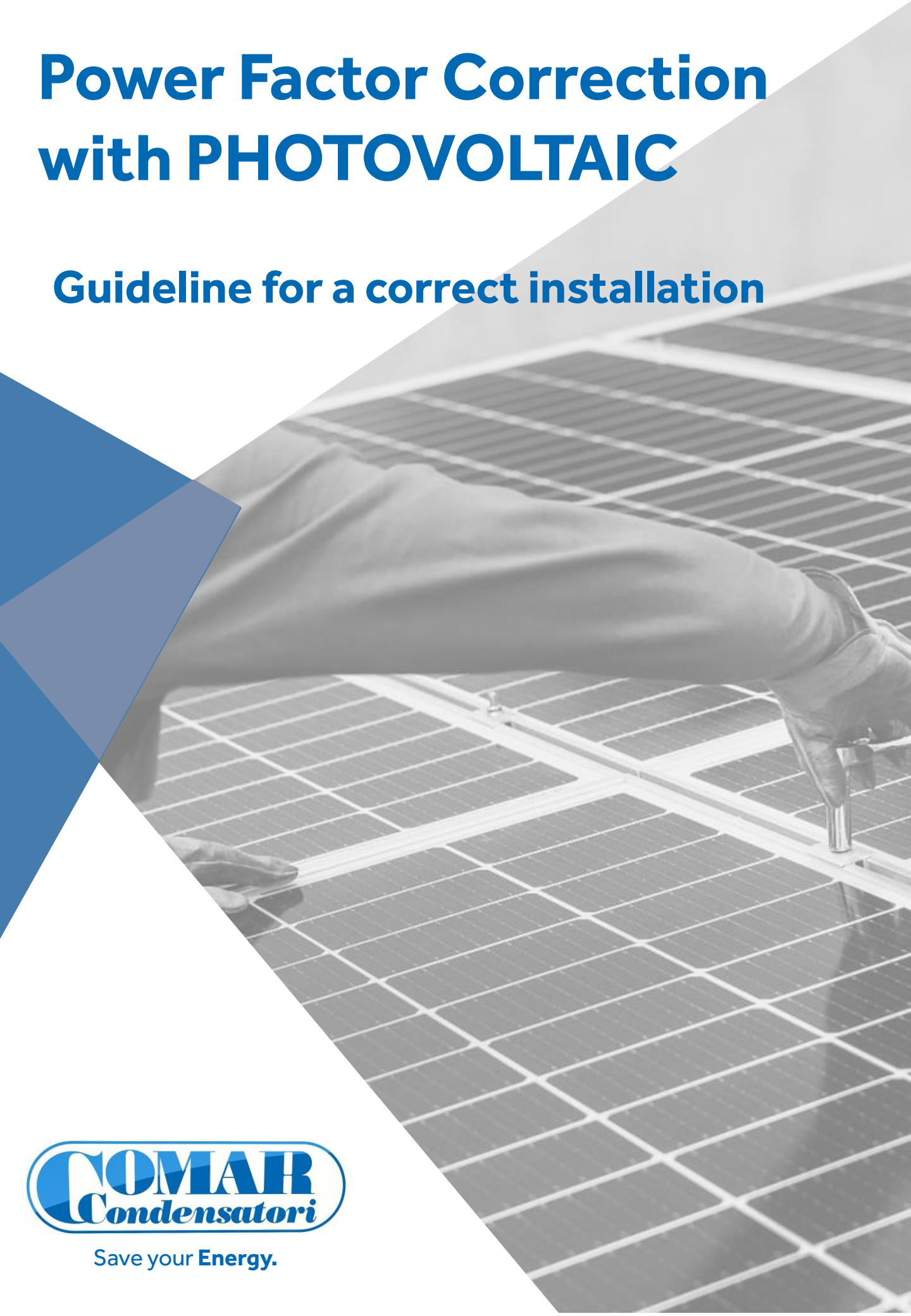
Power Factor Correction with PHOTOVOLTAIC

Guideline for a correct installation



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Save your **Energy.**

This study is intended as a guideline for those who are installing a photovoltaic system (PV) in a location where an automatic power factor correction system (APFC) is needed or already existing.

The factors to be taken into account for a professional design and installation are the

power supply connection of the APFC unit and
the position of the measuring current transformer (CT).

