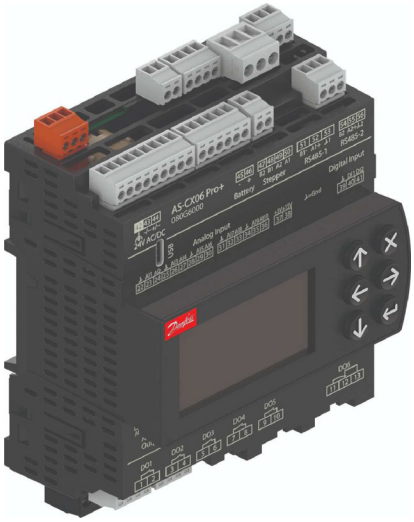
Data sheet



Program. controller, 6 relays

AS-CX06 / AS-UI Snap-on / AS-UI Cover kit / AS-Side / AS-DIN Side

Programmable electronic controller suitable for all HVAC applications needs.

Description

The AIsmart™ 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.

The new portfolio features a next-generation controller, offering enhanced capabilities and improved performance. In addition, the portfolio includes basic controllers, extension modules, displays, and a complete software toolchain that work seamlessly together to provide a comprehensive solution for HVAC control.

Features & benefits

- Flexible I/O
  - Modular concept (up to 20 Input/Output expansions)
  - Auto-recognition function of the I/O expansions
  - Universal I/Os
  - Stepper driver embedded (Plus versions)
- Higher execution speed and memory
  - Enhanced CPU memory
  - Scalable RAM and ROM
  - Faster cycle time
- Secure and Reliable
  - Isolated power supply and RS485
  - High precision I/Os
  - FailSafe feature for Ethernet connectivity
  - Designed following IEC62443 cybersecurity guidelines
- Enhanced Connectivity
  - 2 Ethernet ports
  - USB-C
  - 2 opto-isolated RS485
  - CAN FD as fieldbus to remote HMI and other AS-CX
- Complete Software Toolchain
  - Alsmart Design for programming and debugging
  - IEC61131-3 compliant
  - Alsmart Service Tool for commissioning/monitoring
- MQTTS Cloud connectivity
- Snap-on LCD display

Ordering

Product code numbers

Table: Product part numbers

Description	Code No.	
	Single Pack (connectors kit included)	IPack (27 pieces) (connectors kit NOT included)
AS-CX06 Pro+	080G6000	080G6001
AS-CX06 Pro	080G6002	080G6003
AS-CX06 Mid+	080G6004	080G6005
AS-CX06 Mid+ SSR	080G6038	080G6039
AS-CX06 Mid	080G6006	080G6007
AS-CX06 Mid SSR	080G6040	080G6041
AS-CX06 Lite	080G6008	080G6009

Accessories code numbers

080G6016

Display, AS-UI Snap-on

Function: User Interface, Packing format: Single pack, Quantity per packing format: 1

080G6018

Cover, AS-UI Cover kit 2/pcs

Function: SNAP-ON COVER, Packing format: Single pack, Quantity per packing format: 2

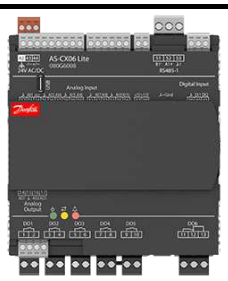
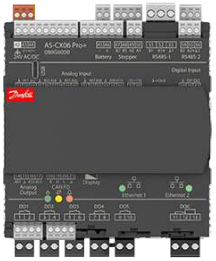
Table: Accessories part numbers

Description	Qty.	Code No.
AS-CX06 Mid+ / Pro+ Connector kit	I-pack (27)	080G6030
AS-CX06 Mid / Pro Connector kit	I-pack (27)	080G6031
AS-CX06 Lite Connector kit	I-pack (27)	080G6032
AS-UI Snap-on	Single pack	080G6016
AS-UI Snap-on, I/27	I-pack (27)	080G6017
AS-UI Cover Kit	2/pcs	080G6018

