ENG

LEO

Current regulator for controlling electromagnetic powder brakes/clutches

USER'S MANUAL

Contents

Warnings

The present manual is for device fitters and operators. It provides indications on the intended use of the device, technical specifications and instructions for installation, adjustment and use.
This manual is an integral part of the device and must be kept until the device is decommissioned. It reflects the technical state of the device at the time of its sale.
The plant builder may include the present manual in the documentation for plant use.
Re S.p.A. reserves the right to update its production and/or manuals without updating products already sold and previous manuals.
Since the device forms part of a plant, the plant builder is responsible for ensuring that all parts comply with the laws in force in the country in which it is installed.
The device must be fitted and adjusted by qualified technical personnel.
It may be moved manually.

Information about device recovery

The device bears a clear, visible and indelible indication allowing identification of the manufacturer and the separate collection symbol (symbol on side).
This symbol, showing a wheelie bin with a cross through it, unequivocally indicates that the device was released after 13.08.2005 and that it must be subject to separate collection.

- In European Union member states

  The device falls within the electrical and electronic equipment category, which must be disposed of not amongst undifferentiated urban waste, but through separate collection. Therefore, at the end of the device's lifetime, it must be disposed of in conformity with the European standards adopted in the member state in which it was installed.

  WEEE (Waste Electrical and Electronic Equipment) may be intended for individual, collective or mixed collection and recovery systems at designated centres (for more information contact the relevant local authorities) or may be returned to the distributor when a new item of equipment is purchased. This eliminates or reduces potentially negative effects on the environment deriving from improper use of the equipment or parts of it.
  For correct waste management, the relevant authorities promote the reduction of final waste disposal by means of re-use, recycling and other forms of recovery to obtain raw materials from waste.

  In the event of illegal disposal of WEEE, offenders will be punished in accordance with the sanctions established by the member state in which it was installed.

- In non-EU countries

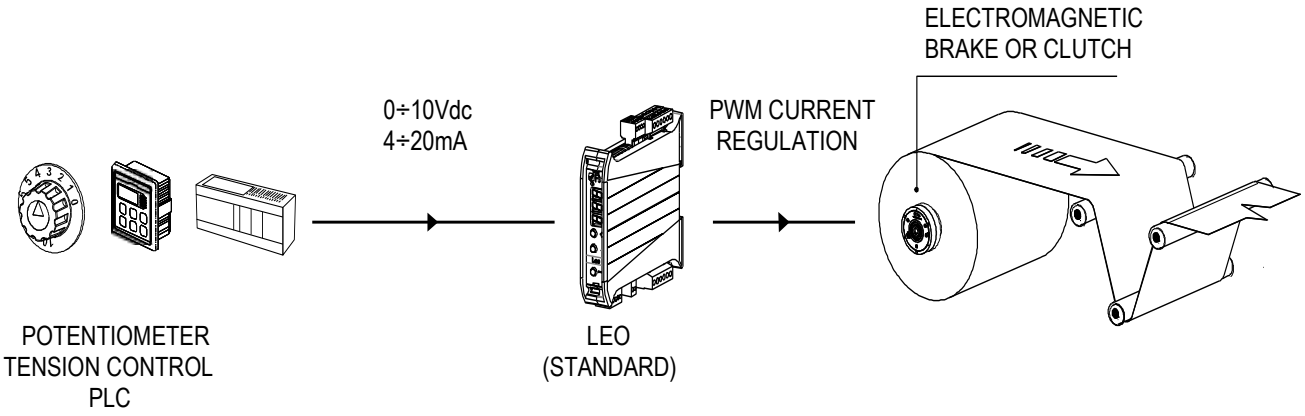
  Recovery and final disposal of the device must be carried out in conformity with the standards in force in the country in which it was installed. It may be advisable to take into account the information provided regarding European Union member states.

Intended use of the device

LEO is an extremely compact and economical device used to directly control electromagnetic brakes (or clutches). It has been specifically designed to be integrated inside the machine's electrical control panel (on a DIN bar). A practical display with keypad is included to calibrate the instrument and program the settings and regulation parameters simply and quickly without needing to connect external equipment.

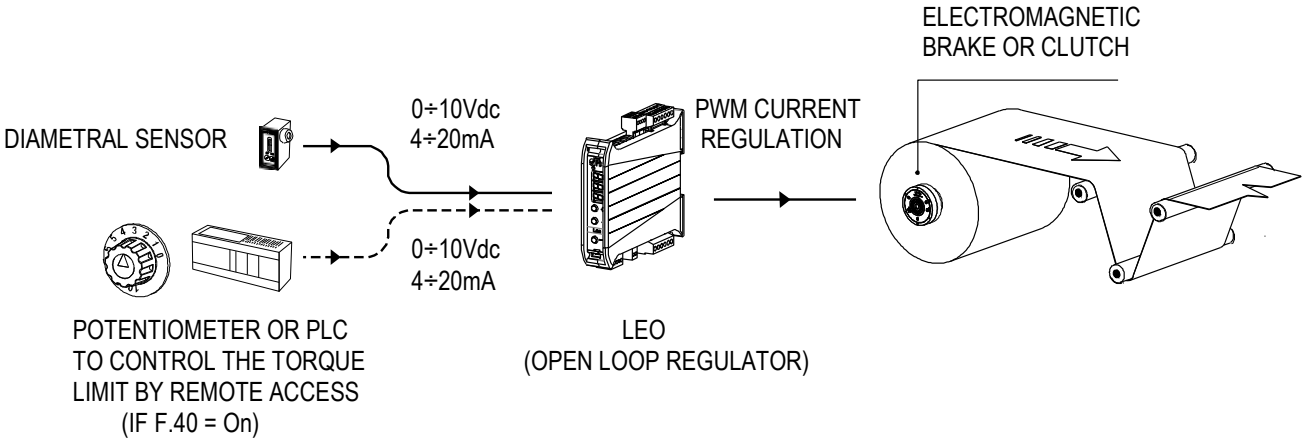
LEO is fitted with a power output with closed loop PWM current regulation, which can keep the torque of the brake (or clutch) that it is connected to stable when the operating conditions change.

LEO can be used as current driver for the brake (or clutch); controlled by a potentiometer, a tension controller or a PLC, all it needs is a simple calibration of the analogue input and it's ready to go.



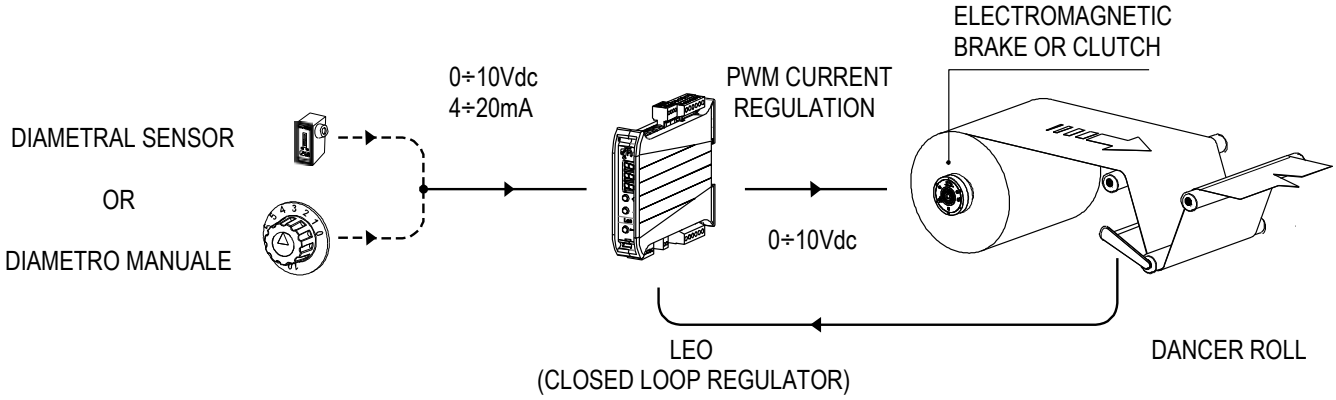
LEO's versatility allows, with a few and simple settings, the activation of the REGULATOR function and obtain a basic but extremely economical tension controlled that can operate:

- in open – loop mode by connecting a diameter sensor;



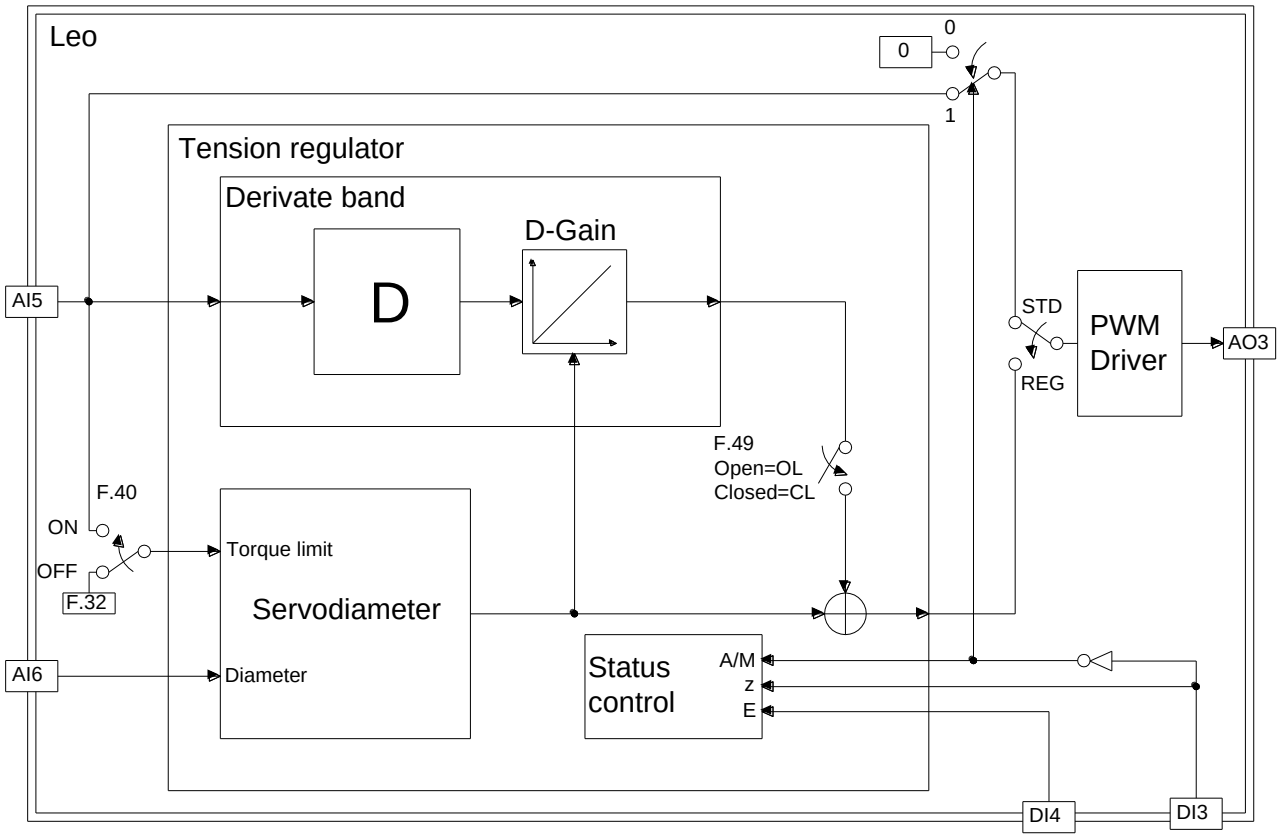
(LEO automatically updates the torque as the diameter changes, maintaining the tension constant during unwinding; by connecting a potentiometer the operator can vary the torque limit as desired to determine the tension on the material).

- in closed – loop mode by connecting a dancer roller;



(The dancer roller position signal connected to the input, combined with the diameter, determines the torque necessary to return the dancer to the desired position. This is added to a derivative action that reacts by stabilizing the movements).

See below for a block diagram of the regulator:



This device is not designed to be operated in open, corrosive, explosive or excessively dusty environments.

Technical specification

General

- Power supply 24Vdc
- Red 3 digit 7 segment display
- 3 keys for front panel programming
- Digital calibration of the I/O (it does not require troublesome regulations with trimmers)
- Brake/clutch demagnetising current set from the function (Anti - Residual)
- Two operating modes available:
  - STANDARD: simple current driver controlled by an external control device
  - REGULATOR: torque control with diameter sensor (open loop) or control of a dancer roller (closed loop) with Proportional - Derivative regulation
- Disconnectable screw terminal blocks
- Compact container for DIN guide mounting
- Operating temperature: 0÷50°C
- Protection rating: IP20

I/O interface

- 2 opto-isolated digital inputs for brake/clutch release and priority stop
- 10Vdc reference power supply for external potentiometers
- 2 analogue inputs configurable to interface with control devices and/or sensors (potentiometer, dancer roller, sonar, PLC, etc.)
- 1 output with PWM current regulation to drive directly an electromagnetic powder brake (or clutch)
- Dedicated terminals for shielded cable connections

Description and electrical specifications of the I/Os

➢ Analog input with automatic variable gain

The variable gain input enables the user to amplify and acquire signals that do not use the entire input range efficiently, while maintaining a good level of measurement resolution. This is essential when acquiring signals via potentiometers (even in the case of limited stroke lengths!) or in general in the case of outputs where the range is equal to or less than 0 – 5 Vdc To get the best out of this feature, perform the "zero" calibration with the lowest possible value at the input. LEO features two inputs with variable gain.

Selecting the correct input mode

- U: set this mode for the acquisition from potentiometer or from sonar, PLC and other devices with voltage output with range 0÷10 Vdc;
- I: set this mode for the acquisition from sonar, PLC and other devices with current loop output with range 4÷20 mA.

Mode	Description
U	Analogue mode standard 0÷10 Vdc
I	Analogue mode standard 0÷10 mA

Specifications

- Equipped with programmable **digital anti-aliasing filter** for limiting unwanted signal variations.

Input	Terminal number	Rin (Ω)	Imax (mA) (I mode)	Gain Steps	Default mode
AI5	13	147K (U mode) or 110 (I mode)	28	1-2-4-5-8	U
AI6	14				

➢ Reference 10Vdc (Terminal 15)

This is a stabilized 10 Vdc analogue output that can be used to power external potentiometers connected to your LEO device.

- Output resistance: ≈10Ω
- Maximum current rating: 10mA

➢ 0VA (Terminal 16) and 0VD (Terminal 26)

These inputs may be used for connecting reference voltages for the analogue (0VA) and digital (0VD) signals. It is important to note that, while we strongly recommend connecting the 0VA reference, even though it is not strictly necessary, the 0VD digital reference MUST be connected, otherwise the digital inputs will not work!

➢ -0V (Terminal 18) and +24Vdc (Terminal 19)

In order to function correctly, your LEO device must be connected to a 24 Vdc power supply; connect the supply to these terminals in order to power the device.

- Voltage range: 20 – 28 Vdc (including ripple)
- Max. current: 0.1A (logic section) + 1.2A (power section)
- Protection fuse : 3.15A (5x20mm CF)

➢ Input for cable shields (Terminals 20, 21, 41 e 42)

The LEO device includes four terminals that can be used for all the signal and power cable shield connections. Connecting the cable shields to these terminals reduces electro-magnetic interference to a minimum. Connect the shields together using these dedicated terminals and connect the two pairs of terminals to the installation earth system or the 0V reference signal.

➢ Opto-isolated digital input

The pair of opto-isolated digital inputs fitted, allow the LEO device to receive simple commands from a PLC or operator panel to change its state based on the machinery state. The inputs are activated by closing a 24 Vdc voltage free contact by connecting the 0VD common terminal to the reference 0V. The controls associated to the activation of the inputs are indicated in the device's electrical wiring diagram and are described in detail in the *Remote control of the states* section (page 16).
The only mode that can be selected for these inputs is the standard digital mode "**dIg**".