The only configuration that avoids malfunctioning of the power factor correction system is the following: (see "CASE 1"):

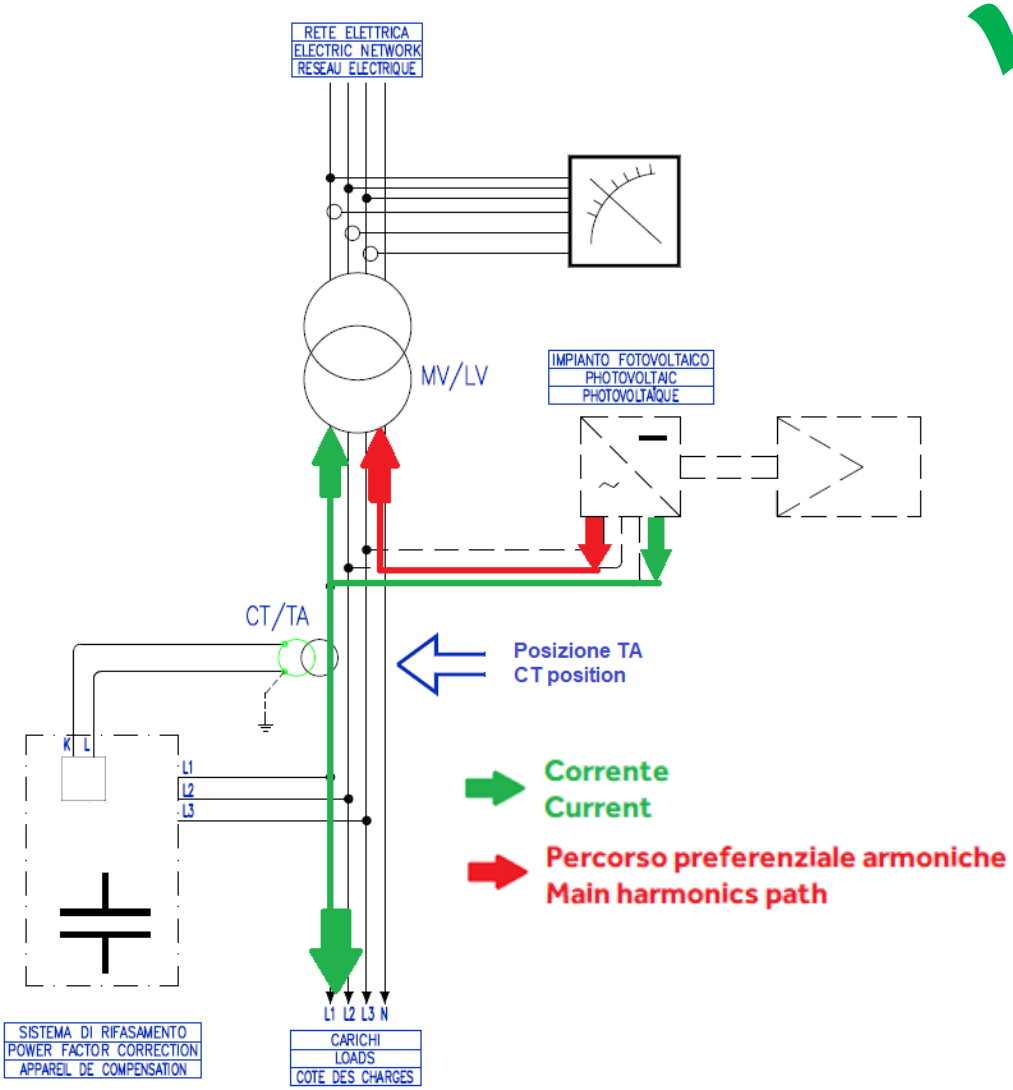
1. Derivate the power supply of the APFC downstream of the inlet point of the photovoltaic (or co-generator);
2. Install the CT downstream of the inlet point of the photovoltaic, but always upstream of the loads and the power factor correction unit itself;

When installing a photovoltaic in a network already equipped with power factor correction devices (or vice versa) and it is NOT possible to carry out the ideal configuration of CASE1, an expedient can be used as illustrated in CASE2.

