



COMPACT GENERAL PURPOSE CONTROLLERS



- CONTROL OUTPUT: REALAY/SSR, mA, Servo
- SMART TUNE- PID CONTROL
- UNIVERSAL INPUT, 3 WIRE- TC, RTD AND LINEAR mA, mV, V
- 2 INDEPENDENT SET POINT RAMP UP/ DOWN PROFILES
- PROCESS, BAND, DEVIATION AND CONTROL FAULT ALARMS
- RS 485 MODBUS SERIAL COMMS OPTION
- DIN RAIL MOUNTING VERSION
- OPC BASED GRAPHICAL CONFIGURATION SOFTWARE
- IP 65 AND NEMA 4X FRONT PROTECTION

EROELECTRONIC

OVERVIEW

Designed to offer outstanding performance in an economic 1/ 16 DIN package providing a comprehensive solution for a wide variety of applications such as food processing, plastic manufacturing, heat sealing and laboratory heating equipment requiring heat/cool control process protection alarms and integrated timer functions.

Universal- thermocouple or RTD input coupled with a responsive, SMART auto-tuning PID control algorithm that is equipped with special functions including, soft start and non linear cooling. A complete set of process protection alarm functions, high and low limit, band and deviation are included.

The user interface is a dual 4 digit LED display with output and status beacons. Logic or Relay outputs are user configurable as either control, timer status or alarm functions. A logic input may be used to select the operating set-point.

Other features include; CT input, Servo valve positioner, (mA) linear control or retransmission output, ModBus communication interface option, PC Configuration software. IP65/ NEMA 4X panel sealing allows these units to be used in wash down or dusty applications.

SMART TUNING

Automatically adjusts the PID parameters according to the process dynamics.

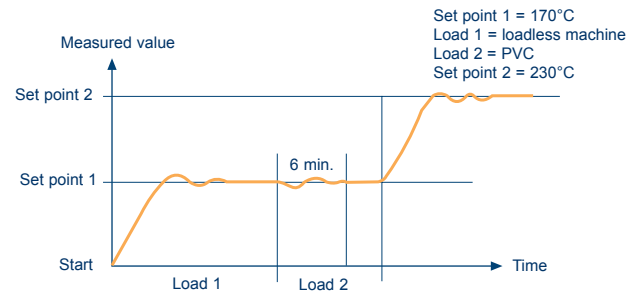
An important characteristic of the ERO Electronic continuous self tuning algorithm is its ability to optimise control parameters without injecting any artificial disturbances into the system.

During Start Up

Optimises the set point approach by implementing the auto-tuning function, calculating the value of the control parameters.

During Normal Regulation at Set-point

The Smart tuning function automatically updates the control parameters according to the characteristic of the process specific to set point change or load change. Test results for the temperature control of an extruder using an ERO Electronic smart tuning controller.



The machine was equipped with electric heating and oil cooling systems.

At start up the extruder was load-less and the first set point was 170°C.

1. In a load-less condition, the maximum deviation at the steady state equalled 0.3°C, machine loaded with PVC and production started.
2. After 6 minutes steady control state is reached. A new set point variation confirmed the results seen for load variation.
3. In all steady state control conditions a maximum deviation from set point was 0.3°C.

PROCESS PROTECTION ALARMS

Process (high or low limit), Band and Deviation alarm outputs are available with the additional flexibility of latching and masking functions until the process variable reaches the alarm threshold plus or minus hysteresis. Band and deviation alarms are also masked after a set point change until process variable reaches the alarm threshold. The alarm latching function holds the alarm on until it is acknowledged.

HEATER BREAK DETECTION

Measures the current in the load when the control output is ON and generates an alarm when the measured current is lower than a programmable value.

Advantages

- signals the partial or total load break down.
- displays the load current (in Amps) when the control output is ON.
- an external ammeter is not required.

OFD FUNCTION - OUTPUT FAILURE DETECTION (optional)

Using the CT input, the output failure detection function monitors the current in the load driven by output 1. Load and actuator protection is provided in the following way:

1. During the ON period of the output, the instrument measures the current through the load and it generates an alarm condition if this current is lower than a pre-programmed threshold. A low current shows a partial or total break down of the load or actuator SSR.
2. During the OFF period of the output, the instrument measures the leakage current through the load and it generates an alarm condition when this current is higher than a pre-programmed threshold value. A high leakage current shows a short circuit of the actuator.

