# Fully configurable dedicated 1U 6-channel system interface unit for ultra-stable, high precision fluxgate technology current transducers

## Features

- 6 channels with D-sub-9 connector
- ±15 V DC supply output with up to 2.2 A per channel
- Universal mains (90-264 V 50/60 Hz) and 127-370 V dc input
- Output voltage with XLR mini connectors
- Access to calibration windings on all channels
- 19” rack mount 1U height
- Power and status LEDs on front
- 15-pin DSUB connector provides access to isolated status signals of each transducer and power
- 6 slots for 1 V or 10 V voltage output modules (VOM)

CE RoHS 2011/65/EU UKCA

## Description

Power supply and interface unit with industry standard D-sub-9 connectors for interfacing a range of DC current transducers (DCCTs). With configurable voltage output modules (VOM) for all 6 channel it makes precision current sensing easy and convenient.

The Ultra-stable 1V or 10V VOM converts output current of the connected transducers to an accurate voltage reading.

Housed in a rack mountable metal case and powered by universal mains, the DSSIU-6-1U-V is a reliable and complete solution for implementation of fluxgate current sensing technology.

## Applications

- Fluxgate DCCTs
- Hall effect DCCTs
- Power measurement
- Electric vehicle (EV) test bench
- Power measurement and power analysis
- Particle accelerators
- Current calibration purposes
- Precision current sensing

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## Electrical specifications

Table 1: Power supply specifications

| Parameter | | Symbol | Unit | Min | Typ. | Max | Comment |
|---|---|---|---|---|---|---|---|
| AC Input Voltage | | $V_{AC}$ | $V_{RMS}$ | 90 | | 264 | |
| AC Input Current | 115 V | $I_{AC}$ | $A_{RMS}$ | | 2.2 | | At rated output current |
| AC Input Current | 230 V | $I_{AC}$ | $A_{RMS}$ | | 1.1 | | At rated output current |
| AC Input Frequency | | f | Hz | 50 | | 60 | |
| DC Input Voltage | | $V_{DC}$ | V | 127 | | 370 | |
| Output Voltage | | $U_{cc}$ | $V_{DC}$ | ±14.75 | | ±15.75 | |
| Output Current | 110 V - 264 V | $I_{cc}$ | A | | | 2.2 | Per channel |
| | 90 V - 110 V | $I_{cc}$ | A | | | 1.65 | Per channel (2.2 A if using only 4 channels) |
| Output Voltage Ripple | | | $mV_{RMS}$ | | | 15 | No load |
| Full Operating temperature range | | $T_a$ | °C | 0 | | 40 | To full rated output current |
| Storage temperature range | | | °C | -20 | | 85 | |
| Relative humidity | | | % | 20 | | 80 | Non-condensing |
| Altitude | | | m | | | 2000 | |
| Usage | | | | | | | Designed for indoor use |
| Pollution degree | | | | | | 2 | |
| Ingress protection rating | | | | | | IP20 | |
| Mass | | | kg | | 5.1 | | |
| Dimensions | W x H x D | | mm | | 483 x 44 x 271 | | |
| EMC standard | | | | | | | EN 61326-1:2013 |
| Safety standard | | | | | | | IEC 61010-1:2010/A1:2019 |

## Voltage Output Module Parameters

Ratio: Output/input transfer ratio.

DC current: Rated continuous DC current rating of the VOM.

DC voltage: Resulting output voltage when the input current is equal to the nominal dc current.

AC current: Rated RMS current.

AC voltage: Resulting RMS voltage output when the input current is equal to the nominal AC current.

