EMKO

ESM-9944-N / ESM-9945-N COOKING CONTROLLERS

ESM-9944-N / ESM-9945-N Cooking Controllers
- 4 digits display
- J type Thermocouple Input or
  K type Thermocouple Input or
  R type Thermocouple Input or
  S type Thermocouple Input or
  2 or 3 wire PT 100 Input
- Adjustable Process Offset Value
- Programmable ON/OFF, P, PI, PD ve PID control types
- Adaptation of PID coefficients to the system by Auto Tune/Self Tune
- Working time selection in minutes or seconds
- Voiced warning via internal buzzer
- Cover switch input
- Steam output (ESM-9945-N)

ESM-9944-N / ESM-9945-N cooking controllers are mainly used for Bakery applications, fermantation cabinets, ceramics and glass ovens, grain drier cabinet, industrial fryer, incubators. Accurate and advanced controlling is performed with selectable ON-OFF, P, PI, PD ve PID, Self-Tune PID, Auto-Tune PID functions.

SPECIFICATIONS
INPUT
Process Input: TC/RTD
Thermocouple (TC): J, K, R and S (IEC584.1)(ITS90)
Thermoresistance (RTD): 2 or 3 wire Pt100 (IEC 751) (ITS90)
Measurement Range: Please refer to parameter $P.dU$ in parameters section.
Accuracy: ± 0.25% of scale for thermocouple and thermoresistance.
Cold Junction Compensation: Automatically ±0.1°C/1°C
Line Compensation: Maximum 10 Ohm
Sensor Break Protection: Upscale
Sampling Cycle: 0.1 second
CONTROL
Control Forms: ON/OFF, P, PI, PD veya PID (Control form can be programmed by the user.)
OUTPUT
Temperature Control Output : Relay (7A@250V∼ at resistive load) or optional SSR Driver Output (Maximum 10mA, 17V⎓)
Time Output : Relay (5A@250V∼ at resistive load) or optional SSR Driver Output (Maximum 10mA, 17V⎓)
Steam Output(ESM-9945) : Relay (5A@250V∼ at resistive load) or optional SSR Driver Output (Maximum 10mA, 17V⎓)
Besides these, there is an internal buzzer for voiced warning.

SUPPLY VOLTAGE
230V∼ (±15%) 50/60Hz - 3VA
115V∼ (±15%) 50/60Hz - 3VA
24V∼ (±15%) 50/60Hz - 3VA
(Must be determined in order.)
DISPLAY
Temperature Display: 16 mm Red 4 digits LED Display
Led Indicators: O1 (Temperature Control Output Status LED), O2 (Time Control Output Status LED), Steam Output LED(ESM-9945-N), Time Indicator, Temperature Indicator, P(Programming Mode LED),°C, °F LEDs
ENVIRONMENTAL RATINGS and PHYSICAL SPECIFICATIONS
Operating Temperature: 0...50ºC
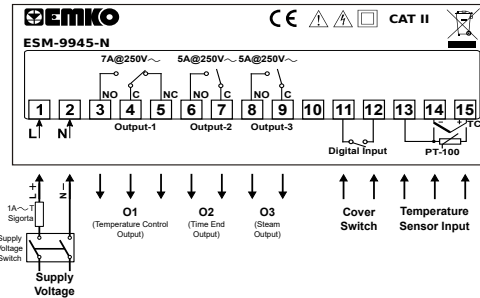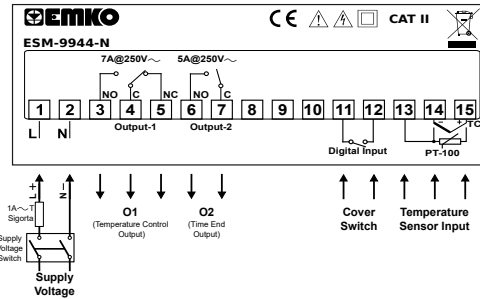**Humidity :** 0-90%RH (none condensing)
Protection Class: IP65 at front , IP20 at rear
Weight: 370 gr.
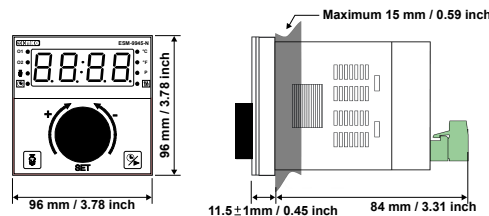**Dimension:** 96 x 96 mm, Depth: 100 mm
Panel CutOut: 92 x 92 mm

