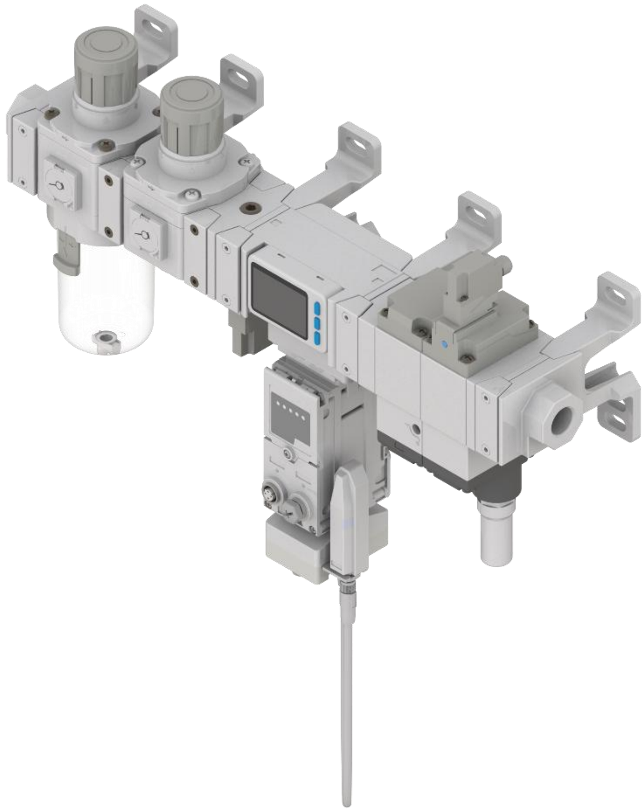
Expertise – Passion – Automation



Technical Transfer Document - AMS Retrofitting Guide

Abstract

This technical transfer document explains the Air Management System (AMS) and outlines the process for commissioning when retrofitting into existing brownfield machines.

SMC Disclaimer

------------------- WHERE APPLICABLE, THIS DISCLAIMER LIMITS SMC LIABILITY ----------------

This technical guide is provided "as is" for information purposes only to support the installation of the air management system. Official operation manuals (OM) and technical files (t-files) are or will be available to support SMC products. This guide is intended to be used only as a reference for additional support.

SMC is not responsible under any circumstances for any harm or damage arising out of or related to the use of this guide and the related files, programs, or industrial ethernet.

Contents

1 Aim & Scope

This technical document is concerned with the Air Management System (AMS) and its commissioning process specifically relating to retrofitting. This document, along with the AMS operation manual, will aid users in this task. These are three major sections within this document to support this aim:

- AMS Overview
- Mechanical Installation
- Connection to a Digital Factory Environment

2 Air Management System Overview

The AMS consists of three main components:

- Standby Regulator: Manual or Electro-Pneumatic, connects to the Air Management Hub.
- Air Management Hub: Network communications and system control with flow, pressure & temperature measurement.
- Residual Pressure Release Valve: Connects to the Air Management Hub.

Note: Various configurations of the Air Management System are possible.

This document covers the Air Management System, abbreviated to AMS, which is a system consisting of an assembly of SMC components that provides control of the supply of compressed air to reduce air consumption. AMS provides high-resolution data (up to 10Hz or 10 data points per second) that can be used by the user for leak detection & air performance analysis by the end user.

Two versions of the AMS are available, providing different pressure setting methods. The AMS##A type (**Figure 1**) uses an ITV series electro-pneumatic regulator, whereas the AMS##B uses AR-type (**Figure 2**) manual regulator to set both Operation pressure and Standby pressure.

Table 1 - Air Management Assembly Types

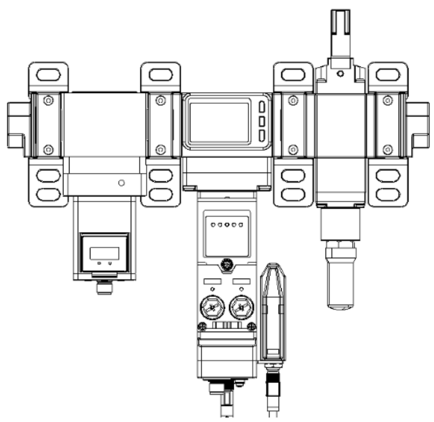
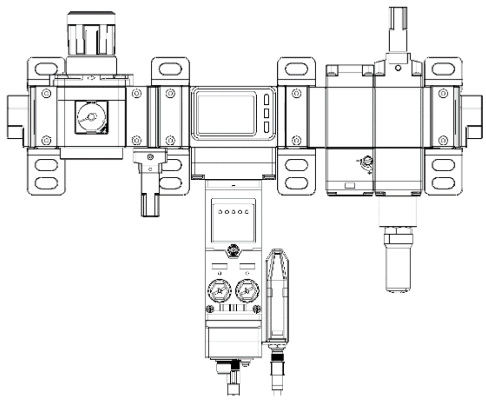
	

Figure 1 - AMS Example Assembly Type A	**Figure 2 - AMS Example Assembly Type B**

The AMS components are compatible modularly with the SMC's AC-D air preparation system and can be combined with current installations. It should be noted that the AMS components are also compatible with other SMC air preparation systems and can also be adapted to fit other brands.

Two versions of the Air Management Hub are available, the wired/base type and the standalone/remote type. The wireless variant of the AMS can be utilised to create a wireless network of up to 11 Air Management Hubs using 1 wireless base and 10 wireless remotes. In addition, an expanded wireless network can also be created using 1 compact wireless base unit, and up to 35 AMS Hub remotes.

Data for all connected AMS devices can be made available on the network via the AMS wired/base unit using OPC UA or the chosen Fieldbus protocol. The following subsections illustrate the various components that together form the Air Management System.

2.1 AMS Links

AMS Global Homepage	AMS Videos	AMS EU Homepage
.pdf Catalogue	Digital Catalogue	Operation Manuals

2.2 Pressure Regulation

Table 2 - Pressure Regulation Variants

The manual pressure setting type uses a Standby Regulator module to set the standby pressure.	The electrical pressure setting type uses an Electropneumatic Regulator module to set the operating pressure and standby pressure.

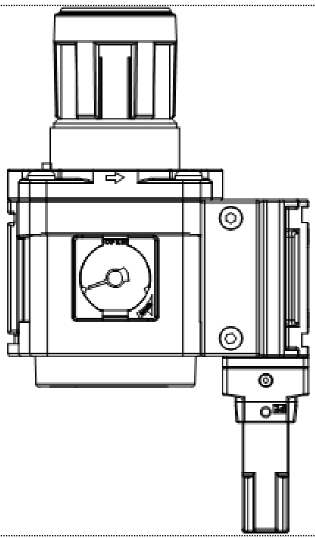
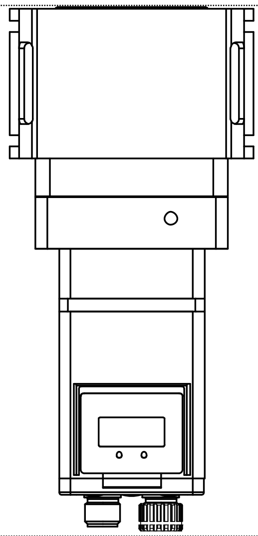

	

Figure 3 - Standby Regulator (AR) – AR#S-#E-Y-15V	**Figure 4 - Electropneumatic Regulator (ITV) – ITV#-IL#-#-#-X399**

2.3 Air Management Hub

Table 3 - Air Management Hub Variants

The Air Management Hub wired/base version comes with Profinet or EtherNet/IP and OPC UA, or Ethercat, for data communication and a webserver for parameter setting. A wireless adapter can be connected to use the Air Management Hub as a wireless base. AMS wireless remotes can then be paired to the AMS wireless base.	The Air Management Hub remote version comes with no data communication to the network and relies on a connection to a base unit. A wireless adapter can be connected to use the Air Management Hub as a wireless remote. Without the wireless adaptor, this device can also operate as a standalone unit independent of a communication network.

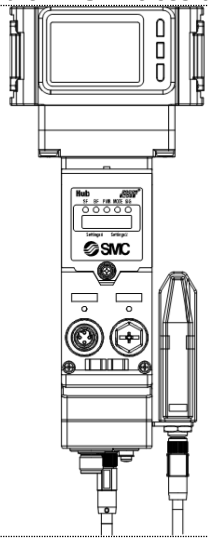
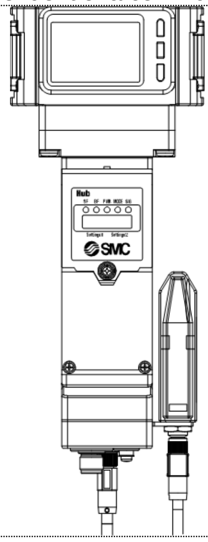

	

Figure 5 - Wired/Base Unit – EXA1-##-##-#	**Figure 6 - Standalone Unit - EXA1-##-SA-#**

Each Air Management Hub has one spare port which can be configured to be:
- 1 x IO-Link connection & 1 x Digital Input connection
- 1 x Digital Input connection & 1 x Digital Output connection
- 2 x Digital Input connections

2.4 Residual Pressure Relief Valves

Table 4 - Residual Pressure Relief Valve Variants

A VP valve module can be used for isolation mode.	A VP valve module can be used for isolation mode, this version includes a soft start valve.

