

Total I/O modules = 48

Sync time = 32 ms

Scan time =  $39.3 \text{ ms} + 32 \text{ ms} + (48 \times 0.04) \text{ ms} + (30 \times 1.170) \text{ ms} + (18 \times 1.174) \text{ ms} \Rightarrow 129.5 \text{ ms}$

Minimum throughput time =  $129.5 \text{ ms} + 7 \text{ ms} \Rightarrow 136.5 \text{ ms}$

Maximum throughput time =  $(2 \times 129.5) \text{ ms} + 13 \text{ ms} = 272.0 \text{ ms}$ .

## System Installation Environment

The installation environment can be a source of common cause failure so it is necessary that the installation assessment covers the environmental specification for the AADvance system and includes the following:

- the prevailing climatic conditions
- type of area, e.g. is it a hazardous or non-hazardous area
- location of power sources
- earthing and EMC conditions

In some customer installations parts of the system can be installed in differing locations; in these cases the assessment must include each location.

### Power Sources and Heat Dissipation Calculations

It is highly recommended that module supply power and field loop power consumption calculations are done to find out the heat dissipation before designing a suitable enclosure and making a decision about the installation environment (see topic "System Design for Heat Dissipation").

### Safety Related System Installation Process

For a Safety Related System the installation process must also be in line with the following:



**WARNING:** You must use the installation guidelines given in this manual and any installation and commissioning procedures that comply with applicable international or local codes and standards.



**CAUTION:** AADvance modules are suitable for use in Class I, Division 2, Groups A, B, C and D Hazardous locations or Non-hazardous locations only or equivalent.



**ATTENTION:** Pour les modules AADvance sont utilisables dans Class I, Division 2, A, B, C et D pour un environnement dangereux ou pour un environnement non dangereux ou équivalente.

## Environment Standards

The AADvance system has been investigated to United States National Standard (s) UL508, 17th Edition and Canadian National Standard (s) C22.2 No 142, 1st Edition. The investigation covers the following modules and provides

requirements for compliance to the standards for use in a non-hazardous and hazardous environments.

The AADvance controller has been investigated and approved by UL for use as Industrial Control Equipment in hazardous locations, Class I, Division 2, Groups A, B, C and D in North America.

The AADvance controller has been assessed for ATEX compliance. The UL Certification No. is DEMKO 11 ATEX 1129711X. The ATEX marking is Ex nA IIC T4 Gc.

Additionally the AADvance controller is approved under the IECEx certification scheme. The certificate number is IECEx UL 12.0032X

## Installation Requirements for Non-Hazardous Environment

### Investigation File Number E341697

#### *Products Covered*

The products investigated and approved:

#### **Programmable Logic Controller Models:**

- T9110 Processor Module
- T9401 Digital Input Module
- T9402 Digital Input Module, 16 Channel
- T9431 Analogue Input Module
- T9432 Analogue Input Module, 16 Channel
- T9451 Digital Output Module
- T9481 Analog Output Module
- T9482 Analogue Output Module, 8 Channel.

#### **Listed Accessories for use with PLCs:**

- T9100 Processor Backplane
- T9300 I/O Backplane
- T9801 Digital Input Termination Assembly, Simplex
- T9802 Digital Input Termination Assembly, Dual
- T9803 Digital Input Termination Assembly, TMR
- T9831 Analogue input Termination Assembly, Simplex
- T9832, Analogue Input Termination Assembly, Dual
- T9833 Analogue Input Termination Assembly, TMR
- T9851 Digital Output Termination Assembly, Simplex and T9852 Digital Output Termination Assembly, Dual
- T9892 Digital Output Termination Assembly, Dual
- T9881 Analogue Output Termination Assembly, Simplex
- T9882 Analogue Output Termination Assembly, Dual.

## *Non-Hazardous Installation Requirements*

### **Environmental**

In a non-hazardous environment a system can be installed in an enclosure or on a support/wall; however, the enclosure or the area where it is installed must not be more than a Pollution Degree 2 or similar environment in accordance with IEC 60664-1:2007.

