



## Automatic management of two different energy sources

### General description

This application note explains how a user can easily switch between two different energy sources at the entry of an Xtender.

These two different sources would be, for example in a backup system, the switch between the grid and a generator, or in a marine application, the switch between the shorepower and the on board generator.

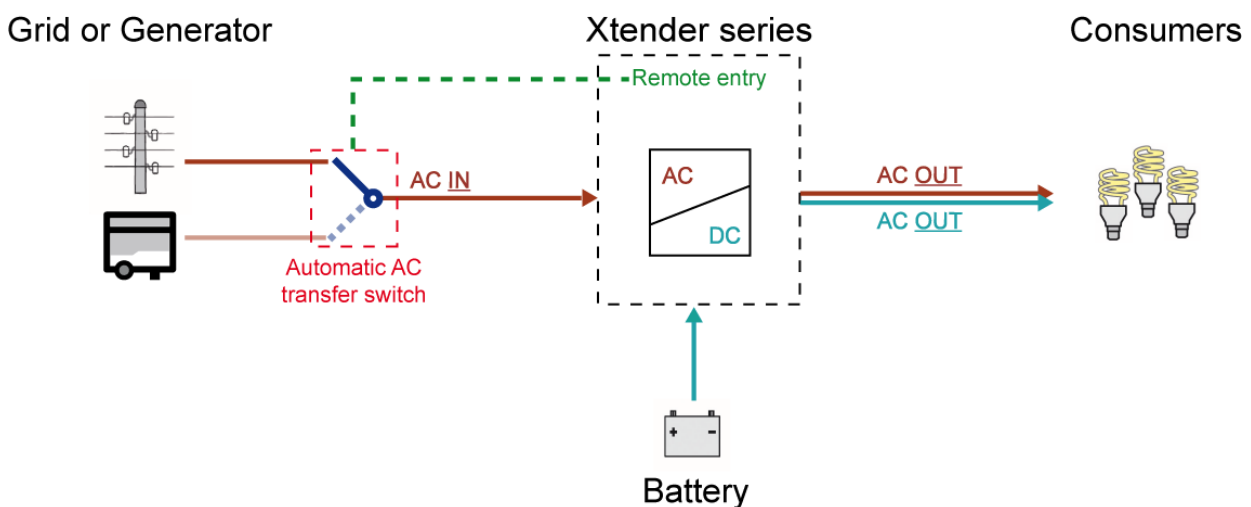
### Features & advantages

- Automatic switch between two different energy sources and possibility to program the two different currents of the two ac sources.
- Possibility to define a master source when two energy sources are present simultaneously.
- Presence of a mechanical interlock module that ensures in all cases no short circuit on the sources.

### Minimal configuration

- Range of inverters
  - All Xtender Series
- Xtender
  - Software vers. : 1.3.28 and higher
- RCC02 / 03
  - Software vers. : 1.3.32 and higher
  - RCC User level : EXPERT

### Application Schematic

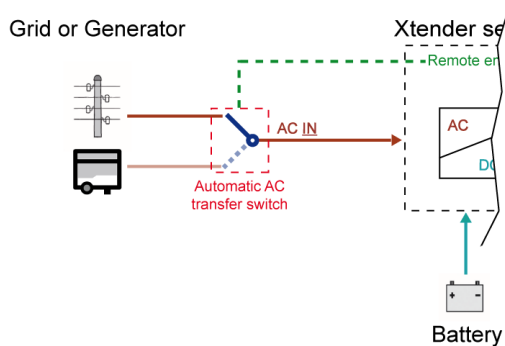


(Figure 1) Automatic management of two different energy sources

## Detailed description

### The automatic AC transfer switch

This particular application is a set composed of three relays and two time-delay relays to detect the presence or absence of different energy sources at the entry of the system.



(Figure 2) Automatic AC transfer switch

The user can define a master source in case of simultaneous presence of the two different energy sources (see situation 4 p.3).

