ENGINEERING TOMORROW

Data Sheet

Alsmart® universal controller platform Type **AS-XP05, AS-XP10, AS-PS20**

Expansion modules for Alsmart Programmable electronic controllers.

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.

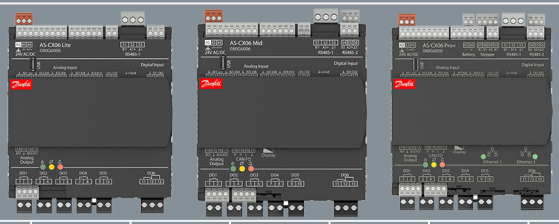
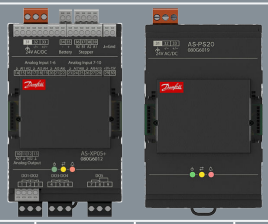
AS-XP and AS-PS20 are accessories that are part of the Alsmart platform and that allow to expand the system ensuring maximum flexibility.

Features:

- 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 16 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)

Portfolio overview

Table 1: Portfolio overview

	AS-CX06							AS-XP, AS-PS (Expansion modules)			
											
	AS-CX06 Lite	**AS-CX06 Mid**	**AS-CX06 Mid SSR**	**AS-CX06 Mid+**	**AS-CX06 Mid+ SSR**	**AS-CX06 Pro**	**AS-CX06 Pro+**	**AS-XP05**	**AS-XP05+**	**AS-XP10**	**AS-PS20**
Digital Outputs	**6** 5xSPST 1xSPDT	**6** 5xSPST 1xSPDT	**6** 4xSPST 1xSPDT 1xSSR	**6** 5xSPST 1xSPDT	**6** 4xSPST 1xSPDT 1xSSR	**6** 5xSPST 1xSPDT	**6** 5xSPST 1xSPDT	**5** 4xSPST 1xSPDT	**5** 4xSPST 1xSPDT	**10** 8xSPST 2xSPDT	0
Digital Inputs	**2** Voltage free	**2** Voltage free	**2** Voltage free	**2** Voltage free	**2** Voltage free	**2** Voltage free	**2** Voltage free	0	0	**4** 24 VAC or 230 VAC	0
Analog Inputs (Universal)	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**14**	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	1 AS-XP	6 AS-XP + 1 AS-PS20	6 AS-XP + 1 AS-PS20	6 AS-XP + 1 AS-PS20	6 AS-XP + 1 AS-PS20	16 AS-XP + 3 AS-PS20	16 AS-XP + 3 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 specification

General features

Table 2: 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[1] for DC only[2][3] 26 W, min. 60 VA if transformer used[4]
Stepper motor power supply	24 V AC/DC, 50/60Hz to be protected by external fuse[1] for DC only[2][3] 12 W, min. 40 V A if transformer used[4]
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
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 3: Analog input

Type	Feature	Data
For AS-XP05: AI1, AI2, AI3, AI4, AI5, AI6, AI7, AI8, AI9, AI10 For AS-XP10: AI1, AI2, AI3, AI4, AI5, AI6, AI7, AI8, AI9, AI10, AI11, AI12, AI13, AI14		
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 0 – 5 V 0 – 10 V	Accuracy	±0.5% FS (FS intended specifically for each type)
	Resolution	1 mV
	Input resistance	>100 kΩ
Pt1000	Meas. range	-60 to +180 °C
	Accuracy[1]	±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[1]	±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

Type	Feature	Data
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

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

Table 4: Digital input

Type	Feature	Data
For AS-XP10: DI1, DI2, DI3, DI4		
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
For AS-XP10: DI1H, DI2H, DI3H, DI4H		
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 5: Analog output (AO1, AO2)

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

Table 6: Digital output

Type	Data
For AS-XP05: DO1, DO2, DO3, DO4 **For AS-XP10: DO1, DO2, DO3, DO4, DO5, DO6, DO7, DO8**	
Relay	SPST 3 A, 250 V AC, 50k cycles, resistive load 2 A, 250 V AC, 30k cycles, inductive load (φ 0.4)
For AS-XP05: DO5 **For AS-XP10: DO9, D10**	
Relay	SPDT 3 A, 250 V AC, 50k cycles, resistive load 2 A, 250 V AC, 30k cycles, inductive load (φ 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.	
Stepper motor output (for AS-XP05+ : A1, A2, B1, B2)	
Bipolar/Unipolar	Danfoss valves: • ETS / KVS / ETS C / KVS C / CCMT 2–CCMT 42 / CTR • ETS6 / CCMT 0 / CCMT 1 Other valves: • Speed 10 – 300 pps • Drive mode full step - 1/32 microstep • Max. peak phase current: 1 A • Output power: 10 W peak, 5 W average
Battery backup	V battery: 18 – 24 V DC(2) max. power 11 W, min. capacity 0.1 Wh