OUTPUT POWER OFF

Turns all control and alarm outputs off.

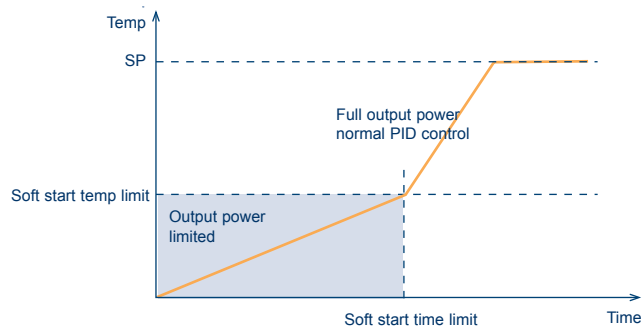
In this mode the instrument operates as an indicator allowing the maintenance and monitoring of the process.

Advantages

- zone switch is now unnecessary
- energy saving is possible for batch processing
- process monitoring is a safety condition for the operator.
- bumpless control when resuming normal control operation.

SOFT START FUNCTION

The Soft-start feature provides time based output power limit protection. Limiting the heater power during startup reduces potential thermal stress on the heating elements. Both the Soft-start time and temperature threshold are configurable.



REAR OF BOARD VERSION (Relay and mA only)

In accordance with EN50022 there is a rear of board version for the Omega DIN.

The electronic circuitry in the rear of board and panel version instruments is the same.

PRODUCT SPECIFICATIONS

Case:	polycarbonate.
Self-extinguishing degree:	V-0 according to UL 746C standard.
Front protection:	designed and tested for IP 65 (*) and NEMA 4X (*) for indoor locations (when panel gasker is installed). (*) Tests were performed in accordance with IEC 529, CEI 70-1 and NEMA 250-1991 STD.
Dimensions:	- 48 x 48mm (<i>according to DIN 43700</i>) - depth 122mm.
Weight:	250g max
Power supply:	- 100 to 240V A.C. 50/60 Hz (-15% to +10% of the nominal value) - 24V AC/DC ($\pm 10\%$ of the nominal value).
Power consumption:	5.5VA
Insulation:	double or reinforced insulation is guaranteed between the power supply input and all the instrument inputs and outputs.
Common mode rejection ratio:	120dB @ 50/60Hz.
Normal mode rejection ratio:	60dB @ 50/60Hz.
EMC/Safety:	this instrument is marked CE. It conforms to council directive 89/336/EEC (reference harmonized standard EN-50081-2 and EN-50082-2), 73/23/EEC and 93/68/EEC (reference harmonized standard EN 61010-1).
Installation category:	II.
Sampling time:	- for linear inputs = 250ms. - for TC or RTD inputs = 500ms.
Accuracy:	$\pm 0.2\%$ f.s.v. @ 25°C and nominal power supply voltage.
Operative temperature:	from 0 to +50°C.
Storage temperature:	from -20 to +70°C.
Humidity:	from 20% to 85% RH not condensing.

MEASURING INPUTS

All the inputs are factory calibrated and user configurable.

Thermocouples

Type:	J, K, L, R, S, N, T are keyboard programmable.
Engineering unit:	°C and °F keyboard programmable.
Sensor break:	detection of input open circuit (wires or sensor) with underrange or overrange indication
Cold junction:	automatic compensation for an ambient temperature between 0 and 50°C.
Cold junction compensation error:	0.1°C/°C.
Input impedance:	> 1M Ω .
Calibration:	according to IEC 584-1.

note: for TC inputs it is possible to select a measuring range, within the standard input range, with a minimum span of 300°C or 600°F.
Using this method it is possible to increase the measurement input sensitivity.

