



# **KTX20**

*Replacement for Nishishiba & Taiyo AVR's*

**Instruction Manual V2.0**

Product version V2.0.0.0

# WARNINGS AND COMMISSIONING INFORMATION



## HAZARDOUS VOLTAGES.



### DO NOT OPERATE WHEN NOT FAMILIAR WITH GENERATORS.

- **Check the isolation of the generator windings before installation. Poor isolation will cause damage to the AVR and dangerous situations for persons.**
- 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.
- 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.
- The unit should be installed with respect to the environmental specifications as well as the rules mentioned in the General installation information.
- For safety reasons the voltage level potentiometers are best turned completely counter clockwise in order to start at the lowest possible voltage.
- Never change the rotary switch or dipswitch settings during operation.

## REVISION HISTORY

Product	Version		Change
	Hardware	Manual	
<b>V1.0.0.0</b>	1.0	1.0	<i>First release</i>
<b>V1.1.0.0</b>	1.1	1.1	<i>Minor hardware improvement</i>
<b>V2.0.0.0</b>	2.0	2.0	<i>AVR supply isolated from input LH1 and LH2. Added input connector 5. <b>Wiring diagrams changed for input connector 1 and 5.</b></i>

The table provides a historical summary of the changes made to the AVR.  
Revisions are listed in chronological order.

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.

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## GENERAL DESCRIPTION

The KTX20 automatic voltage regulator is suitable for compound generators which use a single phase diverting system to control (reduce) the excitation current such as:




- **Nishishiba** - VZRAB 1A1  
VZRAB 1S  
VZRAB 1S(P)  
VZRAB 1S(PT)  
VZRAB 4AP  
VZRAB 4APR  
VZRAB 4APT  
VZRAB 4APTR  
VZRAB 4AS  
VZRAB 4ASR  
VZRAB 4AST  
VZRAB 4ASTR
- **Taiyo** - ASC-31  
ASC-32  
EXU-61A

The KTX20 can be used for parallel operation with other generators that also control voltage droop by means of Quadrature Droop Compensation (QDC) or with Cross Current Compensation (CCC). Parallel operation is possible with additional CT's.

Installation, maintenance and adjustment don't require special application software.

The AVR is protected from the environment by a PUR coating.

# ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Condition	Min.	Max.	Unit
U, V, W	Voltage sensing input <b>200Volt</b>	50-60Hz, continuous. 	-	250	V <sub>AC</sub>
	Voltage sensing input <b>300Volt</b>	50-60Hz, continuous. 	-	400	V <sub>AC</sub>
	Voltage sensing input <b>400Volt</b>	50Hz, continuous. 50Hz, Intermitted < 10s. 60Hz, continuous. 60Hz, Intermitted < 10s. 	- - - -	450 480 500 520	V <sub>AC</sub> V <sub>AC</sub> V <sub>AC</sub> V <sub>AC</sub>
LH1, LH2	Shunt current <sup>(1)</sup>	Continuous. Intermitted < 10s.	- -	-20 -25	A <sub>DC</sub> A <sub>DC</sub>
1, LH2	Supply & Sync. input	50Hz	110	450	V <sub>AC</sub>
		60Hz	110	500	V <sub>AC</sub>
X1, X2	Droop CT 0.5A	Isolated CT < 30s.	-	1	A <sub>AC</sub>
T <sub>AMB</sub>	Operating temperature	95% RHD non condensing <sup>(1)</sup>	0	+50	°C
T <sub>STG</sub>	Storage temperature	95% RHD non condensing	0	+70	°C
	Static control accuracy			1	%

<sup>(1)</sup> Always mount with heatsink fins aligned vertically and allow for sufficient airflow.

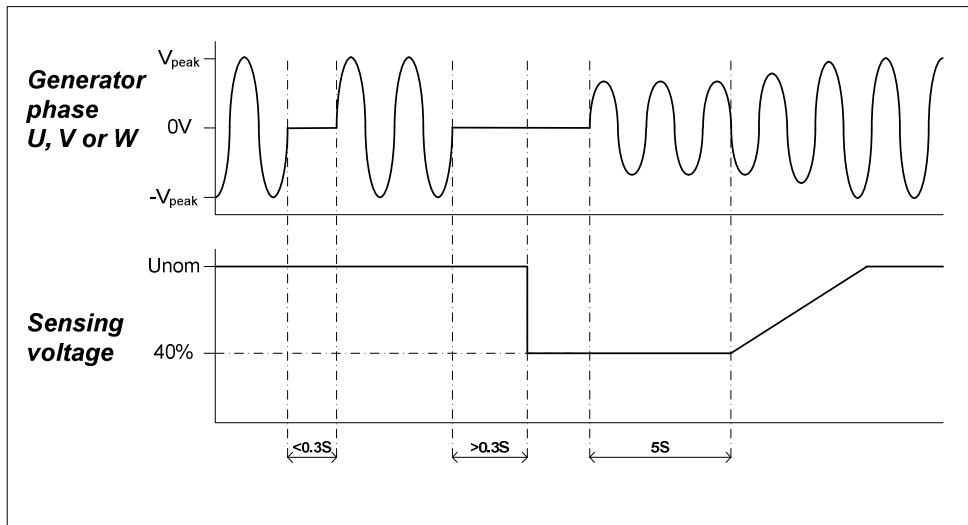


Stresses above “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listing of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability and lifetime.