Overview

Product portfolio

Table: 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**	**6**	**6**	**6**	**6**	**6**	**6**	**5**	**5**	**10**	
	5xSPST	5xSPST	4xSPST	5xSPST	4xSPST	5xSPST	5xSPST	4xSPST	4xSPST	8xSPST	0
	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	1xSPDT	2xSPDT	
			1xSSR		1xSSR						
Digital Inputs	**2**	**2**	**2**	**2**	**2**	**2**	**2**			**4**	
	Voltage free	Voltage free	Voltage free	Voltage free	Voltage free	Voltage free	Voltage free	0	0	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)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	from AS-CX	from AS-CX	from AS-CX	Yes
Stepper motor (bipolar and unipolar)	0	0	0	1	1	0	1	0	1	0	0
Others											
Snap-on LCD display	Yes	Yes	Yes	Yes	Yes	Yes	Yes	–	–	–	–
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		–	–	–	4
Number of AS-XP10	1 AS-XP10	5 AS-XP10 + 2 AS-PS20				15 AS-XP10 + 5 AS-PS20		–	–	–	3
RTC clock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	–	–	–	–
RS485 opto-isolated	1	2	2	2	2	2	2	–	–	–	–
Ethernet / Web server	–	–	–	–	–	2/1	2/1	–	–	–	–
USB-C / Web server	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
Power supply	24V AC/DC, 50/60 Hz[1] for DC only[2][3] 30 W, min. 60 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; 1Y for version with SSR
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: for Lite, Mid, Pro version -40 to +70 °C: for Mid+, Pro+ versions without I/O Expansions attached. -40 to +65 °C otherwise UL: -40 to +65 °C -40 to +60 °C when Snap-on display (080G6016) is mounted
Ambient temperature range, transport [°C]	-40 to +80 °C
Enclosure rating IP	IP20, IP40 on the front when plate or display are mounted
Relative humidity range [%]	5 – 90%, non-condensing
Max installation height	2000 m

[1] For all AS-CX variants PV04 and lower to be protected by external fuse 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 (AI1, AI2, AI3, AI4, AI5, AI6, AI7, AI8, AI9, AI10)

Type	Feature	Data
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
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: Digital input (DI1, DI2)

Type	Feature	Data
Voltage free	Stimulation	Voltage free contact
	Contact cleaning	20 mA
	Other feature	Pulse counting function max. 2 kHz

Table: Analog output (AO1, AO2, AO3)

Type	Feature	Data
	Max. load per each output	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 – 15V
	Frequency range	15 Hz – 2 kHz
	Accuracy	1% FS
	Resolution	0.1% FS

Sync PWM/PPM	Voltage output	Vout Low max. = 0.5 V Vout High min. = 9 – 15V
	Frequency	Mains frequency x 2
	Resolution	0.1% FS

Table: Digital output

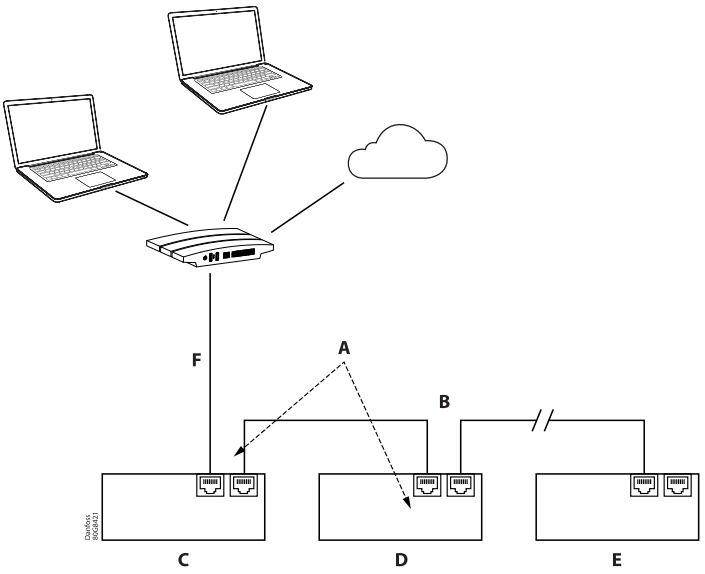
Type	Data
DO1, DO2, DO3, DO4, DO5	
Relay	SPST 3 A, 250 V AC, 50k cycles, resistive load 2 A, 250 V AC, 30k cycles, inductive load (φ 0.4)
DO5 for Mid SSR and Mid+ SSR	
Solid State Relay	SPST 230 V AC / 110 V AC /24 V AC max 0.5 A
DO6	
Relay	SPDT 3 A, 250 V AC, 50k cycles, resistive load 2 A, 250 V AC, 30k cycles, inductive load (φ 0.4)
Isolation between relay in the DO1-DO5 group is functional. Isolation between DO1-DO5 group and DO6 is reinforced.	
Stepper motor output (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 (0.7 A RMS) • Output power: 10 W peak, 5 W average
Battery backup	V battery: 18 – 24 V DC[1] max. power 11 W, min. capacity 0.1 Wh

