eliwell

Energy XT

Chiller-Heat Pump Controller
8 circuits- 8 compressors

General Description

Energy XT represents the latest Eliwell novelty for the control of medium-large Chillers.

On the basis of our ten years of experience in the design of custom products for leading companies in the sector and the success of the Energy 200 and 400 families, Eliwell completes its product range with these series of products designed to provide a simple solution to the requirements of large refrigerating machines like Chillers. Based on the very latest hardware and software technologies and equipped with a 16-bit microprocessor with flash technology, XT presents itself as a sturdy controller which, due to its flexibility and expansion possibilities, covers a wide range of applications at a minimum cost.

The philosophy of **Energy XT** consists in offering a series of models that differ in the size of their memory and the number of their inputs and outputs, so as to optimise the costs of the electronics.

By fitting a base with the various expansions modules (up to a maximum of 4), the number of inputs and outputs required to satisfy even the most complex of applications may be obtained.

Energy XT's easy to use, **WIZARD**-driven software allows control algorithms to be easily customised. Applications range from basic heating and cooling, energy-saving functions such as free-cooling and heat recovery, through to a wide-ranging unit diagnostics system. Applications can be downloaded and upgraded locally or via a PSTN or GSM modem.

Energy XT includes a software tool which automatically generates programme files to enable the structure and text of the user interface to be easily and intuitively personalised. In addition, **MenuMaker** means different languages can be accommodated, with the option to import and export text files and automatically generate user manuals.

The models that make up the XT family are the bases, identified by the letters XTM, the expansions XTE and the keyboards XTK.

The suffix /R indicates models with additional connectivity options (RS 232-CAN1, RTC and Analog Output).

•The letter /H indicates the bases and the expansions with a larger number of inputs and outputs.

Models

Keyboard
EXTK

Main Boards
EXTM

EXTM/R

EXTM/H

EXTM/HR

Expansions
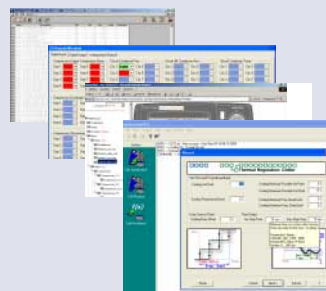EXTE1

EXTE1/H

Configuration Tools

Applications

Available configurations

Energy XT helps designers to describe their machines simply. It represents the Chiller with a particularly effective tree structure, in which the evaporators are the main branches to which the circuits made up of the compressors belong. The configurations available may be seen in the table.

With the help of software tools, **Energy XT** permits an easy configuration and customization of the setting algorithms, of the user interface and of the input/output resources, ensuring the correct execution of a wide range of applicative solutions.
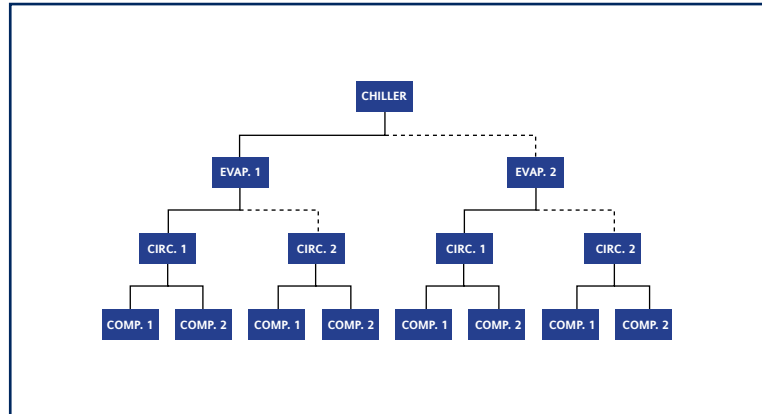
Configuration Examples

The table herewith attached shows some unit configuration examples achievable by **ENERGY XT**; besides the number of evaporators, circuits, compressors and fans it is possible to set other function algorithms as well. The maximum configuration achievable by **Energy XT** allows to manage chiller and heat pumps units with 4 evaporators, 8 refrigerating circuits, 8 choked compressors (hermetic, semi hermetic,...).

