LEROY SOMER®

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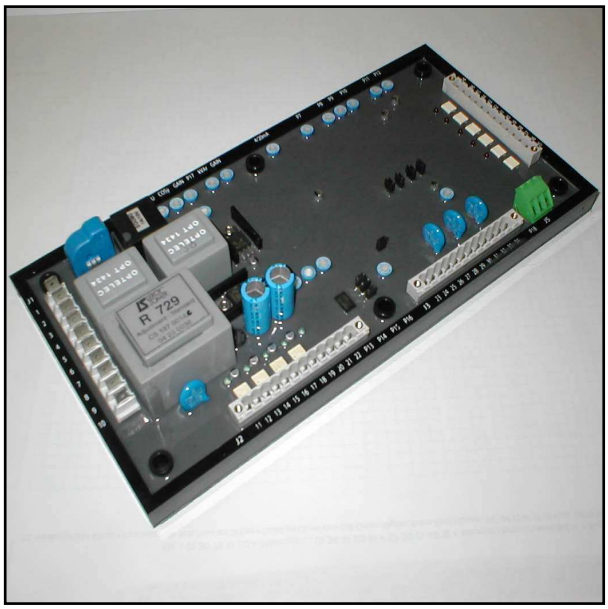


R729

Installation and maintenance

MODULE R729

CONTENTS

MODULE R729

1. Presentation

1.1. Description

When combined with the R 449 or R 452 or R448, the R 729 has the following functions:

Regulation functions

- Regulates PF or kVAr when the alternator is in parallel with the mains (2F).
- Matches alternator voltage to the mains voltage before connection (3F). The alternator can be installed on its own or in parallel with other alternators.

4/20mA function

- Receives a 4/20mA current in order to:
- replace the stator voltage, alternator PF or alternator kVAr set point,
- control the PF or kVAr at a precise point of the installation (mains PF).

Limitation

- Limits the no load or full load minimum excitation current.
- Limits the maximum excitation current when the alternator is short-circuited.
- Limits the stator current.

Fault detection

- detects stator over voltage.
- detects a faulty rotating diode.

- LED signalling of functions 3F, 2F(alternator PF), 2F(kVAr), mains PF and 4/20mA
- LED and contact signalling of a rotating diode fault, a stator over voltage, a minimum excitation current, a maximum excitation current or a maximum stator current
- Absence of 4/20mA current signalled by contact

The board is encapsulated in a box. It can be mounted in the alternator terminal box.
The R 729 will always be mounted in proximity to the R 449 or R 452 or R448 units (Max 5m)

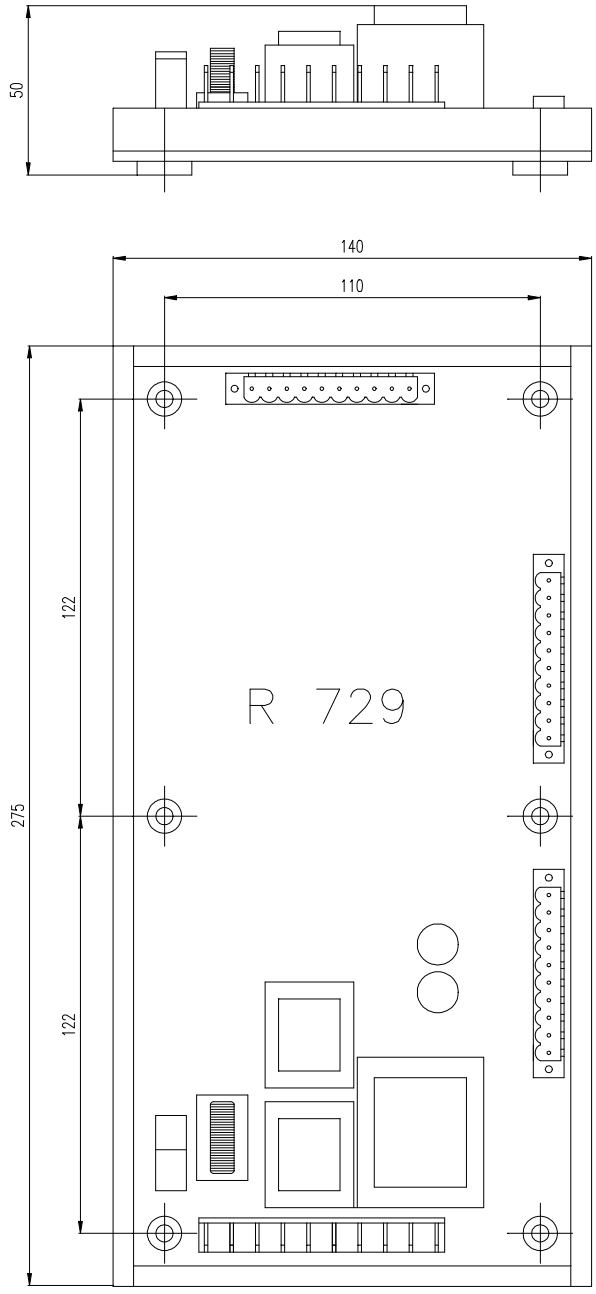
1.2. Characteristics:

- PF regulation
  - Range: 0.95AV to 0.7AR
  - Accuracy: +/-0.02 of PF at rated power
- kVAr regulation
- Stator current data input: max 1A
- U=U
  - Range: +/-15%Un
- Measurement of excitation current: maximum 7A
- Single phase alternator voltage sensing: 0-110-400V 50 or 60Hz
- Single phase mains voltage sensing: 0-110-400V 50 or 60Hz

1.3. Environment:

- Operating temperature: -20℃ to +70℃
- Storage temperature: -55℃ à +85℃
- Vibrations:
  - Below 10Hz: 2mm half peak amplitude
  - Between 10Hz and 100Hz: 100mm/s
  - Over 100Hz: 4G
- EMC - emissions:
  - According to the generic standard: EN 50081-2 (dec93) / EN 55011, Gr1 CLB

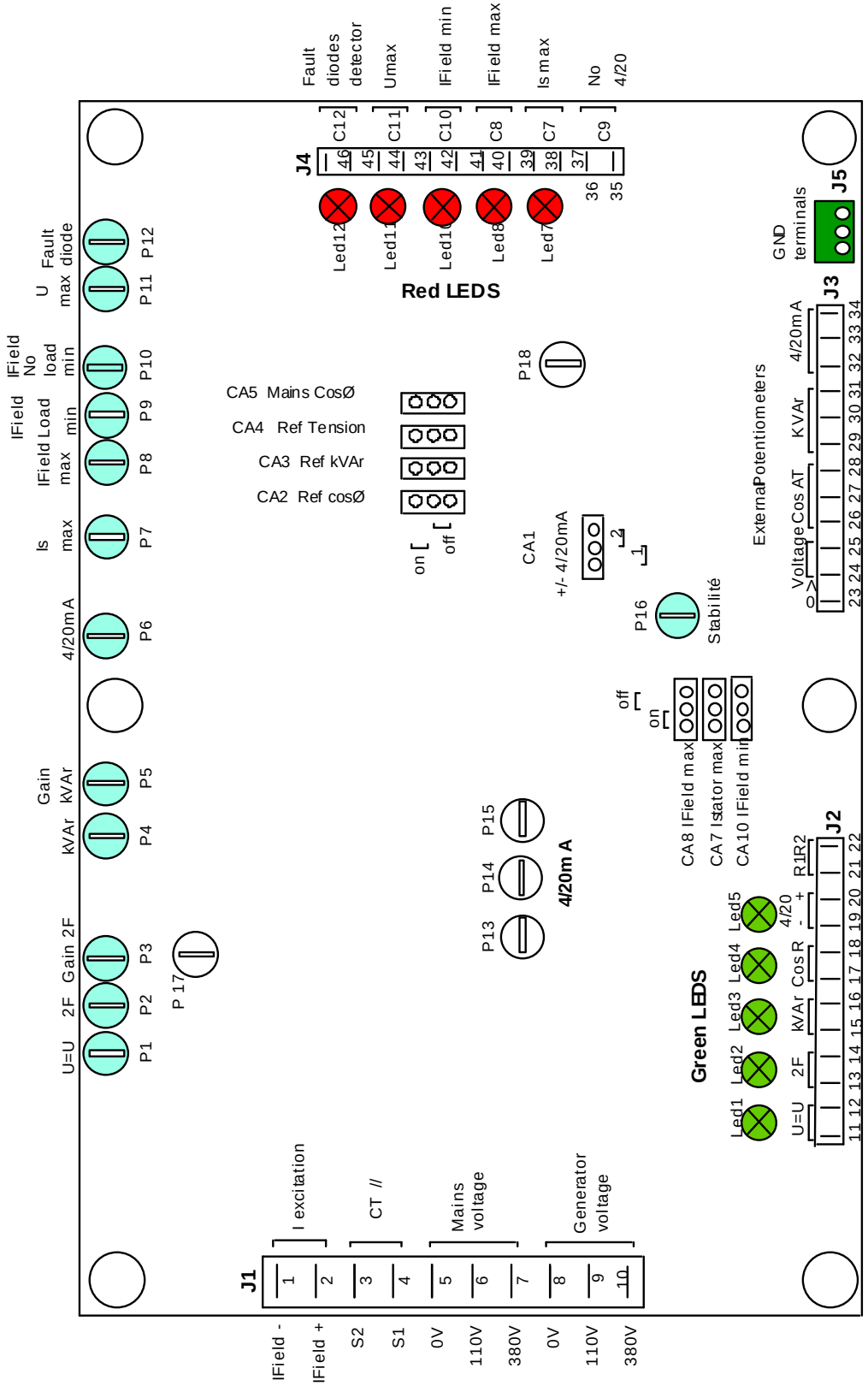
1.4. Overall dimensions



MODULE R729

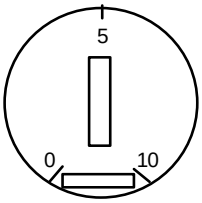
2. Definition of potentiometers, jumpers and LEDs:

2.1. Layout



2.2. Definition of potentiometers:

Representation of a potentiometer



Definition of potentiometers	Potentiometer actions		
	Position 0	**Position 5**	**Position 10**
P1 = U=U	**-**		**+**
P2= PF	**0.95 leading**	**0.9 lagging**	**0,7 lagging**
P3 = PF gain	**-**		**+**
P4 = kVAr	**Capacitive kVAr**	**Equivalent to PF = 0.9 lagging**	**Inductive kVAr**
P5 = kVAr gain	**- (Slow)**		**+ (Fast)**
P6 = 4/20mA reference			
P7 = I stator max	**Limited**		**Not limited**
P8 = Iex max	**Limited**		**Not limited**
P9 = On load Iex min.	**Not limited**		**Limited**
P10 = No load Iex min	**Not limited**		**Limited**
P11 = Overvoltage	**Min voltage**		**Max voltage**
P12 = Rotating diode fault threshold			**No action**
P13 = 4/20mA adjustment (0V)			
P13 = 4/20mA adjustment (Range)			
P6 = 4/20mA gain	**-**		**+**
P16 = Stability	**-**		**+**
P17 = Iex measurement adjustment	**Factory adjusted**		
P18 = Pulse adjustment	**Factory adjusted**		

2.3. Definition of jumpers:

- Jumpers CA1 to CA5 are on the 4/20mA function

CA1 = Sign inversion
CA2 = Ucosφ
CA3 = UkVAr
CA4 = Uvoltage
CA5 = Mains PF

