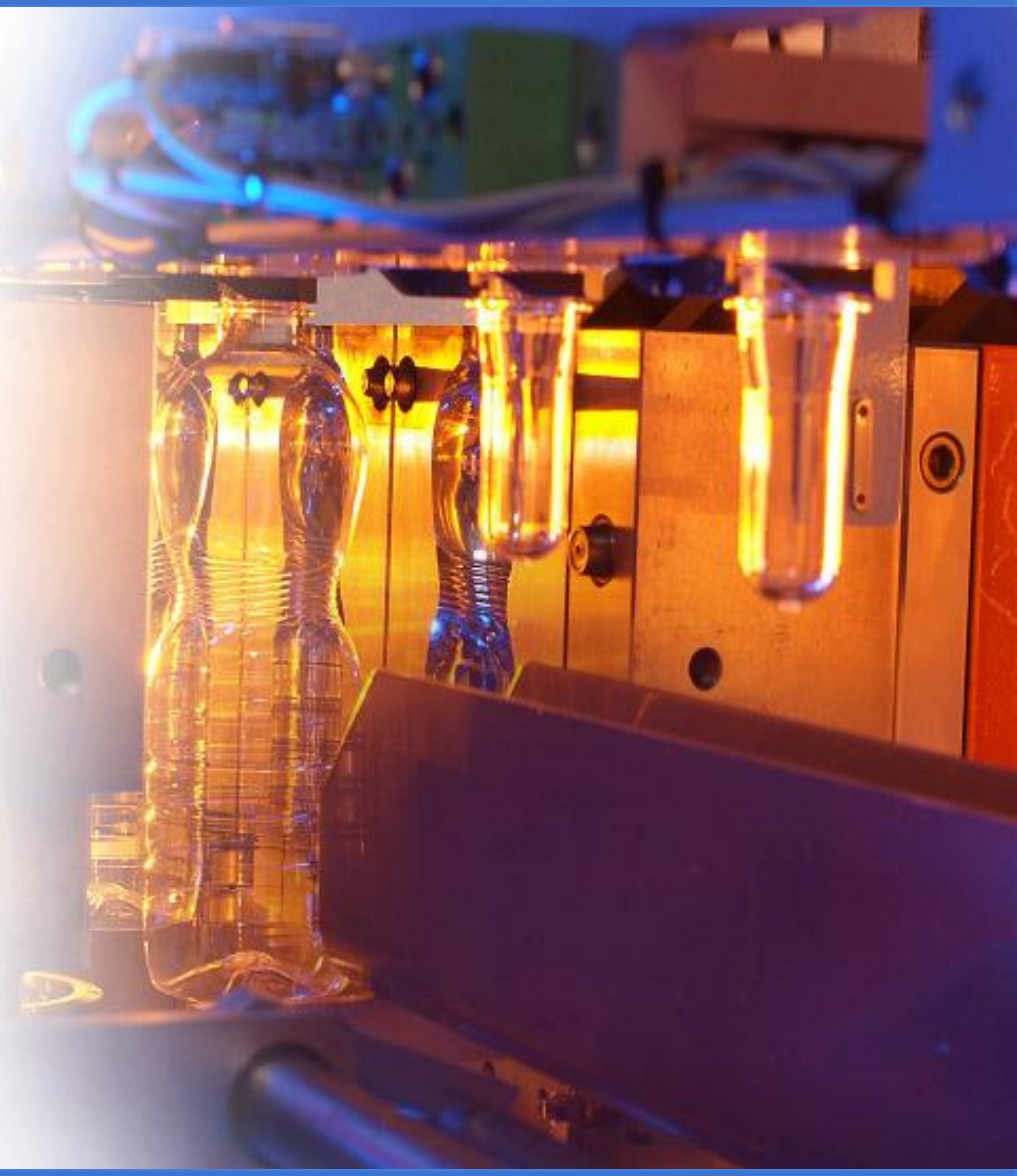
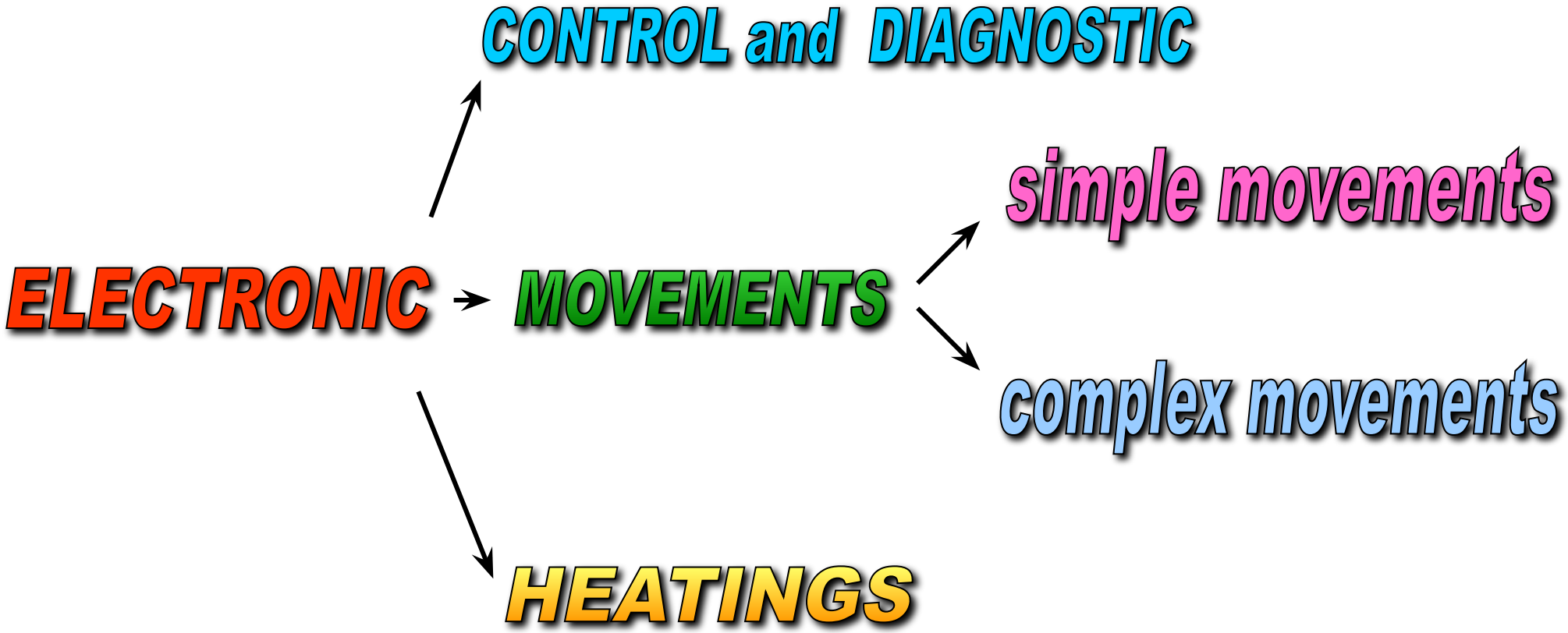
SFR Evo ELECTRIC LAYOUT AND ELECTRONIC MANAGEMENT