Nr. of evaporators	Nr. of circuits per evap.	Nr. of circuits	Nr. of comp. per circuit	Nr of comp.	Nr of stages per comp.
1	1	1	From 1 to 4	1...4	From 1 to 3
1	2	2	From 1 to 4	2 x 1...4	From 1 to 3
1	3	3	From 1 to 2	3 x 1...2	From 1 to 3
1	4	4	From 1 to 2	4 x 1...2	From 1 to 3
2	1	2	From 1 to 4	2 x 1...4	From 1 to 3
2	2	4	From 1 to 2	4 x 1...2	From 1 to 3
2	3	6	1	6	From 1 to 3
2	4	8	1	8	From 1 to 3
3	1	3	From 1 to 2	3 x 1...2	From 1 to 3
3	2	6	1	6	From 1 to 3
4	1	4	From 1 to 2	4 x 1...2	From 1 to 3
4	2	8	1	8	From 1 to 3

Main Functions

The functions currently available on the **Energy XT** are:
• Proportional control or PI of thermoregulation;
• Proportional control of boilers or electric resistors integrating heat;
• Proportional control of the condensation for each circuit through modulation of the speed of the fans.
The function may work on an analogue output (to control an inverter or a phase cut) or on the relays by means of a step control:
• Pump-down management both during circuit power-on and power-off;
• The circuits belonging to an evaporator may be activated on the basis of saturation or balancing logic. The same logic may in turn be applied to the circuits, saturating or balancing the related compressors, and to the compressors with the corresponding dividing valves;
• Rotation of the compressors and circuits according to the hours of operation;
• Management of two pumps for the water integrated with the flow-meter diagnostics;
• History of alarms with the possibility of storing the minutes prior to the alarm;
• Management of the real time clock with the possibility of setting up to 4 time zones per day of the week.

The operator interacts with the machine using a keyboard with a large, backlit graphic LCD.
The information provided by the keyboard, which is extremely easily accessible, enables you to check the status of the machine at any time and to change its settings, when the need arises. The keyboard is extremely easy to assemble: you can either rest it against the panel or enclose it in a wall by making a suitably sized hole; in this case, it is also waterproof.
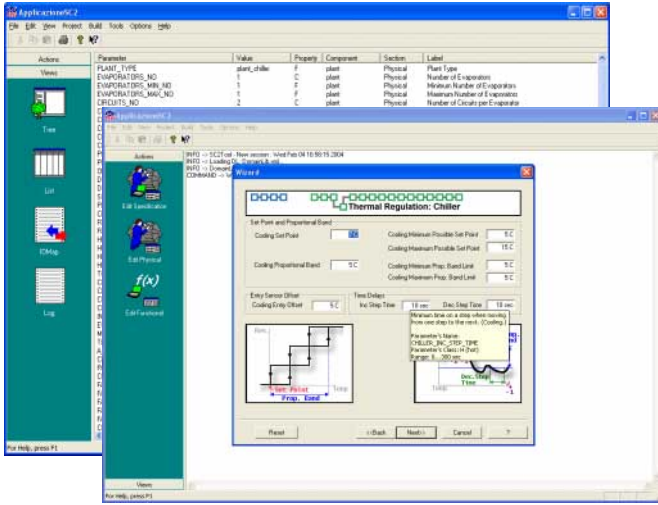
The machine is really quick to install.
Attach the bases and the expansions to the profiled guide and plug in the quick insertion connectors. This is all.
Screw, spring or insulator perforation connectors are available.

# Configuration Tools

Wizard

This software drives the developer to build the unit through a path which helps the configuration of the application and shows any possible conflict or discrepancy.
Starting with the physical description of the plant (type of plant, number of circuits, number and kind of compressors,...), then it defines the regulator algorithms (thermoregulator, fans, pumps, freecooling,...) to end with the diagnostic (antifreeze, pressure alarms, thermics) ensuring the "consistency" of the selected algorithms and ensuring the validity of the built plant.

AppLoader
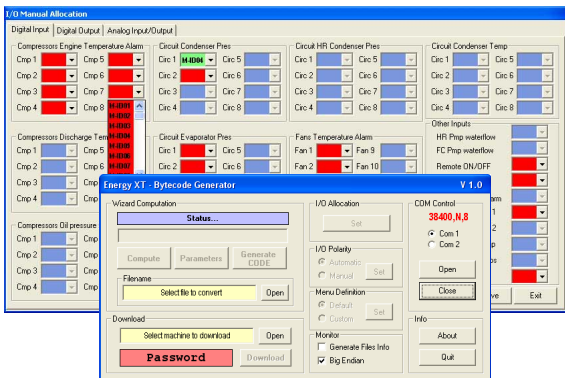
APPLOADER download the application files created by Wizard and Menu Maker to the EXTM both from a local PC and from a remote PC via PSTN or GSM modem. Besides it is possible to manually configure the layout and the features of the INPUTS/OUTPUTS in order to standardize the electrical panels and set the default parameters for Timer functioning: day, hour, ON/OFF, running mode and setpoint

