Brüel & Kjær Vibro

A member of the NSK Group

Installation Instruction

# CM360-CG/VCM-3 Hardware

CE

Keep it accessible for future reference

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Installation Instruction **CM360-CG/VCM-3**, C107899.002 / V02, en, date of issue: 10.11.2021

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## RO Atenție!

Inainte de utilizarea produsului trebuie sa citiţi si sa inţelegeţi prezentul manual de operare. La nevoie puteţi comanda manualul de operare intr-una din limbile recunoscute oficial in U.E. la urmatoarea adresa: www.bkvibro.com

## ES Nota importante!

Antes de utilizar este product debe leer y comprender el manual. Si necesita el manual en otro idioma de la Unión Europea, puede pedirlo en la siguiente dirección: www.bkvibro.com

## NL Attentie!

Voor ingebruikname van het produkt dient de gebruiksaanwijzing gelezen en begrepen te zijn. Bij behoefte aan een gebruiksaan-wijzing in een ontbrekende EU-taal is deze op onderstaand adres aan te vragen: www.bkvibro.com

## FI Huomio!

Ennen käyttöönottoa tulee lukea ja ymmärtää käyttöohjeet. Kun tarvitset käyttöohjeita muilla EU-kielillä ota yhteys seuraavaan osoitteeseen: www.bkvibro.com

## PL Uwaga!

Przed rozpoczęciem użytkowania urządzenia uprzejmie prosimy o uważne zapoznanie się z instrukcją obsługi. Instrukcje obsługi dla naszych urządzeń dostępne są we wszystkich oficjalnych językach Unii Europejskiej. Brakujące egzemplarze można zamawiać pod wskazanym poniżej adresem: www.bkvibro.com

## SL Pozor!

Pred zagonom proizvoda morate najprej prebrati in razumeti navodilo za uporabo. Po potrebi zahtevajte navodilo za uporabo v jeziku EU, ki vam manjka, na naslednjem naslovu: www.bkvibro.com

## ET Tähelepanu!

Enne toote kasutuselevõttu tuleb kasutusjuhend läbi lugeda ja sellest aru saada. Kui vajate kasutusjuhendit mõnes muus EL keeles, küsige seda järgmiselt aadressilt: www.bkvibro.com

## FR Attention!

Avant utilisation du logiciel et de l'appareil, il convient impérativement d’avoir lu et compris ce manuel d'emploi. Si besoin, commander le manuel d'emploi dans la langue manquante à l'adresse suivante: www.bkvibro.com

## SV Observera!

Före idrifttagning av produkten måste bruksanvisningen läsas och förstås. Om nödvändigt kan bruksanvisningen beställas i det saknade EU-språket under följande adress: www.bkvibro.com

## LT Dėmesio!

Prieš pradedant naudoti produktą, atidžiai perskaitykite instrukciją. Esant reikalui, reikalaukite instrukcijos trūkstama ES kalba tokiu adresu: www.bkvibro.com

## IT Nota!

Il manuale deve essere letto e compreso prima della messa in servizio del prodotto. Se necessario, il manuale mancante nella lingua Europea desiderata, è ordinabile al seguente indirizzo: www.bkvibro.com

## DA Henvisning!

Før produktets ibrugtagning skal brugsanvisningen læses og forstås! Brugsanvisningen kan bestilles på et EU-sprog ved henvendelse til: www.bkvibro.com

## EL Προσοχή!

Προτού λειτουργήσετε την συσκευή, πρέπει να διαβάσετε και να καταλάβετε το εγχειρίδιο. Εάν χρειάζεσθε εγχειρίδιο σε κάποια άλλη Ευρωπαική γλώσσα, αποτανθείται στην εξής διεύθυνση: www.bkvibro.com

## CS Pozor!

Před uvedením výrobku do provozu je nutné přečíst si návod k provozu a porozumět mu.
V případě potřeby si návod k provozu v chybějící řeči EU vyžádejte na následující adrese: www.bkvibro.com

## LV Uzmanību!

Pirms produkta ekspluatācijas uzsākšanas, rūpīgi izlasiet lietošanas instrukciju. Vajadzības gadījumā pieprasiet lietošanas instrukciju izstūkstošajā ES valodā pa šādu adresi: www.bkvibro.com

## BG Внимание!

Преди въвеждане в експлоатация на продукта ръководството му трябва да бъде прочетено и разбрано. При нужда от ръководство на липсващ EU език, Вие можете да го поръчате на следния адрес: www.bkvibro.com

## PT Atenção!

Antes de usar o produto é necessário ler a documentação e entender-la. Se for necessário é favor pedir a documentação na língua europeia que necessita dirigindo-se a está direção: www.bkvibro.com

## HU Figyelem!

A termék üzembe helyezése előtt az üzemeltetési utasítást el kell olvasni, és meg kell érteni. Szükség esetén hiányzó EUnyelven az üzemeltetési utasítást, az alábbi címen lehet igényelni: www.bkvibro.com

## SK Upozornenie!

Pred uvedením zariadenia do prevádzky si treba dôkladne prečítať prevádzkový návod a treba jeho obsah správne pochopiť. V prípade potreby si prevádzkový návod vyžiadajte v príslušnom jazyku EÚ na nasledovnej adrese: www.bkvibro.com

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# 1 About this manual

This manual deals with the installation of the CM360 condition monitoring system (CMS) and provides information that is needed to mount and make a connection to CM360 system.
The manual should be read and understood before connecting the system components of the CM360 system and before putting the system into service.

**NOTE!**

For installation of the sensors and, if applicable, junction boxes as well as the computers, please consult the supplied project documentation. Installation depends on the hardware supplied and can vary.

## 1.1 Document conventions

| Feature | Comments |
|---|---|
| Menu items, buttons, tabs, UI features, keyboard instruction | Indicated by **bold** type face. Examples: Click **Remove**. Press **Ctrl+Shift** or Press **F12**. |
| Path denotations | Example: File > Template > Load template |
| Important Note! | **Important Note** indicates information which is potentially serious to either personnel or to the unit. |
| Note! | **Note** text is for special attention. The information is very important for the correct operation of the system. |
| Tables with grey header | The content of these tables is only for information. |
| Tables with reddish header | The content of these tables contains instruction procedures. |



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# 2 Safe use of CM360 system

## 2.1 Disclaimer of liability

The observance of this technical documentation is essential for the proper and safe operation of the product. We assume no liability for injury to persons, damage to property or financial losses resulting from failure to comply with this technical documentation. In this case the liability for material defects is also excluded.

## 2.2 Intended use

The VIBRO Condition Monitoring 3 (from now on referred to as VCM-3) within the CM360 is intended for tapping and digitizing analog signals and processes them for utilization by the Brüel und Kjær Vibro and 3rd party software. VCM-3 is only intended to be used indoor. It is used either for integrating the buffered output signals from existing machine protection systems or directly connect to sensors. Data may also be acquired via RS485 Interface or LAN connections. Data are provided to a back-office server via LAN.

## 2.3 General information

Never operate damaged products. Upon delivery inspect the packaging for damage and compare the delivered item with your order documents. If the CM360 is used in a way that is not described in the present instructions manual, this may result in impairment of functions and of protection.

**NOTE!**

You must observe the instructions in this manual for safe installation, commissioning and disposal of CM360.
Also consider:

- the hardware installation instruction for VCM-3 (C107758.002)
- he instructions from Pulse power supply
- the instructions from circuit breaker

## 2.4 General warnings

### 2.4.1 Staff requirements

Transport, storage, installation, assembly, connection, commissioning, maintenance and service must be undertaken exclusively by qualified technicians. The following must strictly be observed:

- The instructions in this manual
- Instructions for product and safety and the pictograms on the product
- Any product specific provisions and requirements
- All national and regional regulations for safety and accident prevention must be followed.

**WARNING!**

In the event of impermissible opening of the product or removal of components, improper use, or incorrect installation or operation there is a risk of personal injury or damage to property



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## 2.5 Grounding information

The casing of the VCM-3 can be grounded through the Protective Earth Screw at the left side of the cabinet.

## 2.6 Approvals

- CE-compliant in accordance with
  - EMC Directive and EN 61326-1
  - ROHS directive and EN IEC 63000
  - Low Voltage Directive



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# 3 Introduction to CM360 system family

The CM360 systems are designed to acquire:

- Scalar vibration data (Descriptors)
- Process data
- Time series vibration data (Time waveforms)

The CM360-CG/VCM-3 system consists of a

- VCM-3
- Circuit breaker and a
- 24V power supply (either external or built-in)

All embedded into a mild steel cabinet, intended for installation in a benign environment.
Vibration data are measured by accelerometers mounted on the tower, main bearing, gearbox and generator. Speed is measured at the high-speed end of the gearbox. Process parameters as produced power and wind speed can be measured on current 4-20mA inputs or voltage inputs 2-10 Volts. For some turbine types a software interface exists which enables the reading of these parameters and others via TCP/IP or serial RS485/232 communication lines.

