Brüel & Kjær Vibro

RV-110 / 116

Measuring and Monitoring of Relativ Shaft Vibrations using Non-Contacting Displacement Sensor

VIBROCONTROL 1000

Two Channel Machine Monitoring Units

C102 846.002

Contents

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For your notes!

1 Description / Intended Use

The vibration monitoring system VIBROCONTROL 1000, series R, comprising the

- Electronics and non-contact displacement sensors
  is used for measuring and monitoring the relative shaft vibrations. Quick rotations of a rotor shaft relative to the bearing shell are picked up by non-contact displacement sensors and are converted into electrical signals.
  These signals are used by the measuring and monitoring electronics to form

– the max. shaft displacement (s_{max}) with 2-channel operation

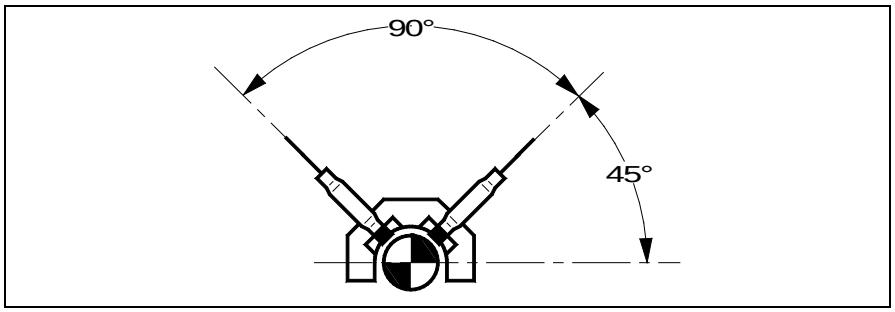


Figure 1 Sensor arrangement with 2-channel operation

– the peak value of vibration displacement (s_p) (with 1-channel operation

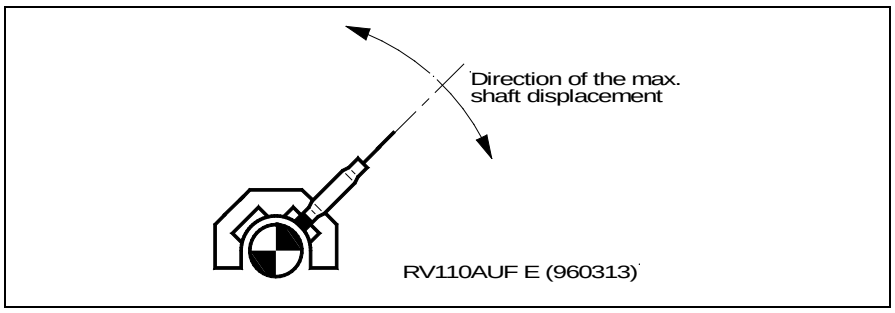


Figure 2 Sensor arrangement with 1-channel operation

The electronics compares either of these values with 2 settable limit values. If these limit values are exceeded the respective alarm relays are switched. Warnings (pre-alarm) or machine shut-down (main alarm) can be released via the potential-free relay contacts.

The instruments types RV-110 and RV-116 only differ in the power supply voltage.

RV-110 requires a power supply voltage of 230 V AC,

RV-116 requires a power supply voltage of 24 V DC.

Adhere to attached safety instructions !

2 Technical Data

Number of measuring channels	2 (X and Y)
Measuring input	designed for a non-contact displacement sensor type SD-05x and SD-08x, as a part of a measuring chain.
Input resistance	The measuring input is adjusted in the factory according to the ordering code
Working frequency ranges	2 ... 5000 Hz (-3 dB)
Measured variable	Vibration displacement (s)

Characteristic

2-Channel operation (X, Y)	Max. shaft deflection (s_{max})
1-Channel operation (X)	Peak value (p)

Measuring ranges

Displacement sensors SD-05x	0 ... 20 µm 0 ... 50 µm 0 ... 100 µm 0 ... 200 µm 0 ... 500 µm
Displacement sensors SD-08x	0 ... 40 µm 0 ... 100 µm 0 ... 200 µm 0 ... 400 µm 0 ... 1000 µm

Analog outputs

Number	2
Voltage output	0 ... 10 V, $R_L \geq 100\ k\Omega$
Current output	0/4 ... 20 mA, $R_B \leq 500\ \Omega$ The current range is changed by soldering jumpers
Error	5 % of measured value 3 % of full scale

Mains connection for instrument type RV-110

Mains voltage	230/115 V AC, +10/-15 %, 50 ... 60 Hz
Power consumption	10 VA
Fusing	2 x 0.1 A, 250 V, slow

The power supply must only be made via separator (switch or circuit breaker)! The switched used as a separator must meet the requirements according to IEC 60947-1 und IEC 60947-3 and be suitable for application

Mains connection for instrument type RV-116

Mains voltage	24 V DC
Power consumption	10 W
Limits of voltage	min. 15 V max. 40 V
Fusing	1.6 A, 250 V, slow

Housing

Design	Aluminum casting
Type of protection	IP 65 as per DIN 40 050
Painting	RAL 7032 (grey)
Dimensions	360 x 160 x 90 mm (L x W x H)
Weight	approx. 4.5 kg

Admissible ambient conditions

Storage temperature	-40 °C ... + 100 °C
Working temperature	0 °C ... + 65 °C
with increased error	-30 °C ... + 65 °C
Air humidity	max 95 %, non-condensing

EMC

EN 61326-1

Safety

EN61010-1

WEEE-Reg.-No. 69572330

product category / application area: 9

Limit values

Number	2
Setting range	10 % ... 100 % of full scale
Setting error	5 % of full scale
Response delay	Limit value LIM1 (pre-alarm) 0.03 s, 1 s, 3 s, 10 s, ± 5 % Limit value LIM2 (main alarm) 0.03 s, 1 s, 3 s, 10 s, ± 5 % The response time is changed by means of jumpers
Switching hysteresis	3 % of full scale

Alarm relays

Number	2
Design	monostable relays, optionally – normally de-energized – normally energized determined by jumpers Changeover between latching/non-latching is realized by means of jumpers

Contact loading (ohmic load)

Switching voltage	AC max. 250 V, at max. 1 A DC max. 150 V, at max. 0,5 A
Switching capacity	AC max. 250VA, at max. 1 A DC voltage-dependent .....at 150 V: P < 70 W .....at 48 V: P < 72 W .....at 24 V: P < 192 W

A spark suppressor must be provided in the case of inductive load!

