AnomAlert* Motor Anomaly Detector

Bently Nevada* Asset Condition Monitoring

Description

AnomAlert Motor Anomaly Detectors continuously identify existing and developing faults on electric motors and their driven equipment. AnomAlert utilizes an intelligent, model-based approach to provide anomaly detection by measuring the current and voltage signals from the electrical supply to the motor. It is permanently mounted, generally in the motor control center and is applicable to three phase AC, induction or synchronous, fixed or variable speed motors. Accompanying AnomAlert Software is used to view the data.

AnomAlert provides both mechanical (unbalance, misalignment, roller bearings, etc.) and electrical (loose windings, short circuits, etc.) anomaly detection as well as electrical parameters such as voltage and current imbalances and power factor. In addition, it can detect changes in the load the motor is experiencing due to anomalies in the driven equipment or process such as cavitations or plugged filters and screens. Since it doesn't require any sensor installation on the motor itself or associated load, AnomAlert is especially attractive for inaccessible driven equipment and is applicable to most types of pumps, compressors, and similar loads.

Each motor requires one AnomAlert and it can be configured entirely from the front panel. The AnomAlert Enterprise Software is necessary to obtain and display data in real-time from the device, to configure the performance of the device, and to save and subsequently retrieve data for display from its database. Networking protocols enable monitoring of motors and processes on remote machines using TCP/IP protocols over the Ethernet.

A System 1* Software Extender is also available that enables adding motors and all their associated AnomAlert data to your overall machinery enterprise hierarchy. It offers viewing real-time data and generating sophisticated alerts and alarms and produces intelligent advisories that deliver Actionable Information to designated users.
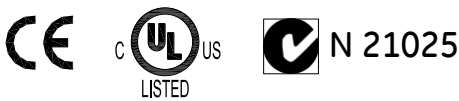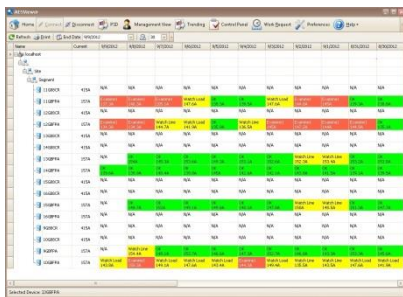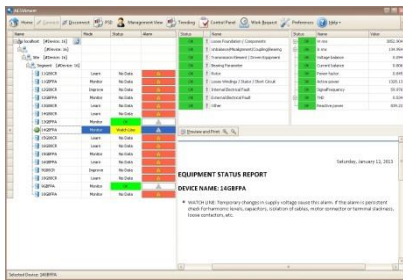
Specifications AnomAlert Hardware

General Information

Motor Type

Three-phase, AC motors

Fixed speed (line driven) or variable speed (inverter driven)

If variable speed: inverter chopping frequency must be greater than 2 kHz; motor current load and speed should not vary by more than 15% during 6 sec intervals

Not for use with soft-starter systems unless they are automatically bypassed immediately after motor start-up and during subsequent use

Operation Type

Continuous

Environmental

Operating Temperature

32 – 104º F (0 – 40º C)

Humidity

Up to 90% RH, non-condensing

Inputs

Note: Current and voltage transformers must meet local standards and regulations. For North America, transformers must be certified by an OSHA appointed NRTL to appropriate product safety standards such as UL or CSA.

Measurement Voltage Inputs

Voltage:

480 Vrms$_{L-L}$ / 277 Vrms$_{L-N}$, max, CAT II

Impedance:

3.5 MΩ phase-to-phase

Frequency:

Varies by model number. Refer to Table 1.

Low Voltage AnomAlert Models (≤480 Vac)

Tap directly off voltage lines to motor

Medium/High Voltage AnomAlert Models (>480Vac)

Fixed speed or scalar controlled VFD: Three Potential Transformers (supplied by customer): 1% or better accuracy; 100 V, 110 V, or 120 V secondary voltages.

Vector controlled VFD: Voltage divider such that nominal input to AnomAlert is 100 V to 120 V.

