

ABB Network Partner AB



One to four shots, three-phase reclosing relay
for transmission and subtransmission lines

General

- Automatic high speed or delayed breaker reclosing after initiation from protective relay trip
- Allows sequential reclosing of breakers in 1 1/2 breaker or multibreaker arrangements
- Breaker position memory included
- Microprocessor based design with four available reclosing programs for one to four three-phase reclosing shots
- Allows extended shot 1 dead time for line protection communication link out of service
- Prepared for coordination with synchronism and dead line check relay
- External "Auto-reclosing On/Off" control
- Three built-in operation counters for shot 1 shot 2 and shot 3 plus 4
- User friendly man-machine-communication by means of three position numerical display, LEDS, push-buttons and selector switches. Continuous self-supervision
- Continuous self-supervision
- Auto-test function
- Available with or without test switch RTXP 18

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1 Application

1.1 General

Transmission and subtransmission lines are protected by line protection relays, usually of distance type. In case of faults, the distance protection initiates the circuit breaker tripping and the fault is cleared. The lines are then brought back into service either by manual reclosing or automatically, when auto-reclosing relays are used.

There are basically two types of faults on power systems; transient and permanent.

Transient faults are usually caused by lightning and, once cleared, with the arc path deionized, the line can be reenergized without the fault reoccurring.

Permanent faults can be caused by a broken conductor, the collapse of a line tower, or a tree leaning toward the line. In these cases, the line can only be re-energized after fault location is traced and the damage repaired.

The basic objective of auto-reclosing is to restore automatically the transmission line back into service after being tripped by line protection relays, without depending on the operator action.

Auto-reclosing of transmission lines provides significant advantages. Statistics have shown that most of faults are of transient nature and in regions with high lightning intensity only about 5% of the faults are permanent.

The use of auto-reclosing will therefore improve the network service reliability increasing the availability of the transmission system, and providing increased transmission revenues. Additionally, it enables the use of unmanned substations and reduces the number of emergency visits, saving operating costs.

The use of high speed auto-reclosing for high voltage and extra high voltage transmission lines, in combination with fast protective relays and circuit breakers, is of primary importance to maintaining system stability.

The choice of the auto-reclosing type, such as, one or more reclosing shots, high speed or delayed, single-phase or three-phase depends on the characteristics of the transmission and protective system, together with the utility practice.

The choice of single- or three-phase reclosing depends on the power system characteristics. Auto-reclosing, specially high speed three-phase, cannot be indiscriminately applied to all system and fault types. Modern power plants with larger generators can be subjected to excessive shaft torques if a high speed auto-reclosure takes place onto a permanent fault. Also three-phase auto-reclosing onto a multi-phase fault could adversely affect system stability.

1.2 Auto-reclosing cycle and definition of times

The involved times in the auto-reclosing cycle are illustrated in Fig. 1 for a transient fault and in Fig. 2 for a permanent fault, one shot auto-reclosing.

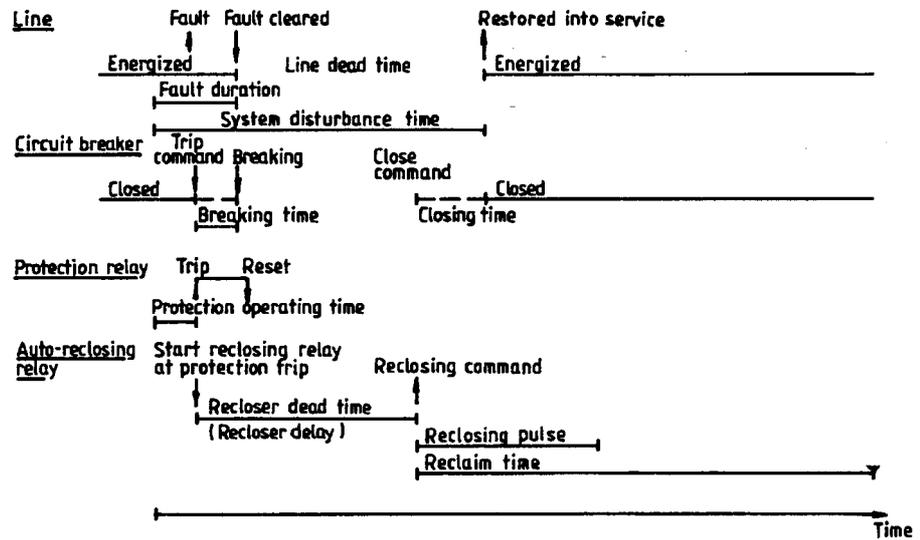


Fig. 1 Auto-reclosing cycle, transient fault

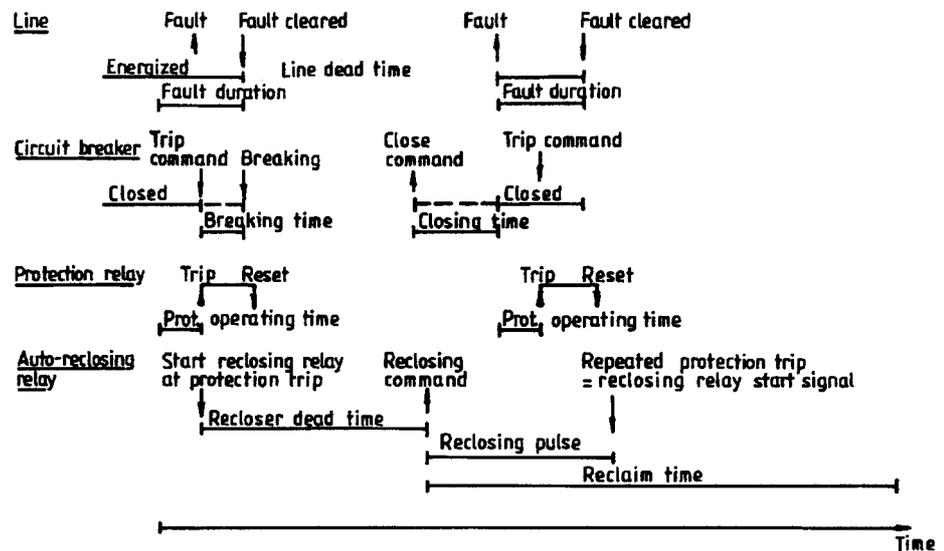


Fig. 2 Auto-reclosing cycle, permanent fault

The times are defined as follows:

Dead Time

A time between the fault clearing and the reclosing shot is necessary to allow for the arc de-ionization. The dead time setting corresponds to the time between the auto-reclosing start and the reclosing shot. Its choice depends on many factors;

High speed auto-reclosing with shorter dead times (typically < 1 s) can be used if the lines are fast and/or simultaneously tripped at both line ends. If there is no communication link available between the protections at both line ends, the dead time is chosen considering the maximum fault clearing time, normally limited by the overreaching time delayed measurements (2nd zone).

