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Last modification: Medvode, 06.06.2006

The producer reserves the right to modify data and design in the light of future progress.

DESCRIPTION GES, REGIS

GES... annunciation relays are self powered from input signals.

Input signal is usually tripping contact with "+" potential from the protection's auxiliary battery.

REGIS registration relays need auxiliary power and has a direct connection to + and - terminal of the protection supply.

Figure-2.1:

Shows the outlook of relays REGIS.4X4, REGIS.8X4 and GES.8H4.



Application:

Basic application of GES relays is visual and audio annunciation of alarming signals in relay protection.

REGIS relay can do annunciation and registration of the signal, which appeared the first in a burst case of more trip signals. Typical recognition resolution is better than 5 ms. In industry it can be used for recording of any contact activity like push buttons, switches, industrial relays or thermostats...

The simplest use is a local identification of alarming signals within the relaying cubical or on the protection relay's board. The mosaic label front plate can contain all data of alarming signals.

Associated LED lamp indication is usually the very first information of the alarming event, especially if the fault was complex, with more tripping signals - virtually simultaneous.

To employ all functions, GES or REGIS is used for remote control of the synoptic display boards in the control room of the power plants, switch yards or substations.

GES & REGIS modules contain 4 or 8 signals. If the project requires more alarming signals, more modules are added. By connecting signals for cascading (Hx, Kx)*, we get a matrix of the desired size.

The 1st trip will be recognized by the whole connected* matrix of REGIS relays. The synoptic table can contain illuminated push buttons for individual or group quitting.

Features:

- recording short trip pulses;
- single or group quitting;
- forming common trigger pulse for audible alarm;
- 4 or 8 signals per H4 or HX4 four seat module;
- Local signaling with LEDs on mosaic labels of module;
- Output for remote synoptic display in command room;
- expandable grouping over the desired matrix of modules;
- REGIS identifies the protection which tripped the first:
 - remotely by fast flashing at the synoptic output and by slow flashing all - later activated;
 - locally only one green LED lights, showing the 1st;
- "D.c." and "a.c." type input: differs only in drop resistance and "a.c. -type" has smoothing capacitors,
- Type: "REGIS.4..+T" contains fast and slow flashing semiconductor-like timing outputs for up to 100 lamps;
- Type: "GES.4..+T" contains slow flashing output.

Description of operation in LOCAL and REMOTE mode for annunciation relays

Figure-4.1 and Figure-4.2:

show a sequence of the LED lamp's "ON and OFF" operations, related to the moment of appearance of the protection signal -A and -B and the moment of quitting.

Signal-B disappeared before pressing the button "Quit all".

Recording



Figure-4.1

• Local event registration:

Every signal Z(i), which appears for more than 5 ms, causes both LED lamps, yellow and red to light.

Both LEDs remain ON, even if the signal Z(i) disappears.

• Remote signaling:

Output L(i), for synoptic lamp driving will cause the lamp in the synoptic board to start blinking.

After Quitting

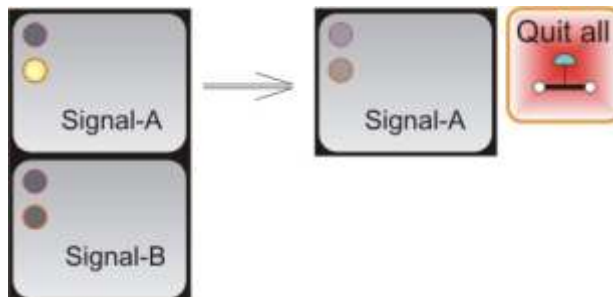


Figure-4.2

When signal-A disappears:

- in Local: Red LED extinguishes.
- In remote: the constantly ON lamp will extinguish together with signal.

After Quitting we can see:

• Locally on the mosaic of GES:

A: Yellow LED Y(A) lights: This means that signal-A was still present in the moment of pressing the button "Quit All".

B: Both LEDs extinguished: signal-B is no more present.

• Remote:

A: Lamp L(A) in the synoptic board, which displays state of protection signal-A = Z(A), will change from blinking to constant "ON - light".

B: Lamp L(B) will change from blinking to OFF, which means that signal-B is no longer present at the time of quitting.

Diagram - 5.1: Timing diagram below shows local and remote operation.