Measurement Current Inputs

Voltage, current, impedance:

Varies by model number. Refer to Table 2

Fixed Speed AnomAlert Models and 1A or 5A Variable Speed Models

Three Current Transformers (supplied by customer): 1% or better accuracy, with either 5A or 1A secondary outputs depending on AnomAlert model selected.

Variable Speed (Inverter Driven) AnomAlert Models

3 Hall-effect Current Sensors (supplied by customer) with 50-400 mA secondary outputs; selection based on motor to be monitored and AA model chosen. Refer to Table 2.

Note: Hall-effect Current Sensors need external power sources, generally installed in the motor control panel, too.

Power Input Required

Use UL listed fuse with proper voltage rating:

100-240 Vac (-15%, +10%), 47 – 64 Hz, 19 VA, 200 mA

or

120-300 Vdc, 19 VA, 200 mA

Outputs

Alarms

4 Alarm Parameters:

Line Change (unexpected change in incoming power)

Load Change (unexpected change in process)

Examine 1: plan maintenance

Examine 2: perform maintenance

Warnings

Any measured or calculated parameter outside its expected range based on internal data base and learned mode.

Relay

One assignable relay output, user programmable; NC/NO contacts

Communications

RS422/485

RS232 (with additional appropriate converter)

Ethernet (with additional appropriate converter)

Physical

Weight

Line: 2.58 lb (1170 g)

Inverter: 2.16 lb (980 g)

Dimensions WxHxL

3.78 in x 3.78 in x 5.51 in

(96 mm x 96 mm x 140 mm)

Mounting

Front Panel Mounting (indoor)

Protection Class

Front Panel: IP 40

Whole Unit: IP 20

Indicators

6 LEDs and LCD Readout

Keypad

6 tactile membrane keys

Compliance & Certifications

EMC:

Europe:

EMC Directive 2004/108/EC

EN 61326-1: 2006 Measurement Control and Laboratory Use for Industrial Environments

Australia/New Zealand:

C-tick

IEC 61326-1: 2005 Measurement Control and Laboratory Use for Industrial Environments

Electrical Safety:

Europe:

Electrical Safety Directive 2006/95/EC

EN 61010-1 Safety Requirements for Electrical Equipment

North America:

UL Listed, Canada and US

UL 61010-1 Safety Requirements for Electrical Equipment

Australia/New Zealand:

C-Tick

IEC 61010-1 Safety Requirements for Electrical Equipment

Specifications AnomAlert Enterprise Software

AnomAlert Enterprise Software is a stand-alone system or serves as the gateway between AnomAlert units and System1. Simple configuration process covers set-up of system, devices, and connected machinery. Includes ability to change data presentation from English to Spanish, Portuguese, Russian or Turkish. Built-in OPC server provides all computed values and statuses and allows remote control of devices. Software DVD also includes step-by-step setup movies and manuals.

System Features

AES

Artesis** Enterprise Server

AAviewer

AnomAlert Display

Maximum Hardware Connections

Up to 200 AnomAlerts through serial and TCP/IP per computer (Refer to Figure 4)

10 AnomAlerts per serial or TCP/IP channel

Multiple AES instances can share a single SQL database and OPC server

100 AnomAlert units per System1

OPC Server

1 per system (on master AES instance)

Number of tags per AnomAlert

Over 180, supplying full range of measurement and status information

Tag update rate

90 seconds

Communication

Network support

Ethernet and RS232 (with appropriate converter)

Protocols

Input: TCP/IP

Output: OPC DA 2.0

Computer Requirements

Operating System

Microsoft Windows** XP, Windows Server 2003, Windows Server 2008, Windows Vista, or Windows 7

Processor Speed

2 GHz recommended

Memory

2 GB RAM or higher

10 GB hard disk space

Peripherals

Super VGA (1024x768) or higher resolution video adapter and monitor

Keyboard and mouse or compatible pointing device

Database Software

Includes Microsoft SQL Express enabling enterprise with up to 20 AnomAlerts; for enterprises of greater than 20 the full version of SQL is required (purchased separately)

Ordering Information

For a detailed listing of country and product specific approvals, refer to the *Approvals Quick Reference Guide* (document 108M1756) located at the following website: www.GEmeasurement.com.

Order one AnomAlert per motor to be monitored. Refer to Figure 1, Figure 2, and Figure 3.