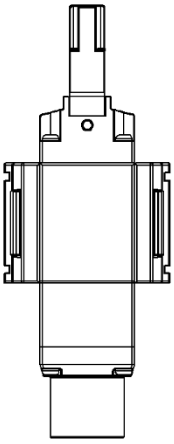
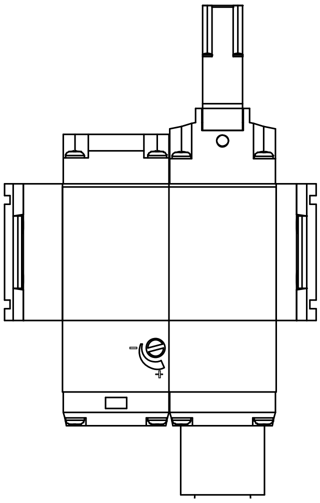

	

Figure 7 - Residual Pressure Relief Valve - VP#46E-X660/661	**Figure 8 - Residual Pressure Relief Valve with Soft Start - VP#46E-S-X660/661**

2.5 Wireless Adaptor

Table 5 – Wireless Adaptor

Wireless adapter for air management hub EXA1

Figure 9 - Wireless Adaptor - EXW1-A11N

2.6 Compact Wireless Base Units

Table 6 – Wireless Base Units

Compact wireless bases can be used instead of the AMS wireless base when additional IO capacity is required. The X10 versions (PROFINET (PN)or EtherNet/IP(EN)) provide the same webserver functions as the AMS base and allow for up to 35 AMS remotes to be connected to one base unit.

In addition, further compact wireless remotes, IO-Link, digital IO, or analogue can be paired to these base units to expand the available IO.

A special part number is available.

EXW1-B#NAC1-X10

This version incorporates the AMS webserver for centralised parameter setting.

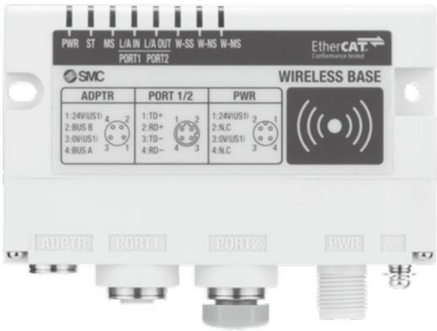


Figure 10 - Compact Wireless Base - EXW1-BENAC1-X10

2.7 Working Principle

The Air Management System (AMS) has three functional modes: Operation, Standby and Isolation. In operation mode the air flow rate is constantly monitored by the AMS Hub. When the measured flow rate reduces to below the set flow value of **[FrtE]** for longer than the set value of **[t_on]** and the **[SIS]** is ON (24 VDC by digital input or logic high by PLC or OPC UA), the AMS will engage standby mode. Wherein the output pressure will be reduced from the operation pressure **[PS1]** down to the user specified standby pressure **[PS2]**. Note that the AMS has a non-relieving construction therefore air consumption is required to drop pressure to the standby pressure.

While in standby mode, and if enabled **[iSoL]** after a set time **[t_iSo]** the eco valve will close, and the upstream pressure will be exhausted.

While in Standby Mode or auto Isolation Mode, if the **[SIS]** switches OFF (0 V and logic Low), the AMS output pressure will increase back to the operation pressure **[PS1]**. If the **[SIS]** is ON (24 VDC/High) again within the set time **[t_off]** after returning to operation mode, the AMS will immediately return to Standby Mode.

If at any point the **[IIS]** is OFF (0 V/Low), the AMS will be forced into isolation mode. Hysteresis can also be set for the standby flow rate threshold **[FrtE]** with parameter **[FHYS]**. The above describes the behaviour for the Normally Closed (N.C.) type. For Normally Open (N.O.) type, the isolation input signal **[IIS]** is inverted.

- AMS##A series can set the time to reach operation pressure with the Pressure Ramp-up duration.
- AMS##B series has a Soft Start Function that functions between isolation mode to operation mode.

Refer to the below **Table 7** for definitions of the parameters available on the AMS. In addition, refer to the timing chart of **Figure 11** which illustrates the sequence of events when the AMS operates to save air consumption.

Table 7 - Summary of AMS Inputs and their Definitions

Label	Name	Definition
[FrtE]	Standby flow rate threshold	Flow rate value that partially defines the standby mode activation.
[t_on]	Standby ON delay	Countdown delay timer that partially defines the standby mode activation.
[SIS]	Standby input signal	Signal provided to the Hub, either via Process Data or a Digital Input.
[PS1]	Operation pressure	Normal Operation Pressure.
[PS2]	Standby pressure	Secondary Operation Pressure.
[iSoL]	Auto isolation	Defines if the isolation valve is able to be activated or it is not.
[t_iSo]	Isolation delay	Countdown delay timer to activate Isolation mode.
[t_off]	Standby OFF delay	Timer to quickly re-engage Standby mode after deactivation
[IIS]	Isolation input signal	Signal provided to the Hub, either via Process Data or a Digital Input.
[FHYS]	Standby flow rate hysteresis	Flow rate threshold hysteresis
[FS1]	Pressure ramp-up duration	Configurable Pressure ramp-up duration exclusive to the AMS##A.
[SS]	Soft start function	Manually defined and set by an adjusting screw on the product.

2.8 Standby Mode in brief

Ultimately, when PIN 4 on PORT 3 is energised <u>AND</u> the user programable logic conditions are met, standby mode is activated, the machine air supply pressure will be regulated to the PS2 value. For the ITV type AMS, the PS2 value is defined either on the ITV or the webserver once connected to a base unit. For the AR type AMS, the PS2 value is defined by the AR setting.

2.9 Auto Isolation mode in brief

Auto isolation mode, when enabled via the **[iSoL]** parameter, occurs after a secondary timer has elapsed **[t_iSo]** from the moment standby mode is activated as explained above in **Section 2.8**. In this mode the upstream pressure will be exhausted.

2.10 Timing Diagram

Figure 11 shows an example timing diagram for the Normally Closed (N.C.) type AMS. This timing chart is for reference only, actual behaviour depends on the machine volume connected to the AMS outlet side.

