

1 SAFETY OPERATIONS

- Keep these Operating Instructions in a place where they can always be easily consulted by the operator or by maintenance personnel.
- Before making an intervention or connection of any kind, make sure that the mains are disconnected both from the instrument and from any device connected to it.
- Caution, there may be hot components inside the plastic instrument container.
- No user-serviceable parts are inside the plastic instrument container.
- EKTRON products and any other devices connected to them must be installed in compliance with the safety regulations in force.
- Make sure that, whenever a transformer for instrument power supply is required, it complies with the safety regulations in force.
- EKTRON products are designed in compliance with the safety regulations in force. Nevertheless, if our products are not installed in accordance with the Safety Instructions, as well as the indications given in these Operating Instructions, then this may cause a reduction of the safety level of our products. Furthermore, the ambient operating conditions given in our technical data must be complied with, and in any case absolutely avoid: water condensation or excessive humidity; exposure to steam, corrosive or toxic gases, contact with any type of liquid, and exposure to shocks or to extreme vibrations. Not respecting the above indications could cause malfunctioning and unpredictable consequences, e.g., in the worst cases malfunctions that could cause dangerous electrical discharges on probes or other parts.
- EKTRON products are guaranteed for a specific level of immunity against electromagnetic disturbances in compliance with EC regulations. We would like to call to mind that electromagnetic disturbances can be either irradiated and/or conducted. By irradiated electromagnetic disturbances we recommend to screen the instruments with a metallic screen connected to ground. To eliminate, or at least reduce conducted electromagnetic disturbances, that do not only propagate through the power supply, but also through probes or connected loads, we recommend to connect the electrical wiring according to the indications given in these Operating Instructions. If necessary, use filters suitable for specific applications and for the type of disturbances detected.
- Probes are to be used in contact with foodstuffs, make sure that the employed type of probe is in compliance with the local sanitary / health regulations.
- EKTRON products do not provide any type of protection for the connected loads against short-circuits, overcurrent or overvoltage, excessive temperature etc., that must therefore be protected by suitable means (such as fuses, thermo-magnetic circuit breakers, thermal protections, etc.). At any rate the electrical power lines that (directly or through a transformer) supply an EKTRON product and any other device connected to it, must be manufactured in compliance with the regulations in force.
- When incorporating an EKTRON product in other devices, where any malfunction whatsoever could cause a form of damage to the life risk to persons, animals or things, it is ABSOLUTELY MANDATORY to provide a suitable safety device, other than the EKTRON product, that automatically starts operating in case of a failure.
- EKTRON products cannot be used as critical components in life support devices systems without an expressly written approval of the Managing Director of EKTRON.

2 GENERAL DESCRIPTION

The microprocessor-based electronic controllers of the REK... series were designed to measure, visualize, and control the temperature of refrigeration systems.

The more elaborate models can also control a defrost cycle and the evaporator fan through a relay output.

The relay outputs are incorporated in all controllers except for model REK30, were said outputs are included in the MEK43 and MEK44 modules, to which the REK30 controller must be connected for the indications given in these Operating Instructions.

With regard to the control of the alarm output, model REK43 is supplied with either an "open collector" transistor or a built-in relay, depending on which option was requested; this model also has a digital input, with a normally open contact, the function of which can be programmed through the related parameters.

All models are completely configurable through specific parameters, that permit the controller to be adapted to any particular operative requirements. Access to the configuration parameters menu is achieved through the front panel keyboard by following a very simple security procedure, after which the required parameter values can be set quickly and easily.

Each controller model can execute a Self-Test routine, which allows to quickly verify the correct functioning of the controller and connected loads, as well as to review the set parameter configurations. The big three-digit display visualizes the detected temperature or the configuration parameter codes and values or, by irregular functioning, the related error messages (HA: high temperature alarm; LA: low temperature alarm; PF1: thermostat probe failure; PF2: defrost-end probe failure; HLA high L. limit alarm; LLA: low L. limit alarm; OFF: CAL: compressor alarm; dAL: digital alarm).

