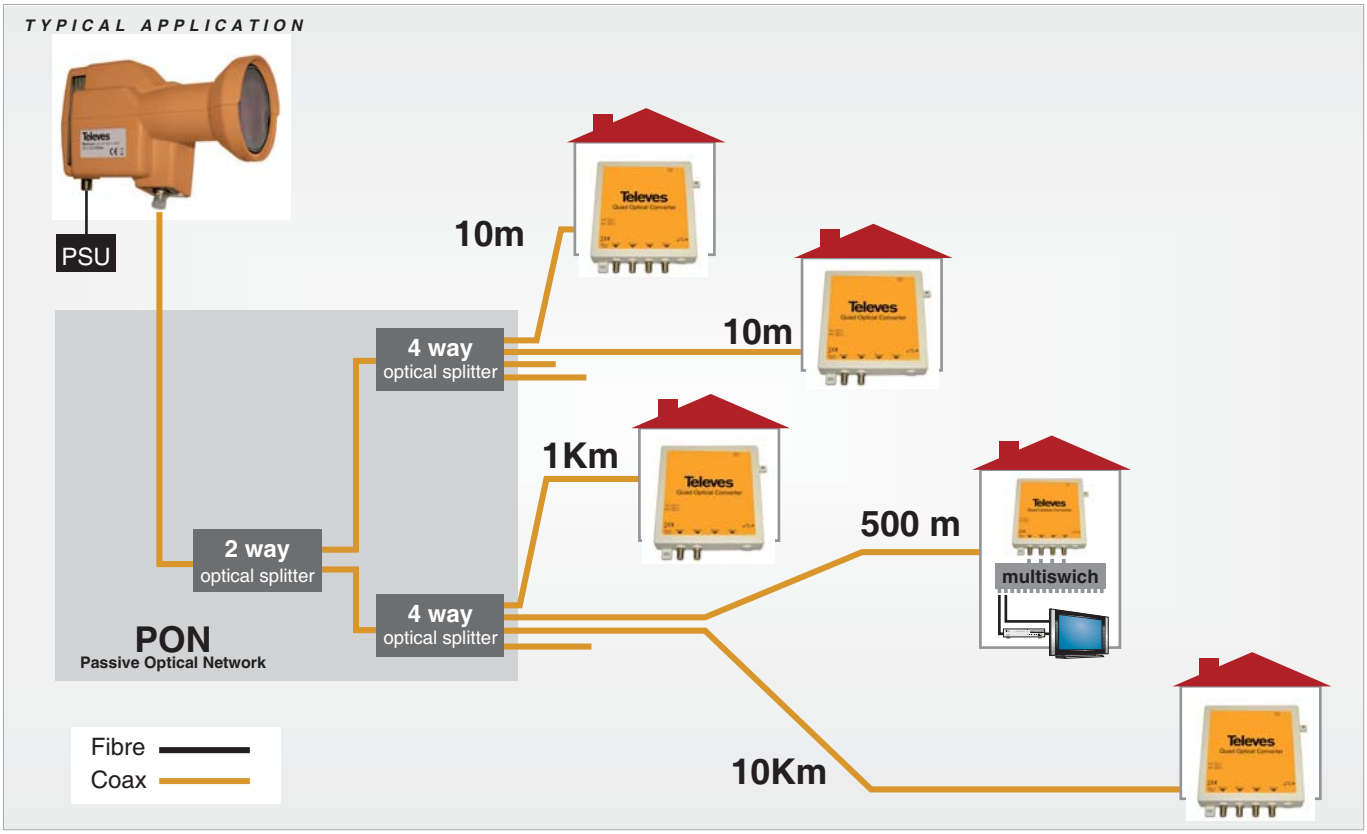
Twin and Quad Optical Converters

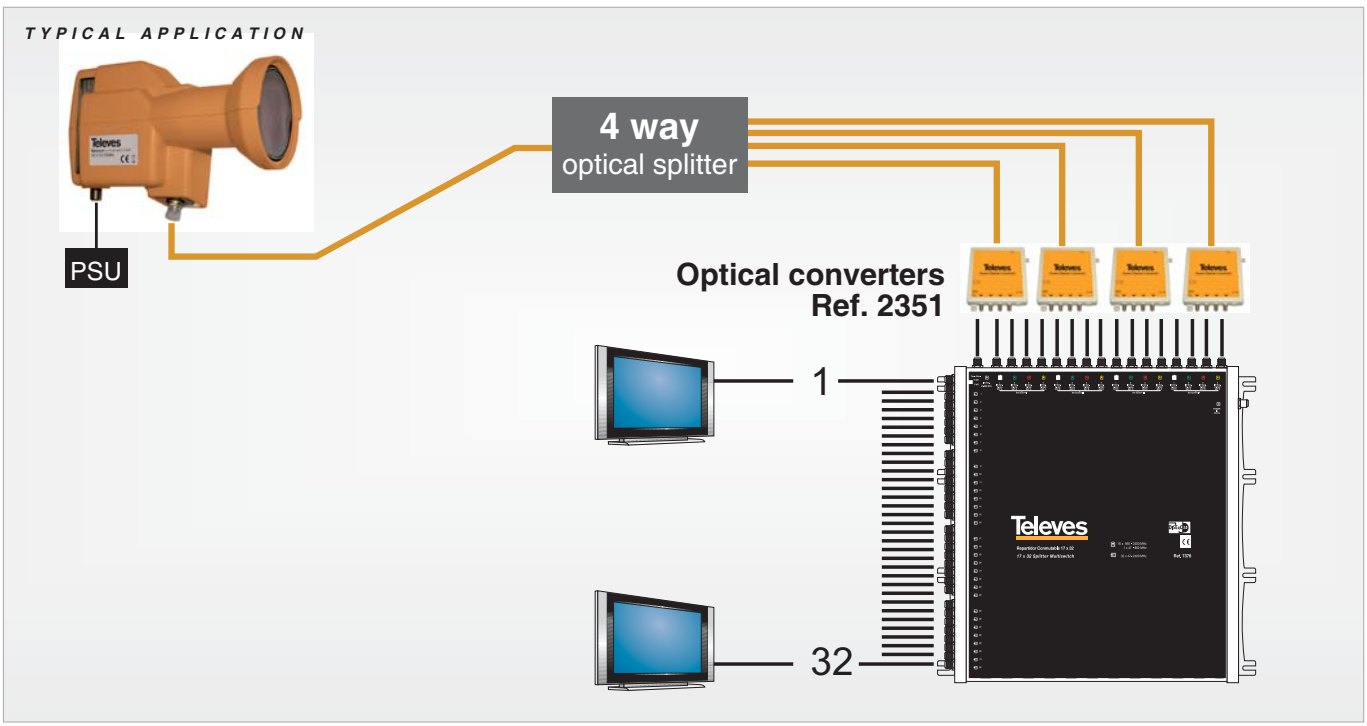
- Converters optical signals from a MDU Optical LNB to IF
- Provides up to 2/4 Universal Satellite feeds from 1 Fibre Optic connection.
- Plug and Play
- Powered via the STB

Reference			2351-2352
Input parameters			
Frequency range		GHz	0,950-5,45
Optical RLR		dB	20
Optical power	SML PON setting	dBm	- 13 min./0 max
	SMD PON setting		- 18 min./-14 max
Nominal transponder		dBm	- 180 min./-40 max
Output parameters			
RF frequency range	Horizontal high band	MHz	1100-2150
	Vertical high band		1100-2150
	Horizontal low band		950-1950
	Vertical low band		950-1950
Nominal output level/transponder		dBm	-65 min. / -25 max.
Rejection between outputs		dB	30
Out of band spurious level		dBm	-60
Impedance		ohm	75
Powering (only for Quatro version, Twin & Quad to be powered from STB)	voltage	Vdc	12
	consumption	mA	330 max.
Operating temperature		ºC	0 to 50
Connectors	DC Input	type	F Female
	Optical output		FC/PC

Reference		2353
Input frequency	GHz	10,7-12,75
Output frequency		0,950-5,45
Optical output power	dBm	7
Noise figure	dB	0,5 typ
Gain		72 max.
Cross polar rejection		30 typ
Powering	Vdc	12
Current consumption	mA	450 max.
Operating temperature	ºC	-30 to 60
DC input connector	type	F Female
Optical output connector		FC/PC

Optical Output LNB and Optical Converters





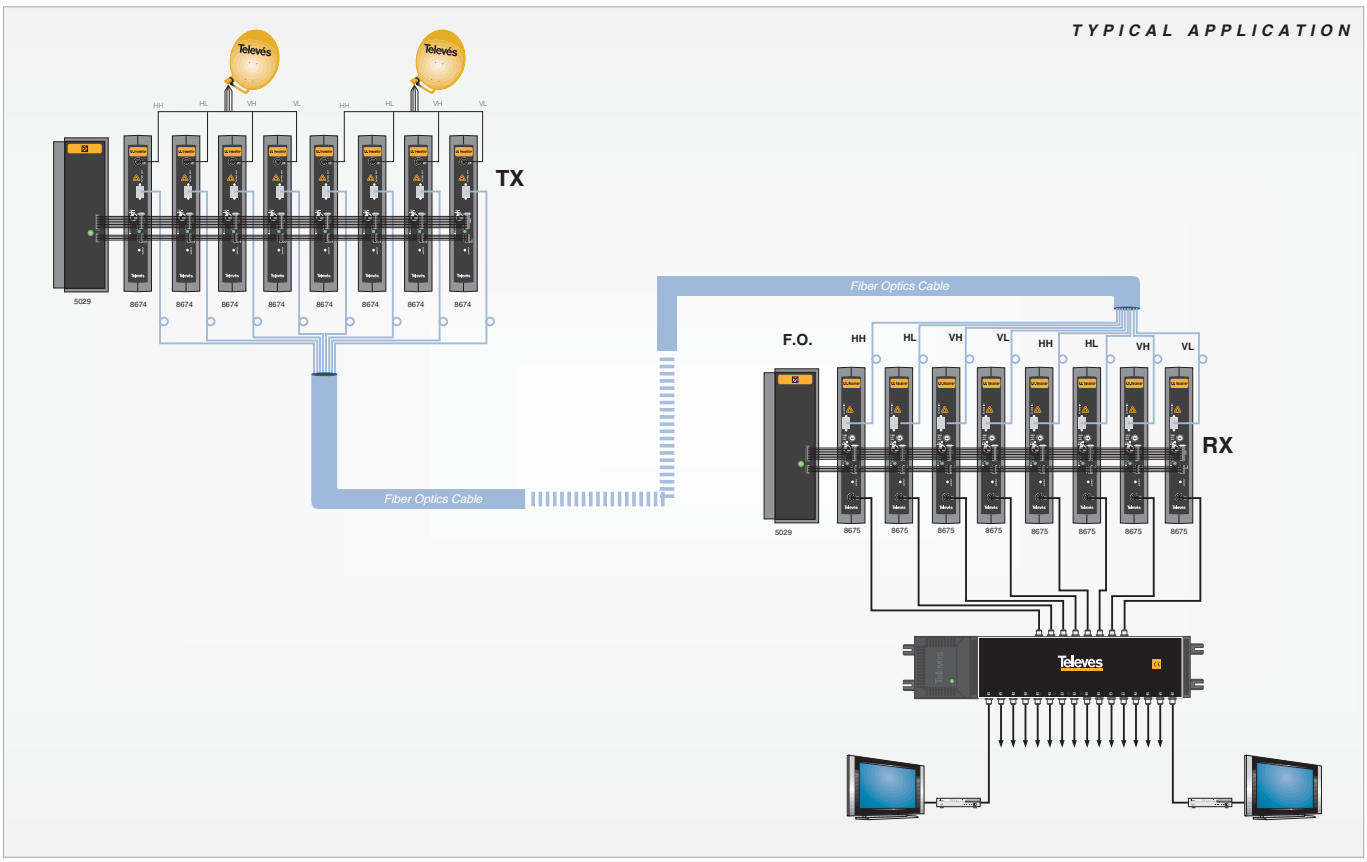
Optical transmitter

PRODUCT RANGE	
REF.	DESCRIPTION
8674	Optical Fiber transmitter
8676	Optical Fiber transmitter with return path
502905	PSU for T03/T05

8676

References		8674	8676
Optical output			
Laser type		MQW-DFB	MQW-DFB
Wave length	nm	1310 ± 20	1310 ± 20
Optical output power	mW	2	2
Optical output connector		SC/APC	SC/APC
RF input			
Bandwidth	MHz	47-2400	5-2400
Return losses	dB	> 11	> 11
Impedance	Ohm	75	75
Max. input level (2 tones)	dBµV	106/tone	106/tone
RF input connector		F	
Return path		no	yes
Powering		15V - 320mA	
Working temperature	ºC	-10 to +45	
Dimensions	mm	35x197x163	

TYPICAL APPLICATION



Optical receiver

PRODUCT RANGE	
REF.	DESCRIPTION
8675	Optical Fiber receiver
8677	Optical Fiber receiver with return path
502905	PSU for T03/T05

8677

References		8675	8677
Optical input			
Wave length	nm	1200 - 1600	1200 - 1600
Maximum optical input power	mW	2	2
Optical input connector		SC/APC	SC/APC
RF output			
Bandwidth	MHz	47 - 2400	5 - 2400
Return losses	dB	> 11	> 11
Impedance	Ohm	75	75
Max. output level (2 tones)	dBµV	108 / tone	108 / tone
RF output connector		F female	F female
Return path		no	yes
Powering		15V - 350mA	
Temperature	ºC	-10 to +45	
Dimensions	mm	35x197x163	

Outdoor optical fiber receiver

PRODUCT RANGE	
REF.	DESCRIPTION
2310	Outdoor optical receiver

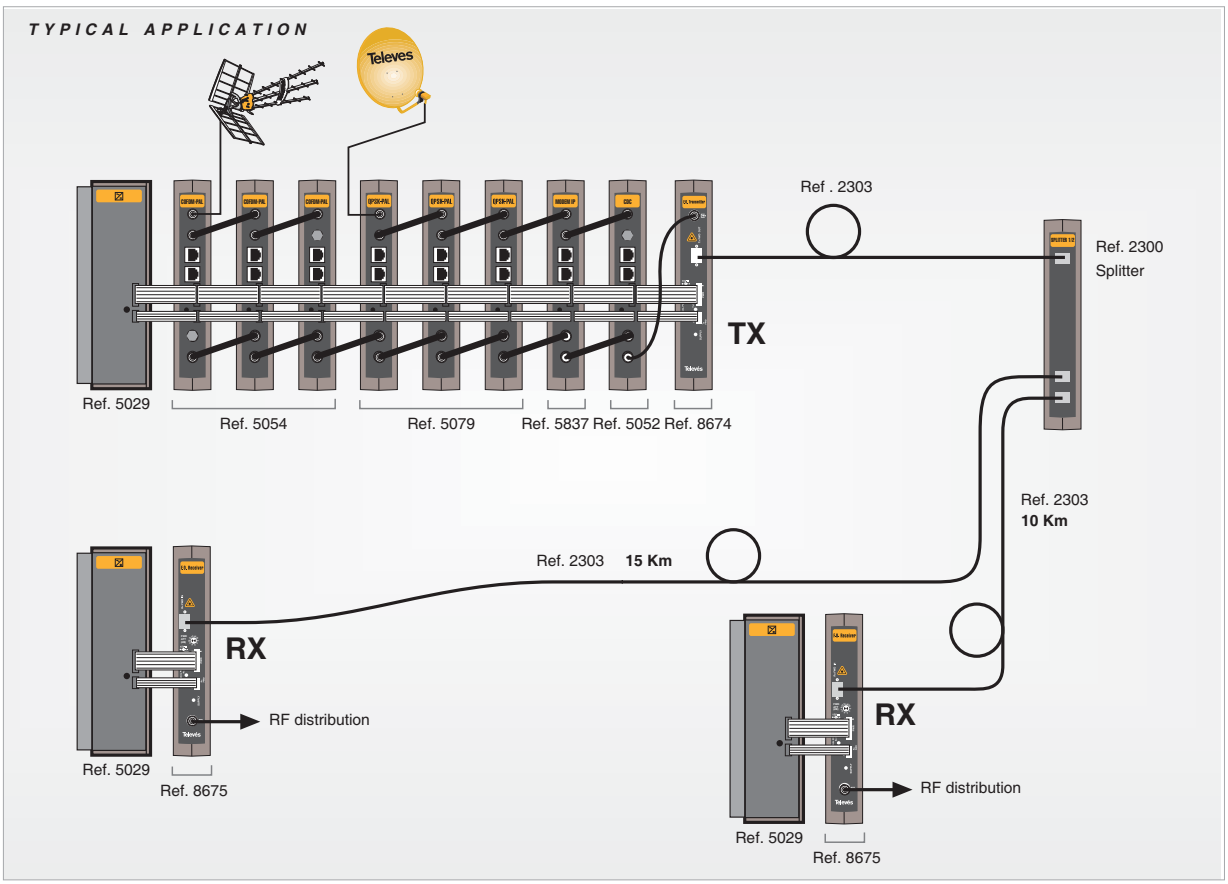
new

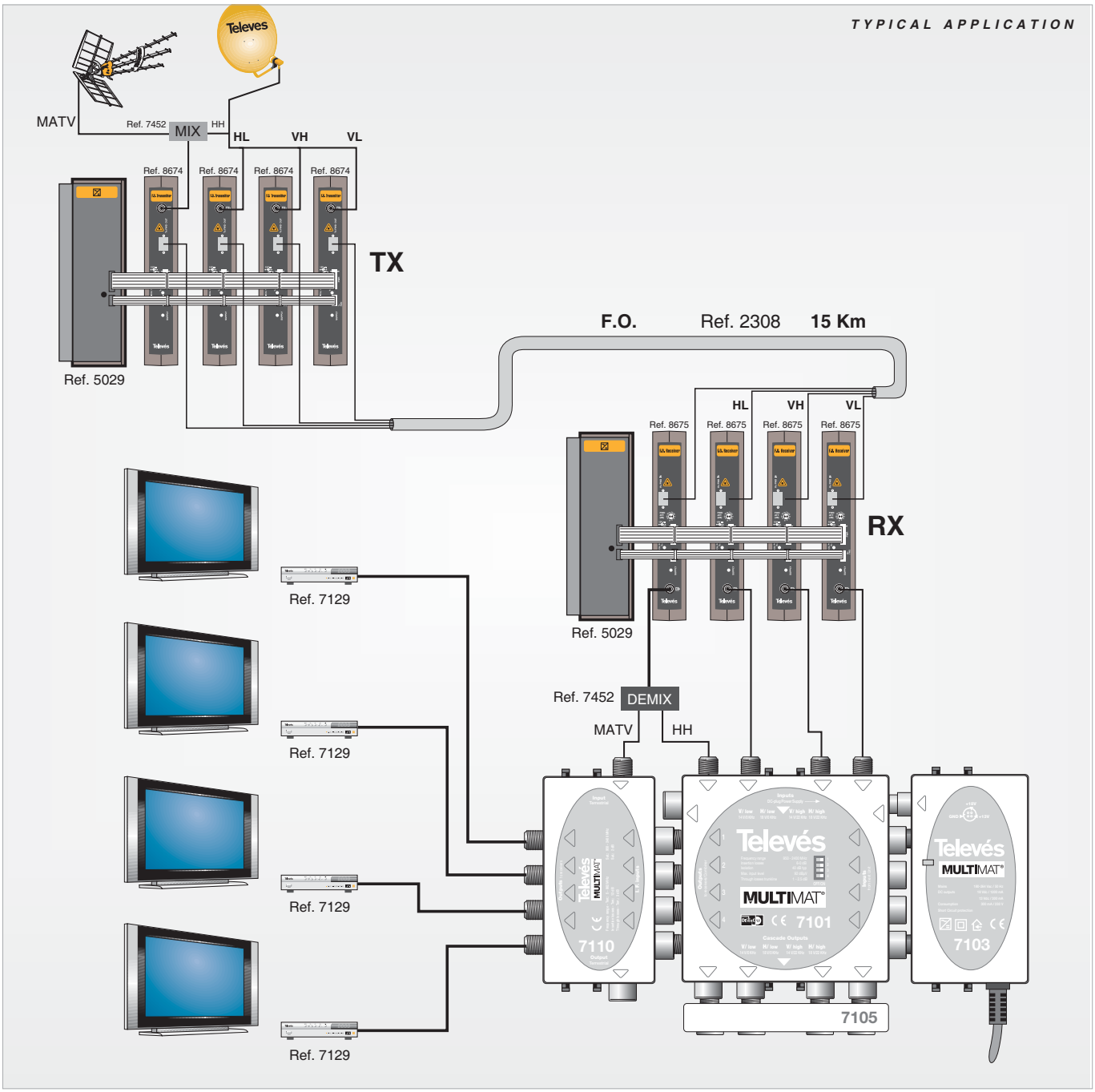
Optical splitter

PRODUCT RANGE	
REF.	DESCRIPTION
2300	Optical splitter, 2 ways
2302	Optical splitter, 4 ways
	Power supply
502905	PSU for T03/T05 range
	PSU1

2300

References		2300	2302
Wave length	nm	1310±40 / 1550±40	
Number of outputs		2	4
Through losses	dB	3.4	6.8
Return losses	dB	>12	
Rejection between outputs		>55	
Fiber type		ITU-T G.652 SMF	
Temperature	ºC	-40 to +85	
Dimensions	mm	35x197x163	




TYPICAL APPLICATION
Televes
MATV
Ref. 7452
MIX
HH
HL
VH
VL
Ref. 8674
Ref. 8674
Ref. 8674
Ref. 8674
TX
Ref. 5029
F.O.
Ref. 2308
15 Km
HL
VH
VL
Ref. 8675
Ref. 8675
Ref. 8675
Ref. 8675
RX
Ref. 5029
Ref. 7129
Ref. 7129
Ref. 7129
Ref. 7129
Ref. 7452
DEMIX
MATV
HH
7110
7101
7103
7105

Distribution and accessories

Complete range of products for the TV signal distribution, adapted to work in every band (VHF, UHF, IF Satellite).

Designed for an easy installation and time saving, using innovative connection systems.

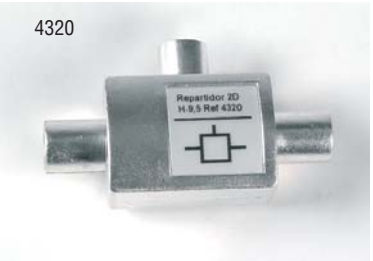
Televes

Plug-in

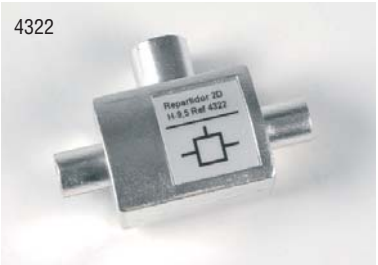
PRODUCT RANGE	
REF.	DESCRIPTION
4322	2 ways F in / M-M out
4320	2 ways M in / F-F out

Shielded splitters/mixers that might be connected directly to the outlets, video tapes, TV or other equipment as they incorporate IEC connectors.

4320

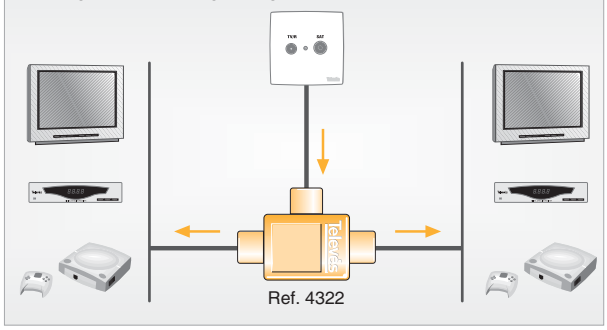


4322



References		4322	4320
Band		V/U	
Through losses	dB	4.5	4.5
Rejection between outputs	dB	>20	
Outputs with DC bypass		1	1
Output connectors	mm	2M 9.5	1M 9.5
Input connectors	mm	1F 9.5	2F 9.5

TYPICAL APPLICATION



SAT-MATV Mixers

Combiners/splitters for MATV and IF signals.

