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Coupling networks

IEC /EN 61000-4-16

- Coupling networks for tests according to IEC /EN 61000-4-16, for the PGA 1241-XX suitable as accessories

Observe the safety instructions for immunity tests!

Overview

Coupling networks for power supply connections and inputs/outputs:

For each wire the coupling network for powerline conductors is made of a serious connection of a resistor and a capacitor. Coupling networks of each wire are connected to establish the coupling network of the corresponding M-type.

The value of the capacitor is C = 1,0 µF, the value of the resistor is R = 100 x n Ω, where n is the number of the wires (n ≥ 2). Values of capacitor and resistor shall match with a limiting deviation of 1 %. For DC tests the 1,0 µF capacitors shall be short circuited.

For safety reasons coupling networks M2 and M3 are separated units for DC tests and AC tests. Short circuiting the capacitor by mistake while an alternating current is applied inevitably destroys the coupling network.

Each connection which is not under test must be grounded (SW2). For this reason an isolated BNC jumper plug is included.

Coupling networks for communication lines:

For communication and other connections intended for balanced line pairs, a "T" network is used as the coupling network.

For type T network the value of the capacitance is C = 4.7 µF, the value of the resistance R = 200 Ω and the value of the inductance L = 2 x 38 mH (bifilar winding).

The components must match each other with their limiting deviation such that the "T" network does not significantly reduce the asymmetry attenuation of the device under test.

For DC voltage tests, the 1.0 µF capacitors must be shorted.

All connections not in the test must be connected to ground (SW2) - for this purpose an insulated BNC shorting plug is supplied with each coupling network.

Important safety instructions for immunity tests

Please observe the following safety instructions for tests on AC and DC supply lines (AC > 30 V / DC > 60 V):

- The coupling network must have a flat contact to the ground reference plane!
- An additional cable connection between the ground plate of the coupling network (threaded bolt) and the reference ground plate is recommended!
- Check all ground connections before connecting the supply line to the AE connection!
- Always remove the supply line from the AE connection before disconnecting an earth connection!

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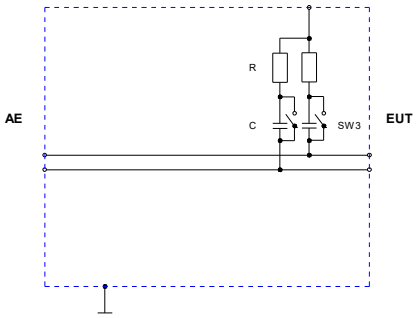
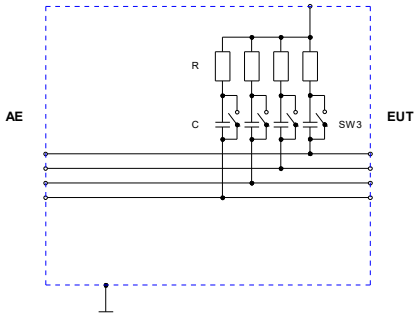
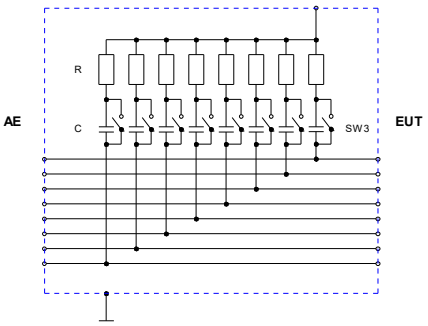
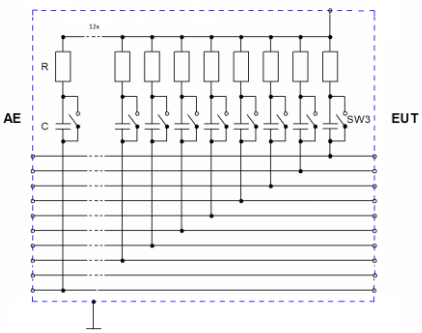
Coupling networks

Type	Simplified diagram	Description
AF2		Coupling network according to EN 61000-4-16, for unshielded, unbalanced lines Frequency range: AC (15 Hz - 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 V / 0.5 A Connector EUT / AE: clamp terminal DC tests the capacitors are short circuited by a rocker switch
AF4		Coupling network according to EN 61000-4-16, for unshielded, unbalanced lines Frequency range: AC (15 Hz - 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 V / 0.5 A Connector EUT / AE: clamp terminal DC tests the capacitors are short circuited by a rocker switch
AF8		Coupling network according to EN 61000-4-16, for unshielded, unbalanced lines Frequency range: AC (15 Hz - 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 V / 0.5 A Connector EUT / AE: clamp terminal DC tests the capacitors are short circuited by a rocker switch
AF12		Coupling network according to EN 61000-4-16, for unshielded, unbalanced lines Frequency range: AC (15 Hz - 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 V / 0.5 A Connector EUT / AE: clamp terminal DC tests the capacitors are short circuited by a rocker switch

