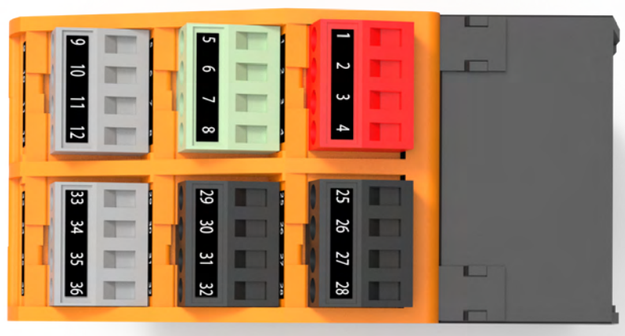
Sumitomo Drive Technologies

Cyclo SMART®

Cyclo SMART User Manual

2023

Contents



General

- Product Line: SMART (System Maintenance and Reliability Technolody) Products
- Unit Type: CycloSMART Condition Monitoring
- Voltage Rating: 200 mA @ 24 VDC
- Ambient Conditions: Operating/Ambient temperature: 0-60 °C, Protection Rating: IP20, Relative Humidity Range: < 90%

Safety Instructions

The unit described is a subcomponent for integration into a system.

- The system architect is responsible for the safety of the system.
- The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorized by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorized by the machine operator.
- Protect units and cables against damage.
- The design of the unit corresponds to protection class III (EN61010) except for the terminal blocks. Protection against accidental contact (safety from finger contact to IP 20) for qualified personnel is only ensured if the terminals have been completely inserted. Therefore the unit must always be mounted in a control cabinet of at least IP 54 which can only be opened using a tool.
- For DC units the external 24 V DC supply must be generated and supplied according to the requirements for safe extra-low voltage (SELV) since this voltage is provided near the operating elements and at the terminals for the supply of sensors without further protection measures.

Introduction

The purpose of this document is to establish an overall understanding as well as a general standard of CycloSMART diagnostic units. This document will discuss topics such as; applications, electrical connections, utilized sensors, starting a new project, and how to utilize the applied system.

System Function

The CycloSMART unit will be used to monitor and collect data of the machine being monitored. Once the user applies the condition monitoring unit to the desired system, it can be operated to optimize down time and eliminate catastrophic failure.

The diagnostic units discussed in this user manual will contain the following:

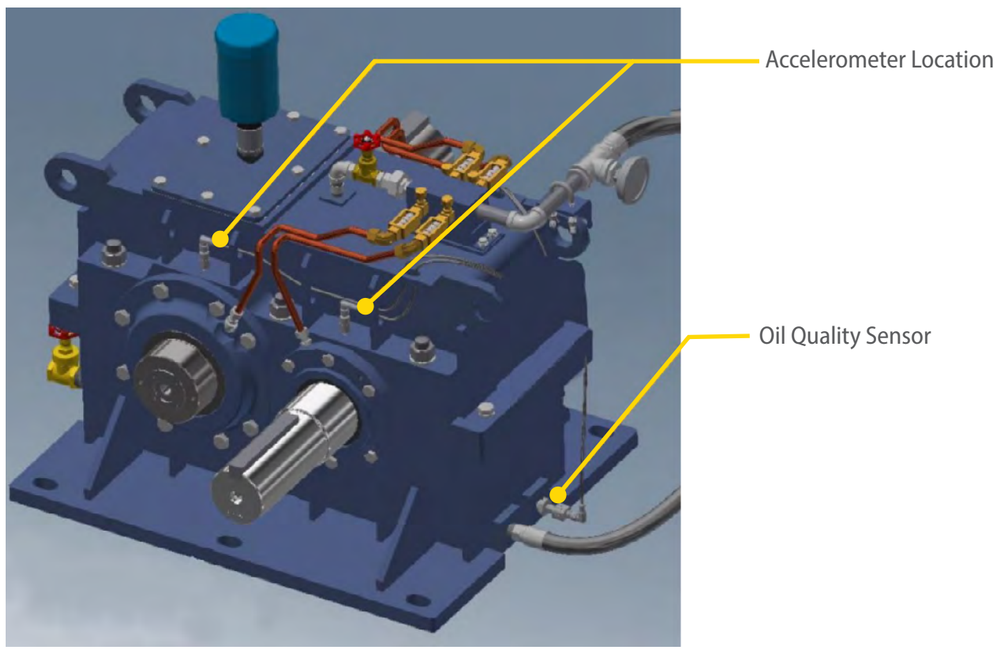
- 4 dynamic inputs used for vibration monitoring
- 2 analog inputs used for 4-20 mA signal sensors (i.e. temperature, oil level, etc.)
- 1-3 RJ45 ports depending on unit model
- 1, 200 mA @24 VDC power supply (either SMA or user provided)

CycloSMART diagnostic units themselves cannot monitor without additional component hardware in unison with the diagnostic element. See the Sensor Overview section for sensors and their descriptions. It is also important to note, to program these two components to cooperate with each other, a parameterization software is needed. See Operating Instructions for software operating instructions.