DC bypass in the IF line.

PRODUCT RANGE	
REF.	DESCRIPTION
	Terrestrial-Satellite
7452	RF+IF Mixer
7407	Double mixer (2 outputs) 2FI-2D

7452

7407

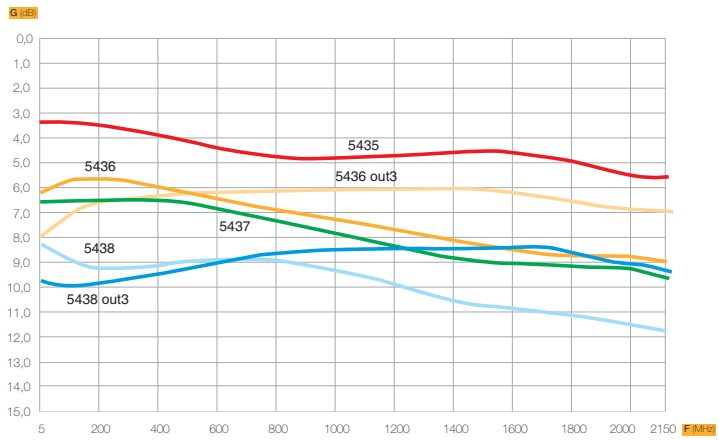
References		7452	7407
Mixed bands		MATV-IF	
Inputs with D/C bypass		1 (IF)	2 (IF)
MATV through losses	dB	<2	<5.5
IF through losses	dB	<2	<3
MATV-IF rejection	dB	>20	>15
Dimensions	mm	98x75x26	93x78x25

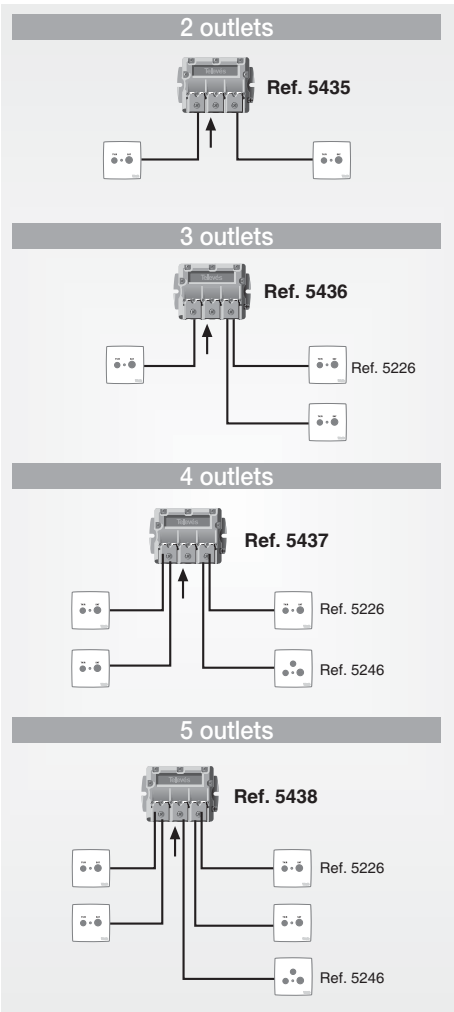
easyF

PRODUCT RANGE	
REF.	DESCRIPTION
	5-2400 MHz
5435	2 Ways 4/5 dB
5436	3 Ways 7/9 dB
5437	4 Ways 7.5/9.5 dB
5438	5 Ways 9.5/12 dB
5469	6 Ways 11/14 dB
5489	8 Ways 14/16 dB

System accesories	
5455	Face plate
4177	Black plastic case (small)
4163	Black plastic case (big)
4087	Terminal load DC-blocked

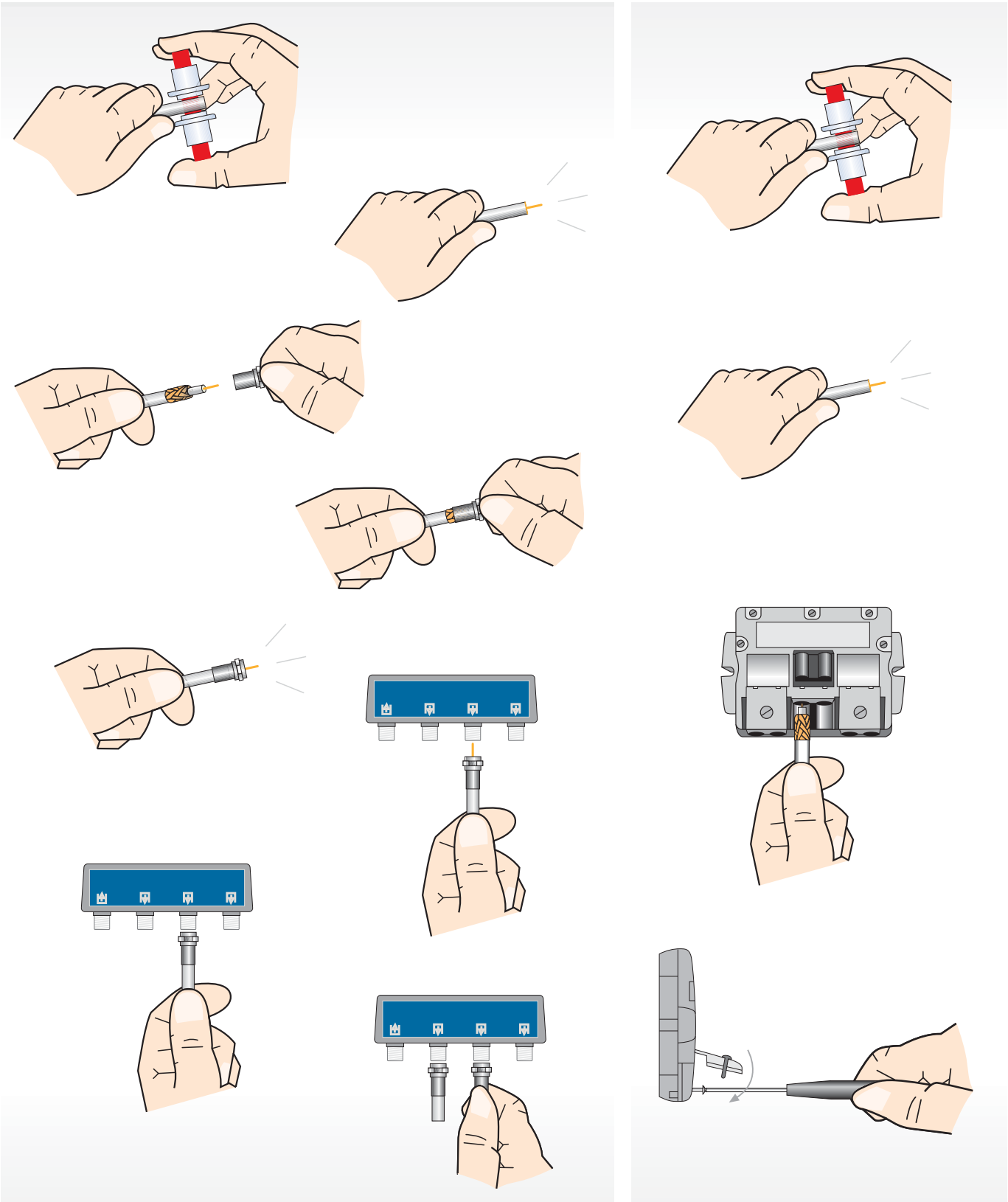
5435





References			5435	5436	5437	5438	5469	5489
Band		MHz	5-2400					
Number of outputs			2	3	4	5	6	8
Through losses IN -OUT S1 ... S8	5-47	dB	3.5 S1,2	6.5 S1,2,3	8 S1,2,3,4	10 S1,2,3,4,5	12 S1,2,3,4 17 (S5,6)	14 (S1,2) 17 (S3,4) 18 (S5,6) 20 (S7,8)
	47-862		4.5 S1,2	7 S1,2,3	7,5 S1,2,3,4		14 (S1,2) 12 (S3,4) 13 (S5,6)	14 (S1,2) 16 (S3,4) 14 (S5,6) 15 (S7,8)
	950–2400		5 S1,2	7...11 S1,2,3	9,5 S1,2,3,4	9,5...12 S1,2,3,4,5	14 (S1,2) 12 (S3,4) 11 (S5,6)	14 (S1,2) 16 (S3,4) 14 (S5,6) 15,5 (S7,8)
Reject. between outputs	5-862	dB	>15	>17		>15	> 9	> 10
	950-2400			>12			>16	> 12
Outputs-inputs DC bypass		mA	300				300 S1,2,3,4	300 S1,2,3,4,5,6
Max. voltage		Vdc	40					

Detail of F connector and Easy F



F connector

PRODUCT RANGE

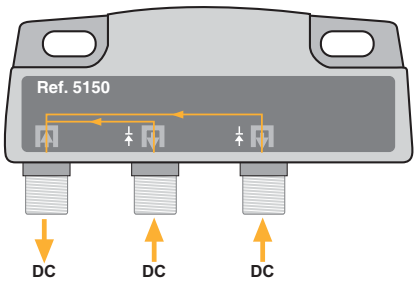
REF.	DESCRIPTION
	5-2400MHz
5150	2 Ways 4/5 dB
5151	3 Ways 7/9 dB
5152	4 Ways 7.5/10 dB
5153	5 Ways 10/12 dB
7441	6 Ways 12/16 dB
7406	8 Ways 14/19 dB
5155	2 Ways all DC
5156	4 Ways all DC
5157	5 Ways all DC
5158	6 Ways all DC
5159	8 Ways all DC

	5-1000MHz
4530	2 Ways
4532	3 Ways
4531	4 Ways
4534	6 Ways
4533	8 Ways
	950-2150MHz active
7402	8 Ways active

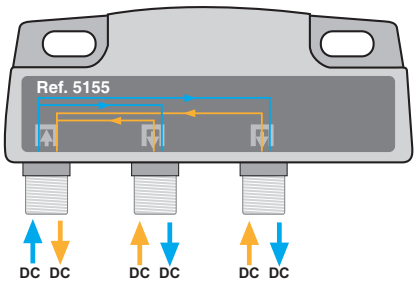
System accesories

4061	F-Type 75Ω load DC blocked
4058	F connector load

4534



DC bypass from the outputs to the input



ALL DC Splitters

References			4530	4532	4531	4534	4533
Band		MHz	5-1000				
Number of outputs			2	3	4	6	8
Through losses	VHF	dB	5	7	9	10	12
	UHF		5	7	9	10	12
Rejection between outputs		dB	15	20	15	20	15
Type of connectors			F				
Dimensions		mm	52x50x20	74x50x20		123x60x20	

References		7402
Band	MHz	950-2150
Number of outputs		8
IF gain	dB	5-7.5
Rejection bet. outputs	dB	12
DC bypass outputs-inputs		Yes
Noise figure	dB	<8
Dimensions	mm	141x97x24

References			5150	5151	5152	5153	7441	7406	5155	5156	5157	5158	5159
Band		MHz	5 - 2400						5 - 2400				
Number of outputs			2	3	4	5	6	8	2	4	5	6	8
Through losses	MATV	dB	4	7	7.5	10	12	14	4	7.5	10	10	11
	FI		5	9	10	12	16	19	5	10	10	11.7	13.6
Rejection between outputs	MATV / FI	dB	> 20				> 17	> 19	> 20			> 28	> 34
Max. output-input DC bypass		A	1										

5-2400 MHz Easy F

PRODUCT RANGE

REF.	DESCRIPTION	
	2 Ways	
5425	2D 12 dB (Floor 1)	TA
5426	2D 16 dB (Floor 2, 3)	A
5427	2D 20 dB (Floor 4-6)	B
5428	2D 24 dB (Floor 7-12)	C
	4 Ways	
5444	4D 12 dB (Floor 1)	TA
5445	4D 17 dB (Floor 2, 3)	A
5446	4D 20 dB (Floor 4, 5)	B
5447	4D 25 dB (Floor 6, 7)	C
5448	4D 29 dB (Floor 8)	TD

	6 Ways	
5492	6D 16 dB (Floor 1)	TA
5493	6D 20 dB (Floor 2, 3)	A
5494	6D 24 dB (Floor 4, 5)	B
	8 Ways	
5610	8D 16 dB (Floor 1)	TA
5611	8D 22 dB (Floor 2)	A
5612	8D 28 dB (Floor 3)	B

2W/4W

6W/ 8W

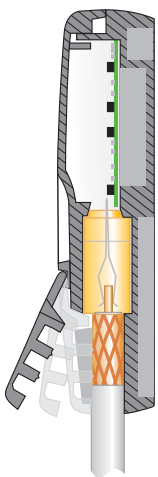
The innovative easy fast F-connector provides the advantages of the S&C connector and the F-connector.

Fully shielded.

They allow an IN-OUT current bypass.

References			5425	5426	5427	5428	5444	5445	5446	5447	5448
Number of outputs			2				4				
Floor			1	2···3	4···6	7···12	1	2···3	4···6	7···12	12···16
Through losses IN - OUT	C. ret.	dB	<4	<1.5	<2	<1	5.5	3	2.3	1.5	1.3
	MATV	dB	2.2	1.2	1.1	0.7	4.7	2.3	1.6	1.3	1.2
	FI	dB	2.4	2	1.2	0.9	5-7.5	2.3-3	2.1	1.4-3	1.3-3
Tap losses IN-D1/D2	C. ret.	dB	<13	<16	<20	<24	12	17	20	25	28
	MATV	dB	13	16	20	24	13	17	20	25	28
	FI	dB	12	16	20	24	15	17	22	25	29
Rejection output-tap	MATV	dB	> 32	> 27	> 35	> 42	> 33	> 32	> 33	> 35	> 40
	FI	dB	> 25	> 24	> 35	> 38	> 30	> 33	> 30	> 33	> 35
Rejection bet. taps	MATV	dB	> 37	> 42	> 30	> 30	> 28	> 27	> 28	> 30	> 32
	FI	dB	> 31	> 34	> 22	> 23	> 21	> 20	> 22	> 25	> 30
Max. bypass current		mA	300								

Referencias			5492	5493	5494	5610	5611	5612
Number of outputs			6			8		
Floor			1	2···3	4···5	1	2	3
Through losses IN - OUT	C. ret.	dB	<11	<6	<6	14	4	4
	MATV	dB	5	3	3	7	2	2
	FI	dB	5	3,5	4	8	5	5
Tap losses IN-D1/D2/D3/D4	C. ret.	dB	<18	<20	<26	<18	<24	<30
	MATV	dB	16	20	24	16	23	28
	FI	dB	16	20	24	16	23	28
Rejection bet. taps	C. ret.	dB	>30	>30	>35	>30	>30	>40
	MATV	dB	>30	>30	>30	>30	>30	>35
	FI	dB	>30	>25	>25	>20	>20	>30
Rejection bet. taps	C. ret.	dB	>30	>40	>45	>35	>40	>40
	MATV	dB	>30	>40	>45	>35	>40	>40
	FI	dB	>30	>40	>45	>35	>40	>40
Max. voltage		Vdc	40					
Max. bypass current		mA	300					



5-2400 MHz F connector

2 Ways

PRODUCT RANGE	
REF.	DESCRIPTION
5130	12 dB
5131	15 dB
5132	18 dB
5133	23 dB
5134	27 dB

5133

References			5130	5131	5132	5133	5134
Frequency range		MHz	5-2400				
Through losses	MATV	dB	2.5	1.2	1.5	1	1
	IF		2.6	2	1.5	1.5	1
Tap losses	MATV		12	15	18	23	27
	IF		12	15	19	23	27
Rejection output-tap	MATV		> 32	> 27	> 35	> 42	> 50
	IF		> 25	> 24	> 30	> 35	> 35
Rejection bet. taps	MATV	dB	> 30				
	IF						
Max. bypass current		A	1				

4 Ways

PRODUCT RANGE	
REF.	DESCRIPTION
5141	4W 12 dB
5142	4W 16 dB
5143	4W 19 dB
5144	4W 24 dB
5145	4W 28 dB

References			5141	5142	5143	5144	5145
Frequency range		MHz	5-2400				
Through losses	MATV	dB	4.5	2.3	1.5	1	1
	IF		5	3.4	2.5	2	1.5
Tap losses	MATV		12	16	19	24	28
	IF		12	16	20	24	29
Rejection output-tap	MATV		> 50	> 35			
	IF		> 30				
Rejection bet. taps	MATV	dB	> 25		> 20		
Max. bypass current		A	1				

6 Ways

PRODUCT RANGE	
REF.	DESCRIPTION
5135	18 dB
5136	20 dB
5137	24 dB

8 Ways

PRODUCT RANGE	
REF.	DESCRIPTION
5146	18 dB
5147	20 dB
5148	23 dB

System accesories	
4061	F-Type 75Ω load DC blocked
4058	F connector load

References			5135	5136	5137	5146	5147	5148
Frequency range		MHz	5-2400					
Through losses	Ret. Path	dB	3	1.7	1.5	3	1.7	1.5
	VHF							
	UHF		3.3	2	1.5	3.3	2	1.5
	IF		5	4	2.5	5	4	
Tap losses	Ret. Path		18	20	24	18	20	23
	VHF							
	UHF							
	IF		19	21	25	19	20	25
Rejection between taps			>21					
Max. bypass current		A	1					

5-1000 MHz F connector

PRODUCT RANGE	
REF.	DESCRIPTION
	1 Way
4515	6 dB
4516	8 dB
4517	11 dB
4518	14 dB
4519	17 dB
	2 Ways
4560	4 dB terminal
4561	9 dB
4562	11 dB
4563	14 dB
4564	17 dB
4565	20 dB
4566	23 dB
4567	26 dB
	4 Ways
4571	8 dB terminal
4572	11 dB
4573	14 dB
4574	17 dB
4575	20 dB
4576	23 dB
4577	26 dB
	8 Ways
4578	12 dB terminal
4579	14 dB
4580	17 dB
4581	20 dB

System accesories	
4061	F-Type 75Ω load DC blocked
4058	F connector load

This passive line for interior distribution provided with F connectors includes taps with 1,2, 4 and 8 ways, as well as a support for wall mounting.

4578

4560

4571

References	1D	4515	4516	4517	4518	4519
Frequency range	MHz	5-1000				
Tap losses	dB	6.5	8	11	14	17
Through losses		3	2.4	1.5	1.5	1.3
Rejection between taps		30	30	33	35	37
Dimensions	mm	52x50x20				

References	2D	4560	4561	4562	4563	4564	4565	4566	4567
Frequency range	MHz	5-1000							
Tap losses	dB	4.5	8	11	14	17	20	23	26
Through losses		-	2.5	2.0	2.0	1.5	1.0	1.0	1.0
Rejection between taps		28	28	27	27	27	27	27	27
Dimensions	mm	52x50x20							

References	4D	4571	4572	4573	4574	4575	4576	4577
Frequency range	MHz	5-1000						
Tap losses	dB	8	11	14	17	20	23	26
Through losses		-	4.0	2.5	2.0	1.0	0.5	0.5
Rejection between taps		25						
Dimensions	mm	66x56x20						

References	8D	4578	4579	4580	4581
Frequency range	MHz	5-1000			
Tap losses	dB	12	14	17	20
Through losses		-	<5	<3.5	<2
Dimensions	mm	92x56x20			

Through

PRODUCT RANGE	
REF.	DESCRIPTION
	5-2150 MHz
5236	20 dB + DC
5227	14 dB + DC
5228	10 dB + DC
5229	4 dB+ DC end splitter outlet
	Low losses 5-862 MHz
5230	FM-TV 4 dB end outlet
5231	FM-TV BP 10 dB
	5-1000 MHz
5232	FM-TV End outlet SCATV
5233	FM-TV SCATV

End

PRODUCT RANGE	
REF.	DESCRIPTION
5226	Diplexed TV/FM-SAT
524605	Triplexed TV-R-SAT
5270	MATV **(bridged)**

System accessories	
REF.	DESCRIPTION
5442	Back box
5441	Face plate R-TV
5440	Face plate TV/FM-SAT
544302	Face plate TV-R-SAT
5274	RJ 45 TV/R-SAT Face plate adapter

easyF

new

Ref.	Symbol		Tap losses (dB)													
			Bands	Return	BI	Subband	FM	Low S	BIII/DAB	High S Hyperb.	UHF	IF - SAT		DC bypass (350mA)	Through losses loss (dB)	
				5-47	47-68	68-89	88-108	104-174	174-230	230-446	470-862	950-2150	2150-2400		MATV	IF SAT
SCATV 5-1000 MHz																
5232			TV	<1			-	<1				-		-	-	-
			R	-			3	-								
5233			TV	<8	7		-	7				-		-	2.6	3
			R	-			26	-								
DC pass outlets 5-2150 MHz																
5229			TV/R	1	4							5	6.5	-	-	-
			SAT	1	4							5	6.5	SAT→IN		
5228			TV/R	6	7.5							10.5	13	IN→OUT	3.5	5
			SAT	11	8.5							9	10	SAT→IN		
5227			TV/R	10.5	13							13.5	14	IN→OUT	1.2	2
			SAT	10.5	13							14	14.5	SAT→IN		
5236			TV/R	20	20							24	23	IN→OUT	0.6	1
			SAT	18	20							24	24.5	SAT→IN		
Low losses 47-860 MHz																
5231			TV	10	9.5		-	9.5				-		-	<1.3	2
			R	-			26	-								
5230			TV/R	4.3	4.5		-	4.5				-		-	-	-
			SAT	-			18	-							-	-
End bridged																
5270			TV/R	<5*								-		Yes	-	-
			SAT	<5*												
Splitters - 2 outputs																
5226			TV/R	0.3	0.6							-		SAT→IN	-	-
			SAT	-								1.5 ± 0.2				
Triple triplexed																
524605			TV	<8	4.5							-		-	-	-
			R	<8	4.5											
			SAT	-								1.5 ± 0.2		SAT→IN		

End outlet	Through outlet	Female IEC connector	Male IEC connector	F Female

TV response *R response* *SAT response*

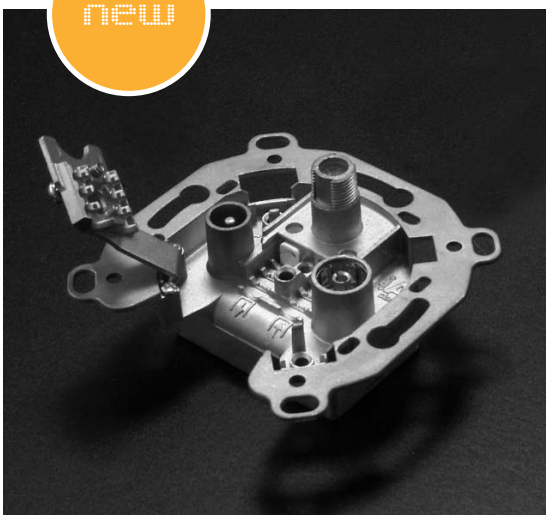
** Depending on the output loaded*

Multimedia

PRODUCT RANGE	
REF.	DESCRIPTION
5240	Multimedia end outlet
5247	10dB pass-through outlet
5248	15dB pass-through outlet
5249	20dB pass-through outlet

easyF

new



NEW Lateral Opening Clamp

- **Easy and fast connection system** for different inner conductor diameters
- **Snap-in terminals** for inner conductor
- **Inner conductor conical** guiding path for ease of connection
- Holes to release the inner conductor cable by pressing **the self-retaining contact**
- **180º opening** lateral clamp
- **Class A** screening

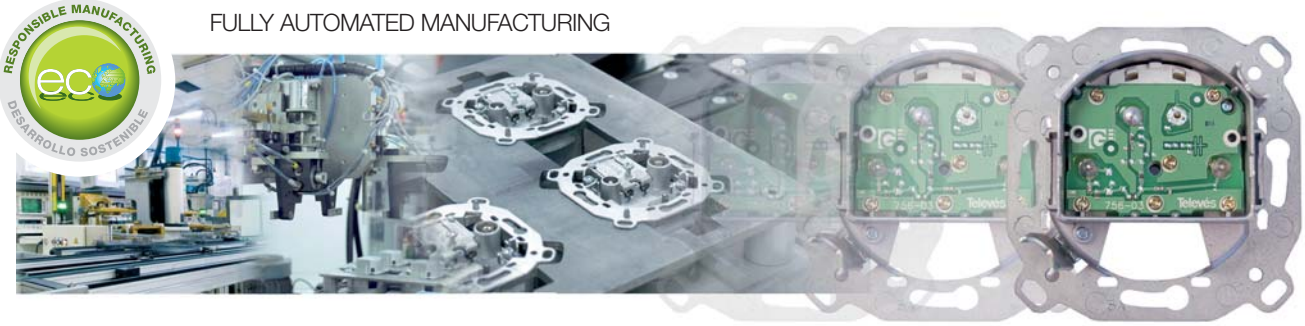
Total quality in one step
Click - and-go system

	5240	5247	5248	5249
Frequency range (MHz)	TV-RF-DATA / 110..1000-87..108-5..1000			
Through losses (dB)	-	<2	1,5	1
Tap losses DATA (dB)	<3,5	10,5	15	20
Tap losses TV (dB)	<5	10	15	20
Tap losses RF (dB)	<10	15	20	25
Isolation DATA-TV (dB)	>70			
Isolation DATA-RF (dB)	>30			
VSWR input (dB)	>14			
VSWR DATA (dB)	>14			
VSWR TV (dB)	>10			
HF- connections	IEC Male/Female/F			

- The choice of distribution products is automatically produced to receive a great high-class level. This family consists in a complete product range which fulfils all demands from single systems up to CATV systems.