Electrical Wirings

ESM-9944-N — 7A@250V∼ 5A@250V∼ CE CAT II
Output-1 / Output-2 / Digital Input / PT-100 / TC
O1 (Temperature Control Output) / O2 (Time End Output) / Cover Switch / Temperature Sensor Input / Supply Voltage

ESM-9945-N — 7A@250V∼ 5A@250V∼ 5A@250V∼ CE CAT II
Output-1 / Output-2 / Output-3 / Digital Input / PT-100 / TC
O1 (Temperature Control Output) / O2 (Time End Output) / O3 (Steam Output) / Cover Switch / Temperature Sensor Input / Supply Voltage
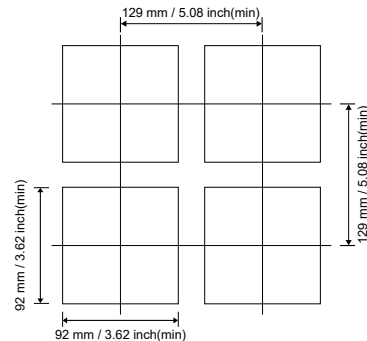
⚠ To reduce the effect of electrical noise on device, low voltage line (especially sensor input cables) wiring must be separately from high current and voltage line. If possible, use shielded cable abd shield must be connected to ground only one side.
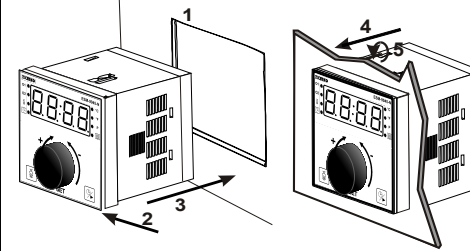
Dimensions

96 mm / 3.78 inch
96 mm / 3.78 inch
Maximum 15 mm / 0.59 inch
11.5±1mm / 0.45 inch
84 mm / 3.31 inch

Panel Cut-out

129 mm / 5.08 inch(min)
129 mm / 5.08 inch(min)
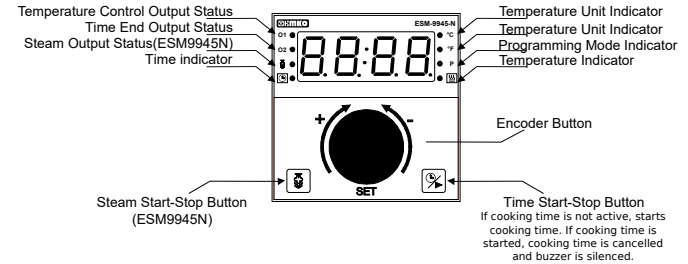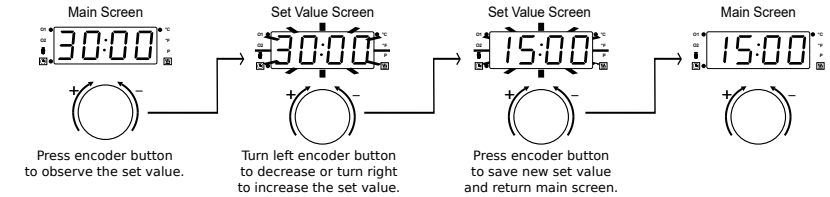92 mm / 3.62 inch(min)
92 mm / 3.62 inch(min)