Delayed or low speed auto-reclosing (with dead time typically of 5 - 60 s) is normally used only for three-phase shots. When the line can be fed by both ends, it is usually necessary to check the phase angle, voltage and frequency difference before the reclosing is attempted.

Fault duration

Short protective relay tripping times and high speed circuit breakers improve the possibilities of a successful reclosing. A fast fault clearing leads to less damage and less ionization in the fault path. The network is as well less stressed which also contributes to a successful reclosing.

Reclaim time

The reclaim time is the time during which a new start of the auto-reclosing is blocked. It is chosen considering the breaker operating cycle, which specifies the minimum allowed time between successive breaker reclosing attempts, so that an eventual tripping and reclosing on to permanent faults, will neither deteriorate breaking capacity nor damage the breaker.

1.3 REXA 103 reclosing programs

REXA 103 is used in applications when only three-phase reclosing is required. Four alternative reclosing programs are available and can easily be changed after installation in case the operating requirements of the power system change;

- One shot, three-phase reclosing
- Two shots, three-phase reclosing
- Three shots, three-phase reclosing
- Four shots, three-phase reclosing

The dead times can be individually set for;

Three-phase reclosing, shot 1 (t1)

Three-phase reclosing, shot 2 (t2)

Three-phase reclosing, shot 3 and 4 (t34)

1.4 Cooperation with external equipment

REXA cooperates with the following equipment:

- Line protection relays
- Line circuit breakers
- Indication, annunciation and event recording systems
- External synchronism and dead line check relay
- External "Auto-reclosing On/Off" control
- Another REXA for coordinated and sequential reclosing in multibreaker arrangements
- Other protective relays or control functions, enabling external block of auto-reclosing

REXA cooperation with external equipment, such as line protection relays, circuit breakers and indication, is greatly simplified as several input and output possibilities are already provided built-in the relay, without being necessary inclusion of externally connected functions.

1.5 REXA inputs

REXA is provided with opto-coupler inputs associated to the following functions:

Auto-reclosing On/Off

This input enables to switch the automatic reclosing On or Off from a station control panel or from a control centre. One pulse at this input (min. length of 200 ms) switches REXA "On", another pulse switches it "Off". See Fig. 3. This input works in combination with a toggle switch at the relays front and is enabled provided the switch is at "On" position.

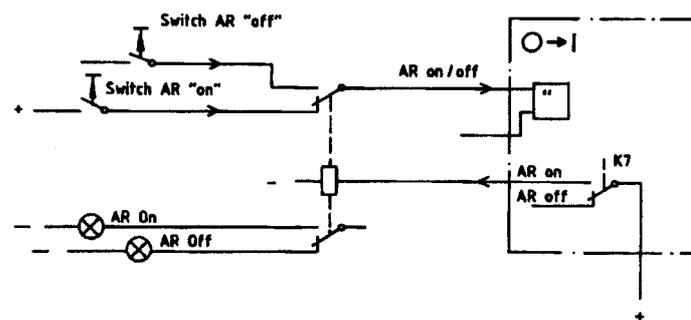
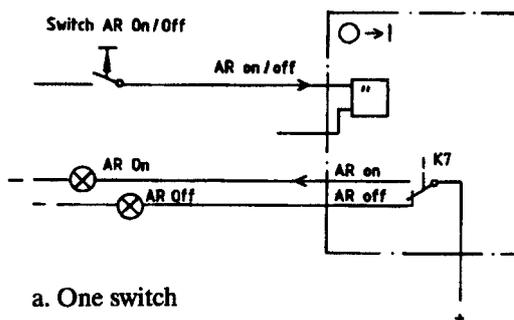


Fig. 3 REXA 103 On/Off by external control

Protection trip/Start recloser

REXA is started by a line protection trip pulse to this input. A new pulse after reclosing will inform the reclosing relay that a new trip occurred due to a remaining line fault.

Block AR (auto-reclosing)

External contacts, e.g. from back-up time delayed relays or breaker failure relays, can be connected to this input to interrupt the reclosing cycle and temporarily block the recloser. The blocked state will remain for five seconds after the block input signal has been removed.

Should a blocking signal occur during the reclaim time, after a reclosing pulse has been issued, reclosing will be blocked for the remaining reclaim time but at least 5 s.

CB closed

A circuit breaker auxiliary contact or position repeat contact can be connected to this input and REXA will check that the circuit breaker has been closed for a certain time (5 s) to allow a new reclosing cycle to be started. This will prevent auto-reclosing on to a fault. This function is also useful in multi breaker arrangement to control that only the CB closed, when the fault occurs, is automatically reclosed.

In case the CB-closed signal duration is less than appr. 40 ms after initiation of REXA, REXA will not behave correctly.

The solution is a slow or drop-out delayed intermediate auxiliary relay.

By using the switch no.3 "CB pos. bypassed" at the relays front, this input function is disabled. The blocking of auto-reclosing at manual CB closing must then be made at REXA blocking input.

CB-ready

This input is intended to be connected to a contact of the operating mechanism of the circuit breaker to inform REXA that the CB has enough stored energy for closing. Should the breaker not be ready for the first high speed reclosing at the end of the dead time, REXA is blocked. For the next reclosing, the breaker will be given the delayed reclosing dead time to recharge. The input is checked just before making an auto-reclosing attempt to prevent unnecessary blocking due to transients in the breaker energy storing system.

Synchronism or dead-line-check

The synchro- or dead-line-check is made externally to REXA. A leader and follower terminals are defined. The leader terminal is first reclosed after dead-line-check condition is fulfilled. The follower terminal will then reclose after the synchro-check conditions are present. When high speed auto-reclosing is used, the operating times of the synchronism and dead-line-check relays must be compatible with the chosen dead time delay.