OK relay

Number	1
Design	same as alarm relay, ***however***, normally energized non-latching

Self-monitoring

Responding to:

- Short-circuit/interruption in the input circuit
- Wrong distance of sensor to measuring track
- Failure of supply voltage
  Fault is signalled via the OK relay ***without*** response delay

Since external voltages can be connected to the relay contacts, hazardous contact voltage may still be present, even after disconnection of the power supply.

2.1 Ordering code for instrument type RV-110

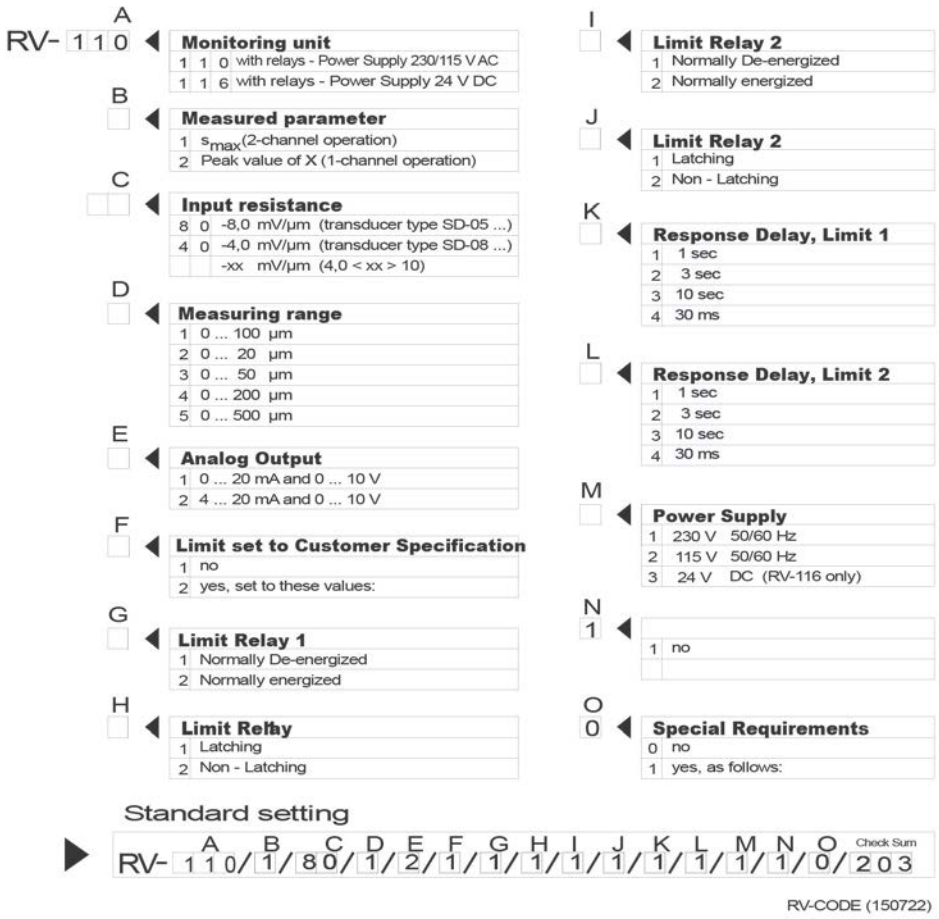


Figure 3 Ordering code

2.2 Ordering code for instrument type RV-116

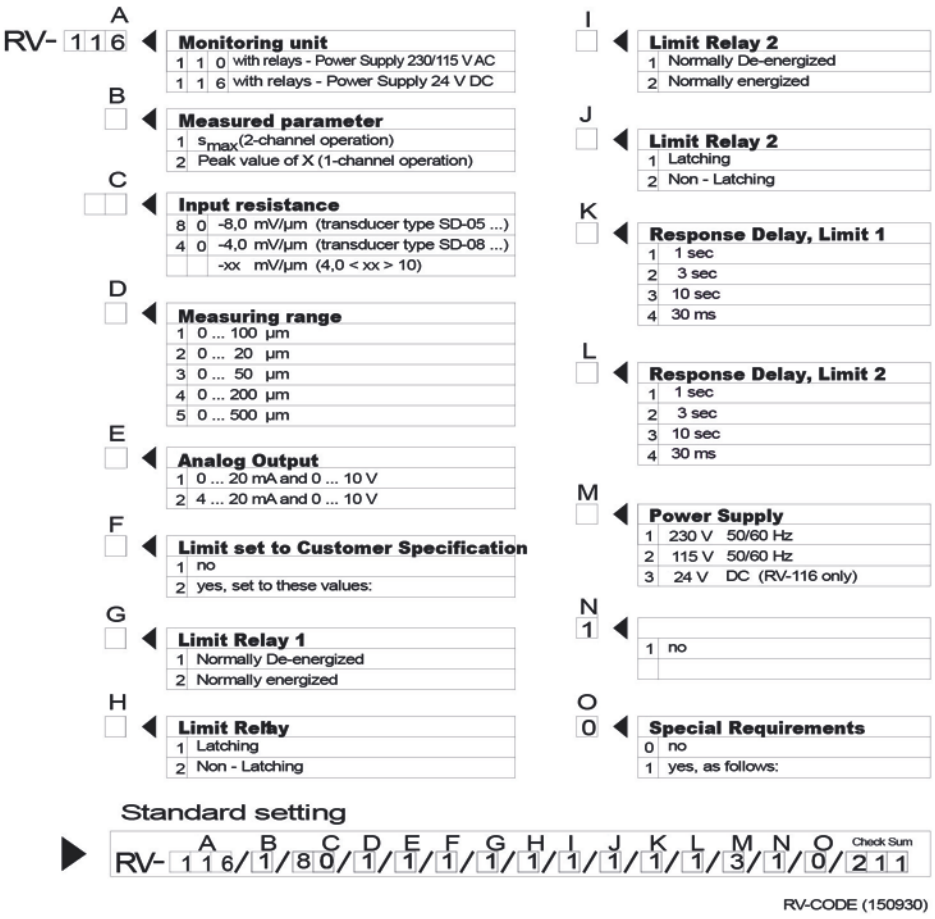


Figure 4 Ordering code

3 Commissioning

Adhere to attached safety instructions !

3.1 Installation

Remove housing cover and fix base part by using 4 Phillips heads M6. Any installation position is accepted!

Replace unused conduit threads by sealed metallic pegs to ensure type of protection IP 65 and EMC security.

