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INSTALLATION MANUAL
OUTDOOR HEATING CABLE AND MAT

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MAGNUM Outdoor system

Item nr.	Description	Wattage	Size	Ohm
125019	Outdoor Cable 1900	1900 Watt, 28 W/m[1]	67,8 meter	27,8 Ohm
125034	Outdoor Cable 3400	3400 Watt, 28 W/m[1]	121,4 meter	15,5 Ohm
126002	Outdoor Mat 2,5m²	700 Watt, 280 W/m²	5 x 0,5 meter	75,6 Ohm
126005	Outdoor Mat 5m²	1400 Watt, 280 W/m²	10 x 0,5 meter	37,8 Ohm
126010	Outdoor Mat 10m²	2800 Watt, 280 W/m²	20 x 0,5 meter	18,9 Ohm

options	Description
893550	ETO2-4550 Din Rail temperature/humidity unit 3x16A- 230Volt
890065	ETOG-55 Sensor unit surface temperature/humidity for ETO2-4550
900055	ETOR-55 Moisture-roof gutter sensor incl. 10mtr power supply cable
891551	ETI-1551 Din Rail thermostat -10/+50°C max. 10A-230Volt
901441	ETF-744/99 outdoor/air temperature sensor for ETI-1551 thermostat
860199	ETF-144 ground (floor) sensor
900004	MAGNUM Outdoor control case 3,6 kW incl. 2 ground (floor) sensors
900010	MAGNUM Outdoor control case 10 kW incl. 2 ground (floor) sensors
900020	MAGNUM Outdoor control case 20 kW incl. 2 ground (floor) sensors
900030	MAGNUM Outdoor control case 30 kW incl. 2 ground (floor) sensors
900040	MAGNUM Outdoor control case 40 kW incl. 2 ground (floor) sensors

CONTENTS:

1. INSTALLATION REQUIREMENTS

MAGNUM Outdoor is usually provided as a complete set incl. heating cables and/or mats, sensor units and control case (IP-66), all according to EN regulations and necessary features, such as relays, RCD, groups, and so on. The automatic frost- or ice detection system checks for snowfall or ice on the ground, and prevents slippery roads, bridges, ramps etc, making the entrance at hospitals, fire barracks, etc, more safe.

The MAGNUM Outdoor frost protection cable/ mat is a 2-conductor cable, ready to install and with 10 meter power cable. The connection between the two cable types is 100% watertight and may, for warranty conditions, never be broken. The heating cables are additional armed, resistant to high temperatures to approximately 180 ° C, and can be installed direct underneath asphalt or concrete. The quality and cable construction is in accordance with the IEC 800 regulations, European approved and provided with a CE marking. On the production and quality control is the ISO 9001 certificate issued. The cable has a 10 year factory warranty regarding to the technical functioning, as long as the electrical connection to the cabinet and power net was carried out by an approved Installer conforms to the applicable installation standards.

The capacity of the heating cable is 28W per meter on 230V. The power cable (10 meter long) may be extended or shortened. The connection should never be broken and the resistance cable must not be shortened!

1.1 Features MAGNUM Outdoor system:

- Economic regulation of frost and snow protection systems
- self responding to temperature and/or humidity.
- power steering: 24 V
- Operating Voltage: 230V/400V

Important:
- Test the cable/mat after each step in the installation
  - protect the cable/mat during installation (i.e. using hard board panels)
  - Make sure there is no power switched on the cable/mat during installation!
- The heating cables should not cross and should be installed with a minimum distance of 6 cm.
- The connection between resistance wire and power cable may never be broken!

1.2 installed power:

The amount of power to be installed can be determined on the basis of the climate and the necessary response rate in combination with the control mechanism. Taking the British climate in combination with the special control systems (thermostat and ground sensors) the following data can be used:

280 W/m² for total surface heating
Cable distance 10 cm
280 W/m² for wheel track heating
Cable distance 10 cm
Note: : Mats have a fixed value of 280 W/m².

For café terraces, landings, stairs etc: to keep them continuously free of frost and snow it is also possible to install less power: 60 to 100W/m². In this case, another type of heating cable is used (17 W/m) in combination with an electronic thermostat with floor sensor.