Specifications

Input	Terminal number	Rin (KΩ)	fmax (Hz) mod. dlg	Default mode
DI3	24	4,7	50	dlg
DI4	25			

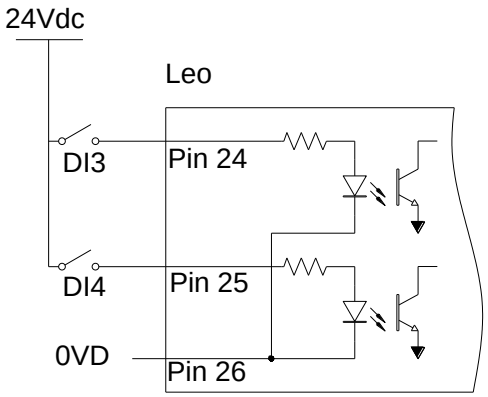


Figure 1

➢ PWM current regulator output for electro-magnetic brakes (or clutches)

This output may be connected directly to Re S.p.A. electro-magnetic brakes or clutches in order to modulate the current in the magnetising coil, thereby generating an adjustable and stable torque when the operating temperature of the brake changes.

Specifications

- Protection from short-circuits and over-currents
- Protection from over-heating
- Real-time current output monitoring
- Anti-residual brake demagnetising function

Output	Terminal number	ILmax (A)	Range I (A)	Max. resolution (A)	Ireg_freq (Hz)
AO3	37-38	1,2	-0,099 ÷ 1	0,00025	2200

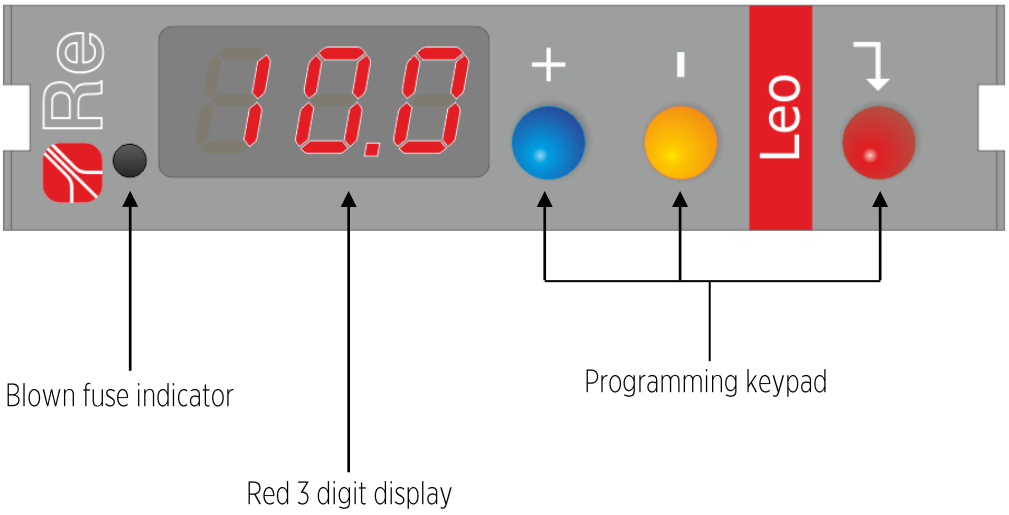
Electro-magnetic compatibility (EC)

The LEO device conforms to the requirements of the generic EMC directives EN6100-6-2 (2005) and EN61000-6-3 (2007)

The following harmonised standards were used for the tests: :

- CISPR 16-2-3
- CISPR 16-2-1 par. 7.4.1 e CISPR 16-1-2 par. 4.3
- EN61000-4-2 : 1995 + A1 :1998 + A2 : 2001
- EN61000-4-3 : 2007
- EN61000-4-4 : 2004
- EN61000-4-5 : 2006
- EN61000-4-6 : 2009

Control panel



Blown fuse indicator

When illuminated indicates that the current has exceeded the maximum limit and the circuit protection fuse has blown. Replace the fuse.

Red 3 digit display

The device normally displays the percentage value of the output during the operation in open loop regulator mode, or the percentage value of the input when operating in other modes. Pressing the keys you can temporarily display other useful information such as: reel diameter, dancer roller position, current output in the brake, etc. The availability of this information varies based on the application selected. For more information refer to the *Information indicated on the display* section (next page).

Programming keypad

Use these keys to access the device programming menus, vary its parameters and settings and change the displayed information.
The LEO device has two separate configuration menus: the first menu is identified by the initials P.0 and includes all the functions necessary for setting up the device hardware, whereas the second, which is identified by the initials P.1, can be used to set-up the regulator operating parameters.
To select the menu, press and hold the ↵ key for approximately 3 seconds the letter P. Appears on the display, followed by the menu identification number; press the + / – keys to scroll to the desired menu, then press ↵ to select it and continue pressing to access the functions menu.

Information indicated on the display

The tables below show the information that can be indicated on the display in the different operating modes, divided based on the menu selected.

STANDARD Mode		
Keys to press	Menu selected P. 0	Menu selected P. 1
None	Current (A) supplied by AO3	Input (%) (1)
+	Current (A) supplied by AO3	Input (%)
–	Mode in use ("Std")	Mode in use ("Std")
+ e –	Current (A) supplied by AO3	Current (A) supplied by AO3
↵ e +	Current (A) supplied by AO3	Input (%)
↵ e –	Current (A) supplied by AO3	Input (%)

REGULATOR mode – "OPEN LOOP" (O.L.)		
	Menu selected P. 0	Menu selected P. 1
Keys to press	Current (A) supplied by AO3	Output (%) (2)
None	Current (A) supplied by AO3	Regulator state (3)
–	Mode in use ("REg")	Type of regulation ("OL")
+ e –	Current (A) supplied by AO3	Current (A) supplied by AO3
↵ e +	Current (A) supplied by AO3	Diameter
↵ e –	Current (A) supplied by AO3	Torque limit (%)

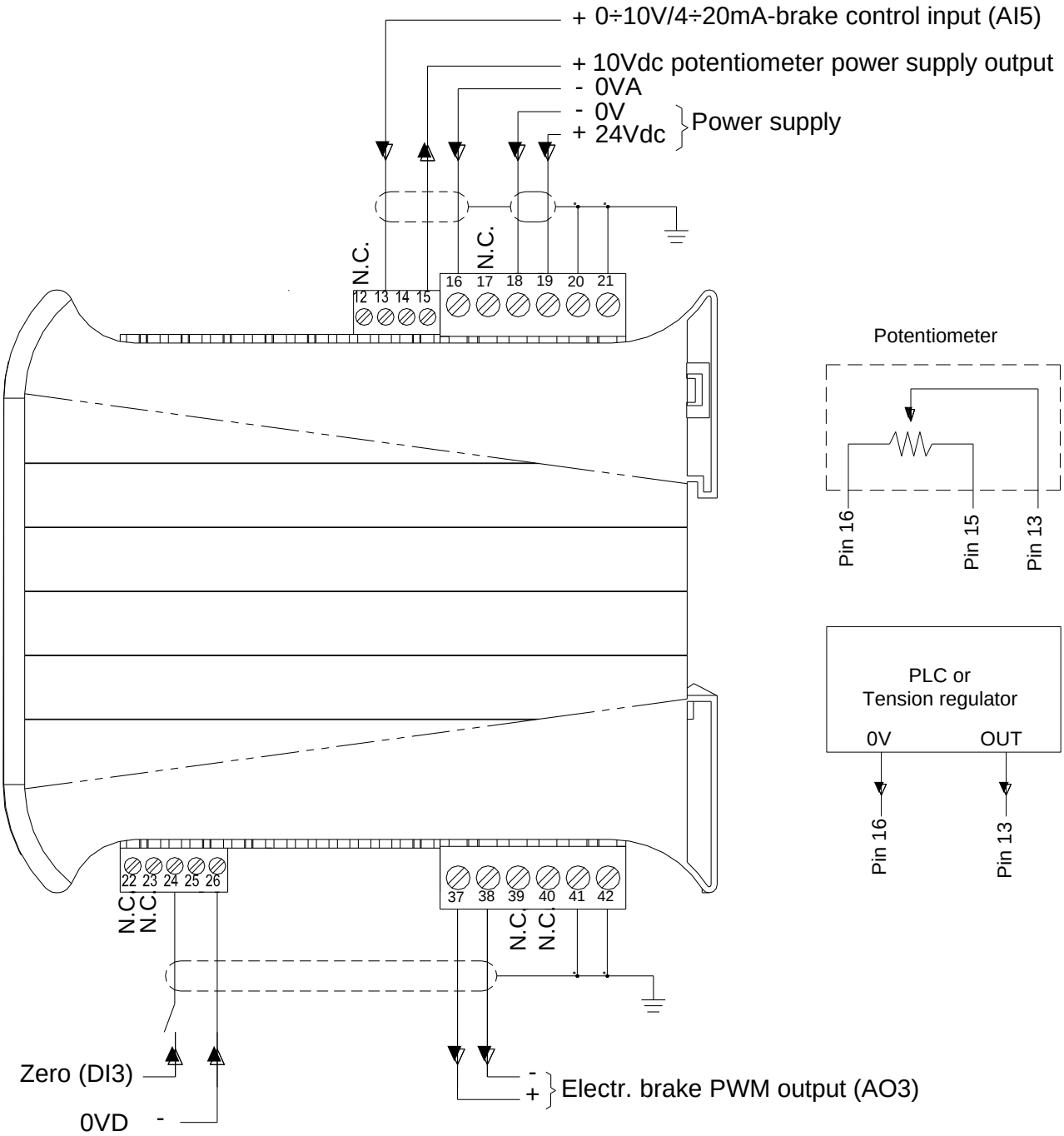
REGULATOR mode – "CLOSED LOOP" (C.L.)		
	Menu selected P. 0	Menu selected P. 1
Keys to press	Current (A) supplied by AO3	Dancer roller position (%) (2)
None	Current (A) supplied by AO3	Regulator state (3)
–	Mode in use ("REg")	Type of regulation ("CL")
+ e –	Current (A) supplied by AO3	Current (A) supplied by AO3
↵ e +	Current (A) supplied by AO3	Diameter
↵ e –	Current (A) supplied by AO3	Output (%)

