ENGINEERING
TOMORROW

Programming Guide

VLT® Condition-based Monitoring
VLT® FC Series

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Contents

1 Before you begin

1.1 Introduction to the Programming Guide

Introduction

This chapter describes the purpose of the programming guide, intended audience, disclaimer, safety conventions, and additional resources.

Purpose of this Programming Guide

This programming guide provides information on working with Condition-based monitoring parameters on the VLT® FC series.

It provides an overview of parameters and value ranges for operating the drive. Installation and operating instructions are not in scope of the programming guide.

Intended Audience

The intended audience of the programming guide is trained personnel, automation engineers, and programmers with experience in operating with parameters and with basic knowledge of Danfoss AC drives.

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Safety Symbols

The following symbols are used in this manual:

⚠ DANGER ⚠

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

⚠ WARNING ⚠

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

⚠ CAUTION ⚠

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

Additional Resources

Additional resources are available to help you understand related information.

Technical documentation for various product options is available via the Danfoss home page in the Service and Support/ Documentation section.

1.2 Reading the parameter table

This programming guide includes parameter and options tables. These descriptions explain how to read the parameter and options tables.

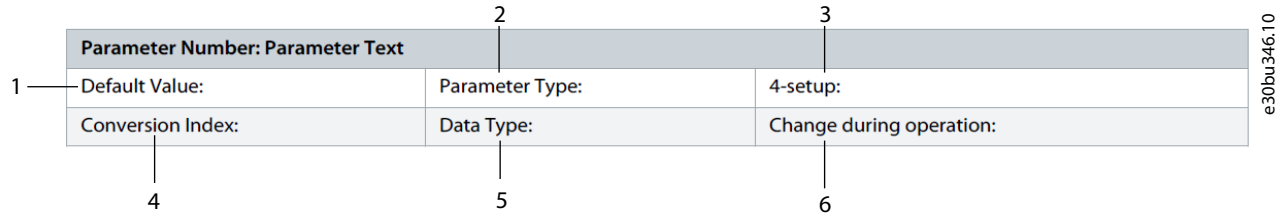

Illustration 1: Parameter Table

1 indicates the value set in factory.

2 indicates whether the parameter type is option or range.

3 indicates the manner of parameter set-ups. *All setups* means that the parameter can be set individually in each of the 4 setups. For example, 1 single parameter can have 4 different data values. *1 setup* indicates that the data value is the same in all setups.

4 refers to the conversion index. Parameter values are transferred as whole numbers only. Conversion factors are therefore used to transfer decimals. If a value is transferred as 100 and a conversion index of -1, the real value is 10.0.

5 indicates the different data types for the parameters.

6 indicates whether the parameter value can be changed while the frequency converter is in operation. False indicates that the frequency converter must be stopped before a change can be made.

Table 1: Conversion Table

Conversion index	Conversion factor
100	1
75	3600000

Conversion index	Conversion factor
74	3600
70	60
67	1/60
6	1000000
5	100000
4	10000
3	1000
2	100
1	10
0	1
-1	0.1
-2	0.01
-3	0.001
-4	0.0001
-5	0.00001
-6	0.000001

Table 2: Data type

Data type	Description	Type
2	Integer 8	Int8
3	Integer 16	Int16
4	Integer 32	Int32
5	Unsigned 8	Uint8
6	Unsigned 16	Uint16
7	Unsigned 32	Uint32
9	Visible string	VisStr
33	Normalized value 2 bytes	N2
35	Bit sequence of 16 boolean variables	V2
54	Time difference w/o date	TimD

2 Overview of Condition-based monitoring

2.1 Introduction to Condition-based Monitoring

Condition-based monitoring in Danfoss VLT® drives is launched as a factory-flashed licensed firmware, embedded within the Danfoss drive. The Condition-based monitoring requires control card MK II.

NOTICE

The Condition-based monitoring software must be purchased separately along with the drive from the factory.

