

TECHNICAL REFERENCE MANUAL

DSI ADAPTERS V25-3



2.3.1. Features of DSI adapters:

- **EXTEND ANALOG INPUTS:** DSI adapters are compatible with any Dewesoft amplifier with a DSUB-9 analog input, independent of the product family. They will fit SIRIUS DAQ system, KRYPTON DAQ modules, IOLITE DAQ and Control System, MINITAURS or DEWE-43 DAQ instrument.
- **PLUG-AND-PLAY WITH TEDS:** All DSI adapters have a TEDS chip built-in for automatic sensor detection and plug-and-play setup. Just connect the sensor to the DSI adapter and DSI adapter to one of our DSUB-9 analog inputs and everything from scaling, units, calibration data, etc. will be configured automatically.
- **COMPACT AND RUGGED:** All electronics are built into small and rugged DSUB-9 aluminum housing with screw connectors to firmly screw adapters to the analog input channel.



Hint

When isolation is required, you must use the DSI-adapters on isolated DewesoftX® devices: e.g. Sirius modules.

All DSI-adapters are the size of a DSUB-9 housing, which contains the electronics as well as the sensor connector. The miniature electronics of each DSI sensor also contain a TEDS chip in which the identification, calibration and configuration data of the DSI are stored. TEDS data are read automatically by the DewesoftX® software and are immediately applied to the channel setup.



Hint

When using DSI® adapters, DewesoftX® can read the TEDS information of the adapter and also the TEDS information of any sensors that are connected to the adapter (the old MSI adapters could not read the TEDS of the connected sensor).

*The Bridge Completion Adapters are available in a separate [technical reference manual](#).

2.4. DSI: General Specifications

Connectors	
DAQ interface connector	DB9 Male
Sensor connector	See individual adapter specification
Environmental	
Operating Temperature	-10 to 60 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 95 % RH non-condensing at 50 °C
IP rating	IP50
RFI susceptibility	±0.5 % span error at 400 MHz, 5 W, 3 m
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D

2.4.1. Calibration

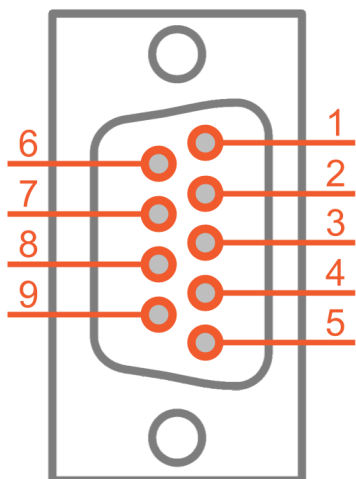
The DSI-adapters are calibrated at 23 °C ± 3 °C and meet their specifications when leaving the factory. The time interval for calibration depends on environmental conditions. A two year calibration interval is recommended.



Important

Total measurement accuracy depends on the adapter accuracy and host amplifier accuracy!

2.4.2. DSI: Pin-out



DSI connector: pin-out (DSUB-9 male)

Pin	Name	Description
1	Exc +	Excitation +
2	In+	Input +
3	Sns-	Sense -
4	GND	Ground
5	N.C.	Not connected
6	Sns+	Sense +
7	In-	Input -
8	Exc-	Excitation -
9	TEDS	TEDS

2.4.3. Environmental



Warning

All DSI® specifications within this manual are valid at 25 °C.
All DSI-adapters are produced according to ISO 9001 and ISO 14001.

2.4.4. DSI adapters / TEDS sensor support

Since there is an inbuilt TEDS device in the adapter itself and if ☒ DSI adapters/TEDS sensors under hardware setup are selected, adapter will be recognised and proper EXC. Voltage will be set automatically.

Please check if you are using the latest software where LVDT Adapter is supported.

2.16. DSI-LVDT

LVDTs (Linear Variable Differential Transformers) are linear position sensors. They are used to measure linear displacement and position over relatively short distances.



DSI-LVDT

2.16.1. Electrical specifications

The DSI LVDT adapter is powered by EXC voltage. The LVDT adapter is compatible with SIRIUS(i) (variable EXC), DEWE-43A type instrument (fixed +/-5V EXC) and KRYPTON STG and IOLITE STG amplifiers.