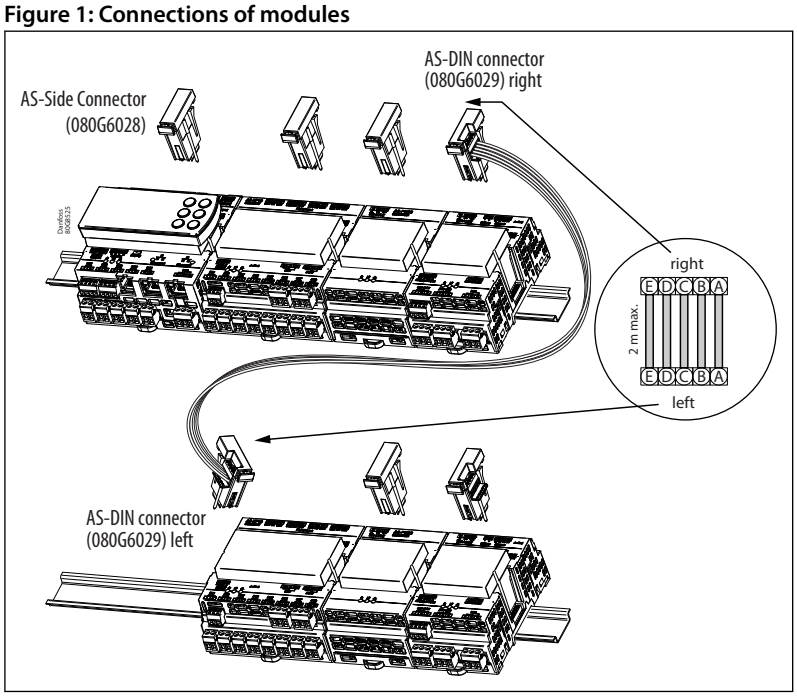
[2] 477 5x20 Series from LittelFuse (0477 3.15 MXP).

Table 7: 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

Connections of modules

Figure 1: Connections of modules



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. 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 five expansion modules AS-XP05 or AS-XP10 if you want to extend the I/O further.

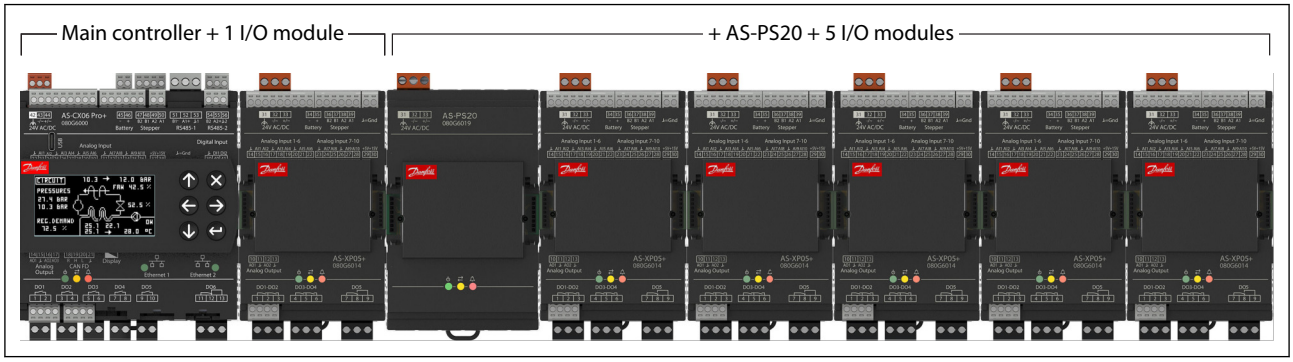
The AS-CX main controller and any subsequent AS-PS20 and AS-XP stepper valve may be powered by the same power supply provided that the electrical specifications described in Table 2: General features and eventual end application requirements are met.