## 3.1 CM360 variants

The CM360 system family consist of a range of variants based on the options that are suitable to the specific application. The options include: power supply options, bottom plate with cable glands or connectors, cellular connectivity etc.
This manual will refer to the CM360-CG/VCM-3 variant, that includes a 24V power supply, a circuit breaker and a bottom plate with cable glands for external connections.

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### 3.1.1 CM360-CG/VCM-3 example

Below picture shows an example of a CM360-CG/VCM-3 system, with external power supply, embedded into a cabinet.

## 3.2 Scalar data values (descriptors)

These are used efficiently for condition monitoring (CM) and condition-based maintenance (CBM) purposes. Many types of descriptors can be measured by a CM360 unit. For example, band pass values that indicate the vibration level in a wider range of the frequency spectrum. Another example is that of the vibration level of single vibration components, such as vibrations that refer to the speed of the shaft. Other descriptors may be the result of arithmetic operations on two or more of the other descriptor values.

## 3.3 The monitoring template

This configures the range of descriptors provided by the CM360.



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# 4 CM360 system installation overview

## 4.1 Before installing the CM360 system

The CM360 unit is mounted in an IP 65 mild steel enclosure. The total system weight it 14 kg.

| Please read the following instructions before mounting the cabinet: | |
|---|---|
| • | The enclosure must be clean and undamaged when it is installed |
| • | Unused cable entries in the cabinet must be closed with suitable plugs to ensure the IP rating |
| • | Use appropriate tools to install the cabinet |
| • | Only personnel with the appropriate training should perform the installation work |
| • | Enclosures that are installed on support frameworks must be mounted securely |
| • | The enclosure is fitted with 4 threaded bushings—10mm depth—which need M8 x 1 screws |
| • | All the fastening bushings that are provided must be used |

## 4.2 Lightning protection

Due to possible damage caused by lightning, we recommend an optional connection between CM360 and an equipotential bonding bar.

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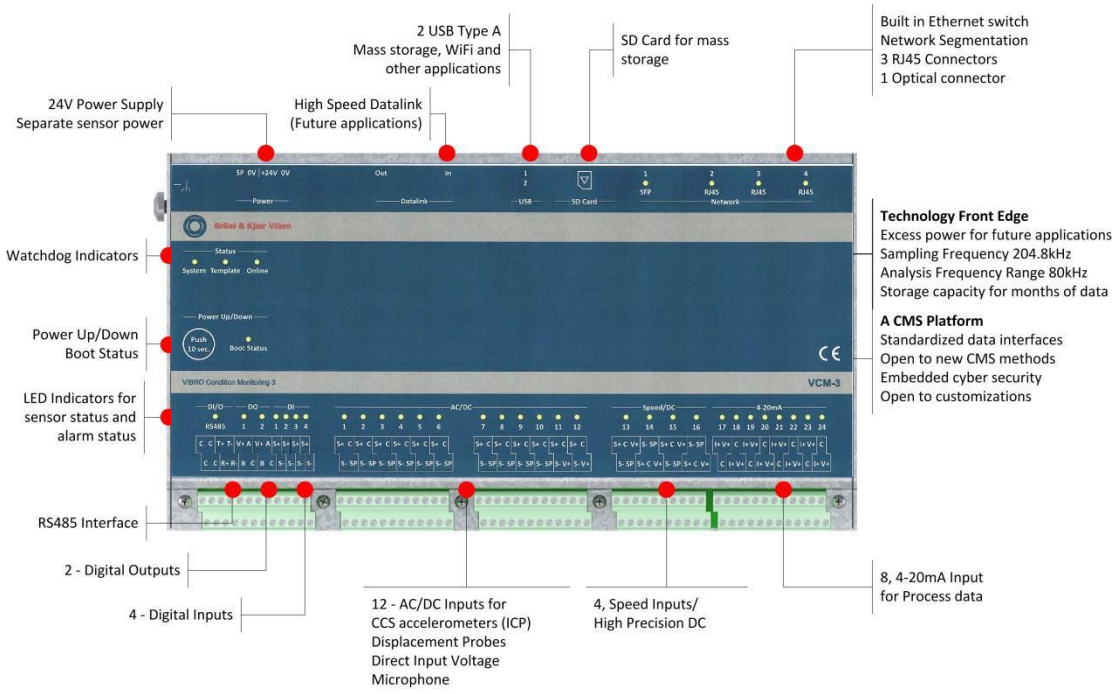
## 4.3 Hardware connections

The hardware connections are located in the lower part of the CM360 and are used to connect sensors, LAN, and the main power supply to the unit.

**NOTE!**

Due to electrostatic discharge (ESD) concerns, all installation work must be carried out by trained personnel.

Example: Location of Hardware Connections




## 4.4 LAN connection

The connection to the network is via the CM360 unit. This must be connected to the network via copper or fiber optic cables. The connection to the computers is over a direct LAN connection. The CM360 unit has built-in switch functionality that consists of three RJ-45 connectors and one optical port.



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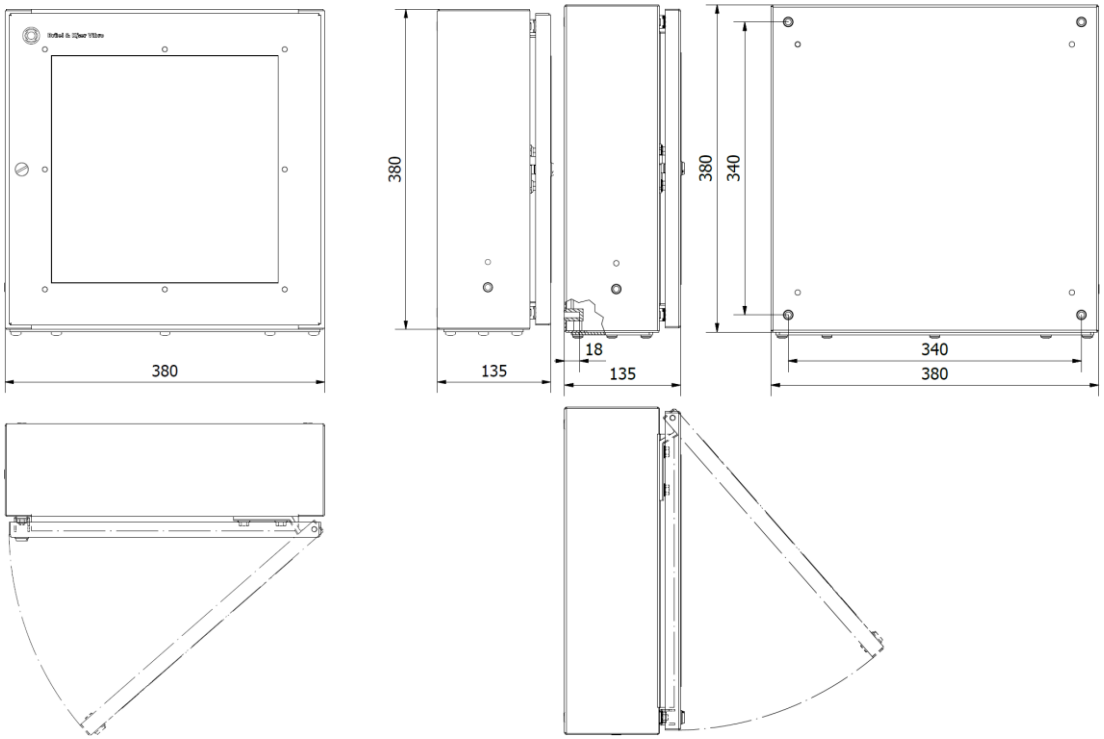
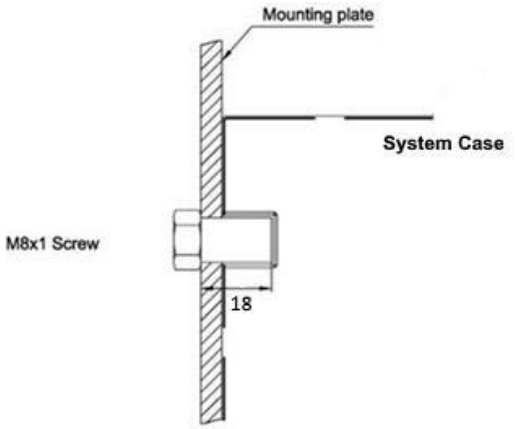
# 5 CM360 unit