Table 2: Voltage output module (VOM) selection table with nominal values

| VOM | Ratio [V/A] | Input impedance [Ω] | Output impedance [Ω] | DC current [A] | DC voltage [V] | AC current [A RMS] | AC voltage [V RMS] | Partnumber |
|---|---|---|---|---|---|---|---|---|
| VOM0100-10 | 100.000 | 11.111 | <1 | 0.100 | 10.000 | 0.067 | 6.667 | 2514200038 |
| VOM0300-10 | 33.333 | 3.704 | <1 | 0.300 | 10.000 | 0.200 | 6.667 | 2514200042 |
| VOM0333-10 | 30.000 | 3.333 | <1 | 0.333 | 10.000 | 0.222 | 6.667 | 2514200080 |
| VOM0400-10 | 25.000 | 2.778 | <1 | 0.400 | 10.000 | 0.267 | 6.667 | 2514200036 |
| VOM0667-10 | 15.000 | 1.667 | <1 | 0.667 | 10.000 | 0.444 | 6.667 | 2514200069 |
| VOM0800-10 | 12.500 | 1.389 | <1 | 0.800 | 10.000 | 0.533 | 6.667 | 2514200071 |
| VOM0100-1 | 10.000 | 10.000 | 50 | 0.150 | 1.500 | 0.100 | 1.000 | 2514200037 |
| VOM1333-10 | 7.500 | 0.833 | <1 | 1.333 | 10.000 | 0.889 | 6.667 | 2514200060 |
| VOM0300-1 | 3.333 | 3.333 | 50 | 0.450 | 1.500 | 0.300 | 1.000 | 2514200068 |
| VOM0333-1 | 3.000 | 3.000 | 50 | 0.500 | 1.500 | 0.333 | 1.000 | 2514200079 |
| VOM0400-1 | 2.500 | 2.500 | 50 | 0.600 | 1.500 | 0.400 | 1.000 | 2514200035 |
| VOM0667-1 | 1.500 | 1.500 | 50 | 1.000 | 1.500 | 0.667 | 1.000 | 2514200073 |
| VOM0800-1 | 1.250 | 1.250 | 50 | 1.200 | 1.500 | 0.800 | 1.000 | 2514200070 |
| VOM1333-1 | 0.750 | 0.750 | 50 | 2.000 | 1.500 | 1.333 | 1.000 | 2514200029 |

Table 3: Voltage output module (VOM) electrical performance specifications at 23 °C, when used with a suitable Danisense transducer

| VOM | Ratio error | Ratio Temp. Coef. | Ratio stability | Linearity | Offset | Offset temp. coef. | Bandwidth | RMS noise < 100 kHz |
|---|---|---|---|---|---|---|---|---|
| VOM0100-10 | 50 ppm | 3 ppm/K | 5 ppm/month | 5 ppm | 3 µV | 0.2 µV/K | 500 kHz | 1200 µV |
| VOM0300-10 | 50 ppm | 3 ppm/K | 5 ppm/month | 10 ppm | 3 µV | 0.2 µV/K | 500 kHz | 300 µV |
| VOM0333-10 | 50 ppm | 3 ppm/K | 5 ppm/month | 10 ppm | 3 µV | 0.2 µV/K | 500 kHz | 300 µV |
| VOM0400-10 | 50 ppm | 3 ppm/K | 5 ppm/month | 10 ppm | 3 µV | 0.2 µV/K | 500 kHz | 300 µV |
| VOM0667-10 | 50 ppm | 3 ppm/K | 5 ppm/month | 10 ppm | 3 µV | 0.2 µV/K | 500 kHz | 360 µV |
| VOM0800-10 | 50 ppm | 3 ppm/K | 5 ppm/month | 10 ppm | 3 µV | 0.2 µV/K | 500 kHz | 360 µV |
| VOM0100-1 | 50 ppm | 2.5 ppm/K | 5 ppm/month | 5 ppm | 0 µV | 0 µV/K | 3 MHz | 120 µV |
| VOM1333-10 | 100 ppm | 3 ppm/K | 5 ppm/month | 30 ppm | 3 µV | 0.2 µV/K | 500 kHz | 360 µV |
| VOM0300-1 | 50 ppm | 2.5 ppm/K | 5 ppm/month | 10 ppm | 0 µV | 0 µV/K | 3 MHz | 120 µV |
| VOM0333-1 | 50 ppm | 2.5 ppm/K | 5 ppm/month | 10 ppm | 0 µV | 0 µV/K | 3 MHz | 120 µV |
| VOM0400-1 | 50 ppm | 2.5 ppm/K | 5 ppm/month | 10 ppm | 0 µV | 0 µV/K | 3 MHz | 120 µV |
| VOM0667-1 | 50 ppm | 2.5 ppm/K | 5 ppm/month | 10 ppm | 0 µV | 0 µV/K | 2 MHz | 120 µV |
| VOM0800-1 | 50 ppm | 2.5 ppm/K | 5 ppm/month | 10 ppm | 0 µV | 0 µV/K | 1 MHz | 120 µV |
| VOM1333-1 | 100 ppm | 2.5 ppm/K | 5 ppm/month | 30 ppm | 0 µV | 0 µV/K | 1 MHz | 120 µV |