# PROTECTIONS

## Phase loss protection

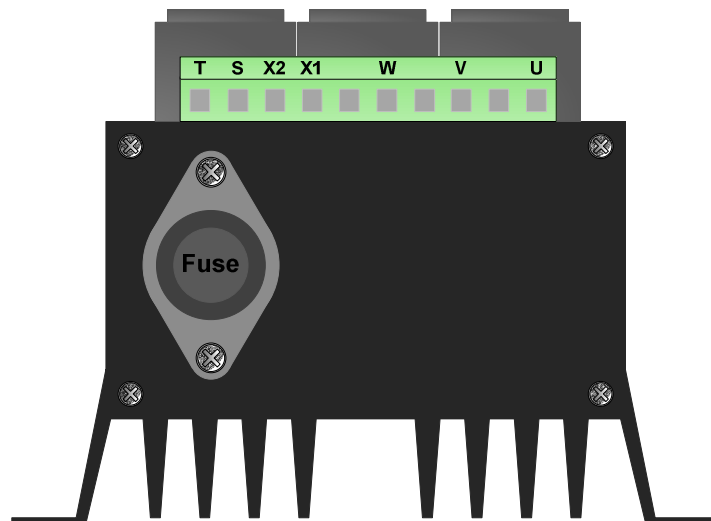
Dip 4



The phase loss protection validates the presence of all three generator phases on the sensing terminals U, V and W. When one of the three phases is not sensed anymore for more than 300ms the AVR decreases the generator voltage setpoint to +/- 40% of  $U_{nom}$ . If the error condition is relieved for 5s, the generator voltage is ramped up again to nominal voltage.

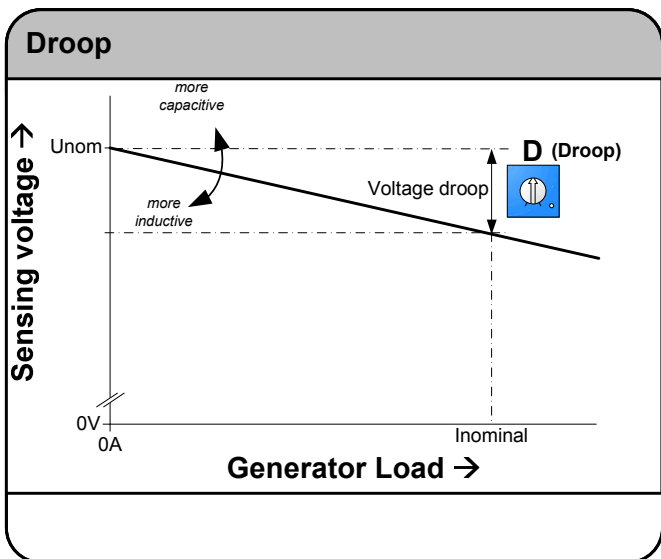
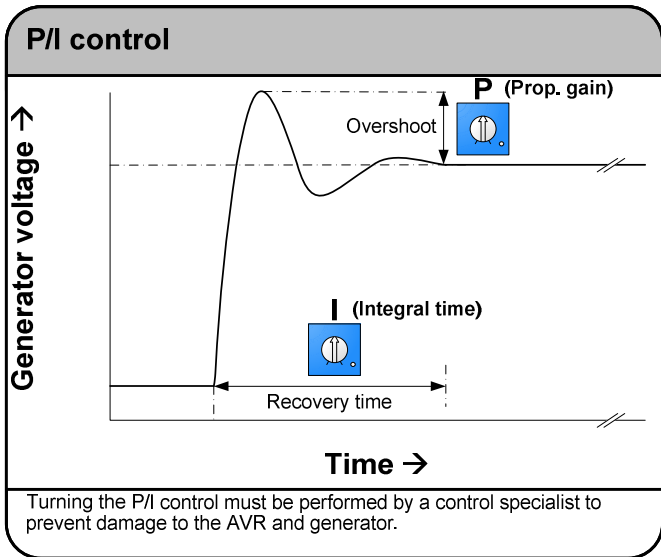
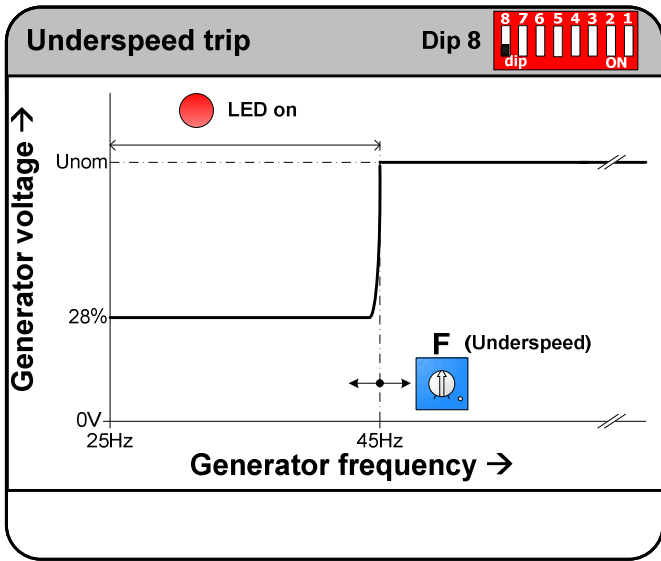
Default the phase loss protection is disabled.