The surrounding air temperature ratings are:

- For the T9110 Processor module = 60 °C
- For all other I/O modules, base units and termination assemblies = 60 °C

### **Pollution Degree Definition**

For the purpose of evaluating creepage distances and clearances, the following four degrees of pollution in the micro-environment are established:

- Pollution Degree 1: No pollution or only dry pollution occurs. The pollution has no influence.
- Pollution Degree 2: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.
- Pollution Degree 3: Conductive pollution occurs or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected.
- Pollution Degree 4: Continuous conductivity occurs due to conductive dust, rain or other wet conditions.

## **Installation Requirements for Hazardous Environment**

The AADvance controller has been investigated and approved by UL for use as Industrial Control Equipment in hazardous locations, Class I, Division 2, Groups A, B, C and D in North America.

The AADvance controller has been assessed for ATEX compliance. The UL Certification No. is DEMKO 11 ATEX 1129711X. The ATEX marking is Ex nA IIC T4 Gc.

Additionally the AADvance controller is approved under the IECEx certification scheme. The certificate number is IECEx UL 12.0032X.

### **Installation Requirements**

To comply with the standards the following conditions must be applied to the installation:

**WARNING:** Special conditions for safe use:

- Model T9110: The ambient temperature range is -25 °C to +60 °C (-13 °F to +140 °F).
- All other Models: The ambient temperature range is -25 °C to +60 °C (-13 °F to +140 °F).
- Subject devices are to be installed in an ATEX/IECEx Certified, IP54, tool accessible enclosure that has been evaluated to the requirements of EN 60079-0: 2012+A11:2013 and EN 60079-15:2010/IEC 60079-0 Ed 6 and IEC 60079-15 Ed 4. Enclosure is to be marked with the following: "Warning - Do not open when energized". After installation of subject devices into the enclosure, access to termination compartments must be dimensioned so that conductors can be readily connected. Grounding conductor should have a minimum cross sectional area of 3.31 mm<sup>2</sup>.
- Subject devices are for use in an area of not more than pollution degree 2 in accordance with IEC 60664-1.
- Subject devices are to use conductors with a minimum conductor temperature rating of 85 °C.
- Subject devices are to be installed in the vertical orientation only.

AADvance meets the essential requirements of EN 60079-0:2012 + A11:2013 & EN 60079-15:2010 and IEC 60079-0 Ed 6 and IEC 60079-15 Ed 4.

## File Number E251761

The AADvance controller investigation and approval is contained in the following file certifications:

- NRAG.E251761: Programmable Controllers for Use in Hazardous Locations Class I, Division 2, Groups A, B, C and D.

The products have been investigated using requirements contained in the following standards:

- ANSI/ISA 12.12.01-2013, Nonincendive Electrical Equipment for use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous Locations.
- UL508, Industrial Control Equipment, Seventeenth edition, with revisions through and including April 15, 2010.
- NRAG7.E251761: Programmable Controllers for Use in Hazardous Locations Certified for Canada; Class I, Division 2, Groups A, B, C and D.

The products have been investigated using requirements contained in the following standards:

- CSA C22.2 No 213-M1987, Nonincendive Control Equipment for Use in Class I, Division 2, Hazardous Locations.
- CSA C22.2 No 142-M1987, Process Control equipment, Edition 1 - Revision date 1990-09-01.

### *Products Covered*

The products investigated and approved:

#### **Programmable Logic Controllers Models:**

- T9110 Processor Module
- T9401/2 Digital Input Module

- T9431/2 Analogue Input Module
- T9451 Digital output Module
- T9482 Analogue Output Module.

**Listed Accessories for use with PLCs:**

- T9100 Processor Backplane
- T9300 I/O Backplane
- T9801 Digital Input Termination Assembly, Simplex
- T9802 Digital Input Termination Assembly, Dual
- T9803 Digital Input Termination Assembly, TMR
- T9831 Analogue input Termination Assembly, Simplex
- T9832, Analogue Input Termination Assembly, Dual
- T9833 Analogue Input Termination Assembly, TMR
- T9851 Digital Output Termination Assembly, Simplex.

## **Certifications for Safety System Applications in Hazardous Environments**

### **ATEX Certificate**

Refer to AADvance Series T9000 Programmable Control and Safety System - ATEX certificate, publication [9000-CT003](#).

### **IECEX UL Certificate**

Refer to AADvance Series T9000 Programmable Control and Safety System - IECEX certificate, publication [9000-CT006](#).

## **Module Label**

The following label information must be attached to each module.