Table 4: VOM dc voltages with selected transducers at nominal currents

| | DT50ID | DS50ID | DT100ID | DT200ID | DS200ID | DS300ID | DS400ID | DQ500ID | DS600ID/DQ600ID |
|---|---|---|---|---|---|---|---|---|---|
| Transducer Ratio | 1/500 | 1/500 | 1/1000 | 1/1000 | 1/500 | 1/1000 | 1/2000 | 1/1750 | 1/1500 |
| Nominal current (A dc) | 50 | 75 | 100 | 200 | 300 | 450 | 600 | 750 | 900 |
| VOM0100-10 | 10.000 | 10 (@ 50 A dc) | 10.000 | 10 (@ 100 A dc) | - | - | - | - | - |
| VOM0300-10 | 3.333 | 5.000 | 3.333 | 6.667 | - | - | 10.000 | - | - |
| VOM0333-10 | 3.000 | 4.500 | 3.000 | 6.000 | - | - | 9.000 | - | - |
| VOM0400-10 | 2.500 | 3.750 | 2.500 | 5.000 | 10 (@ 200 A dc) | 11.250 | 7.500 | 10.714 | 10 (@600 A dc) |
| VOM0667-10 | 1.500 | 2.250 | 1.500 | 3.000 | 9.000 | 6.750 | 4.500 | 6.429 | 9.000 |
| VOM0800-10 | 1.250 | 1.875 | 1.250 | 2.500 | 7.500 | 5.625 | 3.750 | 5.357 | 7.500 |
| VOM0100-1 | 1.000 | 1.500 | 1.000 | 1 (@ 100 A dc) | - | - | - | - | - |
| VOM1333-10 | 0.750 | 1.125 | 0.750 | 1.500 | 4.500 | 3.375 | 2.250 | 3.214 | 4.500 |
| VOM0300-1 | 0.333 | 0.500 | 0.333 | 0.667 | - | 1.500 | 1.000 | 1.429 | 1.33 (@ 600 A dc) |
| VOM0333-1 | 0.300 | 0.450 | 0.300 | 0.600 | 1.2 (@ 600 A dc) | 1.350 | 0.900 | 1.286 | 1.2 (@ 600 A dc) |
| VOM0400-1 | 0.250 | 0.375 | 0.250 | 0.500 | 1.500 | 1.125 | 0.750 | 1.071 | 1.500 |
| VOM0667-1 | 0.150 | 0.225 | 0.150 | 0.300 | 0.900 | 0.675 | 0.450 | 0.643 | 0.900 |
| VOM0800-1 | 0.125 | 0.188 | 0.125 | 0.250 | 0.750 | 0.563 | 0.375 | 0.536 | 0.750 |
| VOM1333-1 | 0.075 | 0.113 | 0.075 | 0.150 | 0.450 | 0.338 | 0.225 | 0.321 | 0.450 |

Table 5: Continued: VOM dc voltages with selected transducers at nominal currents

| | DN1000ID | DM1200ID | DL2000ID | DQ640ID |
|---|---|---|---|---|
| Transducer Ratio | 1/1500 | 1/1500 | 1/1500 | progr. |
| Nominal current (A dc) | 1000 | 1500 | 3000 | 40-640 |
| VOM0100-10 | - | - | - | Depends on progr. |
| VOM0300-10 | - | - | - | |
| VOM0333-10 | - | - | - | |
| VOM0400-10 | 10 (@600 A dc) | - | - | |
| VOM0667-10 | 10.000 | - | - | |
| VOM0800-10 | 8.333 | 12.500 | - | |
| VOM0100-1 | - | - | - | |
| VOM1333-10 | 5.000 | 7.500 | 10 (@ 2000A dc) | |
| VOM0300-1 | - | - | - | |
| VOM0333-1 | - | - | - | |
| VOM0400-1 | 1.5 (@ 900 A dc) | - | - | |
| VOM0667-1 | 1.000 | 1.500 | - | |
| VOM0800-1 | 0.833 | 1.250 | - | |
| VOM1333-1 | 0.500 | 0.750 | 1.500 | |

