SIEMENS

SIPLUS CMS1000

SIPLUS CMS1000 Bearing Guard
6AT8001-1AA00

SIPLUS CMS1000 Sensor
6AT8001-1AA00-1XA0

Operating Instructions - English
Release 2011-02

Safety Guidelines

This document contains notices which you should observe to ensure your own personal safety as well as to avoid property damage. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring to property damage only have no safety alert symbol.

Danger

Indicates an **imminently** hazardous situation which, if not avoided, will result in death or serious injury.

Warning

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Caution

Used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Caution

Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Notice

Used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state.

When several danger levels apply, the notices of the highest level (lower number) are always displayed. If a notice refers to personal damages with the safety alert symbol, then another notice may be added warning of property damage.

Qualified Personnel

The device / system may only be set up and operated in conjunction with this documentation. Only qualified personnel should be allowed to install and work on the equipment. Qualified persons are defined as persons who are authorized to commission, to earth, and to tag circuits, equipment and systems in accordance with established safety practices.

Intended Use

Please note the following:

Warning

This device and its components may only be used for the applications described in the catalog or technical description, and only in connection with devices or components from other manufacturers approved or recommended by Siemens.

Trademarks

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Disclaimer of Liability

We have checked the contents of this document for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in the manual are reviewed regularly, and any necessary corrections will be included in subsequent editions. Suggestions for improvement are welcomed.

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Table of Contents

1 Preface

1.1 Purpose of this document

These operating instructions support you to operate the Condition Monitoring System SIPLUS CMS1000.

1.2 Required basic knowledge

Basic knowledge of automation technology and condition monitoring equipment is necessary.

These operating instructions contain a description of the components, which are valid at the time of publishing the manual. We reserve the right, to enclose product information with current information to new components and updated components.

1.3 Validity of this document

This document is valid for the Condition Monitoring System SIPLUS CMS1000.

1.4 Modification compared with the previous version

- Redesign and adjustment of pictures
- Upgrading chapter 5 with subchapter **Error! Reference source not found.** and 5.4
- Correction of cable order numbers

Notice

You find the version of the operating instructions in the footer: A5E01653960.

1.5 Declaration of conformity

Product name, model

SIPLUS CMS1000

6AT8001-xxxxx-xxxx

is in compliance with the following standard(s) or documents:

- Low-Voltage Equipment Directive 2006/95/EG

- EMC Directive 2004/108/EG

Harmonized standards applied to all devices

- EN 61326
- EN 61010

In accordance with the aforementioned EC directives, the EC Declarations of Conformity are kept available for the relevant authorities by

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If this product is used outside the European Union, the standards and regulations valid in the owner's country must be observed!

1.6 Standards

You will find detailed information in chapter 6.1 of these operation instructions.

Notice

The specified concessions are only valid according to an authorized label on the product.

1.7 Directory

The operating instructions describe the hardware of the Condition Monitoring System SIPLUS CMS1000.

It contains the following topics:

- Installation and wiring (Chapter 3 and 4)
- Commissioning and diagnosis (Chapter 5)
- Technical data (Chapter 6)
- Order numbers (Chapter 7.1)
- List of abbreviations with explanation of the general definitions of the used terms (Chapter 7.5)
-

1.8 Recycling and disposal

The Condition Monitoring System SIPLUS CMS1000 is environmental compatible and recyclable.

For environmental compatible recycling and disposal of your old device contact a certified waste disposal for electronic.

2 Product Overview

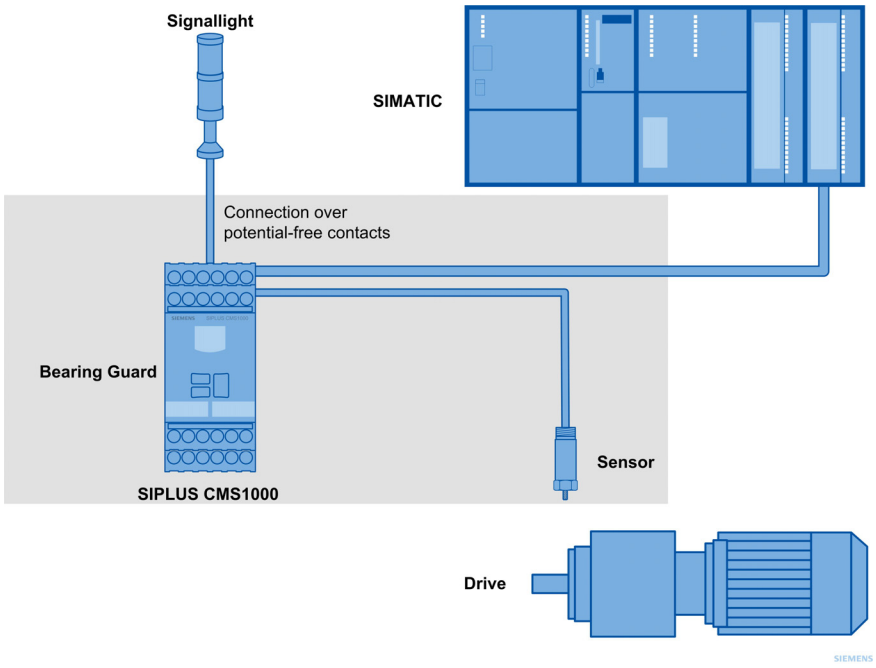
2.1 What is SIPLUS CMS1000?

The SIPLUS CMS1000 is an easy start-up system for permanent monitoring of bearings with constant and variable rotation speed in industrial plants as well as for vibration monitoring of machines.

SIPLUS CMS1000 consists of two components:

- SIPLUS CMS1000 Bearing Guard, subsequently named Bearing Guard.
- SIPLUS CMS1000 Sensor, subsequently named Sensor.

SIPLUS CMS can be integrated into the TIA-Architecture.



Picture 1 Typical configuration

2.2 What is a SIPLUS CMS1000 Bearing Guard?

Definition

The Bearing Guard analyses the condition of bearing by summarizing vibration data with the method based on VDI 3832 (K(t) in the following called **DKW-method**.

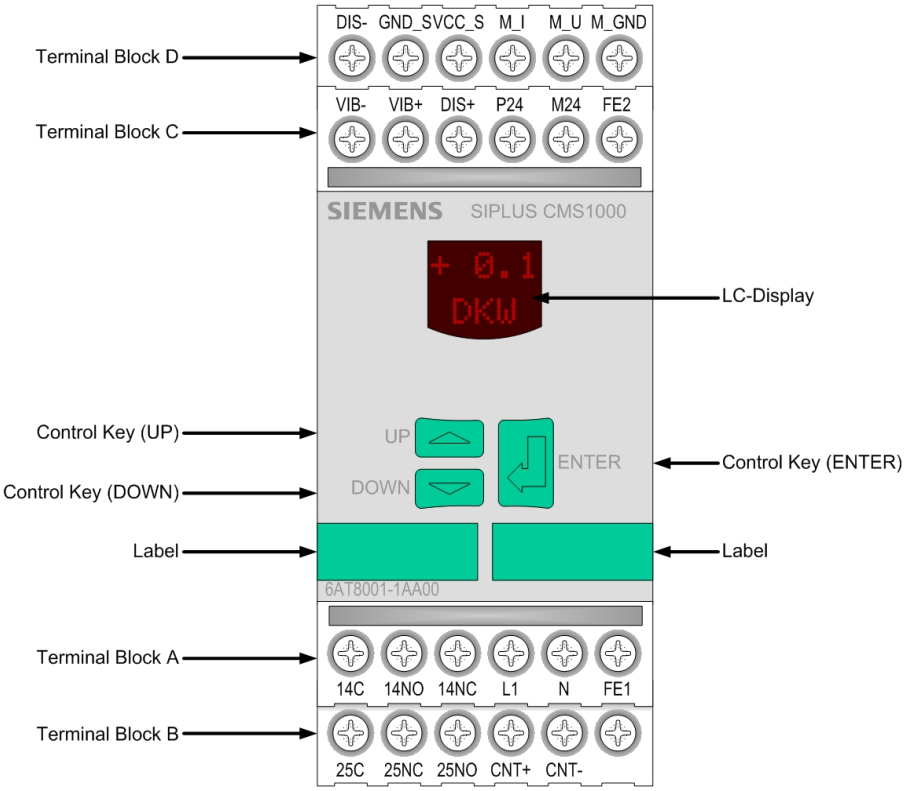
The Bearing Guard also analysis the overall vibration condition of electromechanic machines through broadband measurement of signals between 2Hz/10Hz and 1000Hz and calculating the root mean square value according to ISO 10816, in the following called **RMS-method**.

Application Area

- The Bearing Guard is suited for the application in a control cabinet (IP20).
- The compact design of the Bearing Guard enables the application in space-saving ranges.
- Easy handling of the Bearing Guard provides a fast commissioning and maintenance.
- The product is designed for the application on a DIN Rail.

Display

The Bearing Guard consists of 4 terminal blocks A, B, C and D, one LC-display and some operational control keys. The terminal blocks are mechanically coded..



Picture 2 Bearing Guard

2.3 What is a SIPLUS CMS1000 Sensor?

Definition

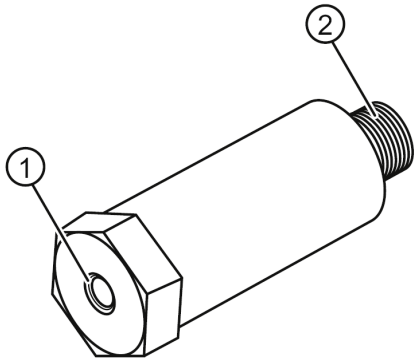
The Sensor collects reliable, and with high accuracy the increasing of vibration in one axis and changes it to an analogue, differential signal of voltage.

Application Area

- The Sensor is suited for the application in industrial environment, due to the robust construction and the degree of protection IP67.
- The compact design of the Sensor enables the application in space-saving ranges.
- Easy handling of the Sensor provides a fast commissioning and maintenance.
- The device is applicable for direct use on motor or gearing chassis.

Display

The Sensor is constructed insulated to ground. It consists of a M12 sensor cable attachment and a M6-thread for mounting on the machine chassis.



Picture 3 Sensor

2.4 Scope of Delivery

What is delivered?

