

Set Point Controller OC 351

Owner's Manual

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SECURITY CONSIDERATIONS

The instrument has to be protected with a fuse to fulfil security considerations of EN 61 010-1 + A2.

The instrument is not suitable for explosive environments!

EUROPEAN NORMS

The controllers OC 351 are fulfilling the European requirements 89/336/EWG.

They fulfil the requirements of the European and Czech norms:

EN 55 022, class B

EN 61000-4-2, -4, -5, -6, -8, -9, -10, -11.

The instrument can be used for industrial and agriculture applications.

CONNECTIONS

The power supply lines have to be laid separately from the signal lines to prevent interferences.

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Vor dem Einschalten

Überzeugen Sie sich, ob Ihre Sendung das richtige Gerät Orbit Controls Modell OC 351 beinhaltet, einschliesslich einer Betriebsanleitung OC 351.

Vor dem Einschalten des Gerätes überprüfen Sie die Anschlüsse und die Versorgungsspannung. Ein falsch angeschlossenes Gerät kann beschädigt werden und damit auch die mitverbundene Folgeelektronik. Für falsche Handhabung wird jede Haftung abgelehnt.

ZU BEACHTEN

Dieses Gerät wurde sorgfältig verpackt. Falls es bei Ihnen in beschädigtem Zustand eintrifft, benachrichtigen Sie unverzüglich den Orbit Controls Kundendienst (Tel: +41 44 730 2753 oder Fax: +41 44 730 2783) und nehmen Sie einen Schadenrapport auf, welchen Sie auch von der Transportgesellschaft unterschreiben lassen. Bewahren Sie bitte das Verpackungsmaterial für eventuelle Reklamationen auf.

Unpacking Instructions

Remove the Packing List and verify that you have received all equipment, including the following:
Orbit Controls Model OC 351 Set Point Controller.

Operator's Manual OC 351.

If you have any questions about the shipment, please call the Orbit Controls Customer Service Department.

NOTE

When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the Orbit Controls customer service, Phone +41 44 730 2753 or Fax +41 44 730 2783 and to the shipping agent. The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in event the reshipment is necessary.

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SET POINT CONTROLLER

OC 351

- ✓ 5 digit display ± 99999
- ✓ 16 Bit Conversion
- ✓ DC voltage and Current ranges
- ✓ Two Point Relays
- ✓ Excitation
- ✓ AC or DC supply
- ✓ Free programmable
- ✓ Two point calibration
- ✓ AC true RMS ranges

The controller OC351 is a programmable 5 digit instrument with 16 Bit analogue converter. It is suitable for connecting to process signals 0/4-20mA, 100mV to 300VDC or true RMS, linear potentiometers, resistors, Thermistors, temperature sensors and signals from various analog sources.



With the keyboard the menu can be opened and the process parameters set for the required application. The menu contains the assignment of the input signal to the display, selection of two set points, setting of the filter, the measuring speed, the display resolution and the password. A Tara function is available for setting the display to zero at any measuring point. For supplying of external sensors an Excitation is available.

Service Menu *HtES*t is suitable for checking of the instrument's performance and the calibration.

Two Set Points can be selected within the display range of 0 to ± 99999 . They control two open collector transistors or two mechanical relay. The hystereze can be set from 0 to 99 increments.

Input Conditioner can be programmed for inputs $\pm 1V$, $\pm 10 V$, $\pm 100V$ or 0/4-20mA. Optional 20mV range is available by using an on board resistor. The Ranges are selectable with jumpers inside.

Digital Filter calculates the average value of the measurements prior they arrive at the display. The selection can be made for 0, 1 ... 99.

Tara will be activated with the keyboard and forces the display to zero. It remains stored also when the power is switched-off from the instrument. The Tara can be canceled at any time and the display returns to show the non-tara input signal.

Display Rate can be selected between 1 and 30 measurements which refresh the display readings. By selecting 1 the display will refresh at a speed of 15 samples/sec.

Display Count can be select for 1, 2, 5 or 0. With the count 1 the display increments all numbers 1, 2, 3,... 0. With the count 2 the display increments only even numbers. With the count 5 the display shows only 5 and 0. When the count 0 is selected the LSD remains at zero (dummy zero).