CASES 3, 4 and 5 are illustrated as negative situations that unfortunately do occur, but these are configurations that can cause the tripping of the regulator protections and the consequent inefficiency of the power factor correction system

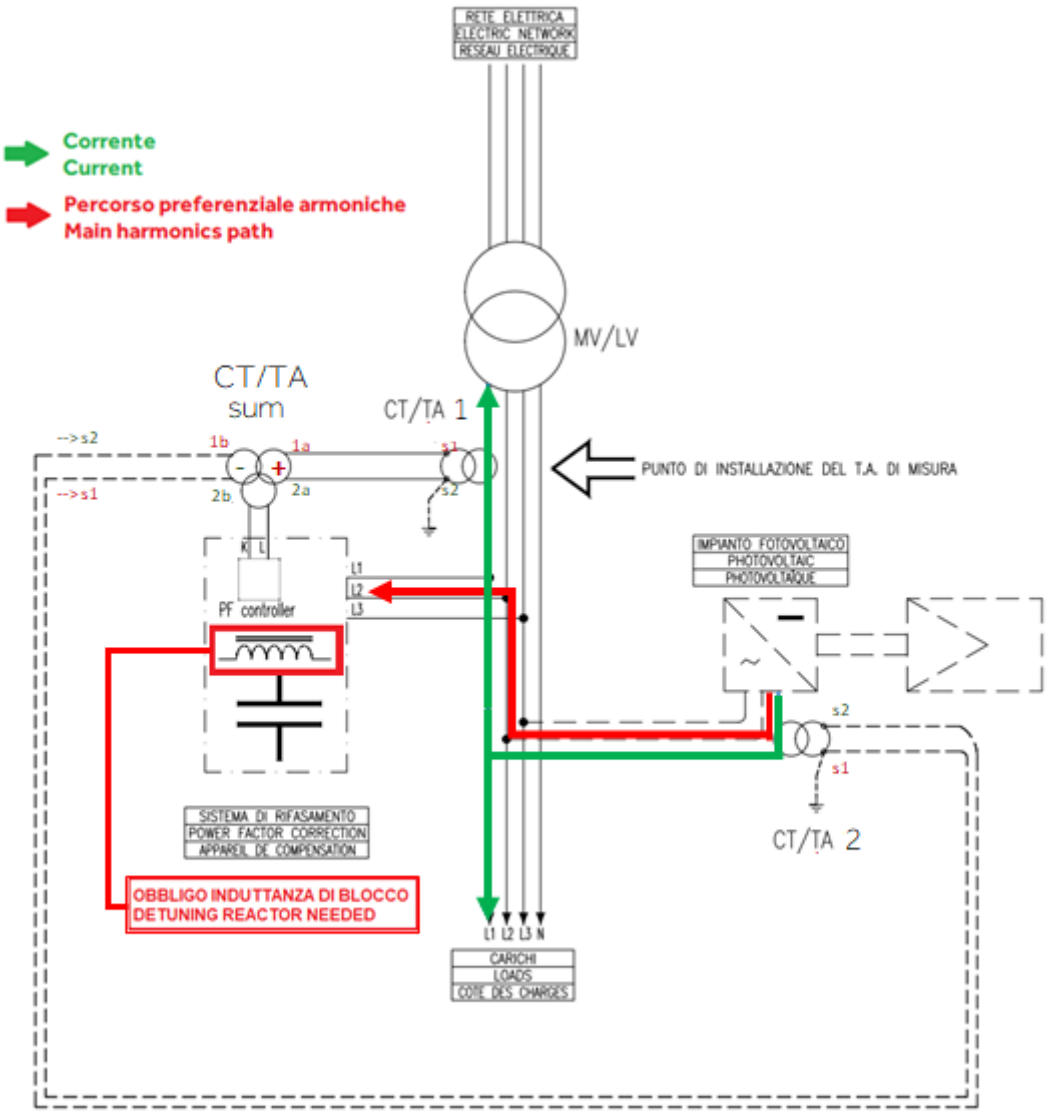
The choice of the most suitable APFC series depends on many other factors which are discussed in other specific publications.

CASE 1 – IDEAL ARRANGEMENT	
Current Transformer	Downstream of PV
APFC power supply	Downstream of PV and of CT
Loads	Downstream of CT



In this arrangement, erroneous compensation by the power factor correction controller is avoided as the current drawn by the Loads is fully and correctly measured by the CT.
In addition, problems related to the presence of photovoltaic-generated current harmonics are greatly reduced.

CASO 2 - WALK-AROUND when PV IS DOWNSTREAM OF APFC	
Current Transformer	Upstream of PV
APFC power connection	Upstream of PV
Loads	Downstream of CT



When an optimal solution (see 'CASE 1') is not possible, the above 'escamotage' may be used to have the APFC more effective:

A CT must be added to the photovoltaic (TA2) and its signal brought to a summing CT on which arrives also the signal from the line CT (TA1).