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

Table 8: 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 AS-XP	6 AS-XP + 1 AS-PS20	6 AS-XP + 1 AS-PS20	6 AS-XP + 1 AS-PS20	6 AS-XP + 1 AS-PS20	16 AS-XP + 3 AS-PS20	16 AS-XP + 3 AS-PS20

Figure 2: 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.

Wire lengths

Table 9: Wire lengths

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

Dimensions

Figure 3: AS-XP05, AS-XP05+

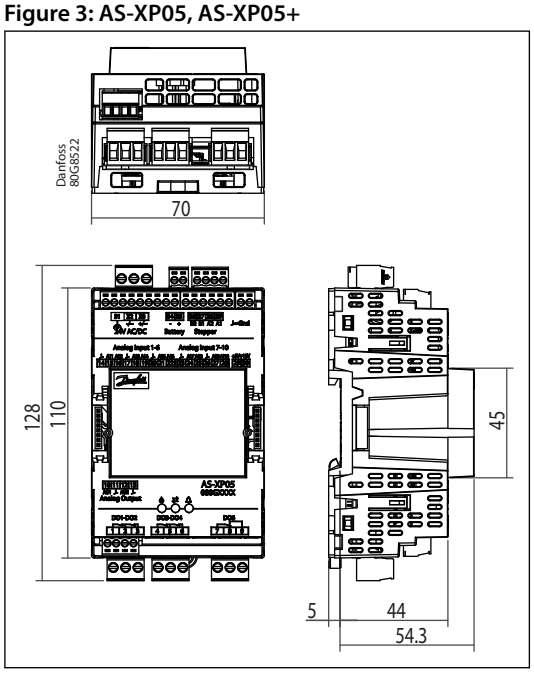


Figure 4: AS-XP10

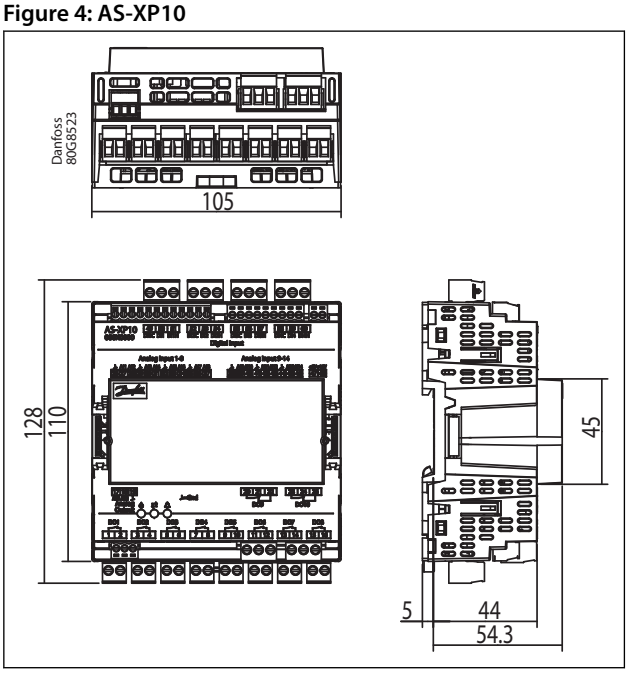
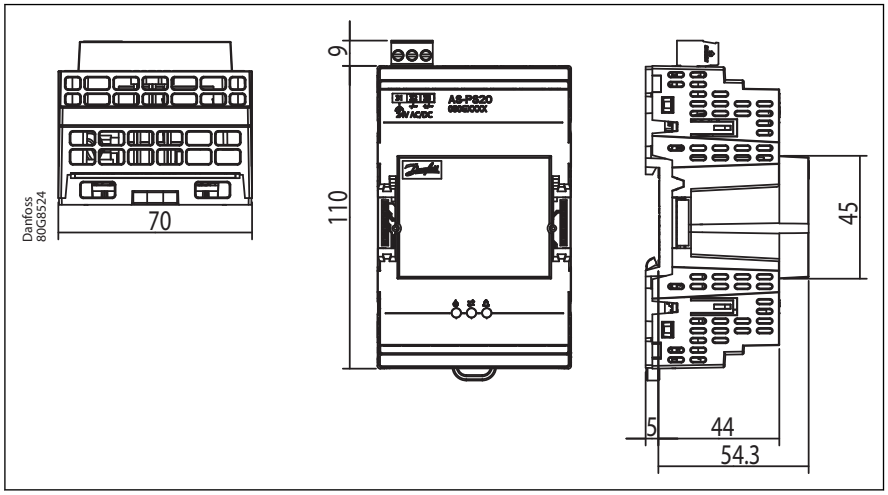


