



# ELECTRONICAL INDUSTRY

by **celduc**<sup>®</sup> relais

[www.celduc-relais.com](http://www.celduc-relais.com)

DESIGNER &  
MANUFACTURER OF  
SOLID STATE RELAYS AND  
MAGNETIC SENSORS

MOTION CONTROL,  
HEATING CONTROL,  
POWER CONTROL



# CONTENTS

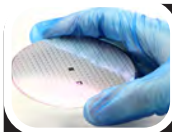
<b>WHO ARE WE ? .....</b>	<b>pages 2-3</b>
<b>MAIN PROCESSES .....</b>	<b>pages 4-19</b>



## PHOTOVOLTAIC CELLS MANUFACTURING

- Diffusion furnace
- Anti-Reflective Coating
- Fast-Firing & regeneration furnace

**pages 4-8**



## SEMICONDUCTORS MANUFACTURING

- Annealing - Diffusion - Oxidation
- Scrubbers for Wafer cleaning
- Chillers
- Dry etching & cleaning
- CVD (and ALD and PVD)
- Gas supply systems

**pages 9-14**



## COMPONENTS MANUFACTURING

- Tin wave soldering
- Reflow soldering
- Climate chambers

**pages 15-17**



## FLAT PANEL DISPLAY MANUFACTURING

- Pre bake oven
- Hot air oven
- Screen coating
- Heat treatment

**page 18**



## PACKAGING

- Blister packaging machines
- Encapsulation

**page 19**

## OUR SOLUTIONS . . . . . pages 20-36

pages 20-21



- Single phase SSR and optional modules for diag. function

pages 22-23



- Power Solid State Relays with Diagnostics

pages 24-25



- EMC optimised SSRs

pages 26-27



- Analogue control relays (single phase and three-phase)



**PRODUCTS  
MADE IN  
FRANCE FOR  
MORE THAN  
50 YEARS !**



- Two-phase Solid State Relays

pages 28-29



- 2-leg three-phase and Three-phase SSRs

pages 30-33

**EMR vs SSR . . . . . page 34**

**WHY CHOOSING CELDUC SSR ? . . . . . page 35**

# WHO ARE WE ?

**celduc® group** specializes in electrical engineering and electronics.

With many years of experience **celduc®** is fully focused on serving its market and customers all over the world. The company was founded in 1964 by Michel Guichard. Set up near Saint-Etienne, the **celduc® group** is the only French company producing and selling solid state relays. Today **celduc® group** has:

- 200 employees
- Two production centers totaling 10 000 square meters
- A worldwide presence

A strong innovation to challenge the future

**celduc® relais** constant product development and commitment to work with customers to develop bespoke solutions has increased its production capacity by around 10 to 15 % per year.

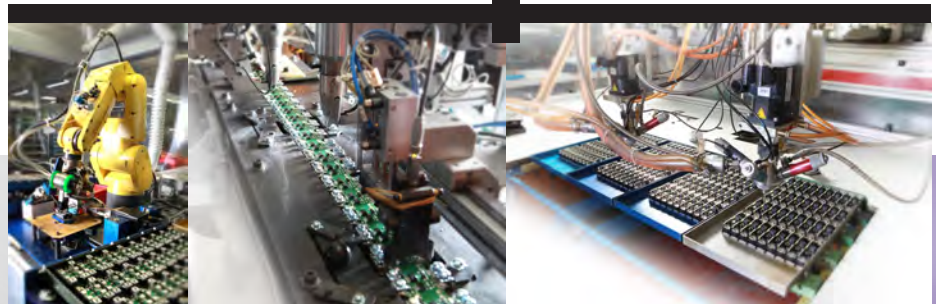
Innovation is the challenge that **celduc® relais** has to take up every day by anticipating the market trends and implementing specific knowledge and skills in partnership with industry and research.

From design to manufacturing

**celduc® relais** controls the complete chain : design, development, production, testing and marketing.

**celduc® relais** manufactures the most comprehensive range of Solid State Relays but has also developed its own production equipment to ensure the most efficient manufacturing methods.

Thanks to this high-capacity and unique tooling, **celduc®** products can be found all over the world and have been recognized by the most renowned industrial companies.





# HIGH QUALITY PRODUCTS

Quality is of paramount importance and is maintained at all times, aided by our own specially developed in house testing equipment.

**celduc® relais** solid state relays and magnetic sensors are manufactured in accordance with the major international standards (UL, CSA, EN, VDE, CE, ATEX, ...)...



All products are designed, tested and manufactured in compliance with the strictest international standards and always with reliability and safety in front of our mind

The solutions displayed in this brochure should be considered as non-exhaustive examples.

# FROM INGOT TO MODULE



## PHOTOVOLTAIC CELLS MANUFACTURING

Solar/Photovoltaic cell is an electrical component that converts part of the radiant energy contained in light into electrical energy. Silicon is the initial product in the manufacturing process of silicon wafer-based solar cells involving several stages :

