

# Stromberg SMUX2R retrofit avr



1-12-2011

retrofit SMUX2R avr

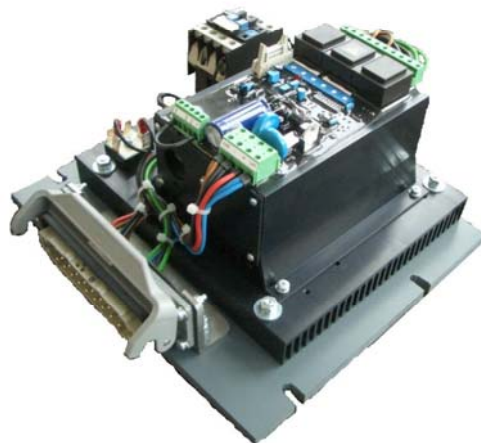
Stromberg HSPTL generators according below schematic diagram are fitted with SMUX2R avr's.

Note that externally from the actual avr's differences may exist !

The retrofit avr, fits on the same physical place, and fits the genuine connector / plug.



Pictures of the genuine avr



Picture of the retrofit avr

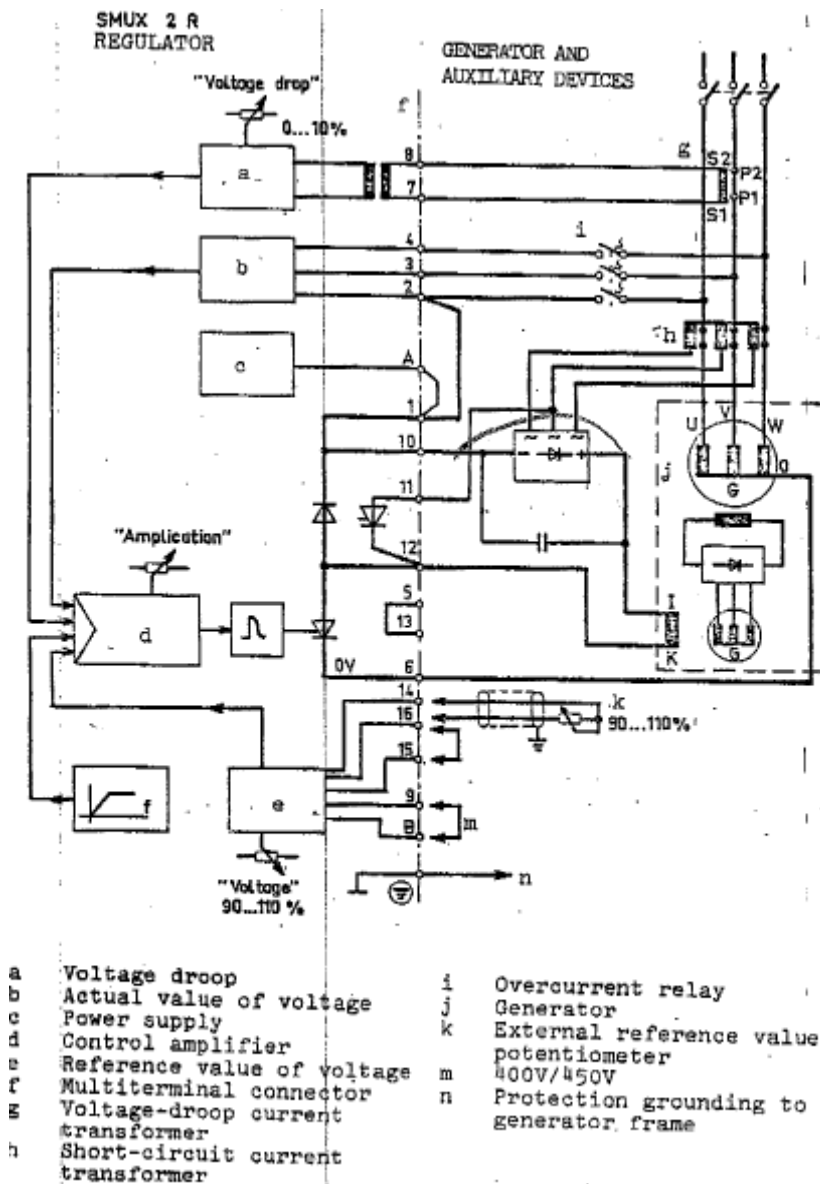
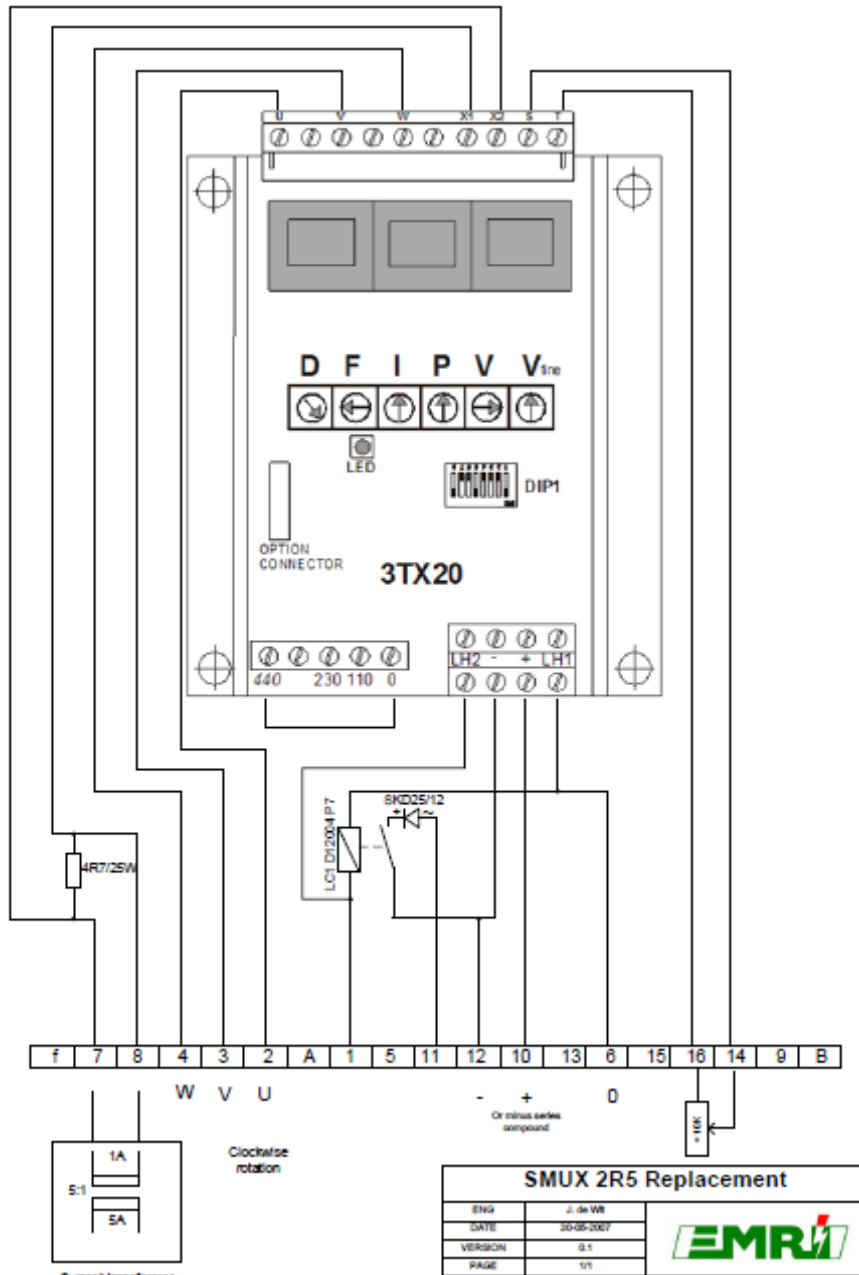


Fig. 2. Block diagram of the SMUX 2 R regulator.

Genuine schematic diagram of the HSPTL ( smux controlled ) generator



Retrofit avr schematic diagram.