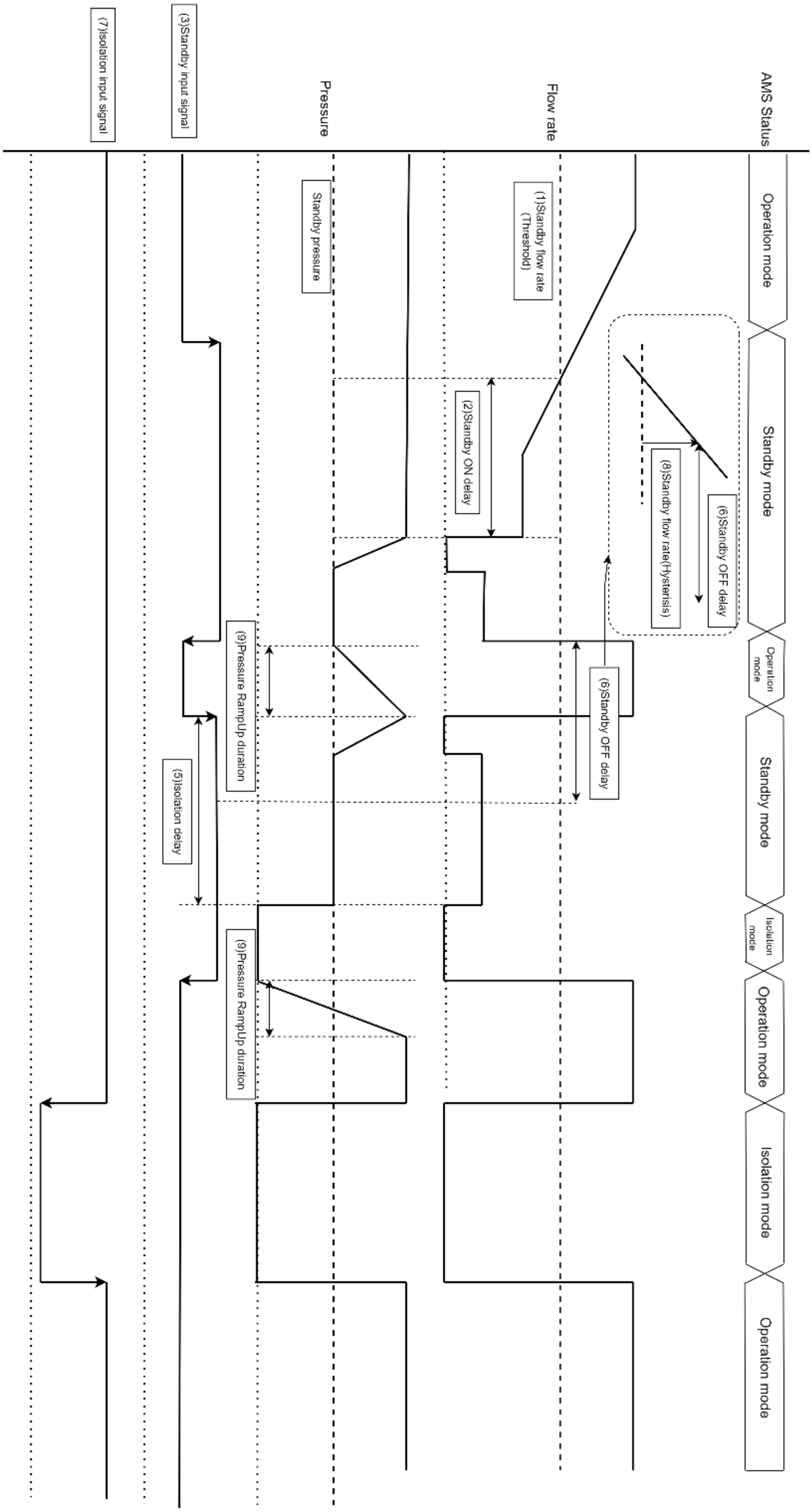


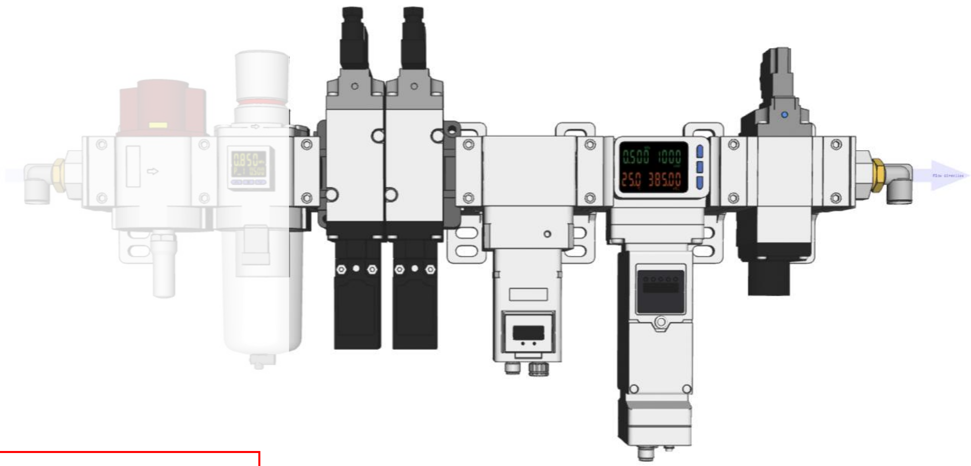
Figure 11 - Timing diagram for N.C. type AMS

3 Mechanical Installation

This section details the steps required to install the AMS and enable the device to begin operating.

3.1 AMS Integration in the Machine Air Preparation Kit

The AMS components should not simply be added before or after the host machines Air Preparation Kit, it should be combined. This guarantees the maximal use of the AMS's economical features, data capture and appropriate use when in combination with Safety Vent Valves. Two simple examples are presented below for clarity and understanding.

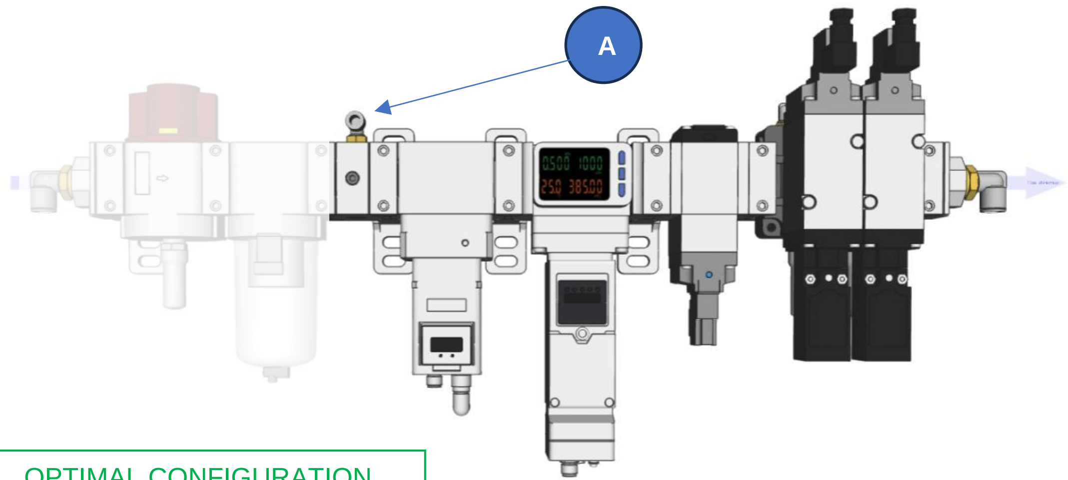


ILL ADVISED CONFIGURATION

Figure 12 - Poor AMS Integration

Figure 12 above shows an example of poor AMS integration. This is the case as the three AMS components are installed at the end of the air preparation kit assembly. Notable points are:

- There is a filter regulator installed in position #2 and an EP regulator installed in position #4. Regulating the air twice increases pressure drops and ultimately the machine will use more air during its life – *use a filter only*.
- The safety vent valves are installed upstream of the AMS, safety vent valves should always be at the end of an air preparation kit assembly – *reposition the safety vent valves and ensure they are externally piloted*.



OPTIMAL CONFIGURATION

Figure 13 - AMS Integration

Figure 13 above shows an example of AMS integration. This is the case as the three AMS components are installed within the air preparation kit assembly. Notable points are:

- Filtered air is supplied to the machine and the external pilot line, indicated by "A" has been prepared, further detail in **Section 3.2.2**.
- The safety vent valves are installed downstream of the AMS and the safety vent valves are positioned at the end of the air preparation kit assembly.

3.2 AMS and use with Safety Vent Valves

The Air Management System (AMS) is designed to isolate compressed air to a machine during idle, non-productive periods to reduce energy consumption. Because the AMS is not a safety-rated or certified device, it must not be used to release air pressure from a machine for safety purposes.

To meet safety requirements, the AMS should be installed before an ISO 13849-1 certified residual pressure release valve (RPRV). SMC recommends that the AMS and the safety system, including the RPRV, operate independently. The system designer or end user is responsible for defining the final configuration to ensure compliance with all applicable safety regulations; SMC can only provide recommendations.

When specified, the residual pressure relief valve (**Figure 7**) is supplied as part of the AMS assembly. The Residual Pressure Relief valve sole function is to reduce unnecessary compressed-air consumption by isolating the air supply when the machine is not in use. With the recommended configuration, the AMS standby pressure can be set as low as 0 bar, maximising the potential energy savings. This section does not address the minimum operating pressure requirements of other components connected to the AMS; it is the responsibility of the end user to confirm their suitability for zero-pressure or low-pressure states.

Because the RPRV is positioned downstream of the Residual Pressure Relief valve, there may be situations where the RPRV is deprived of supply pressure. This is particularly important when an internally piloted RPRV is used. If the RPRV loses its supply pressure, it becomes inoperable. In this condition, **Isolation mode cannot be enabled**, meaning the RPRV cannot perform its safety-related pressure-release function.

If an internally piloted RPRV is used to provide both safety isolation and economic isolation, the minimum settable pressure must not fall below the RPRV's minimum operating pressure. For example, the VP744R-5DZ1-04F-M-X538 requires a minimum operating pressure of 2.5 bar. Operating below this threshold would prevent the RPRV from functioning correctly. By following the recommended system configuration described above, this limitation is avoided, and the AMS standby pressure can be safely reduced to 0 bar.

3.2.1 *Recommendations*

The suggestion is to use the AMS with a Normally Open (N.O.) Residual Pressure Relief valve and an RPRV with an external pilot that is taken from the main airline after filtration and before regulation. It is important to ensure that a check valve is included in the external pilot airline, this ensures that the appropriate pressure is supplied to the RPRV irrespective of the AMS regulated pressure. This allows for the uninhibited use of the AMS for economical usage and the uninhibited use of the RPRV for safety usage.

3.2.2 *General Layout*

In this section outlines the general considerations to be recognized in the combined use of the AMS and RPRV. Figure 14 below displays a free body diagram defining the general scheme of parts, how they are connected electrically and how they are supplied with compressed air. Figure 15 presents the pneumatic scheme in support of **Table 8**.