The CTs, PTs, and CSs are customer supplied. Refer to Measurement Inputs section of Specifications Section above for requirements.

Order the type and number of converters as required for your network of AnomAlerts. Refer to Figure 4.

Order at least one version of the software. For integration into System1 refer to datasheet 174590-01 for the AnomAlert Extender.

For generator monitoring see AnomAlert datasheet 288496-01.

AnomAlert for Fixed Speed Motor

390100 – AXX – B01 – CXX - D01

A: Motor Voltage

0 1	Low (≤ 480 Vac)
0 2	Medium/High (> 480 Vac)

B: Motor Speed Type

0 1	Fixed (line driven)
0 2	Variable (inverter driven)

C: Motor Nominal Current (CT secondary output)

0 1	1 A
0 2	1 - 5 A

D: Language

0 1	English

AnomAlert for Variable Speed Motor

390100 – AXX – B02 – CXX - D01

A: Motor Voltage

0 1	Low (≤ 480 Vac)
0 2	Medium/High (> 480 Vac)

B: Motor Speed Type

0 1	Fixed (line driven)
0 2	Variable (inverter driven)

C: Motor Nominal Current

0 1	up to 1 A
0 2	1 - 5 A
0 3	5 - 100 A
0 4	100 – 500 A
0 5	500 – 1000 A
0 6	1000 – 2000 A

D: Language

0 1	English

AnomAlert Enterprise Software

Must be ordered separately. Order 1 per enterprise computer. Refer to Figure 4. Includes ability to change data presentation from English to Spanish, Portuguese, Russian or Turkish. Includes step-by-step setup movies, manuals, quick install guides.

390125-01   AnomAlert Enterprise Software

Note: To bring data into System 1 see datasheet 174590-01 to order S1 AnomAlert System Extender. Quick configuration tool for bringing data into S1 is available at BN technical support via the following website:
www.GEmeasurement.com.

Converter Kits

Up to 10 AnomAlert units can be connected through each converter to a computer. Refer to Figure 4.

287127-01

RS 232/485 to RS 422 converter, with power supply and plug adapters. Kit includes sample cable for connection to AnomAlert, and sample cable for interconnection between converter and PC (1 required for each PC to which daisy-chained AnomAlerts will be connected).

287128 – AXX

Moxa* Nport* DE-311 RS422 to TCP/IP Ethernet converter with null modem mini adapter and power supply. Kit includes sample cable for connection to AnomAlert and a sample cross-cable for Ethernet connection.

A: Power Plug Type

0 1	American (US, Canada, Japan, Mexico)
0 2	British (UK, Hong Kong)
0 3	European (Turkey, Germany, Russia...)
0 4	Australian
0 5	China

AnomAlert Manuals

Hardware and software manuals can be found in electronic format on the DVD that contains the software itself. However, the hardware manual can be ordered in hardcopy format using the following part number, if desired.

286869-01   User's Manual

AnomAlert Quick Install Guides

Not required to be ordered. Are included in electronic format on the AnomAlert Enterprise Software DVD and come in hardcopy with the appropriate monitors and converter kits. They can also be ordered as hardcopies using the following part numbers, if required.

286870-01   Low Voltage, Line
286871-01   Low Voltage, Inverter
286872-01   Med/High Voltage, Line Model
286873-01   Med/High Voltage, Inverter Model
286874-01   RS485-RS422
286875-01   TCP/IP
286876-01   Software TCP/IP