[1] For all AS-CX variants PV04 and lower to be protected by external fuse 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

Communication interface



A	Internal switch with Fail Safe mechanism in case of offline devices.
B	Operational network
C	Device1
D	Device2
E	DeviceN
F	IT network

Table: Communication interface

Interface	Use and technical data	Available on
Ethernet	Point to point star topology with network hubs/switches. Each AS-CX device incorporates a switch with fail-safe technology which allows to daisy chain devices via Ethernet without the need of external switches and keep devices connected in case of offline devices; it also ensures IT and OT networks separation in case Device1 is offline. Ethernet type: 10/100TX auto MDI-X Protocols supported: HTTPS, Modbus, BACnet IP[(1)], MQTTS[(1)] Webserver functionality for Alsmart Service Tool. **First access information:** To access the web front-end interface of the device, enter the assigned IP address into the address bar of a standard web browser. The IP address allocation depends on the connection method: • Ethernet connection: By default, the device obtains its IP address automatically via DHCP. To determine the assigned IP address, press ENTER on the device keypad to access the default settings menu, then navigate to Ethernet Settings. • USB connection *(RNDIS CDC ECM – Ethernet-over-USB service, enabled by default)* When the device is connected via USB, a network interface is automatically established between the PC and the device, requiring no additional configuration. The device can be accessed using the static IP address 169.254.255.253 or the hostname AS-CX06.local. Upon connection, the browser will redirect to the login interface. Use the following factory-default credentials: • Username: *Admin* • Password: *Administrator* • Numeric password (LCD interface only): *12345* After the initial successful login, the system will enforce a password change procedure. **Important:** Forgotten passwords cannot be retrieved.	AS-CX06 Pro AS-CX06 Pro+
CAN FD	CAN FD communication is used for device-to-device communication. It is also used to connect Alsmart remote HMI via display port.	All models
RS485-1	RS485 ports are isolated and can be configured as client or server. They are used for fieldbus and BMS systems communication. Protocols supported: Modbus RTU, BACnet MSTP[(1)]	All models

RS485-2		AS-CX06 Mid (SSR) AS-CX06 Mid+ (SSR) AS-CX06 Pro AS-CX06 Pro+
USB-C	USB version 1.1/2.0 high speed, DRP and DRD support. Max. current 150 mA. For connection to pen drive (e.g. SW update, datalogging) and laptop (e.g. Alsmart Design programming tool, Alsmart Service Tool[(1)]). The controller in addition can be powered via USB to program software or configure parameters. In case the output capability of the USB port is not sufficient, then power it also with the 24 V input.	All models

[(1)] In preparation & continuously being updated.

AS-UI Snap-on and AS-UI Cover Kit

Identification

Figure: AS-UI Snap-on

Table: Features

Features	Description
Power supply	From the main controller
Display	• graphical LCD black and white transmissive • resolution 128 x 64 dots • dimmerable backlight via software
Keyboard	6 keys individually managed via software
Ambient temperature range, operating [°C]	-20 to +60 °C
Ambient temperature range, transport [°C]	-40 to +80 °C
Enclosure rating IP	IP40
Relative humidity range [%]	5 – 90%, non-condensing
Max installation height	2000 m

Dimensions

Table: Wire lengths

Interface	Wire length (m)	Max. baudrate CAN (bps)	Min. wire size
Ethernet	100	10/100 Mbit/s	
Canbus	1000	50 kbit/s	0.83 mm^2 - 18 AWG
	520	125 kbit/s	0.33 mm^2 - 22 AWG
	250	250 kbit/s	0.21 mm^2 - 24 AWG
	80	500 kbit/s	0.13 mm^2 - 26 AWG
	30	1 Mbit/s	0.13 mm^2 - 26 AWG
RS485	1000	125 kbit/s	0.33 mm^2 - 22 AWG
Signal wiring	30		