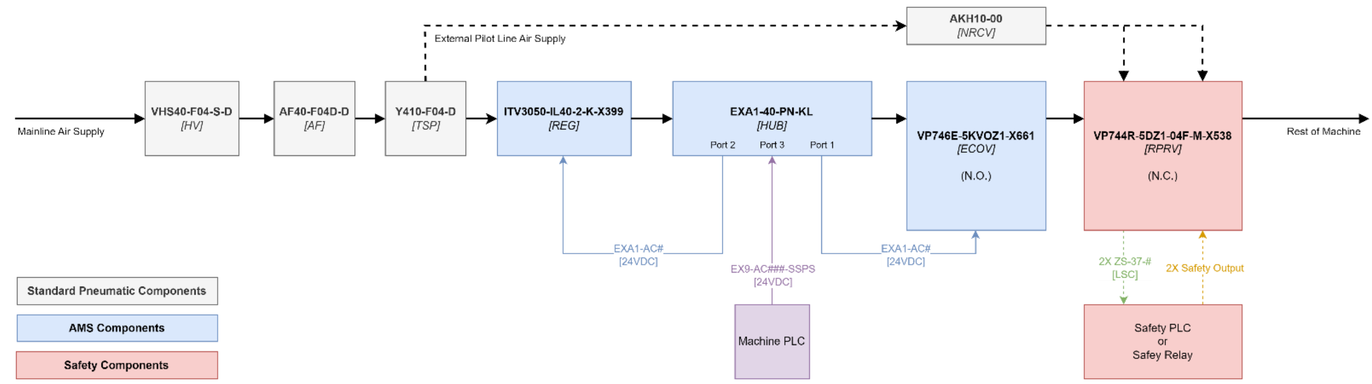


Figure 14 - Free Body Diagram of suggested layout of components

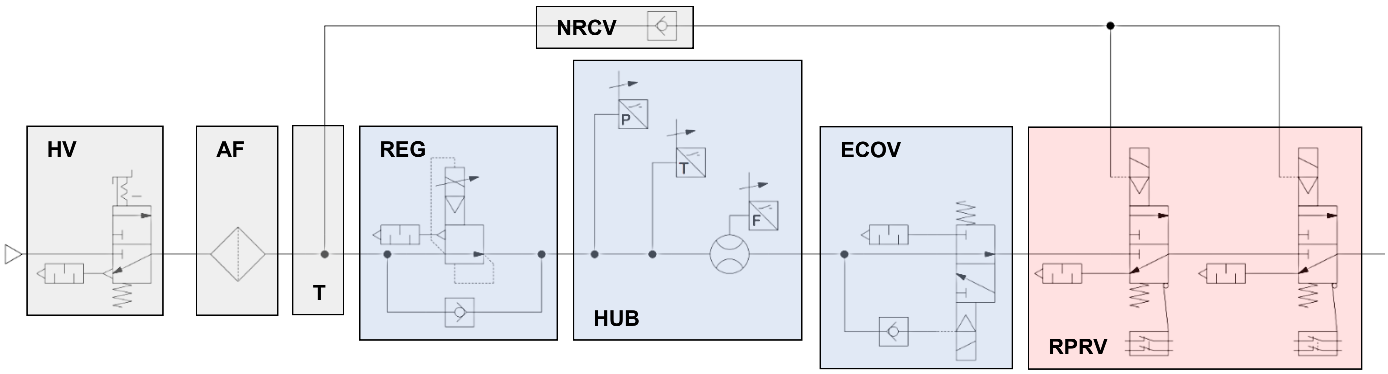


Figure 15 - Outline Pneumatic Circuit Drawing (Extracted from DKY03837-D-259)

Table 8 - Key for Figure 14 and Figure 15

Label	Definition	Example Part Number
HV	Hand Valve	VHS40-F04-S-D
AF	Air Filter	AF40-F04D-D
T	T-Spacer	Y410-F04-D
REG	Pressure Regulator (Note: symbol for E/P regulator shown in **Figure 15**)	ITV3050-IL40-2-K-X399 (E/P Regulator)
HUB	AMS Hub	EXA1-40-PN-KL
ECOV	Economical Residual Pressure Release Valve	VP746E-5KVOZ1-X661
RPRV	Safety Residual Pressure Relief Valve	VP744R-5DZ1-04F-M-X538
NRCV	Non-Return Check Valve	AKH10-00

4 Operational Setup

This section provides guidance to enable the functions on the AMS to be set up to run with the host machine. These recommendations are in line with experiences in retrofitting AMS onto live machines.

4.1 Choosing an AMS Assembly

The end user should pre-select certain specification points to maintain consistency across machines. These key specification points could be:

- The AMS must be a remote variant.
- The Residual Pressure Relief Valve should be a Normally Open N.O. type (see Note 1).
- If paired with safety vent valves, an externally piloted safety vent valve must be specified (see Note 2).

Note 1: For a retrofitting project, it is recommended that a Normally Open (N.O.) type AMS assembly is suggested. This is the case as this does not add added complexity to the air delivery system. Preexisting normally closed N.C. parts should remain N.C., this is also the case if SMC is replacing parts too.

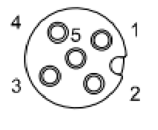
Note 2: If an internally piloted safety vent valve already exists in the system to be upgraded, the safety vent valve would need to be changed to external pilot type. Otherwise, the lowest possible minimum standby pressure cannot be achieved, in addition isolation mode can never be enabled reducing economic savings the AMS can provide.

4.2 Control and Signalling

The AMS Hub requires a digital standby signal on PIN 4 of PORT 3. This signal may be provided by a PLC, or by any suitable device capable of supplying a compatible digital output, see the line drawing on the right of **Figure 16** for the location of this port along with the port configuration information.

•Digital input signal for Standby or Isolation mode
This port is for an input signal to control Standby mode and Isolation mode.
The connection required is according to user's equipment.

M12 5-pin A-corded (Socket)

Connector	Pin No.	Signal	Details
	1	24 V	24 VDC: Output *1
	2	IN2	Input for Isolation *2
	3	0 V	0 V
	4	IN1	Input for Standby
	5	NC	Not connected

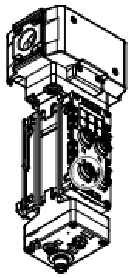


Figure 16 - AMS Hub PORT 3 location and pin definitions [Source; Operation manual PFxx-OMA1007, Page 26]

While a PLC generated signal can be a straightforward integration method, it is not the only means of providing the standby input signal to the AMS Hub. Any device capable of supplying a suitable signal can be used, including machine status beacons (stack lights), auxiliary contacts on relays or contactors, motor drives with logic outputs, optical sensors, pressure switches, timers, or any other intelligent field device.

This flexibility allows the AMS to be retrofitted to existing equipment with minimal engineering effort and, in many cases, without any modifications to the machine PLC software. The ability to utilise existing machine signals is a key advantage of the AMS, reducing commissioning time, avoiding changes to validated control programs, and helping to minimise both integration costs and potential warranty or OEM support concerns.

The conditions in which the logic could send a signal to the AMS Hub are outlined, but not limited to:

- Machine is waiting for product.
- Machine is waiting for boxes, trays etc.
- The machine outfeed is full.
- The machine is in a go-slow mode.
- The machine is off.

Also consider that provisions within the PLC logic should be made to inhibit signal delivery to the AMS hub in instances when reduced pressures or air isolation would be detrimental to the machine function, some examples are listed below.

- Cleaning operations.
- Raw material run out.
- Machine start-up.
- Maintenance mode(s).
- The machine is in an error state.

Following the signal delivery to the AMS hub, both standby mode and isolation mode are therefore fully determined by the AMS hub and its user programable logic.

4.3 Machine Pressure Switch Management

It's likely that the host machine already has a pressure switch installed. The purpose of such a pressure switch is usually to allow the machine to confirm that the minimum pressure required to operate the machine is present before enabling function to commence. In this scenario the pressure switch will require repositioning. It is suggested that two solutions are considered:

- Reposition the pressure switch to a location before the primary regulator. This confirms that the machine is receiving pressure and allowing a non-error state to occur because of the AMS going into standby or isolation mode.
- Reposition the pressure switch to a location after the regulator. Edit the pressure setting on the pressure switch to a level that is equal to or less than the set level of the assigned pressure level.

Please note that the pressure sensor in the AMS Hub cannot be used for this purpose. This is the case as when in Isolation mode, pressure is held between the regulator and valve, avoid taking readings from this location.

4.4 DIP Switch Setting

DIP switches are small toggle switches that can be found on the front of the AMS hub, these need to be set correctly in order to enable the correct operation of the AMS, it's connected regulator and Residual Pressure Relief Valve.

For example, the recommended N.O. part numbers defined for the ITV and Residual Pressure Relief Valve and that the AMS hub shall be a remote variant the dip switches set on the AMS hub should be as defined; **DOWN - UP – UP.**

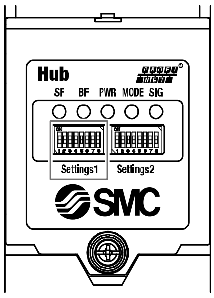


Figure 17 - AMS HUB Detail

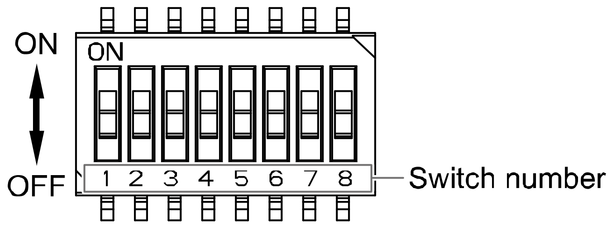


Figure 18 - AMS HUB DIP Switches

Refer to the following table to set the DIP switches.