General specifications	
Sensor connector	DB9 Female
Power supply Exc. Voltage	10 V – 15 V, from EXC+ to EXC- outputs
Power supply Exc. Current	44 mA, from EXC+ to EXC- outputs (see 1)
Output voltage	1.00 V = 500 mV/V (see 2)
Output bandwidth	1 kHz
Gain error	1 % of Full Scale
Output TCR	55 ppm/K of Full Scale
Sensor VTR = S x d, Sensitivity	2000 mV/V maximum
Sensor supported type	Differential LVDR or RVDT, Inductive Half-Bridge LVDT
Sensor Exc. voltage	2.88 Vrms (differential) (see 3)
Sensor Exc. frequency	Selectable 4.02 kHz / 9.60 kHz typical; 2.5% error
Phase compensation	-50° to +85° @ 4kHz; -75° to +70° @ 10kHz
TEDS	1024-bit, 1-Wire EEPROM (see 4)

1) Absolute maximum rating, specified for SIRIUSi

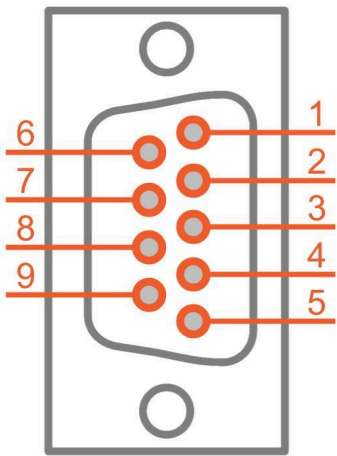
2) For sensor VTR (Voltage Transfer Ratio) = 1000 mV/V

3) Sinusoidal, 50dB THD typical, not possible to sync from adapter to adapter

4) Only one device per TEDS line is supported. Can be set to internal (adapter) or external (sensor)

2.16.2. LVDT connectors

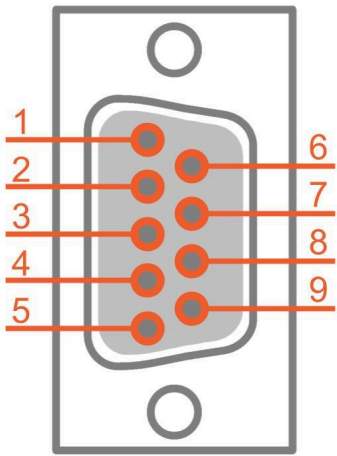
2.16.2.1. DSUB Input connector pinout



9 pin DSUB male

Pin	Name	I/O	Description
1	PS+	I, Power	Power Supply +
2	Out+	O, Signal	Adapter Output (Single ended) +
3	PSEn-	I, Signal	Power Supply Enable -
4	AGND	I	Analog Ground
5	NC	I/O	Reserved / Not Connected
6	PSEn+	I, Signal	Power Supply Enable +
7	Out-	O, Signal	Adapter Output (Ground) -
8	PS-	I, Power	Power Supply -
9	TEDS	I/O, Signal	TEDS

2.16.2.2. DSUB Output connector pinout



9 pin DSUB female

Pin	Name	I/O	Description
1	Exc+	O, Power	Sensor supply, excitation +
2	In+	I, Signal	Sensor Output +
3	Sns-	I, Signal	Sense -
4	AGND	I	Analog Ground
5	NC	I/O	Reserved / Not Connected
6	Sns+	I, Signal	Sense +
7	In-	I, Signal	Sensor Output -
8	Exc-	O, Power	Sensor supply, excitation -
9	NC	I/O	Reserved / Not Connected