The thermostat probe is installed in a place where it is protected from direct air flow (i.e., away from fans or doors), so that the average cold-room temperature can be measured.

The evaporator probe (also called defrost-end probe) must be installed in the coldest area between the evaporator fins, i.e., there where the most ice will form, and not near the resistances or near the area that warms up first during defrosting, in order to avoid anticipating termination of the defrost cycle.

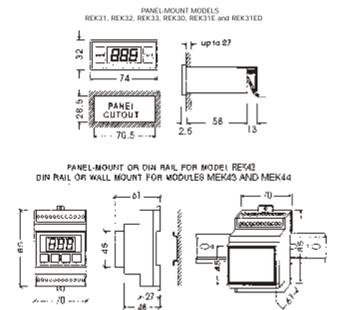
If the probe used is not water-proof, we recommend to place it with its head upwards so that water drops, that form due to condensation, cannot penetrate into the bulb and damage the sensor.

For low temperature refrigerators we advise the use of silicon probe cables, due to the frequent and ample temperature oscillations. This, since the PVC cables tend to become porous after a relatively short period and therefore allow humidity to enter which, when reaching the sensor, may cause faulty temperature value readings that could entail not easily controllable consequences.

3 TECHNICAL DATA

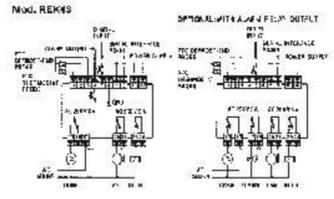
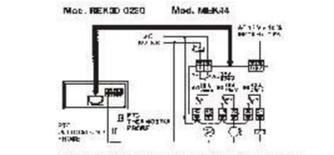
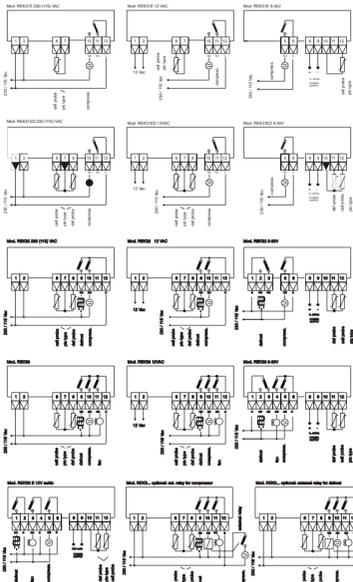
	REK 31E	REK 31ED	REK 31	REK 32	REK 33	REK 43	REK30	REK31	REK31ED	MEK4	MEK4
FAN OUTPUT											
SPST relay, AC 250 V 10 A (res.)											•
SPST relay, AC 250 V 5 A (res.)											•
DC 0/12 V 50 mA											•
ALARM OUTPUT											
SPDT relay, AC 250 V 8 A (res.)									optio- nal		•
SPST relay, AC 250 V 10 A (res.)											•
SPST relay, AC 250 V 5 A (res.)									optio- nal		•
Open collector Transistor, DC 30 V 50 mA										optio- nal	•
DC 0/12 V 50 mA											•
RESOLUTION											
1 unit	•	•	•	•	•	•	•	•	•	•	•
ACCURACY											
± 0.7 % f.s.	•	•	•	•	•	•	•	•	•	•	•
SAMPLING TIME											
1 second	•	•	•	•	•	•	•	•	•	•	•
OPERATING CONDITIONS											
Operating ambient temperature: (0...+50°C) 32...122°F	•	•	•	•	•	•	•	•	•	•	•
Storage ambient temperature: (-20...+80°C) 68...176°F	•	•	•	•	•	•	•	•	•	•	•
Relative ambient humidity: +30...+85%, non-condensing	•	•	•	•	•	•	•	•	•	•	•
MECHANICAL FEATURES											
Panel mount	•	•	•	•	•	•	•	•	•	•	•
Wall mount	•	•	•	•	•	•	•	•	•	•	•
DIN rail mount (on omega rail)	•	•	•	•	•	•	•	•	•	•	•
ABS, self-extinguishing plastic container (UL 94 VO)	•	•	•	•	•	•	•	•	•	•	•
3 mm diameter screw terminal block for 14 AWG 2.5 mm ² gauge wire	•	•	•	•	•	•	•	•	•	•	•
Telephone type irreversible connector	•	•	•	•	•	•	•	•	•	•	•
DISPLAY											
3-digit, 14.2 mm high, red LEDs	•	•	•	•	•	•	•	•	•	•	•
PTC PROBE (-50...+95°C)											
Thermostat probe	•	•	•	•	•	•	•	•	•	•	•
Evaporator probe	•	•	•	•	•	•	•	•	•	•	•
DIGITAL INPUT											
Normally open external contact	•	•	•	•	•	•	•	•	•	•	•
POWER SUPPLY											
AC 230 V ± 10%, 50/60 Hz	•	•	•	•	•	•	•	•	•	•	•
AC 115 ± 10%, 50/60 Hz	•	•	•	•	•	•	•	•	•	•	•
AC 24 V ± 10%, 50/60 Hz	•	•	•	•	•	•	•	•	•	•	•
AC 12 V ± 10%, 50/60 Hz	•	•	•	•	•	•	•	•	•	•	•
DC/AC 9...27 V	•	•	•	•	•	•	•	•	•	•	•
COMPRESSOR OUTPUT											
SPST relay, AC 250 V 8 A (res.)	•	•	•	•	•	•	•	•	•	•	•
SPST relay, AC 250 V 8 A (res.)	•	•	•	•	•	•	•	•	•	•	•
SPST relay, AC 250 V 15 A (res.)	•	•	•	•	•	•	•	•	optio- nal	•	•
SPST relay, AC 250 V 8 A (res.)	•	•	•	•	•	•	•	•	optio- nal	•	•
SPST relay, AC 250 V 5 A (res.)	•	•	•	•	•	•	•	•	optio- nal	•	•
DC 0/12 V 50 mA	•	•	•	•	•	•	•	•	•	•	•
DEFROST OUTPUT											
SPDT relay, AC 250 V 8 A (res.)	•	•	•	•	•	•	•	•	•	•	•
SPST relay, AC 250 V 10 A (res.)	•	•	•	•	•	•	•	•	•	•	•
SPST relay, AC 250 V 8 A (res.)	•	•	•	•	•	•	•	•	•	•	•
SPST relay, AC 250 V 5 A (res.)	•	•	•	•	•	•	•	•	•	•	•
DC 0/12 V 50 mA	•	•	•	•	•	•	•	•	•	•	•