AMS	Switch Position	Switch Number			
		1	2	3	4
		Communication Method	Regulation Type	NO/NC	Wireless Pairing Mode
Base Type	OFF	Industrial Ethernet	ARS	N.C.	Refer to Wireless Network Configuration
	ON	OPC UA	ITV	N.O.	
Remote Type	OFF	**Wireless Remote**	ARS	N.C.	
	ON	Standalone	**ITV**	**N.O.**	

*: Switch Numbers 1 to 3 must be set with the power supply OFF.
*: Use an insulated flat-blade screwdriver.

4.5 Setup Advice

Now that the AMS is set up following the recommendations above, the parameters within the AMS device can now be set.

4.5.1 Standby flow rate threshold [FrtE]

What is the flow rate that you want to set the AMS to react to? Consider setting this at 95% of the operational flow rate when commissioning as a first step.

4.5.2 Standby flow rate (Hysteresis) [FHyS]

What hysteresis do you want to apply to the Standby flow rate threshold? Choose a percentage based on the volatility of air consumption. The larger the range the less sensitive the AMS will be to flow fluctuations – i.e., it'll activate less frequently.

4.5.3 Standby delay on [t_on]

It's advised to set this value to 3 times the length of the machine cycle or three times the duration it takes for an individual product to pass through the machine from entry to exit.

4.5.4 Operating Pressure [PS1]

This value should be in line with the recommended pressure defined by the OEM.

4.5.5 Standby Pressure [PS2]

This value should be as low as possible whilst ensuring that the minimum operating pressure for individual axis is sustained.

Pay specific attention to the needs of any safety valves that are internally piloted. It is recommended that the AMS system is paired with externally piloted safety vent valves to remove the restriction on the minimum pressure and allow the maximum air savings to be achieved via standby mode use.

4.5.6 Isolation active [iSoL]

This condition should be activated if the machine can be de-energised, i.e., can sustain a state with no air supply. It may well be that the machine cannot sustain an "idle" state. Such states may be:

- Material holding - de-energising may lead to dropping product.
- Material pressing - de-energising may lead to insufficient force being applied to the product.

If this is the case, defining a take-off branch after filtration and before the regulator is a potential solution.

4.5.7 Isolation delay on [t_iSo]

The isolation delay adds another timer that counts down after the standby mode (i.e., both signal and user parameters are satisfied) has activated.

How soon you wish for the machine to be isolated from air supply will depend on how much air the machine would use whilst idle. Consider that the larger the air consumption the smaller the isolation delay should be to maximise savings.

As an initial parameter setting consider 30 times the length of the machine cycle or 30 times the duration it takes for an individual product to pass through the machine from entry to exit. Tune this value to find an appropriate balance between saving air and not impeding the machine function.

4.6 Proposed Rationale

Consider using only PIN4 to allow for the AMS to enter standby mode. Then, using user settable parameters on the AMS Hub, applied manually or via a webserver (when connected to a base unit) the end user can initiate isolation mode as defining in the logic of the AMS i.e., **iSoL** & **t_iSo**. This approach allows the end user to edit & control those variables without entering in the machine PLC and avoids both warranty and service costs.

5 FAT Checklist

This section is included to assist in Factory Acceptance Testing (FAT) activities concerning the AMS, below is a table that may be used as a quick guide to confirm the correct and appropriate setup of an AMS device on a new machine:

Topic	Action / Comment	In-document Reference
Build	Confirm the AMS has power	**n/a**
Build	Confirm the AMS Hub is a remote version	**Figure 6**
Build	Confirm the EP Regulator (ITV) is a Normally Open (N.O.) type	**Figure 4**
Build	Confirm the Eco Valve is a Normally Open (N.O.) type.	**Figure 7** **4.1**
Build	Confirm that the AMS is integrated into the air preparation kit and not simply added on at the end or at the start	**Figure 13**
Build	If Safety Valves are required, ensure these Safety Valves are externally piloted versions and installed downstream of the AMS - These need their own air supply which should include a non-return check valve.	**Figure 13**
Settings	Has the OEM set Primary Pressure?	**4.5.4**
Settings	Has the OEM set Secondary Pressure? (If they have chosen third party Safety Valves)	**4.5.5**
Settings	Has the OEM set the Standby flow rate threshold?	**4.5.1**
Settings	Has the OEM set Standby flow rate hysteresis value?	**4.5.2**
Settings	Has the OEM set Standby ON delay?	**4.5.3**
Settings	Has the OEM set Standby OFF delay? (Most likely not needed)	**n/a**
Settings	Has the OEM enabled Auto isolation?	**4.5.6**
Settings	Has the OEM set an Isolation delay?	**4.5.7**
Settings	Has the OEM set Pressure ramp up duration? (Most likely not needed)	n/a
Control	Confirm the OEM supplies the standby input signal **[SIS]** to the AMS when it is waiting or stopped	**2.8** **Table 7**
Control	Confirm the OEM does not supply the standby input signal **[SIS]** to the AMS when the machine is in any Maintenance, Cleaning or Error states.	**4.2**
Control	Confirm the OEM does not energise PIN2 on PORT 4 in any scenario. Assuming NO, otherwise logic is inverted so 24V is needed to open	**4.2**
Control	Confirm the OEM has correctly set the DIP switches according to the installed AMS components	**4.4**

6 Connection to the Digital Factory Environment

This section details the steps required to enable the connection of the AMS devices to one another and then on to the end users of the Digital Factory Environment.

6.1 Web Server Connection

The Air Management Hub wired/base type and the **EXW1** has a web server which can be used for AMS configuration and maintenance. To access the web server, connect a PC to the network and enter the Air Management Hub IP address into a web browser. Ensure that the Air Management Hub and PC are on the same IP subnet. The default login credentials are:

- Username = “Administrator”
- Password = “admin”

Use SMC’s “IP Address Setting Tool” EX9–ZSW–IPC1 to set this. The tool is available on the SMC Global Website

Consider changing these initial access credentials after initial setup for enhanced security.

Refer to **Figure 19** and **Figure 20** below for clarity on the interface.

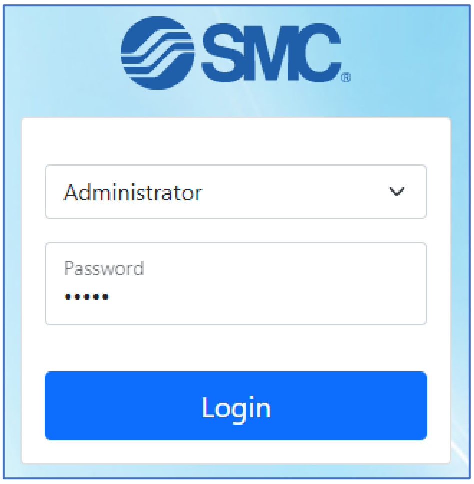


Figure 19 - Air Management Hub Webserver Login

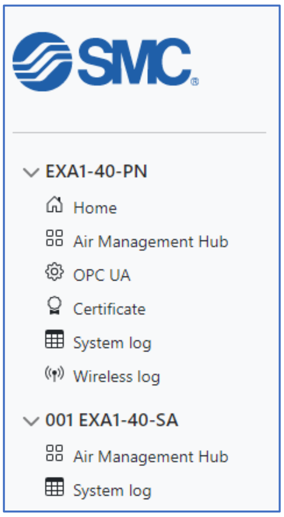


Figure 20 - Webserver Navigation Panel

Details for each Air Management Hub can be viewed by clicking the relevant AMS in the navigation panel. Referring to **Figure 20** above “001 EXA1-40-SA” can be selected from the list.

6.2 Wireless Network Configuration

The AMS Hub can be configured to make a wireless network. Connecting the wireless adapter to the M8 “ADPTR” port of the AMS will facilitate this wireless communication.

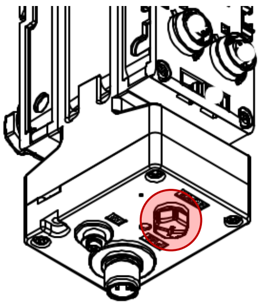


Figure 21 - M8 “ADPTR” port on the Air Management Hub

Figure 22 - Wireless Adaptor - EXW1-A11N

Each of the AMS devices needs to be set to pairing mode. Start with DIP switch 4 of Settings 1 in the OFF position (down) and perform the sequence ON >> OFF >> ON. The SF/ST and BF/SA LEDs of each device will flash red if using Profinet. “SF/MS/ST and BF/NS/SA if using EtherNet/IP.

Connect to the webserver as described in **Section 6.1** above. Available remote devices will appear in the "FREE REMOTE" section. Using the ⇅ symbol, click and drag the remote devices up to the "Remote Registration" section. Click "Write Configuration" to pair the devices and then set DIP switch 4 of Settings 1 to OFF on the Air Management Hub Base.