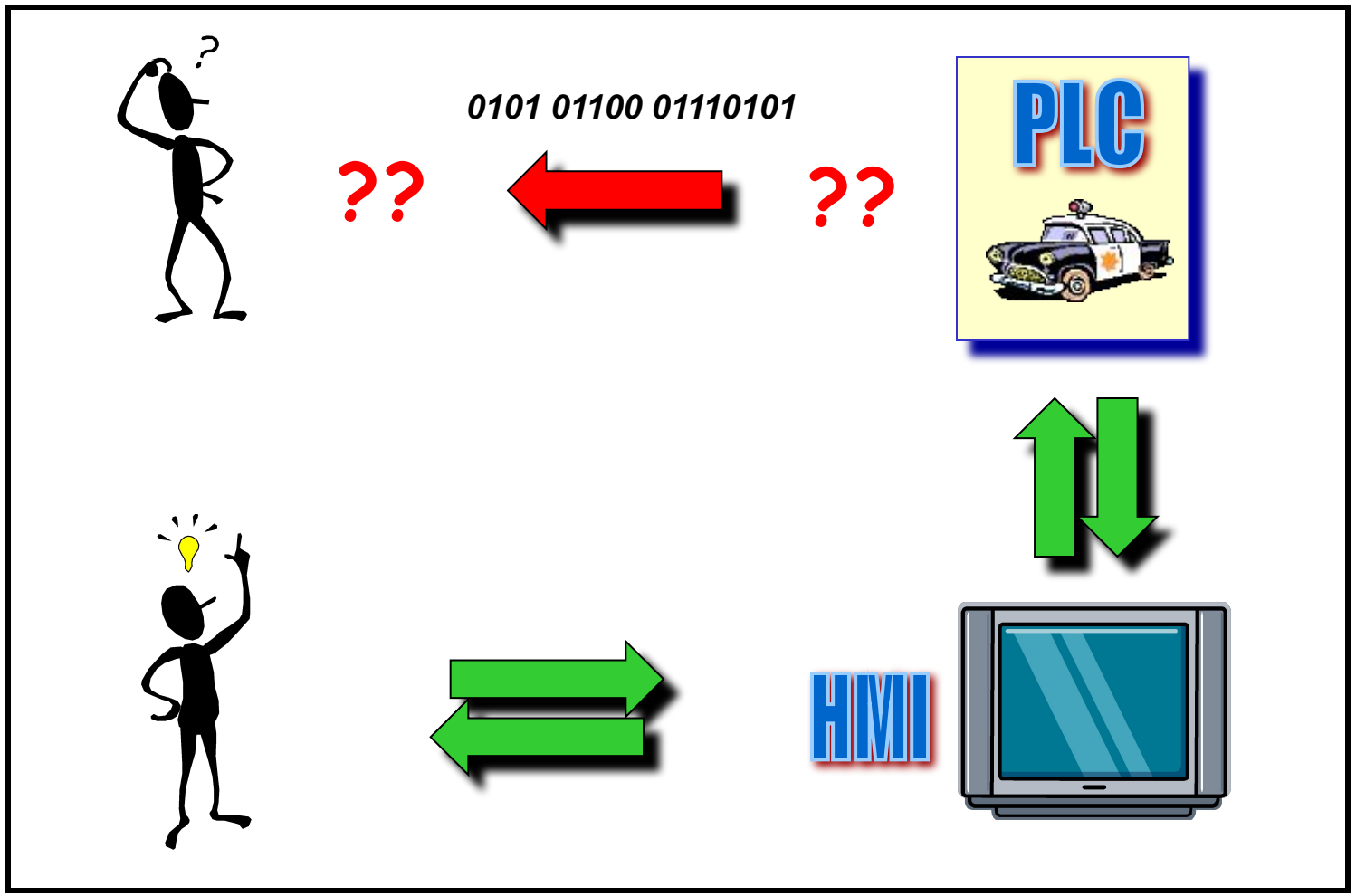


SIPA
Plastic Packaging Systems
TRAINING

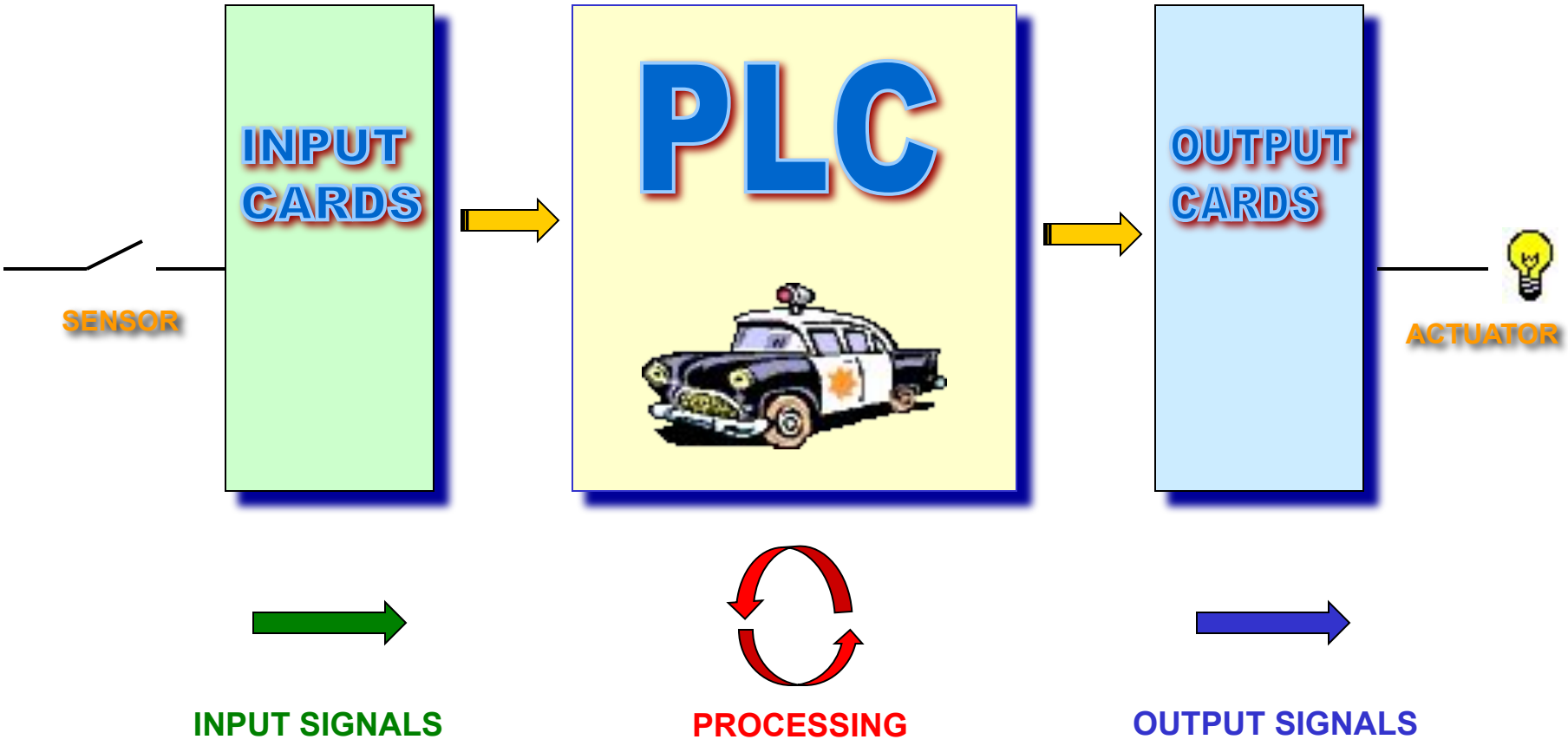
ELECTRONIC SYSTEM PURPOSE



OPERATOR INTERFACE PURPOSE



PLC - Programmable Logic Controller



PC - Personal Computer

PLC

+

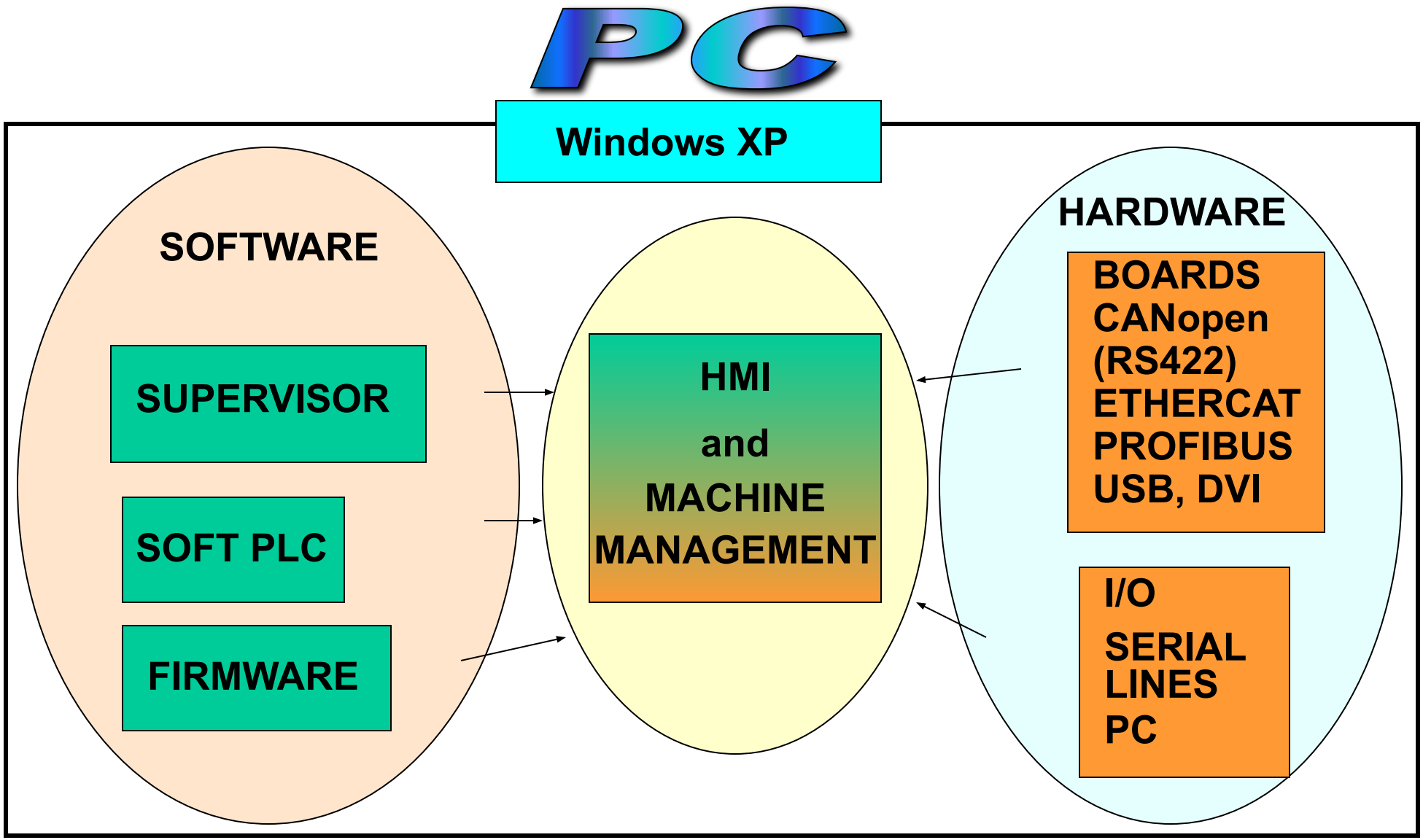
HMI

⇒

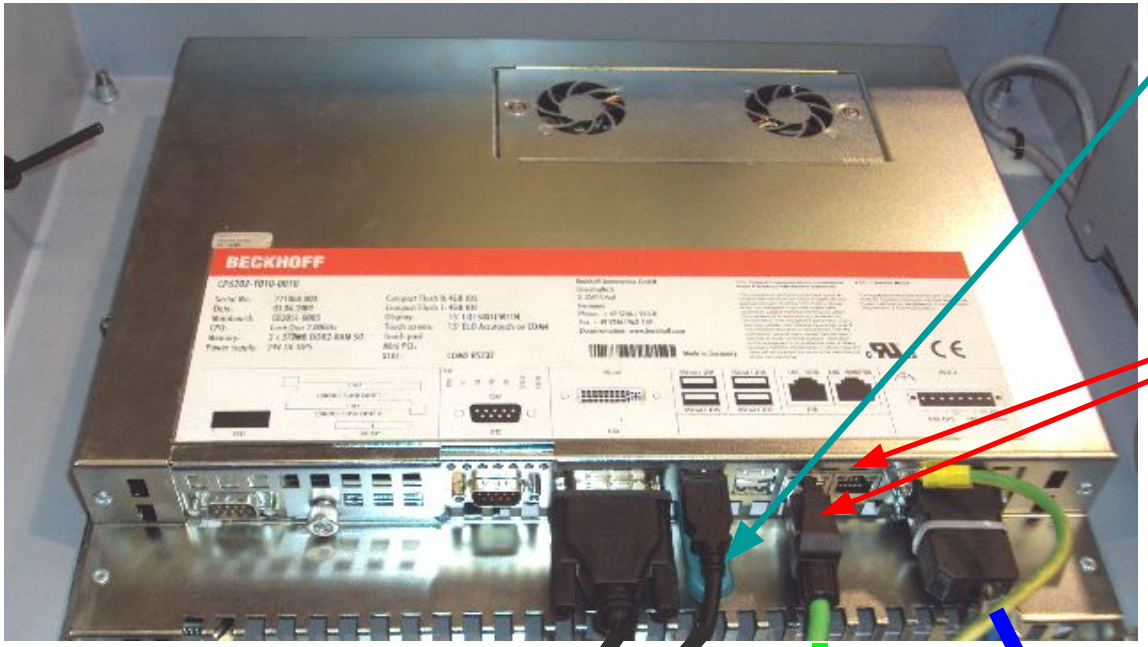
PC

- SOFT PLC (TWINCAT)

- HMI (ZENON)


PC
Windows XP
SOFTWARE
SUPERVISOR
SOFT PLC
FIRMWARE
HMI
and
MACHINE
MANAGEMENT
HARDWARE
BOARDS
CANopen
(RS422)
ETHERCAT
PROFIBUS
USB, DVI
I/O
SERIAL
LINES
PC

LAYOUT PANEL PC



DONGLE ZENON (USB)

ETHERNET

TOUCH SCREEN

DVI

USB

ETHERCAT

24 Vdc

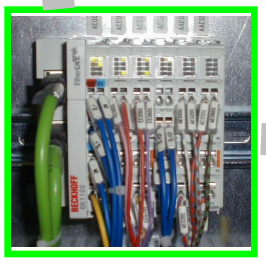
UPS

EK1100 - BRIDGE

LAYOUT BRIDGE EK1100

INTELLIGENT SOCKETS

EK1100



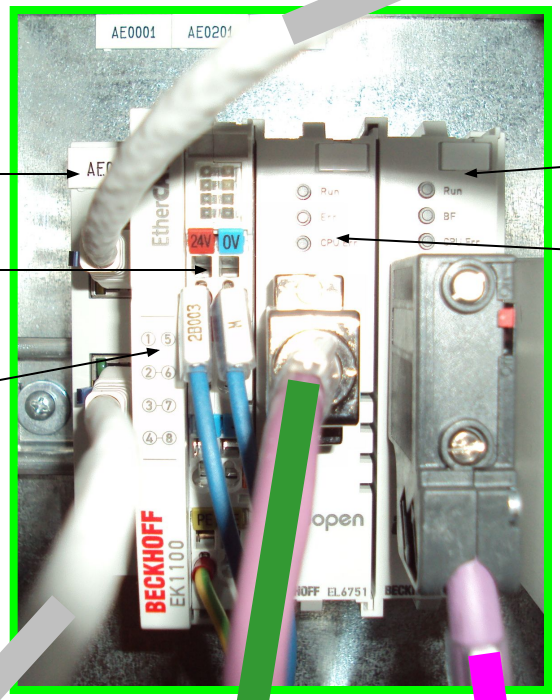
ETHERCAT

EK1100 - BRIDGE

SLAVE ETHERCAT

SUPPLY 24V

BASE MODULE EK1100



MASTER PROFIBUS

MASTER CANOpen

ETHERCAT

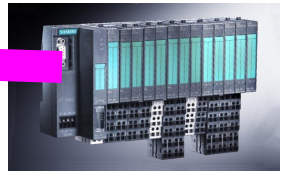
PC (MASTER ETHERCAT)

CANOpen

PWRC08

PROFIBUS

I/O MODULES



SIPA Plastic Packaging Systems

TRAINING

SERIAL LINES

PROFIBUS serial line

It allows communication between PLC and the nodes (slave), i.e. PLC with ET200S modules.

Ethercat serial line

Fast ethernet without communication dead times. It allows communication between PC (Master) and I/O modules EK1100 and the Intelligent Sockets (slave).

CANopen serial line

or

RS422 serial line

It allows communication between PC and PWRC08 power cards.

It allows communication between PC and IRAZ24 power cards.

USB & DVI serial line

It allows communucation between PC and the HMI panel and modem.

