



# AVR COMPACT

Automatic Voltage regulator

**USER MANUAL – TECHNICAL DOCUMENTATION**



Part Number: A65Z1 9 0020 B EN  
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### Technical documentation history

Date	Version	Comment
December, 2016	A	Initial edition
May, 2018	B	Update of pictures

CRE Technology believes that all information provided herein is correct and reliable and reserves the right to update at any time. CRE Technology does not assume any responsibility for its use.

You can download the most up-to-date version of this documentation and different other documentations relating to AVR Compact on our web site <http://www.cretechnology.com>.



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## 1 PRESENTATION

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The voltage regulator AVR Compact is a universal shunt AVR for single phase and three-phase generators. With an additional droop CT, parallel operation is possible.

Check the connection diagrams in this manual for the most suitable connection.

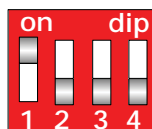
AVR Compact capabilities include:

- Robust and strong mechanical housing
- Easy configuration by dip-switch and potentiometers
- Electrical protections : Under speed and Over current
- CT droop input for parallel operations
- Voltage supply and Voltage sensing separated
- External input for voltage control (Synchronization, power factor, KVAR sharing management)
- Excitation output (Max 12.5 Amps / Voltage = max 35% of supply Voltage)
- PI control for Voltage stability
- Control of % of Droop



**1.1 WARNING****WARNING****Check the generators isolation values before commissioning****DANGER****HAZARDOUS VOLTAGES. Do not operate when not familiar with generators.**

- The system should not be installed, operated, serviced or modified except by qualified people who understand the danger of electric shock hazards and have read and understood the user instructions.
- Never work on a LIVE generator. Unless there is another person present who can switch off the power supply or stop the engine.
- Dangerous voltages are present at the voltage regulator board. Accidental contact with live conductors could result in serious electrical shock or electrocution.
- Disconnect the power source before making repairs, connecting test instruments, or removing or making connections to the voltage regulator or generator.
- Defects in the generator or AVR may cause consequential loss. Precautions must be taken to prevent this from occurring.
- For safety reasons the voltage level potentiometers are best turned completely counter clockwise in order to start at the lowest possible voltage.

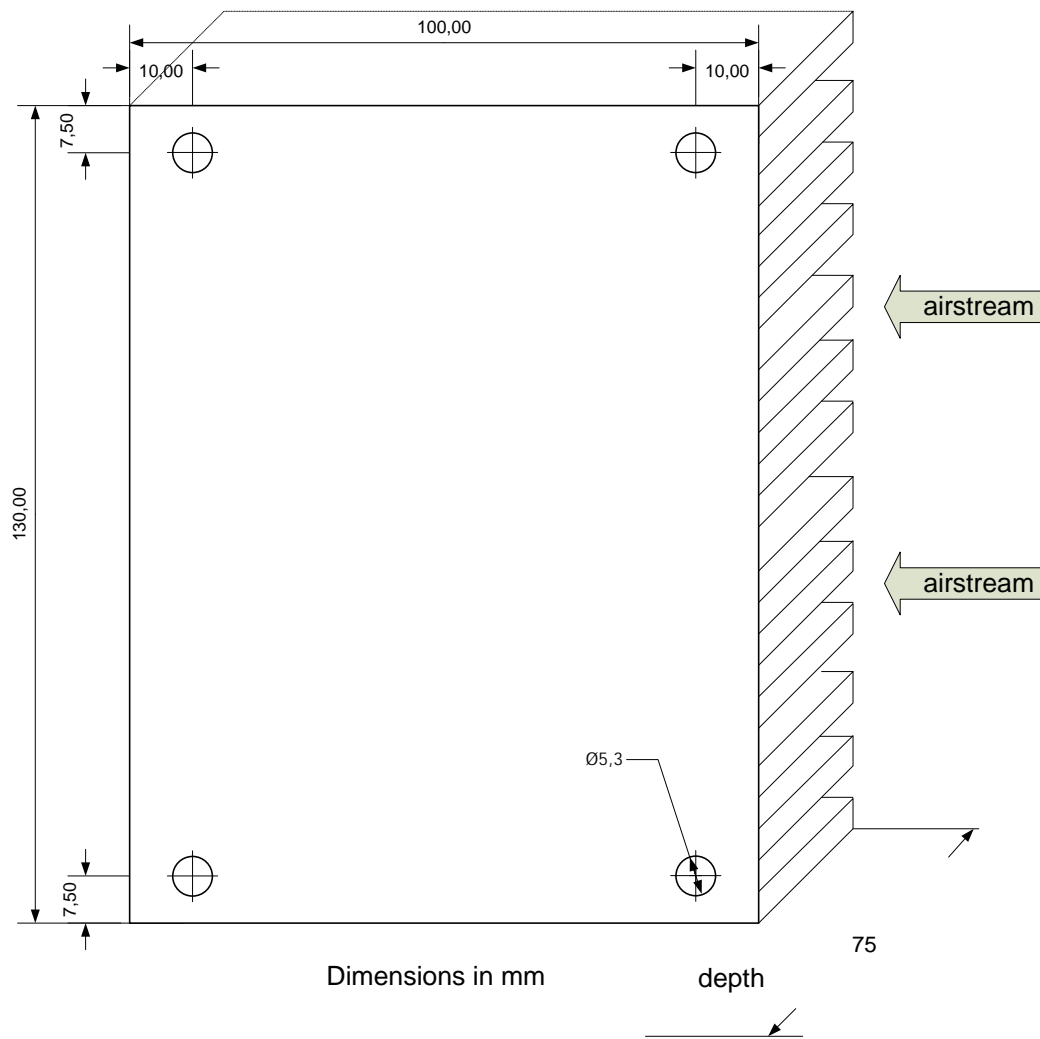
**Failure to follow these instructions will result in death or serious injury****WARNING****Never change the dipswitch settings during operation****WARNING**

The manual does not cover ALL technical details of the product. Specifications may be modified by the manufacturer without notice. For further information, the manufacturer should be contacted.