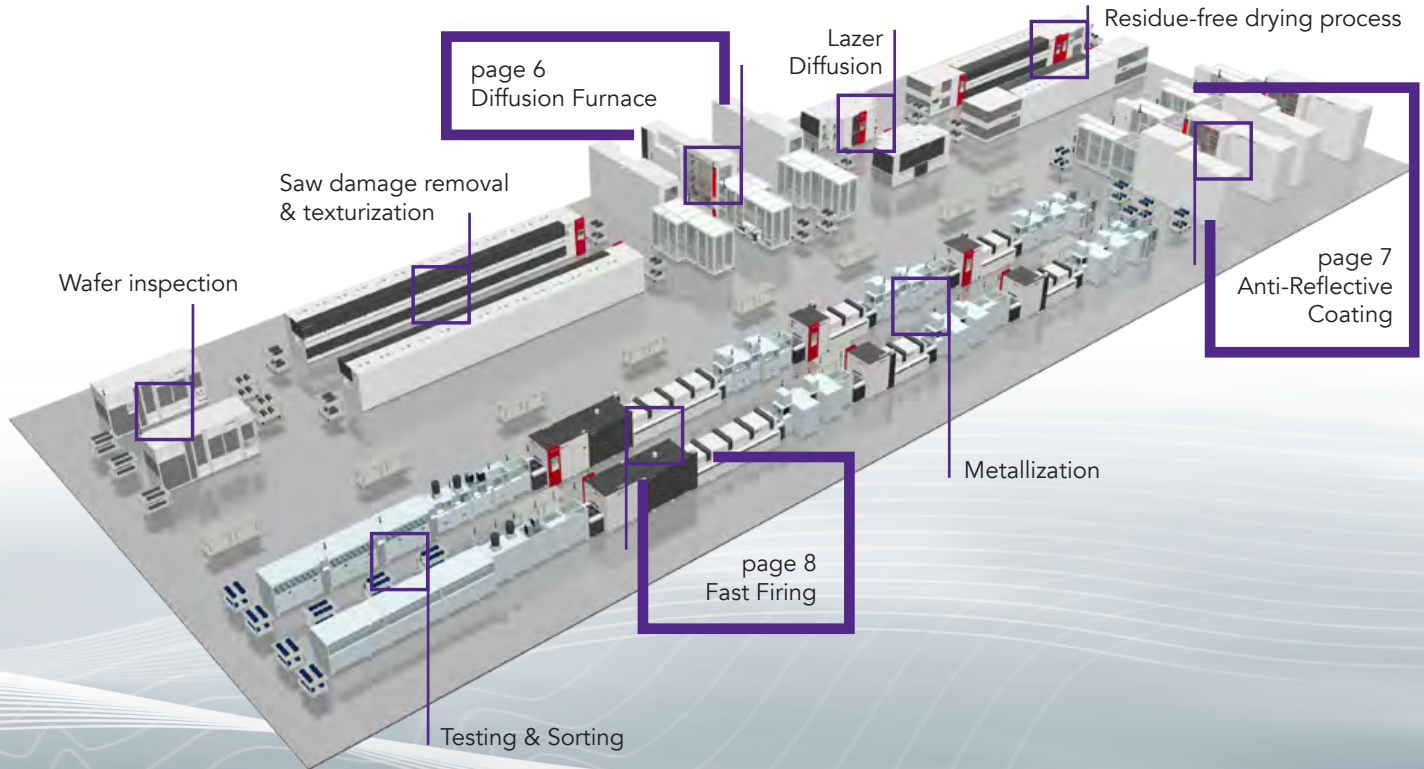


# SSRs FOR EACH EQUIPMENT

For all equipment used for these processes Solid State Relays are widely used because of their ability to work in harsh environments without operating problems.



**PHOTOVOLTAIC  
CELLS  
MANUFACTURING**



# DIFFUSION FURNACE

Thermal processing furnaces, also known as diffusion furnaces, have been widely known and used for many years to perform a variety of semiconductor fabrication processes, including annealing, diffusion, oxidation, and chemical vapour deposition. These furnaces are designed to heat semiconductor wafers to desired temperatures to promote either diffusion of the dopants to a desired depth while maintaining line width smaller than 1 micron or to perform other conventional processing techniques such as the application of an oxide layer to the wafer or deposition of a chemical vapour layer to the wafer.



PHOTOVOLTAIC  
CELLS  
MANUFACTURING

## CELDUC® RELAIS, WORLD LEADER IN SOLID-STATE POWER SWITCHING & CONTROL

- Heating control of infrared light elements

### KEY PRODUCTS

#### SOLID STATE RELAYS

##### SINGLE PHASE



with diagnostics  
SOD range  
pages 22-23

##### THREE-PHASE



cel3pac® range  
pages 32-33



Image courtesy of centrotherm international AG

# ANTI-REFLECTIVE COATING

Bare silicon has a high surface reflection of over 30%. The reflection is reduced by texturing and by applying anti-reflection coatings (ARC) to the surface.



PHOTOVOLTAIC  
CELLS  
MANUFACTURING

## CELDUC® RELAIS, MORE THAN 50 YEARS MARKET EXPERIENCE AND HIGH QUALITY PRODUCTION IN FRANCE

- Heating control

### KEY PRODUCTS

#### SOLID STATE RELAYS

##### SINGLE PHASE



okpac® range  
pages 20-21

##### THREE-PHASE



sightpac® range  
pages 32-33

### ADVANTAGES :

SSRs control of the heating zones will ensure that temperature requirements are accurately carried out.



Image courtesy of centrotherm international AG



# FAST-FIRING FURNACE REGENERATION FURNACE



PHOTOVOLTAIC  
CELLS  
MANUFACTURING

Fast firing furnace is used for burning out and sintering of solar cell metal contacts. Usually, the firing zone is equipped with short wave infrared light elements. After first exposure to light mono-crystalline solar cells might suffer performance losses due to light induced degradation (LID). Therefore, a regeneration process is applied directly after fast firing.

## A TECHNOLOGY FOR EVERY APPLICATION !

8

9

- Heating control

### KEY PRODUCTS

#### SINGLE PHASE SSR



EMC optimised  
SON range  
pages 24-25



Burst control  
mode controller  
pages 26-27



Phase angle  
controller  
pages 26-27

#### ADVANTAGES :

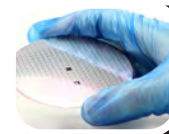
Phase angle controllers  
allow the power to be  
finely adjusted.



