



# Power supply AS-XP05, AS-XP10, AS-PS20

Expansion modules for Alsmart Programmable electronic controllers.

## Description

The Alsmart™ Universal controller platform is a new portfolio of electronic programmable controllers designed to address the needs of the HVAC market, including heat pumps, chillers, and air conditioning systems. AS-XP and AS-PS20 are accessories that are part of the Alsmart platform and that allow to expand the system ensuring maximum flexibility.

## Features & benefits

- Comprehensive Input/Output Expansion Options
  - Two sizes of Input/Output expansion modules for covering most of the requirements in HVAC applications: AS-XP05 is provided with 17 I/Os and 1 stepper driver output, AS-XP10 with 30 I/Os.
- Modular concept: up to 20 I/O expansions thanks to the AS-PS20 power modules
- Mechanical connection of modules
- Auto-recognition function of the expansion modules connected to the AS-CX main controller
- Universal I/Os configurable via software
- Stepper driver embedded (Plus versions)

## Ordering

### Product code numbers

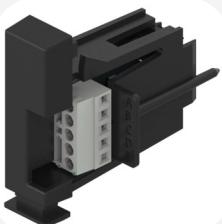
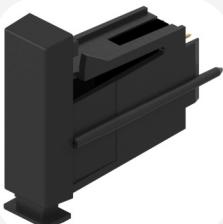
Type	Packing format	Quantity per packing format	Code number
AS-XP05+	Single pack	1	080G6012
AS-XP05+	Industrial pack	36	080G6013
AS-XP05	Single pack	1	080G6014
AS-XP05	Industrial pack	36	080G6015
AS-PS20	Single pack	1	080G6019
AS-PS20	Industrial pack	36	080G6020
AS-XP10	Single pack	1	080G6024
AS-XP05	Single pack	1	080G6025
AS-XP05	Single pack	1	080G6026
AS-XP10	Industrial pack	27	080G6033
AS-XP05	Industrial pack	36	080G6034
AS-XP05	Industrial pack	36	080G6035

#### Note:

Single Pack – Includes both AS-side connectors and the connectors kit.

Industrial Pack – Includes AS-side connectors, but **does not** include the connectors kit.

### Accessories code numbers

	<p>080G6029</p> <p><b>Connector, AS-DIN Side</b></p> <p>Function: Din rail jumper left+right, Type designation: AS-DIN Side connector kit, Packing format: Single pack, Quantity per packing format: 1</p>		<p>080G6028</p> <p><b>Connector, AS-Side</b></p> <p>Function: SIDE CONNECTOR, Type designation: AS-Side connector kit 5/pcs, Packing format: Single pack, Quantity per packing format: 1</p>
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## Overview

### Product portfolio

Table: Portfolio overview

	AS-CX06							AS-XP, AS-PS (Expansion modules)			
	AS-CX06 Lite	AS-CX06 Mid	AS-CX06 Mid	AS-CX06 Mid+	AS-CX06 Mid+ SSR	AS-CX06 Pro	AS-CX06 Pro+	AS-XP05	AS-XP05+	AS-XP10	AS-PS20
Digital Outputs	6	6	6	6	6	6	6	5	5	10	0
	5xSPST	5xSPST	4xSPST	5xSPST	4xSPST	5xSPST	5xSPST	4xSPST	4xSPST	8xSPST	
	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	2xSPDT	
			1xSSR		1xSSR						
Digital Inputs	2	2	2	2	2	2	2	0	0	4	0
	Voltage free	Voltage free	Voltage free	Voltage free	Voltage free	Voltage free	Voltage free			24 VAC or 230 VAC	
Analog Inputs (Universal)	10	10	10	10	10	10	10	10	10	10	0
Analog Outputs	3	3	3	3	3	3	3	2	2	2	0
Power Supply (24 V AC/DC isolated)	Y	Y	Y	Y	Y	Y	Y	from AS-CX	from AS-CX	from AS-CX	Y
Stepper motor (bipolar and unipolar)	0	0	0	1	1	0	1	0	1	0	0
Others											
Snap-on LCD display	Y	Y	Y	Y	Y	Y	Y	-	-	-	-
CAN FD	Remote HMI	AS-CX and Remote HMI	AS-CX and Remote HMI	AS-CX and Remote HMI	AS-CX and Remote HMI	AS-CX and Remote HMI	AS-CX and Remote HMI	-	-	-	-
Number of expansion modules (including AS-PS20)	1	7				20		-	-	-	-
Number of AS-XP05	1 AS-XP05	5 AS-XP05 + 1 AS-PS20				16 AS-XP05 + 4 AS-PS20		-	-	-	-