Application

With the following system the following functions can be practiced:

- Vibration monitoring (general vibration according to ISO)
- Condition Monitoring (condition monitoring from vibration parameters)
- Reducer protection (real-time vibration parameter monitoring with a time very fast reaction up to 1 ms)



Monitoring of up to 24 objects (indicators for reducer parts, vibration parameters or process values)

- **Dynamic values in the time range (e.g. v-RMS according to ISO)**
- **Dynamic values in the frequency range FFT or HFFT (e.g. imbalance or bearing)**
- **Control of process values (analog signals) higher or lower than the reference**
- **Digital signals indicating an alert condition (e.g. pressure switches, flow, temperature, etc.)**

The equipment has an internal historical memory (600,000 values) with real-time clock and flexible memory intervals for each object. The unit has a circular memory type (FIFO). Up to 32 counters can be configured to measure the duration of value overrun limit and/or operating times. On objects in the designated frequency range (imbalance, bearing, etc.), monitoring is carried out in multiplex mode. For objects in the time range (v-RMS, a-RMS, and a-Peak), the 4 dynamic inputs are monitored simultaneously and without interruption. The parameterization of monitoring tasks and alarms is carried out through the VES004 software. With the software you can view and record the measurement values current, spectra and time signals (online data). Through the Ethernet interface of the equipment there is the ability to establishing a network for the data display (measurement values, alarm states, etc.) in other systems (e.g. SCADA, MES). Data exchange takes place via Ethernet/IP ports (e.g. measurement, alarm states, limit values, rotation speeds, counter values, etc.) between diagnostic electronics and a PLC or SCADA data acquisition systems or DCS.

CycloSMART Sensor Overview

Vibration Sensors (AEPX5951-B101)

These externally mounted sensors are made to be mounted directly on to the housing of the component itself using a hardening epoxy adhesive (Loctite 330 recommended). These sensors will be placed as close as possible to the object that is to be monitored. These sensors can measure multiple objects with only one sensor, as long as it is contained within a 20" radius of the sensor itself. Vibration sensors require a mounting puck with the corresponding mount screw, to fasten the accelerometer to the gearbox. This will connect to a four-wire cable that is to be wired into the desired monitoring unit.

Vibration sensors themselves require no programming because it is analyzing the exact frequency of the desired object. The sensor utilizes a MEMS style design which calls for no calibration, and programmable measuring range. The sensor will monitor the frequency of the specific object in mg's. Sensor includes 10m of cable, wired to a Male - M12 Connector.

Temperature Sensors/RTD's (AEPX5951-B102 & AEPX5951-B103)

Similar to the vibration sensors, the temperature sensors are to be mounted directly to the gearbox housing via mounting pad and screw. These Sensors connect to a temperature transmitter that is used to process a 4-20 mA signal in the output process of measuring data. Temperature transmitters can be programmed if the need for precision sampling rate is required.

Temperature transmitters used in typical situations are pre-programmed to measure from 0°C to 100°C. For specific applications where very precise measurements are desired, this range can be shortened to provide a more precise and acute data sample. If the desired temperatures to be measured exceed 100°C, then higher rated sensors and transmitters can be applied in the same orientation.

Light Trees (AEPX5951-E001)

The light tree is a way of notifying an individual of the system condition, visually. This light can be placed in any desired location as long as it can be wired to the monitoring unit itself. These light trees are to be mounted in close proximity to the diagnostic unit to allow proper assessment.

Oil Level Switch (AEPX5951-B304)

These oil level switches can be used in water, coolants, and standardly oil to direct low fluid levels. THis switch measures the meduil mevel by impedance spectroscopy at the probe tip.

