

A. Eberle

40 Years of Experience in the Field of Measurement and Regulation Technology



Founded in 1980
Located at
Nurnberg



India Office
Dedicated for
Middle East &
Asia

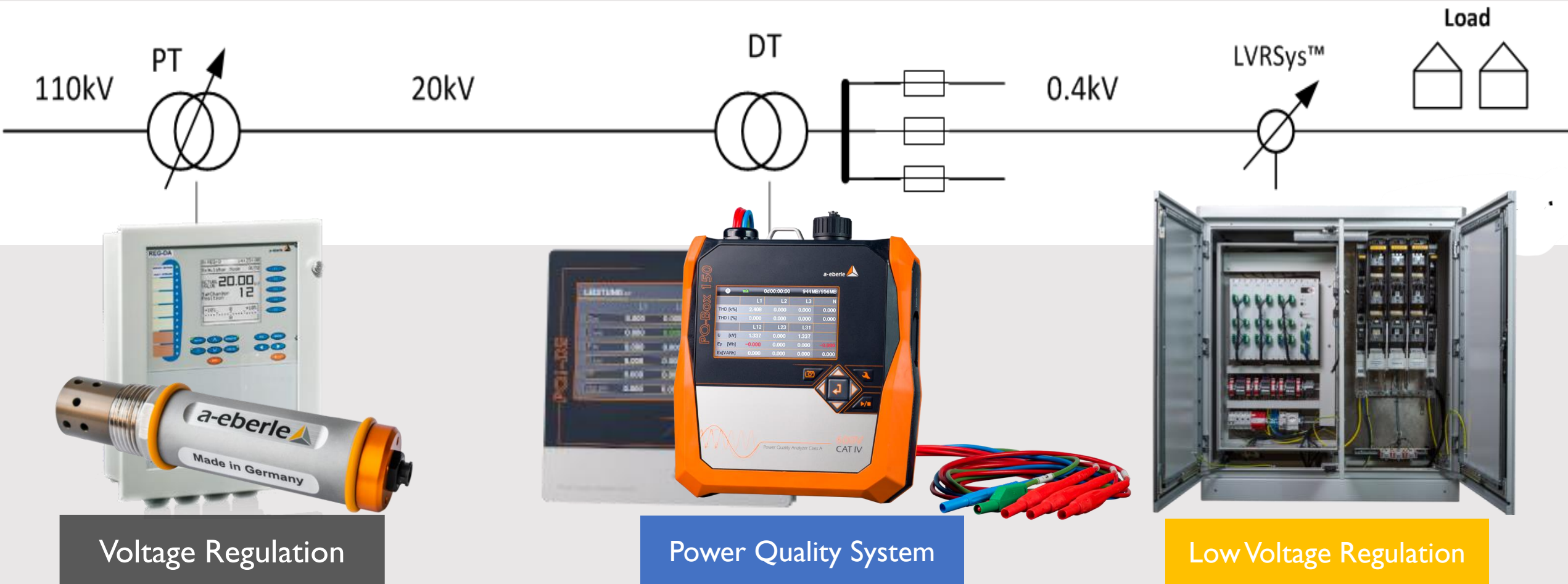


Active at all
Voltage Levels
in Generation,
Transmission and
Distribution of
Electrical Energy