Figure 5: AS-PS20



Connection terminals

Table 10: 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 mm²	Analog Output, +5V, (Battery)
Female screw plug, 4 poles	Grey	0	1	pitch 3.5 mm section cable 0.14 – 1.5 mm²	(Stepper)
Female screw plug, 6 poles	Grey	1	1	pitch 3.5 mm section cable 0.14 – 1.5 mm²	Analog Input (AI7-AI10)
Female screw plug, 9 poles	Grey	1	1	pitch 3.5 mm section cable 0.14 – 1.5 mm²	Analog Input (AI1-AI6)
Female screw plug, 3 poles	Orange	1	1	pitch 5 mm section cable 0.2 – 2.5 mm²	PWM syncro/ (Stepper valve power supply)
Female screw plug, 3 poles	Black	3	3	pitch 5 mm section cable 0.2 – 2.5 mm²	XP05 Digital Output (DO1-DO5)

Table 11: AS-XP10

Type	Color	Quantity	Pitch	Function
Female screw plug, 2 poles	Grey	3	pitch 3.5 mm section cable 0.14 – 1.5 mm²	Analog Output, +5V, (Battery)
Female screw plug, 9 poles	Grey	1	pitch 3.5 mm section cable 0.14 – 1.5 mm²	Analog Input (AI9-AI14)
Female screw plug, 12 poles	Grey	1	pitch 3.5 mm section cable 0.14 – 1.5 mm²	Analog Input (AI1-AI8)
Female screw plug, 2 poles	Black	8	pitch 5 mm section cable 0.2 – 2.5 mm²	Digital Output (DO1-DO8)
Female screw plug, 3 poles	Black	6	pitch 5 mm section cable 0.2 – 2.5 mm²	Digital Output (DO9-DO10) Digital Input (DI1-DI4)

Table 12: AS-PS20

Type	Color	Quantity	Pitch	Function
Female screw plug, 3 poles	Orange	1	pitch 5 mm section cable 0.2 – 2.5 mm²	Power supply

Connection diagrams

AS-XP05 and AS-XP05+

Figure 6: Top Board

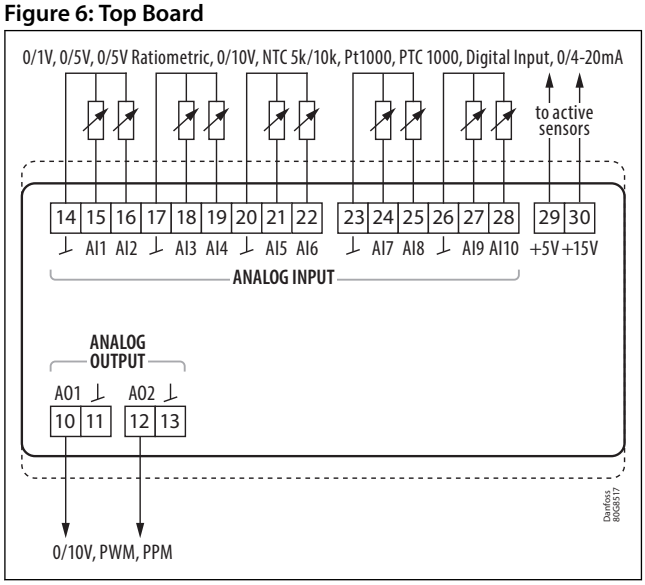
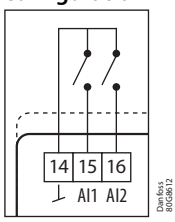
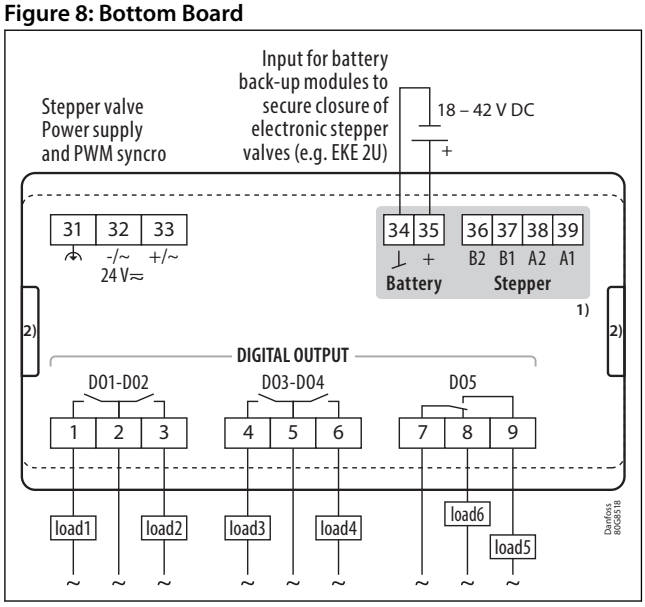