NODES

Electronic units dedicated to specific tasks and areas of the machine. Identified by an address. Each node is connected via serial line. There are different kinds of nodes:

PROFIBUS node

- I/O MODULES, digital and analogue (slave)
- BRIDGE EK1100 (Master)
- DRIVES (slave)

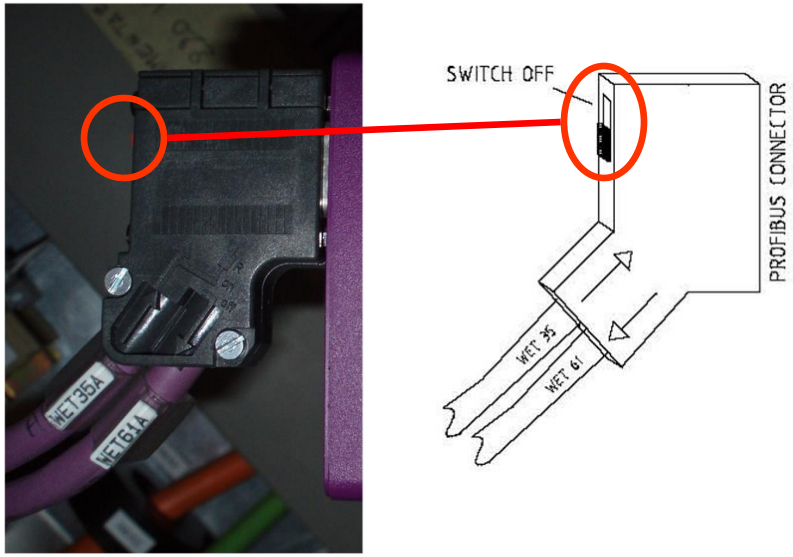
Ethercat node

- PC (Master)
- BRIDGE EK1100 (slave)
- I/O EK1100 (slave)
- INTELLIGENT SOCKETS (slave)

CANbus node

- PWRC08 (slave)
- BRIDGE EK1100 (Master)

NODES ADDRESSES

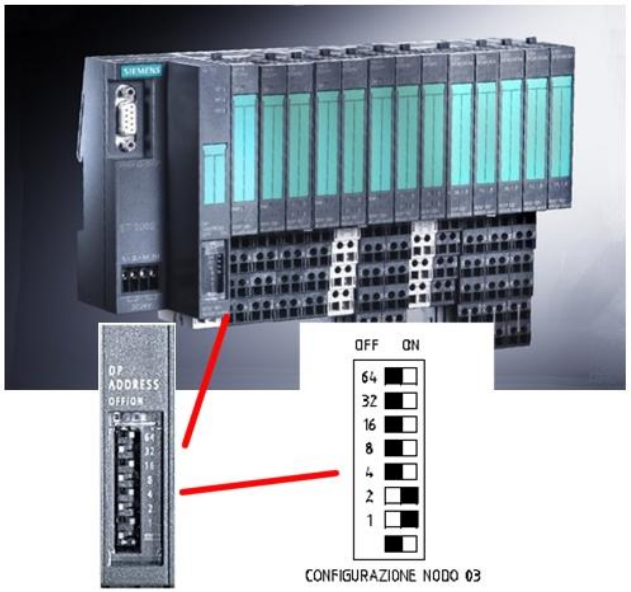


PROFIBUS connector selector

Can have 2 positions:

ON – for terminal positions (beginning and end of the serial line)

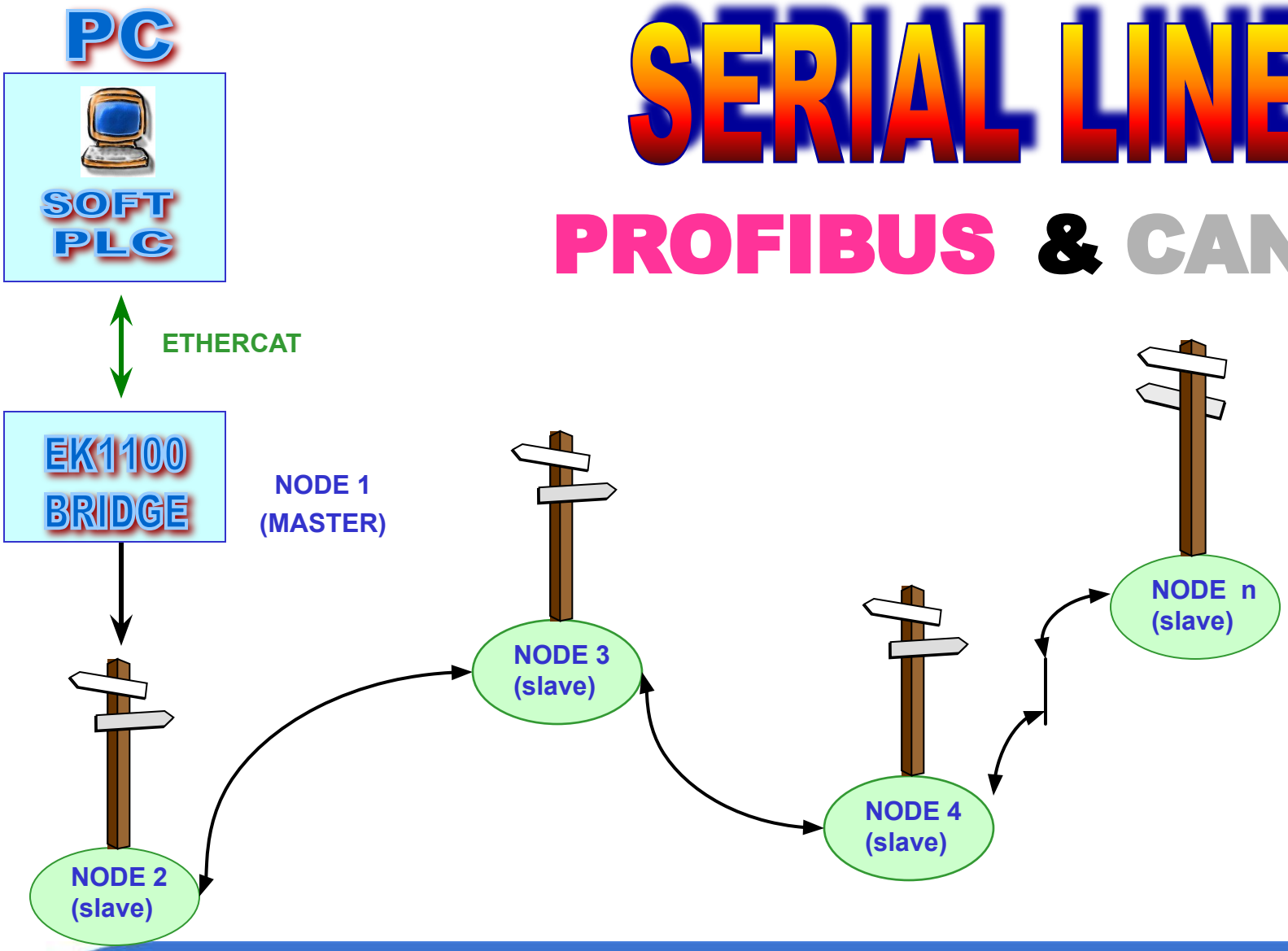
OFF – for the intermediate positions (passer-by)



Setting PROFIBUS node address (dip-switches)