Depending on the scope of ordering (see Chapter 7.1):

- Device SIPLUS CMS1000 Bearing Guard + Manual (short)
- Device SIPLUS CMS1000 Sensor + Manual (short)
- CABLE-MEMS-44-xxxx (xxxx: different cable lengths)
- Adapter M6/M6; M6/M8
- Adapter M6/SPM

Unpacking and Checking

After unpacking, please check

- the packet for completeness and
- all parts for transport damages.

Warning

Do not use any parts that show signs of damage!

3 Installation

3.1 Bearing Guard

3.1.1 Installation Location, Installation Position, Dimensions

Installation Location

The Bearing Guard is adapted for assembly in control cabinets.

The control cabinet must fulfill the request for fire-protection.

Protection against electric shock must be warranted.

A pull relief of all outward cables must be secured.

Installation Position

The Bearing Guard is suited for installation on a DIN Rail.

Bring the upper guard attachment into the rail and press the device down until catching.

Constriction of the installation position: the module must be installed vertical.

Distance to keep for correct ventilation:

on the side: 0 mm; on the top: 40 mm; on the bottom: 22mm.

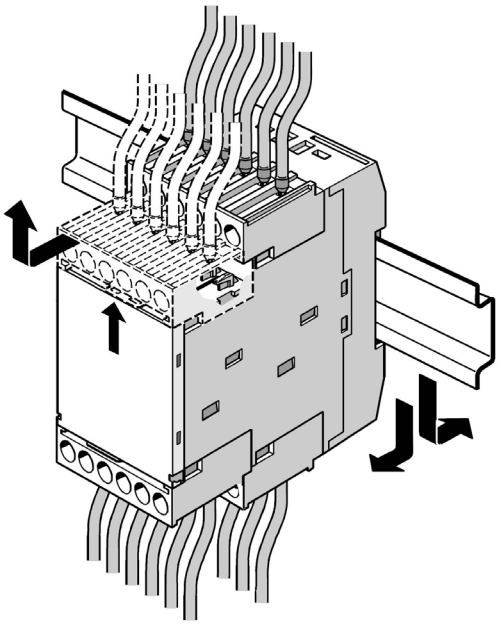
Assembly recommendation

Take care about an efficient grounding of the machine. The connection between motor and base must be bare (without any color) so that a good grounding is guaranteed.

Dimensions

Chart 1 Dimensions

Dimensions (mm)	
Installation face length	45 mm
Installation height	106 mm
Installation depth	86 mm



Picture 4 Example for installation position Bearing Guard

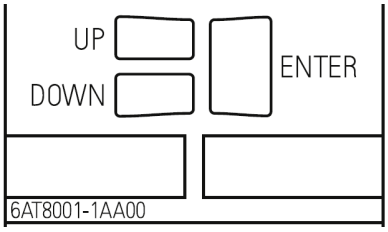
3.1.2 Label Plate

Characteristics

You can mark the device with a label plate, which is exchangeable.

Exchanging the label plate

1. Push the screwdriver in the small opening on the bottom edge of the label plate and hang it out.



Picture 5 Label 1 and 2

2. Push the label plate with the finger in the indentation.

The order numbers for additional labels (20 mm x 7 mm, ‘pastell-türkis’) can be found in the following catalogue in chapter 7:

Niederspannungs-Schalttechnik
SIRIUS - SENTRON - SIVACON
Katalog LV 1 - 2010
Bestell-Nr. E86060-K1002-A101-A9
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or on the Internet-website IA&DT Information- and Downloadcenter

3.2 Sensor

3.2.1 Installation Position, Dimensions

Installation Position

The Sensor should be fixed radial to the rotating axis of the motor and as close as possible near the bearing in the load-zone that shall be monitored.

The Sensor is only allowed to be fixed on safe grounded metal parts.

The Sensor cable must only be installed in rooms with a maximal environmental temperature of +90º Celsius. Joining the cable to the crankcase is forbidden.

Dimensions

Chart 2 Dimensions

Dimensions (mm)	
Installation length	64 mm
Diameter	22 mm

Notice

- The Sensor must be fixed form-closed, to assure the correct transmission of the vibration.
- The Sensor must not be mounted on curved or coated surfaces
- The signal line should be as short as possible
- Ensure that there are no additional changeover of material besides bearing and bearing carrier
- Oscillating parts of housing are not permitted as measurement position
- Measurement should proceed in direction of load
- Mounting should be done in direction of highest velocity of vibration. As far as there are no measurement or data available mounting should be done in 135 ° or 225 ° from A-side
- Very low diagnostic characteristic values might be caused by wrong measurement position or faulty installation of the sensor
- Measurement of RMS should not be done with sensor mounted on exposed SPM-nipple
- Changes in the setting-up area of the motor can influence the diagnostic characteristic values.

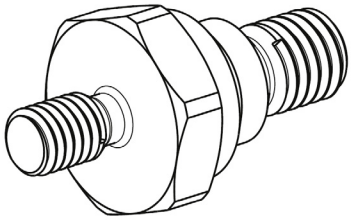
3.2.2 Assembly options

For the assembly of the Sensor (M6-thread) on the motor three adapters are available.

If there is no thread to assembly the adapter on the machine a blind hole must be drilled with minimum 10 mm depth and fitting thread.

Adapter M6/SPM

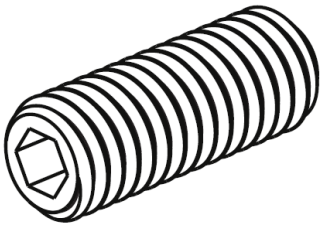
Is needed for IEC cage rotor motors that are provided with the bearing monitoring option Q01/G50. To check the vibration of the bearing a fitting to measure the SPM-impact momentum is attached.



Picture 6 Adapter M6/SPM

Adapter M6/M6

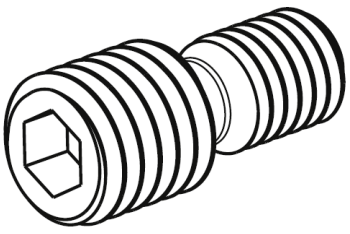
Is needed for motors that have a M6-thread for bearing monitoring.



Picture 7 Adapter M6/M6

Adapter M6/M8

Is needed for motors that have a M8-thread for bearing monitoring.



Picture 8 Adapter M6/M8

4 Wiring

4.1 General Rules and Regulations for operation of SIPLUS CMS1000

Supply voltage

The SIPLUS CMS1000 must either be supplied with 24 V DC or with 115 … 240 V AC/DC. (Both voltages at the same time are forbidden!)

The following chart shows what you have to observe for the DC24 V-Supply.

Chart 3 DC 24V-Supply

At…	**you must ensure that …**
DC 24 V-Supply	safe (electrical) disconnection of low voltage

Protection against external electrical influences

The following chart shows what you have to observe for the protection of electrical influences or faults.

Chart 4 Protection of electrical influences

At…	**you must ensure that …**
all devices or systems, where SIPLUS CMS1000 is installed	the device or system for conduction of electromagnetic failure on grounding (SHIELD) is connected.
Supply, signal and bus lines	wiring arrangement and installation is correct.
Signal and bus lines	a line or strand breakage should not lead to an undefined situation of the device or system.

Specifications to the wiring:

- Temperature: the wiring must be installed so that they can not take any damage. The wiring to the Bearing Guard must be applicable for environmental temperature of -25 °C to +60 °C.

Important: The cables must not contact hot motor parts. Suitable distance pieces must be designed

- Insulation thickness: >=0.21 mm (wire insulation)

  ca. 1 mm (outer cover)

- conductor cross-section: 0.34 mm²

- strain-relief: A strain-relief both in the area of the Sensor and the Bearing Guard must be planned.

Notice: The wiring must be fixed (binders), so that in case of loosening of a line link no bridging in the insulation can occur. (e.g. primary against 24 V DC).

- The connection-wires must be bared according to the drawings on the specification plate and when indicated be provided with core cable ends.
- Conductor cross section: see specification plate.
- The supply voltage connection (AC/DC 115… 240 V) must be realized according to VDE 0100 and VDE 0160.
- Core cable ends: the cross section characterization is also valid for core cable ends that have to be sleeve-insulated.

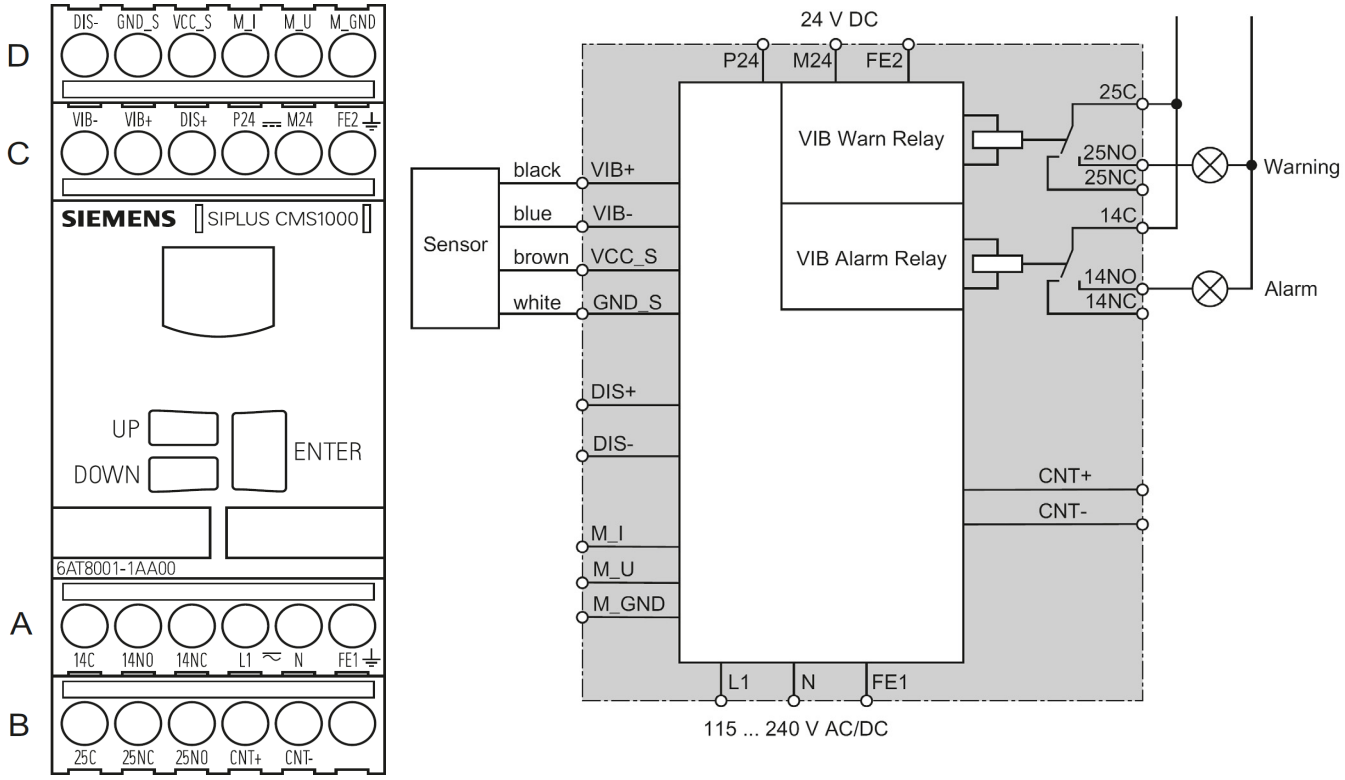
Warning

Take care that no contactable conductors/wires hang out of the clamps. Danger of electric shock !

