

Technical Information

Foot Pedal

KEP Uni-directional and Bi-directional



Revision history

Table of revisions

Date	Changed	Rev
August 2019	Updated to Engineering Tomorrow design	0502
July 2015	Converted to Danfoss layout	EA
November 2011	Corrected Option 1 and 2 drawing	DA
October 2011	Added interchangeable part number reference to Unidirectional Model Type table	CB
September 2010	Major update	CA
January 2010	Major update	BA
January 2009	Initial release	AB

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Overview

Description

The electronic foot pedal is used to drive vehicles equipped with hydrostatic transmissions and/or electronically-controlled engines. It provides an electrical signal to the engine's electronics proportional to the degree of pedal actuation. The electronic foot pedal features a sensor specifically designed for heavy vehicle applications.

Danfoss offers two types of foot pedals: Uni-directional and Bi-directional. The uni-directional uses a potentiometer sensor and was the first electronic foot pedal introduced by Danfoss in 1993. The new bi-directional type uses Hall effect sensors. Both types of foot pedals are PLUS+1[®] Compliant.

Features

Uni-directional model type

- Potentiometer sensor
- Meets or exceeds FMVSS-124 requirements
- Low pivot point eliminates need for external heel rest
- Controls acceleration and deceleration smoothly
- Potentiometer mounting location minimizes mounting space requirements and reduces vulnerability to dirt, water, and foreign contaminants
- 3 pin Weather Pack compatible connector

Bi-directional model type

- Hall effect sensors
- $14 \pm 2^\circ$ angular rotation, fore and aft
- FMVSS 124 and 302 compliant
- Dual ratiometric Automatic Protection Switching (APS) output
 - This feature provides redundancy
- Independent, isolated APS circuits
- Protected against electrical misconnection
- 6 pin Metri-Pack 150 Series connector directly on the sensor
- Two 3 pin Weather Pack compatible connector
 - These connectors are used with the recommended cable (reference [Schematics of a foot pedal connected to a PLUS+1 module](#) on page 16)
- Non contact sensor
- Black coated steel base and treadle
- Chromate conversion module components

Operation

Uni-directional model type

The electronic foot pedal accepts a typical supply voltage of 5 Vdc and varies the output from 10% to 90% of supply through the pedal's rated angle. Three standard accelerator position sensor models are available for vehicle toeboard angles ranging from 0° to 25°. Custom mounting, termination, and electrical characteristics are available upon factory request.

Bi-directional model type

The electronic foot pedal contains two independent non-contact transducers (Hall elements). The transducers are designed to operate at 5 Vdc.

Overview

The signal range for each transducer can be configured to match a machine's requirements. Currently, two different signal options are offered, reference Technical data, [Bi-directional model type](#) on page 8.

Ordering information

Use product description and part numbers for ordering electronic foot pedals. For detailed specifications, refer to chapters [Technical data](#) on page 7; [Dimensions](#) on page 9; and [Electrical connections](#) on page 13.

Uni-directional model type

Description	Foot pad	Mating connector	Angle	Signal 1	Signal 2	Transducer	Part number
KEPA14181	Uni-directional	Rubber	Weather Pack	28° ¹	10% to 90%		2500 Ohms ² KEPA14181 ³
KEPA14161	Uni-directional	Rubber	Weather Pack	35° ¹	10% to 90%		2500 Ohms ² KEPA14161 ³ 791681N ⁴
KEPA14171	Uni-directional	Rubber	Weather Pack	45° ¹	10% to 90%		2500 Ohms ² KEPA14171 ⁵

¹ Refer to Technical data, [Uni-directional model type](#) on page 7 and [Bi-directional model type](#) on page 8.

² Plus a 1K internal current limiting resistor.

³ US part number.

⁴ EU part number.

⁵ Interchangeable US part number is 11044101.

Mating electrical connector

Description	Part number
3 pin Weather Pack kit	K08620

Bi-directional model type

Description	Foot pad	Mating connector	Angle	Signal 1	Signal 2	Part number	
Option 1	Bi-directional	Rubber	6 pin Metri-Pack 150 Series	±14°	10% to 90%	90% to 10%	11065877
Option 2	Bi-directional	Rubber	6 pin Metri-Pack 150 Series	±14°	10% to 80%	20% to 90%	11065874

Danfoss recommended mating electrical wire harness and connectors

Description	Part number
6 pin Metri-Pack 150 Series	100 cm (39.37 in) from end to end
Two 3 pin Weather Pack	
3 pin Weather Pack tower kit	Used with wire harness, Danfoss part number 11065878
3 pin Weather Pack shroud kit	

Overview

Optional connector

The optional mating electrical connector for the bi-directional model type must be ordered directly from a Packard Electric (Delphi Connection Systems) supplier.

