OC 7166
DUAL MULTIFUNCTIONS
COUNTER

OWNER´S MANUAL

Vor dem Einschalten

Überzeugen Sie sich, ob Ihre Sendung das richtige Gerät Orbit Controls Modell OC 7166 beinhaltet, einschliesslich einer Betriebsanleitung OC 7166.
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 1 730 2753 oder Fax: +41 1 730 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 7166 Programmable Controller.
Operator's Manual OC 7166.
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 +411 730 2753 or Fax +411 730 2783 and to the shipping agent.
The carrier will not honor demage 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.

INDEX

Dual Multifunction Counter OC7166

√ **Two Signal Channels P and S**
√ **Incremental – Positioning Counter**
√ **Dual Frequency Counter - Tachometer**
√ **Dual Up-Down Counter**
√ **Dual Period Counter**
√ **Display selection: P or S**
P + S, P - S
P : S, P x S
√ **Max. and Min. Display Memory**
√ **Display HOLD**
√ **Free scalable**
√ **RS 232, RS 485,**
√ **BCD-parallel**
√ **Analog Output 0/4-20mA and 0-10V**
√ **Four Relay Outputs**

Orbit Controls Model OC7166 is a 6 digit dual counter with two inputs P and S. The two counters operate independently from each other. The common display can be selected to show the results of the counter P or the counter S, the addition P+S, the subtraction P-S, the multiplication PxS or the division P:S. The display function is selected with the keypad at the front.

The instrument´s menu offers independant parameter settings in each counter which permits each counter to be scaled in different process units.

The displayed results can be sent via the serial or the parallel port to PC, large display, programmable controller or other supervisory unit.

Two Analog outputs are generated simultaneously and can be assigned with the keypad to any two display values.

Four Set Points with open collector transistors or with four mechanical relay can be used for contol purposes.

The data ports, analog outputs and set points can be assigned to the signal channel P or S, P+S, P-S, PxS or P:S.

For supplying of external sensors adjustable excitation between 5 and 24V is available.

OC7166 permits measurements in one or two channels as a Quadrature Counter with two 90° phase shifted input signals A and B, Tachometer-Frequency Counter, Up-Down Counter or Period Counter.

If only one channel is used for measurements, the second channel can be used for Display Hold.

Quadrature Counter uses two 90° phase shifted signals A and B from resolvers. With the keypad the function as Incremental Positioning counter or bi-directional Tachometer can be selected. The display can be also programmed for angular measurements with resolution of up to 359.999º.

Frequency Counter is suitable for measuring of frequencies between 0.001Hz and 100 kHz. By using Scaling, the input frequency can be displayed in required process units such as RPM, m/sec, liter/min. etc.

By using signals A and B from resolvers, the display can be programmed as Tachometer with recognition of revolving direction.

The frequency - tachometry measurements can be performed simultaneously in both signal channels P and S.

Up-Down Counter function can be programmed in two channels P and S or in one channel only. The counting direction Up or Down is determined by the logical signal at the corresponding input. Also a Reset-input is provided to set the display to zero.

Period Counter measures the period time of periodical signals. The display can be resolved up to 10 μs.

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Scaling of the display is achived by multiplication with a six digit constant with decimal point and sign. The scale is programmable from 0.00001 to $\pm$ 999999 and permits the display to measure in process units such as kg, liter, RPM, m/sec., liter/h etc. The scale can be independently programmed in both signal channels P and S. In the menu is it assigned as *SCAL P* and *SCAL S*.

Set - is an additive six digit constant with decimal point and sign, programmable from 0.00000 to $\pm$999999. The set will be added to the input signal and acts at the display as digital offset. It is programmable in both channels and in the menu it is assigned as *SET P* and *SET S*.

Four Set Points *SP1, SP2, SP3* and *SP4* – can be programmed within the entire display range from 0 to $\pm$999999. Each set point has programmable hystereze. The corresponding transistor or relay output is activated as soon as the display arrives at or is larger than the set point. The set points can be assigned to displays P, S, P + S, P - S, P x S or P : S.

Two Analog Outputs -10V ... +10V and 0/4-20mA are generated simultaneously and have 12 bit resolution. They can be assigned to two display values in the menu steps *AOut L* and *AOut H* in all display modes P, S, P + S, P - S, P x S or P : S. They can be selected as direct acting or inverted. The current output can be set for 0 or 4mA.

BCD parallel data outputs is available as option. The data port is activated in the menu step *Outbcd* and can be programmed for positive or gegative logic. Open Collector or Emitor outputs are available.

Serial Data Ports RS232 and RS485 with 8 bit, no parity, 1 start, 1 stop, and with programmable baud rate from 1200 to 19200 bd is available as option. Up to 31 instruments can be connected to one RS485-data bus and activate with and address.
For Windows applications a communication programm is available.

In the frequency mode two parameters *FbASE* and *ObASE* can be programmed. The *FbASE* determines the sampling time and is programmable between 0.025 and 3 sec. The *ObASE* is the reset time and is programmable from 0.05 to 1000 sec.The reset time determines the lowest frequency. When programmed for 1000 sec, the lowest frequency which can be measured is 0.001Hz.
The sampling time *FbASE* determines the display refresh and also the refresh of the data and the analog outputs.

Password is programmable in the menu step *St PASS* as one of 20 stored number combinations. To enter the menu and to change the parameters, the correct password has to be entered. With uncorrect password the menu is locked.

Memory of the maximum and the minimum value which the display achives during the measurement can be activated in one signal channel (P or S). The stored values can be recaled with the keys UP or DOWN. The key ACK resets the memory.
This memory function requires a software version 7166_V23MM.hex, CS 325E.

1   SPECIFICATIONS

Inputs:
Two signal channels P and S, positive pulses 5V TTL, protected to 28V.
Quadrature Counter: DC - 100 kHz.
Up-Down Counter: DC - 100 kHz.
Freuqency Counter: 0.001Hz - 100 kHz.
Period Counter: 10 μs - 1000 sec.

Each signal channel has three inputs:
Pulse Input: INP1 (Pin 21) and INP4 (Pin 15)
Direction: INP2 (Pin 19) and INP5 (Pin 13)
Reset: INP3 (Pin 17) and INP6 (Pin 11)
The trigger level of INP1 and INP4, INP2 and INP5, INP3 and INP6 is adjustable
Inside the instrument with three potentiometers - § 14.2.

Display:
6 digit, 7 segment red LED display, 14.5mm digits.
Display capacity: 0 ... ± 999999. At overrange the display switches into
exponential form, e.g.: 1234E6.

Arithmetics: 4 byte floating point with autorange.

Sampling: In the menu step *FbASE* is the sampling time programmable from 0.025 to 3sec.

Reset: In the menu step *ObASE* is the reset time programmable from 0.05 to 1000sec.