Note: All dimensions are given in millimeters



4.3 Connections

We recommend the use of wire gauges, adequate for the given load power ratings in order to avoid damage to the screw connector. The connections for each model are given in the schemes below.



4.4 Self-Test

The Self-Test routine permits a quick functional test of the controller and connected loads, as well as the control of the set parameters. During the Self-Test routine normal controller operations are temporarily interrupted.

To run a Self-Test routine depress the DOWN key on the controller front panel for 5 seconds and then release it: all display segments turn on in sequence; the three digits of the three display digits turn on simultaneously; the three digits of the display turn on in sequence and simultaneously the relay outputs are activated in sequence, and all blinking configuration parameter codes and related values (not blinking) are displayed in sequence. The Self-Test routine takes about 2 minutes.

Pressing any controller key, while the display segments are being scanned, will temporarily interrupt the Self-Test routine and the controller display will visualize the code linked to the respective key (code F1 for the UP key, F2 for the DOWN key, F3 for the SET key, F4 for MANUAL DEFROST key); this allows to manually check the correct function of the keys.

5 FRONT PANEL FUNCTIONS

The front panel, as shown in the figures below, includes 4 keys, i.e., the UP key (increase), the DOWN key (decrease), the SET key (setting), the MANUAL DEFROST key, and a three-digit display with three signal LEDs, i.e., DP1, DP2, and DP3.