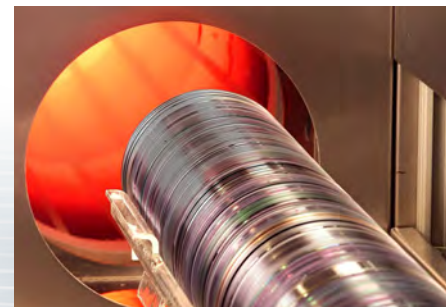
# ANNEALING – DIFFUSION - OXIDATION PROCESSES

Semiconductor annealing (heat treatment) is used for activating silicon wafers injected with impurities (increasing density/speed). The temperature should be accurate at this stage. In fact, if the heat penetrates too deeply, the impurities will diffuse into deeper layers, forming a thick semiconductor layer. Flash annealing limits heat treatment to the surface layer, preventing the diffusion of impurities and allowing the production of extremely thin semiconductor layers.

During diffusion process dopants are introduced inside the material. Oxidation process forces oxygen, vapour, to diffuse into the wafer surface at high temperatures between 800 and 1200°C so that a thin, smooth layer of silicon dioxide can be created.



SEMICONDUCTORS  
MANUFACTURING



## ADVANTAGES :

Using our own-design thyristors technology and RVF process (RoHs Void Free Process) for a longer lifespan (+40%)

## • Heating control

### KEY PRODUCTS

#### SOLID STATE RELAYS

##### SINGLE PHASE



celpac® range  
pages 20-21

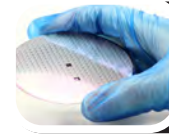
##### THREE-PHASE



cel3pac® range  
pages 32-33



# SCRUBBERS FOR WAFER CLEANING PROCESS



SEMICONDUCTORS  
MANUFACTURING

Scrubber systems are designed to perform one of the most important process functions in Integrated Circuit manufacturing : wafer cleaning. It can be used between any two steps in the wafer manufacturing process. These systems remove contaminants such as particles, residues and other unwanted surface defects that can cause fatal errors in IC devices.

## CELDUC® RELAIS' SSRs ARE THE RIGHT CHOICE FOR ACCURATE AND LONG LIFE TIME TEMPERATURE CONTROL

- Heating control

### KEY PRODUCTS

#### SOLID STATE RELAYS

##### SINGLE PHASE



okpac® range  
pages 20-21

##### THREE-PHASE



cel3pac® range  
pages 32-33

### ADVANTAGES :

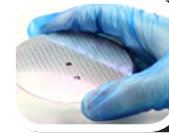
An accurate temperature control is needed as chemicals should always be at the precisely correct temperature before being released. Our high power SSRs up to 125A are used to switch ON & OFF the heater to keep the temperature stable.



Image courtesy of Unisem

# CHILLER

This sensitive process requires accuracy when dealing with liquid cooling or air conditioning cooling.



SEMICONDUCTORS  
MANUFACTURING

**CELDUC® RELAIS : A TEAM OF EXPERTS  
AT YOUR SERVICE.  
WE CAN EVEN DESIGN SPECIFIC PRODUCTS  
ACCORDING TO YOUR SPECIFICATIONS**

- Heating control

## KEY PRODUCTS

### SOLID STATE RELAYS

#### SINGLE PHASE



celpac® range  
pages 20-21

#### 2-LEG THREE-PHASE



sightpac® range  
pages 30-31

### ADVANTAGES :

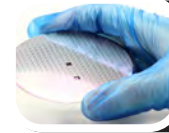
Controlling the temperature is critical in the production of semi-conductor devices.  
The use of celduc's Solid State Relay is the right choice !



Image courtesy of Unisem

# DRY ETCHING & CLEANING

Dry etching is to remove layers from the surface of a wafer during the manufacturing process. Plasmas or etchant gases are used to remove the substrate material.



SEMICONDUCTORS  
MANUFACTURING

## USE DUAL RELAYS FOR SPACE SAVING IN YOUR CONTROL PANELS !

12

13

- Heating control

### KEY PRODUCTS

#### SOLID STATE RELAYS

##### TWO-PHASE



SOB range  
pages 28-29

##### 2-LEG THREE-PHASE



SMB range  
pages 30-31

### ADVANTAGES :

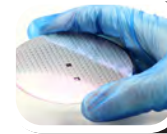
In this process, substrate temperature is generally considered as an important parameter which explains the use of Solid State Relays rather than ElectroMechanical Relays.





# CVD

## CHEMICAL VAPOUR DEPOSITION



SEMICONDUCTORS  
MANUFACTURING

Chemical vapour deposition, or CVD, is a commonly used method of creating thin films used in semiconductor manufacturing. The coating material is vaporized inside a vacuum chamber and begins to uniformly settle on the substrate.

## QUALITY IS CONSIDERED OF PARAMOUNT IMPORTANCE AT CELDUC®RELAIS

- Heating control

### KEY PRODUCTS

#### SOLID STATE RELAYS

##### SINGLE PHASE



okpac® range  
pages 20-21

##### THREE-PHASE



sightpac® range  
pages 32-33

### ADVANTAGES :

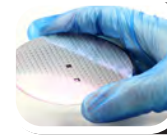
In compliance with the major international standards.