Peak & Valey memory stores the maximum and the minimum display readings. With the keys UP and DOWN the stored value can be entered into the display. With the key ACK the memory is set to zero.

Password is used to prevent an unauthorized access to the menu parameters. Without the password only the set points can be programmed.

1 KEYBOARD



MENU

ACK

UP

DOWN

SET

1, 2 activated Set Points

P Program Mode

2 SPECIFICATIONS

Display: 0 ... ± 99999 , 7 segment red 14.7 mm display units with decimal point.

Input: The input is factory set for DC or AC voltage or current, RTD, Thermocouples or Thermistors, Potentiometers or Resistor Measurement.

Voltage $\pm 100\text{mV}$ to 300V DC or true RMS.
Option: 20mVDC for strain gauges with 10V or 12V excitation

Current 0/4-20mA, $\pm 20\text{mA}$ to 5A DC or true RMS.

Pt-100 2 or 4 wire. $-200\ldots+650^{\circ}\text{C}$ according to PT385.

OHM 10 Ω -100k Ω , 2 or 4 wire connection

T/C E, J, K, S, B, C, T, according to DIN.

Cold Junction automatic compensation 0 - 60 $^{\circ}\text{C}$.

Thermistors 9796 Ω @ 0 $^{\circ}\text{C}$, 27965 Ω @ 0 $^{\circ}\text{C}$

ADC: 16 bit, bipolar, sampling time 63ms.

Integral Nonlin: $\pm 0.006\%$ of range

Zero Error: $\pm 0.0168\%$ of range

Rollover Error: $\pm 0.032\%$ of range

Tempco: $\pm 10\text{ppm}^{\circ}\text{C}$

Linearity: $\pm (1 \text{ LSB} + 1 \text{ digit})$.

Accuracy **DC Ranges** $\pm (0.01\%$ from value + 2 digit)

True RMS 50Hz - 5 kHz: $\pm (0.1\%$ from value + 2 digits).

Pt-100 and T/C *Pt-100:* $\pm (1^{\circ}\text{C} + 1 \text{ digit})$

T/C, Thermis: $\pm (2^{\circ}\text{C} + 1 \text{ digit})$

Tempco: $\pm 25 \text{ ppm}/^{\circ}\text{C}$.

Set Points: Set Points SP1, SP2 with transistor output or mechanical relays 5A-230VAC. The setting range is ± 999999 . Each Set Point has adjustable Hysteresis from 0 to 99 and the selection of OPEN or CLOSE in the alarm condition.

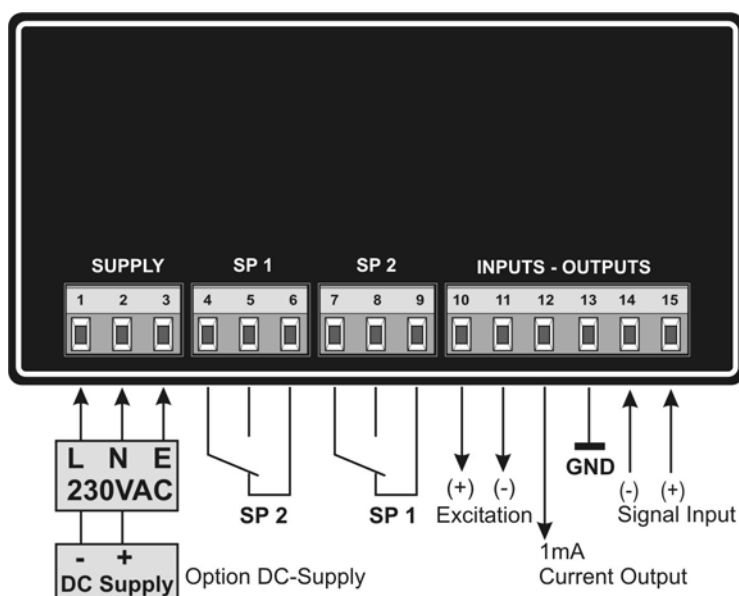
Excitation: Voltage: Isolated 10V, 12V or 24V - 40mA jumper selectable.
 Current: Constant Current 1mA for RTD and Resistance Measurements
 Reference: Reference voltage 1.25V for Potentiometric applications

Supply: 115V / 230V \pm 10%, 48-60 Hz. Option 24VDC-4W.