## 1.2 DIMENSIONS

The AVR Compact is protected against environmental conditions by a PUR coating.

AVR dimensions:



Note : The AVR Compact product, is a provided with a kit of springs, screws, and bolts to help you on mounting.

### 1.3 ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	Min.	Max.	Unit
U, V, W	Sensing Voltage	50Hz, continuously, 230 Volt	-	260	V <sub>AC</sub>
		60Hz, continuously, 230 Volt < 20sec	-	285	V <sub>AC</sub>
		50Hz, continuously, 400 Volt +5%	-	450	V <sub>AC</sub>
		60Hz, continuously, 400 Volt	-	500	V <sub>AC</sub>
+, -	Excitation	continuously	-	10	A <sub>DC</sub>
		intermittent < 10s.	-	12,5	A <sub>DC</sub>
		intermittent < 1s.	-	20	A <sub>DC</sub>
	Excitation Volt, % of LH1-LH2 (example 35% of 230 Volt := 80 Volt )			35	%DC
	Resistance more than			2	Ω
LH1-LH2	Supply voltage	50-120 Hertz	100	295	V <sub>AC</sub>
		Minimum self excitation	3,5		V <sub>AC</sub>
S1, S2	CT Droop, isolated	0,5 or 1 Amp. Selection J1	5VA	0,5 / 1	A <sub>AC</sub>
		intermittent < 30s.		1 / 2	A <sub>AC</sub>
		Intermittent < 5s.		1,5 / 3	A <sub>AC</sub>
T <sub>AMB</sub>	Operating temperature, 95% RHD non condensing		-40	+70	°C
T <sub>STG</sub>	Storage temperature, 95% RHD non condensing		-40	+70	°C
	Static accuracy			1	%

### 1.4 COMMISSIONING INFORMATION

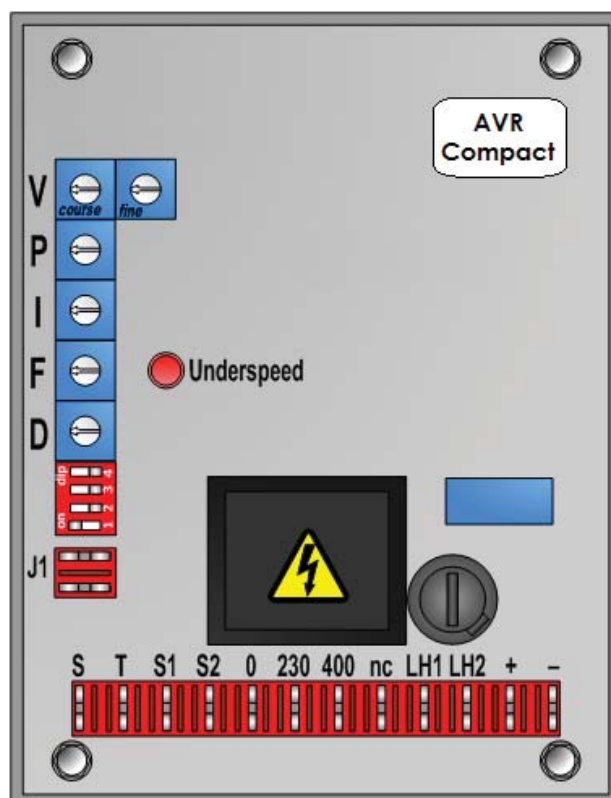
1. The system should not be installed, operated, serviced or modified except by qualified personnel who understand the danger of electric shock hazards and have read and understood the user instructions.
2. Defects in the generator or AVR may cause consequential loss. Precautions must be taken to prevent this from occurring.
3. Never work on a LIVE generator. Unless there is another person present who can switch off the power supply or stop the prime mover.
4. Dangerous voltages are present at the voltage regulator board. Accidental contact with live conductors could result in serious electrical shock or electrocution.
5. Disconnect the power source before making repairs, connecting test instruments, or removing or making connections to the voltage regulator.
6. For safety reasons the voltage LEVEL potentiometers are best turned completely Counter clockwise in order to start at the lowest possible voltage.

The AVR Compact is provided with a Quick Start document, which will help in term of safety for settings and wirings.