Operating
internationally in
approx. 65
countries

Our Motto
Monitor & Regulate the Voltage



TRAFOSTICK

Oil BDV & Dissolved Gas Sensor



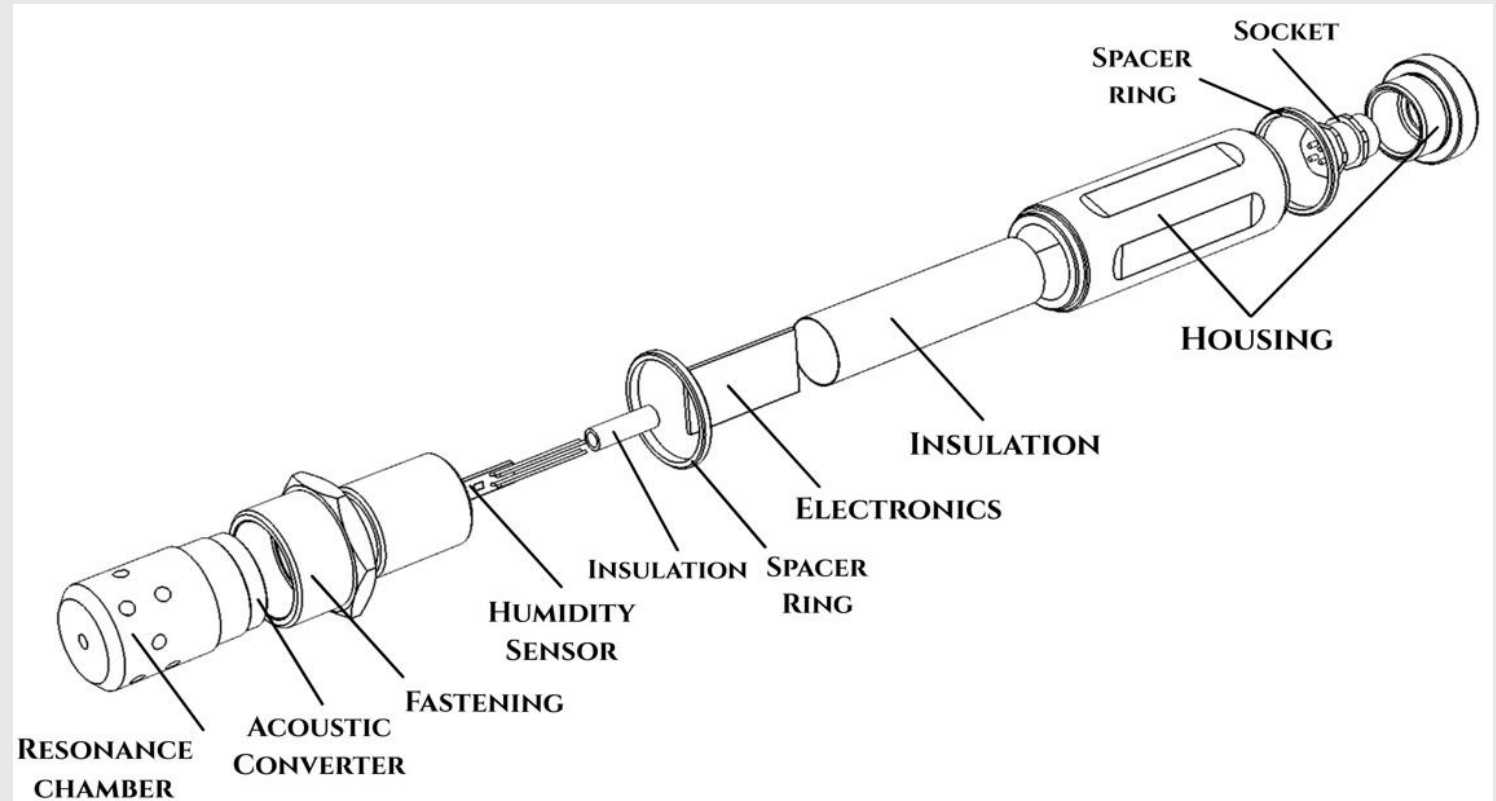
Transformer Oil BDV Monitoring



Acoustic Hybrid Sensor / TrafoSticks TS 4A(dvanced) and TS 5G(as)



- TrafoStick™ is an ultrasound sensor, which measures phase shifts and signal amplitudes of the sound waves and combines them with humidity-in-oil and temperature of oil to provide an accurate BDV determination



Transformer Oil BDV Monitoring

Measured parameters

The following transformer-oil parameters are determined with both TrafoSticks:

BDV @20°C	Breakdown voltage [kV]		; 1-5%
BDV TM	Breakdown voltage [kV]		; 1-5%
Wc	Water content [ppm]	; 2.0%	
Temp	temperature [°C]		; 0,1%
RS	relative saturation[%]	; 1-5%	

AVG_Wc (S, M, L) ; AVG_BDV (S, M, L) ; AVR_BDV-TM (S, M, L)

AND

with TrafoStick TS 5G two gases additionally - H₂ & CO

**(Hydrogen & Carbon Monoxide continously
- 1 value/sec. via MODBUS TCP/IP)**

	BDV
	Water content
	Temperature
	TOF
	Velocity
	DBDS
	Interfacial tension
ρ	Density
δ	DF