Standard range table Servo

TC type	°C	°F
L	-100/900	-150/1650
	-100,0/900,0	
J	-100/1000	-150/1830
	-100/999,9	
K	-100/1370	-150/2500
	-100,0/999,9	
N	-100/1400	-150/2550
R	-50/1760	60/3200
S	-50/1760	60/3200
T	-200/400	-330/750
	-199,9/400,0	

Standard range table Relay/mA

TC type	°C	°F
L	0/400,0	0/1650
	0/900	
J	-100/400	-150/1830
	-100/1000	
K	-100/400	-150/2190
	-100/1200	
N	-100/1400	-150/2550
R	0/1760	0/3200
S	0/1760	0/3200
T	-199,9/400,0	-330/750

RTD input (only LFS Relay and LFS mA)

Type: Pt 100 3 wires connection.
Calibration: according to DIN 43760.
Line resistance: max 20Ω/wire with no appreciable error.
Engineering unit: °C and °F keyboard programmable.
Sensor break: detection of sensor opening and of one or more wires opening.
detection of sensor short circuit.

Standard range table

°C	°F
-199,9/400	-199,9/400
-200/800	-330/1470

Linear inputs

Read-out: programmable from -1999 to 4000.
Decimal point: programmable in any position.

Standard range table

Input	Impedance
0-20 mA	< 5Ω
4-20 mA	<5Ω
0-60 mV	>1Ω
12-60 mV	>1 MΩ
0-5 V	>200 KΩ
1-5 V	>200 KΩ
0-10 V	>400 KΩ
2-10 V	>400 KΩ

LFS - Relay

Control Action

Algorithm: PID + SMART
Type: one (heating) or two (heating and cooling) control outputs.
Proportional Band: programmable
- from 1.0% to 100.0% of the input span for a process with one control output.
- from 1.5% to 100% of the input span for a process with two control outputs.
setting a proportional band equal to 0 the control action becomes ON/OFF.
Hysteresis (for ON/OFF control action): programmable from 0.1% to 10.0% of the input span.
Integral time: programmable from 1 second to 20 minutes or excluded.
Derivative time: programmable from 1 second to 10 minutes or excluded.
Integral preload: programmable
- for one control output, from 0 to 100% of the output range
- for two control outputs, from -100% to +100% of the heating/cooling output range.
Out 1 cycle time: from 1 second to 200 seconds.
AUTO/MANUAL mode: selectable by front pushbutton.
MANUAL/AUTO transfer: bumpless method type.

Two control outputs (heating/cooling)

Relative out 2 gain: programmable from 0.20 to 1.00 referred to the proportional band.
Overlap/dead band: programmable from -20% (dead band) to +50% (overlap) of the proportional band.
note: by setting, during the configuration procedure, the proper cooling medium: (air, oil or water) the instrument will set automatically the output 2 parameters.

Control Outputs

this instrument is equipped with 2 independent outputs programmable as:

- heating + alarm 1
- heating + cooling.

In addition to the standard outputs, optional output (OUT 3) maybe programmable as:

- alarm 2 output
- alarm 2 output + OFD alarm output.

Type: time proportioning.

Update time: - for linear inputs = 250mSec
- for TC or RTD inputs = 500mSec

Direct/reverse action: keyboard programmable.

Output level indication: the instrument separately displays the output 1 level (heating) and the output 2 level (cooling).

Output level limiter: for one control medium: from 0 to 100%.
for two control mediums: from -100 to +100%.
this function may be operative at instrument start up for a programmable time (soft start to avoid thermal shock and/or preheating the plant).

Relay outputs

Output cycle time: programmable from 1 second to 99 seconds

Output 1 (heating): SPDT contact with rated current 3A at 250V AC on resistive load.

Output 2 (cooling): SPST contact with rated current 2A at 250V AC on resistive load.

Output 3 (optional): SPST contact with rated current 2A at 250V AC on resistive load.

Logic voltage for SSR driver
(output 1 only): logic level 0: V out < 0.5V DC.

logic level 1: 14V < V out < 24V DC (@ 20mA)

maximum current = 20mA.

OFD function

load current monitoring using current transformer input (CT).

Input range: 50mA AC.

programmable from 10A to 100A (in 1A increments).

Scaling: - for full scale up to 20A: 0.1 A (in 0.1A increments).

Resolution: - for full scale from 21A to 100A (in 1A increments).

Active period: - for relay output: NO or NC programmable

- for SSR output: logic level 1 or 0 programmable.

Minimum measurement period: 400 mSec

note: the CT input option excludes the logic input (external set point selection).