MenuMaker
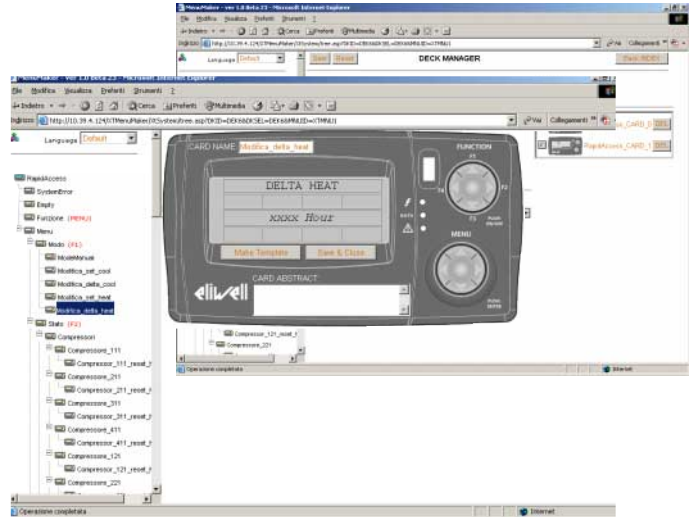
MenuMaker allows to modify or to create a customised user interface both in terms of structure and labels, it provides also the possibility to manage a standard mask library for a quicker customization. Moreover, it is possible to import and export text files for a simple languages management beside an automatic creation of applicative files and user manual.
Furthermore it is possible to determine the functions related to the 4 keyboard configurable buttons.

ParamManager
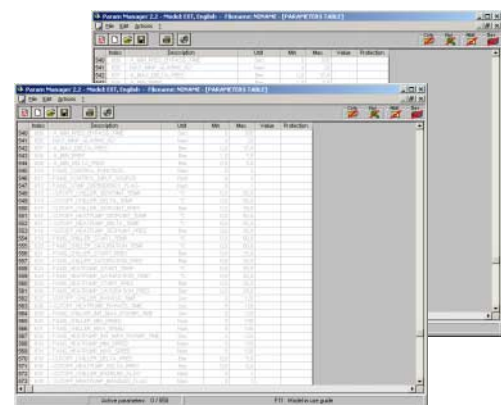
The steady software used for the parameters configuration of the Energy family, can be also used to modify the whole range of Energy XT parameters, by the management of the files for the different parameters lists. The programming table allows to modify all the functional parameters in a simple and rapid way, for ex. the set point cooling and heating, the selection of some functions such as "freecooling", heat recovery and the diagnostic algorithms.

EXTM **Main boards**

I/O layout

EXTM (I/O)

I/O std

base board   upper view

EXTM/H (I/O)

