

## Coupling Networks CNxx

According to IEC / EN 61000-4-16



### Coupling networks for powerline conductors

For each wire the coupling network for powerline conductors is made of a series 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  $C = 1,0 \mu\text{F}$ , the value of the resistor is  $R = 100 \times n \Omega$ , where  $n$  is the number of the wires ( $n \geq 2$ ). Values of capacitor and resistor shall match with a limiting deviation of 1 %. For DC tests the  $1,0 \mu\text{F}$  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 balanced communication lines and similar lines a "T" network is used.

The "T" network is made of capacitors ( $C = 4,7 \mu\text{F}$ ), resistors ( $R = 200 \Omega$ ) and inductances ( $L = 2 \times 38 \text{ mH}$  / bifilar winding). All components shall match with a limiting deviation to ensure that there is no significant reduction of the differential to common mode conversion loss of the EUT. For DC tests the capacitors shall be short circuited.

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

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**Important safety instructions for immunity tests according to EN 61000-4-16**

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

- The coupling network must be in tight connection to the ground reference plane!
- An additional cable connection between coupling network baseplate (threaded bolts) and ground reference plane is recommended!
- Always ground the coupling network before connecting any power line to the AE-port!
- Never open the ground connection between coupling network and ground reference plane before removing the supply lines from the AE-port!

Type	Simplified diagram	Description
AF2		<p>Coupling network acc. EN 61000-4-16 for unscreened, unbalanced lines</p> <p>Frequency range: DC / 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rocker switch.</p>
AF4		<p>Coupling network acc. EN 61000-4-16 for unscreened, unbalanced lines</p> <p>Frequency range: DC / 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rotary switch.</p>
AF8		<p>Coupling network acc. EN 61000-4-16 for unscreened, unbalanced lines</p> <p>Frequency range: DC / 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rotary switch.</p>

Type	Simplified diagram	Description
M2/AC		<p>Coupling network acc. EN 61000-4-16 for unshielded powerline conductors</p> <p>Frequency range: 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.; 300 V (1sec) power frequency</p> <p>EUT / AE - Connector: 250 VAC / 32 A (50 VDC / 32 A)</p> <p>Connector EUT / AE: 4mm safety banana jack</p> <p><u>For AC tests only</u></p>
M2/DC		<p>Coupling network acc. EN 61000-4-16 for unshielded powerline conductors</p> <p>Frequency range: DC</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 32 A</p> <p>Connector EUT / AE: 4mm safety banana jack</p> <p><u>For DC tests only!</u></p>
M3/AC		<p>Coupling network acc. EN 61000-4-16 for unshielded powerline conductors</p> <p>Use for EUT with functional earth!</p> <p>Frequency range: 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.; 300 V (1sec) power frequency</p> <p>EUT / AE - Connector: 250 VAC / 32 A (50 VDC / 32 A)</p> <p>Connector EUT / AE: 4mm safety banana jack</p> <p><u>For AC tests only</u></p>
M3/DC		<p>Coupling network acc. EN 61000-4-16 for unshielded powerline conductors</p> <p>Use for EUT with functional earth!</p> <p>Frequency range: DC</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 32 A</p> <p>Connector EUT / AE: 4mm safety banana jack</p> <p><u>For DC tests only!</u></p>

Type	Simplified diagram	Description
M4/AC		<p>Coupling network acc. EN 61000-4-16 for unshielded powerline conductors</p> <p>Frequency range: 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.; 300 V (1sec) power frequency</p> <p>EUT / AE - Connector: 250 VAC / 32 A</p> <p>Connector EUT / AE: 4mm safety banana jack</p> <p><u>For AC tests only</u></p>
M5/AC		<p>Coupling network acc. EN 61000-4-16 for unshielded powerline conductors</p> <p>Use for EUT with functional earth!</p> <p>Frequency range: 15 Hz to 150 kHz</p> <p>Test level: 50 V cont.; 300 V (1sec) power frequency</p> <p>EUT / AE - Connector: 250 VAC / 32 A</p> <p>Connector EUT / AE: 4mm safety banana jack</p> <p><u>For AC tests only</u></p>
T2		<p>Coupling network acc. EN 61000-4-16 for unshielded, balanced lines</p> <p>Frequency range: DC / 15 Hz to 150 kHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rocker switch.</p> <p>Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB</p> <p>Insulation: 1 kV, 50/60 Hz, 1 min</p>