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## Droop CT connection:

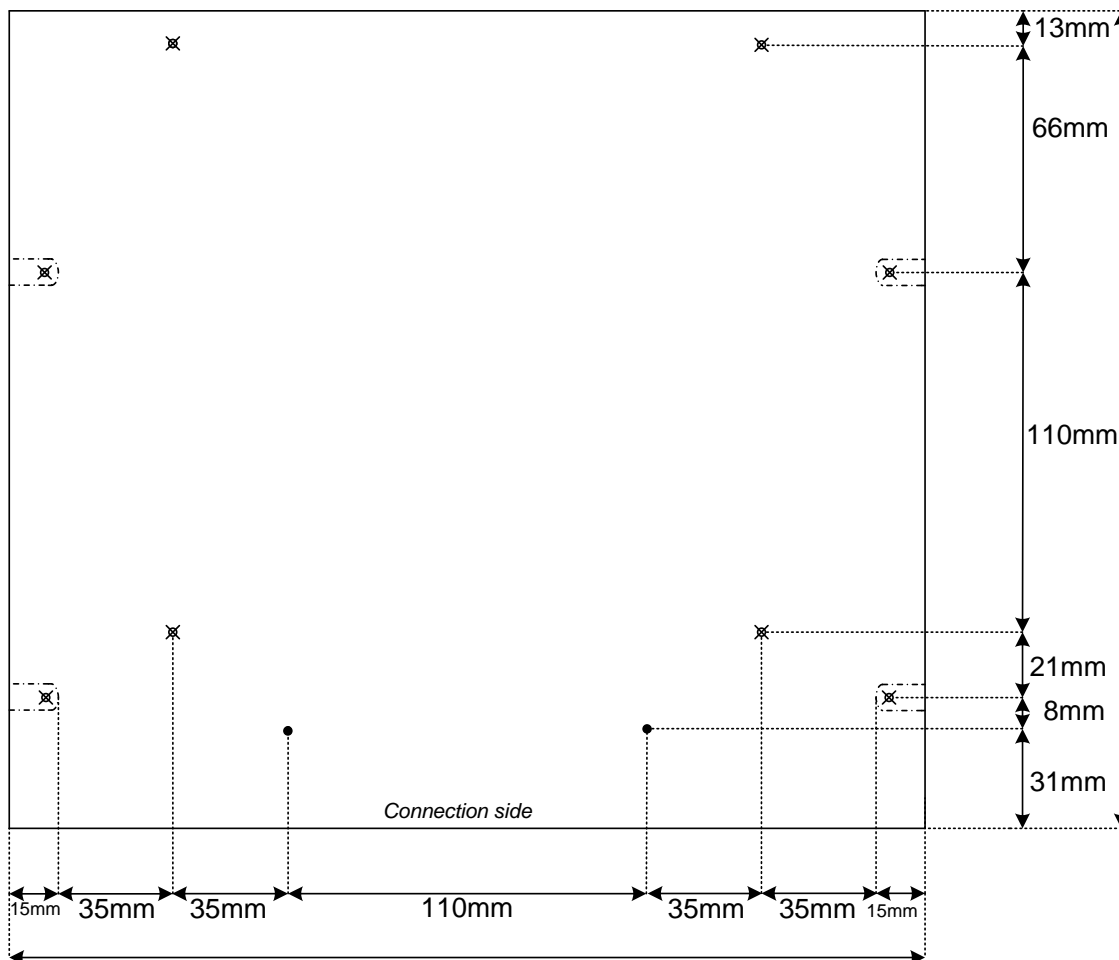
The SMUX 2R replacement avr is build for acceptance / connection to a 1 Amp secondary Droop CT at clockwise direction.

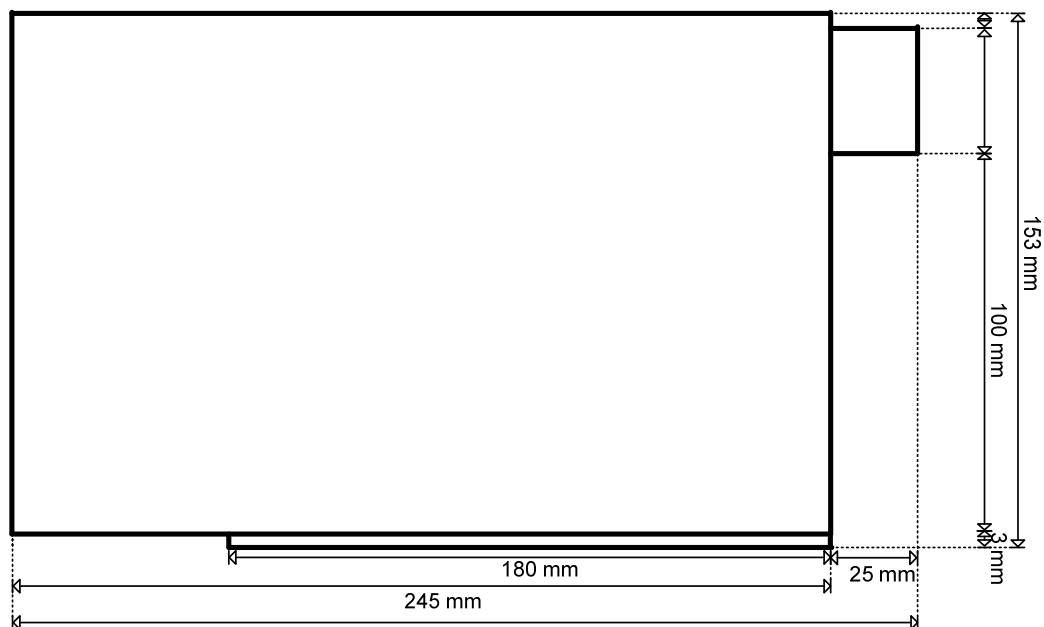
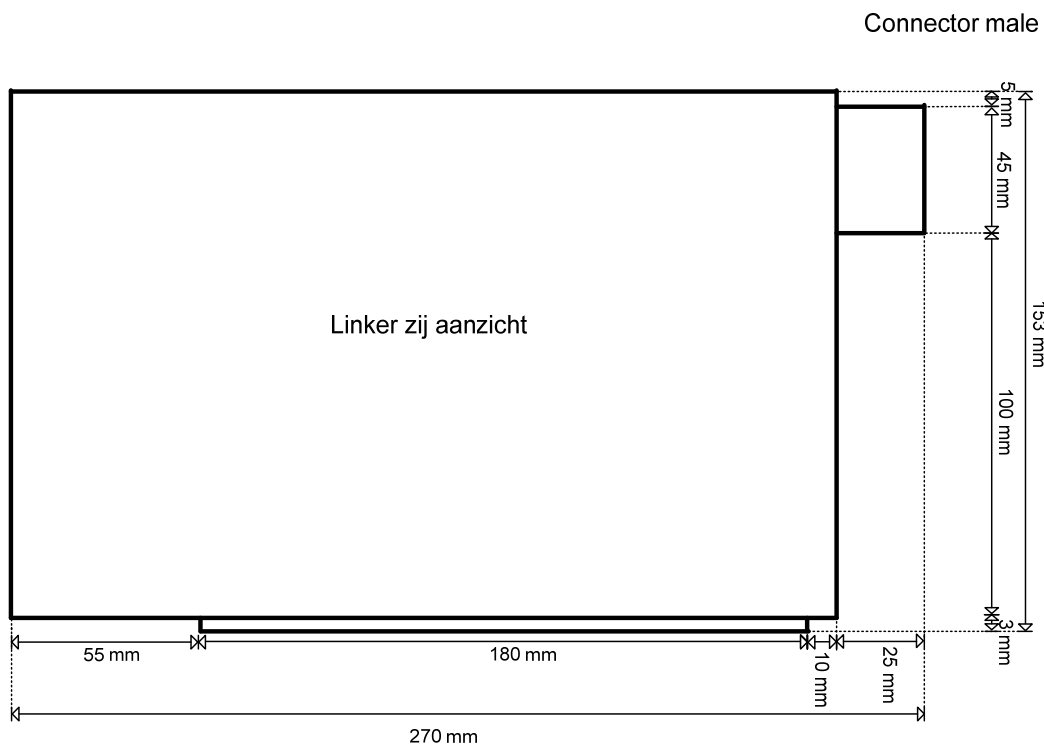
( CT tagged **g** in the manual of the AVR / Generator, fitted in the V Phase )

If the generator which is to be equipped with the SMUX 2R replacement AVR has a current transformer with a secondary current of 5 Amps, you should use the adaptation current transformer 5:1 Amps.