5.1 Functions of the keys

- When depressed, while programming either the main setpoint or the parameter configurations, will increase the value visualized on the display.
- When depressed during normal controller operations the evaporator temperature, detected by the defrost-end probe, will be visualized on the display (except REK31 and REK31E).
- When depressed, while programming either the main setpoint or the parameter configurations, will decrease the value visualized on the display.
- Depressing this key for 5 seconds, during normal controller functioning, will start the self-test routine.
- When depressed and then released, during normal controller functioning, will visualize the main setpoint;
- Depressing this key for 5 seconds will allow to enter the configuration menu, through which one can change the parameters listed in the Table of Configuration Parameters;
- When depressed, after having programmed the main setpoint or a configuration parameter value, will confirm said value.
- Depressing this key for 3 seconds during normal controller operations will start the manual defrost cycle.
- Depressing these keys simultaneously for 5 seconds will lock or unlock access to the parameter configuration menu.

5.2 Display functions

Besides the temperature value, detected during normal functioning, the display also visualizes the value of the main setpoint and the configuration parameter values, as well as the codes of the latter and possible error messages.

5.3 LED indications

- DP1 blinking: indicates that one is either in the parameter programming mode or the main setpoint is being set.
- DP1 ON: indicates that the compressor output is activated;
- DP2 ON: indicates that the defrost output is activated;
- DP3 ON: indicates that the fan output is activated (only models REK30 REK33 and REK43).

5.4 Display of main setpoint

When depressing the SET key, the display will visualize the main setpoint for 10 seconds.

5.5 Display of the evaporator temperature

When keeping the UP key depressed, the evaporator temperature, detected by the defrost-end probe, will be visualized on the display. When releasing the key the detected cold room temperature will again be visualized on the display (except REK31 and REK31E).

5.6 Changing the main setpoint

- Depress the SET key (the display will visualize the previously set main setpoint value; DP1 will start to blink);
- Change the main setpoint value visualized on the display by either using the UP or the DOWN key (the change must be made within 10 seconds after the SET key was depressed otherwise the controller will switch back to the normal operating mode and visualizes the coldroom temperature);
- The main setpoint cannot be programmed outside the limit values fixed through parameters #3 and #4;

- Confirm the newly set value by depressing the SET key (the key must be depressed within 10 seconds from completion of the previous operation, otherwise the controller will switch back to the normal operating mode and visualize the coldroom temperature without modifying the main setpoint; when the newly set main setpoint value blinks for 2 seconds, this means that the acceptance and storage of this new data is confirmed).

5.7 Changing the configuration parameters

- Depress the SET key for 5 seconds, (the display will visualize the code of the first parameter and, after two seconds, its value; DP 1 will start to blink);
- Modify the visualized value of the first parameter using the UP or DOWN keys (the modification must be made within 10 seconds after the SET key was released, otherwise the controller will switch back to the normal operating mode and visualize the coldroom temperature);
- Confirm the newly set value by depressing the SET key (the key must be depressed within 10 seconds from completion of the previous operation, otherwise the controller will switch back to the normal operating mode and visualize the coldroom temperature without modifying the parameter; when the newly set value blinks for 2 seconds this means that the acceptance of this new data is confirmed; after the new value is confirmed the controller will display the second parameter code and, after 2 seconds, the related value);
- Change the displayed value of the second parameter and confirm its new value by repeating the previously described procedure, and so on for all other parameters. Once the last parameter has been confirmed, the display will again show the code of the first parameter and, after 2 seconds, its value.

Note: In order to leave a configuration parameter unchanged during the modification procedure, depress the SET key when, after having stored the modified value of the previous parameter, the controller visualizes the code of the parameter one would like to leave unchanged. In this manner the controller proceeds and visualizes the code and then the value of the parameter following the unchanged one. The changes made related to time values are only effective after the, currently running, timed cycles end, while changes regarding other variables are effective immediately.

To save the changed values, one must wait for 15 seconds until the controller automatically exits the programming mode.

Warning: the modified parameter values are only saved if the above indications are followed.

