ENGINEERING
TOMORROW

Technical Information

PLUS+1® Mobile Machine Displays
DP570 Series

Revision history

Table of revisions

Date	Changed	Rev
January 2017	Added topic: High range input impedance for analog inputs	0701
November 2016	Minor update	0604
March 2016	Corrected literature number	0603
March 2016	Updated to Engineering Tomorrow design	0602
February 2016	DP570 overview text changes; Linux® operating system text changes	0601
July 2015	Vault memory, removed reference to USB port (DP570 does not have one)	FB
March 2015	Various	FA
February 2015	Converted to Danfoss layout; Ingress Protection (IP) rating updated; new drawing with updated bracket and seal for flush mounted option	EA
December 2013	Model feature	DA
November 2013	Screw lengths and torque	CA
November 2013	Operating temperature	BA
November 2013	First edition	AA

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Literature references

DP570 reference literature

Literature title	Literature type	Literature number
DP570 Series PLUS+1® Mobile Machine Displays	Technical Information	L1328765
DP570 Series PLUS+1® Mobile Machine Displays	Data Sheet	L1317788
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

This user operation manual (OM) details information regarding the PLUS+1® GUIDE tool set that is used to build PLUS+1® applications. This OM covers the following broad topics:

- How to use the GUIDE graphical application development tool to create machine applications
- How to configure module input and output parameters
- How to configure module input and output parameters
- How to download 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

Danfoss product literature is online at: *http://powersolutions.danfoss.com/literature/*

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.

DP570 Series Displays

DP570 Series Displays are designed to perform in the most extreme mobile machine environments. The latest technology with backlight 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.

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

DP570 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 DP570” in your written request to:

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

Ordering information

Product naming convention

DP570 model code

A					B		C		D		E		F		G	
D	P	5	7	0												

P200166

This is not a variant configurator.

Product configuration model code

A	B	C	D	E	F	G	Part number
DP570	01	00	00	00	00	01	11134525
DP570	01	00	00	00	01	01	11130432
DP570	01	00	00	00	00	00	11140997
DP570	01	00	00	00	01	00	11140996

A—Model name

Code	Description
DP570	PLUS+1® Mobile Machine Displays

B—Input/output options

Code	Description
01	User configurable: 1 CAN, 2 DIN/AIN, 2 DIN/AIN/4-20 mA, 2 Multi-function, 1 DOUT or 2 CAN, 2 DIN/AIN/4-20 mA, 2 Multi-function, 1 DOUT

C—Real time clock

Code	Description
00	RTC

D—Flash memory/application key

Code	Description
00	512 MB/without application key

E—Application log (vault memory)

Code	Description
00	16 MB

F—Video input options

Code	Description
00	None
01	One video input

Ordering information

G—Mounting options

Code	Description
00	Post mounting
01	Panel mounting

Related products

Mating connector kit contents

Description	Part numbers
M12 5 pin male connector	11130712
DEUTSCH terminal	10100743
16 to 22 AWG crimp tool	10100744
20 AWG crimp tool	10100745
12 pin DEUTSCH WM 125 locking plug	10100741
DEUTSCH DTM06-12SA 12 pin connector kit (16 to 22 AWG)	10102025
DEUTSCH DTM06-12SA 12 pin connector kit (20 AWG)	10100944
Connection-kit DP570 with camera cable	11145163

Accessories

Description	Part numbers
Panel mounting kit	11140430
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)
Post mounting kit	11144122

Inputs/outputs

Inputs

DP570 Series Displays support the following pin types:

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

DP570 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/CAN

Normal range multifunction input

Description	Unit	Minimum	Maximum	Comment
Range	V	0	5.88	—
Resolution	mV	2.14		—
Worst case error	mV	130		—
Input impedance	kΩ	233 ± 3		To 0 V
Input impedance with pull-down	kΩ	14.1 ± 0.2		To 0 V
Input impedance with pull-up	kΩ	14.1 ± 0.2		To 5 V
Input impedance with pull-up/down	kΩ	7.3 ± 0.1		To 2.5 V