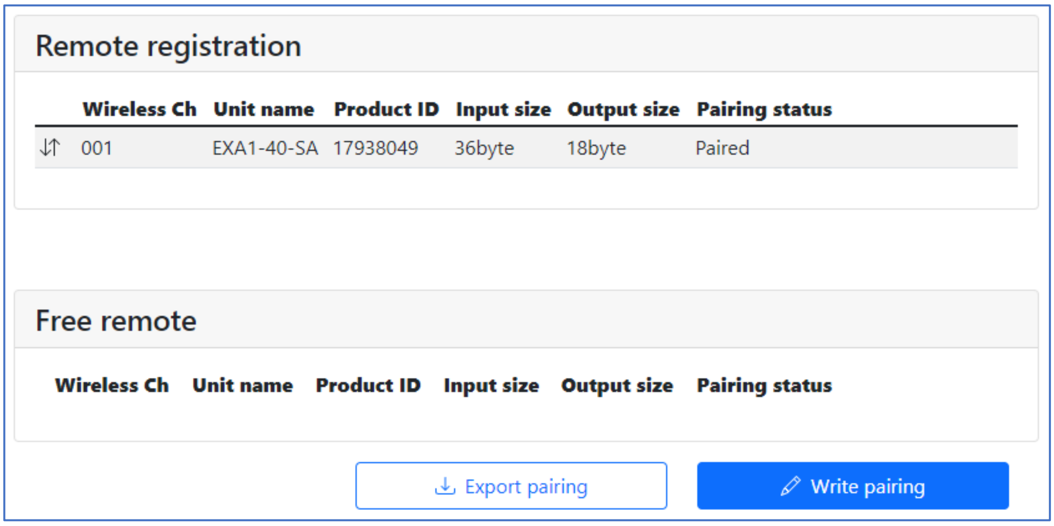


Figure 23 – AMS Wireless Pairing Interface

6.3 OPC UA

The Wireless base provides data from connected remotes via OPC UA. Depending on the OPC UA client, the AMS Base may require an OPC UA certificate. Use the SMC Certificate Generator software to prepare this for your system. OPC UA certificates are specific to each device and unique each time they are generated. The end user generates these, and certificate expiration is a parameter during generation.

The SMC Certificate Generator is available from the SMC World website and directly from this link (downloads a 3274kB .zip file). A guide on how to link the certificate to your device(s) has been prepared (DOC1056928) and can be viewed following this link.

6.3.1 AMS Communication Specifications

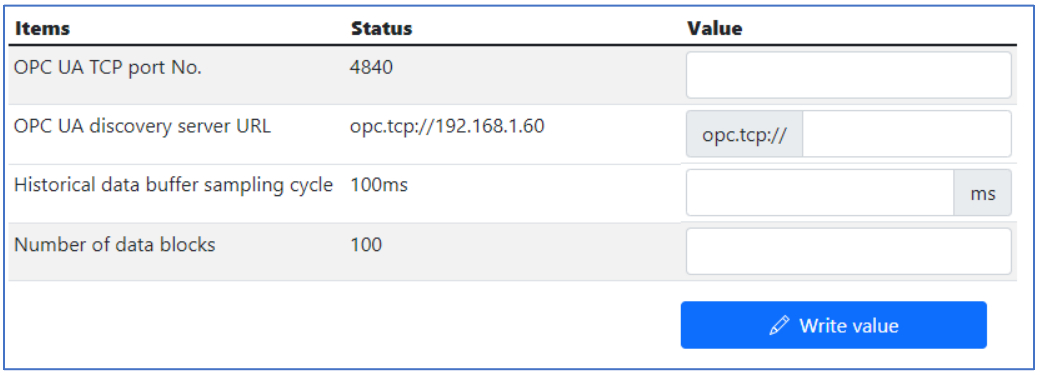
See **Table 9** for the AMS OPC UA communication limits.

Table 9 – OPC UA Communication Specifications

Parameter	Value
MaxMonitoredItemsPerCall	100
MaxNodesPerBrowse	20
MaxNodesPerMethodCall	5
MaxNodesPerNodeManagement	0
MaxNodesPerRead	100
MaxNodesPerRegisterNodes	1
MaxNodesPerTranslateBrowsePathsToNodeIds	20
MaxNodesPerWrite	30
MinsupportedSampleRate	1000 ms

6.3.2 AMS OPC UA Configuration

The OPC UA parameters can be changed in the webserver by selecting the “OPC UA” section of the Air Management Hub wired/base. An OPC UA discovery server address can be provided. The air Management Hub Base will connect to the discovery server to obtain the correct timestamp.



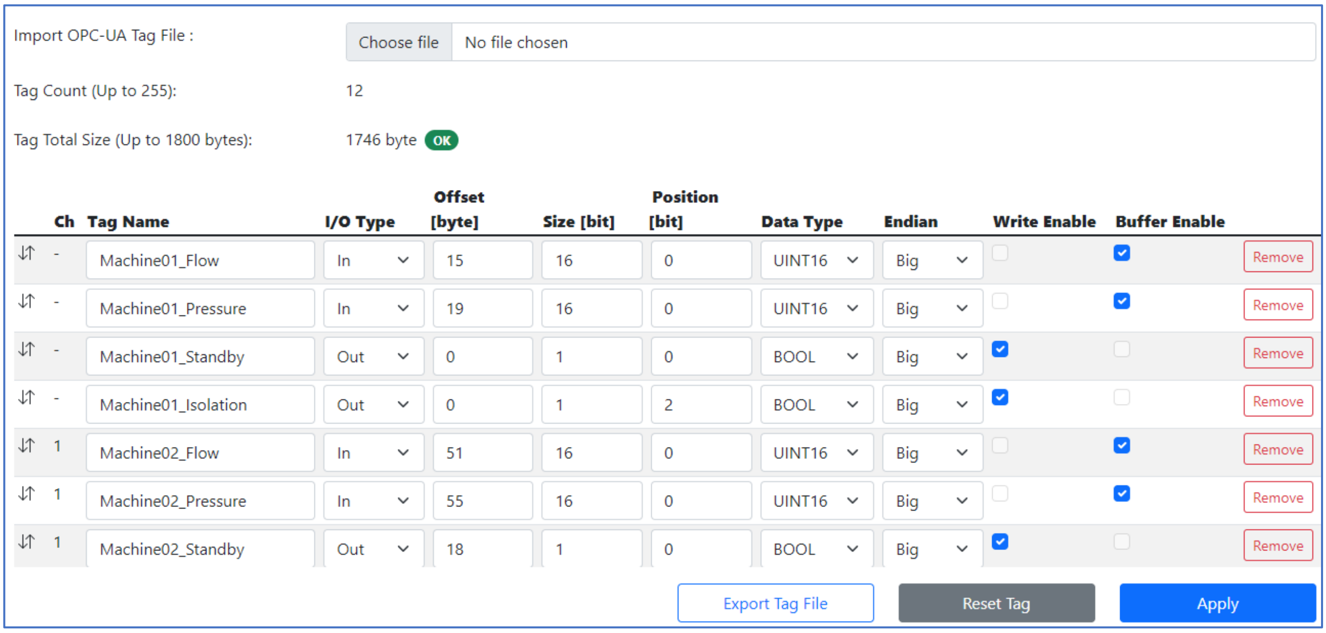
Items	Status	Value
OPC UA TCP port No.	4840	
OPC UA discovery server URL	opc.tcp://192.168.1.60	opc.tcp://
Historical data buffer sampling cycle	100ms	ms
Number of data blocks	100	

Write value

Figure 24 - OPC UA Parameters

6.3.3 AMS OPC UA Nodes Configuration

OPC UA nodes are user configurable and can be imported and exported via CSV file, refer to the process data map to configure these nodes. The “Write Enable” check box enables outputs to be written to by OPC UA. The “Buffer Enable” check box enables the buffering of the selected node. Refer to **Figure 25** below for details.



Import OPC-UA Tag File : Choose file No file chosen

Tag Count (Up to 255): 12

Tag Total Size (Up to 1800 bytes): 1746 byte OK

	Ch	Tag Name	I/O Type	Offset [byte]	Size [bit]	Position [bit]	Data Type	Endian	Write Enable	Buffer Enable	
⇅	-	Machine01_Flow	In	15	16	0	UINT16	Big	☐	☑	Remove
⇅	-	Machine01_Pressure	In	19	16	0	UINT16	Big	☐	☑	Remove
⇅	-	Machine01_Standby	Out	0	1	0	BOOL	Big	☑	☐	Remove
⇅	-	Machine01_Isolation	Out	0	1	2	BOOL	Big	☑	☐	Remove
⇅	1	Machine02_Flow	In	51	16	0	UINT16	Big	☐	☑	Remove
⇅	1	Machine02_Pressure	In	55	16	0	UINT16	Big	☐	☑	Remove
⇅	1	Machine02_Standby	Out	18	1	0	BOOL	Big	☑	☐	Remove

Export Tag File | Reset Tag | Apply

Figure 25 - OPC UA Node Configuration

As seen in **Table 10** an adjustable data buffer is available via OPC UA for up to 1800 bytes of data and a sampling rate of 100ms or longer.