From CA2 to CA5, only one of these functions can be selected at a time.

- Validation of protections

CA8 = Iexc max
CA7 = Istator max
CA10 = Iexc min

2.4. Definition of LEDs:

LED 1 = U=U
LED 2 = 2F (cosφ AT)
LED 3 = kVAr
LED 4 = Mains PF
LED 5 = 4/20mA present
LED 7 = Istator max
LED 8 = Iexc max
LED 10 = Iexc min
LED 11 = Um max
LED 12 = Rotating diode fault

2.5. Definition of signalling contacts:

C7: I stator max
C8: Iexc max
C9: 4/20mA absent
Characteristics of contacts: 220vAC, 0.2A
C10: Iexc min
C11: Overvoltage
C12: Rotating diode fault detector

3. Operation and settings:

Regulation functions

3.1. U=U (3F)

This function matches the alternator voltage to the mains voltage during a mains connection request. It works with an alternator on its own or in parallel with other alternators.
To operate this function, close contact J2-11/12, the green LED 1 will light. This voltage is adjusted by potentiometer P1. When the alternator is connected to the mains, open contact J2-11/12

3.2. Power Factor (2F)

This function controls the alternator PF when it is in parallel with the mains.
To activate this function, close contact J2-13/14, the green LED 2 will light. The PF is adjusted by potentiometer P2 and its gain by P3
An external (10kΩ-3W) setpoint potentiometer can be added to terminals J3-26/27/28, (place the cursor at J3-27). It is connected to the regulator by a shielded cable with its shielding connected to terminal J3-23 (maximum length 50m)

3.3. Function kVAr (2F)

This function regulates the alternator kVAr when it is in parallel with the mains.
To activate this function, close contacts J2-13/14 the J2-15/16, the green LEDs 2 and 3 will light. The kVAr is adjusted by potentiometer P4 and its gain by P5.
An external (10kΩ-3W) setpoint potentiometer can be added to terminals J3-26/27/28, (place the cursor at J3-30). It is connected to the regulator by a shielded cable with its shielding connected to terminal J3-23 (Maximum length 50m).