Image courtesy of SNTK

Image courtesy of JUSUNG-ENGINEERING

# GAS SUPPLY SYSTEM



SEMICONDUCTORS  
MANUFACTURING

Gases have been a key enabler of the electronics industry. At almost all stages of semiconductors manufacturing, gases are used : Deposition, Photolithography, Etching, Doping, Annealing, Chamber cleaning,...

These systems are used to safely supply special gases required for semiconductor and solar manufacturing processes.

14

15

- Heating control

## KEY PRODUCTS

### SOLID STATE RELAYS

#### TWO-PHASE

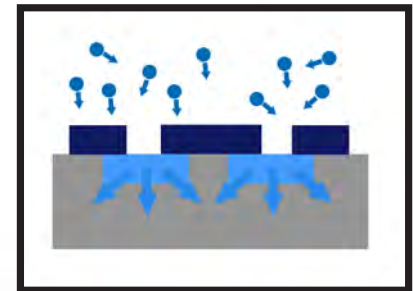
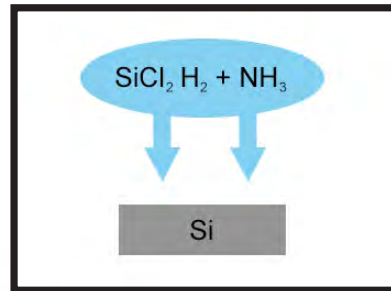


SOB range  
pages 28-29

#### 2-LEG THREE-PHASE



sightpac® range  
pages 30-31



## ADVANTAGES :

Accurate temperature control to keep the gas temperature very stable.



# TIN WAVE SOLDERING

This technology is used to solder the electronic components on a PCB. This technology is used to solder the electronic components on a PCB. This reliable and automatic system is widely used in the electronics industry. Wave soldering process is composed by four steps:

## 1 FLUX SPRAYING

Cleaning the metal surface is a key step in the process in order to ensure soldering performance.

## 2 PRE-HEATING

PCBs travel through a heat tunnel to carry out pre-heating and activate flux. The drying is made by infra-red lamps. To dry efficiently, an accurate temperature control is necessary.

## SSR

## 3 WAVE SOLDERING

The PCBs go into a melting tin bath which is warmed up to  $220+(-)3^{\circ}\text{C}$  or  $240^{\circ}\text{C}$  for lead free process. The temperature has to be regulated accurately. as copper starts melting at about  $240^{\circ}\text{C}$ , therefore, when reaching this temperature, the tin bath starts being polluted by copper and the soldering can crack.

## SSR

## 4 COOLING

As temperature reaches its peak values during wave soldering process, the PCBs should be cooled up to room temperature, in the cooling zone.



COMPONENTS  
MANUFACTURING

## KEY PRODUCTS

### SOLID STATE RELAYS

#### ANALOGUE CONTROL



Single phase  
SO4  
pages 26-27



Three-phase  
SVTA  
pages 26-27

#### EMC OPTIMISED



EMC optimised  
SON range  
pages 24-25

SSRS SWITCH ON & OFF  
THE HEATER TO KEEP  
THE TEMPERATURE STABLE AND  
TO ALLOW A BETTER SOLDERING

## ADVANTAGES :

Phase angle controllers allow the load power to be finely adjusted.

# REFLOW SOLDERING

Reflow soldering is another process to sold components on PCB.  
Differents steps in the process:

## 1 APPLYING SOLDERING PASTE

Soldering Alloy is applied on PCB with serography process.

## 2 COMPONENTS ARE PLACED ON PCBs

SMD components are picked & placed.

## 3 THERMAL SOAK **SSR**

Reflow soldering also depends on flux contained in solder paste. Temperature has to increase to activate the flux. ■

## 4 REFLOW SOLDERING **SSR**

Peak temperature leads solder paste to be melted and reflowed. Temperature control plays a crucial role in reflow soldering process. Too low a temperature stops solder paste from sufficiently reflowing while too high a temperature may cause damage on SMT components or boards. ■

## 5 COOLING

Temperature will go down soon after top temperature is achieved during step n° 4. Cooling ensures the solder to be solidified.



**COMPONENTS  
MANUFACTURING**

## KEY PRODUCTS

### SOLID STATE RELAYS

#### SINGLE PHASE



celpac® range  
pages 20-21

#### TWO-PHASE



SOB range  
pages 28-29

#### THREE-PHASE



sightpac® range  
pages 32-33

## ADVANTAGES :

SSR control of the heating zones will ensure that temperature requirements are accurately carried out.



# CLIMATE CHAMBER

- Heating control



COMPONENTS  
MANUFACTURING

CELDUC® RELAIS IS A RELIABLE  
AND EXPERIENCED PARTNER IN THE  
ELECTRONICAL INDUSTRY

## KEY PRODUCTS

### SOLID STATE RELAYS

#### SINGLE PHASE



celpac® range  
pages 20-21

#### THREE-PHASE



cel3pac® range  
pages 32-33

## ADVANTAGES :

Lifetime and control accuracy of celduc®'s SSRs are the key features to maintain the test conditions very precisely during long periods of testing.





# FLAT PANEL DISPLAY MANUFACTURING EQUIPMENT



FLAT PANEL  
DISPLAY  
MANUFACTURING

## OUR PRODUCTS ARE USED FOR HEATING AND PROCESS CONTROL IN THESE EQUIPMENT

18

Solid State Relays are widely used in the equipment for flat panel display manufacturing :

- **Pre Bake Oven**

19

- **Hot air Oven** System for the hardening process of substrate
- **Screen coating** to protect the screen against scratches, touch, reflection, ... this coating is applied to the substrate in liquid form and then cured in large oven. One problem with preferred coating compositions is that the temperature can not be tolerated by the glass substrate of the screen panel. For example one protective coating composition cures at about 800°C and the maximum temperature the glass substrate can withstand is about 550°C before it brings thermal damage. To compensate, the protective coating is "cured" in an oven set at a temperature lower than specified but for an extremely long period of time.
- **Heat treatment after coating** : after coating the screen is put in a large chamber for heat treatment  $250^{\circ}\text{C} \pm 3^{\circ}\text{C}$ . There are around 5 heaters beams, each one controlled in temperature to insure the right temperature ( $\pm 3^{\circ}\text{C}$ ).