Number of AS-XP10	1 AS-XP10	5 AS-XP10 + 2 AS-PS20					15 AS-XP10 + 5 AS-PS20		-	-	-	-
RTC clock	Y	Y	Y	Y	Y		Y	Y	-	-	-	-
RS485 opto-isolated	1	2	2	2	2		2	2	-	-	-	-
Ethernet / Web server	-	-	-	-	-		2	2	-	-	-	-
USB-C	1	1	1	1	1		1	1	-	-	-	-
Dimensions (1 DIN module = 17.5 mm)	6 DIN	6 DIN	6 DIN	6 DIN	6 DIN		6 DIN	6 DIN	4 DIN	4 DIN	6 DIN	4 DIN

## Product details

### General data

**Table: General features**

Features	Description
AS-XP05, AS-XP10 power supply	From the main controller AS-XP05: 5 W (stepper motor current excluded) AS-XP10: 6 W
AS-PS20 power supply	24 V AC/DC, 50/60 Hz to be protected by external fuse <sup>(1)</sup> for DC only <sup>(2)(3)</sup> 26 W, min. 60 VA if transformer used <sup>(4)</sup>
Stepper motor power supply	24 V AC/DC, 50/60Hz to be protected by external fuse <sup>(1)</sup> for DC only <sup>(2)(3)</sup> 12 W, min. 40 V A if transformer used <sup>(4)</sup>
Mounting	DIN rail, vertical position
Plastic housing	Self-extinguishing V0 and glowing/hot wire test at 960 °C Ball test: 125 °C Leakage current: ≥ 225 V according to IEC 60112
Type of control	To be integrated in Class I and/or II appliances
Type of action	1C
Period of electric stress across insulating	Long
Pollution	Suitable for use in environments with degree of pollution 2
Immunity against voltage surges	Category II
Software class and structure	class A
Ambient temperature range, operating [°C]	-40 to +70 °C UL: -40 to +65 °C
Ambient temperature range, transport [°C]	-40 to +80 °C
Enclosure rating IP	IP20
Relative humidity range [%]	5 – 90%, non-condensing
Max installation height	2000 m

(1) 477 5x20 Series from Littelfuse (0477 3.15 MXP).

(2) A higher DC voltage can be applied if the control is installed in an application where the manufacturer declares a reference standard and a voltage level for accessible SELV/PELV circuits to be considered non-hazardous by the application standard. That voltage level can be used as power supply input though 60 V DC must not be exceeded.

(3) US: Class 2 < 100 VA

(4) In short circuit condition DC power supply must be capable of supplying 7 A min. and 50 A max.

## Input/Output

**Table: Analog input**

Type	Feature	Data
<b>For AS-XP05: AI1, AI2, AI3, AI4, AI5, AI6, AI7, AI8, AI9, AI10</b>		
<b>For AS-XP10: AI1, AI2, AI3, AI4, AI5, AI6, AI7, AI8, AI9, AI10, AI11, AI12, AI13, AI14</b>		
0/4-20 mA	Accuracy	± 0.5% FS
	Resolution	1 µA
0/5 V Ratiometric		Relative to 5 V DC internal supply (10 – 90 %)
	Accuracy	±0.4% FS
	Resolution	1 mV
0 – 1 V	Accuracy	±0.5% FS (FS intended specifically for each type)
0 – 5 V	Resolution	1 mV
0 – 10 V	Input resistance	>100 kΩ
Pt1000	Meas. range	-60 to +180 °C
	Accuracy <sup>(1)</sup>	±0.7 K [-20 to +60 °C], ±1 K otherwise
	Resolution	0.1 K
PTC1000 (PTC 990 Ohm at 25 °C, e.g. EKS 111)	Meas. range	-60 to +80 °C
	Accuracy <sup>(1)</sup>	±0.7 K [-20 to +60 °C], ±1 K otherwise
	Resolution	0.1 K
NTC10k (beta 3435 at 25/85 °C, e.g. EKS 221)	Meas. range	-50 to +160 °C
	Accuracy	± 1 K [-30 to +160 °C]
	Resolution	0.1 K
NTC5k (beta 3980 at 25/100 °C, e.g. EKS 211)	Meas. range	-50 to +120 °C
	Accuracy	± 1 K [-35 to +120 °C]
	Resolution	0.1 K
Digital Input	Stimulation	Voltage free contact
	Contact cleaning	20 mA
	Other feature	Pulse counting function 150 ms debounce time