## Mechanical drawing

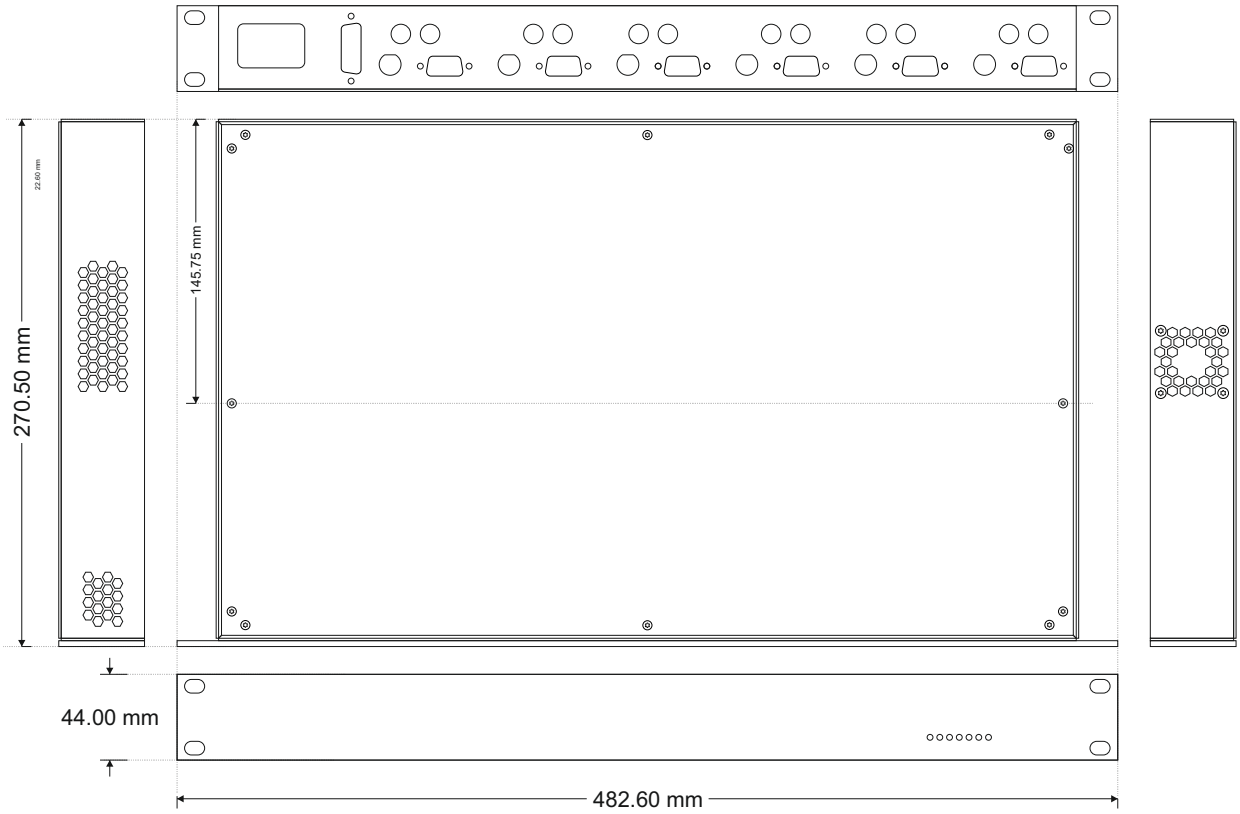



Figure 1: Mechanical Dimensions. Tolerance is 0.3 mm

## Connections

Each channel has a D-sub-9 female connector to interface with the sensor head (Fig. 3), and XLR mini connection for the output voltage reading (Fig. 4) and a positve and negative calibration current banana terminal. Furthermore, there is a D-sub-15 female connector to read the status of all channels, according to Table 6. The backplate with connection outlines is shown in Fig. 2.