# BLISTER PACKAGING MACHINES



PACKAGING

- Conveyor motor control
- Up/down film roller motor control
- Cutting station motor control
- Sealing heating resistance control

CELDUC® IS THE PREFERRED  
GLOBAL EXPERT OF WORLD'S  
LARGEST MANUFACTURERS

## KEY PRODUCTS

SINGLE PHASE  
SSRs



okpac® range  
pages 20-21

POWER SSRs WITH  
DIAGNOSTICS



SOD/SILD  
pages 22-23



Image courtesy of HOONGA



# celpac<sup>®</sup> okpac<sup>®</sup>

## TWO RANGES OF SINGLE PHASE SOLID STATE RELAYS TO COVER ALL YOUR NEEDS

OUR **OKPAC**<sup>®</sup> AND **CELPAC**<sup>®</sup> RANGES  
COMBINE INNOVATION, PERFORMANCES AND DESIGN

With our integrated back to back thyristors technology (direct copper bonded ceramic) offering a very high life expectancy, our SSRs are perfectly adapted to the requirements of electronics processing machines manufacturers. Our single phase range okpac<sup>®</sup> SO9 or celpac<sup>®</sup> SU9 are ideal solutions for heating resistance control.

We offer a wide range with thyristor ratings up to 125A / 660V as well as a wide AC-DC input range with regulated current models. Removable flaps for IP20 protection.



## Zero-cross single phase Solid State Relays designed for resistive loads AC-51

# celpac<sup>®</sup> 2G

Reference	Thyristor rating	Max. switching current at 25°C	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t	Specifications
<b>SU942460</b>	25A	depends on heatsink	12-280VAC	600V	3-32VDC	600A <sup>2</sup> s	For mounting on heatsink
<b>SUL963460</b>	35A	30A	24-600VAC	1200V	3.5-32VDC	882A <sup>2</sup>	22.5mm heatsink
<b>SUL967460</b>	75A	35A	24-600VAC	1200V	3.5-32VDC	7200A <sup>2</sup> s	22.5mm heatsink

To add functions to your SSR, use our two modules directly pluggable on our SSR type SU and SUL →



ECOM  
PID temperature controller,  
current monitor and  
communication interface  
in one unit



ESUC  
Current monitoring,  
Diagnostics module



SU9



SUL9

# okpac<sup>®</sup>

Reference	Thyristor rating	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t
<b>SO945460</b>	60A	12-280VAC	600V	3-32VDC	2800A <sup>2</sup> s
<b>SO963460</b>	40A	24-600VAC	1200V	3.5-32VDC	1250A <sup>2</sup> s
<b>SO965460</b>	60A	24-600VAC	1200V	3.5-32VDC	2800A <sup>2</sup> s
<b>SO967460</b>	90A	24-600VAC	1200V	3.5-32VDC	7200A <sup>2</sup> s



SO9

Other models available please visit our website [www.celduc-relais.com](http://www.celduc-relais.com)

## USE OUR POWER SSRs WITH DIAGNOSTICS

TO SIGNAL SSR AND LOAD STATUS

### Solid State Relays SU/SUL combined with ESUC module



Diagnostic information  
for up to 5 heaters in  
parallel in a compact and  
ready to use solution

- Permanent load current monitoring,
- Current teaching function,
- Two alarm thresholds : +/-16% of Iteach,
- Partial load break detection,
- Open load detection,
- Detection of shorted SSR.

See product description page 21

### Power Solid State Relays with diagnostics : SOD range



To be mounted  
on heatsink

- Status of the SSR and the load,
- Normally closed status output,
- Without external power supply,
- Status visualisation by yellow LED,
- Status output can be chained,
- This zero cross model switches ON in case of overvoltage.

### "Ready to use" Solid State Contactor : SILD range



Compact solution and  
ready to use solution



# okpac<sup>®</sup>

## Power SSRs with diagnostics

- Our SOD range gives the status of the SSR and the load without external power supply.

Reference	Thyristor rating	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t
<b>SOD843180</b>	35A	50-265VAC	600V	7-30VDC	1 250A <sup>2</sup> s
<b>SOD845180</b>	50A	50-265VAC	600V	7-30VDC	2 800A <sup>2</sup> s
<b>SOD849180</b>	125A	50-265VAC	600V	7-30VDC	22 000A <sup>2</sup> s
<b>SOD865180</b>	50A	150-510VAC	1200V	7-30VDC	2 800A <sup>2</sup> s
<b>SOD867180</b>	75A	150-510VAC	1200V	7-30VDC	7 200A <sup>2</sup> s



# celpac<sup>®</sup>

## "Ready to use" Solid State Contactors with diagnostics

- The SILD range of diagnosis relay is in celpac housing (ready to use).