<sup>(1)</sup> For controller ambient temperature [-20 to +60 °C].

**Table: Digital input**

Type	Feature	Data
<b>For AS-XP10: DI1, DI2, DI3, DI4</b>		
24 V AC	Stimulation	24 V AC +/-15%, 60 VDC
	Contact cleaning	2 mA @24 V AC
	Other feature	Pulse counting function max. 100 ms
<b>For AS-XP10: DI1H, DI2H, DI3H, DI4H</b>		
230 V AC	Stimulation	86 – 265 V AC
	Contact cleaning	2.5 mA @265 V AC
	Other feature	Pulse counting function max. 100 ms

**Table: Analog output (AO1, AO2)**

Type	Feature	Data
	Max. load per each output	15 mA
0 – 10 V	Accuracy	Source: 0.5% FS Sink 0.5% FS for $V_{out} > 0.5$ V 2% FS whole range ( $I \leq 1$ mA)
	Resolution	0.1% FS
Async PWM	Voltage output	$V_{out}$ Low max. = 0.5 V $V_{out}$ High min. = 9 – 15 V
	Frequency range	15 Hz – 2 kHz
	Accuracy	1% FS
	Resolution	0.1% FS
For AS-XP05 Sync PWM/PPM	Voltage output	$V_{out}$ Low max. = 0.4 V $V_{out}$ High min. = 9 – 15 V
	Frequency	Mains frequency x 2
	Resolution	0.1% FS

**Table: Digital output**

Type	Data
<b>For AS-XP05: DO1, DO2, DO3, DO4</b>	
<b>For AS-XP10: DO1, DO2, DO3, DO4, DO5, DO6, DO7, DO8</b>	
Relay	SPST 3 A, 250 V AC, 50k cycles, resistive load 2 A, 250 V AC, 30k cycles, inductive load ( $\phi$ 0.4)
<b>For AS-XP05: DO5</b>	
<b>For AS-XP10: DO9, D10</b>	
Relay	SPDT 3 A, 250 V AC, 50k cycles, resistive load 2 A, 250 V AC, 30k cycles, inductive load ( $\phi$ 0.4)
For AS-XP05, isolation between relays in the DO1-DO4 group is functional and isolation between DO1-DO4 group and DO5 is reinforced.	
For AS-XP10, isolation between relays in the DO1-DO8 group and in the DO9-DO10 group is functional and isolation between DO1-DO8 group and DO9-D10 group is reinforced.	
<b>Stepper motor output (for AS-XP05+: A1, A2, B1, B2)</b>	
Bipolar/Unipolar	Danfoss valves: <ul style="list-style-type: none"><li>• ETS / KVS / ETS C / KVS C / CCMT 2-CCMT 42 / CTR</li><li>• ETS6 / CCMT 0 / CCMT 1</li></ul> Other valves: <ul style="list-style-type: none"><li>• Speed 10 – 300 pps</li><li>• Drive mode full step - 1/32 microstep</li><li>• Max. peak phase current: 1 A</li><li>• Output power: 10 W peak, 5 W average</li></ul>
Battery backup	V battery: 18 – 24 V DC <sup>(2)</sup> max. power 11 W, min. capacity 0.1 Wh

(2) 477 5x20 Series from Littelfuse (0477 3.15 MXP).