Note:

Installation (assembly) may only be performed by trained personnel!

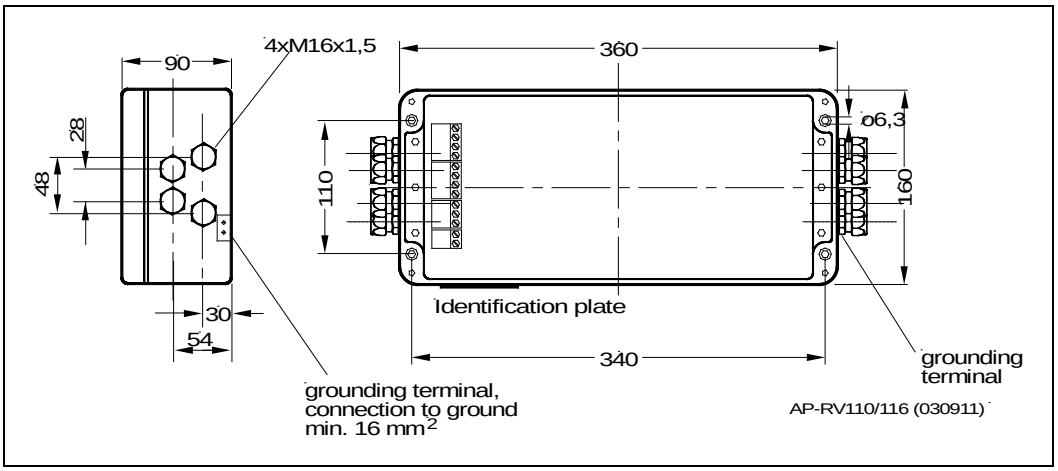


Figure 5 Dimensions

Note!

The assembly of the VIBROCONTROL 1000 (RV-110/RV-116) must not be undertaken in areas with permanent vibrations. Possibly a vibration-isolated installation must be implemented.

3.2 Setting data

The measuring and monitoring electronics have been set and tested according to the details given in your order.

The setting data are defined on insert sheet "Ordering code/device setting". The insert sheet is contained in the housing.

If the device setting is other than standard, you will find the setting data under the heading of "Factory setting". For your own safety you should write down each change of the setting data together with the serial no. in the insert sheet.

3.3 Connections for instrument type RV-110

Removal of the housing cover enables access to the connection terminals.