For adjustments: see the attached manual 3TX20 avr.

## Dimensions:





# Stromberg SMUX2R retrofit avr



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retrofit SMUX2R avr



SMUX2R connector side avr male plug:



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# 3TX20 V2.0

- Manual



Jan '08





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## READ THE MANUAL PRIOR BEFORE COMMISSIONING

Application, use or commissioning can only take place by acceptance of the general deliveries conditions of EMRI by which are available upon request.

Check [WWW.EMRI.NL](http://WWW.EMRI.NL) for latest manual / updates / modifications or general installation information.

### INTRODUCTION

This manual provides information for use and application of the product.

This information consists of

- Warnings
- Layout
- Absolute maximum ratings
- Commissioning information
- Dipswitch and potentiometer settings
- Layout terminals
- General installation information and environmental aspects Application Diagrams

**WARNING**

To avoid personal injury or equipment damage:  
Mounting, connecting and commissioning, should be performed by electrical qualified personal only.

**WARNING**

Never work on a LIVE generator.

The manual does not cover all technical details of the product. Also may specifications being modified by the manufacturer without notice.

For further information, the manufacturer should be contacted.

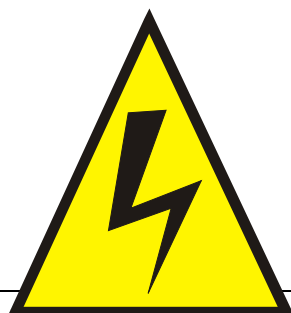


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**ELECTRICAL DANGER**

**LIVE VOLTAGE**



**ELECTRICAL DANGER**

**LIVE VOLTAGE**

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## Introduction

This manual provides information for use and application of the EMRI 3TX20.

This information consists of

- AVR Layout
- Absolute maximum ratings
- Commissioning information
- Dipswitch and potentiometer settings
- Layout terminals
- General installation information and environmental aspects
- Application Diagrams

**WARNING**

To avoid personal injury or equipment damage:  
Mounting, connecting and commissioning, should be performed by electrical trained and qualified personal only.

**WARNING**

Never work on a LIVE generator.  
Unless there is another person present who can switch of the power supply or stop the engine

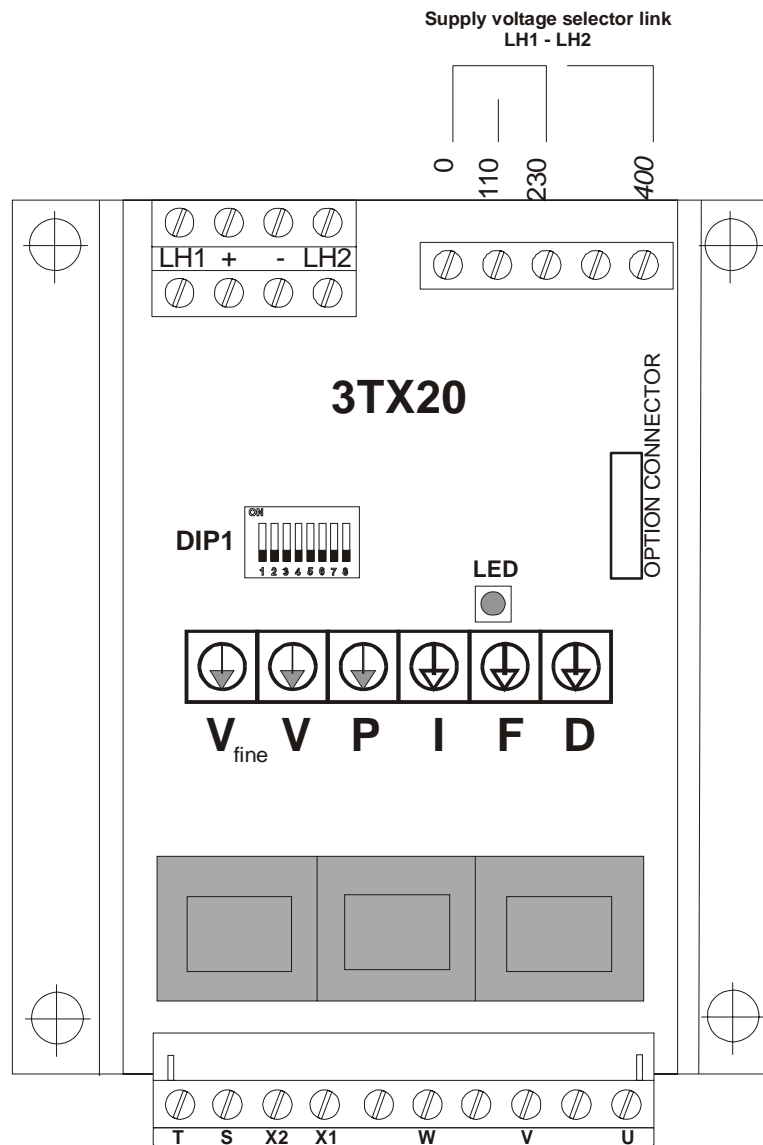
The manual does not cover all technical details of the product. Also specifications may be modified by the manufacturer without notice. For further information, the manufacturer should be contacted.



**ELECTRICAL HAZARDOUS VOLTAGES  
DANGEROUS  
DO NOT OPERATE WHEN NOT  
FAMILIAR WITH  
GENERATORS**



## AVR Layout



**THE AVR IS PROTECTED FROM THE ENVIRONMENT BY AN EPOXY COATING**

**DIMENSIONS :**  
**L X W X H**  
**160 X 145 X 110 MM**  
**WEIGHT:**  
**1850 GR.**

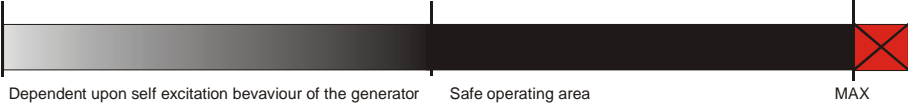
### Absolute maximum ratings / Specifications

SYMBOL	PARAMETER	CONDITION	MIN.	MAX.	UNIT
$U_U, U_V, U_W$	Voltage sensing input	< 30 s.	-	500	$V_{AC}$
Accuracy	Voltage			1 %	
$I_{x1}, I_{x2}$	Droop input			0,75	$A_{AC}$
$I_+, I_-$	AVR field current Forced < 0.5 sec.			20 40	$A_{DC}$
LH1-LH2 110 230 400	Supply input		30* <sup>1</sup> 55* <sup>1</sup> 115* <sup>1</sup>	50 / 60 115/140 230/260 440/480	Hertz V
$R_{field}$	Field resistance	Supply 110 V Supply 230 V Supply 400 V	2.5 5 15	- -	$\Omega$ $\Omega$
$V_{se} *1$	Self excitation (S.E.)	> 5 V	3	10	V
$T_{AMB}$	Operating ambient temperature	non condensing	0	+50	$^{\circ}C$
$T_{STG}$	Storage temperature	non condensing	-45	+150	$^{\circ}C$

\*1 depending upon self excitation behaviour of the generator

### Supply Voltage selection link

Link 110Volt			
50Hertz	30V	90V	115V
60Hertz	30V	90V	140V
Link 230Volt			
50Hertz	55V	175V	230V
60Hertz	55V	175V	260V
Link 440Volt * <sup>2</sup>			
50Hertz	115V	330V	440V
60Hertz	115V	330V	480V

Select the supply voltage range so that MAX. value will never be exceeded

\*<sup>2</sup> Use this high voltage input only upon low current and/or higher voltage exciter value's  
ask the manufacturer when in doubt

### Commissioning information

The unit should be installed with respect to the environmental specifications as well as the rules mentioned in the General installation information. Dipswitch settings may not be altered when operating but need to be set beforehand. For safety reasons the voltage-LEVEL potentiometer is best turned completely counter clockwise, to start at the lowest possible voltage. Potentiometers P and I should be turned to centre position. As a reference the chart below shows generator voltages for different configurations. The option connector should be occupied with the supplied dummy connector, containing some essential inter connections.

