ENGINEERING
TOMORROW

Danfoss

Technical Information

PLUS+1® Mobile Machine Displays
DP7XX Series

Revision history   *Table of revisions*

Date	Changed	Rev
January 2019	Removed references to obsoleted display	0802
August 2018	Changed the Pin assignments drawings and tables	0801
May 2018	Inputs Digital/analog, High range multifunction input table, Range unit changed to V	0703
March 2018	Added text to Flush mounting option drawing	0702
February 2018	Added Service Parts and included USB replacement kit	0701
December 2017	Filled in function of C3-P3 pin	0602
January 2017	Added topic: High range input impedance for analog inputs	0601
November 2016	Minor update	0504
March 2016	Corrected literature number	0503
March 2016	Updated to Engineering Tomorrow Design	0502
February 2016	DP7XX overview text changes; Linux® operating system text changes; Updated flush mounting option drawing with new bracket displayed	0501
October 2015	Added the DP730 series information	EA
November 2014	Added DP720 LCD statement; Corrected Pin Assignments callouts on image of back of Display	DC
March 2014	Changed note to warning	DB
December 2013	LCD option table added, changed Panel Mounting Kit part number	DA
October 2013	Various	CA
July 2013	Added section	BA
May 2013	First edition	AA

Contents

Contents

Literature references

DP7XX reference literature

Literature title	Literature type	Literature number
DP7XX Series PLUS+1® Mobile Machine Displays	Technical Information	L1315553
DP700 Series PLUS+1® Mobile Machine Displays	Data Sheet	L1205618
DP710 Series PLUS+1® Mobile Machine Displays	Data Sheet	L1205246
DP720 Series PLUS+1® Mobile Machine Displays	Data Sheet	L1205154
DP730 Series (black and gray bezel) PLUS+1® Mobile Machine Displays	Data Sheet	AI00000269
PLUS+1® GUIDE Software User Manual	Operation Manual	10100824

Technical Information (TI)

A TI is comprehensive information for engineering and service personnel to reference.

Data Sheet (DS)

A DS is summarized information and parameters that are unique to a specific model.

API Specifications (API)

An API is specifications for programming variable settings.

API specifications are the definitive source of information regarding pin characteristics.

PLUS+1® GUIDE User Manual

The Operation Manual (OM) details information regarding the PLUS+1® GUIDE tool used in building PLUS+1® applications. This OM covers the following broad topics:

- How to use the PLUS+1® GUIDE graphical application development tool to create machine applications
- How to configure module input and output parameters
- How to download PLUS+1® GUIDE applications to target PLUS+1® hardware modules
- How to upload and download tuning parameters
- How to use the PLUS+1® Service Tool

Latest version of technical literature

Comprehensive technical literature is online at *www.danfoss.com*

User liability and safety statements

OEM responsibility

The OEM of a machine or vehicle in which Danfoss products are installed has the full responsibility for all consequences that might occur. Danfoss has no responsibility for any consequences, direct or indirect, caused by failures or malfunctions.

- Danfoss has no responsibility for any accidents caused by incorrectly mounted or maintained equipment.
- Danfoss does not assume any responsibility for Danfoss products being incorrectly applied or the system being programmed in a manner that jeopardizes safety.
- All safety critical systems shall include an emergency stop to switch off the main supply voltage for the outputs of the electronic control system. All safety critical components shall be installed in such a way that the main supply voltage can be switched off at any time. The emergency stop must be easily accessible to the operator.

Overview

PLUS+1® Mobile Machine Displays are designed to provide flexible, expandable, powerful and cost effective total machine management system displays for a wide variety of vehicle applications.

DP7XX Series Displays

DP7XX Series Displays are designed to perform in the most extreme mobile machine environments. The latest technology with back-light provides outstanding brightness and contrast performance resulting in an easy-to-read screen. Develop your own software and layout using the PLUS+1® GUIDE (Graphical User Integrated Development Environment) and the GUIDE Vector Based Screen Editor (VBSE). A basic graphic library is available.

Display options

The DP7XX offers different display options to meet your application needs. An optional projective capacitive touch screen that works through mud, water and with gloves is available for the DP720 model. The DP730 model is equipped by default with the projective capacitive touch screen.

LCD options

LCD option	Type	Contrast	Brightness (cd/m2)	Viewing angle*	For application use
Standard	Transmissive	1000:1	400	80°, 80°, 80°, 80°	In and out of cab
High-performance	Transmissive-Enhanced View TFT	800:1	550	80°, 80°, 80°, 80°	In and out of cab

* Viewing angle: Up, Down, Right, Left

PLUS+1® GUIDE

PLUS+1® GUIDE (Graphical User Integrated Development Environment) is a complete toolbox that generates downloadable applications for all programmable PLUS+1® Compliant products.

A screen editor allows easy development of applications by programmers without formal software development training. The expertise from a software engineer is not needed to find your way around in PLUS+1® GUIDE

Linux® operating system

DP7XX Series Displays contain embedded Linux® operating system software that is copyrighted software licensed under the GPL Version 2.0 or LGPL Version 2.1.

Linux® operating system software is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; Licenses full notice available:

GPL Version 2.0 *http://www.gnu.org/licenses/old-licenses/gpl-2.0.html*

LGPL Version 2.1 *http://www.gnu.org/licenses/old-licenses/lgpl-2.1.html*

As an installer of Linux® operating system you will have your own obligations under the licensing agreements, which may include among other things the obligation to include a copy of these licenses or to include an offer of a physical copy of the source code for such software with your distributions of the equipment. You should carefully review the licenses to determine what your obligations and options may be for your intended use.

Anyone in receipt of this program may obtain the complete corresponding source code from Danfoss for a period of three years after the last shipment of this product and/or spare parts by going on line at *http://www.danfoss.com* or include "source code for DP7XX" in your written request to:

PLUS+1® Helpdesk Danfoss (US) Company, 3500 Annapolis Lane North Plymouth, MN 55447 USA

Ordering information

DP7XX naming convention

DP7XX model code

	A	B	C	D	E	F	G
D P 7 ☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	

P200152

This is not a variant configurator.