5.8 Locking/unlocking the keyboard

Keeping the UP and DOWN keys simultaneously depressed for 10 seconds makes it possible to lock/unlock access to the configuration parameters menu. The controller will signal this respectively by either visualizing the blinking message "POFF" (push-button OFF) or "PON" (push-button ON). It is very useful to lock the keyboard in order to avoid tampering with the configuration parameter values by non-authorized personnel.

6 TABLE OF CONFIGURATION PARAMETERS

The configuration parameters and related limits or options are given in the table below. A square without a symbol means that the corresponding controller does not have said parameter.

REK 31E	REK 31ED	REK 31	REK 32	REK 33	REK30	REK31	REK31ED	MEK4	MEK4	PARAMETER	LIMITS / OPTIONS
d1	d1	d1	d1	d1						Main Setpoint	(#3) ... (#4)
d2	d2	d2	d2	d2						Differential (hysteresis)	0 ... +20 °C (°F)
d3	d3	d3	d3	d3						Lower limit of main setpoint	-45 ... (#4) °C -49 ... (#4) °F
d4	d4	d4	d4	d4						Upper limit of main setpoint	(#3) ... +95 °C (#3) ... +203 °F
d5	d5	d5	d5	d5						Minimum time interval between the deactivation and successive activation of the compressor	0 ... 999 s
d6	d6	d6	d6	d6						Max. temperature alarm differential	0 ... +50 °C (°F)
d7	d7	d7	d7	d7						Maximum or minimum temperature alarm delay	0 ... 99 min
d8	d8	d8	d8	d8						Time interval between defrost cycles	1 ... 999 h
d9	d9	d9	d9	d9						Max. defrost cycle time	1 ... 999 min
d10	d10	d10	d10	d10						Defrost-end temperature	-45 ... +50 °C -49 ... +122 °F
d11	d11	d11	d11	d11						Time interval for supplementary defrost cycles	0 ... 99 min
d12	d12	d12	d12	d12						Real temperature display delay at defrost-end	0 ... 99 min
d13	d13	d13	d13	d13						Compressor function during defrosting	0 = always OFF 1 = always ON
d14	d14	d14	d14	d14						Dripping time	0 ... 99 min

6 TABLE OF CONFIGURATION PARAMETERS

(continuation)

d15										Fan operating mode during normal controller function	0 = linked to the compressor operating mode 1 = always ON
d16										Fan activation delay at controller startup and after defrosting	0 ... 99 min
d17										Fan activation temperature at controller startup and after defrosting	-45 ... +50 °C -49 ... +122 °F
d18	d18	d18	d18	d18						Evaporator probe offset	-20 ... +20 °C (°F)
d19	d19	A19	C19	d19						Cold-Room temperature	-20 ... +20 °C (°F)
d20	d20	d20	d20	d20						Probe type	0 = PTC 1 = NTC
d22	d22	A22	C22	d22						Unit of measure	0 = Celsius 1 = Fahrenheit
d23	d23	A23	C23	d23						Compressor function during a probe failure	0 = always OFF 1 = always ON 2 = timed ON and OFF
d24	d24	A24	C24	d24						Compressor ON-time during a probe failure	1 ... 99 min
d25	d25	A25	C25	d25						Compressor OFF-time by probe failure	1 ... 99 min
d27										Serial line address	0 ... 99
d28										Serial line address	0 ... 99
d29										Off-line/On-line	0 = Off-Line 1 = On-Line
d31										Compressor function with closed digital input contact	0=disables the alarm output, interrupts the regulation process, visualizes "OFF" in the blinking mode. 1=activates the alarm output, alternately visualizes "CAL" and "dAL" in the blinking mode on the display. 2=disables the maximum or minimum temperature alarms. 3=disables the minimum or maximum temperature alarms, deactivates the fan outputs, activates the alarm output, and visualizes "dAL" and "the coldroom temperature on the display
d32										Delay for visualizing the "dAL" message	0 ... 99 min
d33										Controller function start delay related to d31 when closing the digital input contact	0 ... 999 s
d34	C34	C34								First defrost cycle after controller startup	0 = after 10 minutes 1 = after #8 (hours)
d37	d37									Controller type	1 = REK31ED 2 = REK31ED
d38	d38	A38	C38	d38						Minimum temperature alarm differential	0 ... +50 °C (°F)