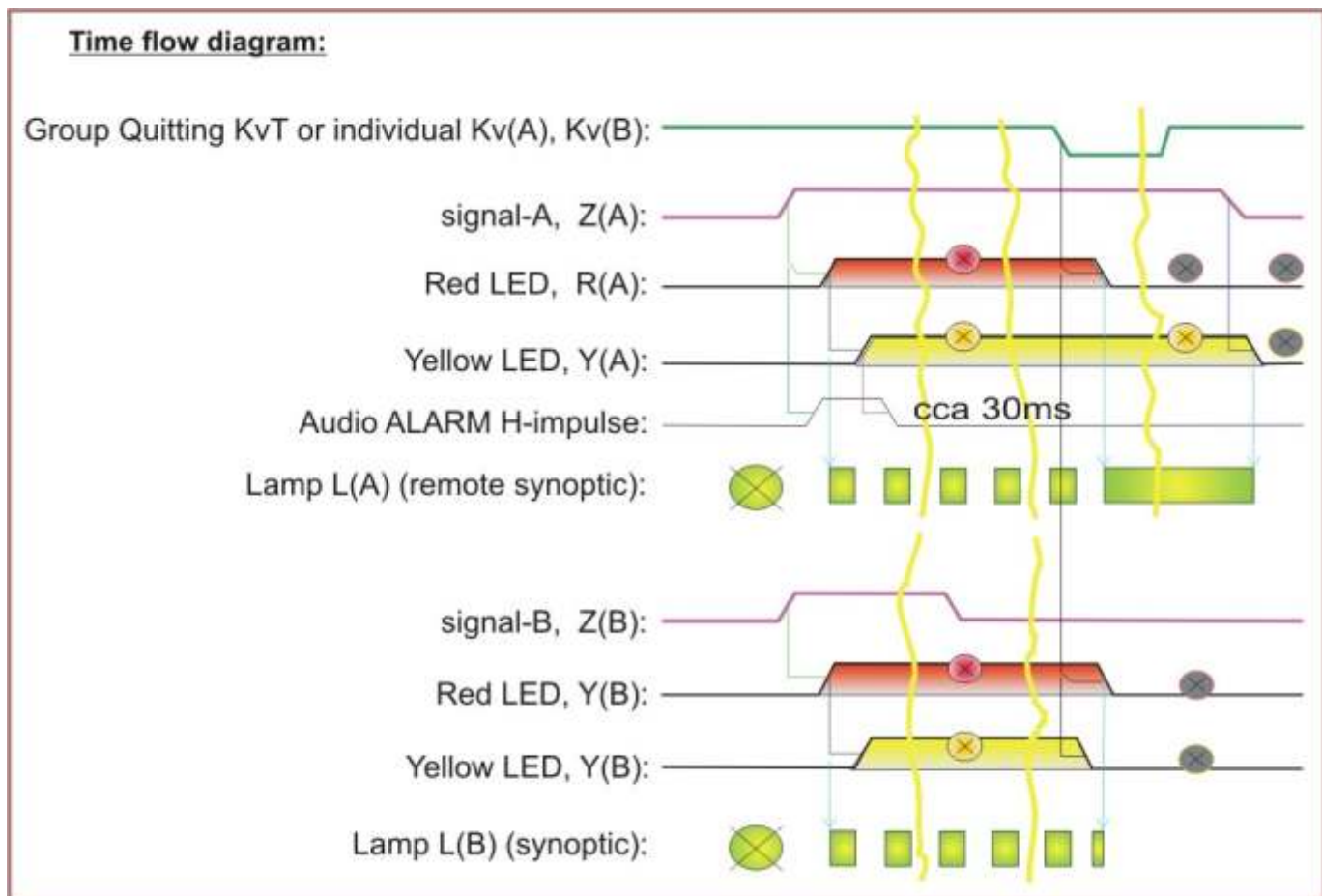


Diagram explanation:

1. Thin vertical line or arrow: connects Cause and Consequence signals. The new event is shown with a delay (relay's turn on/off = 2 to 5 ms).
2. Free hand yellow line: means "long" time interval; waiting on operator's action, like "press quit" button...
3. Quit signal is normally High, activated Low!

Figure - 6.1:

An example of remote synoptic group of signaling Lamps with group quitting push button in the center of the mosaic. This group can be remotely controlled by one module GES.8.. or by two modules GES.4. When there is a request for more space on the mosaic label for text or for symbols, than it is more convenient to take two units of GES.4 for local signaling.

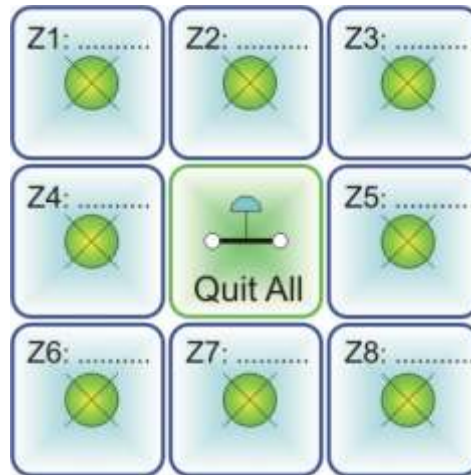
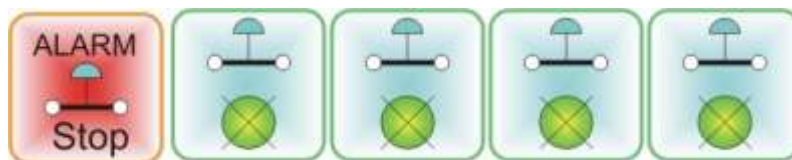


Figure - 6.2:

The case of 4 lamps, built in the push button switches, which could be a part of synoptic table in the remote control room. This matrix of individual signal quitting switches with associated lamps can be controlled by single GES.4. Type "GES.4.+T" contains the blinking unit, which can drive up to 50 lamps (24 to 60V, 100mA).



Description of LOCAL operation of registration relays

Figure - 7.1 and Figure - 7.2:

present an outlook of the Local operation as it appears on the mosaic front plate of REGIS unit.

There are 3 time snaps:

1. Recording the events:

First comes the signal Z2. Its green LED latched ON, excluding all latter signals (Z1, Z3), to be able to set its green lamp.

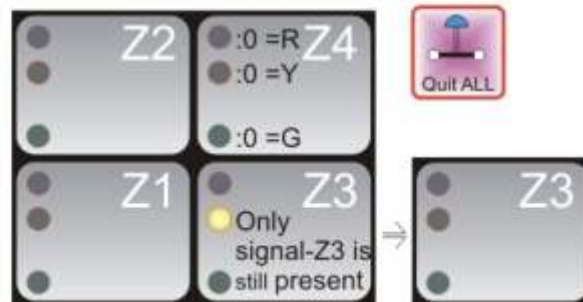
2. After pressing the button "Quit All" signal LEDs will extinguish, if their signal is no more active (Z1 and Z2). You can see that after quitting all LEDs are dark, except yellow Y3, which belongs to still active protection "Z3".

3. The residual Y-LED will extinguish together with the disappearance of signal Z3.

Recording



After Quitting



Outlook of fault registration has 3 forms:

1. "The 1st signal" operates all 3 LEDs: (R & Y & G). In the illustrated case it is the label field "Z2".
2. All signals which come after the first in the observed group will turn ON only red and yellow LED R & Y).

Forming the Time Compare Group of signals, amongst which we want to find the first trip. Such a matrix is especially useful in a case of burst error. The resolution time of REGIS is under 5 ms. It is obvious that only 1 green LED can be turned ON, inside the compare group of signals.

The smallest group, in which we want to detect the first trip, contains 2 signals. Both are placed and occupy the same printed board. Inside the relay REGIS.8 there are 4 equal boards and they can be organized in up to 4 independent groups by 2 signals.

In the case of Combiflex module REGIS.8X4, the customer is free to wire the signal-Kx from board to board, thus enlarging the observed time compare group.

By wiring the "interlock signal-Kx" to the next REGIS units, we expand the size of the interlocked matrix to obtain the desired number of signals, among which we want to find first.

3. The protection signal, which is still present afterward, is displayed on the local mosaic plate with a lit yellow LED. The case signal in the figure above is on the label Z3. When the remaining signal Z3 disappears, the "forgotten Y- LED" will extinguish by removing signal Z3.

Diagram - 8.1:

shows a signal time flow, describing the local operation. Please refer to the explanation of GES.