Reference	Thyristor rating	Max. switching current at 25°C	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t
<b>SILD845160</b>	50A	32A	70-280VAC	600V	3-32VDC	1 500A <sup>2</sup> s
<b>SILD865170</b>	50A	32A	150-510VAC	1200V	3.5-32VDC	1 500A <sup>2</sup> s
<b>SILD867170</b>	75A	35A	150-510VAC	1200V	3.5-32VDC	5 000A <sup>2</sup> s



Other models available please visit our website [www.celduc-relais.com](http://www.celduc-relais.com)

# celduc®

## ■ EMC OPTIMISED SOLID STATE RELAYS (LOW ELECTROMAGNETIC EMISSION LOW RFI)

**NEW**

### **SON RANGE:**

THESE RELAYS ARE DESIGNED FOR USE IN APPLICATIONS WHERE  
LOW ELECTROMAGNETIC EMISSION IS ESSENTIAL.

24

25



You can find standard "low noise" SSRs on the market but these are limited to a low switching current of 5A for domestic applications or to low inductive loads, while lots of pure resistive loads applications have high emission noise.

Our new EMC optimized SON range meets these requirements (Conducted emission noise level < 66dB $\mu$ V) and can control class B appliances on pure resistive loads.

According to the application, applicable European standards are different. For celduc®, the major EN standards for Low Electromagnetic Noise Emission are EN55022, EN55011 and EN55014 which represent the main categories for electrical appliances.

# SON

## Power and control connections with screws

Reference	Thyristor rating	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t	Specifications
<b>SON845040</b>	50A	40-260VAC	600V	6-32VDC	2800A <sup>2</sup> s	EMC optimised (low electromagnetic emission – low RFI)
<b>SON865040</b>	50A	50-480VAC	1200V	6-32VDC	2800A <sup>2</sup> s	
<b>SON867040</b>	75A	50-480VAC	1200V	6-32VDC	7200A <sup>2</sup> s	



Our new EMC optimised SON can control class B appliances on pure resistive loads with switching current > 5A with conducted emission noise level < 66dB $\mu$ V. This is a great advantage compared to standard "low noise" SSRs currently available on the market.

Standard	Reference standard	Current limit
<b>CEI 60947-1</b>	CISPR 11, B class, 1st group	40A @ 220V
<b>CEI 60947-4-3</b>	CISPR 22, B class	27A @ 400V

# SCFL

## Power connection by FASTON terminals

Reference	Thyristor rating	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t	Specifications
<b>SCFL42100</b>	25A	12-280VAC	600V	4-30VDC	312A <sup>2</sup> s	EMC optimised (low electromagnetic emission – low RFI)
<b>SCFL62100</b>	25A	24-440VAC	1200V	5-30VDC	312A <sup>2</sup>	

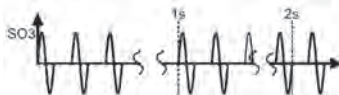

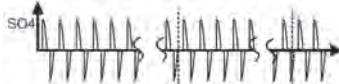


Other models available please visit our website [www.celduc-relais.com](http://www.celduc-relais.com)

# ANALOGUE CONTROL RELAYS

## WHICH MODE TO CHOOSE?

→ Comparison of the 3 control modes - setting to 50%

	Working principles	Advantages	Typical applications
<b>BURST CONTROL MODE</b> <b>SO3 RANGE</b> 	<p>In the time of a given cycle (here 1 or 2 seconds), the variation of the load power is done by eliminating whole alternations. The distribution of eliminations is carried out according to a complex rule. Thus, in the example shown, the load is only powered to 50% because of the elimination of an alternation out of two.</p>	<p>This type of control allows the power to be finely modulated according to the analogue control, while limiting disturbances.</p>	<p>For the control of resistive loads at low thermal inertia such as the short-wave infrared transmitters (infrared tubes)</p>
<b>FULL WAVE PULSE CONTROLLERS</b> <b>SG5 RANGE</b> 	<p>In the time of a given cycle (variable depending on the models), the variation of the load power is done by eliminating whole alternations. The elimination is done linearly following the cyclic Ton/Tcycle report requested by the control input. Thus, in the example opposite, the load is only powered 50% of the time of the cycle (<math>T_{on}/T_{cycle}=0.5</math>).</p>	<p>This type of control presents the advantage of not generating interference since start-up is near 0 voltage.</p>	<p>Adapted to loads with high inertia (industrial furnaces).</p>
<b>PHASE ANGLE CONTROLLERS</b> <b>SINGLE PHASE</b> <b>SG4 - SO4 - SIL4 - SIM4 RANGES</b> <b>THREE-PHASE</b> <b>SGTA AND SVTA RANGE</b> 	<p>On the principle of the light dimmer, this control mode allows a very fine control of the load power by removing a part of the the mains voltage sinusoid in accordance with the control input. The proportional response between the input control and the output power depends on the controller model and can be linear in angle, <math>U^2</math> or in Urms. Thus, in the example below, the load is only powered to 50% because of the elimination of the half of the half-alternations of the mains voltage.</p>	<p>This control mode allows the load power to be finely adjusted, for example, when the refinement of the temperature regulation takes precedence over the electromagnetic disturbances generated by this type of solution (a filter is recommended).</p>	<p>Mainly for loads that react quickly when faced with voltage variation (lamps, motors). Also for DC loads behind a rectifier bridge (heated wires, Peltier effect modules).</p>

26

27

# ANALOGUE CONTROL RELAYS

Types of input control: 0-10VDC, 4-20mA, potentiometer or PWM (Pulse Width Modulation).