High range multifunction input

Description	Unit	Minimum	Maximum	Comment
Range	mV	0	37.296	—
Resolution	mV	14.3		—
Worst case error	V	1.296		—
Input impedance	kΩ	110 ± 2		To 0 V
Input impedance with pull-down	kΩ	13.2 ± 0.2		To 0 V
Input impedance with pull-up	kΩ	13.2 ± 0.2		To 5 V
Input impedance with pull-up/down	kΩ	7 ± 0.1		To 2.5 V

Digital/Analog/4-20mA

Normal range multifunction input

Description	Unit	Minimum	Maximum	Comment
Range	V	0	5.88	—
Resolution	mV	2.14		—
Worst case error	mV	130		Over the full temperature range -30° C to +60° C (-22° F to +140° F)
Input impedance	kΩ	233 ± 3		No pull up or pull down
Input impedance with pull-down	kΩ	14.1 ± 0.2		Pull down to ground
Input impedance with pull-up	kΩ	14.1 ± 0.2		Pull up to +5 V
Input impedance with pull-up/down	kΩ	7.3 ± 0.1		Pull up to +2.5 V

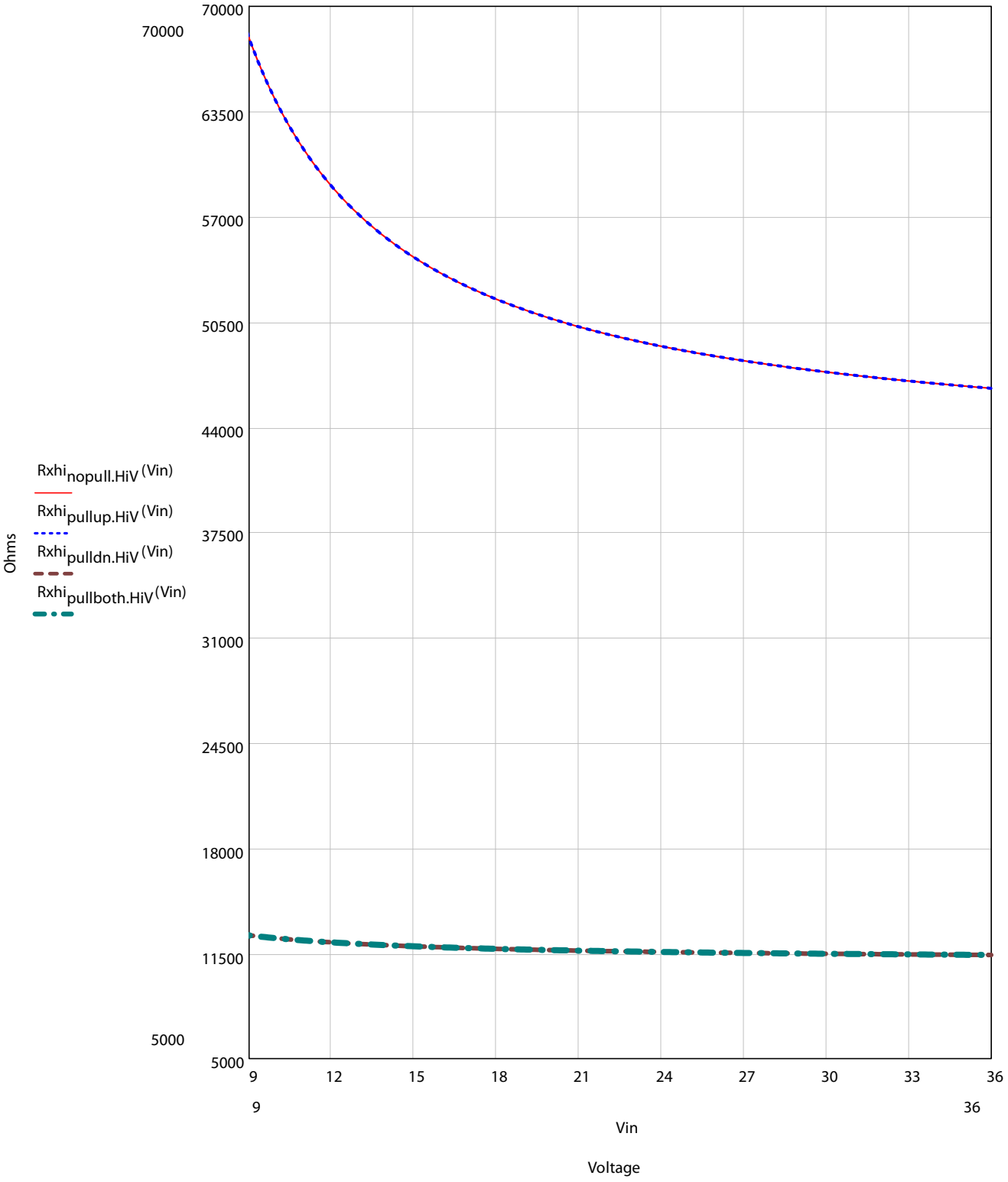
Inputs/outputs

Current input

Description	Unit	Minimum	Maximum	Comment
Range	mA	0	5.43	—
Resolution	µA	21		—
Worst case error	mA	1.7		Over the full temperature range -30° C to +60° C (-22° F to +140° F)
Input impedance	Ω	100.76 ± 0.1		—

Inputs/outputs

High range input impedance for analog inputs



Inputs/outputs

Multifunction

Low range frequency input PPU

Description	Minimum	Typical	Maximum	Comment
Minimum discernible voltage	0 mV	—	12.9 mV	—
Maximum discernible voltage	377 mV	404 mV	431 mV	—
Precision	—	—	0.149 mV	—