I/O extended

I/O LEGENDA
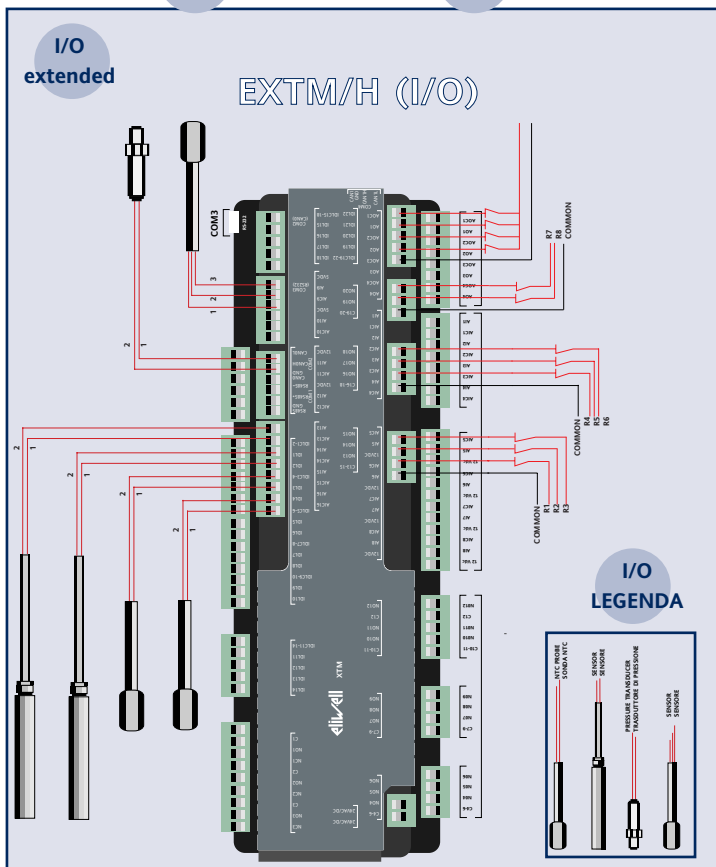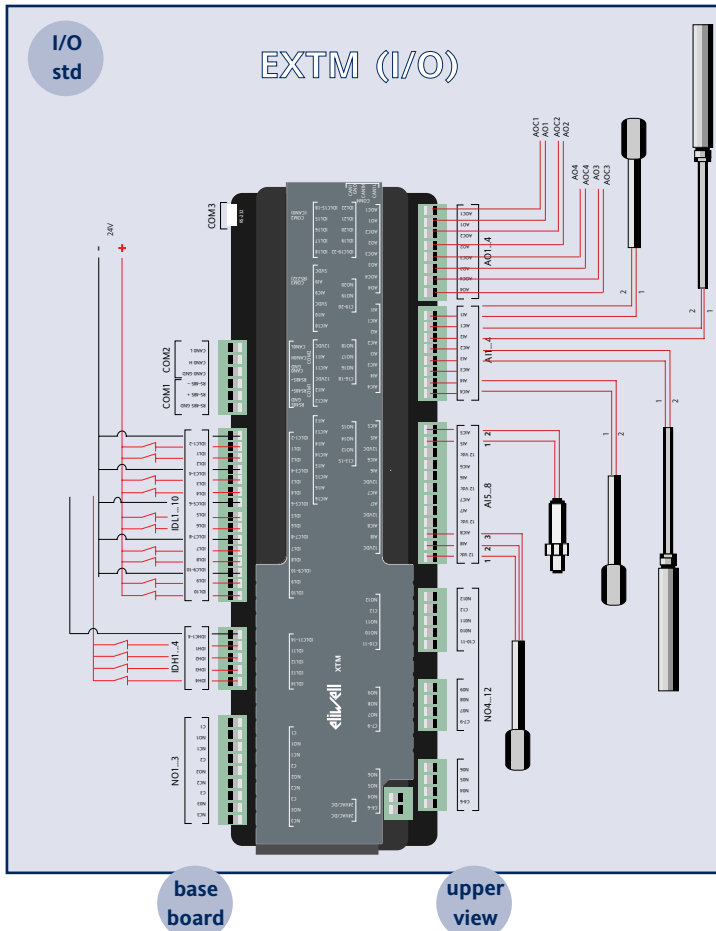
I/O Features

EXTM (I/O)

- 8 Analogue inputs: 4 temperature + 4 configurable
- 14 Digital inputs: 10 Low Voltage + 4 (High or Low Voltage)
- 12 Digital output: 9 SPST + 3 SPDT
  - COM1: RS-485
  - COM2: CAN-BUS 0 for connection to • keyboard
    - exp. EXTE1(/H)

| 8 AI | 14 DI | 12 DI |

EXTM/R (I/O)

- 8 Analogue inputs: 4 temperature + 4 configurable
- 14 Digital inputs: 10 Low Voltage + 4 (High or Low Voltage)
- 12 Digital output: 9 SPST + 3 SPDT
- 4 Analogue outputs: single configurable (4-20mA, 0-10V)
  - COM1: RS-485
  - COM2: CAN-BUS 0 for connection to • keyboard
    - exp. EXTE1(/H)
  - COM3: RS-232
  - COM4: CAN-BUS 1 for connection to remote keyboard

| 8 AI | 14 DI | 12 DI | 4 AO |

EXTM/H (I/O)

- 16 Analogue inputs: 8 temperature + 8 configurable
- 22 Digital inputs: 14 Low Voltage + 8 (High or Low Voltage)
- 20 Digital outputs: 17 SPST + 3 SPDT
  - COM1: RS-485
 - COM2: CAN-BUS 0 for connection to • keyboard
    - exp. EXTE1(/H)

| 16 AI | 22 DI | 20 DI |

EXTM/HR (I/O)

- 16 Analogue inputs: 8 temperature + 8 configurable
- 22 Digital inputs: 14 Low Voltage + 8 (High or Low Voltage)
- 20 Digital outputs: 17 SPST + 3 SPDT
- 4 Analogue outputs: single configurable (4-20mA, 0-10V)
  - COM1: RS-485
  - COM2: CAN-BUS 0 for connection to • keyboard
    - exp. EXTE1(/H)
  - COM3: RS-232
  - COM4: CAN-BUS 1 for connection to remote keyboard

