

Data Sheet

Alsmart™ universal controller platform

Type **AS-CX06, AS-UI Snap-on**

Programmable electronic controller suitable for all HVAC applications needs.



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.

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

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

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

MQTT Cloud connectivity

Snap-on LCD display

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 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	
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	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	7	7	7	7	20	20	-	-	-	-
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

AS-CX06

General features

Features	Description
Power supply	24V AC/DC, 50/60 Hz to be protected by external fuse ⁽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⁾ 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 2: 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	±0.7 K [-20 to +60 °C], ±1 K otherwise
	Resolution	0.1 K
PTC1000	Meas. range	-60 to +80 °C
	Accuracy	±0.7 K [-20 to +60 °C], ±1 K otherwise
	Resolution	0.1 K
NTC10k	Meas. range	-50 to +160 °C
	Accuracy	± 1 K [-30 to +160 °C]
	Resolution	0.1 K
NTC5k	Meas. range	-50 to +120 °C
	Accuracy	± 1 K [-35 to +120 °C]
	Resolution	0.1 K

Alsmart™ universal controller platform, type AS-CX06, AS-UI Snap-on

Type	Feature	Data
Digital Input	Stimulation	Voltage free contact
	Contact cleaning	20 mA
	Other feature	Pulse counting function 150 ms debounce time

Table 3: 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 4: Analog output (AO1, AO2, AO3)

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

Table 5: 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

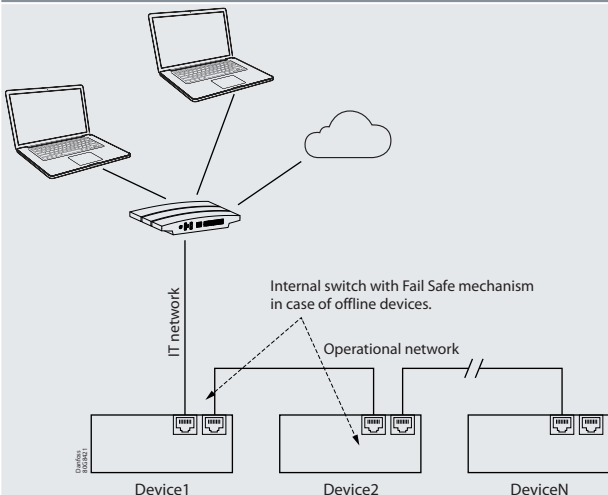
⁽¹⁾ 477 5x20 Series from Littelfuse (0477 3.15 MXP).

Table 6: 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

Table 7: Communication interface

Interface	Use and technical data	Available on:
Ethernet	 <p>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.</p> <p>Ethernet type: 10/100TX auto MDI-X</p> <p>Protocols supported: HTTPS, Modbus, BACnet IP⁽¹⁾, MQTT⁽¹⁾</p> <p>Webserver functionality for Alsmart Service Tool.</p> <p>First access information:</p> <p>The device automatically acquires its IP address from the network via DHCP.</p> <p>To check the current IP address, press ENTER to access the default settings menu and select Ethernet Settings. Enter the IP address in your preferred web browser to access the web front-end. You will be directed to a login screen with the following default credentials:</p> <p>Default User: Admin Default Password: Administrator Default Numeric Password: 12345 (to be used on LCD screen).</p> <p>You will be prompted to change your password after your initial successful login.</p> <p>Note: that there is not a way to retrieve a forgotten password.</p>	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.	All models
RS485-2	Protocols supported: Modbus RTU, BACnet MSTP ⁽¹⁾	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⁾).	All models

⁽¹⁾ In preparation & continuously being updated.