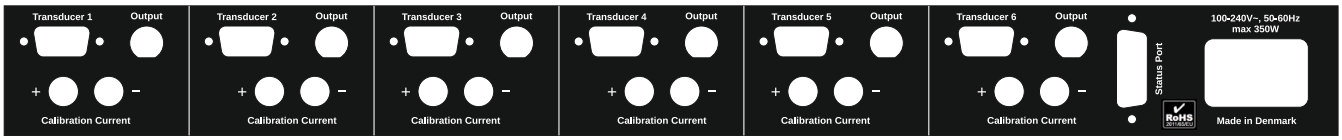



Figure 2: rear connection panel

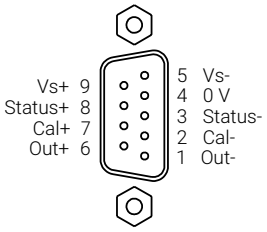



Figure 3: D-sub-9 connection pinout

D-sub-9 pin description:

| | | |
|---|---|---|
| 1 | Out- | Measurement output negative terminal |
| 2 | Cal- | Calibration winding negative terminal |
| 3 | Status- | Status signal negative terminal |
| 4 | 0 V | 0 V connection for supply voltage |
| 5 | $V_S$- | Negative supply voltage |
| 6 | Out+ | Measurement output positive terminal |
| 7 | Cal+ | Calibration winding positive terminal |
| 8 | Status+ | Status signal positive terminal |
| 9 | $V_S$+ | Positive supply voltage |

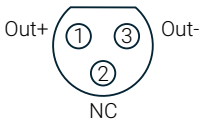



Figure 4: XLR mini voltage reading output connector pinout. Recommended connector: AF3F Amphenol.

## Status port

The status port provides access to the status of the system via optically isolated pins in a DSUB15. The optocoupler output can be used with a pullup resistor limiting current below 100 mA at 1 V on the (+) pin, see Fig. 5. See Table 6 for pin connections for each channel.

Example: 5V supply, resistor of 1kOhm is connected between 5V and + of channel 1 (pin 1) and pin 9 is connected to 0V. If the transducer is working correctly pin 1 and 9 are shorted with above optocoupler circuit. The voltage on pin 1 will be around 1V and current I®=(5V-1V)/1kOhm=4mA.

| Status port | (+) terminal | (-) terminal |
|---|---|---|
| Channel 1 | 1 | 9 |
| Channel 2 | 2 | 10 |
| Channel 3 | 3 | 11 |
| Channel 4 | 4 | 12 |
| Channel 5 | 5 | 13 |
| Channel 6 | 6 | 14 |

Table 6: Status port D-sub-15 connection pinout. Current direction is from (+) to (-)

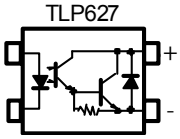



Figure 5: Status signal optocoupler

## Intended use

⚠ To ensure safety protection, only use the device as described by the manufacturer

The DSSIU-6-1U-V is designed to power up to six current transducers such as Danisense DT, DS, DQ, DN, DM, DL series or similar. Please see the product manual: https://danisense.com/user-manual.

- Cleaning only with a damp cloth
- Power/unpower the device by plugging/unplugging the mains power cord
- Always keep mains power cord accessible

## Instruction for use

1. Do not power up the device before all cables are connected.
2. If the DSSIU-6-1U-V is intended for desk use, mount the rubber feet which are part of the package.
3. If the DSSIU-6-1U-V is intended for Rack mounting, use the screw kit for mounting and do not mount the rubber feet.
4. Place the primary conductor through the aperture of the transducer.

5. Connect a D-sub-9 cable between the DSSIU-6-1U-V and sensor.
6. Connect a high impedance voltmeter or power analyzer on the output (XLR mini connector).
7. When all connections are secured - connect mains power.
8. Apply primary current.

## Safety Instructions

DO NOT TRY TO DISASSEMBLE THE UNIT. Make sure that the unit is properly connected to earth ground (through IEC power inlet). Do not block the ventilation openings on the side panels. If the fan does not operate properly, or if the green "POWER" LED is not lit when mains is applied, disconnect power and contact Danisense for further instruction.

## Front panel LEDs

If the leftmost LED is ON, it indicates that the DSSIU-6-1U-V is powered. The following 1 to 6 LEDs indicate the status signal (if available) of their corresponding transducer connected to the channel of the same number in the rear DSSIU-6-1U-V panel.