RESPONSIBLE MANUFACTURING ecoe DESARROLLO SOSTENIBLE

FULLY AUTOMATED MANUFACTURING



IEC Elbowed shielded

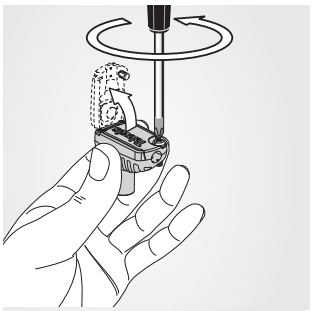
PRODUCT RANGE	
REF.	DESCRIPTION
	IEC Shielded
4130	Male 9.5 mm Ø
4131	Female 9.5 mm Ø
413201	Male 9.5 mm Ø pro
413301	Female 9.5 mm Ø pro
437401	Male 9.5 mm Ø pro (blister)
437501	Female 9.5 mm Ø pro (blister)
437601	M/F 9.5 mm Ø pro (blister)

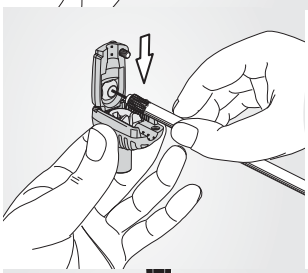
4130/4131

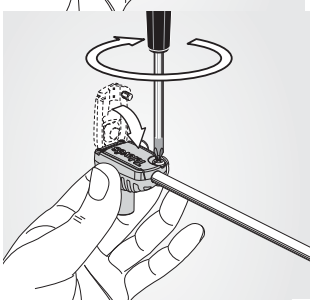
413201 / 413301

new

easyF







The Televes connector "EASY" guarantees the maximum quality in the equipments and systems connexion, providing the SHIELDING to the digital signals in the installation at issue.

The coaxial cable junction turns into an easy and fast operation. Not having different pieces, makes it ideal to connectorize the cable in difficult locations, where the elements handling is a tricky task.

Simplicity and speed of assembly:

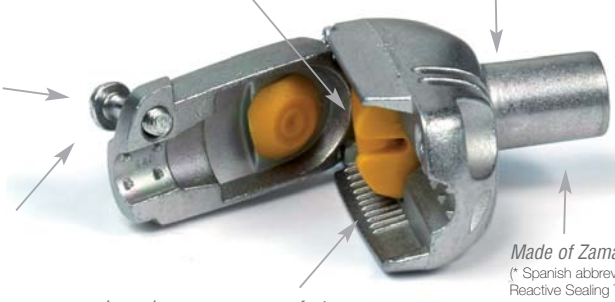
- One single screw.
- Connection always visible.
- Without curled up pieces.
- Without detachable pieces

Safe connection:

- Assures the fiability of the connection and does not need future revisions.
- The installer will have the feeling that if something fails, it is not the connectors fault.

Electrically perfect:

- Automat fabrication.
- Total shielding that prevents from unwanted effects in the DTT reception.
- Perfect adaptation to the distribution network elements.
- Due to its performance and quality, it is the connector tobe used with the actual DTT and in the **future HDTV.**



SCATV 5/8” Type

PRODUCT RANGE	
REF.	DESCRIPTION
4121	5/8” cable 1/2”
4122	5/8” cable TR165

4121

4122

F Type

PRODUCT RANGE	
REF.	DESCRIPTION
4176	Elbow push fit (CXT&T100)
4171	Plug twist (CXT&T100)
9349	Plug twist (TR165)
4120	Plug crimp (1/2”)
4127	Plug twist (CXT 5 mm)
413401	Elbow male professional
4135	F connector T100

4176

4134

new

4171

4120

4127

9349

Joint connectors

PRODUCT RANGE	
REF.	DESCRIPTION
4066	Coaxial joint
4173	F female - F female

4066

4173

Connection accessories

PRODUCT RANGE	
REF.	DESCRIPTION
	Adapters
4123	5/8” - F connector
4071	DC block F connector
	75 Ω Terminal loads
4061	F type DC blocked
4058	F type
4087	For saddle&clamp, DC blocked
	SCART leads
7352	2 SCART 21 pin

4123

4071

4061

4058

4087

7352

Cases for Easy F splitters and taps

PRODUCT RANGE	
REF.	DESCRIPTION
5455	Face plate
4177	Black plastic case (small)
4163	Black plastic case (big)

5455

4177

PRODUCT RANGE

REF.	DESCRIPTION	
	Copper braid	
2106	CXT5 PVC	150 m
2138 /V02/V03	CXT PVC	100/250/500 m
2139	CXT PVC Black	100 m
2141 /V05/V07	T100 PVC	100/100/250 m
2155 /V03	T100 PE	100/250 m
2149	TR165 PE	250 m
2140	1/2” PE	500 m

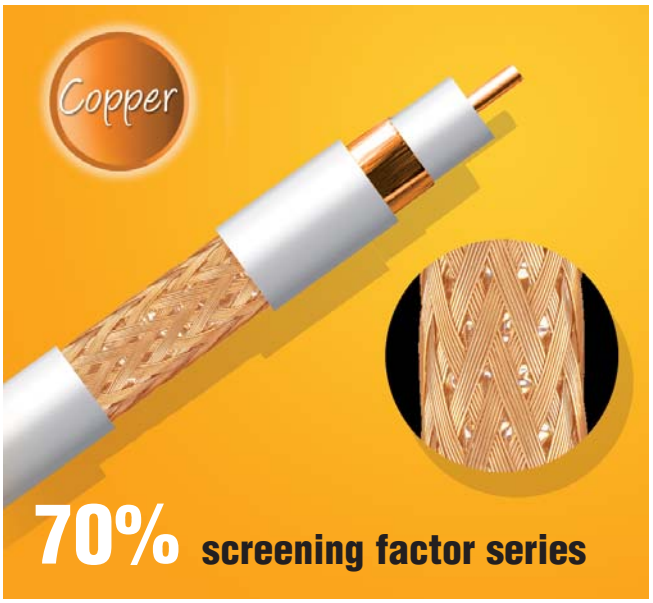
References			2141 V05/V07	2155/V03	2106	2138 V02/V03 2139	2149	2140
Model			T100		CXT5	CXT	TR-165	1/2´´
Inner cond.	Ø (mm)		1,13	1,13	0,8	1	1,63	2,7
	Material		Cu	Cu	Cu	Cu	Cu	Cu
	Resist.	(Ω/Km)	20	20	35	23	9	3,2
Dielectric	Ø (mm)		4,8	4,8	3,4	4,8	7,2	11,5
	Material		PEE	PEE	PEE	PEE	PEE	PEE
Overlapping shielding foil			B	B	A	B	A	B
Braid	Resist.	(Ω/Km)	20	20	25	35	13	7
	Material		Cu	Cu	CuSn	Cu	Al	Cu
Antimigration film			Yes	Yes	No	No	No	No
Petrol jelly			No	No	No	No	No	Yes
Outer sheath	Ø	(mm)	6,6	6,6	5	6,6	10,1	15
	Colour		W/B/W	Black	White	W/W/W/B	Black	Black
	Material		PVC	PE	PVC	PVC	PE	PE
Minimum bending radio		(mm)	33	33	25	33	50	75
Shielding		(dB)	>75	>75	>75	>75	>75	>75
Capacitance		(pF/m)	55	55	53	55	53	55
Impedance		(Ω)	75	75	75	75	75	75
Meters / reel		(m)	100/100/250	100/250	100	100/250/500 100	250	500
Attenuations								
Freq. (MHz)	200	dB/m	0,08	0,08	0,11	0,09	0,05	0,03
	500		0,12	0,12	0,19	0,14	0,10	0,06
	800		0,15	0,15	0,23	0,18	0,12	0,07
	1000		0,18	0,18	0,26	0,20	0,14	0,08
	1350		0,21	0,21	0,31	0,23	0,17	0,10
	1750		0,24	0,24	0,35	0,27	0,19	0,11
	2050		0,27	0,27	0,39	0,29	0,20	0,12
	2150		0,27	0,27	0,40	0,30	0,20	0,13
	2300		0,28	0,28	0,42	0,31	0,22	0,14

Sheath	Environment
PVC	Indoor
PE	Outdoor
LSFH	Special

Cu + Fe: Copper clad steel	**PE:** Polyethylene
Al: Aluminium	**PEE:** Foam polyethylene
Cu: Copper	**LSFH:** Low Smoke Free Hallogen

Overlapped foil	
A	Al + Polyester + Al
B	Cu + Polyester

PRODUCT RANGE (70% screening factor series)		
REF.	DESCRIPTION	
214102 /V04/V08	T100 PVC	100/250/100 m
215101	T100 LSFH	100 m
2128 /V01	CXT PVC	100/250 m
2127 V01/V02/V03/V04	CXT1 PVC	100 m
215501 /V02	T100 PE	100/250 m
2126 V01/V02/V03	T100 PVC	100/250/250/100 m
2149 V01	TR165 PE	250 m



References			2126 V01/V02/V03	214102 /V04/V08	2149 V01	215101	2128/V01	2127 V01/V02/V03/V04	215501/V02
Inner conductor	Ø mm		1,12	1,13	1,63	1,12	1	1	1,13
	Material		Cu	Cu	Cu	Cu	Cu	CCS	Cu
	Resistance	(Ω/Km)	18	16	9	18	20	97	18
Dielectric	Ø mm		4,8	4,8	7,2	4,7	4,5	4,7	4,8
	Material		PEE	PEE	PEE	PEE	PEE	PEE	PEE
Overlapping Foil	Material		B	B	A	B	A	A	B
Outer conductor	Resistance	(Ω/Km)	27	12	8	14	31	30	13
	Dimensions (carrier x strands x Ø mm)		16x6x0,14	16x8x0,11	16x7x0,15	16x8x0,11	16x6x0,14	16x7x0,13	16x8x0,11
	Screening	(%)	74	73	70	73	74	73,4	73
	Material		Al	Cu	Cu	Cu	Al	Al	Cu
Antimigrating film			no	yes	no	yes	no	no	yes
Outer Sheath	Ø	(mm)	6,9	6,6	10,1	6,6	6,5	6,7	6,6
	Colour		white/white/black/black	white/white/black	black	white	white	W/B/B/W/W	black
	Material		PVC	PVC	PE	LSFH	PVC	PVC	PE
Minimum bending radius		(mm)	34,5	33	50,5	33	32,5	33,5	33
Shielding		(dB)	>75	>75	>75	>75	>75	>75	>75
Impedance		(Ω)	75	75	75	75	75	75	75
Metres / reel		(m)	100/250/250/100	100/250/100	250	100	100/250	100/100/250/250/500	100/250
Attenuations									
Frequence (MHz)	85	dB/100 m	5,35	5,40	3,59	4,85	5,82	6,38	5,07
	200		8,02	7,88	5,44	7,50	8,68	9,39	7,88
	500		13,15	12,69	8,97	12,00	14,13	15,24	12,69
	750		16,49	15,80	11,20	15,00	17,72	19,27	15,74
	800		17,06	16,32	11,59	15,60	18,33	20,00	16,33
	1000		19,3	18,37	13,13	17,00	20,68	22,84	18,36
	1350		22,76	21,62	15,48	20,50	24,27	27,50	21,64
	1750		26,35	24,87	18,00	23,50	28,12	32,26	24,82
	2050		28,88	27,22	19,78	25,70	30,71	35,67	27,12
	2150		29,55	27,85	20,31	26,00	31,42	36,87	27,81
	2300		31,54	29,15	21,12	27,00	32,75	38,50	29,47

Sheath	Environment of use
PVC	Indoor
PE	Outdoor
LSFH	Special

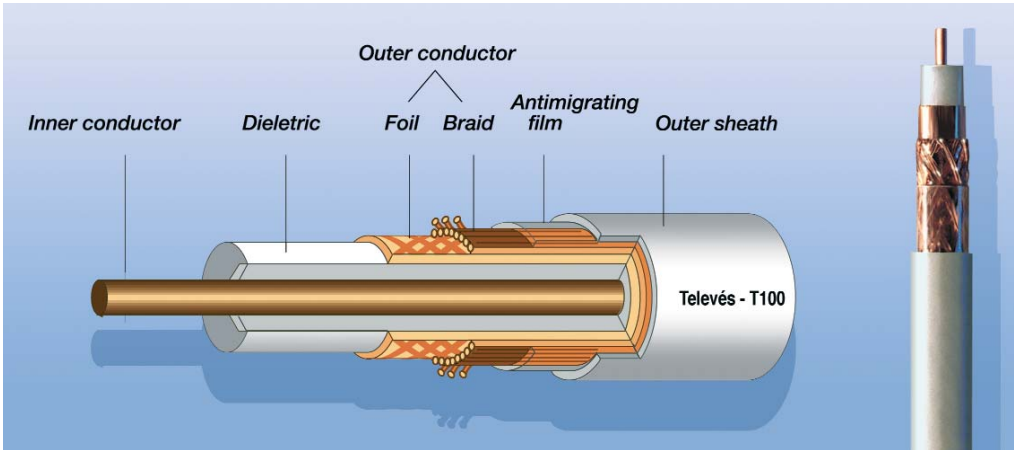
Al: Aluminium	PE: Polyethylene
Cu: Copper	PEE: Foam Polyethylene
PVC: Polyvinyle Clorhidre	LSFH: Low Smoke Free Hallogen
CSS: Copper Clad Steel	

Overlapping foil composition	
A	Al + Polyester + Al
B	Cu + Polyester
C	Cu + Polyester

Remark:

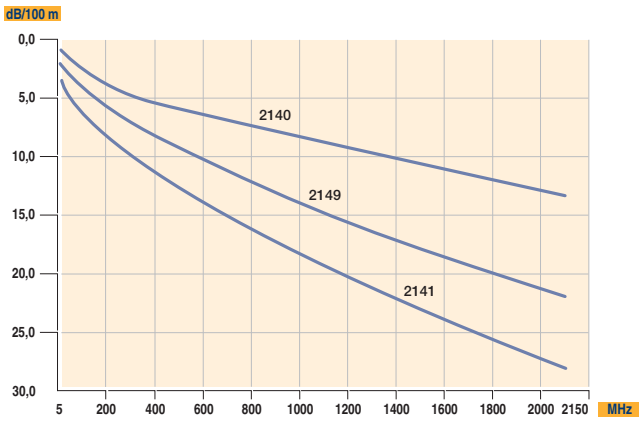
The PE cables (polyethylene) are used for outdoor applications.

The PVC cables are used for indoor applications.

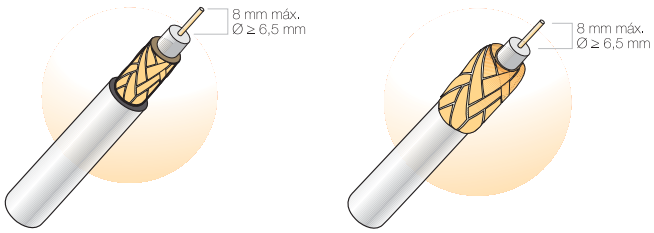


Coaxial cable section detail

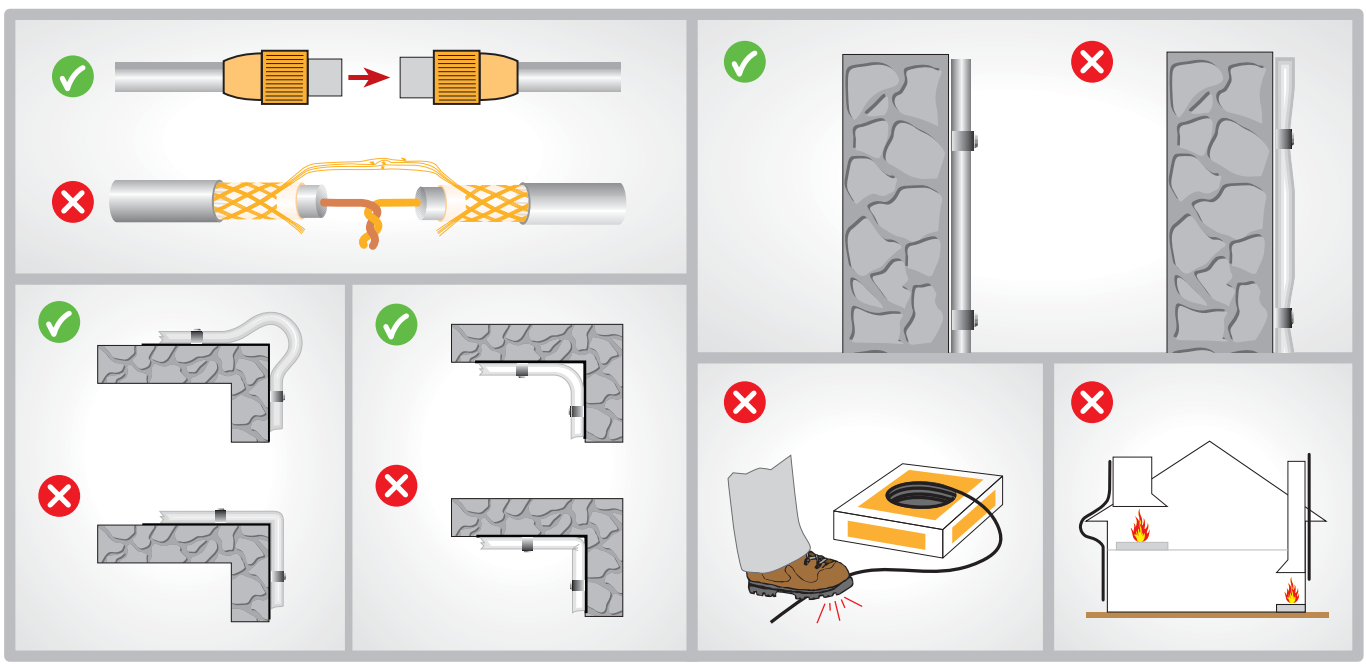
Cable losses

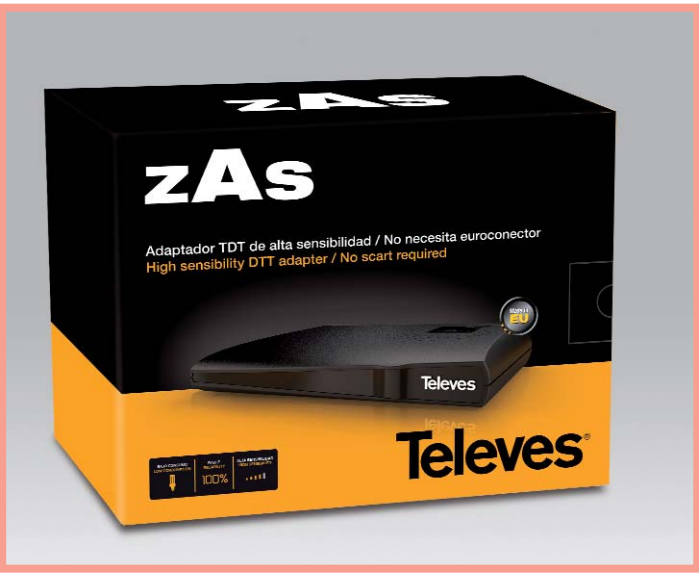


Coaxial cable stripping detail



Recommendations





DTH receivers

Indoor receivers for terrestrial and satellite channels. Easy to use, with easy and intuitive menus.

Televes

Made in EUROPE

New functions:

- **Teletext:** Withstanded function by the own adapter, that makes it independent from teletext function on behalf of the television set.
- **Subtitles:** Function of special demand in professional associations, as:

  People with hearing deficiency.

  People interested in languages and/or in programs in original version.
- **Complete EPG:** More information about programming and events.
- **Channel sorting: Function that is independent from the list of favourites and that allows the channel sorting at the users ease.**
- Less consumption**:** The compromise with the environment leads the zAs to carry out, through the remote control, a real standby time (consumption lower than 2,5W). The ecological zAs.

PRODUCT LICENSEE BY...

DVB T TERRESTRIAL

MPEG

Televes

DVB Digital Video Broadcasting

MEMBER ID 50251

Functions:

- **Incorporated modulator:** Configurable through the menu, with output in any UHF channel.

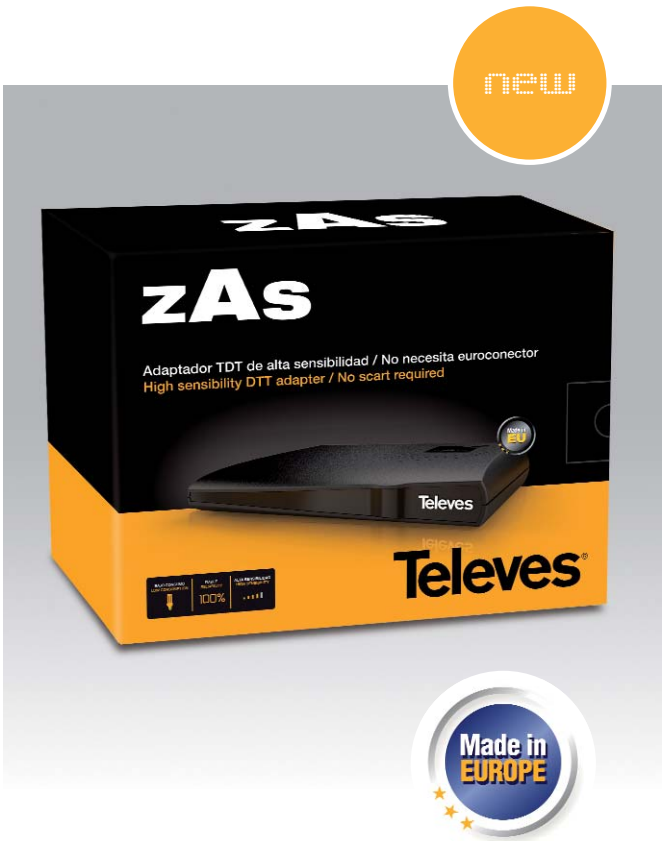
  Its advantages:

  - Be part of a coaxial distribution network. The service tuned by the zAs can be distributed over the whole house by means of the antenna network.
  - It is compatible with old television sets, without SCART, and/or with television sets from secondary houses.
  - It is not necessary to throw away old television sets.