! Caution

The electrical connection may be at risk. Wiring directly to the 6 pin Metri-Pack connector, which is integral to the sensor, may not provide the flexibility and overall integrity that can otherwise be obtained by using the Danfoss recommended harness (Danfoss part number 11065878).

Optional mating electrical connector piece parts for bi-directional model type

Description		Packard Electric part number
6 pin Metri-Pack 150 Series	One Connector and Seal	12066317
	Six Terminals	12013881

Technical data

Uni-directional model type

Electrical and environmental technical data

Supply voltage	Typical: 5.0 Vdc Maximum: 16 Vdc (5 minutes)
Operating temperature	-40 to +70° C [-40 to +158° F]
Maximum rated output current	20 mA
Pedal potentiometer resistance	2500 ± 500 Ohms, plus a 1K internal current limiting resistor
Sealing of electronics	IP 66

Materials

Castings	Iridited aluminum
Potentiometer shaft	Stainless steel
Roller and spring sleeve	Glass filled nylon
Base plate	Zinc plated steel
Springs	Stainless steel

Mechanical ratings

Pedal angle (toeboard angle)	28° (16° to 25°) 35° (6° to 15°) 45° (0° to 5°)
Activation force	Typical: 2.3 Kg [5 lbs] (at start) 5.5 Kg [12 lbs] (at full travel)
Activations, full stroke	Minimum: 3 million

Signal output

Signal current	Maximum: 20 mA
Idle position	Minimum: 10% ± 2%
Full pedal stroke	Maximum: 90% + 2%, - 7%
Pedal potentiometer resistance	2500 ± 500 Ohms, plus a 1K internal current limiting resistor

Technical data

Bi-directional model type

Electrical and environmental specifications

Supply voltage (Ucc1, Ucc2) Current consumption (each Hall element)	5 Vdc \pm 0.5 Vdc Maximum: 10 mA (for both Hall elements 20 mA)
Operating temperature	-40 to +85° C [-40 to +185° F]
Sealing of electronics	IP 66

Material

Casting	Iridited aluminum
Hall element shaft	Stainless steel
Base plate	Zinc plated steel
Spring	Stainless steel
Weight	Typical: 2.6 Kg [5.6 lbs]

Mechanical ratings

Pedal angle (toeboard angle)	Maximum: 14° \pm 2°
Activations (full stroke)	Minimum: 3 million
Static load limit (forward or reverse)	Maximum: 1500 N (measured 150 mm from pivot)
Side load limit	Maximum: 500 N (measured 150 mm from pivot)
Vertical load limit (neutral)	Maximum: 1000 N (measured center of treadle on pivot axis)

Signal output

Signal current (APS1, APS2)	Maximum: 0.5 mA
Signal load	Maximum: 10 K Ohms
Short circuit of signal (APS1, APS2)	Maximum: 20 minutes

Option 1, signal level

Signal 1 range nominal (APS1)	90% +2% and -4% A 10% +4% and -2% B
Signal 2 range nominal (APS2)	10% +4% and -2% A 90% +2% and -4% B
Neutral 1 range nominal (APS1)	50% \pm 4%
Neutral 2 range nominal (APS2)	50% \pm 4%

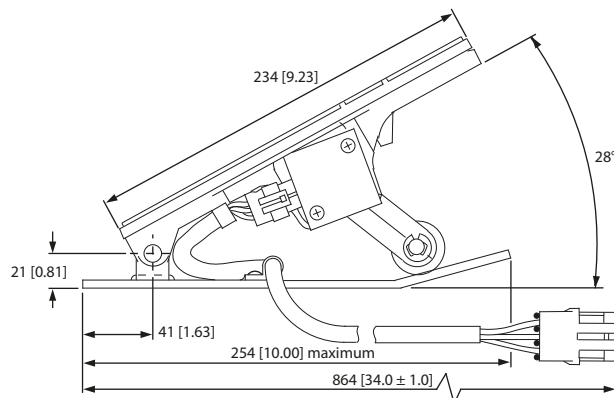
Option 2, signal level

Signal 1 range nominal (APS1)	10% +4% and -2% A 80% +2% and -4% B
Signal 2 range nominal (APS2)	20% +4% and -2% A 90% +2% and -4% B
Neutral 1 range nominal (APS1)	45% \pm 4%
Neutral 2 range nominal (APS2)	55% \pm 4%