Also, the user can program the current of the two ac sources. The Xtender will automatically select the predefined current depending on the connected ac source. With the remote entry, the Xtender is informed about which of the ac source is selected to set the proper current.

It is possible to order all the necessary equipment at Studer Innotec. Note that Studer Innotec does not supply prewired mounting for this application. (Scheme and list of equipment available on page 5).

### Function description

To better illustrate this function, we will take two concrete examples.

Note also that there are two general cases involving the use of different energy sources at the entry of an Xtender:

1. Backup systems
2. Marine systems

#### Backup systems

In the case of a system requiring no power interruption (backup system), there could be two different ac sources, for example the grid and a generator. The automatic AC transfer switch will automatically connect to the second source in case for example of a blackout.

For example, the computer system of a company...

This computer system is connected to the grid (like any other consumer) but it is the system that can not afford a power outage in case of a blackout.

It is therefore necessary for the company to have a second source of energy only for the computer system. (Backup source consists of a generator, a battery and an inverter-charger).

For this reason, the second ac source may be less powerful than the grid. For example, the current delivered by the grid is 40A while the current drawn by the computer system is only 8A. So the generator should be sized for 8 to 10A.

The backup runs on batteries and if the blackout is too long, the generator is started.

In normal case the max. current of the ac source = 40A and in backup case the max. current of the ac source = 10A.

#### Marine systems

In the case of a boat equipped with an on board generator. When the boat is at sea, the energy source is the on board generator. But when the boat is moored into port, the energy source is also the shorepower. In most cases, these two ac sources have different powers.

The on board generator might provide 16A as the shorepower only 8A. This will require many changes during docking or departure at sea of the boat.

With the automatic management of two different energy sources, all these changes belong to the past.

For example, back to our boat...

A boat docked at the port during the night will be connected to the dock (max. current of the ac source = 8A). When the boat goes at sea, its power source becomes the generator (max. current of the ac source = 16A).

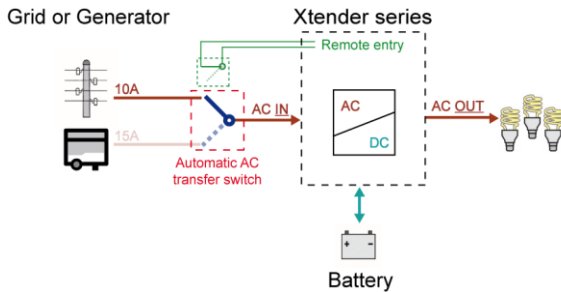
At midday, the boat returns to port and connects back to the dock (max. current of the ac source = 8A).

The boat heads for sea again for the afternoon and uses the generator as energy source (max. current of the ac source = 16A).

## System situations

**Warning**, the values of the energy sources (grid and generator) are only used to illustrate the examples below. These values are to be defined for each case!

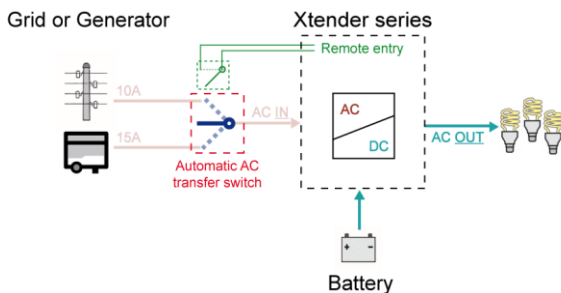
### Situation 1



(Figure 3) System on grid connected

- The power is delivered from the grid (or for a marine application from the shorepower), AC out = AC in.
- The contact “remote entry” is closed. (max. current of the ac source = 10A)
- The battery is automatically charged.