Panel Mounting

1- Before mounting the device in your panel, make sure that the cutouts is of the right size.
2- Check front panel gasket position.
3- Insert the device through the cutout. If the mounting clamps are on the unit, put out them before inserting the unit to the panel.
4- Insert the mounting clamps to the two of designated holes that located on four sides of device.
5- Drag the mounting clamps in direction 5 until the device completely immobile within the panel.
6- In order to remove device push on the mounting clamp as shown with arrow 6 and pull back.
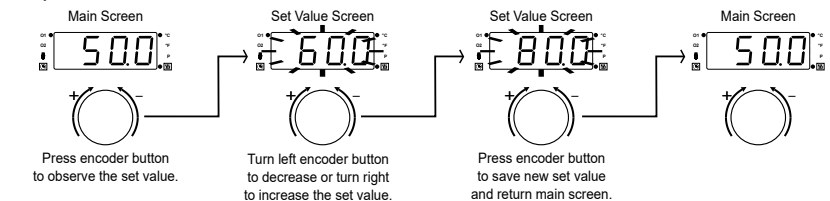
Front Panel Definition

Temperature Control Output Status
Time End Output Status
Steam Output Status(ESM9945N)
Time indicator
Temperature Unit Indicator
Temperature Unit Indicator
Programming Mode Indicator
Temperature Indicator
Encoder Button
Steam Start-Stop Button (ESM9945N)
Time Start-Stop Button
If cooking time is not active, starts cooking time. If cooking time is started, cooking time is cancelled and buzzer is silenced.

Access and Change Set Value

Time Set Value

Main Screen — Press encoder button to observe the set value.
Set Value Screen — Turn left encoder button to decrease or turn right to increase the set value.
Set Value Screen — Press encoder button to save new set value and return main screen.
Main Screen

Temperature Set Value

Main Screen — Press encoder button to observe the set value.
Set Value Screen — Turn left encoder button to decrease or turn right to increase the set value.
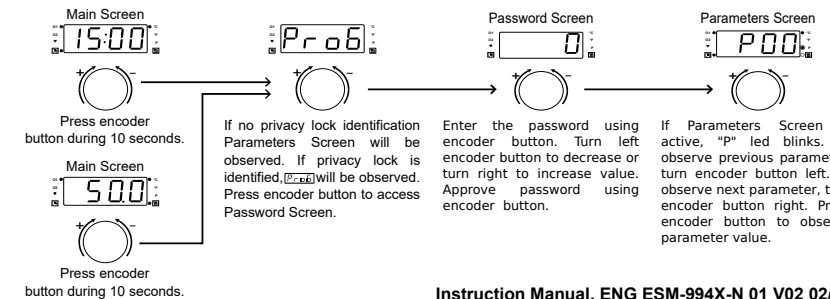Set Value Screen — Press encoder button to save new set value and return main screen.
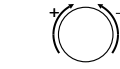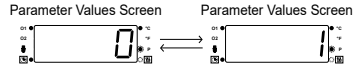Main Screen

Note : If no operation for 10 seconds, device automatically exits from Set Value Screen without saving the value.

Access the Parameters


Main Screen — Press encoder button during 10 seconds.
Main Screen — Press encoder button during 10 seconds.
$ProG$ — If no privacy lock identification Parameters Screen will be observed. If privacy lock is identified, $Pr.oL$ will be observed. Press encoder button to access Password Screen.
Password Screen — Enter the password using encoder button. Turn left encoder button to decrease or turn right to increase value. Approve password using encoder button.
Parameters Screen — If Parameters Screen is active, "P" led blinks. To observe previous parameter, turn encoder button left. To observe next parameter, turn encoder button right. Press encoder button to observe parameter value.

Access, Change and Record the Parameter Values

Parameter Values Screen ⟷ Parameter Values Screen

`0` ⟷ `1`

To increase parameter value, turn encoder button right. Press encoder button to save.
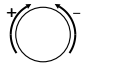
To decrease parameter value, turn encoder button left. Press encoder button to save.
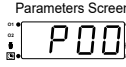
Parameters Screen — `P00`
Parameters Screen — `P26`

Turn encoder button left to observe previous parameter or turn right to observe next parameter.
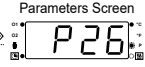
Turn encoder button left to observe previous parameter or turn right to observe next parameter.