4.2 Bearing Guard wiring

Caution

Only when the installation is correct, protection category IP20 and safe contacting are ensured.



Picture 9: Pin assignment and circuit diagram with lamps for warning and alarm display

4.2.1 Sensor connection

The Sensor signal has to be connected on clamp unit C, the Sensor feeding voltage to clamp unit D.

Chart 5 Connection assignment Sensor

Assignment	Description / wire color
VIB+	Sensor signal: black
VIB-	Sensor signal: blue
VCC_S	Sensor feeding voltage: brown
GND_S	Sensor feeding voltage: white

4.2.2 Connection of the Disable-Function

By activating the Disable-Input though SPS, frequency converter etc., e.g. during the start-stop procedure of the motor, the Bearing Guard can be disabled.

The connections of the Disable-Function are on clamp unit C and D.

Connection assignment

Chart 6 Connection assignment Disable-Function

Assignment	Description
DIS+	24 V DC+
DIS-	24 V DC GND

Notice: The device is also working without connecting the Disable-Input.

4.2.3 Connection for signaling alarm and warning (signaling contacts)

When the preset limits are reached, warning or alarm-state is signaled via two relay outputs (signaling contacts).

The connectors for signaling warning and alarm are located on clamp units A and B.

Warning

The relay output (warning/alarm) must be fused with:

60°C environment temperature max. 500 mA allowed. (fuse 2.5 A)

40°C environment temperature max. 5 A allowed. (fuse 10 A)

Connection assignment signaling contacts

Chart 7 Connection assignment warning and alarm signaling

Assignment	Description
14C	relay for voltage up to 230V AC alarm
25C	relay for voltage up to 230V AC warning
14NOC (alternatively: 14NCC) *)	indicating lamp for alarm
25NOC (alternatively: 25NCC) *)	indicating lamp for warning

*) NOC means normal open contact, NCC means normally closed contact

4.2.4 Connection for motor rotation speed recording with variable rotation speed

The rotation speed of motor or transmission shaft that is suitable for the bearing, can be collected either analog -as current or voltage value- or digital (BERO) by a counting input on the device.

The connector for the analog recording is on clamp unit D, the connector for the digital recording is on clamp unit B.

Connection assignment

Chart 8 Connection assignment motor rotation speed / load recording

Assignment	Description
M_I und M_GND	rotation speed / load recording with current value 4..20 mA
M_U und M_GND	rotation speed / load recording with voltage value +-10 V
CNT+ und CNT-	rotation speed recording with digital signal (BERO) 24 V switching frequency max. 200 Hz 1 impulse per rotation

4.2.5 Connection power supply

The device can be supplied with 115…240 V AC/DC or with 24 V DC.

The connectors for feed-in 115…240 V AC/DC are on clamp unit A, the one for feed-in 24 V DC on clamp unit C.

Caution

The supply voltage (AC/DC 115…240 V; 50 Hz/60 Hz und DC 24V) of SIPLUS CMS1000 must be fused with 2.5 A.

4.2.6 Connection assignment

Chart 9 Connection assignment power supply

Assignment	Description
L1, N, FE1	Power supply AC/DC 115 … 240 V; 50 Hz/60 Hz; protective earth contact 1
P24, M24, FE2	Power supply DC 24 V; protective earth contact 2

Caution

An extern allowed circuit breaker must be provided for separating elements. It must not be arranged in the earth or neutral conductor. This easily operable circuit breaker must have a certain value (16A EU / 20A USA) and must be arranged close to the device (3m).

The switch must be marked as appendant to the device.

4.3 Sensor Cable

Caution

Only when the installation is correct, protection category IP67 and safe contacting are ensured.

4.3.1 Connection Sensor cable

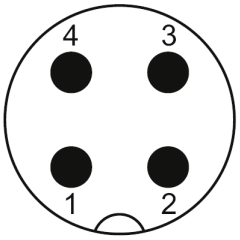
Caution

It is recommended to use standard SIPLUS CMS cables. Using self made cable connections leads to exclusion of warranty.

Picture 10 SIPLUS CMS1000 Sensor cable

4.3.2 Connection assignment

Chart 10 Connection assignment SIPLUS CMS1000 Sensor cable

PIN	Assignment	Wire color	Display
1	VCC_S	brown	
2	GND_S	white	
3	VIB-	blue	
4	VIB+	black	
	shielding	knurled screw	

4.3.3 Sensor cable connection

Push the connector of the Sensor cable in vertical position on the M12 connector plug. Twist the M12 plug with the knurled ring nut tight until it snaps. (about 1/2 rotation)

For EMC safety it is obligatory that the Sensor-cable must be grounded across a wide area (e.g. grounding bar). The experience shows that especially with longer cables a screening is obligatory otherwise errors in measurement will occur.

Caution

Avoid canting between plug connector of the Sensor and M12 connector!

5 Commissioning and diagnosis of Bearing Guard

5.1 Commissioning and start-up

In delivery status the Bearing Guard has activated both methods, RMS-method and DKW-method. Detailed description of these methods and their relevant parameters can be found in chapter 5.2(DKW) and chapter **Error! Reference source not found.**(RMS).

Please make sure that all parameters for the activated methods are set properly.

5.1.1 Preconditions for commissioning (IBS)

1. Bearing Guard mounted with Sensor (see chapter 3).

2. Bearing Guard wired with Sensor (see chapter 4).

While operating with a frequency inverter it should be avoided to adjust the inverter frequency below 8 kHz. The closer the frequency approaches 8 kHz the more perturbations will occur.

If it is not possible to adjust the inverter frequency outside this frequency range the perturbations can be partially filtered out by Teach-In with the LEARNING operation (see chapter 5.2.1). However initiating damages might not be detected (oscillations with small amplitude). Only increasing damages will lead to a detectable increased diagnosis value.

5.2 DKW-method

A method for calculating a characteristic diagnosis value (DKW according VDI 3832) is detecting damages at an early stage especially for bearings.

The DKW-value represents the condition of the bearing. Short disturbances are filtered out.

The calculated value will be compared with reference values previously learnt during a Teach-In phase by running a failure free machine in normal condition. The Bearing Guard displays the deviation of actual DKW-value from reference value.

Exceeding the threshold value of DKW (deviation from reference), potential-free contacts signal status ‘Warning’ or status ‘Alarm’. The calculated characteristic diagnosis value DKW is shown on the display.

5.2.1 Learning (Teach-In) operation

Before this sequence of learning is done all parameters must be adjusted. (see Chapter 5.2.5)

It must be ensured that the motor has finished its run-in procedure.

Parameter „LeaTi“

In menu “LEARN“ the learning of the machine reference condition is done. The Teach-In or reference operation measures the reference condition of the bearing oscillation. It is important to use a machine that is not damaged but has completed the run-in.

5.2.1.1 Teach-In operation with constant rotation speed

Parameter „cons“

The recording of the Teach-In value must be done under operating load and with operating rotation speed. All diagnosis conclusions correspond to the Teach-In value of the start conditions of the monitored machine that has been established. The Teach-In value is stored persistent in the Bearing Guard and can be shown via keystroke on the display at every time.

The maximum Teach-In time is terminated to one hour.

The teach-In becomes more precisely the more time for learning is appointed.

5.2.1.2 Teach-In operation with variable rotation speed

Parameter „var“

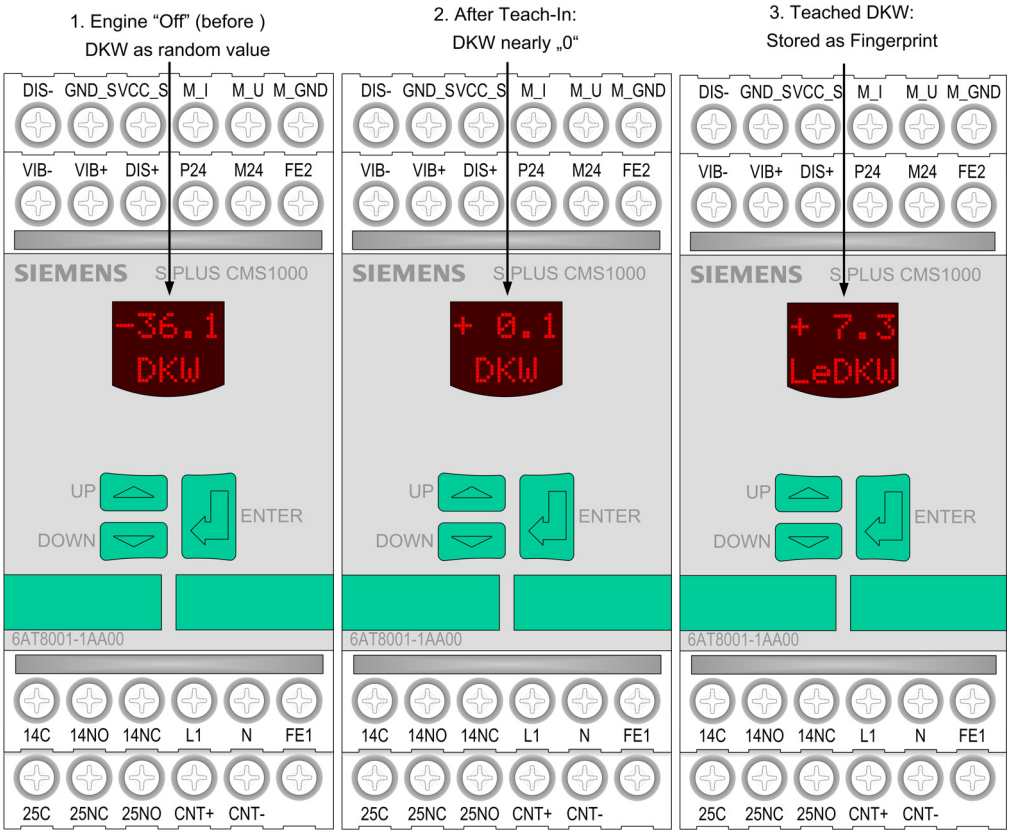
With variable rotation speed the teach-in operation must include all operating points that occur during a normal operating. All rotation speeds occurring in normal operation must be reached during teach-in sequence. One rotation speed can be reached several times during Teach-In sequence.