Worst case error	—	—	27 mV	Over the full temperature range -30° C to +60° C (-22° F to +140° F)
Rising voltage threshold	0.11 V	—	0.30 V	Voltage required for frequency input to read high
Falling voltage threshold	0.04 V	—	0.22 V	Voltage required for frequency input to read low
Input impedance	230 kΩ	233 kΩ	236 kΩ	No pull up or pull down
Input impedance	13.9 kΩ	14.1 kΩ	14.3 kΩ	Pull up to +5V or pull down to ground
Input impedance	7.2 kΩ	7.3 kΩ	7.4 kΩ	Pull to +2.5V

Middle range frequency input PPU

Description	Minimum	Typical	Maximum	Comment
Minimum discernible voltage	0 mV	—	20 mV	—
Maximum discernible voltage	5.62 V	5.75 V	5.88 V	—
Precision	—	—	2.14 mV	—
Worst case error	—	—	130 mV	Over the full temperature range -30° C to +60° C (-22° F to +140° F)
Rising voltage threshold	0.178 V	—	3.92 V	Voltage required for frequency input to read high
Falling voltage threshold	0.84 V	—	2.79 V	Voltage required for frequency input to read low
Input impedance	230 kΩ	233 kΩ	236 kΩ	No pull up or pull down
Input impedance	13.9 kΩ	14.1 kΩ	14.3 kΩ	Pull up to +5V or pull down to ground
Input impedance	7.2 kΩ	7.3 kΩ	7.4 kΩ	Pull to +2.5V

High range frequency input PPU

Description	Minimum	Typical	Maximum	Comment
Minimum discernible voltage	0 mV	—	130 mV	—
Maximum discernible voltage	34.704 V	36 V	37.296 V	—
Precision	—	—	14.3 mV	—

Inputs/outputs

High range frequency input PPU (continued)