Wire lengths

Table 8: 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		

Dimensions

Figure 1: Without LCD display

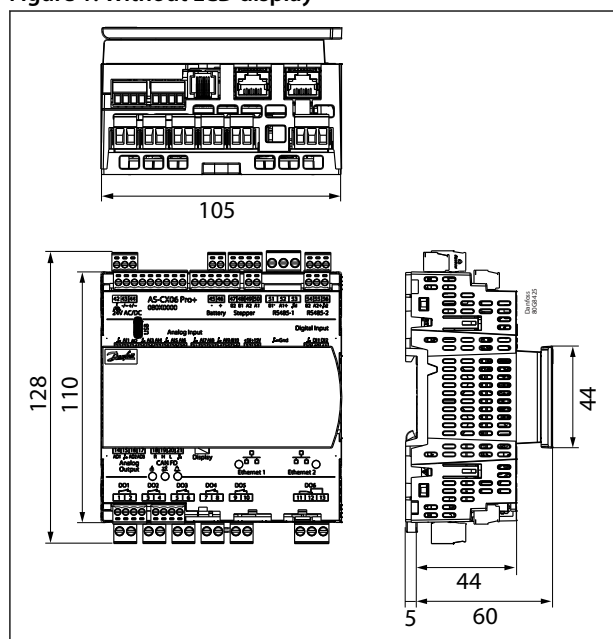
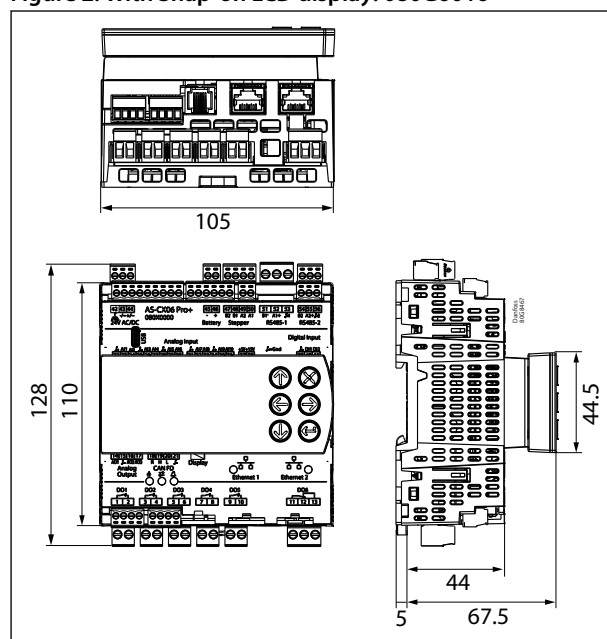


Figure 2: With Snap-on LCD display: 080G6016



Connections

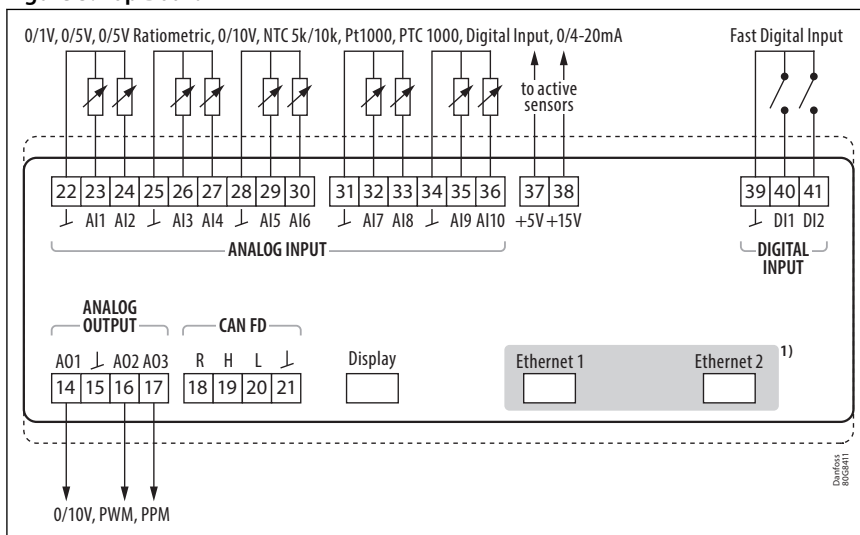
Table 9: Connections

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	+5V, (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, (Step- per)
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

Type	Color	Quantity			Pitch	Function
RJ12 plug	Black	1	1	1		CAN-FD Display
RJ45 plug	Black	2 (Pro/Pro+)				Ethernet1, Ethernet2
USB-C		1	1	1		USB

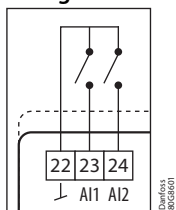
Connection diagrams

Figure 3: Top Board



1. Available only on: Pro, Pro+

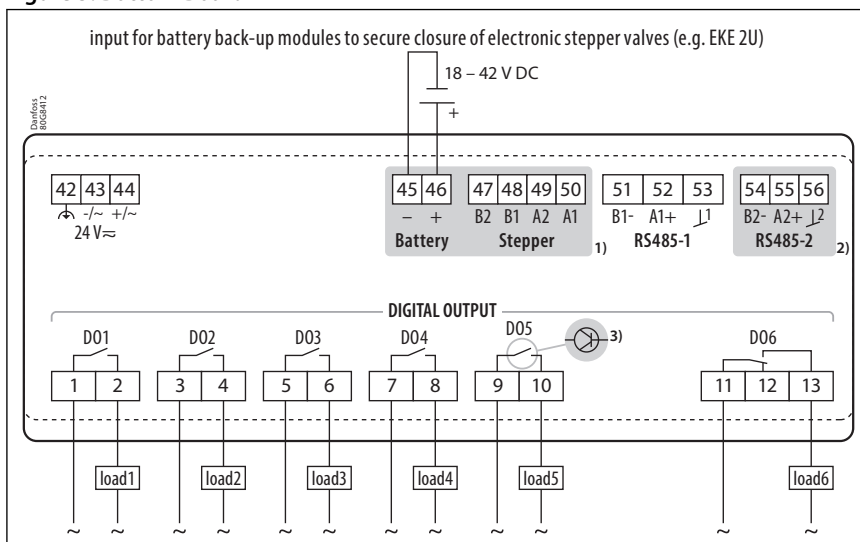
Figure 4: AI – DI configuration




NOTE:

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

Figure 5: Bottom Board

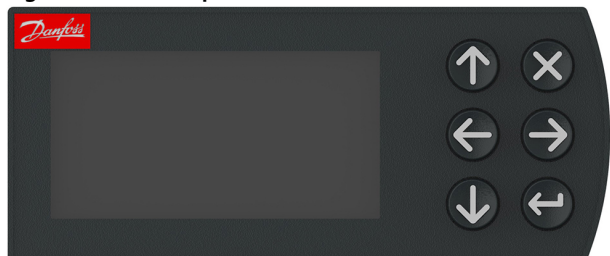


1. Available only on: Mid+, Pro+
2. Available only on: Mid, Mid+, Pro, Pro+
3. SSR  is used in the place of SPST relay on some specific models.

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

Identification

Figure 6: AS-UI Snap-on



Features

Table 10: Features

Features	Description
Power supply	From the main controller
Display	<ul style="list-style-type: none"> 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

Figure 7: AS-UI Snap-on (080G6016)

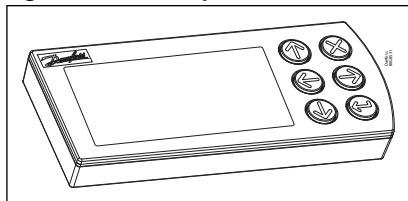


Figure 8: Dimensions

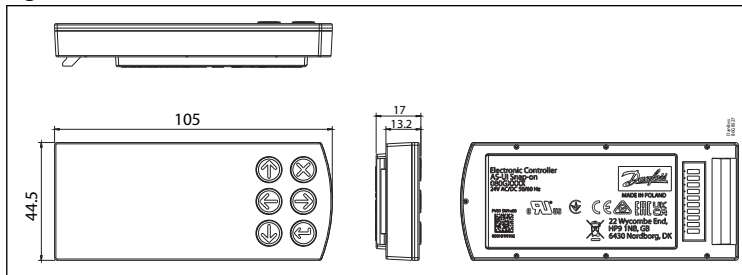


Figure 9: AS-UI cover kit (080G6018)

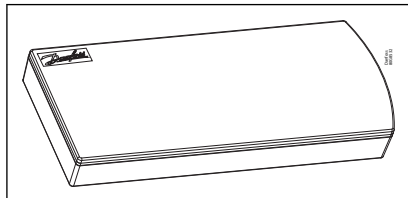
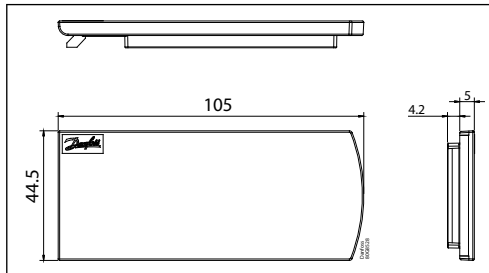


Figure 10: Dimensions

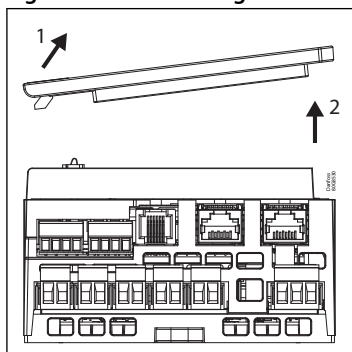


Mounting

Replacement of the cover with the display and vice versa.

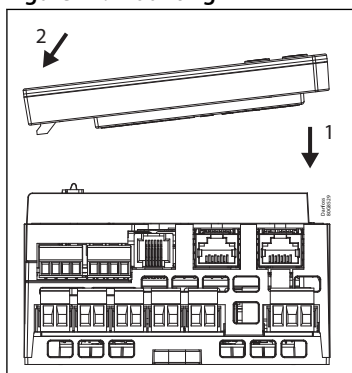
Remove the cover as shown in the **Figure 11**, first lifting the right side (point **1** in the **Figure 11**), applying a slight upward force to overcome the magnetic attraction between the cover and controller and then releasing the left side (point **2** in **Figure 11**).

Figure 11: Unmounting



Mount the display as shown in the **Figure 12**, first hooking the left side (point **1** in the **Figure 12**) and then lowering the right side (point **2** in the **Figure 12**) until the magnetic connection between the display and controller is established.

Figure 12: Mounting



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

Ordering

Product part numbers

Table 11: 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 part numbers

Table 12: 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



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 13: 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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