



# THE BUFFER STATION

VOLTAGE DROP COMPENSATION



**Elektroline**

THE BUFFER  
STATION IS  
DESIGNED TO  
COMPENSATE  
FOR SHORT-  
TERM CURRENT  
AND VOLTAGE  
DROPS WITHIN  
OCS CATENARY  
NETWORKS.



This station is installed in areas where the OCS does not meet the energy requirements for trolleybuses. Typically, these areas are located some way from power substations as the long-distance resistance of the wires causes a voltage drop. The station is installed in cases where the catenary is powered by only one converter station, typically during reconstruction. The buffer station can provide good compensation for a lack of voltage in the system.







Elektroline



INCREASED ENERGY DEMANDS ARE ANTICIPATED, WHEN USING HYBRID BATTERY TROLLEYBUSES. UPON RETURNING TO THE CATERNARY, THESE BUSES NOT ONLY CONSUME ENERGY FOR THEIR NORMAL OPERATIONS, BUT ALSO FOR ONBOARD BATTERY CHARGING. THE TOTAL TROLLEYBUS CONSUMPTION AMOUNTS TO THE SUM OF THE BATTERY CURRENT AND THE TRACTION CURRENT.

Further upgrades can be made to the buffer station based on customer requests, including the installation of higher capacity batteries. The main advantage of these higher capacity batteries lies in their ability to store energy. This is especially useful when the track is powered by a small photovoltaic power plant as the stored energy can in turn support the catenary system.





OUR BUFFER STATION  
IS BASED ON A DC-DC  
600/600 TRACTION DRIVE  
WHICH ENSURES THE SAFE  
AND RELIABLE TRANSFER OF  
ENERGY TO AND FROM THE  
TRACTION SYSTEM.