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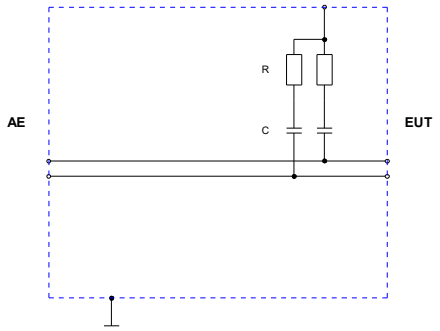
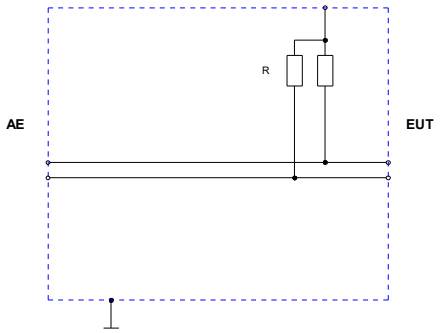
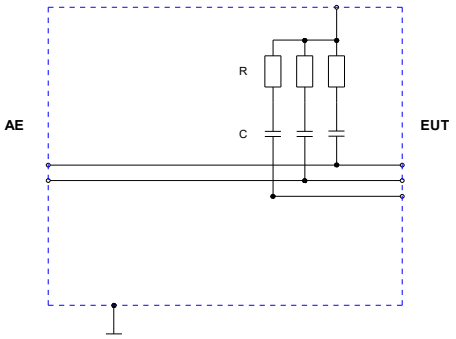
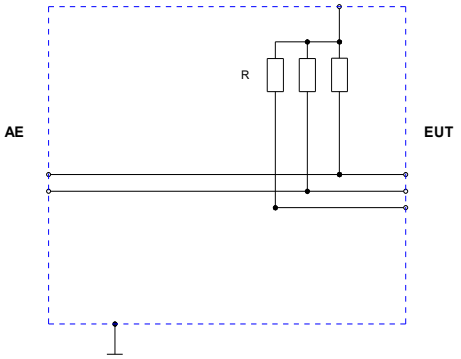
Type	Simplified diagram	Description
M2/AC		Coupling network according to EN 61000-4-16 for unshielded power supply lines Frequency range: 15 Hz - 150 kHz Test level: 50 V cont.; 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 250 VAC/VDC 32A Connector EUT / AE: 4 mm safety banana jack Only for AC voltage tests!
M2/DC		Coupling network according to EN 61000-4-16 for unshielded power supply lines Frequency range: DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 VAC/VDC 32A Connector EUT / AE: 4 mm safety banana jack Only for DC voltage tests!
M3/AC		Coupling network according to EN 61000-4-16 for unshielded power supply lines. Use for EUTs with functional earth connection! Frequency range: 15 Hz - 150 kHz Test level: 50 V cont.; 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 250 VAC/VDC 32A Connector EUT / AE: 4 mm safety banana jack Only for AC voltage tests!
M3/DC		Coupling network according to EN 61000-4-16 for unshielded power supply lines. Use only for DUTs with functional earth connection! Frequency range: DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 VAC/VDC 32A Connector EUT / AE: 4 mm safety banana jack Only for DC voltage tests!