## 2 INSTALLATION

### 2.1 THE CONNECTION TERMINALS



Symbol	Description	Notes
Underspeed	Underspeed active LED	When the LED is on, underspeed limiting is active.
Vcourse	Generator voltage course adjustment	
Vfine	Generator voltage fine adjustment	
P	Control loop proportional gain	
I	Control loop integral action	
F	Underspeed frequency setpoint	
D	Voltage droop setpoint	For parallel operation. $Unom \pm 10\%$
Dipswitch.1	Disable extern voltage adjust	On = short terminals S & T
Dipswitch.2	½ phase sensing	On = ½ phase sensing.
Dipswitch.3	Stability range selection	Off = Normal I-time
Dipswitch.4	Underspeed trip	Off = enabled
J1	Droop CT selection	Open = 0.5 A, Closed = 1 A



Connections

male "Faston" 6,3

Sensing

115V, 200-275V, 400-480V

Sensing voltage range:

0 230 400

115V  
200-275V

50% sensing

0 230 400

230V  
400-480V

100% sensing

Supply voltage

100-295 Volt ac, 50-120 Hertz

LH1 LH2

100-295V  
50-120 Hz

Field output

max. 35% of LH1-LH2. 12,5 Amp, R > 2 Ω

+

35% (LH1-LH2) Vdc  
12,5 Amp dc

CT Droop

In / 0,5 or 1 A, 5VA  
phase 2 / V, use two phase sensing

LS=1Amp, Stamford=0,5Amp

S1 S2

S1 S2 Amp :  
1A 0,5A

Phase 2  
U V W

External voltage setter

0K → 0V<sub>ac</sub>  
10K → -/ 45V<sub>ac</sub>

S T

External potentiometer  
0 kΩ : 0V  
10K : 45V<sub>ac</sub>

0-10V<sub>dc</sub> (isolated)  
@ Rx=10K, 1V<sub>dc</sub>/3,5V<sub>ac</sub>  
@ Rx=100K, 1V<sub>dc</sub>/0,2V<sub>ac</sub>

1K

0-10V<sub>dc</sub> isolated

Rx

Symbol	Description	Notes
S/T	External voltage adjust input	If not used set Dipswitch.1 ON
S1/S2	CT input for droop	
0	Neutral voltage sensing input	
230	230V sensing input	
400	400V sensing input	
nc	Not connected	Leave unconnected
LH1/LH2	Supply input	
+/-	Field excitation output	

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## 2.2 QUICK REFERENCE (QUICK START DOCUMENT)

**Volt**

**course**

**fine**

**Stability**

**P<sub>prop. gain</sub>**

**Underspeed**

**F knee**

40Hz 60Hz

*Dip4 off: underspeed enabled, Hertz: Tr/min*

**Droop**

**D**

0% 100%

*I (φ) →*

**DIP switches**

4: on is underspeed disabled  
3: Increase I-action  
2: Half phase sensing voltage  
1: Short terminals S & T  
*Shown are factory settings*

**J1 CT Droop selection**

S1-S2

In : 0,5 A

S1-S2

In : 1 A

**Stability P&I**

overshoot

Prop. Gain

Int. Time Dip 3 : (x 2)

Recovery time

Time →

Stability adjustments must be performed by an expert.  
Lower supply voltages result in better stability

@ excitation currents << 100mA, a parallel resistor for E+&E- may improve stability

**AVR Compact**

**V**

**P**

**I**

**F**

**D**

underspeed

**Fuse 10AT**

**J1**

**S T S1 S2 0 230 400 nc LH1 LH2 + -**

**Ext.**

0 kΩ: 0V  
10k: 45V<sub>ac</sub>

**CT**

phase V/L2

Droop CT for Parallel operation CT in Phase V rotation clockwise

S1-S2

In : 0,5 A

S1-S2

In : 1 A

**Sensing**

400-480V gen.  
N U V W  
-230V-  
Three or single phase  
400-480V gen.  
U - 400V - W  
400-480V gen.  
1/2U - 200V - 1/2W  
115-230V gen.  
N 1/2U  
-115V-  
Three or single phase  
rotation clockwise

**Supply voltage**

shunt stator phase

Auxiliaires winding

pmg

Transformer Generator-supplied

Supply Voltage

100-295 Volt ac,  
50-100 Hertz

**Output**

E+ E-

max. 35% of supply voltage  
LH1-LH2  
12,5 Amp.  
R > 2 Ω

If field forcing  
Use an isolated battery

Output +,- is at phase potential

**General**

Voltage regulator  
For three or single phase generator.  
12.5 Amp field current.

Before commissioning:

Generator isolation-value must be > 1 MΩ

Min. field resistance 2 Ω

Self excited from 3,5 Vac (LH1-LH2)

Never break excitation output +,- during operating.

Parallel operation CT:

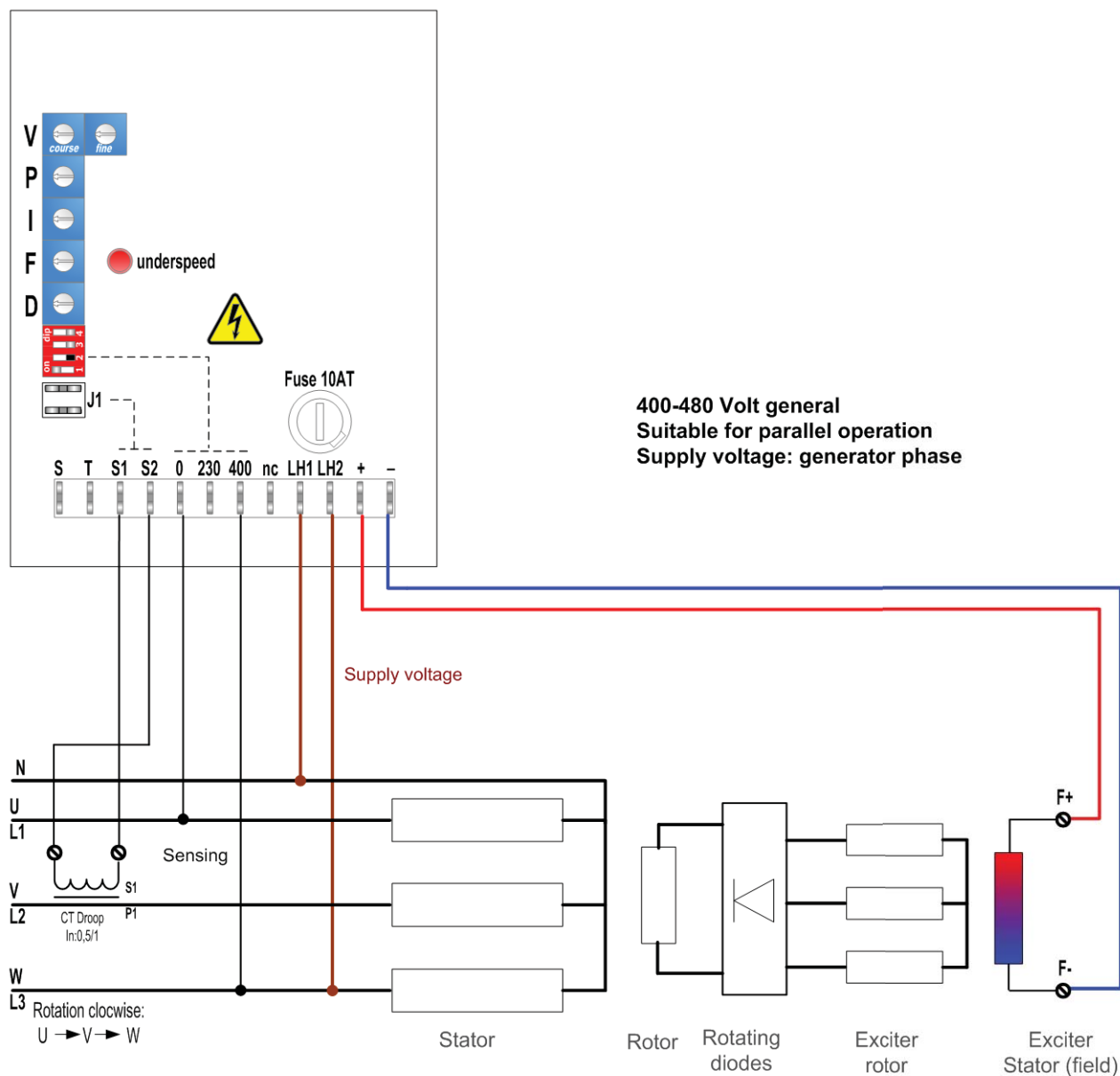
CT Droop Phase V  
P1 S1

Phase sequence  
**U → V → W**

## 2.3 CONNECTION DIAGRAMS

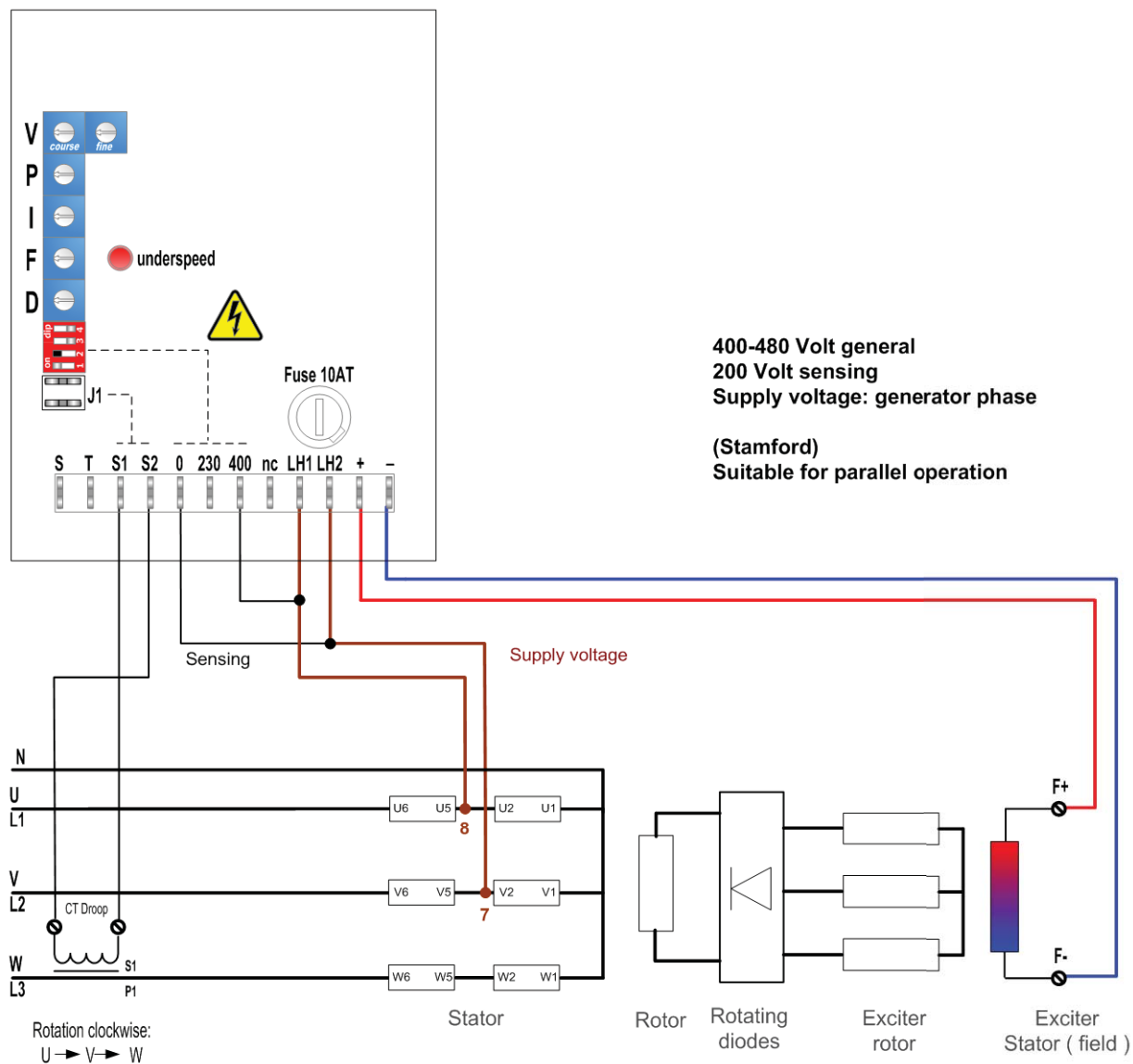
### 2.3.1 400 VAC sensing

Diagram reference for Generator 400-480 AC Volt,  
CT droop current can be connected for parallel operation,  
This diagram is usually used on site.