## 5.1 Enclosure dimensions




## 5.2 Screw mounting in the bushing



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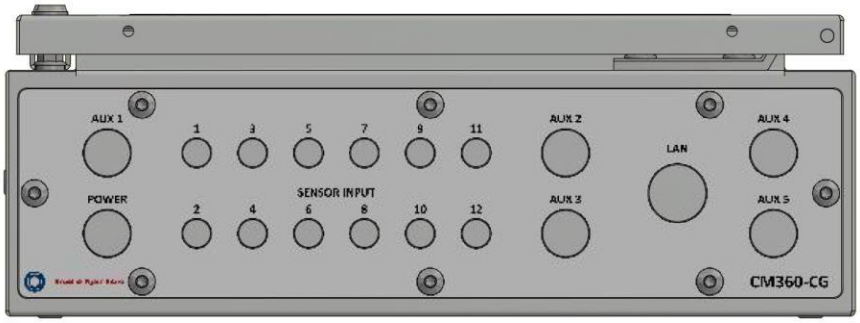
## 5.3 Gland layouts




## 5.4 Gland use, size and cable diameter

| Use | Gland Size | Cable Diameter |
|---|---|---|
| Power | 1 x M20 | 7-12 mm |
| Aux 1-4 | 4 x M20 | Blind |
| Aux 5 | 1 x M20 | 7-12 mm |
| LAN | 1 x M25 | 5-7 mm |
| Sensors<br>Process parameters (multi- pair) | 12 x M12 | 3-6 mm |



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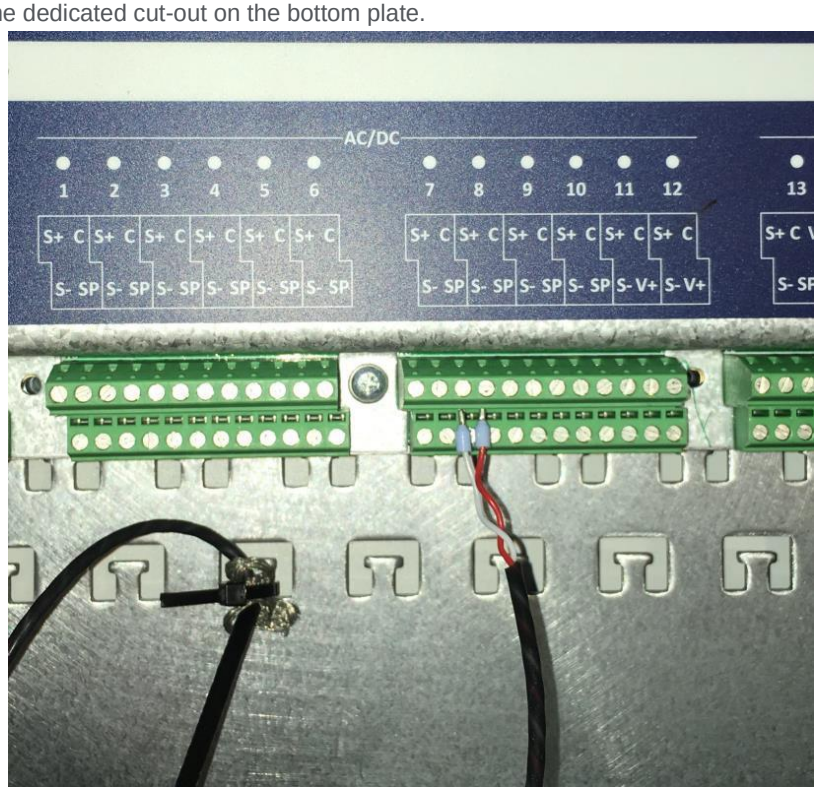
## 5.5 Connections and wiring procedure

| How to connect cables | |
|---|---|
| 1 | Pull the cables through the cable glands found at the bottom of the cabinet. |
| 2 | Route the cables inside the cabinet. |
| 3 | If single-screened sensor cable is used, then the screen must be folded back on the cable jacket and then strapped to the dedicated cut-out on the bottom plate.   |
| 5 | Connect the sensor cables to the CM360 unit according to the instructions given in 7 Termination of sensor signals (especially under chapter 7.4 to 7.11). |
| 6 | Tighten the cable gland when the cable is correctly installed. |

### 5.5.1 Mains power connection

This section is relevant for CM360-CG/VCM-3 which includes a 24VDC power supply.

**NOTE!**

Mains must be connected to the circuit breaker, but must not be connected directly to the DC Power Supply. The CM360-CG/VCM-3 is equipped with one PULS Power Supply Type ML50.100 with mains voltage range 100 to 240 VAC.

| How to connect mains power to CM360 | |
|---|---|
| 1 | Pull the cables through the cable glands found at the bottom of the cabinet. |
| 2 | Route the mains power cable inside the cabinet and ensure that it is securely fasten. When the cable is in the correct position, tighten the cable gland at the bottom of the cabinet. |
| 3 | Connect the mains power cable to L and N terminals on the ABB circuit breaker and connect the PE to the PE terminal beside the circuit breaker |
| 4 | The circuit breaker terminals accept wire gauges in the range from 0.5 mm² to 2.5 mm².The stripped cable ends should be provided with ferrules. |
| 5 | When the cable is correctly installed, tighten the mains power cable gland at the bottom of the cabinet. |

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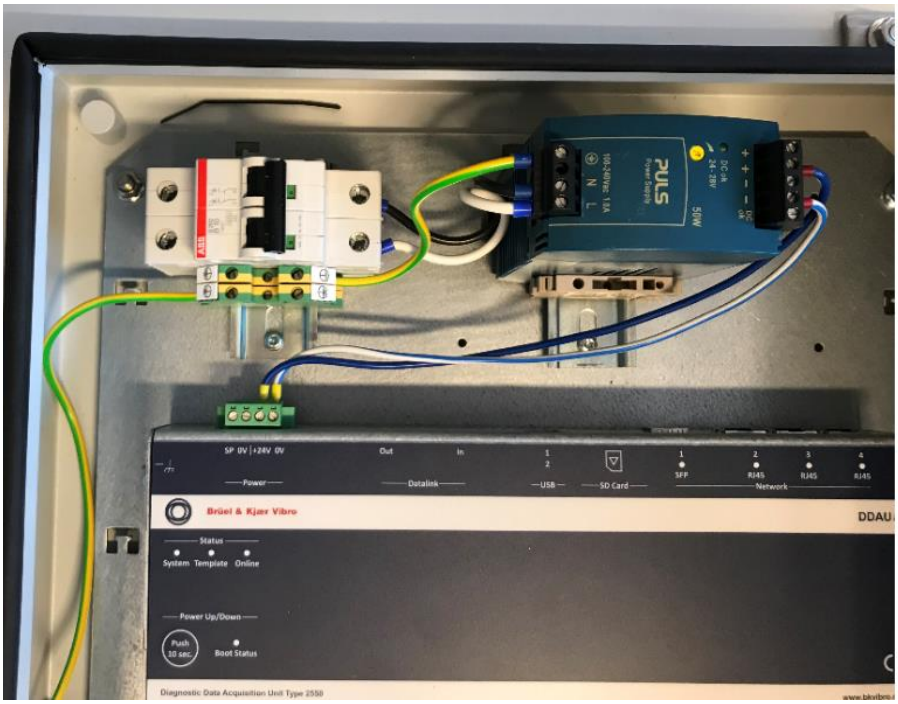


### 5.5.2 Grounding of the CM360 system

This section is relevant for CM360-CG/VCM-3 which includes a 24VDC power supply.
The CM360 system shall be grounded through the PE connector on the PE terminal on the terminal block.
On the left of the cabinet additional grounding option is provided with a treaded hole M8 x 15mm.



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# 6 Basic operation of the VCM-3

## 6.1 First time the VCM-3 is powered up

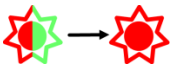
The very first time a VCM-3 is powered up it will run with a factory default template. The intention of the factory template is to enable a first test of the installation. The factory default template provides the necessary descriptors for completing the initial commissioning procedure of the VCM-3. The readings of the descriptors are available via the Commissioning Report feature on the VCM-3 Homepage. Refer to Appendix 2 for a further description of the factory default template and an instruction of how to carry out the initial commissioning test.
When the initial test has been completed the VCM-3 is ready for upload of the machine specific template.

## 6.2 About LED indicators

The LED indicators on the VCM-3 front panel provide a quick visual overview of the state of the VCM-3. In general LED colors which is other than green or switched off indicates an abnormal condition.
Refer to Appendix 1 for a description of the LED color indications.