Cabinet: DIN 48x96x100 mm (H x W x D), Panel cut-out 45 x 90 mm. IP65 front protection.

Terminals: Pluggable Terminal Blocks

3 TERMINALS



4 MENU

The key **MENU** opens the Menu. The required parameter will be confirmed with **ACK**.

With **UP** or **DOWN** the parameters will be set.

The flashing digit - Cursor - can be positioned with **ACK**. The sign and the decimal point can be set after the cursor is positioned outside the display range (none of the digit is flashing).

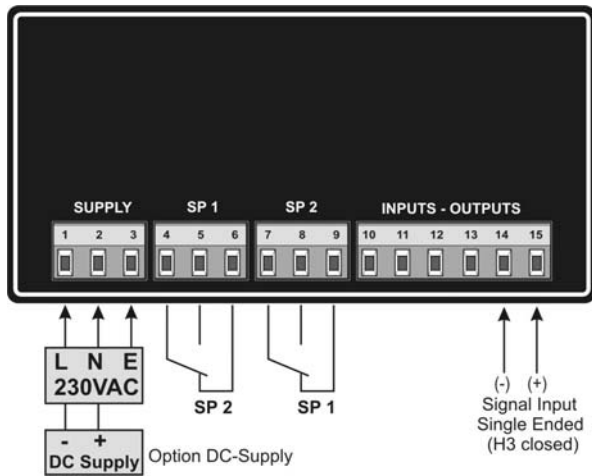
The key **UP** sets the decimal point, the key **DOWN** sets the sign. The key **SET** terminates the programming and the display returns to the measuring mode.

KEY	DISPLAY	FUNCTION
MENU	PASS	Enter of the Passwort (see StPAS last menu step),
ACK	PXXXX	Enter one of 20 preselected combinations P1001, P2010, P0102, P1201, P2021, P0121, P1020, P2100, P0002, P1200, P0001, P1010, P2102, P0201, P1021, P2121, P1100, P2002, P0200, P2200.
MENU	SP 1	Set Point SP1
ACK	XXXXXX	Selection -99999 to 99999. The Relay SP1 is activated at the Set Point value or above it.
MENU	HSt 1	Hysteresis of the SP1
ACK	XXXXXX	Selection: -99999 bis 99999
MENU	FnrL1	Function of the SP1 Relay
ACK	OPEN	Selection between OPEN and CLOSE
MENU	SP 2	Set Point SP2
ACK	XXXXXX	Selection -99999 to 99999. The Relay SP2 is activated at the Set Point value or above it.
MENU	HSt 2	Hysteresis of the SP2
ACK	XXXXXX	Selection: -99999 bis 99999
MENU	FnrL2	Function of the SP2 Relay
ACK	OPEN	Selection between OPEN and CLOSE
MENU	SEnS	Type of the Input Signal
ACK	LinEAr	DC and AC Voltages or Currents, Proces Signals
	POLYn	Polynom 6th degree
	Pt 100	RTD Thermometer
	tErEt	Thermistor 27936 Ohm @ 0 °C
	tErSt	Thermistor 9796 Ohm @ 0 °C
	TC E	Thermocouple E with automatic Junction compensation
	TCC E	Thermocouple E without automatic Junction compensation
	TC J	Thermocouple J with automatic Junction compensation
	TCC J	Thermocouple J without automatic Junction compensation
	TC L	Thermocouple K with automatic Junction compensation
	TCC L	Thermocouple K without automatic Junction compensation
	TC S	Thermocouple S with automatic Junction compensation
	TCC S	Thermocouple S without automatic Junction compensation
	TC b	Thermocouple B with automatic Junction compensation
	TCC b	Thermocouple B without automatic Junction compensation
	TC t	Thermocouple T with automatic Junction compensation
	TCC t	Thermocouple T without automatic Junction compensation
	Cold	Temperature measured with the compensator at the terminals