Figure: Without LCD display

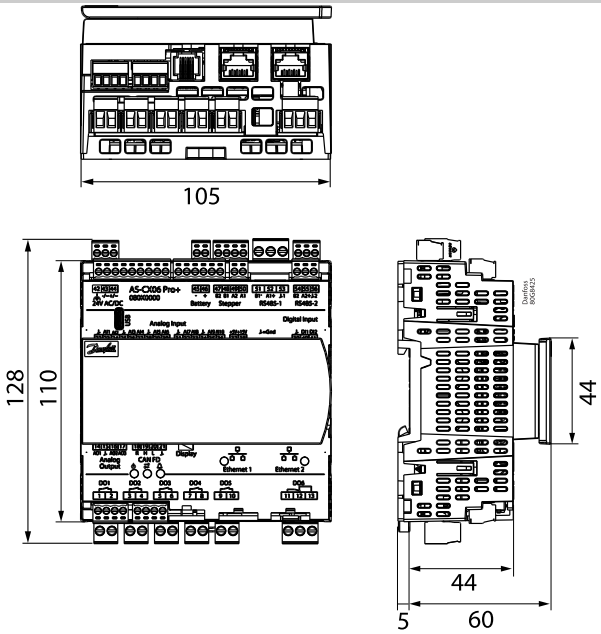
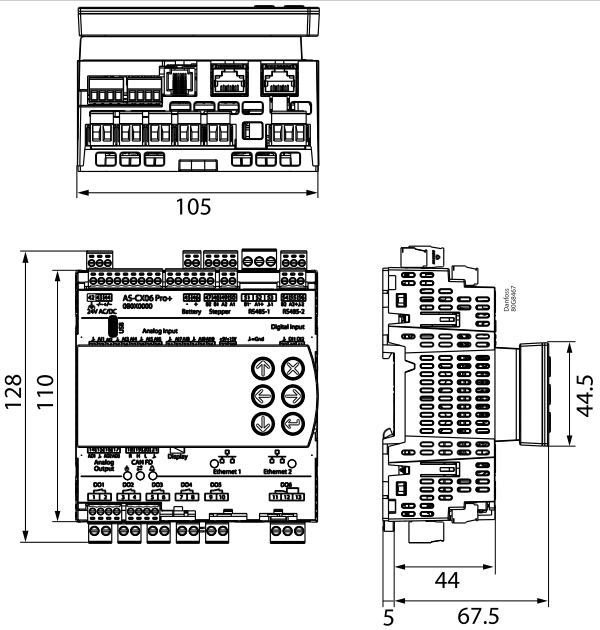


Figure: With Snap-on LCD display: 080G6016



AS-UI Snap-on and AS-UI Cover Kit

Figure: AS-UI Snap-on (080G6016)

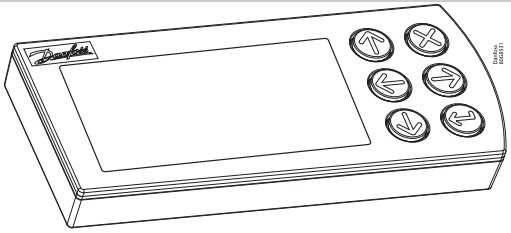


Figure: Dimensions

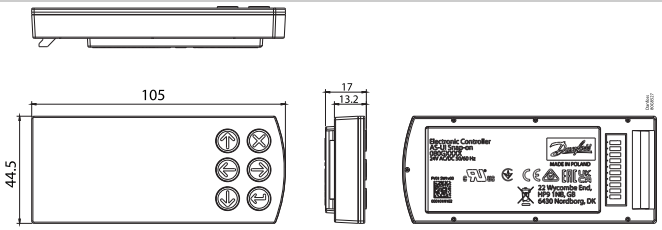


Figure: AS-UI cover kit (080G6018)

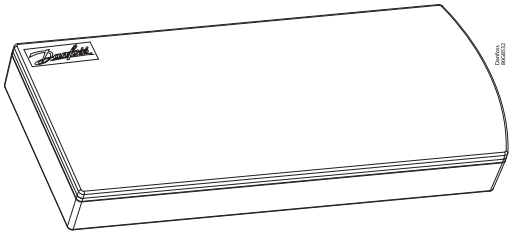
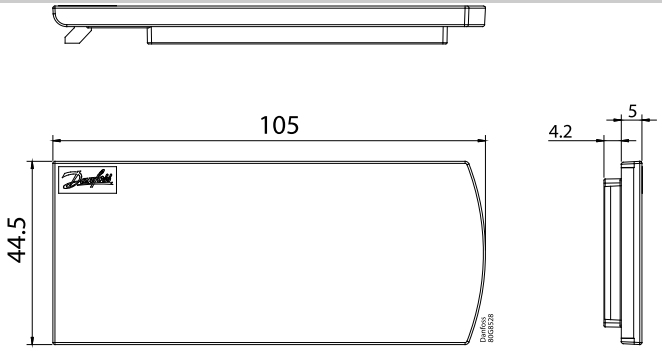