1.3 Installation step by step:

Preparations:

- check the available power and voltage.
- measure the resistance (Ohm value) of the heating cable (see table on page. 2).
- from the control case two pipes should be mounted underneath the surface (for the connection wires of the ground sensors). This makes replacement of the sensors after installation possible.

Mounting of the heating cable:

- Pull the cable end (marked: *******) to the control case. The connection between resistance wire and power cable (*splice*) must be visible and has to be covered with final top layer (cement, concrete or asphalt).
 - If steel nets are placed, plastic ty raps can be used to attach the cable to the steel nets. Otherwise, use spacer strips to install the cable in a zig zag way to the under floor.
- Connection to the power net has to be done by a certified electrician.
-If the control case is installed more than 10 meters away from the ramp a connection box can be used. If needed, the control case can be adjusted. The minimum top layer on top of the heating cables is 30 mm to maximum 100 mm, making it possible to cut and drill in the surface layer without damaging the cable..

Control case:

The control cases can be assembled custom made. The standard control case has water proof cable transit (according installation regulations) relays, circuit breaker, RCD, terminals for an easy installation of the power and heating cables and the special Outdoor ground sensor units. The schedule as displayed inside of the control case should be used.
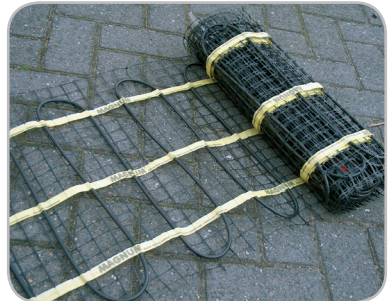
In case snow and/or ice don't melt:

- check if the power is on.
- if the ground sensor is wet, a higher melt temperature must be set.
- if the ground sensor is dry, it probably has to be relocated.
 -if wanted, a time clock can be used to save electricity at times the system does not have to be active.

More questions?:
Please visit our website at: www.magnumheating.com

2. INSTALLATION OF THERMOSTAT/SENSORS

The ETO2 is a fully-automated and economic thermostat for frost protection of surfaces and (roof) gutters. Icing occurs due to a combination of low temperature and moisture. The ETO2 thermostat detects moisture and temperature, switching on the power only if there is a combination of moisture, snow and low temperature.

Product program:
ETO-2-4550 Thermostat
ETOG-55 ground (Floor) sensor unit for the detection of moisture and low temperature.
ETOR-55 roof gutter sensor for the detection of moisture.
ETF-744/99 outdoor sensor for temperature measurement.

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WARNING- IMPORTANT INSTRUCTIONS!

Always switch off the power before maintenance at any part of the installation! Maintenance or installation should always be executed by a certified electrician. The electrical installation should be installed according to regulations.

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2.1 Technical data

Thermostat ETO-2-4550

Power	: 240V AC ±10%, 50-60 Hz
Built in electronics	
Power (SMPS)	: 24 V DC, 8 VA
3 exit relay (potential free contact)	: 3 X 16 A
Alarm relay (potential free contact)	: max. 5 A
On/off differential	: 0.3°C
Temperature scale	: 0/+10°C
Ambient temperature	: 0/+50°C
Ambient air humidity	: 10-95%
Class	: IP 20 / Nema 1
Weight	: 600 g
Size H/B/D	: 90/156/45 mm
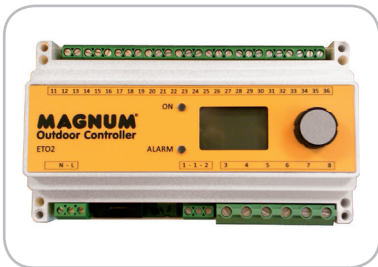
built in ground sensorunit ETOG-55

Designed for installation in outdoor situations such as
ramps and driveways.