2.16.3. Output bandwidth - Magnitude and Phase response

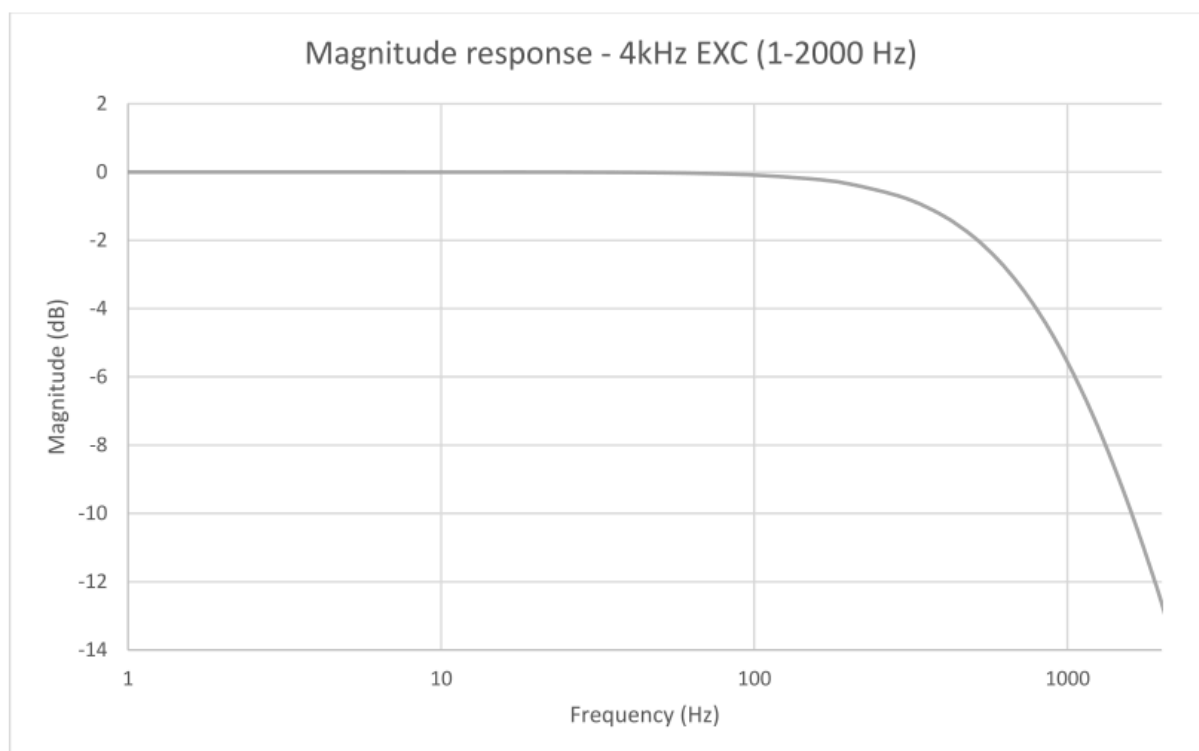


Image 1: Typical magnitude response for 4kHz EXC

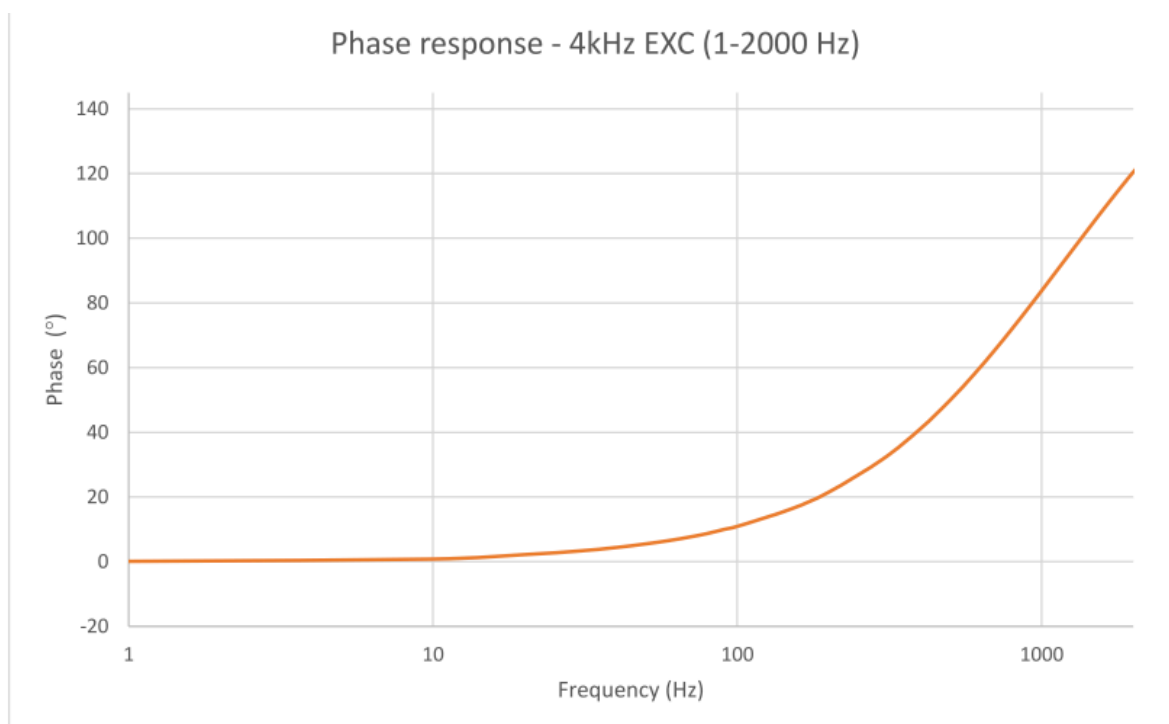


Image 2: Typical phase response for 4kHz EXC

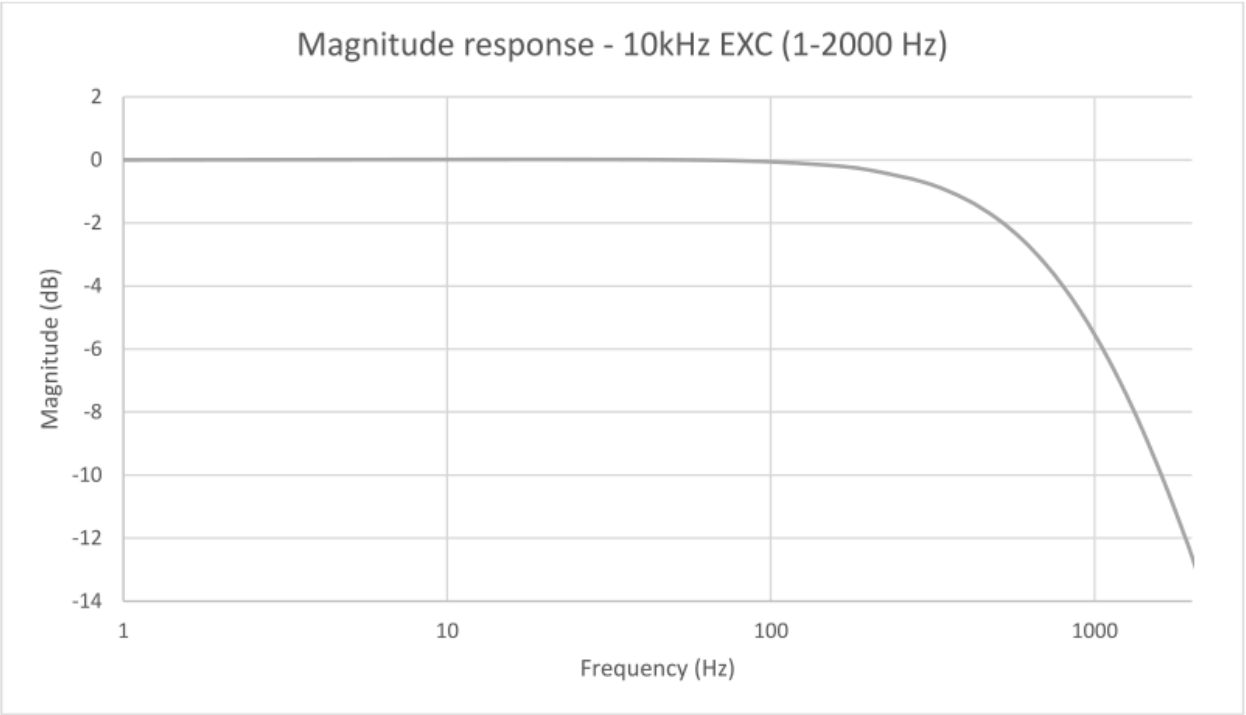


Image 3: Typical magnitude response for 10kHz EXC

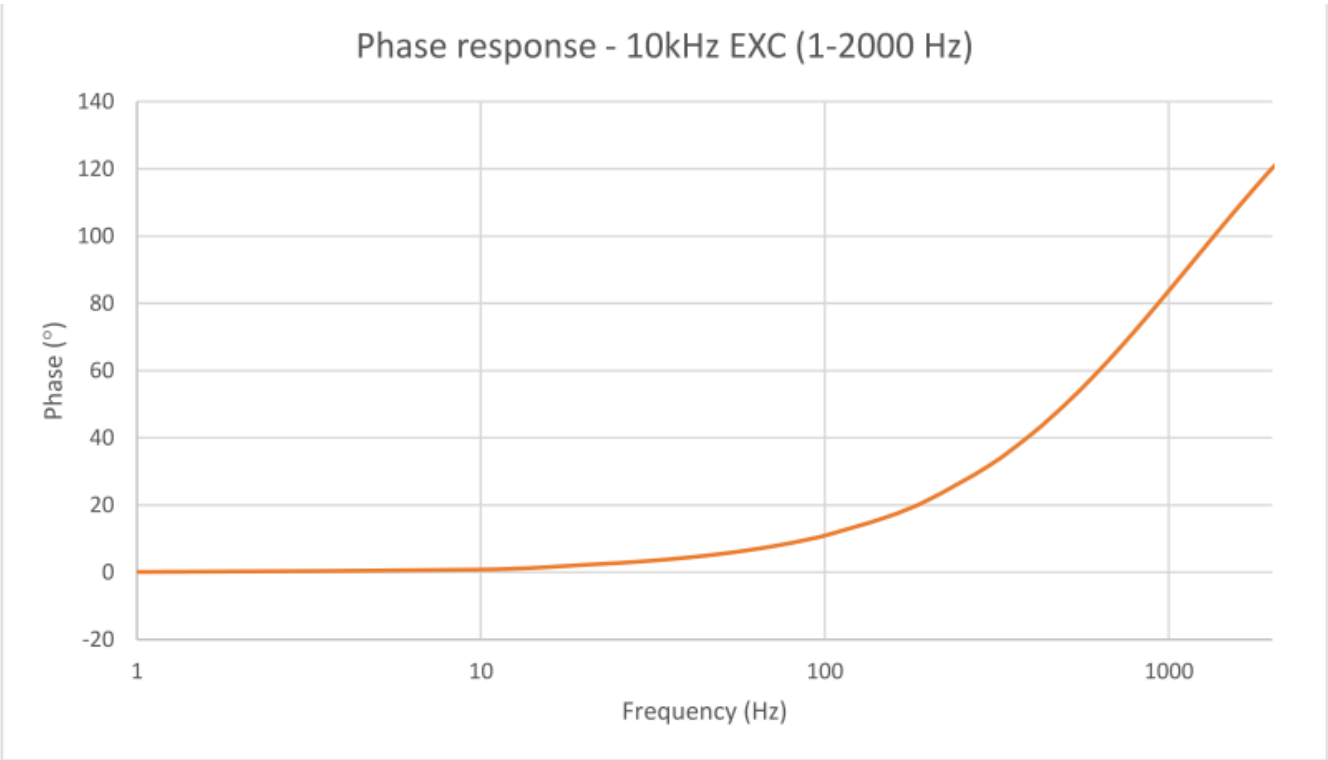