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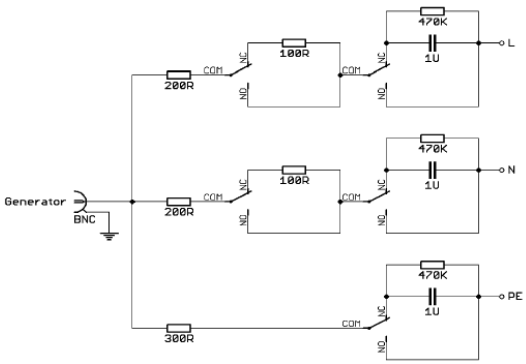
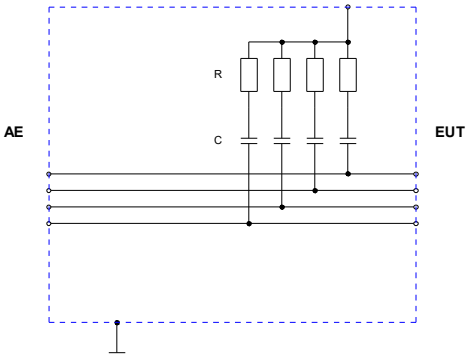
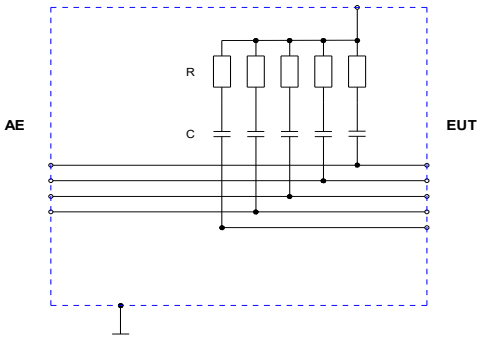
Type	Simplified diagram	Description
M2+M3 AC/DC		Coupling network according to EN 61000-4-16 for unshielded power supply lines Frequency range: DC, 15 Hz - 150 kHz Test level: 50 V cont.; 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 250 VAC / 350 VDC / 32 A Connector EUT / AE: 4 mm safety banana jack
M4/AC		Coupling network according to EN 61000-4-16 for unshielded power supply lines. Frequency range: 15 Hz - 150 kHz Test level: 50 V cont.; 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 250 VAC/VDC 32A Connector EUT / AE: 4 mm safety banana jack Only for AC voltage tests!
M5/AC		Coupling network according to EN 61000-4-16 for unshielded power supply lines. Use only for DUTs with functional earth connection! Frequency range: 15 Hz - 150 kHz Test level: 50 V cont.; 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 250 VAC/VDC 32A Connector EUT / AE: 4 mm safety banana jack Only for AC voltage tests!

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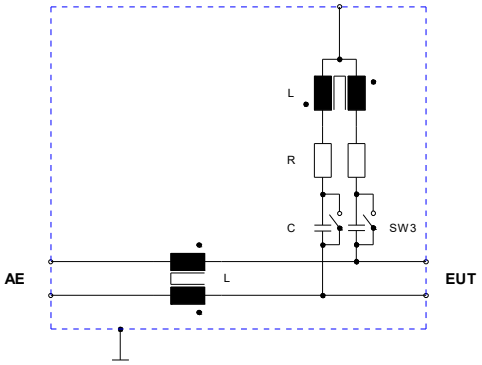
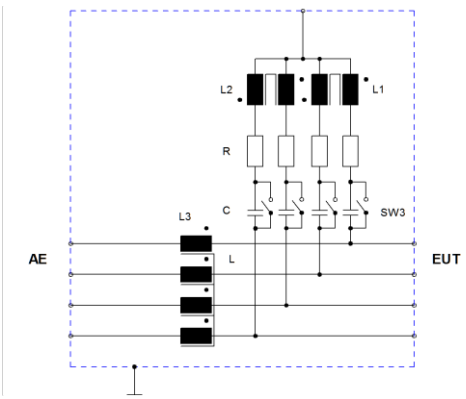
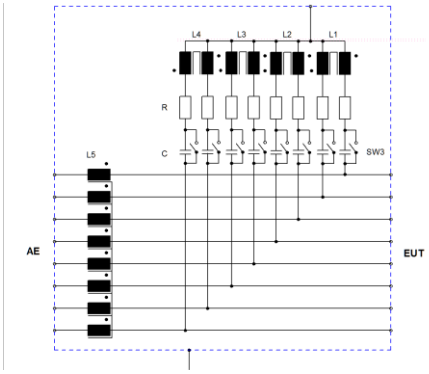
Coupling networks

Type	Simplified diagram	Description
T2		Coupling network according to EN 61000-4-16, for unshielded, balanced lines Frequency range: AC (15 Hz - 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE - port: 50 V / 0.5 A Connector EUT / AE: clamp terminal For DC tests the capacitors are short circuited by a rocker switch. Asymmetrical decoupling in frequency range 15 Hz - 150 kHz: 60 dB Insulation: 1 kV, 50/60 Hz, 1 min
T4		Coupling network acc. EN 61000-4-16 for unscreened, balanced lines Frequency range: AC (15 Hz- 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE- port: 50 V / 0,5 A Connector EUT / AE: clamp terminal For DC tests the capacitors are short circuited by a rotary switch. Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB Insulation: 1 kV, 50/60 Hz, 1 min
T8		Coupling network acc. EN 61000-4-16 for unscreened, balanced lines Frequency range: AC (15 Hz- 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE- port: 50 V / 0,5 A Connector EUT / AE: clamp terminal For DC tests the capacitors are short circuited by a rotary switch. Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB Insulation: 1 kV, 50/60 Hz, 1 min

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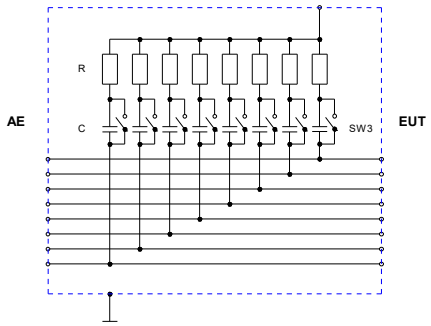
Type	Simplified diagram	Description
RJ45		Coupling network acc. EN 61000-4-16 for unscreened, balanced lines Frequency range: AC (15 Hz- 150 kHz) / DC Test level: 50 V cont., 300 V (1 sec per 60 sec) power frequency EUT / AE- port: 50 V / 0,5 A Connector EUT / AE: RJ 45 Jacks For DC tests the capacitors are short circuited by a rotary switch.