- High sensibility: It adapts televisions in zones of poor coverage. The tuners sensibility is higher than the one incorporated in televisions that are compatible with DTT. Besides, it provides telesupply to activate devices (DAT HD, MRD and Amplifiers FI_MIX).

- **Size:** Its discrete dimensions make it perfect for reduced locations.

- European Technology Made in Europe: From the design and manufacturing up to the firmware, everything is made in Spain.



Reference		5111
General		
Channels		198 (99TV + 99 Radio)
EPG		yes
Through output	MHz	47-862
Demodulator		
Signal range		COFDM, 2K, 8K
Input band	MHz	174-862
Input Level	dBµV	45-90
Constellations		16QAM, 64QAM
FEC		1/2, 2/3, 3/4, 5/6, 7/8
Guard interval		1/4, 1/8, 1/16, 1/32
Ouput frequency	MHz	474-862
Ouput channel		CH 21 - 69 (CCIR)
TV		PAL B/G
Video		
Input format and decod.		MPEG-2 MP @ ML
Max. video rate	Mbps	15
Screen format		4:3 / 16:9
Video resolution		720 x 576

Audio		
Audio decoder		MPEG/MusiCam Layer I & II
INPUT/OUTPUT Port		
Input connector		1 x IEC (female)
Output connector		1 x IEC (male)
Serial port connection		RS232C, SUB-D female 9-pins
Video output RGB		1 x SCART TV connector
Video output CVBS Analog audio output		1 x SCART TV connector
Analog audio output		1 x SCART TV connector
Powering		
Consumption	mA(V)	0.40 (12)
Consumption (Stand-by)	W	< 2,5
Mains voltage		220-240 Vac, 50/60 Hz
Physical characteristics		
Dimensions	mm	180 x 29 x 140
Weight	Kg	0.3

7142

Digital terrestrial receiver

new

- Allows MPG files to be recorded directly onto an external disk or pen drive by USB or memory card (SD/MS/MMC).
- TimeShift Function by USB
- Allows to play AVI, MPG, DviX, JPG and MP3 files.

References		7142
General		
Channels		1500
Channel blocking		Yes
EPG		Yes
Display in frontal		Clock in Standby/Channel in ON
Teletext		Yes
Subtitles		Yes
Timer		Yes
Frequency scanner		Yes
Screen format		4:3 and 16:9
Through ouput		Yes
Ouput signal		A/V by SCART
TV standards		PAL/NTSC Automatic conversion
Demodulator		
Signal range		COFDM, 2K and 8K
Input band	MHz	170-230 470-862
Input Level	dBm	-75 to -20
Video		
Video decoding mode		MPEG-2 MP @ ML
Video output RGB		TV x 1 (SCART)
Video output CVBS		2 SCARTS (TV, VCR)

Audio		
Audio decoding mode		MPEG2 -Layer I&II
Audio mode		Dual/Stereo
INPUT/OUTPUT Port		
Input/output connectors		2 x IEC (antenna loop)
Antenna powering		yes (5Vdc/100mA)
Connection		USB/SD
Number of SCARTS		2 (TV and VCR)
Optical output for digital audio		1xS/PDIF
Powering		
Consumption	W	6,5
Mains voltage		100-250 Vac, 50/60 Hz
Physical characteristics		
Dimensions	mm	240x115x36
Weight	Kg	0,3

TDT - SCART receiver

711701

new

- Small-sized digital Receiver that is directly connected to the television set throughout the SCART.
- Gifted with IR sensor and a discrete and easeful remote control.
- Besides of a DTT receiver, it works also as player of video and audio files through a USB entry, port that can also be used for software updates or to record directly in MPEG files onto an external disc or pendrive (FAT32).
- EPG and subtitles.
- Menu blockage: function that obstructs the access to the receiver configuration.
- Ideal for hotels or locations with manipulation risk.
- Mosaic: shows six channels in one single screen.
- In stand-by mode, the power supply is disconnected from the USB memory.
- It allows the configuration of the channel list through a dumped file through USB.
- Timeshift function.
- New functions in the video files reproduction: repetition, choose of language.

Reference		711701
General		
Channels		1500
EPG and teletext		Yes
Demodulator		
Signal		COFDM, 2K, 8K
Input Band	MHz	170..230-470..862
Input Level	dBµV	45-78
Constellations		16QAM, 64 QAM
Video		
Video decoding mode		MPEG-2 MP @ ML
TV standard		PAL/NTSC
Video resolution		720 x 576 / 724 x 480
Screen format		4:3 Letter Box/4:3 Pan Scan/16:9

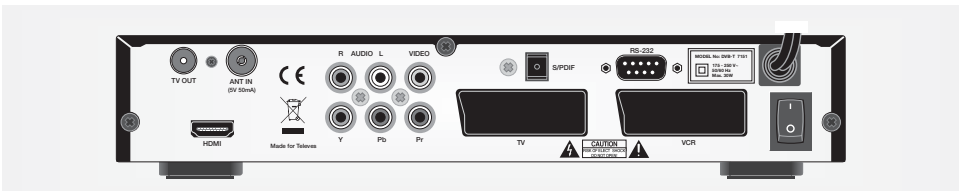
Audio		
Audio decoding mode		MPEG-2 Layer I & II
Audio mode		Dual/Stereo
INPUT/OUTPUT Port		
Input connector		1 x IEC (female)
Output connector		1 x SCART
Output connector		Mini USB 1.1 / 2.0
Output connector		Jack a 3 x RCA
Powering		
Consumption	W	8
Mains voltage		100-250 Vac, 50/60 Hz
Physical characteristics		
Dimensions	mm	100 x 69 x 23.5
Weight	grs.	200

TDT MPEG4 (HD) receiver

new

7151

- MPEG2 and MPEG4 (SD and HD) compatible.
- JPG files reading
- Time shift function
- USB PVR Ready
- Video output RGB - CVBS
- Output HDMI (720p and 1080i)
- Digital audio output SPDIF
- 1 x USB input
- Channels edition (remove, move, block an favourites)
- Favourite programmes list.
- Teletext OSD
- Subtitles and teletext
- EPG
- Control access
- Automatically saving of the last displayed channel.
- Easy and fast channel search.
- Timer
- Display VFD (Vacum fluorescent display)
- Software update via USB o RS232
- Six games



MP3 JPEG MPEG2 MPEG4 H264 EPG

SERIAL ATA USB HDMI DOLBY DIGITAL TXT GAMES

PRODUCT LICENSEE BY...

DVB T TERRESTRIAL MPEG

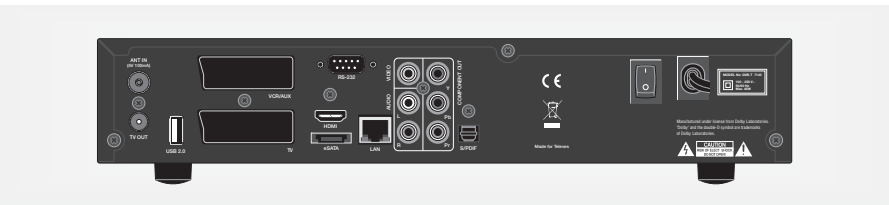
Televes DVB MEMBER ID 50251

MPEG 4 Terrestrial digital receiver

7143

new

- EPG
- Compatible with MPEG2 and MPEG4
- Access control .
- Automatically saving of the last displayed channel
- Reads MP3, JPG.
- Return function.
- Video output - RGB; CVBS.
- HDMI output (576i, 576p, 720p and 1080i).
- Configurable matrix display (name, number and “Stop and Go”)
- SATA connection (hard disk) and LAN
- 2 x USB inputs:
- Clock (in standby shows the time).
- Software update via USB or RS-232C.
- Channels edition (remove, move, block and favourites)
- Digital audio output- SPDIF.
- Favourite channels list.
- 3 games.
- Teletext OSD.
- Editable mosaic (2, 4, 6 or 9 programmes).
- Subtitles and Teletext.
- USB PVR Ready
- Sleep function.
- Timer.
- Time Shift



MP3 JPEG MPEG2 MPEG4 H264 EPG

SERIAL ATA USB HDMI DOLBY DIGITAL TXT GAMES

PRODUCT LICENSEE BY...

DVB T TERRESTRIAL MPEG

Televes DVB MEMBER ID 50251

Satellite Digital Receiver

Domestic unit for digital satellite channels reception.

Audio/video signals are provided via SCART or RCA outputs.

Compatible with both DiSEqC and USALS positioners.

PRODUCT RANGE	
REF.	DESCRIPTION
7118	FTA Satellite receiver w/modulator

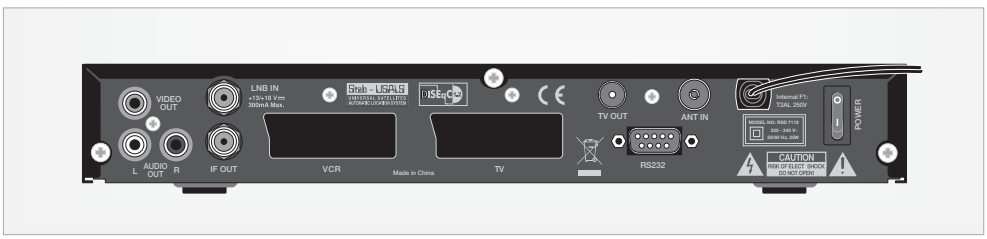
7118

new

MODULATOR

References		7118
General		
Number of channels		4000
Number of channels		various
Channels block		yes
Teletext		no
Subtittles		no
Timer		yes
Tuner / LNB input		
Input band	MHz	950 - 2150
Frequency scanning		yes
Number of LNB inputs		1 "F"
Loop through signal for LNB		yes
LNB powering	volt/mA	13-18 / 350
DiSEqC		1.0 / 1.2 / toneburst A/B
Positioner system		USALS / DiSEqC 1.2
Symbol rate		2 - 45 Msps
SAT Bands		C & Ku

Video / Audio decodification mode		
Video		MPEG-2
Video format		4:3, 16:9
Audio		MPEG-1
Audio modes		Mono; Dual; Stereo; "Joint stereo"
Output signal		
Output signal mode		(A/ V) RGB, CVBS, Audio L/R
Input connector		1 SCART
INPUT/OUTPUT Ports		
RS232		1 x (9-pin D-sub)
SCARTS		2 x (TV / VCR)
RCA		3 x (video - L audio - R audio)
LNB		2 x "F" (in-out)
Powering and physical characteristics		
Mains voltage		90 - 260 V, 50/60 Hz
Consumption	W	15
Dimensions	mm	280 x 165 x 43
Weight	Kg	1.3



Field Strength Meters

The fastest and most precise portable meter in the world within arm's reach. The H45 meter has been designed with digital processing technology allowing Real-time sweeping and unthinkable versatility and preciseness.

Televes

H45 with Digital Processing

HANDHELD Field Strength Meter

Perfect evolution is not making a smaller meter.

Perfect evolution is making a Digital Processing meter in a small format.

The Digital Processing engine of the H45 field strength meter enables **us to unveil details of the radioelectric spectrum that were unimaginable to date...**

Handheld

H45 with Digital Processing

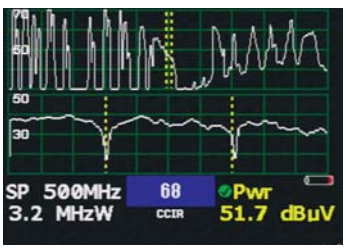
genetically Perfect

PRODUCT RANGE	
REF.	DESCRIPTION
5990	H45 Compact
5991	HD Option (H45 Compact)
5992	H45 Advanced

Captures, measures and processes *up to 20MHz of bandwidth in less than 10ms,* giving the installer intelligently simple functionality.

EXCLUSIVE FUNCTIONALITY

COMBO MODE IN REAL TIME



ZOOM SPECTRUM

QUALITY CHECKMARKS

SCAN&LOG TERR/SAT

Constellations · DVB S2 SATELLITE · Q.A.L. QPSK AUTO LOCK · ECHOES Function · HD · Link Margin · Wi-Fi

H45 meter

Televes H45 is a milestone in the field strength meters world. The latest technology and high-end features in a complete range, that will never be outdated ,due to its capability of being upgradable at any time.

Its easy and intuitive interface , becomes the instrument in a reference for all the installers .

PRODUCT RANGE

REF.	DESCRIPTION
5990	H45 Compact
599001	H45 Compact **Full HD** (MPEG4) NEW
599002	H45 Compact + CAM NEW
599003	H45 Compact + Optical Receiver NEW
5992	H45 Advance
599201	H45 Advance **Full HD** (MPEG4) NEW
599202	H45 Advance + CAM NEW
599203	H45 Advance + Optical Receiver NEW
	Options
5909	Certified calibration
5991	HD option for H45 Compact
5994	Upgrade H45 Compact to Advance
5997	Full HD (MPEG4 Compact / Advance) NEW
5998	CAM (Conditional Access Module) NEW
5999	Optical receiver option NEW

H45 Advance

Ref. 5992

H45 Compact

Ref. 5990

Digital Processing Technology

- A/D conversion in IF with great velocity.
- Real time sweeping speeds.
- Up to 20 MHz digitally captured in less than 10 ms.
- Digital filtering and powerful mathematical algorithms.
- FFT and Digital signal processing technology.
- Speed , Accuracy and Versatility.

Constellations | DVB S2 SATELLITE | Q.A.L. QPSK AUTO LOCK | ECHOES Function | HD | Link Margin | Wi-Fi

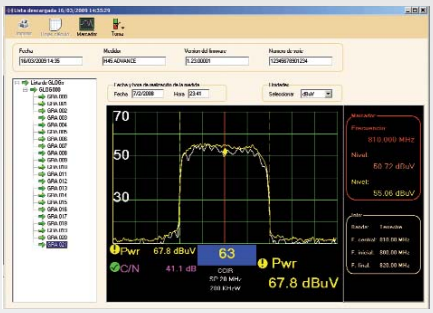
Software HSuite (included)

The latest technology applied to the field strength meters has created a total revolution in the installers way of working.

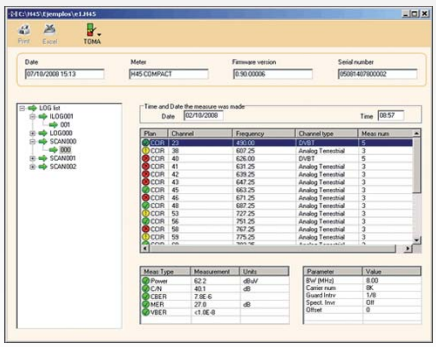
The current idea of the installation process as a laborious and hard-working task, will make history. **Automatizing the operations/measurements**, will allow the installer to scan and analyze all the signals in the outlet. Moreover, channels identification and graphically plotting **is a reality.**

All the collected data in the installation site is internally stored in the memory meter. Besides this memory, the H45 has a SD card (Advance model) that offers the possibility of uploading the data stored in the meter.

Hsuite software is included in H45 product range.



GraphLogs



DataLogs

Accessories

PRODUCT RANGE	
REF.	DESCRIPTION
	ACCESSORIES
5995	H45 soft case

- The soft case is made of nylon and covered with high-density resin.
- It allows the meter use in adverse environments.

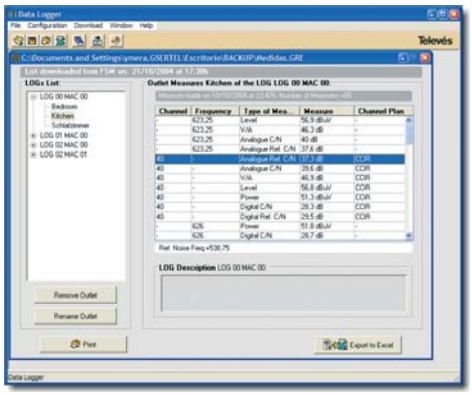
VERSION			H45 Compact (ref. 5990)/599001/02/03	H45 Advance (ref. 5992)/599201/02/03
Bands	Return Channel (5 MHz-47 MHz) Measurement and Demodulation of Analog Channels, DVB-T and DVB-C		✗	YES, Continuous Band (without gaps) from 5MHz to 2.500MHz
	Terrestrial (47 MHz-880 MHz) DVB-T, DVB-C, DVB-H and *Demodulation of Analog Channels		✓	
	Radio FM (80 MHz-110 MHz) Measurements and Demodulation		✓	
	GSM (880 MHz-950 MHz) Measurements in Spectrum Mode		✗	
	Satellite (950 MHz-2220 MHz) Measures Analog Satellite. Measurements and Demodulation of DVB-S y DVB-S2		DVB-S2 with HD OPTION (ref.5991) and ref. 599001	
	WIFI (2220 MHz-2500 MHz) Measurements in Spectrum Mode		✗	
ANALOG Signal Measurements (with DIGITAL PROCESSING Technology)	Level with Colour-coded Level Scale representing signal state		✓	
	Audible signal according to Level and CN		✓	
	V/A and C/N (without losing video visualisation)		CN 45dB	CN 52dB
	Synch Impulse: Real representation		YES, Terrestrial	
	Video Line Representation (user defined, with off-set and zoom)		✗	✓
	Automatic C/N		✓	
	Line C/N		✗	✓
	TV Norms		PAL B/G,D/K,I, SECAM B/G,D/K,L, NTSC	
	Measure Margin -15 dBµV to 130 dBµV		✓	
DIGITAL Signal Measurements (with DIGITAL PROCESSING Technology)	Power		-15 to 130 dBµV	
	Automatic C/N		✓	
	Audible signal according to Power and CN		✓	
	Impulse Channel Response in COFDM (Echoes)		HD OPTION (ref.5991) and ref. 599001	✓
	Constellation QAM, DVB-S2 (8PSK or QPSK), COFDM (with manual carrier selection)		HD OPTION (ref.5991) and ref. 599001	✓
	Packet Error Rate		✗	✓
	NICAM		✗	✓
	QAM	BER	9.9E-2 - 1.0E-8	
		MER	>38 dB	
		Att. Auto.	✓	
		PWR	40-125 dBµV	
		Symbol Rate	AUTO, (700-7200Kbaud)	
	COFDM	cBER	9.9E-2 - 1.0E-6	
		vBER	1.0E-4 - 1.0E-8	
		MER	>35 dB	
		PWR	40-125 dBµV	
		Auto Offset Detection	✓	
	QPSK (with Q.A.L.technology)	cBER	1.0E-2 - 1.0E-6	
		vBER	1.0E-4 - 1.0E-8	
		MER	✓	
		PWR	40-120 dBµV	
		Symbol Rate	AUTO, from 1 - 45Mbaud	
		Code Rate	AUTO, 2/3, 3/4, 5/6, 7/8, 1/2	
	8PSK - DVB S2	Link Margin	HD OPTION (ref.5991) and ref. 599001	(-8.3) - 20dB
		cBER		1.0E-2 - 1.0E-8
		BCH BER		5.0E-2 - 1.0E-8
		MER		✓
		Att. Auto.		✓
		PWR		40 - 120 dBµV
		Symbol Rate		AUTO, 1 - 30 Mbaud
		Code Rate		AUTO (supports 1/4, 1/3, 2/5, 3/5, 1/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10)
MPEG	Decodes Free-to-Air MPEG-2 with Standard Resolution		✓	
	Decodes Free-to-Air MPEG-4 Resolution up to 1920X1080p -Full HD		- / ✓	- / ✓
	Number of Services, Service Selected, Service Audios		✓	
	NID, VPID, APID, SID (with Network Descriptor)		✓	
	Video Resolution, Audio Type and Language		✓	
	HD Identification		✓	
	Conditional Access Module (only MPEG-2)		- / - / ✓ /-	- / - / ✓ /-
	Optical Receiver		- / - /- / ✓	- / - /- / ✓

VERSION			H45 Compact (ref. 5990)	H45 Advance (ref. 5992)
ANALYSER Mode (with DIGITAL PROCESSING Technology)	Span	Terrestrial	5, 10, 20, 50, 100, 200, 500 and FULL	100, 200, 500Khz, 1, 2M … 1, 1,5 and 2GHz and Full
		Satellite	5, 10, 20, 50, 100, 200, 500 and FULL	100, 200, 500Khz, 1, 2M … 1, 1,5 and 2GHz and Full
	RBW	Terrestrial	100, 200, 800 and 3200 KHz	Configurable from 300Hz to 6,4 MHz
			User selectable: NO	
			Automatic depending on Span: YES	
		Satellite	200, 800 y 3200 KHz	
			User selectable: NO	
			Auto based on Span: YES	
	B.E.R. measurement in Spectrum		✗	✓
	Vertical Reference Level		config 5 and 10 dB	config 1, 2, 5, 10 dB
	Saturation Warning signal (Vertical Reference Level colour change)		✓	
	REAL-TIME Sweep		< 250ms	< 10ms
	Screen Refreshing Rate		<250ms	<100ms
	Hold	Max.	✓	
		Min.		
	Marks		2	Up to 3
	SPECTRUM ZOOM within the same screen (Spectrum 1 is variable in span. Spectrum 2 is the zoom of the central channel in Spectrum 1)		✗	✓
	Visualisation of 2 CONFIGURABLE TRACES (max. and min.)		✗	✓
	EVENT TRIGGERS to detect Pulsing Signals		✗	✓
	Represents Background Noise		✓	
	Configurable Detectors for Sampling Digital signals		✗	✓
	Variable VBW		✗	✓
Powering LNBs	Voltage, Extra burst (14 V, 19.5V to compensate cable losses)		13/18/24V - 13+1/18+1/24V (Extra Burst)	
	22 KHz tone		✓	
	DiSEqC and SCR		✓	
	Motor Control		✗	✓
Battery	Type / Autonomy		Litio-Ion (>4 hours in Low Consumption mode)	
	Advance Energy Management: Normal, Low Power and Auto		✓	
	Battery status indicator (icon and tone)		✓	
General Characteristics	Dynamic Margin	Terrestrial	50 dB	60 dB
		Satellite	45 dB	55 dB
	Satellite Frequency Selection		IF, Real RF, Channel and Memory	
	Units		dBµV, dBmV, dBm, dBµV/m	
	Automatic Shut-down		YES (programmable 1- 59 min.)	
	Automatic Suspend			
	Languages		English, German, Spanish, French, Italian, Portuguese, Russian and Polish	
	Menu and Measurements Presentation		On-Screen-Display (OSD)	
	All measurements in one screen		✓	
	QUALITY CHECKMARKS		✓	
	COMBO MODE IN REAL-TIME (3 windows - spectrum, all measurements and video image)		✓	
	Rotary-Capacitive Selector		✓	
	Teletext		Analog and Digital	
	SW upgrades through USB port		✓	
	Interfaces		USB and Scart	SD
Programmed Measurements	Memories		250	1000
	Macros		100 macros with 250 memories each	
	Datalogs		✓	
	Stored Measurement Capacity		Up to 30.000	
	Download Datalogs into SD		✗	✓
	Outlet type selection when executing automatic measurements		✓	
	Clasification of Datalogs by Installation or Outlets		✓	
	Instant Log		✓	
	GRAPHS LOGGER		✗	✓
HSuite (PC-applications)	Data Logger		✓	
	Graph Logger		✗	✓
	Check Quality Marks		✓	
Miscellaneous	DIGITAL PROCESSING Technology		✓	
	SCAN & LOG with Automatic Channel Identification	Terrestrial	✓	
		Satellite	✓	
	UAL Technology (Universal auto lock DVB-T, DVB-C, DVB-S y DVB-S2)		✓	
	Q.A.L. (QPSK Auto Lock) Technology		✓	
	HW and SW upgrades to accomodate newest features/technologies without changing meters		✓	
	Capacitive Technology to make knob navigation faster and more precise		✓	

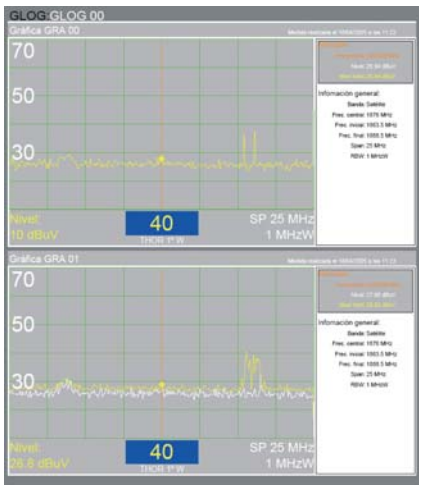
Data Logger and Graph Logger

Data Logger application allows the download to a PC of all the measurements stored in the FSM meter.
Once downloaded, the measurements can be analyzed in an easy way and a report of the installation can be obtained automatically selecting the option print or exporting the data to an Excel file. Both the printed reports and the Excel files could be customized by adding the installer´s details.