Image 4: Typical phase response for 10kHz EXC

2.16.4. Theory of operation

DSI LVDT Adapter uses a unique ratiometric architecture to eliminate several of the disadvantages associated with traditional approaches to LVDT interfacing. The benefits of this new circuit are: minimal adjustments are required; temperature stability is improved; and transducer interchangeability is improved.

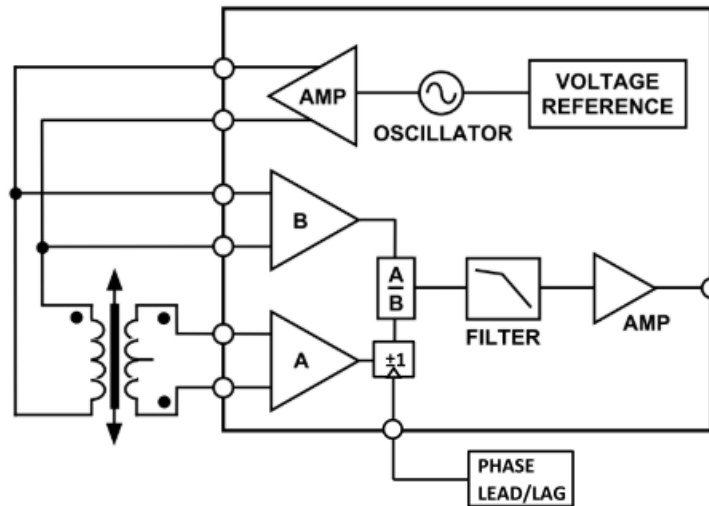


Image 5: Functional block diagram

LVDT adapter SENSE inputs are connected as B-Inputs and adapters IN are connected as A-Inputs. Phase Lead / Lag circuit will compensate for the difference of the sensor output in reference to Exc. and Sense inputs.

Output signal level will depend on the phase difference between sensor output and Sense inputs.

