



Technical Information

# PLUS+1<sup>®</sup> Compliant CLS1000 Laser Receiver



---

**Technical Information**      **PLUS+1® Compliant CLS1000 Laser Receiver**

---

**Revision History***Table of Revisions*

| <b>Date</b>     | <b>Changed</b> | <b>Rev</b> |
|-----------------|----------------|------------|
| 07 January 2014 |                | AA         |

**Contents**

|   |          |
|---|----------|
| <b>Product Overview .....</b>   | <b>4</b> |
| Features and Options .....  | 4        |
| Theory of Operation LED laser strike .....  | 4        |
| User Liability and Safety Statements - OEM User Liability and Safety Responsibility ..... | 4        |
| Ordering Information .....  | 4        |
| <b>Dimensions .....</b>   | <b>5</b> |
| <b>Connector Pin Assignments .....</b>  | <b>5</b> |
| <b>Specifications .....</b>   | <b>6</b> |
| <b>Automatic Error Symbol Range .....</b>   | <b>6</b> |
| <b>Wiring Guidelines .....</b>  | <b>7</b> |
| <b>Welding Procedures .....</b>   | <b>7</b> |
| <b>Using the Sensor's Configuration Input Pin to Set the Source Address .....</b>         | <b>8</b> |
| <b>CAN Communication .....</b>  | <b>9</b> |
| PGN/ID Summary .....  | 9        |

**Product Overview**

The CLS1000 Laser Receiver is a machine control sensor which is ideal for control systems that provide automated grade leveling for mobile machine applications when paired with a standard rotating laser.

**Features and Options**

- Illuminated Display
- Range up to 800 m (0.5 mi)
- Designed to withstand the mobile environment
- PLUS+1® Compliant GUIDE function block available
- CAN 2.02 B compliant
- Input pin for use of multiple sensors on a single CAN bus
- 9 to 36 Vdc power supply
- CE Compliant

**Theory of Operation LED laser strike**

The Laser Deviation CAN message is initiated by a rotating transmitter laser beam striking the CLS1000 Laser Receiver, repeating for each rotation. The CLS1000 Laser Receiver has a bright LED display which indicates laser strike deviation from the center of the sensor (default) or the LED deviation display can be customized by CAN messages from the system.

The LED display will automatically indicate proportional laser strike deviation from the center of the sensor over a fixed window. The system developer can customize the LED display flash rate and window size by writing LED Display CAN messages.

**User Liability and Safety Statements - OEM User Liability and Safety Responsibility**

The OEM of a machine or vehicle in which PLUS+1™ compliant product is 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.

- This product is not intended to be used as a stand-alone safety device in safety critical applications.
- Danfoss has no responsibility for any accidents caused by incorrectly mounted or maintained equipment.
- Danfoss does not assume any responsibility for 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.

**Ordering Information**
*Part Number Quick Reference*

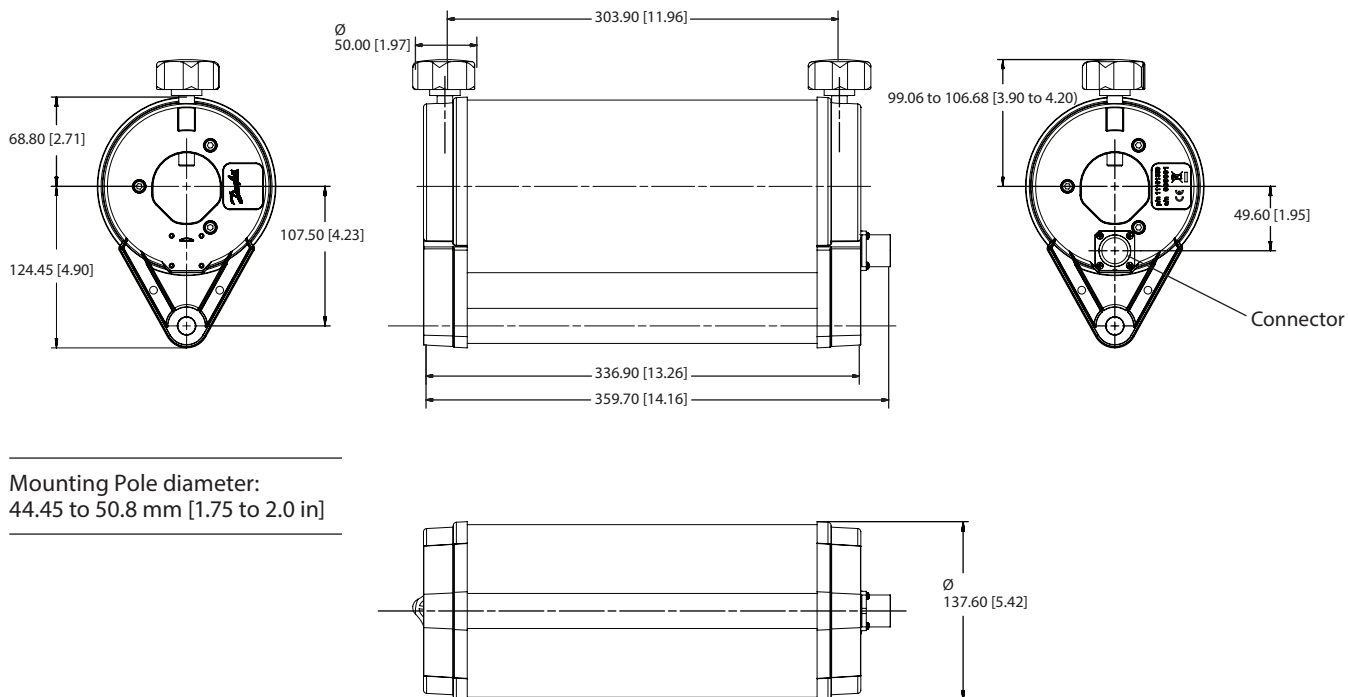
| Part number | Supply voltage | Connector |
|-------------|----------------|-----------|
| 11101359    | 9 to 36 Vdc    | 6 pin     |