SERIAL LINE

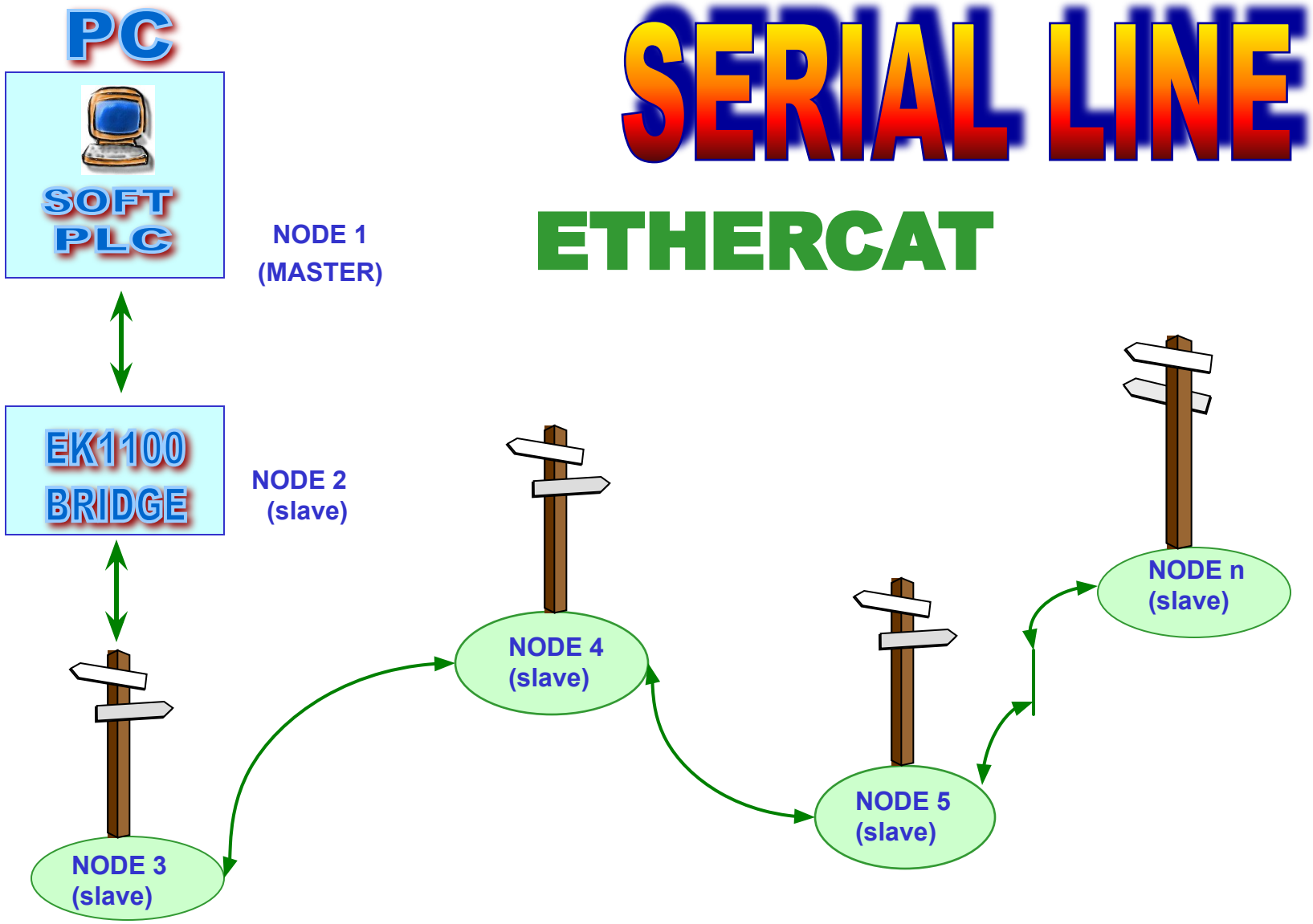
PROFIBUS & CANopen



SIPA Plastic Packaging Systems TRAINING

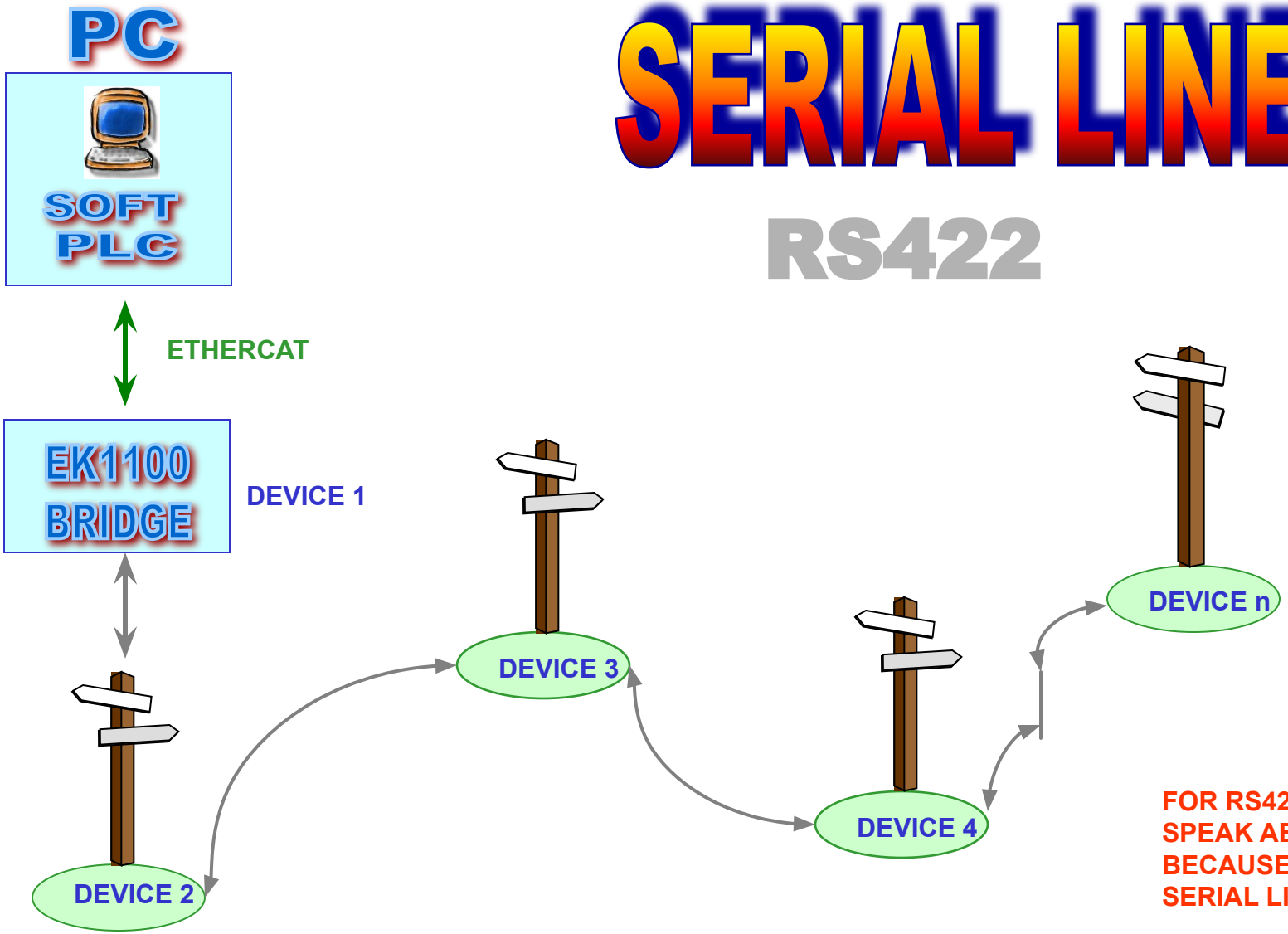
SERIAL LINE

ETHERCAT



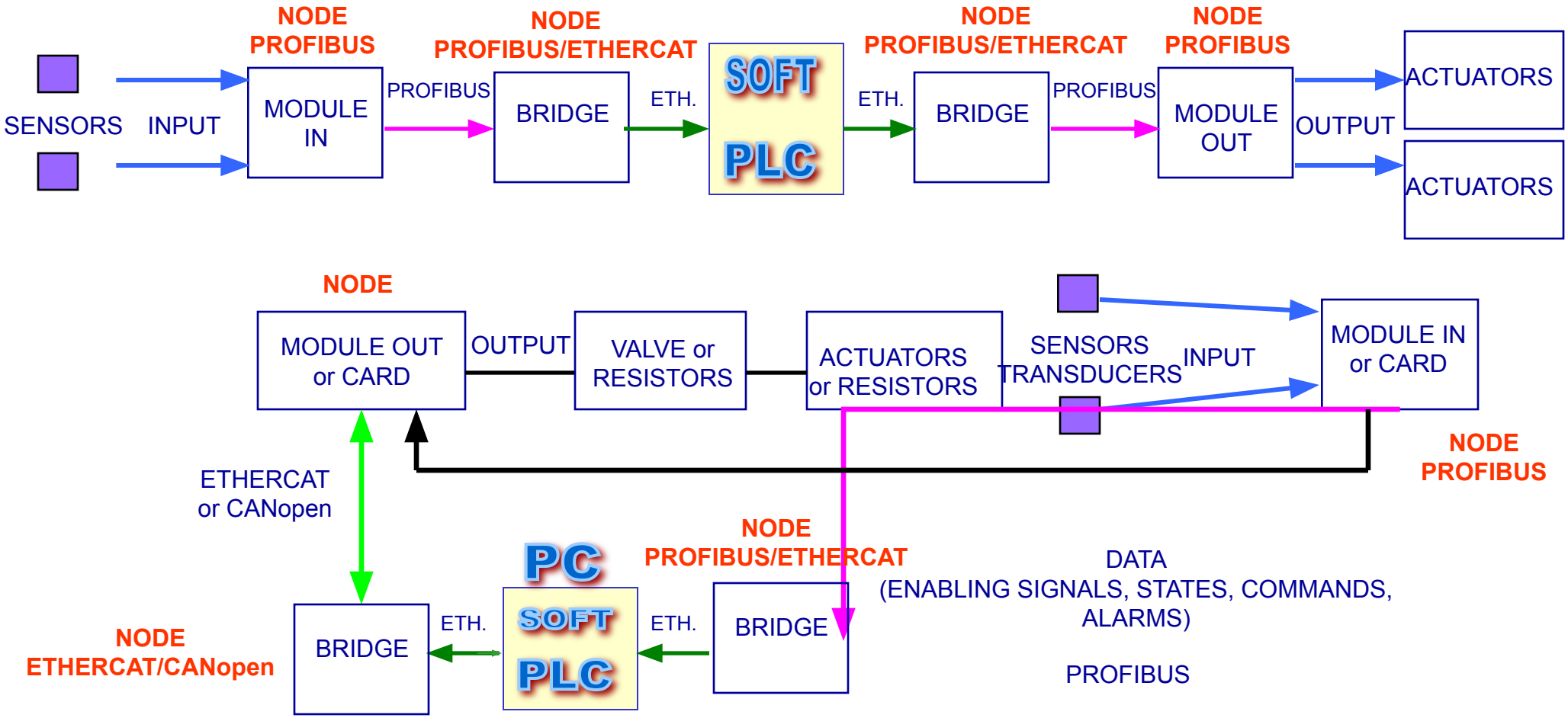
SERIAL LINE

RS422



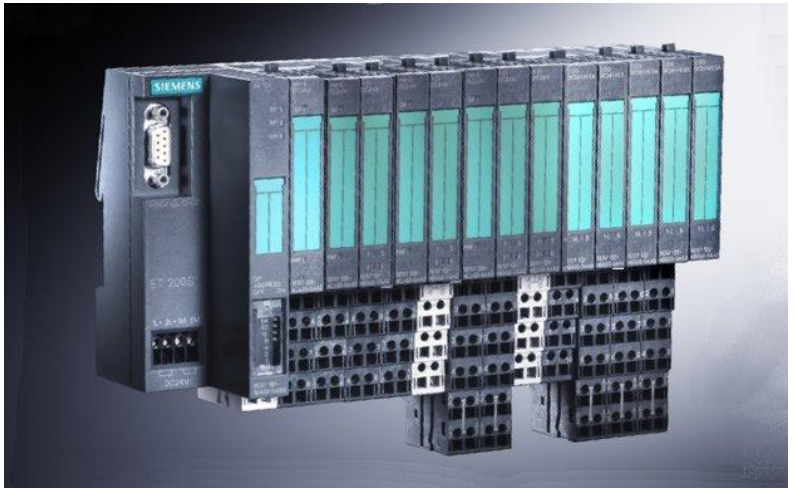
FOR RS422 WE CANNOT SPEAK ABOUT NODES BECAUSE IT IS A PURE SERIAL LINE

NODES


NODE
PROFIBUS
NODE
PROFIBUS/ETHERCAT
NODE
PROFIBUS/ETHERCAT
NODE
PROFIBUS
SENSORS
INPUT
MODULE
IN
PROFIBUS
BRIDGE
ETH.
SOFT
PLC
ETH.
BRIDGE
PROFIBUS
MODULE
OUT
OUTPUT
ACTUATORS
ACTUATORS
NODE
MODULE OUT
or CARD
OUTPUT
VALVE or
RESISTORS
ACTUATORS
or RESISTORS
SENSORS
TRANSDUCERS
INPUT
MODULE IN
or CARD
NODE
PROFIBUS
ETHERCAT
or CANopen
NODE
PROFIBUS/ETHERCAT
PC
SOFT
PLC
DATA
(ENABLING SIGNALS, STATES, COMMANDS,
ALARMS)
PROFIBUS
NODE
ETHERCAT/CANopen
BRIDGE
ETH.
ETH.
BRIDGE

SIEMENS ET 200S I/O MODULES

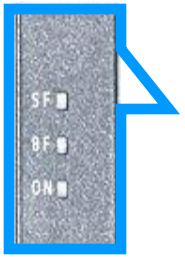
Connector for PROFIBUS serial line

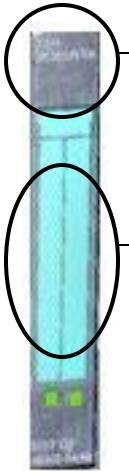


DIAGNOSTIC LEDs:

- ON ON: internal module correctly supplied
- ON OFF: internal module not supplied
- BF ON: failed communication with the CPU
- BF OFF: communication OK
- SF ON: failed communication between modules
- SF OFF: no errors

-LED SF
-LED BF
-LED ON





DI: Digital Input
DO: Digital Output
AI: Analogic Input
AO: Analogic Output

E (Engang) xxxx: Input
A (Ausgang) yyyy: Output

24 Vdc supply

ADDRESS setting of the module (and of the node)

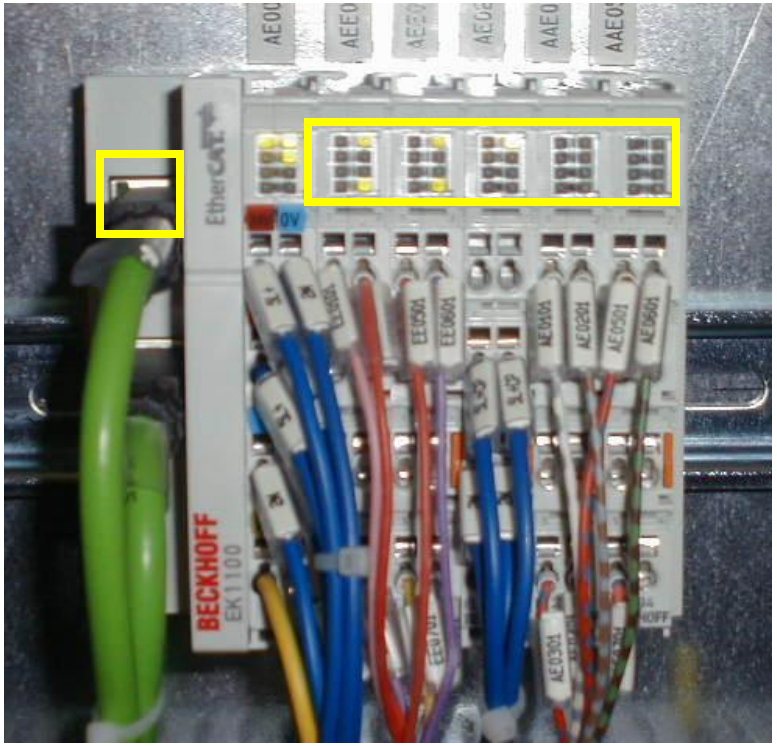
Terminal box for input and output signals