(1) With DI3 input active, the display indicates "- 0 -".
(2) With DI3 or DI4 input active, the display indicates the state of the regulator ("- 0 -" or "- E -").
(3) For the list and description of the regulator states, refer to the *Remote control of the states* section (page 16).

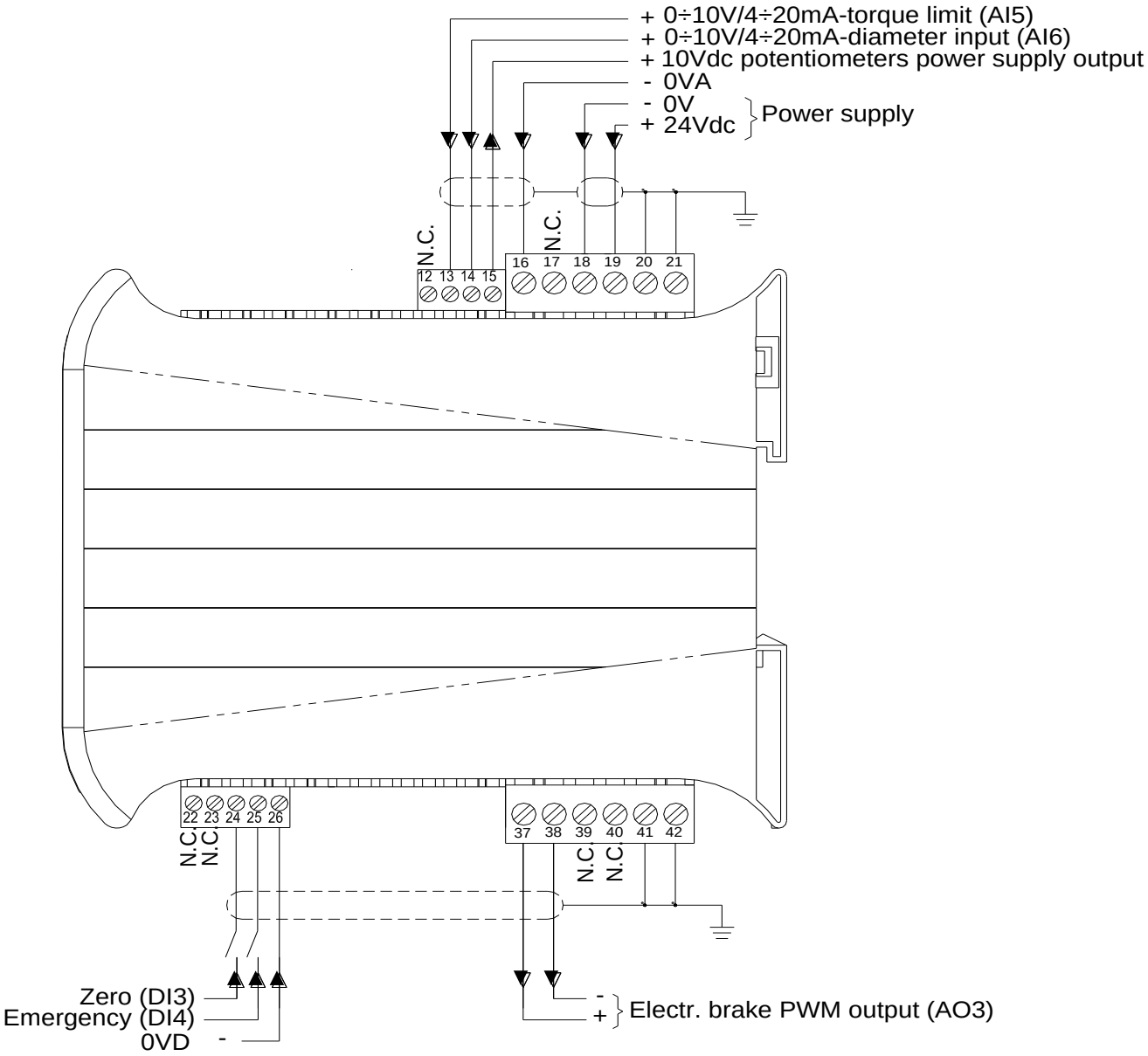
Electrical wiring diagrams

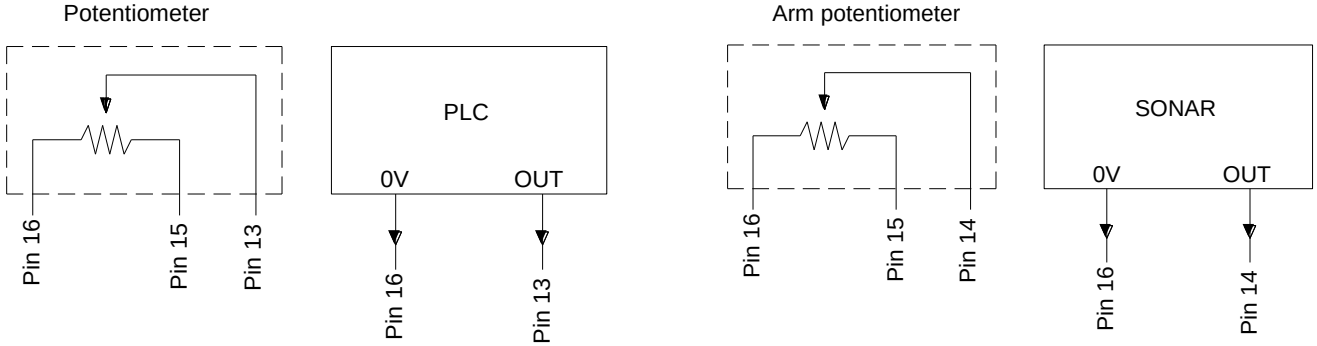
All connection cables must shielded and the shields must be earthed.
The earth connection must be as short as possible.