## Fuse protection

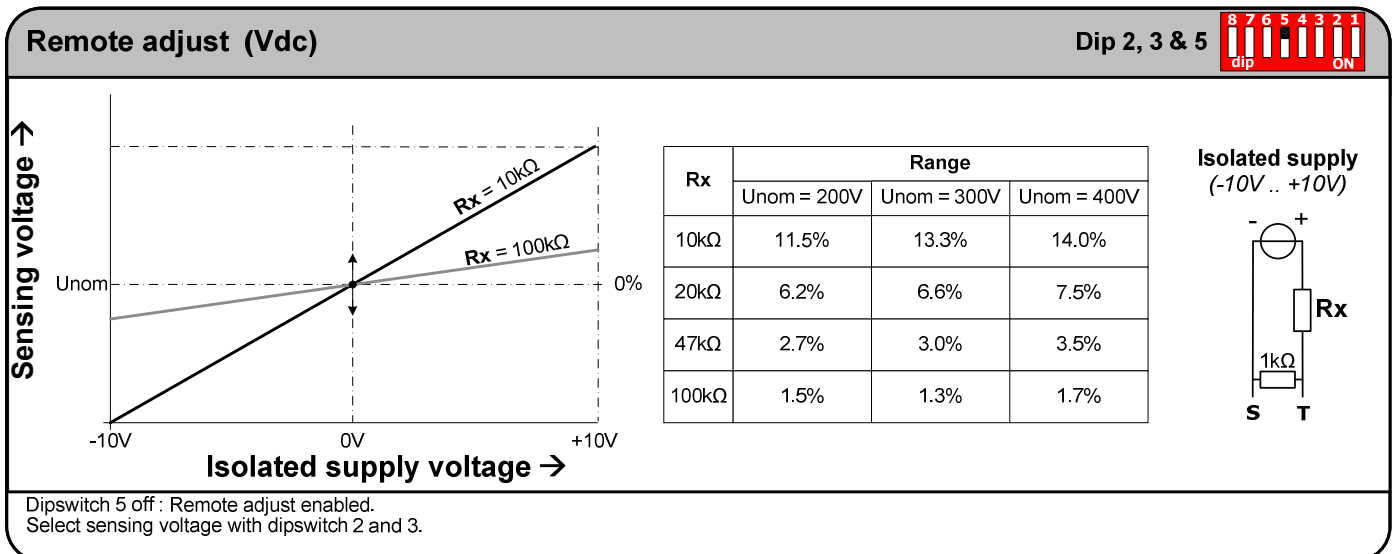
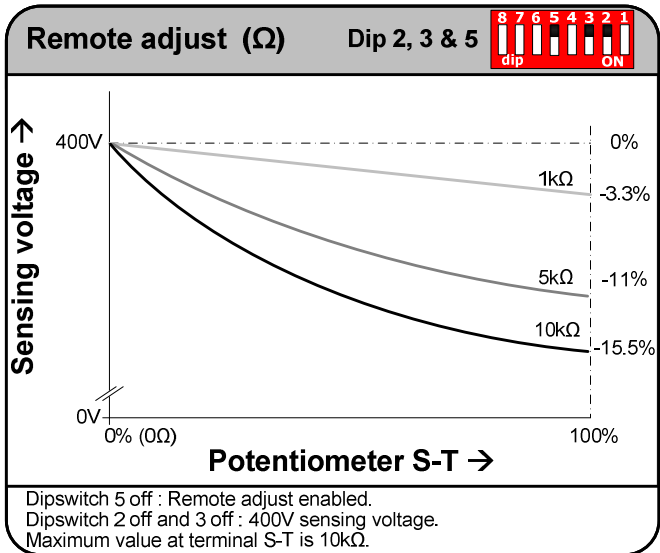
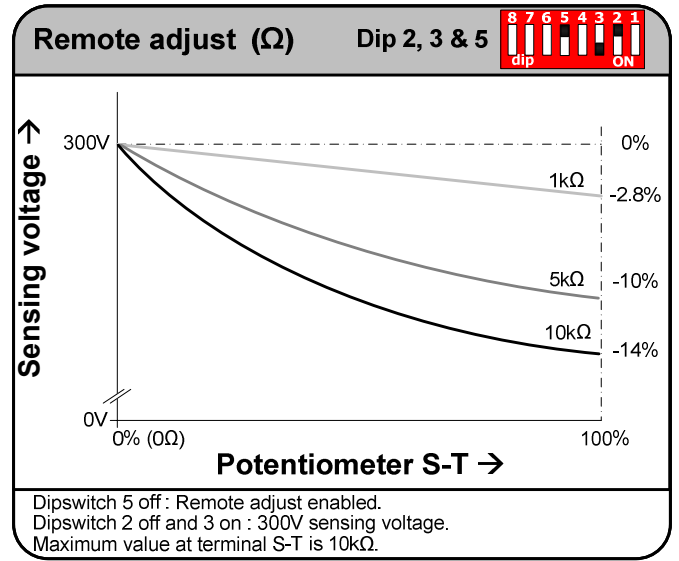
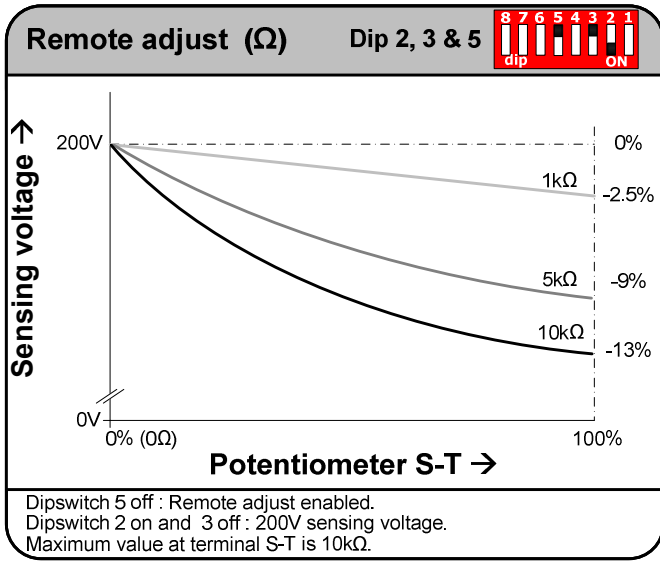