## 6.3 Power Up/Down

When the 24V power supply is connected the VCM-3 will automatically boot up, the boot process is complete when the Boot status LED shows constant green light.
If the VCM-3 shall be powered down or powered up, the normal procedure is to use the Power Up/Down button using the following procedure:

| Power Down/Up | | |
|---|---|---|
| **Action** | **Boot Status LED** | **Explanation** |
| Soft Power Down (Normal) | | Soft Power down will close down the VCM-3 in an orderly manner where it is ensured that al data is stored in non-volatile memory before power is taken off.<br>Push the button for approximately 3 sec. until the Boot Status LED starts flashing red/green. Release the button. The power down is now in progress |
| | | When the button turns into constant red light, all data has been saved and the power plug can be removed/power can be turned off |
| Hard Power Down<br>(On error conditions) |  | Hard Power Down corresponds to pulling the power plug. This can be applied in case the VCM-3 ends in a state where the watchdog has stopped the VCM-3 operation due to an error in one of its services. (System LED lights blue)<br>Keep pushing the button for approximately 10 sec. until the Boot Status LED starts flashing Red/White.<br>Release the button |
| | | The Boot Status now turns into constant red light. |
| Power Up<br>(When the power cable is inserted into the plug) | | Insert the power plug/turn power on. The Boot status LED starts flashing green. |
| | | When the button turns into constant green light, the boot process is complete. The monitoring template now starts and when the status light above the inputs lights up the unit is ready to measure |
| Power Up (From Hard or Soft Power down | | Hold down the button while the Boot Status is flashing red. |



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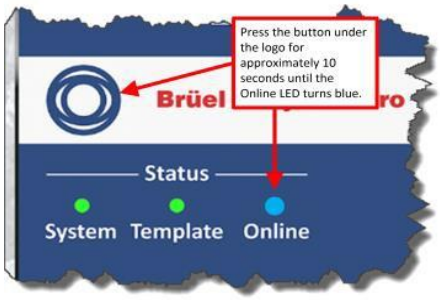
| Power Down/Up | | |
|---|---|---|
| **Action** | **Boot Status LED** | **Explanation** |
| state) | | When the Boot Status starts flashing green release the button. The VCM-3 will complete the boot sequence. |
| | | When the Boot Status turns into constant green light the VCM-3 is ready. |

## 6.4 Reset to default IP address

In the case that the IP address is unknown it is possible to open for access by using the factory default IP. Please follow the procedure below.

| How to reset the IP Address of VCM-3 to its default (temporarily) | |
|---|---|
| **Step** | **Explanation** |
| 1 | Push the button under the logo for approximately 10 seconds until the Online status LED turns into blue.<br>  <br>When the Online status is blue the VCM-3 firewall allows a user to login to the VCM-3 using the default IP address: https://192.168.2.202. The VCM-3 will remain in that state for approximately an hour.<br>Change the laptop network settings to match the IP range of the VCM-3.<br>E.g. Set the laptop to IPv4 address 192.168.2.199, Netmask 255.255.255.0<br>**NOTE!**<br>Refer to Appendix 4 for a description of the procedure of how to change the network settings of the laptop. |
| 2 | Log into the VCM-3. Refer to the description in C107762.002 EN VCM-3 Homepage Manual. |
| 3 | Select the “Commissioning Configuration” page. On this page the IP setting of VCM-3 is displayed. Change it if required. Remember to click **Save Changes** |

## 6.5 How to access to VCM-3 homepage

The VCM-3 is accessed via an internet browser. Google Chrome or Firefox is recommended. Refer to the description in C107762.002 EN VCM-3 Homepage Manual.



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# 7 Termination of sensor signals

The following section describes how to connect the various sensors and inputs to the VCM-3
The various types of channel inputs must have been enabled in the VCM-3 monitoring template in order to be used. Configuration of VCM-3 monitoring template is not a part of this manual.

**IMPORTANT NOTE!**

The shield connections of the cables are not shown on the connection drawings.
The shield must be connected to ground as described below.

## 7.1 Electrical Parts

- Ensure that any electrical parts are disconnected before mounting the VCM-3 unit. Otherwise there can be a risk of death or severe personal damage
- Do not touch live electrical parts
- Disconnect electrical parts before any connections are made

## 7.2 Sensor connection terminals

Accepts wires up to 0.5mm2 with ferrule and plastic sleeve.

## 7.3 Shielding

It is very important that the shields of the sensor cables and the housing of VCM-3 are connected to the same ground potential. That is, to the cabinet where they are mounted. On the side of VCM-3 housing a ground cable can be fastened to the cabinet. The sensor cables can be connected to the cabinet through the EMC rail or other means.

If a floating chassis/ground connection shall be used in connection with VCM-3, please refer to Appendix 3 for an explanation.



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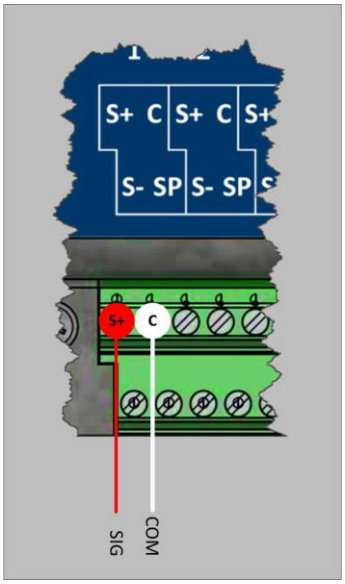
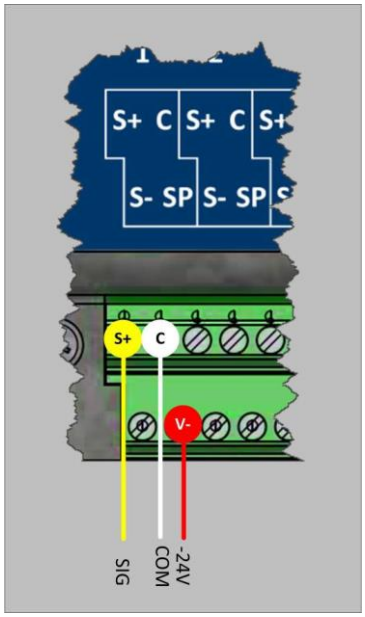
## 7.4 Constant current line drive accelerometers (CCS) channel 1-12

| Constant current line drive accelerometers (CCS) | |
|---|---|
|  | This type of sensors needs a constant current, which is supplied by the VCM-3 unit. Examples of high quality accelerometers offered by Brüel & Kjær Vibro includes:<br>• AS-667 (multipurpose) 100mV/g<br>• AS-447 (high sensitivity) 500mV/g<br>**NOTE!**<br>The current source for the CCS sensors must be enabled in the channel setup of the VCM-3 monitoring template |

## 7.5 Displacement sensors (proximity probes) channel 1-12

| Displacement sensor mounting | |
|---|---|
|  | This type of sensor needs -24V DC sensor power. This requires that a -24V power supply is connected between 0 and SP in the power plug used for supply current to VCM-3.<br>Refer to the section “Power Connection – External Sensor Power” in the “Other Connections” section of this manual. The sensor power terminal “SP” is internally connected to the individual “SP” terminals for each sensor.<br>**NOTE!**<br>The color coding of the wires follows the colors of the IN08x displacement sensor series from Brüel & Kjær Vibro |



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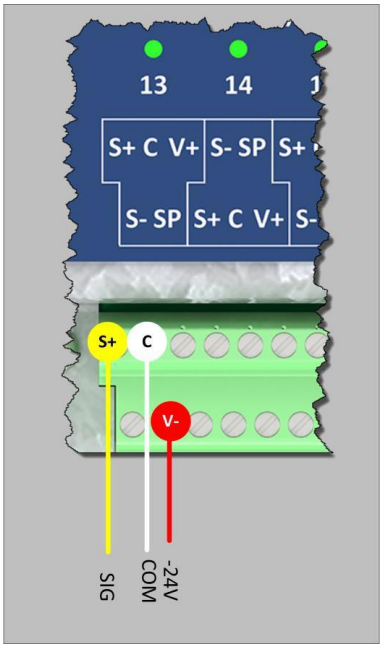
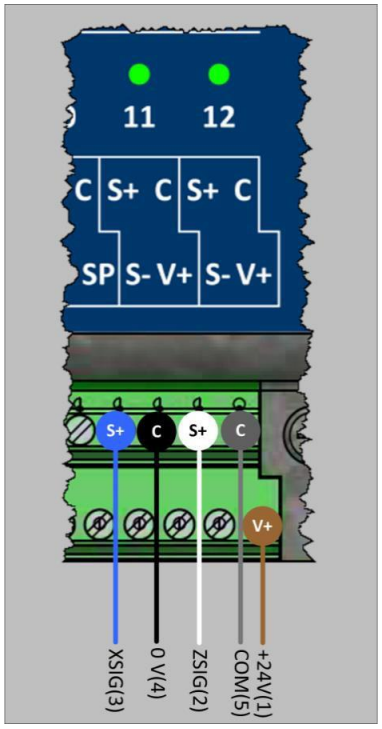
## 7.6 Displacement sensors (proximity probes) channel 13-16

| Displacement sensor mounting | |
|---|---|
|  | This type of sensor needs -24V DC sensor power. This requires that a -24V power supply is connected between 0 and SP in the power plug used for supply current to VCM-3.<br>Refer to the section “Power Connection – External Sensor Power” in the “Other Connections” section of this manual. The sensor power terminal “SP” is internally connected to the individual “SP” terminals for each sensor.<br><br>**NOTE!**<br>The color coding of the wires follows the colors of the IN08x displacement sensor series from Brüel & Kjær Vibro |