| 16 AI | 22 DI | 20 DI | 4 AO |

Four configuration of EXTM are available with different number of inputs/outputs and two communication layers to offer the best solution to the various application requirements.
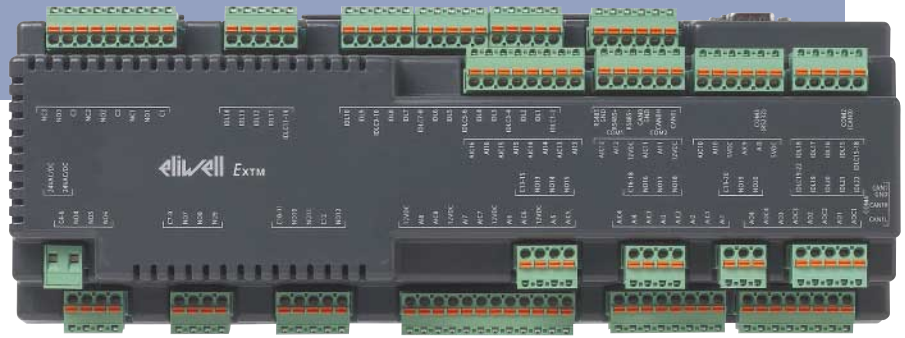
Technical data

- Plastic housing: resin plastic body PC+ABS UL94 V-0
- Mount: on DIN-RAIL EN 50022 guide
- Protection grade: IP00
- Operating temperature: -5...60 °C.
- Storage temperature: -30...85 °C.
- Operating humidity: 10...90 % R.H. (non condensing)

- Storage environment humidity: 10...90% R.H. (non-condensing)
- Terminals and connectors: screw or spring removable connectors, vertical insertion
- Data storage: on non-volatile EEPROM memory.
- Power supply: 24 V~/⎓ 50/60 Hz

Technical Data EXTM and EXTM/R Base

- Digital inputs:
  - 14 inputs 24V~/⎓
    or, on demand, 10 inputs 24V~/⎓
    + 4 inputs 230V~
- Analog inputs:
  - 4 NTC inputs, range –35 to 150°C
  - 4 inputs configurable to 0-1V, 0-5V, 0-10V, 0-20mA, 4-20mA, NTC range –35 to 150°C
- Digital outputs:
  - 3 relays SPDT, 250V~ 8A;
  - 9 relays SPST N.O., 250V~ 8A

(only /R model)
- Analogue outputs:
  - 4 outputs 0-10V⎓ up to 1% of resolution (or 4...20mA on demand)

Technical Data XTM/H and XTM/HR Base

- Digital inputs:
  - 22 inputs 24V~/⎓
    or, on demand, 14 inputs 24V~/⎓
    + 8 inputs 230V~
- Analog inputs:
  - 8 NTC inputs, range –35 to 150°C
  - 8 inputs configurable to 0-1V, 0-5V, 0-10V, 0-20mA, 4-20mA, NTC range –35 to 150°C
- Digital outputs:
  - 3 relays SPDT, 250V~ 8A;
  - 17 relays SPST N.O., 250V~ 8A

(only /R model)
- Analogue outputs:
  - 4 outputs 0-10V⎓ up to 1% of resolution (or 4...20mA on demand)

Models Summary

MODELS	DIGITAL INPUTS	ANALOGUE INPUTS	ANALOGUE OUTUTS	RELAY OUTPUS	SERIAL
EXTM	14	8	4	12	COM1,2
EXTM/R	14	8	4	12	COM1,2,3,4
EXTM/H	22	16	4	20	COM1,2
EXTM/HR	22	16	4	20	COM1,2,3,4