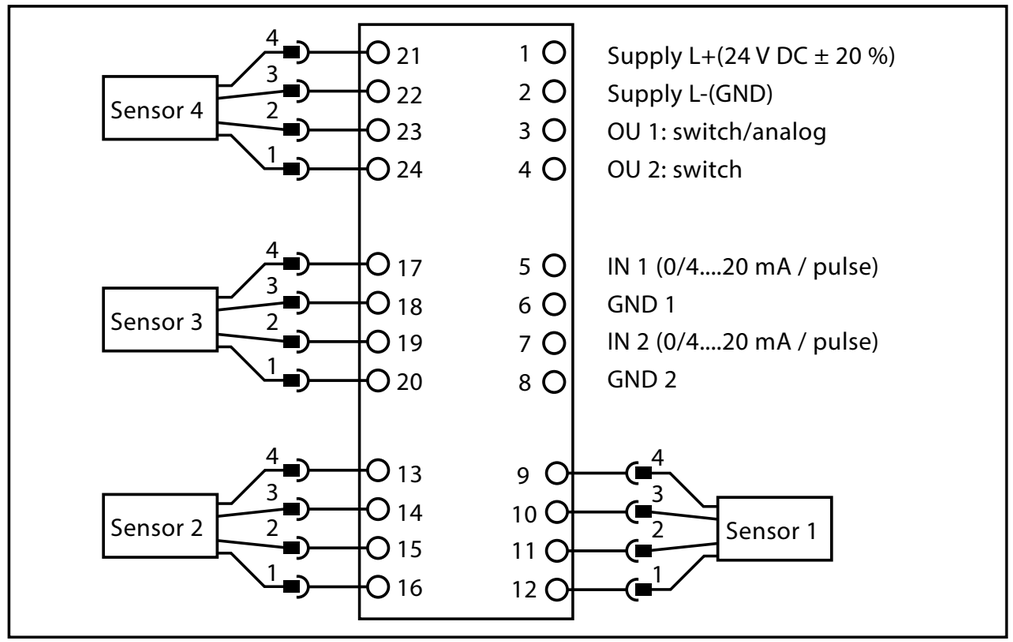
Oil Quality Sensor (AEPX5951-B305)

These oil level sensors can be used in water, coolants, and standardly oil to gather accurate oil volume data. Sensors utilize a custom fitted probe to the application, which sits inside the oil sump that uses wave radar to track the desired medium. The Des-case sensor uses aa 4-20ma output signal, to the diagnostic unit for integration into the monitoring system.

Electrical Connections

When wiring the diagnostic units' sensors, refer to the wiring diagram located on the side of the unit. If the unit is not in a place where the diagram legible, the same diagram is located in the manual provided in the diagnostic unit. Make sure that all wiring lengths are in ordinance with maximum wire lengths. On the opposite side of the wire is where the actual sensor resides. When mounting the sensor, make sure to utilize the proper medium to secure the mounting puck to the surface of the component (Loctite 330 recommended).

Shown below is the wiring diagram for the system sensors as well as supply voltage wiring. The sensors labeled "Sensor 1-4" are dynamic inputs, while "IN1" and "IN2" are analog inputs.



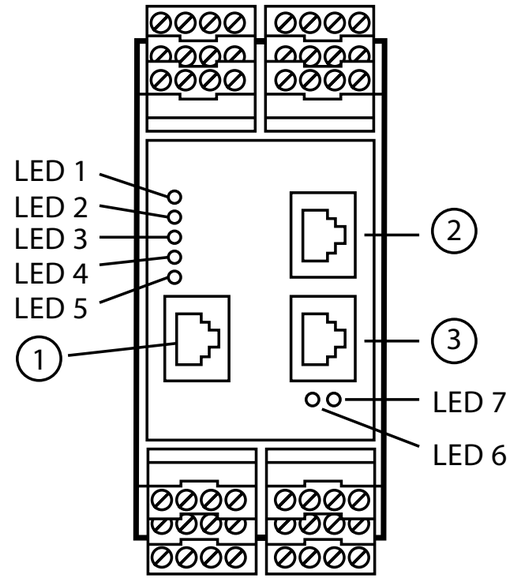
The wiring diagram shows each dynamic input sensor with 4-wire cable, labelled accordingly. These wires are Brown, White, Blue, and Black, numerically. The wire signals for both analog and digital sensors are shown below.

Sensor				VSA	IEPE/VSP	0...20mA
S1	S2	S3	S4			
09	16	20	26	BN:L+(+9V)	not connected (n.c.)	not connected (n.c.)
10	15	19	23	WH: signal	IEPE+	signal
11	14	18	22	BU:GND	IEPE-	GND
12	13	17	21	BK: test	not connected (n.c.)	not connected (n.c.)

Operating Instructions

The following instructions explain what to do after you receive the system and clarify how to monitor the system, checking the system history, and understanding what the data produced truly exemplifies. These directions will be generalized, and will not directly associate with one particular system, as all CycloSMART systems are unique to the explicit project.