Accuracy: Production calibration at 5ppm. Software calibration available in service menu - § 10.

Tempco: 50ppm/ K

Scale:
SCAL P and *SCAL S* multiplication constants for signal channel P and S, programmable
from ± 0.00001 to ± 999999.

Set Points:
SP1 ... SP4 programmable between ± 0.00001 and ± 999999, with four NPN open-collector transistors 60V/100mA. The set points can be locked in menu step *SP FCE.*
Each output can be set as activ or non-activ.
Option: Four Relay 5A - 230VAC.

Hystereze: ± 0.00001 and ± 999999. free programmable.

Outputs:
Two isolated analog outputs are generated simultaneously:
Voltage output: -10V ... 10V, max. load 10 kOhm.
Current output: 0/4 - 20mA, shunt 0 ... 400 Ohm.
Isolation 250V RMS.

Serial Ports:
Two isolated serial ports are available as option: RS232 and RS485, with 8 Bit, 1 Start and
1 Stop, no Parity, 1200 to 19200 bd and address 00 to 31. The address 00 activates
automaticaly RS232. One of addresses 01-31 activates RS485. Isolation 250V r.m.s.

BCD parallel:
Isolated BCD parallel data output of all 6 digits are optionaly available.
Logic type: 1-2-4-8:   Open Collector 48V/100mA per each output.
                       Emmiter Follower 50mA/output, with external supply 5 ... 48V.

Display Hold: Option: In application where channel P is used, the display hold can be initialized with external logic signal in channel S, Pin 15.
Signal level 5VTTL to 28V.   log 0: Display HOLD
                                                      log 1: Display count

Keyboard: Five keys UP, DOWN, ACK, MENU and SET.

Password: Password selection in the menu step *St PASS* for locking the keyboard against unauthorized entry.

Resolution: The display resolution can be set in the menu step *Ord P* and *Ord S*.

Brightness: The display brightness can be set in 8 steps with the key ACK.

Supply: 115V/230V ±10%, 50-60Hz/8VA. Fuse 80mA-T/230V, 160mA-T/115V.
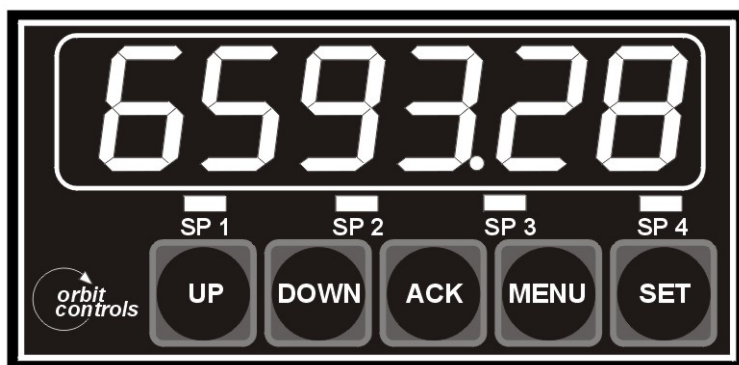Option: DC supply 9-36V/6W.

Excitation: Adjustable inside the instrument between 5 and 24V/40mA.

Cabinet: DIN 48 x 96 x 150. Panel cut-out 45 x 93 mm.

Terminals: Plugable screw terminals 16- and 22- pins.

Communication: Option: Soft Manager under Windows 95/98 at a diskette.

2   KEYBOARD

2.1   Key Function

UP   Parameter setting during programming. In measure mode: Display selection of channel P.
            Memory recal of the maximum stored display value (only with SW 7166_V23MM.hex).
DOWN   Parameter setting during programming. In measure mode: Display selection of channel S.
            Memory recal of the minimum stored display value (only with SW 7166_V23MM.hex).
ACK   Confirmation of the menu step during programming. Brightness in measure mode.
            Memory reset of the maximum stored display value (only with SW 7166_V23MM.hex).
MENU   Enter the menu.
SET   Termination of the menu, switching into measuring mode. In the measuring mode: seting of
            SET or RESET.

3   START

After power-on, the program from EEPROM is read by the microcontroller and the instrument is programmed for the function. The display shortly shows the model and the software revision and switches into the measuring mode. The display capacita is ±999999. At the overrange the display switches into exponential form, e.g. 1234E6.

4   MODE OF OPERATION

OC7166 counter has two signal channels with each 3 inputs. The signal channels are assigned as P (primary) and S (secondary). The submeny have corresponding sufixes.
The three inputs have following functions:

INP 1 and INP 4	=	Signal Input
INP 2 and INP 5	=	Counting Direction
INP 3 and INP 6	=	Reset

The function is programmable in menu steps *Cnt P* and *Cnt S*:

OFF: Signal channel OFF. This function will be selected when measuring in only one channel is selected. The second - not used - channel will be switched-off.

qUAd C: Up-Down Counter - positioning counter - for signals from quadrature resolvers with 90° phase shifted output signals A and B. The display counts up or down, depending on the phase shift of the output signals. Two incremental sensors can be connected to the inputs INP 1 (INP 4) and INP 2 (INP 6).

Updn C: Up-Counter with controlled input. The pulses are connected to the input INP 1 or INP 4. The inputs INP 2 and INP 5 control the counter ON and OFF. With logic signal 0 at INP 2 (INP 5) increments the display. Logic signal 1 stops the counter.

Ud ic C   Up - Down Counter with controlled counting direction. The pulses are connected to INP 1 or INP 4. The inputs INP 2 and INP 5 control the counting direction. With logic signal 0 at INP2 (INP 5) increments the counter UP. With logic signal 1 increments the counter DOWN.

qUAd F   Tachometer-Frequency Counter for Quadrature Signals from incremental resolvers with output signals A and B. This counter function is mainly dedicated to speed or RPM measurement at which also the direction has to be controlled

UPdn F   Tachometer-Frequency Counter with control input for ON and OFF. The pulses are connected to inputs INP 1 or INP 4. Logic signal 0 at INP 2 (INP 5) enables the display function for counting. Logic signal 1 causes the display to stop.

Udic F   UP - DOWN Tachometer Frequency Counter with control input. The pulses are connected to to inputs INP 1 or INP 4. Logic signal 0 at INP 2 (INP 5) causes the display to count in + direction. Logic signal 1 causes the display to illuminate the minus sign.

OFF.HLd   When programmed in signal channel S, the HOLD-function will be activated in signal channel P. For each counter function programmed in channel P, a logic signal 1 at input INP4 causes DISPLAY HOLD. The internal counter continu incrementing the input pulses. For connection see Fig. § 9.7.

OFF.Cnn   Memory of the max. and the min. values of one signal channel P or S. Only one channel can be activated (e.g. Cnt P=Udic F), the other channel has to be closed (e.g. Cnt S = OFF.Cnn). The key UP recals the maximum value, the key DOWN recals the minimum value. The key ACK resets the memory (display confirms with CLUPdn).