Benefits of installing the condition-based monitoring firmware are as follows:

- Reduces unexpected downtime
- Optimizes drive or motor working conditions
- Eliminates unexpected halts in production

Condition-based monitoring enables to regularly check the condition and performance of the machine when the drive is in service and detects mechanical, motor, or application failures in advance. Corrective actions can be performed before the process or application is impacted. Alarms or warnings are triggered in the drive to notify customers or service technicians. Some of the corrective actions include replacement of faulty motors or bearings and ensuring the motor is running within optimal conditions.

Following are the monitoring capabilities introduced:

- **Motor stator winding monitoring:** During monitoring, inter-turn short circuit or unbalance in the motor winding is detected in advance. Damages caused by motor stator winding isolation occurs over a period of time. When more winding turns are impacted, the overcurrent protection is activated due to extensive heating and stops the motor.
- **Vibration monitoring:** With the help of external sensors, the drive can monitor vibration levels in a motor. Vibrations affect motor control and can lead to motor failure. During monitoring, early detection of motor misalignment is detected and wear and tear of mechanical parts are identified earlier.

  NOTICE

  ISO10816 standard provides guidance for evaluating vibration severity for machines operating within 10-200 Hz of frequency range. The standard shall be complied with before commissioning of vibration monitoring function.

- **Load envelope:** Mechanical load of an application is monitored by comparing current load curve with expected load curve based on data gathered during commissioning. During monitoring, overload and under-load deviations which occur in applications are detected.

To begin condition-based monitoring a baseline must be generated. During this activity, the system captures motor stator winding, vibration monitoring, and load envelope speed points for each baseline. The user can define the duration, minimum and maximum speed for baseline generation. During baseline generation, 20 speed points are captured. To secure a speed point, a provision is provided to select a bandwidth of +/- 2% for each speed point. The first and last speed point is captured based on the defined minimum and maximum speed respectively.

When speed points are not captured properly, baseline generation fails. For more monitoring over a duration, a new baseline has to be generated.

The baseline serves as a reference for threshold limits. Using parameters, the user can select the type of baseline measurement.

- **Baseline Run:** The drive controls the motor speed and monitors required values to derive a baseline. The drive creates a speed profile for baseline measurement. The drive interrupts the application during baseline run to operate on the speed profile created for baseline measurement. The duration for baseline calculation can be specified.
- **Online Baseline:** When the application begins operation, the drive measures the baseline automatically. The drive measures the baseline without interfering with the motor control. Danfoss Drives recommend running the application for 24 hours to 1 week for effective measurement of baseline data.

Different stages of condition-based monitoring are as shown.

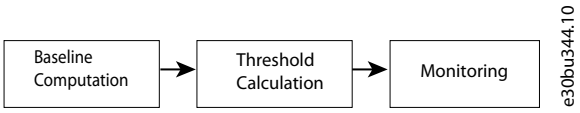

Illustration 2: Condition-based monitoring stages

Baseline Computation: During the initial stage, baselines for different types of condition-based monitoring are computed, based on the type of baseline mode selected by the user.

Threshold Calculation: Once the baseline is computed, the thresholds for warnings (stage 1 and stage 2) and alarms are computed based on the warning or alarm mode. The threshold and mode are set via parameters.

Monitoring: After the thresholds are calculated, condition-based monitoring begins. Alarms and warnings are triggered during deviations to notify customers.

2.2 Alarms and Warnings

In condition-based monitoring, for each feature, the user can define activation stages for warnings and alarms. The interpretation of alarm and warning color codes are as follows:

Green: No alarms are indicated. Condition-based monitoring operations continue.

Yellow: First indication of warning stage 1 alarm is visible. Warning stage 1 faults is also shown as *warning S1*. Notification to users to plan for maintenance operations. In this stage, condition-based monitoring operations continue.

Orange: Clear indication of warning stage 2 alarm is visible. Warning stage 2 faults is also shown as *warning S2*. Notification to users to act as soon as possible before the fault becomes critical.

Red: A critical alarm has occurred and condition-based monitoring operations has stopped.