Figures and Tables

After selecting AA model see Tables 1 and 2
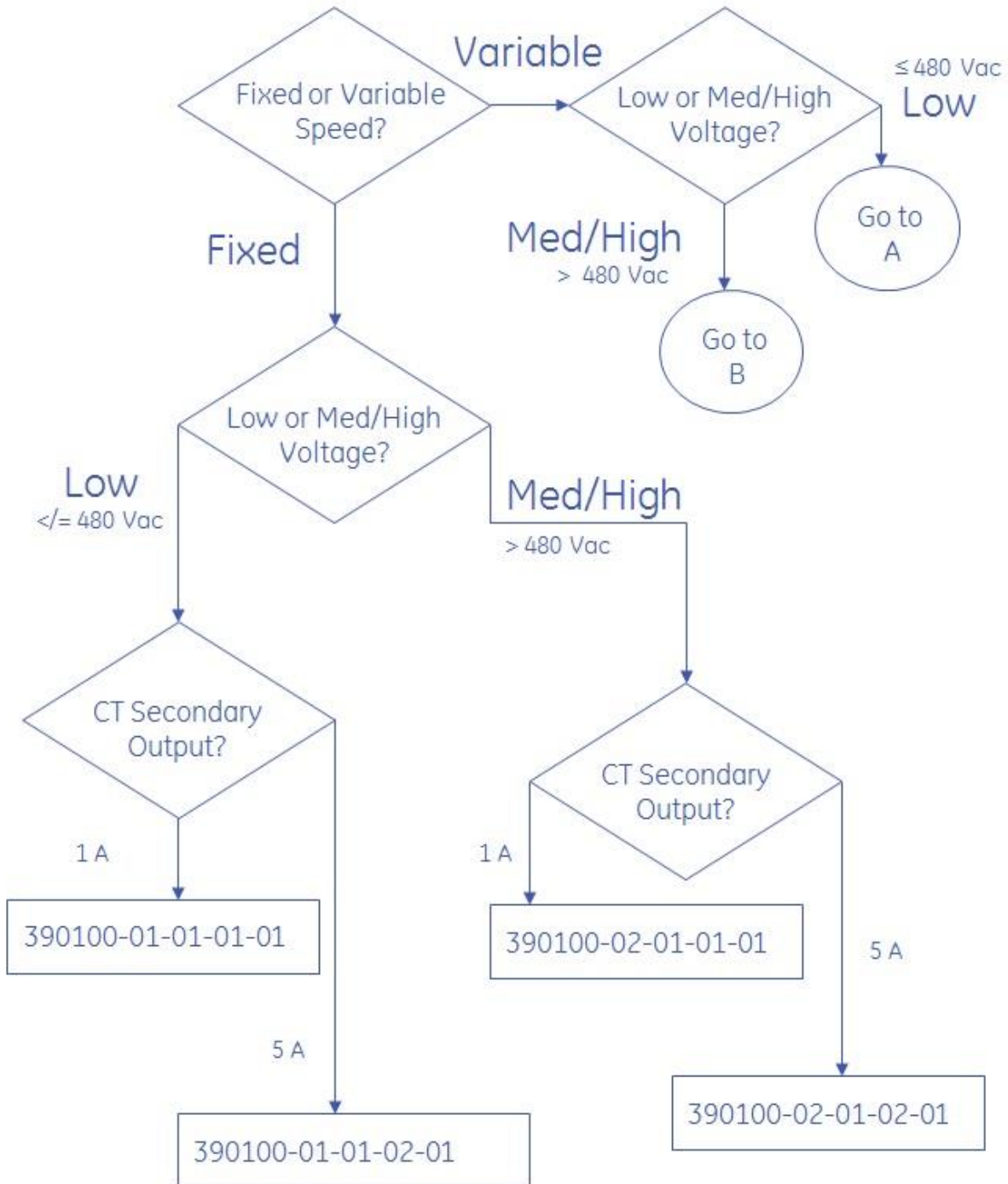for sensor/transformer selection