; 1-

Transformer Oil BDV Monitoring

Mounting on top of transformer tank



Mounting on Flange



Transformer Oil BDV Monitoring

Mounting on the pipeline



Mounting on top of Tapchanger



Transformer Oil BDV Monitoring

Mounting – as recommended

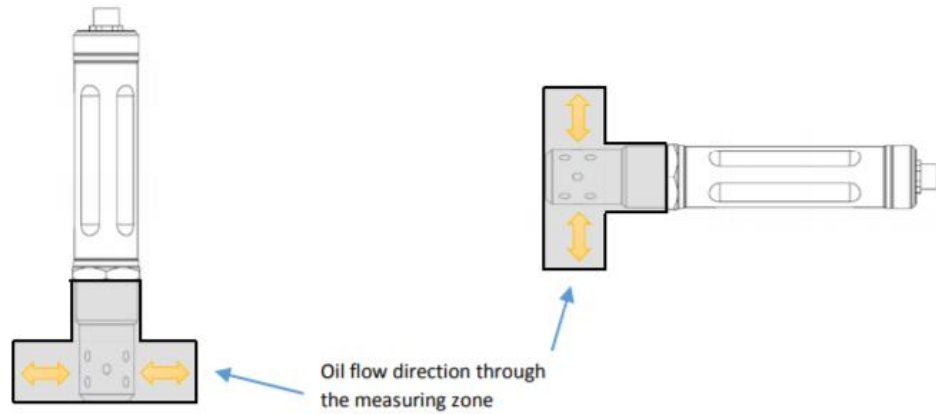


Figure 3-1 Typical mounting positions in the hydraulic system Vertical & Horizontal(preferable)



Figure 3-2 1-inch tee and device during assembly

Mounting – to avoid

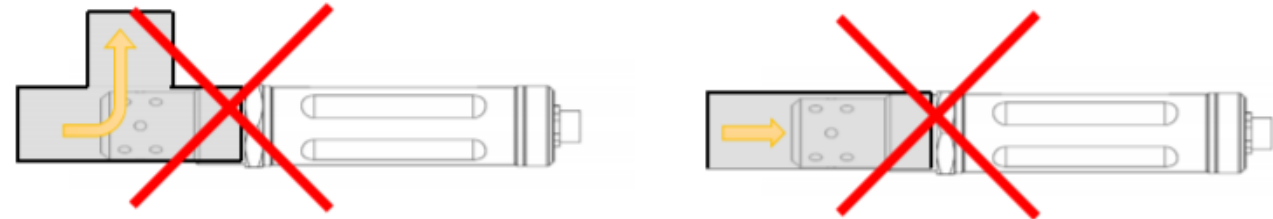


Figure 3-3 Incorrect installation of the device

Transformer Oil BDV Monitoring

Mounting – as recommended

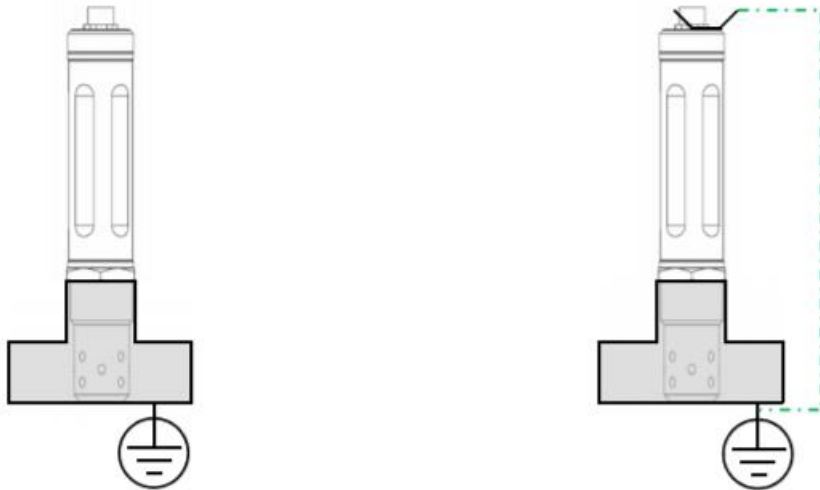


Figure 3-6 Grounding the device enclosure

When the installation is complete, check the protective circuit (total resistance must be $< 1.5 [\Omega]$)

Mounting – to avoid

To screw the device into the T-connector, use a 36-size metric wrench or a 1½ inch spanner. To tighten TrafoStick™ Basic, hold only the part right above the thread.