**Table: Aux power output**

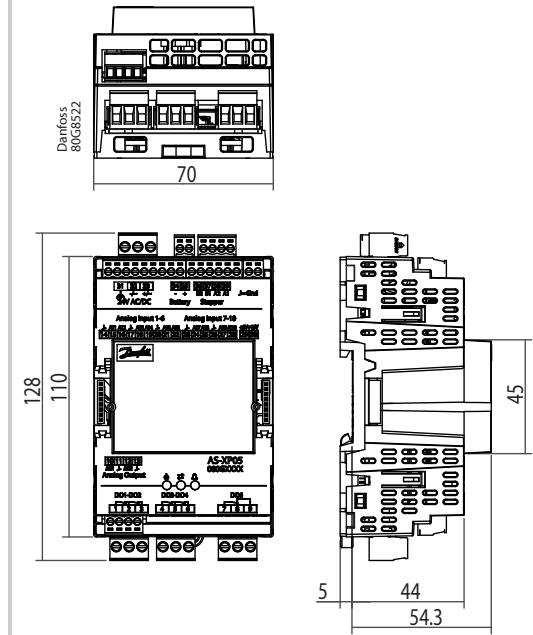
Type	Feature	Data
+5 V	+5 V DC	Sensor supply: 5 V DC / 80 mA
+15 V	+15 V DC	Sensor supply: 15 V DC / 120 mA