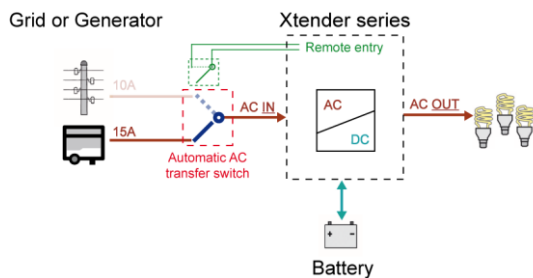
### Situation 2



(Figure 4), System in mode "stand-alone"

- The grid is disconnected, there is no more power on AC in.
- The contact “remote entry” is open. (max. current of the ac source = 15A)
- The battery supplies energy to AC out through the inverter.

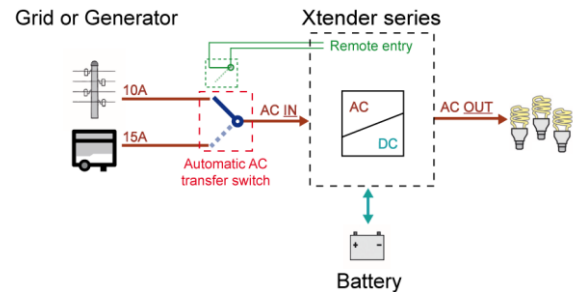
### Situation 3



(Figure 5) System on generator connected

- The power is delivered from the generator, AC out = AC gen.
- The contact “remote entry” is still open. (max. current of the ac source = 15A)
- The battery is automatically charged.

### Situation 4



(Figure 6) System simultaneously connected the grid and on a generator

- There are two energy sources on the system but the master source selected is the grid.
- The power is delivered from the master source, here the grid (or for a marine application from the shorepower), AC out = AC in.
- The contact “remote entry” is closed. (max. current of the ac source = 10A)
- The battery is automatically charged.

## Parameters & descriptions

Three parameters allow controlling this function :

1. "Use an alternate max. input current" {1566}.

↳ authorize the use of a second energy source at the input of the system.

*Set as YES*

2. "Alternate max. input current" {1567}.

↳ is the value of the power ac source of the second energy source.

*Set according to the size of the circuit breaker or the grid capacity.*

3. "Remote entry active" {1545}.

↳ This parameter allows you to determine if the command entry is activated closed or open.

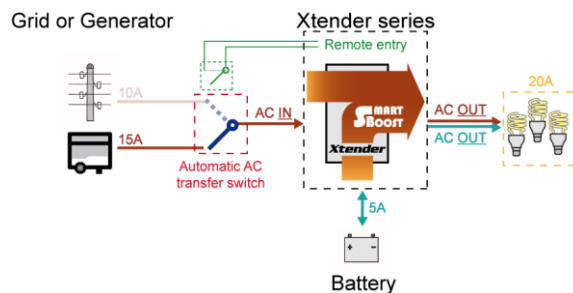
*Set as active open  
(Master source = closed)  
(Second source = open)*

## Additional function

1. "Smart-Boost allowed" {1126}. **(Optional)**

↳ helps the generator by adding the missing power. Prevents from overloading the input even if consumers are higher than the input source (grid or generator).

*Set as YES*



(Figure 7), System with the Smart-Boost function activated

2. "Immediate detection of input voltage loss" {1435}. **(Optional)**

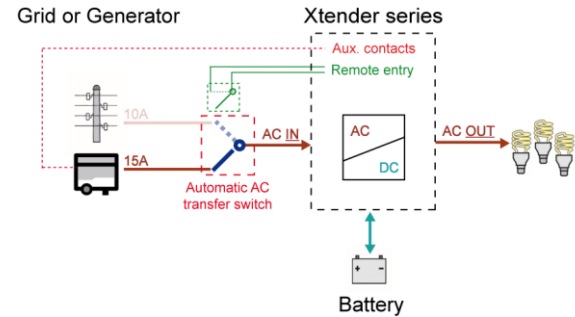
↳ Allows to starting the inverter mode as quick as possible in case of fluctuations of the AC-in grid. This function is useful when it comes to very sensitive loads that require an uninterruptible power supply (UPS mode).