Figure 3-4 Correct tightening of the device

Using or Holding another part of the housing while tightening, may damage the device or unseal the entire housing.



Figure 3-5 Incorrect tightening of the device

Transformer Oil BDV Monitoring

Software

Oil Humidity (in ppm) – via model

Oil Temperature

Estimation confidence (only for debug purpose)

Oil BDV at Temperature

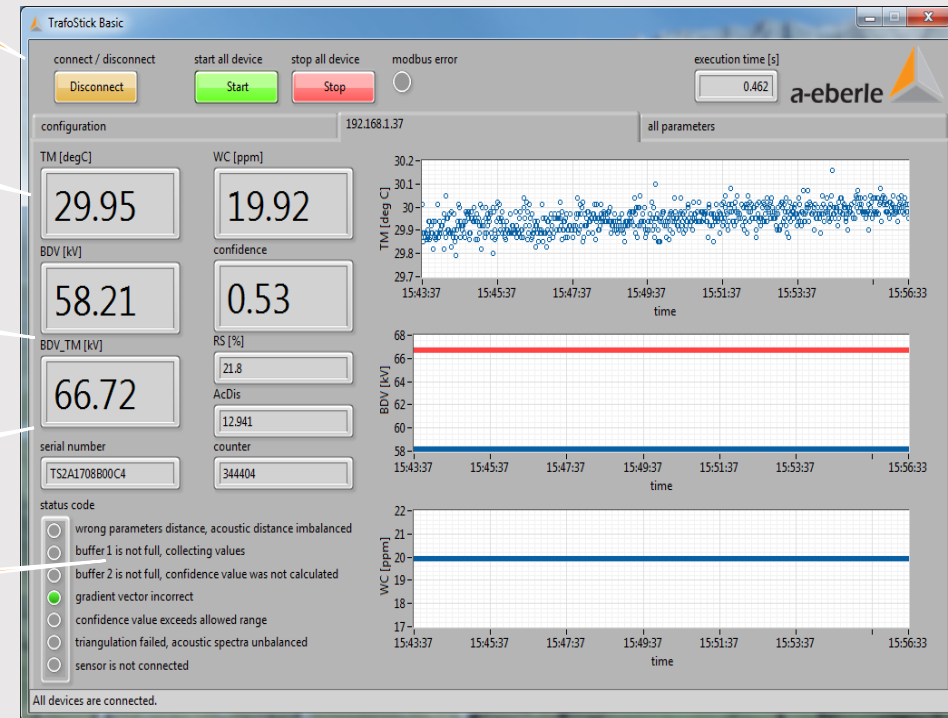
Oil Humidity (%) – measured

Oil BDV normalized at 20°C

Acoustic parameter

Measurements taken

Momentary Status (only for debug purposes)



TrafoStick – TSO India



Customer

Power Grid Corporation India Limited is an Indian, central public sector undertaking, under the owner-ship of the Ministry of Power, Government of India. It is engaged mainly in transmission of bulk power across different states of India. It is headquartered in Gurugram. Power Grid transmits about 50% of the total power generated in India on its transmission network.

“pilot-project” - TrafoStick TS4:

Customer: TSO

Country: India

Author:
Pradeep Modi 02/2024

Application – “pilot”-installation

MEMBER PRESENT

POWERGRID	PTss
1.DR.VINIT KUMAR SINGH, GM	1.MR.JAYA CHANDRAN, Service Engineer
2.MR.NAVEEN KR GUPTA, Asst.Manager	(9150045759)
3.MR.RAMJASH BHAKAL	