### Dipswitch and potentiometer settings

Carefully determine the correct way of connecting the AVR from the suitable application diagram.

Incorrect installation could lead to hazardous situations and damage to generator and AVR. When dipswitch 2 is set to 230V sensing (on), the AVR expects 200 – 325V at it’s inputs. When dipswitch 3 is set to 280V sensing (on), the AVR expects 225 – 375V at it’s inputs. When dipswitch 2 and 3 are **not** set, the AVR expects 280 – 480V at it’s inputs. When dipswitch 1 is set, the self excitation circuit is activated, and the generator excites with residual voltage \*1

DIPSWITCH	1	2	3	4	5	6	7	8
<b>ON</b>	SELF. EXCITED	230V SENSING RANGE	280V SENSING RANGE	PHASE LOSS ENABLED	S & T SHORTENED	NOT USED	NOT USED	UNDERSPEED. PROTECTION ENABLED
<b>OFF</b>	NOT SELF EXCITED			PHASE LOSS DISABLED	S & T OPEN			UNDERSPEED. PROTECTION DISENABLED



POTENTIOMETER	FUNCTION
V COURSE	GENERATOR VOLTAGE ADJUSTMENT
V FINE	GENERATOR VOLTAGE ADJUSTMENT
P-STABILITY	PROPORTIONAL GAIN ADJUSTMENT
I-STABILITY	PROPORTIONAL GAIN ADJUSTMENT
F-UNDERSPEED	UNDERSPEED TRIP LEVEL SEE NOTE
DROOP	VOLTAGE DROOP (PARALLEL OPERATION)

Note: Too low setting F-Underspeed or disabling Underspeed protection may cause damage to the generator or the AVR due to incorrect voltage / frequency ratio.

### Layout terminals

TERMINAL	CONNECTIONS
U,V,W	THREE PHASE SENSING
X1,X2	DROOP CT CONNECTIONS (PARALLEL OPERATION)
S,T	EXTERNAL VOLTAGE SETTING POTENTIOMETER
LH1,LH2	SUPPLY VOLTAGE FOR AVR
0,110,230,400	SUPPLY VOLTAGE SELECTOR
+,-	EXCITER FIELD CONNECTION

### Fuse

20 A	20 AT, 500 V, 10.3 X 38.1 MM
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### Factory Settings Dipswitches

DIPSWITCH	1	2	3	4	5	6	7	8
ON	SELF. EXCITED				S & T SHORTENED	NOT USED	NOT USED	UNDERSPEED. PROTECTION ENABLED
OFF		OFF	OFF	PHASE LOSS DISABLED				



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## General installation information

### Absolute Maximum Ratings

- The Absolute Maximum Ratings are those limits for the device that, if exceeded, will likely damage the device. Exceeding the absolute maximum ratings voids any warranty and/or guarantee.

### Mounting

- Mounting of the product should be done in such a way that the absolute maximum ambient temperature rating of the product will never be exceeded.
- Mounting of the product should be done in such a way that maximum cooling (direction of cooling ribs and direction of airflow) is achieved.
- Mounting of the product should be done in such a way that no humid air can flow through the product or condensation occurs.
- Mounting of the product should be done in such a way that dust or other materials or residue will not remain in or on the product.
- Mounting of the product should be done in such a way that the maximum vibration is not exceeded.
- Mounting of the product should be done in such a way that personal contact with persons is impossible.

### Wiring

- Diameter size of the wiring should be enough to carry the expected current. Wire insulation should be enough to withstand the expected operating voltages and temperatures.
- To improve EMC emission and immunity, care should be taken for the lay out of the wiring. This in respect to all wiring in the installation.
- Keep current carrying wires as short as possible.
- Keep wires carrying a total sum of zero Ampere close to each other, or in one single cable. E.g. U, V, W or + and -, or Phase and neutral, X1 and X2.
- Avoid current carrying conductors next to sensing or control wiring. Especially current controlled by SCR's or PWM controlled transistors.
- If sensitive sensing signal cables need to be laid across distance along other cabling, shielded cable is preferred.  
Keep the shield as long as possible and the wiring outside the shield as short as possible. Do not solder or shrink the shield to a regular wire. Connect the original shield to ground with a as large as possible contact surface.

## Additional installation information

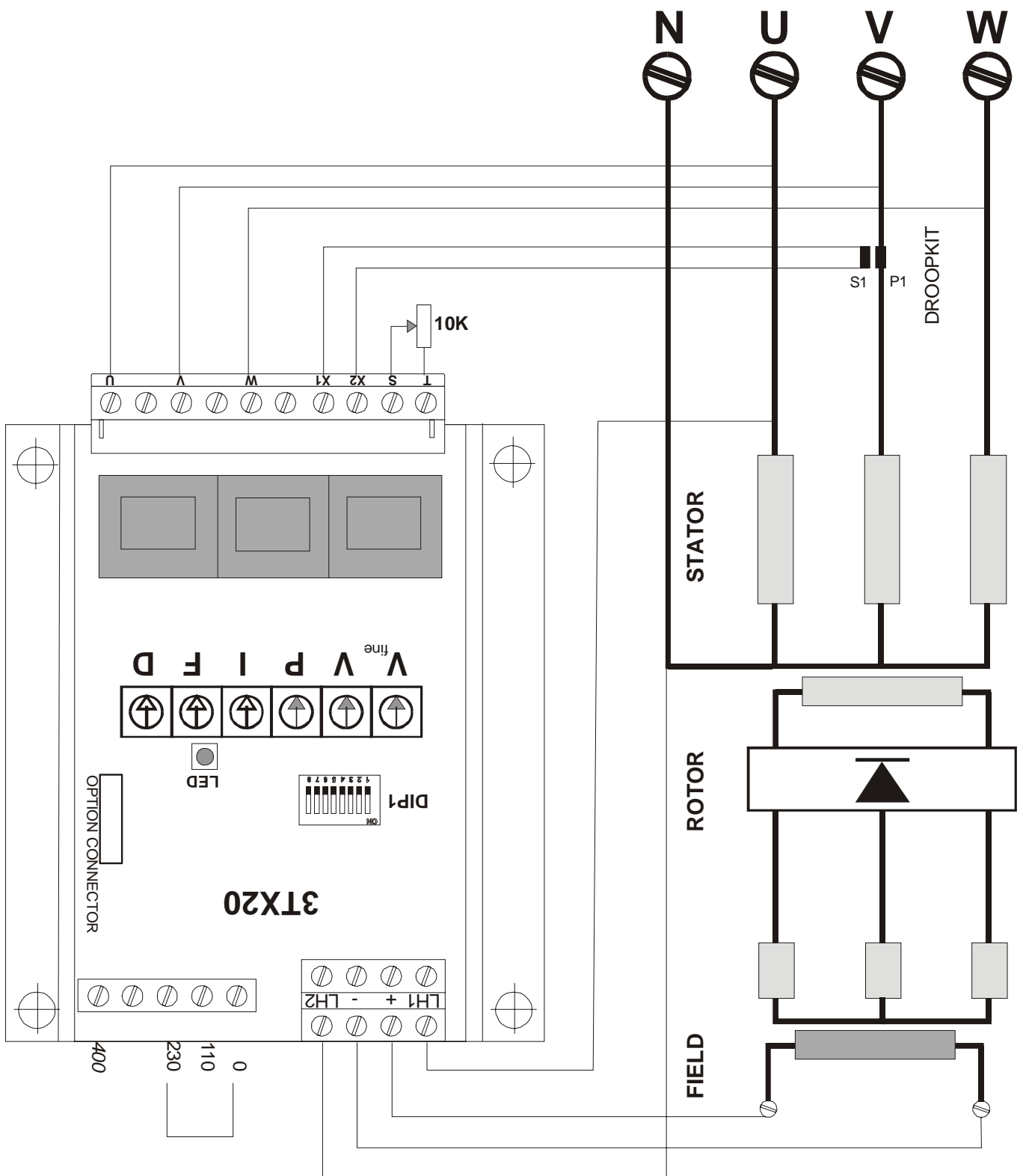
- When the product is supplied by means of a transformer, it should never be an auto-transformer. Auto-transformers react as voltage sweep up coil and may cause high voltage peaks.
- Standard fit capacitors or over-voltage suppressers across F+ and F- or exciter field terminals inside the generator should be removed.
- When the product is supplied by means of a transformer, it should be able to carry at least the maximum expected current. Advisable is, to have a transformer which can carry twice the maximum expected current. Inductive loads make voltage sags and peaks into the secondary voltage of a transformer, from which the device may malfunction.
- It is not recommended to apply switches in dc outputs. It is preferred to use switches in the ac supply inputs of devices. In case it is unavoidable to have switches in the dc output of a device, action must be taken to avoid over voltage damage to the device due to contact arcing. Use a voltage suppressor across the output.
- It is not recommended to apply switches or fuses in the sensing lines. Defects can cause high voltage situations due to over-excitation.
- When using a step down transformer in medium or high voltage generators, the transformer should be three phase (if three phase sensing), and the transformer should be suitable for acting as a sensing transformer. If the transformer is unloaded, connect a resistor to avoid voltage waveform distortion.
- The phase relation from the generator to the AVR is important. Also when voltage transformers and/ or current transformers are installed.
- When using a step down or insulation transformer in the droop circuit, phase relation from the generator to the AVR is important.
- CT's wiring, connected to the AVR should never be grounded.
- Always disconnect electronic products, circuits and people before checking the insulation resistance (Megger check).
- Due to differences in generators impedance's, EMC behaviour is not predictable. Therefore the commissioner / installer should be aware of proper and correct installation.
- Large, highly inductive, exciter stator windings can cause destructive high voltage peaks. Adding a resistor from 10 to 20 times the exciter stator fieldresistance reduces voltage spikes. If necessary, a RC filter can be fitted additionally
- Upon problems during commissioning, faulty behaviour or defects in the generator, consult the fault finding manual at our web site
- Some advises may be overdone or seem extraordinary, but since the electrical rules are the same everywhere, these advises are given.