* only for model REK43

7 PARAMETER DESCRIPTION

- #1 Main setpoint:** When the compressor is activated to decrease the refrigeration room temperature, this parameter fixes the temperature value of said refrigeration room, that must be fixed within the limits set in parameters #3 and #4, and which, when reached, activates the compressor.
- #2 Differential (hysteresis):** When the compressor is OFF and the coldroom temperature increases, this parameter fixes the maximum increase for said coldroom temperature, with respect to the main setpoint, which, when reached, activates the compressor.
- #3 Lower and upper limit of main setpoint:** These parameters respectively fix the minimum (#3) and maximum (#4) limits of the main setpoints. The main setpoint cannot be programmed outside said limit values.
- #5 Minimum time interval between the deactivation and successive activation of the compressor:** #5 fixes the time interval which starts when the compressor is turned OFF and during which it is not possible to reactivate it, in order to allow the internal refrigeration circuit pressures to stabilize.
- #6 Maximum temperature alarm differential:** This parameter fixes the increase of the coldroom temperature with respect to the main setpoint, which, when exceeded, causes the controller to activate the alarm output after #7 minutes and visualizes "HA" (-HA by REK31E and REK31ED) on the display in the blinking mode, that alternates with the blinking temperature value, provided that during time interval #7 the coldroom temperature always remains above #1+#6.
- #7 Maximum or minimum temperature alarm delay:** #7 fixes the time interval in minutes between the moment in which the process variable exceeds value #1+#6 and the moment the "HA" (-HA by REK31E and REK31ED) alarm signal is given, provided that during this time interval the temperature always remains above #1+#6.
- #8 Intervals between defrost cycles:** This parameter fixes the time interval between the beginning of a defrost cycle and the beginning of the following one. When starting a manual defrost cycle, time interval counting restarts from zero. The beginning of the first defrost cycle is regulated by parameter #4.
- #9 Maximum defrost cycle time:** By time-controlled defrosting (models REK31 and REK31E), this parameter fixes the duration of a defrost cycle; by evaporator probe temperature-controlled defrosting (models REK30, REK32, REK33, REK30 and REK43), this parameter fixes the maximum defrost cycle time, provided that the evaporator defrost-end temperature, set in #10, is not reached, or that an evaporator probe failure does not occur.
- #10 Defrost-end temperature:** This parameter fixes the evaporator temperature, which, when reached, ends the defrost cycle or starts the optimization of the same. At any rate, for security purposes, defrosting ends after the time set in #9 ends. This parameter (#10) is not foreseen for models REK31 and REK31E, in which defrosting is only time-controlled.
- #11 Supplementary defrosting time intervals:** During defrosting this parameter fixes the time interval starting the moment the evaporator temperature, exceeds #10 for the first time and during which supplementary defrosting cycles are activated every time the evaporator temperature drops below (#10)-2, to bring it to the value set in parameter #10 (except REK31 and REK31E). At any rate, defrosting ends when the time set in #9 ends.
- #12 Delayed display of the real temperature at defrost cycle end:** This parameter serves to set the time interval, that starts at the end of a defrost cycle, and during which the controller displays the last temperature value visualized before the defrost cycle started, provided the coldroom temperature is higher than said value. If not, and in any case at the end of the above mentioned time interval, the controller will again display the real coldroom temperature.
- #13 Compressor function during the defrost cycle:** This parameter indicates the compressor function mode during a defrost cycle, i.e., always OFF when #13=0, always ON when #13=1 (not for models REK31 and REK31E).
- #14 Dripping time:** This parameter serves to set the time interval that starts at the end of a defrost cycle and during which the compressor remains OFF to allow optimum drying of the evaporator.
- #15 Fan function mode during normal controller operations:** This parameter indicates the fan function mode during normal controller operations, i.e., synchronized with the compressor when #15=0, always ON when #15=1 (only for models REK30 and