Graph Logger application allows the download of the graphs stored in the FSM meter.
Besides the capture of the graph, additional information will be shown, because this application includes a marker that can be used to analyze the graphs in the frequency range determined by the span.
The application allows making a customized printed report including company and installer information as well as Logs description.

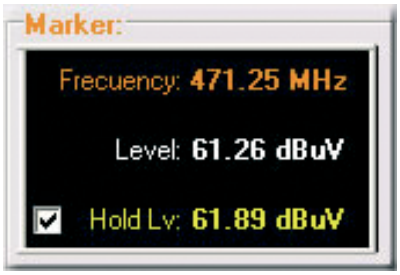


Visualizing data with Graph Logger



Graph Logger report

Visualizing a graph with Graph Logger



Using a marker in Graph Logger

Noise generator

PRODUCT RANGE	
REF.	DESCRIPTION
5930	Noise generator

A device designed to carry out attenuation and flatness testing in F.I. satellite installations with no entry signal, connected to a Televés FSM or MTD series field strength meter.

Equipped with a thumbwheel allowing the output level to be varied by 10 ± 2 dB in 10 steps

- Normal signal output. Electrical connection from installation to power the simulator.
- Output attenuated by 30 dB compared to output obtained in 1. If the attenuated output is used, the main output must be charged.
- Thumbwheel to vary the output level in both connectors by 10 ± 2 dB.
- LED indicator
- Connector to provide external power to the simulator using the DC adaptor.

Reference		5930
Power supply (external or via coaxial cable)	V	12 ...18
Consumption	W	2
Output connector		"F" female
Frequency	MHz	5 - 2150 MHz
Maximum output level		80 ± 3 dBµV / 3 MHz
Output level regulator	dB	0-10
Dimensions	mm	80x65

Coaxdata

The bandwidth of the coaxial cable allows to multiplex a number of services ohter than televison. Coaxdata is a state-of-the-art system that converts a television coaxial network into a high speed local network. By means of Coaxdata, sharing resources (computers, printers, an internet connection, etc) does not need any additional cable..

Televes

Coaxdata HOMEPLUG

PRODUCT RANGE	
REF.	DESCRIPTION
7689	Ethernet Hybrid Adapter 200Mbps

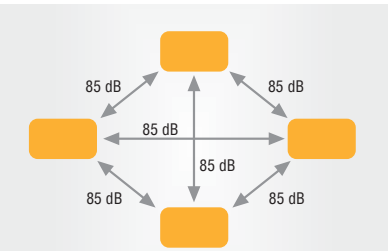
The existing infrastructures such as hotels, residential homes, schools and hospitals can face with ref. 7689 the increasing number of internet-users, offering them an access to the net from their own rooms.

In those cases where the existent infrastructure is coaxial (i.e hotels), sharing the system to offer TV Digital Broadcast services (QAM, COFDM) and IP services (IPTV, VoD, Internet, VoIP) at a time, is a great choice.

The new Ethernet Hybrid Adapter 200Mbps brings advantages to the installations, thanks to several improvements in design, as well as in functionality.

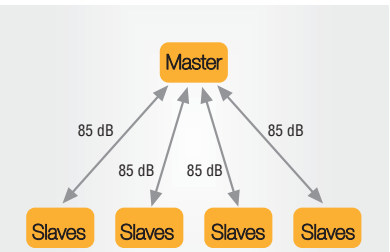
References	7689
Connectors	
Ethernet interface	2 RJ45
Coaxial interface	2 F: TV + Data
Powering	AC 100 - 240V (50-60 Hz)
Data Coaxial Interface	
Output power	130 dBµV
Minimum Power spectral density	-135 dBm/Hz
Output impedance	75 ohms
Bandwidth	2-30 Mhz
Return losses	> 10 dB
TV Coaxial Interface	
Through losses	2 dB
Return losses	> 10 dB
Bandwidth	57 a 2150 MHz
Output impedance	75 ohms
Power/Temperature	
Working temperature (min., max.)	-10ºC, 45ºC
Maximum consumption	4.6 Watts (45mA)
Firmware features	
Maximum number of slaves	253 (1012 using 4 masters)
Maximum length of data network (Coax Cable)	900 m.
Maximum length of data network (Power Line)	200 m.
Users per slave	2

Home Networking: multipoint-to-multipoint



Up to 254 Devices LAN

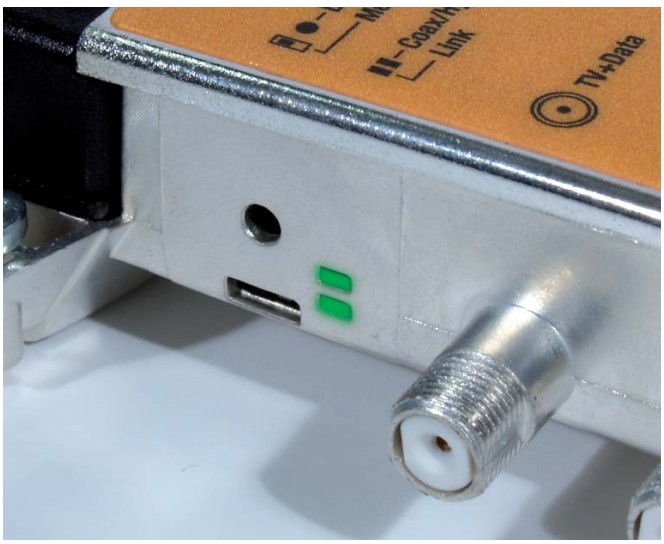
MxU: point-to-multipoint



253 Slaves per Master

Possible coverage when big number of users, by means of masters multiplexation over the same frequency band.

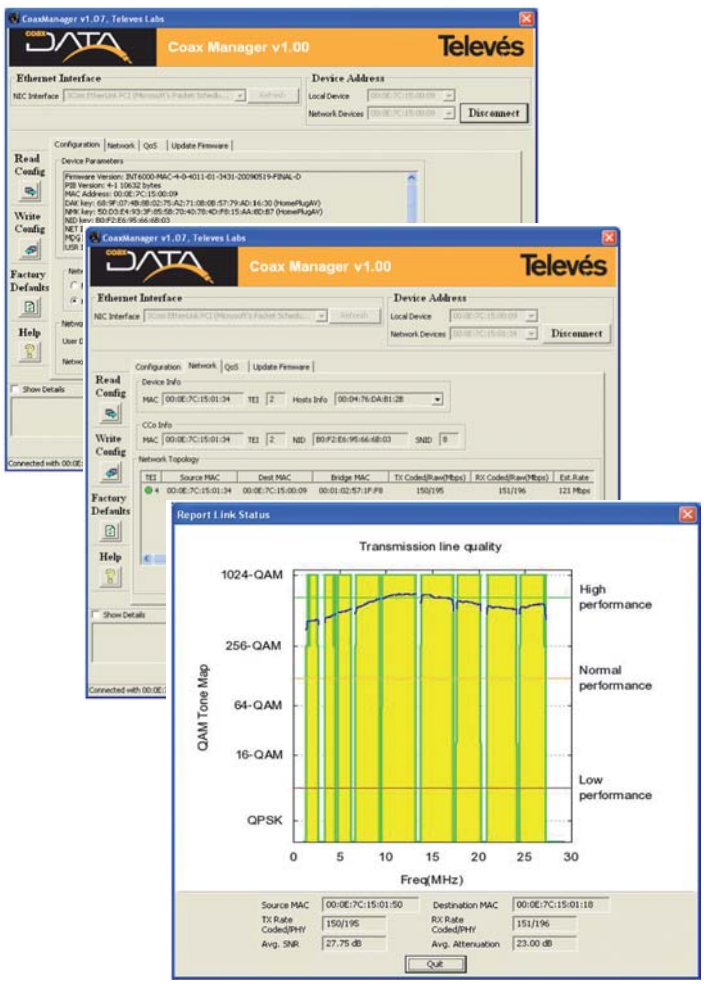
LEDs indicators of the channel quality



Coax Link Status

Tricolor LED (green/orange/red) will be iluminated if connectivity with another element in the network is possible.

- 120 Mbps < Throghput < 150 Mbps
- 70 Mbps < Throghput < 120 Mbps
- 0 Mbps < Throghput < 80 Mbps

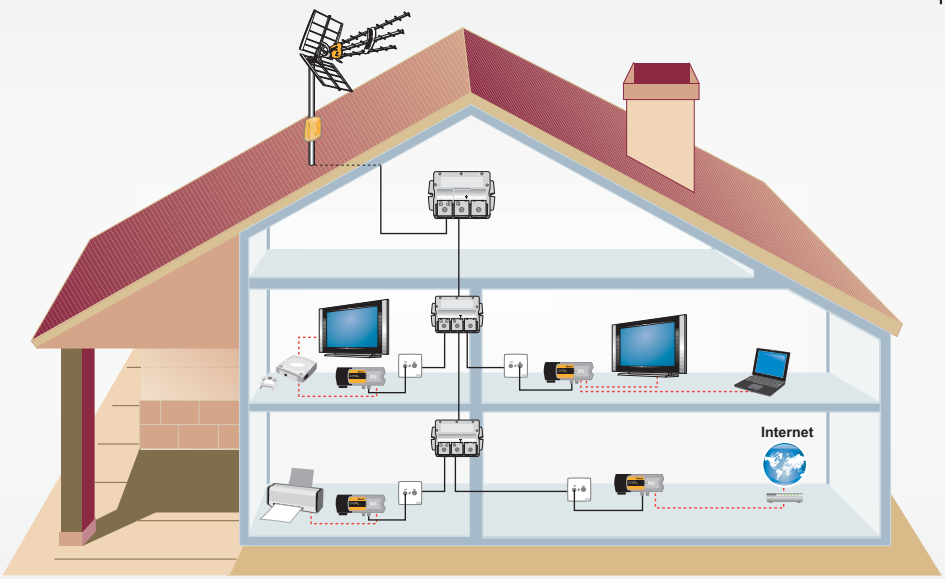


CoaxManager Software tool allows setting the installation parameters. Ad-hoc software development option i.e, Management and Invoicing applications.

- Networking or MxU.
- Private networks (encryption).
- QoS parameters configuration.
- MACs limitation per Slave.
- IGMP configuration.
- Status link information detailed, i.e SNR attenuation and tone-map list; allowing to get an itemized view of the installation performance.

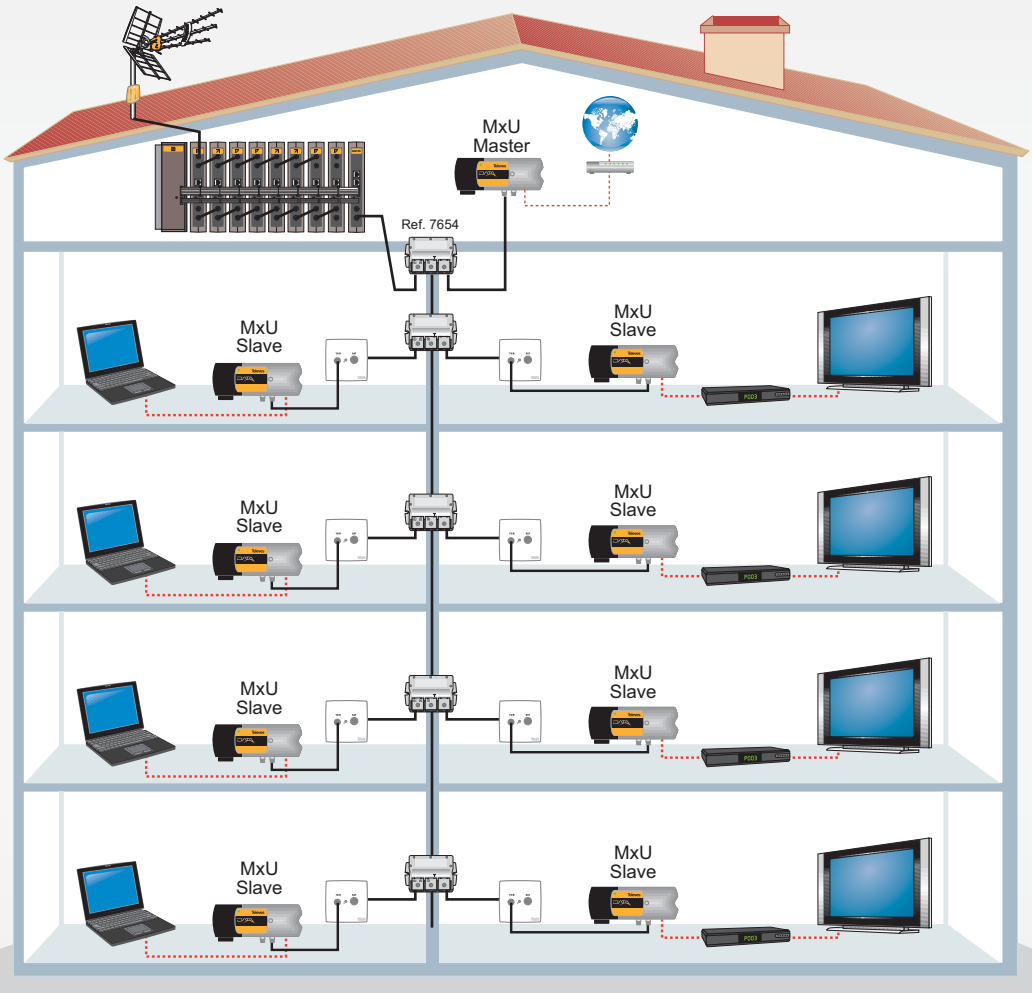
TYPICAL APLICATION

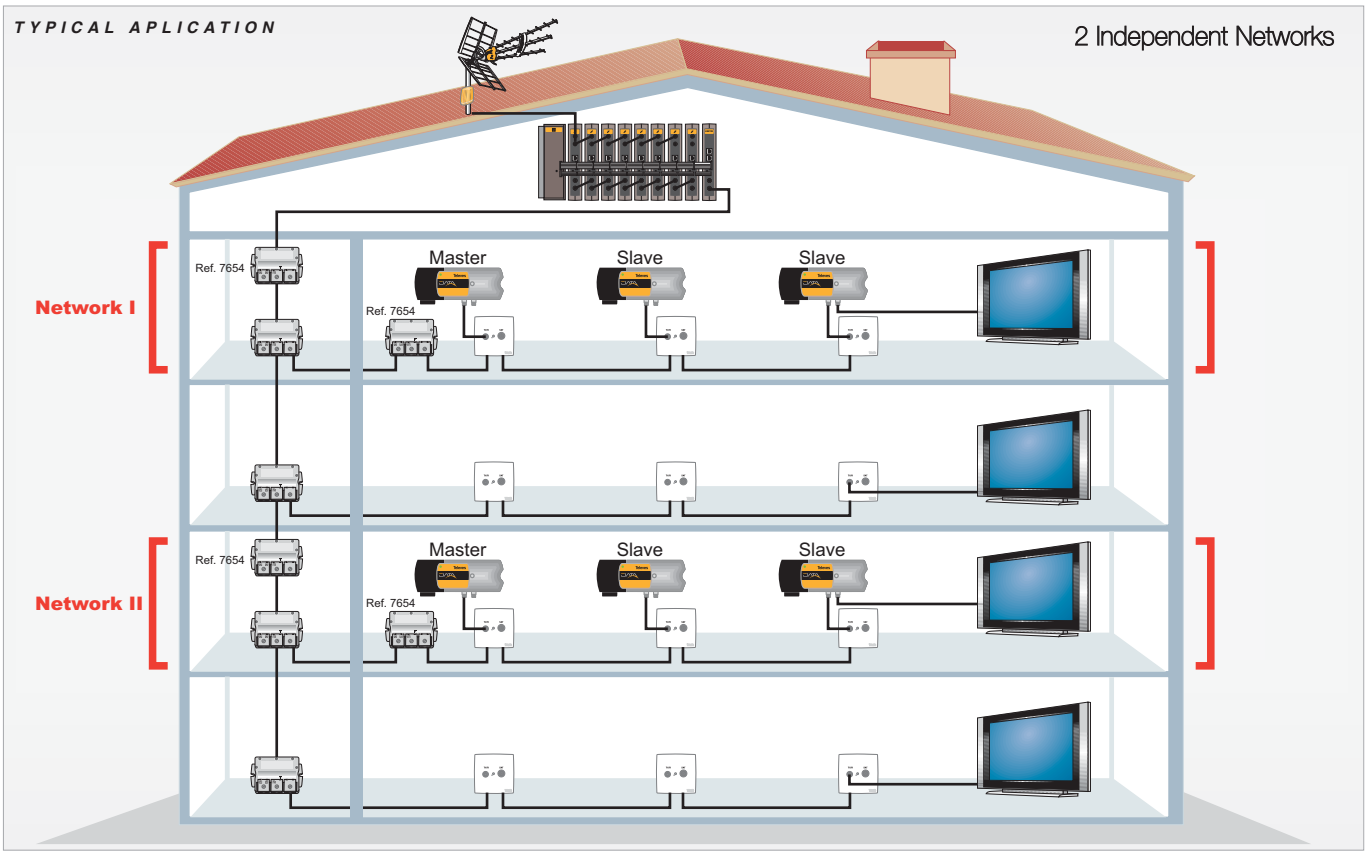
Home Networking

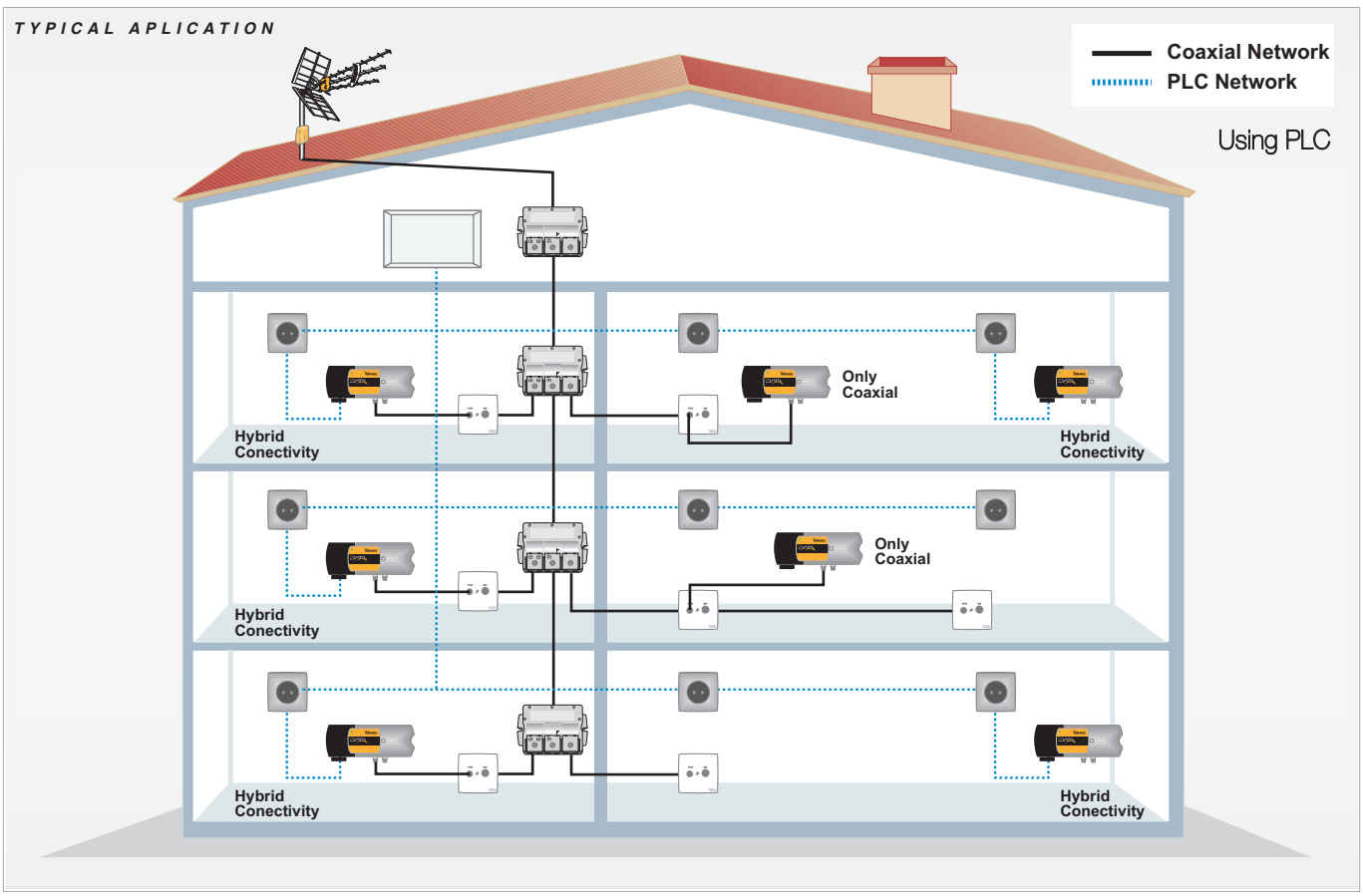


TYPICAL APLICATION

MXU




TYPICAL APLICATION
2 Independent Networks
Network I
Network II
Ref. 7654
Ref. 7654
Master
Slave
Slave
Ref. 7654
Ref. 7654
Master
Slave
Slave

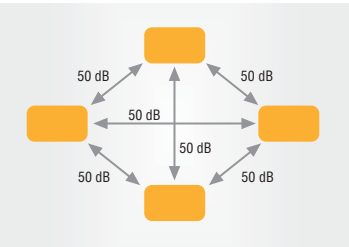

TYPICAL APLICATION
Coaxial Network
PLC Network
Using PLC
Only Coaxial
Hybrid Conectivity
Hybrid Conectivity
Only Coaxial
Hybrid Conectivity
Hybrid Conectivity

Coaxdata HPNA

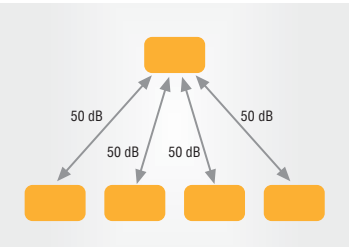
PRODUCT RANGE	
REF.	DESCRIPTION
7664	Ethernet coaxial adaptor 128 Mbps
7672	Ethernet coaxial adaptor MxU T05 128 Mbps
7666	Coaxial Router MxU
7653	Combiner filter (1-25 MHz ... 47-2150 MHz) *
7654	Combiner filter (1-40 MHz ... 47-2150 MHz) *
7668	DOC Diplexor

- The bandwidth of the coaxial cable allows to multiplex a number of services other than television.
- Coaxdata is a state-of-the-art system that converts a television coaxial network into a high speed local network. By means of Coaxdata, sharing resources (computers, printers, an internet connection, etc) does not need any additional cable.
- CoaxData provides two technologies: Home Networking and MxU