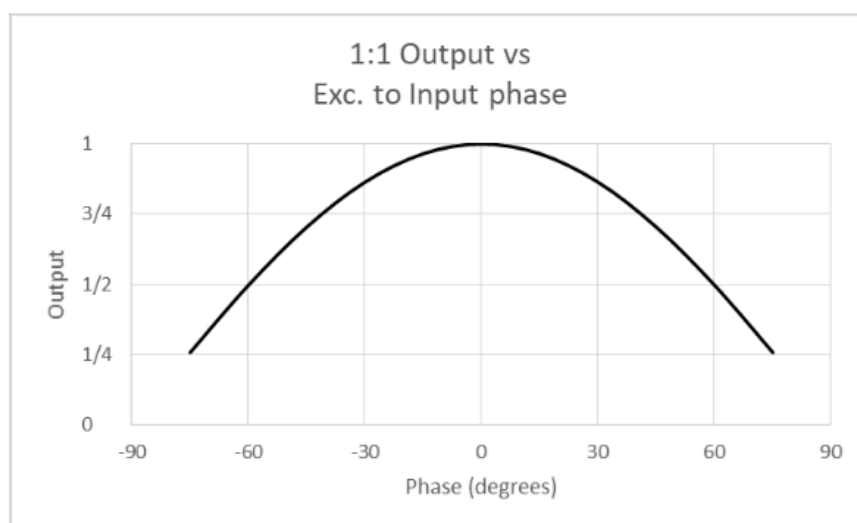


Image 6: LVDT adapter output sensitivity to input signal phase lead/lag, 1:1 sensor

Two examples are shown for sensors with sensitivity = 0,5. Output signal level is 1/2 of the Exc. Signal. Sensor output phase lag is 45°. LVDT adapter output is $\approx 0,35$ ($\approx 1V_{exc} \cdot \text{sensitivity} \cdot 0,70$) according to Image 2.

When phase compensation matches phase lead / lag of sensor output LVDT adapter output will be at its maximum = 0,5 ($= 1V_{exc} \cdot \text{sensitivity} \cdot 1,00$).

