

Business Unit Energy Storage

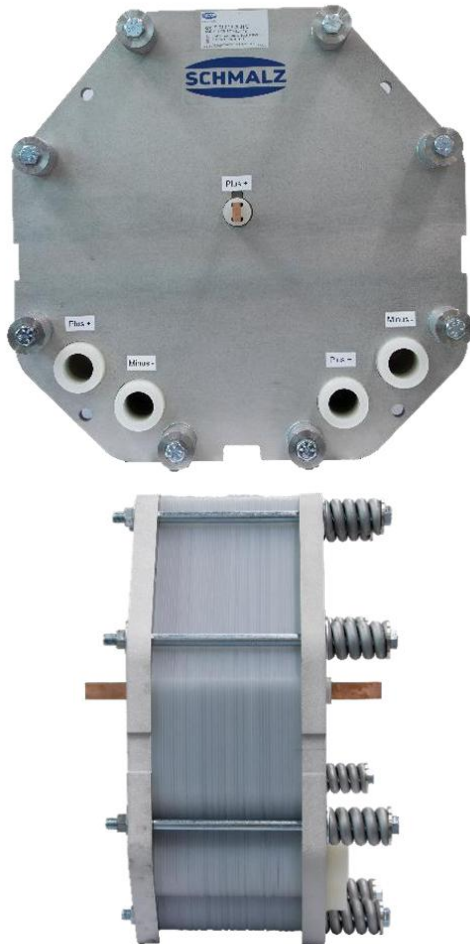
SCHMALZ Redox-Flow-Battery Stack Generation 4.0
V 1.2 / Sep. 2026



Article no. / type description

19.01.01.02186 / RFB-ST-VEL-39Z

Applications:



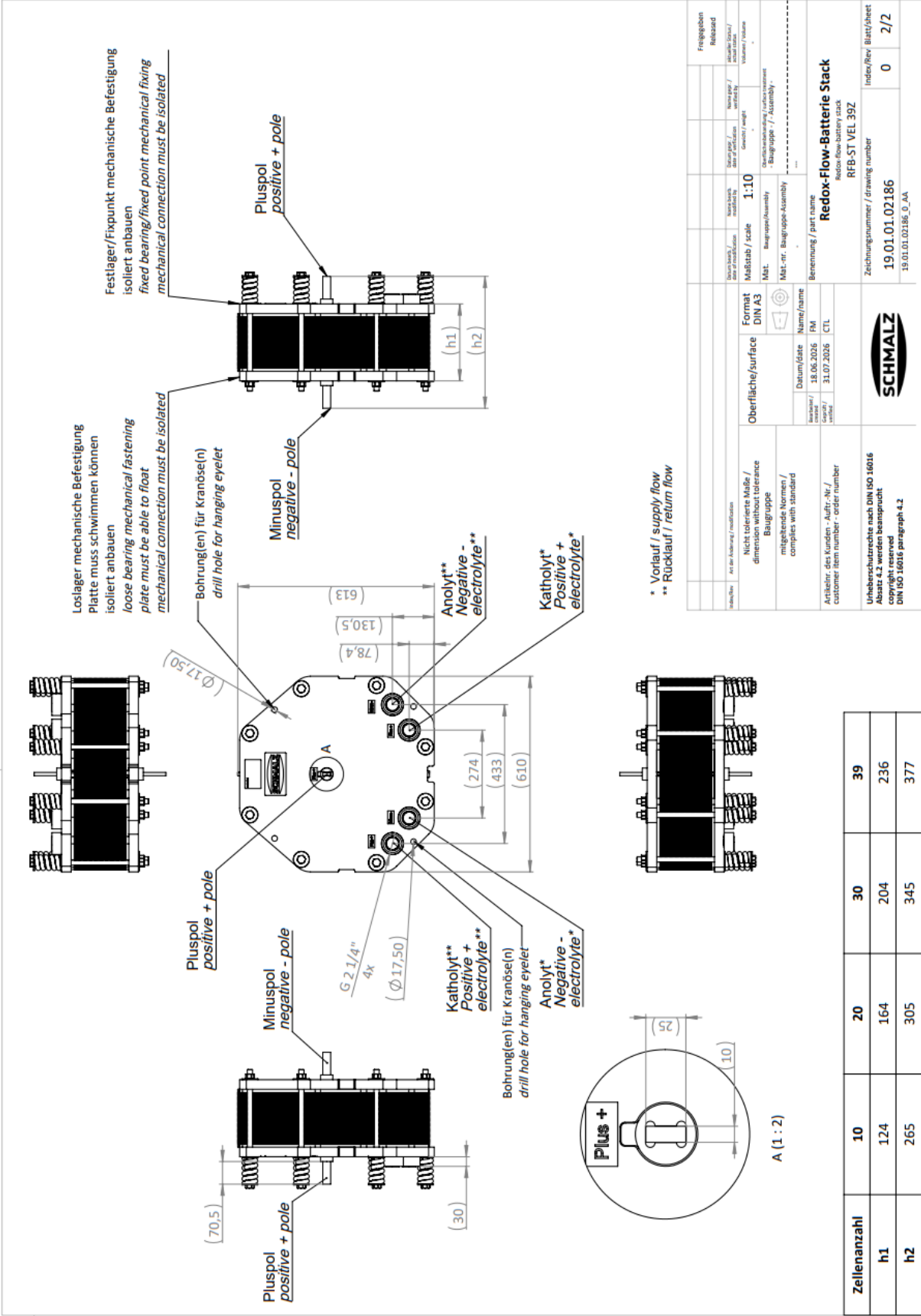
- Stack for use with vanadium electrolyte solution with sulfuric acid as base electrolyte
- Suitable for multiple chemistries (Organic, Fe/Cr, H₂/Me and similar items)
- Easy access of the hydraulic connections (inlet & outlet) at the bottom
- Ultra Deep Mäander (Patented Technology) provides the best shunt current protection at given pressure loss
- Very thin cell design provides excellent mass transport at given flow rate
- Can be adopted on different electrodes and membranes
- Multiple redundant sealing system
- Compact design and ready for cascading
- Stack voltage can be adjusted by the number of cells
- Central electrical connections
- Low internal electrolyte volume resulting in less self-discharge during stand-by