Mechanical Features

Model	Length	Width	Height
EXTM	316mm	114mm	80mm
EXTM/R	316mm	114mm	80mm
EXTM/H	316mm	114mm	80mm
EXTM/HR	316mm	114mm	80mm
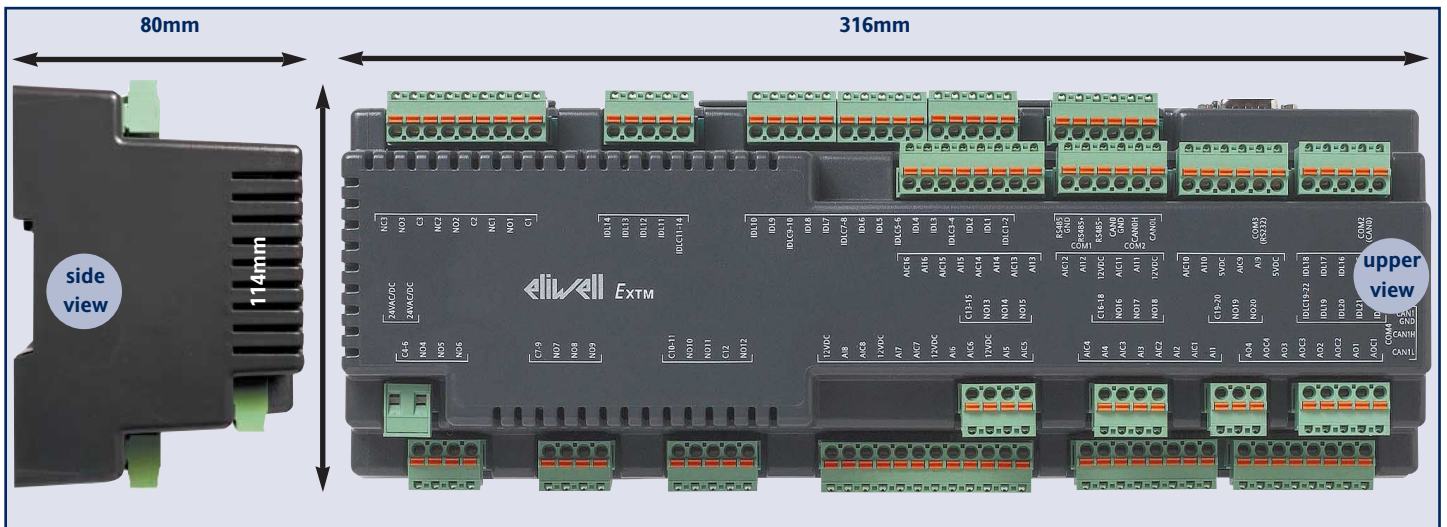
EXTE1 expansions

The combination of the 2 different available expansion modules offers ample modularity to cover a wide range of Air Conditioning applications with a high degree of scalability, optimising the cost to performance ratio.

Easy expansion module connectivity (max 4 in the network), through an "Ethernet" cable, ensures speed and reliability, in order to reach the maximum I/O configuration and to cover the most complex applications in the Air Conditioning segment.
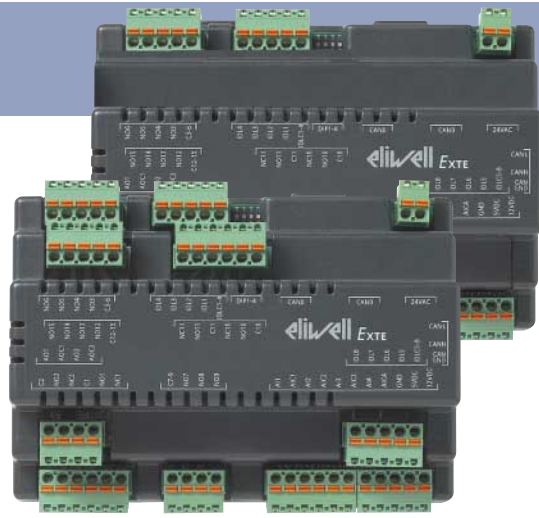
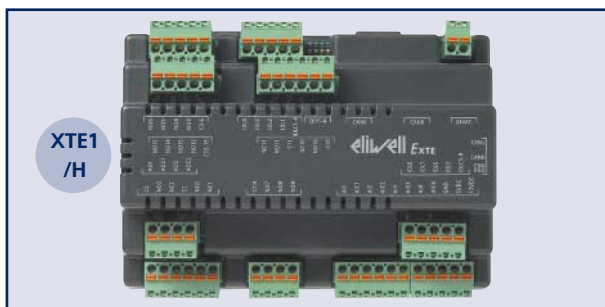| MAX I/O CONFIGURATION: 1 EXTM/H+ 4 EXT1/H			
DIGITAL INPUTS	ANALOGUE INPUTS	ANALOGUE OUTPUTS	RELAY OUTPUTS
54	32	12	80

I/O Features

EXTE1 Expansion

XTE1

• 4 Configurable analogue inputs
• 4 Digital inputs: 4 Low Voltage
• 9 Digital output: 7 SPST + 2 SPDT

4 AI	4 DI	9 NO

EXTE1/H Expansion

XTE1 /H

• 4 Configurable Analogue inputs
• 8 Digital inputs: 4 Low Voltage + 4 (High or Low Voltage)
• 15 Digital output: 11 SPST + 4 SPDT
• 2 Analogue outputs: single configurable (4-20mA, 0-10V)

4 AI	8 DI	15 NO	2 AO

Technical data

• Dimensions: 158 (Length) x 110 (Width) x 80 (height) mm
• Plastic housing: resin plastic body PC+ABS UL94 V-0
• Mount: on DIN-RAIL EN 50022 guide
• Protection grade: IP00
• Operating temperature: -5...60 °C.
• Storage temperature: -30...85 °C.