Detection   : Moisture and temperature
Installation   : outdoor situations
Ambient temperature   : -20/+70°C
Size   : H32, Ø60 mm

Heating (brown / green)   : 296 Ohm
Moisture (yellow / white)   : 0 Ohm*
*Normal no value, With moisture: full power
Temperaturesensor: Depends on temperature

-4 °C	: 43 K Ohm	4 °C	: 29,8 K Ohm
-2 °C	: 39 K Ohm	5 °C	: 27 K Ohm
0 °C	: 35 K Ohm	10 °C	: 22 K Ohm
2 °C	: 32,4 K Ohm		

Roof gutter sensor ETOR-55

Designed for roof gutters. Used in combination with
an ETF temperature sensor.

Detection   : moisture
Installation   : In gutter or drainage pipe
Ambient temperature   : -20/+70°C
Size H/B/D   : 105/30/13 mm

Outdoor sensor type ETF-744/99

Detection   : Temperature
Installation   : wall mounted
Ambient temperature   : -20/+70°C
Size H/B/D   : 86/45/35 mm

The frost protection system will be deactivated in case of a sensor failure.

2.2 Thermostat ETO-2-4550

If not installed in a ready made switch case: The unit must be mounted on a DIN-rail in an approved panel or control case. The power PE, N en L must be connected. This electrical and mechanical installation must be carried out in accordance with the rules in force. Two sensors can be connected to the thermostat. Two sensors in the same zone, or a single sensor and two different zones (2) zone control), equal to 2 x ETOR/EFT sensors.

| Connection	Color code	Wiring
PE, N, L		power, 240 V AC 50/60 Hz
1, 2		Alarm relay (potential free) max. 5 A
3, 4		output relay 1, 16 A (potential free), heating cable 1 (zone 1)
5, 6		output relay 2, 16 A (potential free), heating cable 2 (zone 2)
7, 8		output relay 3, 16 A (potential free), heating cable 3
11, 12	brown/green	heating element 1+2, ETOG-55 en ETOR
13, 14	grey/purple	Temperature sensor 1, ETOG-55
15, 16	yellow/white	moisture sensor 1, ETOG-55 / ETOR
17, 18	grey/purple	temperature sensor 2, ETOG-55
19, 20	yellow/white	moisture sensor 2, ETOG-55 / ETOR
31, 32		ambient air temperature sensor, ETF
33, 34		External signal for "standby" input
35, 36		External signal for "override heating" input
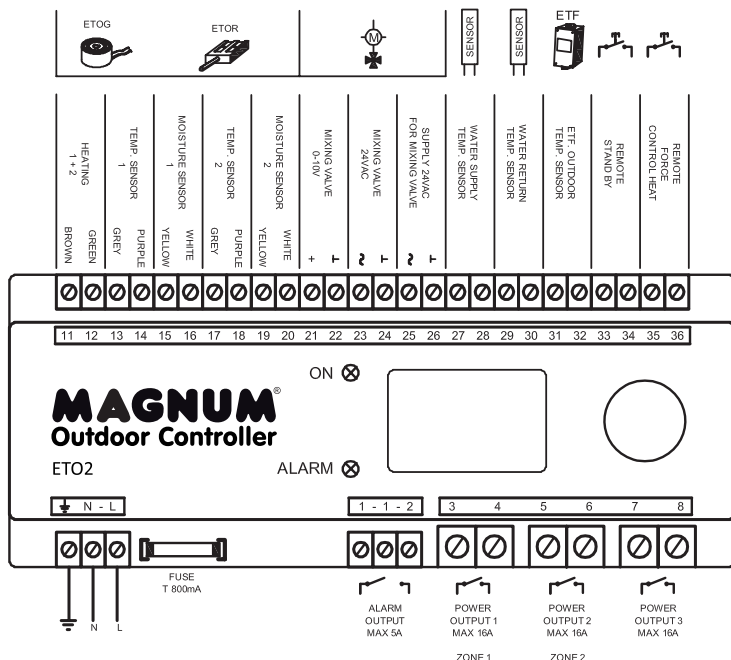
2.3 Ground sensorunit ETOG-55:

For installation at places where snow and ice cause problems. The sensor must be installed equally to the surface. By using the included plate the sensor can be hold in position. The sensor cable must be installed according to regulations. For protection it is recommended to install a pipe to put the sensor cable in. The sensor should be positioned between two heating cables. This way the sensor can react to temperature changes. See "Phase 1" on this page and "Phase 2" on page 12 for installation of the ground sensor unit.