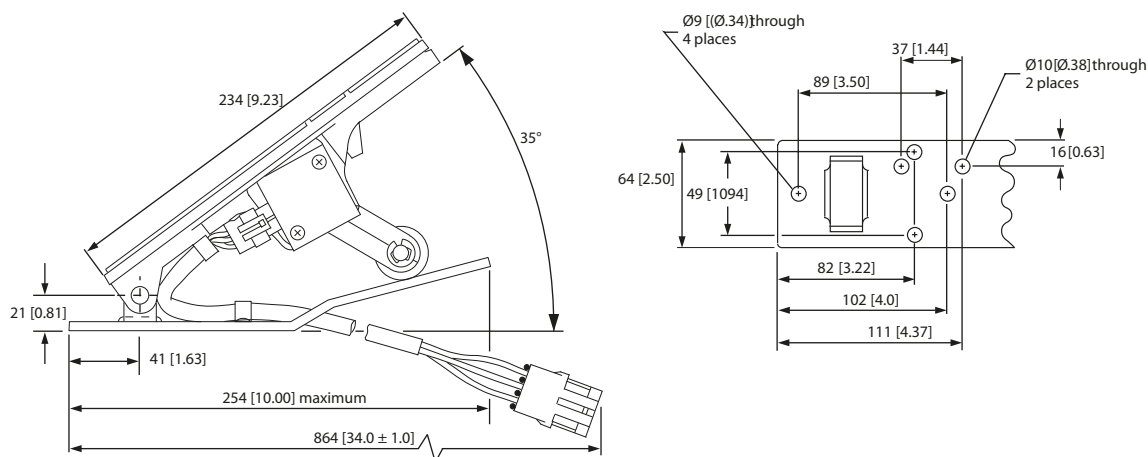
Dimensions

Uni-directional model type

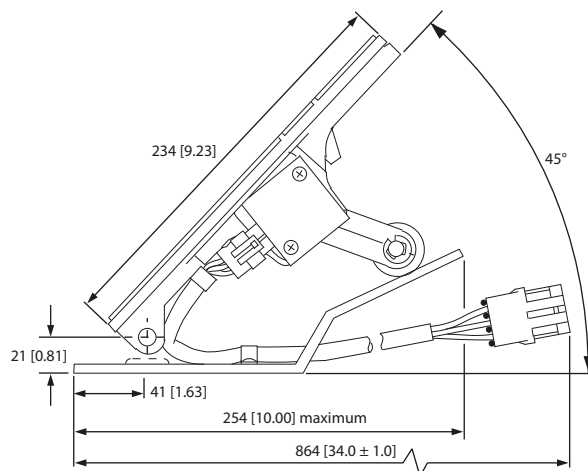
Part number KEPA14181 (mm [in])



Part number KEPA14161 (mm [in])