Through this input REXA checks the state of a contact at an external "Synchronism or dead-line-check" relay after a three-phase dead time. A closed external contact allows a reclosing to be made. Should the synchro- or dead-line-check conditions not be met within five seconds, REXA will interrupt the reclosing cycle. This input contact function is enabled by setting the switch no.1 of the relays front at position "Synchronism check".

Priority release

This input is used in multiple breaker arrangements, such as 1 and 1/2 breaker, 2 breakers and ring bus stations, when a line terminal is switched by two circuit breakers. A sequential reclosing is used to not unnecessarily stress the breakers and due to the limited breaker capacity of parallel breaking. One REXA is provided for each breaker and both units are interconnected by a "priority circuit" to give sequential reclosing of the breakers after a line fault. See Fig. 4. Thus, only one circuit breaker is reclosed and retripped at a permanent fault, reducing the circuit breaker wear. This input is enabled by setting switch no.2 at the relays front to pos. "Low priority".

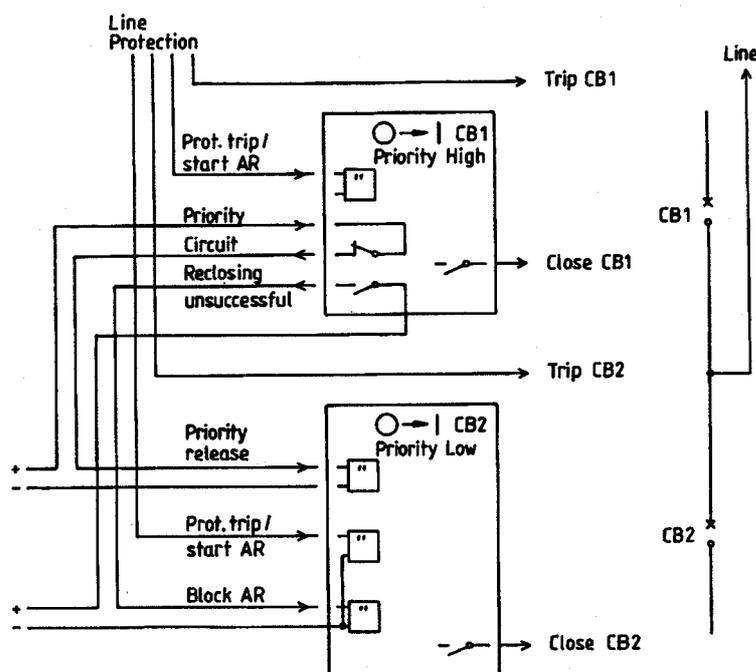


Fig. 4 Interconnection circuits in multi-breaker arrangements. Sequential reclosing, CBI before CB2

Communication link out of service

This input enables a particular feature of REXA.

High speed auto-reclosing can successfully be used when line protection relays use telecommunication channel, ensuring fast and simultaneous tripping of the two line terminals. Three-phase auto-reclosing with short dead times around 0.3-0.5 s can herewith be used.

Should however the communication channel be out of service, there is a risk that the tripping of one line terminal is issued by a time delayed 2nd zone function, usually set at 0.3-0.4 s. Due to the non simultaneous tripping and reclosing at the two line ends, the effective dead time can be too short for a successful reclosing. This difficulty is overcome by using a contact of the communication equipment connected to this input, indicating that the communication channel is out of service. This will cause REXA to add an extra 0.4 s to the reclosing dead time.

While the alternative is to block auto-reclosing at communication failure, this feature will enable successful AR in the whole line section, even without the communication link.

1.6 REXA outputs

REXA is provided with printed circuit board potential free contacts, associated to the following functions:

Recloser ready/not ready

Normally activated, this output resets whenever an auto-reclosing cycle is started and remains low up to the end of the reclaim time. This signal can be used to connect an accelerated stage of a distance relay zone 1 when high speed AR is used with no communication link available. The low status of this output after an unsuccessful reclosure will always ensure a selective trip.

Reclosing in progress

Normally opened, this output closes at the auto-reclosing cycle start and resets 1 s after the reclosing pulse is issued. It is used for event logging or to start synchro/dead-line-check.

Close CB

By this output the reclosing pulse to the circuit breaker is issued.

Reclosing unsuccessful

A new trip after the last reclosing shot activates this output. It can be used for alarm or annunciation and to prevent auto-reclosing of a low priority breaker at a non-successful reclosing of the high priority breaker in a multi-breaker system, as shown in Fig. 4.

Internal relay fault

This output is activated when the relay self-supervision identifies an internal fault or the auxiliary DC supply is lost.

AR On/Off

This output reflects the On/Off status of the auto-reclosing.

Priority circuit

This output is intended for use in multi-CB arrangements, e.g. 1 1/2 CB. Normally closed, this output contact opens at the start of the auto-reclosing cycle and closes 1 s after the reclosing pulse. Used at the reclosing relay associated with the high priority breaker, it is connected to the "Priority Release" input of the reclosing relay associated with the low priority breaker. See Fig. 4.

1.7 Special operating features

The conditions to issue a reclosing command are not met

If "CB ready" or "Synchro. check" signal are not present at the end of the reclosing dead time, the reclosing cycle will be interrupted and the reclosing will be first blocked for 5 s. After that, REXA will be controlled by the "CB closed input", that is, after the CB has being closed for more than 5 s, REXA becomes ready for operation.

Extended "Prot. trip/start AR" signal

If the trip signal remains high until after the reclosing dead time, when a reclosing pulse is about to be issued, the reclosing will be inhibited. First the blocking state of REXA will remain for a time equal to the reclaim time "tB". Should the trip signal be removed during the reclaim time, the state of REXA will then be controlled by the "CB closed" signal in the normal way.

Should the trip signal remain also after the reclaim time, REXA will automatically be switched off. A notification of the abnormal condition is obtained by the output signal "Recloser Off". Before switching REXA "On" again, the trip signal should be removed. Otherwise the "Blocking and switching off" sequence will be repeated.

Interruption and return of the power supply

Short dips in the power supply are bridged over by the DC/DC converter.

The settings, counters content and "On" or "Off" state will be saved even at a longer power supply interruption. When the power supply returns, REXA reassumes the "On" or "Off" state present before the interruption. REXA will first be blocked for 5 s and then check the "CB closed" condition before getting ready.