## Dimensions

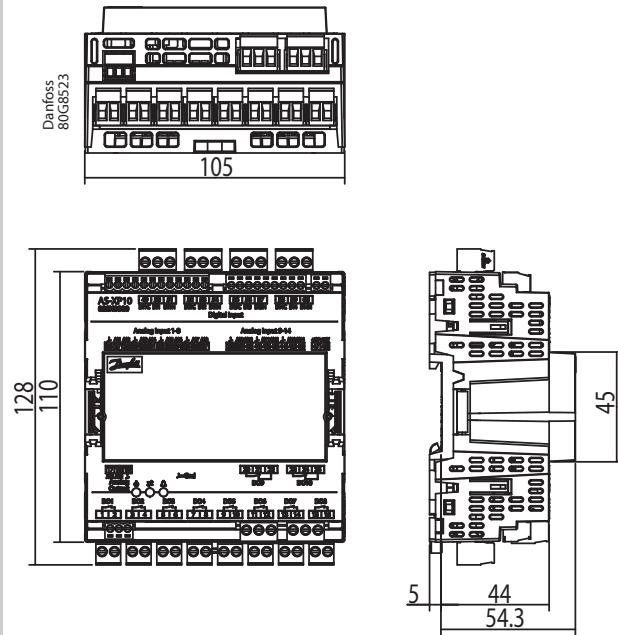
**Table: Wire lengths**

Interface	Wire length (m)
AS-DIN connector 080G6029	3
Signal wiring	30

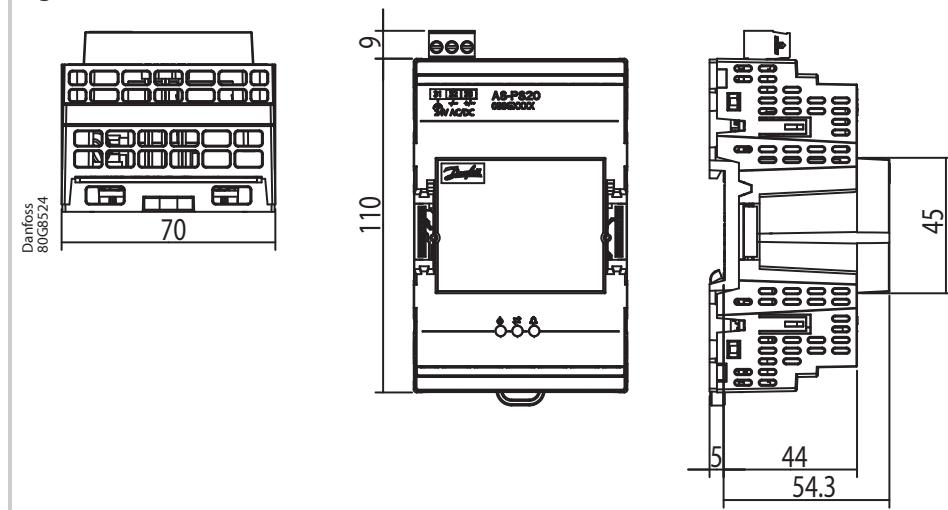
**Figure: AS-XP05, AS-XP05+**



**Figure: AS-XP10**

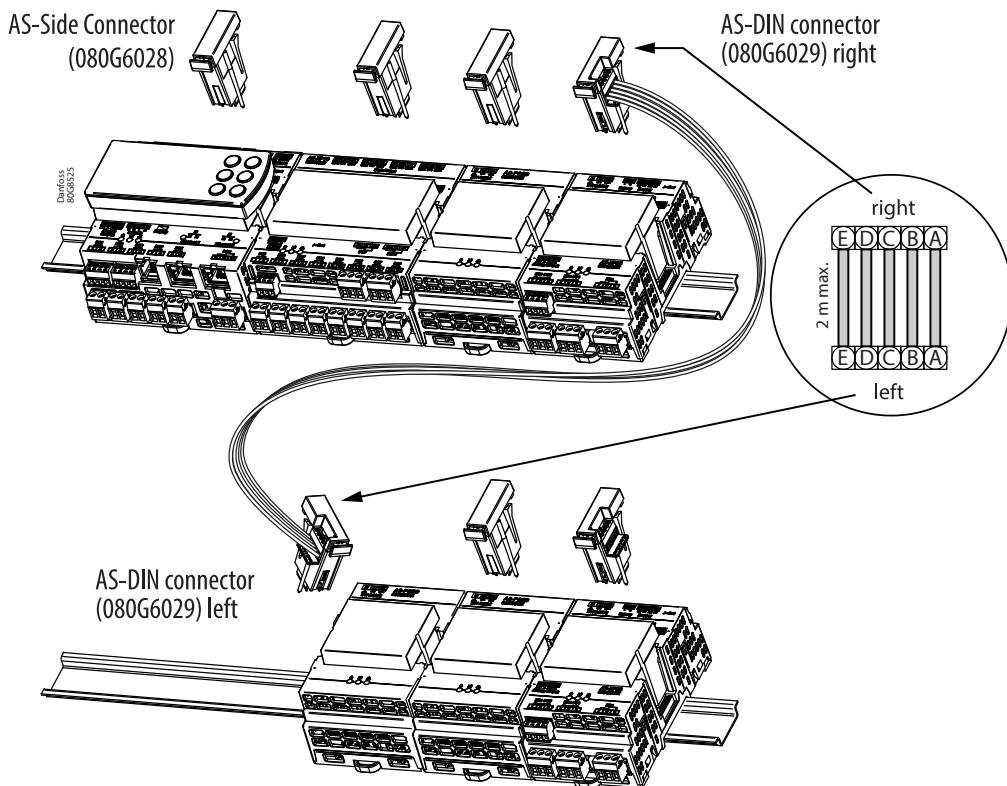


**Figure: AS-PS20**



## Connections

**Figure: Connections of modules**



Before servicing the equipment, the controller and modules must be disconnected from the power mains.

Connect I/O expansion modules AS-XP05 and/or AS-XP10 and/or the external power supply AS-PS20 through the side connector (AS-Side Connector 080G6028) if you need to extend the number of Input/Output (I/O) of the main controller.

Fix the controllers on the DIN rail, place them close to each other and insert the Side Connector until it clicks. Use the special side connector with screws (AS-DIN Connector 080G6029) if you need to extend I/O in more than one row and connect them as explained in figure. It is recommended to place the split before the AS-PS20 to keep the AS-PS20 and the powered units close to each other. Maximum cable length: 2 m.

The main controller is capable to power autonomously one expansion module. You need to add one AS-PS20 for every four AS-XP05 or three AS-XP10 expansion modules if you want to extend the I/O further.

The AS-CX main controller and any subsequent AS-PS20 and AS-XP stepper valve may be powered by the same power supply provided that the electrical specifications described in *Table: General features* and eventual end application requirements are met.