Note1: PID control parameters ($P\,10$, $P\,11$, $P\,12$, $P\,13$, $P\,14$, $P\,15$) are not seen when output control type parameter ($P07$) is set as $onoF$.
Note2: ON/OFF control parameters ($P08$, $P09$) are not seen when output control type parameter ($P07$) is set as $P\,\iota d$.
Note3: $P\,19$ parameter is not seen when $P\,18$ parameter set as 0. $P20$ parameter can be seen after $P\,18$ parameter.
Note4: $P25$ parameter is not seen in ESM9944N device. $P26$ parameter can be seen after $P24$ parameter.
Note5: If $P26$ is different from 0 and user enters 0 on password screen, parameter values except $P26$ are observed but can not be changed.
Note6: If no operation for 20 seconds on Parameters Screen, device automatically returns Main Screen .

Parameters Descriptions

$P00$: Process input type selection parameter. (Default: 0)
  0 J type (Fe,Cu,Ni) Thermocouple; -200ºC,900ºC ; -328ºF,1652ºF
  1 J type (Fe,Cu,Ni) Thermocouple; -199.9ºC,900.0ºC ; -199.9ºF,999.9ºF
  2 K type (Ni,Cr,Ni) Thermocouple; -200ºC,1300ºC ; -328ºF,2372ºF
  3 K type (Ni,Cr,Ni) Thermocouple; -199.9ºC,999.9ºC ; -199.9ºF,999.9ºF
  4 R type (Pt13%RhPt) Thermocouple; 0ºC,1700ºC ; 32ºF,3092ºF
  5 R tipi (Pt13%RhPt) Thermocouple; 0.0ºC,999.9ºC ; 32.0ºF,999.9ºF
  6 S tipi (Pt10%RhPt) Thermocouple; 0ºC,1700ºC ; 32ºF,3092ºF
  7 S tipi (Pt10%RhPt) Thermocouple; 0.0ºC,999.9ºC ; 32.0ºF,999.9ºF
  8 PT100 Thermoresistance; -200ºC,650ºC ; -328ºF,1202ºF
  9 PT100 Thermoresistance; -199.9ºC,650.0ºC ; -199.9ºF,999.9ºF
$P0\,1$: Unit selection parameter. ºC or ºF can be chosen. (Default: ºC)
$P02$: Operation scale minimum(Low Limit) value. It changes according to the process input type and scale. (Default: -200)
$P03$: Operation scale maximum(High Limit) value. It changes according to the process input type and scale. (Default: 900)
$P04$: Process set value low limit parameter. It can be adjusted between Operation Scale Minimum($P02$) and Process Set Value High Limit($P05$). (Default:-200)
$P05$: Process set value high limit parameter. It can be adjusted between Process Set Value Low Limit($P04$) and Operation Scale Maximum($P03$) and (Default: 900)
$P06$: Process offset value. It can be adjusted as a degree(ºC or ºF), from -10% of scale to 10% of scale.It is added to the process value. (Default: 0)
$P07$: Output control type parameter. It can be selected $onoF$ or $P\,\iota d$. (Default: $onoF$)
$P08$: Hysteresis value. It can be adjusted from 1º(point representation: 0.1º) to 20º. (Default: 3)
$P09$: Minimum ON/OFF control output time parameter. It can be adjusted from 0 to 60 seconds. (SSR Default: 0 ; Relay Default: 5)
$P\,10$: Proportional band (P). It can be adjusted from %1.0 to %100.0. (Default: 10.0)
$P\,11$: Output Control Period. If control output is SSR, It can be adjusted from 0.5 to 150.0 seconds. If control output is Relay, It can be adjusted 60.0 to 150.0 seconds. (SSR Default: 10.0 ; Relay Default: 60.0)
$P\,12$: Proportional Offset value. This parameter is used for shifting the proportional band. It can be adjusted from (-Operation Scale Maximum /2) to (Operation Scale Maximum /2). (Default: 0)
$P\,13$: Integral Time. It can be adjusted from 0 to 3600 seconds. (Default: 100)
$P\,14$: Derivative Time. It can be adjusted from 0.0 to 999.9 seconds. (Default: 25.0)