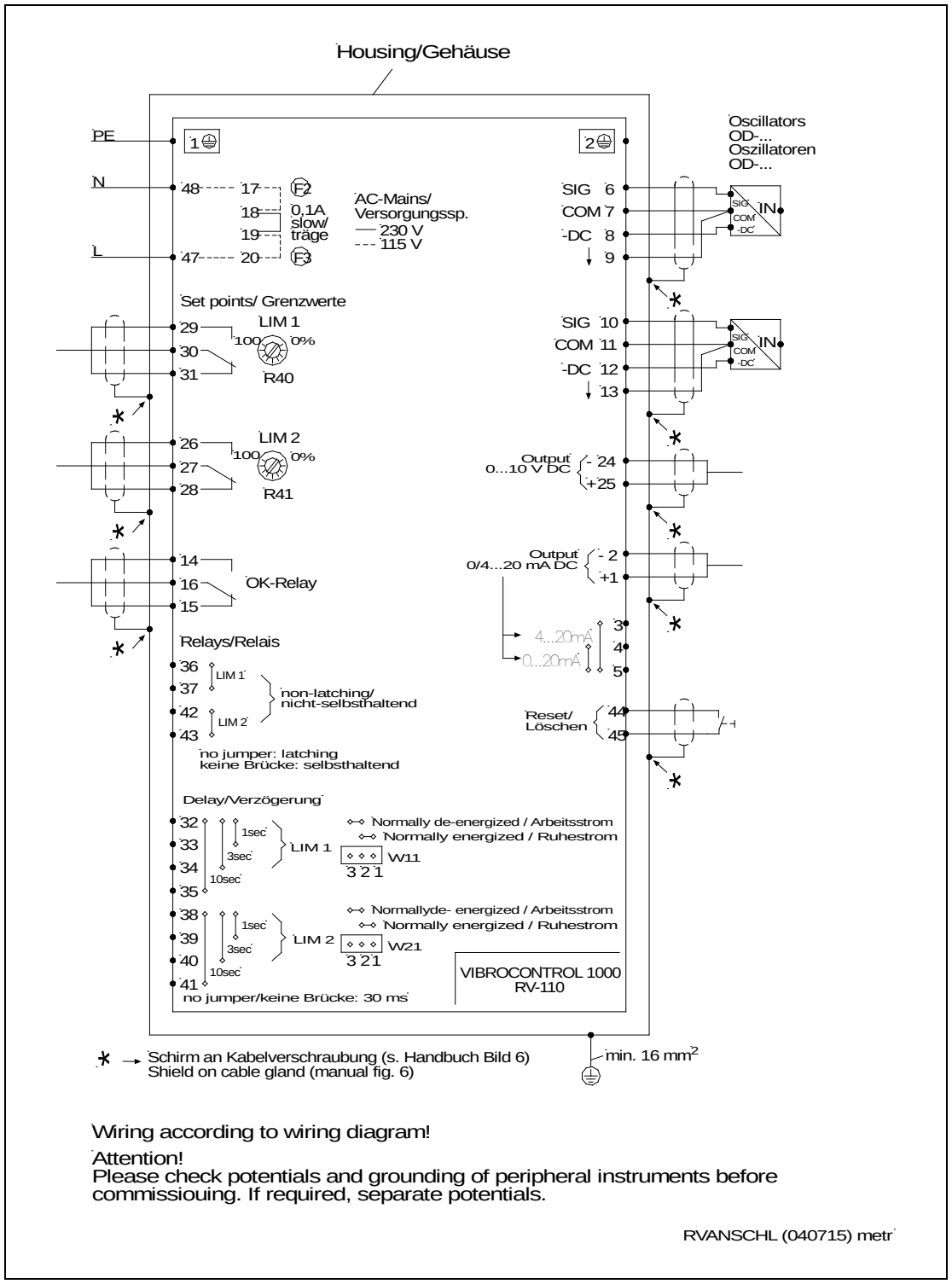


Figure 6 *Connection terminal diagram*
(The relay contacts are shown in de-energized condition.)

3.4 Connections for instrument type RV-116

Removal of the housing cover enables access to the connection terminals.

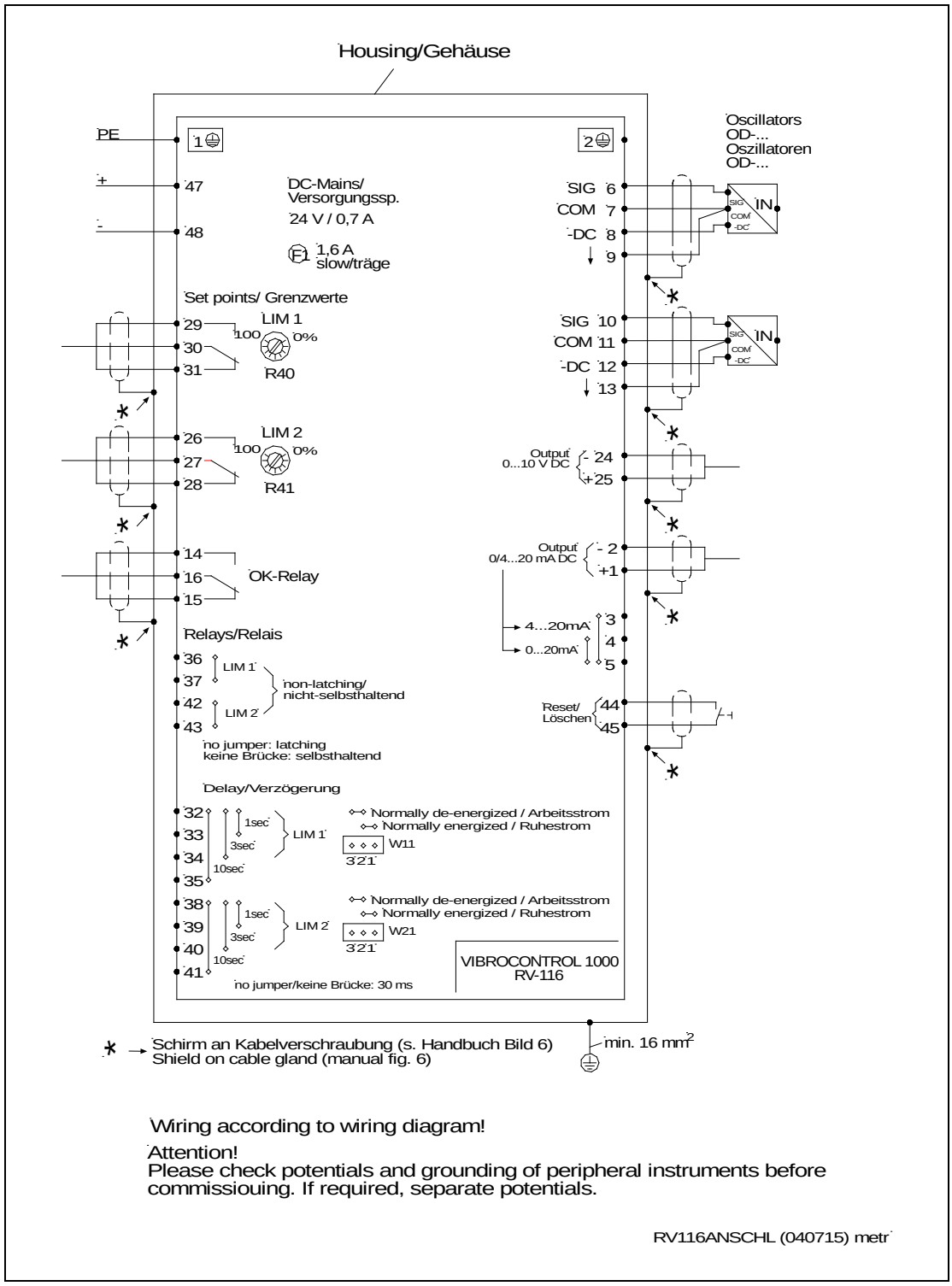


Figure 7 *Connection terminal diagram*
(The relay contacts are shown in de-energized condition.)