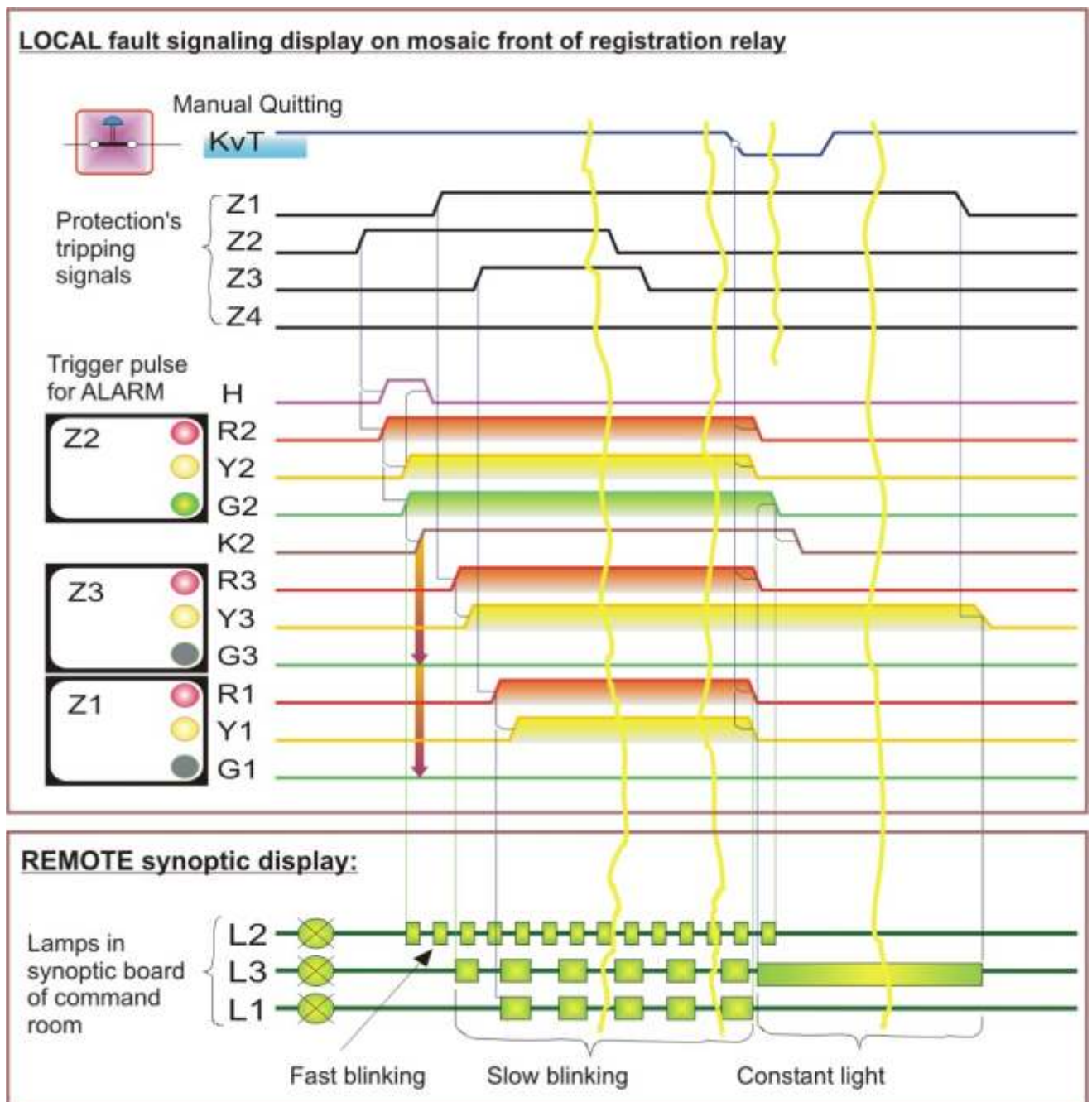


Diagram - 8.2:

is pointing only to the time flow of remote Lamps' driving. To show the first signal REGIS forces a fast flashing light. All signals which appear later are blinking slowly. The residual lamps are constantly lit.

Example 1 is using combiflex model REGIS.4X4

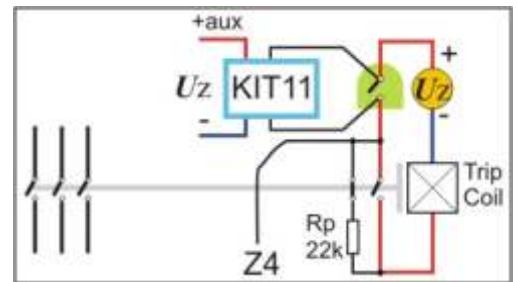
- Basic connection for controlling remote synoptic board, using illuminated push buttons.
- Lamp test push button has n.c. Contact;
- Alarm reset is done by n.o. contact. Voltage UB for the alarm latching relay could be the same as auxiliary supply for protection Uz , which is usually 220 V or 110 V d.c..
- GES and REGIS relays are using potential free output contacts. This enables the use of 4 independent voltage sources:

Uz = auxiliary voltage for protection,	Recommended:
UB = voltage for alarm latching relay,	110 or 220 Vd.c.
UA = alarm auxiliary voltage,	$UB = Uz$
UL = voltage source for Lamps in synoptic board	24 to 60 V
	24 to 60 V