Home Networking: multipoint-to-multipoint

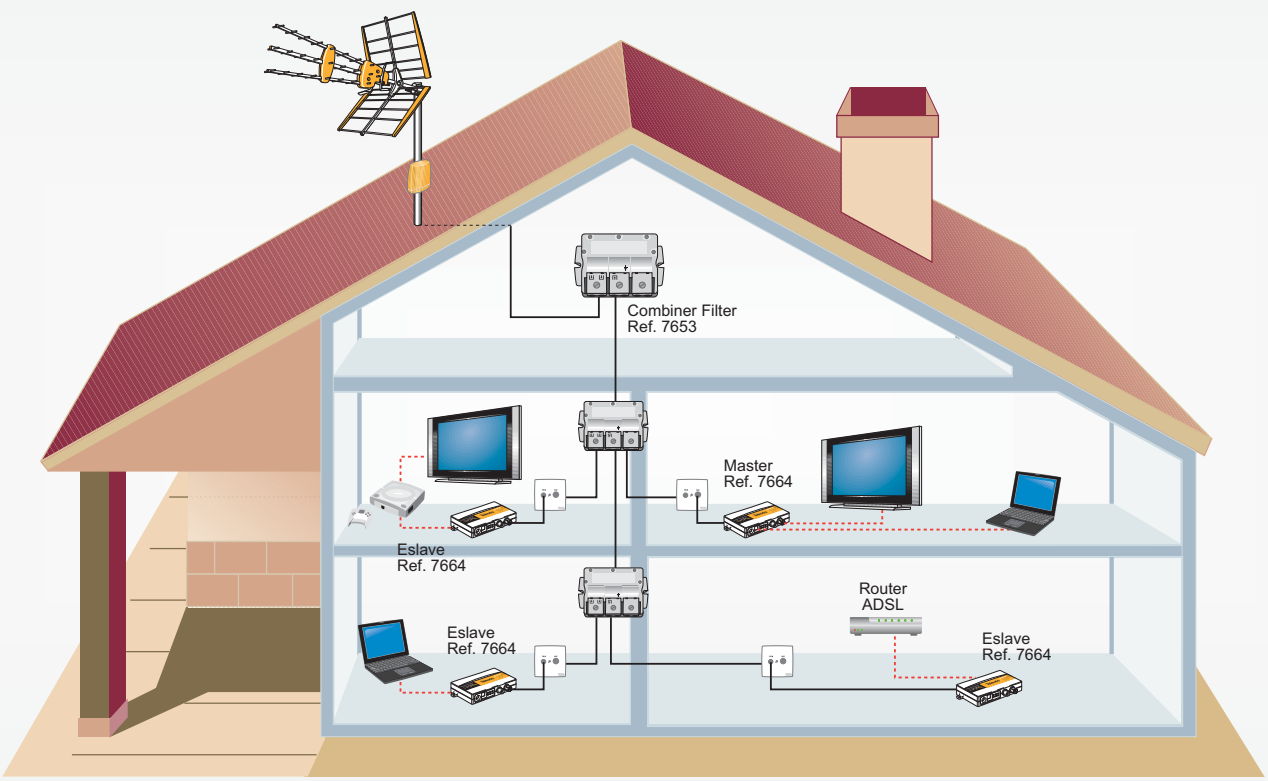


MxU: point-to-multipoint



TYPICAL APLICATION

Home Networking



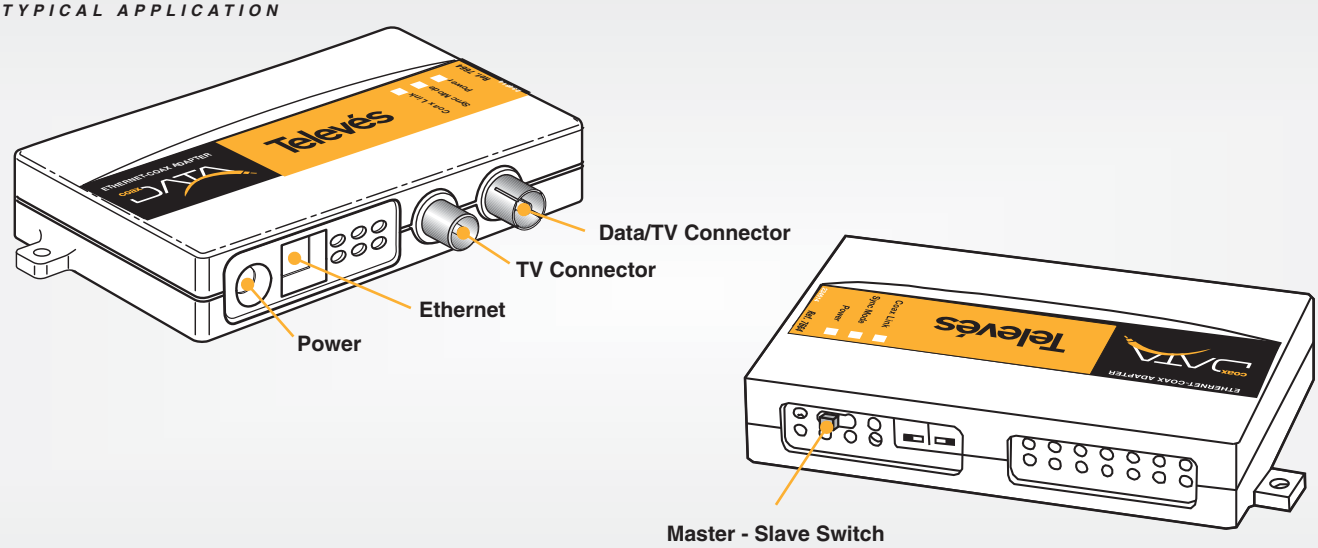
Ethernet Coaxial Adaptor Home Networking 128 Mbps

- Device that allows to create a data network using the coaxial cable of the already existing TV distribution network.
- Possibility of sharing the LAN resources (router, printers, computers, etc.)

References	7664
Output level	112 dBµV
Maximum allowed attenuation	50 dB
Working bandwidth	4-21 MHz
Maximum consumption	External PSU 12-15 VDC:
	3,9 Watts
Max. power espectral density	-70 dBm/Hz
Min. reception spectral density	-120 dBm/Hz
Working temperature	[-10ºC, 45ºC]
Transmission rate	128 Mpbs
Maximum length of data network	1.1 Km
Quality of Service	VLAN 802.1p Priority Support
Maximum number of users	16
Connectors	Ethernet RJ-45
	Coaxial CEI
	CEI Connector for TV/Radio
	Jack connector for PSU

7664

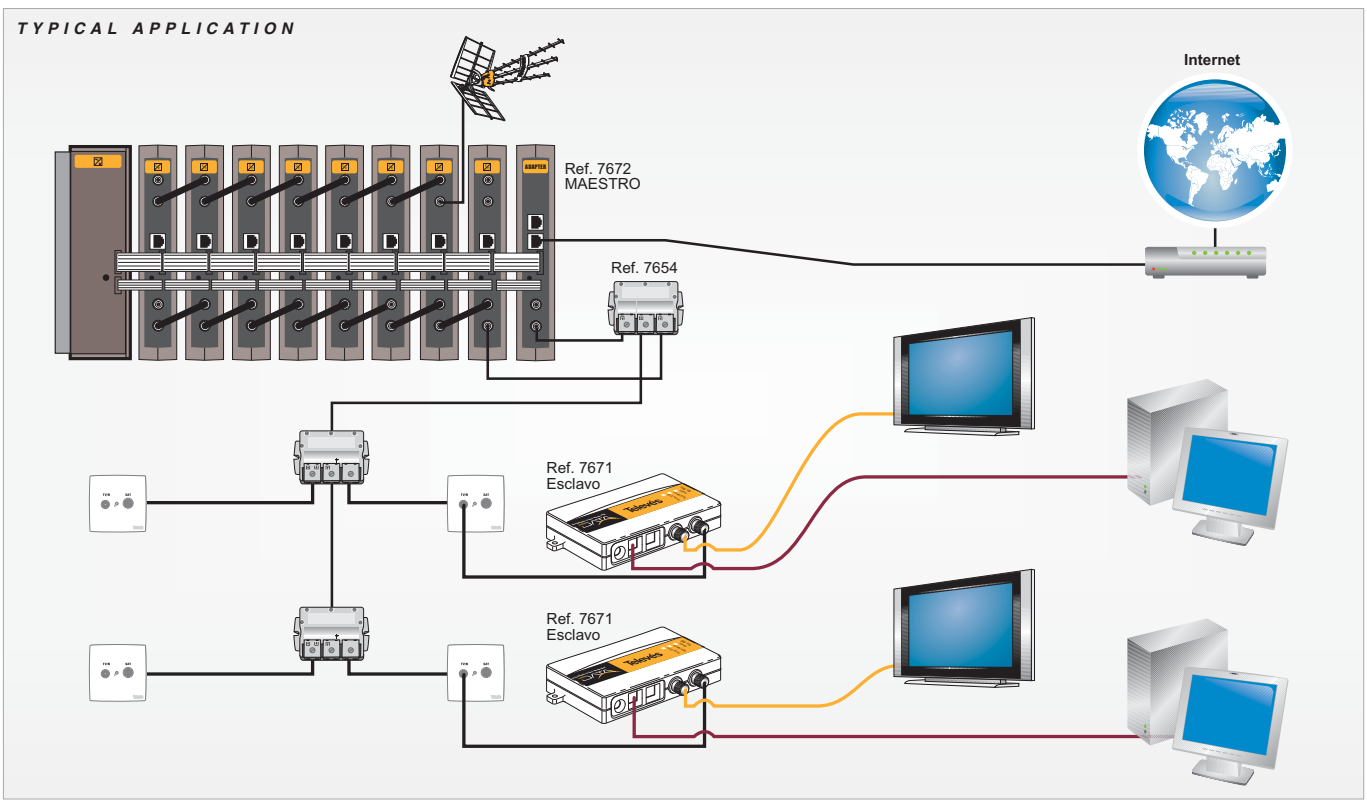
TYPICAL APPLICATION



Ethernet Coaxial Adaptor MxU 128 Mbps

References	7671
Connectors	
Ethernet interface	2 RJ45
Coaxial interface	2 F: TV + Data
Powering	15V/800 mA
Data Coaxial Interface	
Output power	120 dBµV
Sensibility reference	-38 dB (-110 dBm/Hz)
Output impedance	75 ohms
Bandwidth	12-28 Mhz
Return losses	> 10 dB
TV Coaxial Interface	
Through losses	2 dB
Return losses	> 10 dB
Bandwidth	57 a 2150 MHz
Output impedance	75 ohms
Power/Temperature	
Working temperature (min., max.)	-10ºC, 45ºC
Maximum consumption	6 Watts
Firmware features	
Maximum number of slaves	31
Maximum length of data network	800 m.
Maximum allowed attenuation	50 dB
Minimum allowed attenuation	12 dB
Users per slave	2

- Device that allows to share an internet connection, using the coaxial cable of the already existing TV distribution network.
- MxU does not permit to create an internal LAN with the existing 7671, unless the router reference 7666 is used.NETWORKING



Ethernet Coaxial Adaptor MxU T05 128 Mbps

References	7672
Connectors	
Ethernet interface	2 RJ45
Coaxial interface	2 F: TV + Data
Powering	16 pins, T-05 standard
Data Coaxial Interface	
Output power	120 dBµV
Sensibility reference	-38 dB (-110 dBm/Hz)
Output impedance	75 ohms
Bandwidth	12-28 Mhz
Return losses	> 10 dB
TV Coaxial Interface	
Through losses	2 dB
Return losses	> 10 dB
Bandwidth	57 a 2150 MHz
Output impedance	75 ohms
Power/Temperature	
Working temperature (min., max.)	-10ºC, 45ºC
Maximum consumption	6 W
Firmware features	
Maximum number of slaves	31
Maximum length of data network	800 m.
Maximum allowed attenuation	50 dB
Minimum allowed attenuation	12 dB
Users per slave	2

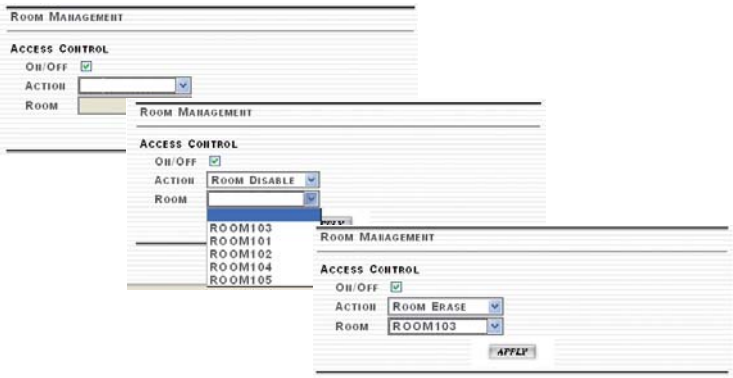
- Device that allows to share an internet connection, using the coaxial cable of the already existing TV distribution network.
- The MxU adapter does not create a coaxial network.
- T05 format

Ethernet Coaxial Router

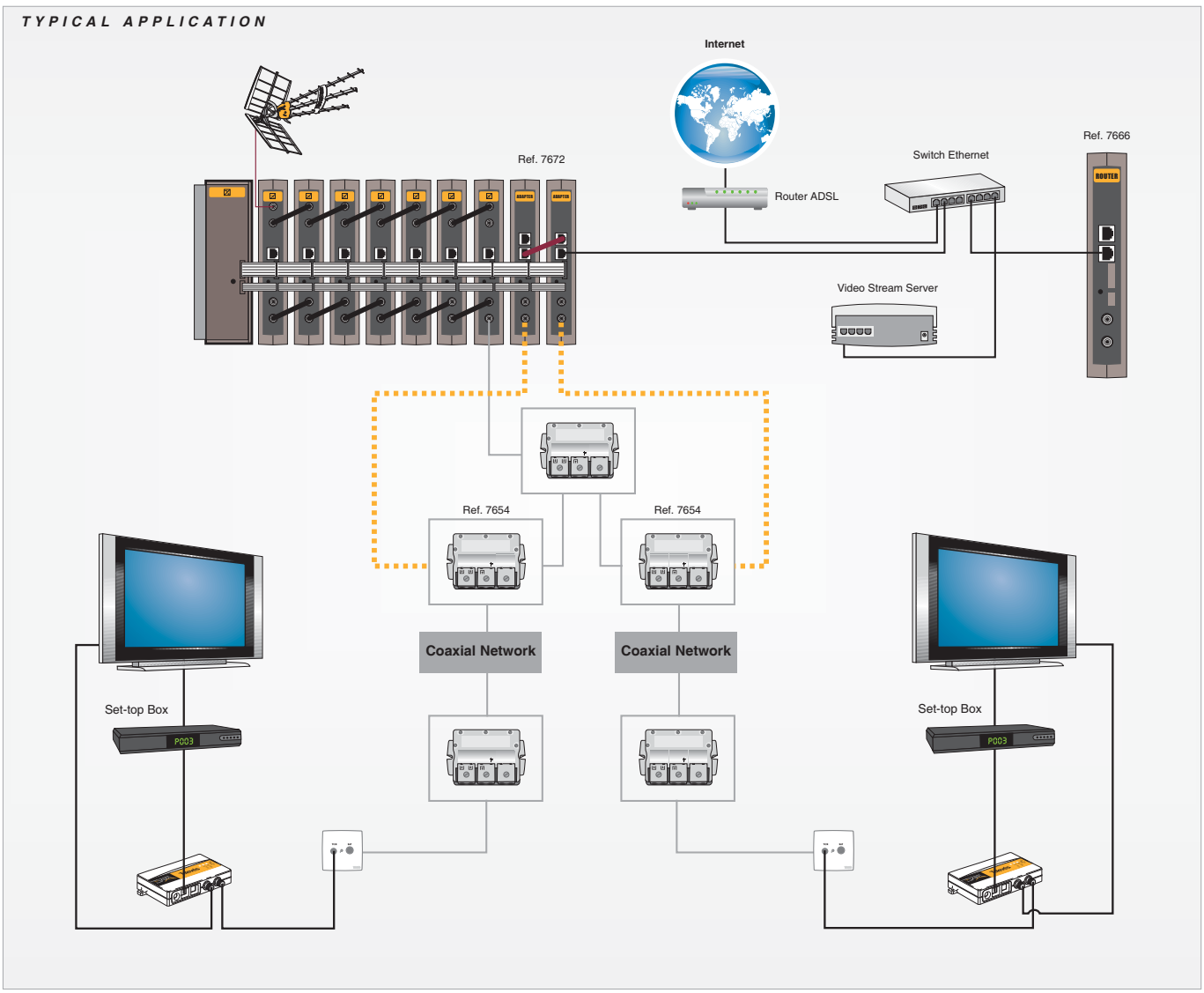
References	7666
Conectores	
Ethernet interface	2 RJ45
Coaxial interface	2 F: TV + Data
Powering	16 pins T-05 standard
Interfaz Coaxial Datos	
Output power	120 dBµV
Sensibility reference	-38 dB (-110 dBm/Hz)
Output impedance	75 ohms
Bandwidth	12-28 Mhz
Return losses	> 10 dB
Interfaz Coaxial TV	
Through losses	2 dB
Return losses	> 10 dB
Bandwidth	57 a 2150 MHz
Output impedance	75 ohms
Potencia/Temperatura	
Working temperature (min., max.)	-10ºC, 45ºC
Maximum consumption	6 W
Características firmware	
Maximum number of slaves	31
Maximum length of data network	800 m.
Maximum allowed attenuation	50 dB
Minimum allowed attenuation	12 dB
Users per slave	2

- This device is provided with a Web interface to configure:
  - IP addresses of the coaxial and ethernet interfaces and DHCP servers.
  - Access control to activate and deactivate the modems installed in the coaxial network.

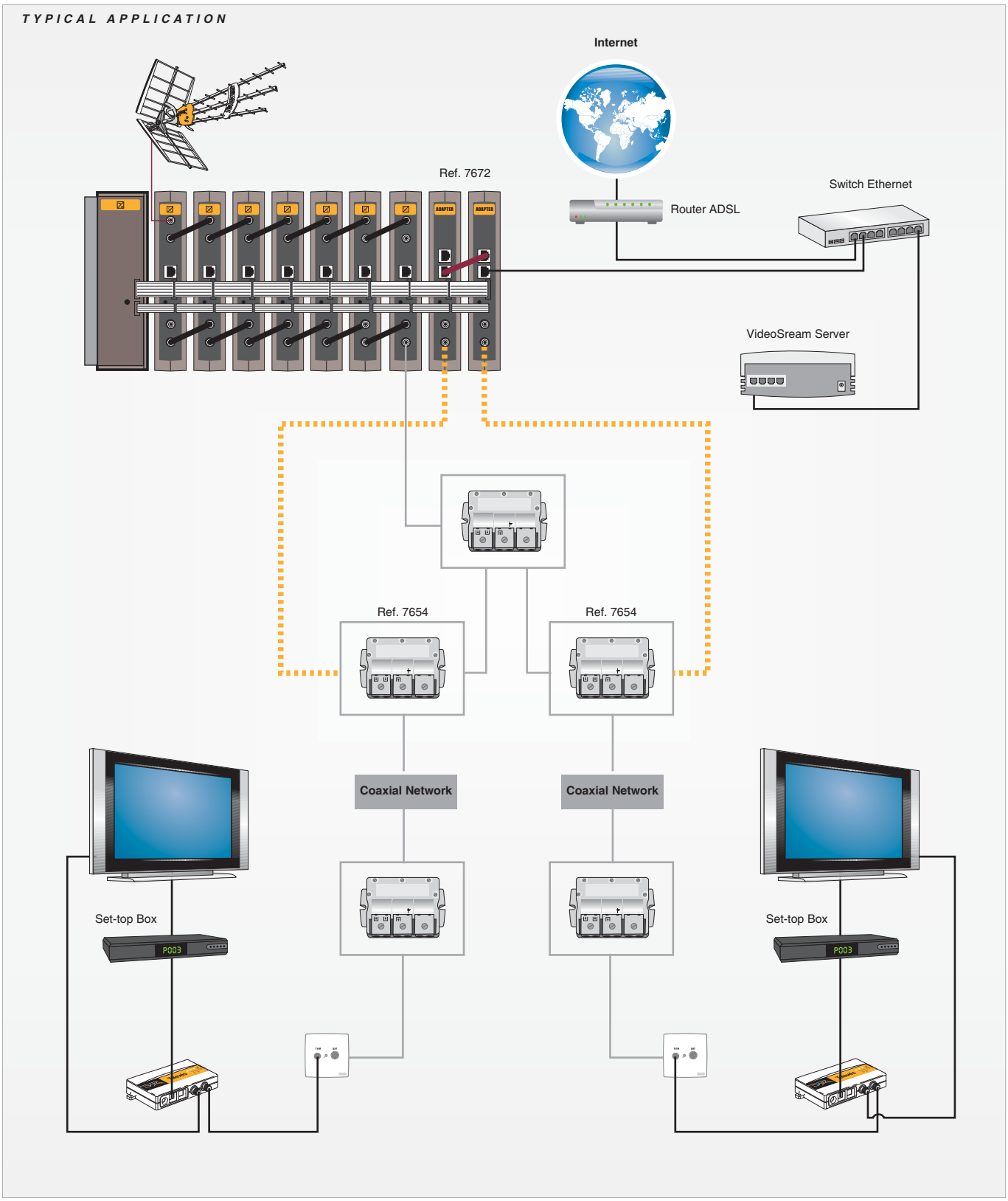
Management web inteface of Ref. 7666



TYPICAL APPLICATION



Ref. 7666 as a re-router of coaxial networks


TYPICAL APPLICATION
Internet
Ref. 7672
Router ADSL
Switch Ethernet
VideoSream Server
Ref. 7654
Ref. 7654
Coaxial Network
Coaxial Network
Set-top Box
Set-top Box

Home accessories

Complete range of product for domestic use.