Type	Simplified diagram	Description
T4		<p>Coupling network acc. EN 61000-4-16 for unshielded, balanced lines</p> <p>Frequency range: DC / 15 Hz to 150 kHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rotary switch.</p> <p>Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB</p> <p>Insulation: 1 kV, 50/60 Hz, 1 min</p>
T8		<p>Coupling network acc. EN 61000-4-16 for unshielded, balanced lines</p> <p>Frequency range: DC / 15 Hz to 150 kHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rotary switch.</p> <p>Differential to common mode conversion loss (15 Hz to 150 kHz): 60 dB</p> <p>Insulation: 1 kV, 50/60 Hz, 1 min</p>
RJ45		<p>Coupling network acc. EN 61000-4-16 for unshielded, balanced lines</p> <p>Frequency range: DC / 15 Hz to 150 KHz</p> <p>Test level: 50 V cont.</p> <p>EUT / AE - port: 50 V / 0,5 A</p> <p>Connector EUT / AE: clamp terminal</p> <p>For DC tests the capacitors are short circuited by a rotary switch.</p>

Ordering Information	Coupling network
CN AF2	Coupling Network acc. to EN 61000-4-16; for unscreened nonbalanced lines; DC / 15 Hz to 150 kHz; connector: clamp terminal
CN AF4	Coupling Network acc. to EN 61000-4-16; for unscreened nonbalanced lines; DC / 15 Hz to 150 kHz; connector: clamp terminal
CN AF8	Coupling Network acc. to EN 61000-4-16; for unscreened nonbalanced lines; DC / 15 Hz to 150 kHz; connector: clamp terminal
CN M2-AC-32	Coupling Network acc. to EN 61000-4-16; for unscreened supply lines; 32A; 15 Hz to 150 kHz; connector: 4 mm Safety Banana Jacks
CN M2-DC-32	Coupling Network acc. to EN 61000-4-16; for unscreened DC supply lines; 50V / 32A; connector: 4 mm Safety Banana Jacks
CN M2+3	Coupling Network acc. to EN 61000-4-16; for unscreened supply lines; 32A; 15 Hz to 150 kHz; connector: 4 mm Safety Banana Jacks
CN M3-AC-32	Coupling Network acc. to EN 61000-4-16; for unscreened supply lines; 32A; 15 Hz to 150 kHz; connector: 4 mm Safety Banana Jacks
CN M3-DC-32	Coupling Network acc. to EN 61000-4-16; for unscreened DC supply lines; 50V / 32A; connector: 4 mm Safety Banana Jacks
CN M4-AC-32	Coupling Network acc. to EN 61000-4-16; for unscreened supply lines; 32A; 15 Hz to 150 kHz; connector: 4 mm Safety Banana Jacks
CN M5-AC-32	Coupling Network acc. to EN 61000-4-16; for unscreened supply lines; 32A; 15 Hz to 150 kHz; connector: 4mm Safety Banana Jacks
CN RJ45	Coupling Network acc. to EN 61000-4-16; for unscreened balanced lines; 15 Hz to 150 kHz; connector: RJ45 Jacks
CN T2	Coupling Network acc. to EN 61000-4-16; for unscreened balanced lines; DC / 15 Hz to 150 kHz; connector: clamp terminal
CN T4	Coupling Network acc. to EN 61000-4-16; for unscreened balanced lines; DC / 15 Hz to 150 kHz; connector: clamp terminal
CN T8	Coupling Network acc. to EN 61000-4-16; for unscreened balanced lines; DC / 15 Hz to 150 kHz; connector: clamp terminal
CN 1240-32	Switchable Coupling Network M2, M3, M4, M5 acc. to EN61000-4-16; for unscreened supply lines, max. 32A; DC, 15 Hz to 150 kHz; connector: 4mm Safety Banana Jacks
CN 1240-125	Switchable Coupling Network M2, M3, M4, M5 acc. to EN61000-4-16; for unscreened supply lines, max. 125A; DC, 15 Hz to 150 kHz; connector: 6mm Safety Jacks

Isolation transformer	
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
Amplifier with integrated generator	
PGA 1240-5A	GA1240-05; Precision power generator $\pm 50V / \pm 5A$ ; including software
PGA 1240-16A	GA1240-16; Precision power generator $\pm 50V / \pm 16A$ ; including software
PGA 1240-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 1330)
PGA 1330	Immunity generator for short-term tests up to 300 V acc. EN 61000-4-16; USB connection; including software