If reclosing cycle is in progress when the power supply disappears, that cycle is interrupted and not restarted when the power returns. Should the reclaim time be running when the power supply is interrupted, REXA will be blocked for the whole reclaim at power supply return. This is made to prevent a too fast start of a new reclosing cycle.

REXA operation in multi-breaker arrangements

REXA is prepared to be used in applications with different switchgear arrangements, such as "One and half a half breaker", "Double breaker" and "Ring bus stations".

One reclosing relay is used for each line circuit breaker. The two REXAs are interconnected according to Fig. 4. One circuit breaker is given the high priority and will reclose first, in this case CB1. The "Low priority" switch of REXA associated to CB2 is set in pos. 1 which enables the input "Priority release".

Transient line fault

1. A line fault occurs, the line protection trips the two CBs and starts the two reclosing relays. When CB1 REXA is started, it opens its output contact "Priority circuit", which sets low CB2 REXA input "Priority release". This will cause CB2 REXA to be in a waiting state, without starting its dead time.
2. After the set dead time, CB1 is reclosed by its reclosing relay and the fault has disappeared.

3. One second after the reclosing pulse, the reclosing is considered successful and CB1 REXA closes its output "Priority circuit" (and open "Reclosing in progress"). The input "Priority release" of CB2 REXA will become high and the dead time for CB2 is started.
4. The CB2 reclosing relay will reclose CB2.
5. The CB1 and CB2 reclosing relays reset after their reclaim times run out.

Permanent line fault

1. As above
2. The CB1 reclosing relay will reclose CB1, but the fault remains and the line protection trips again. Tripping will be three-phase and issued to CB1 and CB2 (CB2 may be closed in two phases). Assuming that REXA is set to only one reclosing attempt, when receiving a new start it will close the output contact "Reclosing unsuccessful". This output is connected to CB2 REXA input "Block AW" and the CB2 auto-reclosing relay is therewith blocked.
3. The CB1 and CB2 reclosing relays will reset after their reclaim times but now the circuit breakers are open and they must be closed for at least 5 s before a new reclosing cycle can be started.

Note:

Should the high priority breaker CB1 be out of service, the "Priority Circuit" contact of the associated REXA will remain closed, releasing the CB1 priority and CB2 is normally reclosed after the dead time.

Use of the "CB Ready" as a start criteria

The "CB ready" condition is checked only at the end of the dead time and, if not present by then, blocks the auto-reclosing from that first attempt. Auto-reclosing is still possible if the breaker operating gear mechanism stores up enough pressure between the first and subsequent shots.

However, in some applications it is requested that the auto-reclosing, is already blocked at the start if the "CB ready" is not present, because of the considered small chances that enough pressure for an auto-reclosing sequence develops. In these cases, the output "AR not ready" should be already closed, providing selective trip.

Should this "CB ready" condition be required as a further condition to enable start, the necessary logic can be implemented externally to REXA. It may be added to the input circuit of "CB closed" and the condition for a "Close-Open" sequence would then be both "CB closed" and "CB charged and ready".

Breakers with hydro-pneumatic operating gear

In this case, the contact indicating the operating gear status, to be used as "CB ready" condition, can have the following particular features; It may be temporarily open by pressure drop at the CB tripping or in its closed

condition, it indicates that the circuit breaker is ready for an Open-Close-Open (O-C-O) and may open after the first trip (the contact opens when the gear has energy for just Close-Open (C-O) sequence).

Two points must be considered, in connection with the use of the "CB ready" and start criteria used with REXA.

-Instant of the start pulse to REXA

If the "CB ready" is used to enable the start and auto-reclosing is started with the tripping pulse to the breaker, with no further delays, REXA will then have enough time to acknowledge the start condition before a possible "CB ready" input temporary reset due to a the low pressure caused at the instant of the breaker trip.

Should the start pulse to REXA occur by the time of the circuit breaker opening, the "CB ready" condition can possibly reset and prevent REXA to start, although the CB pressure would eventually recover. In this case an external time delayed reset (around 200 ms) of "CB ready" condition would solve the problem.

-Type of CB operating mechanism monitoring used as "CB ready" criteria

There are different possible CB monitoring outputs available to indicate the breaker condition before a reclosing is attempted, namely:

Open - Close - Open (O-C-O)
Close - Open (C-O)
Open (O)

At REXA it is assumed that the CB monitoring output used as "CB ready" input is a C-O condition (normally available at spring type CB operating mechanisms).

With breakers where only O-C-O condition is available, it can not be used as "CB ready" input since after the first trip the O~C-O condition would reset and thus block the reclosing attempt. Even if REXA is started it will block the reclosing as the "CB ready" condition is checked after the dead time, before reclosing.

An external logic can be implemented, if this is the case, to prevent auto-reclosing in case the O-C-O condition is not present. The "CB ready" input shall not be used. An interlocking of the O-C-O breaker output contact with the "Breaker closed" condition would prevent an incorrect start of REXA, as shown in Fig. 5. With the O-C-O breaker sequence possible, start is allowed.

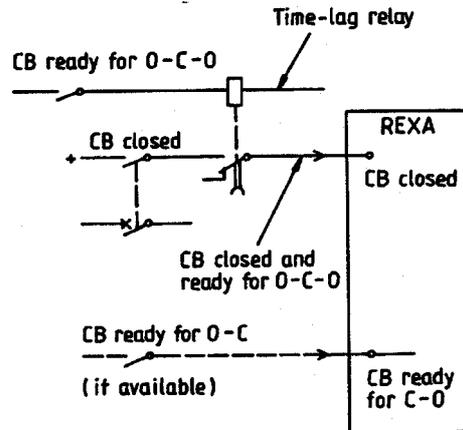


Fig. 5 Use of O-C-O breaker monitoring contact to block REXA start

2 Design

REXA 103 reclosing relay consists of a plug-in unit mounted in a cassette. This cassette is intended for mounting in a 19" rack and occupies 6U-modules high (267 mm) and 21 TE-modules width (107mm) of system RL. The cassette of REXA 101 including the test switch occupies 35 TE-modules width (178 mm).

The cassette without test switch is mounted in the rack through two card guides located at the positions 01/02 and 21/22 TE-modules (straight edge right and left respectively). Three card guides are used for mounting the cassette with test switch and they shall be located at the positions 03, 15 and 35 TE-modules (straight edge left, right and left respectively).