Figure 7: AI – DI configuration



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

Figure 8: Bottom Board



[1] Available only on: AS-XP05+

[2] Side-by-side connection to expansion modules for 080G6028-9 connectors.

AS-XP10

Figure 9: Top Board

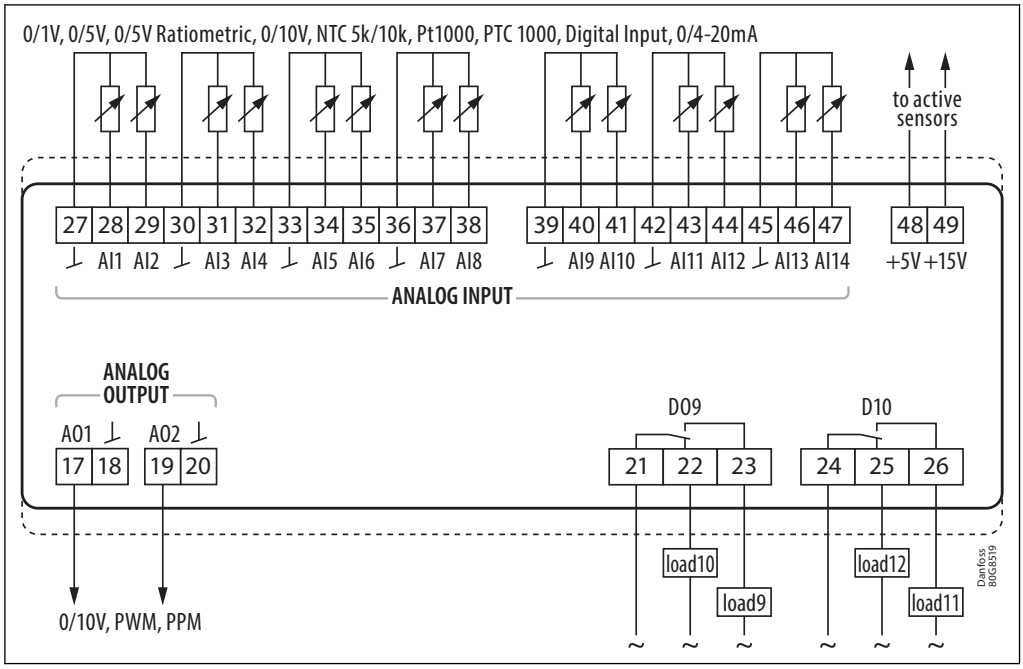
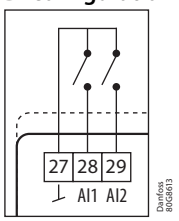
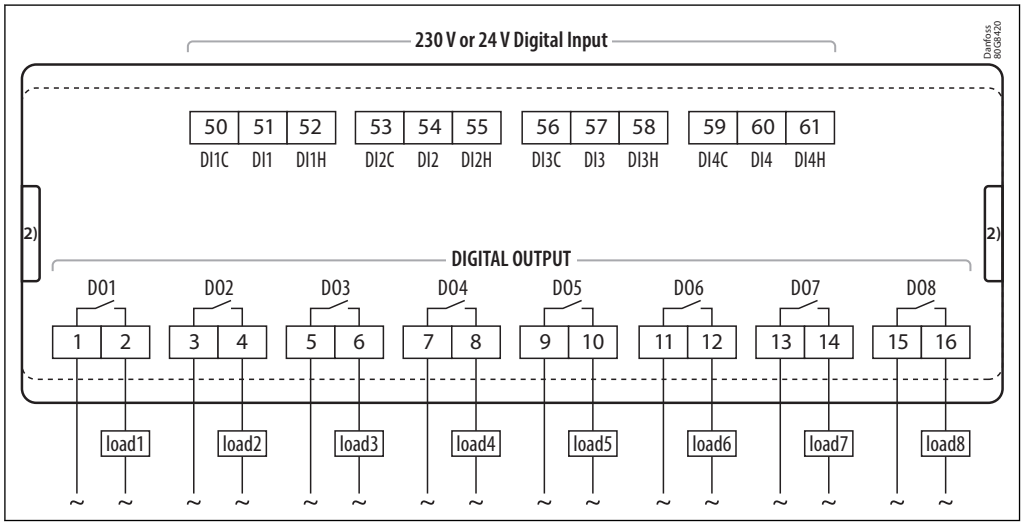