• Operating humidity: 10...90 % R.H. (non condensing)
• Storage environment humidity: 10...90% R.H. (non-condensing)
• Terminals and connectors: screw or spring removable connectors, vertical insertion
• Data storage: on non-volatile EEPROM memory.
• Power supply: 24 V~/= 50/60 Hz

EXTE1 Expansion Technical Data

• Digital inputs: 4 inputs 24 V~
• Analogue inputs: 4 inputs configurable to 0-1V, 0-5V, 0-10V, 0–20mA, 4-20mA, NTC
• Digital outputs: 2 relays SPDT + 7 relays SPST N.O. 250 V~ 8A

EXTE1/H Expansion Technical Data

• Digital inputs: • 4 inputs 24 V~
                            or 4 inputs 24V~/= + 4 inputs 230V~ **(on demand)**
• Analogue inputs: 4 inputs configurable to 0-1V, 0-5V, 0-10V, 0–20mA, 4-20mA, NTC
• Digital outputs: 4 relays SPDT + 11 relays SPST N.O. 250 V~ 8A
• Analogue outputs: 2 0-10 outputs V=   with 1% of resolution max.

EXTK keyboard

EXTK is a keyboard with a wide LCD graphical display (122x32mm) and 10 buttons which allows to access all the data required
through a simple menu driven easily customisable with the software tool MenuMaker (different languages). It is possible to connect to the EXTM up to 2 keyboards (1 local +1 remote) for panel (IP54) or wall mounting.

• Power supply: 12 V~/⎓
• Dimensions: 219 (Length) x 119 (Width) x 32 (height) mm
• Mounting: for panel (IP54) or wall mounting.
• Connections: screw connectors

User Interface - LEDs

Led 1 GREEN

It indicates power supply is present.

Led 2 YELLOW

It indicates the presence of a base - keyboard connection/communication

Led 3 RED

It indicates presence of alarms

User Interface - buttons

F1

F4

F2

F3
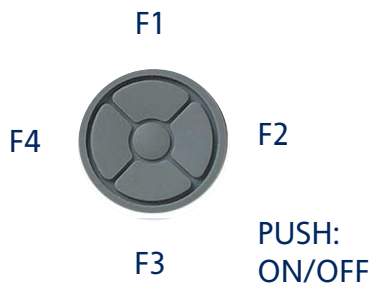
PUSH: ON/OFF

"FUNCTION" function buttons

• From the four external positions (F1...F4): functions configurable by the user
• PUSH:ON-OFF: machine startup and shutdown.
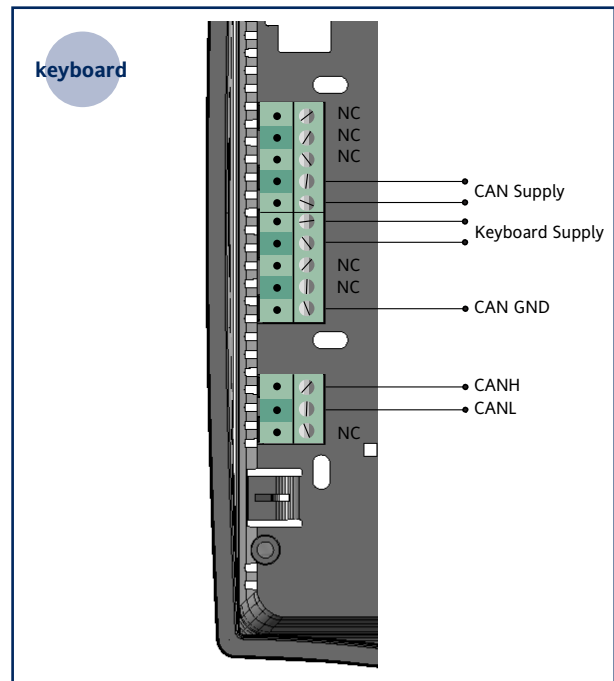 The device switches from ON to OFF (standby) and from OFF (stand-by) to ON.
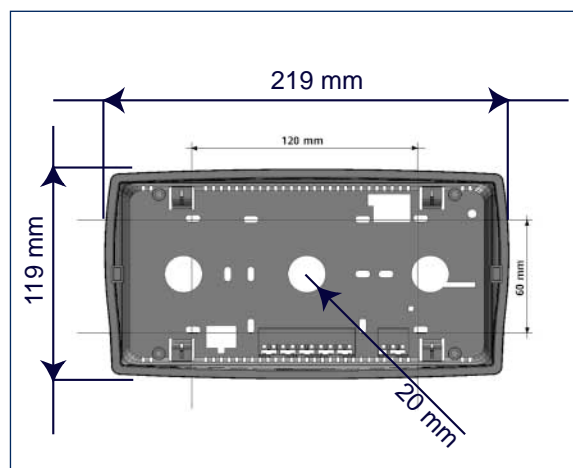
PUSH: ENTER

"MENU" Menu buttons

From the four external positions (UP: up; DOWN: down; RIGHT:right; LEFT(ESC):left): Buttons to manage the menu; Central button: ENTER.