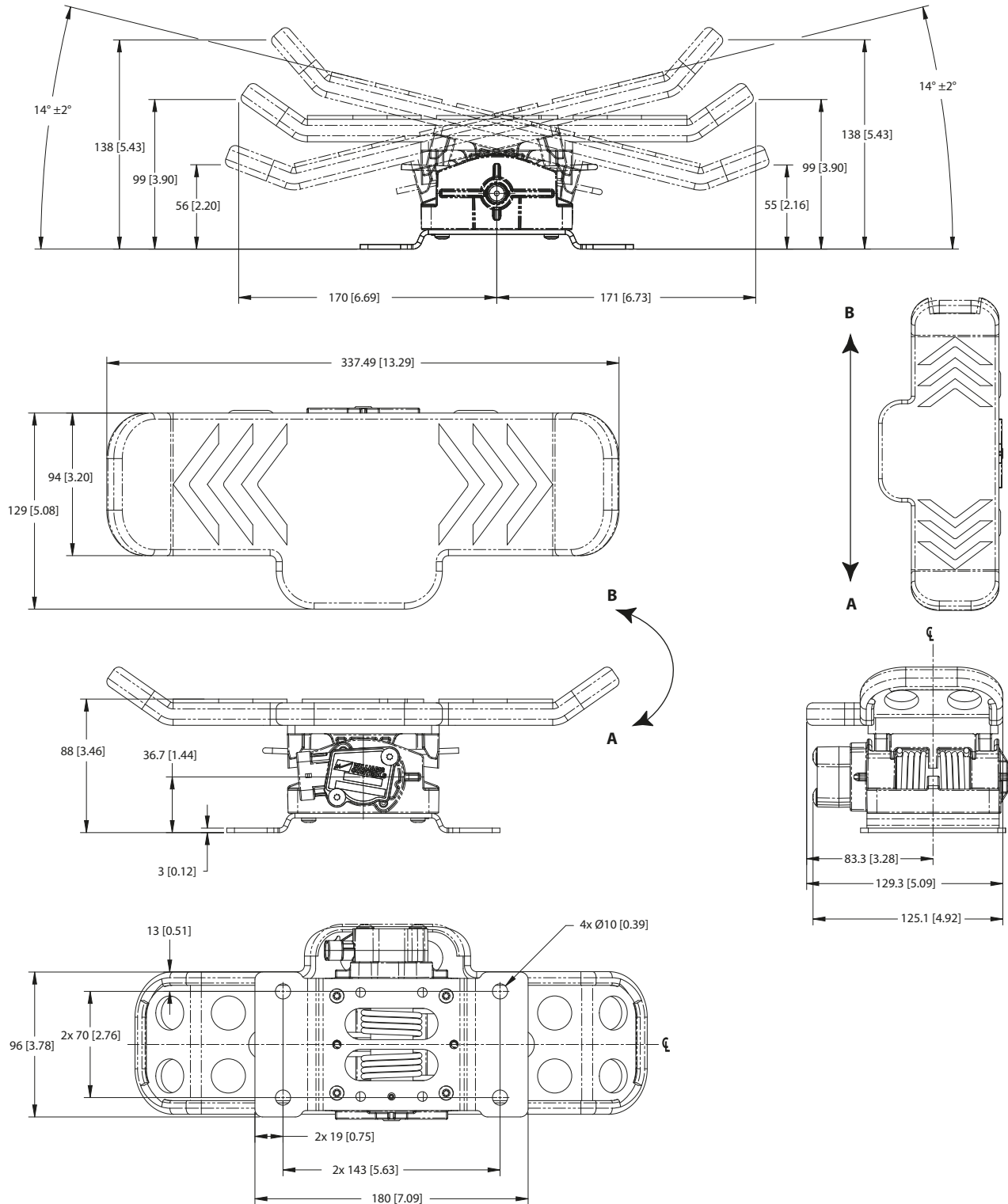
Part number KEPA14171 (mm [in])



Dimensions

Bi-directional model type

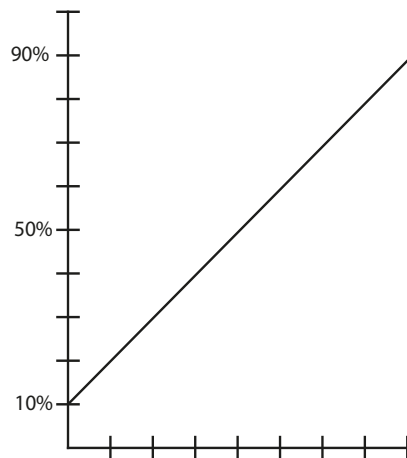
A and B direction; full fore and full aft $14^\circ \pm 2^\circ$; dimensions are in mm [in]