Note:

*This chapter describes the connection terminals of **RV-110 and RV-116.** Possibly necessary changes of the device setting are described in the "Service" chapter.*

Protective conductor

Protective conductor SL of the power supply cable must be connected to grounding point 1 of filter board CEM V 001 (see Fig. 11). Use the cable lug that is already attached to grounding connection 1.

Screening

All cables connected to the electronics with exception of the power supply cable must be screened!

– The screen is connected to the respective conduit thread as shown in Fig. 8.

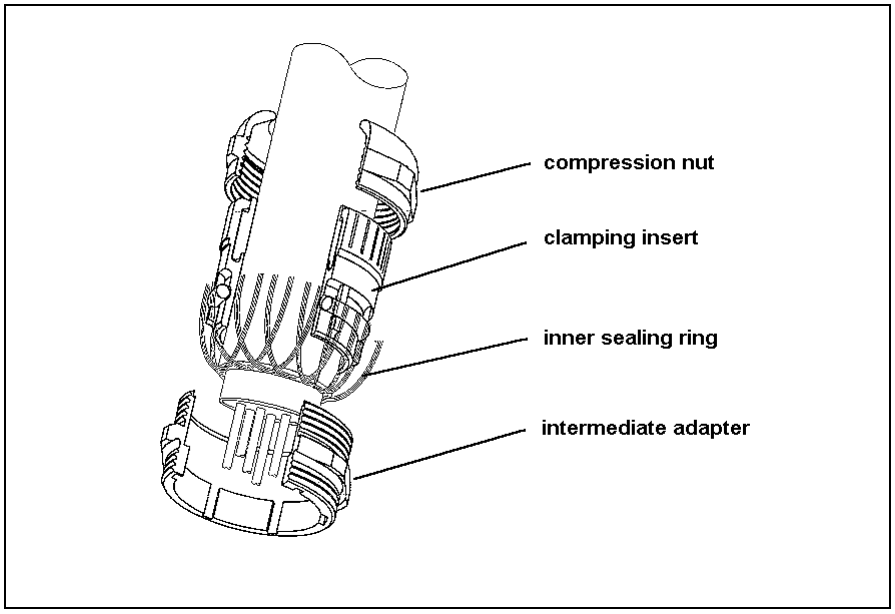


Figure 8 Connecting the cable gland to the conduit thread

1-Channel operation (X)

During 1-chanel operation, the Y-channel has to be adapted with resistors to avoid an OK-relay error.

If the 1-channel operation is known by the order the adaption is made in the factory according to the ordering code.

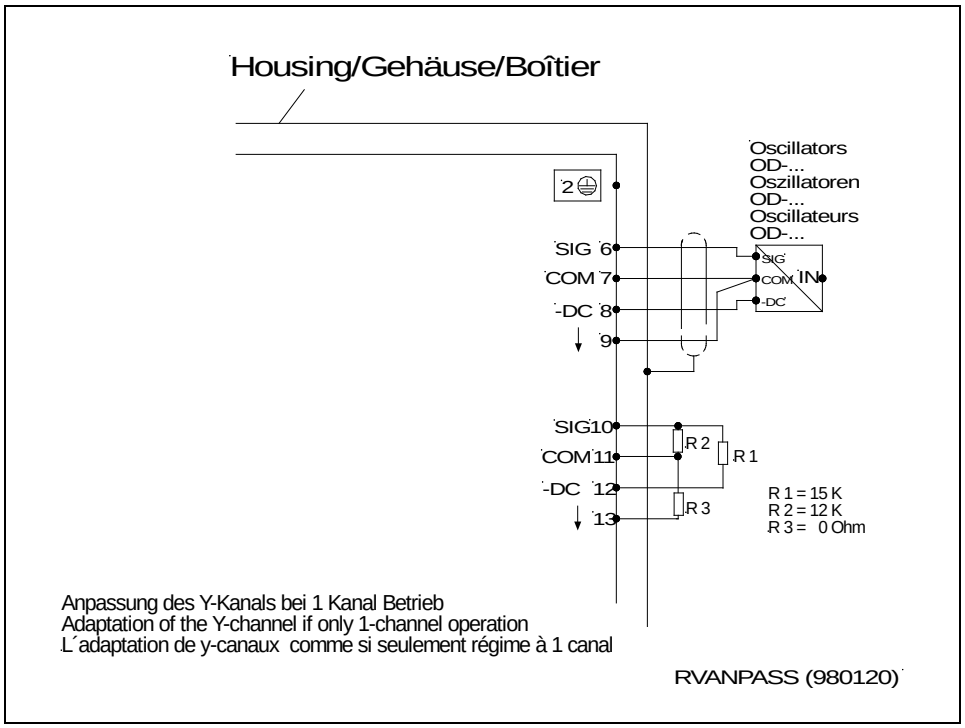


Figure 9 *Adaptation of the Y-Kanals by 1-Channel operation*

3.5 Alarm relay

If the limit values are exceeded the respective alarm relays res-pond with time delay.

Their potential-free change-over contacts enable release of a warning or shut-down of the monitored machine.

3.5.1 What you should know about alarm relays

Two switching variants are available:

- Normally de-energized

  The relay coil is dead with ***non-exceeded*** limit value (OK), it is life when the limit value (alarm) is exceeded - the relay is energized.

- Normally energized

  The relay coil is life with ***non-exceeded*** limit value (OK), it is dead when the limit value (alarm) is exceeded - the relay is released.

Set the desired variant by using jumpers (see connection terminal diagram Fig. 6 and 7).