3.4. Function 4/20mA

Using a 4/20 mA current supplied by the user, this function can replace the stator voltage, PF or kVAr setpoint. When this current is the matches the PF (or kVAr) at a particular point of the installation (mains PF), it can be used to control it.
Each of these functions is activated by setting a jumper to the ON position.
Jumper CA1 inverts the 4/20mA signal.
Only one of these 4 functions can be selected at a time.

- The PF function is selected with jumper CA2
- The kVAr function is selected with jumper CA3
- The voltage function is selected with jumper CA4
- The copy mains PF function is selected with jumper CA5

P6 is the setpoint potentiometer for the selected function.
An external (10kΩ-3W) setpoint potentiometer can be added to terminals J3-32/33/34, (place the cursor at J3-33). It is connected to the regulator by a shielded cable with its shielding connected to terminal J3-23 (Maximum length 50m).

3.4.1. Alternator PF setpoint adjustment:

Do not apply the 4/20mA current
Set CA1 to position 1, CA2 to the ON position, P15 = 5
Connect the alternator to the mains and select alternator PF adjustment (2F)
Adjust the PF using P2 to give the upper value of the range (E.g.: cos φ = 1)
Apply the 4/20mA current – Adjust to obtain 4mA
LED 5 should light.
Adjust with P6 to obtain the same setpoint as before (e.g.: cos φ = 1)
If this is not possible, set jumper CA1 to 2, then repeat the same tests. (CA1 inverses the 4/20mA signal)
Apply 20mA
Adjust with P15 to obtain an inductive PF (e.g.: PF = 0.8 lagging)
With this setting, when the current varies from 4 to 20mA, the PF varies from 1 to 0.8.
In the event that there is no 4/20mA current, the setpoint automatically returns to the internal setpoint value for the function concerned and contact C9 is closed.

3.4.2. kVAr setpoint adjustment:

Do not apply the 4/20mA current
Set CA1 to position 1, CA3 to position ON, P15 = 5
Connect the alternator to the mains and select alternator PF adjustment (2F), then kVAr adjustment.
Adjust the kVAr values using P4 to give the minimum kVAr or capacitive kVAr values (e.g.: kVAr = 0 or cos φ = 1)
Apply the 4/20mA current – Adjust to obtain 4mA
LED 5 should light.
Adjust with P6 to obtain the same setpoint as before (e.g.: kVAr = 0)
If this is not possible, set jumper CA1 to 2, then repeat the same tests.
Apply 20mA
Adjust with P15 to obtain the maximum inductive kVAr.
With this setting, when the current varies from 4 to 20mA, kVAr varies from 0 to the specified inductive kVAr values.
In the absence of a 4/20mA current, the setpoint automatically returns to the internal setpoint value for the function concerned and contact C9 is closed.

3.4.3. Voltage setpoint adjustment:

Do not apply the 4/20mA current
Set CA1 to position 2, CA4 to the ON position, P15 = 5
Run the alternator at no load with Un –5%Un.
Apply the 4/20mA current – Adjust to obtain 4mA
LED 5 should light.
Adjust with P6 to obtain Un –5%Un
If this is not possible, set jumper CA1 to 2, then repeat the same tests.
Apply 20mA
Adjust with P15 to obtain Un + 5%Un.
With this setting, when the current varies from 4 to 20mA, the voltage varies by +/ -5%Un.
In the absence of a 4/20mA current, the setpoint automatically returns to the internal setpoint value for the function concerned and contact C9 is closed.

3.4.4. Mains PF adjustment:

Do not apply the 4/20mA current
Set CA1 to position 1, CA5 to the ON position, P15 = 5
Connect the alternator to the mains and select the alternator PF adjustment function (2F)
Apply the 4/20mA current – Adjust to obtain 12mA
LED 5 should light.
Set P6 to the centre position.
Close the mains PF contact connected to terminals J2-17/18
LED 4 should light.
If the adjustment differs, set jumper CA1 to 2.
Adjust the gain, if required, with P15 (position 10 = maximum gain)
In the absence of a 4/20mA current, the setpoint automatically returns to the internal setpoint value for the function used and contact C9 is closed.