Product configuration model code

A	B	C	D	E	F	G	H	Part number
DP700	02	01	01	02	04	01	--	11126310
DP700	03	01	01	02	04	01	--	11126311
DP710	02	01	02	02	04	01	--	11126323
DP710	03	01	02	02	04	01	--	11126324
DP720	02	02	02	02	04	01	--	11126326
DP720	03	02	02	02	04	01	--	11126327
DP730	02	02	02	02	02	01	00	11162884
DP730	03	02	02	02	02	01	00	11162885
DP730	02	02	02	02	02	01	01	11162887
DP730	03	02	02	02	02	01	01	11162888

A—Model name

Code	Description
DP700	PLUS+1® Mobile Machine Displays
DP710	
DP720	
DP730	

B—LCD options

Code	Description
02	Standard—Transmissive
03	High performance—Transmissive-Enhanced View TFT

C—Touch screen options

Code	Description
01	None
02	Projective Capacitive touch

Ordering information

D—Input/output options

Code	Description
01	User configurable 1 CAN, 2 AIN/DIN, 2 DIN/AIN/FreqIN/Rheo/4-20 mA IN, DOUT 2 CAN, 2 DIN/AIN/FreqIN/Rheo/4-20 mA IN, DOUT
02	User configurable 1 CAN, 2 AIN/DIN, 2 DIN/AIN/FreqIN/Rheo/4-20 mA IN, 2 Video IN, DOUT 2 CAN, 2 DIN/AIN/FreqIN/Rheo/4-20 mA IN, 2 Video IN, DOUT

E—Flash memory/application key

Code	Description
02	512 MB/without application key

F—USB port type

Code	Description
04	USB device rear/USB host rear or front
02	USB device rear/USB host rear

G—Application log (vault memory)

Code	Description
01	16 MB

H—Bezel color

Code	Description
00	Black
01	Gray

Related products

Connector bag assemblies

Description	Part numbers
12-pin connector kit (16 to 20 AWG)	10102025
12-pin connector kit (20 to 24 AWG)	10100944
Mating connector kit with camera cable[*]	11130520
USB cable (device only)	11130518
USB cable (device and host)	11130519

[*] Only valid for DP710, DP720, and DP730.

Connection tools

Description	Part numbers
Crimp tool 16 to 20 AWG	10100744
Crimp tool 20 to 24 AWG	10100745

Ordering information

Mounting kit

Description	Part number
Panel mounting kit	11144800

Software

Description	Part number
PLUS+1® GUIDE Professional Software (includes 1 year of software updates, a single user license, Service and Diagnostic Tool and Screen Editor)	11179523 (annual renewal with 11179524 to keep the software updates)

Service Parts

Description	Part number
USB replacement kit	11202184

Inputs/outputs

Inputs

DP7XX Series displays support the following pin types:

- Digital or Analog (DIN/AIN)
- Multifunction (DIN/AIN/FreqIN, Rheo, 4–20 mA)
- Fixed Range Analog or CAN shield (AIN/CAN shield)

DP7XX Series displays have input pins that support multiple functions. Pins that support multiple input types are user-configurable using PLUS+1® GUIDE software.
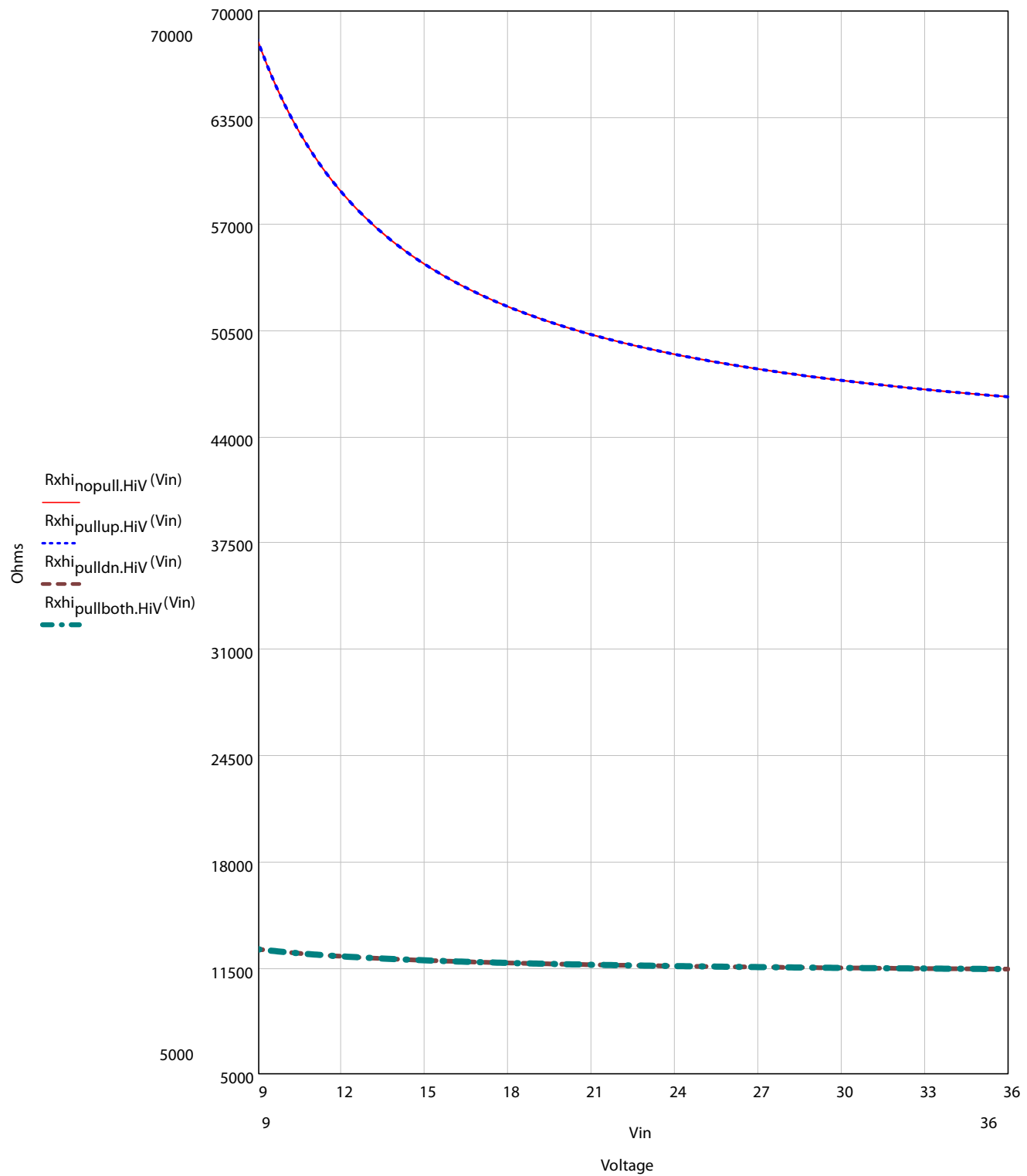
Digital/analog