Table 10 - OPC UA Buffer Settings

Parameters	**Description**
Data buffer Enable or Disable	*The data buffer array can be enabled or disabled for each OPC UA node.*
Historical Data buffer Count	*The number of points stored in the buffer. The parameter is applicable for all nodes with the data buffer enabled.*
Historical Data Buffer Sampling Cycle	*Sampling cycle time for the buffer. The parameter is applicable for all nodes which enabled the data buffer.*

The time stamp is LDAP/Win32 format. To convert from the buffer data to a time, the bytes must first be combined. The resulting decimal value is the number of 100 ns passed since January 1st, 1601. The example in **Table 11** below is using the buffer node “Machine01_Flow” as configured in **Figure 25** above.

Table 11 - OPC UA Buffer Timestamp Conversion

	Data[0]	**Data[1]**	**Data[2]**	**Data[3]**
DEC	472	38370	12261	55367
HEX	1D8	95E2	2FE5	D847
Combine	1D895E22FE5D847			
DEC	133020987706169000			

6.4 Profinet

6.4.1 TIA Portal

Figure 26 below shows an example AMS configuration in TIA Portal. Select the diagnostic data to use and the wireless base type then add any additional remote units. This example shows a system with full diagnostics, one AMS Base and two AMS remotes.

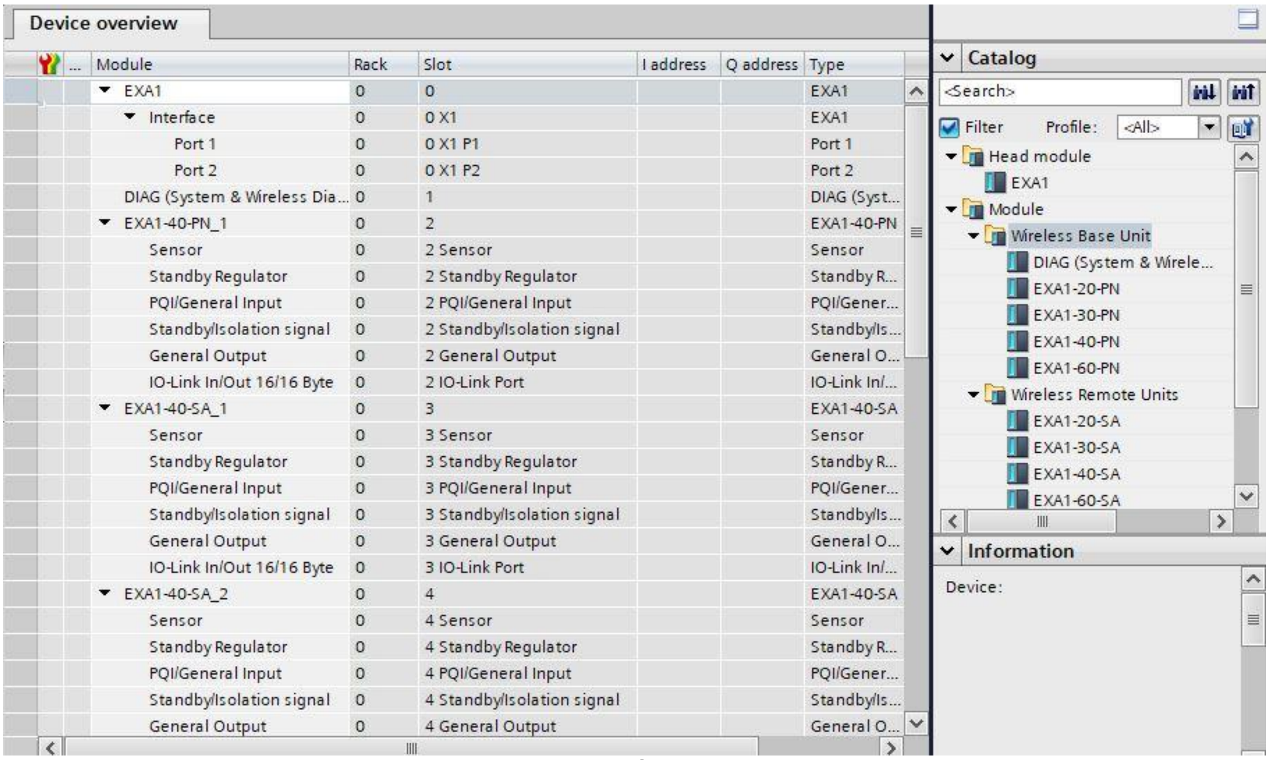


Figure 26 - AMS in TIA Portal

Each AMS component can be configured in Device Overview. Select the component and view the properties tab to modify the AMS parameters. GSDML settings will only be written if the record data parameter is set to enabled, see **Figure 27** for an example on this data entry.

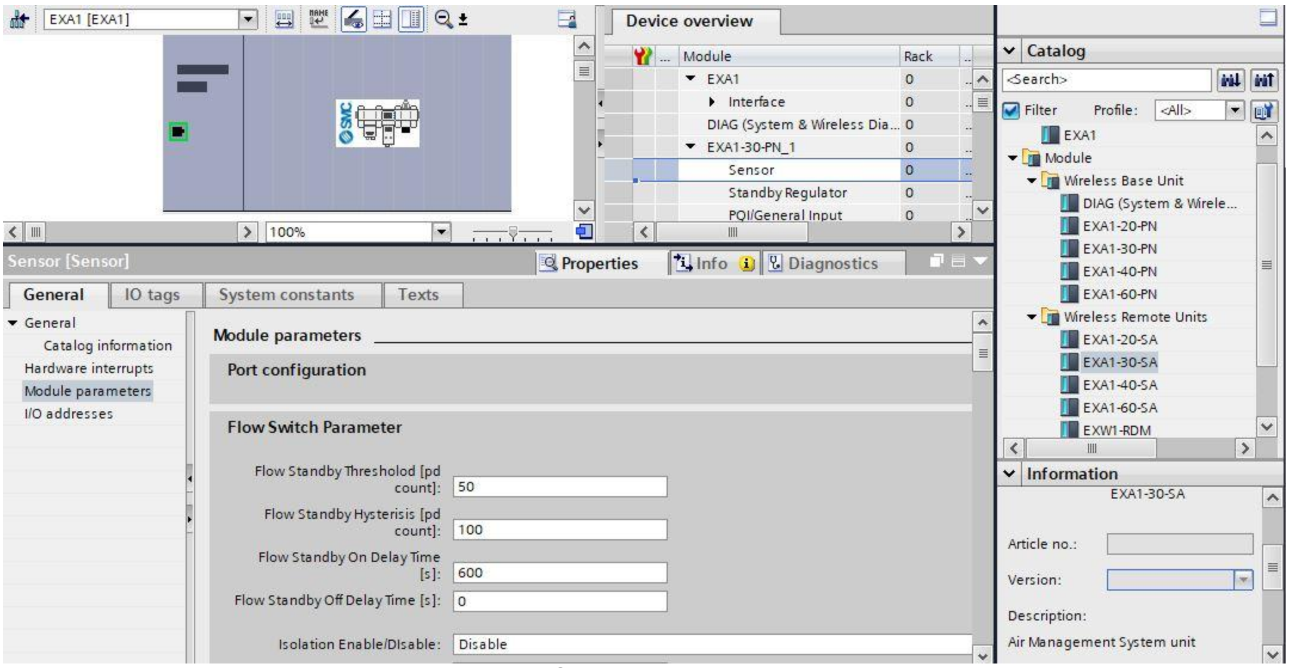


Figure 27 - AMS parameter setting in TIA Portal

6.5 EtherNet/IP

An AMS can be added in studio 5000 either by using an EDS file or as a generic module. There is no pre-installed EDS profile for the AMS in standard studio 5000 installations. Users must configure the connection parameters manually using the webserver. **Figure 28** below shows an example of Studio 5000 Logix Designer interface showing the Controller Organizer and the Controller Tags editor for an AMS base unit configuration.