## 7.7 AS 247 tower sensor (dual axis)

| AS247 tower sensor mounting | |
|---|---|
|  | AS 247 is a bi-axial sensor, that is, it produces two output signals one for each axis. In the figure these two axes are denoted XSIG and ZSIG.<br>This sensor needs a +24VDC supply which is available on the (V+) terminals on AC/DC channel 11 and 12.<br>If the AS 247 sensor shall be connected to other AC/DC channels the +24 signal must be looped to the SP terminal. The +24 V supply may also be connected to the sensor power input besides the power connector on the top of the VCM-3. Refer to the section “Power Connection – External Sensor Power” in the “Other Connections” section of this manual. The sensor power terminal “SP” is internally connected to the individual “SP” terminals for each sensor.<br>The color of the connection wires corresponds to sensor connection cable AC-1401. |



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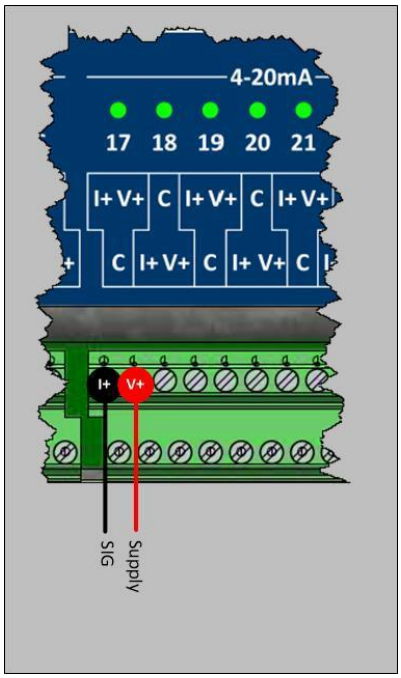
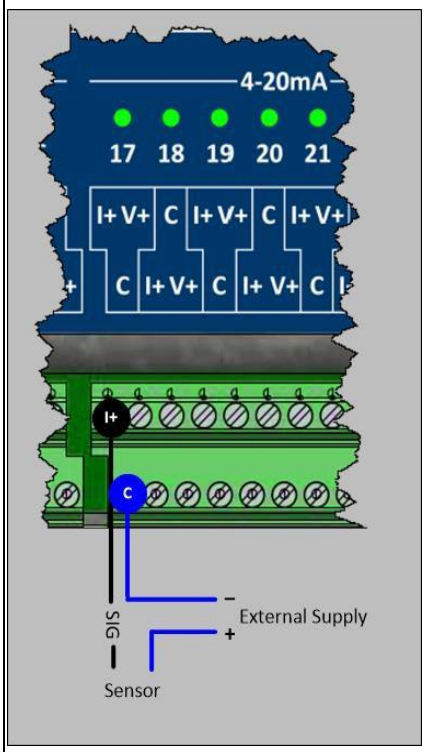
## 7.8 4-20mA input

| 4-20mA input mounting. Current loop supplied by the VCM-3 | |
|---|---|
|  | This input is for 4 to 20 mA signals provided, for example, by a temperature transmitter. The current loop is driven by the VCM-3 power supply.<br>The current loop input provides “NAMUR” compatibility.<br>If the 4-20mA sensor supplies “NAMUR” functionality this functionality can be enabled via the VCM-3 monitoring template. |
| **4-20mA input mounting. Current loop supplied by an external current source.** | |
|  | This input is for 4 to 20 mA signals provided, for example, by a temperature transmitter. The current loop is driven by an external power supply.<br>The current loop input provides “NAMUR” compatibility.<br>If the 4-20mA sensor supplies “NAMUR” functionality this functionality can be enabled via the VCM-3 monitoring template.<br><br>No need for loop supply |



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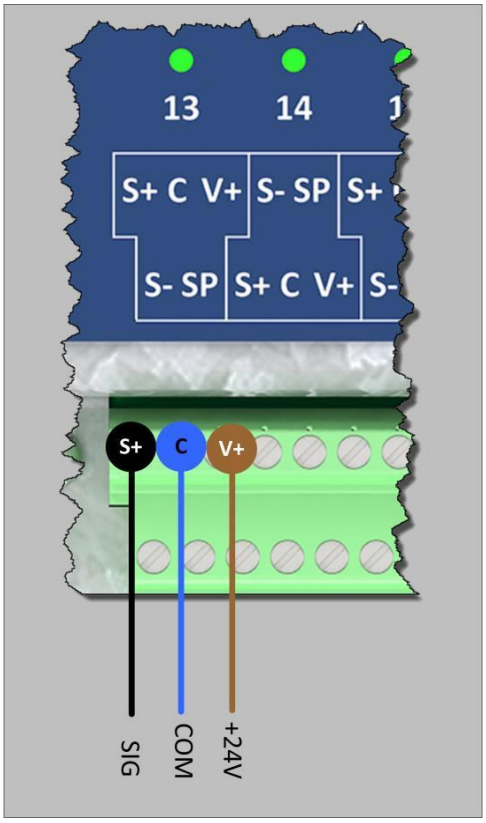
## 7.9 Speed sensor, proximity switch, PNP and NPN type

| About PNP and NPN sensor types | |
|---|---|
| General information | This type of sensor is for measuring the speed of a shaft.<br>The +24 VDC supply for this type of sensor is supplied by the VCM-3 unit. |
| When to use PNP or alternatively NPN | To VCM-3 it makes no difference whether the sensor is PNP or NPN.<br>Some PLC's inputs need NPN, other needs PNP. In Europe PNP is the most widespread, in Asia NPN tend to be the preferred.<br>An NPN or sinking output accepts voltage and sinks it to ground to complete the circuit. A PNP or sourcing output sources voltage and the external circuit sinks it to ground to complete the circuit. |

| Speed sensor, PNP type - mounting | |
|---|---|
|  | The +24 VDC supply for this type of sensor is supplied by the VCM-3 unit.<br><br>**NOTE!**<br>The color coding of the wires follows the standard for proximity switches. |



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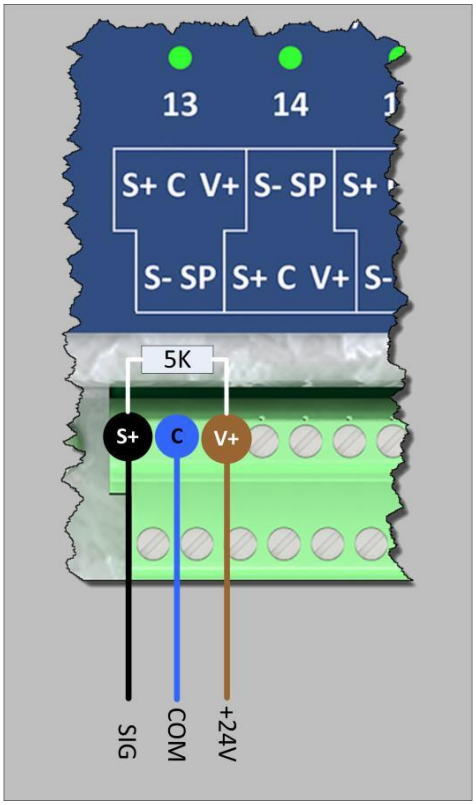
## Speed Sensor, NPN type – mounting




This type of sensor is for measuring the speed of a shaft. The +24 VDC supply for this type of sensor is supplied by the VCM-3 unit.

**NOTE!**

The color coding of the wires follows the standard for proximity switches.

**NOTE!**

A resistor between 1kΩ and 10kΩ needs to be mounted. With the lower resistor value longer cables can be used. However, on the cost of more power to be supplied by the VCM-3



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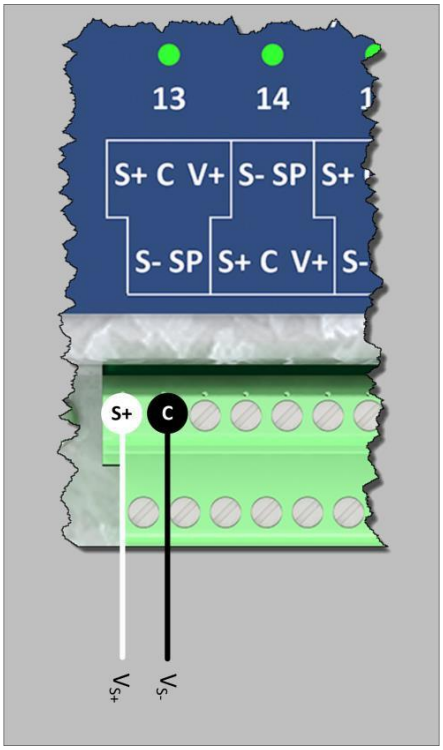
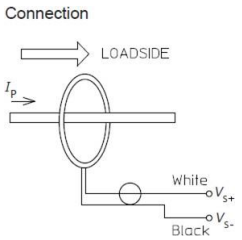
## 7.10 Rogowski probe for current and power measurements