Output characteristics

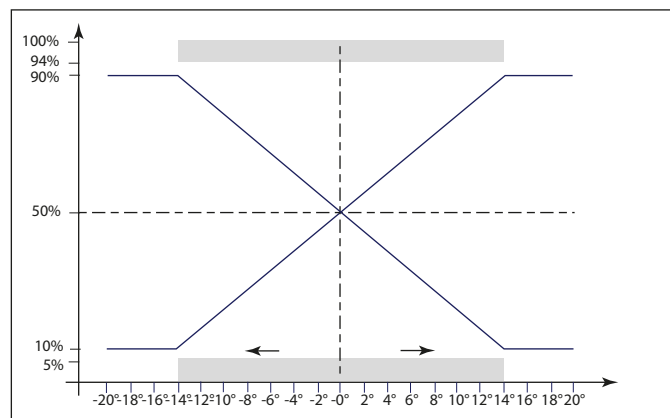
Uni-directional model type

Output and supply voltage - Idle to full pedal stroke



Bi-directional model type

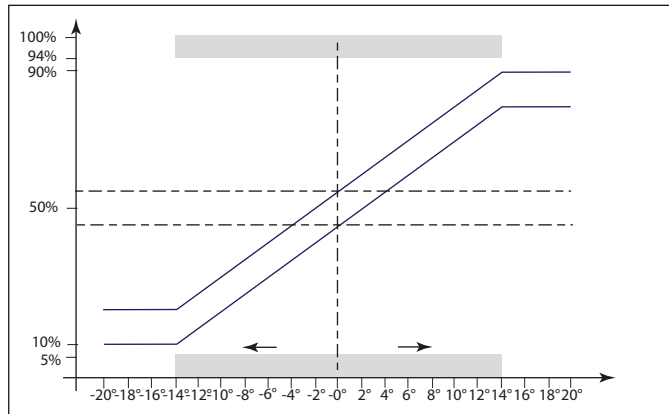
Option 1, 10% to 90% and 90% to 10%



Left of vertical dashed line	Direction A	Right of vertical dashed line	Direction B
Horizontal dashed line	Neutral position	Shaded areas	Fault area
Above neutral position	Sensor 1 output (percent of input voltage)	Horizontal line with arrow	Pedal angle
Below neutral position	Sensor 2 output (percent of input voltage)		

Output characteristics

Option 2, 20% to 90% and 10% to 80%



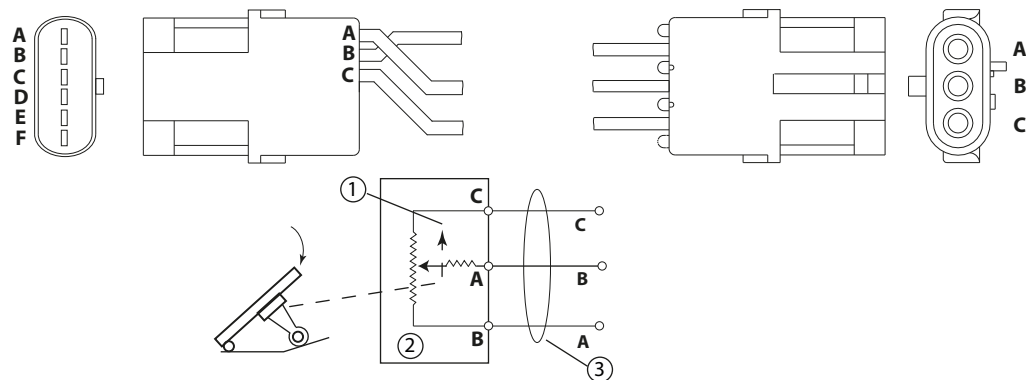
Left of vertical dashed line	Direction A	Right of vertical dashed line	Direction B
Two horizontal dashed lines	Neutral positions	Shaded areas	Fault area
Above neutral position	Sensor 2 output (percent of input voltage)	Horizontal line with arrow	Pedal angle
Below neutral position	Sensor 1 output (percent of input voltage)		

Electrical connections

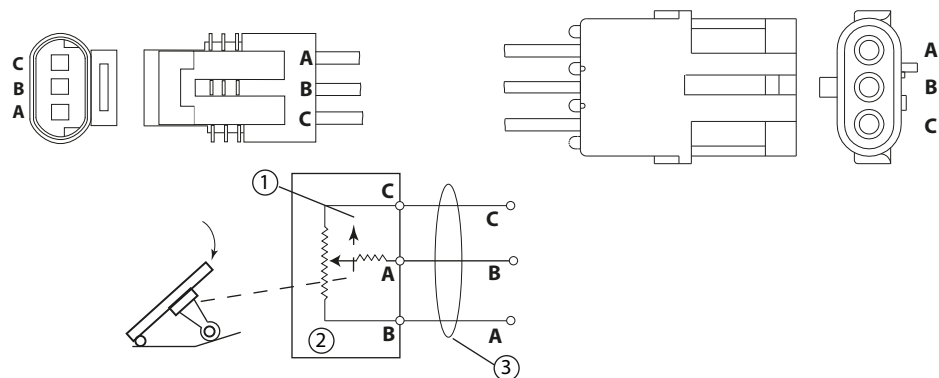
Uni-directional model type

Connector mounted on potentiometer sensor.