*Set as YES*

## Automatic start of a generator **(Optional)**

For backup systems, it is obviously convenient to have a fully automated system. Thus it is possible in case of blackout and under-voltage battery to start the generator automatically <sup>i</sup>.

This is possible with the Xtender and one of its auxiliary contacts.



(Figure 8) System with an automatic generator startup

## Notes

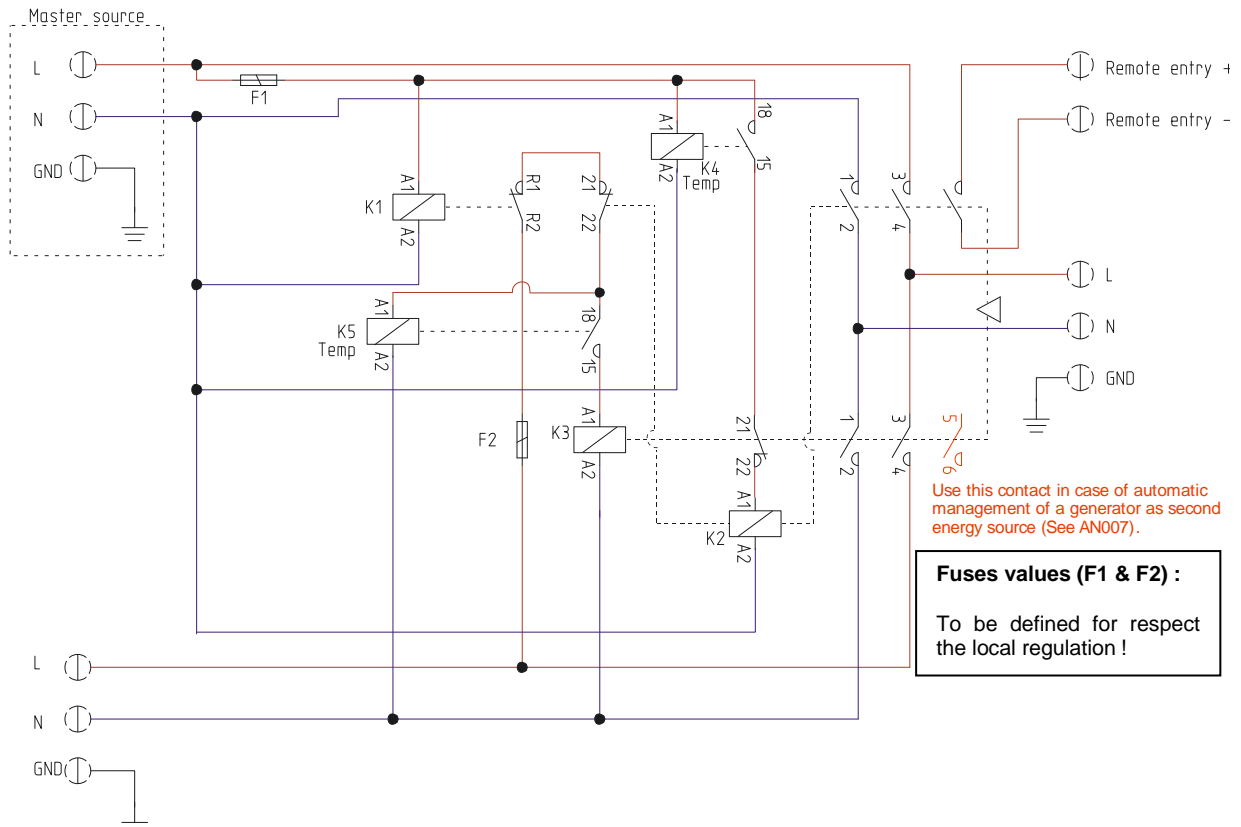
Associated application notes :

- ▶ AN001 AC source assistance (Smart-Boost function)
- ▶ AN007 Automatic start of a generator