Figure: Dimensions



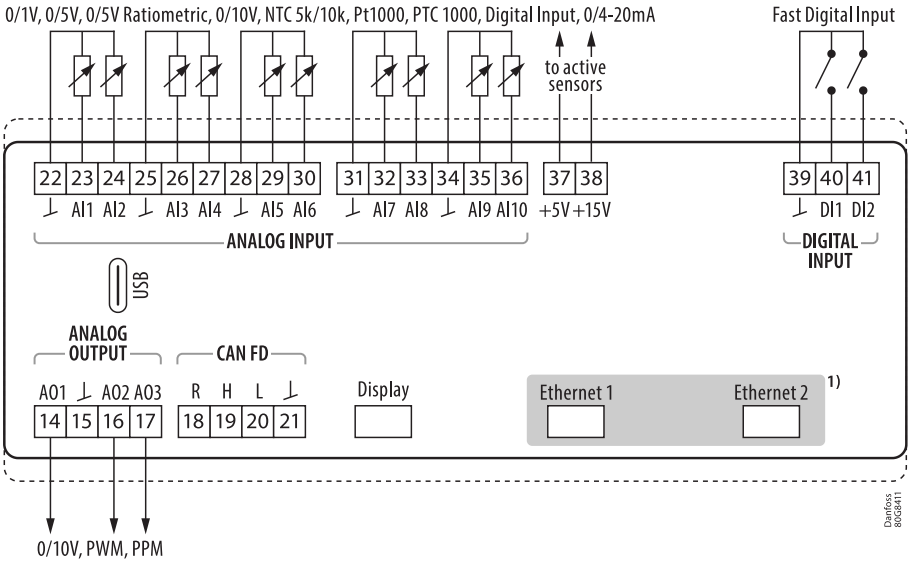
Connections

Table: Connections

Type	Color	Quantity			Pitch	Function
		Mid+ / Pro+	Mid / Pro	Lite		
Female screw plug, 2 poles	Grey	2	1	1	pitch 3.5 mm section cable 0.14 - 1.5 mm^2	+5 V, (Battery)
Female screw plug, 3 poles	Grey	2	2	1	pitch 3.5 mm section cable 0.14 - 1.5 mm^2	Digital Input, (RS485-2)
Female screw plug, 4 poles	Grey	3	2	2	pitch 3.5 mm section cable 0.14 - 1.5 mm^2	Analog Output, CAN-FD, (Stepper)
Female screw plug, 6 poles	Grey	1	1	1	pitch 3.5 mm section cable 0.14 - 1.5 mm^2	Analog Input (AI7-AI10)
Female screw plug, 9 poles	Grey	1	1	1	pitch 3.5 mm section cable 0.14 - 1.5 mm^2	Analog Input (AI1-AI6)
Female screw plug, 3 poles	Orange	1	1	1	pitch 3.5 mm section cable 0.14 - 1.5 mm^2	24 V
Female screw plug, 2 poles	Black	5	5	5	pitch 5 mm section cable 0.2 - 2.5 mm^2	Digital Output (DO1-DO5)
Female screw plug, 3 poles	Black	1	1	1	pitch 5 mm section cable 0.2 - 2.5 mm^2	Digital Output (DO6)
Female screw plug, 3 poles	Grey	1	1	1	pitch 5 mm section cable 0.2 - 2.5 mm^2	RS485-1
RJ12 plug	Black	1	1	1		CAN-FD Display
RJ45 plug	Black	2 (Pro/Pro+)				Ethernet1, Ethernet2
USB-C		1	1	1		USB