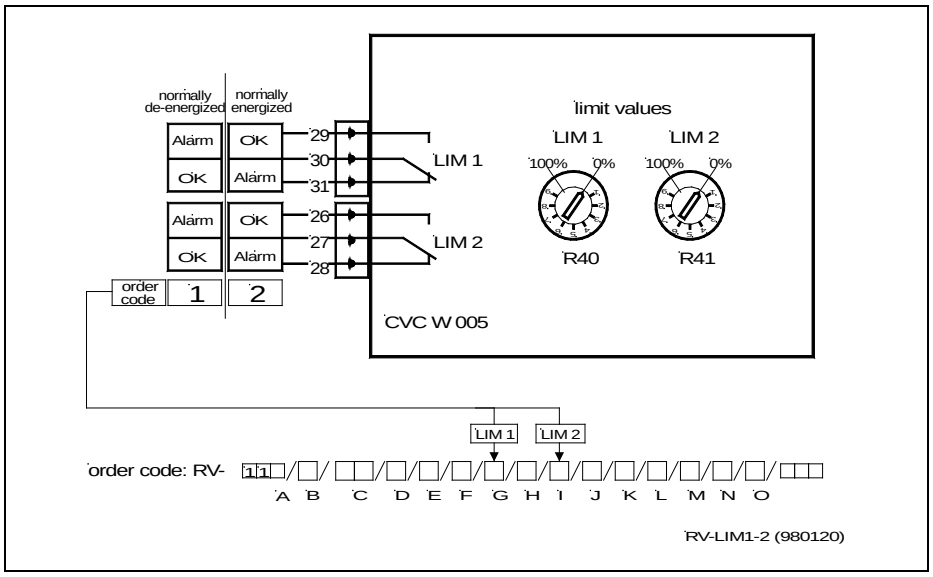


Figure 10 *Limit value relay*
The contacts are shown in dead condition.

Two modes of operation are possible:

- latching
- non-latching

The required mode of operation is set by means of jumpers (see connection terminal diagram Fig. 6 and 7)

3.5.2 Reset (acknowledgement of relay messages)

Latching alarm relays must be reset after

- an alarm message has been given or
- switching on the monitoring electronics.

The jumper between terminals 44 and 45 effects "permanent reset" If required, this jumper may be removed and be replaced by an external reset button that will bridge terminals 44 and 45 only when actuated (see Fig. 6 and 7).

Connect the reset button with ***screened*** line only!

3.5.3 Setting limit values

The response thresholds of both alarm relays are defined via potentiometers LIM1 and LIM2. Setting is done in % related to set full scale.

Example:

Requirement:	Pre-alarm at 50 µm/s Main alarm at 70 µm
Setting	Measuring range: 100 µm (= 100 %)
	Pre-alarm: Potentiometer LIM1 50 µm = 50 %
	Main alarm: Potentiometer LIM2 70 µm = 70 %

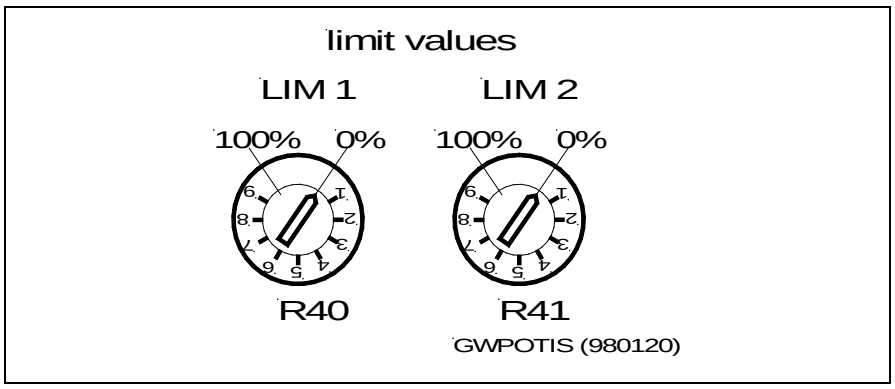


Figure 11 Alarm potentiometer

3.6 OK relay (self-monitoring)

Integrated self-monitoring signals

- short circuit/interruption of input circuit
- wrong distance of the transducer to the measuring track
- failure of the supply voltage

The message is given ***without*** delay via the OK relay.

The OK relay is ***always***

- Normally energized and
- Non-latching

Upon connection of the measuring and monitoring electronics after the elimination of functional errors, the OK relay automatically changes from "Alarm" back to "OK" (Reset is not required).

Alarm messages are ***not*** influenced by self-monitoring.

3.7 Readiness for operation

Energize the voltage supply after having provided for all connections and settings; the OK relay is energized and switched to "OK".

With self-latching alarm relays, actuate the external reset button - no alarm ***must*** be pending!

During acceleration the machine might reach vibration values that exceed the limit values (e.g. passing resonance value).

If the alarm delay time is not sufficient to enable a resonance condition to be run through, then the corresponding limit value relays will be activated with consequental machine shut-down.

To avoide this condition, the relay activation must be over-riden.

Upon reaching working condition:

- Actuate reset button
- Reactivate shut-down system

4 Explosion protection

Vibration monitoring system VIBROCONTROL 1000, type R, can also be used to monitor machines in hazardous areas.

In this case, two safety barriers per measuring chain are required:

- 1 Supply barrier
- 1 Signal barrier

Connection is realized according to the attached wiring diagram.

Please take further information from

- the grounding recommendations for explosion protection - installation in the appendix.
- Installation instructions for displacement sensors in the appendix.

Install electronics and the safety barriers outside the hazardous area !!!

The user is responsible for installation according to local regulations and acceptance by the authorities.

5 Service

Adhere to attached safety instructions !

5.1 Changing settings on the upper board CVC W 005

Settings of electronics are modified at the coding terminals on the upper board CVC W 005.

Access to terminals is possible after having removed the housing cover.

The following table shows all possibilities of setting and their coding. The coding terminals are shown on terminal connection diagram Fig. 6 and 7.