<sup>i</sup> Only possible with a generator equipped with an automatic start

## Scheme of the automatic AC transfer switch

### Independent neutral



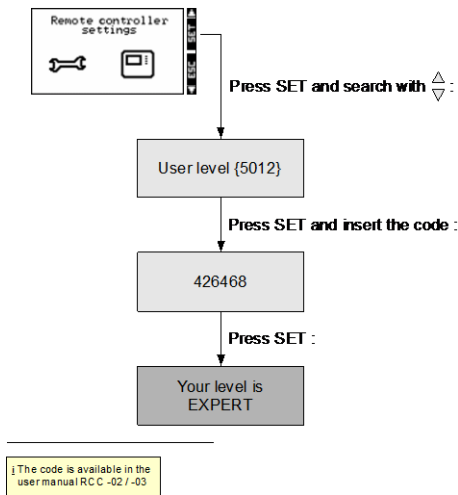
(Figure 9) Automatic AC transfer switch with independent neutral

### List of parts

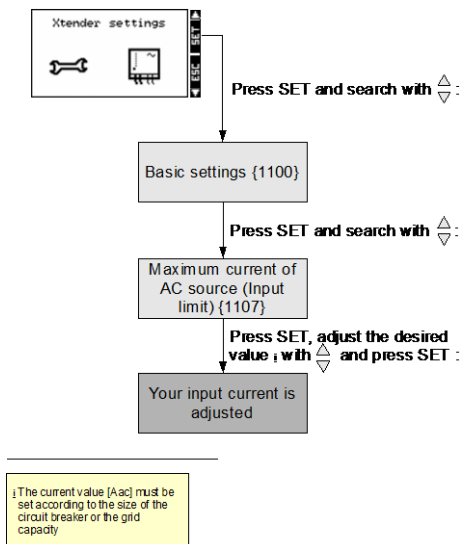
Part Name	Designation	Studer reference	Quantity	Specification
K1	Installation relay [16A]	REL-INSTAL-16A	1	
K2, K3	Contacteur three-phase [Allen-Bradley 32A]	REL-CONTACTEUR-3L-32A-230V	2	
(21 22)	Mechanical lock block	REL-CONTACTEUR-BLOC-VERROU	1	For K2 and K3
F1, F2	Fuse block [Woertz - 4mm <sup>2</sup> - Grey]	B-WOERTZ-4#-FUSIBLE	2	
K4, K5	Time-delay relay	REL-INSTAL-RETARD-5A	2	Time-delay = 2s
-	Junction Block	B-WOERTZ-6#-BLEU	3	6mm <sup>2</sup> - Blue
-	Junction Block	B-WOERTZ-6#-GRIS	5	6mm <sup>2</sup> - Gris
-	Junction Block	B-WOERTZ-6#-JAUNE-VERT	3	6mm <sup>2</sup> - Yel./Gr.
-	Closure for junction block	B-WOERTZ-PAROI-DE-FERMETURE	1	
-	Locking Block	B-BUTEE-PLASTIC	2	6/6 - Grey.