4.1 Signal Inputs

Funktion	INP 1	INP 2	INP 3	INP 4	INP 5	INP 6
QUAdr C (F)	A1	B1	reset P	A2	B2	reset S
Up dn C (F)	pulses P	ON/OFF P	reset P	pulses S	ON/OFF S	reset S
Ud ic C (F)	pulses P	control signal P	reset P	pulses S	control signal S	reset S

5 MEASURE MODE

After power-on the internal counters are set to zero. The parameters from internal nonvolatile memory are entered int two ASIC circuits, programming thus the counter function. When incremental or up-down function is programmed, the last reading before the power has been switched-off is entered into the display.

The frequency or pulses are processed, scaled, preset added and shown at the display. The display shows the results of each channel, or the addition, subtraction, multiplication or division.

At frequency measurements also the period length can be displayed.

The selection of *Ord P* or *Ord S* determines the resolution.

The both channels process the input signals, measure frequencies or period. The first channel is P, the second S. The P-channel has the scale constant *SCAL P*, the offset *SEt P*, the resolution *Ord P* and the selection *Cnt P*. The S-channel has the scale constant *SCAL S*, the offset *SEt S*, the resolution *Ord S* and the selecttion *Cnt S*.

The display shows: Display P = Imp1 x SCAL P + SET P (Imp1 = pulses in channel P)
Display S = Imp2 x SCAL S + SET S (Imp2 = pulses in channel S)

When the frequency measurement is activated, the *FbASE* (smapling time) and the *ObASE* (Resettime) can be programmed according to the application.

> **NOTE** When the application requires measurement in one channel only, the second channel has to be switched-off.
>
> Example: Measuring in signal channel P
> Menu step Ctr S = OFF

5.1 Channel selection with the keyboard

During measurements the channels can be selectively shown at the display by using the keys UP or DOWN.

As long as the key UP is pressed, the display shows:
When released, the display shows the results of the
signal channel P.

As long as the key DOWN is pressed, the display shows:
When released, the display shows the results of the
signal channel S.

5.2   Reset and Set
In the mode as Incremental or Up-Down Counter, the preprogrammed offset values *Set P* and   *Set S*
can be entered into the display with the keyboard or with external logic signal.

5.2.1   Reset and Set with keyboard
The desired function is selected with SET , executed ACK.

Key	Display	Function	
SET	SEt P	*Set P*	Preset in channel P selected
SET	rSt P	*rSt P*	Reset in channel P selected
SET	SEt S	*Set S*	Preset in channel S selected
SET	rSt S	*rSt S*	Reset in channel S selected
ACK	rEAdY	*rEAdY*	The selected function is executed

5.2.2   Set with external control signal input
The control signal is connected to INP 3 or INP 6. The menu steps **rSt P** and **rSt S** has to be
programmed **rSt L** .

Log. signal 0 = SET is entered
Log. signal 1 = Display counts

6   OUTPUTS
Two analog outputs, for set points and two serial ports and BCD parallel data port are generated.They
can be assigned to any counter mode. They are generated and controlled independently of the selected
display.

6.1   Analog Outputs
The analog output has menu steps *AOUt L*, *AOUt H, Fn AnL* and *OUtAnL* and can be assigned to P or S,
independently of the display function. The analog output can be programmed in menu step *Fn AnL* and
OUtAnL is direct acting or inverted.

6.2   BCD parallel - Data Port
BCD parallel port from all 6 digits is option and can be activated in the menu step *Out bcd* and selected
for positive or negative logic. Open Collector or Emitter Follower are available.

6.3 Set Points

The Set Points are selectable in following menu steps: *SP1 - SP4, HSt1 - HSt4, FnrEL1 - FnrEL4* and *rEL1 - rEL4*. They can be controlled from P or S channels, independently of the selected display function. They can be set for activ or not-activ at the alarm conditions in the menu step *FnrEL* and *rEL*.

6.4 Serial Data Ports

RS232 and RS485 are generated simultaneously. The baud rate is programmable in the menu step *bAUd*.

The RS232 has a request mode and transmits the data after receipt of any ASCII symbol, which is terminated by <CR> <LF>.

The RS485 transmits the data after receipt of two byte. The first byte is the address, the second byte is <44H = D>. The address contains the number 128 plus the address instrument's address (1-31). The string has to be terminated by <CR> <LF>. The line can be selected for 2 or 4 wire connection with jumpers inside the option card. The type of the serial port can be selected in the menu step *rS SEL*.

7 MENU STEPS

The key MENU opens the menu. Wit the same key the menu can scroll at the display. The required menu step will be confirmed with ACK. The parameter selection is with UP or DOWN. The flashing digit - coursor - can be positioned with ACK. When with the key ACK the flashing digit is moved out of the display, the decimal point and the sign can be set. The key UP sets the decimal point, the key DOWN the sign. Each parameter change is automaticaly stored in nonvolatile memory.

PASS   The Password is required to enter the menu. The password combinations are memorized in the menu step *StPASS*.

SP 1   Set Point 1 with output transisitor or relay. Setting from 0.00000 to ± 999999.

HSt 1   Hystereze 1 selectable from 0.00000 to ± 999999.

FnrEL1   Assignement of the SP1 to one of the signal channels P or S:
                FrE P   Signal channel P
                FrE S   Signal channel S
                Fr Add   P + S
                Fr SUb   P - S
                Fr qUA   P x S
                Fr div   P : S
                ti   P   Signal channel P
                ti   S   Signal channel S
                ti Add   P + S
                ti Sub   P - S
                ti qUA   P x S
                ti div   P : S

rEL1   Selection for OPEN or CLOSE when SP1 is activated.

SP 2, HSt 2, FnrEL2, rEL 2   ... same as SP1
SP 3, HSt 3, FnrEL3, rEL 3   ... same as SP1
SP 4, HSt 4, FnrEL4, rEL 4   ... same as SP1

OUtAnl   Analog Output: *OFF*, *Out LH* (direct acting), *Out HL* (inverted).

Outbcd   *OFF* (BCD parallel off),   *tPc L*   negative logik, open collector
                                          tPc H   positive logik, open collector
                                          tPE L   *n*egative lLogik, emitter follower
                                          tPE H   *p*ositive logik, emiter follower

AOUt L   Display value assigned to analog output of 0/4mA and -10V.

AOUt H   Display value assigned to analog output 20mA and +10V.