Middle range

Description	Unit	Minimum	Typical	Maximum	Comment
Minimum discernible voltage	mV	—	—	0.03	—
Minimum discernible voltage	mV	5.64	5.78	5.92	—
Resolution	mV	—	1.4	—	—
Worst case offset and gain error	mV	—	—	±0.14	$V_{Measure}$ = 5.78 V
Non-linearity	mV	—	—	±8.5	—
Input impedance	kΩ	230	233	236	No pull up or pull down
Input impedance (5V/GND)	kΩ	13.9	14.1	14.3	Pull up or pull down
Input impedance (2.5V)	kΩ	7.1	7.3	7.4	Pull up and pull down

High range

Description	Unit	Minimum	Typical	Maximum	Comment
Minimum discernible voltage	mV	—	—	0.16	—
Minimum discernible voltage	mV	37.5	38.8	40.1	—
Resolution	mV	—	9.5	—	—
Worst case offset and gain error	mV	—	—	±1.3	$V_{Measure}$ = 38.8 V
Non-linearity	mV	—	—	±56.8	—
Input impedance	kΩ	108.2	109.3	110.4	No pull up or pull down (Vin < 5.7 V)
Input impedance (5V/GND)	kΩ	13.0	13.2	13.4	Pull up or pull down (Vin < 5.7 V)
Pull up and pull down input impedance (2.5V)	kΩ	6.9	7.0	7.1	Pull up and pull down (Vin < 5.7 V)

Inputs/outputs

High range input impedance for analog inputs

Legend:

$Rxhi_{nopull.HiV}$ (Vin) — red solid line

$Rxhi_{pullup.HiV}$ (Vin) — blue dotted line

$Rxhi_{pulldn.HiV}$ (Vin) — dark red dashed line

$Rxhi_{pullboth.HiV}$ (Vin) — teal dash-dot line

yru148581580292

Inputs/outputs

Multifunction

Frequency input low range (PPU)

Description	Unit	Minimum	Maximum	Comment
Range	Hz	0	10000	In steps of 1 Hz
Sensitivity	mVpp	1000	—	Sinus peak-to-peak
Low threshold voltage	mV	75	200	—
High threshold voltage	mV	150	350	—
Input impedance	kΩ	233 ± 3		To 0 V
Input impedance with pull-down	kΩ	14.1 ± 0.3		To 0 V
Input impedance with pull-up	kΩ	14.1 ± 0.3		To 5 V
Input impedance with pull-up/down	kΩ	7.27 ± 0.2		To 2.5 V

Frequency input normal range (PPU)

Description	Unit	Minimum	Maximum	Comment
Range	Hz	0	10000	In steps of 1 Hz
Range (phase and quad)	Hz	0	5000	When measuring phase or quadrature counts
Low threshold voltage	V	1.1	2.6	—
High threshold voltage	V	2.2	4.4	—
Input impedance	kΩ	233 ± 3		To 0 V
Input impedance with pull-down	kΩ	14.1 ± 0.3		To 0 V
Input impedance with pull-up	kΩ	14.1 ± 0.3		To 5 V
Input impedance with pull-up/down	kΩ	7.27 ± 0.2		To 2.5 V

Resistance input

Description	Unit	Minimum	Maximum	Comment
Range	Ω	0	10000	In steps of 1 Ω
Resolution		1		@ 0 Ω
		2		@ 1 kΩ
		42		@ 10 kΩ
Source current	m	0	4	—

4–20 mA input

Description	Unit	Minimum	Maximum	Comment
Range	mA	0	50	—
Resolution	µA	22		—
Worst case error	mA	±(0.2 + I*3%)		—
Input impedance	Ω	100 ± 2		To 0 V
Shut-off current	mA	54		—

Inputs/outputs

⚠ Warning

Using these inputs can affect the accuracy of any Safety Critical closed loop control. These displays do not have a Real Time Operating System (RTOS). Do not use these displays as the master control for any type of safety critical control, or closed loop control system. Frequency inputs are managed by the operating system. Accuracy can be affected by processor load. These displays should only be used for non-safety critical related functions.

Encoder

The encoder input is only suitable for user interface functions, such as, navigating in menus and adjusting values because there is no guarantee that all pulses are detected and the detected direction can be false. The rate of pulses should be kept at a few tens per second to minimize the loss of detected position changes.

The encoder function samples the A and B signals from the encoder and increments or decrements the counter according to the phase sequence. The counter is incremented/decremented on every low to high and high to low edge of the A signal. Some encoders with detents give a complete pulse between detents and the counter will be incremented/decremented by two for every detent. The counter is incremented when the A signal is the leading phase and decremented in the opposite case.

Outputs

Digital output

Only to be used for buzzer output.

USB

USB Input/Output

Description	Unit	Minimum	Maximum	Typical	Comment
2.0 full speed	Mbit/s	—	—	12	—
Vbus input voltage	V	—	—	> 4.4	—
Vbus input resistance	kΩ	—	—	70	Vbus < 5.25 V
Short circuit protection (No damage)	V	0	36	—	—
Vbus output voltage	V	4.75	5.25	—	—
Vbus output current	A	—	—	0.5	—
Vbus short current	A	—	1.1	—	—

The DP7XX series displays all have USB ports that support memory sticks and computer connection. The DP7XX functions as a device when connected to a computer for diagnosis purposes or software download. The DP7XX functions as a host when a standard USB memory stick is connected so log-data can be transferred. There is also an option for a front type-A USB connector. The front connector is USB host, the rear connector is USB host and device. You can only use one host connection at a time (either front or rear), but you can use front host and rear device at the same time.

Other than supporting memory sticks and computer connection, the DP7XX series display USB port does not support any other standard computer peripherals.

Inputs/outputs

Video

Video output

Description	Unit	Minimum	Maximum	Typical	Comment
Short circuit protection	V	0	36	—	—
12 V output voltage (9 V < Ubat < 70 V)	V	11.5	12.5	12	—
12 V output current	A	—	—	0.5	Vbus < 5.25 V
24 V output voltage (9 V < Ubat < 70 V)	V	23	24	24	—
24 V output current	A	—	0.5	—	—
Video inputs	—	—	—	—	Both NTSC and PAL support

To power the camera up, it is recommended to use the display as power supply. If using a different power supply, it should meet the specification of the camera in regards of the voltage type and range, the current and voltage amount it can supply to its load, stability of the output voltage and current under varying line and load conditions, operating/storage temperature ranges.