When replacing the fuse, a 20A/500V slow type fuse with dimensions 10.3 x 38.1mm must be used.

# MODES OF CONTROL I



# MODES OF CONTROL I I



# QUICK REFERENCE I

**Droop**

**D**

0% 100%

(Page 6)

**Underspeed**

**F**

+

-

Trip @  
Higher - RPM - Lower  
+/- 65Hz +/- 33Hz

**LED**

(Page 6)

**Stability**

**I** **P**

- +

- +

**I-action**  
(Integral time)

**P-action**  
(Proportional gain)

(Page 6)

**Voltage**

**Coarse V** **Fine V**

- +

- +

When potentiometers in mid position.

Voltage is +/- 195V @ sensing range 200V

Voltage is +/- 305V @ sensing range 300V

Voltage is +/- 390V @ sensing range 400V

**Factory settings**

Sensing voltage : 400V

Underspeed frequency : 47Hz (Underspeed disabled)

Droop : 100%

Stability P-action : 50%

Stability I-action : 50 %

Dipswitch 1 : Off

Dipswitch 2 : Off

Dipswitch 3 : Off

Dipswitch 4 : Off

Dipswitch 5 : On

Dipswitch 6 : Off

Dipswitch 7 : Off

Dipswitch 8 : Off

**Sensing range**

**Not permitted**

**200V**

Dip 2 on & Dip3 off  
Range +/- 160 .. 250V

**300V**

Dip 2 off & Dip3 on  
Range +/- 250 .. 400V

**400V**

Dip 2 off & Dip3 off  
Range +/- 315 .. 510V

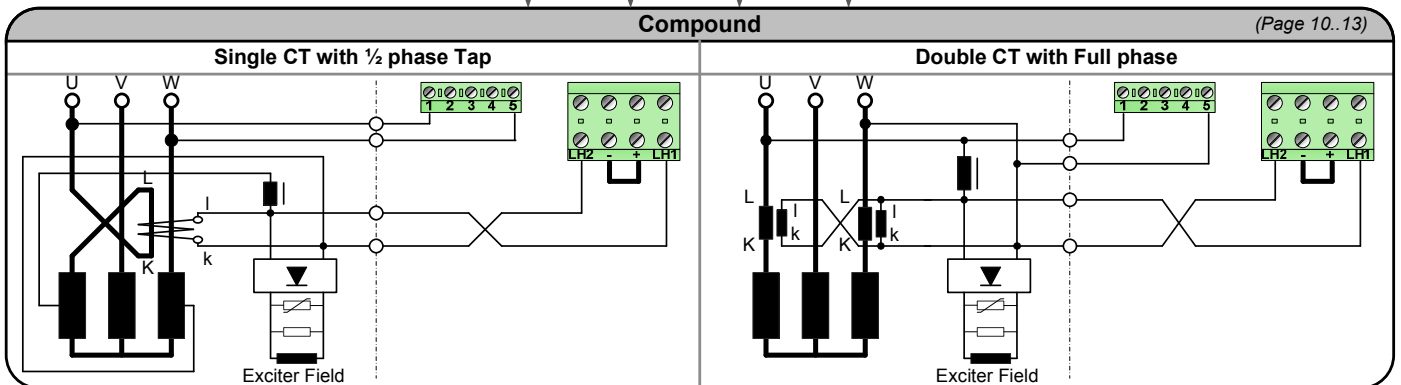
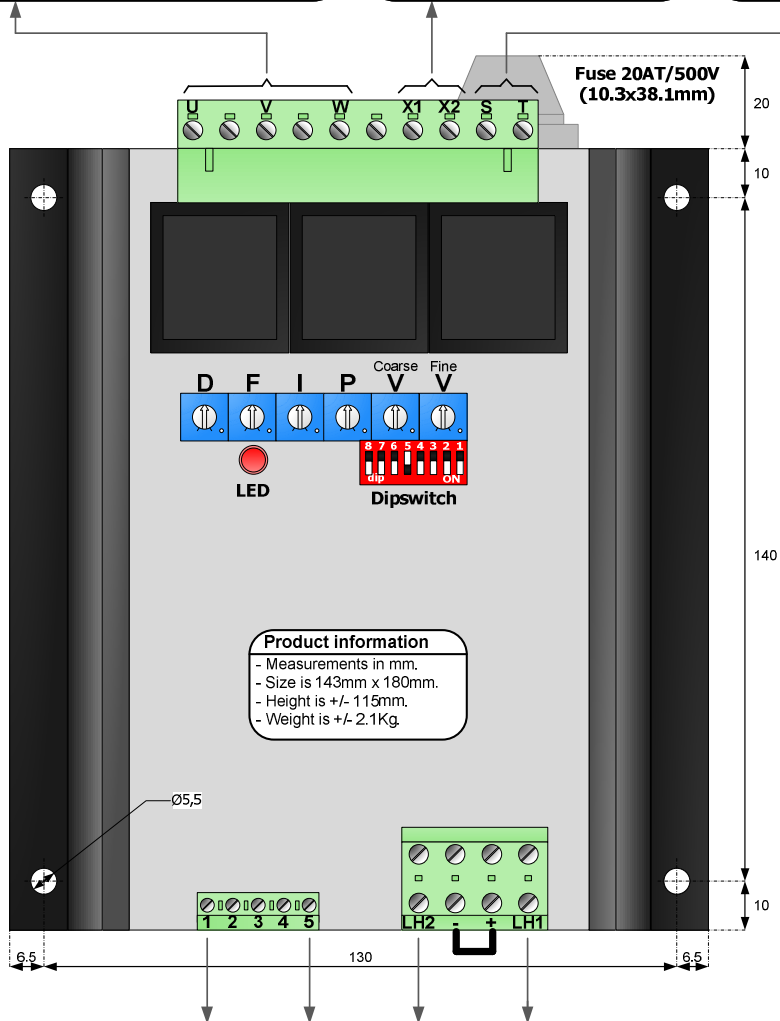
**Dipswitch** (Page 6, 7)

DIP	Off	On
1	Not used.	Not permitted.
2	See : Sensing range	
3		
4	Phase loss protection disabled.	Phase loss protection enabled.
5	Remote adjust enabled.	S-T internally shorted.
6	Not used.	Not used.
7	Not used.	Not used.
8	Underspeed protection disabled.	Underspeed protection enabled.