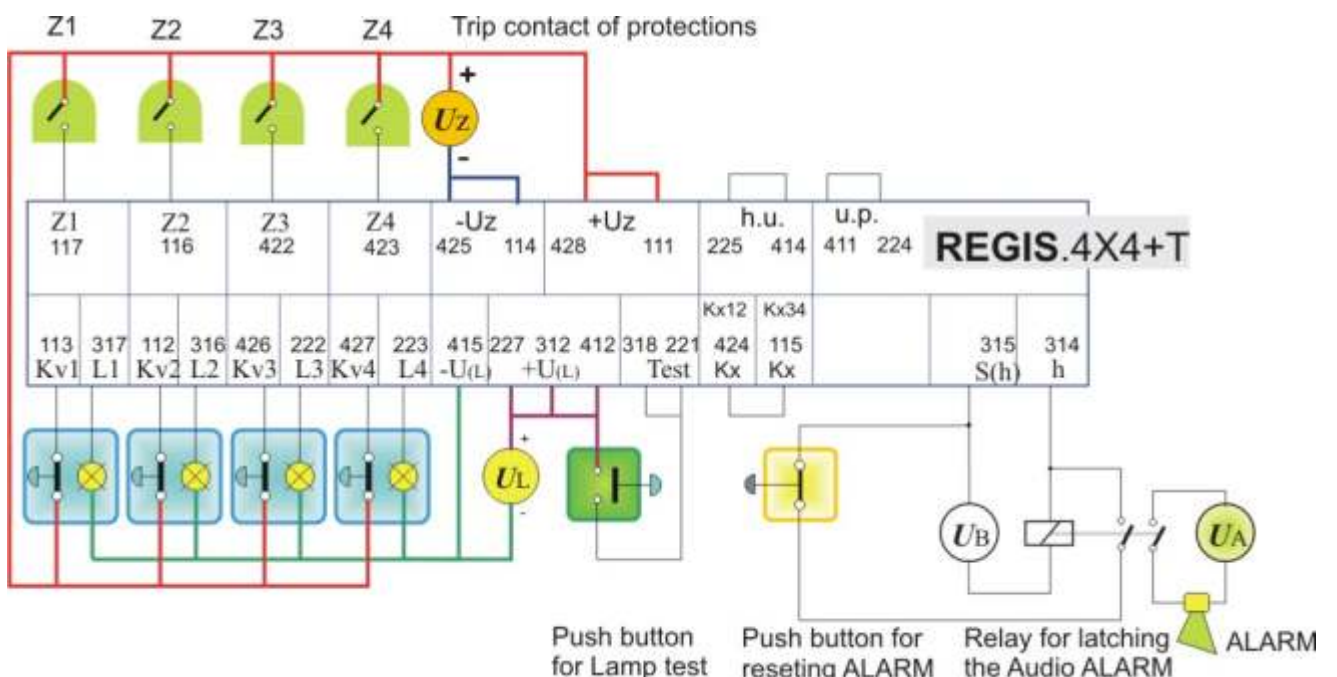
- Signal voltage Uz is in standard version d.c. It is the auxiliary battery voltage source.
- On a Customer order the signal voltage Uz can be alternating, 50 Hz voltage. In production we add to all signal input circuits (Z1, to Z4) the capacitors and fitting drop resistors. Relay topology remains the same but it must be said that a.c. version is slower for about 15 ms.

GES and REGIS fault signaling doesn't require extra, free contact. Protection trip contact, can also be wired to their signal input (Z1,... Z8), as it is shown for signal Z4 in the figure on the left.

All standard tripping circuit connections and parts, like "trip circuit supervision relay", disclosing contact of circuit breaker, e.t.c. can be used in a standard way.



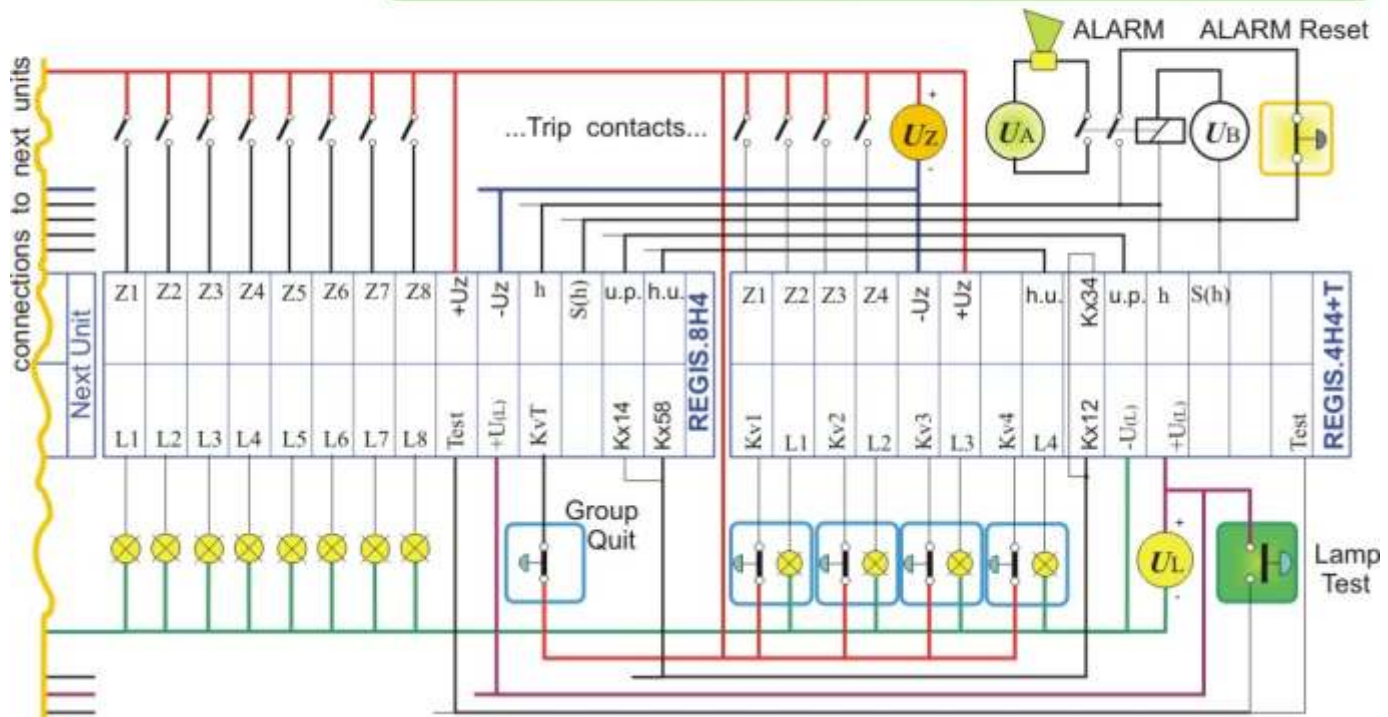
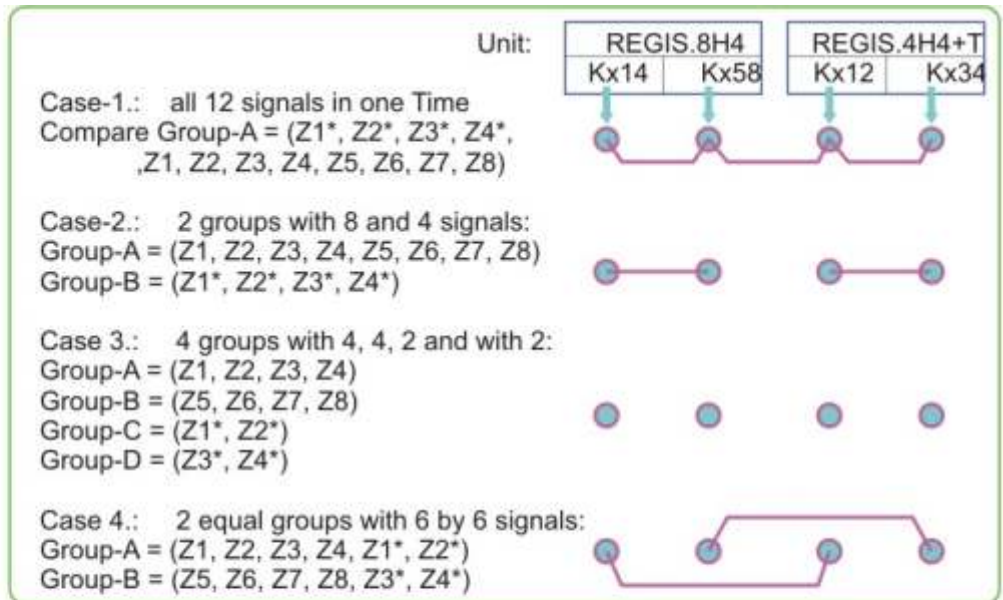
In the case that there is no need for an indication of the first trip, in a connection scheme below - the relay REGIS is replaced by relay "GES.4X4+T". The blinking unit of "GES...+T" includes only one slow flashing blink relay. It has VMOS output "contact" with caring capacity for about 50 Lamps (24V; 2W). In a case of GES, the diagram below doesn't need connections like: $+Uz$, h.u. and Kx.