*Related Product*

| Part number | Description      |
|-------------|------------------|
| 11031032    | Mating connector |

**Dimensions**

Millimeters [Inches]



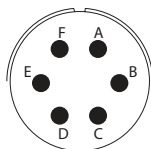
Mounting Pole diameter:  
44.45 to 50.8 mm [1.75 to 2.0 in]

**Caution**

This device is not field serviceable. Opening the device housing will void the warranty.

**Connector Pin Assignments**

6 pin Connector



Pinout and Wiring Information

| Pin | Controller function |
|-----|---------------------|
| A   | Power               |
| B   | Ground              |
| C   | CAN Hi              |
| D   | CAN Lo              |
| E   | Config              |
| F   | CANshield           |








Use care when wiring mating connector. Above pinouts are for device pins.

**Specifications**

|                                    |  |
|------------------------------------|--|
| <b>Supply voltage</b>              | 9 to 36 Vdc                                  |
| <b>Operating temperature range</b> | -20° to 70° C (-4° to 158° F)                |
| <b>Storage temperature range</b>   | -40° to 85° C (-40° to 185° F)               |
| <b>Horizontal reception angle</b>  | 360 degrees                                  |
| <b>Vertical reception height</b>   | 250 mm (9.84 in)                             |
| <b>Operating range</b>             | 800 m (0.497 mi)                             |
| <b>Center resolution</b>           | < 1 mm (< 0.039 in), Up to 800 mm (31.50 in) |
| <b>IP rating</b>                   | IP 67  |
| <b>Weight</b>                      | 3.1 kg (6 lbs)                               |

May be customized with LED Display control message.

**Automatic Error Symbol Range**

| <b>Automatic Error Symbol</b>   | <b>Automatic Error Indicator</b> | <b>Range (mm)</b> |
|---|----------------------------------|-------------------|
|    | Out of range up                  | 120 mm +          |
|    | Large up - large arrow up        | 60 to 120 mm      |
|    | Small up - small arrow up        | 5 to 60 mm        |
|    | On grade - straight line         | ± 5 mm            |
|    | Small down - small arrow down    | -5 to -60 mm      |
|   | Large down - large arrow down    | -60 mm to -120 mm |
|  | Out of range                     | -120 mm -         |

### 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. Power the analog sensors by the sensor power source from the module and ground returned to the sensor ground pin on the module.
- 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.
- Ground electronic modules to a dedicated conductor of sufficient size that is connected to the battery (-).

### Welding Procedures

The following procedures are recommended when welding on a machine equipped with modules:

1. Turn the engine off.
2. Disconnect the negative battery cable from the battery.
3. Do not use electrical components to ground the welder.
4. Clamp the ground cable for the welder to the component that will be welded as close as possible to the weld.

### Using the Sensor's Configuration Input Pin to Set the Source Address

The device has one configuration input to set the Source Address, SA, which is capable of detecting up to 32 distinct SAs. The input can be connected directly to ground (SA 0), left floating (SA 31) or connected to ground through 1 of 30 different resistor values (SA 1-30).

