



# BUFFER STATION

COMPENSATION OF VOLTAGE DROP





# THE BUFFER STATION IS DESIGNED TO COMPENSATE SHORT TERM CURRENT AND VOLTAGE DROP WITHIN OCS CATENARY NETWORKS.

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This station is located where the OCS does not meet the energy required for trolleybuses. Typically, these areas are located far from power substations as the long-distance resistance of the wires causes a voltage drop. Installation of the station occurs when the catenary is powered by only one converter station, typically during reconstruction. The buffer station can compensate well for a lack of tension in the system.







Elektroline

AN INCREASE IN ENERGY DEMAND IS EXPECTED WHILE USING HYBRID BATTERY TROLLEYBUSES. WHEN THESE BUSES RETURN TO THE CATENARY THEY CONSUME ENERGY NOT ONLY FOR NORMAL OPERATIONS, BUT ADDITIONALLY FOR ON-BOARD BATTERY CHARGING. THE TOTAL CONSUMPTION OF TROLLEYBUSES IS THE SUM OF THE BATTERY CURRENT AND TRACTION CURRENTS.

Further upgrades to the buffer station can be made under customer requests, including one which would install higher capacity batteries. An advantage of these higher capacity batteries is the enablement the energy storage. 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.



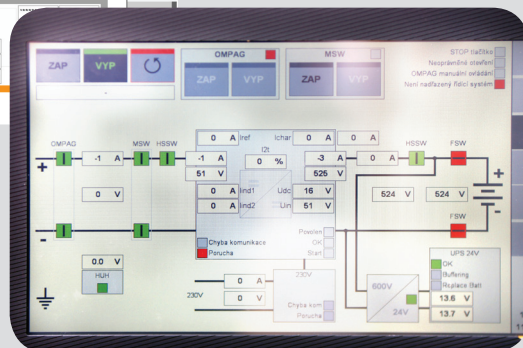




THE FOUNDATION OF OUR  
BUFFER STATION IS A  
TRACTION DRIVE (DC-DC  
600/600) THAT ASSURES  
THE SAFE AND RELIABLE  
TRANSFER OF ENERGY TO  
AND FROM THE TRACTION.