The use of a different power supply for the camera can create "noise" on the signal line which will affect its functionality.

Real Time Clock (RTC)

Parameter	Min	Max	Units
Backup Time	1		month
Drift		10	s/day

Controller Area Network (CAN) specifications

CAN shield/analog inputs

The CAN shield pin on the unit can be used as a non-configurable analog input.

The values in the following table assumes that software compensates for errors in the analog to digital (A/D) converter.

CAN shield

Description	Unit	Minimum	Maximum	Typical	Comment
Input impedance	—	—	—	0.68 µF + 1 Ω	—

Analog input (5 V only)

Description	Unit	Minimum	Maximum	Comment
Allowed voltage at pin	V	0	36	—
Measuring range	V	0	5.75	—
Resolution	mV	1.4		—
Worst case error	mV	±(20 + U*2%)		—
Input impedance	kΩ	233 ± 3		—

Analog input

Analog input (5 V only)

Description	Unit	Minimum	Maximum	Comment
Allowed voltage at pin	V	0	36	—
Measuring range	V	0	5.75	—
Resolution	mV	1.4		—
Worst case error	mV	±(20 + U*2%)		—
Input impedance	kΩ	233 ± 3		—

CAN communication

CAN communication

Description	Unit	Minimum	Maximum	Typical	Comment
Available baud rates	kBd	50	1000	50	With 120 Ω termination. The default baud rate is 250kbit.
				100	
				125	
				250	
				500	
				1000	
Maximum input voltage range	V	0	36	—	—

Gateway channels

PLUS+1® Service Tool can be connected to the CAN bus by using the following gateway channels.

Controller Area Network (CAN) specifications

Gateway channels

Channel	Description
0	Display only
1	Display + CAN0
2	Display + CAN1
3	Display + CAN0+1
4	CAN0
5	CAN1
6	CAN0+1

Selecting channel zero will not increase CAN traffic because of the PLUS+1® Service Tool communication.

Another PLUS+1® Service Tool can be connected to the CAN bus by using the following gateway channels.

Simultaneous usage gateway channels

Channel	Description
0	CAN[0] and CAN[1]
1 or 4	CAN[1]
2 or 5	CAN[0]
3 or 6	No CAN port

Memory

NV memory

> ⚠️ **Caution**
>
> Non-volatile (NV) memory data loss is possible when the NV write cycle is not fully completed. When downloading a new application ensure data is not being written to NV memory.

FRAM Memory

DP7XX Series Displays use Ferroelectric Random Access Memory (FRAM). FRAM has a write endurance of over 100 trillion cycles, which is ideal for datalogging. 2kB is available for application.

Vault Memory

DP7XX Series Displays have 16 MB of flash vault memory (application logging memory). Application developers use this memory to log machine event data then use the PLUS+1® Service Tool to extract the logged data.

Accessing non-volatile or application log memory can delay the service tool scan.

Product ratings

Electrical

Supply voltage

Description	Unit	Minimum	Maximum	Comment
DC supply voltage	V	9	36	With reverse polarity protection
DC supply current (circuit board only)	A	0	1	UBat = 14 V
		0	0.5	UBat = 28 V
Power supply interruption (without rebooting)	ms	—	—	200 ms

5 V reference output

Description	Unit	Minimum	Maximum
Output voltage	V	4.8	5.2
Output current	A	0	0.5
Output short circuit	A	—	1
Short circuit protection	V	0	36
Measuring of output voltage	V	0	5.75
Resolution	mV	1.4	
Worst case error	mV	± (20+U*2%)	

⚠ **Warning**

Output pins produce high voltage. High voltage can cause fire and/or electrical shock, if flammable gasses or chemicals are present, can cause an explosion. To protect against product damage and possible injury, do not exceed power supply voltage ratings and do not store this product where flammable gasses or chemicals are present.

Environmental

Temperature

Description	Units	Minimum	Maximum	Comment
Operating temperature	˚C [˚F]	-30 [-22]	+60 [+140]	—
Storage temperature	˚C [˚F]	-30 [-22]	+80 [+176]	—

Ingress Protection (IP) rating

Series	Rating	Comment
DP700, DP710, DP720	IP67	With mating connector installed and sealing plugs in unused connections.
DP730	Front: IP69K	
	Rear: IP67	

⚠ **Warning**

Excessive high/low operating/storage temperatures can damage electronics. Damaged electronics can result in performance failure. To protect against product damage and possible injury, do not operate/store product in a environment that exceeds specified temperature ratings.

Product ratings

Testing criteria

Climatic

Condition	Rating
Cold/heat storage and operation	IEC 60068-2-1, IEC 60068-2-2
Fogging	IEC 60068
Temperature change	IEC 60068-2-14
UV tests	ASTM G155
Sunlight radiation	ISO 16750-4
Temp humidity voltage	IEC 60068-2-38

Chemical

Condition	Rating
Chemical resistance	ISO 16750-5

Mechanical

Condition	Rating
Vibration, resonance	IEC 60068-2-6
Vibration, operation	IEC 60068-2-64
Bump	IEC 60068-2-29
Shock	IEC 60068-2-27
Free fall	IEC 60068-2-32

Maintenance guidelines

> ❗ **Caution**
>
> Warranty will be voided if device is opened.
> Device is not field serviceable. Do not open the device.

LCD module

> ❗ **Caution**
>
> Prolonged exposure to direct intense sunlight can cause premature failure of the LCD module. This risk can be reduced by providing shading or mounting the display at an incline rather than the horizontal.

> ❗ **Caution**
>
> The protective glass will break if hit with a hard or heavy object. If the protective glass is broken, remove the display from your machine then return the display to Danfoss to be serviced.