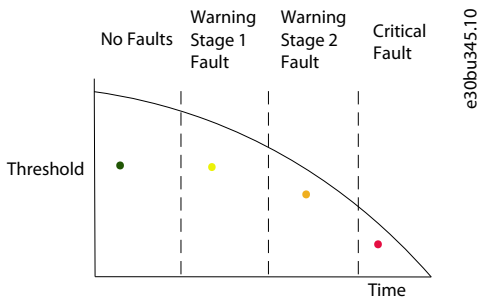

Illustration 3: Alarm and Warning Stages

For more information, see 4.1 Motor Stator Windings, 4.2 Vibration Monitoring, and 4.3 Load Envelope.

3 Parameter Descriptions

3.1 Parameter Group 45 -** Condition-based Monitoring

In this parameter group, you can enable condition-based monitoring, define units, baseline computation, input sources, view baseline status, and progress.

Parameter 45-00: Function

Table 3: Parameter 45-00

45-00: Function		
Default Value:*Off*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: False

Set type of notification level and to enable monitoring of the drive.

Table 4: Options

Options		
Option	Name	Description
[0]	Off	Notification is disabled.
[1]	Warning	Warning notifications are triggered.
[2]	Alarm & Warning	Both alarm and warning notifications are triggered.

Parameter 45-01: Status

Default Value: *Off*	Parameter Type: Option	4-setup: *2setup*
Conversion Index: -	Data Type: Uint8	Change during operation: False

Set the parameter to view current monitoring status.

Option	**Name**	**Description**
[0]*	Off	Status is disabled.
[1]	On	Shows current monitoring status.
[2]	Waiting For Baseline	Baseline computation is in progress.

Parameter 45–20: Type

Default Value: *Off*	Parameter Type: Option	4-setup: *All setups*
Conversion Index: -	Data Type: Uint8	Change during operation: True

Use the parameter to select type of baseline computation.

Option	Name	Description
[0]*	Off	Baseline computation type is not set.
[1]	Baseline Run	Select the option when the application can operate from minimum to maximum speed in one sweep. On enabling this option, the condition-based monitoring function sets speed points. On completion of baseline computation, the motor is ramped down to 0. The option can only operate when Hand On mode is set via control panel.
[2]	Online Baseline	Select the option in applications where baseline run cannot be utilized. In this type of baseline computation, the drive is controlled by the application baseline and speed points are recorded and saved during the duration specified in *Parameter 45-24 Duration*. The option can only operate when Auto On mode is set via control panel.

Parameter 45–21: Status

Default Value: *Not Started*	Parameter Type: Option	4-setup: *All setups*
Conversion Index: -	Data Type: Uint16	Change during operation: True

Shows the current status of baseline computation.

Option	Name	Description
[0]*	Not Started	-
[1]	Baseline Run running	-
[2]	Online Baseline running	-
[3]	Baseline Completed	-
[4]	Baseline Failed	-

Parameter 45–22: Progress

Default Value: *0%*	Parameter Type: [0-100%]	4-setup: *All setups*
Conversion Index: -	Data Type: Uint8	Change during operation: True

Shows the progress of baseline computation. 0% indicates that the baseline computation is not started and 100% indicates that baseline computation is completed.

Parameter 45–24: Duration

Default Value: *Size related*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: False

Select a suitable duration for baseline computation. If a value is not selected, by default, the system considers 2 minutes for baseline run and 1 hour for online baseline.

Option	Name	Description
[0]	1 Min	-
[1]	2 Mins	-
[2]	4 Mins	-
[6]	10 Mins	-
[9]	30 Mins	-
[13]	1 Hour	-
[16]	2 Hours	-
[19]	4 Hours	-
[23]	8 Hours	-
[27]	1 Day	-
[30]	2 Days	-
[33]	5 Days	-
[36]	1 Week	-
[40]	2 Weeks	-
[43]	1 Month	-
[46]	2 Months	-
[49]	4 Months	-
[52]	6 Months	-

Parameter 45–25: Online Speed Band

Default Value: *2%*	Parameter Type: [0–5%]	4-setup: *2 setup*
Conversion Index: 0	Data Type: Uint8	Change during operation: True

Use this parameter to define a window to capture the baseline data for different speed points when the speed of drive is within the specified band percentage. Setting the parameter increases a chance to capture all speed points in online baseline mode.