Hint: In case that the entire range of speed is relevant in normal operation mode, a Teach-In sequence with a ramp is recommended. The change of rotation speed during Teach-In must not exceed 180 rpm / min (= 3Hz s^{-1})

Due to restricted number of DKW-supporting points of Bearing Guard corresponding deviations might occur on single rotational speeds in case of highly non-linear characteristic of DKW-curve.

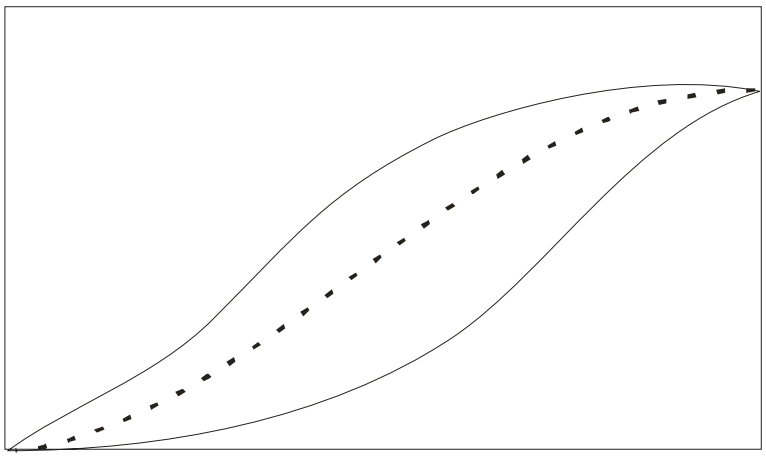
Operating points that could not be learnt during Teach-In phase can lead to false alarms.

5.2.1.3 Display before and after Teach-In



Advantages of the DKW-method for monitoring a bearing:

- One characteristic to detect a bearing damage
- Defects are detected early (DKW faster than RMS).
- Illustrates the defect from the early phase to the breakdown of the bearing.



Picture 11 DKW-method

- All types of bearing defects are detected in one value (inner ring/outer ring, cage, rolling element).
- No input of bearing values necessary.
- Only one Teach-in operation necessary.
- Mostly independent of temperature.
- Mostly independent of load
- The sensor is mostly independent of its position compared to a fitting on the bearing shell

5.2.2 Measuring ranges with the DKW-method

With a raw filter two measurement bands for the analysis of the Sensor signal can be adjusted.

Raw filter **ON (recommended)**: 1 kHz to 6.5 kHz
In this measurement area low-frequency interruptions are filtered out. The diagnosis is focused on monitoring the bearing. We recommend only using integrated RMS-method to detect unbalances. Both methods DKW and RMS can be run simultaneously (alternating calculation).

Raw filter **OFF (not recommended)**: 0 Hz to 6.5 kHz
In this measurement area all frequencies are regarded, even potential machine vibrations. We recommend only using integrated RMS-method to detect machine vibration.

5.2.3 Violation of limits

While start-up the System both threshold values for warning and alarm must be preset.

Basically the limits have to refer to DKW-values that had been calculated during teach-in-phase with an undamaged bearing.

The Bearing Guard has defaults values that had been determined during laboratory tests with a damaged bearing type 6208. This value can differ from actual DKW-values with different type of bearing.

There is no norm to determine to Threshold value. The user must assure that during commissioning the SIPLUS CMS1000 the correct limits are adjusted.

5.2.3.1 Exeeding the warning limit

When the characteristic diagnosis value (DKW) exceeds the limit for warning, a relay for signaling this condition is switched on. This relay stays active till the user resets it by keystroke. If the device is switched currentless the state of warning will be reset. This is not a disadvantage since the device detects the existing damage during restart and goes back to warning state.

A machine that violates the warning-limit of characteristic diagnosis value (DKW) is usually not applicable for continuous-running operation. But it is commonly allowed to work in this state for a terminated time, until there is an opportunity for corrective actions.

Notice

If a closer examination of the motor shows no noticeable problems, the warning-limit could be set to a higher level.

5.2.3.2 Exeeding the alarm limit

When the characteristic diagnosis value (DKW) exceeds the limit for alarm, a relay for signaling this condition is switched on. This relay stays active till the user resets it by keystroke. If the device is switched currentless the state of alarm will be reset. This is no disadvantage since the device detects the existing damage during restart and goes back to alarm state.

Machinery which characteristic diagnosis value (DKW) violate the alarm-limit are usually not applicable for continuous-running operation anymore. It is strongly recommended to maintain the machine and replace it when indicated.

Notice

If a closer examination of the motor shows no noticeable problems, the warning-limit can be set to a higher level.

5.2.3.3 Threshold bands

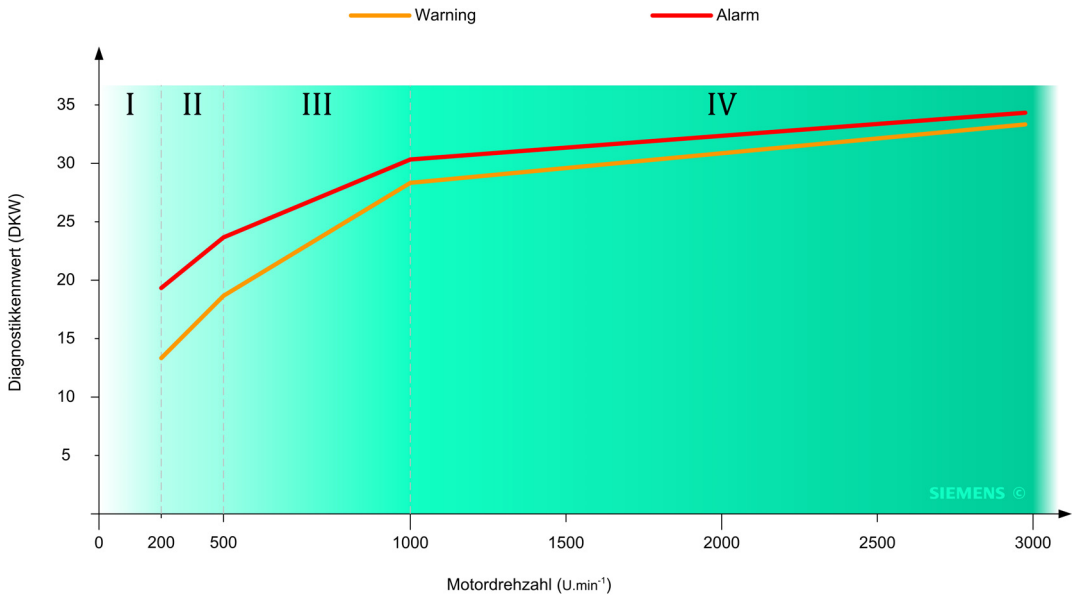
The following threshold bands are regarded as an example to adjust the SIPLUS CMS1000 Bearing Guard limit for warning and alert.

To explore the following threshold bands a 5.5 kW motor with bearings of the type 6208 was used. The motor was mounted on stiff basement.

The bearings have been specific damaged:

- lightly damaged: no warning necessary
- advanced damaged: warning necessary
- heavily damaged: alert necessary

The measurement was taken in the load zone with the following threshold bands proposed.



Picture 12 Threshold bands for motors with different rotational speed

I	Rotation speed too slow for DKW-method
II, III	For both rotation speed ranges different values for warning and alarm can be applied according to the chart.
IV	Within this rotation speed range the same value for warning and alarm should be entered . The distance between these values is too small.

5.2.3.3.1 Threshold values for variable rotation speed 200 rpm to 400 rpm

If the rotational speed is between 200 rpm and 400 rpm please see orange and red curves in chart above E.g. it is recommended to take following DKW-values at rotational speed 300rpm: (In the example Warning: DKW = 16; Alarm: DKW = 22).

5.2.3.3.2

5.2.3.3.3 Threshold values rotation speed 400 rpm to 1000 rpm

Due to stronger increasing DKW-values in speed range between 400 rpm and 1000 rpm the limits can be picked from the threshold band chart (see picture 15) only for limited rotational speed ranges. (e.g. 400-600rpm; 600-800 rpm; 800-1000rpm)

5.2.3.3.4 Threshold values rotation speed greater than1000 rpm

For rotational speed greater than 1000 rpm it is recommended to merge the limits for warning and alarm.

Notice

If a closer examination of the motor shows no noticeable problems the alarm limit can be set to a higher level.

5.2.4 Menu navigation

5.2.4.1 Description of the display

RUN

The default display is „DKW“. With the arrow keys (UP / DOWN) the display content can be changed. In this display mode active values are only displayed, the parameters can not be modified.

SET

When pressing ENTER for minimum 3 s, the system goes to „SET“ mode. Then ENTER-key leads to each parameter. The parameter values can be changed with the arrow keys (UP / DOWN). Pressing those keys for longer time changes the parameter value faster.

When pressing ENTER for minimum 3 s, the system goes back to „RUN“ mode. This futhermore causes the parameters to be saved in a nonvolatile storage.