The maximum number of expansion modules which can be connected depends on the model of the main controller:

**Table: Connections**

	AS-CX06 Lite	AS-CX06 Mid	AS-CX06 Mid SSR	AS-CX06 Mid+	AS-CX06 Mid+ SSR	AS-CX06 Pro	AS-CX06 Pro+
Max. number of expansion modules (AS-PS20 included)	1		7			20	
Number of AS-XP05	1 AS-XP05		5 AS-XP05 +1 AS-PS20			16 AS-XP05 + 4 AS-PS20	
Number of AS-XP10	1 AS-XP10		5 AS-XP10 + 2 AS-PS20			15 AS-XP10 + 5 AS-PS20	

**Figure: Example of connection with 1 AS-PS20**

**Auto-configuration of modules**

At first startup the system initiates the auto-configuration procedure of all the modules connected to the main controller. It detects the last element in the chain and insert the line termination resistance. Then it assigns the network address to each element (auto-enumeration) starting from the last.

In case the modules are already enumerated the operation is not executed. It will be managed by the software application whether the complete enumeration procedure should be restarted to force system renewal.

**Connection terminals**
**Table: AS-XP05, AS-XP05+**

Type	Color	Quantity		Pitch	Function
		AS-XP05	AS-XP05+		
Female screw plug, 2 poles	Grey	3	4	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	Analog Output, +5V, (Battery)
Female screw plug, 4 poles	Grey	0	1	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	(Stepper)
Female screw plug, 6 poles	Grey	1	1	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	Analog Input (AI7-AI10)
Female screw plug, 9 poles	Grey	1	1	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	Analog Input (AI1-AI6)
Female screw plug, 3 poles	Orange	1	1	pitch 5 mm section cable 0.2 – 2.5 mm <sup>2</sup>	PWM syncro/ (Stepper valve power supply)
Female screw plug, 3 poles	Black	3	3	pitch 5 mm section cable 0.2 – 2.5 mm <sup>2</sup>	XP05 Digital Output (DO1-DO5)

**Table: AS-XP10**

Type	Color	Quantity	Pitch	Function
Female screw plug, 2 poles	Grey	3	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	Analog Output, +5V, (Battery)
Female screw plug, 9 poles	Grey	1	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	Analog Input (AI9-AI14)
Female screw plug, 12 poles	Grey	1	pitch 3.5 mm section cable 0.14 – 1.5 mm <sup>2</sup>	Analog Input (AI1-AI8)
Female screw plug, 2 poles	Black	8	pitch 5 mm section cable 0.2 – 2.5 mm <sup>2</sup>	Digital Output (DO1-DO8)
Female screw plug, 3 poles	Black	6	pitch 5 mm section cable 0.2 – 2.5 mm <sup>2</sup>	Digital Output (DO9-DO10) Digital Input (DI1-DI4)

**Table: AS-PS20**

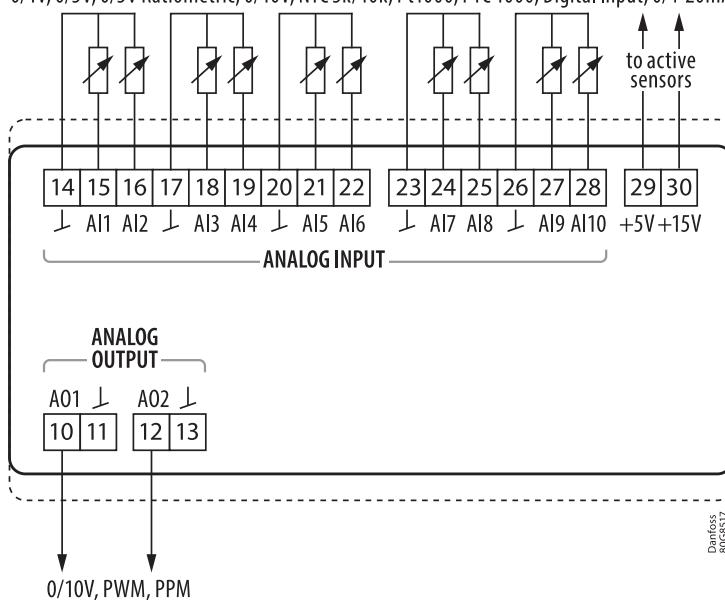
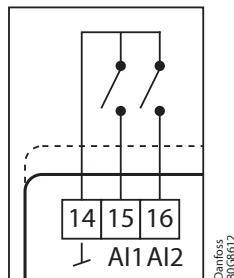
Type	Color	Quantity	Pitch	Function
Female screw plug, 3 poles	Orange	1	pitch 5 mm section cable 0.2 – 2.5 mm <sup>2</sup>	Power supply