Sensor cable:
The ETOG-55 sensors have a 10 meter long power cable. If needed it can be lengthened up to 200 meter by using a standard installation cable 6 x 1,5 mm² for the ETOG-55 (total resistance may not exceed 10 Ohm).
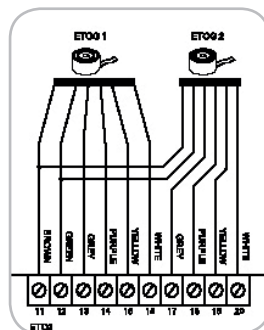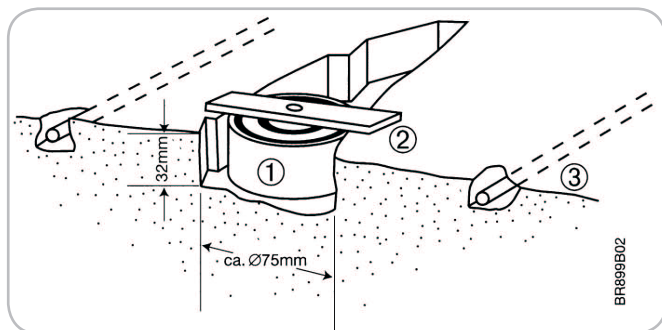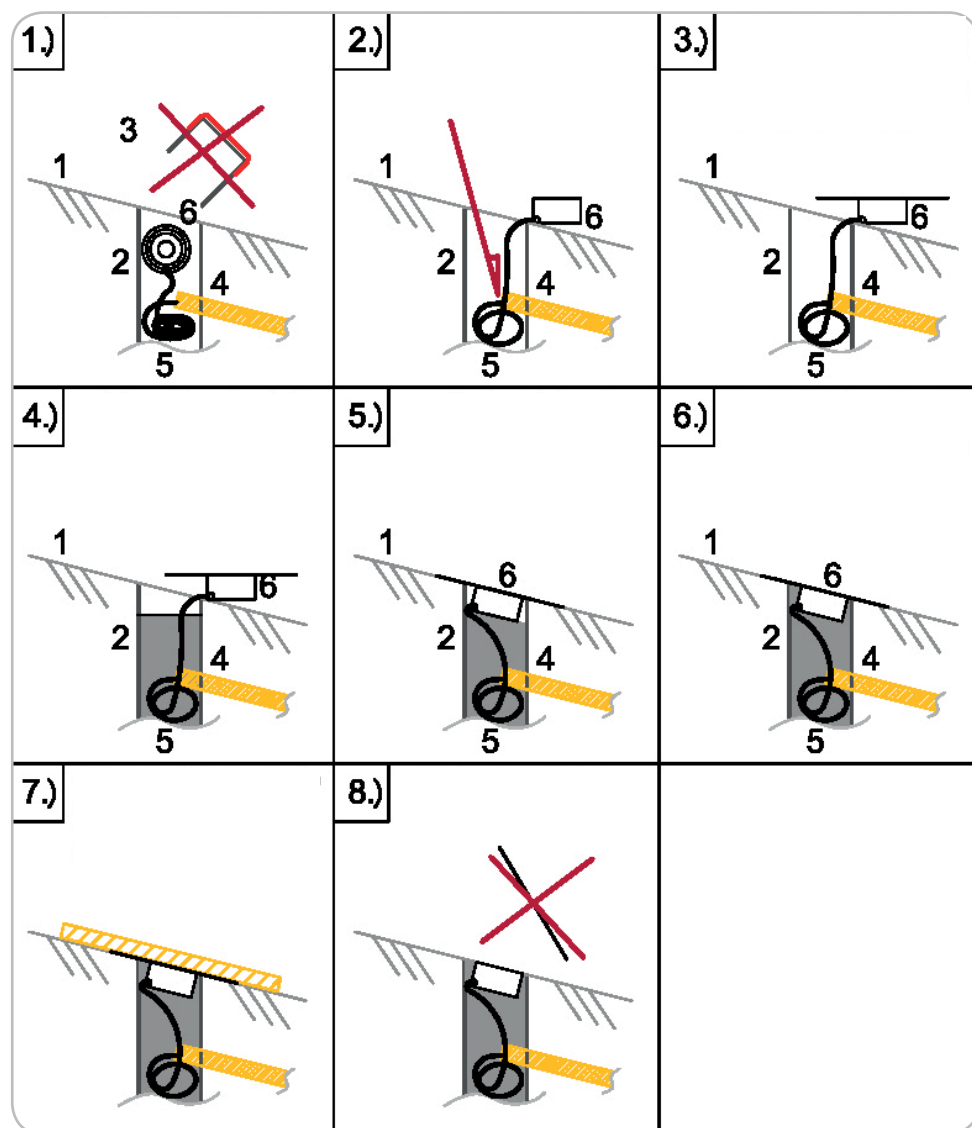
Phase 1 before pooring concrete floor.
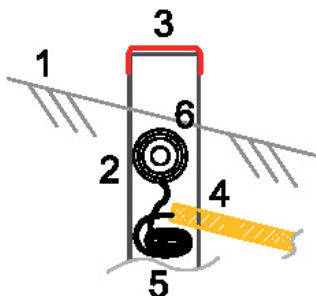
1. Future level finished floor.