| About Rogowski probes (Rogowski coils) | |
|---|---|
| General information | An alternating or pulsed current in a conductor develops a magnetic field and the interaction of this magnetic field and the Rogowski coil local to the field gives rise to an induced voltage within the coil which is proportional to the rate of change of the current being measured. Provided the coil constitutes a closed loop with no discontinuities the voltage E induced in the coil is proportional to the rate of change of the encircled current. The output voltage E from the Rogowski probe is sent through an integrator to produce an output voltage proportional the current flow through the cable encircled by the Rogowski coil.<br> <br>This integrator is provided by the VCM-3; thus, no external adapters needs to be supplied.<br>The VCM-3 integrator output shall be scaled into the appropriate units for current or power using the information provided in the technical information of the Rogowski probe. This scaling takes place in the VCM-3 monitoring template. |

| Rogowski coil - mounting | |
|---|---|
|  | It is recommended to us the Speed/DC input channels for the Rogowski coils as this input has a high absolute DC accuracy.<br><br>**WARNING!**<br>Do not stress the coil by applying any kind of mechanical force (i.e. twisting, puncturing, excessive pressure, tight bending, etc. which will dramatically degrade the device's accuracy.<br><br>  <br>$V_{out} = V_{S+} - V_{S-}$ is positive when the current flows in the direction of the arrow.<br>The coil does not need to be physically fastened around the primary conductor. Should the coil be secured, make sure no mechanical stress is applied to the coil itself. |



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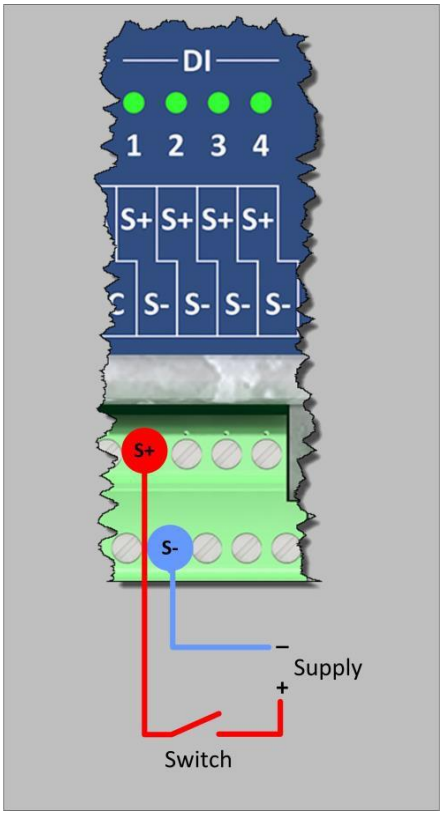
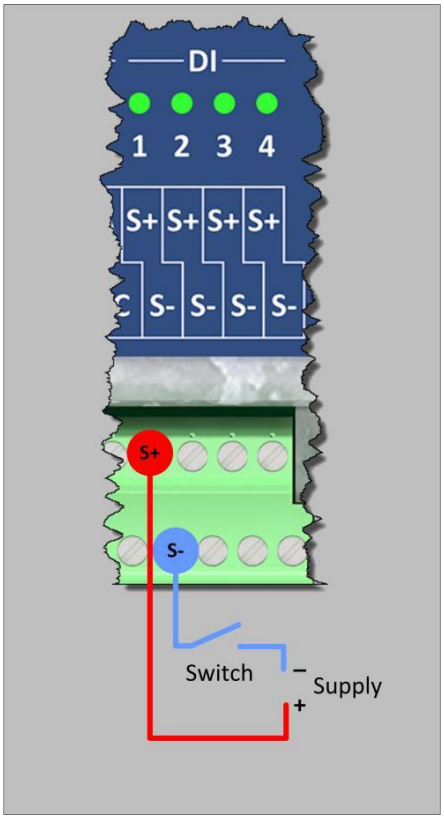
## 7.11 Digital inputs

| Digital Inputs | |
|---|---|
|  |  |

The Digital Input can be used to trigger the capture of time waveforms but can also be used for other purposes such as pulse counters. Applications other that capturing of time waveforms needs configuration and implementation in the monitoring template.

The Digital Input can receive a signal from the digital output on another VCM-3, thus making it possible to synchronize time waveform capture on several VCM-3 units with a delay less than 100ms.
The S- connection is not connected to chassis ground.
The input is galvanically isolated up to a voltage of 125Vrms
The digital inputs are designed according to IEC 946 Binary direct voltage signals for process measurement and control systems.

- Digital Input Low voltage limits: [-3, 5] V
- Digital Input High voltage limits: [13,33] V



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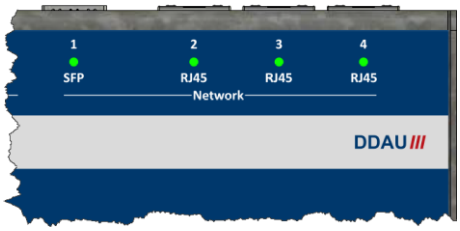
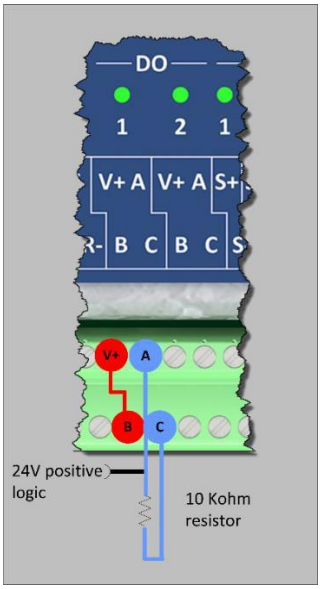
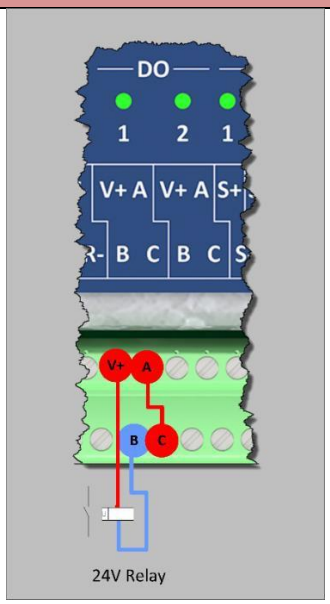
# 8 Other connections

## 8.1 LAN interface, RJ45

| LAN interface connections |
|---|
|  |
| The VCM-3 has four network connections: Three for RJ-45 connectors and one for optical fiber. The connectors are organized as shown below. |

| Item | Details |
|---|---|
| Auto detect | The RJ-45 ports have an auto-detect functionality. |
| Switch functionality | The unit has built in switch functionality which allows for “daisy chaining” of the VCM-3s on a network. The maximum number of VCM-3s allowed in the chain is five. |
| Optical fibre port | The small form-factor pluggable optic transceiver accepts a Duplex LC optical interface for multi-mode fibres, amongst others.<br>Recommended SFP-Module Type SFP-1FE Series from Moxa |

## 8.2 Digital Output

| Digital Output – connections | |
|---|---|
|  |  |
| The digital outputs on VCM-3 is implemented using photo relays. The photo relays in used for the digital outputs are rated for an on-current of 1A up to 50 degC and 0,5A at 85C.<br>The max. off-voltage is 33V. (The outputs are protected by 33V TVS - Transient Voltage Suppression). | |



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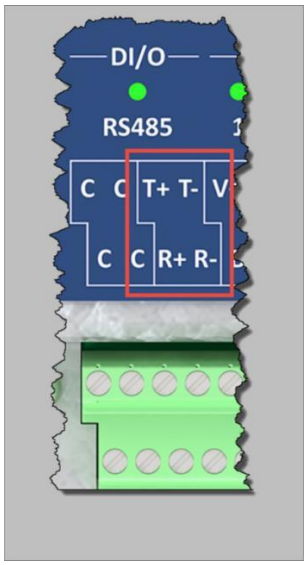
## 8.3 RS485 interface

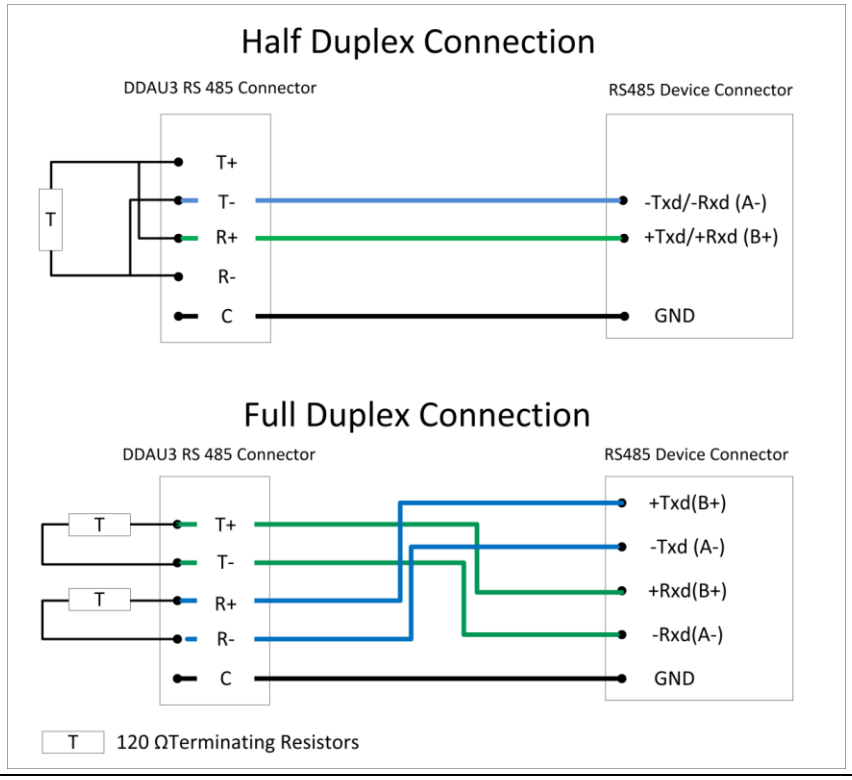
**RS 485 connections**




This connection is often utilized for serial MODBUS interface. The interface in the VCM-3 supports both full duplex and half duplex communication. Please refer to the connection diagram below for details.