Parameter 45–26 Min. Speed

Default Value: *Size Related*	Parameter Type: Range [*parameter 4-11* – 3600 RPM]	4-setup: *2 setup*
Conversion Index: 67	Data Type: Uint16	Change during operation: False

Use this parameter to set the minimum speed of the drive to begin condition-based monitoring functions. Ensure to set a value which exceeds the minimum speed limit of motor. The minimum limit of motor speed corresponds to the setting in *parameter 4-11 Motor Speed Low Limit [RPM]*. For more information, refer to VLT® AutomationDrive FC 301/302 Programming Guide.

Parameter 45–27: Max.Speed

Default Value: *Size Related*	Parameter Type: [0 – *parameter*4-13]	4-setup: *2 setup*
Conversion Index: 67	Data Type: Uint16	Change during operation: False

Use this parameter to set the maximum speed of the drive for condition-based monitoring functions. Setting the minimum and maximum speed defines the speed range for condition-based monitoring functions to perform effectively. Ensure to set a value which does not exceed the maximum limit of motor speed. The maximum limit of motor speed corresponds to the setting in *parameter 4-13 Motor Speed High Limit [RPM]*. For more information, refer to VLT® AutomationDrive FC 301/302 Programming Guide.

Parameter 45–28: Speed Points

Default Value: *Size related*	Parameter Type: Range [*parameter 45-26 – parameter 45-27*RPM]	4-setup: *2 setup*
Conversion Index: 67	Data Type: Uint16	Change during operation: False

Shows the baseline speed points calculated within the range defined in *parameter 45-26 Min.Speed* and *parameter 45-27 Max.speed*.

Parameter 45–30: Baseline Statistics

Default Value: *Mean*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: True

Select type of baseline statistical data for visualizing calculated threshold limits. The calculated threshold is used for monitoring purposes.

Option	Name	Description
[1]*	Mean	Average of the baseline data is shown.
[2]	Maximum/Minimum	Maximum and minimum of the baseline data is shown.
[3]	Mean +/- 3 Standard Deviation	Mean and +/-3 standard deviations of the baseline data is shown.

Parameter 45–31: Warning Mode

Default Value: *Absolute*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: True

Select a mode to define threshold limit for warnings.

Option	Name	Description
[0]*	Absolute	Absolute value is considered as threshold limit.
[1]	Offset	Calculates threshold as a sum of the computed baseline data and the offset values.
[2]	Factor	Calculates threshold as baseline data * factor.

The values can be specified in *Parameter 45-34 Warning S2 High* , *Parameter 45-35 Warning S1 High*, *Parameter 45-36 Warning S1 Low*, and *Parameter 45-37 Warning S2 Low*. For example, if you select Absolute as the option and an warning S2 low and warning S1 high value as 200 and 300 respectively. The threshold limit for warning stage 2 ranges from 200 to 300.

Parameter 45–32: Alarm Mode

Default Value: *Absolute*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: True

Select a mode to define the threshold limits for alarms.

Option	Name	Description
[0]*	Absolute	Absolute value is considered as threshold.
[1]	Offset	Calculates threshold as a sum of the computed baseline data and the offset values.
[2]	Factor	Calculates threshold as baseline data * factor.

The values can be specified in *Parameter 45-33 Alarm High* and *Parameter 45-38 Alarm Low*. For example, if you select Absolute and set an alarm low and alarm high value as 200 and 300 respectively. The threshold limit for alarms ranges from 200 to 300.

Parameter 45–33: Alarm High

Default Value: *Size Related*	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for high alarm notification. Based on the type of alarm mode selected by the user, a high alarm threshold is calculated.

Parameter 45–34: Warning S2 High

Default Value: *Size Related*	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for computing a warning S2 high notification. Based on the type of warning mode selected by the user, a warning S2 high threshold is calculated.

Parameter 45–35: Warning S1 High

Default Value: *Size Related*	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for computing a warning S1 high notification. Based on the type of warning mode selected by the user, a warning S1 high threshold is calculated.