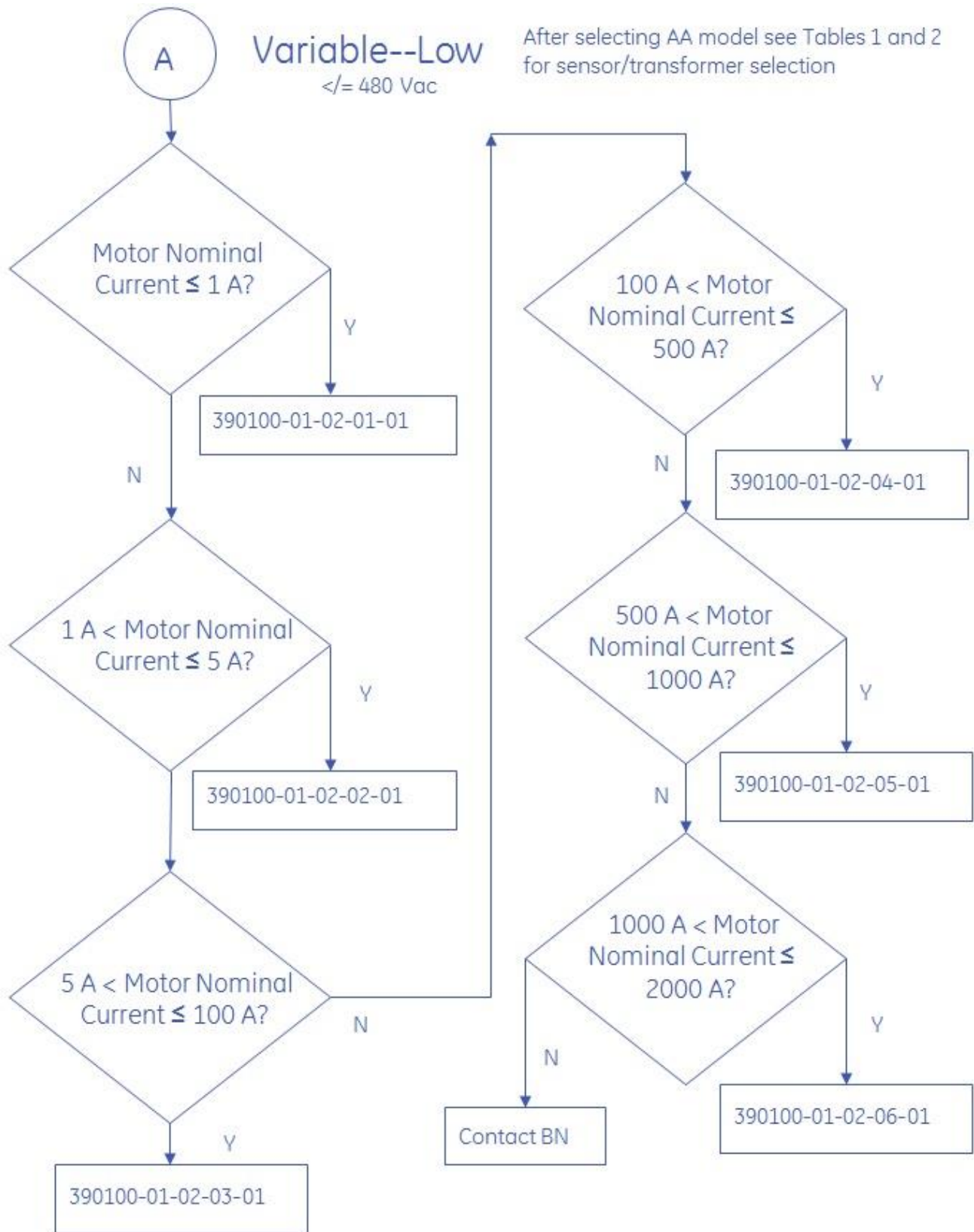**Figure 1: Model Number Selection: Fixed Speed**