# THE BUFFER STATION – the pros and cons

compared to a traction substation

## THE BUFFER STATION

low

no needed

low

ease of relocation

Acquisition cost

Power supply

Building demands

Mobility

high

22kV or 35kV  
connection

big

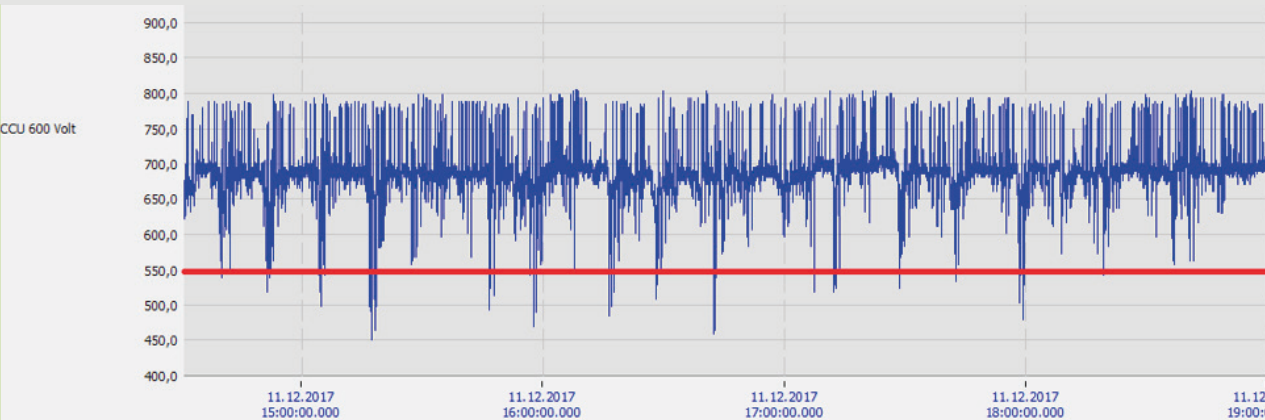
relocation impossible

## TRACTION SUBSTATION



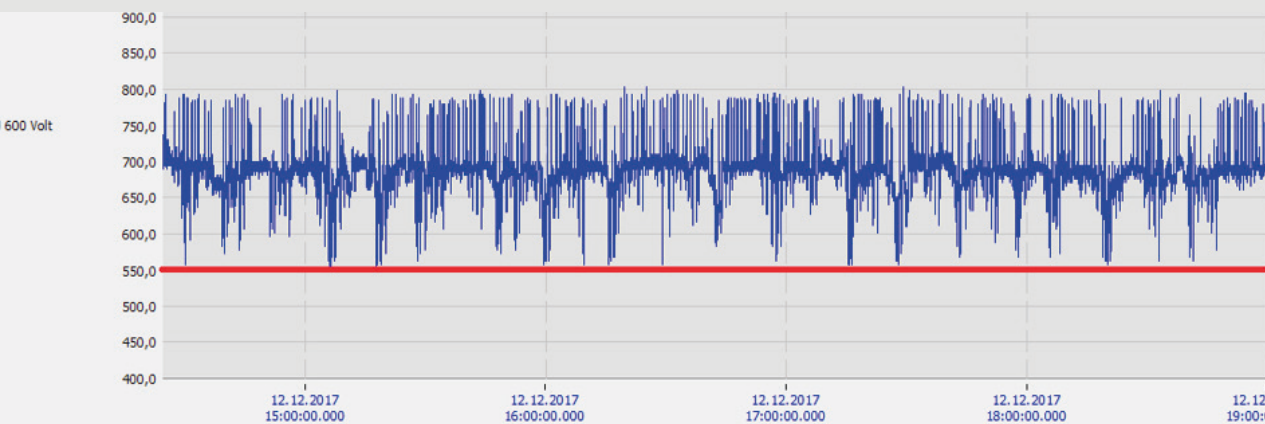


# THE VOLTAGE WAVEFORM



The voltage waveform of the trolley catenary without BS support. The voltage drop is visible as the voltage is consistently below 450 V (notice the drops below the red 550 V boundary line).

Now, look at the waveform of a trolley catenary with the buffer station's support. The voltage never falls beneath the set 550 V boundary during rush hour.





The technology and all of the buffer station's components fit into the self-supporting steel frame, allowing for easy and fast installations or relocations.