LEO - cod. 5E01014 – General wiring diagram (STANDARD mode)

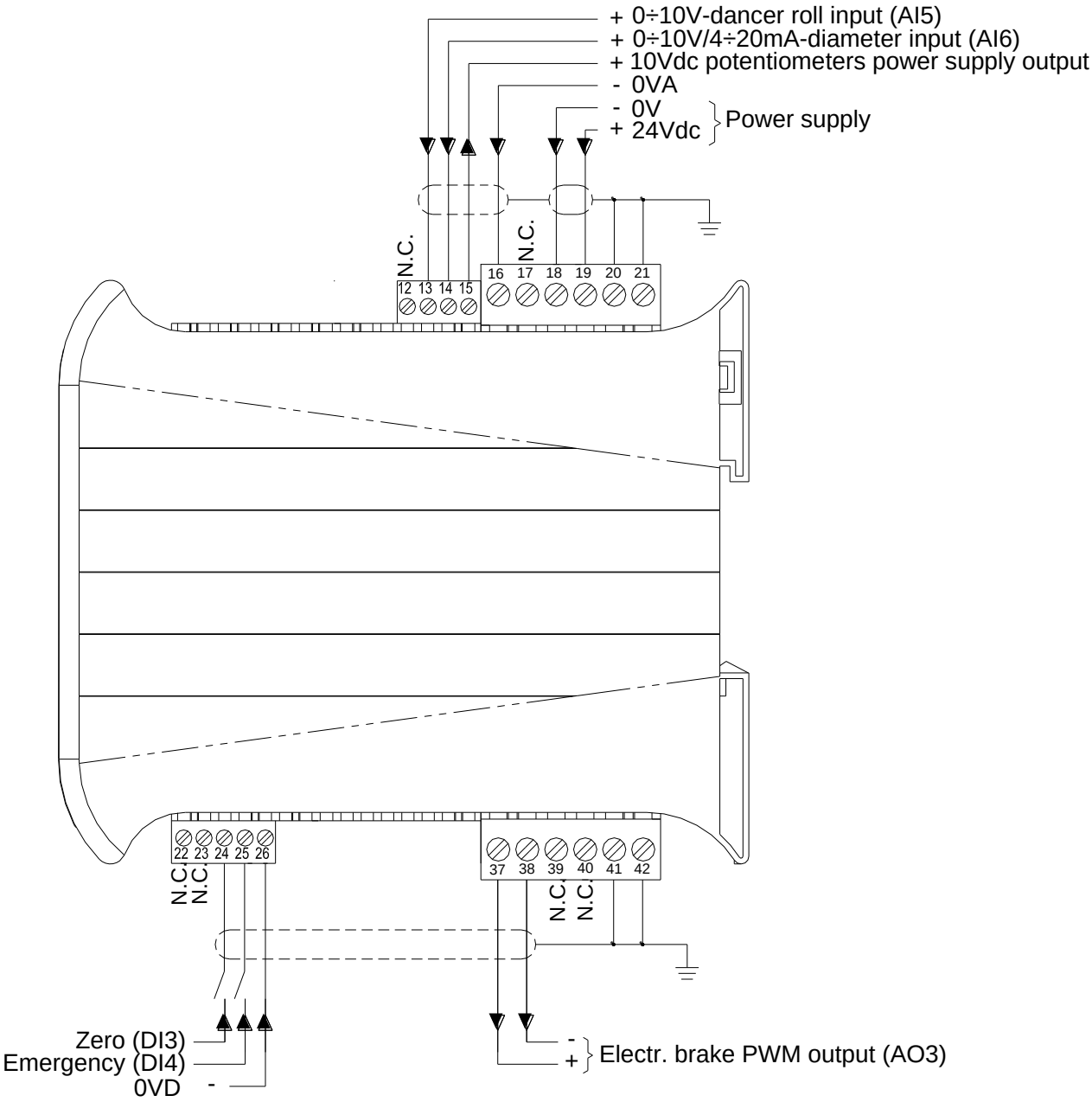


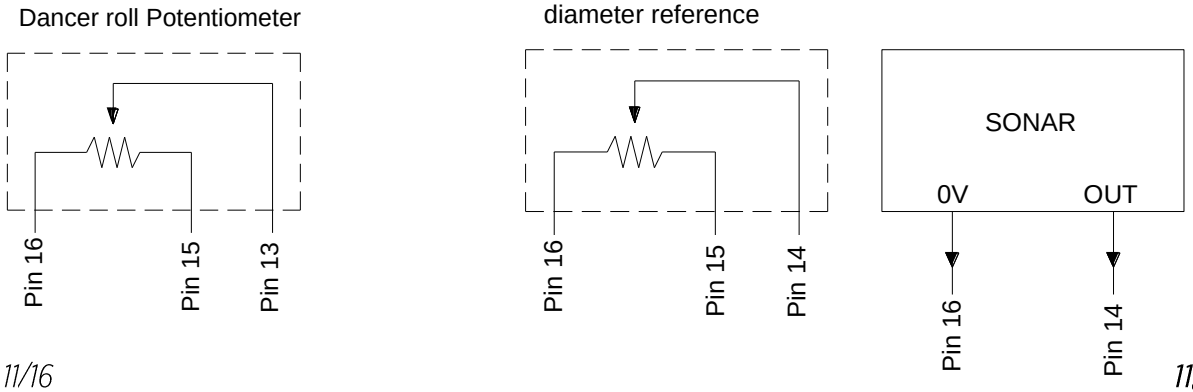
LEO - cod. 5E01014 - Electrical diagram for open loop REGULATOR mode with diameter input





LEO - cod. 5E01014 - Electrical diagram for closed loop REGULATOR mode dancer roller P.D.





Hardware settings

To access the programming environment press the ↵ key for approx. 3 seconds. The display indicates the letter P. followed by the menu identification number Use the + / – keys to select the hardware set-up menu "P. 0". Press the ↵ key again to access the menu. The display indicates the letter F. followed by the number that identifies the first available function.

Use the + / – keys to scroll through the list of programming functions.

To change the parameter relative to a function, display the number of the desired function press the ↵ key: the display indicates the current parameter value. Use the + / – to set the desired value, then press the ↵ key to confirm.

To save the new settings, select the first function in the menu and press the – key, or select the last function and press the + key, after approx. 3 seconds the unit will exit the menu and the data will be saved.
See below for a list of the functions available for the configuration and hardware calibration of the LEO device; for a complete and detailed description of the functions refer to the *Detailed description of the hardware set-up menu* section *(P. 0)* on page.

Hardware settings menu (P.0)

Function ID	Short description	Range	Factory value
F.60	Select the operating mode	Std / REg	Std
F.80	Select I/O to configure	AI5 / AI6 / DI3 / DI4 / AO3	-
F.81	Enable/Disable selected I/O	OFF / On	On
F.82(4)	Set mode for selected I/O	(4)	-
F.83(4)	Set-up digital filter for selected input	0 ÷ 100	20
F.86(4)	Calibrate the selected analogue input "Zero"	-	-
F.87(4)	Calibrate the selected analogue input "Gain"	-	-
F.89(4)	Set the minimum current for the PWM output (or the current to demagnetise the brake/clutch)	0.00A÷F.90 (- 99mA÷0mA)	0.00A
F.90(4)	Set the maximum current for the PWM output	Se F.89 ≥ 0: F.89 ÷ 1.00A Se F.89 < 0: 0.00 ÷ 1.00A	1.00A
F.91(4)	Enable/Disable the input logic inversion	OFF / On	OFF
F.95	Set-up the display brightness	0 ÷ 15	4
F.96	Restore the factory settings	-	-
F.97	Enter "Admin" password	0 ÷ 999	0
F.98	Save "Admin" password	0 ÷ 999	0
F.99	Display the Firmware version	XX.X	-

(4) The availability varies based on the I/O currently selected.

Setting up the regulator

To access the programming environment press the ↵ key for approx. 3 seconds. The display indicates the letter P. followed by the menu identification number Press the + / – keys to scroll to the regulator set-up and parameters menu "P.1". Press the ↵ key again to access the menu. The display indicates the letter F. Followed by the number that identifies the first available function.

To scroll the list of functions, change the parameters for each function and save the set-up, refer to the instructions to access the hardware settings menu P. 0 in the previous page 17.

