Voltage Regulating Control Relay

The Voltage Regulating Control Relay «TARTN20D» provides regulation of the supply medium-voltage (MV) provided by a transformer HV / MV or by two parallel transformers.

The **TARTN20D** monitors the voltage and current of HV network and initiates to the transformer tap changer mechanism the different commands to raise or lower voltage.

The **TARTN20D** can operate according two modes:

- · direct regulation by measuring output voltage of the transformer,
- by reactive compoundage regulation.

The direct regulation operates by comparison between transformer output voltage and the setting voltage Vc ($\pm \alpha$ value).

The reactive compounding takes into account the complex load impedance of the network: Z = R + jX, in order to calculate a compensated output voltage.

The setting of **TARTN20D** can be done:

- directly in front face, by using the 16 keys of keypad, the screen display and the signalling LEDs,
- with a laptop connected to the front RS232 port.



Functionalities

- compounding
- voltage compensation
- voltage monitoring

The TARTND20D allows:

- great flexibility of settings:
- choice of all compounding categories (active, reactive, additive & subtraction of reactive),
- choice of time delays (definite or dependent time) for the first tap changing

- choice of taps failure on undervoltage or by external command

- 2 settings of voltage available (1 for Summer & 1 for Winter)
- friendly MMI by PC under WINDOWS[®] or by local keypad / screen
- auto-test of all electronic cards
- choice of wiring connection (front or rear connections)
- high immunity level EMC (IEC 8001.4 class 4, ...)







DIGITAL VOLTAGE REGULATING RELAY

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Control functions

- Un is the secondary rated voltage of transformer (e.g.: 20 kV)
- Vc is the setting voltage value (e.g.: 98% of Un)
- α is the sensitization threashold value (e.g.: 2% of Un)
- + β is the abnormal voltage threadshold value (e.g.: 3% of Un)
- Um is the output voltage of the transformer
- if Vc- α < Um < Vc + α , nothing happens
- if Um > Vc + α , TARTN20D initiates the command "low" to the tap changer
- if Um < Vc α , TARTN20D initiates the command "raise" to the tap changer
- if Um < Vc β or Um > Vc + β , there is abnormal condition (Um is too low or too high)



Time delay for the first tap changing

- for the first tap changing, operator has a choice between a two time delay TA1 (definite or inverse time)
 inverse time allows to accelerate the starting of the regulation (time being shorter when difference Um-Vc is
- high)characteristics of the inverse time curve can be changed





COMPOUNDING FUNCTION

Active or Reactive Compounding

Our compounding modules allow the voltage compensation in order to take account of the line impedance.

Fed by the 3 current phases, they provide a voltage compensated, or a compounding image of the network load [(R + jX).I]from the ouput voltage of the transformer "**Um**". It allows the AVR to regulate the voltage, not at the secondary of the transformer but to a fictive point of the network, with:

Um compensated : Um - (R + jX).I **R**: line resistance **X**: line reactance

I: current by phase

This compounding voltage is proportional to the current of the line but also to the impedance between the transformer and the fictive point (R + jX).



Tap changer failure

The « Tap Changer Failure » module allows, if commands are available:

- to decrease the tap changer until a determinate tap
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• to block all tap change commands if tap is lower or higher than the determinated tap.

The unblocking operates during the out of service of the function.

This command is available locally or remotely.

Common functions

Abnormal voltage "High" & "Low"

If the difference between the voltage Um and the setting voltage Vc becomes higher than a limited value (β), TARTN20D generates a "abnormal voltage" alarm after a time delay T2 or during the feeding of the transformer, or a "abnormal voltage" time delay T3, if the network is already fed.

Tap changer failure

If a "lower" or "raise" command is sent or remains during a time greater or egal to T1, TARTN20D operates an alarm "Tap changer failure".

Control voltage failure

"Lower" and "raise" commands are mutually locked-out by output relays. Both commands cannot be sent simultaneously.

Also if both commands appear together (control voltage failure), or if the interlock position for "C.B. close" is failing, a "Control voltage failure" alarm is operated.

TARTN20D failure (WD)

If internal auxiliary supply are lost, an alarm « TARTN20D » is activated.

Undervoltage function

In order to avoid an overvoltage when the voltage is back, it's possible to force the tap changer to be in the lower tap position in case of lost of voltage.

Tap change position boosting after voltage back

When the voltage is back, a time delay TA3 of 1 min is initiated.

During this time-delay, it's possible to accelerate the commands of the tap changer by changing the long time delay **TA1** about the first tap changing by another time delay **TA2** (10 s).



Auxiliary Supply		
Auxiliary supply		48 or 125 Vdc
 Accuracy 		-20% to +10%
 Power 	rated	24W
	maximum	32W
Analogue inputs		
Rated Current		5A (50 Hz)
		I ≤ 20 In
	overload limit	I = 2 In (permanently)
		I = 20 In (5s)
burden at In		1 VA maximum by phase (active or reactive on 10%)
Rated Voltage		100/√3 or 100 Vac
		U ≤ 1.2 Un
	overload limit	U = 1.5 Un (permanently)
		U = 1.9 Un (5s)
	burden at Un	0.3 VA
 Frequency 	within accuracy	47 ≤ F ≤ 52 Hz
	out of accuracy	$46 \le F \le 54 Hz$
Setting		
• 1 or 2 setting	y voltage values Vc	-12 to +12% Un (step of 1%)
• Sensitization threshold α		1 to 4% Vc (step of 0.25%)
• Abnormal voltage threshold β		2 to 10% Vc (step of 1%)
Setting modification by remote control		0.95 Vc
Compounding: active		0 to 10% (step of 1%)
positive reactive (Q+)		0 to 20% (step of 1%)
negative reactive (0-)		0 to 10% (step of 0.5%)
Taps management		
1 5	Number of taps managed	40 maximum
	Tap position on under voltage	1 to 40
	Tap position on external command	1 to 40
Time delay setting		
• TA1 (1 st tap change) with definite time		10 to $60s$ (step of 1s)
• TA1 (1 st tap c	hange) with inverse time	setting can be changed
• TA2 (tap by t		1 to 60s (step of 1s)
 T5 (under voltage validation before tap changer failure) 		3 to 60s (step of 3s)
Time delay fixed		
Ime delay for UVR T1 (tag shapped failure)		25
• 11 (tap changer failure)		1205
• 12 (abriorinal voltage when voltage back)		
• 13 (abnorma	i voltage if network is already red)	60S
Accuracy		
 Resetting pe 	rcentage for H/L thresholds	high threshold, abnormal high threshold: 99.8%
		low threshold, abnormal low threshold: 100.2%
Voltage detection		threshold 0.73 Un
		Resetting percentage: 96%
• Thresholds α & β		± 0.25%
• Time delay		± 5%
Display of measured values		± 5%
Installation		
Rear connection		19" cabinet installation
Dimensions		
• W x H x D (m	nm)	440 x 266 x 350
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TRANSMISSION

GENERATION

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DISTRIBUTION

• ISO 19443 : 2018 • ISO 9001 : 2015 • ISO 14001 : 2015 certified •

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