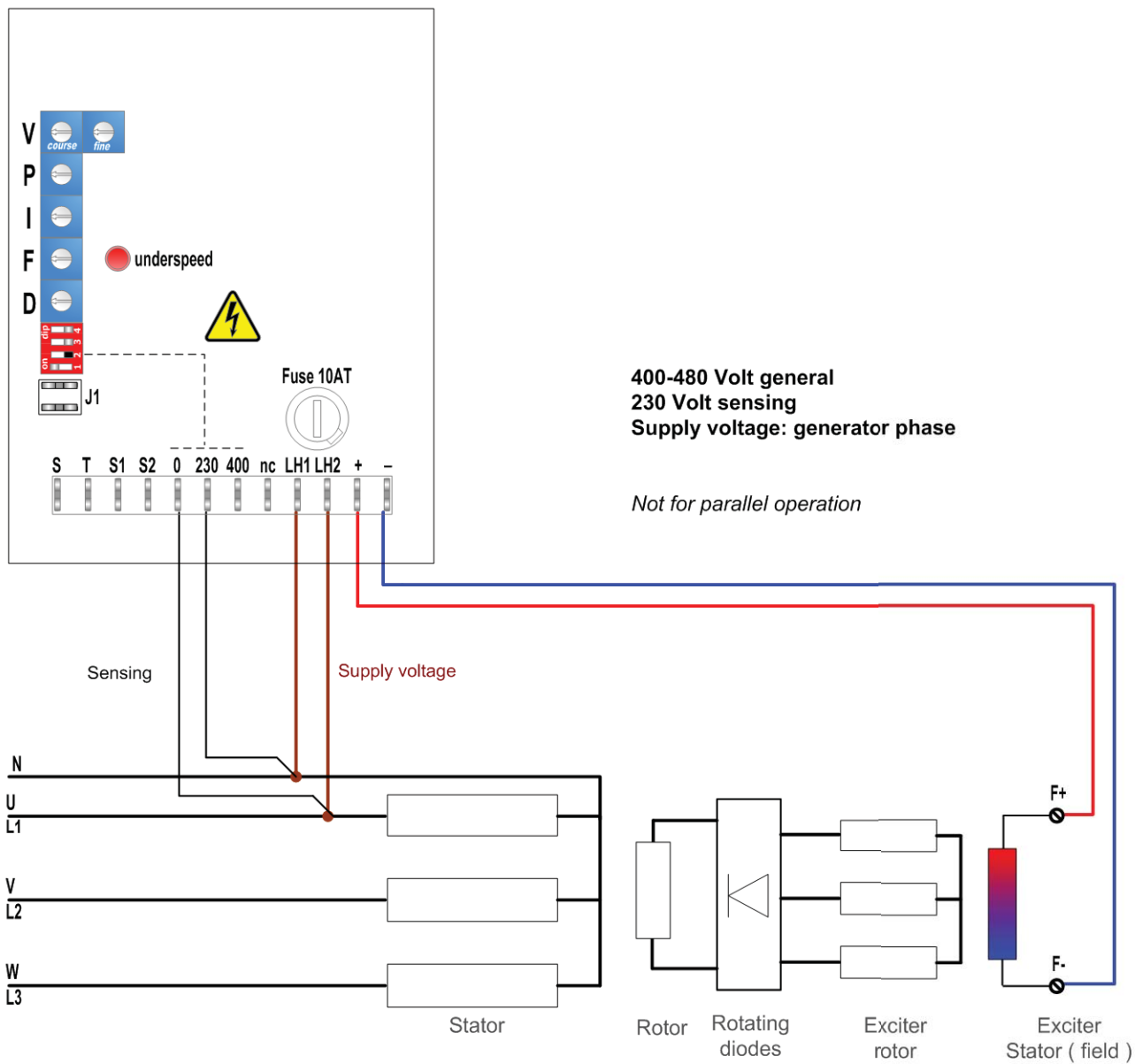
### 2.3.2 200 VAC sensing

Diagram reference for Generator 400-480 AC Volt,  
CT droop current can be connected for parallel operation,  
This diagram is typically used for Stamford and Caterpillar alternators.