If the parameter “LeaTi“ is set to a value bigger than 0 in „SET“ mode, the system navigates to “LEARN“ mode when leaving the SET-Mode. If parameter ”LeaTi“ is changed back to 0 (counting down from the set value, e.g. 60 to 0) this mode will be left. A manual abortion is possible by pressing the arrow keys (UP/DOWN) for minimum 1 s.

LEARN

The system navigates to ”LEARN“ mode if the parameter ”LeaTi“ is set to > 0 in “SET“ mode. In ”LEARN“ mode the Teach-In process for the reference conditions of the machine will start. The Teach-In process measures the reference conditions of the bearing oscillations. For the Teach-In process it is important not to use a pre-damaged machine. The reference points must be recorded with nominal load and during nominal rotation speed. In case constant rotation speed was adjusted, **one** characteristic diagnosis value (DKW) is recorded as reference value. With variable rotation speed the teach-in process must get all operating points that occur during normal operating. Operating points that are not taught can lead to false alarms. All diagnosis reports apply to the „Teach-In-value“-characteristic that was calculated in original condition.

For further information about the Teach-In process see chapter 5.2.1

ERROR

The system automatically navigates into the „ERROR“ mode on condition that:

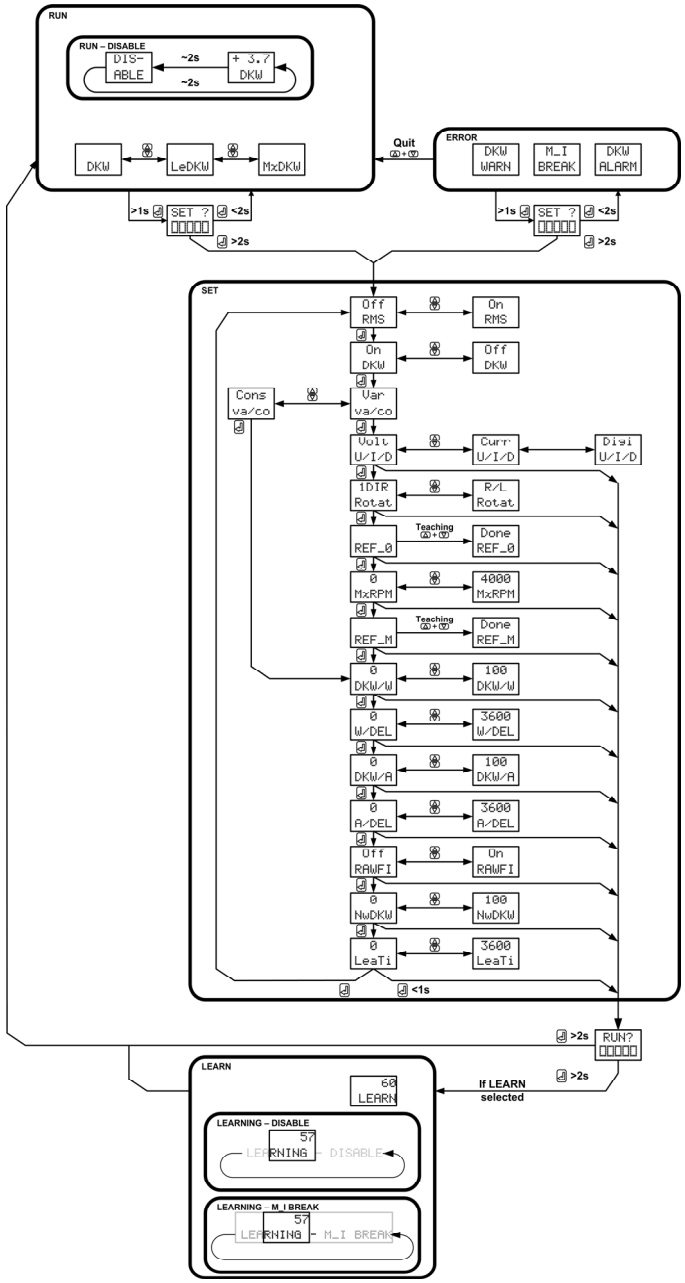
- PRI0 1: Warning „VIB WARN“
- PRIO 2: Alarm „VIB ALARM“
- PRIO 3: Cable break analog input/rotation speed „M_I BREAK“

This state can be confirmed by pressing both arrow keys (UP/DOWN) at the same time for minimum 1s. The adjusted limit will not be lost. If there are more than one error at the same time, the one with top priority is displayed. If necessary the limits have to be reassessed with the „SET“-menu.

For further information see chapter 5.2.3

The error „ Cable break analog input “ can not be quit by the user. It is cancelled automatically when error is resolved.

5.2.4.2 Menu navigation with display



Picture 13 menu navigation with display for DKW-method

5.2.4.3 Abbreviations in the display

RUN-menu

DKW:	Actual characteristic diagnosis value (DK-value)
LeDKW:	Learned/stored DK-value
MxDKW:	Maximal reached DK-value
DISABLE	The SIPLUS CMS1000 is actually disabled

SET-menu

RMS:	Sets the operation mode of the Bearing Guard (with or without RMS-method)
DKW:	Sets the operation mode of the Bearing Guard (with or without DKW-method).
va/co:	Sets whether the motor runs with variable (var) or fix (cons) rotation speed.
Volt/Curr/Digi:	Sets whether the rotation speed is fed as voltage (Volt) current (Curr) or as digital pulse (Digi) (in case of “Digi” one impulse per rotation is expected.)
1Dir / R/L:	Sets whether the motor works in one rotational direction or in counter- and clockwise rotation.
REF_0:	If ”Volt“is selected for parameter “Volt/Curr/Digi“ the voltage value REF_0 refers to voltage at 0 rpm. IN case “Curr” s selected, At 0 rpm the parameter ”Curr“ is 4mA. (In case parameter “Volt/Curr/Digi” is selected as “Digi”, REF_M is not relevant)
MxRPM:	Adjusts the maximum expected motor rotation in rpm.
REF_M:	Represents the value at maximum rotational speed in Volt/Current/Digital Impulses. (dependant on parameter ”Volt/Curr/Digi“) E.g. in case parameter ”Volt/Curr/Digi“ is selected as ”Volt“, parameter REF_M is the voltage value at maximal rpm. (In case parameter “Volt/Curr/Digi” is selected as “Digi”, REF_M is not relevant)
DKW/W:	Sets the Warning DKW-value (deviation from reference)
W/DEL:	Adjusts the delay between recognizing and signaling a Warning.
DKW/A:	Sets the limit for signaling the alarm state.(deviation from reference)
A/DEL:	Adjusts the delay time between recognizing and signaling an Alarm.
RAWFI:	It is recommended to switch this parameter ON. By activating (on) the raw data filter, frequencies from 1 Hz to 6.5 kHz are interpreted. By deactivating (off) the raw data filter, frequencies from 0 Hz to 6.5 kHz are interpreted.
NwDKW:	If the Bearing Guard is replaced but the sensor will stay with the motor, the previous learnt DKW-value (visible as LeDKW) can be entered into the new Bearing Guard. This feature skips a new Teach-In-phase.
LeaTi:	Time for teaching the characteristic oscillation value(s) in seconds. Adjustable from 0 to 3600 sec.

ERROR-Menu

VIB WARN:	Warning state
VIB ALARM:	Alarm state
M_I BREAK:	Cable break on motor speed input

LEARN-menu

LEARNING	learning state

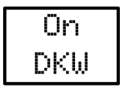
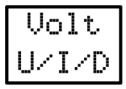
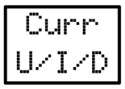
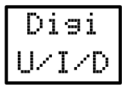
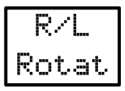
5.2.5 Parameterisation

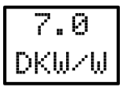
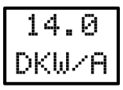
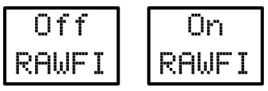
5.2.5.1 Parameterisation with fix motor rotation speed

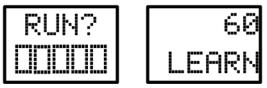
Step Nr.		Display	Description
1	Switch from RUN-mode to SET-mode.	SET ? 0000	Press and hold „ENTER“ until „SET?“ is no longer shown but first parameter will be displayed.
			
2	Switch off the RMS-method	Off RMS	Only as an example in case RMS should be actually deactivated. Default is RMS On.
			
3	Switch on the DKW-method	On DKW	
			
4	Select „fix rotation speed“ mode.	Cons va/co	
			
5	Setting the limit for WARNING.	7.0 DKW/W	Setting value: 0-100. Example for limits see Chapter 5.2.3
			
6	Setting the delay time in seconds, before WARNING is displayed with relay.	300 W/DEL	Setting value: 0-3600 sec.
			
7	Setting the limit for ALARM.	14.0 DKW/A	Setting value: 0-100.
			
8	Setting the delay time in seconds, before ALARM is displayed with relay.	1800 A/DEL	Setting value: 0-3600 sec.
			

Step Nr.		Display	Description
9	De-/activating the high-pass filter (>1000Hz).	Off RAWFI / On RAWFI	Suppression of low-frequency oscillation measurements On (default setting, recommended): interpretation of measurements from 1 kHz to 6.5 kHz Off: interpretation of measurements from 0 Hz to 6.5 kHz. For further information.see chapter 5.2.2.
			
10	Setting the learned DK-value. **(Only relevant in case of fixed rotational speed and device exchange)**	3.7 NwDKW	After exchanging a device, the former during Teach-In calculated „LeDKW“ from old device can be entered into the new device. Setting value: 0-100. Else go on with „ENTER“
			
11	Setting the time for the Learn-cycle.	60 LeaTi	The Teach-In-phase shall include all operating points that appear during normal operating. Setting value: 0-3600 sec. Press ENTER for 0.5 s to get into Learn-mode
			
12	Switch from SET-mode to RUN -mode.	RUN?	Press and hold ENTER until „RUN?“ is no longer shown. **Now all adjusted values get stored.**

5.2.5.2 Parameterisation with variable motor rotation speed

Step Nr.		Display	Discription
1	Switch from RUN-mode to SET-mode.		Press and hold „ENTER“ until „SET?“ is no longer shown but first parameter will be displayed.
			