The auto-reclosing function is performed by use of a pre-programmed single-chip microcomputer (MCU). The program is stored in a programmed read only memory (PROM) of the MCU. The timer settings, program and the counters content are stored in a non-volatile memory (NOVRAM). Galvanically separated contact interfaces with interference suppression are used at the out-put circuits and opto-couplers are used at the input circuits. A built-in DC/DC converter provides the power supply to the internal electronic circuits. The means for indication, reading and settings are provided at the relay front.

3 Operating and setting instructions

3.1 Means for Man-Machine-Communication

The means for indication, reading and setting are available at the relays front. See Fig 6.

1. Display:

Consists of a three position numerical display and is used to show the setting parameter values and the contents of the operation counters.

2. On/Off- switch:

This toggle switch in the front of the relay switches the auto-reclosing on and off. The input "AR On/Off" is blocked when this switch is in Off position.

REXA can be switched on and off either by the toggle switch in front of the unit or by the "AR On/Off" input. See Fig. 6. When the toggle switch is pushed up, REXA is switched on and the switch returns automatically to the middle position. In this case, the "AR On/Off" input responds to pulses; one pulse switches "AR On", the next switches "AR Off".

When the toggle switch is pushed down, REXA is switched off. Leaving the switch in the "Off" position ensures that the auto-reclosing is always Off (i.e., is not influenced by the "AR On/Off" input).

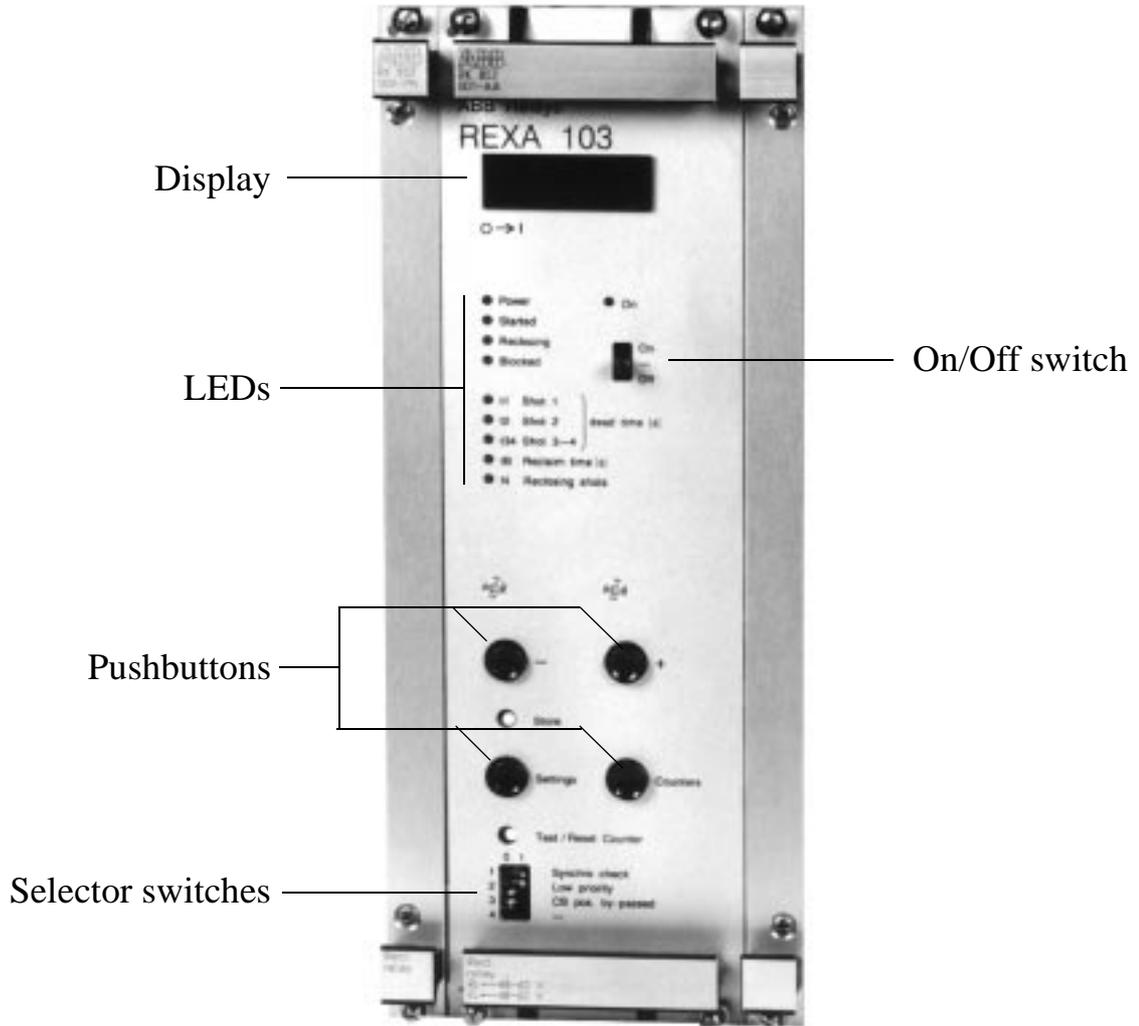


Fig. 6 Means for Man-Machine-Communication

3. LED'S:

Ten light emitting diodes are used to indicate REXA status during normal (rest) conditions, during a reclosing cycle and when reading or setting the reclosing relay (see Figs 3 and 4), namely:

Green LEDs:

"Power" REXA is in healthy condition and has auxiliary power connected
"On" REXA is in service

Yellow LEDs:

"Started" REXA is started. A reclosing cycle is in progress
"Reclosing" REXA is issuing a reclosing attempt
"Blocked" REXA is blocked, either by external control or temporarily, e.g., during the reclaim time

The progress of REXA during the auto-reclosing cycle is indicated by the following LEDs, also used when reading or changing the settings:

"t1 Shot1"
"t2 Shot2"
"t34 Shot3-4"
"tB Reclaim time"

The indications displayed in operation reset automatically. No manual resetting is possible.