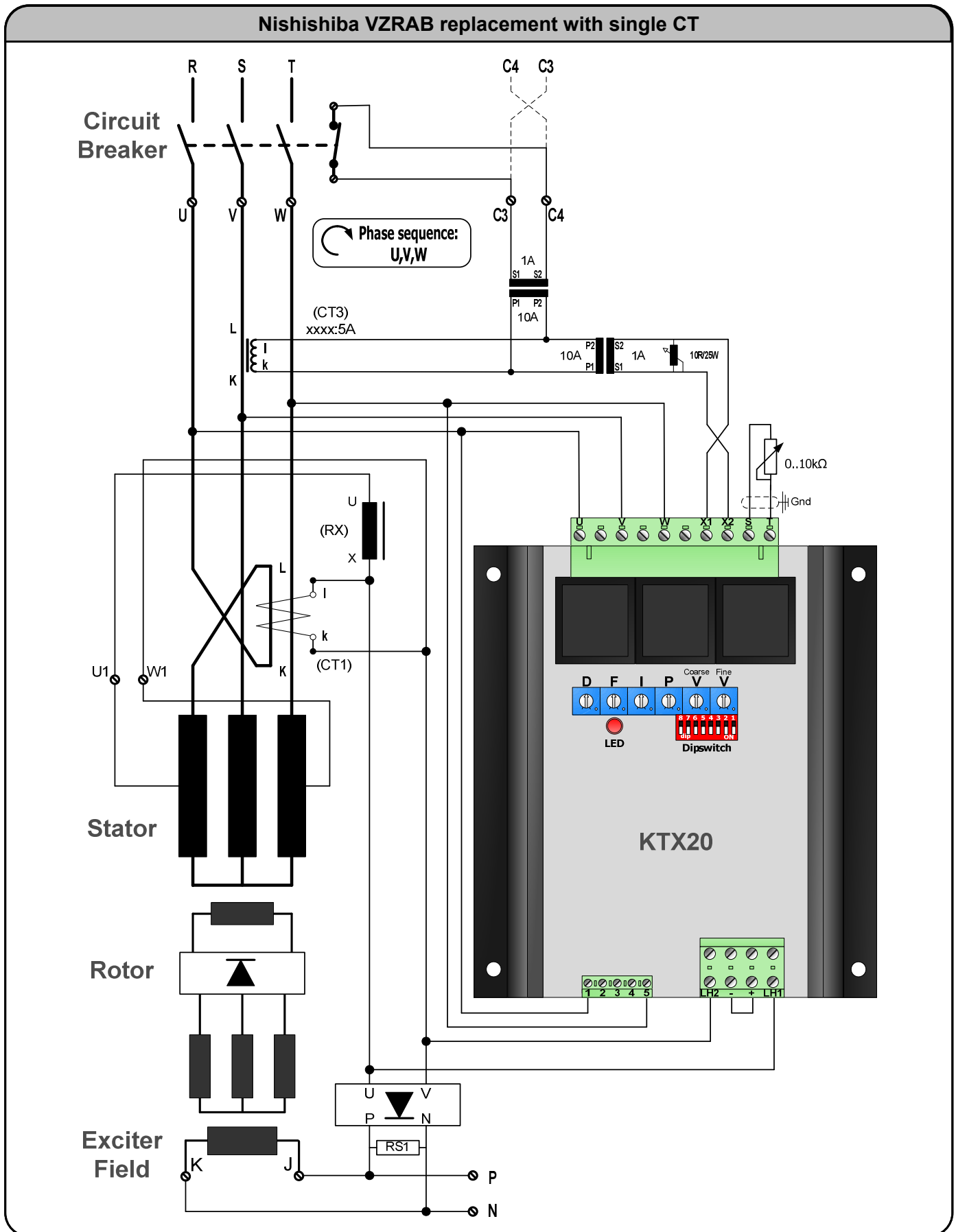


# QUICK REFERENCE II

Sensing			Current sensing	Remote adjust	
200V	300V	400V	Max. rating : Continuous : 0.5Aac Intermittent : 1Aac < 10s.	Max. value : 10K <i>Dipswitch 5 off</i>	Max. : -10V..+10V <i>Dipswitch 5 off</i>
			V phase 0.5A  X1 X2	0..10k $\Omega$ 	Rx (10k $\Omega$ ..100k $\Omega$ ) Isolated supply (-10V .. +10V) 
 U-V-W clockwise			Input X1-X2 CT 0.5A (Droopkit)		