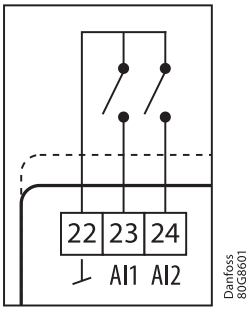
Connection diagrams

Figure: Top Board



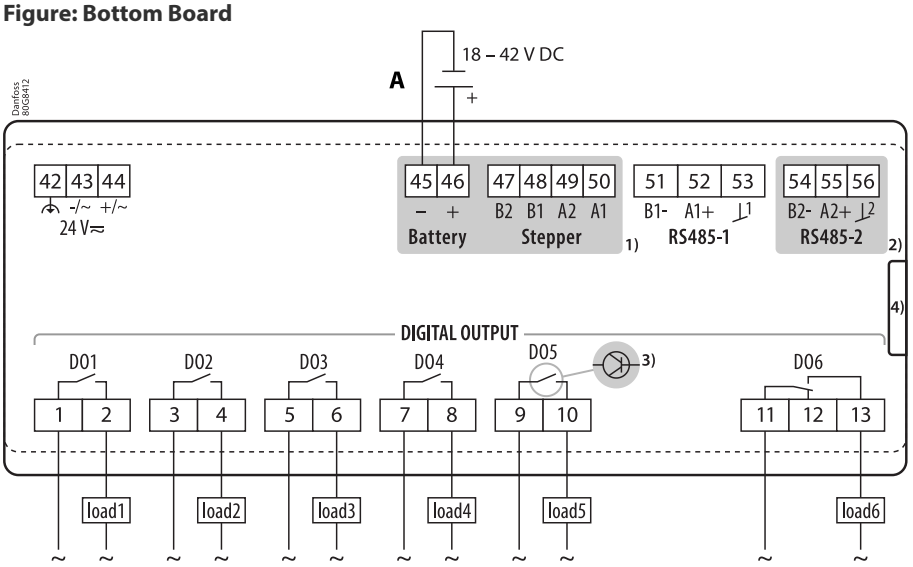
1) Available only on: Pro, Pro+

Figure: AI – DI configuration



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

Figure: Bottom Board



A	Input for battery back-up modules to secure closure of electronic stepper valves (e.g. EKE 2U)

1) Available only on: Mid+, Mid+ SSR, Pro+

2) Available only on: Mid, Mid+, Mid+ SSR, Pro, Pro+

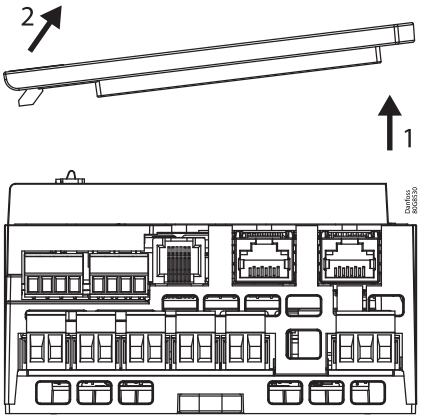
3) SSR is used in the place of SPST relay on some specific models.

4) Side-by-side connection to expansion modules for 080G6028-9 connectors.

Installation

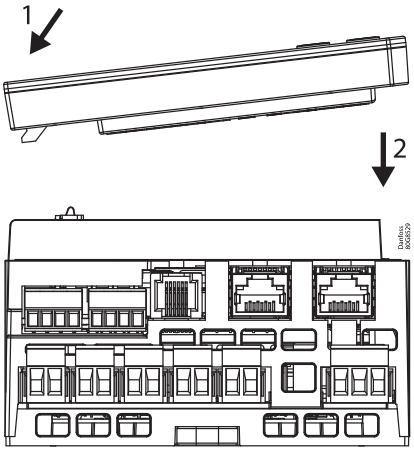
Mounting

Figure: Unmounting



Replacement of the cover with the display and vice versa.
Remove the cover as shown in the *Figure: Unmounting,* first lifting the right side (point **1** in the *Figure: Unmounting*), applying a slight upward force to overcome the magnetic attraction between the cover and controller and then releasing the left side (point **2** in *Figure: Unmounting*).

Figure: Mounting



Mount the display as shown in the *Figure: Mounting*, first hooking the left side (point **1** in the *Figure: Mounting*) and then lowering the right side (point **2** in the *Figure: Mounting*) until the magnetic connection between the display and controller is established.

The procedure to replace the cover with display is the same.

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
Electrical Safety Certificate	UL E31024	UL - Underwriters Laboratories inc.	UL-CSA
Manufacturer's Declaration	Manufacturer's Declaration 080R6015	Danfoss	Flammable refrigerant gases
EU Declaration	Danfoss EU 080R6012	Danfoss	EMC, LVD, EU RoHS
Export Control Declaration	ALSMART Programmable Controller Accessories	Danfoss	
Export Control Declaration	ALSMART programmable controllers	Danfoss	

Mark(1)	Country
CE	EU
cURus (UL file E31024)	NAM (US and Canada)

(1) The list contains the main possible 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.
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