2. PVC Tube (Ø 80mm) fixed to steel net.

3. Cover to keep out dirt, moisture or concrete.

4. Plastic pipe from control case.

5. Cable (or extension) of floorsensor with overlenght.

6. Floor sensor (not fixed!)

Phase 2 after pooring concrete floor.

2.4 Roof gutter sensor ETOR-55

For installation in a roof gutter or drainage pipe at the sun side of a building (see fig. 1 point 2). It is important that the contact elements of the sensor point towards the direction of the flow of the water. If needed, two elements can be connected in parallel.

Sensor cable:
The ETOR sensors have a 10 meter long power cable. If needed it can be lengthened up to 200 meter by using a standard installation cable 4 x 1,5 mm² for the ETOR (total resistance may not exceed 10 Ohm).

2.5 Outdoor sensor ETF:

To be used in combination with a roof gutter sensor ETOR. Can also be used separately only for temperature measurement. The sensor must be placed at the North side of the building (see fig. 1 punt 3).

Sensor cable:
The ETF can be installed with a cable length of 50 mtr. The cables must be installed according to regulations. Thes cables may not be installed parallel to the power cables while electrical interference may occur and influence the sensor cable.
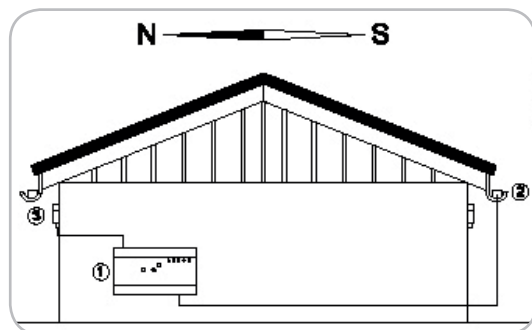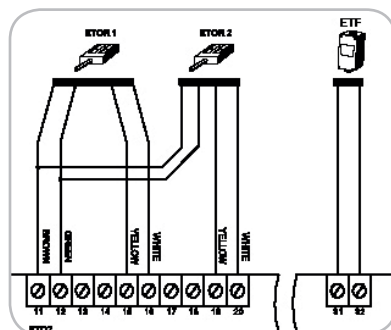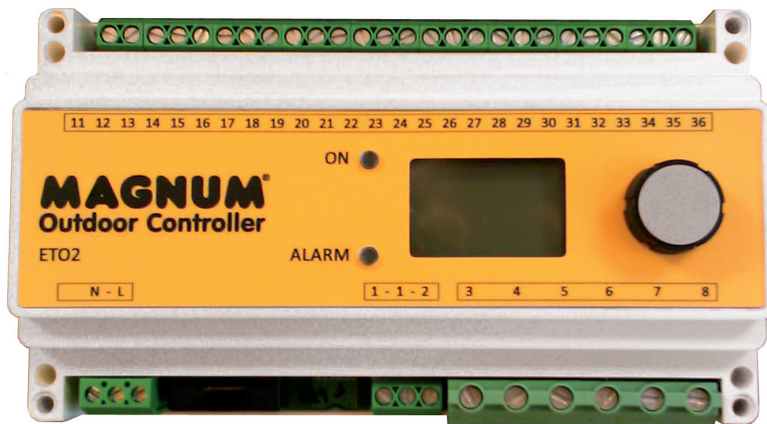
Fig.1