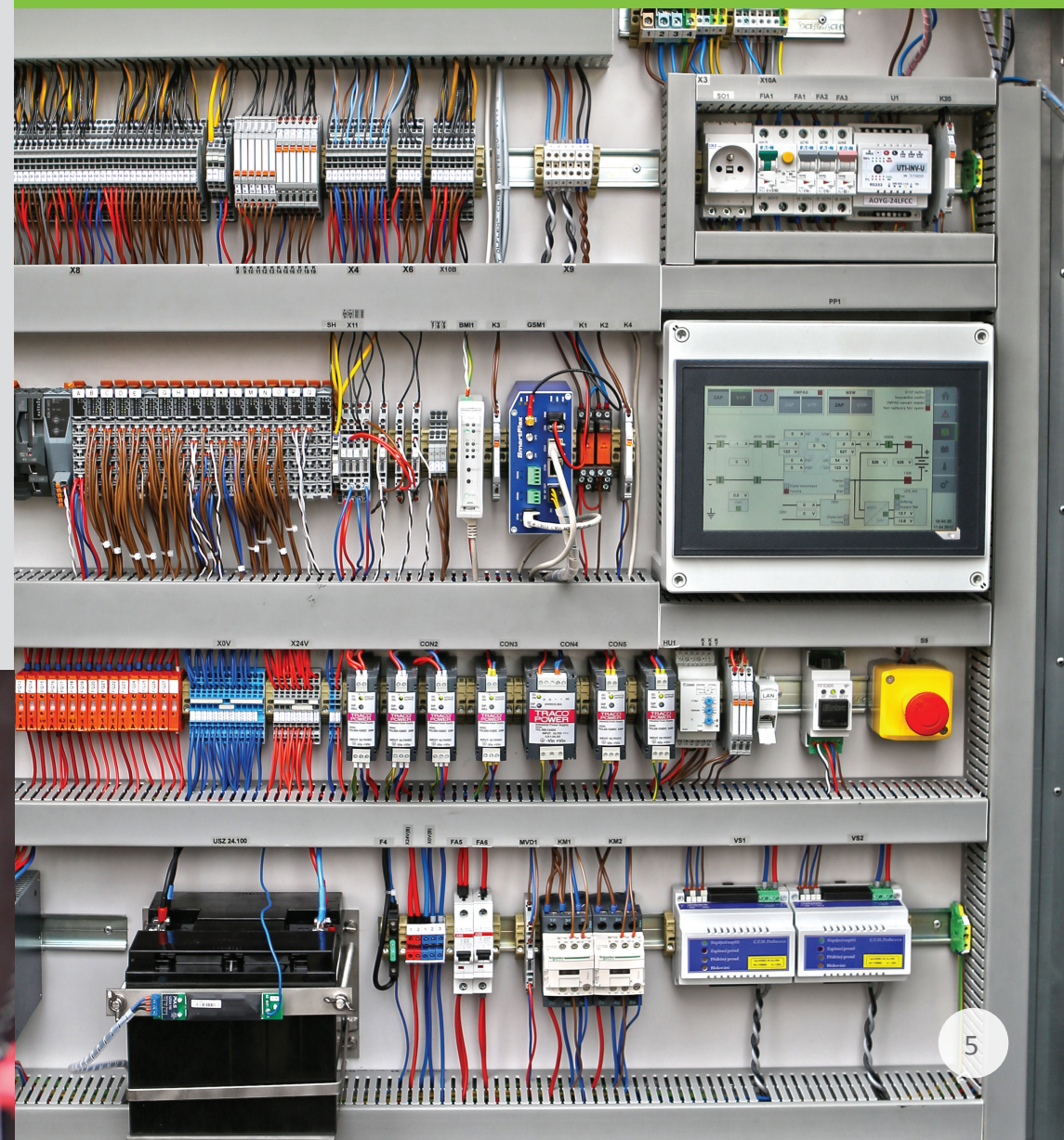






An advantage of the Buffer station is its functionality and ease of use, as it is controllable on-site as well as from afar as our web interface gives users control of the Buffer Station remotely. Additionally, the buffer station can communicate with the master traction power supply station.

The main station regulator controls the traction drive. An air condition unit is installed within our Buffer stations to maintain an equilibrium of temperature, a factor crucial for the health and longevity of the batteries.







# BUFFER STATION – Advantages & Disadvantages

in comparison with the traction substation station.