Televes

Universal remote control units

PRODUCT RANGE		
REF.	DESCRIPTION	
7264	Programmed	4x1 modes

7264

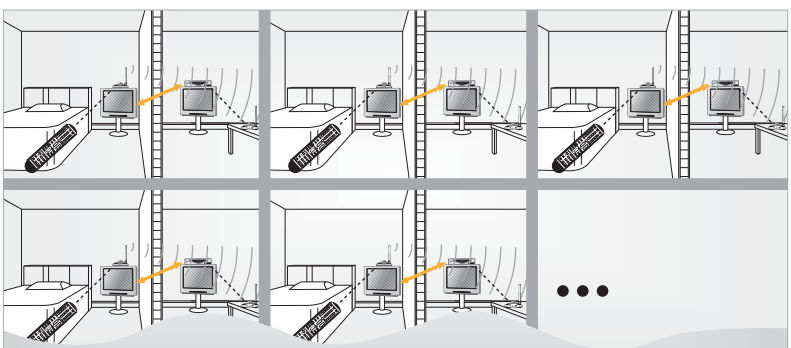
A/V and infrared transmitters

PRODUCT RANGE		
REF.	DESCRIPTION	
7307	Digidom AV	(Trans.+Receiver)
7604	Digidom AV	(Receiver)
7237	Digidom I/R disc shape	(Trans.+Receiver)
7232	Digidom I/R disc shape **16C**	(Trans.+Receiver)
7219	Digidom IR disc shape	(Transmitter)

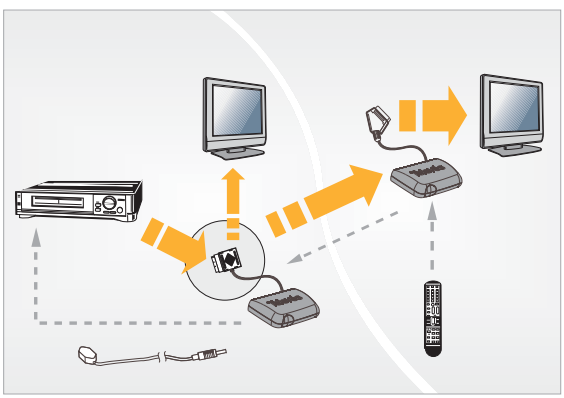
7237/7232

7307

References		7237/7219	7232	7307/7604
RCU Transmission band	MHz	434	434	400
Video transmission band		-	-	2400
Video input signal	Vpp	-	-	1
Modulation		AM	AM	FM
No. of channels		1	16	4



Up to 16 devices controlled simultaneously



A/V and infra-red transmitters

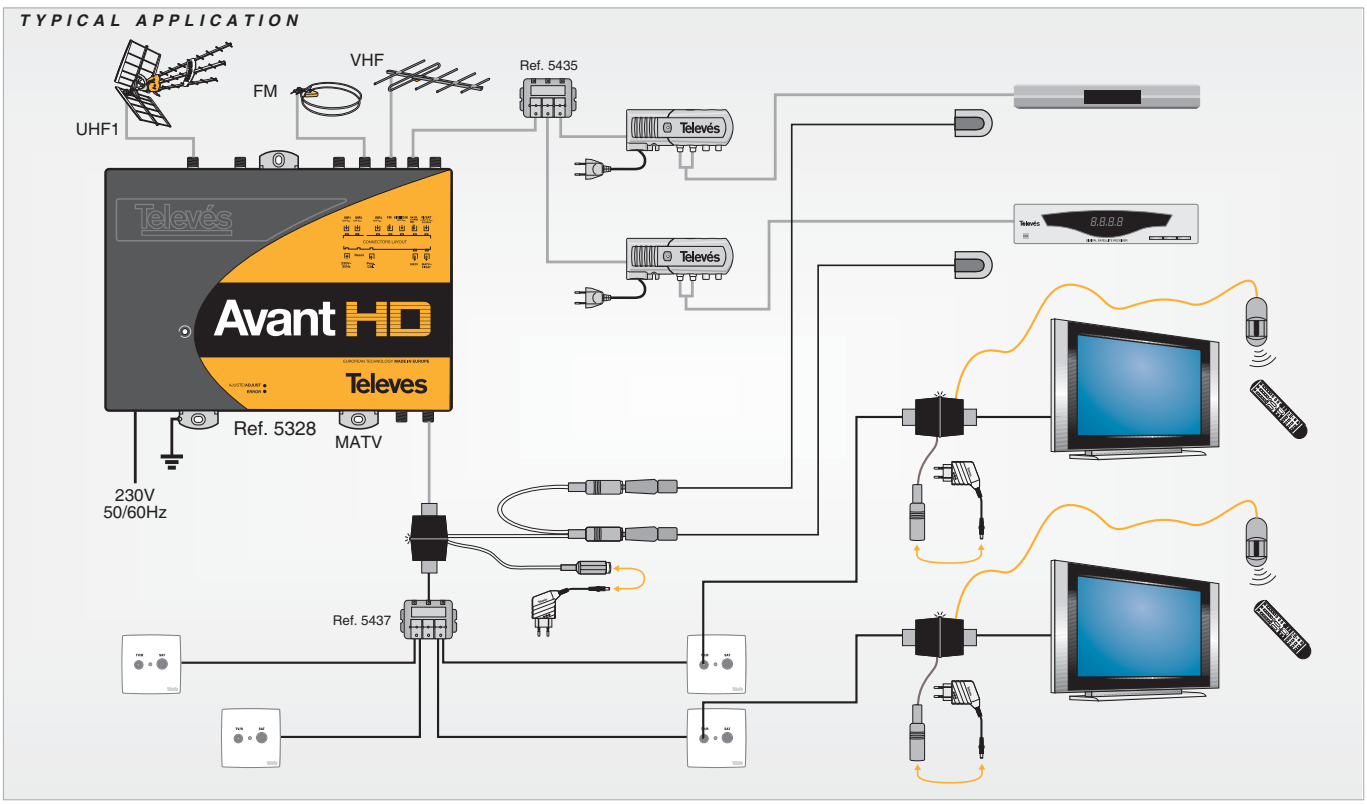
new

PRODUCT RANGE	
REF.	DESCRIPTION
7605	IR extensor with coaxial link (Trasmitter + Receiver)
7606	IR extensor with coaxial link (Receiver)

- IR Remote control extensor, using coaxial cable link.
- Interference free.

References		7605 TR+IR
Output frequency	KHz	36 (RC5)
Sensitivity	dBm	< –60
Consumption	mA	12 (12Vdc)
Output powering		30 (12Vdc)
Through losses	dB	0,5 (5-862 Mhz)

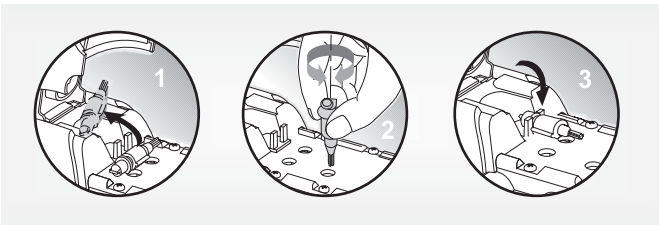
References		7606 IR
Modulation frequency	MHz	14,7 MHz
Output level	dBm	> – 10
Powering	mA	9-12 (9-12Vdc)
Through losses	dB	0,5 (5-862 Mhz)
Harmonic level	dBc	-45



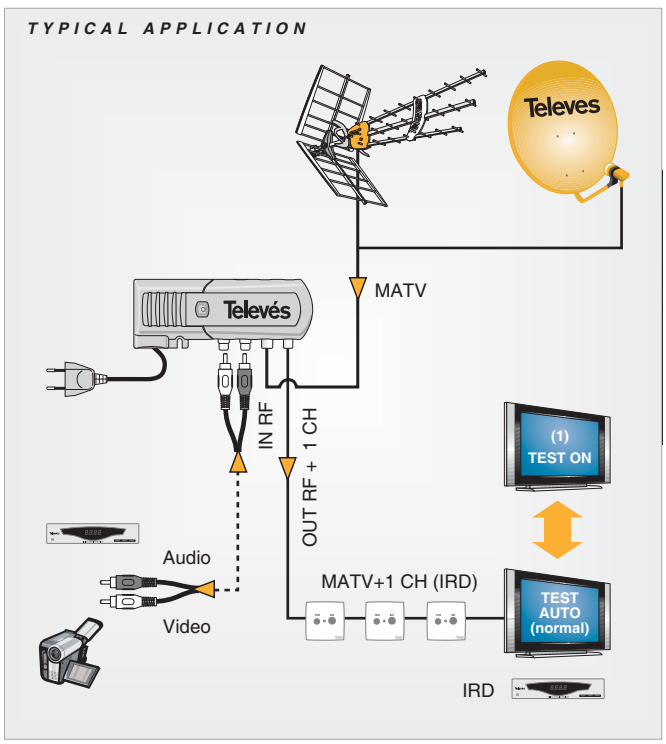
Domestic modulators

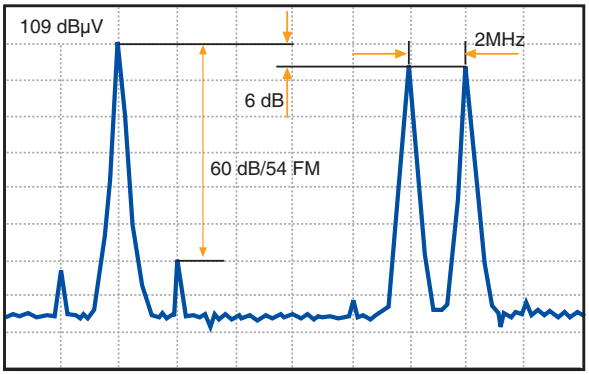
PRODUCT RANGE	
REF.	DESCRIPTION
5858	UHF/VHF Modulator

- Push-buttons instead of rotating selectors.
- Interface with the user via displays
- Output level regulation to avoid interferences with other channels in the installations
- 5-2150 Mhz frequency range, IF included
- DC bypass Input-Ouput.
- Small size



References		5858
Modulator		
Standard		PAL B/G, B Australia, PAL I, K CCIR, M-N, SECAM L, D OIRT, D-K PAL
Channels VHF (Pal B/G)		BS (S01-S10), BIII (C5-C12), BS (S11-S29)
Channels UHF		Ch 21- 69
Output level RF	dBµV	85-90
Attenuation	dB	15
Audio Carrier	MHz	5,5MHz (Pal B/G)
Modulation Depth	%	85
Video input level	Ω	1Vpp s/75
Thru-input		
Frequency range	MHz	5-2150
Attenuation	dB	2 typ.
Return losses		10 typ.
Powering		
Mains voltage		196-264V~ 50-60Hz
Total consumption (I máx)	A	0,026
DC bypass	mA	300 máx.





Technical Data

Televes

Conversion table

Levels (measured over 75 Ω impedance)

µV	dBµV	dBm	mV	dBµV	dBm	V	dBµV	dBm
1	0	-109	1	60	-49	1	120	11
1.5	3.5	-105.5	1.5	63.5	-45.5	1.5	123.5	14.5
2	6	-103	2	66	-43	2	126	17
2.5	8.0	-101	2.5	68	-41	2.5	128	19
3	9.5	-99.5	3	69.5	-39.5	3	129.5	20.5
3.5	11	-98	3.5	71	-38	3.5	131	22
4	12	-97	4	72	-37	4	132	23
4.5	13	-96	4.5	73	-36	4.5	133	24
5	14	-95	5	74	-35	5	134	25
6	15.5	-93.5	6	75.5	-33.5	6	135.5	26
7	17	-92	7	77	-32	7	137	26.5
8	18	-91	8	78	-31	8	138	29
9	19	-90	9	79	-30	9	139	30
10	20	-89	10	80	-29	10	140	31
15	23.5	-85.5	15	83.5	-25.5			
20	26	-83	20	86	-23			
25	28	-81	25	88	-21			
30	29.5	-79.5	30	89.5	-19.5			
35	31	-78	35	91	-18			
40	32	-77	40	92	-17			
45	33	-76	45	93	-16			
50	34	-75	50	94	-15			
60	35.5	-73.5	60	95.5	-13.5			
70	37	-72	70	97	-12			
80	38	-71	80	98	-11			
90	39	-70	90	99	-10			
100	40	-69	100	100	-9			
150	43.5	-65.5	150	103.5	-5.5			
200	46	-63	200	106	-3			
250	48	-61	250	108	-1			
300	49.5	-59.5	300	109.5	0.5			
350	51	-58	350	111	2			
400	52	-57	400	112	3			
450	53	-56	450	113	4			
500	54	-55	500	114	5			
600	55.5	-53.5	600	115.5	6.5			
700	57	-52	700	117	8			
800	58	-51	800	118	9			
900	59	-50	900	119	10			
1000	60	-49	1000	120	11			

Conversión $\frac{V_2}{V_1}$ a $\frac{V_2}{V_1}$ (dB)

dB.	0	1	2	3	4	5	6	7	8	9
0	1	1.12	1.26	1.41	1.59	1.78	2.00	2.24	2.51	2.82
10	3.16	3.55	3.98	4.47	5.01	5.62	6.31	7.08	7.94	8.91
20	10	11.2	12.6	14.1	15.9	17.8	20.0	22.4	25.1	28.2
30	31.6	35.5	39.8	44.7	50.1	56.2	63.1	70.8	79.4	89.1
40	100	112	126	141	159	178	200	224	251	282
50	316	355	398	447	501	562	631	708	794	891
60	1000	1122	1259	1413	1585	1778	1995	2239	2512	2818
70	3162	3548	39.81	4469	5012	5623	6310	7080	7943	8912

Conversion formula: $\frac{V_2}{V_1}$ (dB)= 20 log $\frac{V_2}{V_1}$

Example: ¿How many dB are $\frac{V_2}{V_1}$ = 200

Result: 40+6= 46 dB

Reduction of max. output level (derating)

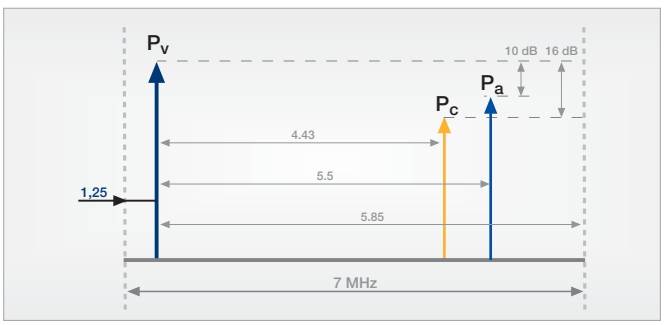
Broadband amplifiers

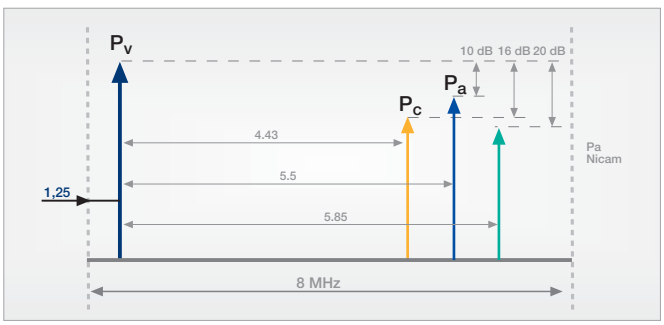
Channels	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	32
Reduction (dB)	0	2.5	3	4.5	5	5.5	6	6.5	7	7.5	8	8	8.5	8.5	9	9	12

TV frequency bands

VHF							UHF		
BI	Sub B	FM	Low S	BIII	High S	Hyperband	BIV	BV	
C2 C3 C4			S1-S10	C5-C12	S11-S21	S21-S41	C21-C37	C38-C69	

47 68 88 10 17 23 30 47 60 86





Radio frequency standards

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)
H Standard (Australia)				
IV	H28	526-533	527,25	532,75
	H29	533-540	534,25	539,75
	H30	540-547	541,25	546,75
	H31	547-554	548,25	553,75
	H32	554-561	555,25	560,75
	H33	561-568	562,25	567,75
	H34	568-575	569,25	574,75
	H35	575-582	576,25	581,75
	H36	582-589	583,25	588,75
	H37	589-596	590,25	595,75
	H38	596-603	597,25	602,75
V	H39	603-610	604,25	609,75
	H40	610-617	611,25	616,75
	H41	617-624	618,25	623,75
	H42	624-631	625,25	630,75
	H43	631-638	632,25	637,75
	H44	638-645	639,25	644,75
	H45	645-652	646,25	651,75
	H46	652-659	653,25	658,75
	H47	659-666	660,25	665,75
	H48	666-673	667,25	672,75
	H49	673-680	674,25	679,75
	H50	680-687	681,25	686,75
	H51	687-694	688,25	693,75
	H52	694-701	695,25	700,75
	H53	701-708	702,25	707,75
	H54	708-715	709,25	714,75
	H55	715-722	716,25	721,75
	H56	722-729	723,25	728,75
	H57	729-736	730,25	735,75
	H58	736-743	737,25	742,75
	H59	743-750	744,25	749,75
	H60	750-757	751,25	756,75
	H61	757-764	758,25	763,75
	H62	764-771	765,25	770,75
	H63	771-778	772,25	777,75
	H64	778-785	779,25	784,75
	H65	785-792	786,25	791,75
	H66	792-799	793,25	798,75
	H67	799-806	800,25	805,75
	H68	806-813	807,25	812,75
	H69	813-820	814,25	819,75

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)
I Standard (Great Britain -South Africa)				
III	I4	174-182	175,25	181,25
	I5	182-190	183,25	189,25
	I6	190-198	191,25	197,25
	I7	198-206	199,25	205,25
	I8	206-214	207,25	213,25
	I9	214-222	215,25	221,25
	I10	222-230	223,25	229,25
	I11	230-238	231,25	237,25
	I(12)	238-246		
	I13	246-254	247,43	253,43

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)
B Standard (Italy)				
I	A	52,5-59,5	53,75	59,25
	B	61-68	62,25	67,75
II	C	81-88	82,25	87,75
III	D	174-181	175,25	180,75
	E	182,5-189,5	183,75	189,25
	F	191-198	192,25	197,75
	G	200-207	201,25	206,75
	H	209-216	210,25	215,75
	H1	216-223	217,25	222,75
	H2	223-230	224,25	229,75

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier Hz)
L Standard (France)				
III	L05	174,75-182,75	176,00	182,50
	L06	182,75-190,75	184,00	190,50
	L07	190,75-198,75	192,00	198,50
	L08	198,75-206,75	200,00	206,50
	L09	206,75-214,75	208,00	214,50
	L10	214,75-222,75	216,00	222,50

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)
K Standard				
III	K4	174-182	175,25	181,75
	K5	182-190	183,25	189,75
	K6	190-198	191,25	197,75
	K7	198-206	199,25	205,75
	K8	206-214	207,25	213,75
	K9	214-222	215,25	221,75

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)
I Standard (Ireland)				
I	A-1	44,5-52,5	45,75	51,75
	B-1	52,5-60,5	53,75	59,75
	C-1	60,5-68,5	61,75	67,75
III	D-1	174-182	175,25	181,25
	E-1	182-190	183,25	189,25
	F-1	190-198	191,25	197,25
	G-1	198-206	199,25	205,25
	H-1	206-214	207,25	213,25
	I-1	214-222	215,25	221,25

TV Bands	Ch.	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)
D Standard - OIRT				
I	R1	48,5 - 56,5	49,75	56,25
	R2	58 - 66	59,25	65,75
	R3	76 - 84	77,25	83,75
II	R4	84- 92	85,25	91,75
	R5	92-100	93,25	99,75
III	R6	174-182	175,25	181,75
	R7	182-190	183,25	189,75
	R8	190-198	191,25	197,75
	R9	198-206	199,25	205,75
	R10	206-214	207,25	213,75
	R11	214-222	215,25	221,75
	R12	222-230	223,25	229,75

TV Standards

Country	VHF	UHF	Colour System
Algeria	B	H	PAL
Argentina	N	N	PAL
Australia	B	H	PAL
Austria	B	G	PAL
Bahrain	B	G	PAL
Belgium	B	H	PAL
Bulgaria	D	K	SECAM
China	D	K	PAL
Cyprus	B	G	PAL
Croatia	B	G	PAL
Czechoslovakia	D	K	SECAM
Denmark	B	G	PAL
Egypt	B	G, H	SECAM
Finland	B	G	PAL
France	EIL	L	SECAM
Germany	B	G	PAL
Gibraltar	B	H	PAL
Great Britain	I	I	PAL
Greece	B	G	SECAM
Holland	B	G	PAL
Hong Kong	(A)I	I	PAL
Hungary	D	K	SECAM
Iceland	B	G	PAL
India	B	-	PAL
Indonesia	B	-	PAL
Iran	B	G	SECAM
Iraq	B	-	SECAM
Ireland	I	I	PAL
Israel	B	G	PAL
Italy	B	G	PAL
Japan	M	M	NTSC
Jordan	B	G	PAL
Korea (Rep.)	M	-	NTSC
Kuwait	B	G	PAL

Country	VHF	UHF	Colour System
Lebanon	B	G	SECAM
Libya	B	H	PAL
Luxemburg	C	L	PAL/SECAM
Malta	B	H	PAL
Malaysia	B	G	PAL
Mexico	M	M	NTSC
Monaco	E	L	SECAM
Morocco	B	H	SECAM
Nigeria	B	G	PAL
Norway	B	G	PAL
Oman Sultanate	B	G	PAL
Pakistan	B	-	PAL
Philippines	M	M	NTSC
Poland	D	K	SECAM
Portugal	B	G	PAL
Qatar	B	-	PAL
Romania	B	G	PAL
Russia	D	K	SECAM
Saudi Arabia	B	G	PAL/SECAM
Singapore	B	G	PAL
Slovenia	B	G	PAL
Spain	B	G	PAL
Sri Lanka	B/H	-	PAL
South Africa	I	I	PAL
Sweden	B	G	PAL
Switzerland	B	G	PAL
Syrian Arab. Rep.	B	H	SECAM
Thailand	B	R	PAL
Tunisia	B	G	SECAM
Turkey	B	G	PAL
U.A.E.	B	G	PAL
U.S.A.	M	M	NTSC
Yemen P.D. R.	B	-	PAL

TV standards									
Standard		B/G CCIR	D/K OIRT	H Belgium	I UK	K1[1] FOPTA[5]	L France	M FCC	N South America
Frequency band		VHF/UHF		UHF	VHF/UHF				
Number of lines		625						525	625
Field frequency	Hz	50						60	50
Line frequency	Hz	15625						15750	15625
Video bandwidth	MHz	5	6	5	5.5	6		4.2	
RF channel bandwidth	MHz	7/8	8					6	
Video - audio[2] spacing	MHz	+5.5/5.74/5.85	+6.5	+5.5	+6/6.552	+6.5	±6.5	+4.5	
Vestigial Side Band	MHz	0.75		1.25				0.75	
Spacing between the left edge of the channel and the video carrier	MHz	+1.25							
RF sync level	%	100					<6	100	
Picture modulation		C3F negative					C3F positive	C3F negative	
Sound modulation		F3E / F3EH[2]	F3E				A3E	F3E	
Frequency modulation	KHz	±50					-	±25	
A/V carrier ratio		10:1 to 20:1[4] 20:1:0.2[2]	10:1 to 5:1	5:1 ato10:1	5:1	10:1		10:1 to 5:1[4]	10:1 a 5:1

[1] Also known as K' / [2] For dual audio or stereo, the second value for second carrier / [3] In Germany since April 1976
[4] 6.7:1 y 2,9:1 in Japan / [5] Group of territories represented by the French Overseas Post and Telecommunications Agency (FOPTA)

Channel - Frequency Tables

Bands	Channel	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)	Subcarrier colour (MHz)
Channels distribution according to CCIR (B Standard +G Europe)					
I	2	47···54	48.25	53.75	52.68
	3	54···61	55.25	60.75	59.68
	4	61···68	62.25	67.75	66.68
Sub. Band	L1	68···75	69.25	74.75	73.18
	L2	75···82	76.25	81.75	80.25
	L3	82···89	83.25	88.75	87.32
II	FM	88···108			
S Low Band	S1	104···111	105.25	110.75	109.68
	S2	111···118	112.25	117.75	116.68
	S3	118···125	119.25	124.75	123.68
	S4	125···132	126.25	131.75	130.68
	S5	132···139	133.25	138.75	137.68
	S6	139···146	140.25	145.75	144.68
	S7	146···153	147.25	152.75	158.68
	S8	153···160	154.25	159.75	158.68
	S9	160···167	161.25	166.75	165.68
	S10	167···174	168.25	173.75	172.68
BIII	5	174···181	175.25	180.75	179.68
	6	181···188	182.25	187.75	186.68
	7	188···195	189.25	194.75	193.68
	8	195···202	196.25	201.75	200.68
	9	202···209	203.25	208.75	207.68
	10	209···216	210.25	215.75	214.68
	11	216···223	217.25	222.75	221.68
	12	223···230	224.25	229.75	228.68
S High Band	S11	230···237	231.25	236.75	235.68
	S12	237···244	238.25	243.75	242.68
	S13	244···251	245.25	250.75	249.68
	S14	251···258	252.25	257.75	256.68
	S15	258···265	259.25	264.75	263.68
	S16	265···272	266.25	271.75	270.68
	S17	272···279	273.25	278.75	277.68
	S18	279···286	280.25	285.75	284.68
	S19	286···293	287.25	292.75	291.68
	S20	193···300	294.25	299.75	298.68
Hyperband	S21	302···310	303.25	308.75	307.68
	S22	310···318	311.25	316.75	315.68
	S23	318···326	319.25	324.75	320.68
	S24	326···324	327.25	332.75	331.68
	S25	334···342	335.25	340.75	339.68
	S26	342···350	343.25	348.75	347.68
	S27	350···358	351.25	356.75	355.68
	S28	358···366	359.25	364.75	363.68
	S29	366···374	367.25	372.75	371.68
	S30	374···382	375.25	380.75	379.68
	S31	382···390	383.25	388.75	387.68
	S32	390···398	391.25	396.75	395.68
	S33	398···406	399.25	404.75	403.68
	S34	406···414	407.25	412.75	411.68
	S35	414···422	415.25	420.75	419.68
	S36	422···430	423.25	428.25	427.68
	S37	430···438	431.25	436.75	435.68
	S38	438···446	439.25	444.75	443.68

Bands	Channel	Frequency Channel (MHz)	Video carrier (MHz)	Audio carrier (MHz)	Subcarrier colour (MHz)
Channels distribution according to CCIR (B Standard +G Europe)					
IV	21	470···478	471.25	476.75	475.68
	22	478···486	479.25	484.75	483.68
	23	486···494	487.25	492.75	491.68
	24	494···502	495.25	500.75	499.68
	25	502···510	503.25	508.75	507.68
	26	510···518	511.25	516.75	515.68
	27	518···526	519.25	524.75	523.68
	28	526···534	527.25	532.75	531.68
	29	534···542	535.25	540.75	539.68
	30	542···500	543.25	548.75	547.68
	31	550···558	551.25	556.75	555.68
	32	558···566	559.25	564.75	563.68
	33	566···574	567.25	572.75	571.68
	34	574···582	575.25	580.75	579.68
	35	582···590	583.25	588.75	587.68
	36	590···598	591.25	596.75	595.68
	37	598···606	599.25	604.75	603.68
V	38	606···614	607.25	612.75	611.68
	39	614···622	615.25	620.75	619.68
	40	622···630	623.25	628.75	627.68
	41	630···638	631.25	636.75	635.68
	42	638···646	639.25	644.75	643.68
	43	646···654	647.25	652.75	651.68
	44	654···662	655.25	660.75	659.68
	45	662···670	663.25	668.75	667.68
	46	670···678	671.25	676.75	675.68
	47	678···686	679.25	684.75	683.68
	48	686···694	687.25	692.75	691.68
	49	694···702	695.25	700.75	699.68
	50	702···710	703.25	708.75	707.68
	51	710···718	711.25	716.75	715.68
	52	718···726	719.25	724.75	723.68
	53	726···734	727.25	732.75	731.68
	54	734···742	735.25	740.75	739.68
	55	742···750	743.25	748.75	747.68
	56	750···758	751.25	756.75	755.68
	57	758···766	759.25	764.75	763.68
	58	766···774	767.25	772.75	771.68
	59	774···782	775.25	780.75	779.68
	60	782···790	783.25	788.75	787.68
	61	790···798	791.25	796.75	795.68
	62	798···806	799.25	804.75	803.68
	63	806···814	807.25	812.75	811.68
	64	814···822	815.25	820.75	819.68
	65	822···830	823.25	828.75	827.68
	66	830···838	831.25	836.75	835.68
	67	838···846	839.25	844.75	843.68
	68	846···854	847.25	582.75	851.68
	69	854···862	855.25	860.75	859.68

GAIN (dB):
This is the difference between the output power of an amplifier with the characteristic impedance (75 Ω) and the input power. *(Fig.1)*

FREQUENCY RESPONSE:
The variation in amplitude within a certain band or channel.