Clean the display's housing and protective glass with a clean, soft, damp cloth, or mild dishwashing detergent because abrasive pads or solvents, including alcohol, benzene, and paint thinner can cause scratching and discoloration.
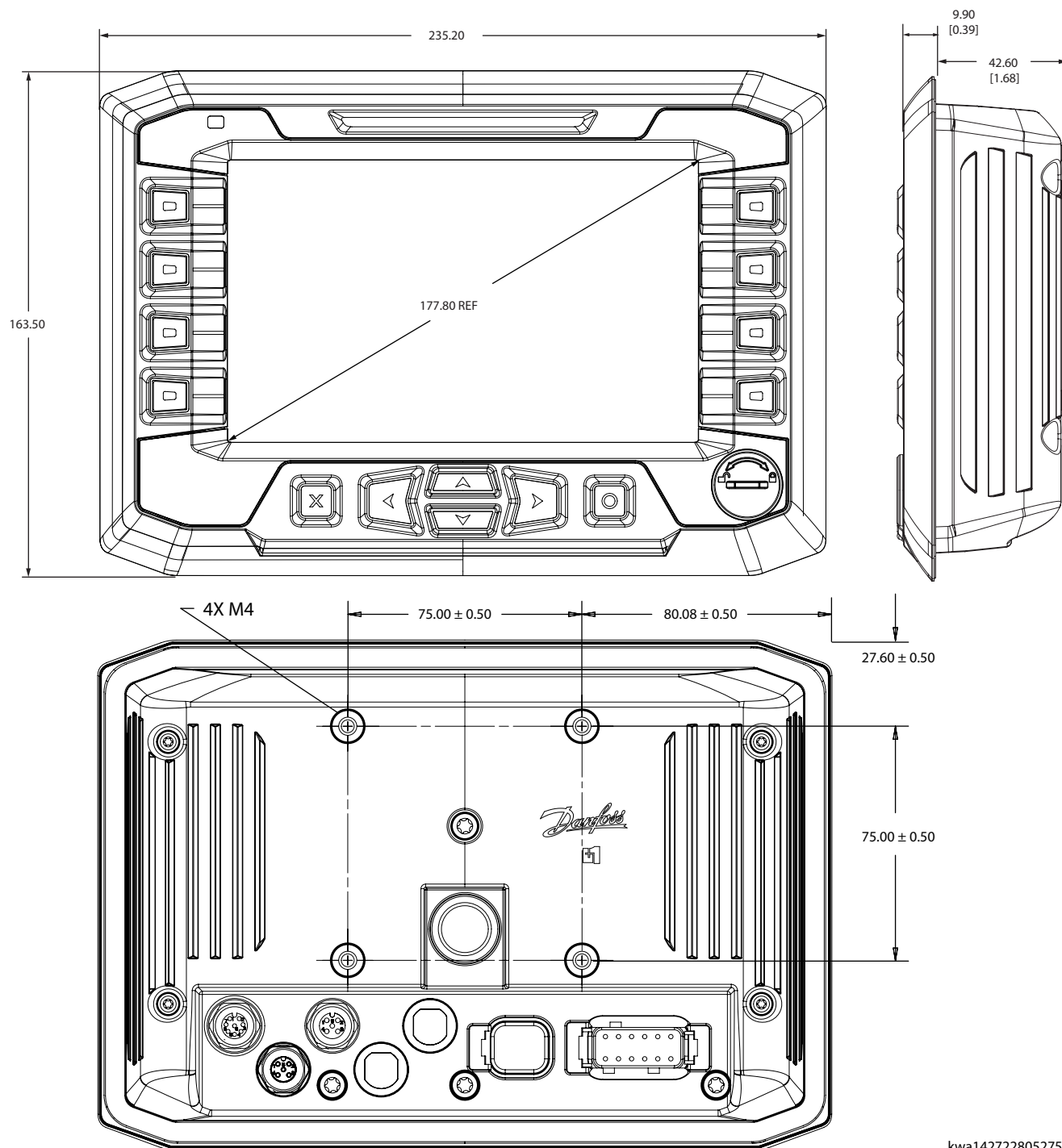
LCD press and hold feature

The DP7XX LCD press and hold registers for 5 to 6 seconds then releases. The software inside the touch screen controller prevents permanent items (such as mud on the screen) from registering as a continuous press and hold.

Installation

DP700, DP710, DP720 dimensions
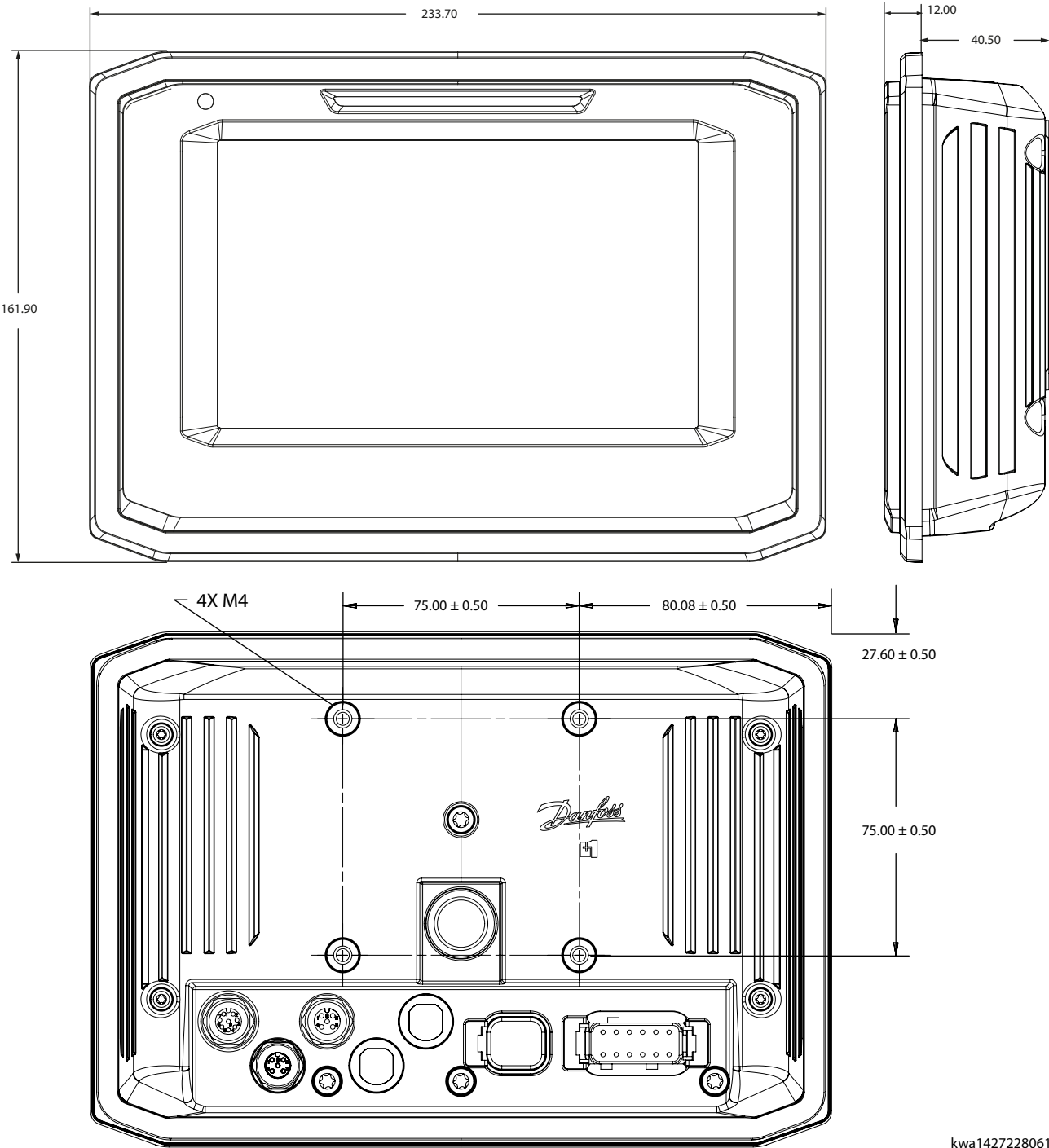
Dimensions in millimeters