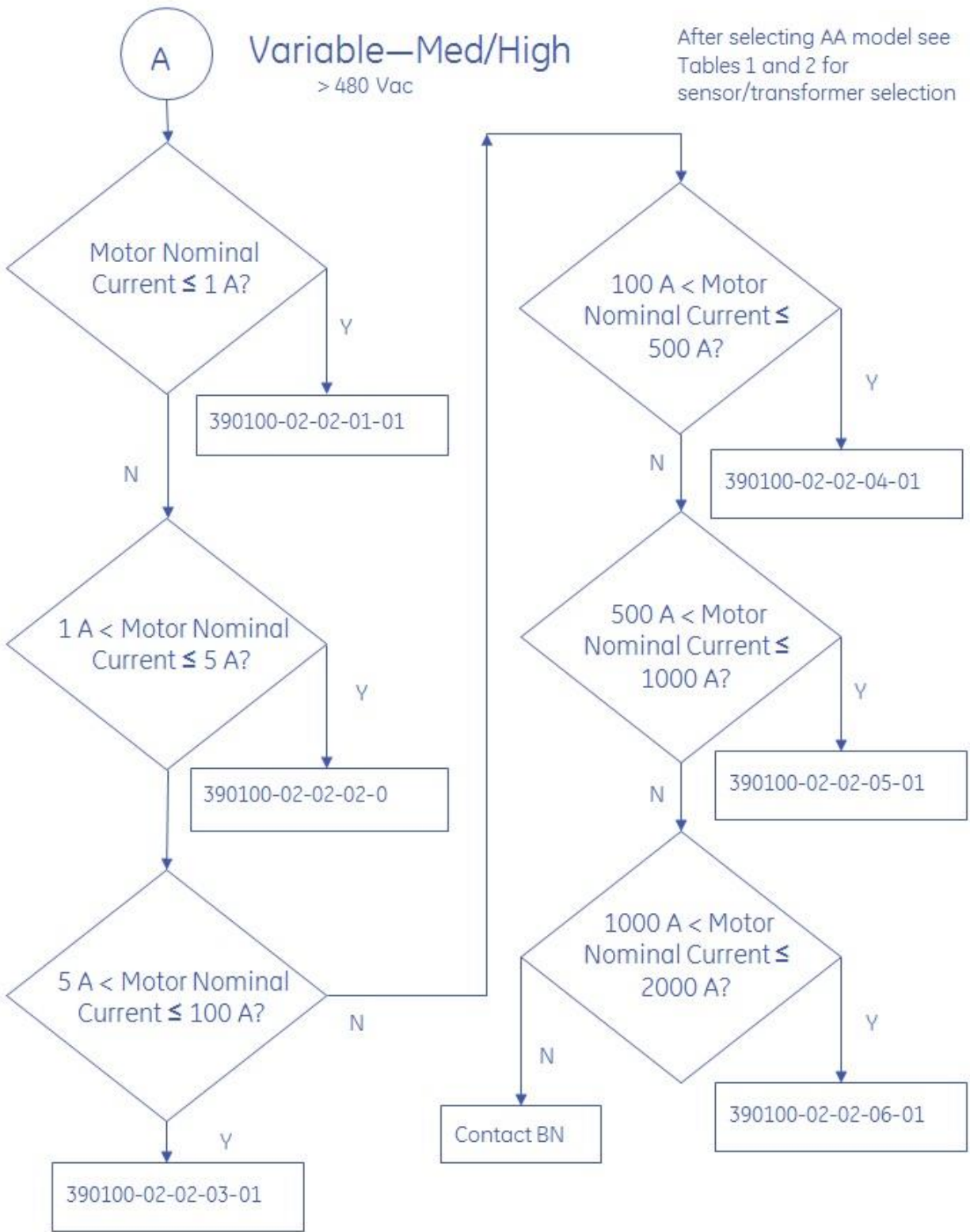**Figure 2: Model Number Selection: Variable Speed, Low Voltage**

Figure 3: Model Number Selection: Variable Speed, Medium Voltage

Table 1: Voltage Measurement Inputs

AnomAlert Part Number	Application	Minimum Frequency (Hz)	Maximum Frequency (Hz)	Best Practice Interface Recommendation
	Fixed Speed			
390100-01-01-01-01	≤480 V, 1A	45	65	Motor supply voltage connected to AA without sensor
390100-01-01-02-01	≤480 V, 5A	45	65	Motor supply voltage connected to AA without sensor
390100-02-01-01-01	>480 V, 1A	45	65	PTs with 100-120V secondary
390100-02-01-02-01	>480 V, 5A	45	65	PTs with 100-120V secondary
	Variable Speed			
390100-01-02-01-01	≤480 V, 1A	45	65	Motor supply voltage connected to AA without sensor
390100-01-02-02-01	≤480 V, 1-5A	45	65	Motor supply voltage connected to AA without sensor
390100-01-02-03-01	≤480 V, 5-100A	25	90	Motor supply voltage connected to AA without sensor
390100-01-02-04-01	≤480 V, 100-500A	25	90	Motor supply voltage connected to AA without sensor
390100-01-02-05-01	≤480 V, 500-1000A	25	90	Motor supply voltage connected to AA without sensor
390100-01-02-06-01	≤480 V, 1000-2000A	25	90	Motor supply voltage connected to AA without sensor
390100-02-02-01-01	>480 V, 1A	45	65	PTs with 100-120V secondary if scalar controlled VFD, else use voltage dividers
390100-02-02-02-01	>480 V, 1-5A	45	65	PTs with 100-120V secondary if scalar controlled VFD, else use voltage dividers
390100-02-02-03-01	>480 V, 5-100A	25	90	PTs with 100-120V secondary if scalar controlled VFD, else use voltage dividers
390100-02-02-04-01	>480 V, 100-500A	25	90	PTs with 100-120V secondary if scalar controlled VFD, else use voltage dividers
390100-02-02-05-01	>480 V, 500-1000A	25	90	PTs with 100-120V secondary if scalar controlled VFD, else use voltage dividers
390100-02-02-06-01	>480 V, 1000-2000A	25	90	PTs with 100-120V secondary if scalar controlled VFD, else use voltage dividers