3.5. External voltage potentiometer:

The external voltage potentiometer of the R 449 or R 452 (470Ω for +/-5%Un and 1kΩ for +/-10%Un) is transferred to terminals J3-24/25 of the R 729 when these are combined with the R729.

Limiting functions

3.6. Limitation of minimum excitation current

This function only acts when the alternator is in parallel with the mains.
It controls the excitation current to adjust the amount of reactive power that the alternator can absorb at very low load and at full load.
Potentiometer P10 adjusts the amount of reactive power that the alternator can absorb at very low load.
Potentiometer P9 adjusts the amount of reactive power that the alternator can absorb at full load.
The function is activated by setting jumper CA10 to the ON position and deactivated by setting it to the OFF position
While the excitation current is limited, LED 10 (red) is lit and contact C10 is closed (terminals J4-41/42).

3.7. Limitation of maximum excitation current

This function controls the excitation current to limit the alternator's stator current when in over-load or in the event of repeated load surges. This limitation takes effect after a time delay of 10 seconds and at 110% of the excitation current.
This threshold is adjusted with potentiometer P8.
The function is activated by setting jumper CA8 to the ON position and deactivated by setting it to the OFF position
While the excitation current is limited, LED 8 (red) is lit and contact C8 is closed (terminals J4-39/40).

Note: When the alternator is short-circuited, the maximum excitation current is controlled with potentiometer P5 on the R 449 or R 452 unit.

3.8. Limitation of stator current

This function limits the stator current (such as when starting-up large motors), by lowering the voltage (e.g.: 1.5xIn).
This threshold is adjusted with potentiometer P7.
The function is activated by setting jumper CA7 to the ON position and deactivated by setting it to the OFF position
While the stator current is limited, LED 7 (red) is lit and contact C7 is closed (terminals J4-37/38).

Fault detection

3.9. Overvoltage detection:

This function detects when the voltage exceeds a preset threshold value.
The threshold is adjusted with potentiometer P11.
When overvoltage occurs, LED 11 (red) is lit and contact C11 is closed (terminals J4-43/44).

3.10. Rotating diode fault detection:

This function detects rotating diodes that have cut-out or short-circuited
The fault threshold is adjusted with potentiometer P12
When a faulty rotating diode is detected, LED 12 (red) is lit and contact C12 is closed (terminals J4-45/46).

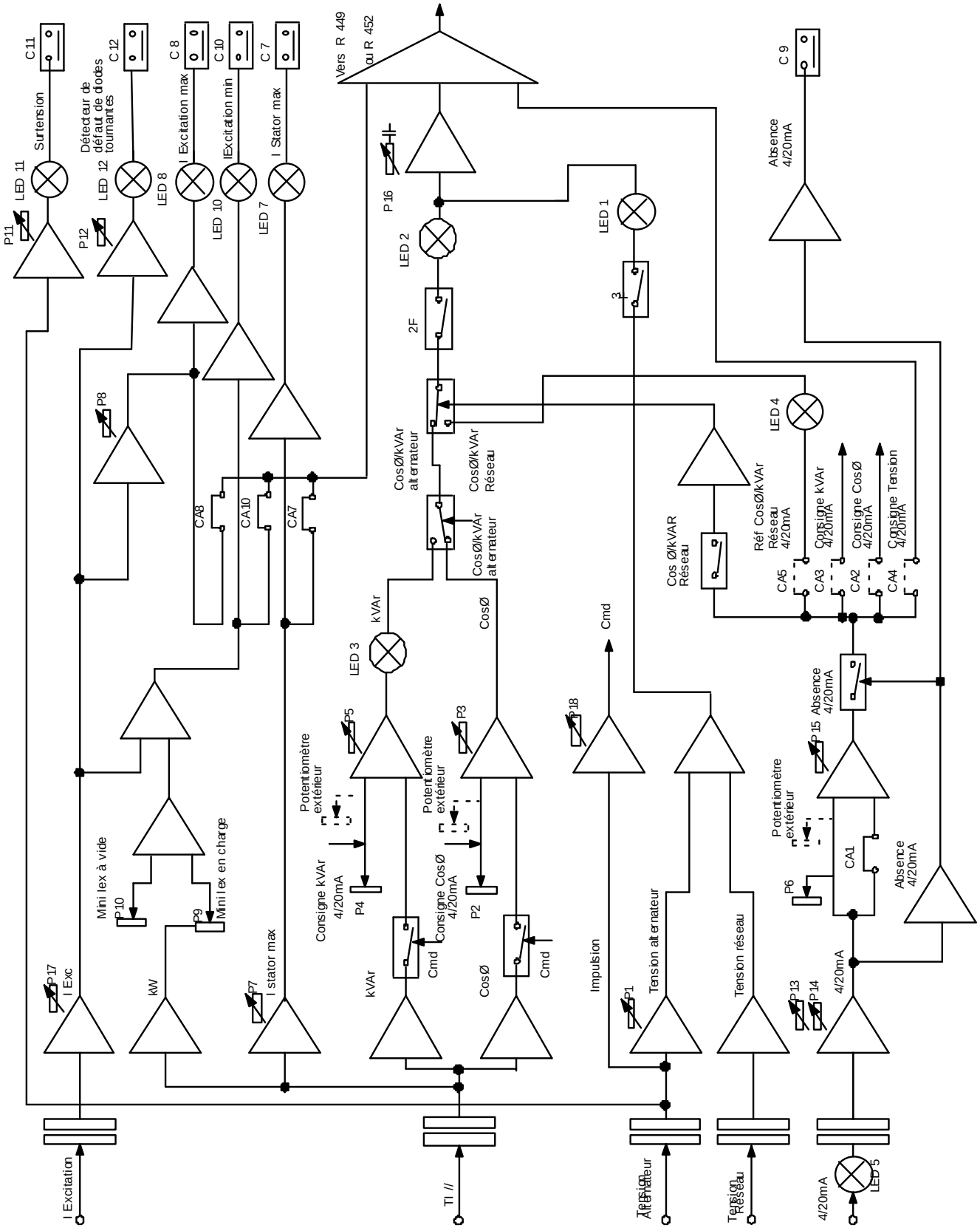
3.10.1. Rotating diode fault detector adjustment:

Disconnect the stem of a diode from the rotating rectifier bridge and mechanically attach it to another part of the bridge in such a way that the anode and the cathode of the diode are at the same potential. Disconnect the wires from terminals J4-45/46 in order to avoid a fault tripping the unit. Run the alternator at its rated speed and voltage. The alternator must remain at no-load. It can operate at no-load with one branch of the rectifier bridge open. Adjust P12 so that LED 12 just lights. The detector is now set.
Note: As the diode fault detector is powered by the alternator, the fault will no longer be indicated when the alternator shuts down.

Note: Generally speaking, as the contacts and the LEDs are powered by the alternator, signalling will no longer be maintained when the alternator shuts down.

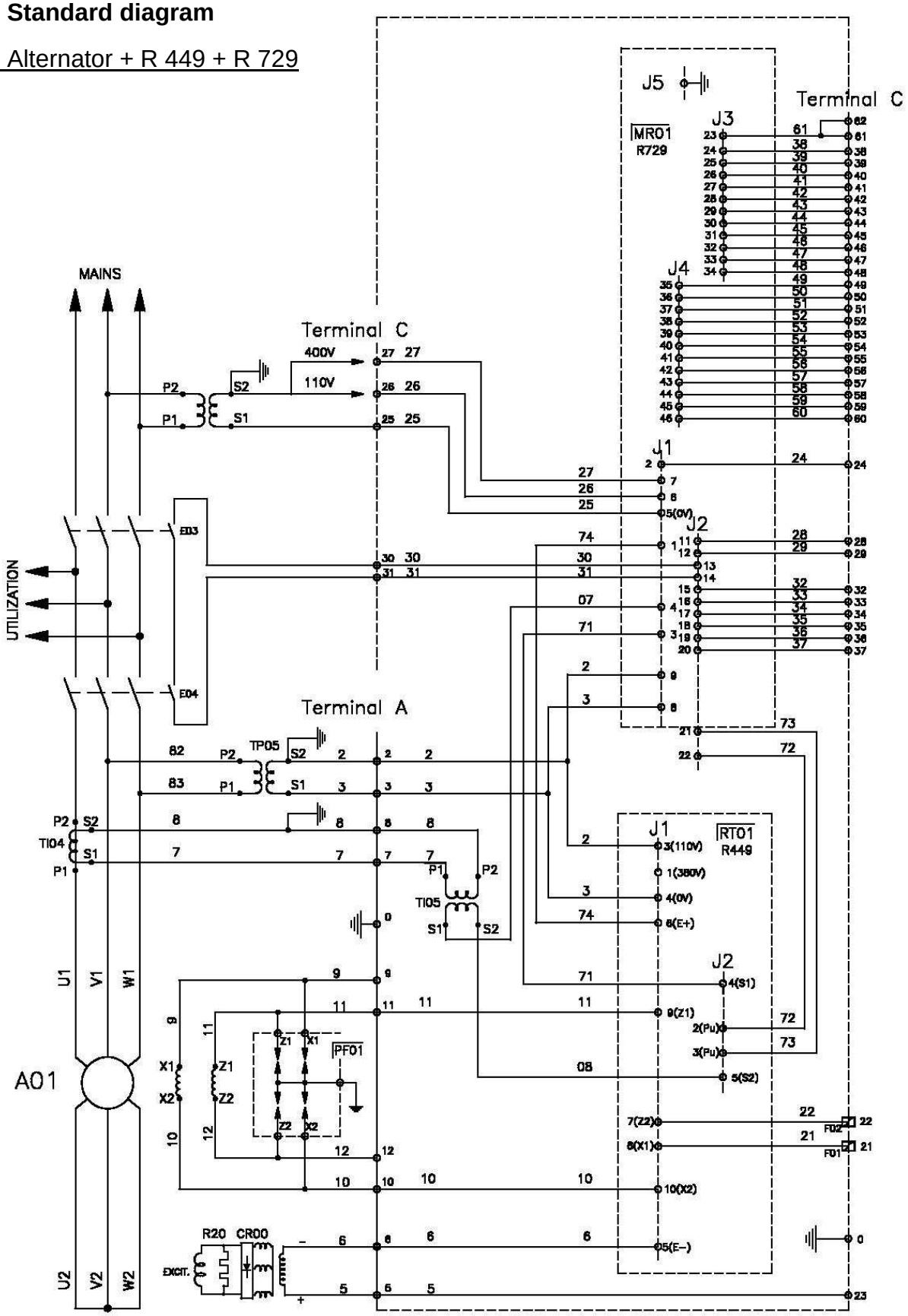
4. Diagrams

4.1. Block diagram

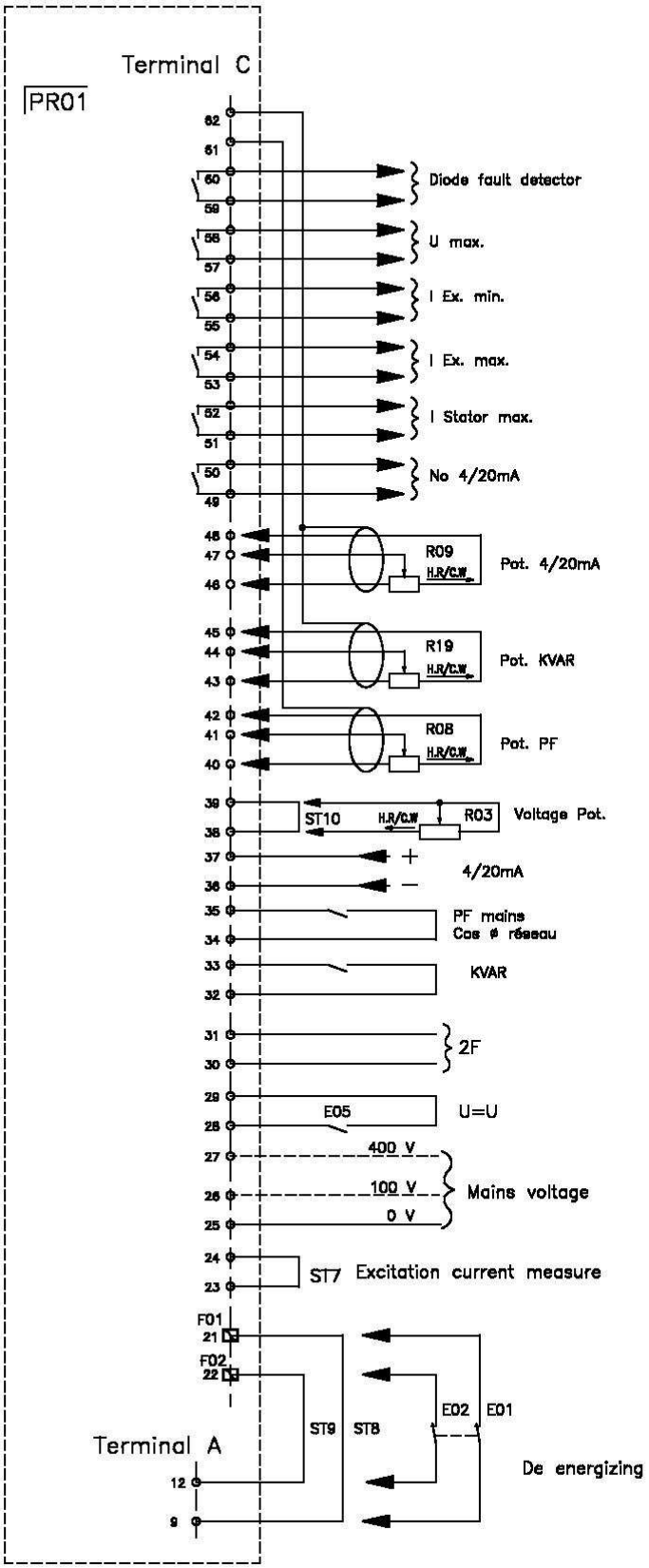


4.2. Standard diagram

4.2.1. Alternator + R 449 + R 729



4.2.2. Terminal block C:



5. Commissioning

- Case of a regulator mounted in the terminal box:
It is recommended to perform initial tests in the as-delivered state. Once these tests are completed, any external potentiometers and/or contacts can be connected in accordance with the wiring diagrams provided with the machine.

- Case of a cabinet-mounted regulator tested with the alternator:
Connections to the machine must be checked, and in particular the voltage, stator current and excitation current detection inputs.