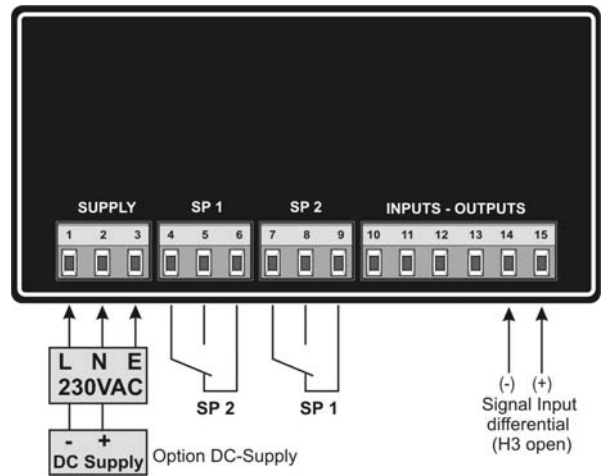
MENU	Set in	Input Signal Polarity
ACK	0.0 1	For bipolar Signals such as 0...20mA
	0.2 1	For Signals with Offset such as 4-20mA
	-1 1	For bipolar Signals such as -20 ... +20V
MENU	Set LO	Required display value with minimum input signal (e.g. 4mA)
MENU	Set HI	Required display value with the maximum input signal (e.g. 20mA)
MENU	OrdEr	Display resolution
ACK	CCC.dd	Selection with UP or DOWN
MENU	FiltEr	Digital average Filter
ACK	OFF	Selection from OFF to 1,2....99
MENU	Count	Count of the LSD
ACK	0	Dummy Zero
	1	Display incrementing 1,2,3....9,0
	2	Display incrementing 2,4,6...
	5	Display incrementing 0,5,0,5...
MENU	dSP	Display refreshing after selected number of measurements
ACK	1	Selection 1, 2 50
MENU	Fn tArA	Tara activation
ACK	OFF	Tara OFF
	ONLY	Display resets to Zero when SET pressed
	ON	Display resets to Zero when SET is pressed. When pressed for second time, the display returns to the original non-tara value
MENU	StPAS	Password selection (20 preprogrammed combinations)
MENU	Start	Measuring Mode

5 CONNECTIONS

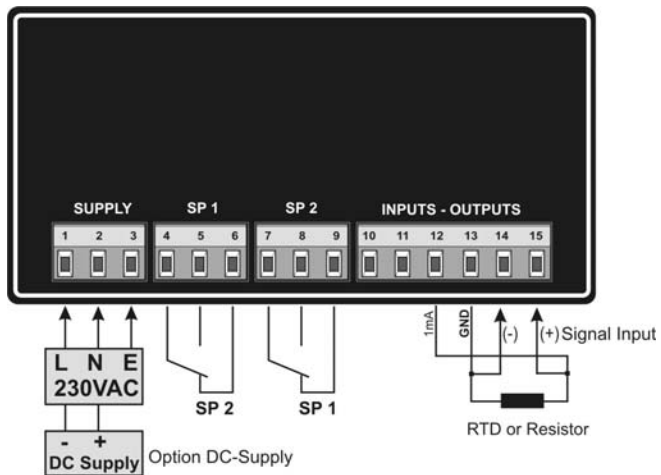
5.1 Process Signal 0/4-20mA V-DC, V-AC, Single Ended