Adjustment by means of jumpers at the coding terminals	
Relay - latching/-non-latching (not valid for OK relay!)	
LIM 1 latching	without jumper
LIM 1 non-latching	36 + 37
LIM 2 latching	without jumper
LIM 2 non-latching	42 + 43
Relay - response delay (not valid for OK relay!)	
LIM 1 30 ms	without jumper
LIM 1 1 s	32 + 33
LIM 1 3 s	32 + 34
LIM 1 10 s	32 + 35
LIM 2 30 ms	without jumper
LIM 2 1 s	38 + 39
LIM 2 3 s	38 + 40
LIM 2 10 s	38 + 41
Relay - normally de-energized / normally energized	jumpers
LIM 1 Normally de-energized	W 11 Pin 2 + 3
LIM 1 Normally energized	W 11 Pin 1 + 2
LIM 2 Normally de-energized	W 21 Pin 2 + 3
LIM 2 Normally-energized	W 21 Pin 1 + 2

5.2 Changing settings on the lower board CYC V 003

Settings of electronics are modified at the coding terminals on the lower board CYC V 003.

Access to terminals is possible after having removed the upper board.

The following table shows all possibilities of setting and their coding. The coding terminals are shown on terminal connection diagram Fig. 6 and 7.

Adjustment by means of jumpers at the coding terminals	
Function	jumper at terminals
Analog output	
4 ... 20 mA	3 + 5
0 ... 20 mA	4 + 5

5.3 Basic settings

Basic settings must be changed by authorized service personnel only !!! Unauthorized intervention is forbidden!

Deenergize the device before opening!

Access to basic board CYC V 003 is achieved by removing the upper section consisting of upper board CVC W 005 and filter board CEM V 001.

The following components are located on the base:

- fuses F2 and F3 for instrument type RV-110
- fuse F1 for instrument type RV-116
- analog outputs terminal 3 ... 5
- soldering jumpers to change the measuring range
  W40 ... W42
  W50 ... W52

Hinweis:

Since external voltages can be connected to the relay contacts, hazardous contact voltage may still be present, even after disconnection of the power supply.

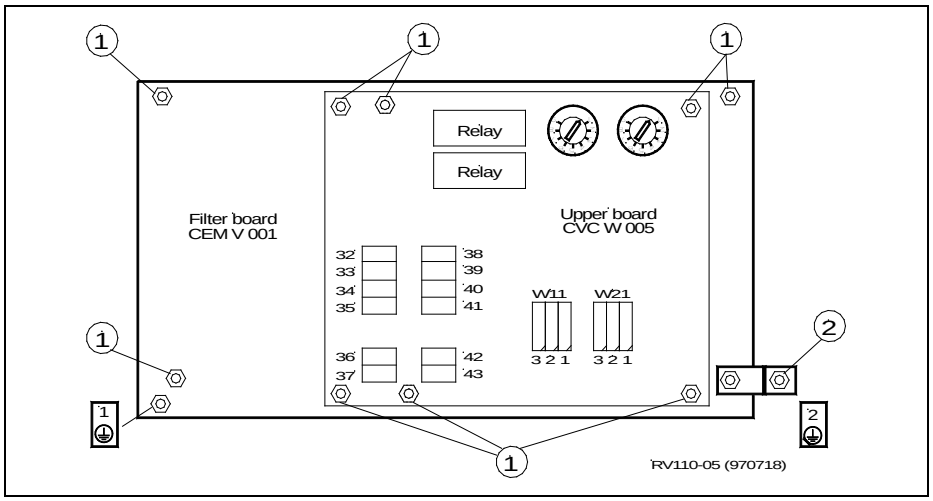


Figure 12 Upper board CYC V 003

Removing upper board block

Remove upper board CVC W 005

4 hexagon nuts M3. (item. 1) fixing point see Fig. 12

Remove the X1 plug

Release filter board CEM V 001

6 hexagon nuts M3. (item. 1) fixing point see Fig.. 12

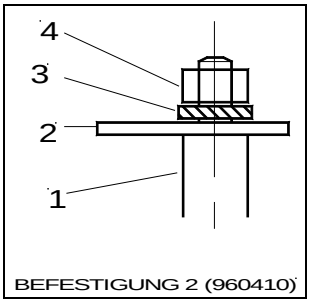
1 Phillips head M6 x 10 (item. 2) fixing point see Fig. 14

Turn up the filter board CEM V 001

The base plate CYC V 003 is then accessable.

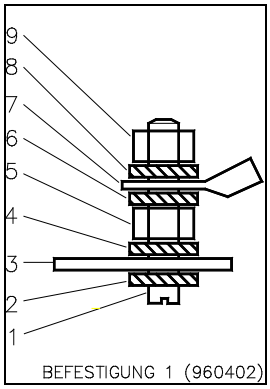
Reassembly is the reverse procedure.

Installing upper panel board



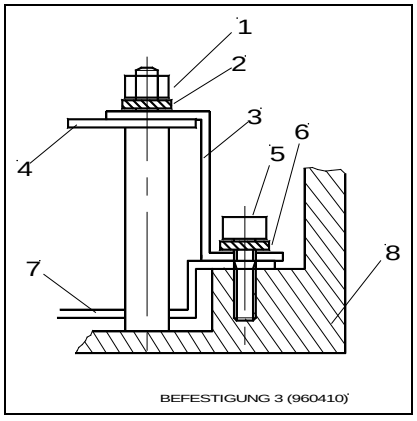
1 = Socket pin
2 = Filter board CEM V 001
3 = Spring washer
4 = Hexagon nut M3

Figure 13 Fixing point item 1



1 = Cheese head screw M3 x 12
2 = Toothed disk
3 = Board
4 = Toothed disk
5 = Hexagon nut M3
6 = Washer
7 = Cable lug
8 = Washer
9 = Hexagon nut M3

Figure 14 Grounding connection [1]



1 = Hexagon nut M3
2 = Toothed disk
3 = Grounding angle
4 = Filter board CEM V 001
5 = Phillips head M6 x 10
6 = Toothed disk
7 = Mounting plate
8 = Housing

Figure 15 Grounding connection [2]

5.3.1 Replacing fuses

The fuses are installed on base plate CYC V 003. Replacement of fuses is possible after having removed the upper board block.