- Case of a replacement regulator not tested with the alternator:
  - Set the potentiometers to the same positions as on the original regulator.
  - The initial tests will be performed without the limitations or the 4/20mA function. Jumpers CA2, CA3, CA4, CA5, CA7, CA8, CA10 must therefore be set to the Off position

  - Run at no-load and full load, then connect to the mains.
  - Adjust the functions U=U, cosφ, kVAr and stability
  - Stop the alternator

  - Set limit adjustments

  - Setting the minimum no-load excitation current:
    - Set jumper CA10 to the ON position, run the alternator at no-load then adjust P10 until LED 10 just goes out.

  - Setting the minimum full load excitation current:
    - Connect the alternator to the mains and set to PF=0.95 leading, then adjust P9 until LED 10 just goes out.
    - Stop the alternator.

  - Setting the maximum full load excitation current:
    - Set jumper CA8 to the ON position
    - The threshold is set at 110% of the excitation current.
    - Connect to the mains and run the alternator at its rated power with a PF giving 110% of the excitation current, then adjust P8 until LED 8 just goes out.
    - Stop the alternator.

  - Setting the maximum stator current:
    - Set jumper CA7 to the ON position
    - The current threshold will be set according to the load to be started-up (e.g.: 1.5In).

  - Activation of the 4/20mA function
    See paragraph 34

6. Troubleshooting

SYMPTOM	PROBABLE CAUSES	SOLUTIONS