LFS - mA

- Measurement update time:** - for linear inputs = 250mSec.
- for TC or RTD inputs = 500mSec.
- Proportional Band:** programmable from 1 to 200%.
- Action:** direct/reverse programmable by front keyboard.
- Output level indication:** the instrument displays separately the output 1 level (heating) and the output 2 level (cooling).
- Output level limiter:** for one control medium: from 0 to 100%.
for two control mediums: from -100 to +100%.
this function is programmable to operate at instrument start up for a programmable time (to avoid thermal shock and/or preheating the plant).

Output 1

- Type:* optoisolated 0-20mA or 4-20mA programmable.
- Function:* programmable as:
- control output (heating or cooling)
- retransmission of the measured value
- retransmission of the operative set point.
- Scaling:* programmable from -1999 to 4000.
- Maximum load:* 500Ω.
- Resolution:* - 0.1% when used as control output
- 0.05% when used as analog retransmission.
- Digital filter:* it is possible to enable the digital filter, on the output retransmission, with the same time constant for the read-out.
- Output level indication (as control output only):* from 00.0 to 100%.
- Output status indication:* the indicator OUT 1 flashes with a duty cycle proportional to the output level.

Output 2

- Type:* relay SPST contact (NO or NC selectable by jumper).
- Contact with rated current:* 2A at 250V AC on resistive load.
- Function:* programmable as:
- control output (heating or cooling)
- alarm 1 output.
- Output cycle time:* programmable from 1 second to 99 seconds (when used as control output).

Output 3

- Type:* relay SPST
- Contact with rated current:* 2A at 250V AC on resistive load.
- Function:* programmable as:
- control output (heating or cooling)
- alarm 2 output.
- Output cycle time:* programmable from 1 second to 99 seconds (when used as control output).

LFS - Servo

Control outputs

Algorithm: PID + SMART.

Type: one (heating) or two (heating and cooling) control outputs.

Proportional Band: programmable from 1.0% to 200.0% of the input span.

setting the Proportional Band equal to 0 the control action becomes ON/OFF.

Hysteresis (for ON/OFF control action): programmable from 0.1% to 10.0% of the input span.

Integral time: programmable from 1 second to 20 minutes or excluded.

Derivative time: programmable from 1 second to 10 minutes or excluded.

Control action

1. Closed loop servomotor output:

feedback potentiometer range: from 100 up to 1K.

the initial and final stroke points are keyboard programmable.

servomotor dead band: from 1 % to 50 % of the selected feedback potentiometer span.

control action: direct or reverse programmable.

valve position limiter: low and high limiters programmable.

2. Open loop servomotor output with valve position indication:

indication potentiometer range: from 100 up to 1K.

the initial and final stroke points are keyboard programmable.

servomotor dead band: from 1 % to 50 % of the selected servomotor stroke time.

servomotor stroke time: programmable from 25 seconds to 3 minutes.

control action: direct or reverse programmable.

3. Open loop servomotor output without valve position indication:

servomotor dead band: from 1 % to 50 % of the selected servomotor stroke time.

servomotor stroke time: from 25 seconds to 3 minutes.

control action: direct or reverse programmable.

4. One time proportioning output:

output used: output 1

control action: direct or reverse programmable.

output cycle time: from 1 second to 200 seconds.

output power limiting: high limit programmable.

5. Two time proportioning outputs:

output used: output 1 and 3

output cycle time: from 1 second to 200 seconds.

output power limiting: high limit programmable.

Outputs - Out 1 and 2

Function: - servo-motor output

- one time proportional output.

Relay type: two interlocked SPST relays.

Contact rating: 3A @ 250V AC on resistive load

Out 3

Function: - time proportional output.

- alarm 1 output

Relay type: SPST relay.

Contact rating: 2A @ 250V AC on resistive load

Out 4

Function: - alarm 2 and/or alarm 3 output

Relay type: SPST relay.

Contact rating: 2A @ 250V AC on resistive load

ALARMS

Output Action:	direct or reverse function programmable.
Alarm reset:	automatic or manual reset programmable on each alarm.
Masking:	programmable as masked or standard alarm.
Hysteresis:	programmable from 0.1% to 10.0% of the input span.

Process alarm

<i>Operative mode:</i>	minimum or maximum programmable.
<i>Threshold:</i>	programmable in engineering units within the whole range.