2	Switch off the RMS-method		Only as an example in case RMS should be deactivated. Default is RMS On.
			
3	Switch on the DKW-method		
			
4	Select „variable rotation speed“ mode.		
			
5	Select whether rotational speed is fed in as current or voltage or digital pulse.	  	„Volt“: The rotational speed/load is fed as voltage between -10 und +10 Volt. „Curr“: The rotational speed/load is fed as current (4-20 mA) . „Digi“: The rotation speed/load is fed as digital pulses. One digital pulse per rotation.
			
6	Adjust whether the motor works in one rotating direction or in counter-and clockwise rotation.	 	Example 1 (one rotating direction): Motor runs between 0 and 4000 1/min: MxRPM = 4000, Rotat = „1Dir“ Example 2 (counter-and clockwise rotation): Motor runs between -4000 und +4000 : MxRPM = 4000, Rotat = „R/L“
			
7	Teach the reference point (rotational speed = 0) of the analog input.	  	Press and hold „UP“ und „DOWN“ until „done“ is displayed, while the voltage/current/pulse for stopped motor is pending.

Step Nr.		Display	Discription
			
8	Adjust the maximal rotation speed in rpm		Example 1) Motor runs between 0 and 4000 rpm: MxRPM = 4000, Rotat = „1Dir“ Example 2) Motor runs between -4000 and +4000: MxRPM = 4000, Rotat = „R/L“
			
9	Teaching the reference point (rotation speed = maximum) of the analog input.		Press and hold „UP“ und „DOWN“ until „done“ is displayed, while the maximum voltage/current/pulse is pending.
			
10	Setting of WARNING limit.		Setting value: 0-100.
			
11	Setting the delay time in seconds, before WARNING is displayed together with relay switching.		Setting value: 0-3600 s.
			
12	Setting of ALARM limit		Setting value: 0-100.
			
13	Setting the delay time in seconds, before ALARM is displayed together with relay-switching.		Setting value: 0-3600 sec.
			
14	De-/activate the high-pass filter (>1000Hz).		Suppression of low-frequency vibration measurements. **On:** (default setting, recommended): interpretation of measurements from 1 kHz to 6.5 kHz **Off**: interpretation of measurements from 0 Hz bis 6.5 kHz. For further information.see chapter 5.2.2.

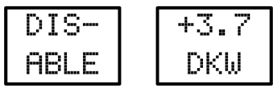
Step Nr.		Display	Discription
			
15	Setting the time for the teach-in-phase.		The learn cycle should include all operating points, that appear during the normal operating. Operating points that are not learnt can lead to false alarms. Example: the motor runs 5 minutes with 1500 rpm, after that 5 minutes with 4000 rpm, then again with 1500 rpm and so on. The time for the learn cycle should be minimum 10 minutes, or better 20 minutes. Setting value: 0-3600 sec
			
16	Switch from SET-mode to RUN-mode.		Press and hold ENTER until „RUN?“ is not longer shown. **Now all adjusted values get stored.**

5.2.5.3 Error / Confirmation

Nr.		display	description
1	DKW-Warn		Pressing both arrow keys (UP/DOWN) at the same time for minimum 1 s confirms the status „DKW-Warn“.The adjusted limit will not get lost.
2	DKW-Alarm		Pressing both arrow keys (UP/DOWN) at the same time for minimum 1 s confirms the status „DKW-Alarm“. The adjusted limit will not get lost.
3	M_I Break		This error cannot be removed by keystroke. It indicates that the cable for current input has been disconnected. (This feature is only available for current interface)

4	The Learn-Processing has been interrupted		If a cable break appears during teach-in-phase, the timer and the processing are frozen. **Important:** **If the calibration is realized with ramp function and the cable break appears during the teach-in-phase, the teach-in-phase must be executed again.**

5.2.5.4 Disable

Nr.		display	description
1	The DKW-Processing has been disabled		The SIPLUS CMS1000 Bearing Guard is disabled if 24V is applied on [DIS+; DIS-]. Display toggles between “DISABLE” and the last Value
2	The Learn-Processing has been disabled		If Disable is applied during Learn-Processing, the timer LeaTi and the Processing are frozen.

5.3 RMS-method

The calculation of RMS-value (root mean square-value of vibration velocity according DIN ISO 10816) increasing vibrations of a machine can be detected.

The RMS-method was implemented according ISO 10816. The vibration signals from the Sensor are analyzed, the root mean square value (RMS) is calculated and shown on the display. The RMS-value is an indicator for general vibration status of the machine. Short disturbances are filtered out. If exceeding tunable limit values potential-free contacts signal warning- or alarm-status.

.

5.3.1 Selection of frequency range for vibration analysis

Basically the rpm-range has to be adjusted via menu for processing the sensor signal (parameter RPM). The low frequency limit has to be adapted to rotational speed. The user has to determine the major operating mode, bigger or smaller than 600 rpm.

RPM ≥ 600 rpm: (pass filter: 10 .. 1000 Hz)

120 rpm < RPM < 600 rpm: (pass filter: 2 .. 1000 Hz)

5.3.2 Exceeding of limits

During commissioning both threshold values for warning and alarm-condition must be adjusted. The user can apply to table 5.3.2.3 (according ISO 10816). .

Under circumstances the threshold values might differ from recommendations of ISO 10816 and have to be adapted to actual case.

5.3.2.1 Exceeding the warning limit

When the root mean square value (RMS) exceeds the adjusted limit for warning, a relay for signaling this condition is switched-on. This relay stays active until the user resets it by keystroke. If the device is switched off the state of warning is reset. This is not a disadvantage because the device will detect the damage at restart and will go warning state again.

Machines which exceed the root mean square value (RMS) warning-limit are usually not applicable for continuous-running operation. The reason for machine vibration has to be examined. Commonly machine may be allowed to work in this state for a terminated time until there is an opportunity for corrective actions.

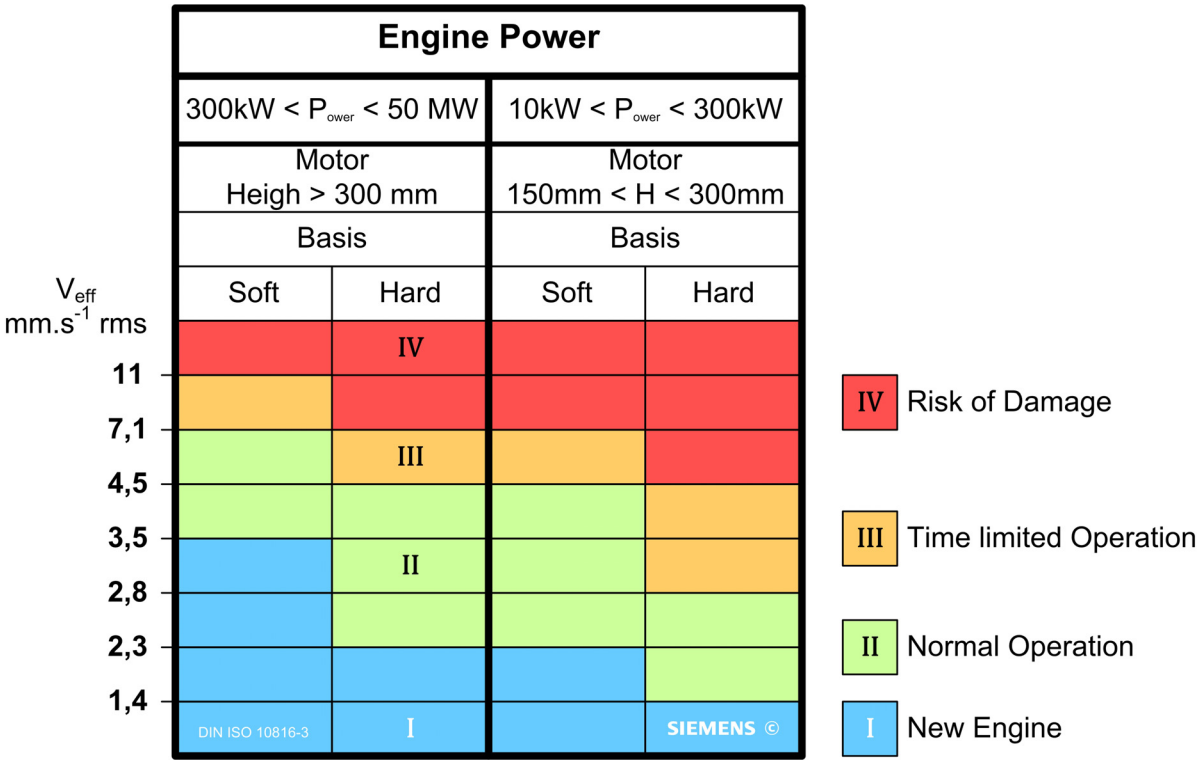
5.3.2.2 Exceeding the alarm limit

When the root mean square value (RMS) exceeds the adjusted limit for alarm, a relay for signaling this condition is switched-on. This relay stays active till the user resets it by keystroke. If the device is switched off the state of warning is reset. This is not a disadvantage because the device will detect the damage at restart and will go warning state again.

Machines which exceed the root mean square value (RMS) alarm-limit are usually not applicable for continuous-running operation anymore. It is strongly recommended to maintain the machine or replace it when indicated.

5.3.2.3 Threshold bands

The following table according ISO 10816 allows a qualitative interpretation of the machine's vibration condition. The values are a recommendation to adjust warning and alarm level. Valid are the limit values between coloured sections.



Picture 14 Threshold bands for different motors with different parameters

Rotational speed is not relevant to determine the limits for warning and alarm.

5.3.3 Menu navigation

5.3.3.1 Description of the display

RUN

The default display is „RMS“. With the arrow keys (UP / DOWN) the display content can be changed. In this display mode active values are only displayed, parameters can not be modified.

SET

When pressing ENTER for minimum 3 s, the system goes to „SET“ mode. Then ENTER-key switches to each parameter next. The parameter values can be changed with the arrow keys (UP / DOWN). Keeping the arrow keys pressed changes the parameter value faster.

When pressing ENTER for minimum 3 s, the System goes back to „RUN“ mode. This also causes the parameters to be saved in a nonvolatile storage.