235.20

163.50

177.80 REF

9.90
[0.39]

42.60
[1.68]

4X M4

75.00 ± 0.50

80.08 ± 0.50

27.60 ± 0.50

75.00 ± 0.50

kwa1427228052758

Installation

DP730 dimensions

Dimensions in millimeters

233.70

12.00

40.50

161.90

4X M4

75.00 ± 0.50

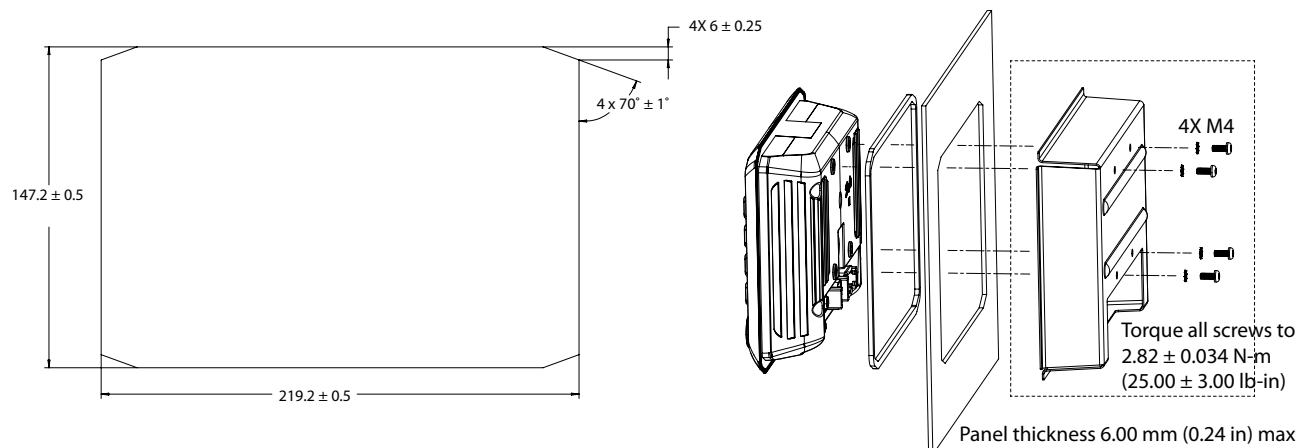80.08 ± 0.50

27.60 ± 0.50

75.00 ± 0.50

kwa1427228061493

Installation

Two mounting options

Flush mounting option

Use the Danfoss panel mounting kit (Danfoss part number 11144800) to flush-mount into a dashboard.

Panel cutout, dimensions in millimeters

4X 6 ± 0.25
4 x 70° ± 1°
147.2 ± 0.5
219.2 ± 0.5
4X M4
Torque all screws to
2.82 ± 0.034 N-m
(25.00 ± 3.00 lb-in)
Panel thickness 6.00 mm (0.24 in) max

Stand-alone on post mounting option

Mount according to VESA (Video Electronics Standards Association) Mount Standards The VESA hole pattern for these displays is: 75.00 mm x 75.00 mm (02.95 in x 02.95 in). There are four holes for four M4 screws, 0.7 mm (0.3 in) thread x 12 mm (0.47 in) maximum depth.