Application Diagram

230 Volt Supply

GENERATOR OUTPUT, ROTATION CLOCKWISE

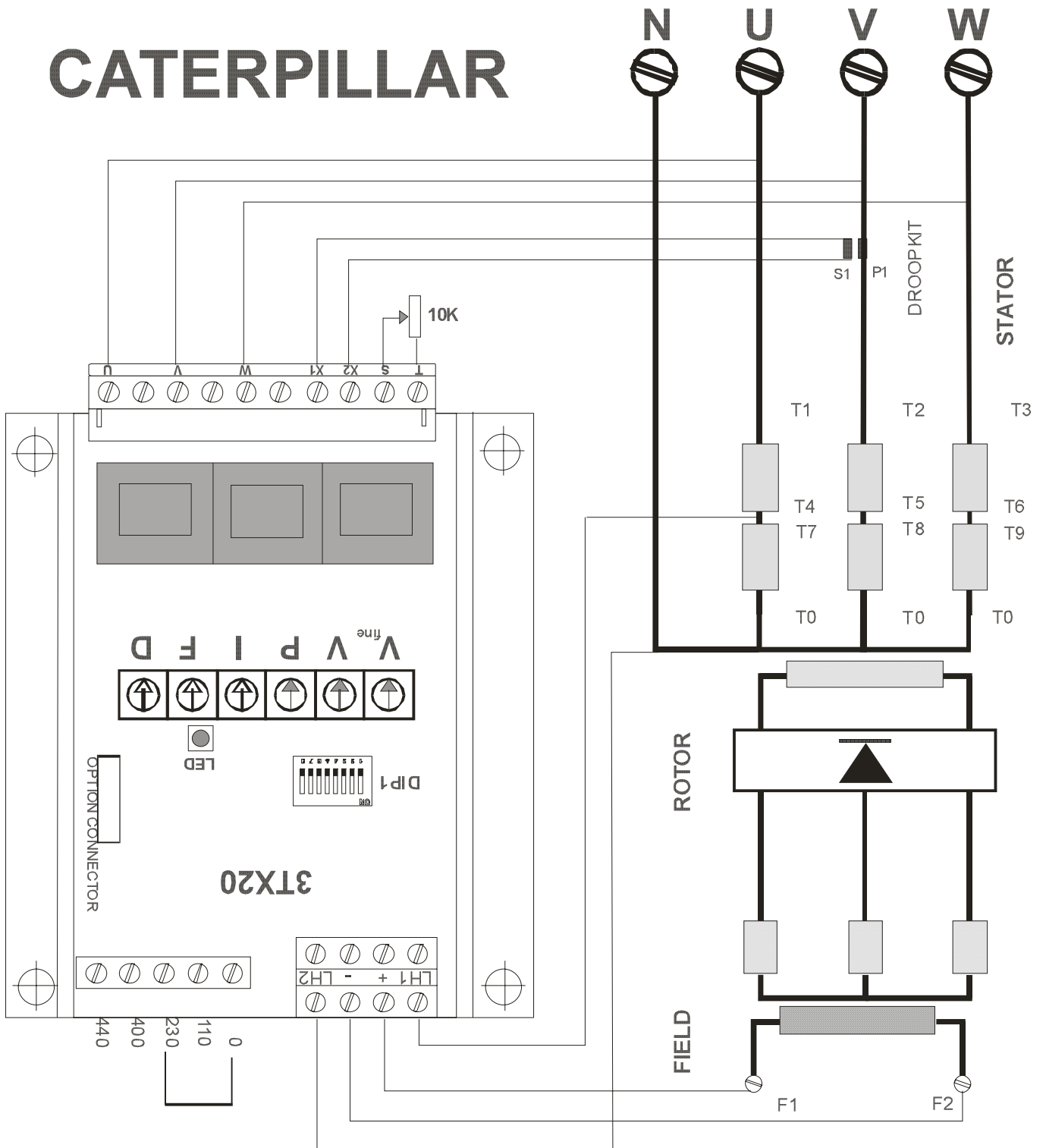
N U V W



Application Diagram

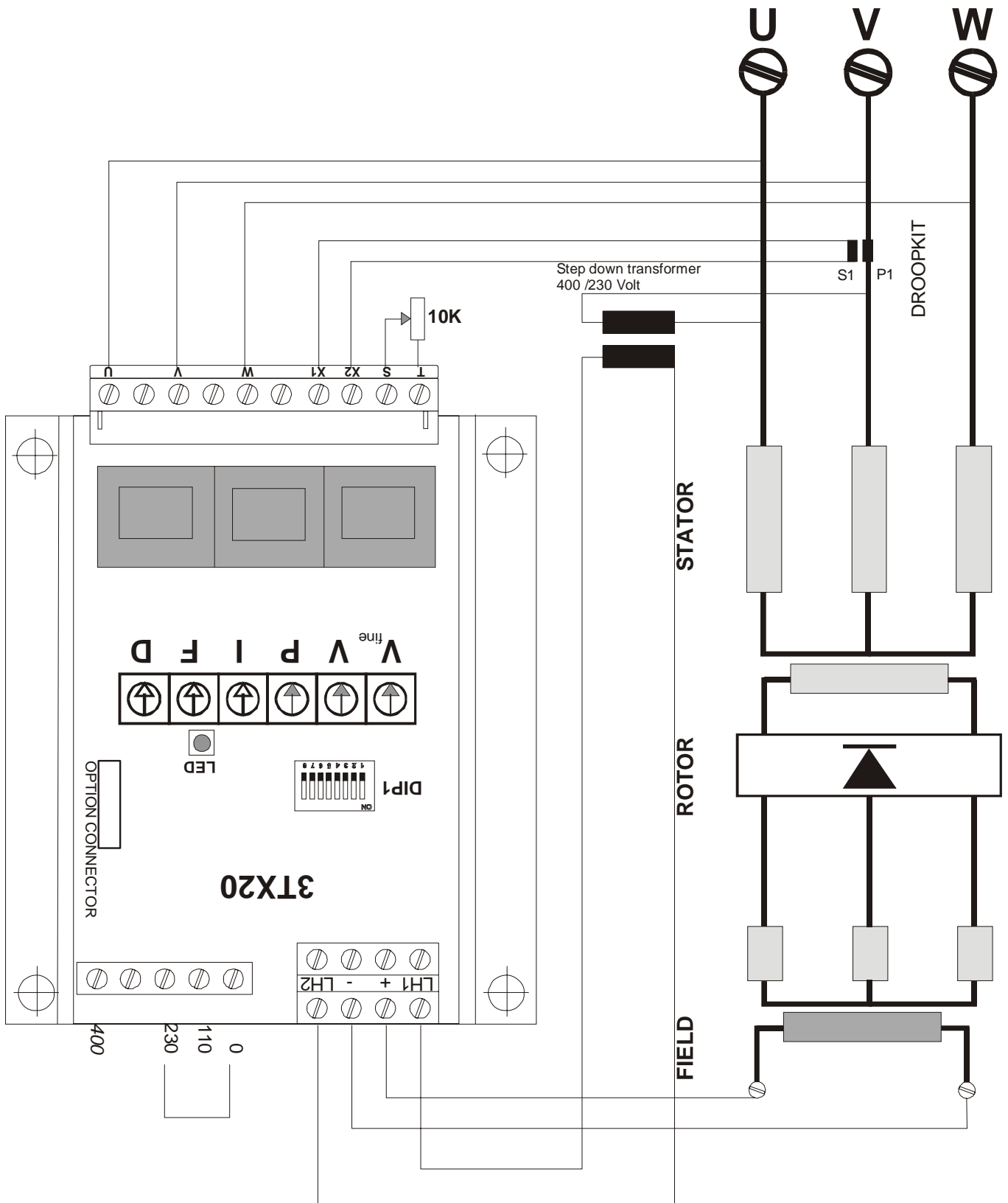
Caterpillar 400-450 Volt  
GENERATOR OUTPUT, ROTATION  
CLOCKWISE

# CATERPILLAR



Application Diagram