ERROR

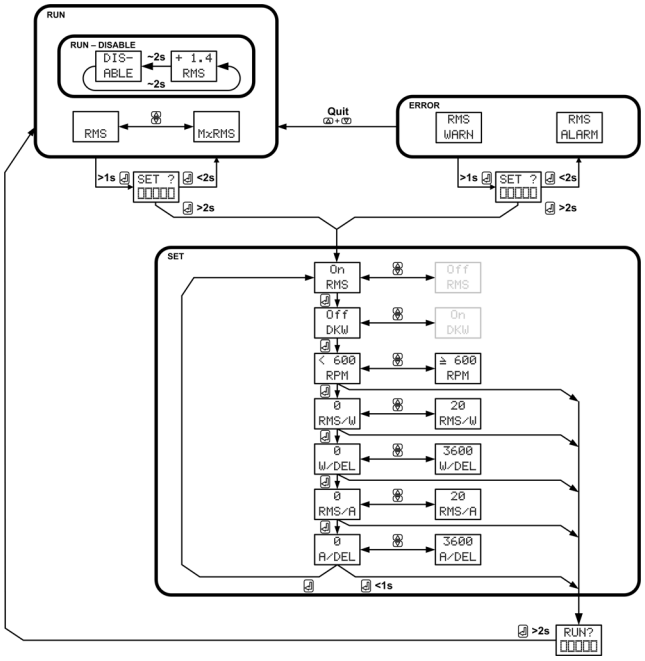
The system automatically navigates into the „ERROR“ mode on following condition:

- PRI0 1: Warning „VIB WARN“
- PRIO 2: Alarm „VIB ALARM“

This state can be confirmed by pressing both arrow keys (UP/DOWN) at the same time for minimum 1 s. The adjusted limit will not be lost. If there are more than one errors at the same time the one with top priority is displayed.

For further information see chapter 5.2.3

5.3.3.2 Menu navigation with display



Picture 15 menu navigation with display for the RMS-method

5.3.3.3 Abbreviations in the display

RUN-menu

RMS:	Actual root mean square value (RMS)
MxRMS:	Maximal reached RMS value
DISABLE	The SIPLUS CMS1000 is actually disabled

SET-menu

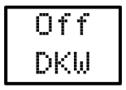
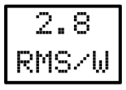
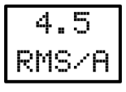
RMS	Switches the RMS-method On or Off.
DKW	Switches the DKW-method On or Off.
RPM	Sets the predominant RPM. (Bigger or smaller than 600 rpm)
RMS/W:	Sets the limit for signaling the warning state.
W/DEL:	Sets the delay between recognizing and signaling a warning.
RMS/A:	Sets the limit for signaling the alarm state.
A/DEL:	Sets the delay time between recognizing and signaling an Alarm.

ERROR-Menu

VIB WARN:	Warning state
VIB ALARM:	Alarm state

5.3.4 Parameterisation

5.3.4.1 Parameterisation with fix motor rotation speed

Step Nr.		Display	Description
1	Switch from RUN-mode to SET-mode.		Press and hold „ENTER“ until „SET?“ is no longer shown and the first parameter is displayed.
			
2	Switch ON the RMS-method		
			
3	Switch OFF the DKW-method		Only as an example in case DKW-method should be deactivated.
			
4	Select the predominant RPM	 	Setting value: <600 or ≥600
			
5	Setting the limit for WARNING.		Setting value: 0-20. Refer for limits to chapter 5.3.2
			
6	Setting the delay time in seconds, before WARNING is displayed and relay is switched.		Setting value: 0-3600 sec.
			
7	Setting des limit for ALARM.		Setting value: 0-100.
			
8	Setting the delay time in seconds, before ALARM is displayed and relay is switched.		Setting value: 0-3600 sec.
			
9	Switch from SET-mode to RUN -mode.		Press and hold ENTER until „RUN?“ is no longer shown. **Now all new adjusted values get active**

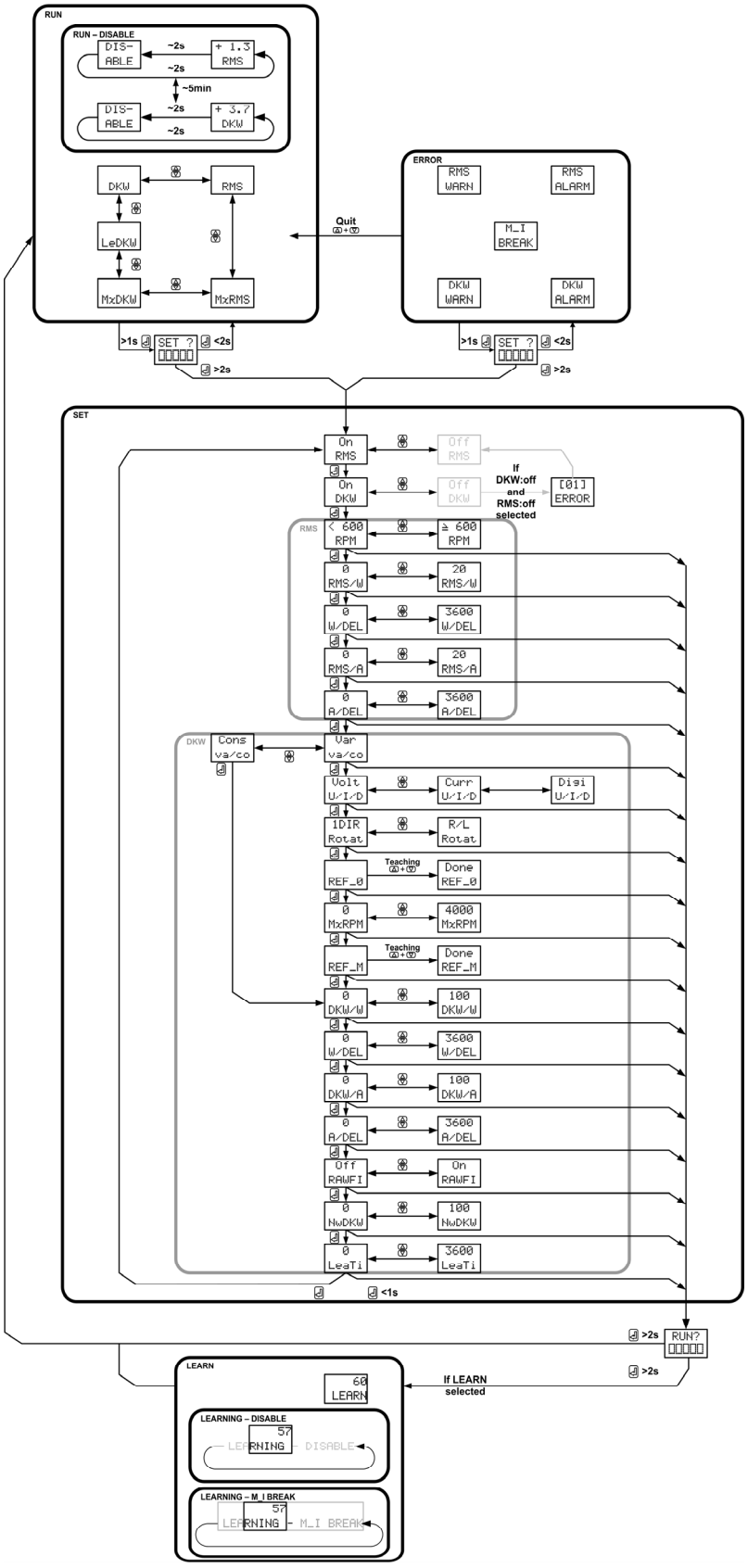
5.3.4.2 Error / Confirmation

Nr.		display	description
1.	RMS-Warn	RMS WARN	Pressing both arrow keys (UP/DOWN) at the same time for minimum 1 s confirms the status „RMS-Warn“.The adjusted limit will not get lost.
2.	RMS-Alarm	RMS ALARM	Pressing both arrow keys (UP/DOWN) at the same time for minimum 1 s confirms the status „RMS-Alarm“. The adjusted limit will not get lost.

5.3.4.3 Disable

Nr.		display	description
1.	The RMS-method has been disabled	DIS- ABLE +1.4 RMS	The SIPLUS CMS1000 Bearing Guard is disabled when 24V is applied on [DIS+; DIS-], Display will toggle between “DISABLE” and the last calculated value

5.4 Simultaneous operation of RMS- and DKW- method



Picture 16: Menu for simultaneous operation of RMS- und DKW-method

SIPLUS CMS1000 Bearing Guard can be configured for simultaneous operation of RMS- and DKW-method. The calculated values RMS and DKW will be displayed in an alternating way.

To step into this modus the parameters RMS and DKW in menu SET have to be switched ON.

Further settings for DKW and RMS refer exactly to chapter 5.2 (DKW) and 5.3 (RMS)

Specialties:

In case of deactivating both methods DKW and RMS an error will be displayed and SET-menu will restart.

At least one method has to be activated.

Nr.		display	description
1	01 - ERROR	[01] ERROR	If the both methods are switched off, this Error message will remind you that at least one has to be activated.

In case of deactivating the Bearing Guard by Input DISABLE, following behavior will be shown

Nr.		display	description
2	DISABLE	DIS- ABLE +1.4 RMS DIS- ABLE +3.7 DKW	The SIPLUS CMS1000 Bearing Guard is disabled when 24V is applied on [DIS+; DIS-], Display will toggles between “DISABLE” and the last value of RMS-method, after that between “DISABLE” and the last value of DKW-method.

6 Technical Data

6.1 Standards and Approvals

Product Name

Device	**SIPLUS CMS1000**

EMV Directive

The product is designed for use in an industrial environment.

EMV-requirements: IEC 61010-1:2001

Area of Application	**Requirements for**	
	Emission	**Immunity**
Industry	IEC 61000-6-4:2006	IEC 61000-4-6:2008
		IEC 61326-1:2005

Installation Guide Lines

The product meets the requirements if you meet the installation instructions and safety-related notices as described in this commissioning manual.

EC Declaration of Conformity

The EC Declaration of Conformity is available for the responsible authorities according to the abovementioned EC Directive at the following address:

SIEMENS AG

I IA CE SE

WUERZBURGER STR. 121

90766 FUERTH

GERMANY

Notes for the manufactures of machines

This product is not a machine in the sense of the EC Machinery Directive. There is therefore no declaration of conformity relating to the EC Machinery Directive 89/392/ECC for this product.