3 control modes are available:

- Burst control mode controllers
- Full wave pulse controllers
- Phase angle controllers



## SINGLE PHASE RANGE

Reference	Thyristor rating	Switching voltage	Control	External power supply required ?	Specifications / Control mode	Fig.
SO465020	50A	200-480VAC	0-10VDC	yes	Phase angle controller	1
SO465320	50A	200-480VAC	Potentiometer	yes		1
SO465320	50A	200-480VAC	Potentiometer	yes		2
SG444020	40A	115-265VAC	0-10VDC	no	Phase angle controller	3
SG468420	70A	200-460VAC	4-20mA	no		3
SG469120	110A	200-460VAC	Potentiometer	no		3
SO367001	75A	400VAC	0-10VDC	no	Burst control mode	4



## THREE-PHASE RANGE

Reference	Thyristor rating	Switching voltage	Control	External power supply required ?	Specifications / Control mode	Fig.
SVTA4650E	50A	0-10VDC	No	yes	Phase angle controller	5
SVTA4684E	95A	4-20mA	No	yes		5
SVTA4691E	125A	Potentiometer	no	yes		5





# okpac<sup>®</sup>

■ USE DUAL RELAYS FOR SPACE SAVING !



**NEW**

SOBR RANGE: **"PUSH-IN" SIMPLE CONNECTION**  
WITH NO TOOLS REQUIRED

Always ahead in solid-state control innovation, celduc<sup>®</sup> relais has launched a new range of two phase Solid State Relays in okpac<sup>®</sup> housing with push-in spring power terminals.

# okpac<sup>®</sup>

## Two-phase Solid State Relays



Connectors  
to be ordered  
separately

Our two-phase range provides two solid state relays in a compact standard 45mm enclosure.

Advantages of using our two-phase SSRs :

- Cost reduction of the complete solution
- Simple wiring
- Compact standard 45mm housing

Reference	Thyristor rating	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t	Specifications
<b>SOB942660</b>	2x25A	12-280VAC	600V	10-30VDC	600A <sup>2</sup> s	2 controls
<b>SOB943360</b>	2x35A	12-280VAC	600V	10-30VDC	1250A <sup>2</sup> s	1 control
<b>SOB965660</b>	2x50A	24-600VAC	1200V	10-30VDC	2500A <sup>2</sup> s	2 controls
<b>SOB967660</b>	2x75A	24-600VAC	1200V	10-30VDC	7200A <sup>2</sup> s	2 controls

New range of two phase Solid State Relays in okpac<sup>®</sup> housing with push-in spring power terminals. Limited to 24A by connections.



Reference	Thyristor rating	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t	Specifications
<b>SOBR965660</b>	2x50A	24-600VAC	1200V	10-30VDC	2500A <sup>2</sup> s	2 controls
<b>SOBR965560</b>	2x50A	24-600VAC	1200V	10-30VDC	2500A <sup>2</sup> s	2 controls - 1 common internal connection on input

Other models available please visit our website [www.celduc-relais.com](http://www.celduc-relais.com)

# sightpac®

## 2 LEG THREE-PHASE SOLID STATE RELAYS



**NEW**

SMB RANGE : COMPACT 45MM VERSION

Our SMB and SGB ranges are designed for controlling three phase loads connected in delta or, if balanced, connected in star without the neutral connection. Two of the three phases are switched by the SSR, the third being directly connected.

Simplicity of wiring ensures this reliable solution can be easily integrated into control systems.

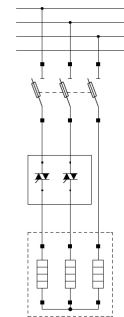
30

31

# cel3pac® sightpac®

## 2 leg three-phase solid state relays

Our SMB and SGB ranges are designed for controlling three phase loads connected in delta or, if balanced, connected in star without the neutral connection. Two of the three phases are switched by the SSR, the third being directly connected. Simplicity of wiring ensures this reliable solution can be easily integrated into control systems.



Reference	Thyristor rating	Switching current AC-51 (at 40°C)	Switching current AC-53 (at 40°C)	Switching voltage	Peak voltage	Control voltage	I <sup>2</sup> t	Protections
<b>cel3pac® range</b>								
<b>SGB8850200</b>	2x50A	3x50A	3x12A	24-640VAC	1600V	4-30VDC	2800A <sup>2</sup> s	VDR
<b>SGB8890200</b>	2x125A	3x85A	3x32A	24-640VAC	1600V	4-30VDC	22000A <sup>2</sup> s	VDR
<b>sightpac® range</b>								
<b>SMB8650510</b>	2x50A	3x30A	3x12A	24-640VAC	1600V	4-30VDC	2800A <sup>2</sup> s	RC - VDR
<b>SMB8670910</b>	2x75A	3x35A	3x16A	150-520VAC	1600V	4-30VDC	7200A <sup>2</sup> s	RC - VDR Aux. contact

Other models available please visit our website [www.celduc-relais.com](http://www.celduc-relais.com)

cel3pac®  
sightpac®

## THREE-PHASE SOLID STATE RELAYS & CONTACTORS : NEW VISIONARY RANGES



SMT RANGE (45MM VERSION)  
SGT RANGE (100MM VERSION)

**NEW**

Superior design, easy installation, optimum lifespan and price effectiveness are delivered with the new generation of three-phase Solid State Relays.

32

33



# cel3pac® sightpac®

## Three-phase Solid State Relays & Contactors

- Maximum peak voltage up to 1600V,
- Thyristor rating up to 125A,
- AC or DC Input control available,
- Using TMS<sup>2</sup> technology thyristors and RVF process (RoHs Void Free Process) for a longer lifespan (+40%),
- IP20 protection on terminals with removable flaps,
- Protections available : RC snubber, VDR, TVS.