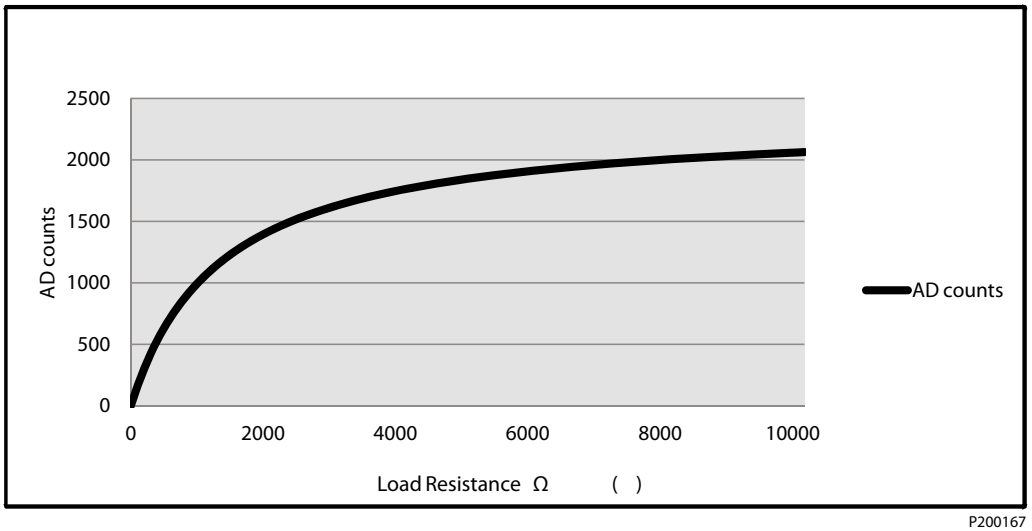
Description	Minimum	Typical	Maximum	Comment
Worst case error	—	—	1.296 mV	Over the full temperature range -30° C to +60° C (-22° F to +140° F)
Rising voltage threshold	11.83 V	—	26.55 V	Voltage required for frequency input to read high
Falling voltage threshold	5.61 V	—	18.89 V	Voltage required for frequency input to read low
Input impedance	108 kΩ	110 kΩ	112 kΩ	No pull up or pull down
Input impedance	13.0 kΩ	13.2 kΩ	13.4 kΩ	Pull up to +5V or pull down to ground
Input impedance	6.9 kΩ	7 kΩ	7.1 kΩ	Pull to +2.5V

Resistance input

Description	Unit	Minimum	Maximum	Comment
Range	Ω	0	10000	—
Resolution	—	—	—	—
Source current	mA	0	3.6*	—

* When configured as a resistance/rheostat/temp sensor input, the device will provide up to 3.76 mA current to an external load which can then be measured. The equation for calculating AD counts for a given load is: AD counts = (2338* RL / (RL + 1330)).

Rheostat inputs: AD counts and load relationship



P200167

4–20 mA input

Description	Unit	Minimum	Maximum	Comment
Range	mA	0	54.3	—
Resolution	µA	21		—

Inputs/outputs

4–20 mA input (continued)

Description	Unit	Minimum	Maximum	Comment
Worst case error	mA	1.7		Over the full temperature range -30° C to +60° C (-22° F to +140° F
Input impedance	Ω	100.76 ± 2		—
Maximum over-current voltage	V	5.43		—

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.

Video

There is one video input, which can accept either NTSC or PAL video signals.

Outputs

Video power output

Description	Unit	Minimum	Maximum	Typical	Comment
12V	V	11.58	12.42	12	—
Video camera power current	mA	0	400	—	—
Short circuit protection	V	—	36	—	—

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.

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		—

CAN communication

There are two stand-alone CAN-busses. Both CAN ports are software configurable and can be used for PLUS+1® communication. One of them can be used either as CAN or a digital-analog input.

CAN communication

Description	Unit	Minimum	Maximum	Comment
Available baud rates	kBd	50	1000	The default baud rate is 250kbit.
Maximum input voltage range	V	0	36	—

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

DP570 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

DP570 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	—	UBat = 12 V
		0	—	UBat = 24 V
Power supply interruption (without rebooting)	ms	—	—	200 ms

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

General

Description	Units	Minimum	Maximum	Comment
Operating temperature	°C [°F]	-20 [-4]	+60 [+140]	—
Storage temperature	°C [°F]	-30 [-22]	+80 [+176]	—
Ingress Protection (IP) rating	IP67			With mating connector installed and sealing plugs in unused connections.

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.

Testing criteria

Climatic

Condition	Rating
Cold/heat storage and operation	IEC 60068-2-1, IEC 60068-2-2
Temperature change	IEC 60068-2-14
Moisture ingress	IEC 60529
Sunlight radiation	ISO 16750-4
Temp humidity voltage	IEC 60068-2-38

Mechanical

Condition	Rating
Vibration, resonance	IEC 60068-2-6
Vibration, operation	IEC 60068-2-64

Product ratings

Mechanical (continued)

Condition	Rating
Bump	IEC 60068-2-29
Shock	IEC 60068-2-27
Free fall	IEC 60068-2-32

Maintenance guidelines

Opening the display's housing voids the factory warranty.