Current configuration



Configuration before February 2006



- | | | | |
|---|---------------|---|------------------|
| 1 | Full stroke | A | White wire color |
| 2 | Potentiometer | B | Black wire color |
| 3 | Cable | C | Red wire color |

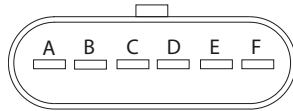
PLUS+1® module pin connections example

Pin	Sensor	Connector
Power ground -	Not used	Not used
Power supply +	Not used	Not used
Sensor power +	C	C
Sensor power -	B	A
AIN/CAN0 shield	A	B
AIN/CAN1 shield	A	B
DIN	Not used	Not used
DIN/AIN	A	B
DIN/AIN/FreqIN	A	B
AIN/Temp/Rheo	A	B

Electrical connections

Bi-directional model type

Metri-Pack Series 150 (view facing connector end)

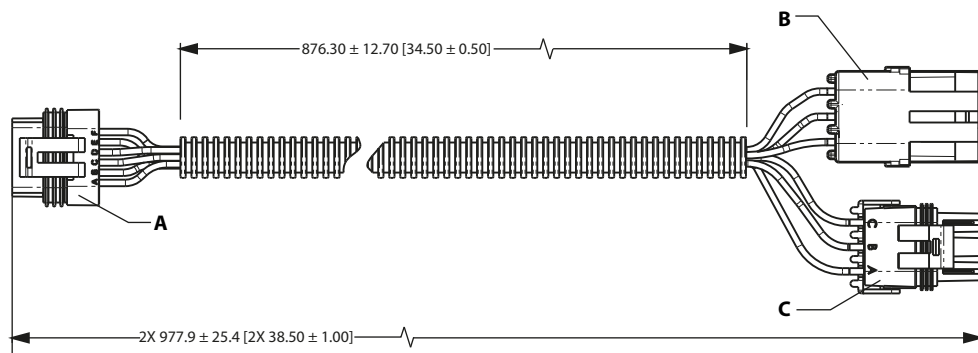


Housing part number	12066317
Terminal part number	12103881

Sensor connections

Pin	Function	Wire color
A	Signal 1 = Us1	Black
B	Ground 1 = GND1	White
C	Supply 1 = Ucc1	Red
D	Supply 2 = Ucc2	Green
E	Ground 2 = GND2	Blue
F	Signal 2 = Us2	Orange

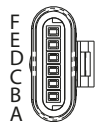
Wiring harness



- A** Metri-Pack 150 Series Connector
- B** Weather Pack Connector (Shroud)
- C** Weather Pack Connector (Tower)

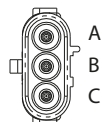
Electrical connections

Connector A: Metri-Pack connector



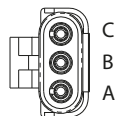
Pin	Function	Wire color
A	Signal 1 = Us1	Black
B	Ground 1 = GND1	White
C	Supply 1 = Ucc1	Red
D	Supply 2 = Ucc2	Green
E	Ground 2 = GND2	Blue
F	Signal 2 = Us2	Orange

Connector B: Weather Pack connector (shroud)



Pin	Function	Wire color
A	Ground 1 = GND1	White
B	Signal 1 = Us1	Black
C	Supply 1 = Ucc1	Red

Connector C: Weather Pack connector (tower)