Regulator set-up and parameters menu (P.1) – Mod. STANDARD (F.60 = "Std")

Function ID	Description	Range	Factory value
F.36	Input display filter	0 ÷ 100	80
F.97	Entering the "Admin"password	0 ÷ 999	0
F.98	Saving the "Admin" password	0 ÷ 999	0

Regulator set-up and parameters menu (P.1) – Mod. REGOLATORE (F.60 = "REg")

Function ID	Description	Range	Factory value
F.5(5)	"Derivate" regulator in AUTO state	0.00 ÷ 9.99	2.00
F.19	Torque in EMERGENCY state (%)	0.0 ÷ 99.9	60.0
F.32	Torque limit (%)	0.0 ÷ 99.9	99.9
F.36(5)	Dancer roller position display filter	0 ÷ 100	80
F.40	Eneble/Disable the acquisition of the torque limit from remote	OFF / On	On
F.41	Torque limit acquisition from remote filter	0 ÷ 100	80
F.42	Diameter acquisition mode	OFF/1÷4	1
F.43	Setting minimum diameter	0 ÷ F.44	100
F.44	Setting maximum diameter	F.43 ÷ 999	999
F.45	Diameter acquisition filter	0 ÷ 100	80
F.49	Type of regulation (Closed-Loop / Open-Loop)	CL / OL	OL
F.97	Entering the "Admin"password	0 ÷ 999	0
F.98	Saving the "Admin" password	0 ÷ 999	0

(5) Available only when the Closed – Loop regulation is set.

Hardware installation, configuration and calibration procedure

This section describes the installation, configuration and calibration procedure for a fast start up of the instrument. More information about on the individual functions is provided in the following part of the manual (from page 17).

1. Mechanically install the LEO device, the brake/clutch and any control sensors and/or devices that will be connected to the device.
2. Perform all the necessary electrical connections, as shown in the *Electrical wiring diagrams* (from page 9) referring to the specific diagram for the type of application that the LEO regulator will be used in.
3. Connect the device to its power supply and switch it on.
4. Press and hold the ↵ key for approx. 3 seconds, until the display indicates the letter P. 1; press the – key to select the hardware set-up menu "P. 0"; press and hold the ↵ key until the first function available of the menu (F. 60) appears on the display.
5. Access the F.60 function and set the desired operating mode: " Std " to operate as standard current driver, e.g. controlled by a potentiometer, a tension controller or a PLC; " REg " to operate as open loop tension regulator with servo diameter or with Proportional - Derivative action with dancer roller.
6. Configure the AI5 and AI6 analogue inputs based on your requirements and proceed with their calibration, repeating the procedure below for each input being used:
   - access the function F.80 and select the input to be configured (e.g. AI5);
   - access the function F.81 and check that the input is enabled (" On " or " CAL "), if not press + to enable it;
   - access the function F.82 and set " U " for the 0÷10 Vdc mode or" I " for the 4÷20 mA mode (see the "*Select the correct input mode*" section in the *Description and electrical specifications of the I/O* chapter on page 4);
   - select the function F.86 without accessing it and follow the instructions on page 18 for the " Zero " calibration;
   - select the function F.87 without accessing it and follow the instructions on page 18 for the " Gain " calibration;
   - only for input AI5: access the function F.91 and if necessary (e.g. for the regulation with dancer roller), enable or disable the logic inversion.
7. Using functions F.80 and F.81, select and disable all the I/Os that you do not intend to use on your application.
8. Scroll to the last available function in the menu, then press the + button to save the settings and close the hardware settings menu.
9. If the operating mode (F.60) has been changed: switch off and on the LEO device to activate the change.

Regulator configuration procedure (only if F.60 = “ REg ”)

This section describes the regulator configuration procedure in the two options, in open loop and with dancer roller. More information about the individual functions is provided in the following part of the manual (from page 21).

1. Press and hold the ↵ key for approximately 3 seconds, until the display indicates P. followed by the menu identification number; press the + / – keys and select the regulator settings menu “P.1”; keep the ↵ key pressed until the first function available of the menu appears on the display (e.g. F. 19).
2. Access the function F.42 and set the diameter acquisition mode (see page 22)
3. Access the function F.43 and set the minimum diameter value;
4. Access the function F.44 and set the maximum diameter value;
5. Access the function F.49 and set the desired type of regulation: “ CL ” for the closed – loop regulation with dancer roller; or “ OL ” for the open – loop regulation with servo diameter;

Configuration of the Open-Loop regulator with servo diameter (only if F.49 = ” OL ”)

6.1 Access the function F.40 and set-up “ On ” to change the torque limit with the remote signal from, for example an external potentiometer or a PLC, connected to the input AI5; or set “ OFF ” to change the torque limit from the menu with the F.32 function;

6.2 If F.40 = “ OFF ”: access the function F.32 and set-up the torque limit at the desired percentage;
If F.40 = “ On ”: access the function F.41 and adjust the acquisition filter to achieve the necessary response speed for the remote signal of the torque limit.

Configuration of the Closed-Loop regulator with dancer roller (only if F.49 = “ CL ”)

6.1 Access the function F.40 and set-up “ On ”;

6.2 Access the function F.41 and adjust the acquisition filter to achieve the necessary response speed for the dancer roller potentiometer signal.

6.3 Access the function F.5 and adjust the derivative action (increasing it gradually starting from 0) to stabilize the oscillations of the dancer.

Remote control of the states

The LEO device has digital inputs that can interface with a PLC, relays or an operator panel with pushbuttons and/or switches to control simple commands that change its state. The map of the commands on the inputs can be seen in the electrical diagram for the operating mode selected for the device.
The available remote controls are:

- EMERGENCY: it can only be activated if the device is operating in REGULATOR mode, this command has priority over all the others and immediately forces the output to a fixed torque value (set in % with the function F.19) to allow the reel to stop quickly;
  Attention! The EMERGENCY command does not provide any type of protection and/or safety required by the applicable standards.
- ZERO: if active, it immediately forces the output current to the minimum value (set in F.89) and consequently also the torque, to release the brake/clutch;

LEO device states

Display indication	State	LEO device behaviour
-AU	AUTO(6)	Normal operation
-0-	ZERO	Brake/clutch release
-E-	EMERGENCY(6)	Fixed torque for fast stop

(6) The AUTO and EMERGENCY states apply only for the REGULATOR mode

Detailed description of the hardware settings menu (P. 0)

Function 60 – LEO operating mode

This function is used to select the operating mode for the LEO device from those described in the *Intended use for the device* section (page 2). Once selected the new mode will be activated the next time the device is switched on.

Press ↵ to access the function, the display indicates the current mode set.

Press + / – and select the desired mode.

Press ↵ to confirm.

Keep – pressed to exit the menu and save.

Switch off and back on the LEO device to activate the selected mode.

Function 80 – Select I/O to configure

You can use this function to select one of the available I/Os; once it has been selected it will be possible to perform a range of operations on the I/O (using the functions F.81 to F.91).

For example, in order to disable output AO3, first select "AO3" in function F.80, then set F.81 to "OFF" to disable it.

Press ↵ to access the function the display will indicate the name of the I/O that is currently selected.

Press + / – to scroll through the list of available I/Os and select the desired one.

Press ↵ to confirm the selection.

Attention! Functions F.81 to F.91 inclusive are used to configure and calibrate the I/Os; they are common to all the I/Os (but available only for some) and when used they only affect the I/O that is currently selected in F.80. Hence, always make sure that the correct I/O is selected in F.80 before carrying out any configuration and/or calibration procedures on any of the I/Os.

Function 81 – Enable/Disable selected I/O

You can use this function to enable or disable the I/O currently selected in F.80 according to the requirements of your application; we recommend you disable all the I/Os that are not in use as they could compromise the correct operation of the rest of the system if left in a floating state.

Some I/Os need to be calibrated first or they will not operate correctly; once they have been activated these inputs they remain in the "CAL" state awaiting calibration; once the calibration procedure has been completed they switch automatically to the "On" state.

I/O state	Description
OFF	I/O deactivated
On	I/O activated and ready
CAL	I/O active but awaiting calibration

Press ↵ to access the function, the display will indicate the state of the I/O that is currently selected.

Press + / – and set-up " On " (or " CAL ") to activate the I/O, or " OFF " to disable it.

Press ↵ to confirm and update the state of the I/O.

Function 82 – Setting mode for selected I/O

You can use this function to change the operating mode of the I/O currently selected in F.80; note that the available operating modes vary depending on the type of I/O, also, if you select an I/O that only has one available operating mode it will be selected automatically and this means that, for this type of I/O, this function may not appear in the menu.
For a complete list of all the operating modes available for the various I/O types see page 4-6.
Press ↵ to access the function, the display indicates the mode set for the selected I/O.
Press + / – to scroll through the list of available operating modes and select the desired one.
Press ↵ to confirm and update the mode of the I/O.

