





Coupling devices for Power Line Carrier systems

- Line Matching Units
- Differential Hybrid circuits
- Adaptable attenuator

Communications / HV Telecommunications / Line Matching Units & Accessories

LMUs & Accessories



Key features:

- Designed according to IEC 60481 standard (composite loss ≤2dB and return loss ≥12dB in the selected bandwidth)
- Distortion and intermodulation:
 80 dB below the level corresponding to the nominal power (P.E.P.)

Description

Introduction

Power-Line Carrier (PLC) systems form part of the power utilities' communication networks using high-voltage electrical power lines to transmit information related to the operation of the power system.

The line trap and line-trap tuner are devices installed in series with the conductor used for signal transmission. The set has a higher impedance at the PLC link transmission frequencies and a lower impedance at the power system frequency (50 or 60 Hz). Installing line trap and liner-trap tuners at the ends and tie points of HV lines, allows using them as communication lines since the PLC link is separated from the energy transmission at the power frequency.

The line matching units, together with the coupling capacitors, make up filters which adapts the impedances between the high voltage line, used as a signal transmission line, and the PLC equipment. Line matching units are also the elements in charge of isolating the PLC terminal and personnel from the HV line.

A line matching unit contains tuning elements, an isolating transformer and protection devices.

ZIV COMMUNICATIONS wide range offering includes adaptable line-tuning units with different tuning circuits, allowing optimal settings according to the bandwidth and the line parameter requirements of each application. Also available, are line matching units with integrated hybrid circuit, reducing the number of devices required for phase-to-phase and three-phase couplings.

Quality Control You Can Rely On

Quality is built into our products in every step.

ZIV COMMUNICATIONS has its own test laboratory for type testing of line matching units in order to verify IEC 60481 compliance.

Special models on request

Line matching units with different specifications and models for underground cables can be developed on request. Please contact ZIV COMMUNICATIONS with your special application details.



 $\begin{array}{c} \text{IF} \quad P_{l}\left(\omega\right)=P_{max} \\ (P_{ref}\left(\omega\right)=0) \\ \text{(PERFECT MATCHING FREQUENCIES)} \\ \omega=\omega_{01}, \ \omega=\omega_{02} \\ \\ \textbf{USEFUL BANDWIDTH} \\ \textbf{(MATCHING BANDWIDTH)} \\ \text{The frequency range where} \\ a_{c}\left(\omega\right)\leq a_{c}, \ a_{r}\left(\omega\right)\leq a_{r} \end{array}$

Being α_c and α_r a specified values

	R/R ₀	R ₀ /R	P _{ref} / P _{max} (%)	P _I / P _{max} (%)	α _r (dB)	α _c (dB)
	1,000	1,000	0,00	100,00	infinite	zero
	0,952	1,050	0,06	99,94	32,2557	0,0026
	0,606	1,650	6,02	93,98	12,2067	0,2695
	0,598	1,671	6,31	93,69	12,0003	0,2830
	0,588	1,700	6,72	93,28	11,7253	0,3022
	0,571	1,750	7,44	92,56	11,2854	0,3357
	0,560	1,785	7,94	92,06	11,0001	0,3594
	0,556	1,800	8,16	91,84	10,8814	0,3698
	0,541	1,850	8,90	91,10	10,5085	0,4046
	0,526	1,900	9,63	90,37	10,1631	0,4398
	0,519	1,925	10,00	90,00	10,0000	0,4576
	0,513	1,950	10,37	89,63	9,8420	0,4755
	0,174	5,750	49,52	50,48	3,0522	2,9688
	0,172	5,800	49,83	50,17	3,0254	2,9953
	0,171	5,850	50,13	49,87	2,9990	3,0217
R	0,169	5,900	50,43	49,57	2,9731	3,0479
	0,168	5,950	50,73	49,27	2,9476	3,0739
	0,167	6,000	51,02	48,98	2,9226	3,0998

Applications

These are the most common types of line coupling applications:

Phase-to-earth coupling

The PLC terminal is connected between one of the line's phases and earth.



Phase-to-phase coupling

The signals are injected equally in two phases of a line. The phases can be in the same or in different arms.

It is possible to use a differential transformer acting as a hybrid circuit to separate the phases and increase the reliability of the link.



Three-phase coupling

The signals are injected in the three conductors of the line, half of the power in the central conductor and the other half distributed equally between the external conductors.