Fig.2

3. USER INSTRUCTIONS ETO-2 THERMOSTAT

INDEX:

3.1 Start up

After starting up the ETO for the First time you must choose between Celsius or Fahrenheit. Turn the button to make a selection and confirm by pushing the button.

```
SELECT SCALE:

CELCIUS
FAHRENHEIT
```

SENSOR 1 is shown to make a selection in case 1 sensor is attached to input 1.
ETOG-55 : ground sensor unit
ETOR-55 : roof gutter + ambient air temperature sensor
Turn the button to make a selection and confirm by pushing the button.

```
SENSOR 1:

ETOG
ETOR
```

SENSOR 2 is shown to make a selection in case a 2nd sensor is connected to input 2. Turn the button to make a selection and confirm by pushing the button.

```
SENSOR 2:

OFF
ETOG
ETOR
```

Select if an ETF-sensor has been connected to terminal 31-32. Turn the button to make a selection and confirm by pushing the button.

```
OUTDOOR SENSOR:

OFF
ETF
```

Turn the button to make a selection and confirm by pushing the button.
ELECTRIC 1-ZONE : 1 zone electrical heating control
ELECTRIC 2-ZONE : 2 zones individual electrical heating control
ELECTRIC 2-STEP : 1 zone, 2 step electrical heating control (Y/)
WATERBASED : 1 zone water heating control

```
APPLICATION:

ELECTRIC 1-ZONE
ELECTRIC 2-ZONE
ELECTRIC 2-STEP
WATER BASED
```

Select the required option and press to confirm. The system now is programmed and will function automatically according to the factory settings. See "FACTORY SETTINGS". Alternative settings can be programmed in SETTINGS.

```
ZONE 1 HEAT    OFF
ZONE 2 HEAT    OFF
AFTERRUN 1     0.00
AFTERRUN 2     0.00
STANDBY        OFF
```

Actual status and post-heating time for zone 1 and 2 are shown in the display.

3.2 Functioning

The ETO2 is equipped with a simple button (turn and press) and a display showing the current status. The display light is activated by pushing the button and automatically switches off after 30 seconds. Push the button and the main menu will be shown in the display. By turning the button different options can be selected. Not all options will be shown but will get visible by turning the button. Confirm by pushing the button.

3.3 Main menu

ZONE 1	OFF
ZONE 2	OFF
SENSOR 1	##.#°C
SENSOR 2	##.#°C
MOIST 1	NO
MOIST 2	NO
OUT. TEMP	##.#°C
SUPPLY W.	##.#°C
RETURN W.	##.#°C
ALARM	NO
SHOW INFO	
SETUP	
RESTART	
EXIT	

3.4 Display teksten:

`ZONE 1          OFF`   Heating zone 1 active (ON) or Not active (OFF)

`ZONE 2          OFF`   Heating zone 2 active (ON) of Not active (OFF)

`SENSOR 1     ##.# °C`   Sensor 1 temperature, only with ETOG-55 sensor

`SENSOR 2     ##.# °C`   Sensor 2 temperature, only with ETOG-55 sensor

`MOIST 1          NO`   Sensor 1 moisture

`MOIST 2          NO`   Sensor 2 moisture

`OUT. TEMP    ##.# °C`   Ambient temperature, ETF

`SUPPLY W.    ##.# °C`   Input water temperature, only with water heating

`RETURN W.    ##.# °C`   Output water temperature, only with water heating

`ALARM           NO`   Alarm, type error will be shown.
Red LED on front thermostat will flash

3.5 Application info:

`SHOW INFO`

`APP:      E.  1-ZONE`   Type system: Electrical or water heating

`SW VERSION     1.00`   Software version

`SENSOR 1       ETOG`   Sensor type, sensor 1

`SENSOR 2        OFF`   Sensor type, sensor 2

`SENSOR ETF      OFF`   ETF-sensor connected

`EXIT`   Back to main menu

3.6 Settings:

Attention; false settings can have a negative influence on the frost protection system. Push the button to make the submenu visible. Sect your choice and confirm by pushing the button.