Parameter 45–36: Warning S1 Low

Default Value: *Size Related**	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for computing a warning S1 low notification. Based on the type of warning mode selected by the user, a warning S1 low threshold is calculated.

Parameter 45–37: Warning S2 Low

Default Value: *Size Related*	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for computing a warning S2 low notification. Based on the type of warning mode selected by the user, a warning S2 low threshold is calculated.

Parameter 45–38: Alarm Low

Default Value: *Size Related*	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for computing a low alarm notification. Based on the type of alarm mode selected by the user, a low alarm threshold is calculated.

Parameter 45–39: Online Baseline Counter

Default Value: *2*	Parameter Type: Range [0–65535]	4-setup: *2 setup*
Conversion Index: 0	Data Type: Uint8	Change during operation: True

Type the minutes during which monitoring values are captured for a speed point during baseline generation. Speed points are captured for different types of condition-based monitoring during the minutes specified in this parameter.

Parameter 45–50: Sensor 1 Source

Default Value: *None*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: False

Select an analog input source for receiving sensor signals. Scaling of analog inputs is performed as defined in *parameter group 6*. For more information on *parameter group 6*, refer to VLT® Automation Drive FC 301/302 Programming Guide.

Option	Name	Description
[0]*	None	-
[1]	Analog Input 53	-
[2]	Analog Input 54	-
[3]	Analog Input X30/11	-
[4]	Analog Input X30/12	-
[5]	Analog Input X42/1	-
[6]	Analog Input X42/3	-
[7]	Analog Input X42/5	-
[8]	Analog Input X48/2	-

Parameter 45–51: Sensor 1 Unit

Default Value: *mm/s*	Parameter Type: Option	4-setup: *2 setup*
Conversion Index: -	Data Type: Uint8	Change during operation: True

Use the parameter to set unit of monitoring signals from the sensor. The unit is specified on the vibration sensor.

Option	Name	Description
[0]*	mm/s	-
[1]	inch/s	-
[2]	m/s2	-
[3]	g	-

3.2 Parameter Group 47 -** CBM Baseline Data

In this parameter group, you can view active and previous condition-based monitoring values.

Parameter 47–04: Active Speed

Default Value:-	Parameter Type: Range [*parameter 45–26– parameter 45–27*RPM]	4-setup: *All setups*
Conversion Index: 67	Data Type: Uint16	Change during operation: True

Shows the current baseline speed and is shown when baseline computation is completed. An index parameter with 20 pointers which shows all minimum to maximum baselines.

Parameter 47-06: Active Max

Default Value:-	Parameter Type: Range [*parameter 45-26 – parameter 45-27* RPM]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: True

Shows the maximum stator winding readings for active baseline.

Parameter 47-07: Active Mean + 3 Std.Dev

Default Value:	Parameter Type: Range [0–100%]	4-setup:
Conversion Index: -2	Data Type: Uint16	Change during operation: True

Shows the mean and three standard deviations of stator winding readings for active baseline.

Parameter 47-08: Active Mean

Default Value:	Parameter Type: Range [0–100%]	4-setup: All setups
Conversion Index: -2	Data Type: Uint16	Change during operation: True

Shows the average of stator winding readings for active baseline.

Parameter 47-09: Active Min

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: True

The parameter shows the minimum value of motor stator windings for active baseline.

Parameter 47–10: Active Counter

Default Value:	Parameter Type: Range [0–65535]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

The parameter shows the active minutes to capture monitoring alues for speed points.

Parameter 47–16: Active Max

Default Value:	Parameter Type: Range [0–100%]	4-setup: All setups
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the active stator resistance.

Parameter 47–17: Active Mean + 3 Std. Dev

Default Value: *Size Related*	Parameter Type: Range [0–100%]	4-setup: *2 setup*
Conversion Index: -2	Data Type: Uint8	Change during operation: True

Type the threshold value for high alarm notification. Based on the type of alarm mode selected by the user, a high alarm threshold is calculated.

Parameter 47–18: Active Mean

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the mean of stator resistance recordings for active load in active baseline.