4. Push-buttons:

Six push-buttons are used for reading, setting and checking the reclosing relay;

" + "
" - "
"Store"
"Settings"
"Counters"
"Test/Reset Counter"

5. Selector switches:

Three switches are used to enable or by-pass certain inputs;

"Synchro check", S1
"Low priority", S2
"CB position by-passed", S3

The function of following inputs are influenced by the position of related selector switches:

"Synch. Check"(S1, "Synchro check)

Setting S1 in position 1 enables REXA to be controlled by an external contact, e.g. of "Dead line/Synch. check" relay, connected to this input.

"Priority Release"(S2, "Low priority")

The switch S2 of REXA associated with the low priority circuit breaker (e.g. the mid breaker of a 1 1/2 breaker arrangement) shall be set to position 1.

If REXA is not used in multi-breaker systems, this switch is normally set in pos. 0 and the input "Priority Release" is not enabled.

"CB closed" (S3, "CB pos. by-passed")

Normally S3 is set in pos. 0. The input "CB closed" is by-passed when the S3 switch is set in position 1. This is the case when an alternative method is used for blocking of the reclosing relay after a manual CB closing.

6. Operation counters:

Three operation counters are available. In REXA 103 the operation counters register the number of shot 1, shot 2 and shots 3 plus 4.

The reading of the operation counters is initiated by pressing the "Counter" push-button. The content of the first counter is shown in the numerical display and a LED identifying the counter is lit. The "Counter" push-button is then successively pressed to read content of the second and third counters and to leave the counter indication mode.

The counters can be individually reset to zero by pressing the "Test/Reset Counter" push-button while the counter content is displayed.

3.2 Settings

1. Reading the settings

The settings can be read with REXA either in "AR Off" or "AR On". The reading of settings is initiated by pressing the push-button "Settings". The first setting is shown at the display and an LED identifying the set quantity is lit. The other settings are read by successively pressing the "Settings" push-button. The time settings are shown in seconds. In REXA 103 the number of selected three-phase reclosing shots are indicated by numbers 1-4, respectively.

2. Changing the settings

The parameter to be set is called to the display as above described. The value is changed by pressing the push-buttons marked " - " and " + ". A pulse will change the value one step. The value will roll faster if the push-button is held pressed.

When the value in the display has been changed from that one stored previously, it will flash. The push-button "Store" must then be pressed to the new flashing value be stored as the new setting. The displayed value will now be steadily shown. The next parameter is accessed or the setting mode is left by pressing the "Settings" push-button.

Notes

When the settings are only checked but not changed, REXA can be normally started by a trip signal. It will leave the setting mode and start the auto-reclosing cycle.

When a parameter has been changed by a "Store" operation, REXA will be blocked temporarily, until all parameters are run through. The blocking state is indicated by the "Blocked" LED. The blocking is reset when the setting mode is left. It is only at this moment the new settings are actually stored.

If REXA is forgotten blocked in the setting mode, it will return to normal operating mode after three minutes. The previous settings are kept and the new values, entered during the unfinished loop are ignored.

3.3 Auto-tests

1. Self-check

A self-check program is automatically initiated when auxiliary power is applied to REXA. The same program is initiated by pressing the push-button "Test". Auto-reclosing is inoperative during the test. During the test, the LEDs "Power" and "On" slack and the output "Recloser ready" opens. Correct operation of the line protection is therewith assured during the test. When the test is completed without errors, a flashing display indication "8.8.8" is shown.

2. LED test

The proper function of the LEDs are tested by pressing the push-buttons "Test" and "Settings" simultaneously. All LEDs will then light.

3. Output relays test

WARNING

This test will energize the output circuits and issue a closing command to the circuit breaker. The CB closing circuit must therefore be opened, before this test is initiated. If the test switch RTXP 18 is provided, the CB closing circuit can be easily opened by inserting the test plug-handle RTXH 18 or trip-block plug RTXB. Otherwise the trip can be isolated externally to REXA at the cubicle terminals. This test is initiated by pressing the "TEST" push-button until the "8.8.8" is shown at the display. Keeping the "Test" push-button pressed, the "-" is then pressed. The output relays of REXA will pick up initiating the commands and signals. The output relays reset when the push-buttons are released. The output relay "Recloser ready" is however excluded from this test and remains open.

4 Technical data

Auxiliary DC voltage			
Power supply (EL) inputs rated voltage (RL)	48-60 48-60	110-250 110-125	110-250 V DC 220-250 V DC
Permissible variation	80-120%		
Power consumption of power supply (EL) at rated voltage: in normal conditions, max. during operation, max.	6 7	6 7	7W 8W
Power consumption of each input (RL) at rated voltage, max.	0.3	0.5	0.5 W
Type of reclosing	3-Phase		
Selectable number of reclosing shots	1,2,3 or 4		
Dead time settings 3-Phase reclosing, shot 1 3-phase reclosing, shot 2 3-Phase reclosing, shot 3, 4	0.25-60 s in steps of 0.05 to 1 s 2-240 s in steps of 1 s 2-240 s in steps of 1 s		
Reclaim time setting	10-180 s in steps of 1 s		
Fixed settings Reclosing pulse	0.2 s (0.20 - 0.22 s) interrupted at new trip but with min. duration 50 ms		
Reset time of blocking input Condition "CB closed" min. time Extra dead time delay with "Communication link out" Limit wait time for "Synchro-check" signal Limit wait time for "Priority release"	5 s 5 s 0.4 s 5 s 5 min (+ or - 1 s)		
Accuracy in time settings, when not otherwise above stated: Typical error limits Times up to 2 s Times above 2 s	0 to +0.020 s 0 to +0.100 s		
Dispersion in time at repeated operations, typically	+ or - 0.010 s		
Reclosing output relay contact data:	General outputs and CB closing outputs		

Max system voltage AC/DC	250 V	
Max continuous current carrying capacity	4 A (General outputs) 5 A (CB closing output)	
Making and conducting capacity in 1 s, DC inductive, L/R > 10 ms	10A	
Breaking capacity; at AC, P.F. > 0.4	5 A (General outputs) 10 A (CB closing output)	
at DC, L/R < 40 ms 48 V, max 110 V, max 220 V, max	General outputs 0.5 0.2 0.1	CB closing 0.5 A 0.25 A 0.15 A
Insulation test		
Dielectric test Between circuits and to ground Across open contact	(IEC Publ. 255-5) 2 kV, 50 Hz, 1 min. 1 kV, 50 Hz, 1 min. (General outputs) 1.5 kV, 50 Hz, 1 min. (CB closing output)	
Impulse test voltage	5kV, 1.2/50 us, 0.5 J (IEC Pub. 255-5)	
Interference tests	IEC Publ. 255-4 class III	
Interruption of the auxiliary DC supply, IEC 255- 11, SS 436 15 03:		
Short or long interruptions Interruptions without effect EL 48-60 V 110-125 V 220-250 V	No undue close commands Shorter than 100 ms Shorter than 100 ms Shorter than 100 ms	
Interruptions in normal rest state	Temporarily blocking Return to normal with return of voltage	
Interruption during the reclosing cycle	Interruption of the cycle Return to rest state with the turn of voltage	
Permissible ambient temperature Permissible storage temperature	-5 to +55 deg C -40 to +70 deg C	