Fn AnL   Assignement of the analog output to one of the signal channels P or S:

           FrE P   P
           FrE S   S
           Fr Add   P+S
           Fr SUb   P-S
           Fr qUA   PxS
   Fr div   P:S
           ti   P   P
           ti   S   S
           ti Add   P+S
           ti Sub   P-S
           ti qUA   PxS
           ti div   P:S

Analog Outputs vs. Display

TYP	DISPLAY <L	L < DISPLAY > H	DISPLAY > H
OUt LH	-10V, 0/4mA	-10V ... 10V, 0/4 ... 20mA	+10V, 20mA
OUt HL	+10V, 20mA	-10V ... 10V, 0/4 ... 20mA	-10V, 0/4mA

FbASE   Sampling time in frequency measurements, refresh time for analog and data outputs and
           performing of the arithmetic operations. Selection from 0.025 to 3 sec.

ObASE   Reset time in frequency measurements, selectable from 0.05 to 1000 sek. The reset time
           determines the lowest measured frequency. When no puls arrives at the input during the
           programmed reset time, the display resets to zero.

Ord P   Display resolution of the channel P. Selection from *C.ddddd* to *CCCCCC,* whereas the *d*
           Is the resolution after the decimal point.

SCAL P   Multiplicative constant - scale - of the signal channel *P*. Selection from 0.00001 to $\pm$999999.

SEt P   Additive constant - Offset - of the signal channel *P*. Selection from 0.00001 to $\pm$ 999999.

rSt P   Logic signal for the Reset of channel *P*. Selection between r*St L* and *rSt H*.
           When the reset is entered via the keyboard, *rSt H* has to be programmed.
   When the reset is entered with external signal, *rSt L* has to be programmed.

|	
Cnt P	Function of the counter *P*. Selection between *OFF*, *qUAd C* (Quadrature counter), *UPdn* (Up-Counter with control input), *Udic C* (Up-Down Counter with controlled direction), *qUAd F* (Quadrature Tachometer), *Updn F* (Tachometer with control input), *Udic F* (Up-Down Tachometer with controlled direction) and *OFF.HLd* (Hold Funktion of the signal channel *S*) as described in § 4.
Ord S	Display resolution of the channel S. Selection from *C.ddddd* to *CCCCCC,* whereas the *d* Is the resolution after the decimal point.
SCAL S	Multiplicative constant - scale - of the signal channel *S*. Selection from 0.00001 to ±999999.
SEt S	Additive constant - Offset - of the signal channel *P*. Selection from 0.00001 to ± 999999.
rSt S	Logic signal for the Reset of channel *S*. Selection between r*St L* and *rSt H*. When the reset is entered via the keyboard, *rSt H* has to be programmed. When the reset is entered with external signal, *rSt L* has to be programmed.
Cnt S	Function of the counter *S*. Selection between *OFF*, *qUAd C* (Quadrature counter), *UPdn* (Up-Counter with control input), *Udic C* (Up-Down Counter with controlled direction), *qUAd F* (Quadrature Tachometer), *Updn F* (Tachometer with control input), *Udic F* (Up-Down Tachometer with controlled direction) and *OFF.HLd* (Hold Funktion of the signal channel *P*) as described in § 4.
Fn dSP	Selection of the display for functions: *FrE P* (P), *FrE S* (S), *Fr Add* (P+S), *Fr SUb* (P-S), *Fr Qua* (PxS), *Fr dIv* (P:S), *ti P* (Period *P*), *ti S* (Period *S*), *ti Add* (P+S), *ti Sub* (P-S), *ti qUA* (PxS) and *ti div* (P:S).
bAUd	Baud rate of the serial data port programmable between 1200 and 19200 bd.
rS SEL	Selection of RS232 or RS485 with address Adr 01 ... Adr 31.
St PASS	Selection of one from 20 stored password combinations. Default: 1001.

8   COUNTER - REAR VIEW
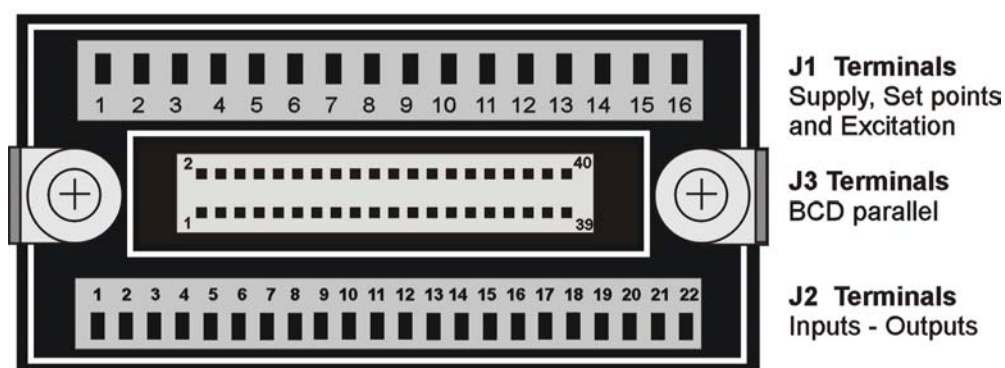
9 TERMINALS

## 9.1 J1 - Upper Terminals, Supply 230V AC, Relay Outputs
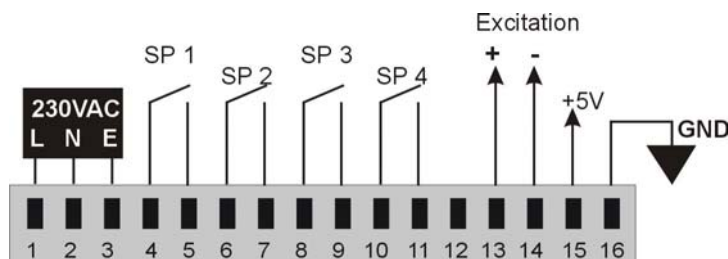
## 9.2 J1 - Upper Terminals, Supply 24VDC, Transistor Outputs
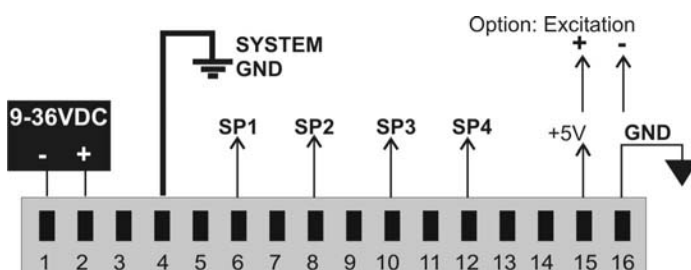
9.3 J2 - Lower Terminals, Input and Output Signals

| Anschluss	Bezeichnung	Funktion	Legende
22	GND 1	GND 1	GND input 1
21	INP 1	Signal input 1	Frequency P (or Quadrature A1)
20	GND 2	GND 2	GND input 2
19	INP 2	Signal input 2	Direction P (or Quadrature B1)
18	GND 3	GND 3	GND Input 3
17	INP 3	Signal input 3	Reset 1
16	GND 4	GND 4	GND Input 4
15	INP 4	Signal input 4	Frequency S or Quadrature A2
14	GND 5	GND 5	GND Input 5
13	INP 5	Signal input 5	Direction S or Quadrature B2
12	GND 6	GND 6	GND Input 6
11	INP 6	Signal input 6	Reset 2
10	0/4-20mA	Isol. Current analog output	0/4-20mA output
9	10V	Isol. Voltage analog output	-10 ... +10V output
8	ISO-ANA GND	Isol. GND of analog outputs	Isol. GND analog output
7	RxD	RxD RS232 output	Serial port RS232
6	TxD	TxD RS232 output	Serial port RS232
5	ISO-RS GND	Isol GND of RS serial ports	Isol. GND RS232 and RS485
4	RS485 +	Output + RS485	Two or four wire selectable inside the instrument with jumpers SW1 and SW2 - see § 12.
3	RS485 -	Output - RS485	
2	RS485 +	In-Out + RS485	
1	RS485 -	In-Out - RS485	