## Connection diagrams

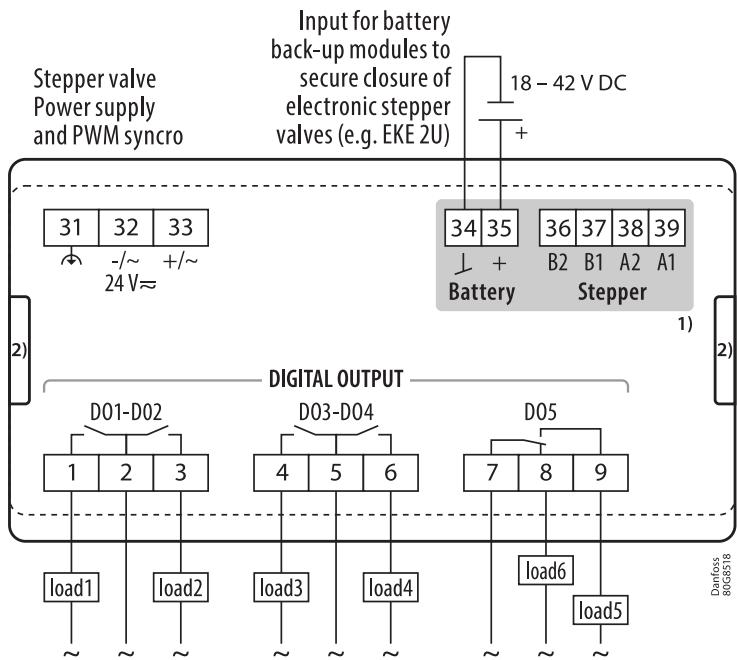
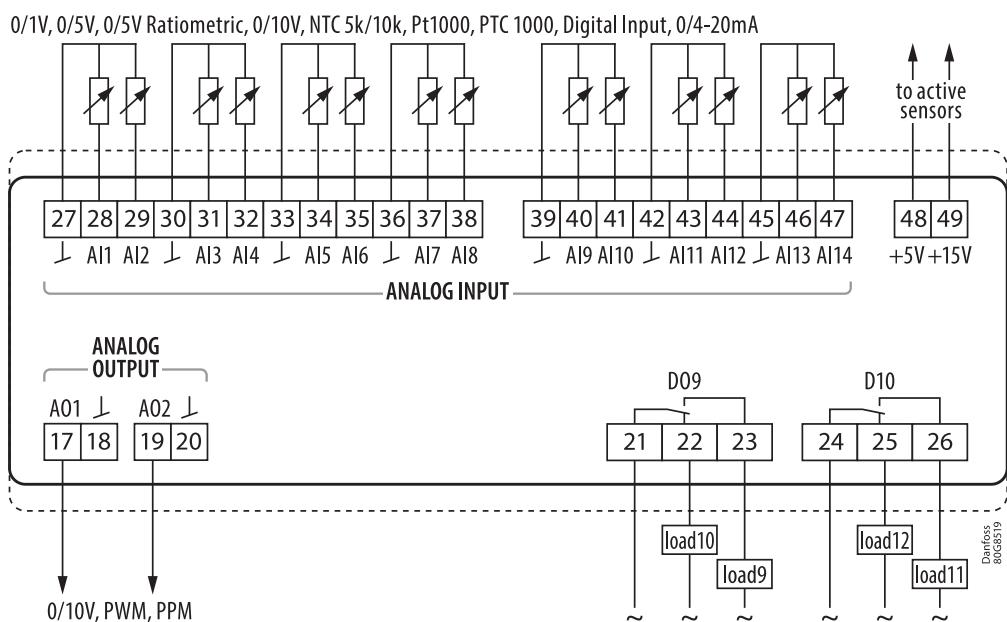
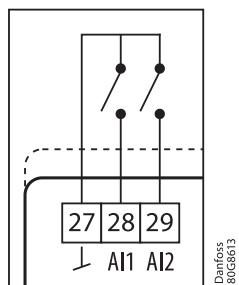
### AS-XP05 and AS-XP05+