Insulation Transformer  
GENERATOR OUTPUT, ROTATION  
CLOCKWISE

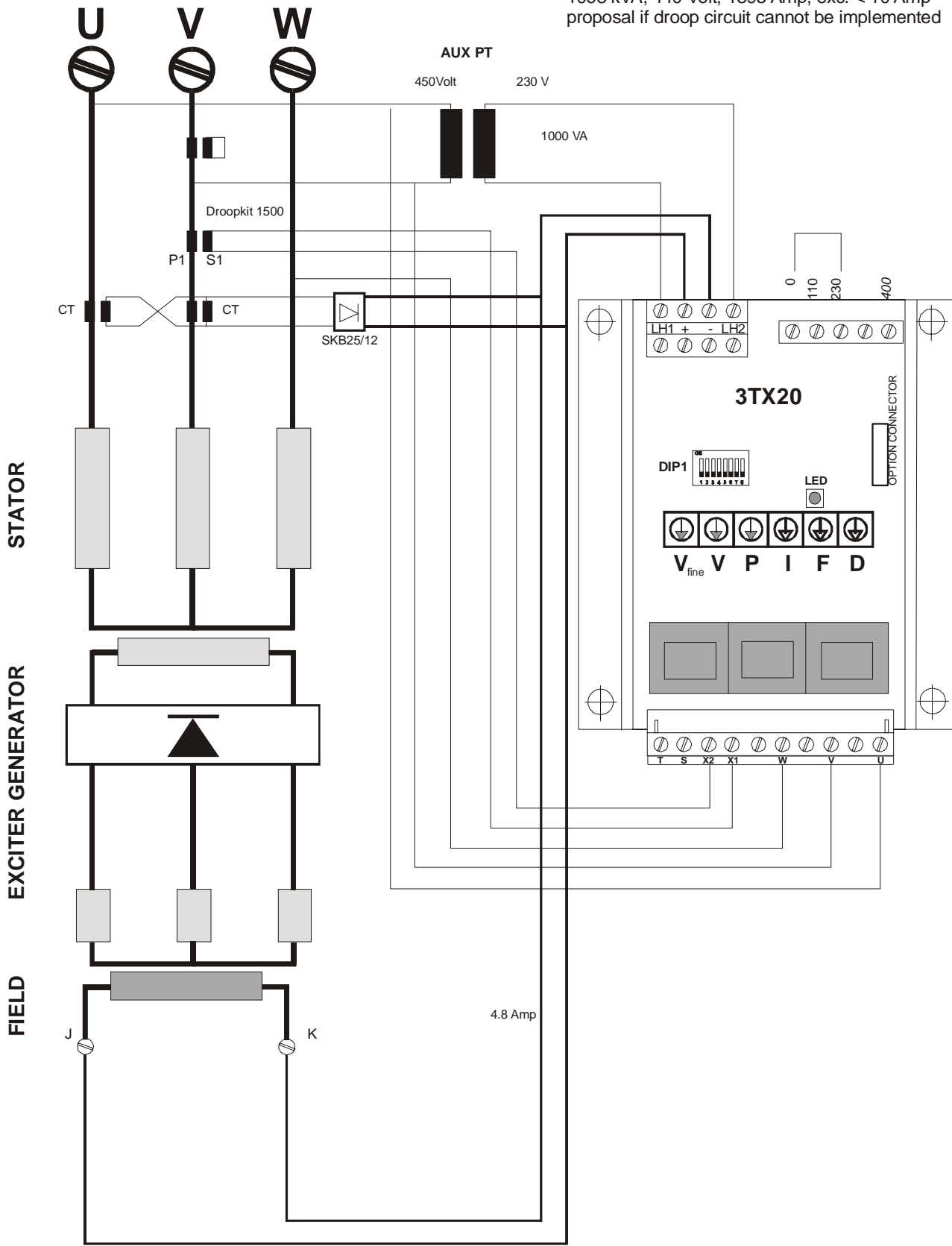


Application Diagram

Nishishiba

**GENERATOR OUTPUT, ROTATION  
CLOCKWISE**

NISHISHIBA GENSET  
1063 kVA, 440 Volt, 1395 Amp, exc. < 10 Amp  
proposal if droop circuit cannot be implemented