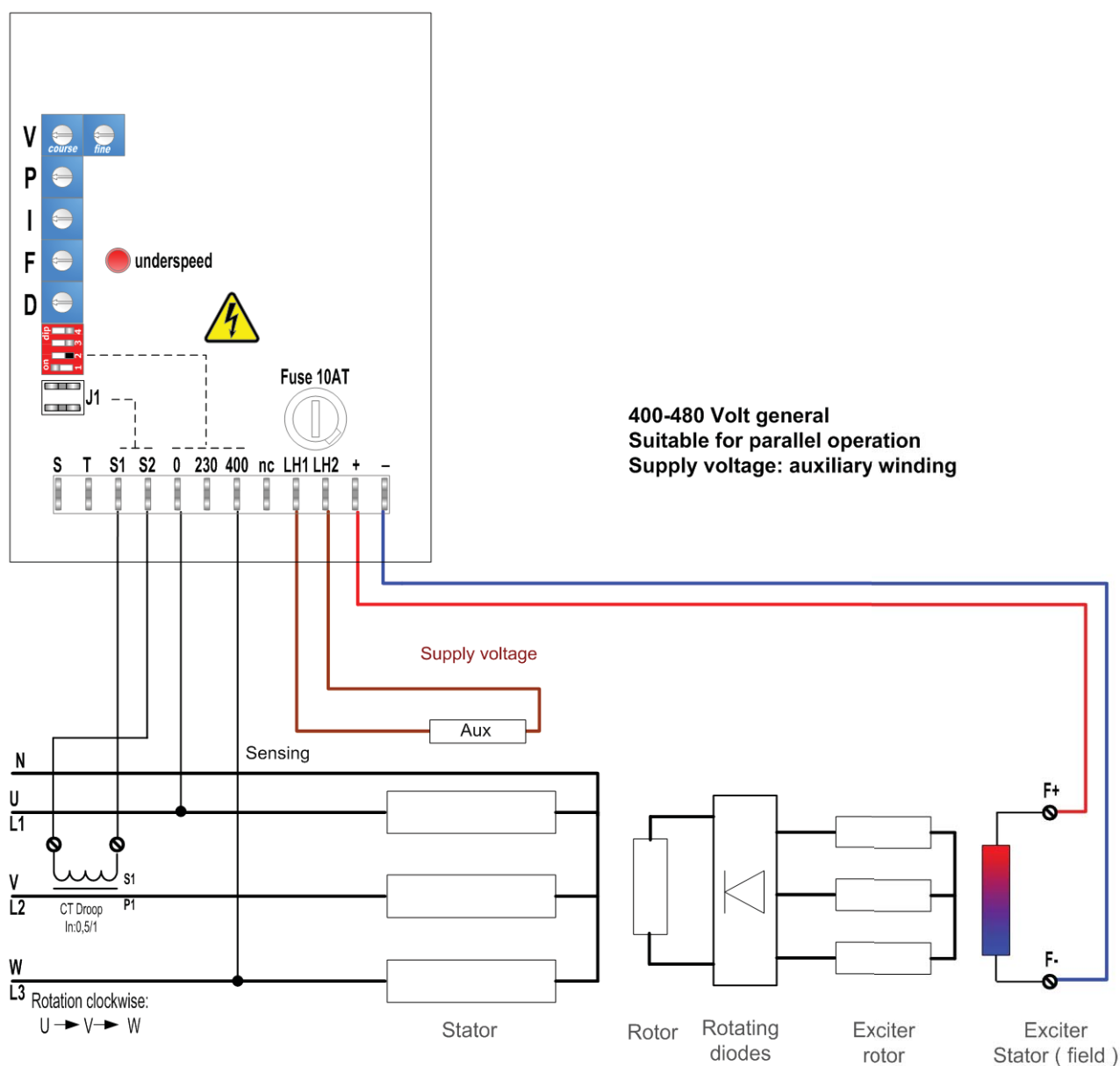
### 2.3.3 230 VAC sensing

Diagram reference for Generator 400-480 AC Volt, or for single phase system  
CT drop current **cannot** be connected. Not use for parallel operation.