`SETUP`

`FORCE HEAT      OFF` Manual start of the heating system. Push the button and select ON to start the heating system. The ETO2 unit will heat up according to the pre programmed after run time. Also see AFTERRUN 1 en 2.

`SELECT SCALE     C` Choice for temperature in Celsius (C) or Fahrenheit (F) is shown. Select the required scale and push the button to return to the SETUP menu.

`SET TEMP 1     3.0C` Temperature setting in Zone 1 : The maximum temperature ice and snow should melt at can be adjusted here. Set the required temperatures and push the button to confirm.

`SET TEMP 2     3.0C` Temperature setting in Zone 2 : The maximum temperature ice and snow should melt at can be adjusted here. Set the required temperatures and push the button to confirm.

`OFF TEMP 1     -10.0C` Lowest operating limit Zone 1 : From set temperature to lowest operating limit, the ETO2 will operate in normal mode. Below this temperature it will be in stand by mode. To change the OFF temperature, press OK and turn the encoder button to the desired value, confirm with OK.

`OFF TEMP 2     -10.0C` Lowest operating limit Zone 2 can be set here. To change the OFF temperature,press OK and turn the encoder button to the desired value, confirm with OK.

`AFTERRUN 1     2:0` After run time Zone 1 : An after run time between 0 and 6 hours can be set here. The system will keep on heating as long as the programmed time after no moisture/ temperature signal has been detected. Turn the button to the required time and confirm by pushing the button.

`AFTERRUN 2     2:0` After run time Zone 2 : An after run time between 0 and 6 hours can be set here. The system will keep on heating as long as the programmed time after no moisture/ temperature signal has been detected. Turn the button to the required time and confirm by pushing the button.

`OFFSET T1     0.0C` Zone 1 Temperature can be calibrated here. The temperature, detected by the ETOG-55 sensor can be corrected so the exact temperature will be shown in the display of the ETO2. Check the temperature beside the sensor with a thermometer. Adjust the temperature by turning the button and confirm by pushing the button.

OFFSET T2   0.0C   Zone 2 temperature can be corrected at the same way. Adjust the temperature by turning the button and confirm by pushing the button.

OFFSET OUT.   0.0C   De buitentemperatuur kan hier worden gekalibreerd. De gemeten temperatuur door de ETF buitensensor kan hier worden gecorrigeerd zodat de exacte temperatuur in de display van de ETO2 wordt getoond. Meet de temperatuur naast de sensor d.m.v. een thermometer. Corrigeer de temperaturen door de knop te draaien en bevestig dit door de knop in te drukken.

FACTORY RESET   All ETO2 factory settings can be reset here. This selection will delete all adjustments.

EXIT   Back to main menu.

REINSTALL   In case of false settings or if new sensors are installed, the installation can be executed again.

REINSTALL
PASSWORD   XXXX   Select PASSWORD and turn the button to the factory code. (call your supplier) The thermostat will return to the start up menu, see STARTUP.

EXIT   Select this option and push the button to return to the main menu.

3.7 Factory settings:

SETUP	MAGNUM SETTINGS	OWN SETTINGS	FACTORY SETTINGS (At Factory Reset)
Application	Electric		Electric
Zone 1	ETOG		ETOG
Zone 2	ETOG		OFF
Select scale	Celsius		Celsius
Afterheat time Zone 1	2.00 hours		2.00 hours
Afterheat time Zone 2	2.00 hours		2.00 hours
Temp. offset Zone 1	0.0°C		0.0°C
Temp. offset Zone 2	0.0°C		0.0°C
Temp. offset ETF	0.0°C		0.0°C
Set temperature	3.0°C		3.0°C
Min. water temperature	5°C		5°C
Max. water temperature	55°C		55°C

MAGNUM® *keeps you warm*

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