Substation name – 400/220KV PGCIL, Mandaula

Transformer details – 400/220kV -33kV 500MVA EMCO make Auto transformer

Online dryout system details – PTSS/EMCO/TDS1GA6X (IECFO)/011/JAN/2016

BDV sensor make – A Eberle

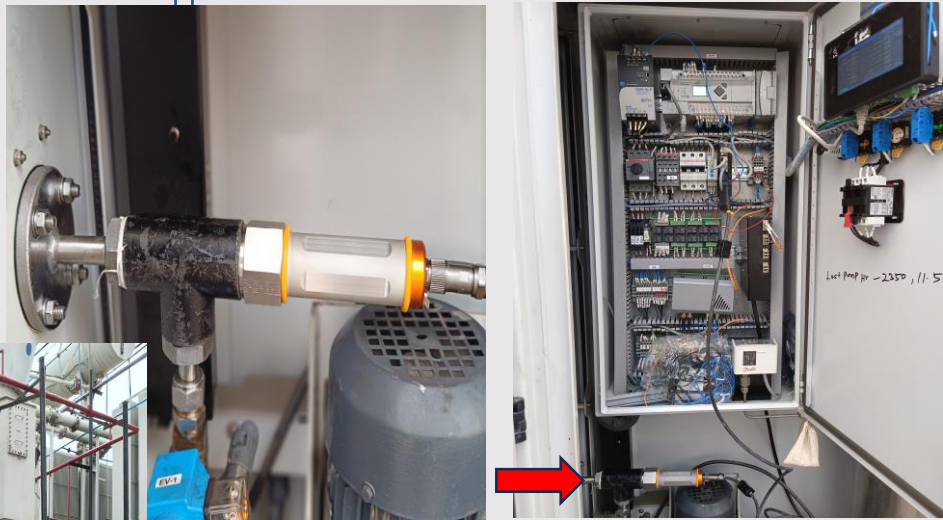
1.PTSS Installed additional feature of Breakdown voltage monitoring using BDV sensor (A Eberle make) on 17 October 2023 at the Inlet oil circuit from Transformer in the existing Online Transformer Dryout System Model PTSS/EMCO/TDS1GA6X (IECFO)/011/JAN/2016 on Auto Transformer 1 (400/220/33KV 500MVA EMCO make).

2.The following observation has been made on the installed system till date regarding online BDV monitoring.

S.NO	DATE	BDV values recorded by Automatic BDV measurement Megger make kit	BDV values reported by online BDV sensor, in PTSS system
1.	17 OCT 2023	73.5kv	75.42kv
2.	28 FEB 2024	75.2kv	74.16kv

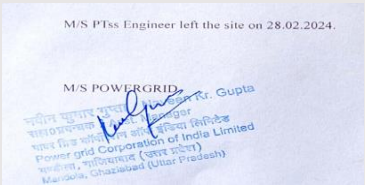
3.The system is generally found in order and acceptable.

4. The picture of the installed sensor is enclosed below.



Customer Feedback

The A. Eberle sensor is generally in order and acceptable!





“Success stories”

**... always written by the combination
of persons and innovative products!!!**



**Commissioning – 27.th March 2024
of two TrafoStick TS G5
(2x 40MVA Transformers);**

2x OLTC`s will follow in May 2024!

Substation “Löffingen”





TrafoStick G5

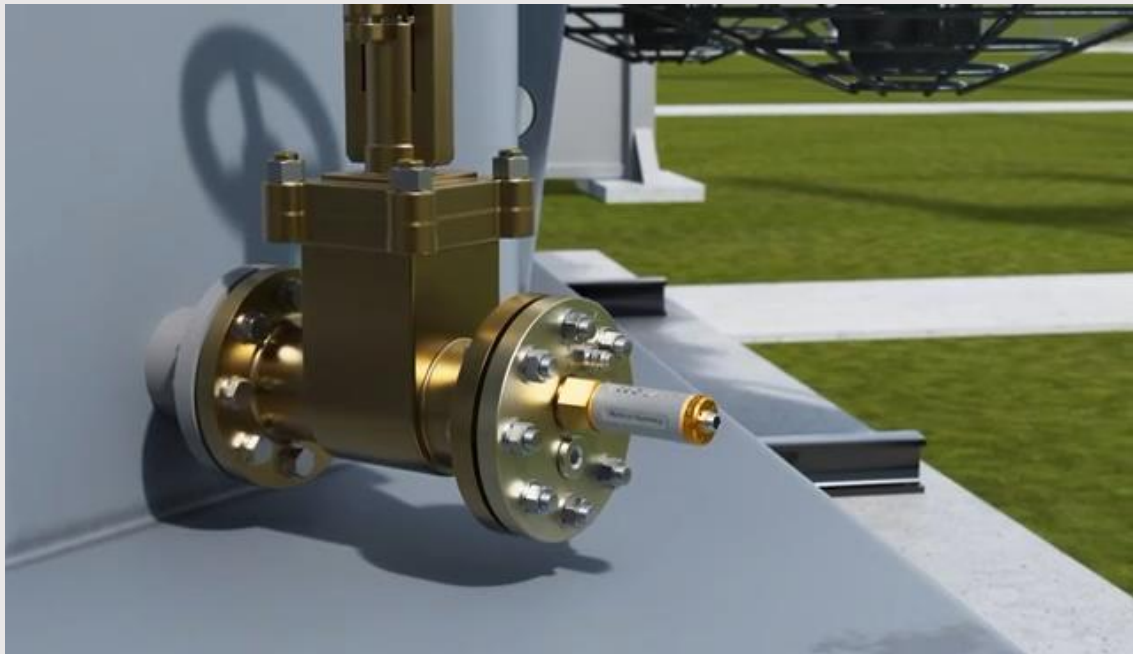
**Communication by
MODBUS TCP/IP to
IEC 61850 and
Local WebServer**