5 Circuit diagrams

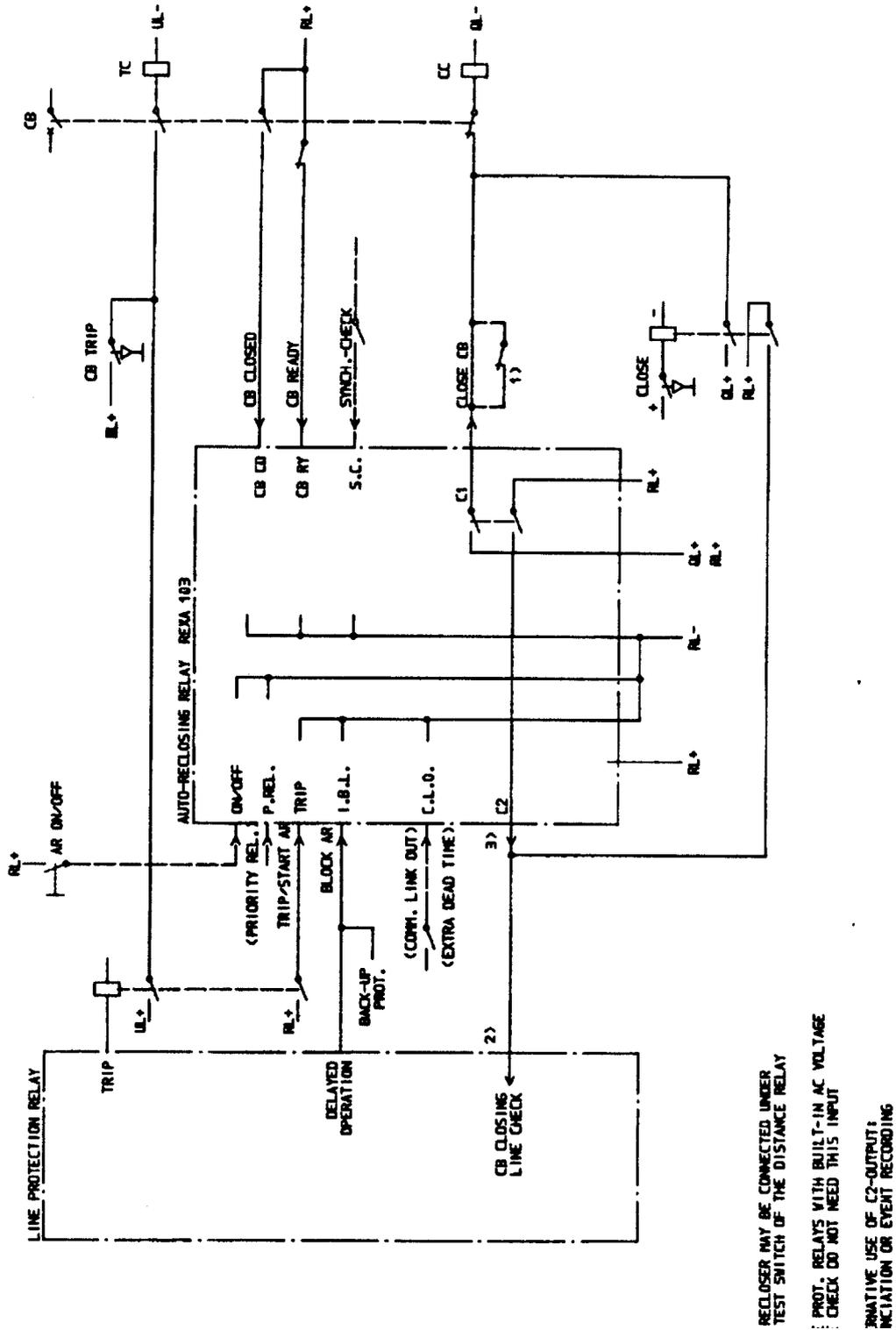


Fig. 7 Typical interconnection of REX4 103 -Line Protection -CB

6 Receiving, Handling and Storage

The recloser is delivered either as loose item or installed together with other equipment, for instance in a cubicle.

The recloser shall be prevented from physical damage and stored in dry and moderate temperature environment. If delivered loose it is recommended that, after inspection, the unit is stored in its packing until installed.

7 Inspection and testing

7.1 Visual inspection

Check that the equipment has not been damaged in transport or installation!

Check that it has the correct auxiliary voltage rating!

Check that the correct connections are made in accordance with the applicable circuit diagrams.

7.2 Testing

Additionally to the auto-tests above described, functional tests can be performed during service without risk for undesired operation when the RTXP 18 test switch is available. If the test switch is not included, the reclosing relay outputs must be properly isolated.

When the test handle is inserted in the test switch, the inputs and outputs of the reclosing relay are isolated from the protective relay and the breaker and made accessible via the test handle. A starting pulse (reclosing initiation) can be simulated and testing of the programming functions and the various time delays can be performed.