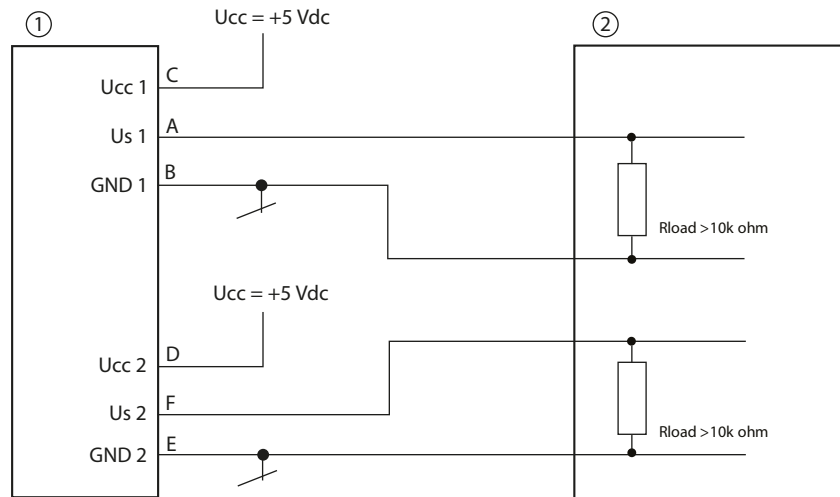
Pin	Function	Wire color
C	Supply 2 = Ucc2	Green
B	Ground 2 = GND2	Blue
A	Signal 2 = Us2	Orange

Electrical connections

Schematics of a foot pedal connected to a PLUS+1® module

Example, part 1

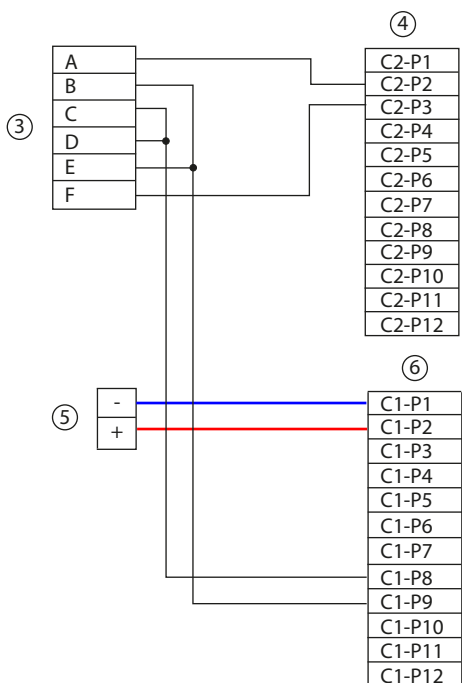
Example of connecting foot pedal to a PLUS+1® module, part 1



1	Sensor
2	Controller

Electrical connections

Example, part 2



3	Footpedal		4	Connector 2			
	Pin	Function		Pin	Controller function	Pin	Controller function
	A	Signal 1 = Us1		C2-P1	DIN	C2-P7	AIN/Temp/Rheo
	B	Ground 1 = GND1		C2-P2	DIN/AIN/FreqIN	C2-P8	AIN/Temp/Rheo
	C	Supply 1 = Ucc1		C2-P3	DIN/AIN/FreqIN	C2-P9	PWMOUT/DOUT/PVGOUT
	D	Supply 2 = Ucc2		C2-P4	DIN/AIN/FreqIN	C2-P10	PWMOUT/DOUT/PVGOUT
	E	Ground 2 = GND2		C2-P5	DIN/AIN/FreqIN	C2-P11	PWMOUT/DOUT/PVGOUT
	F	Signal 2 = Us2		C2-P6	DIN/AIN/FreqIN	C2-P12	PWMOUT/DOUT/PVGOUT

5	Power supply		6	Connector 1			
	-	+		Pin	Controller function	Pin	Controller function
	12/24 Vdc	12/24 Vdc		C1-P1	Power ground -	C1-P7	DIN
				C1-P2	Power supply +	C1-P8	5 Vdc sensor power +
				C1-P3	CAN +	C1-P9	Sensor power ground -
				C1-P4	CAN -	C1-P10	DIN
				C1-P5	AIN/CAN shield	C1-P11	DIN
				C1-P6	DIN	C1-P12	DIN

Electrical connections

PLUS+1® module pin connections example

Pin	Sensor
Power ground -	Not used
Power supply +	Not used
Sensor power +	C, D
Sensor power -	B, E
AIN/CAN0 shield	A, F
AIN/CAN1 shield	A, F
DIN	Not used
DIN/AIN	A, F
DIN/AIN/FreqIN	A, F
AIN/Temp/Rheo	A, F

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