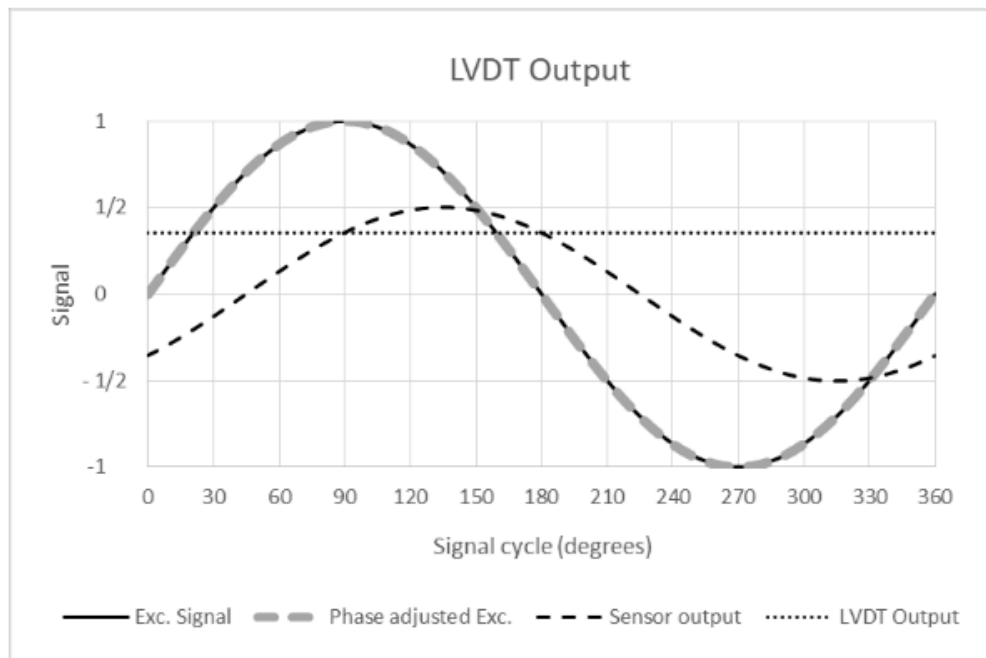


Image 7: Example: 45° sensor output , no compensation

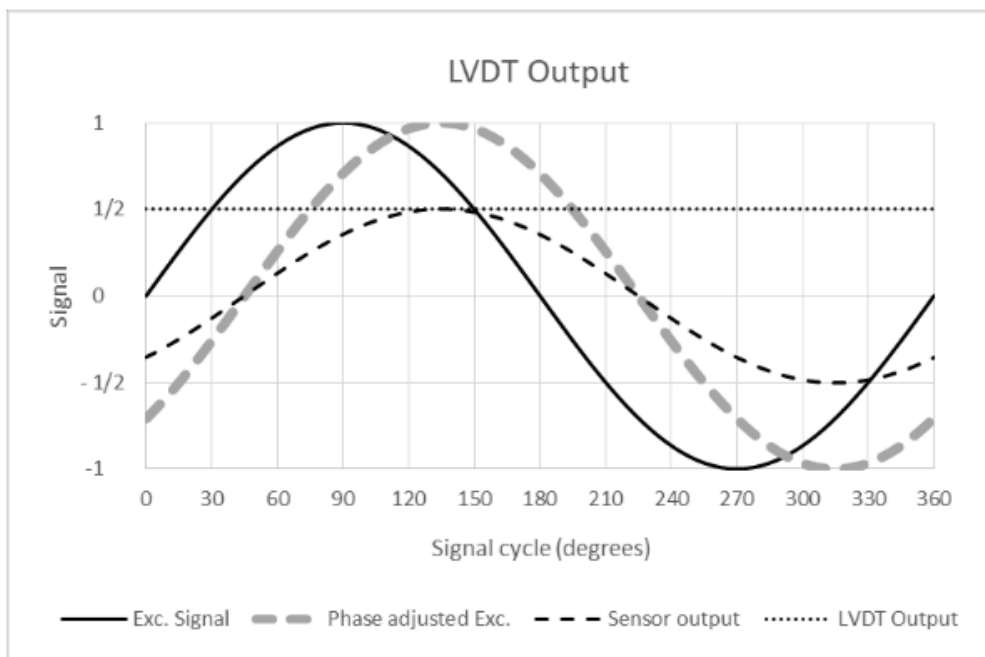


Image 8: Example: 45° sensor output, 45° compensation

2.16.5. Operation

Connect the LVDT Adapter to your SIRIUS or DEWE-43 channel and connect to SENSOR input your sensor probe.

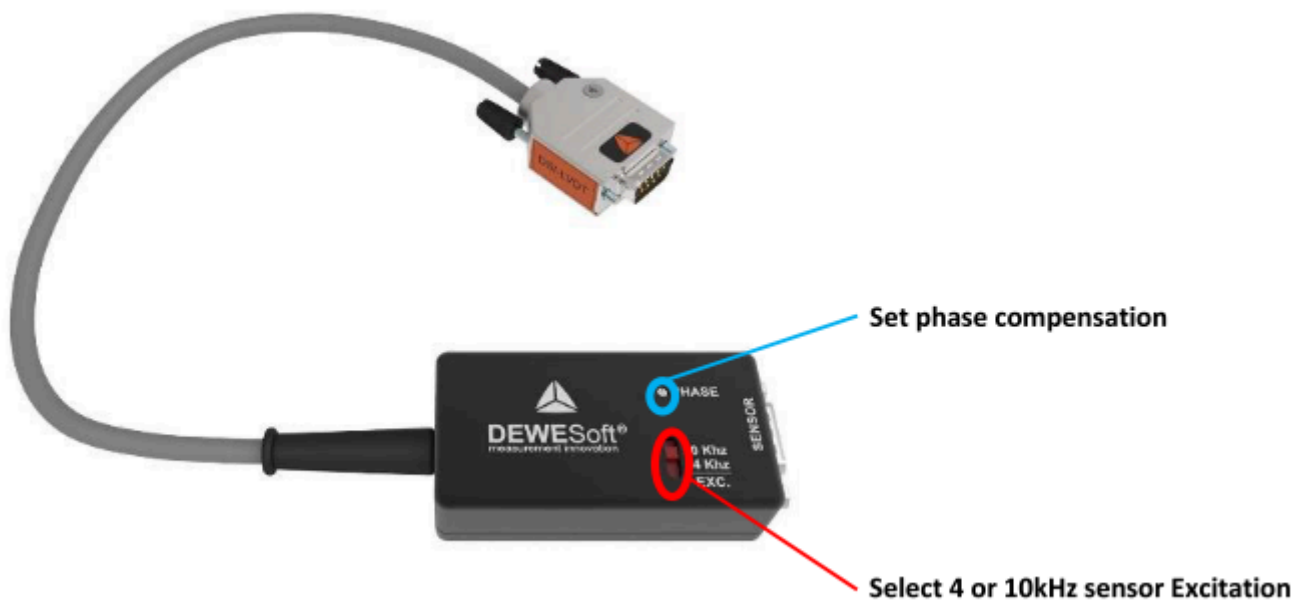


Image 13: Adapter setting, frequency, phase

Depending on the sensor used, select the excitation frequency of the adapter as close as possible to frequency in sensors specifications.

With phase compensation adjust the measured output to maximum output value.