Below the front of a diagnostic unit is shown with LED's for sensor status and communication status. Along with these LED's , the three ports for communication are also labelled for all units including fieldbus communications. The TCP/IP Interface Module (AEPX5951-B001) will only have one communication port for programming and removing stored data.



1: Configuration Port: parameter setting and data interface

2: IE 1: Fieldbus

3: IE 2: Fieldbus

LED 1-5: Sensor status

LED 6-7: Network and Communication Status

LED signaling is shown below for sensors:

LED 1 - 1 LED4 corresponds to Sensor 1 - Sensor 4	
Green on	Sensor connected and Parameterized
Green flashing	Sensor with set parameters Type VSA: Sensor not connected or faulty Type IEPE: Sensor not connected
Yellow on	Warning
Red on	Damage alarm
Green/yellow flash alternately	Internal teaching process is active
Yellow/red flash alternately	No parameter set loaded

LED signaling is shown below for network and communication status: (Note: The chart shown is for Modbus module, but color and state should reflect similarly on all diagnostic.)

Designation	Meaning	Color	State	Description
LED 6 NET	Network status	n.a.	Off	The device is switched off
		Green	Flashing (Approx. 2 Hz)	No connection has been established, an IP address was assigned
		Green	on	Device connected to the network
		Red	on	Error on the fieldbus
LED 7 MOD	Modbus TCP/ IP	n.a.	off	Device is switched off (no voltage supply)
		Green	on	Device functions reliable (normal operation)
		Red	on	Device Error
		Orange	flashes	Firmware image is loaded to the RAM
		Orange	flashes	Firmware image is loaded to the flash
		Green	Flashing for 2s (approx. 2 Hz)	Firmware image has been written correctly to the flash
		Orange	Flashing for 2 s (approx. 2 Hz)	Parameter set was successfully transferred

Once the system is installed and operational, the system begins to record and store data from the applied sensors. Access to this data is all-attainable through the parameterization software which are available for download. Contact your Sumitomo rep for information. Once the software is downloaded and open, the IP address and subnet mask of the device can then be configured to match those of the network that will hold this device. If the device is utilizing a light tree, then this setting can be ignored. Below are the factory settings all diagnostic units.

IP address	192.168.0.1
Subnet mask	255.255.255.0
Gateway	192.168.0.244

Software Utilization

Access to parameterization and monitoring of conditions in real time, is carried out through the PC software. All application parameters configured in the software are programmed and transmitted to the equipment via the configuration port. This is also the same port that is used when connecting the user PC to the system to extract data.

Select one of the following options:

Select the [Project] menu > [Open...]

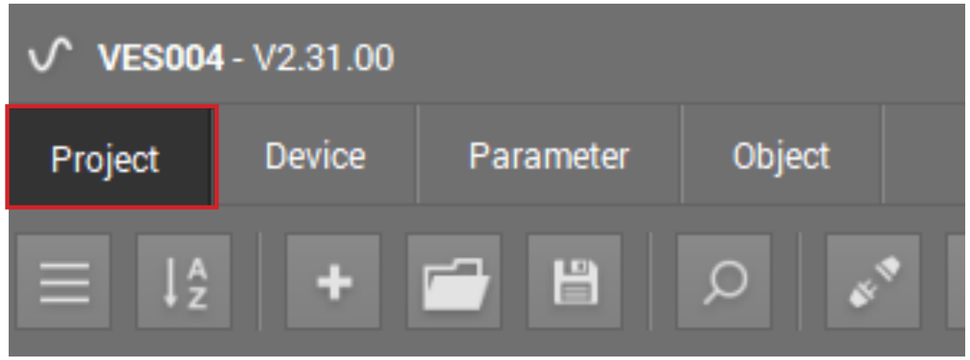
Or:

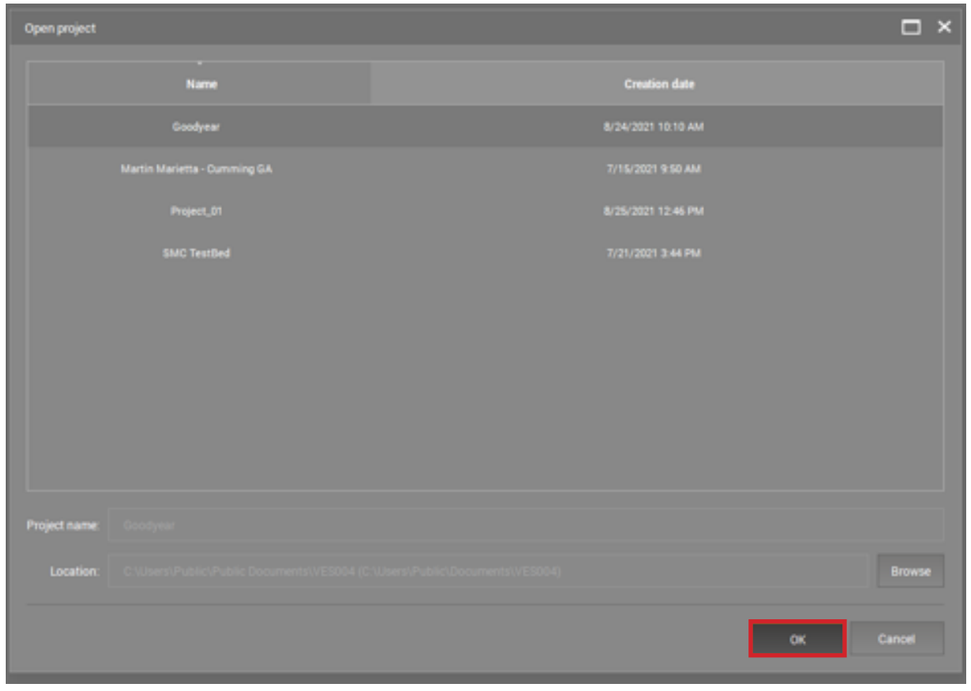
Left-click the [ ] (Open Project) symbol

Or:

[Ctrl]+[O]

- **Select the desired project from the list**
- **Confirm with [Ok]**





The selected project appears in the tree view as [VSE151]

After clicking under [VSE151] on [Settings]:

- **The [VSE151] tab opens in the detailed view**
- **Under the heading [Settings] the [Address] tab appears with the information of connection of the computer.**

Enter the connection information of the diagnostic electronics in the area [Address

TCP/IP]. Factory settings:

- **IP Address: 192.168.0.1**
- **Port: 3321**

Select one of the following options:

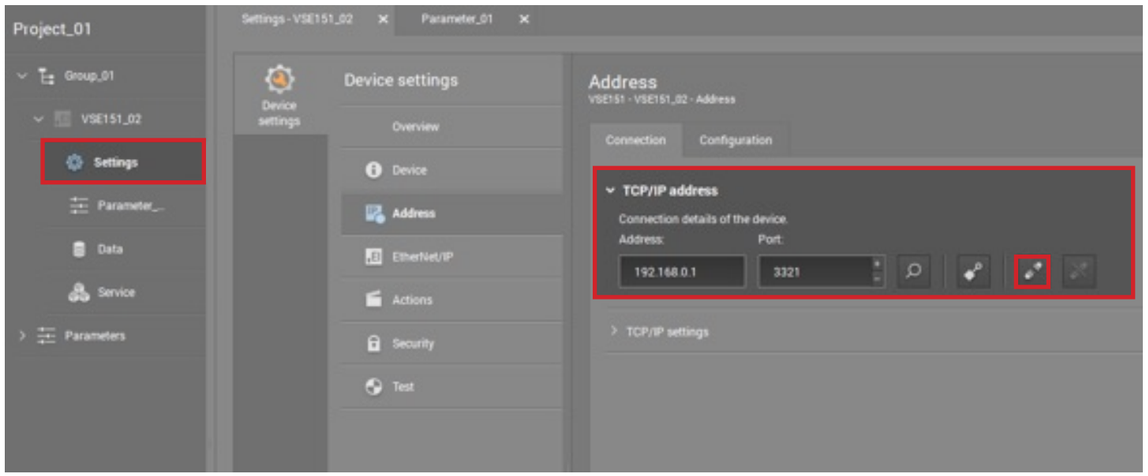
- **Select the [Computer] menu > [Connect]**

Or:

- **In tree view, right-click**
- **[VSE151] > left mouse click [Connect]**

Or:

- **Left-click the [ ] (Establish Connection) symbol)**



Monitoring

This system is made to collect, measure, and filter data from the system. This comes in the form of raw time data, as well as filtered frequency spectra that allows for easy data intake and analysis. Data monitoring displays the current measurement values of objects and/or sub-objects. Object values, along with alarm limits, provide an overview of the current status of the system. The principles of vibration are stored in the parameterization (of objects) of diagnostic electronics and only displays the current measurement result of this monitoring.

Located within the Parameters tab is the Objects Section, having an active connection with the CPU, the current values of the objects will be displayed. With icons illuminated in color of traffic lights, the status of each object is indicated, and if its value is within the range of pre-alarm or alarm.