9.4   J2 - Terminals, Inputs and Outputs
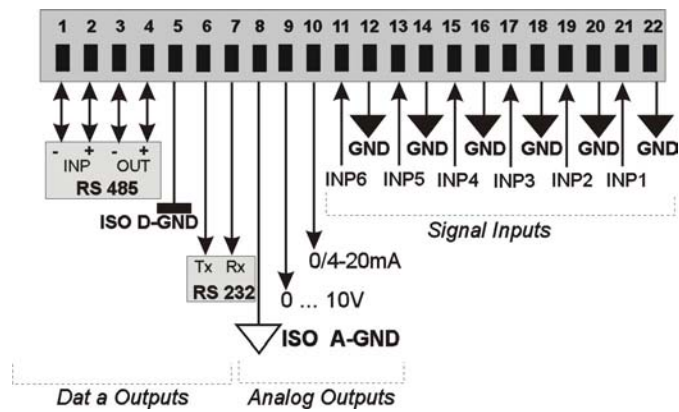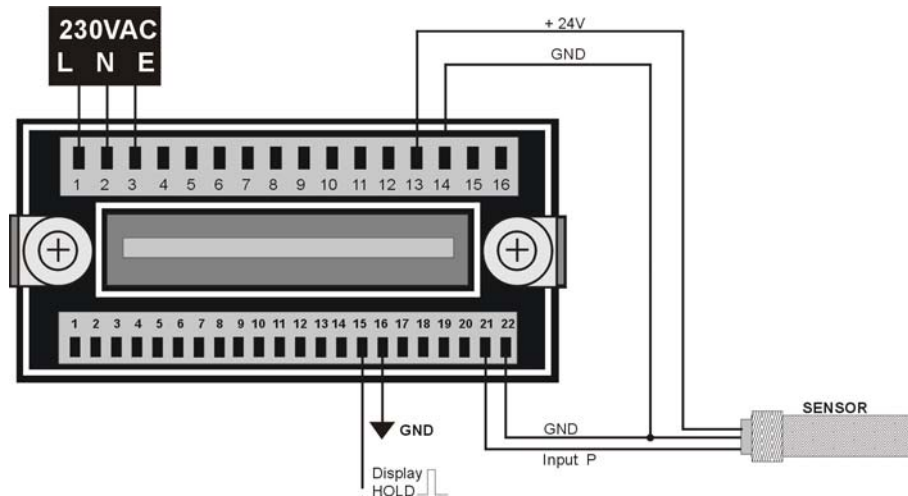

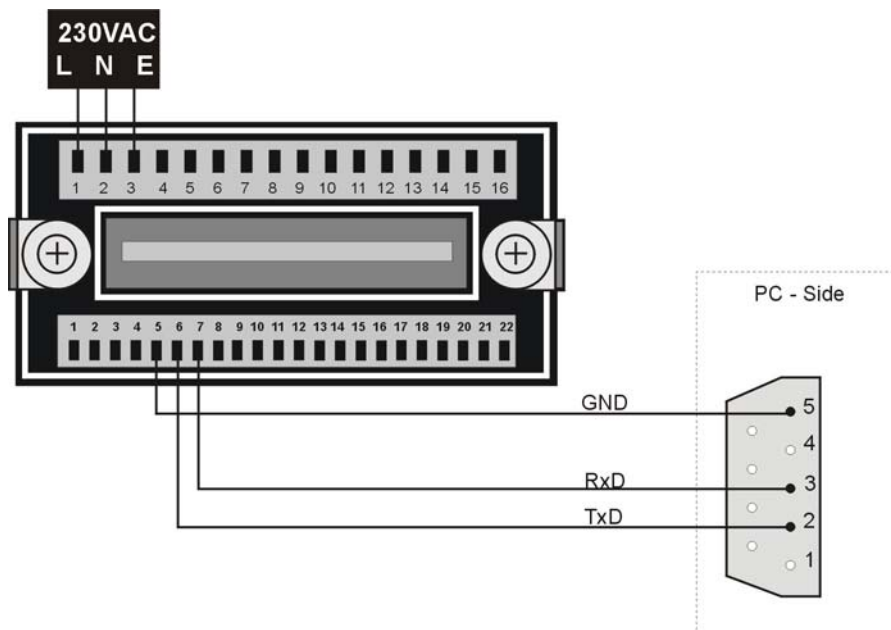## 9.5   J2 - Dual - Frequency Measurements
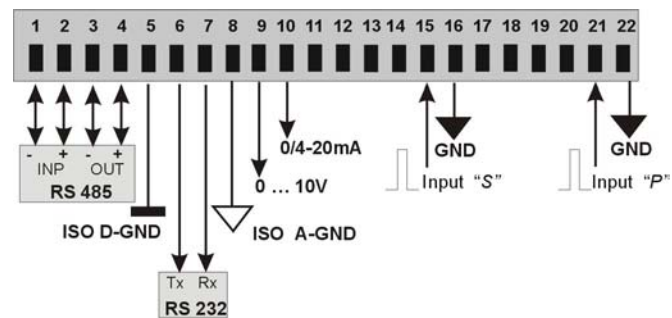
9.6   J2 - Connection of two pick-offs
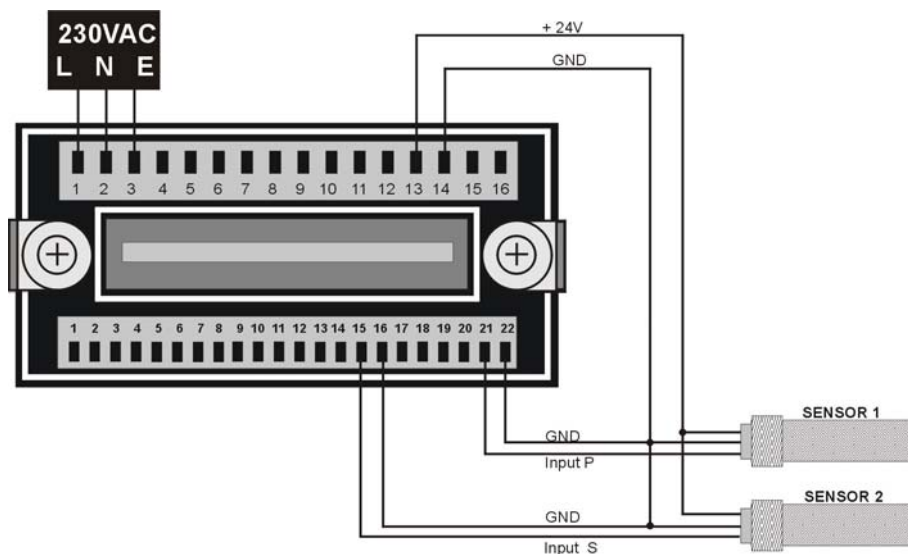
9.7   J2 - Connection of one pic-off and Display Hold