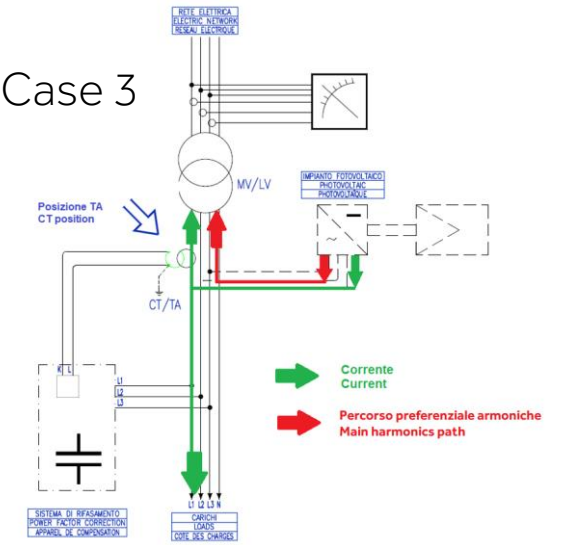
The two summing CTs must be of identical size.

It is important that on the summing CT the two signals are connected in the opposite way, i.e. in "subtraction".

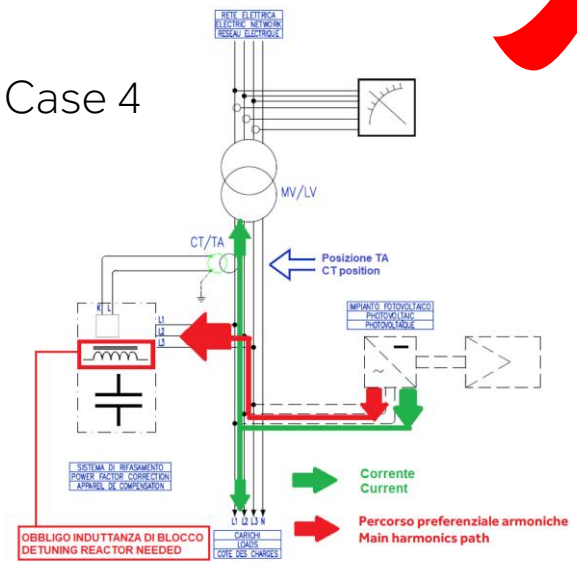
This allows the controller to measure the current drawn by the loads and thus to compensate correctly.

	CASE 3	CASE 4	CASE 5
Current Transformer	Upstream of PV	Upstream of PV	Upstream of PV
APFC power supply	Downstream of PV	Upstream of PV	Upstream of PV
Loads	Downstream of PV	Downstream of PV	Upstream of PV

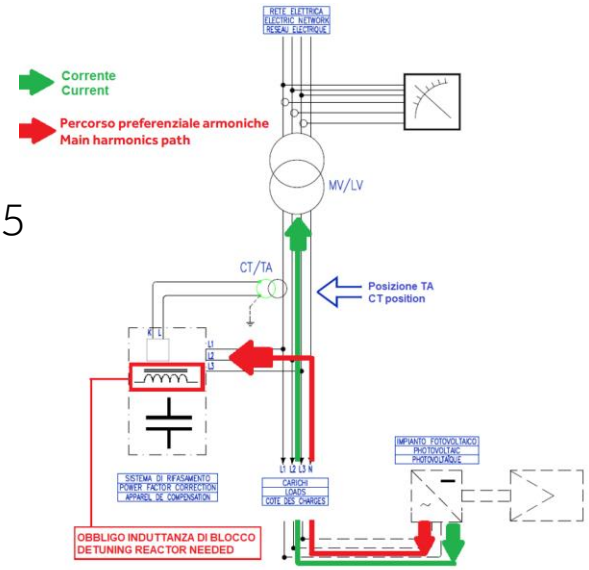
Case 3



Case 4



Case 5



The current drawn by the Loads crosses the CT to a lesser extent because the PV supplies all or part of the ACTIVE power to the users (depending on the difference between the PV power and the power required by the Loads), reducing the current flowing through the CT to only the REACTIVE fraction.

This configuration is non-efficient due to the tripping of the regulator protections that occur in the presence of 'LOW CURRENT' and/or 'HIGH THDI%' alarms.

In addition, the power factor correction unit requires chokes to block harmonics coming from the PV system.

Do you have further questions? Contact us

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