Key features:

- Easy to install
- Highest safety and protection for personnel and communication equipment
- Frequency range from 40 to 500 kHz



Technical specifications

UAPA-1 High-pass/Band-pass unit

Electrical characteristics

Frequency range40 to 500 kHzCoupling capacitor2 to 10 nF. Specific model for 2Nominal power (p.e.p.)400 W for two tonesEquipment-side nominal impedance50 and 75 Ω. Others on requestLine-side nominal impedance100 to 600 Ω, selected by tap coResonant circuitConfigurable as:

Power frequency insulation Impulse voltage insulation Protection elements

Versions

40 to 500 kHz
2 to 10 nF. Specific model for 2 to 12.5 nF
400 W for two tones
50 and 75 Ω. Others on request
100 to 600 Ω, selected by tap connection
Configurable as:

Third-order high-pass filter
Second-order band-pass filter

>10 kVrms
>5 kV (1.2/50 µs)
Line side: drain coil (optional), earthing switch, air-gap surge arrester and an optional solid-state surge arrester
Equipment side: gas surge arrester

- Drain coil and earthing switch outsider the chassis (option)
- Solid-state surge arrester (option)
- Hybrid circuit (option)
- Band-pass or High-pass configuration
- Line connection at the bottom of the chassis (option)

Mechanical characteristics Dimensions

Weight Mounting Connection to line PLC equipment side connection

Connection to earth Material

Height: 400 mm; Width: 344 mm; Depth: 200 mm 11.5 kg (25 lb) Four Ø8.5 mm holes M12 rod or M8 terminal By means of cable glands type PG-21, suitable for cables of between 9 and 18 mm diameter M10 rod Glass-fibre reinforced polyester and specific model in stainless steel

UAPA-1

Key features:

- Band-pass or high-pass filter configurations available.
- Differential transformer acting as a hybrid circuit available in specific models.

UAMC Compact Band-pass unit

Electrical characteristics

Frequency range40 to 500 kHzCoupling capacitor2 to 10 nFNominal power (p.e.p.)400 W for two tonesEquipment-side nominal impedance75 and 150 Ω, selected by jumpers.

Line-side nominal impedance Power frequency insulation Impulse voltage insulation Protection elements

Mechanical characteristics

Dimensions

Weight Mounting Connection to line PLC equipment side connection

Material

40 to 500 kHz 2 to 10 nF 400 W for two tones 75 and 150 Ω , selected by jumpers. Others on request 25 to 750 Ω , selected by tap connection >5 kVrms >2 kVrms Line side: drain coil, earthing switch, air-gap surge arrester and an optional solid-state surge arrester Equipment side: gas surge arrester

Height: 429 mm; Width: 304 mm; Depth: 176 mm 7 kg aprox. (15 lb) Four Ø7 mm holes M8 screw By means of cable glands type PG-21, suitable for cables of between 9 and 18 mm diameter Glass-fibre reinforced polyester and policarbonate (cover)



UAMC

Key features:

- Band-pass filter.
- Can include a built-in differential hybrid circuit.



LMUs & Accessories

Technical specifications

UAM-4 **Band-pass Line Matching Unit**

40 to 500 kHz

400 W for two tones

Others on request

25 to 750 Ω , selected by tap connection

Equipment side: gas surge arrester

Line side: drain coil, earthing switch, air-gap

Drain coil and earthing switch outsider the

surge arrester and an optional solid-state surge

2 to 10 nF

>5 kVrms

>2 kVrms

arrester

chassis

Electrical characteristics

Frequency range Coupling capacitor Nominal power (p.e.p.) Equipment-side nominal impedance 75, 125, 150 and 250 Ω , selected by jumpers.

Line-side nominal impedance Power frequency insulation Impulse voltage insulation Protection elements

Available models UAM-4

UAM-4/D

Mechanical characteristics

Dimensions

Weight Mounting Connection to line PLC equipment side connection

Earthing Material

Same as above with additional solid-state surge arrester Height: 264 mm; Width: 214 mm; Depth: 132 mm 6.5 kg (14 lb)

Four Ø8.5 mm holes M8 rod By means of cable glands type PG-21, suitable for cables of between 9 and 18 mm diameter M10 rod Die-cast aluminium with outdoor polyester powder paint

CIAV-1 Adaptable attenuator

Electrical characteristics

Nominal impedance Frequency range Nominal power (p.e.p.) Selectable attenuation

75 Ω . symmetrical 40 to 500 kHz 400 W Between 1 dB, 2 dB and 3 dB

CHD-4 **Differential Hybrid circuit**

Electrical characteristics Application

Nominal impedance Bandwidth Nominal power (p.e.p.) Insulation between primary and secondary Protection elements

Phase-to-phase coupling. Two PLC terminals coupling. Three-phase coupling 75 Ω . Others on request 40 to 500 kHz 400 W

>2.5 krms / 50 Hz Gas surge arrester

Mechanical characteristics

Dimensions

Weight Mounting Connections

Earthing Material

Height: 264 mm; Width: 214 mm; Depth: 132 mm 5 kg (11 lb) Four Ø8.5 mm holes By means of cable glands type PG-21, suitable for cables of between 9 and 18 mm diameter M10 rod

Die-cast aluminium with outdoor polvester powder paint



UAM-4

Key features:

- Low impedance matching for underground cables.



Key features:

- Especially designed for use when impedance mismatching occurs between the PLC terminals and the line-tuning units



Key features:

- Allows connection of a PLC terminal to two or three phases of a power line to improve signal transmission reliability.
- Enables coupling of two PLC terminals using adjacent frequency bands to avoid interferences.
- HPFA is the model for cabinet mounting





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