**NOTE!**

Beware of ground loops. The GND is the local signal ground. If the cabinets of the RS485 devices are connected via earth ground unfortunate ground loops may be experienced. If this is the case, then omit the local signal ground connection. However, it is not advisable to use this method as earth ground is noisy and a potentially high impedance method for referencing local signal ground.



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## 8.4 Power connection – External sensor power

The external sensor power SP terminal is connected internally to the SP terminal on channel 1-10 and 13-16 on the VCM-3. The most common application of this additional supply is -24 V supply voltage for displacement sensors. However, sensors requiring positive supply voltage can also be supplied through this terminal. Use the free terminals in the power connection terminal block for connecting the sensor power. Max. wire size 2,5 $mm_2$ with ferrule and plastic sleeve.

# 9 Maintenance

**IMPORTANT NOTE!**

Maintenance and repair work may only be carried out by trained personnel.

- Checking power supply.
- The device may be cleaned externally using a slightly damp cloth.
- Check if all screws are tightened.

No moisture in the form of water or other fluids may be introduced into the device!

# 10 Disposal

After use, dispose of the systems, cables and sensors in an environmentally friendly manner, in accordance with the applicable national provisions.
WEEE Reg. No. DE 69572330



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# 11 Appendix 1: Sensor installation

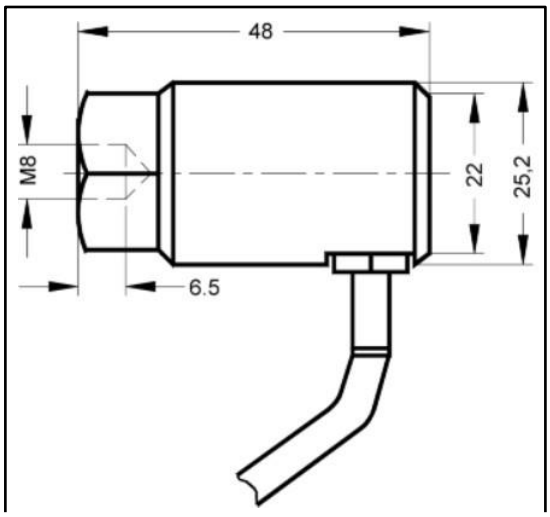
It is necessary to survey the turbine to determine how the sensors should be installed. At the time of the survey the actual position of the sensors are determined. The mounting method and the cable length are also determined at the time of the survey. Protective brackets may also be needed if sensor and /or wires are exposed to mechanical damage during future maintenance work in the nacelle.

- AS-070 is for slow rotating parts as main bearing(s) and first planetary stage of the gearbox.
- AS-062 is used for the other positions.

Both accelerometers are among other lengths available with 10 or 20 meters cable.

## 11.1.1 AS-062 screw mounting

Example




**NOTE!**

For screw mounting only use mounting bolt AC-352 and for drilling only use stepped drill AC-354.
AC-352 is available in the following lengths (l): 25mm, 50mm and 100mm. Use the shortest length possible.



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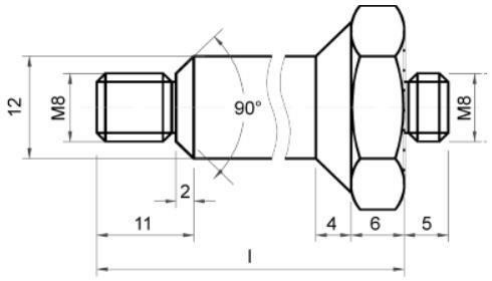
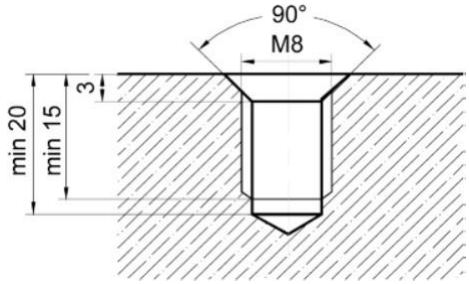
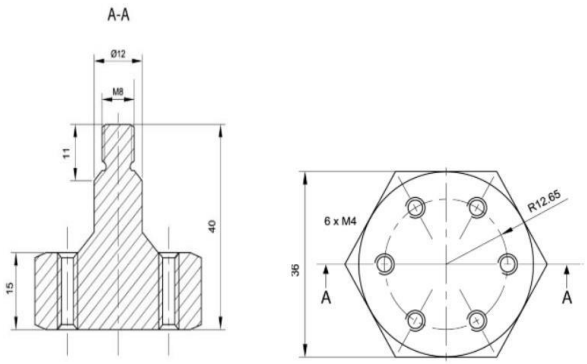
| | |
|---|---|
| **How to use mounting bolt AC-352** | |
| 1 | Apply a thin film of silicone grease on the surface of the mounting bolt to prevent contact resonance. |
| 2 | Screw the sensor onto the threaded stud of the sensor mounting bolt. Recommended maximum torque is 3.5 Nm.<br>Example:<br>  <br> |
| **How to screw mount AS-070** | |
| 1 | Centrelines of the drilled hole and the taper must coincide. For drilling, only use stepped drill AC-354. The drilled hole, taper and thread must all be free from dirt and lacquer. Clean grease on the taper surfaces improves contact.<br>Example:<br>  <br><br>For drilling use stepped drill AC-354. **Note**: Drilled hole, taper and thread must be free from dirt and lacquer. **Tip: Clean grease on the taper surfaces as this improves contact**. |
| 2 | Attach acceleration sensor AS-070 to the sensor mounting bolt type ES2332. Example: |
| |  <br> |
| 3 | Tighten mounting bolt ES 2332 with a tightening torque of 10 to 20 Nm. |
| 4 | Spread a thin layer of silicon grease onto the surface of mounting bolt to prevent contact resonance. |

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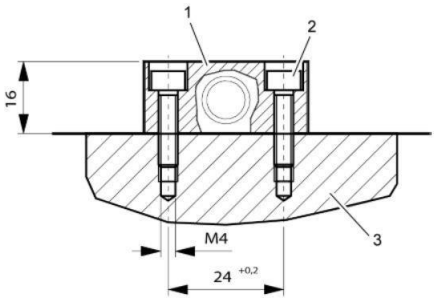
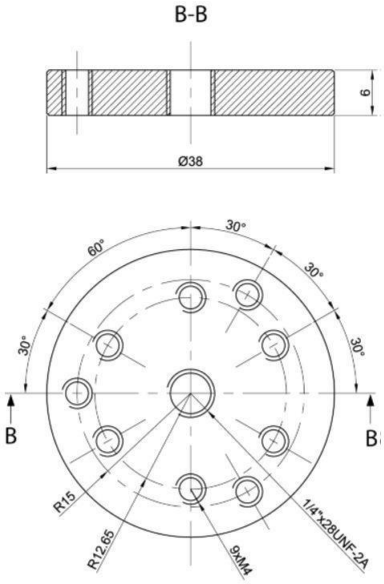
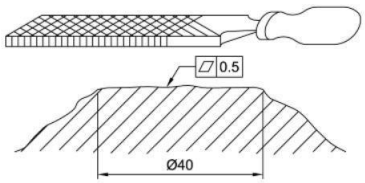
| | |
|---|---|
| 5 | Mount the sensor AS-070 (See 1 in diagram below) buy using two Allen screws M4 l=16 mm (See 2 in diagram below) and then tighten the screws and secure by using for example Loctite®243 medium or Loctite®270 heavy duty. Torque with max. 3 Nm.<br>  |