Dimensions in millimeters

4X M4
75.00 ± 0.50
80.08 ± 0.50
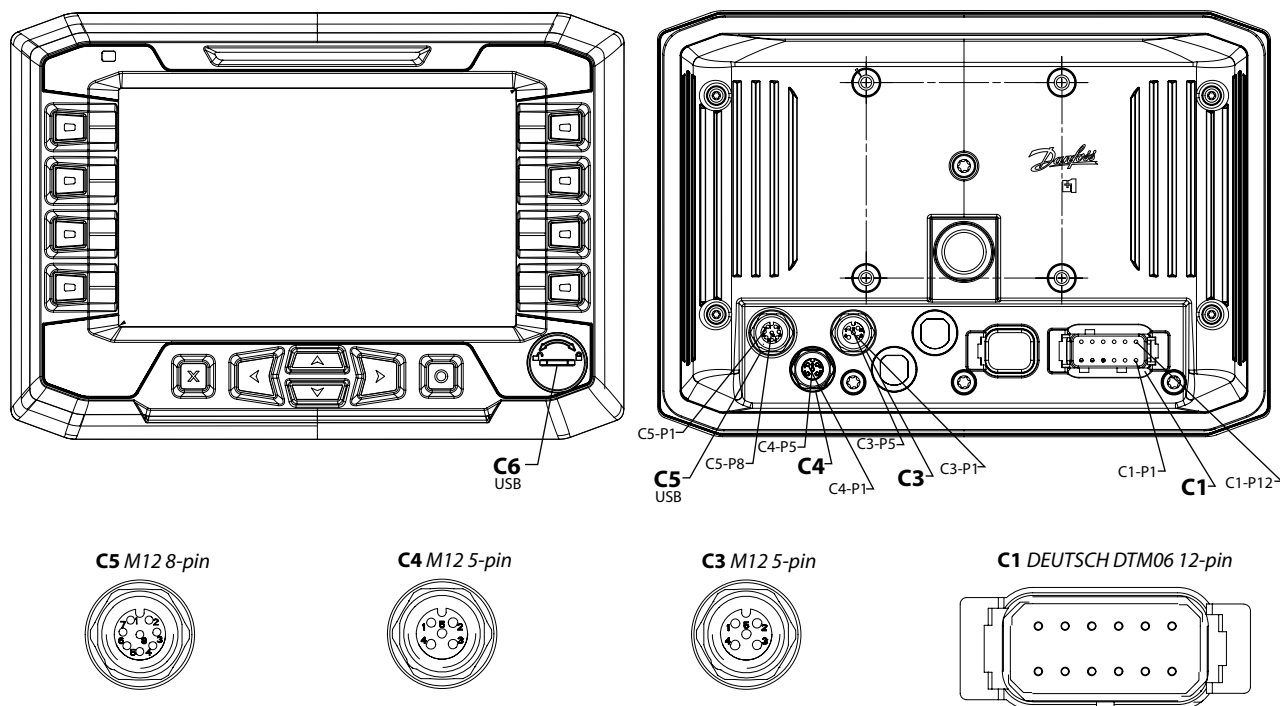27.60 ± 0.50
75.00 ± 0.50
kwa1402426014677
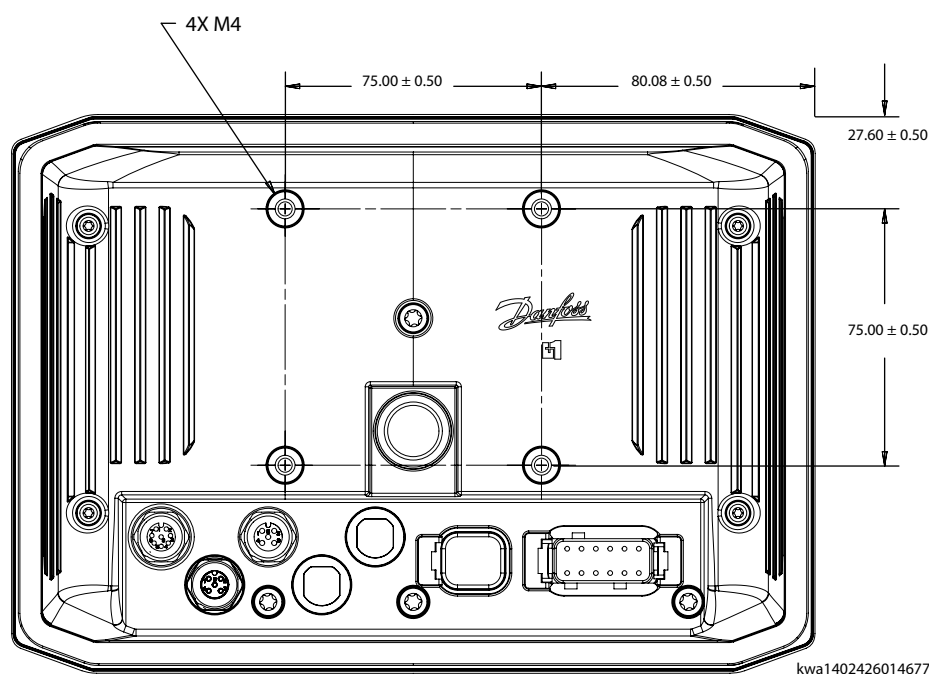
Disconnect your machine's battery power before connecting power and signal cables to the display.

Installation

DP700, DP710, DP720 connectors pin assignments


C6 USB

C5 USB   C5-P1   C5-P8   **C4** C4-P5   C4-P1   **C3** C3-P5   C3-P1   C1-P1   **C1** C1-P12

C5 *M12 8-pin*   **C4** *M12 5-pin*   **C3** *M12 5-pin*   **C1** *DEUTSCH DTM06 12-pin*

C6 pin	Function	C5 pin	Function	C4 pin	Function	C3 pin	Function	C1 pin	Function
C6-P1	USB host VBus	C5-P1	USB device Vbus	C4-P1	Video power ground	C3-P1	Video power ground	C1-P1	Power ground -
C6-P2	USB host D-	C5-P2	USB device D-	C4-P2	Video power supply	C3-P2	Video power supply	C1-P2	Power supply +
C6-P3	USB host D+	C5-P3	USB device D+	C4-P3	Video signal input 1	C3-P3	Video signal input 2	C1-P3	CAN0 High +
C6-P4	USB host GND	C5-P4	USB device GND	C4-P4	Video signal input ground	C3-P4	Video signal input ground	C1-P4	CAN0 Low -
		C5-P5	USB host GND/ RS232 GND	C4-P5	NC	C3-P5	NC	C1-P5	AIN/CAN Shield
		C5-P6	USB host D+/ RS232 RxD					C1-P6	CAN1 High +/ (AIN/DIN)
		C5-P7	USB host D-/RS232 TxD					C1-P7	CAN1 Low -/(AIN/ DIN)
		C5-P8	USB host Vbus					C1-P8	Sensor power/ (AIN/DIN)
								C1-P9	Sensor ground
								C1-P10	Multifunction-input
								C1-P11	Multifunction-input
								C1-P12	DOUT