Band alarm

<i>Operative mode:</i>	inside or outside programmable.
<i>Threshold:</i>	programmable from 0 to 500 units.

Deviation alarm

<i>Operative mode:</i>	high or low programmable.
<i>Threshold:</i>	programmable from -500 to +500 units.

SET POINTS

Two set points are available: main set point (SP) - second set point (SP2)

Set point limiters:	set point low limit and set point high limit are programmable.
Set point transfer:	the transfer may be done by a step transfer or by a ramp with two different programmable rates of rise (ramp up and ramp down).

SERIAL INTERFACE

Type:	isolated RS-485.
Protocol type:	MODBUS, JBUS, ERO polling/selecting.
Baud rate:	programmable from 600 to 19200 BAUD.
Byte format:	7 or 8 bit programmable.
Parity:	even, odd or none programmable.
Stop bit:	one.
Address:	from 1 to 95 for ERO protocol. from 1 to 255 for all the other protocols.
Output voltage levels:	according to EIA standard.

LOGIC INPUTS

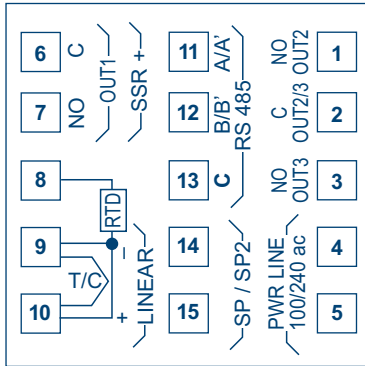
LFS relay and mA

<i>Operative mode:</i>	these instruments are equipped with a logic input which selects between main set point and second set point (SP or SP2).
<i>Threshold:</i>	(For LFS-Relay only) the logic inputs are mutually exclusive with the current transformer input (Output 1 load break down alarm).

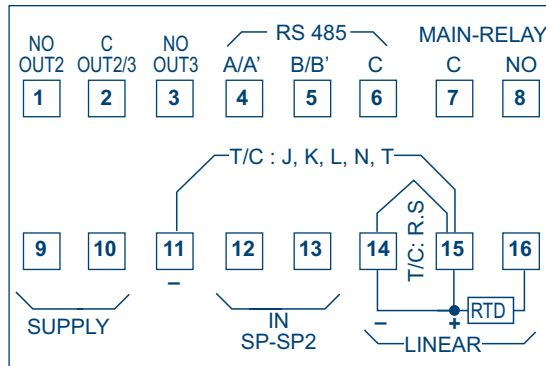
LFS Servo

<i>Operative mode:</i>	The LFS-Servo is equipped with 2 logic inputs (contact closure).
<i>Threshold:</i>	The first is used for the operative set point selection SP, SP2. The second is used for AUTO/MANUAL mode selection.