If the product is part of the equipment of a machine, it must be included in the procedure for the declaration of conformity by the manufacturer of the machine.

Technical specification

6.1.1 Bearing Guard

Interfaces		Constructive Layout	
Power Supply		Dimension (H x W x D)	106 mm x 45 mm x 86 mm
Input voltage DC	24 V (± 20 %)	Minimum distance: front / top / bottom	80 mm / 25 mm / 25 mm
Input voltage AC/DC	115 ... 240 V (± 20 %)	Terminal screw	M3 (for normal screw drive size 2 or pozidriv 2)
Typ. power loss	3.5 W	Attraction torque	0.8 … 1.2 Nm
Vib- Vib+ (sensor input)		Design	Plastics
Number	1 for SIPLUS CMS1000 Sensor	Weight	300 g
Type	Differential interface	Mounting option	DIN rail; EN 50022-35x15 Thickness 2.3 mm
Input voltage	+ 5 V	**Environmental Conditions**	
Frequency range	2 Hz … 6.5 kHz	Transport temperature and storage temperature	-40 ... + 85 °C
Rotation speed input (digital)		Ambient temperature during operation	-25 ... +60 °C
Rated operational voltage DC	24 V	Humidity rating	5 ... 95 %, non condensing
Rotation speed input (analog)		Safety regulation	IEC 61010 - 1
Voltage DC	± 10 V	Electromagnetic compatibility	IEC 61326 - 1
Typ. current DC	4 ... 20 mA	Protection category	IP20
Disable Input		**Certificates**	
Input voltage DC	24 V (± 20 %)	CE	EMV Directive 2004/108/EC Low voltage Directive 2006/95/EC
Relay outputs			
Number	2 changer		
Switching voltage	250 V AC / 24 V DC		
Maximum switching current	0,5 A		
Maximum switching capacity	120 VA / 120 W		
Isolation	5 kV	UL	In preparation

6.1.2 Sensor

Interfaces	
Power Supply	
Input voltage DC	5 V
Typ. power loss at DC 5 V	20 mW
Sensor connection	
Measuring range	±5 g
Frequency range (linear)	2 Hz ... 6.5 kHz
Typ. sensitivity	312 mV/g
Connector type	4-pin connector M12

Constructive Layout	
Dimension (l)	64 mm
Aperture (Ø)	22 mm (WS22) WS: wrench size
Material	stainless steel
Weight	100 g
Drawing	

Environmental Conditions	
Transport and storage temperature	-40 ... +120 °C
Ambient temperature during operation	-40 ... +120 °C
Relative humidity in operation	5 ... 95 %, condensation permitted
Safety regulation	IEC 61010 - 1
Electromagnetic compatibility	IEC 61326 - 1
Protection category	IP67

Cables	
CABLE-MEMS	4 m, 4 x 0.34 mm² PUR-cable shielded, M12, to open end 6AT8001-1AA00-1AA4
CABLE-MEMS	10 m, 4 x 0.34 mm² PUR-cable shielded, M12, to open end 6AT8001-1AA00-1AB1
CABLE-MEMS	30 m, 4 x 0.34 mm² PUR-cable shielded, M12, to open end 6AT8001-1AA00-1AB3

Equipment optional	
Adapter M6/M6; M6/M8	6AT8001-2AA10-1AM0
Adapter M6/SPM	6AT8001-2AA10-1SA0

Certificates	
CE	EMV Directive 2004/108/EC Low voltage Directive 2006/95/EC
UL	In preparation

6.1.3 Overall frequency response of the Sensor

Picture 17 Overall frequency response of the Sensor

6.1.4 Notice for approved cleaning

- The Bearing Guard is only allowed to be cleaned with a dry cloth.
- The Sensor can be cleaned with water and detergent (s. Cap. 7.3) .Cleaning with vapour stream or high-pressure clean is not allowed.

7 Appendix

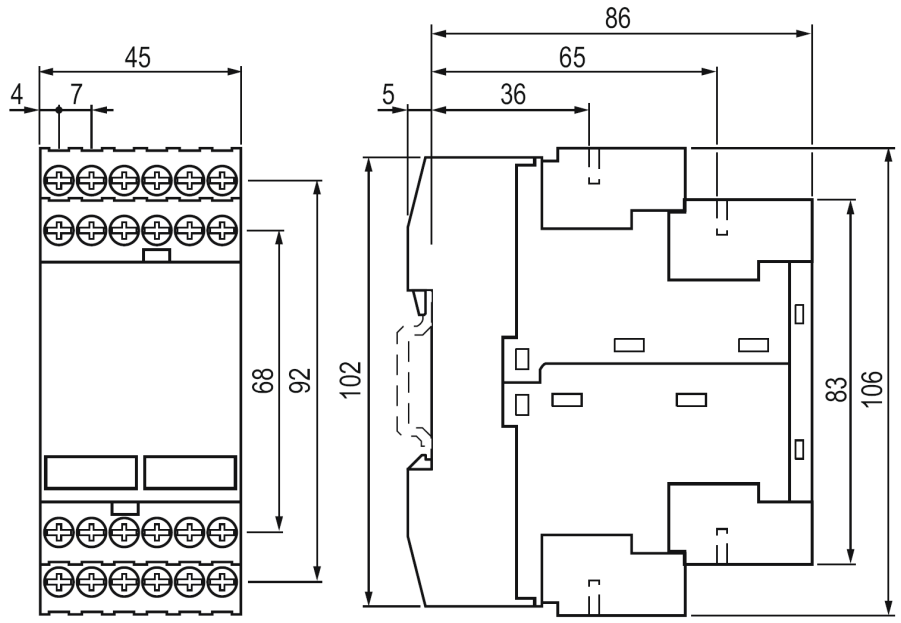
7.1 Order numbers

Product	**Order numbers (MLFB)**
SIPLUS CMS1000 Bearing Guard	6AT8001-1AA00
SIPLUS CMS1000 Sensor	6AT8001-1AA00-1XA0
SIPLUS CMS1000 Operation Instructions	download see chapter 7.4.
Cable	
4 x 0.34 mm² PUR-Cable*) screened, M12, open end	
CABLE-MEMS-44-0004 length 4 m	6AT8001-2AA00-1AA4
CABLE-MEMS-44-0010 length 10 m	6AT8001-2AA00-1AB1
CABLE-MEMS-44-0030 length 30 m	6AT8001-2AA00-1AB3
CABLE-MEMS-44- length variable	on request
*) chemical reliability see Chapter 7.3.	
accessories optional	
Adapter M6/M6; M6/M8	6AT8001-2AA10-1AM0
Adapter M6/SPM	6AT8001-2AA10-1SA0

Further information is available from your local Siemens office and on the homepage www.siemens.com/siplus-cms.

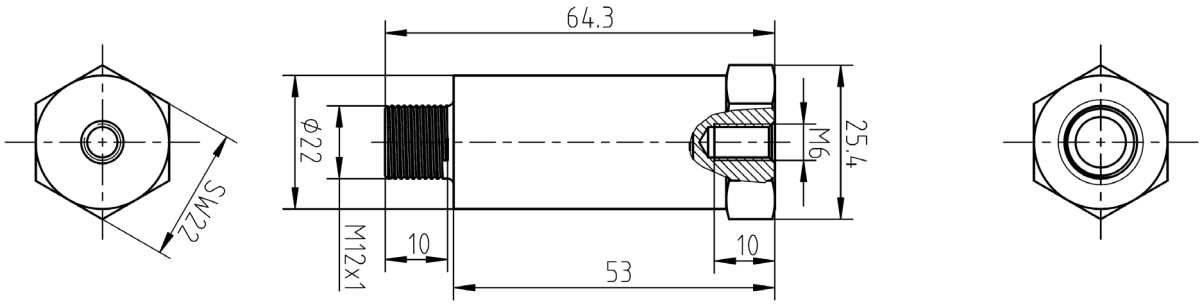
7.2 Dimensional Drawings

7.2.1 Dimensional Drawing Bearing Guard



Picture 18 Dimensional drawing Bearing Guard

7.2.2 Dimensional Drawing Sensor



Picture 19 Dimensional drawing Sensor

7.3 Overview of chemical resistance of the PUR cable

PUR-cable	Chemicals
good resistance	acetal aldehyde, acetate, acetophenone, aldehyde, amine, alcohol, ammoniac, benzoic aldehyde, fuel, benzophenone, citric acid, cyclohexanone, diesel oil, diethylamine, dimethylamine, grain alcohol, ester, ether, fats, formaldehyde, gearbox oil, hydraulic oil, caustic potash, kerosene, ketones, hydrocarbons aliphatic, arenes, fuels, poor bases, solutions of inorganic salts, machine oil, metal chloride, metal sulfate, metal nitrate, methanol, methylamine, lactic acid, mineral oil, motor oil, natron base, propyl alcohol, seawater, ultraviolet resistance, detergent base, water distilled, water cold, water hot
moderate resistance	aceton, formic acid, benzol, boric acid, butanoic acid, acetic acid, unsaturated hydrocarbons chlorinated, ozoniferous, nitric acid, sulfuric acid, terpentine
not resistant	brake fluid, glacial acetic acid, halogens (fluor, chlorine, bromine, jodine), hydrocarbons chlorinated, strong bases, nitrobenzene, hydrochloric acid

7.4 Service & Support in the Internet

In addition to our documentation pool we offer our complete knowledge base on the Internet:

www.siemens.com/automation/service&support

There you can find:

- The newsletter, which is constantly updated to provide you with the latest information about your products.
- The right documents via our search function under Service & Support.
- The bulletin board, a worldwide knowledge exchange for users and experts.
- Your local representative for Industry Automation & Drives Technologies via our representatives database.
- Information about on-site services, repairs, spare parts, and lots more you will find under ”Support”.

7.5 List of Abbreviations

Abbreviation	Item
CMS	Condition Monitoring System
DV	Diagnostics Value
DKW	Diagnosekennwert – diagnostic characteristic value
IEPE	Integrated Electronics Piezo-Electric
MEMS	Micro-Electro-Mechanical Systems
RMS	Root Mean Square
TIA	Totally Integrated Automation