Installation

DP730 connectors pin assignments

C5 *M12 8-pin*   **C4** *M12 5-pin*   **C3** *M12 5-pin*   **C1** *DEUTSCH DTM06 12-pin*
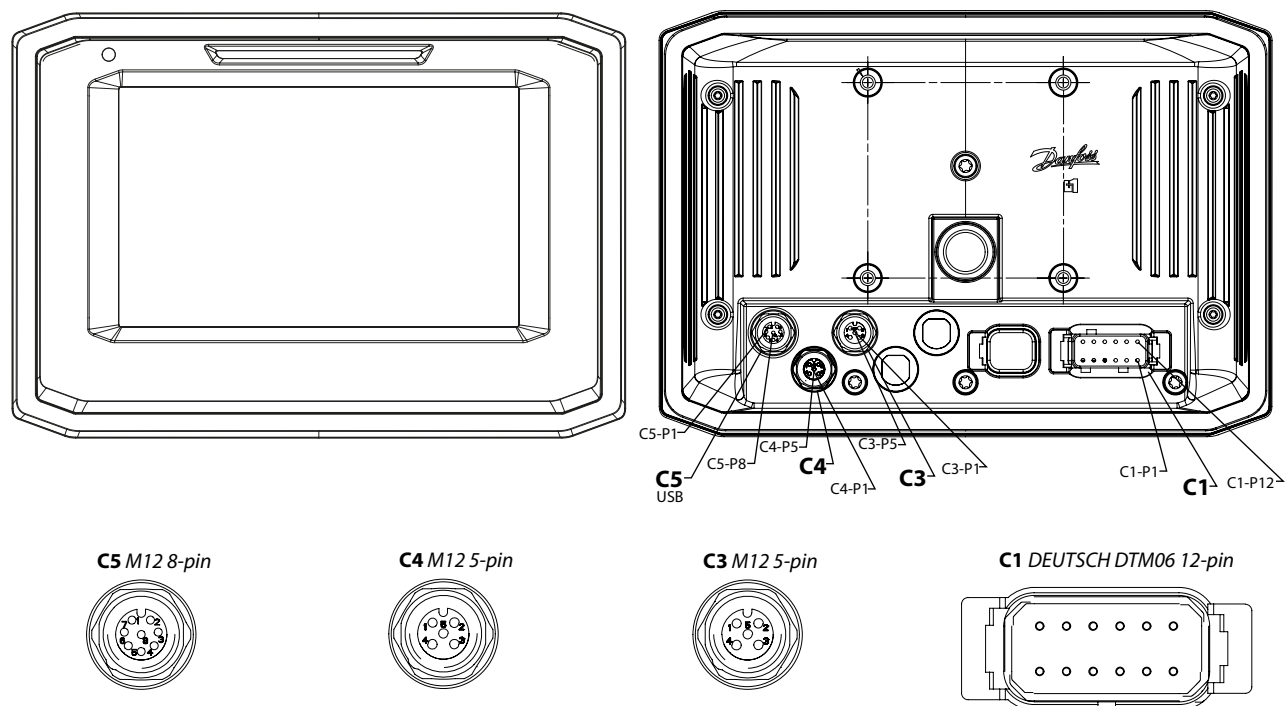
C5 pin	Function	C4 pin	Function	C3 pin	Function	C1 pin	Function
C5-P1	USB device Vbus	C4-P1	Video power ground	C3-P1	Video power ground	C1-P1	Power ground -
C5-P2	USB device D-	C4-P2	Video power supply	C3-P2	Video power supply	C1-P2	Power supply +
C5-P3	USB device D+	C4-P3	Video signal input 2	C3-P3	Video signal input 1	C1-P3	CAN0 High +
C5-P4	USB device GND	C4-P4	Video signal input ground	C3-P4	Video signal input ground	C1-P4	CAN0 Low -
C5-P5	USB host GND/RS232 GND	C4-P5	NC	C3-P5	NC	C1-P5	CAN shield/AIN
C5-P6	USB host D+/RS232 RxD					C1-P6	CAN1 High +/(AIN/DIN)
C5-P7	USB host D-/RS232 TxD					C1-P7	CAN1 Low -/(AIN/DIN)
C5-P8	USB host Vbus					C1-P8	Sensor power/(AIN/DIN)
						C1-P9	Sensor ground
						C1-P10	Multifunction-input
						C1-P11	Multifunction-input
						C1-P12	DOUT

Installation

Machine wiring guidelines

⚠️ **Warning**

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. Improperly protected power input lines against over current conditions may cause damage to the hardware. Properly protect all power input lines against over-current conditions. To protect against unintended movement, secure the machine.

🛑 **Caution**

Unused pins on mating connectors may cause intermittent product performance or premature failure. Plug all pins on mating connectors.

- Protect wires from mechanical abuse, run wires in flexible metal or plastic conduits.
- Use 85˚ C (185˚ F) wire with abrasion resistant insulation and 105˚ C (221˚ F) wire should be considered near hot surfaces.
- Use a wire size that is appropriate for the module connector.
- Separate high current wires such as solenoids, lights, alternators or fuel pumps from sensor and other noise-sensitive input wires.
- Run wires along the inside of, or close to, metal machine surfaces where possible, this simulates a shield which will minimize the effects of EMI/RFI radiation.
- Do not run wires near sharp metal corners, consider running wires through a grommet when rounding a corner.
- Do not run wires near hot machine members.
- Provide strain relief for all wires.
- Avoid running wires near moving or vibrating components.
- Avoid long, unsupported wire spans.
- Ground electronic modules to a dedicated conductor of sufficient size that is connected to the battery (-).
- Power the sensors and valve drive circuits by their dedicated wired power sources and ground returns.
- Twist sensor lines about one turn every 10 cm (4 in).
- Use wire harness anchors that will allow wires to float with respect to the machine rather than rigid anchors.

Machine welding guidelines

⚠️ **Warning**

High voltage from power and signal cables may cause fire or electrical shock, and cause an explosion if flammable gasses or chemicals are present.
Disconnect all power and signal cables connected to the electronic component before performing any electrical welding on a machine.

The following is recommended when welding on a machine equipped with electronic components:
- Turn the engine off.
- Remove electronic components from the machine before any arc welding.
- Disconnect the negative battery cable from the battery.
- Do not use electrical components to ground the welder.
- Clamp the ground cable for the welder to the component that will be welded as close as possible to the weld.

Products we offer:

- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Hydrostatic motors
- Hydrostatic pumps
- Orbital motors
- PLUS+1® controllers
- PLUS+1® displays
- PLUS+1® joysticks and pedals
- PLUS+1® operator interfaces
- PLUS+1® sensors
- PLUS+1® software
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

Danfoss Power Solutions – your strongest partner in mobile hydraulics and mobile electrification.

Go to www.danfoss.com for further product information.

We offer you expert worldwide support for ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide you with comprehensive global service for all of our components.

Comatrol
www.comatrol.com

Turolla
www.turollaocg.com

Hydro-Gear
www.hydro-gear.com

Daikin-Sauer-Danfoss
www.daikin-sauer-danfoss.com

Local address:

Danfoss
Power Solutions (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

Danfoss
Power Solutions GmbH & Co. OHG
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

Danfoss
Power Solutions ApS
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

Danfoss
Power Solutions Trading
(Shanghai) Co., Ltd.
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 3418 5200