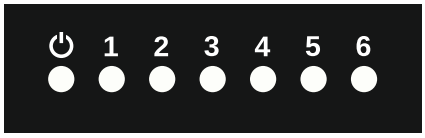


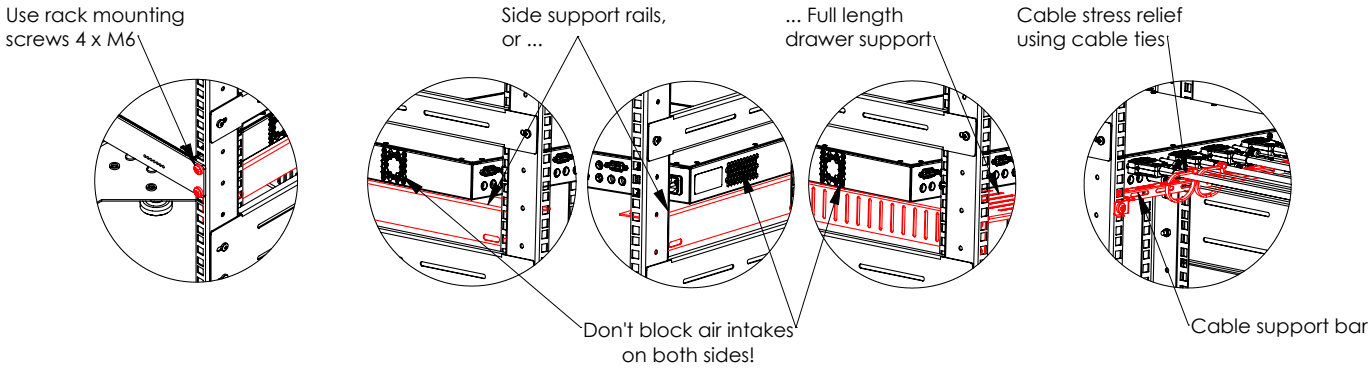

Figure 6: Front panel LEDs

## Connections

- (Front) D-sub-9 connector for connecting the transducer cable with the DSSIU-6-1U-V
- (Front) BNC connector for voltage output
- (Back) 3 pole IEC mains power connector
- (Back) 4 pin connector to read STATUS and TEDS signals fed through from the transducer

## Instructions for rack mounting

To avoid damaging equipment, observe following guidelines when mounting the device in a rack:



## Package contents

- 2m mains power cable—region specific
- DSSIU-6-1U-V
- 4 x rubber feet
- 4 x rack screws with nuts
- Manual/datasheet

## Calibration winding access

Each channel gives access to the calibration winding of transducers with this feature. Currently the following transducers do support this functionality.

- DS200ID-CD1000 - 1000 turns calibration winding (Max 200mA) - Equals a primary current of 200A
- DS200ID-CD100 - 100 turns calibration winding (Max 100mA) - Equals a primary current of 10A
- DS600ID-CD100 - 100 turns calibration winding (Max 100mA) - Equals a primary current of 10A
- DL2000ID-CD100 - 100 turns calibration winding (Max 100mA) - Equals a primary current of 10A

Each transducers calibration winding can be driven either is series with the other transducers or independently with it's own power supply. When using the DS200ID-CD1000, it is possible to do a full scale calibration from –200A to 200A.

## Principle for calibration

It is important to use a stable current source. If the current source is calibrated then there is no need for an Ampere- meter on the calibration current. Example for DS200ID-CD1000 on channel X configured with a 1V voltage module:

1. Connect transducer to channel X on DSSIU-6-1U-V
2. Ensure light is on for channel X on the frontside of the DSSIU-6-1U-V - meaning the transducer is in normal operation
3. Ensure no primary current through the transducer
4. Read the voltage output from channel X - This is the offset of the transducer V(offset)
5. Connect a stable current source to the calibration winding of channel X - +100mA
6. Let the current stabilize according to current source specification
7. Measure the voltage - V(100A)
8. Change polarity of the calibration current (Either by swapping the calibration cable from + to -, or by changing the polarity directly on the current source if possible)
9. Let the current stabilize according to current source specification
10. Measure the voltage - V(-100A)

Vout(100A) theoretical is 0.5V or 5V depending on voltage module installed. Vout(-100A) theoretical is -0.5V or -5V depending on voltage module installed. When evaluating the transducer performance it is important to take the different uncertainties of the measurement instruments into account.