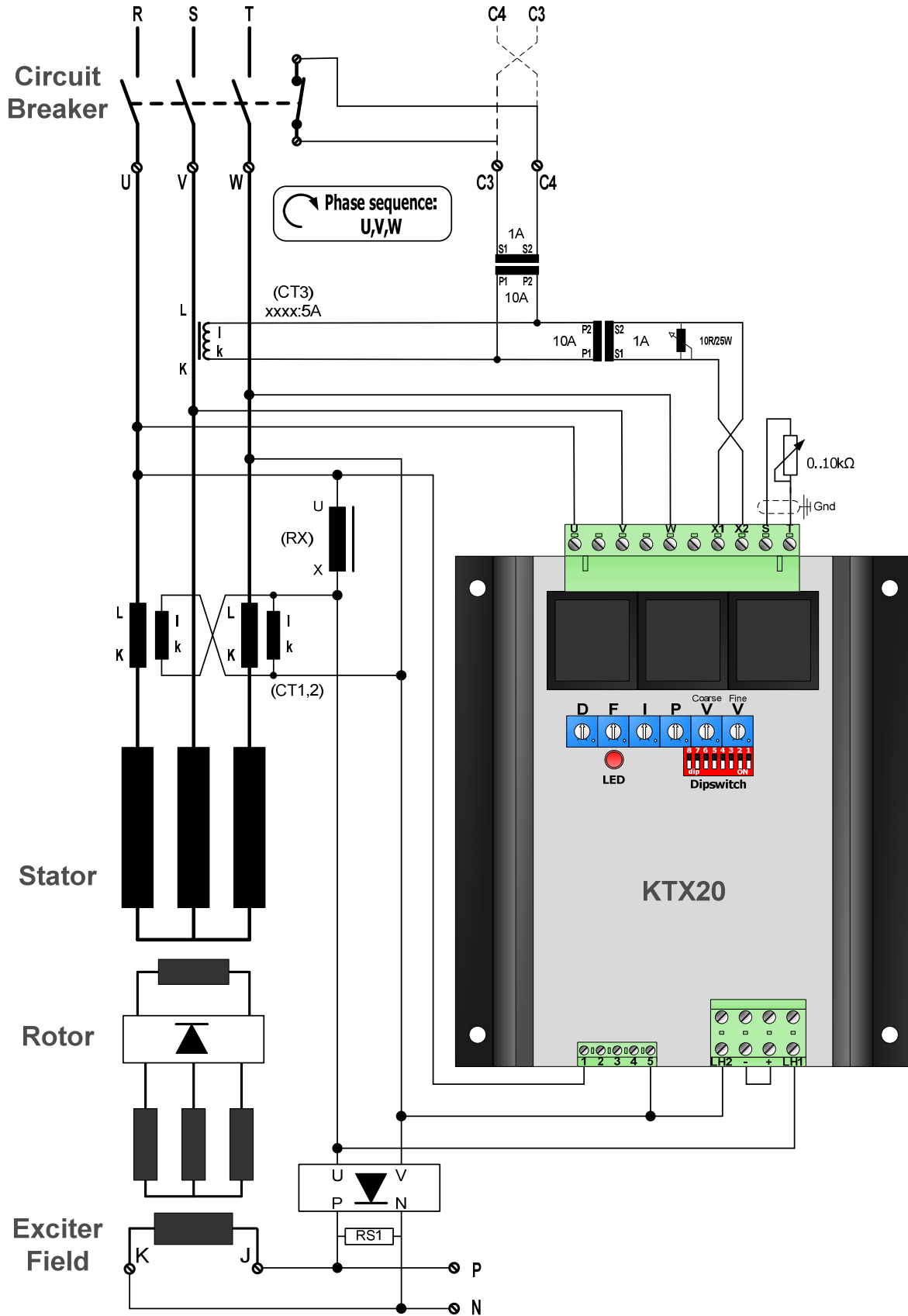


# WIRING DIAGRAM I

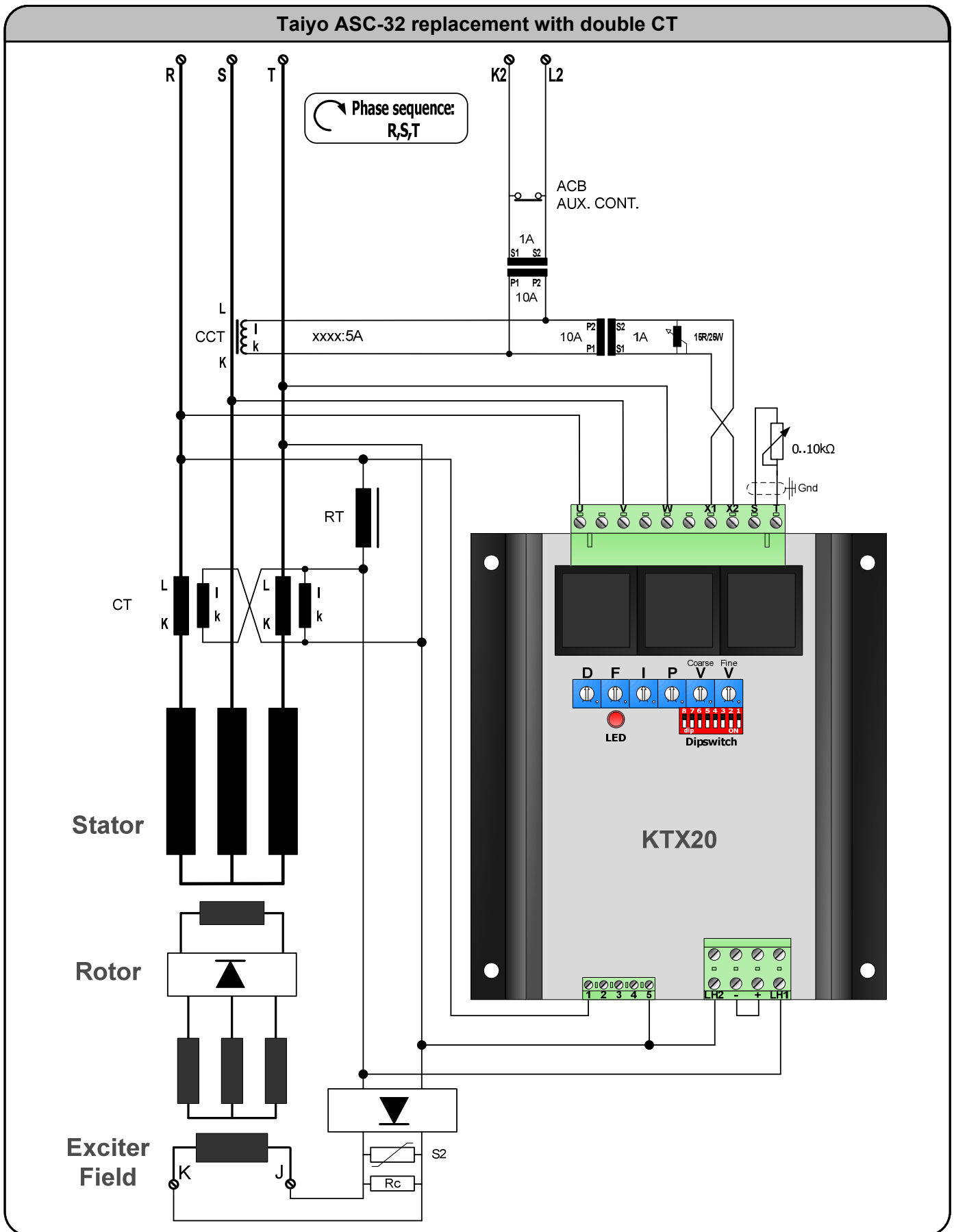


# WIRING DIAGRAM II

Nishishiba VZTAB replacement with double CT



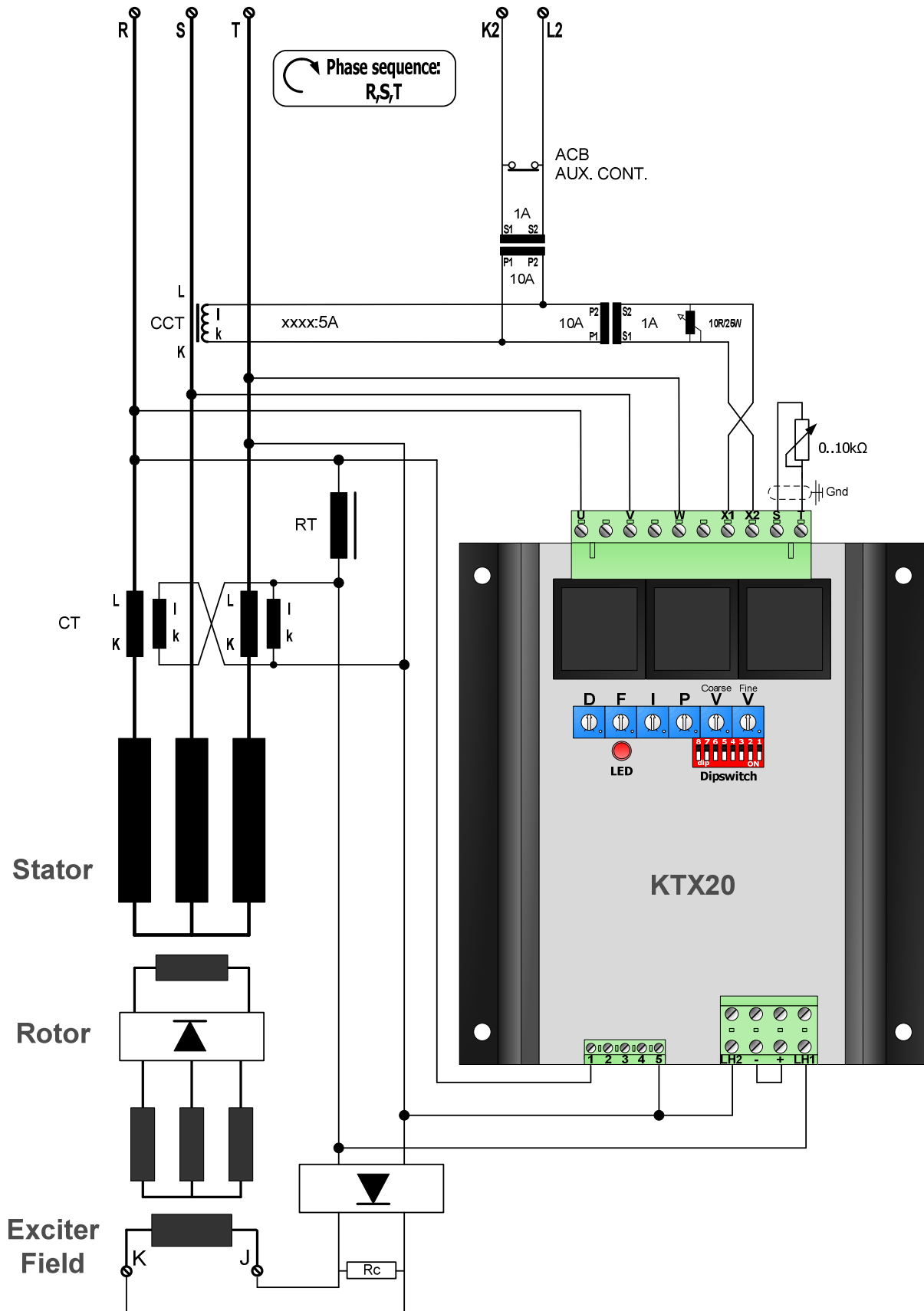
# WIRING DIAGRAM III





# WIRING DIAGRAM V

Taiyo EXU-61A replacement with double CT



# 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.
- maximum cooling (direction of cooling ribs and direction of airflow) is achieved.
- Mounting no humid air can flow through the product or condensation occurs.
- dust or other materials or residue will not remain in or on the product.
- the maximum vibration is not exceeded.
- personal contact with persons is impossible.

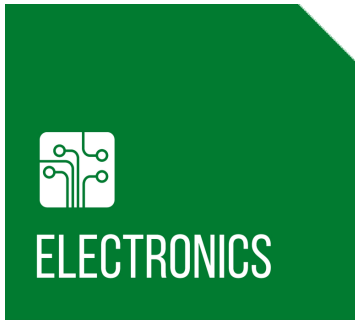
## Wiring

- 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 J (+) and K (-), or Phase and neutral, or S and T.
- 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 at one side with an 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 X (+) and XX (-), 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 behavior 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 field resistance reduces voltage spikes. If necessary filter can be fitted additionally. (e.g. snubber, RC-network)
- Upon problems during commissioning, faulty behavior 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.

# CONTACT



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