Parameter 47–19: Active Min

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the minimum of all stator resistance recordings for active load in active baseline.

Parameter 47–24: Active Max

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the maximum load dependent stator resistance. An indexed parameter with 20 pointers showing stator resistors load recordings from minimum to maximum.

Parameter 47–25: Active Mean + 3 Std. Dev

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the average and standard deviation of stator resistor load recordings for active baseline.

Parameter 47–26: Active Mean

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the average of stator resistor load recordings for active baseline.

Parameter: 47–27 Active Min

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the minimum value of stator resistor load recordings for active baseline.

Parameter: 47–32 Active Max

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the maximum positive load envelope recordings for active baseline. An indexed parameter with 20 pointers of positive load envelope recordings with minimum to maximum.

Parameter: 47–33 Active Mean + 3 Std. Dev.

Default Value:	Parameter Type: Range [0-655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the active mean and 3 standard deviation of load envelope recordings for active baseline.

Parameter: 47–34 Active Mean

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the active mean of load envelope recordings for active baseline.

Parameter: 47–35 Act. Mean - 3 Std. Dev

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the active mean and 3 standard deviation of load envelope recordings for active baseline.

Parameter: 47–36 Active Min

Default Value:	Parameter Type: Range [0–655%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the minimum value of load envelope recordings for active baseline.

Parameter: 47–37 Active Counter

Default Value:	Parameter Type: Range [0–65535]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Parameter: 47–44 Active Max

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the maximum recordings from vibration sensors for active baseline.

Parameter 47-45: Active Mean + 3 Std. Dev

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the average and 3 standard deviations for upper threshold of recordings from vibration sensors for active baseline.

Parameter 47–46: Active Mean

Default Value:	Parameter Type: Range [0-100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the average value of recordings from vibration sensors for active baseline.

Parameter 47–47: Active Min

Default Value:	Parameter Type: Range [0–100%]	4-setup: *All setups*
Conversion Index: -2	Data Type: Uint16	Change during operation: False

Shows the minimum value of recordings from vibration sensors for active baseline.

4 Appendix

4.1 Motor Stator Windings

Following are the list of alarms and warnings for motor stator windings.

4.1.1 Alarm 510, Motor Stator Winding Alarm

Cause

Stator winding has reached condition red. Severe fault is detected in motor.

Troubleshooting

- Check motor stator windings.

4.1.2 Warning 510, Motor Stator Winding Warning 1

Cause

Stator winding reached condition yellow. Early fault detected in motor.

Troubleshooting

- Check motor stator windings.

4.1.3 Warning 500, Motor Stator Winding Warning 2

Cause

Stator winding reached condition orange. Severe fault might occur soon in the motor.

Troubleshooting

- Check motor stator windings.

4.2 Vibration Monitoring

Following are the list of alarms and warnings for vibration monitoring.

4.2.1 Alarm 512, Vibration Monitoring Alarm

Cause

Excessive vibration of motor and has reached condition red.

Troubleshooting

- Check root cause for excessive vibration. ISO10816 standard for machinery must be complied with before commissioning of condition-based monitoring.

4.2.2 Warning 512, Vibration Monitoring Warning 1

Cause

Increased vibration of motor is detected. Vibration levels has reached condition yellow.

Troubleshooting

- Check root cause for increased vibration.

4.2.3 Warning 502, Vibration Monitoring Warning 2

Cause

Much increase in vibration of motor is detected. Vibration levels has reached condition orange.

Troubleshooting

- Check root cause for severe vibration.

4.3 Load Envelope

Following are the alarms and warnings for the application's load envelope.

4.3.1 Alarm 511, Load Envelope Alarm

Cause

Application load has reached condition red.

Troubleshooting

- Check root cause for excessive overload or underload.

4.3.2 Warning 511, Load Envelope Warning 1

Cause

Application load has reached condition yellow.

Troubleshooting

- Check root cause for high motor load.

4.3.3 Warning 501, Load Envelope Warning 2

Cause

Application load has reached condition orange.

Troubleshooting

- Check root cause for increased motor load.

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