## BUFFER STATION



Low acquisition cost



Does not need an additional power source



Minimal construction work



Ease of relocation



Limited support of traction



## TRACTION SUBSTATION



Unlimited support of the system



High acquisition cost



Big building demands

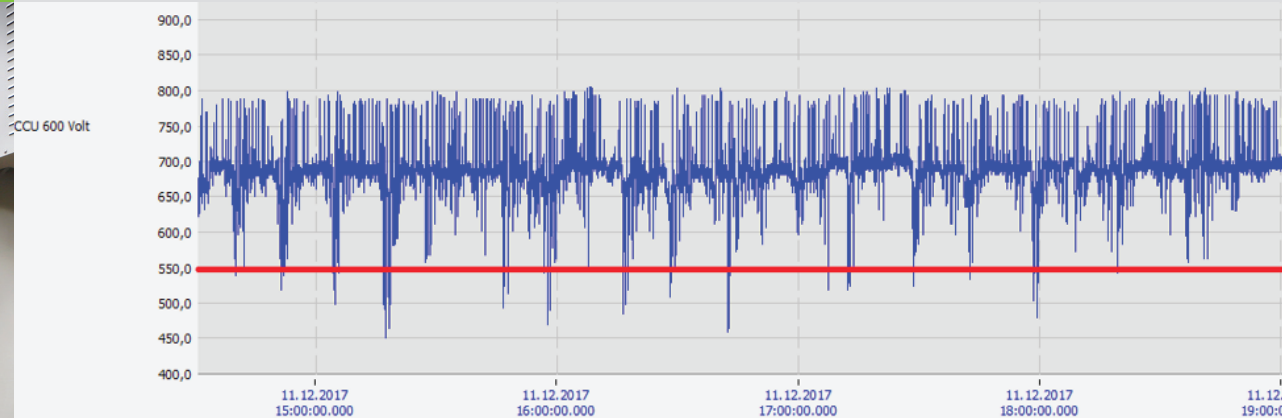


Additional power required



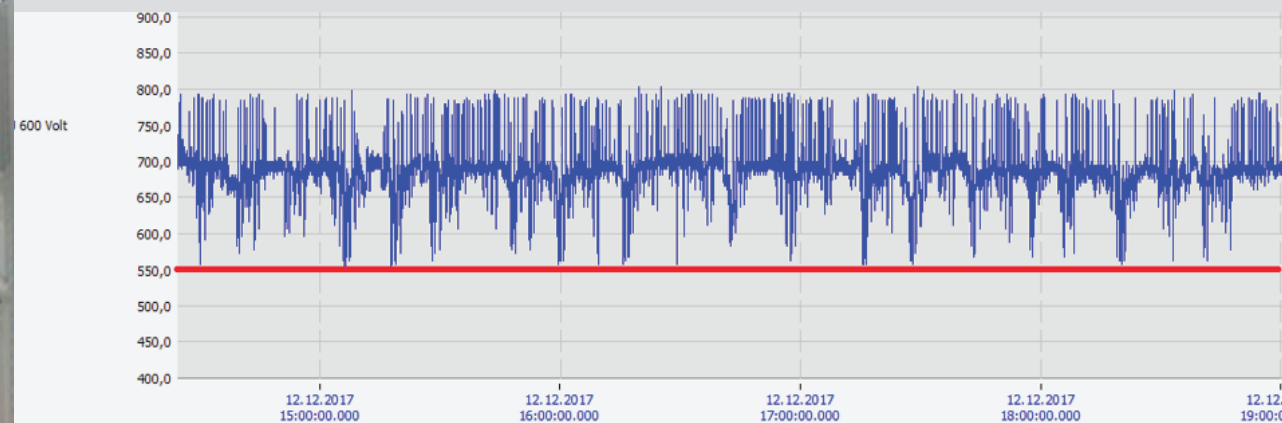


# VOLTAGE WAVEFORM



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

Now look at voltage waveform on the trolley catenary with the buffer station's support. The tension of the trolley catenary during rush-hour never descends below the set boundary of 550 V.