SCHMALZ Redox-Flow-Battery Stack Generation 4.0



Article no. / type description
19.01.01.02186 / RFB-ST-VEL-39Z

Design Data



Business Unit Energy Storage

SCHMALZ Redox-Flow-Battery Stack Generation 4.0

V 1.2 / Sep. 2026



Article no. / type description

19.01.01.02186 / RFB-ST-VEL-39Z

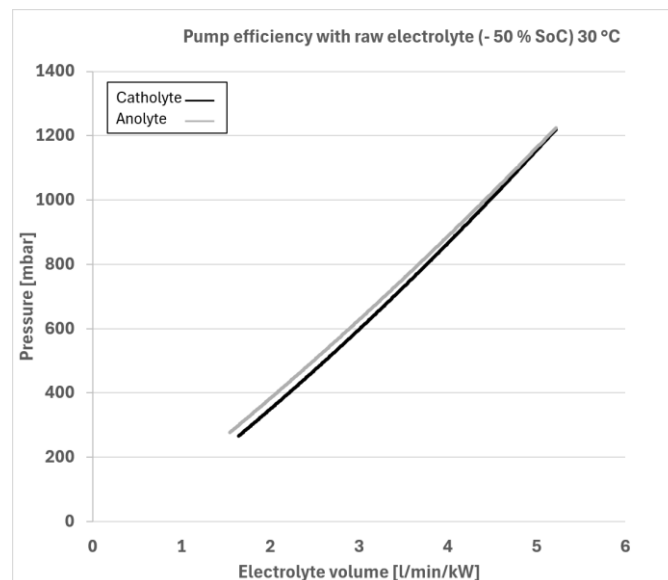
Technical Data

Power	10 kW nominal, 12 kW peak	
Voltage range	40 V to max. 61,62 V (e.g. 39 cells)	
Nominal current	165 A	
Peak current	280 A	
Number of cells	39	
Volumetric flow rate	Max. 60 l/min per anolyte- and catholyte side Min. 20 l/min per anolyte- and catholyte side	
Permitted operating pressure	Max. 120 kPa (1,2 bar)	
Maximum pressure difference	Maximum pressure difference of 10 kPa (0.1 bar) tolerated temporarily. Operate both half-cell sides with equal pressure	
Permitted operating temperature	Min. 10° C to max. 40° C	
Permitted storage temperature	Min. 0° C to max. 60° C	
Internal volume	Approx. 26 L	
Dry weight	Approx. 90 kg (without electrolyte)	
Fluid connection	4 x G 2 ¼" AG (groove designed for O-Ring 46,99 x 5,33 mm)	
Electrical connection	1 x Plus-Pol 1 x Minus-Pol	
Accessoires + spare parts	Accessories: 19.01.01.01493 – half threaded connection female contains: - Union nut G 2 ¼" - PP-insert DN50	
	Spare parts: 10.07.08.00713 - O-Ring FKM 46,99x5,33	