Trafostick Installation Videos

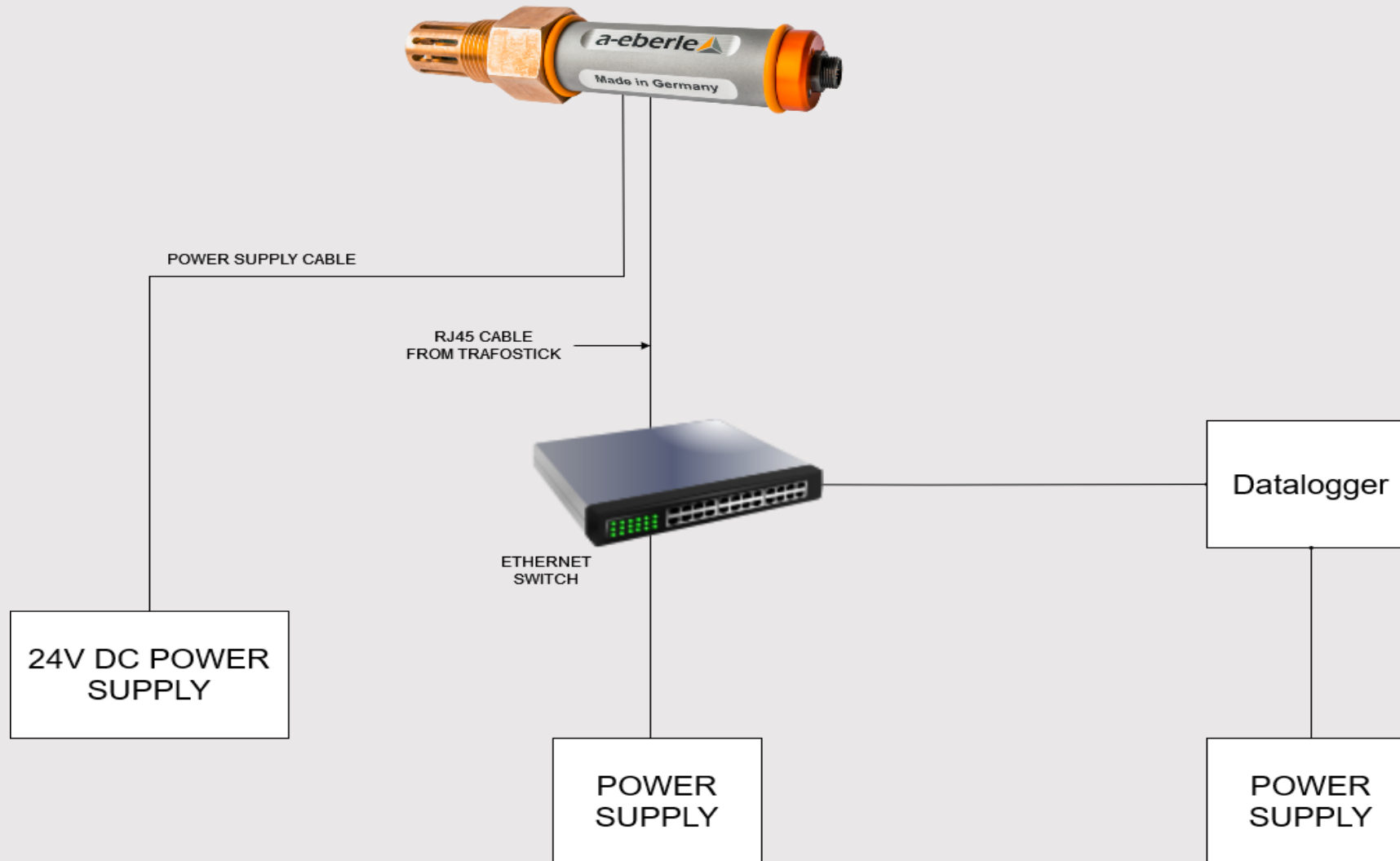


Please find YouTube link to view videos on Installation of Trafostick.