# RCC-02/-03 programming guide

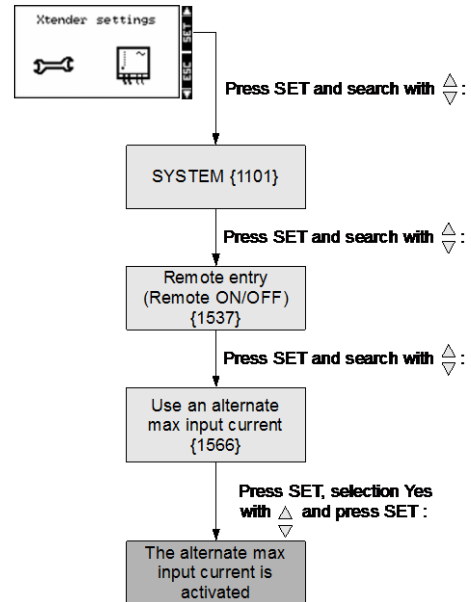
## 1. User level to EXPERT



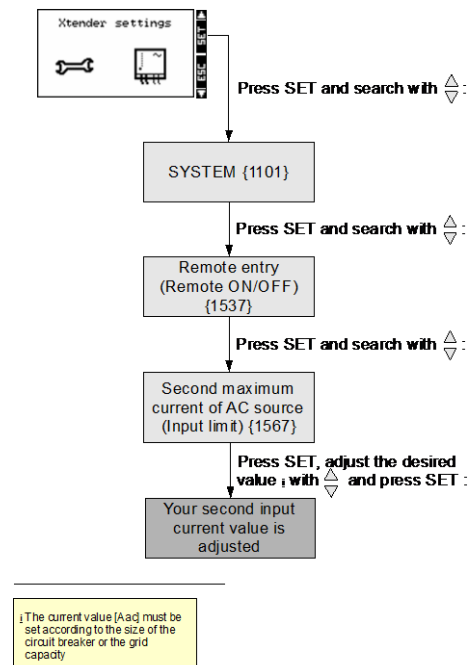
## 2. Maximum current of AC source (Input limit)



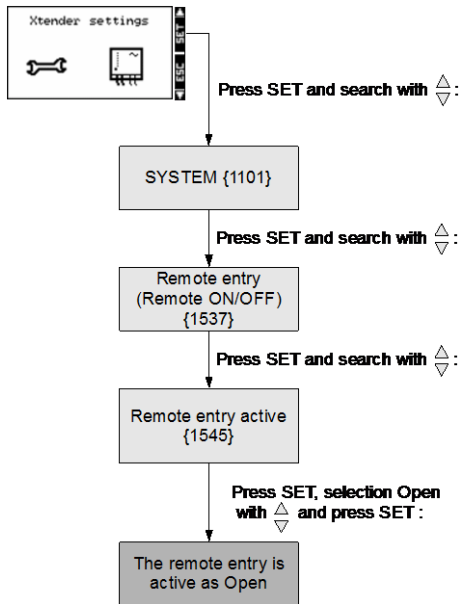
## 3. Use an alternate max. input current



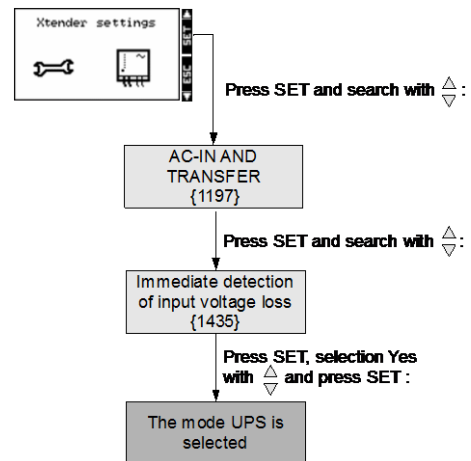
## 4. Second maximum current of AC source (Input limit)