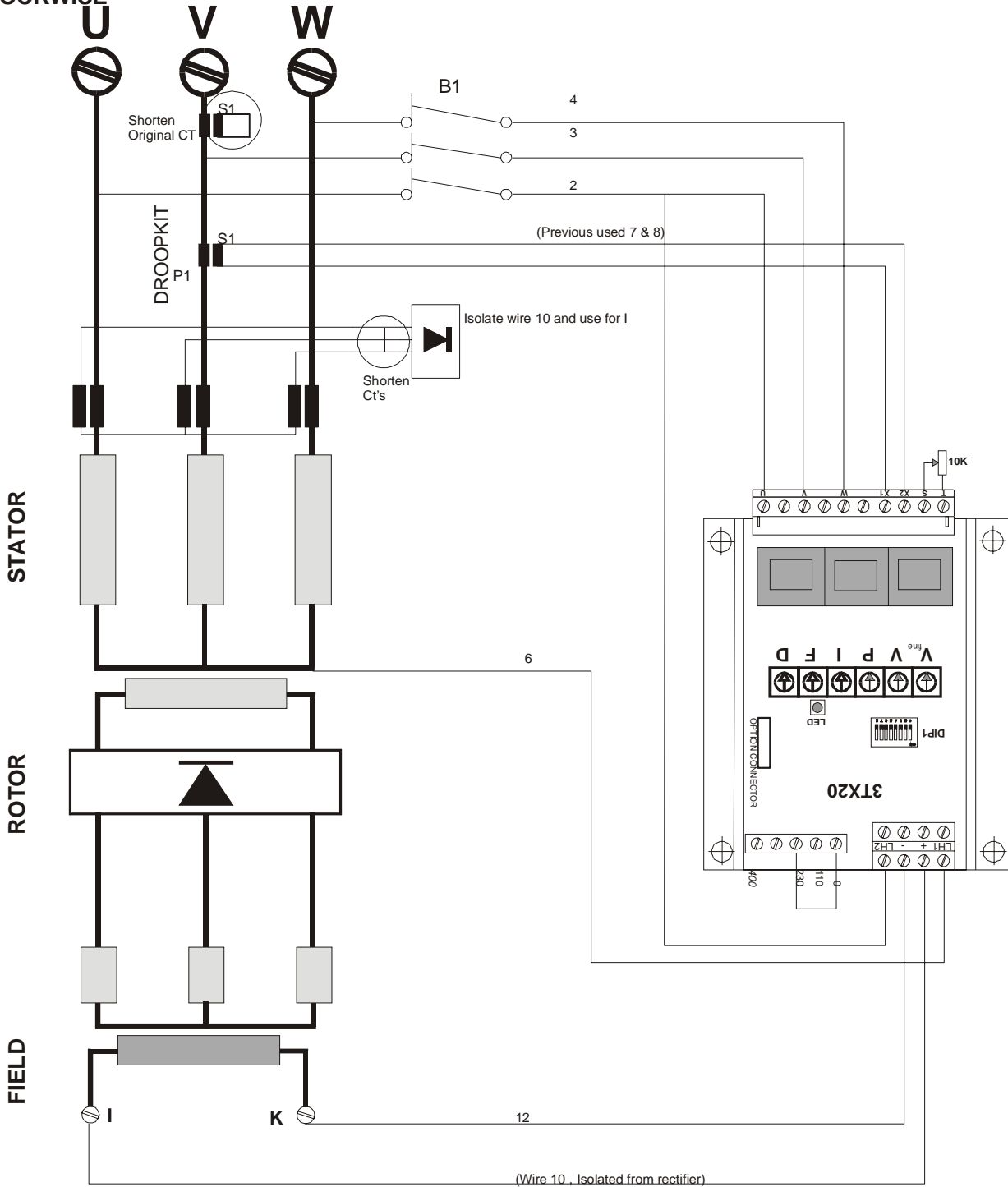


Application Diagram

NEBB STROMBERG SMUX2R

GENERATOR OUTPUT, ROTATION  
CLOCKWISE

SMUX 2R Replacement by 3TX20



The numbers refer to the SMUX connector pin number

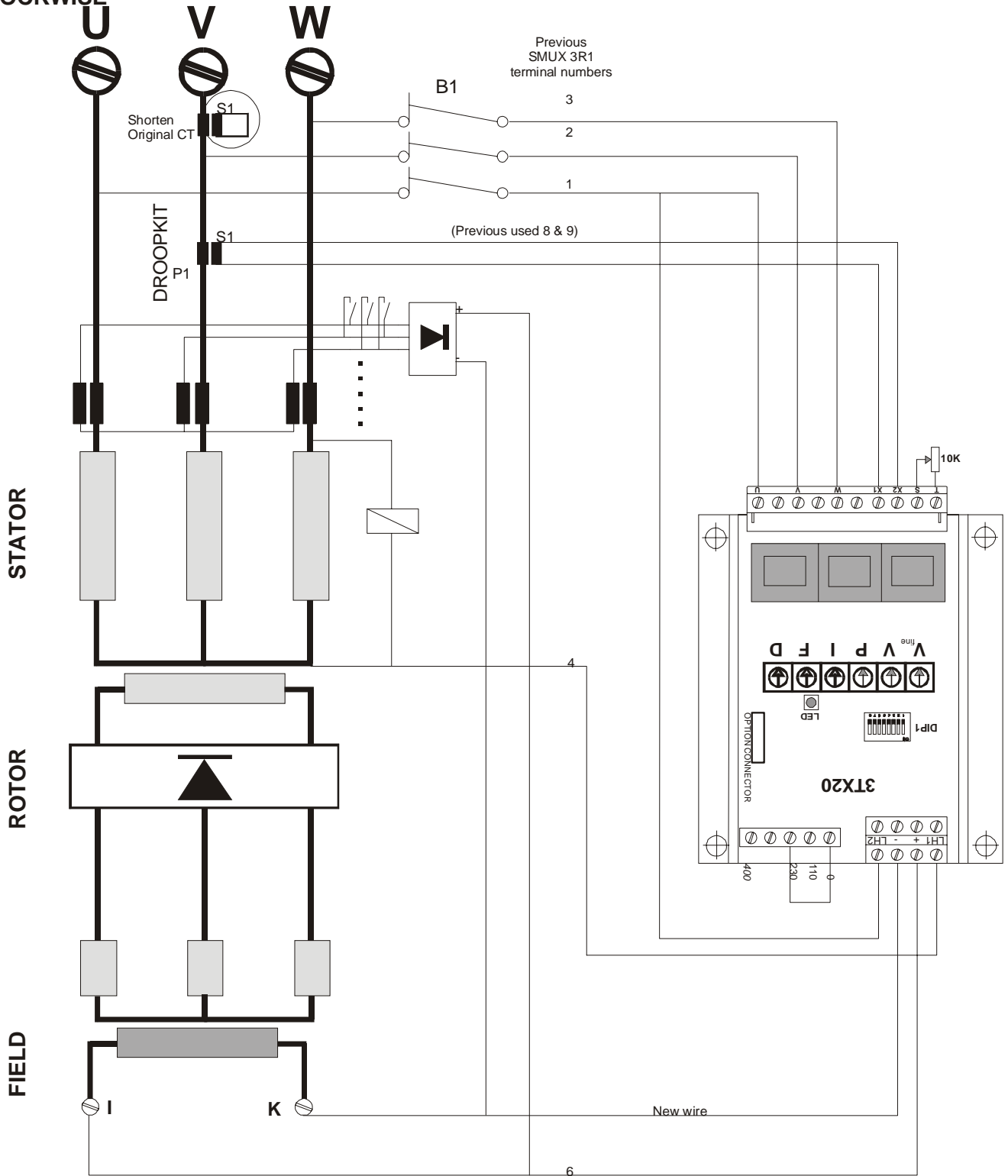
- 1) Isolate the wires 7 and 8 from the original CT and connect them to new DROOPKIT. Shorten old CT !!
- 2) Shorten the input from the rectifier from the compound transformers system, and isolate wire 10, and bring it only to the + (I) of the exciter field and to the + from the AVR
- 3) Connect other wiring as indicated