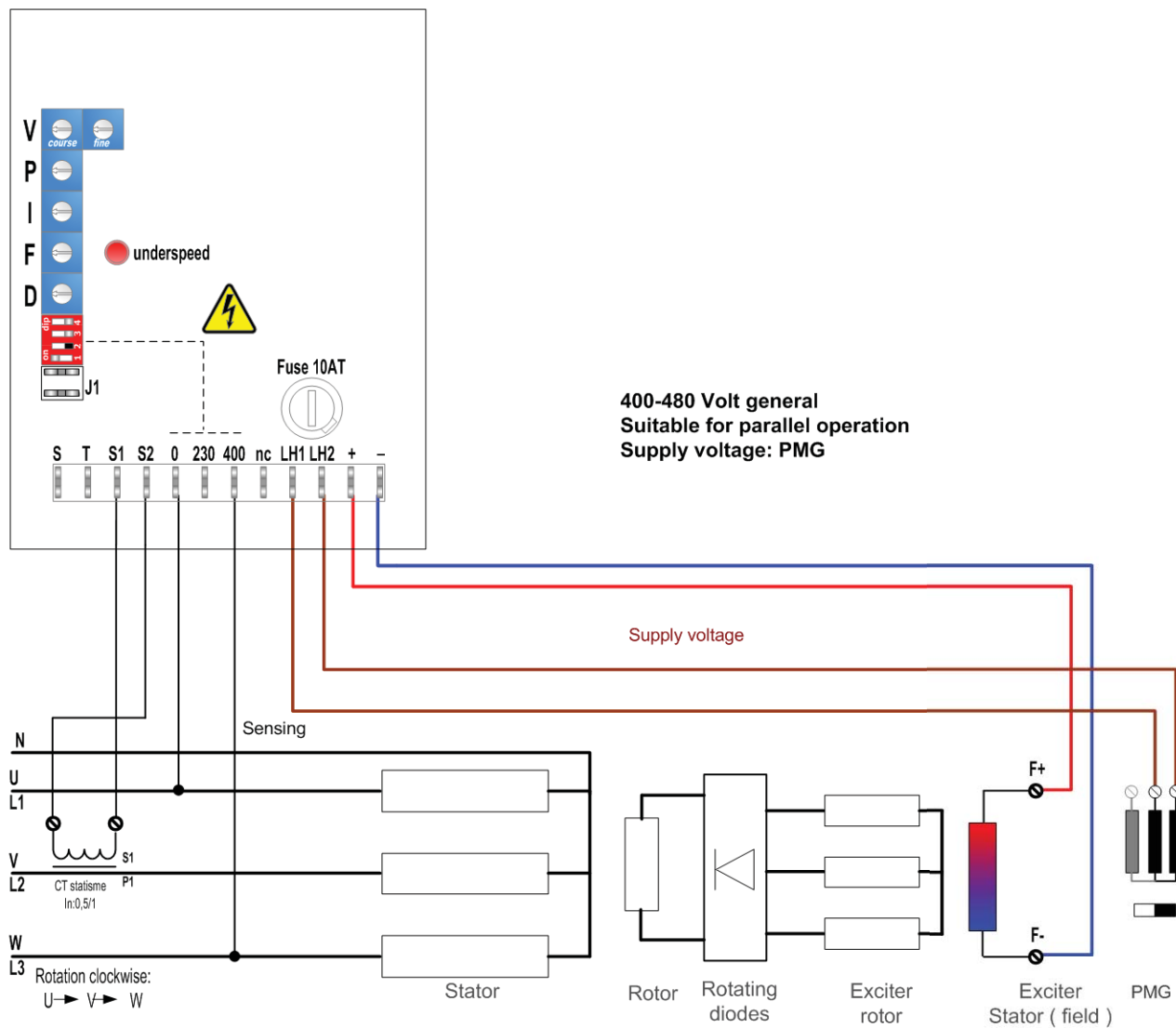
### 2.3.4 Auxiliary supply (Auxiliary windings)

Diagram reference for Generator 400-480 AC Volt,  
CT droop current can be connected for parallel operation.



### 2.3.5 PMG architecture (Permanent Magnet Generator)

Diagram reference for Generator 400-480 AC Volt,  
CT droop current can be connected for parallel operation.