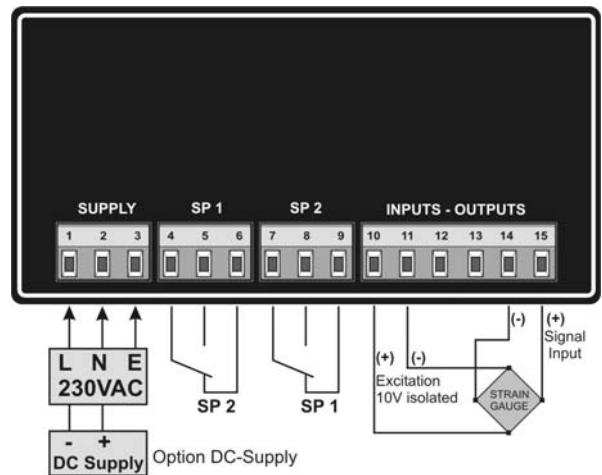
5.2 Differential Signal Inputs



5.3 RTD Thermometer and Ohmmeter



5.4 Strain Gauge



5.5 Range Selection

	20mV	1V	10V	100V	20mA
	H3 = open	H3 = closed	H3 = closed	H3 = closed	H3 = closed
	H4 = 1+2	H4 = 1+2	H4 = 2+3	H4 = 2+3	H4 = 1+2
	H5 = open	H5 = open	H5 = open	H5 = 2+3	H5 = 1+2
	H2 = 1+2 (DC) H2 = 2+3 (AC)	H2 = 1+2 (DC) H2 = 2+3 (AC)	H2 = 1+2 (DC) H2 = 2+3 (AC)	H2 = 1+2 (DC) H2 = 2+3 (AC)	H2 = 1+2
*	Z21 = open	Z21 = open	Z21 = open	Z21 = open	Z21 = open
*	Z22 = closed	Z22 = closed	Z22 = closed	Z22 = closed	Z22 = closed
*	Z21 = GND Ref Z22 = 1.25V Ref R44 = Gain (see page 14)				

The Bridge H3 sets the type of the input stage:

Differential Input: H3 = open

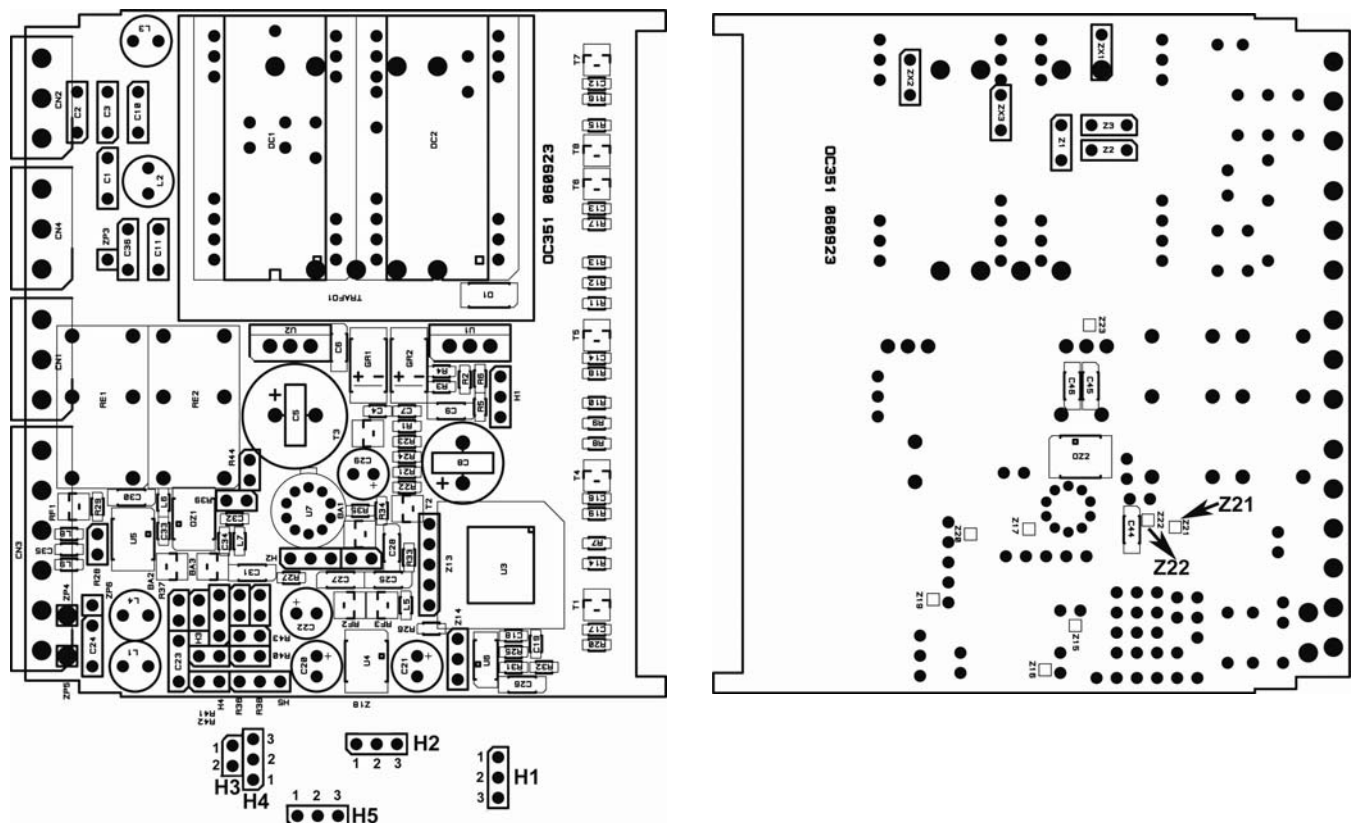
Single ended Input: H3 = closed (- Input of the instrumentation amplifier tied to GND).