# EASE OF RELOCATION

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

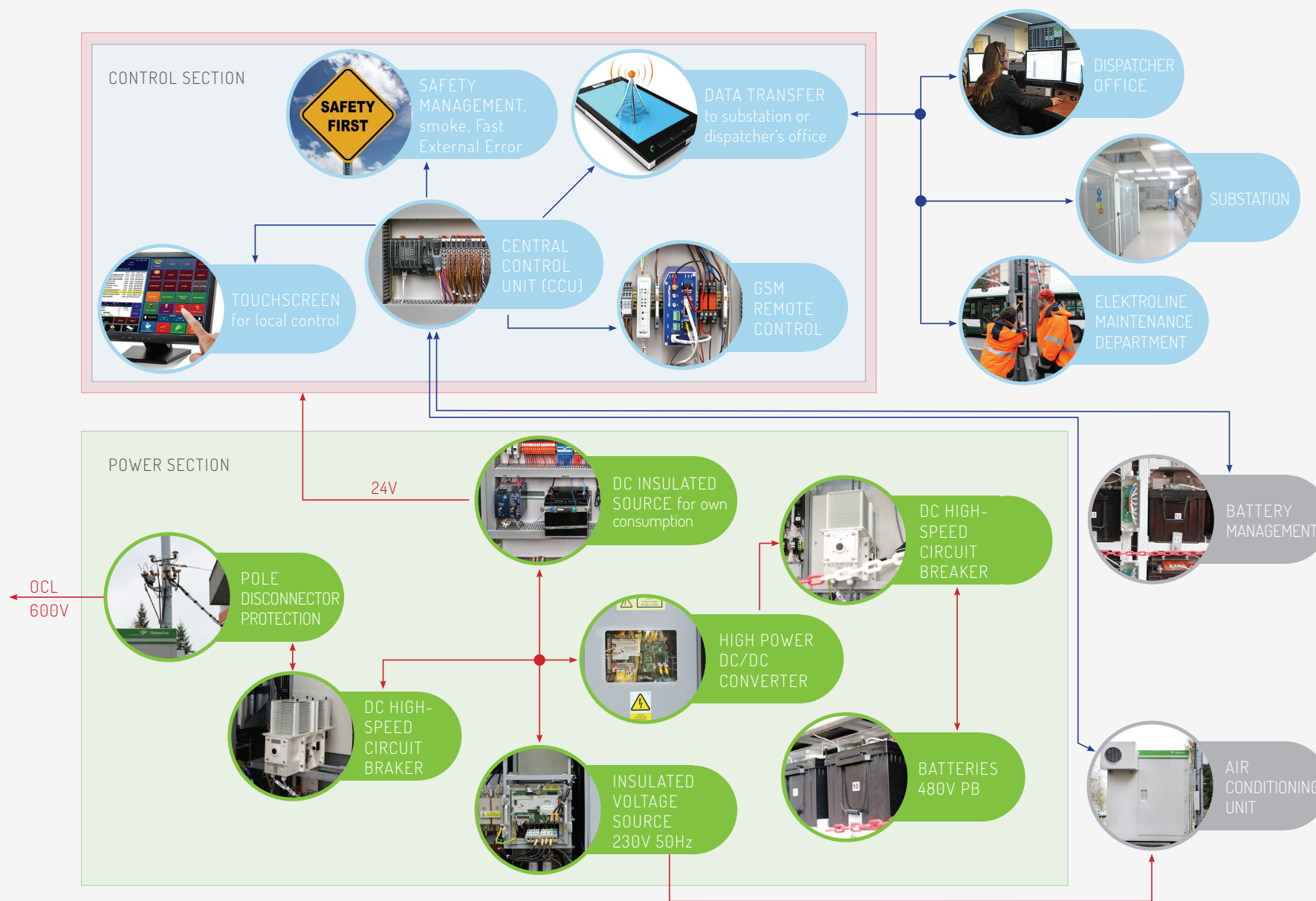


## TECHNICAL SPECIFICATIONS

	Battery type		
	Pb12V	LFP200	LFP400
Input parameters – overhead contact line			
Nominal traction voltage	750V (600V)		
Input voltage tolerance	±33%		
Permitted range of traction voltage	380 ÷ 1000V		
Current supplied to the overhead lines	1000A		
Rate of (supplied) current change	2000A/s		
Short-circuit resistance	yes (fuses, speed-switch, electronic)		
Output parameters – batteries			
Nominal voltage of the batteries	480V	512V	486V
Voltage range of the batteries	350V to 600V	400V to 624V	380V to 590V
Nominal charging power	35 kW	97 kW	97 kW
Nominal discharging power	600 kW / 5s	97 kW	97 kW
Working cycle specification	5 s / 120 s (10%)	customized	customized
Rated charging or discharging battery capacity	32kWh	280kWh	280kWh
Technical specifications of batteries			
Type	SLA, maintenance-free	LiFePo	LiFePo
Nominal voltage	12V	3,2V	3,2V
Nominal capacity	200Ah	200Ah	400Ah
Maximum short-time discharge current	1000A (5 s)	2000A	2000A
Maximum charging current	60A	600A	1200A
Other parameters			
Ingress protection of BS	IP 23D		
Ambient temperature	-20°C ÷ +40°C		
Cooling of BS	AC		
Cooling of the convertor	by the air		
Surge arrester (set)	PSP1/10/III		
Dimensions of BS (W x L x H)	2200 x 4000 x 2600		
Aproximate weight of BS	8000kg		



# BUFFER STATION SYSTEM SCHEME







# INSTALLATIONS



# NILZ

The buffer station is located at an intermediate location where wiring ends and the trolleybuses continue 4 km further without the catenary system. The station supports the system during increases in offtake when the trolleybus is connected to the traction system.







# PILSEN

The catenary system in Pilsen is powered by two converter stations. After a modification occurring Summer of 2018, the station will serve as the catenary support, as a singular converter station cannot hold the traction tension itself.



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