8 Terminal diagrams and connections

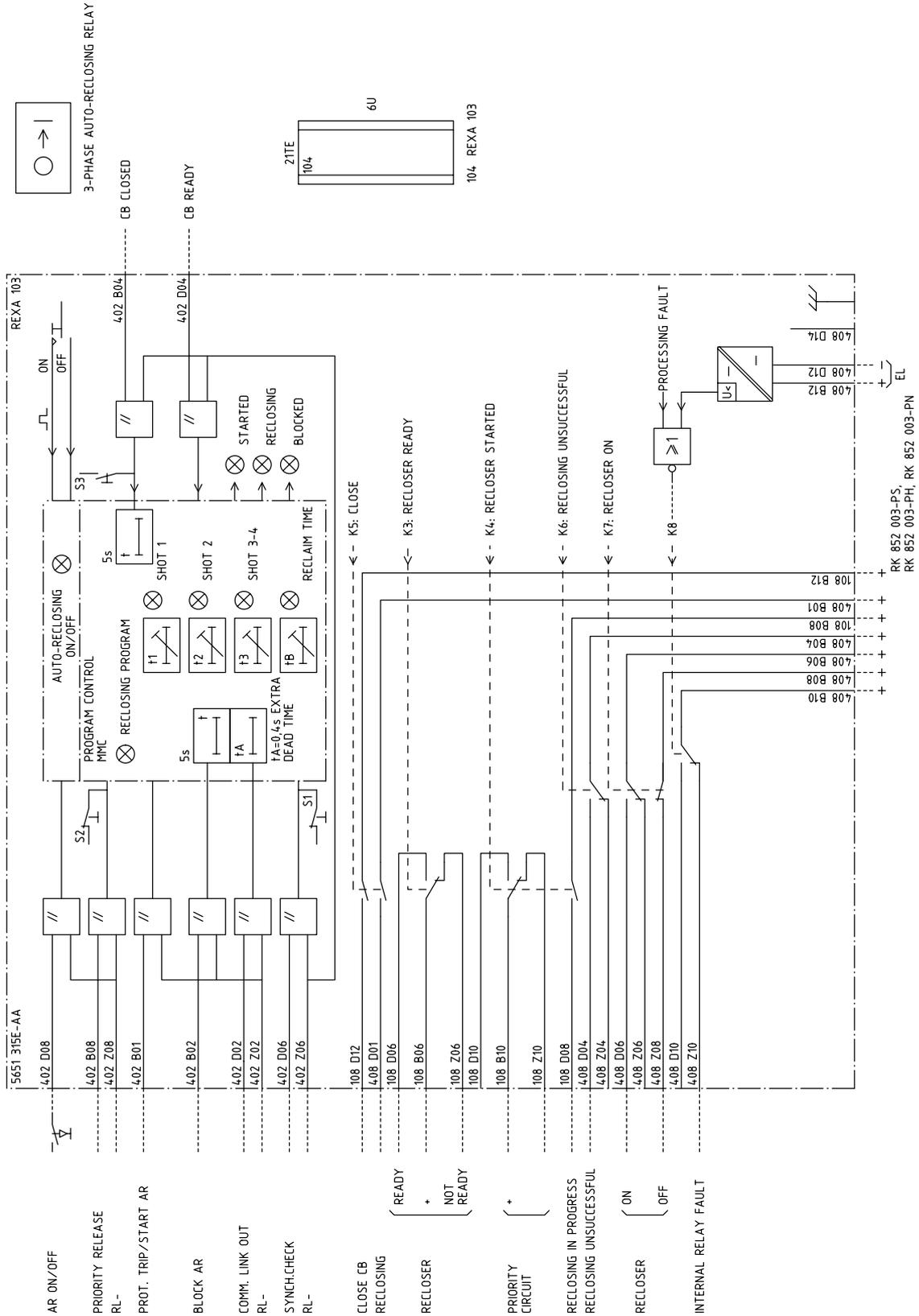
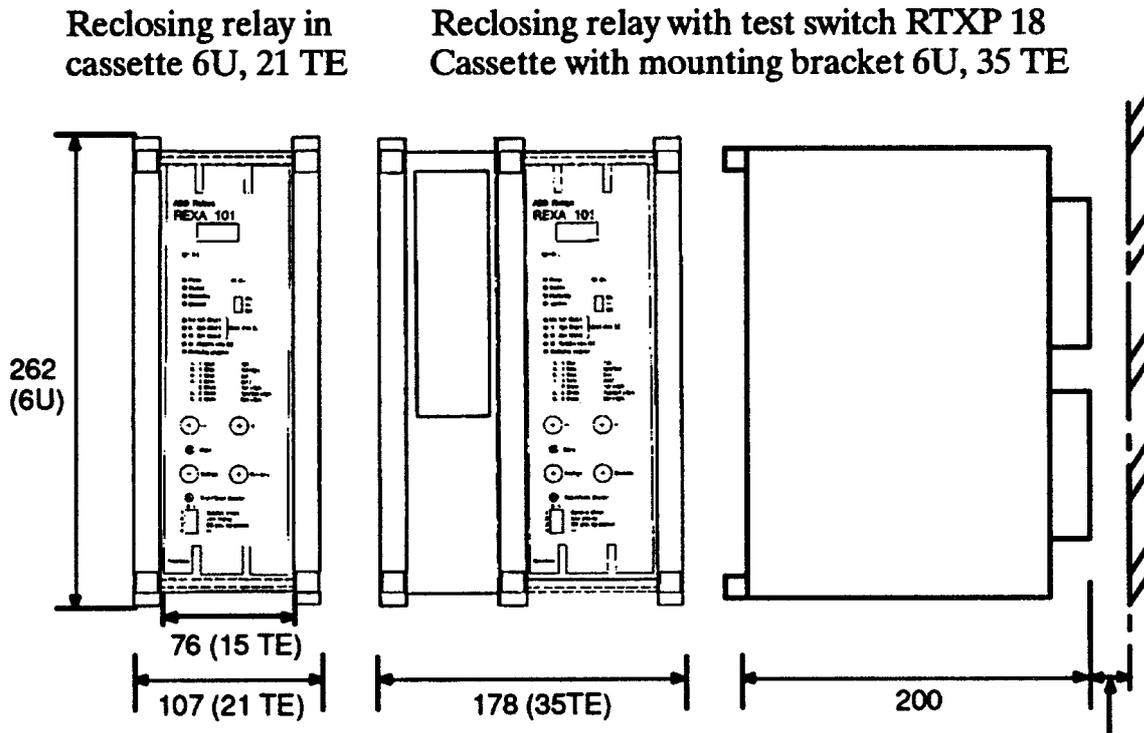


Fig. 8 Terminal diagram for REXA 103 without test switch
Diagram 5651 315E-AA



Actual dimensions are given in mm, decimals rounded off. Space requirements for mounting are indicated as U- and TE-modules in brackets ().

Spare for wiring minimum 30 mm

Fig. 10 Dimensions

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