### 11.1.2 Mounting AS062 and AS070

| How to glue mounting AS062 and AS070 | |
|---|---|
| 1 | Prepare surface of the mounting plate ES2344 for a durable installation.<br>  |
| 2 | Remove all paint at the measurement or mounting point by using a 12-15 inch coarse file or a grinder.<br>  |
| 3 | Clean the surface thoroughly of filings and then treat the surface with degreasing agent. |
| 4 | Cover the drilled holes (9xM4) of the mounting plate ES2344. This stops filler or adhesive from entering and going to the bottom of the mounting plate. |



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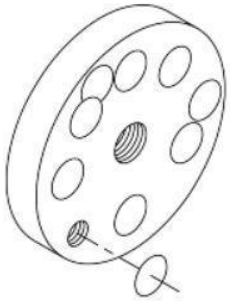
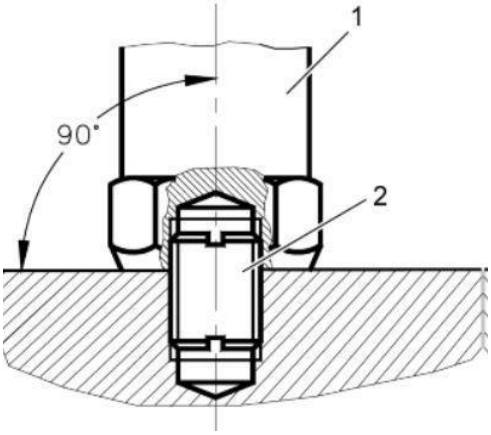
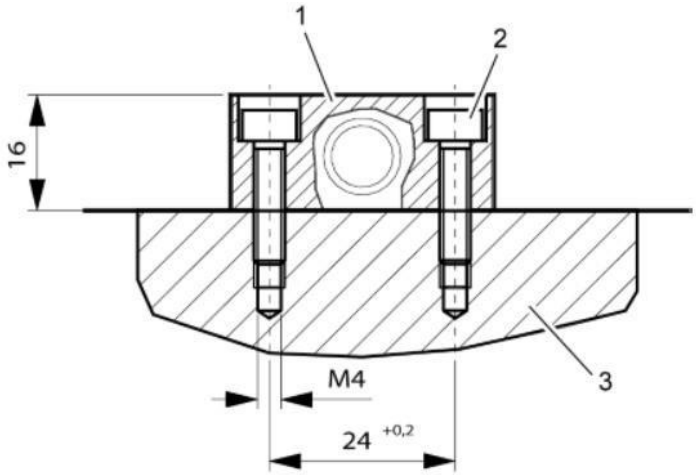
| | |
|---|---|
| |  |
| 5 | Cover the prepared mounting area with filler or adhesive (WQ 0732). |
| 6 | Immediately push the mounting plate onto the treated area.<br>Note: on hot surfaces, the filler or adhesive can cure within 2-5 minutes.<br>  |
| 7 | ***Study the following diagram***. It is referred to in step 8 if you are mount sensor AS-062 or step 9 if you are mounting sensor AS-070:<br>  |
| 8 | If you are ***mounting sensor AS-062*** read this step.<br>Apply a thin file of silicone grease on the surface of the mounting plate and then mount the sensor via threaded stud M8x14. (See 2 in the figure shown in step 7). Torque with max. 3Nm. |
| 9 | If you are ***mounting sensor AS-070*** read this step.<br>Spread a thin layer of silicon grease onto the surface of the mounting bolt to prevent contact resonance. |



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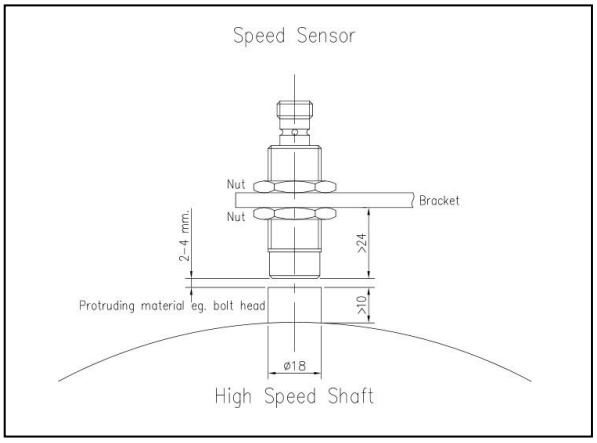
| | |
|---|---|
| | Mount the sensor AS-070 (See 1 in diagram in step 7) by using two Allen screws (See 2 in diagram in step 7). M4 l=16 mm and then tighten the screws and secure them by using, for example, e.g. Loctite®243 medium or Loctite®270 heavy-duty.<br>Torque with max. 3 Nm. |

### 11.1.3 Speed sensor

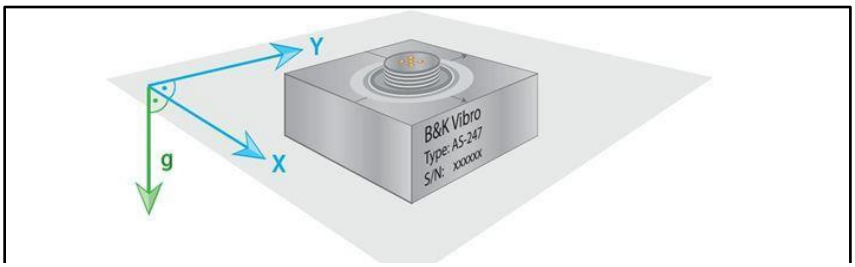
The speed sensor must measure the rotations per minute (RPM) of the high speed shaft. Only one pulse per revolution must be transmitted. Usually, it is necessary to produce taylor-made brackets for the installation.

Example




### 11.1.4 Mounting tower sensors

The acceleration to be measured must lie in the place spanned by X and Y. For measuring the tower vibrations of a wind energy plant, the measuring plane lies, for example, perpendicular to gravitational acceleration (g).
Tower sensors must be mounted in the nacelle, at the center of the tower.
For mounting a free surface of at least 5 cm x 5 cm is necessary. The mounting surface must be flat, solid and absolutely free from dust, dirt and other foreign matter.



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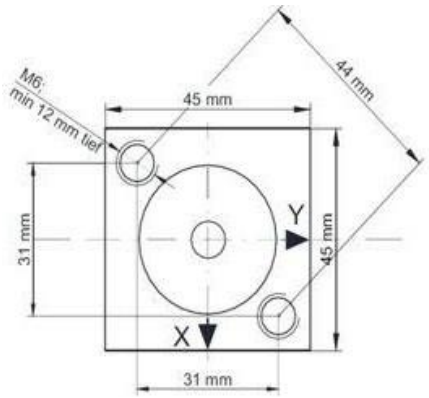
| How to mount tower sensors | |
|---|---|
| 1 | Align the sensor in the measurement plane so that the sensor's measurement axes, labelled X and Y, fit the application context. |
| 2 | Mark the positions of the two holes. |
| 3 | Drill two mounting holes, each with an M6 threaded hole and a depth of at least 12 mm.<br>  |
| 4 | Screw in and secure both M6 stainless steel screws (protection class 70) into the mounting surface by using for example Loctite®243 medium or Loctite®270 heavy duty. |
| 5 | Tighten the screws, alternating between the screws. We recommend a tightening torque of 4 Nm (max. 6Nm) for both screws. |

## 11.2 Appendix: Installation accessories

| B&K Vibro Order No | Description | Qty | Remarks or Comments |
|---|---|---|---|
| AC-352/025<br>AC-352/050<br>AC-352/100 | Mounting bolt for accelerometer | | For AS-062 |
| ES-2332 | Mounting bolt for accelerometer | | For AS-070 |
| AC-354 | Stepped drill | | |
| ES-2342 | Mounting Plate | | AS-062 |
| ES-2344 | Mounting Plate | | AS-070 |
| AS-247 | Tower Sensor | | with Cables: AC-1401/120<br>AC-1401/200 |
| WA-0601 | Mounting Plate | | AS-062 |

| B&K Vibro Order No | Description | Qty |
|---|---|---|
| EQ-2569-2 | Proximity Switch, 18mm | |
| EL-2135-25 | Cable, 25 m, incl. plug | |
| ES-2380 | Mounting flange for EQ2569-2 | |

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# 12 Appendix 2: CE conformity declaration

Brüel & Kjær Vibro
A member of the NSK Group

**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*

**Condition monitoring system**

Typ / *Type*

**CM360-CG/VCM-3**

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***
**2011/65/EU ROHS-Richtlinie / *ROHS-Directive****

***Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten /**
***EU Directive for the restriction of the use of certain hazardous substances in electrical and electronic equipment***

Angewendete harmonisierte Normen / *Harmonized standards applied*

**EN 61326-1: 2013**
**EN IEC 63000:2018**

Bereich / Division
**Brüel & Kjær Vibro GmbH**

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

i.A.
(Niels Karg)

Ort/*Place* **Darmstadt**
Datum / *Date* **15.07.2021**

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# Contact

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