Range20mV: Input stage with instrumentation amplifier and differential inputs.

* Solder Blobs Z21, Z22

Z21 determines the ADC reference point at 0V for unipolar operation e.g. 4-20mA, 0-10V.

Z22 determines the ADC reference point at 1.25V for bipolar operation e.g. -10...+10V.



5.6 Excitation: 10V: H1 = 1+2
12V: H1 = 2+3
24V H1 = open

6 SERVICE MENU - HtESt

The Service Menu **HtESt** permits fast check of the instrument's performance and offers the software calibration via the keyboard. To enter the Service menu, keep the key **MENU** pressed while the instrument is switched-on. Release the key when the display shows **HtESt**. The service menu steps are incremented forward with the key **MENU**, decremented backward with **SET**.

88888 all display segments are activated

AdC ADC internal DC value of the converter. This step permits the calibration.
ATTENTION! The input signal has to be set to ZERO before this Step is entered!

1.25XXX Apply the zero signal value. The display shows the internal voltage reference 1.25V.
The Zero Value will be calibrated when the key **DOWN** is pressed. The display shows **Ac LO**. Press the key **ACK** and keep it pressed until the display shows **EE StO**.
The Zero Signal Value has been calibrated.

2.2XXXX The Maximum Signal Value will be calibrated when the full range signal is applied and the key **UP** is pressed. The display shows **AC HI**. Press the key **ACK** and keep it pressed until the display shows **EE StO**.
The maximum signal value has been calibrated.

rES The Display shortly shows **rES** and switches into the measuring mode. The display corresponds to the **SEt HI** value programmed in the main menu.

SP1 Set Point 1 and the Relays 1 are activated.

SP2 Set Point 2 and the Relays 2 are activated.

CC 7 Cold Junction Compensation. The number represents a correction factor for precision adjustment of the compensator used inside the instrument. This factor is being set during the factory calibration and can be readjusted at any time upon demand.

StArt Measuring Mode

7 CALIBRATION

7.1 Calibration of linear signals DC and AC

The calibration steps are described in §6, Service Menu and *HtESt*. Linear signals such as 4-20mA, 0-1V can be calibrated as described.

7.2 Calibration of non-linear signals (Tables)

Input signals such as RTD Thermometer and Thermocouples will be linearized as follows:

7.2.1 Calibration of Pt-100 Thermometer

Jumper	Pt-100
H4	1 + 2
H5	1 + 2
H3	---
R44	18k Resistor 1%

SEnS LinEAr
Set LO 0
Set HI 100

In the *HtESt* calibrate with 0 Ohm and 100 Ohm. After the calibration is finished, switch OFF and ON again.

SEnS select Pt 100 in the Menu.

Switch into the measuring mode with ACK. The Display follows the temperature of Pt-100 in a range from -200 to 600°C.

7.2.2 Calibration of Thermocouples

Jumper	Thermocouples
H4	1 + 2
H5	1 + 2
H3	---
R44	5k6 Resistor 1%

SEnS LinEAr
Set LO 0
Set HI 100 (100 = 100 mV)

In the *HtESt* calibrate with 0 und 100mV. After the calibration is finished, switch OFF and ON again.

SEnS Select the required T/C in the Menu. Switch into the measuring mode with ACK. The Display follows the temperature of the selected T/C within its defined range.

The cold junction is compensated with SMT160 connected to the terminal block.

7.3 Calculation of R44

When the individual measuring range by using R44 is selected, following has to be considered:

The AD-C type LT2400 is designed for bipolar operation. Its zero reference point is set to +1.25V. Since R44 determines the gain of the input amplifier INA118, its output signal (Pin 6) has to be within 0 and 2.500V for the full range of the input signal. For Zero input is Pin 6 = 1.25V. For maximum negative input is Pin 6 = 2.500V. For maximum positive input is Pin 6 = 0V. It is important to calculate R44 such that the signal swing at the output of INA118 (Pin 6) never goes below 0V and above 2.500V.