I/O MODULES EK1100

Supply 24 Vdc

I/O ENABLED

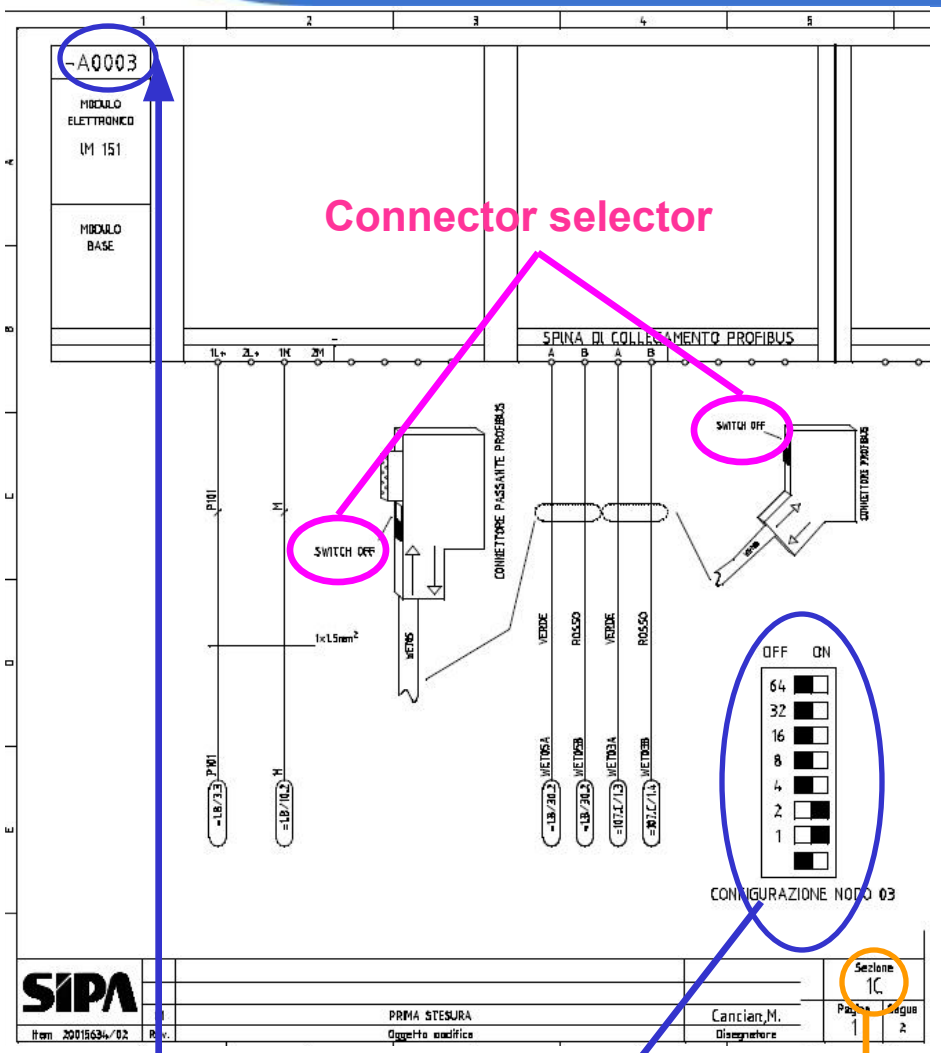
Network connection status

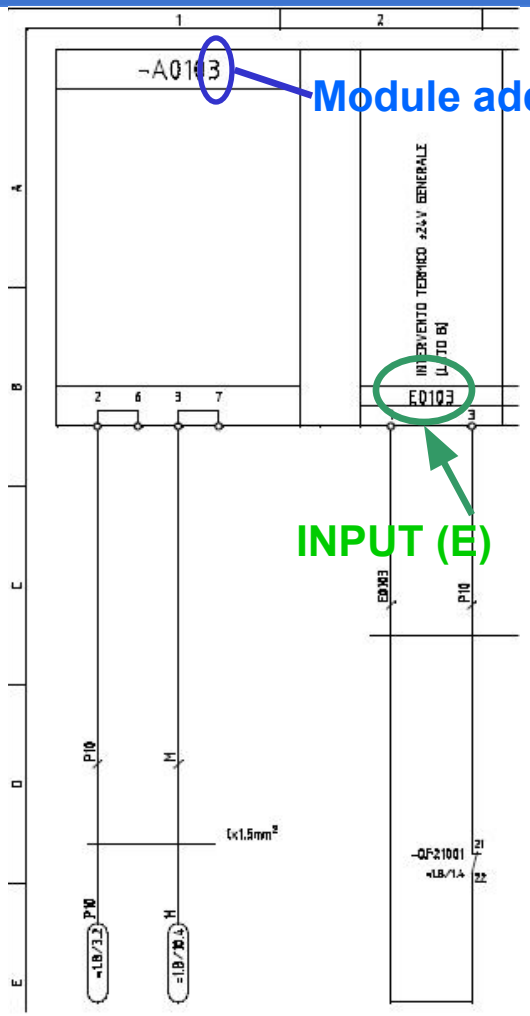


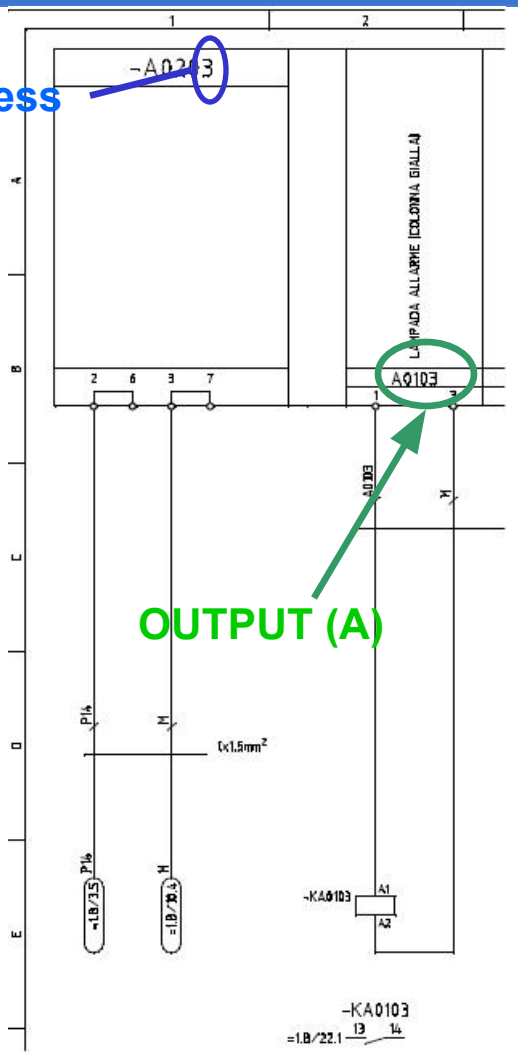
AEE or EE: digital input
AAE or AA: digital output
ARE: analogue input
ARA: analogue output

Serial connection ETHERCAT

Terminal box for input and output signals


-A0003
MODULO ELETTRONICO
UM 151
MODULO BASE
SPINA DI COLLEGAMENTO PROFIBUS
SWITCH OFF
CONNETTORE PASSANTE PROFIBUS
OFF ON
64
32
16
8
4
2
1
CONFIGURAZIONE NODO 03
SIPA
PRIMA STESURA
Cancian,M.
Sezione
1C
Module address
I/O section electric diagrams

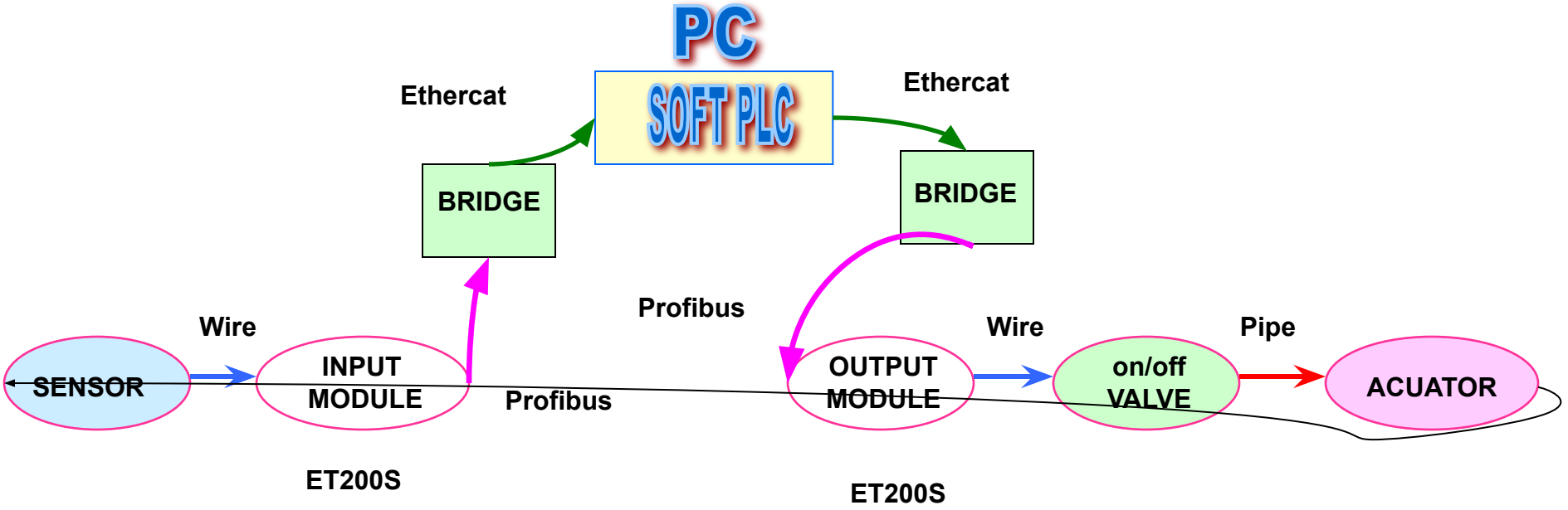

-A0103
Module address
INTERVENTO TERMICO ±24V GENERALE
E0103
INPUT (E)
E0103
P10
-QF21001
-KA0103
OUTPUT (A)


-A0103
LAMPADA ALLARME (COLONNA GIALLA)
A0103
-KA0103

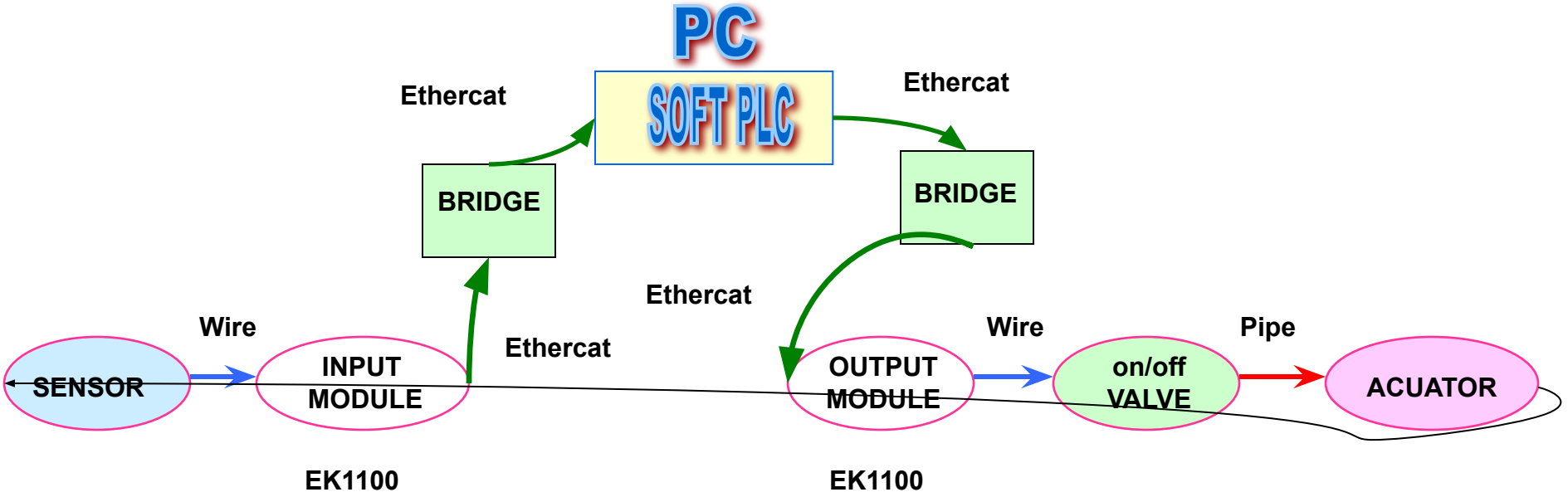
KIND OF MOVEMENTS

- SIMPLE with ON/OFF VALVE and ON/OFF SENSOR
- COMPLEX with DRIVE and TRANSDUCER (linear or rotary)

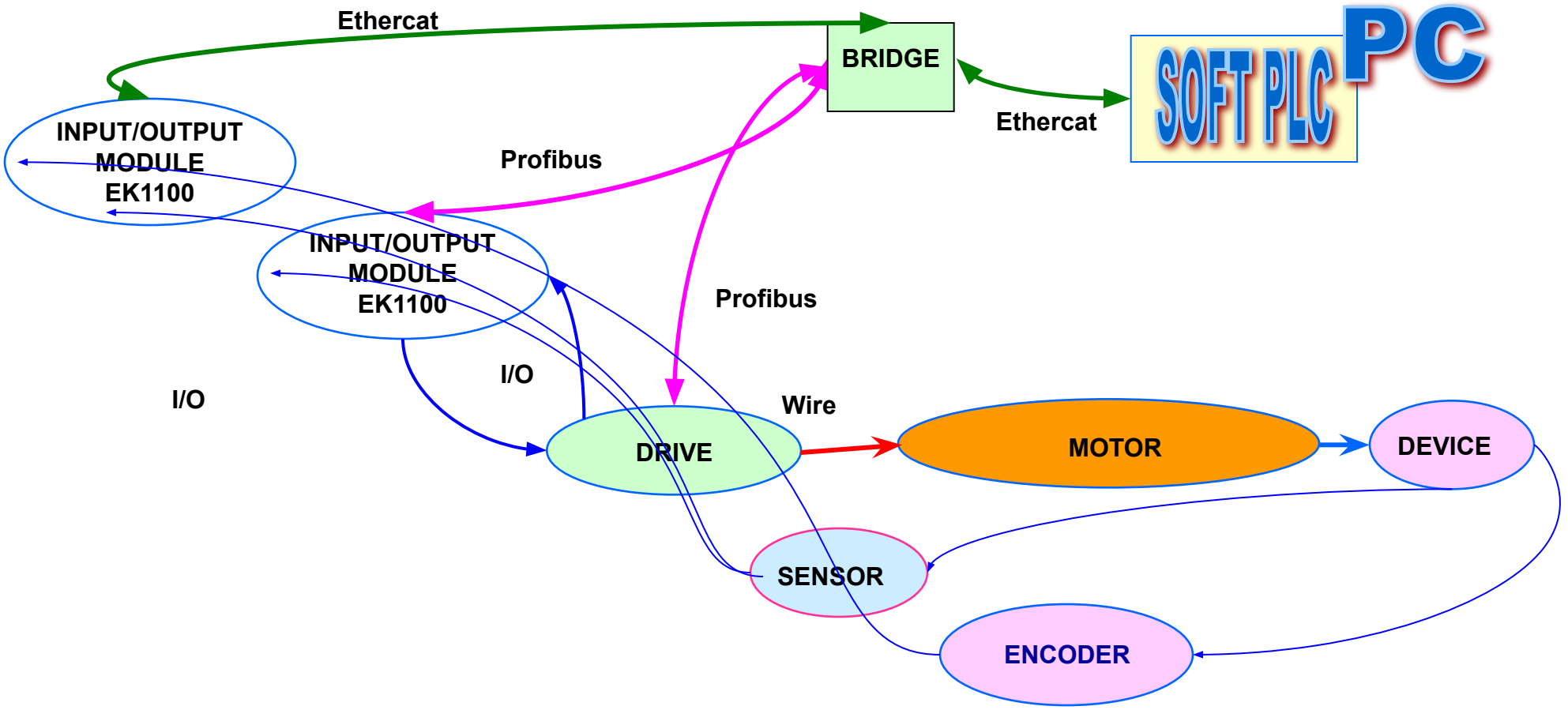
SIMPLE MOVEMENTS (1)