Table 2: Current Measurement Inputs

| AnomAlert Part Number	Application	AA Nominal Current Input	AA Minimum Measurable Current Input	AA Maximum Measurable Current Input	Impedance	Maximum Voltage (Vac)	Best Practice Interface Recommendation
Fixed Speed							
390100-01-01-01-01	≤480 V, 1A	1 A	0.04 A	1.4 A	50 mΩ	250	If motor current ≤ 1 A and motor voltage ≤250 Vac no CTs required, else use 1:1 CTs
390100-01-01-02-01	≤480 V, 5A	5 A	0.2 A	7 A	15.3 mΩ	250	If motor current ≤ 5 A and motor voltage ≤250 Vac no CTs required, else use 5:5 CTs
390100-02-01-01-01	>480 V, 1A	1 A	0.04 A	1.4 A	50 mΩ	250	CTs with 1 A secondary
390100-02-01-02-01	>480 V, 5A	5 A	0.2 A	7 A	15.3 mΩ	250	CTs with 5 A secondary
Variable Speed							
390100-01-02-01-01	≤480 V, 1A	Up to 1 A	0.04 A	1.4 A	50 mΩ	250	If motor current ≤ 1 A and motor voltage ≤250 Vac no CTs required, else use 1:1 CTs
390100-01-02-02-01	≤480 V, 1-5A	1-5 A	0.2 A	7 A	15.3 mΩ	250	If motor current ≤ 5 A and motor voltage ≤250 Vac no CTs required, else use 5:5 CTs
390100-01-02-03-01	≤480 V, 5-100A	50 mA	1.5 mA	70 mA	50 Ω	30	LEM Current Sensors: LA100-S, 70A motor current, max
390100-01-02-04-01	≤480 V, 100-500A	100 mA	3 mA	140 mA	25 Ω	30	LEM Current Sensors: LA100-S, 140 A motor current, max; LA205-S, 280 A motor current, max; LA305-S, 350 A motor current, max; LT505-S, 700 A motor current, max