Wiring Diagram

keyboard

NC
NC
NC

CAN Supply

Keyboard Supply

NC
NC

CAN GND

CANH
CANL

NC

Dimensions

219 mm

120 mm

119 mm

60 mm

20 mm

Connectivity

Serial Ports

- COM1: RS-485
- COM2: CAN-BUS 0 for connection to
  - keyboard
  - expansion EXTE1(/H)
- COM3: RS-232*
- COM4: CAN-BUS 1* for connection to remote keyboard

*only /R model

Communication

With two serial ports (RS485 and RS232), **Energy XT** can be directly connected to a supervisory system using the MODBUS communication protocol enabling both local and remote monitoring via a PSTN or GSM modem. **Energy XT** can also send SMS messages via an ordinary GMS modem to guarantee improved safety and easy plant maintenance.
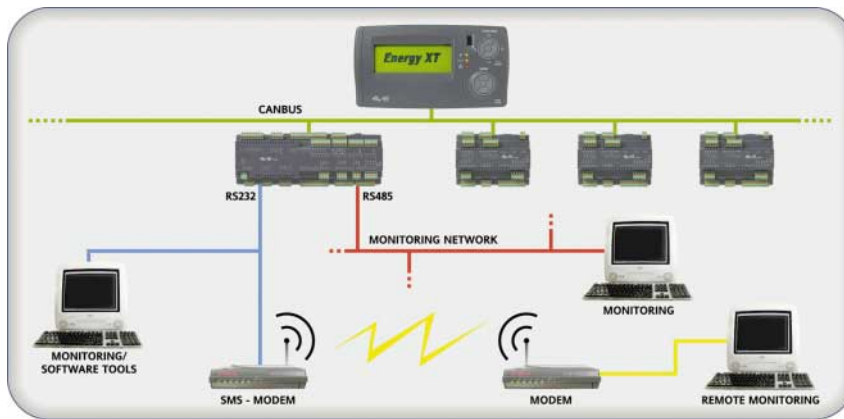
System BUS

The system bus, based on the CANBUS protocol, allows the connection of 4 EXTE expansions and 2 EXTK keyboards (1 local + 1 remote) to an EXTM base, ensuring a fast and robust data exchange and ensuring an high running time of the system.
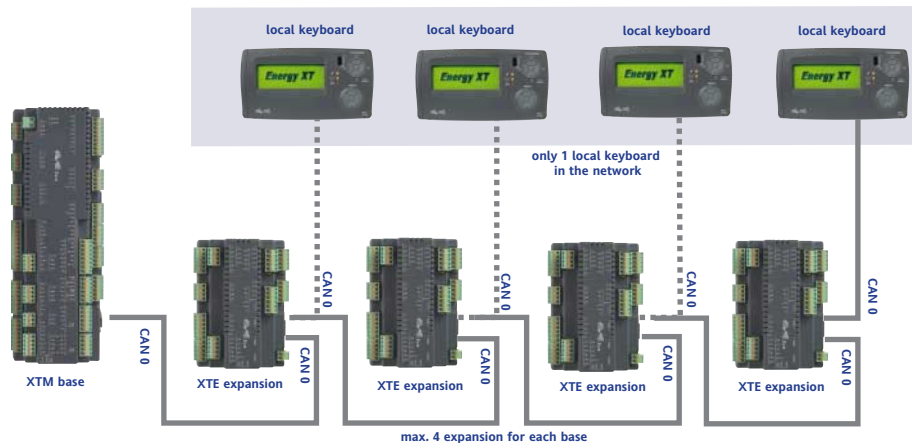
Regulations

The product complies with the following European Community Directives:

- Council Directive 73/23/CEE and subsequent modifications
- Council directive 89/336/CEE and subsequent modifications

and complies with the following harmonised regulations:

- LOW VOLTAGE: EN60335 as far as applicable
- EMISSION: EN50081-1 (EN55022)
- IMMUNITY: EN50082-1 (IEC 1000-4-2/3/4/5)