**Figure: Top board**

0/1V, 0/5V, 0/5V Ratiometric, 0/10V, NTC 5k/10k, Pt1000, PTC 1000, Digital Input, 0/4-20mA

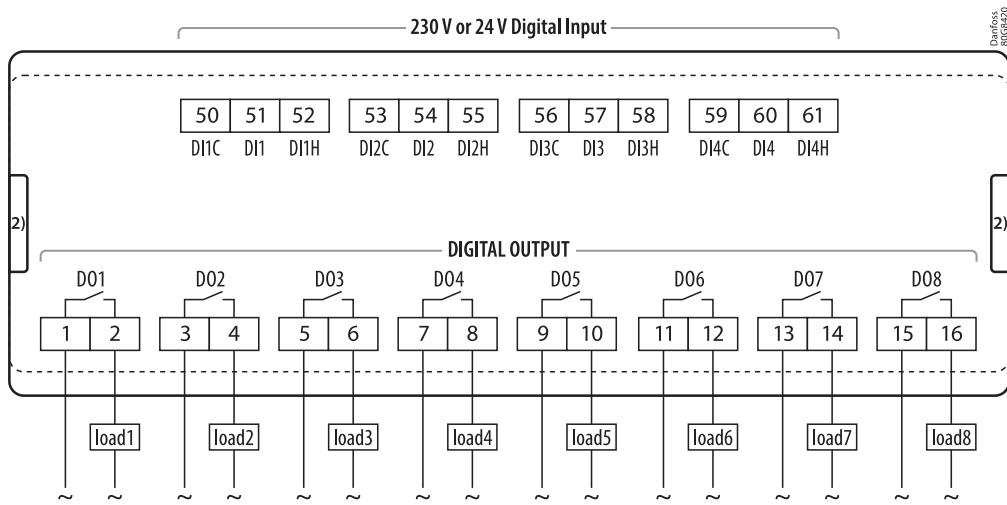
**Figure: AI – DI configuration**

**Note:** AI1 – AI10 can also be configured as Digital Input (DI).

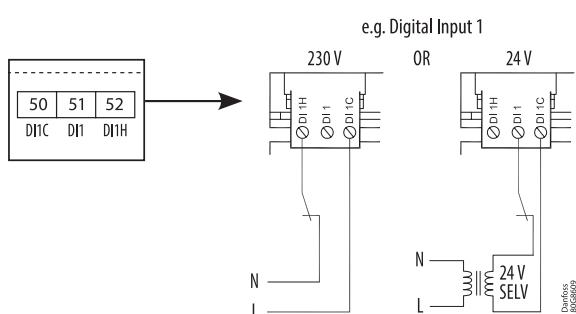
**Figure: Bottom board****AS-XP10****Figure: Top board****Figure: AI – DI configuration**

**Note:** AI1 – AI14 can also be configured as Digital Input (DI).

**Figure 11: Bottom board**

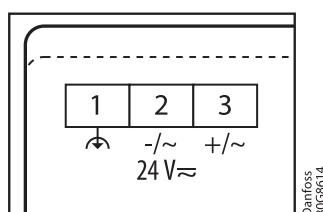


**Figure: 230 V or 24 V digital input**



## AS-PS20

**Figure: AS-PS20**



## Certificates, declarations and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

When you click on the link you will be directed to the latest version of the 'Declaration of Conformity'. Products developed and sold before this date of issue conform to the directives/standards in force at the time of their sale.

Approval type	Title	Certification body	Approval topic
Export Control Declaration	<a href="#"><u>ALSMART Programmable Controller Accessories</u></a>	Danfoss	
Electrical Safety Certificate	<a href="#"><u>UL E31024</u></a>	UL - Underwriters Laboratories inc.	UL-CSA
EU-UK Declaration	<a href="#"><u>Danfoss EU-UK 080R6012.02</u></a>	Danfoss	LVD
Export Control Declaration	<a href="#"><u>ALSMART programmable controllers</u></a>	Danfoss	
Electrical Safety Certificate	<a href="#"><u>UL E31024</u></a>	UL - Underwriters Laboratories inc.	UL-CSA
Manufacturer's Declaration	<a href="#"><u>Manufacturers declaration 080R6019</u></a>	Danfoss	Flammable refrigerant gases

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