390100-01-02-05-01	≤480 V, 500-1000A	200 mA	6 mA	250 mA	12.5 Ω	30	LEM Current Sensors: LT1005, 1250 A motor current, max
390100-01-02-06-01	≤480 V, 1000-2000A	400 mA	12 mA	500 mA	6.25 Ω	30	LEM CSs: LT2005, 2500 A motor current, max
390100-02-02-01-01	>480 V, 1A	1 A	0.04 A	1.4 A	50 mΩ	250	1:1 CTs
390100-02-02-02-01	>480 V, 1-5A	5 A	0.2 A	7 A	15.3 mΩ	250	5:5 CTs
390100-02-02-03-01	>480 V, 5-100A	50 mA	1.5 mA	70 mA	50 Ω	30	LEM Current Sensors: LA100-S, 70 A motor current, max
390100-02-02-04-01	>480 V, 100-500A	100 mA	3 mA	140 mA	25 Ω	30	LEM Current Sensors: LA100-S, 140 A motor current, max; LA205-S, 280 A motor current, max; LA305-S, 350 A motor current, max; LT505-S, 700 A motor current, max
390100-02-02-05-01	>480 V, 500-1000A	200 mA	6 mA	250 mA	12.5 Ω	30	LEM Current Sensors: LT1005, 1250 A motor current, max
390100-02-02-06-01	>480 V, 1000-2000A	400 mA	12 mA	500 mA	6.25 Ω	30	LEM Current Sensors: LT2005, 2550 A motor current, max
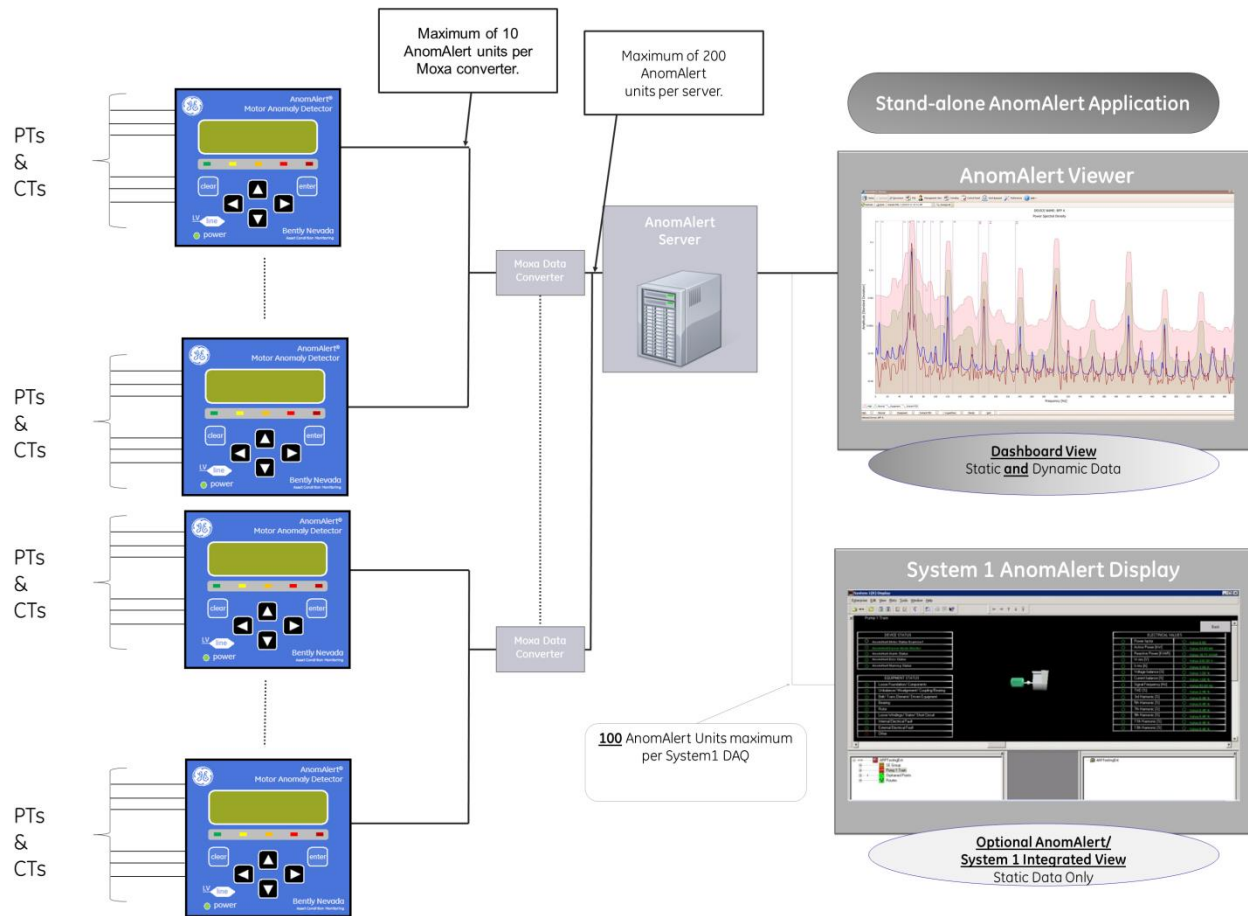
Figure 4: System Architecture

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  Bently Nevada

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