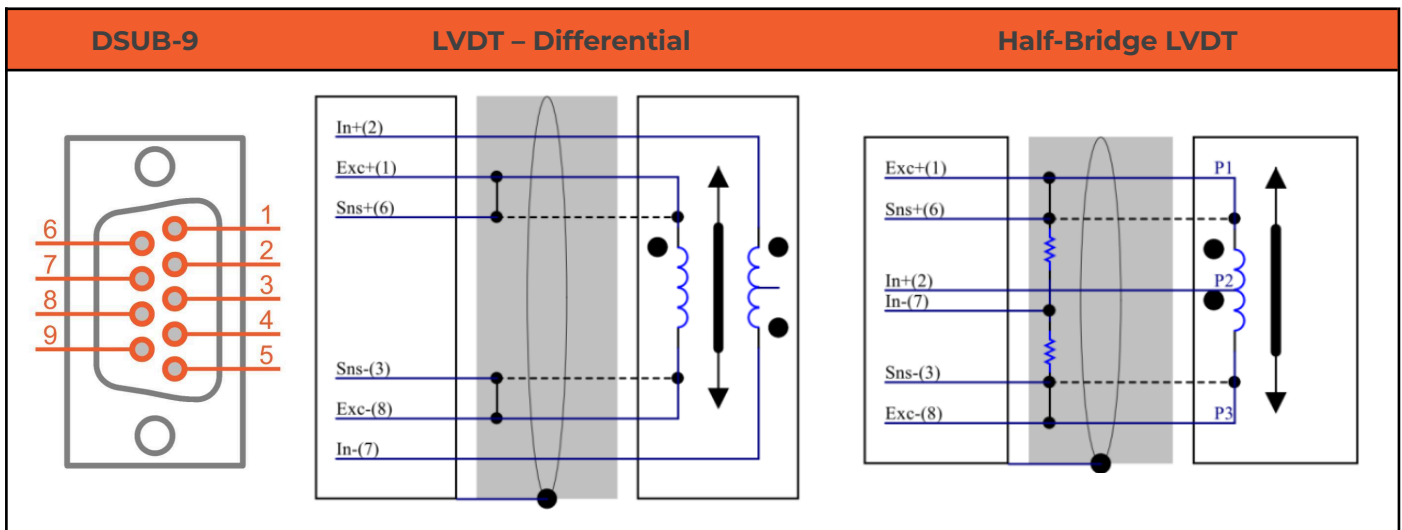
2.16.5.1. Phase adjustment procedure

Please ensure that the pin pairs Exc/Sns are connected with each other (6-wire-connection).

Phase adjustment steps:

1. Manually set the sensor to e.g. $\frac{3}{4}$ of the measurement range, e.g. if you have a displacement sensor with 50mm range, fix it at position 35mm.
2. In the Dewesoft Analog in → Channel setup → check the signal. Adjust the phase with the screw on the DSI-LVDT (blue circle in picture) until the signal is maximized.
3. Then do the calibration (e.g. 2-point-calibration directly in the channel setup)

2.16.5.2. Connections

**Hint**

6-wire connection only shown. 4-wire also possible, connect Sns and Exc signals on the adapter side of the connector.

**Important**

Input - (pin7) shall be connected to half bridge completion resistor divider assembled with discrete resistors with the following recommended specifications: Resistance 1k Ω , Tolerance 0.1%, Temperature coefficient 15ppm, Power 0,125W. This connection is preferred over the previous connection IN- to GND (so called "noisy GND").

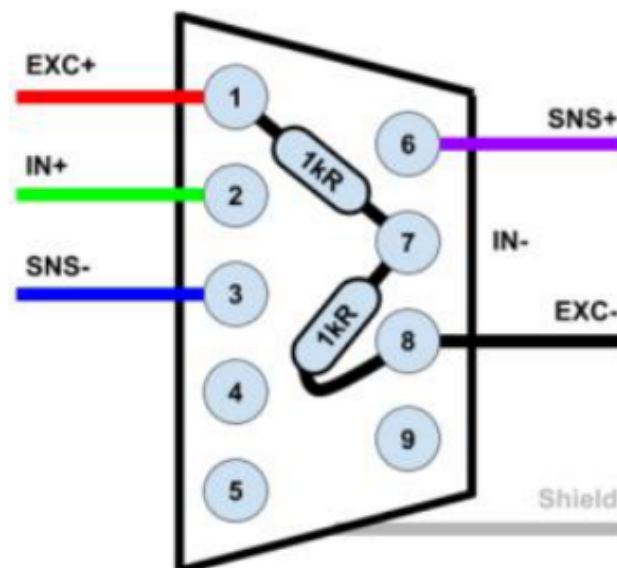


Image 14: Solder side of the DB9 male, HB divider resistors