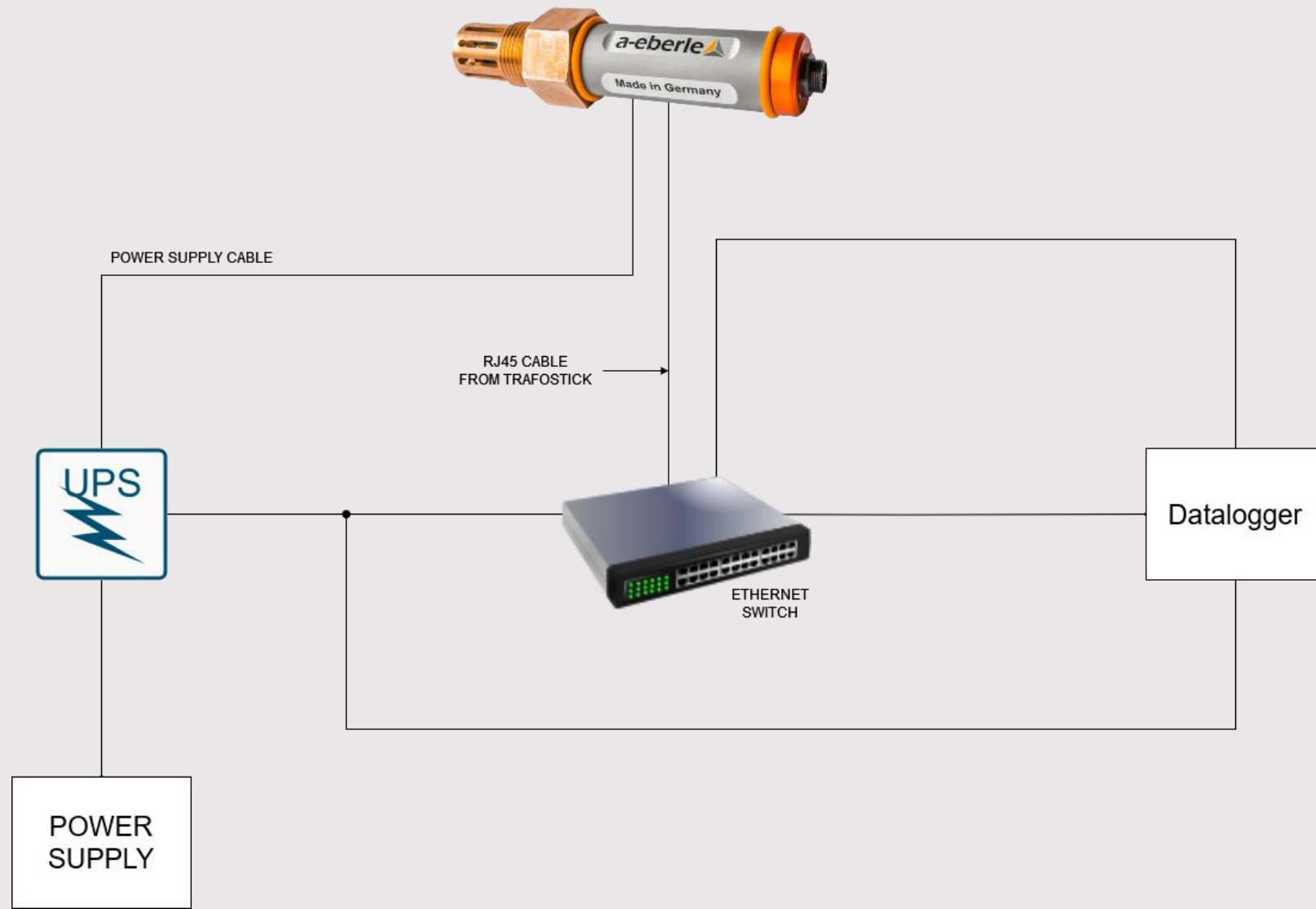
https://www.youtube.com/playlist?list=PLQgXBThFS_0truCKH6nEPMciyi8256dsT



Architecture Overview



Option 1



Option 2