Suitable in combination with isolating transformers (tests according to EN 61558)	
IT-06	Isolating transformer 1380 VA; Prim: 230 V; Sec: 230 V / 6 A; Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB; Insulation: > 1 kV (50/60 Hz); die-cast case
IT-16	Isolating transformer 3680 VA; Prim: 230 V; Sec: 230 V / 16 A; Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB; Insulation: > 1 kV (50/60 Hz); die-cast case
IT-20	Isolating transformer 4600 VA; Prim: 230 V; Sec: 230 V / 16 A; Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB; Insulation: > 1 kV (50/60 Hz); die-cast case

Suitable for amplifiers with integrated generators	
PGA 124x-5A	Precision power generator; DC - 300 kHz, ±50 V; ±5 A; incl. software
PGA 124x-16A	Precision power generator; DC - 300 kHz, ±50 V; ±16 A; incl. software
PGA 133x	Immunity generator for short-term tests up to 300 V acc. EN 61000-4-16; USB connection; including software
PGA 124x-PSG 300	Option EN 61000-4-16: High power input with zero crossing switch on; (only for operation with external voltage source; not needed in connection with PGA 133x)

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Ordering information for coupling network	
Coupling networks for tests according to EN 61000-4-16	
CN M2-AC-32	Coupling network for 2 unshielded power supply lines; 250 VAC/VDC 32A, 15 Hz - 150 kHz, connection 4 mm MC sockets
CN M2-DC-32	Coupling network for 2 unshielded DC power supply lines; 50 VAC/VDC 32A, connection 4 mm MC sockets
CN M3-AC-32	Coupling network for 3 unshielded power supply lines; 250 VAC/VDC 32A, 15 Hz - 150 kHz, connection 4 mm MC sockets
CN M3-DC-32	Coupling network for 3 unshielded DC power supply lines; 50 VAC/VDC 32A, connection 4 mm MC sockets
CN M4-AC-32	Coupling network for 4 unshielded power supply lines; 250 VAC/VDC 32A, 15 Hz - 150 kHz, connection 4 mm MC sockets
CN M5-AC-32	Coupling network for 5 unshielded power supply lines; 250 VAC/VDC 32A, 15 Hz - 150 kHz, connection 4 mm MC sockets
CN M2+M3-32	Coupling network for 2 / 3 unshielded power supply lines,AC (15 Hz - 150 kHz)/DC, 32 A, 250 VAC + 350 VDC, connection 4 mm MC sockets
CN AF 2	Coupling network for 2 unbalanced, unshielded lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN AF 4	Coupling network for 4 single-ended, unshielded lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN AF 4-MC	Coupling network for 2 single-ended, unshielded lines, AC (15 Hz - 150 kHz) / DC, with 4 mm MC banana plugs
CN AF 8	Coupling network for 8 single-ended, unshielded lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN AF 12	Coupling network for 12 single-ended, unshielded lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN T 2	Coupling network for 2 single-ended, unshielded data lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN T 4	Coupling network for 4 single-ended, unshielded data lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN T 8	Coupling network for 8 single-ended, unshielded data lines, AC (15 Hz - 150 kHz) / DC, connector: clamp terminal
CN RJ 45	Coupling network for unbalanced, unshielded RJ45, AC (15 Hz - 150 kHz) / DC, RJ45 connection
CN 124x-32	Switchable coupling network M2, M3, M4, M5 for power supply lines max. 32 A; AC (15 Hz - 150 kHz) / DC; connection 4 mm MC sockets
CN 124x-125	Switchable coupling network M2, M3, M4, M5 for power supply lines max. 125 A; AC (15 Hz - 150 kHz) / DC; connection 6 mm MC sockets
Coupling networks for tests according to IEC 60255-26 / ITU-T	
CN ITU-T	Coupling network according to ITU-T Fig. 1/K54 for telecom lines
CN 60255-C	Coupling network according to IEC 60255-26 for common mode tests
CN 60255-D	Coupling network according to IEC 60255-26 for differential mode tests

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