Article no. / type description

19.01.01.02186 / RFB-ST-VEL-39Z

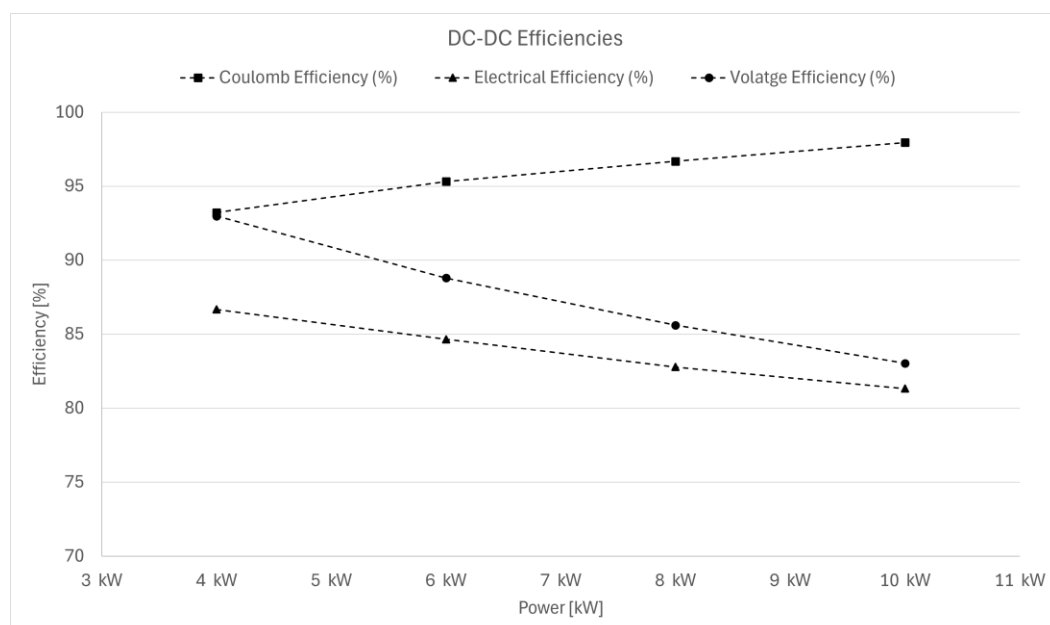
Pump Efficiency of a 10 kW Stack (39 cells)



Performance data were collected with 1.6 M Vanadium Electrolyte, 1 bar pressure and 35 °C.

The characteristic curve was recorded using a Vanadium 1.6 mol/L standard raw electrolyte. The viscosity of the electrolyte correlates with its composition, strongly with temperature and with the state of charge.

Efficiencies of a 10 kW Stack (39 cells)



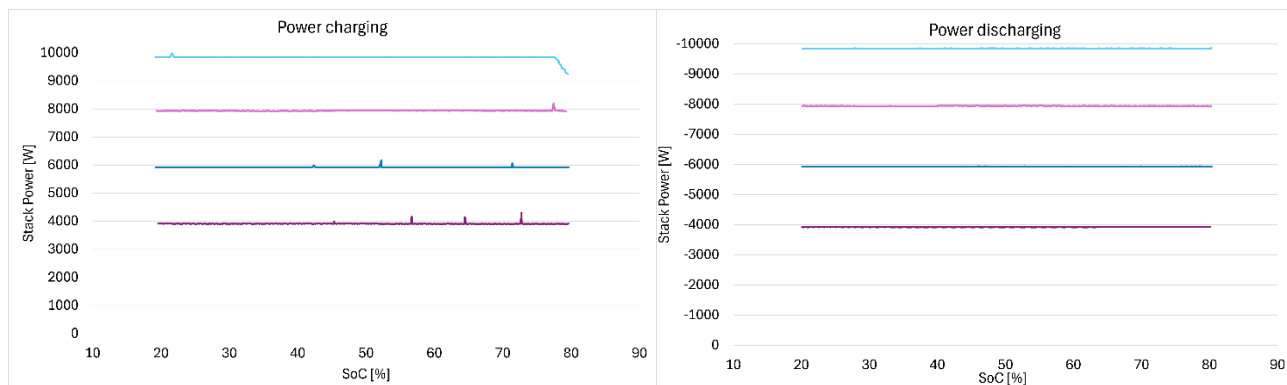
Performance data were collected with 1.6 M Vanadium Electrolyte, 1 bar pressure and 35 °C.

The electrochemical performance is dependent on the electrolyte formulation (cation and anion concentration) and its physical properties like conductivity and viscosity. Electrical efficiency is highly dependent on the flow rate and the electrolyte temperature.