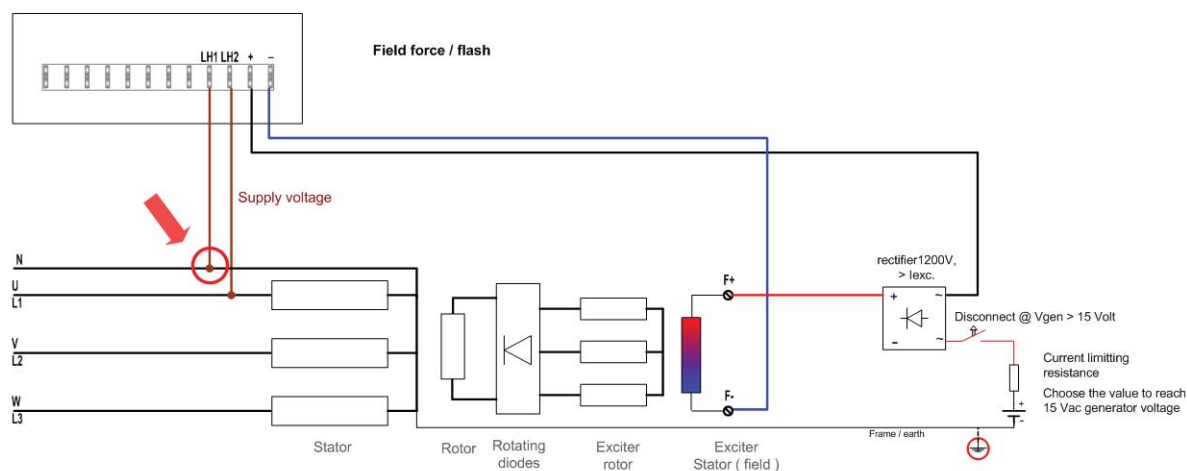


### 2.3.6 Field Force operation

In case of a self excited generator it could be that the residual voltage level is too low for voltage to build up. Causes for a low residual voltage can be prolonged period of stand still, excessive heating or mechanical shock and vibration.

In this case a manual field flash can be operated: follow the instruction of alternator manufacturer , AVR compact must be completely disconnected.

This diagram, can be also manage for Field force flash :



### 2.3.7 Connection with CRE Technology products

Model	AVR gain.	AVR offset	AVR S	AVR T	Comments
<b>GENSYS2.0 range</b>	245	255	H4	H2	Direct Connection
<b>GENSYS Compact UNIGEN 2.0</b>	1.80	2.00	AVR common	AVR output	Put a resistor of 1 Kohms between connection S and T or between connection AVR common and AVR output

**Note :** The resistor 1 Kohms is provided with the AVR Compact product.



## 3 FAULT FINDING

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### 3.1 TROUBLESHOOTING

<b>No voltage at all</b>	<ul style="list-style-type: none"><li>-Excite the generator with a battery</li><li>-Still no voltage : defect in the generator</li><li>-Repeat with the AVR connected</li><li>-If ok, use field force diagram</li></ul>
<b>Too low voltage</b>	<ul style="list-style-type: none"><li>-Check the rpm of the generator</li><li>-Check the rotating diodes</li><li>-Check the various windings</li></ul>
<b>Voltage too high</b>	<ul style="list-style-type: none"><li>-1 defective rotating diode</li><li>-short circuit to earth / frame</li></ul>
<b>Instability</b>	<ul style="list-style-type: none"><li>- Adjust the stability potentiometers</li><li>- Check the rpm</li></ul>

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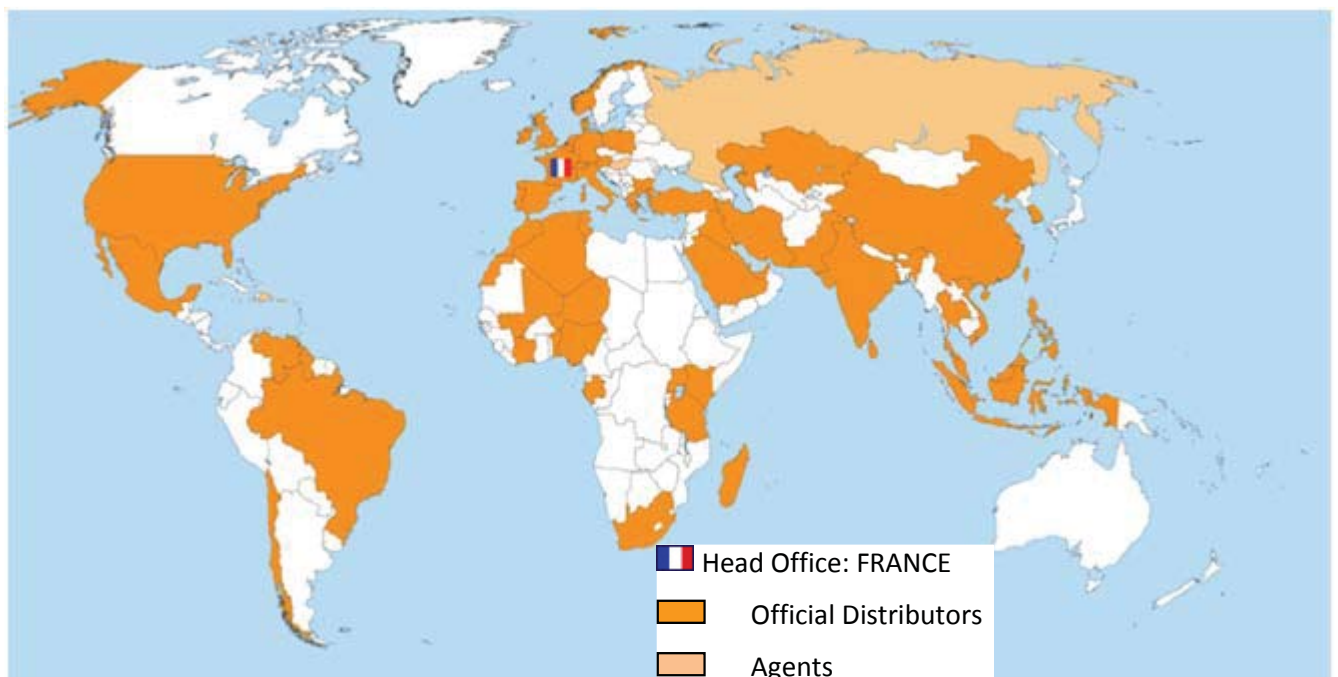
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