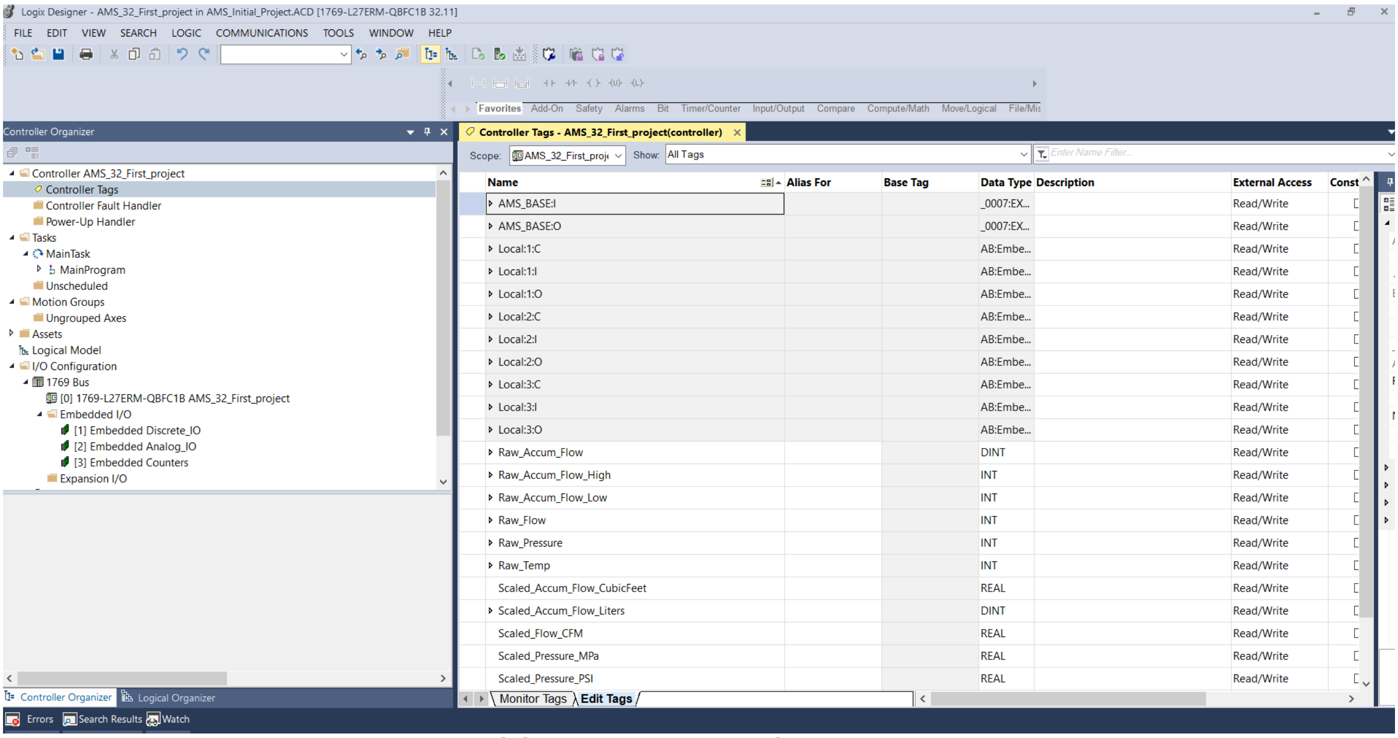


Figure 28 - AMS Controller Tags Editor in Studio 5000 Logix Designer

The AMS Hub transmits sensor and diagnostic data as a series of 16-bit INT Data Type in the EtherNet/IP variant of the AMS.

6.5.1 *Swap Byte*

All AMS process data words arrive in big-endian format. Without the SWPB (Swap Byte) instruction, all scaled values will be wrong. Failure to byte-swap is the most common commissioning error with the AMS EtherNet/IP module. Verify “byte-swap” is applied in every rung before any scaling calculation.

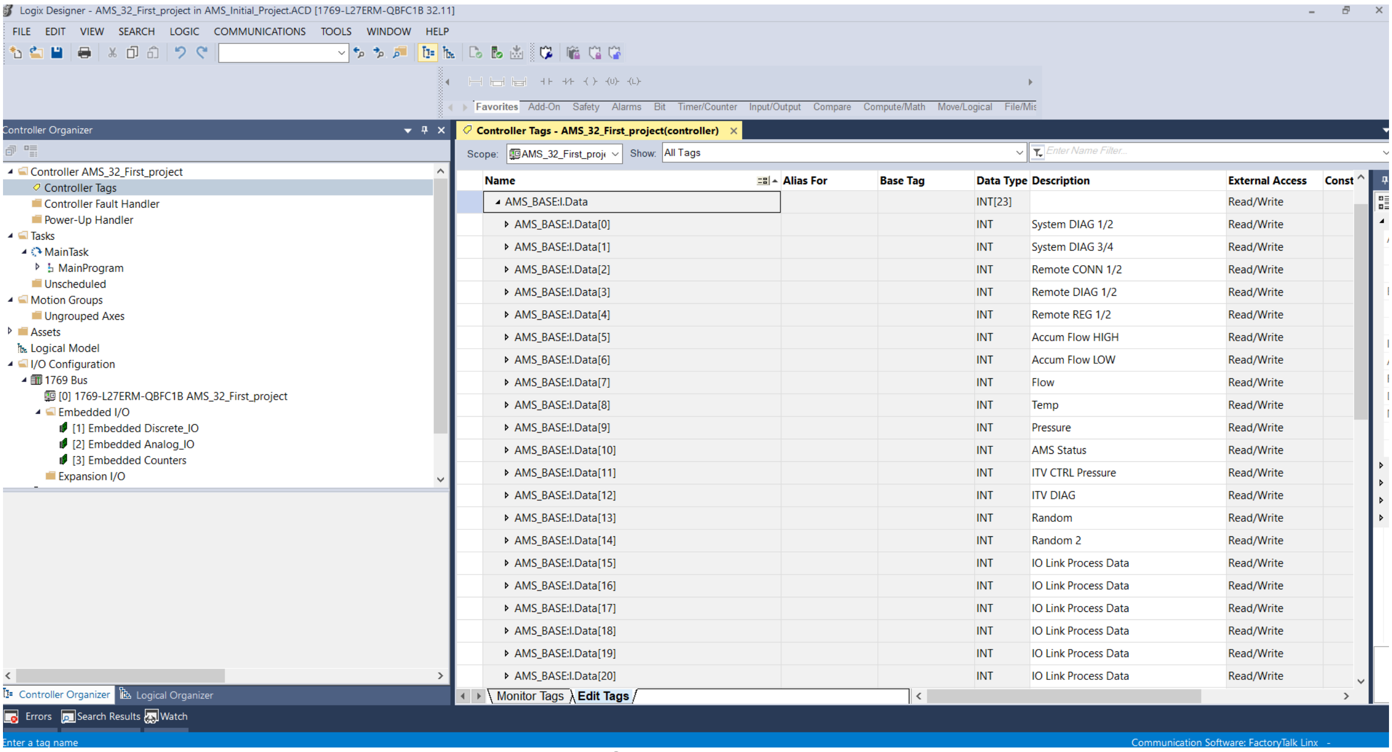


Figure 29 - AMS parameter setting in TIA Portal

Since the AMS transmits data in big-endian byte order. For example, a temperature of 24.7°C is transmitted as the value 247 (i.e., 24.7 × 10) but in big-endian form the two bytes arrive swapped relative to what the CompactLogix expects. The SWPB instruction (Swap Byte) reverses the two bytes in a 16-bit word before any arithmetic is performed.

Composition: SWPB (Source, REVERSE, Destination).

Temperature

Data[8] → SWPB → Raw_Temp (×10°C)
→ DIV(Raw_Temp, 10, Scaled_Temp_C)
→ CPT(Scaled_Temp_F, (Scaled_Temp_C*9/5)+32)

Manual check: Raw= 247 → 247÷10=24.7°C → (24.7×9/5)+32=76.46°F

Pressure

Data[9] → SWPB → Raw_Pressure (kPa)
→ DIV(Raw_Pressure, 1000, Scaled_Pressure_MPa)
→ MUL(Scaled_Pressure_MPa, 145.038, Scaled_Pressure_PSI)

Manual check: Raw=404 → 404÷1000=0.404 MPa → 0.404×145.038=58.595 PSI

Flow Rate

Data[7] → SWPB → Raw_Flow (LPM)
→ MUL(Raw_Flow, 0.035314666, Scaled_Flow_CFM)

Manual check: Raw=0 at rest (no flow)

Accumulated Flow

Data[5] →SWPB→Raw_Accum_Flow_High | Data[6]→SWPB→Raw_Accum_Flow_Low
→ BTD (Raw_Accum_Flow_High,0,Raw_Accum_Flow,16,16) ← puts high word into bits 16–31
→ BTD (Raw_Accum_Flow_Low, 0,Raw_Accum_Flow, 0,16) ← puts low word into bits 0–15
→ MUL (Raw_Accum_Flow, 10, Scaled_Accum_Flow_Liters)
→ MUL (Scaled_Accum_Flow_Liters, 0.0353147, Scaled_Accum_Flow_CubicFeet)

7 Revision Management

Rev.	Date	Pages	Reason for revision	Prepared	Checked	Checked	Approved
-	20/08/2026	ALL	Initial release	DI	SS & AC	ES & MH	DI

8 Links

AMS Catalogue
AMS Operation Manual

EXW1 Catalogue
EXW1 Operation Manual (Profinet)
EXW1 Quick Guide (Profinet)
EXW1 Configuration File (direct download .zip ~40kB)

IP Address Setting Tool

There is a special version of the EXW1 series with the X10 suffix, “EXW1-B#NAC1-X10” this version includes the AMS webserver. This is fundamentally the same as the standard product “EXW1-B#NAC1”.

EXW1-BENAC1-X10 Wireless Pairing Guide