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

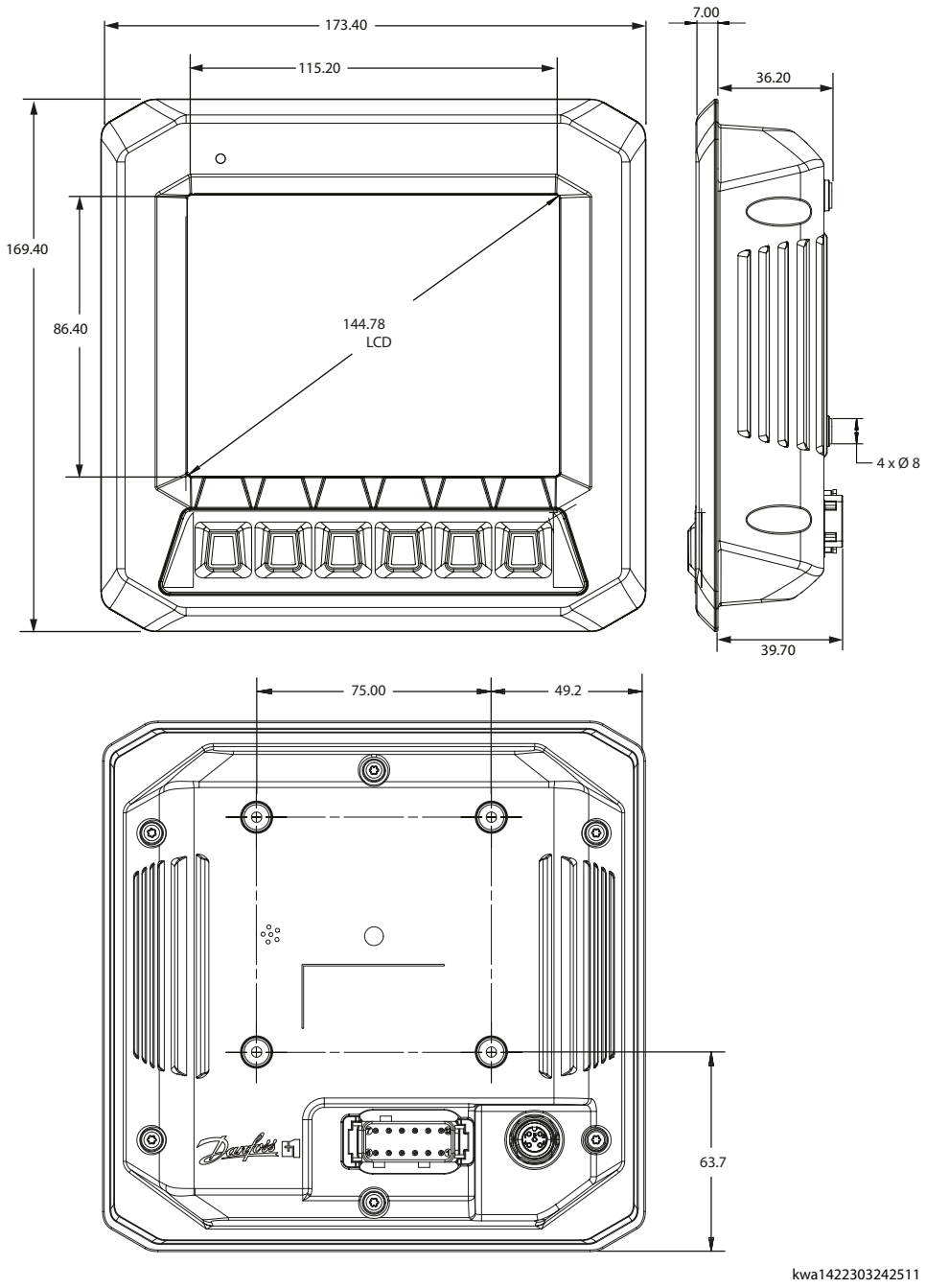
The protective glass will break if hit with a hard or heavy object. If the protective glass is broken, remove the display from your machine then return the display to Danfoss to be serviced.

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.