*Configuration Input Resistor Selection Table*

| <b>SA (dec)</b> | <b>Resistor</b> |
|-----------------|-----------------|
| 0               | 0               |
| 1               | 76.8            |
| 2               | 162             |
| 3               | 249             |
| 4               | 340             |
| 5               | 442             |
| 6               | 562             |
| 7               | 665             |
| 8               | 806             |
| 9               | 931             |
| 10              | 1100            |
| 11              | 1270            |
| 12              | 1430            |
| 13              | 1650            |
| 14              | 1870            |
| 15              | 2150            |
| 16              | 2430            |
| 17              | 2740            |
| 18              | 3160            |
| 19              | 3570            |
| 20              | 4120            |
| 21              | 4750            |
| 22              | 5490            |
| 23              | 6490            |
| 24              | 7680            |
| 25              | 9310            |
| 26              | 11500           |
| 27              | 14700           |
| 28              | 19600           |
| 29              | 28700           |
| 30              | 51100           |
| 31              | open            |

The SA input is only checked during start-up. In order to change the SA values, the device must be powered up with the SA input in the desired SA. Any changes made to the SA input while the device is powered are ignored.



**CAN Communication**

|                    |  |
|--------------------|--|
| <b>Baud Rate</b>   | Up to 1M                                   |
| <b>Termination</b> | No internal, 250 kBaud only, no up to 1Meg |

All communication for the Laser Receiver is through a proprietary protocol.

**PGN/ID Summary**

| PGN Type                | Transmit/Receive | PGN (d) | ID (d)            | ID (h)     |
|-------------------------|------------------|---------|-------------------|------------|
| Laser Leveling PGN      | Transmit         | 65141   | 65141 + (0 – 255) | 0x0CFE75SA |
| LED Display control PGN | Receive          | 65142   | 65142 + (0 – 255) | 0x10FE76SA |

SA is the source address which can be selected through a configuration resistor, as detailed in SA Resistor Configuration table shown above.

|                                  |            |
|----------------------------------|------------|
| <b>Transmission Rate</b>         | 20 ms      |
| <b>Data Length</b>               | 3          |
| <b>PGN</b>                       | 65141      |
| <b>Laser Leveling Identifier</b> | 0x0CFE75SA |

| Byte               | 1   | 2   | 3  |
|--------------------|---|-----|--|
| <b>Bit(s)</b>      | 1-8   | 1-8 | 1-8  |
| <b>Description</b> | Laser Strike Vertical Deviation                       |     | Laser Receiver status message  |
| <b>Type</b>        | U16   |     | U8   |
| <b>Data Range</b>  | 0x0000 – 0xFFFF<br>-32,000 Offset: 0x0000 = -3,200 mm |     | 0 - reserved<br>1 - receiving laser in range<br>2 - have not seen laser<br>3 - laser went out of range, high<br>4 - laser went out of range, low<br>5 - sensor fault |
| <b>Units</b>       | mm x 10   |     | NA   |
| <b>Resolution</b>  | 0.1 mm  |     | NA   |

|                                       |                      |
|---------------------------------------|----------------------|
| <b>Receive Rate</b>                   | 1 per 250 to 500 ms* |
| <b>Data length</b>                    | 1                    |
| <b>PGN</b>                            | 65142                |
| <b>LED Display Control Identifier</b> | 0x10FE76SA           |

\* Custom LED messages must be sent faster than 500 mS or the display will default to the automatic display mode.

|                     |   |
|---------------------|---|
| <b>Byte</b>         | 1   |
| <b>Bit(s)</b>       | 1-8   |
| <b>Description</b>  | LED Display Data  |
| <b>Type</b>         | S8  |
| <b>Data Range**</b> | -4 – Out of range down<br>-3 – Large down<br>-2 – Medium down<br>-1 – small down<br>0 – On grade, middle bar<br>1 – Small up 2 – Medium up<br>3 – Large up<br>4 – Out of range up<br>9 – Lost laser |
| <b>Units</b>        | NA  |
| <b>Resolution</b>   | NA  |

\*\* Writing any other value will blank the LED display: useful for turning off the display or blinking the display.







**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.

Danfoss – Your Strongest Partner in Mobile Hydraulics.

**Go to [www.powersolutions.danfoss.com](http://www.powersolutions.danfoss.com) for further product information.**

Wherever off-highway vehicles are at work, so is Danfoss.

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

Please contact the Danfoss Power Solution representative nearest you.

**Comatrol**

[www.comatrol.com](http://www.comatrol.com)

**Schwarzmueller-Inverter**

[www.schwarzmueller-inverter.com](http://www.schwarzmueller-inverter.com)

**Turolla**

[www.turollaocg.com](http://www.turollaocg.com)

**Valmova**

[www.valmova.com](http://www.valmova.com)

**Hydro-Gear**

[www.hydro-gear.com](http://www.hydro-gear.com)

**Daikin-Sauer-Danfoss**

[www.daikin-sauer-danfoss.com](http://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 (Shanghai) Co. Ltd.**

Building #22, No. 1000 Jin Hai Rd  
Jin Qiao, Pudong New District  
Shanghai, China 201206  
Phone: +86 21 3418 5200

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequential changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.