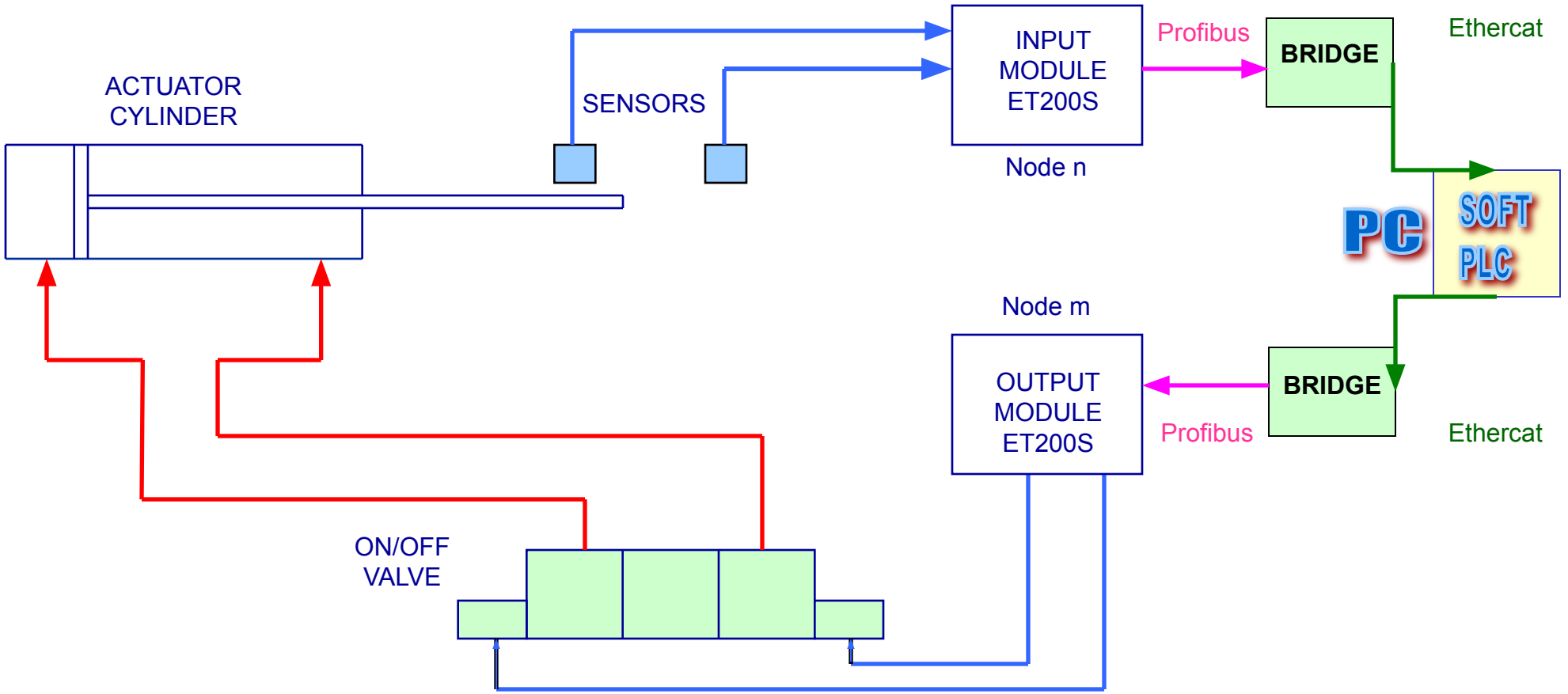
SIMPLE MOVEMENTS (2)



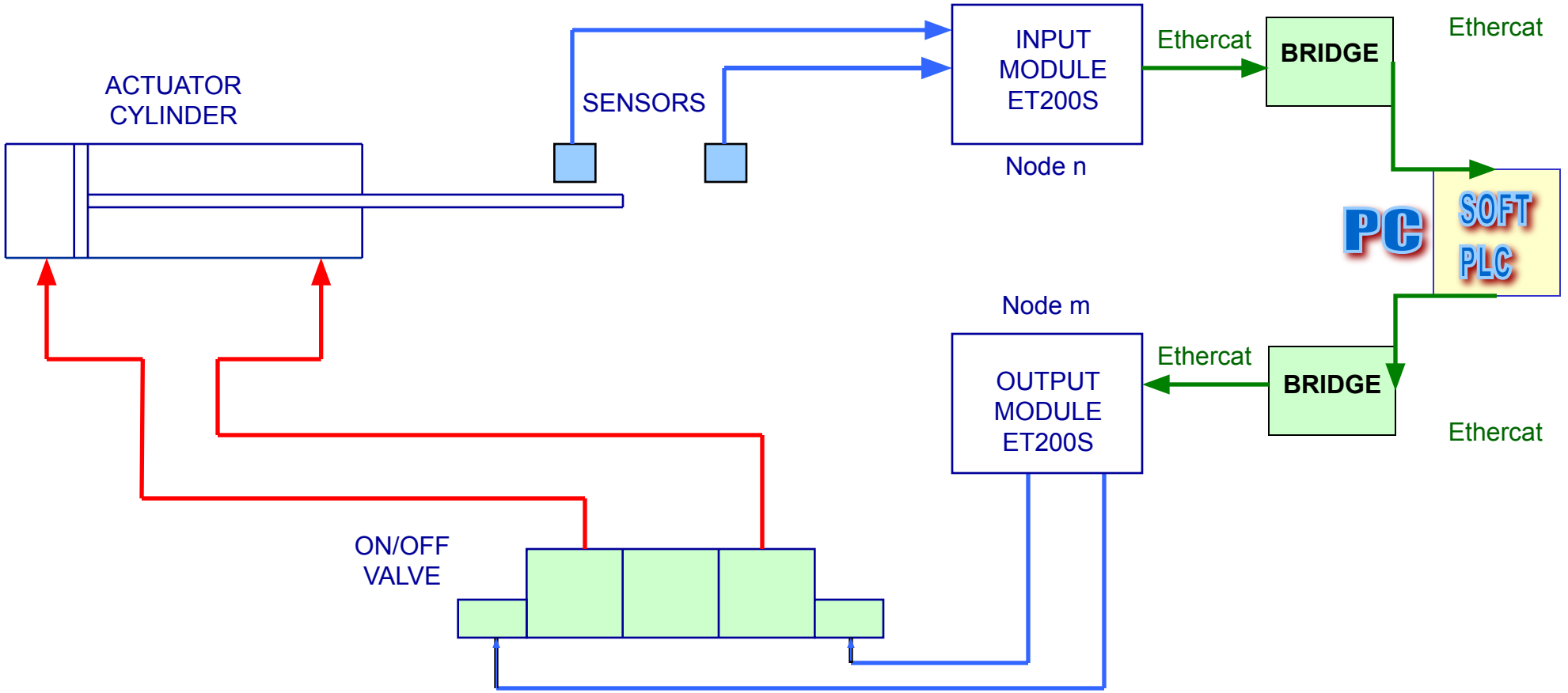
ELECTRIC COMPLEX MOVEMENTS



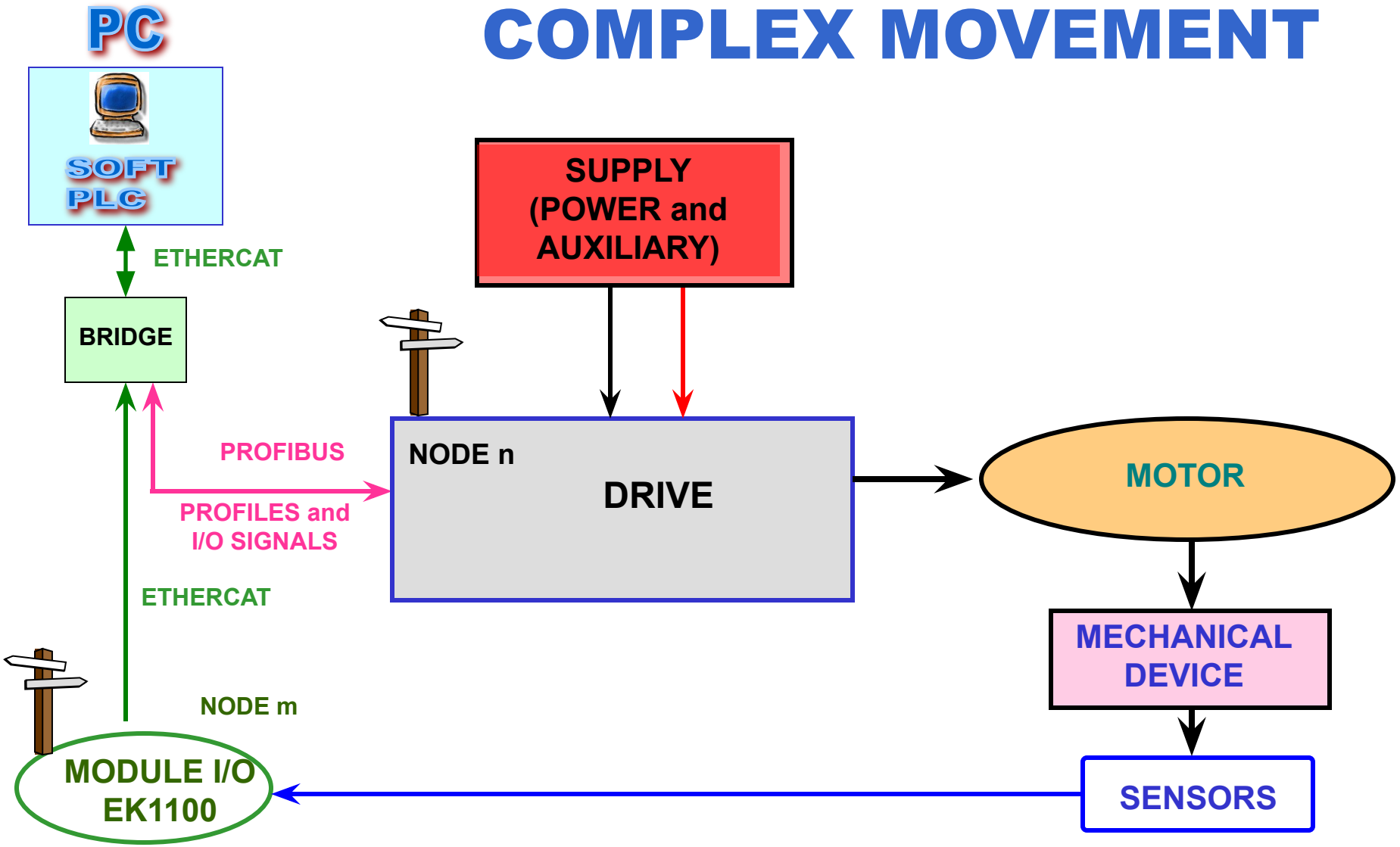
SIMPLE MOVEMENTS WITH ON/OFF SENSORS (1)



SIMPLE MOVEMENTS WITH ON/OFF SENSORS (2)

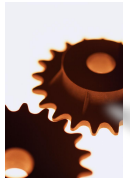


COMPLEX MOVEMENT



ELECTRONIC COMPONENTS

PANEL PC → LOGIC CONTROL (SOFT PLC)
ELECTRONIC CAMS GENERATOR
HMI



CONTROL TECHNIQUES → DRIVE

IP2001 → INTELLIGENT SOCKETS

PWRC08 (IRAZ24) → POWER CARD

ELECTRONIC MANAGEMENT OF THE BLOWING WHEEL

ELECTRONIC CAM GENERATOR: PC has the function, thanks to the implementation of a dedicated software, to create virtual cams. The function is similar to a mechanical cam shaft but these are electronic and programmable. At every revolution of the blowing wheel, these cams send the enabling signals to the intelligent sockets through the Ethercat serial line in precise and fixed (but programmable) angular positions of the blowing wheel.

INTELLIGENT SOCKETS: these IP2001 electronic devices are located on every blowing press and receive the signals from I/O Ethercat modules EK1100. Their function is to enable the valves related to blowing (seals, blowing, compensation, …). In this configuration are seen as digital output modules (slave) and own 8 outputs. The module self addresses automatically. The cards are supplied with 24Vdc.