Reference	Thyristor rating	Switching current AC-51 (40°C)	Switching current AC-53 (40°C)	Switching voltage	V peak	Control voltage	I <sup>2</sup> t	Protections
<b>cel3pac® range</b>								
<b>SGT8678500</b>	3x75A	3x54A	3x16A	24-520VAC	1600V	24-255VAC/DC	7 200A²s	RC – VDR
<b>SGT8690500</b>	3x125A	3x64A	3x32A	24-520VAC	1600V	4-30VDC	22 000A²s	RC – VDR
<b>SGT8850200</b>	3x50A	3x42A	3x12A	24-640VAC	1600V	4-30VDC	2800A²s	VDR
<b>SGT8858200</b>	3x50A	3x42A	3x12A	24-640VAC	1600V	24-255VAC/DC	2 800A²s	VDR
<b>SGT9834300</b>	3x35A	3x30A	-	24-660VAC	1600V	4-30VDC	1250A²s	TVS
<b>SGT9854300</b>	3x50A	3x42A	-	24-660VAC	1600V	4-30VDC	2800A²s	TVS
<b>SGT9874300</b>	3x75A	3x54A	-	24-660VAC	1600V	4-30VDC	7200A²s	TVS
<b>sightpac® range</b>								
<b>SMT8620520</b>	3x25A	3x20A	3x5A	24-520VAC	1200V	4-30VDC	380A²s	RC – VDR
<b>SMT8628520</b>	3x25A	3x20A	3x5A	24-520VAC	1200V	24-255VAC/DC	380A²s	RC - VDR

Other models available please visit our website [www.celduc-relais.com](http://www.celduc-relais.com)

# SSRs GIVE YOU THE FOLLOWING

## ADVANTAGES COMPARED TO EMRs

- Very high number of switching cycles > 10 million
- Very low consumption for control
- Not sensitive to shocks and vibrations
- Very High frequency switching (in temperature control, low switching frequency limits the accuracy)
- Availability of special controls and diagnostics
- Specific switching modes (zero-cross switching, peak starting, ....) allowing a higher life-span of the loads and the relays.

### CONCLUSION

- SSRs can be used to control loads (temperature, motors, accessories) for reducing maintenance periods, reducing energy consumption.
- Additional features to the SSR, such as diagnostics, bus communication, local temperature controller, can save space, wiring and system information.



# OUR STRENGTHS



**MORE THAN 50 YEARS OF EXPERIENCE ON THE MARKET AND A HIGH QUALITY LEVEL OF PRODUCTION IN FRANCE.**

---



## CONTROL OF THE COMPLETE CHAIN

design, development, production, testing and marketing.



## ANALYSIS OF CUSTOMERS' REQUIREMENTS

celduc® relais is the indisputable global expert and preferred choice of companies all over the world.

---



## A WORLDWIDE PRESENCE IN MORE THAN 60 COUNTRIES

for a better understanding of customer's needs and offering of solutions which fully meet their requirements.

---



## CONSTANT PRODUCT DEVELOPMENT

our experienced R & D engineers constantly work on developing 10 to 15% of new products each year.



## IN COMPLIANCE WITH THE MAJOR INTERNATIONAL STANDARDS

our products are designed, tested and manufactured in accordance with the strictest international standards.

# celduc® relais ALSO PRODUCE

## MAGNETIC SAFETY SENSORS

to ensure the safety of machine operators.

celduc® relais is offering 2 ranges to cover all your needs :

- Coded magnetic Safety sensors with REED technology
- Coded magnetic Safety sensors fully electronics, Hall Effect Technology



## REED RELAYS & SWITCHES

For detection of clearance, position and level in extreme environments with no mechanical link between moving parts. These magnetically actuated maintenance free Reed switches can meet the toughest challenges that industry can throw at them.



MORE INFORMATION  
NEEDED ? [www.celduc-relais.com](http://www.celduc-relais.com)

CATALOGUES AND GENERAL INFORMATION LEAFLETS



Product Guide



Single-phase solid state  
relays & contactors  
celpac® range



Three-phase solid state  
relays & contactors  
cel3pac® & sightpac® ranges





# celduc® relais<sup>1</sup>

worldwide presence in more than  
60 countries

ALGERIA  
ARGENTINA  
AUSTRALIA  
AUSTRIA  
BELGIUM  
BRAZIL  
BULGARIA  
CANADA  
CHILE  
CHINA  
COLOMBIA  
CZECH REP.  
DENMARK  
EGYPT  
ESTONIA  
FINLAND  
FRANCE  
GERMANY  
GREECE  
HONG KONG  
HUNGARY  
INDIA  
INDONESIA  
IRELANDE  
ISRAËL  
ITALY  
JAPAN  
LATVIA  
LITHUANIA

MALAYSIA  
MEXICO  
MOROCCO  
THE NETHERLANDS  
NEW ZEALAND  
NORWAY  
PARAGUAY  
PHILIPPINES  
POLAND  
PORTUGAL  
ROMANIA  
RUSSIA  
SINGAPORE  
SLOVAKIA  
SLOVENIA  
SOUTH AFRICA  
SOUTH KOREA  
SPAIN  
SWEDEN  
SWITZERLAND  
SYRIA  
TAIWAN  
THAILAND  
TURKEY  
UNITED KINGDOM  
UNITED STATES  
UKRAINE  
VENEZUELA  
VIETNAM



[www.celduc-relais.com](http://www.celduc-relais.com)

Sales department France : Tél. +33 (0)4 77 53 90 20  
Sales department for Asia : Tél. +33 (0)4 77 53 90 19  
Sales department for Europe : Tél. +33 (0)4 77 53 90 21  
Sales department for America : Tél. +33 (0)4 77 53 90 19

5 rue Ampère - BP 30004 - 42290 Sorbiers - France  
Fax : +33 (0)4 77 53 85 51