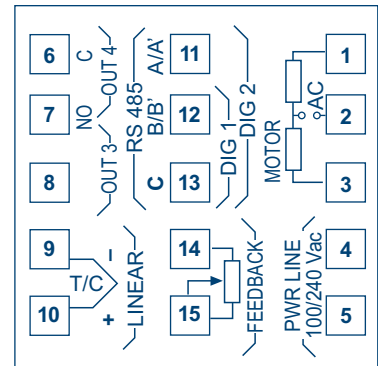
STANDARD VERSION Relay



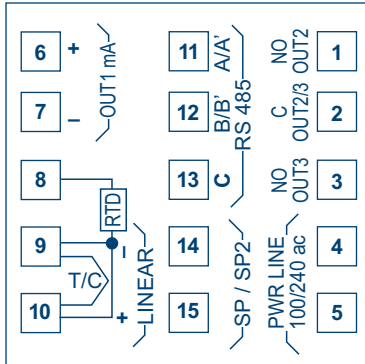
REAR-OF-BOARD VERSION Relay



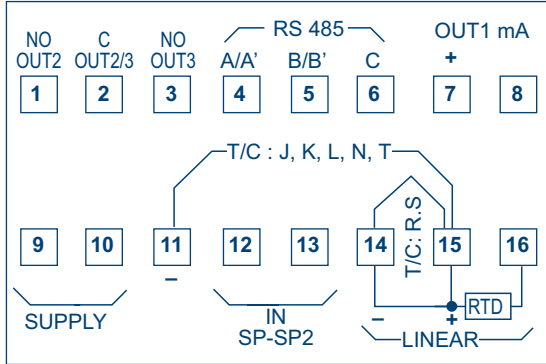
STANDARD VERSION Servo



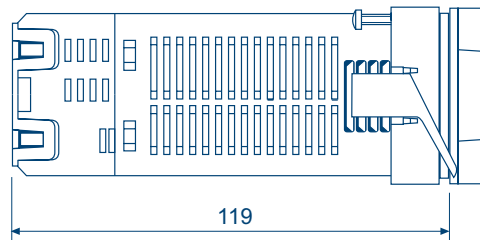
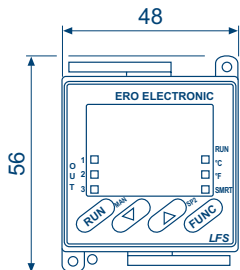
STANDARD VERSION mA



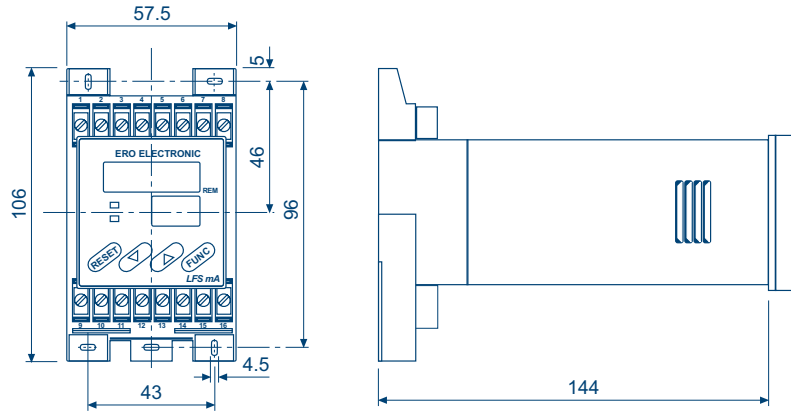
REAR-OF-BOARD VERSION mA



DIMENSIONS AND PANEL CUT - OUT LFS



DIMENSIONS AND PANEL CUT - OUT LFS REAR-OF-BOARD



HOW TO ORDER LFS Relay

MODEL	INPUT	CONTROL ACTION	MAIN OUTPUT	OUTPUT 2	OPTION	POWER SUPPLY	VERSION	CUSTOM.
LFS Dual 4-digit display	9 TC ,RTD, mA, mV, V	3 PID + SMART	1 Relay 6 SSR	1 Relay B SSR	0 not provided 1 Alarm 2 2 Alarm 2 + OFD (or logic input) 3 Alarm 2 + optoi-solated RS 485 4 Alarm 2 + optoi-solated RS 485 + OFD	3 100/240V AC 5 24V AC or DC	0 Standard R Rear-of-board	00 Std ERO Label 0N Neutral Version B0 Blank no manual
LFS	9							

HOW TO ORDER LFS mA

MODEL	OUTPUTS	OPTIONS	POWER SUPPLY	VERSION	CUSTOMISATION
LFS Dual 4-digit display	9371 mA Linear - Relay 93A1 0-10V - Relay 9376 mA Linear-Output 2-SSR	1 Alarm 1 3 Alarm 2 + RS485 6 Output 3 SSR	3 100/240V AC 5 24V AC or DC	0 Standard R Rear-of-board	00 Std ERO Label N0 Neutral Version B0 Blank no manual
LFS					

HOW TO ORDER LFS servo

MODEL	INPUT	CONTROL ACTION	OUTPUT 1 and 2	OUTPUT 3 and 4	OPTIONS	PWS	CUSTOM.
LFS Dual 4 digit display	8 TC, mA, 60mV, 5V and 10V	3 PID + SMART	2 Servomotor	1 Relay	2 two logic inputs 4 RS485(or 2 log.inp.)	3 100/240V AC	000 Std ERO Label
LFS	8	3	2	1		3	000

HOW TO ORDER current transformer (optional accessories)

MODEL	PRIMARY CURRENT
CTR current transformer	1 10A 2 25A 4 50A 5 100A
CTR	

DIMENSIONS