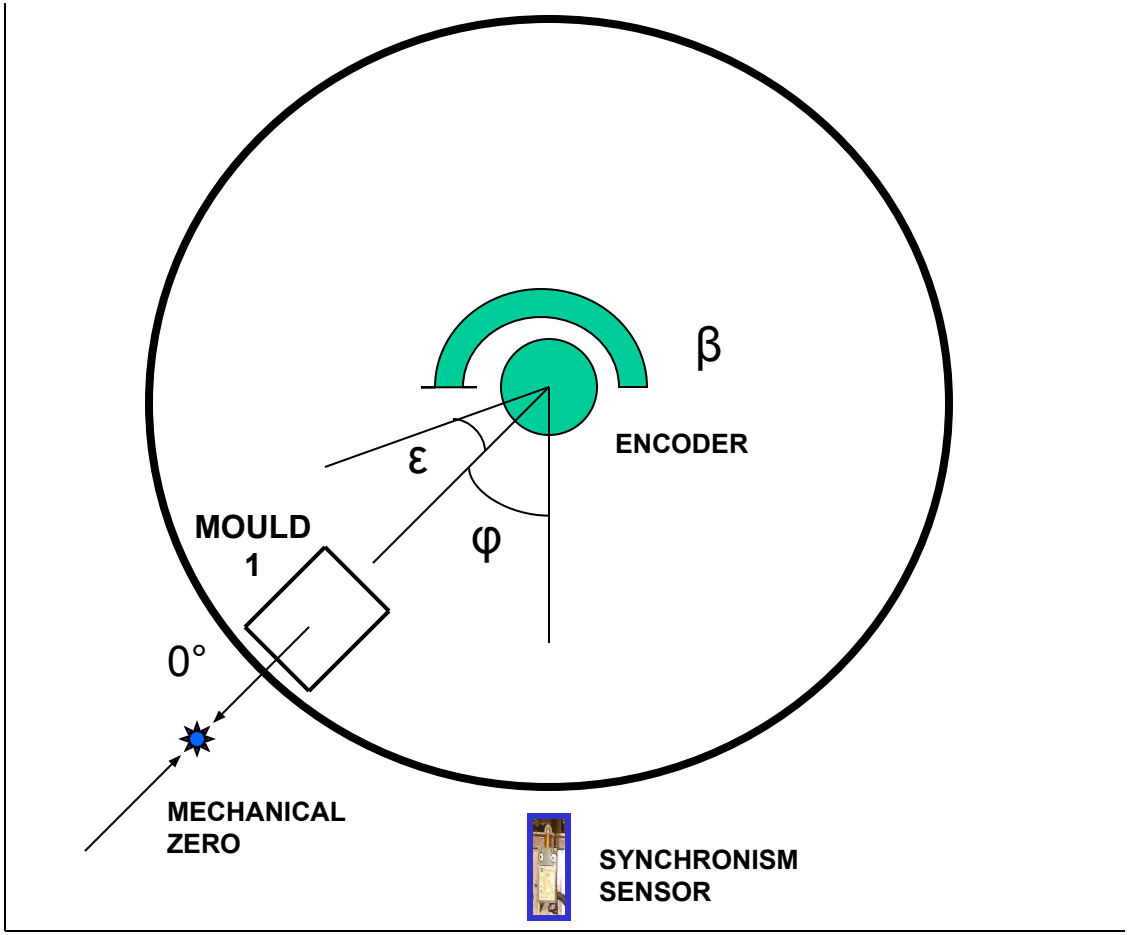
ELECTRONIC MANAGEMENT OF THE BLOWING WHEEL

ABSOLUTE ENCODER: electromechanical device that converts the angular position of its rotating axis in electric numeric signals. The output electric signals codify the exact instant position of the rotor in respect of the body; so that, in any moment, an adequate decodifying circuit can decode and show the angular position of the axis. The data referring to the axis movement (direction, speed, acceleration) are calculated by processing its absolute position in time.
It is used in the SFR machine to determine the angular position in any moment of the mould 1 (and consequently of the other moulds). The signals of the encoder are input of the EK1100 module. Information are not lost in case of powering off, but it is requested a setup procedure for the collimation between the logic zero and the machine zero.

SYNCHRONISM SENSOR: it verifies at every revolution of the blowing wheel the synchronization between the mechanical zero and the electronic zero of the mould 1, that is if every time the mould 1 passes in front of a fixed position of the machine frame (mechanical zero), the encoder reads a value of 0° (electronic zero).

ELECTRONIC MANAGEMENT OF THE BLOWING WHEEL

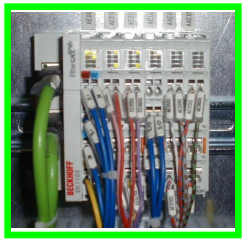
- β = actual angle of the mould 1 read by the encoder
- ε = possible difference of β from 0° (or 360°)
- If ε is different from 0, it is needed to set the correction (offset) in the electronic cams generator so as to have β = 0°
- φ = angle (fixed value) for the synchronism control between the mechanical zero and the electronic one



ELECTRONIC MANAGEMENT OF THE BLOWING WHEEL

ENCODER + CAM GENERATOR + SOFT PLC

EK1100



OUTPUT

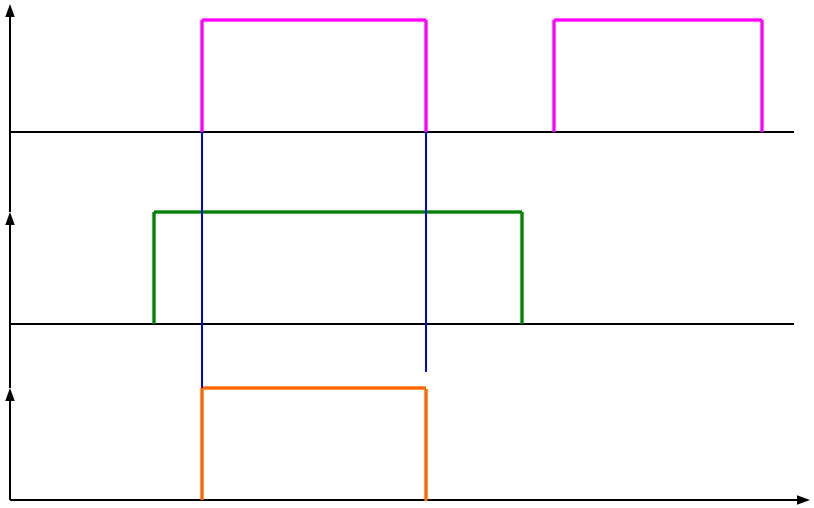
INTELLIGENT SOCKETS

MOLDS

ELECTRONIC CAM

ENABLING FROM PLC

OUTPUT



SIPA Plastic Packaging Systems TRAINING

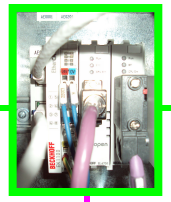
MOTOR DRIVING

CONTROL + DRIVE

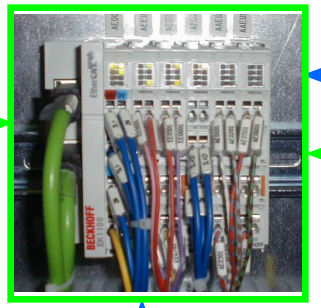
INVERTER + GEAR MOTOR

ELECTRONIC MANAGEMENT

ETHERCAT



BRIDGE ETHERCAT



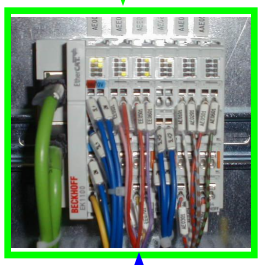
I/O ETHERCAT BOX 70

ABSOLUTE ENCODER

INTELLIGENT SOCKET

I/O ETHERCAT BOX 50

PROFIBUS



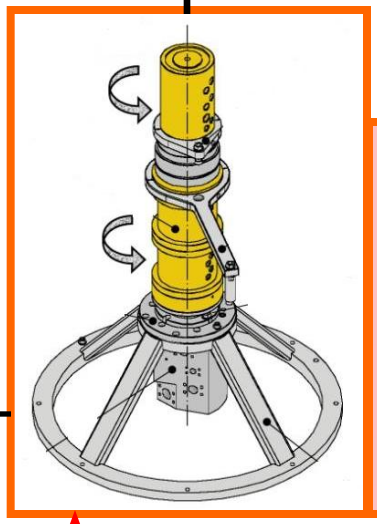
PROFIBUS

I/O PROFIBUS

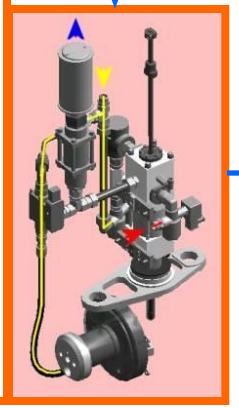
INVERTER

I/O SIGNALS

SYNCHRONISM SENSOR



BLOWING WHEEL



MOULDS VALVES

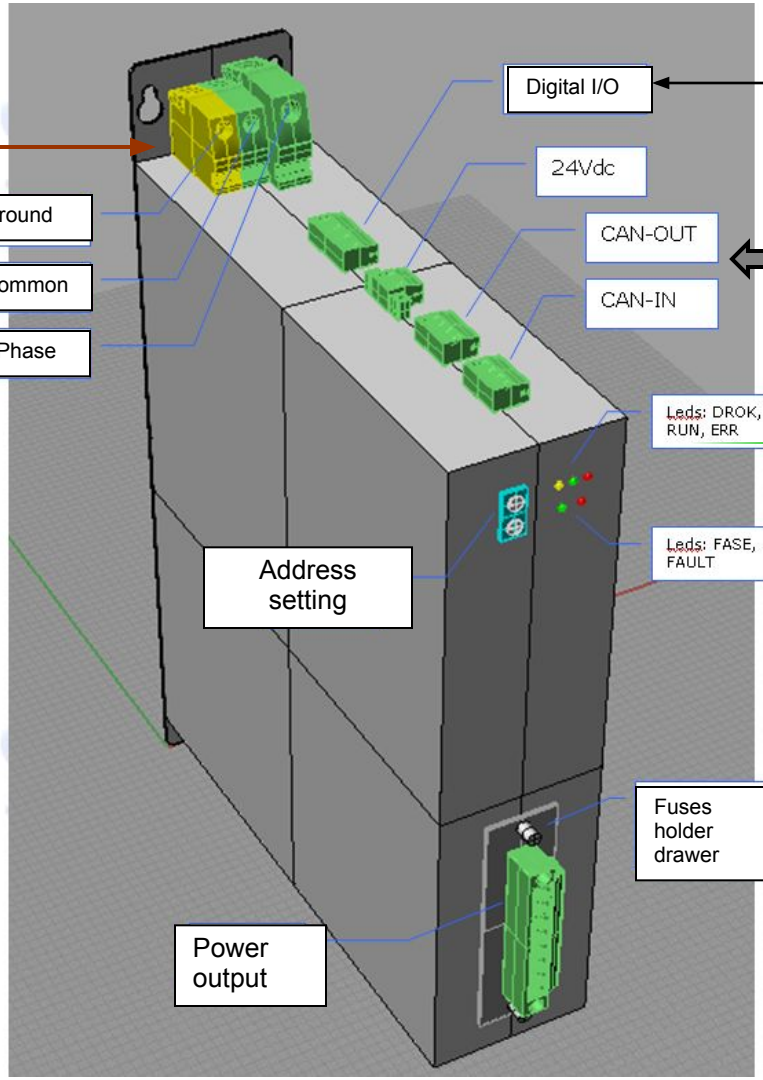
I/O SIGNALS

GEAR MOTOR

PWRC08

CARD SUPPLY (230Vac)