Application Diagram

NEBB STROMBERG SMUX3R1

GENERATOR OUTPUT, ROTATION  
CLOCKWISE

SMUX 3R1 Replacement by 3TX20

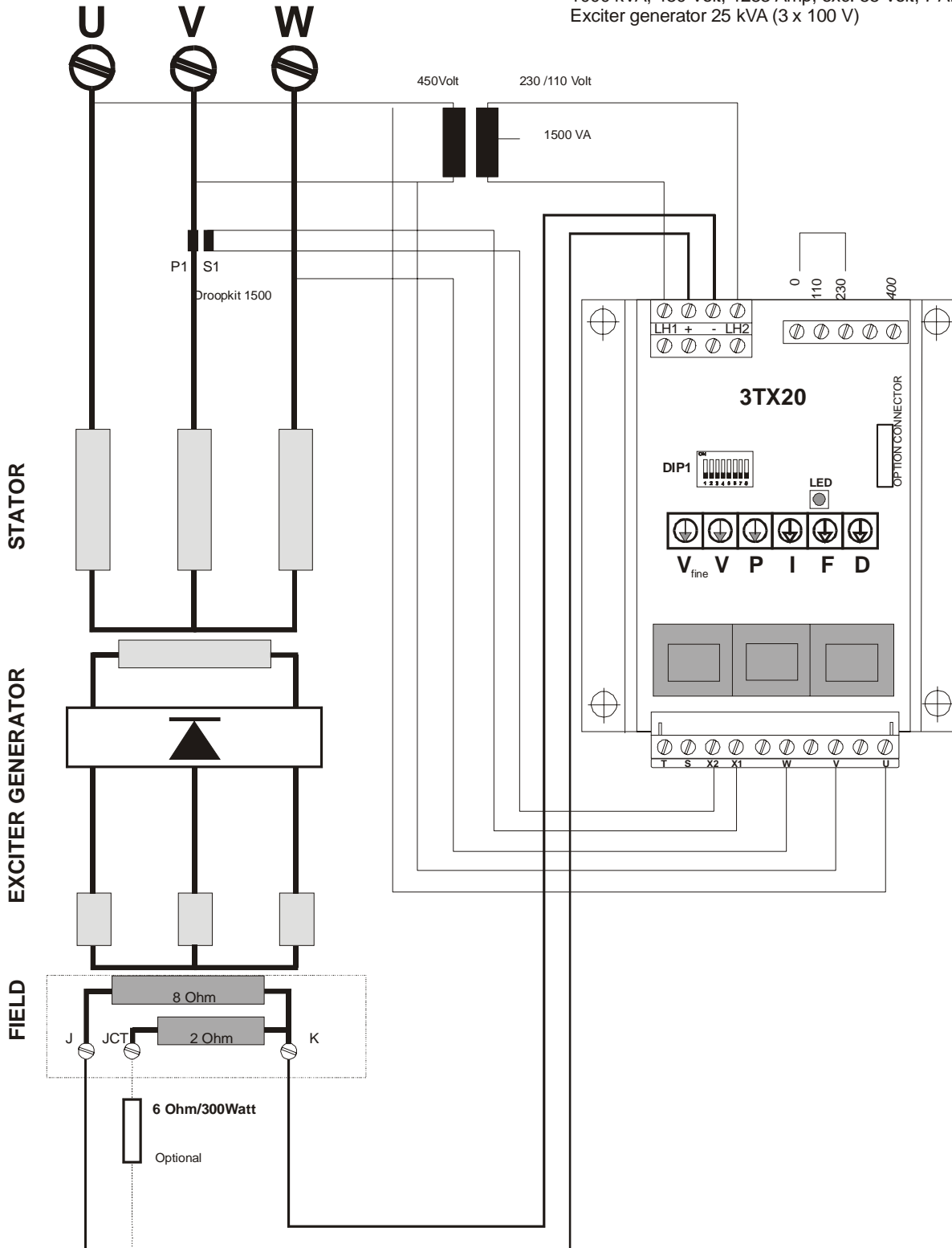


Application Diagram

Daihatsu Mitsubishi

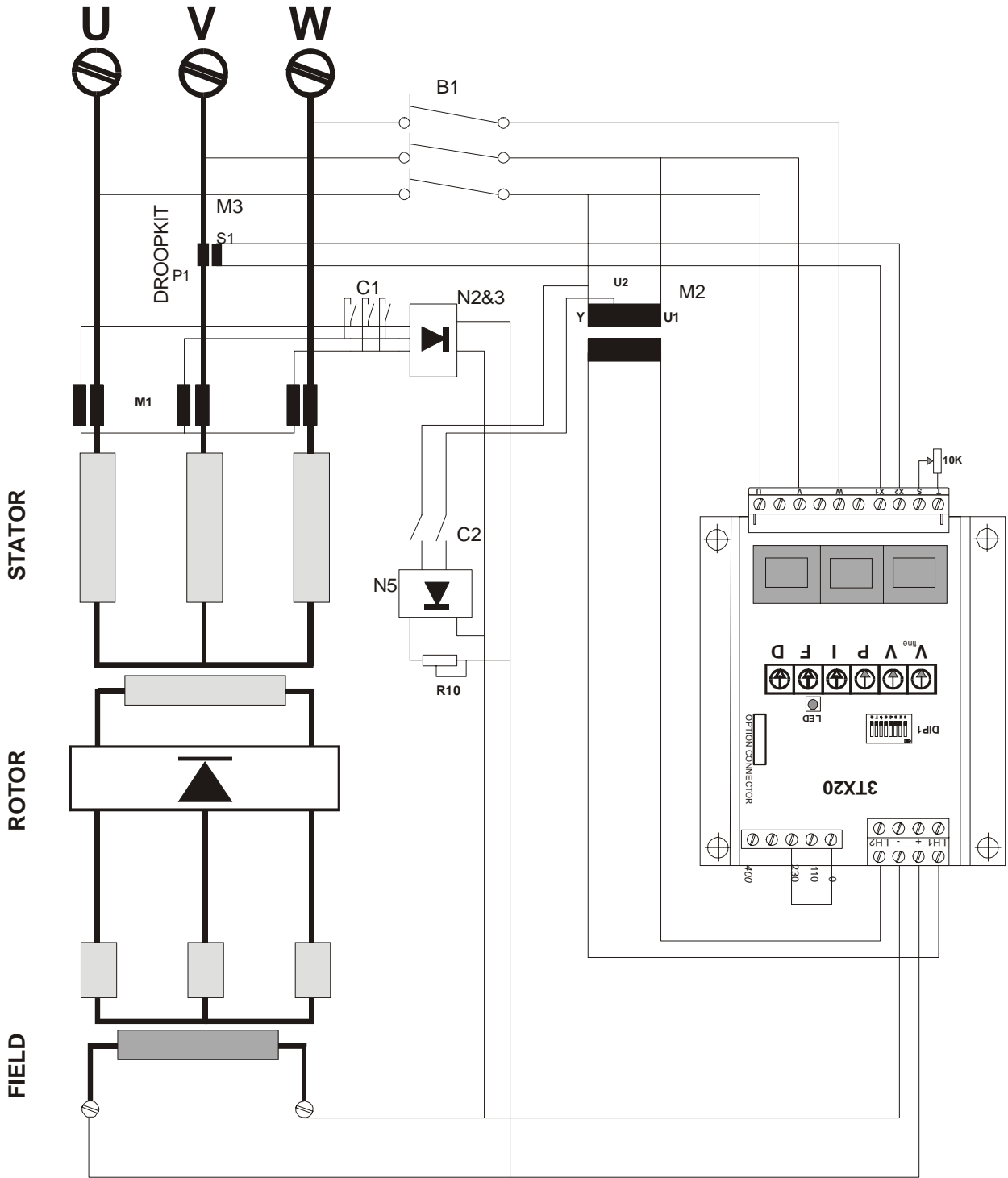
GENERATOR OUTPUT, ROTATION  
CLOCKWISE

DAIHATSU / MITSUBISHI GENSET  
1000 kVA, 450 Volt, 1283 Amp, exc. 55 Volt, 7 Amp  
Exciter generator 25 kVA (3 x 100 V)



Application Diagram  
**GENERATOR OUTPUT, ROTATION  
 CLOCKWISE**

NEBB SF7



**C1 AND C2 MUST BE ENERGIZED ON > 40 % OF Unominal, AND  
 DE-ENERGIZED WHEN < 40 % OF Unominal**

**NEBB SF7 REPLACEMENT WITH / 3TX20 / OR LX10 / OR 3FLASR11**

Application Diagram

> 480 Volt

GENERATOR OUTPUT, ROTATION  
CLOCKWISE

V gen > 480 Volt 60 Hertz

Measuring step down transformer