## TECHNICAL SPECIFICATIONS

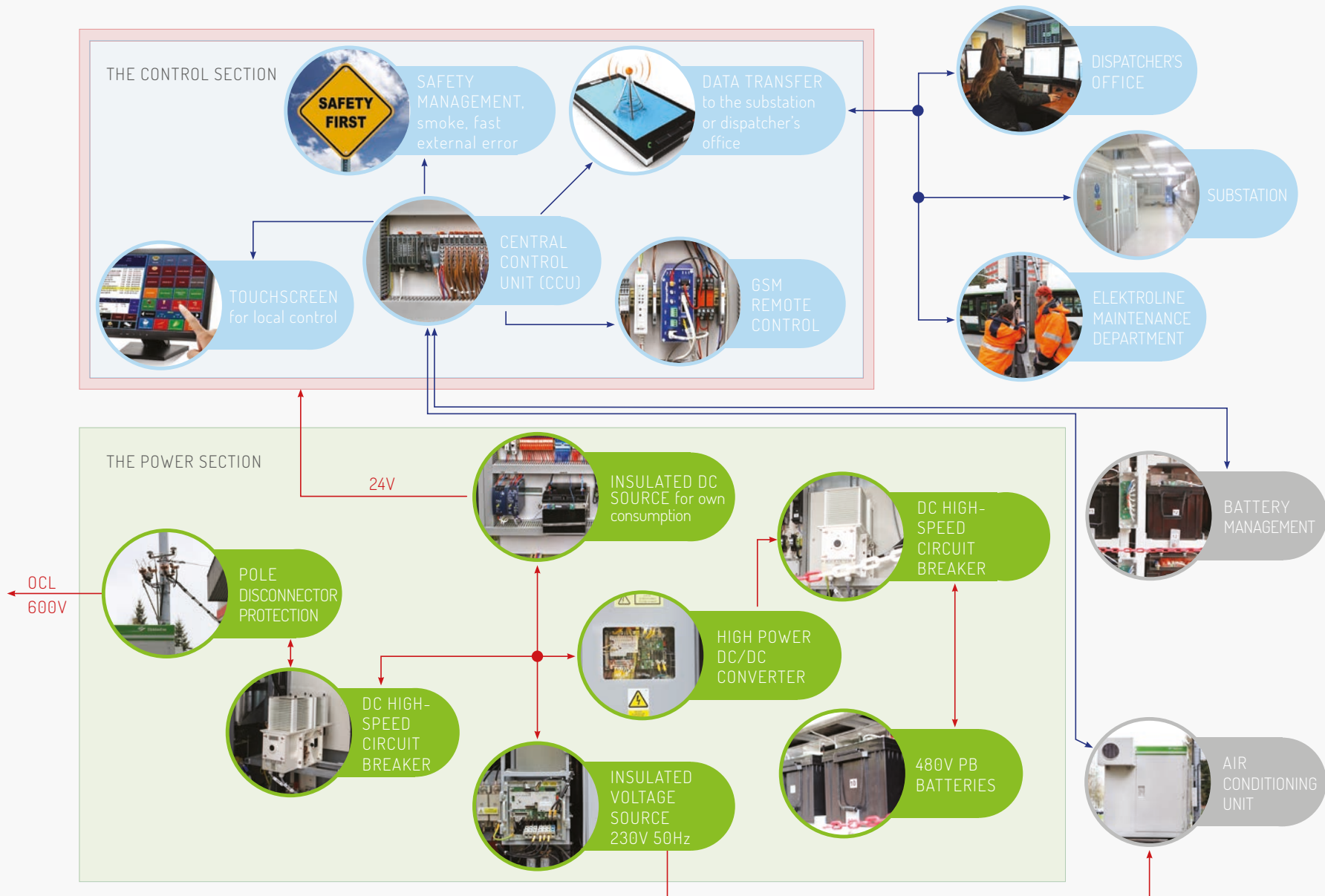
### Basic Specifications of Buffer Station

Nominal traction voltage	600 V or 750 V DC
Range of traction voltage, EN 50163	380 to 1000 V
Voltage range for power supply	400 to 600 V
Maximal current supplied to the overhead lines	1000 A / 5 s max.
Short circuit protection	yes, electronic contactor, fuses
Converter cooling	air conditioning
Cooling of Batteries	AC
BS dimensions (W x L x H)	2200 x 4000 x 2600
Weight of BS with lead-acid batteries	8000 kg
Weight of BS with lithium batteries	7000 kg
BS ingress protection	IP 23D
Auxiliary voltage	230 V AC and 24 V DC
Surge arrester (set)	PSPI 1/10/III
Ambient temperature	-20°C ÷ +40°C

Battery Part	Lead-acid Battery	Lithium Battery
Nominal battery voltage	480 V	533 V
Maximum short-term discharge current	1000 A, 5 s	1000 A, 5 s
Maximum charging current	60 A	266 A, 5 s
Nominal charging current	20 A	133 A
Total stored energy	96 kWh	141.7 kWh
Used stored energy (optimal)	32 kWh	80 kWh
Type of Batteries / battery cells	VRLA, SLA 12 V, 200 Ah	IRC 18650, 2Ah
Number of batteries / battery cells	40 pcs	19 152 pcs
Configuration of batteries	series	series/parallel, 144S/133P



# BUFFER STATION SYSTEM DIAGRAM



# INSTALLATIONS



## NILN

The buffer station is located at an intermediate location where the trolley lines end and the trolleybuses continue for another 4 km without the use of the catenary system, using their batteries. The station supports the system during increases in offtake trolleybuses reconnect to the traction system and also draw power to recharge their batteries.





# PILSEN

Once a modification has been completed in the summer of 2018, the station will serve as a catenary support as the distant converter station is unable to maintain the voltage.

# ELEKTROLINE WORLDWIDE

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