Figure 10: AI – DI configuration



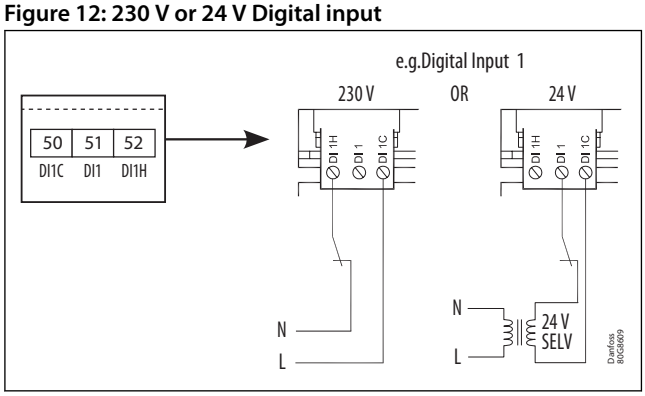
NOTE:
AI1 – AI14 can also be configured as Digital Input (DI).

Figure 11: Bottom Board



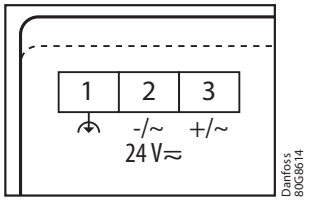
[2] Side-by-side connection to expansion modules for 080G6028-9 connectors.

Figure 12: 230 V or 24 V Digital input



AS-PS20

Figure 13: AS-PS20



Ordering

Product part numbers

Table 13: Product part numbers

Description	Code No.	
	Single Pack (AS-Side connectors included) (connectors kit included)	Industrial Pack (AS-Side connectors included) (connectors kit NOT included)
AS-XP05+	080G6012	080G6013 (36/pcs)
AS-XP05	080G6014	080G6015 (36/pcs)
AS-XP10	080G6010	080G6011 (27/pcs)
AS-PS20	080G6019	080G6020 (36/pcs)

Accessories part numbers

Table 14: Accessories part numbers

Description	Qty	Code No.
AS-XP05+ Connector kit I/36	I-pack (36)	080G6035
AS-XP05 Connector kit I/36	I-pack (36)	080G6034
AS-XP10 Connector kit I/27	I-pack (27)	080G6033
AS-PS20 Connector kit I/36	I-pack (36)	080G6037
AS-Side Connector kit	1/pc	080G6028
AS-DIN Side Connector kit 2/pcs	2/pcs	080G6029

Certificates, declarations, and approvals

A full list of certificates, declarations and approvals are centrally managed in our Product Store. Individual code number may have some or all approvals, and certain local approvals may not be ready yet.

As some of these documents may change over time, you can always check the latest status at danfoss.com, on our Product Store or by contacting your local Danfoss representative.

Certificates, declarations, and approvals

Table 15: Certificates, declarations, and approvals

File name	Document type	Document topic	Approval authority
080R6012	EU/UK Declaration of conformity		Danfoss
080R6015	Manufacturer's Declaration (applications with flammable refrigerants)		Danfoss
E31024	Electrical – Safety Certificate		UL

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