Function 83 - Setting digital filter for selected input

All the analogue inputs present on the LEO device are equipped with digital anti-aliasing and interference suppression filters; you can use this function to modify the filter level for the analogue input currently selected in F.80; if no analogue inputs are selected the function will not appear in the menu.
NOTE: The filter values for each input are set to the optimum operating values in the factory; since excessive use of the filters could prevent the correct operation of the device, we recommend that you do not modify these values unless absolutely necessary.
Press ↵ to access the function, the display indicates the current value.
Press + / – to set the filter to the desired value.
Press ↵ to confirm.

Function 86 – Calibrating the selected analogue input "Zero"

- Only if the input is connected to a DANCER ROLLER: position the dancer roller at the end of its stroke so that its output assumes the minimum value (for example 0V).
- If the input is connected to a GENERIC DEVICE: Set the device up so that its output assumes the minimum value (for example 0 V, 4 mA, etc.)

Press ↵, the word " YES " flashes on the display; the "Zero" calibration procedure is complete.
Once the function has been completed, press ↵ to exit and execute F.87 in order to complete the calibration procedure.

Function 87 – Calibrating the selected analogue input "Gain"

- Only if the input is connected to a DANCER ROLLER: position the dancer roller at the end of its stroke so that its output assumes the maximum value (for example 10V).
- If the input is connected to a GENERIC DEVICE: Set the device up so that its output assumes the maximum value (for example 10 V, 20 mA, etc.)

Press ↵, the " YES " or " bAd " flashes on the display depending on whether the calibration procedure has been successful or not; the "Gain" calibration is complete. If the word "bAd" appears on the display check that the analogue input has been connected and configured correctly and that the minimum and maximum signal levels are correct, then repeat the calibration procedure.

Function 89 – Setting PWM output minimum current (and brake/clutch demagnetization)

You can use this function to set the minimum current value (and therefore the torque value) for the brake/clutch connected in output. Sometimes due to the magnetization an electromagnetic brake/clutch could have a residual torque also with minimum current null. If you need to obtain a minimum torque equal

to zero also with a residual magnetism of the brake, this function lets you activate the Anti-Residual mode that, by using a current with inverse polarity, demagnetizes the brake and cancels the residual torque.
Set the function with the procedure below:

1) Connect the brake/clutch to the selected output;
2) Activate the ZERO remote control so that the output is forced to the minimum value;
3) Press↵ to access the function, the display indicates the current value set (in A when positive or null; in mA when negative);
4) Press + / – to change the current and obtain the desired minimum torque; if with zero current the residual torque still needs to be reduced, press briefly – to activate the ANTI-RESIDUAL and invert the polarity of the current. Press – to **gradually** increase the negative current until the brake has not released completely; never exceed the negative current values to prevent the inverse magnetization of the brake.
5) Press ↵ to confirm.

Function 90 – Setting PWM output maximum current

You can use this function to set the maximum current value (and therefore the torque value) for the brake/clutch connected in output. This function is useful when having to use a brake with a larger torque for the application or with maximum current allowed lower than 1 A (R_{bobina} > 24Ω).
Press ↵ to access the function, the display indicates the current value set. (in A).
Press + / – to set the maximum current to the desired value.
Press ↵ to confirm.

Function 91 – Logic inversion of the selected I/O

You can use this function to invert the operating logic of the I/O.
Press ↵ to access the function,
Press + / – and set " On " to invert the I/O, otherwise set " OFF ".
Press ↵ to confirm.

Function 95 – Display brightness

You can use this function to change the LCD display brightness.
Press ↵ to access the function, the display indicates the current brightness value.
Press + / – to adjust brightness to the level required.
Press ↵ to confirm.

Function 96 – RESET settings

You can use this function to restore all the settings and parameters entered using the P.0 and P.1 menus to the factory values, including the calibration values.
Press ↵ to access the function, the word " RES " is displayed.
Press and hold the + key for approximately 3 seconds, the word "RES" will flash indicating that the reset has been completed and that the unit will restart automatically with the factory settings.

Function 97 – Entering the "Admin"password

Entering the password saved using the function F.98 gives user the user administrator ("Admin") level privileges for the "hardware settings menu" to access the device installation and maintenance functions. This

allows you to ensure that unauthorized personnel cannot alter the hardware configuration and/or calibration settings.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / − and set-up the correct password.

Press ↵ to confirm the password.

Without accessing the set-up menu, press and hold the + , − and ↵ keys simultaneously to display the current “Admin” password.

Function 98 – Saving the “Admin” password

You can use this function to save a three figure “Admin” password in order to prevent unauthorised personnel from accessing the device hardware configuration and calibration functions included in the "hardware set-up menu (P.0)".

Press ↵ to access the function, the display indicates the current value.

Press + / − and set-up the desired password.

Press ↵ to confirm.

Function 99 – Firmware Version

This is a read-only function that indicates the device firmware version.

Press ↵ to access the function, the display indicates the firmware version.

Press ↵ again to close the function.

Detailed description of the regulator set-up and parameters menu (P.1)

Function 5 – "Derivative" regulator in AUTO state

This parameter intervenes in the adjustment to stabilize the position of the dancer roller. Increase the value of the derivative parameter to improve the capacity of the regulator to predict the error trend and compensate for sudden variations in the tension; it is also capable of damping the undesired effects caused by a high proportional value. If the derivative parameter value is set too high the system may become highly sensitive, reacting to even the smallest variations at the input (interference) and resulting in harmful oscillations.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired value.

Press ↵ to confirm.

Function 19 – Torque in EMERGENCY state (%)

You can use this function to set-up the percentage of torque applied to the reel when the machine is forced to perform a rapid stop (EMERGENCY state). To activate the EMERGENCY state, use the dedicated remote command as described in *Remote control of the states by PLC* on page 16.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired torque value, expressed as a percentage.

Function 32 – Torque limit (%)

If the LEO device is configured in REGULATOR open – loop with servo diameter and F.40 = " OFF " mode, you can use this function to set (in percentage) the torque limit and consequently the material tension.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired torque limit, expressed as a percentage.

Press ↵ to confirm.

Function 36 – Dancer roller position display filter

During the operation in REGULATOR closed – loop with dancer roller mode, the device indicates the position (from 0% to 100%) of the dancer roller on the display To make it easier for the user to read this value, it is possible to set-up a dedicated filter in order to eliminate annoying variations caused by the normal vibrations in the machinery and display a mean value that is both stable and legible. The higher the filter setting, the more the displayed value is filtered.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired filter value.

Press ↵ to confirm.

Function 40 – Acquisition of the torque limit from remote

You can use this function to enable or disable the acquisition of the torque limit from the remote analogue signal.

Press ↵ to access the function, the display indicates the current state of this function.

Press + / – and select " OFF " to set the torque limit with the function F.32, or select " On " to set the torque limit with the remote analogue signal.

Press ↵ to confirm.

Function 41 – Torque limit acquisition from remote filter

You can use this function to set a suitable value for the digital filter, when the torque limit is set with the remote analogue signal (F.40 = " On "), to obtain a stable signal free of undesired variations but sufficiently quick for the application requirements (e.g. t.l. with dancer roller). The higher the filter setting, the more the signal is filtered.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired filter value.

Press ↵ to confirm.

Function 42 – Diameter acquisition mode

You can use this function to set the diameter acquisition mode from the options below:

- OFF → the acquisition is disabled and the diameter is forced to the maximum value (F.44);
- 1 → acquisition with diameter sensor;
- 2 → acquisition with diameter sensor and filter for irregular reels activated;
- 3 → acquisition with distance sensor;
- 4 → acquisition with distance sensor and filter for irregular reels activated;

Modes 3 and 4 invert the signal to obtain the diameter from a distance sensor; in modes 2 and 4 a filter is activated that blocks the excessively fast variations of the diameter (useful for example with irregular reels); use modes 1 or 3 if the sensor connected already has this function or you want to disable it.

Press ↵ to access the function, the display indicates the mode set.

Press + / – to set-up the desired mode.