Example 2 is using "wall mounting" units REGIS.4X4+T and REGIS.8H4

- This application controls 12 signals:
 - Quitting for the group of 4 signals (Z1, Z2, Z3 and Z4) on the right side, is individual (Kv1, ... ,Kv4).
 - 8 signals, connected to the unit Regis.8H4 are using group quitting (KvT) by a single push button "Group Quit".
- Application on the connection diagram below respects all 12 input trip signals, as one "Time Compare Group". This means, that we want to find the signal, which tripped the first, especially in the case of a complex burst fault.
- All 12 signals are connected to the same "Kx..." "Time Compare Group". If there is a demand to observe separated groups, there are some standard versions to do it by different connecting of points Kx... Owing to the lack of terminals, standard "8 signal unit" has signal Kx... Consisting of 2 under-groups signals Kx14 and Kx58. Terminal "Kx14" involvessignals Z1 to Z4, while Kx56 relates to signals Z5 to Z8. For unit type "REGIS.4H4" there are both basic group signals available: Kx12, for signals Z1 and Z2 - and Kx34 relating to Z3 and Z4.

Examples of different "time compare groups":



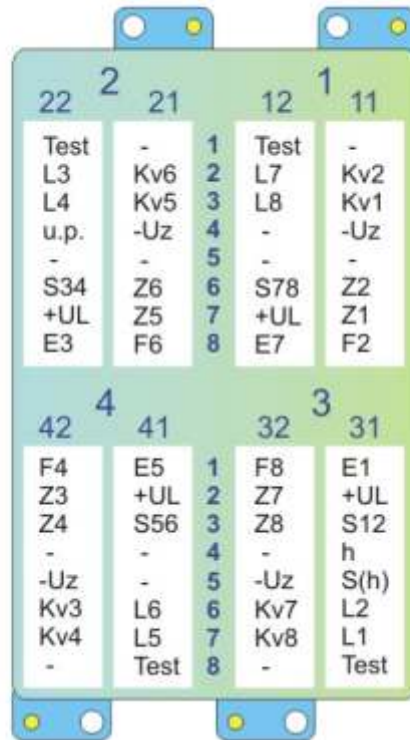
TERMINAL DATA

GES

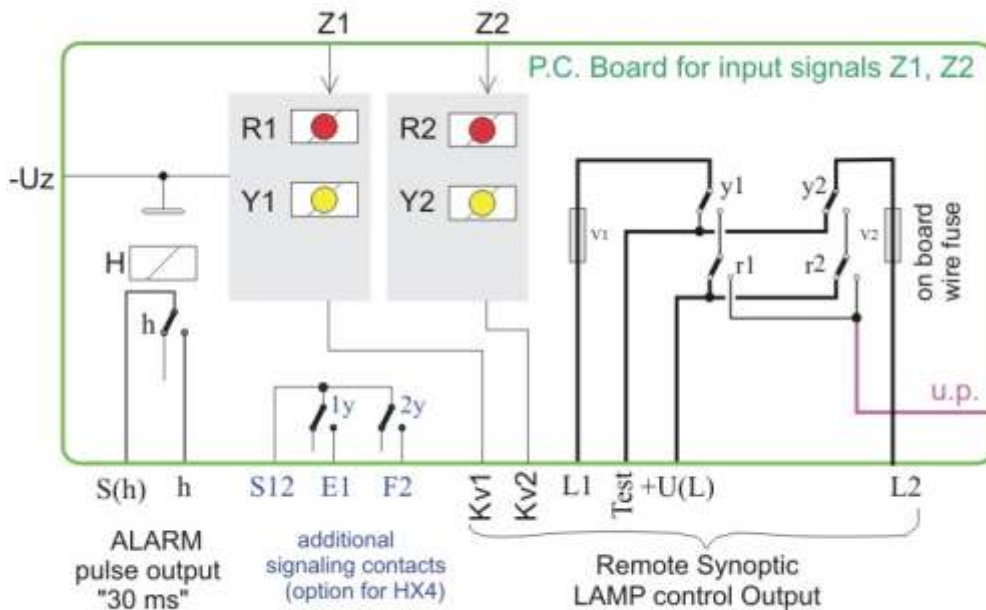
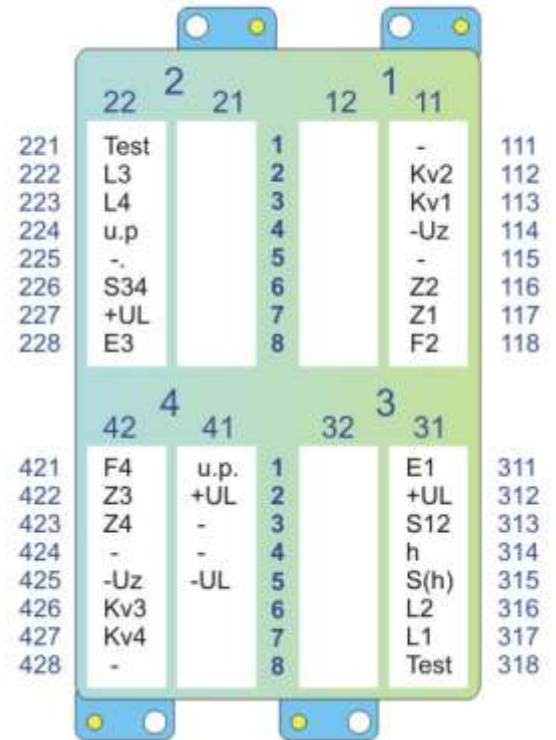
Type: **GES.8X4**

Combiflex Hx4

Bottom view



Type: **GES.4X4 GES.4X4+T**



Relays' & LEDs' nomenclature:

- capital letter for a relay and associated LED;
- small letters for its contacts.