FLATNESS (dB): The difference between the maximum and minimum gain in a certain band or channel.

NOISE FIGURE:
The ratio of the actual noise power generated at the output of an amplifier to that which would be generated in an ideal resistor. The lower the noise figure, the better the performance.
The noise figure is expressed in (dB): NF=10 log F.

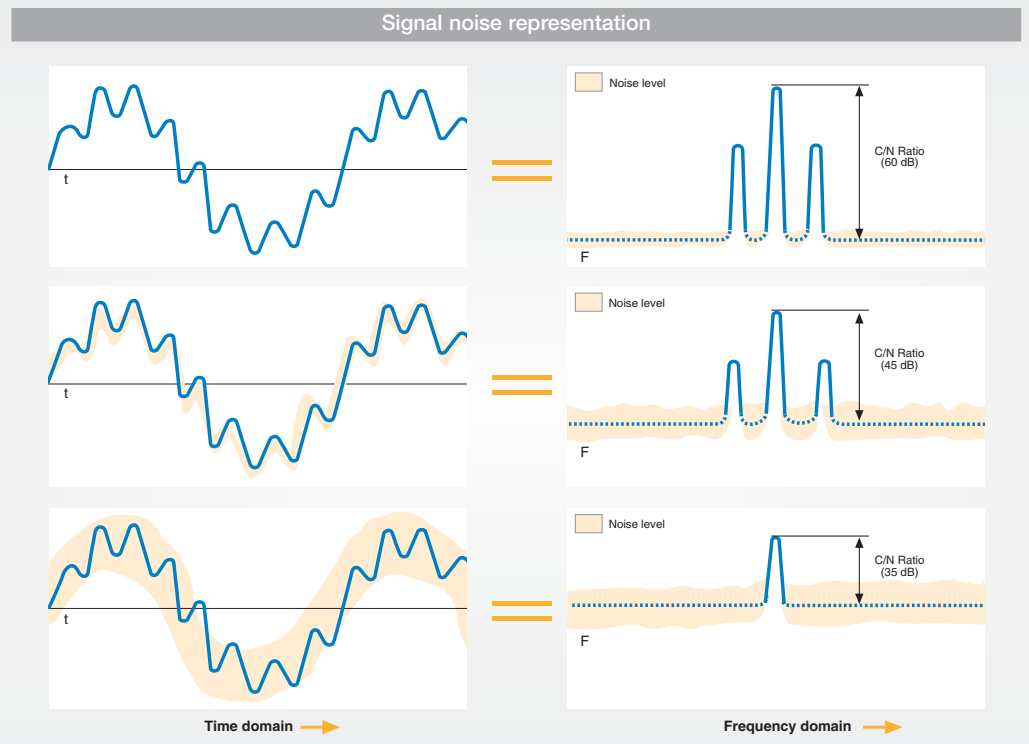
MAXIMUM OUTPUT LEVEL **(dBµV)**.:
Single channel amplifiers:
EN50083-5 standard
Intermodulation distance= 54 dB *(Fig. 2)*

PAL broadband amplifiers:
DIN45004B standard
Intermodulation distance= 60 dB *(Fig.3)*

IF Amplifier:
DIN VDE 0855/12 standard
Intermodulation distance= 35 dB *(Fig.4)*

DAB Amplifier:
Intermodulation distance= 50 dB (2 channeles de 4 MHz) *(Fig.5)*

FM Amplifier:
UNE 523/79 standard
Intermodulation distance= 54 dB *(Fig.3)*



REJECTION BETWEEN INPUTS/OUTPUTS (dB):
The band attenuation between inputs/outputs.

ADJACENT CHANNEL REJECTION (dB):
The difference between the minimum gain in the channel and the maximum gain (minimum attenuation) in the adjacent channel. The adjacent channel in UHF is C±2 and in VHF is C±1).

BAND REJECTION (dB):
The difference between the minimum gain in the amplified band and the maximum attenuation in the rejected band.

(Fig.6 BIII rejection of UHF)
(Fig.7 UHF rejection of BIII)
(Fig.8 rejection of FM)

AGC RANGE (dB):
The difference between the maximum and minimum signal that is necessary for a system with AGC to keep a constant output.

THROUGH LOSSES (dB):
The attenuation that is undergone by signal in a specific band between the input and output of a device.

SPURIOUS (dBc):
The difference in levels between the channel carrier created by a modulator or conversor and the lower side band or local oscillator. This only applies when there is a broadband channel.

Working temperature
The optimum temperature to get the best performance from the electronic equipment is between -10 and 45 °C.
(Unless otherwise specified)

OBSERVATIONS

In general, the VHF band covers the following frequency ranges:

- For MATV: BI, FM, BSMID, BIII: 47···230 MHz.
- For SMATV & CATV: BI, FM, BSMID, BIII, BSUPP, BS HYPER: 47···446 MHz.
- In devices where FM rejection is not specified, this band is either amplified or combined
- Rejection of 27 (MHz) or FM does not mean that the band is not affected by the said bads as they can ingress into the system through the distribution network.
- All Televés headends are in compliance with the CE regulations.

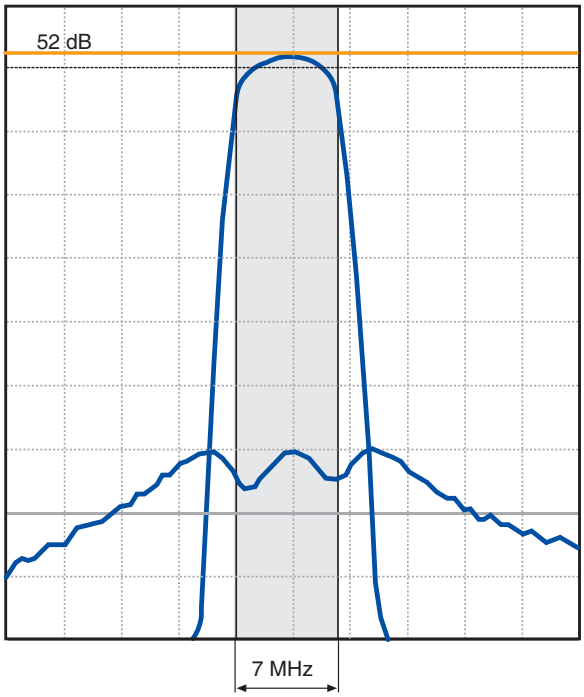


Fig. 1: Gain curve of a monochannel amplifier

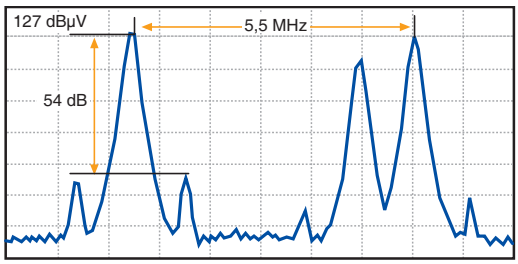


Fig. 2: Max. output volt. measurement for a monochannel amp.

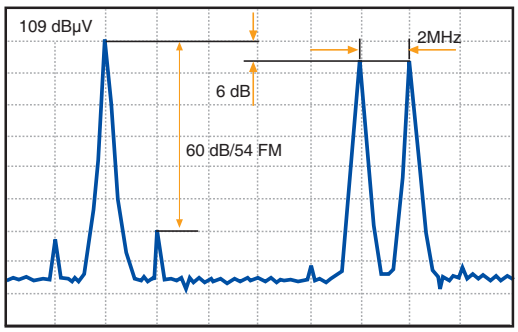


Fig. 3: Max. output volt. measurement for a wide band amp.

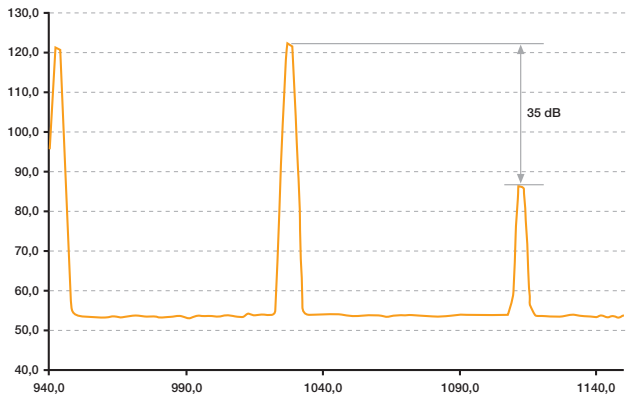


Fig. 4: Max. output volt. measurement for a IF amplifier

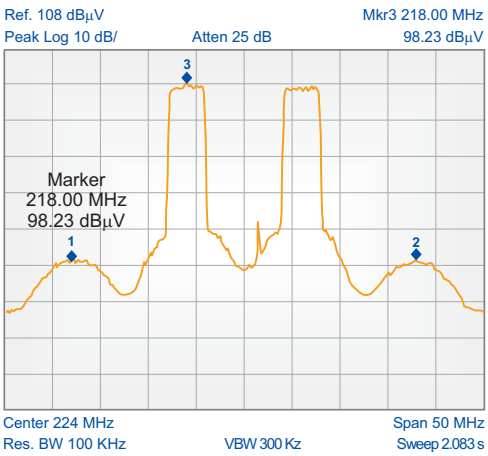


Fig. 5: Max. output volt. measurement for a DAB amp.

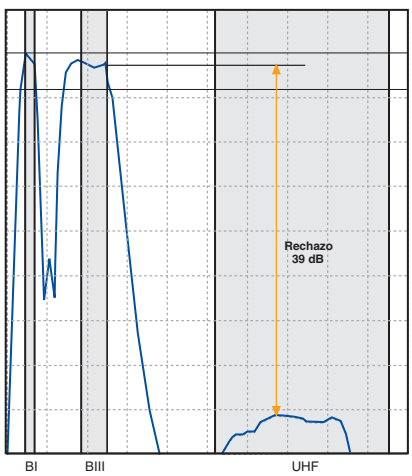


Fig. 6 BIII to UHF rejection

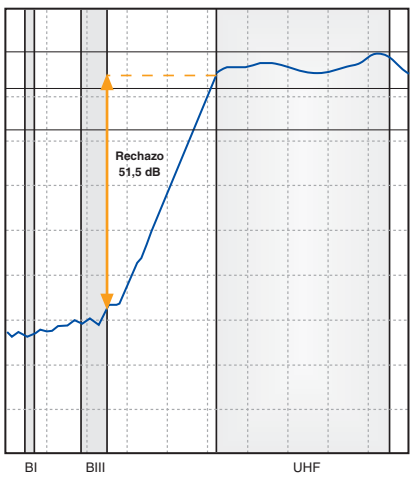


Fig. 7 UHF to BIII rejection

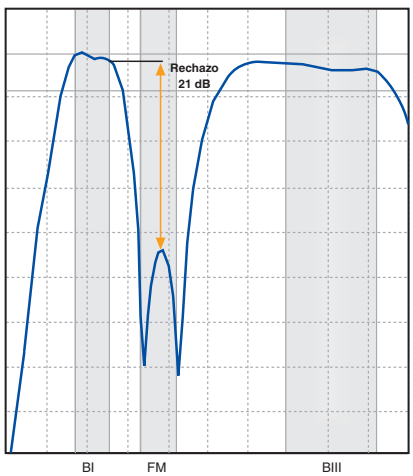


Fig. 8 BI to FM rejection

Carrier-Noise ratio C/N

The carrier-to-noise ratio is defined as the ratio between the video carrier signal level and the RMS noise level. The ratio is expressed in decibels. The threshold of perceptibility of noise on a TV receiver occurs at a C/N ratio approximately 45 dB. Mathematically, for one amplifier it is calculated this way:

$$C/N_1\ (dB) = V_O - (Nt + NF + G)$$

V_O : Output level
Nt: Thermal noise (depends of the considered bandwidth)
NF: Noise figure of the amplifier
G: Gain

Carrier-to-Cross Modulation Ratio C/XMOD

It is defined as the third order distortion which causes the modulation of one signal carrier to modulate another signal carrier.

The threshold of perceptibility of this ratio on a TV screen is less than 40 dB, so the C/X ratio is not the limiting factor in the design of most systems and is, therefore, below the threshold in system designs.

a) XMOD for 1 amplifier

$$XMOD = XMOD_{ref} + 2\cdot(Noutput - Nref.)$$

b) XMOD for N identical amplifiers

$$XMOD_{Namp} = XMOD_{1amp} - 20\ logN$$

c) XMOD for N amplifiers with diferents XMOD

$$XMOD_{N\ amps} = -20\ log\ [10^{-XMOD_1/20} + 10^{-XMOD_2/20} + ... + 10^{-XMOD_N/20}]$$

Carrier-to-Third Order Intermodulation Ratio C/IMD

Third-order intermodulation is the simultaneous pulse of 2 or 3 signal carriers to produce a spurious carrier, caused by the third-order distortion characteristic of the amplifier.
This type of third-order distortion is generally the limiting factor in the output capability of an amplifier. The following is a list of the parameters that one must be aware of when specifying composite triple beat:

1. Number of Channels.- The number of triple beats per channel increases exponentially as the number of channels increases.

2. Levels.- Because triple beat is a third-order distortion, the distortion will increase in output level. If the amplifier operates with a tilt, the distortion will also be affected. A tilted output will give better improvement in the carrier-to-distortion ratio over a flat output.

a) CTB for 1 amplifier

$$CTB = CTB_{ref} + 2\cdot(Noutput - Nref.)$$

b) CTB for N identical amplifiers

$$CTB_N = CTB_1 + 20\ logN$$

c) CTB for N amplifiers with diferents CTB

$$CTB_{total} = -20\ log\ [10^{-CTB_1/20} + 10^{-CTB_2/20} + ... + 10^{-CTB_N/20}]$$

Carrier to Second-Order Intermodulation Ratio (CSO)

It is the simultaneous pulse, or beating together, of 2 signal carriers because of the second-order distortion characteristics of the amplifier.

a) CSO (dB) for 1 amplifier

$$CSO\ (dB) = CSO_{ref} + (Nout - Nref.)$$

b) For N identical amplifiers.

$$CSO\ (dB) = CSO_{1\ amp} - 15\ logN$$

c) CSO for N amplifiers with diferents CSO

$$CSO_{total} = -15\ log\ [10^{-CTB_1/15} + 10^{CTB_2/15} + ... + 10^{-CTB_N/15}]$$

System calculations example

We would like to know the CTB resulting of the use of 5 amplifiers ref. 4511 in cascade, with a tilt of 8 dB.

Data:

From the technical specifications of the amplifier ref. 4511, we know that: CTB = 60 @ 117 dBuV (for plain output, without tilt)

As we will install 5 amplifiers in cascade, with a tilt of 8 dB, we will recalculate the CTB for a medium value of the Output level:
- Output level for C69: 117dBuV
- Output level for C2: 109dBuV

Step 1

Calculate the specification for a new reference level of 113 dBuV, which is the medium value of the tilt (109+8/2=113)

Because the new output level is lower (117 vs. 113 dBuV), it will improve its value.

General formula:

$$CTB = CTB_{ref} + 2\cdot(Noutput - Nref.)$$

We extract CTB_{ref}:

$$CTB_{ref} = CTB + (Nref. - Noutput)$$

Known data:

$CTB_{117dB\mu V}$ = 60 dBc
Reference level: 117dBuV
Output level: 113 dBuV

Then:

$$CTB_{113dB\mu V} = 60\ dB + 2\cdot(117-113)\ dB\mu V = 60+2\cdot4 = 60+8 = 68\ dBc$$

Step 2

Make the calculation for the cascade of 5 amplifiers with a tilt of 8 dB, considering a new specification of CTB = 68dBc @ 113 dBuV (now it is considered as a plain response).

General formula for N amplifiers in cascade:

$$CTB_N = CTB_1 - 20\ logN$$

In this case:

$$N = 5\ y\ CTB_{1amp} = 68\ dBc$$

Step 3

Substituting values:

$$CTB5 = 68 - 20\ log5$$

Already calculated values for the correction factor are shown in the table below.

$$CTB_5 = 68 - 20\ log5 = 68 - 13{,}98 = 54{,}02\ dBc$$

SYSTEM CALCULATIONS AMPLIFIER CASCADE FACTOR			
Cascade (N)	C/N + SSO 10*LOG (N)	CSO 15*LOG (N)	CTB & XMOD 20*LOG (N)
2	3,01	4,52	6,02
3	4,77	7,16	9,54
4	6,02	9,03	12,04
5	6,99	10,48	13,98
6	7,78	11,67	15,56
7	8,45	12,68	16,90
8	9,03	13,55	18,06
9	9,54	14,31	19,08
10	10,00	15,00	20,00
11	10,41	15,62	20,83
12	10,79	16,19	21,58
13	11,14	16,71	22,28
14	11,46	17,19	22,92
15	11,76	17,64	23,52
16	12,04	18,06	24,08
17	12,30	18,46	24,61
18	12,55	18,83	25,11
19	12,79	19,18	25,58
20	13,01	19,52	26,02
21	13,22	19,83	26,44
22	13,42	20,14	26,85
23	13,62	20,43	27,23
24	13,80	20,70	27,60
25	13,98	20,97	27,96

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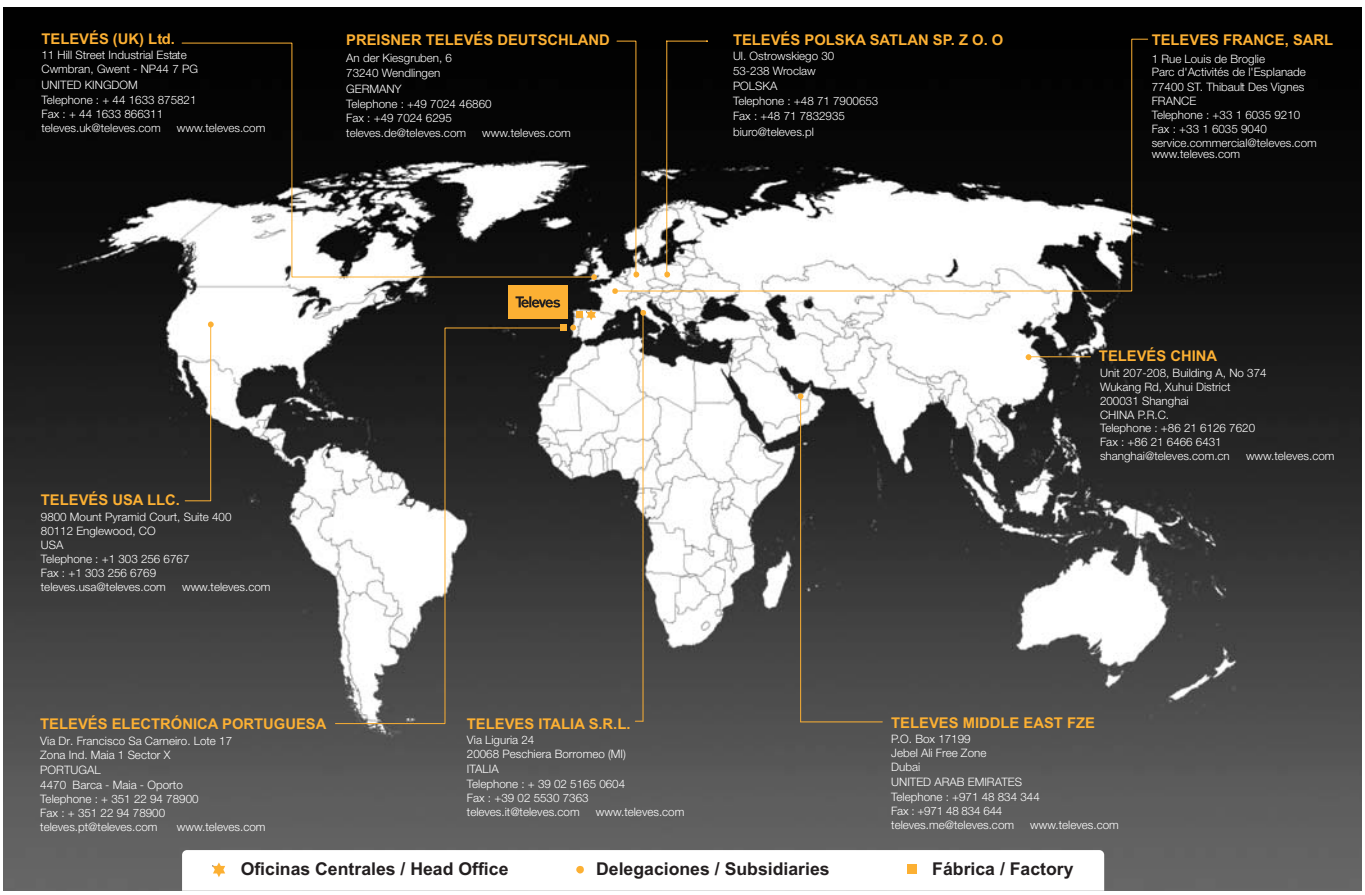

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