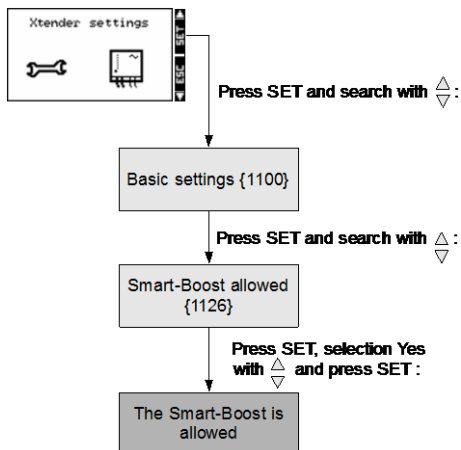
## 5. Remote entry active



## 7. Immediate detection of input voltage loss (optional)

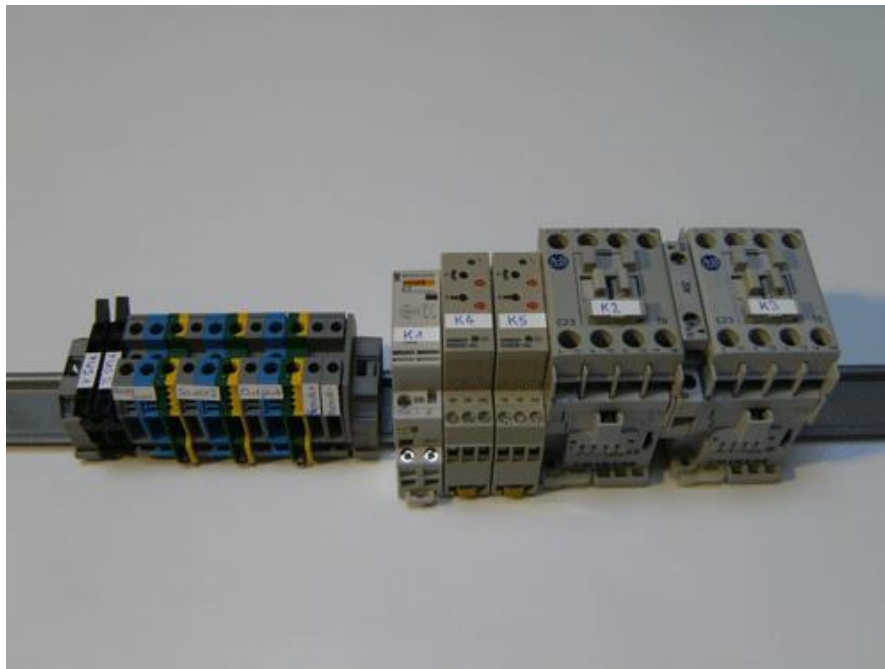


## 6. Smart-Boost allowed (optional)

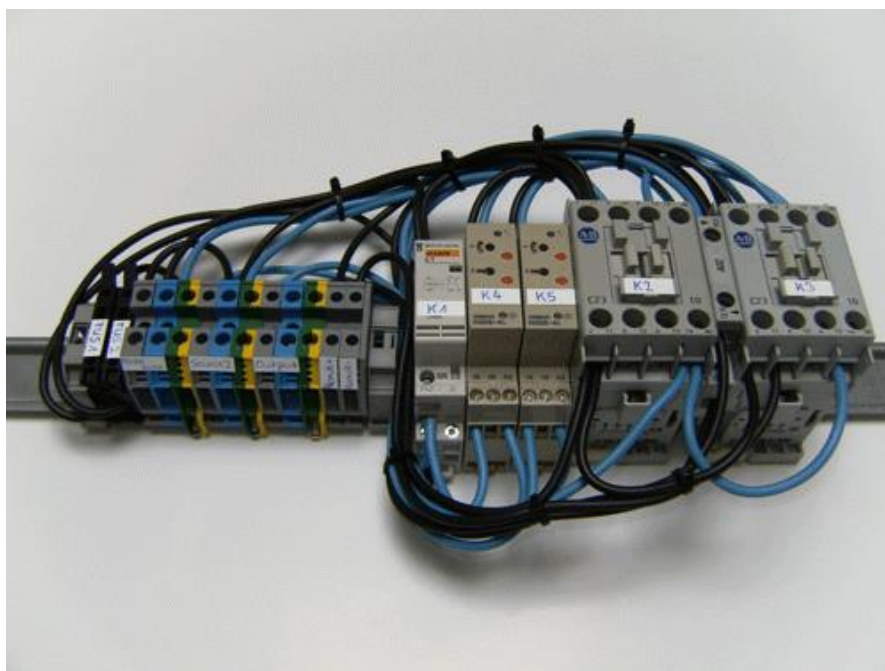


## Example of AC transfert switch

Fieldtests and pictures by STUDER Innotec ( <http://www.studer-innotec.com> )



(Figure 10), Automatic AC transfer switch (not wired)



(Figure 11), Automatic AC transfer switch (wired)



The kit available at Studer Innotec includes only the different parts described on page 5 (List of parts). The wiring and the fixing rail are not provided.