Lamps output = (L1, L2);
 u.p. = slow flashing;
 Test= Lamp test voltage
 +UL= Lamp voltage (high)
 -Uz = Auxiliary voltage minus pole for protection Z1, Z2.
 Kv1, Kv2 = Quit for Z1, Z2.

Type: **GES.8H4**

Wall mounting H4

Top view of the screw terminals

	42	43	44	45	46	47	
	Z1	Z5	L1	L5	Kx58	h.u.	
31	32	33	34	35	36	37	38
	KvT	Z2	Z6	L2	L6	Kx14	h
							S(h)
21	22	23	24	25	26	27	28
	u.p.	Z3	Z7	L3	L7	-UL	+UL
							Test
	12	13	14	15	16	17	
		Z4	Z8	L4	L8	+Uz	-Uz

Type: **GES.4H4 GES.4H4+T**

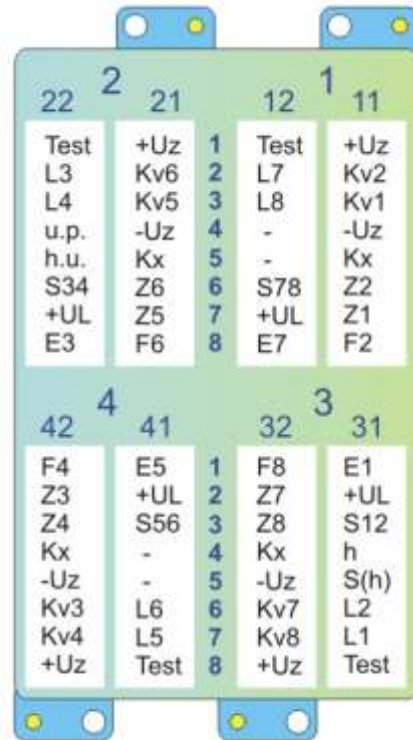
	42	43	44	45	46	47	
	Z1	Kv1	L1		Kx34	h.u.	
31	32	33	34	35	36	37	38
	KvT	Z2	Kv2	L2		Kx12	h
							S(h)
21	22	23	24	25	26	27	28
	u.p.	Z3	Kv3	L3		-UL	+UL
							Test
	12	13	14	15	16	17	
		Z4	Kv4	L4		+Uz	-Uz

TERMINAL DATA

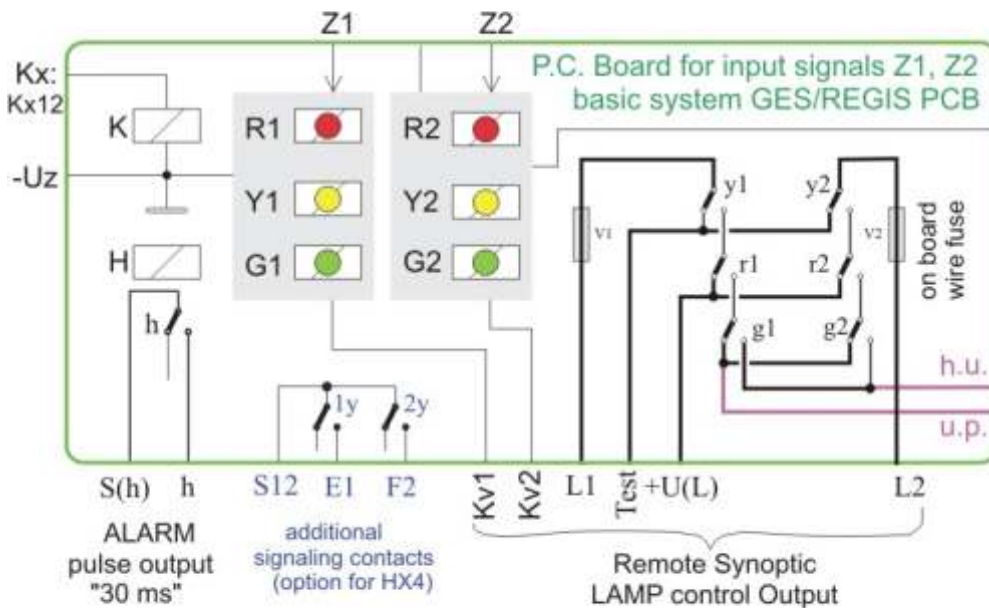
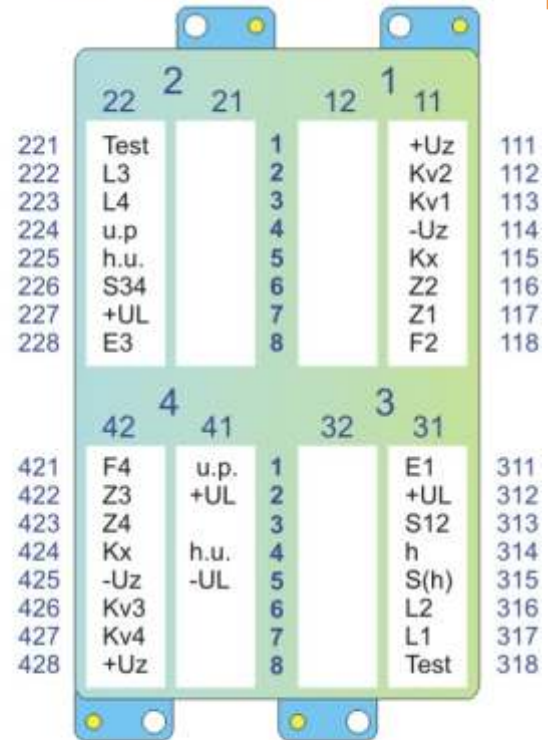
REGIS

Type: **REGIS.8X4**
Combiflex Hx4

Bottom view



REGIS.4X4 REGISS.4X4+T



Relays' & LEDs' nomenclature:
 • capital letter for a relay and associated LED;
 • small letters for its contacts.

Lamps output = (L1, L2);
 u.p. = slow flashing;
 h.u. = fast flashing;
 Test= Lamp test voltage
 +UL= Lamp voltage (high)
 +Uz, -Uz = Auxiliary voltage for protection Z1, Z2.
 Kv1, Kv2 = Quit for Z1, Z2.