Installation

Dimensions

DP570 dimensions in millimeters

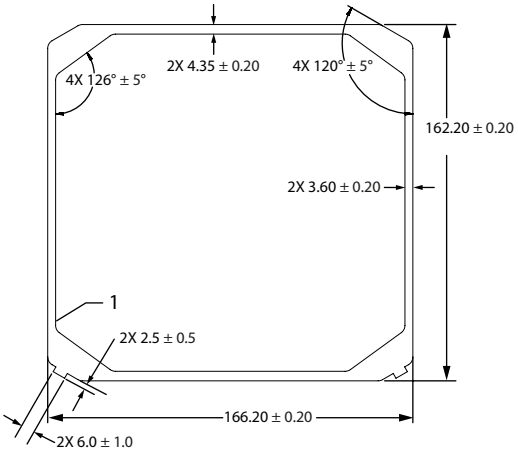


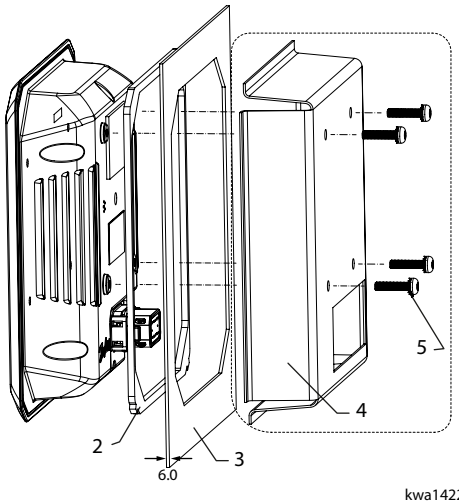
Installation

Two mounting options

Flush mounted

DP570 panel cutout and mounting kit in milimeters



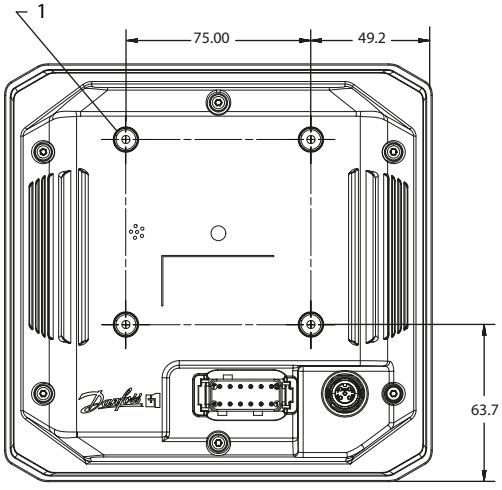


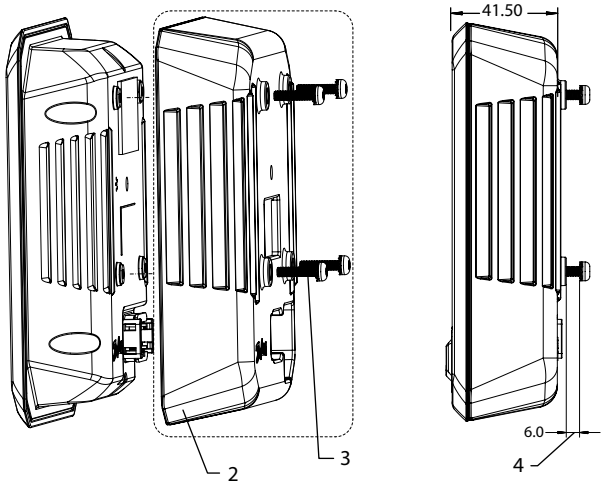
kwa1422304499473

1. 16X R (4)
2. Panel seal is part of the panel mount kit
3. Mounting panel: 6.00 mm maximum thickness
4. Panel bracket
5. M4X10 screws with lock washers (4X)