Article no. / type description

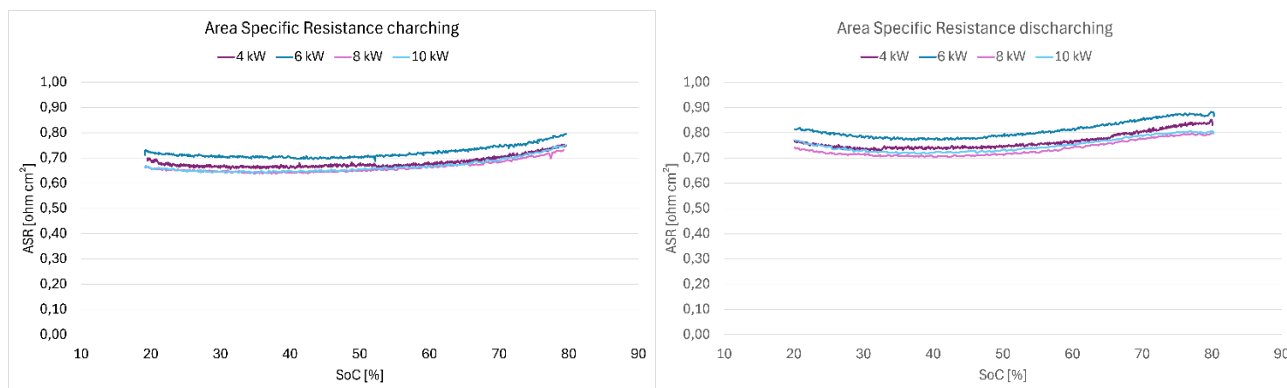
19.01.01.02186 / RFB-ST-VEL-39Z

Charging and Discharging Power of a 10 kW Stack (39 Cells)



Performance data were collected with 1.6 M Vanadium Electrolyte, 1 bar pressure and 35 °C.

Area Specific Resistance During Charging and Discharging



Performance data were collected with 1.6 M Vanadium Electrolyte, 1 bar pressure and 35 °C.

Article no. / type description

19.01.01.02186 / RFB-ST-VEL-39Z

General operation conditions and commissioning

Safety notes	▪ Control both half-cell sides of the stack by pressure – don't operate with pressure difference of more than 10 kPa (0.1 bar) [otherwise internal damage may occur] ▪ Do not block fluid circuits – pressure compensation for each half-cell side has to be ensured! [otherwise critical pressure difference between both half-cell sides may occur] ▪ During normal operation, the stack must never be charged under conditions of insufficient electrolyte flow or, even more critically, in the absence of any electrolyte circulation ▪ The stack shall not be charged unless sufficient electrolyte flow through the stack is ensured. Charging under conditions of inadequate electrolyte circulation, or in the absence of electrolyte flow, is strictly prohibited ▪ Slight amounts of electrolyte may leak during operation and are not critical for the process (observe Personal Protective Equipment notes in the operating instructions). In case of leakage, contact the manufacturer to evaluate the situation ▪ Ensure correct and appropriate electric and hydraulic connections ▪ Pipes and electrical connections must be mounted without any tension /mechanical stress. If necessary, support the pipes mechanically. ▪ Avoid pipe shocks ▪ Move stack with suitable lifting devices and secure it against tilting. ▪ Secure stack against electrical short circuit. ▪ Take note of the shutdown routine in the operating instructions and implement it ▪ Pay attention to voltage deviations between stacks during commissioning and operation; take affected stacks immediately out of operation
End-of-charge voltage	Max. 1,58 V / cell (61,62 V for 39 cell Stack) to avoid side reactions and accelerated aging
Electrolyte supply	Operate stack with at least $\lambda = 1.5$ during charge. [to avoid side reactions]
Temperature	Keep temperature in positive electrolyte circuit (return flow) below 40° C [otherwise V ₂ O ₅ precipitates]

Business Unit Energy Storage

SCHMALZ Redox-Flow-Battery Stack Generation 4.0

V 1.2 / Sep. 2026



Article no. / type description

19.01.01.02186 / RFB-ST-VEL-39Z

Commissioning	▪ Before commissioning, make sure that the temperature of the stack is equal to the ambient temperature at the place of installation. ▪ Fill stack slowly, constantly and symmetrically with 'raw electrolyte'¹. ▪ Membrane must swell overnight (min. 12 h) immersed in the 'raw electrolyte'. ▪ Perform initial charging (electrolyte at state of charge -50 % to approx. 20 % state of charge) by applying a low current (max. 25 A).
Hazardous material information	Please note that the stack is tested for controlled leakage and shipped after assembly without electrolyte. After commissioning with electrolyte, the stack applies to the country specific rules concerning hazardous materials.

¹ 'raw electrolyte' = vanadium electrolyte solution containing vanadium(III) and vanadium(IV) sulfate in a ratio of 1 to 1 (SoC -50%).