Type: **REGIS.8H4**
Wall mounting H4

Top view of the screw terminals

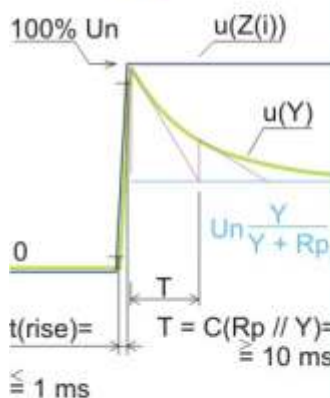
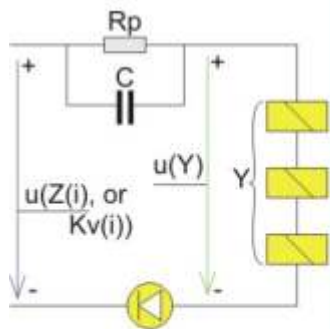


REGIS.4H4 REGISS.4H4+T
REGIS.4H4



Dynamic operation

of GES.8 relays is done by the next relay's loop:

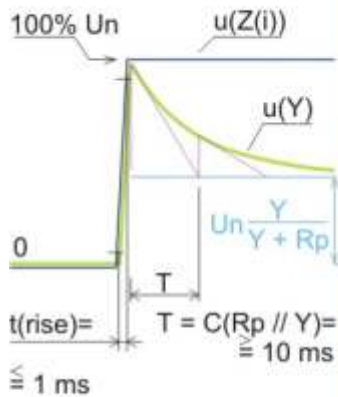
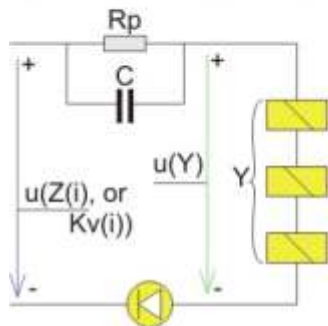


Note:

To reduce thermal overloading of GES.8, by a coincidence of all 8 signals, being presented continuously for more than 2 hours, the upper dynamic relay's triggering is involved. GES.8 incorporates 49 pcb relays with nominal power consumption of 220 mW. By adding power dissipated on drop resistor Rp the static consumption at the nominal relay's rating would exceed 16 W, and without ventilation the GES.8 worst case temperature would not enable a predicted 25 year life time.

GES.4	Relay's input data	Conditions	Min.	Typ.	Max.	Unit
	D.c. input current at Signal input Z(i) and at Quitting input Kv(i) i = 1 to 4	Un 220 V d.c. 110 V 48 V 24 V		4 10 24 48	5,5 11 27 53	mA mA mA mA
	Pick up Voltage Drop out Voltage	0 to 1 1 to 0	70		10	% Un % Un
	Permissible single input overloading	2 W per Z(i)+ +2W per Kv(i)			135	% Un
GES.8	D.c. input current at Signal input Z(i) and at Quitting input Kv(i), for i = 1 to 8	Un 220 V d.c. 110 V		2 5	3,5 8,8	mA mA
	Pick up Voltage Drop out Voltage	0 to 1, static dynamic 1 to 0, static dynamic	90 70		12 15	% Un % Un % Un
	Permissible single input overloading	2 W per Z(i)+ +2W per Kv(i)			160	% Un
GES.4 GES.8	Switching Times Turn on, Turn off Alarm trigger Pulse	D.c. version 0/Un, Un/0 0/Un		5 30	7	ms ms
GES.4/a.c. f = 50 Hz	Switching Times Turn on, Turn off Alarm trigger Pulse	A.c. version 0/Un, Un/0 0/1		30 50	50	ms ms
Rated power consumption for different signal states:						
GES.4 status:	Nominal Voltage: Lowest pick up voltage I(relay) each relay loop	24 V 16,8V 37 mA	48 V 33,6V 24 mA	110 V 77 V 10 mA	220 V 154 V 4 mA	
	only 1 signal is active	2 Po	1,8 W	2 W	2,2 W	1,8 W
	All signals	8 Po	7,2 W	8 W	8,8 W	7,0 W
	After quit:	Po	0,9 W	1 W	1,1 W	0,88 W
	All off	Stand by	0 W	0	0	0 W
GES.8 status:	Nominal Voltage: Lowest pick up voltage I(relay)		dynamic: ... static:	110 V 77 V 99 V 5 mA	220 V 154 V 198 V 2 mA	
	only 1 signal	2 Po			1,1 W	0,88 W
	All signals	16 Po			8,8 W	7,0 W
	After quit:	Po (Power per still active signal)			0,55 W	0,44 W

Dynamic operation
of REGiS.8 relays is done by the next relay's loop:



Note:
To reduce thermal overloading in the worst case of input signals, the REGiS.8 is using a dynamic triggering, shown above.
The worst case means a coincidence of all 8 signals, present continuously for more than 1 hour.
REGiS.8 incorporates 81 pcb relays with nominal power consumption of 220 mW. By adding power dissipated on the drop resistor Rp the static consumption at the nominal relay's rating would exceed 24 W, and without ventilation the REGiS.8 worst case temperature would not enable the predicted life time.

REGiS.4	Relay's input data	Conditions	Min.	Typ.	Max.	Unit
	D.c. input current at Signal input Z(i) and at Quitting input Kv(i) i = 1 to 4	Un 220 V d.c. 110 V 48 V 24 V		4 10 24 48	5,5 11 27 53	mA mA mA mA
	Pick up Voltage Drop out Voltage	0 to 1 1 to 0	70		10	% Un % Un
	Permissible single input overloading	2 W per Z(i)+ +2W per Kv(i)			135	% Un