Stand-alone on post

Post mounting option in millimeters





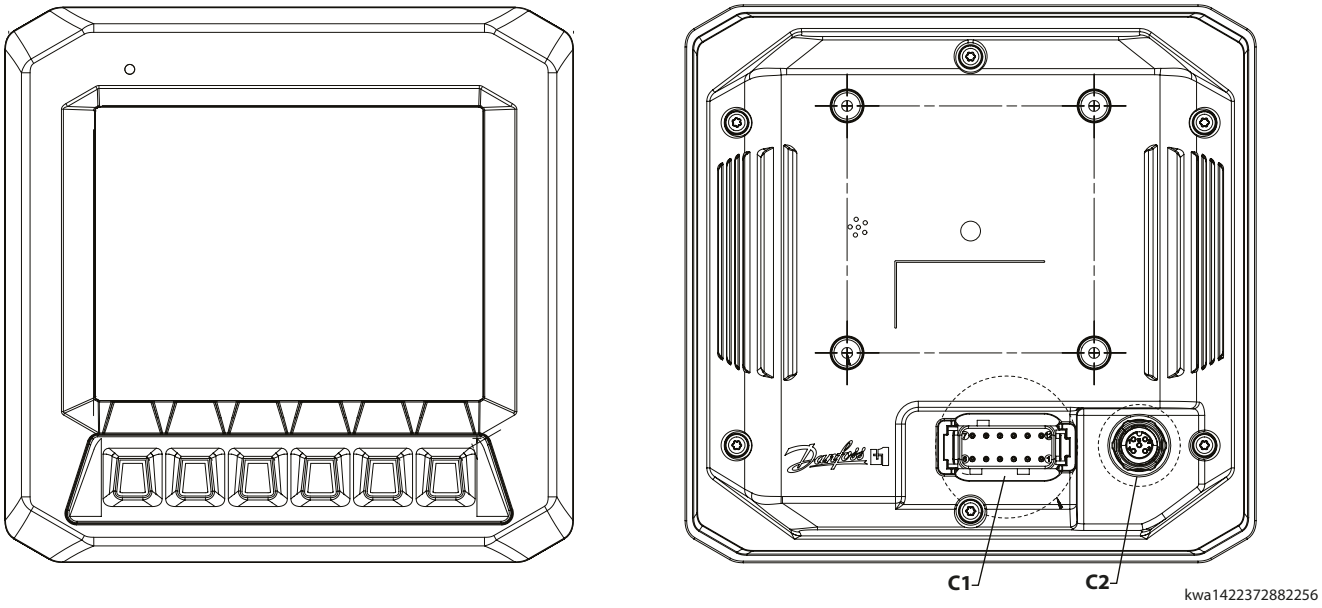
kwa1422368364473

1. 4X insert for M4 screw x 0.7 thread x 11 maximum depth
2. Post mount cover
3. M4X18 screws with Post mount cover lock washers (4X)
4. Maximum bracket thickness using screws provided with cover

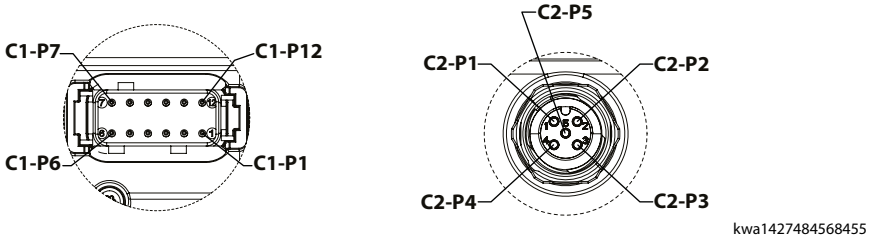
Installation

Pin assignments

DP570 pin assignments



Pin connectors



DEUTSCH DTM06 12-pin	Phoenix M12 5-pin		
C1 pin	**Function**	**C2 pin**	**Function**
C1-P1	Power Ground -	C2-P1	Video Power Ground
C1-P2	Power Input +	C2-P2	Video Power Supply
C1-P3	CAN0 High +	C2-P3	Video Signal Input 1
C1-P4	CAN0 Low -	C2-P4	Video Signal Ground
C1-P5	CAN Shield	C2-P5	NC
C1-P6	CAN1 High + or DIN/AIN		
C1-P7	CAN1 Low – or DIN/AIN		
C1-P8	DIN/AIN/4–20 mA		
C1-P9	DIN/AIN/4–20 mA		
C1-P10	Multi-function Input		
C1-P11	Multi-function Input		
C1-P12	DOUT		

Installation

Machine wiring guidelines

- 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.

Caution

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

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.

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 display 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.

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Products we offer:

- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1® GUIDE
- Proportional Valves
- Sensors
- Steering
- Transit Mixer Drives

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electronic 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. Building on our extensive applications expertise, we work closely with our customers to ensure exceptional performance for a broad range of off-highway vehicles.

We help OEMs around the world speed up system development, reduce costs and bring vehicles to market faster.

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