9.8   J2 - Connection to PC via RS232

10   H - TEST and CALIBRATION

The main Manu contains a Test-Submenu in which different testing and calibration procedures can be performed.

To enter this Sub-Menu, press the key MENU while switching-on the instrument. Keep it pressed as long as the displa shows *HtESt*. With the key MENU the test steps are incremented vorwards, with SET backwards.

First are tested the display segments, than the set points *SP1...SP4* and the LEDs of the display, than the analog outputs *Out-10, Out-5, Out 0, Out 5, Out 10*. During this steps the analog outputs are generated and can be measured at the output terminals. Upon demand, they can be calibrated inside at the analog output option card, as shown at § 11.1.

The next step in the Sub-Menu is *HCF XXX* . The number XXX can be selected with UP or DOWN between 1 and 255. The number corresponds to installed options. By using of more options is this number given by addition of corresponding options.

HCF   1   Relay 1
HCF   2   Rely 2
HCF   4   Rely 3
HCF   8   Rely 4
HCF   16   Analog Output
HCF   32   RS232, RS485 (BAUD)
HCF   64   RS485 (ADDRESS)
HCF   128   Last reading memory in EEPROM (only as incremental counter)

EXAMPLE: When the analog output and SP1 and SP2 are installed, ist the HCF=19 (1+2+16). The other not installed options are suppressed in the menu.
HCF = 255 will be programmed when all options are installed.

The last step in the *HtEST* is the calibration of internal quartz time base. This has been calibrated very precisly during the production. If however a recalibration required, a precise frequency source has to be connected to the input P or S and the display programmed for frequency counter. In the *HtESt* the step *CAL* mus be selected. The number displayed can be increased or lowered with UP or DOWN. This number is an internal scale which adjusts the quartz base.
IMPORTANT: Each parameter adjustment has to be confirmed with ACK in order to be stored in the internal memory.
The key MENU terminates the Test Sub-Menu and starts the measuring mode.

11   ANALOG OUTPUT   (Option card OC 4000A)

Two analog outputs are generated simultaneously. They are calibrated at the factory for 4-20mA and 0-10V. They can however be set for 0-20mA and 0 ... ±10V. The Fig. Bellow shows the layout.
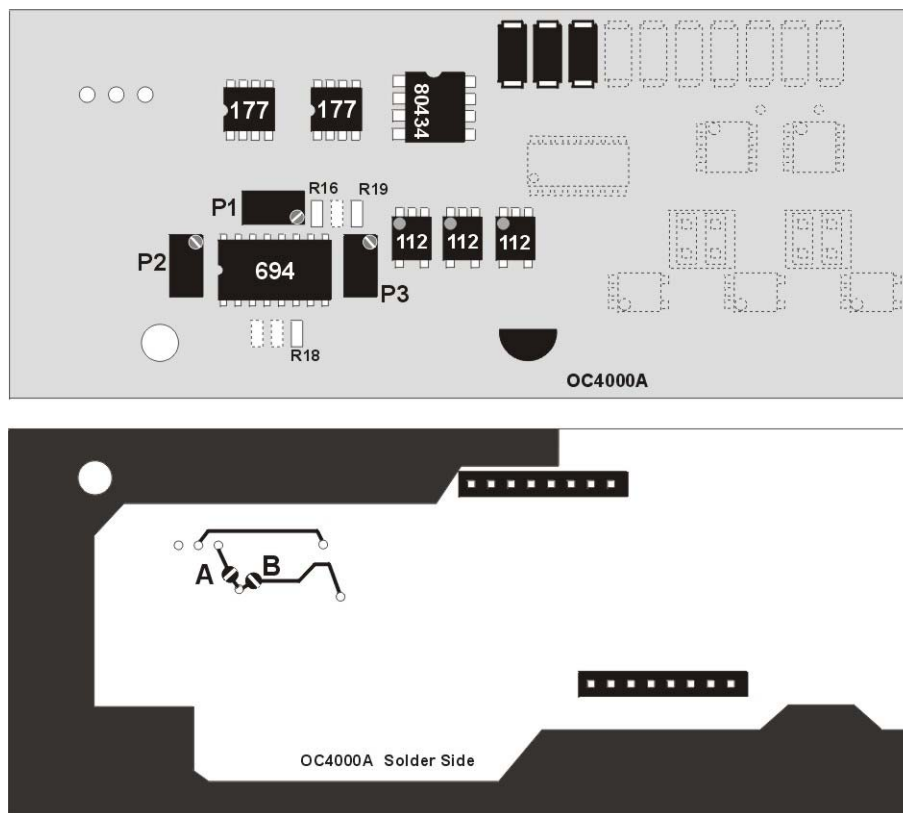
Analog Ausgang	Komponenten und Lötbrücken
0...10V and 0-20mA	R16 not used, A = open, B = closed
0...10V and 420mA	R16, R18, R19 not used, A = closed, B = open
-10...10V and 0-20mA	A = open, B = closed
-10...10V and 4-20mA	R18, R19 not used, A = closed, B = open

11.1   Analog Output - Calibration

Start the *HtESt* as described in § 10. Use precise current and voltage digital instruments with accuracy of ± 0.005% and connect them to the analog outputs 8 (GND), 9 (±10V) and 10 (0/4-20mA).

1.   In *HtESt* select OUt -10.
         With P3 adjust 0 or 4mA, and 0V.
         With P1 adjust -10V. (When 0...10V is selected, P1 is not acting).

2.   In *HtESt* select OUt +10.
         With P2 adjust +10V, and 20mA.

3.   Check again all outputs and correct if necessary.

12   SERIAL DATA PORTS (Option card OC 4000A)

Two serial data ports RS232 and RS485 are available and simultaneously generated. The data format contains 8 bit, no parity, 1 Start and 1 Stop, baud rate programmable from 1200 to 19200 bd. The RS485 has programmable address which allowes connection of up to 31 instruments at one data bus.