SINGLE PHASE VOLTAGE



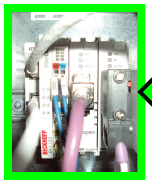
NOT USED

I/O SIGNALS

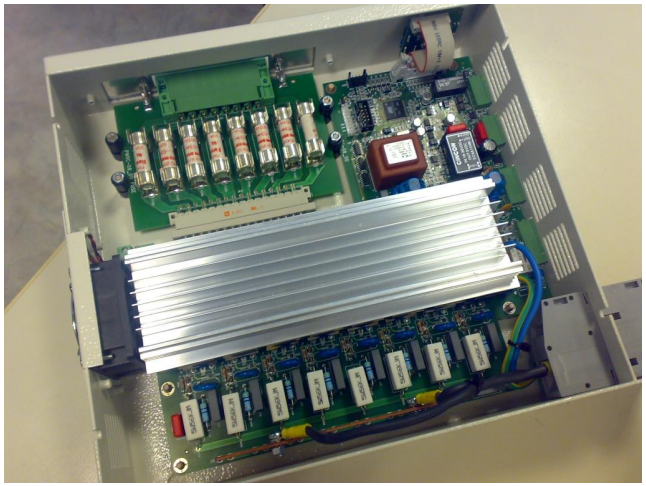
CANOpen

ETHERCAT

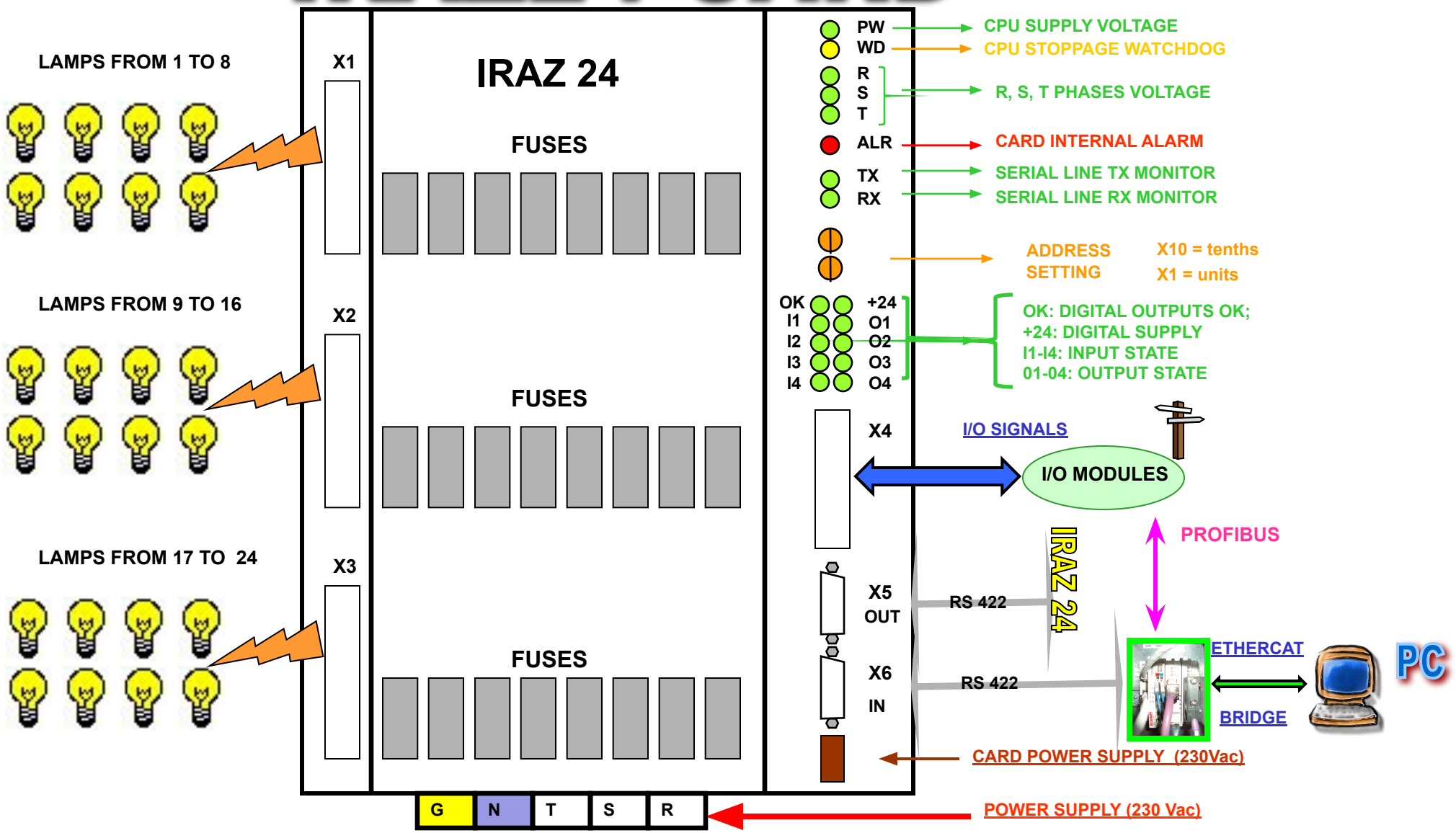
PC



DROK: yellow fixed light = status OK
RUN: fixed = OK
ERR (HW error): off = OK
FAULT (circuit error, lamps, etc.): off = OK

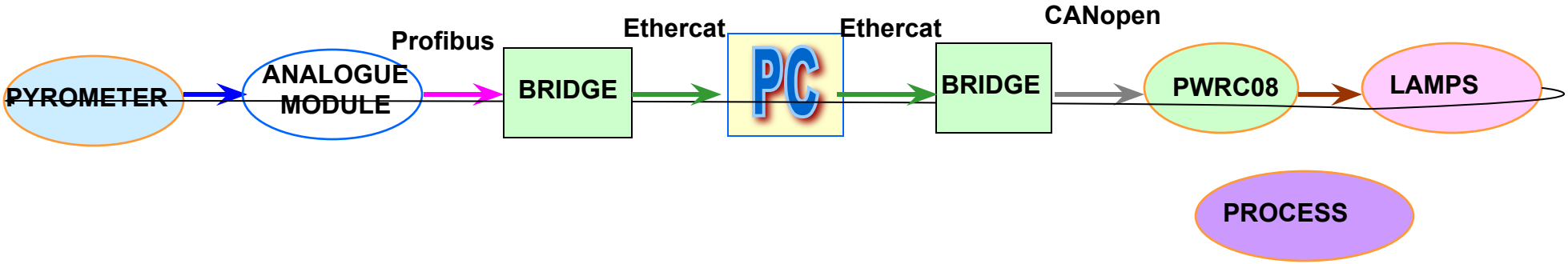


IRAZ24 CARD

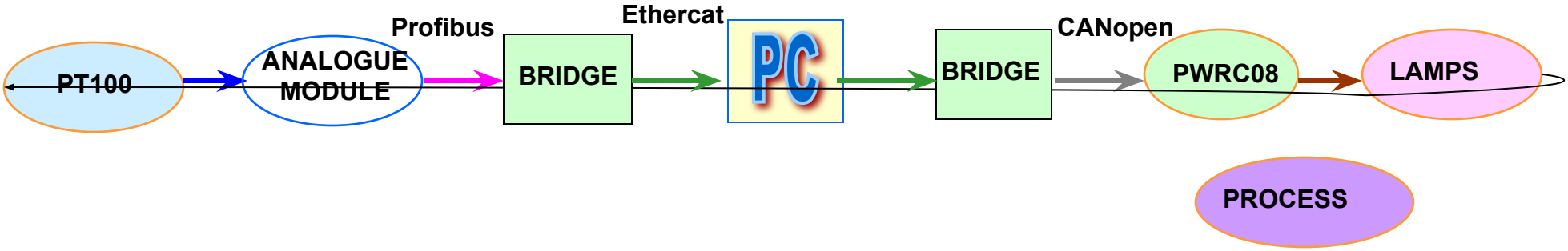

LAMPS FROM 1 TO 8
LAMPS FROM 9 TO 16
LAMPS FROM 17 TO 24
X1
X2
X3
IRAZ 24
FUSES
FUSES
FUSES
PW
WD
R
S
T
ALR
TX
RX
CPU SUPPLY VOLTAGE
CPU STOPPAGE WATCHDOG
R, S, T PHASES VOLTAGE
CARD INTERNAL ALARM
SERIAL LINE TX MONITOR
SERIAL LINE RX MONITOR
ADDRESS SETTING
X10 = tenths
X1 = units
OK
I1
I2
I3
I4
+24
O1
O2
O3
O4
OK: DIGITAL OUTPUTS OK;
+24: DIGITAL SUPPLY
I1-I4: INPUT STATE
01-04: OUTPUT STATE
X4
I/O SIGNALS
I/O MODULES
PROFIBUS
X5
OUT
RS 422
IRAZ 24
X6
IN
RS 422
ETHERCAT
BRIDGE
PC
CARD POWER SUPPLY (230Vac)
G
N
T
S
R
POWER SUPPLY (230 Vac)

HEATINGS MANAGEMENT - PWRC08

PREFORM TEMPERATURE CONTROL

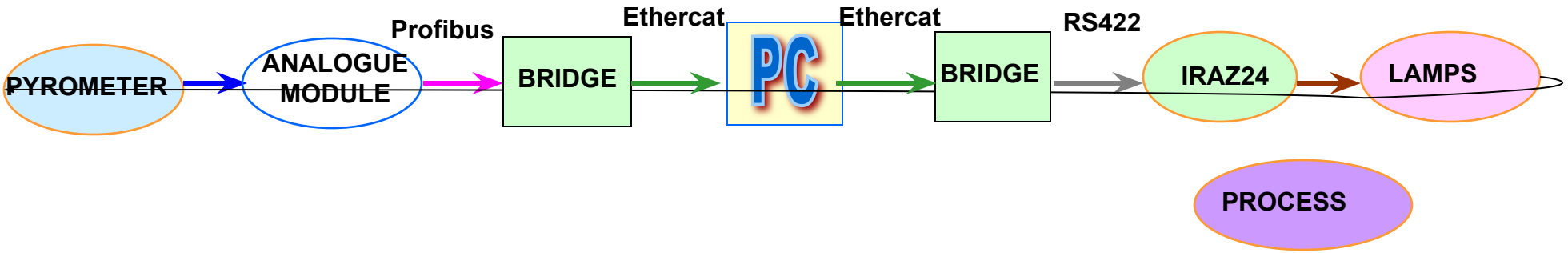


OVEN AIR TEMPERATURE CONTROL

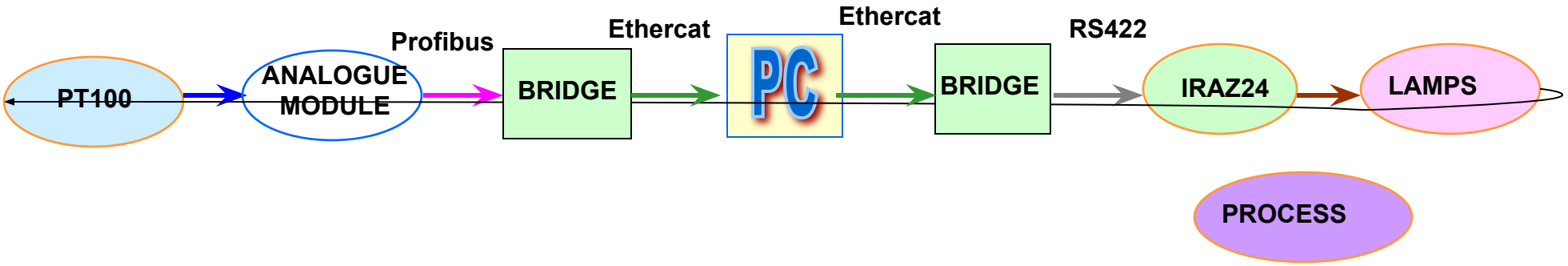


HEATINGS MANAGEMENT - IRAZ24

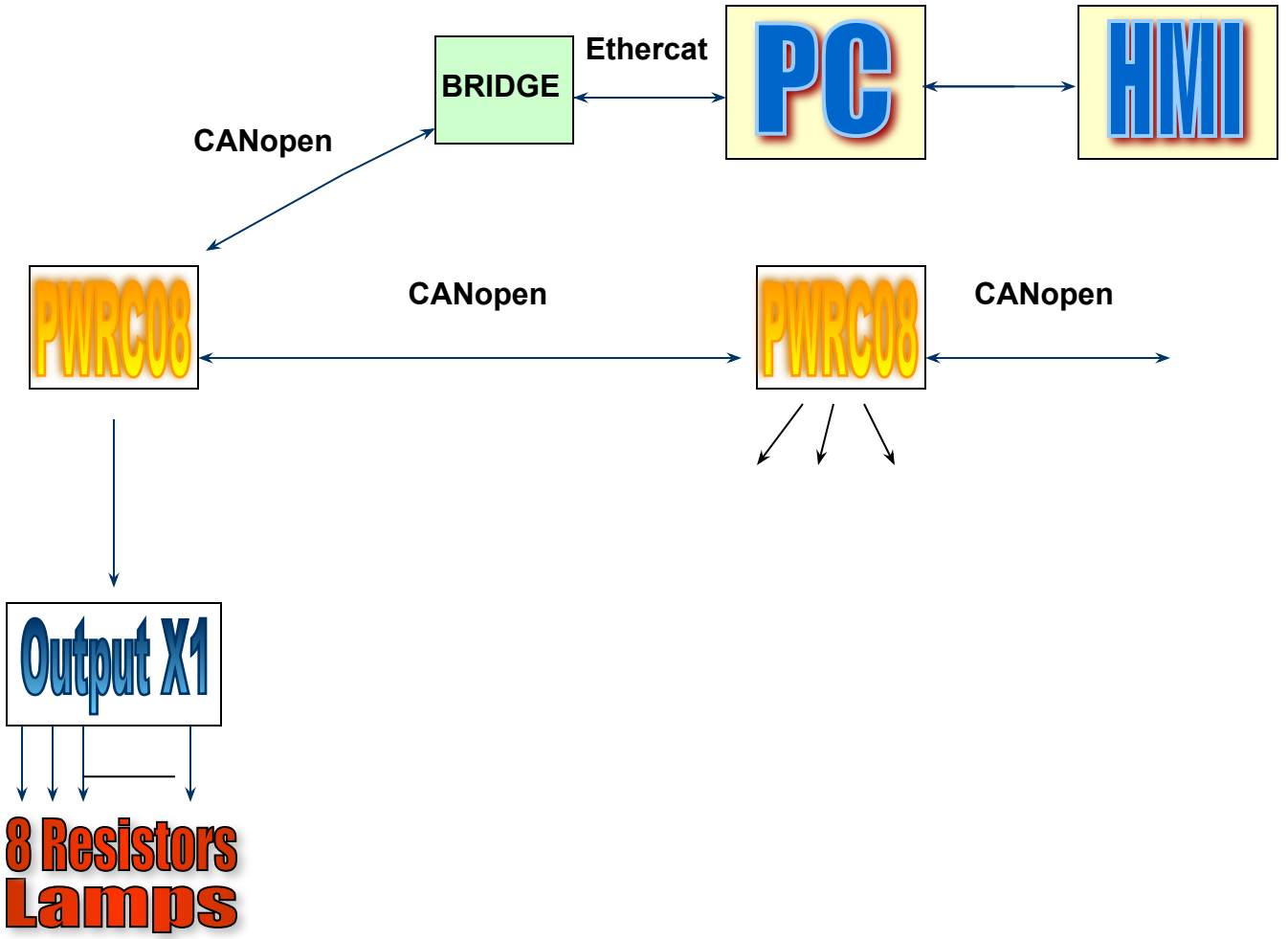
PREFORM TEMPERATURE CONTROL



OVEN AIR TEMPERATURE CONTROL



HEATINGS MANAGEMENT - PWRC08



HEATINGS MANAGEMENT - IRAZ24