Press ↵ to confirm.

Function 43 – Setting minimum diameter

You can use this function to set the minimum diameter value that the reel can reach (axis diameter).

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired value.

Press ↵ to confirm.

Function 44 – Setting maximum diameter

You can use this function to set the maximum diameter value of the reel working.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired value.

Press ↵ to confirm.

Function 45 – Diameter acquisition filter

This function adjusts the acquisition of the signal from the diameter sensor. You can use it to set the value for the digital filter, in order to eliminate any undesired variations and/or dirty readings of the sensor. The higher the filter setting, the more the signal is filtered.

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – to set-up the desired filter value.

Press ↵ to confirm.

Function 49 – Type of regulation

You can use this function to set which one, of the two regulations possible described in the *Intended use of the device* section, (page 2), will be used by the LEO device when operating in REGULATOR mode.

Press ↵ to access the function, the display indicates the type of regulation set.

Press + / – and select " OL " for the open – loop regulation with servo diameter; or " CL " for the closed – loop regulation with dancer roller.

Press ↵ to confirm.

Function 97 – Entering the "Admin"password

In order to prevent the user from modifying the regulator settings and/or parameters, access to the functions included in the LEO "regulator set-up and parameters menu" is restricted to the personnel authorized when setting the unit up. Therefore, it is necessary to enter the pre-defined "Admin" password in order to access these functions (using F.98).

Press ↵ to access the function, the display indicates the corresponding value.

Press + / – and set-up the correct password.

Press ↵ to confirm the password.

Without accessing the set-up menu, press and hold the + , – and ↵ keys simultaneously to display the current "Admin" password.

Function 98 – Saving the "Admin" password

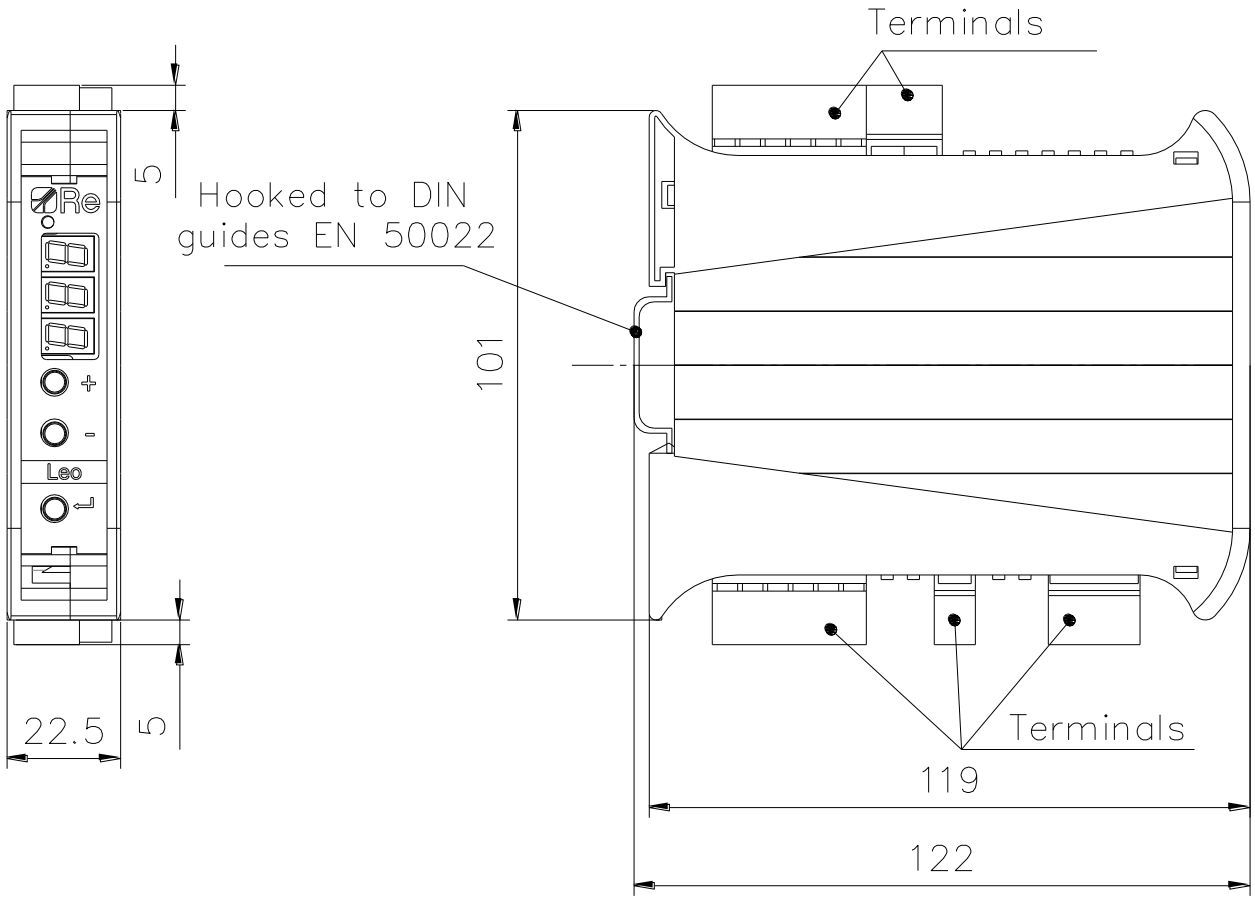
To prevent the user or unauthorized personnel from modifying the settings in the "regulator set-up and parameters menu", you can use this function to save a new "Admin" password (consisting of a numerical value).

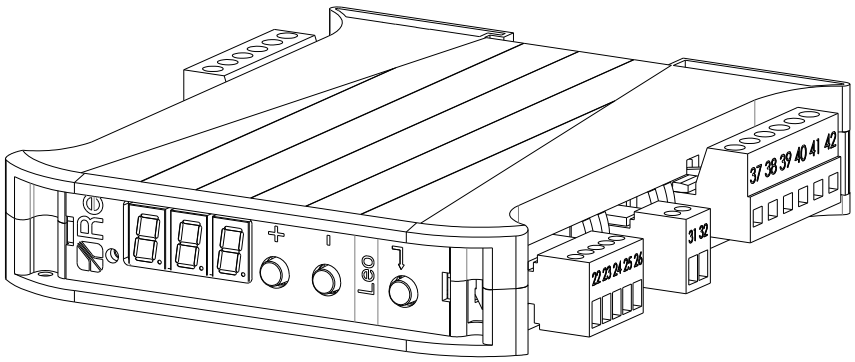
Press ↵ to access the function, the display indicates the current value.

Press + / – and set-up the desired password.

Press ↵ to confirm.

Mechanical dimensions





Guarantees

Re S.p.A. guarantees this device against all defects relative to the materials and manufacturing for a period of 12 months from the date of delivery.
Should your device develop operating faults during the guarantee period, please contact the Company's agent in your country, or, if this is not possible, contact Re S.p.A. directly.
The guarantee includes spare parts and labour. It does not include shipment costs for device delivery or recall.
The guarantee is invalidated by:

- Improper use of the device
- Incorrect installation
- Faulty electrical connections or power supply
- Lack of maintenance
- Changes or work involving non-original components or carried out by persons without Re S.p.A. authorisation
- Complete or partial failure to observe the instructions
- Exceptional events.

At the end of the guarantee period, support will be provided by the support network, which will carry out repairs at the current rates.

Revision History

No. revision	*Date*	*Changes*	*FW version*
04/16	29/04/2016	First version	1.0
05/16	16/05/2016	▪ Changed table of electrical specifications of the I/Os ▪ Functions F5 and F36 active only with closed-loop regulation ▪ Default values for F5 and F49 ▪ Added function F42 with relative description ▪ Updated regulator configuration procedure	1.1
11/16	29/11/2016	Changed the manual graphic setting	1.1

Re S.p.A. Controlli Industriali
Via Firenze, 3 – 20060 BUSSERO (MI) ITALY
Fax (+39) 02 95 03 89 86
Technical support:
Tel. (+39) 02 95 24 30.300 - E-mail: support@re-spa.com
Sales support:
Tel. (+39) 02 95 24 30.200 - E-mail: sales@re-spa.com
www.re-spa.com
Rev. 11/16