J2 - Serial Data Ports
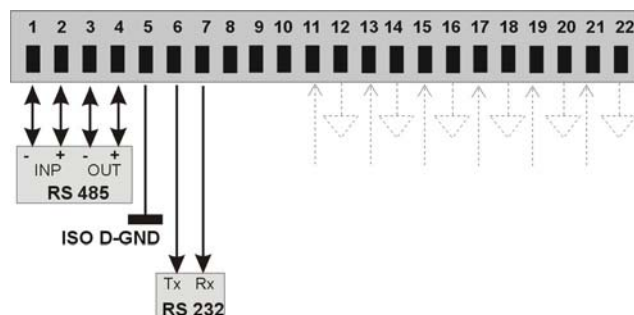
Option card OC4000A
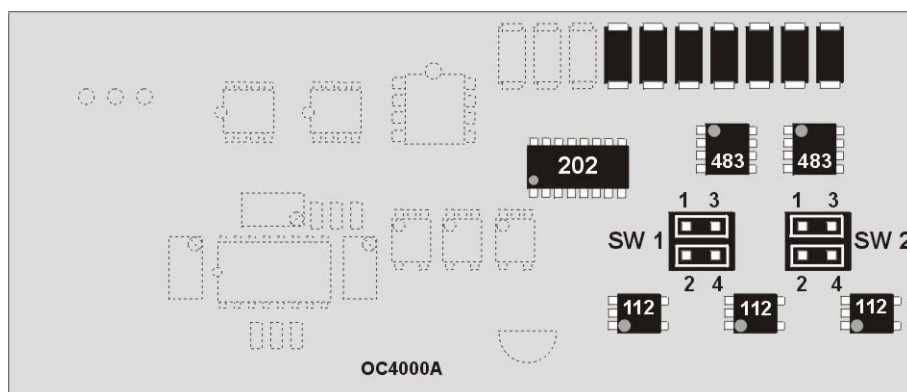
RS 485 - Two and Four Wire Connections

RS485			
	SW1	SW2	J2 - connection pins
Two wire	1 – 2	1 – 3	Pin 1= -, Pin 2 = +
	3 – 4	2 – 4	Pin 3, Pin 4 = not used
Four wire	1 – 3	1 – 3	Pin 1 = Input -, Pin 2 = Input +
	2 – 4	2 – 4	Pin 3 = Output -, Pin 4 = Output +

12.1   Data Format RS 232

Data Format: 8 bit, no Parity, 1 Start and 1 Stop
                   Baud Rate 1200 to 19200 bd.

Request mode: Signal channel P: The PC sends *A* the instrument answers with one telegram
                                        terminated with **<CR> <LF>**.
                   Signal channel S: The PC sends *B* the instrument answers with one telegram
                                        terminated with **<CR> <LF>**.

12.2   Data Format RS 485

Data Format: 8 bit, no Parity, 1 Start and 1 Stop
                   Baud Rate 1200 to 19200 bd.
                   Address programmable from 01 to 31. Up to 31 instruments can be connected to
                   one data bus and individually activated with the address.

Request Mode: The PC sends two Bytes. The first Byte is the **Address**, the second Byte is **A** or **B**.
                   The **A** is for request of the channel **P**, the **B** for channel **S**. The instrument answers
                   with one telegram, terminated with **<CR> <LF>**.

                   First Byte   The *Address* contains the number 128 plus the in the menu
                                       selected address (1 ... 31). For an instrument with address 1
                                       is the first Byte 129 (1 + 128).

                   Second Byte   **A** is $41_H = 65_D$
                                       B is $42_H = 66_D$

13   BCD PARALLEL DATA PORTS

The displayed Data can be send via a BCD parallel port. The corresponding hardware optional card has to be installed, the menu step *Out bcd* activated and positive or negative logic selected. The optional card can be ordered with open collectors od emitter follower logic. The emitter followers require external supply voltage 5 … 45VDC.

BCD parallel
Data terminals
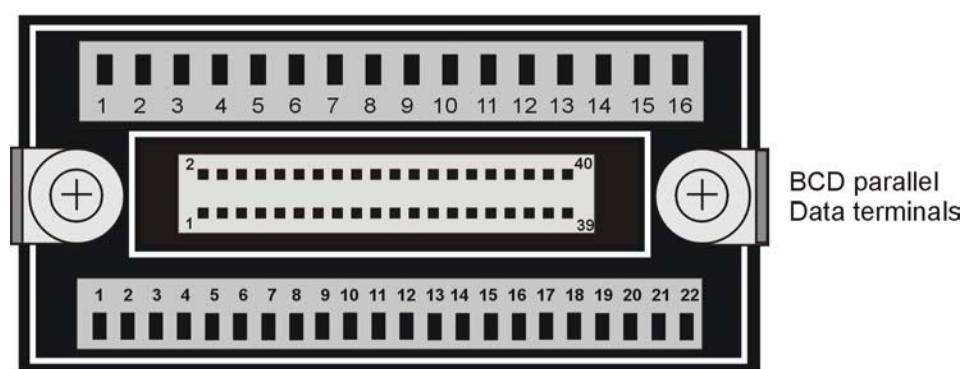
BCD Data Terminals

| Terminal	Value	Text	Terminal	Value	Text
1	+Vcc	ISO + Supply	21	+Vcc	ISO + Supply
2	GND	ISO GND	22	GND	ISO GND
3	Strobe	Strobe	23	2 000	4 Digit bit B
4	Over	Overrange	24	1 000	4 Digit bit A
5	Sign	Sign negative	25	800	3 Digit bit D
6	DP 3	Decimal Point bit C	26	400	3 Digit bit C
7	DP 2	Decimal Point bit B	27	200	3 Digit bit B
8	DP 1	Decimal Point bit A	28	100	3 Digit bit A
9	800 000	6 Digit bit D	29	80	2 Digit bit D
10	400 000	6 Digit bit C	30	40	2 Digit bit C
11	+Vcc	ISO + Supply	31	+Vcc	ISO + Supply
12	GND	ISO GND	32	GND	ISO GND
13	200 000	6 Digit bit B	33	20	2 Digit bit B
14	100 000	6 Digit bit A	34	10	2 Digit bit A
15	80 000	5 Digit bit D	35	8	1 Digit bit D
16	40 000	5 Digit bit C	36	4	1 Digit bit C
17	20 000	5 Digit bit B	37	2	1 Digit bit B
18	10 000	5 Digit bit A	38	1	1 Digit bit A
19	8 000	4 Digit bit D	39	Over +	Overrange +
20	4 000	4 Digit bit C	40	Over -	Overrange -