$P\,15$: If tune parameter is set to $SELF$ or $RUto$, device starts to calculate PID parameters automatically. (Default: no)
  no : Device does not calculate PID parameters.
  $SELF$: Step Response Tuning operation.
  $RUto$: Limit Cycle Tuning operation.
$P\,16$:Temperature - Time display form. If parameter value set as 0 ,only Temperature or Time value is displayed according to selected page. If parameter value set as different from 0, Temperature and Time value is displayed alternately during $P\,16$ parameter value. It can be adjusted from 0 to 99 seconds. (Default: 0)
$P\,17$: Timer displayed form. If parameter value set as 0, timer form is Minute-Second. If parameter value set as 1, timer form is Hour-Minute. (Default: 0)
$P\,18$: Timer counts direction parameter. If the parameter set as 0, timer counts downt-to-up. If the parameter set as 1, timer counts up-to-down. (Default: 0)
$P\,19$: Timer counting method parameter. If the parameter set as 0, timer counts active time. If the parameter set as 1, timer counts set time. If $P\,18$ parameter set as 0, this parameter is not seen. (Default: 1)
$P20$: Timer Relay Position Parameter. If the parameter is 1, Timer relay becomes active position with the time start and becomes passive in the end of the time. If the parameter is 0, then time relay becomes active at the end of the time. (Default: 1)
$P2\,1$: Relay active time parameter. If parameter value set as $- - - -$ then Time End Output will be active continously. If value set as a different value(from 1 to 9999 seconds), Time End Output will be active during the entered time. (Default: $- - - -$)
$P22$: Buzzer active time parameter. If parameter value set as $- - - -$, Buzzer will be active continously. If parameter value set as a different value (from 1 to 9999 seconds), Buzzer will be active during the entered time. (Default: $- - - -$)
$P23$: Digital input circuit parameter. If the parameter set as 0, circuit is Normally Open (NO). If the parameter set as 1, circuit is Normally Closed (NC). (Default: 0)
$P24$: Type of command when digital input activated. If the parameter set as 0, timer stops counting and resets time. If the parameter set as 1, timer pauses counting. (Default: 0)
$P25$: Steam duration parameter (ESM9945N). If the Steam Duration Parameter is selected as 0 then the steam output wil be on during the Steam button is pressed. If the parameter value set as a different value (from 1 to 9999 seconds), after pressing the steam button, output will be on during the Steam Duration Parameter value. If Steam button is pressed when steam output is on, steam output will be off. (Default: 0)
$P26$: Password for accessing to the parameters section. It can be adjusted from 0 to 9999. If parameter value is 0, password screen is not seen. If parameter value is different from 0 and ;
  -If user enters different value from saved value, device will return to main screen automatically.
  -If user enters 0, all parameters can be observed except $P26$.
But device does not allow to do any changes in parameters. (Default: 0)

Tune Operation

Starting the Tune operation
1- Enter the $P\,15$ parameter and select $SELF$ or $RUto$. Observe that $tunE$ blinks.
(If $SELF$ is selected and start conditions are not okay for Tune operation, $tErr$ blinks during 10 seconds.)
2- Device calculates PID control coefficients and sets the process value to wanted value.

Cancelling tune operation:
1- If sensor breaks;
2-If tune operation can not be completed in 8 hours;
3-While tune operation is running, if process value becomes greater than process set value;
4-While tune operation is running, if user changes the process set value;
5-While tune operation is running, if user changes the parameter in menu;
Then tune operation is canceled and device continues to run with former PID parameters without changing PID parameters.