The calibration mode in the *HtESt* shows the range of the input signal (§ 6). When zero signal is applied, the display shows the reference voltage of 1.25xx V. With a maximum signal the display will show 2.500V. It is recommended to set R44 such that the display arrives at 2.2xxx with the maximum value if the input signal. This will permit 10% overload of the input.

$$R44 = \frac{50k\Omega}{G - 1}$$

G = Gain

8 BURST TEST and RECOMENDED GROUNDING

Tester: Burst-Surge Generator HILO, Model CE-Tester
E.U.T.: OC351, SN: 00001, Supply 230VA
Mode: Linear, Set LO = 00000, Set HI = 10000
Input: 4-20mA
Display: 10 000

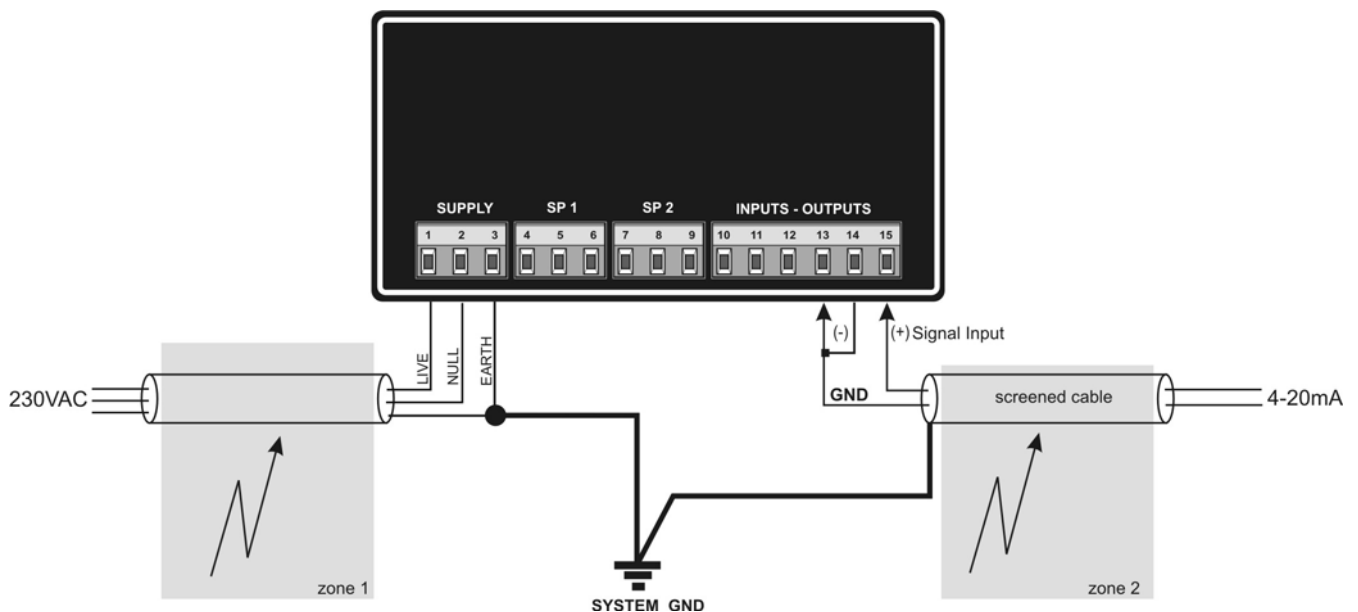
8.1 Test Conditions

Electrical Safety: EN 61 010-1 + A2.

The instrument fulfil the requirement of the norms:

EN 55 022, class B and EN 61000-4-2, -4, -5, -6, -8, -9, -10, -11.

8.2 Test Set - Up



8.3 Test Results

Zone 1:	2kV Burst	Display 10 000 without change
Zone 2:	2kV Burst	Display 10 000 without change

CE Approval through VTUE Prague, experimental laboratory No. 1158 accredited by CIA, o.p.s. with EN ISO/IEC 17025