- Cannot adjust U=U function voltages	- Input voltages	- Check input voltages and connections to the terminals of the R729
- Cannot obtain the requested value of PF (no 4/20mA function)	-Limits - Poor vectorial composition	- Remove jumpers CA8, CA7, CA10 and perform the tests as indicated in paragraph 36,37,38 - Check the voltage and current connection
- Direction of change of PF, kVAr or voltage reversed	- Terminals J2-21/22 reversed	- Change over terminals J2-21/22
- Incorrect voltage, PF or kVAr setpoints with 4/20mA function activated	- Potentiometers of this function out-of-adjustment	- Review potentiometer P6 and P15 settings
- Incorrect setpoint with an external potentiometer	- Potentiometer setting or poor connection	- check the value of the potentiometer and especially the connection of the cursor.
- Unable to obtain excitation current limitation	- Excitation current connected the wrong way around	- Reverse the connections to terminals J1-1/2
- Instability of setting	- Revise settings.	- To correct general instability: adjust potentiometer P16 - To correct PF instability: adjust potentiometer P3 - To correct kVAr instability: adjust potentiometer P5
- Alternator PF cannot be adjusted	- Mains PF contact closed (terminals 17/18 of J2)	- Disconnect the mains PF contact (terminals 17/18 of J2)
- 4/20mA current present in the customer cabinet, but R 729 LED 5 remains unlit.	- Incorrect 4/20mA connection	- Change-over the incoming wires to terminals 19/20 of J2