## Adjustment of Hysteresis Value for ON/OFF Control

In ON/OFF control algorithm, temperature value is tried to keep equal to set value by opening or closing completely last control element. ON/OFF controlled system, temperature value oscillates continuously. Temperature value's oscillation period or amplitude around set value changes according to controlled system. For reducing oscillation period of temperature value, a threshold zone is formed below or around set value and this zone is named hysteresis. Action of control output is described with figures below.

Error Messages

`Sbr`
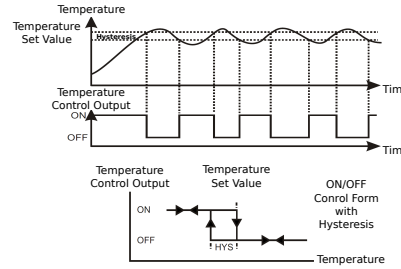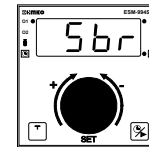
Sensor failure in analog input. If there is no sensor connection or the value that is read from the analog input goes out of the device scale, warning is observed.
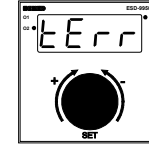
`tErr`

Tune failure. If $SELF$ is selected in PID Tune Parameter($P\,15$) and start conditions are not okay for Tune operation, the temperature value is displayed alternately with $tErr$ message on display during 10 seconds.

Installation

⚠ Before beginning installation of this product, please read the instruction manual and warnings below carefully.

In package,
-One piece unit
-Two pieces mounting clamp
-One piece instruciton manual

A visual inspection of this product for possible damage occured during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.
If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and the electrical connection of the device from the system.
The unit is normally supplied without a power switch or a fuse. Use power switch and fuse as required.
Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.
Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.
Never attempt to disassemble, modify, or repair this unit. Tampering with the unit may results in malfunction, electric shock or fire.
Do not use the unit in combustible or explosive gaseous atmospheres. During the equipment is put in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.
Montage of the product on a system must be done with it's mounting clamp. Do not do the montage of the device with inappropriate mounting clamp. Be sure that device will not fall while doing the montage.
It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts. Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

Other Informations

Manufacturer Information:

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Demirtaş Organize Sanayi Bölgesi Karanfil Sk. No:6 16369
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Repair and Maintenance Service Information:

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Ordering Informations

ESM-9944-N(96x96 DIN 1/4)	A	BC	D	E	/	FG	HI	/	U V	W Z
	20	0			00	/	1	0	0	0

ESM-9945-N(96x96 DIN 1/4)	A	BC	D	E	/	FG	HI	/	U V	W Z
	20	0			1	/	1	0	0	0

A	Supply Voltage	
3	24V∼ (±%15) 50/60Hz	
4	115V∼ (±%15) 50/60Hz	
5	230V∼ (±%15) 50/60Hz	
9	Customer	

BC	Input Type	Scale
20	Configurable	See Parameters ($P00$)

E	Output-1 (Temperature Control Output)	
1	Relay Output (7A@250V∼ at Resistive Load) (NO,NC,C)	
2	SSR Driver Output (Max. 10mA, 17V⎓)	

FG	Output-2 (Time Output)	
01	Relay Output (5A@250V∼ at Resistive Load) (NO,C)	
02	SSR Driver Output (Max. 10mA, 17V⎓)	

HI	Output-3 (Steam Output) (ESM-9945-N)	
01	Relay Output (5A@250V∼ at Resistive Load) (NO,C)	
02	SSR Driver Output (Max. 10mA, 17V⎓)	

⚠ Before commissioning the device, parameters must be set in accordance with desired use. Incomplete or incorrect configuration can cause dangerous stiuations.

⚠ Because of limited mechanical life of relay output contact, SSR output is recommended which the device use PID control algoritm. The device with ON/OFF control algorithm, hysteresis parameter must be set a suitable value for your system, to avoid too much relay switching.

⚠ ∼ → Vac,
⎓ → Vdc,
≂ → Vdc or Vac can be applied.

EMKO
Your Technology Partner

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