For instrument type RV-110: Fuses F2, F3 = 100 mA slow

For instrument type RV-116: Fuse F1 = 1.6 A slow

5.3.2 Measuring range

The measuring range has been adjusted in the factory as defined in the order.

Modification of the measuring range at the customer's is possible by altering the ***soldering jumper*** on base plate CYC V 003.

It is possible to choose the ***next higher*** or ***next lower*** measuring range. The resistors required for modification of the measuring range have been provided on site. Measuring range modification must be performed for ***both channels (X and Y).***

The following table shows the available measuring rangs:

Measuring ranges (µm) with different sensors			
R (kΩ) X- Channel -Y	SD - 05x (8 mV / µm)	SD - 08x (4 mV / µm)	SD - xxx (2 mV / µm)
500 500	0 ... 20	0 ... 40	0 ... 80
200 200	0 ... 50	0 ... 100	0 ... 200
100 100	0 ... 100	0 ... 200	0 ... 400
50 50	0 ... 200	0 ... 400	0 ... 800
20 20	0 ... 500	0 ... 1000	0 ... 2000

Example

Measuring range for sensors SD-05x

set in the factory	0 ... 100 µm
next higher measuring range	0 ... 200 µm
next lower measuring range	0 ... 50 µm

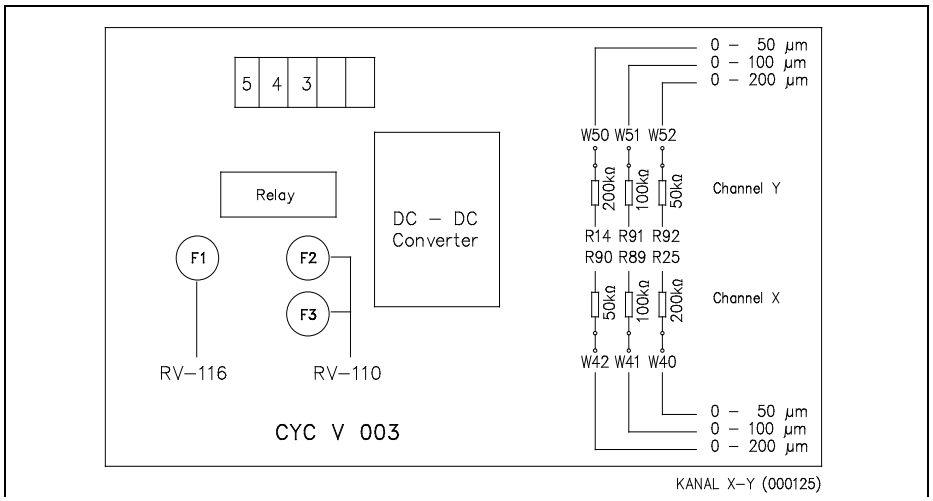


Figure 16 Base plate CYC V 003

5.4 Trouble shooting

Adhere to attached safety instructions !

If the OK-relay signals a malfunction, proper functioning of the monitoring system cannot be guaranteed any longer.

We recommend to perform the following tests:

1. Checking voltage supply

– Required voltage at the mains terminals

Deenergize the instrument!

– Power supply fuses F2 and F3 defective? (for instrument type RV-110)

– Power supply fuse F1 defective? (for instrument type RV-116)
the fuses are installed on base plate CYC V 003.

2. Checking the measuring chain(s)

(cf. also respective data sheets and operating instructions)

– Short-circuit in sensor/extension cable?

– Break of sensor/extension cable?

– Plug/terminal connections defective?

– Oscillator or safety barrier defective?

– Distance between sensor to measuring track too short / too long?

3. Alarm relays shows faulty behaviour

Alarm relay responds even though vibration level is uncritical

– Alarm limits too low?

– Response delay too short?

– Measuring range wrong?

Alarm relay LIM2 released before LIM1

– Limit value LIM2 smaller than LIM1?

– Response delay LIM1 too long?

No reset of alarm relay after remaining under limit value

- Mode of operation "latching" selected?
- Electronic defective?

4. Measured value display even though there is no vibration level

Possible causes:

- Plug-and-socket connection between transducer/extension not insulated *****
- Humming via grounding loop
- Components of measuring chain not tuned*
- Field effect from neighbouring strong current line
- Grounding not in accordance with attached ***grounding recommendations***
- Measuring chain defective?

* ***cf. also the respective data sheets and operating instructions***

6 Cleaning

The device can be cleaned externally using a slightly damp cloth.

Do not bring any moisture such as water and other liquids into contact with the device!

7 Disposal

Adhere to attached safety instructions !

8 Declaration of conformity

Brüel & Kjær Vibro

EU-Konformitätserklärung / *EU- Declaration of conformity*

Hiermit bescheinigt das Unternehmen / *The company*

Brüel & Kjær Vibro GmbH
Leydheckerstraße 10
D-64293 Darmstadt

CE

die Konformität des Produkts / *herewith declares conformity of the product*

Mess – und Überwachungsgerät / Measuring and monitoring equipment

VIBROCONTROL 1000

Typ / *Type*

RV-110, RV-116, RV-120

mit folgenden einschlägigen Bestimmungen / *with applicable regulations below*
EU-Richtlinie / *EU-directive*

2014/30/EU EMV-Richtlinie / *EMC-Directive*
2014/35/EU Niederspannungsrichtlinie / *Low Voltage Directive*

Angewendete harmonisierte Normen / *Harmonized standards applied*

EN 61326-1: 2013
EN 61010-1: 2010

Bereich / Division
Brüel & Kjær Vibro GmbH

Unterschrift / Signature
CE-Beauftragter / *CE-Coordinator*

Ort/*Place* **Darmstadt**
Datum / *Date* **01.03.2016**

i. A.
(Niels Karg)