14   INPUT SIGNAL CONDITIONER

The trigger level of the six signal inputs can be adjusted with Potentiometers P1, P2 and P3 at the main board for input level between 0 and ±28V.
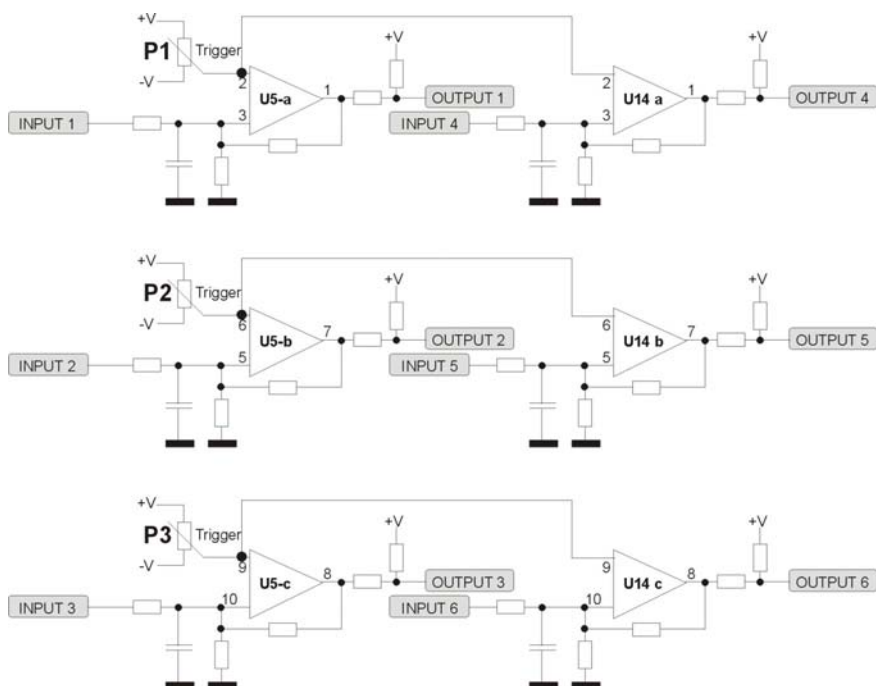Input 1 and input 4 have common adjustment with P1.
Input 2 and input 5 have common adjustment with P2.
Input 3 and input 6 have common adjustment with P3.

14.1   Signal Conditioner - Layout
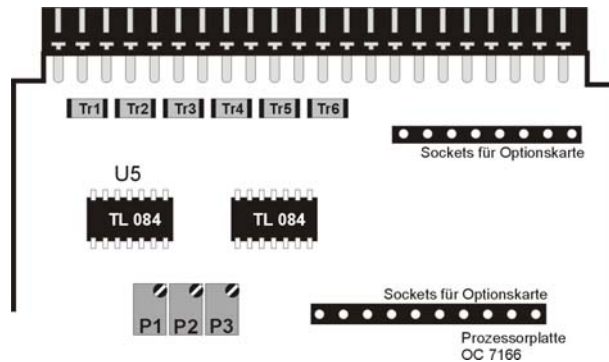
14.2   Signal Level Adjusting Potentiometers P1, P2, P3

Input Signal	Signals at pins 3, 5 and 10	Level at U5 pin 2, 6, 9	Adjustment
TTL 5V positive	0.7V	0,4 V	
12V positive	1.8V	1,0 V	Level at pin 2 adjust with P1
12V bipolar round zero	3.6V	0 V	Level at pin 6 adjust with P2
24V positive	3.6V	2,0 V	Level at pin 9 adjust with P3
24V bipolar round zero	7.2V	0 V	

15   IMMUNITY TEST, CONNECTIONS and GROUNDING

Tester: Burst/Surge Generator Hilo, Model CE - Tester

Date: 18.12.1998. QC3   Technician: Oliver Matthews

E.U.T.:   Model OC7166 SN: 981218, Supply 230VAC
               Mode: Dual Frequency Counter
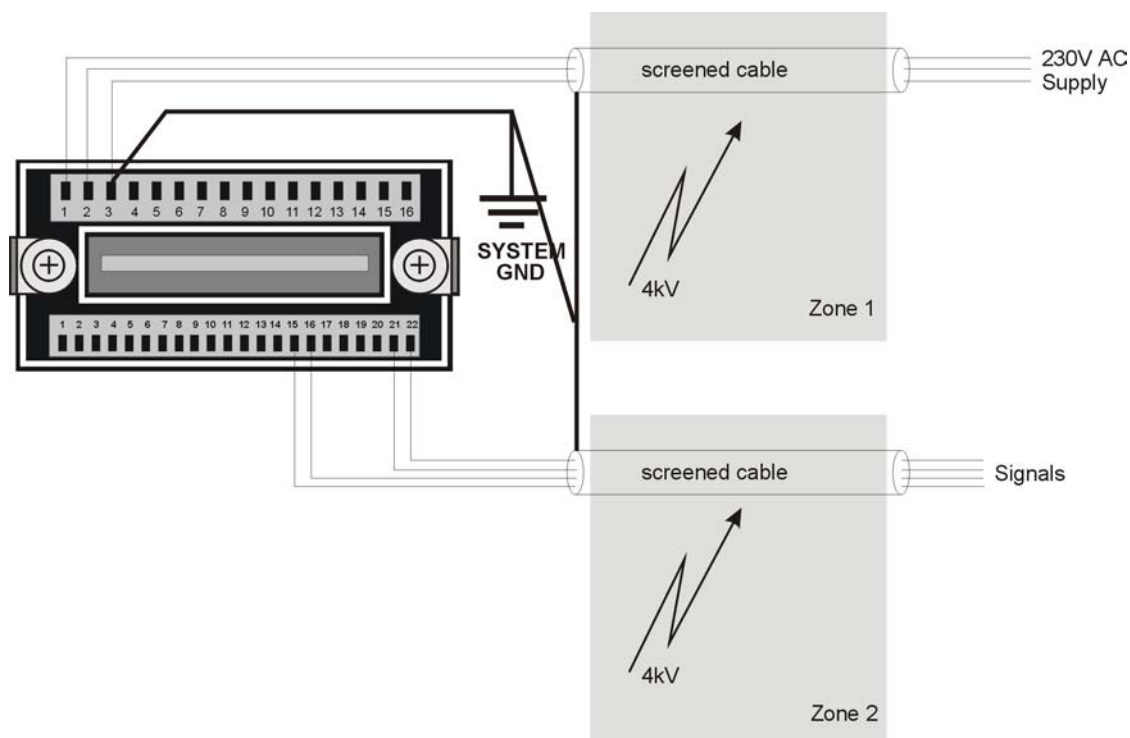   Input: P and S = positive logic signals 12V, 10kHz

TEST CONDITIONS
IEC Norms: IEC 801-4
              IEC 1000-4-4
              EN 50052-1

15.1   TEST SET- UP

15.2   TEST RESULTS

Zone 1:	4kV Burst	without display change
Zone 2:	2kV Burst	without display change
	4kV Burst	display change max. $\pm$ 2 digit

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