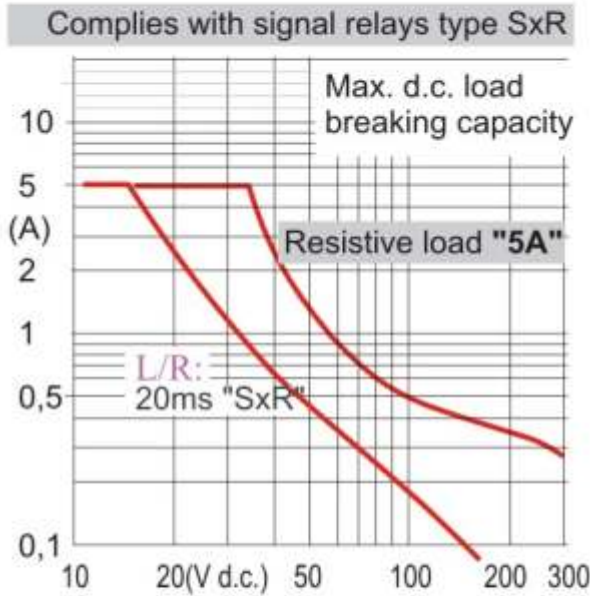
REGiS.8	D.c. input current at Signal input Z(i) and at Quitting input Kv(i), for i = 1 to 8	Conditions	Min.	Typ.	Max.	Unit
	D.c. input current at Signal input Z(i) and at Quitting input Kv(i), for i = 1 to 8	Un 220 V d.c. 110 V		2 5	3,5 8,8	mA mA
	Pick up Voltage Drop out Voltage	0 to 1, static dynamic 1 to 0, static dynamic	90 70		12 15	% Un % Un % Un % Un
	Permissible single input overloading	2 W per Z(i)+ +2W per Kv(i)			160	% Un

REGiS.4 REGiS.8	Switching Times Turn on, Turn off Alarm trigger Pulse Resolution to detect	D.c. version 0/Un, Un/0 0/Un the 1st signal	22 2	5 30 4	7 5	ms ms ms
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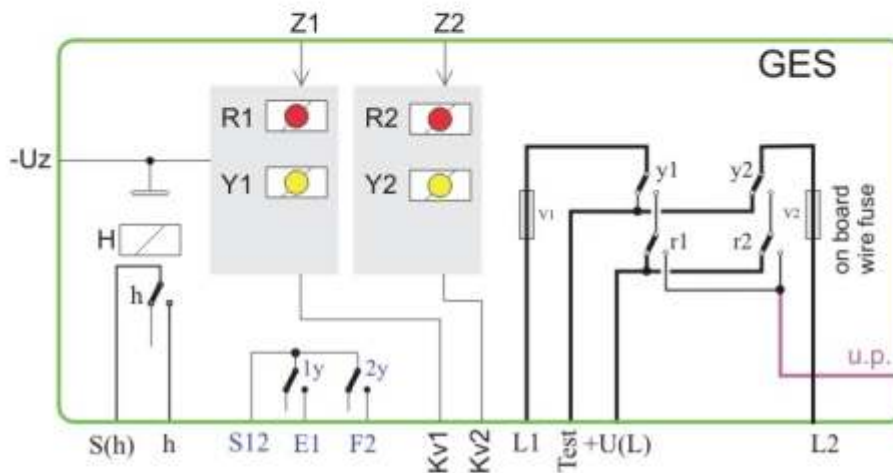
Rated power consumption for different signal states:

REGiS.4 status of LEDs: R Y G	Nominal Voltage:	48 V	110 V	220 V	
	Lowest pick up voltage I(relay) each relay loop	33,6V 24 mA	77 V 10 mA	154 V 4 mA	
	only 1 signal is active	5 Po	2 W	2,2 W	1,8 W
	All signals	11 Po	8 W	8,8 W	7,0 W
	After quit:	Po	1 W	1,1 W	0,88 W
	All off	Stand by	0	0	0 W

REGiS.8 status:	Nominal Voltage:	110 V	220 V	
	Lowest pick up voltage I(relay)	dynamic: ... static:	77 V 99 V 5 mA	154 V 198 V 2 mA
	only 1 signal	7 Po	1,1 W	0,88 W
	All signals	21 Po	8,8 W	7,0 W
	After quit:	Po (Power per still active signal)	0,55 W	0,44 W



Contact data					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Rated current				5	A
Rated voltage				250	V
Breaking voltage				400	V
D.c. breaking capacity* (L/R=20ms, 240V) (20 ms, 200 V) (20 ms, 100 V)				50 60 140	mA mA mA
Lamp switching capacity*	filament D.c. or A.c. Un = 24 V			6 5 2 1	A A A A
*Life time, +45 C	1 break/s	100			1000x
Insulation loop to loop coil loop - contact open contact	50Hz, 1min. separated	2000 2000 1000			Vrms Vrms Vrms
Temperatures Ambient temp. Storage temp.		-20 -40		+45 +85	C C

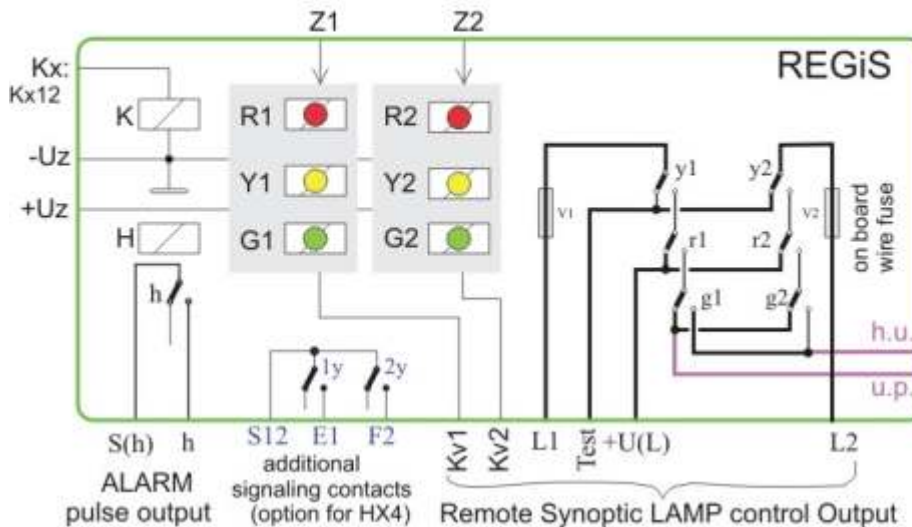


Building module note:

Basic P.C. Board for two input signals: Z(i), Z(i+1) for both systems: GES & REGIS has the same topology. This board also enables dynamic triggering and alternating signal (a.c) Registration.

Signal description:

L1, L2 = Lamps output;
u.p. = slow flashing;
h.u. = fast flashing;
Test= Lamp test voltage
+UL= Lamp voltage - high
+Uz, -Uz = Auxiliary voltage for protection Z1, Z2.
Kv1, Kv2 = Quit for Z1, Z2.



Relay & LED note:

R = red, R+Y: records a trip.
Y = yellow, marks that after quitting signal is still active.
G = green, shows the 1st.
H = Alarm "hooter".
K = Coincidence relay, choose the first signal;
Kx = connects all signals, forming the same comparison group.

Relays' & LEDs' nomenclature:

- capital letter for a relay and associated LED;
- small letters for his contacts.