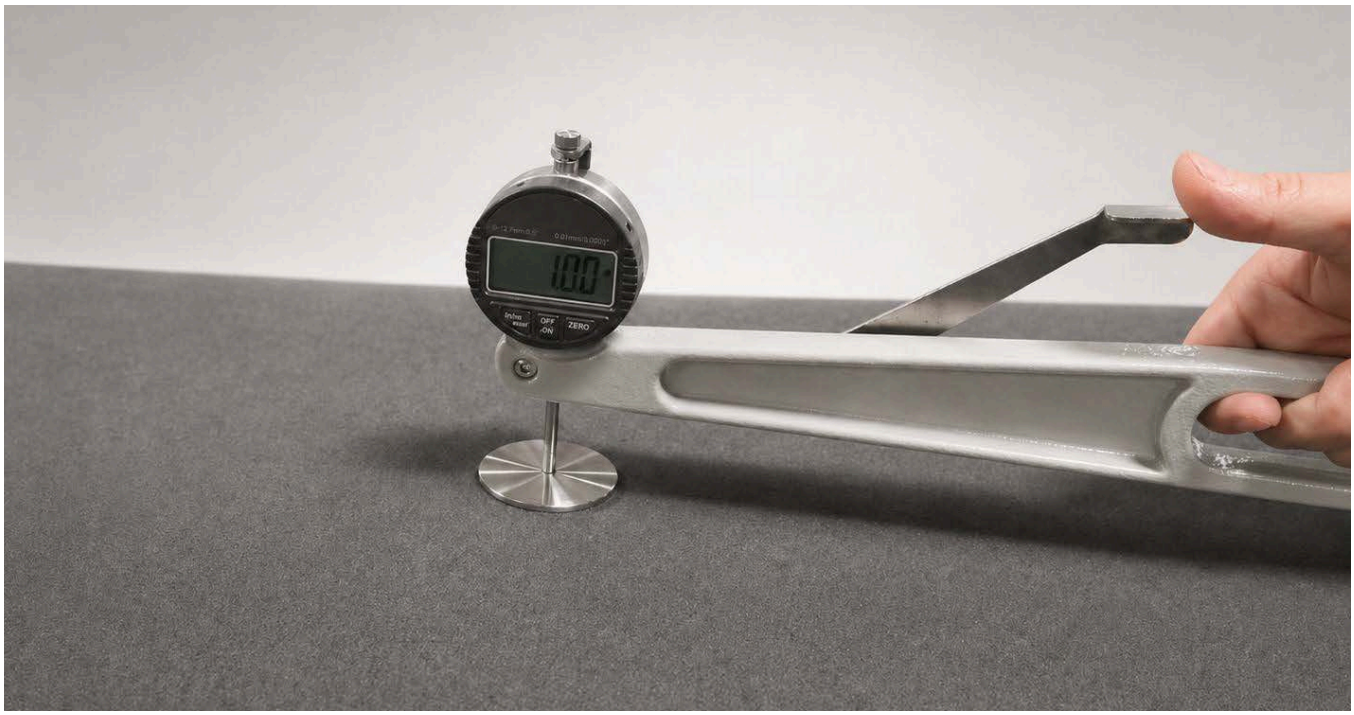
— TECHNICAL DATA SHEET

Electrode Felts & Carbon Cloth



Overview PRODUCT OVERVIEW

AYD **Flow®** series electrode felts and carbon cloth electrodes are produced from **PAN-based** precursors through pre-oxidation, carbonization, graphitization, and surface activation. The needle-punched nonwoven felt offers high porosity and a stable electrochemically active surface, while the woven carbon cloth delivers higher power density and lower area-specific resistance. The complete portfolio covers **five thickness grades from 0.7 to 7.0 mm**, with web widths **> 1400 mm**, supplied as custom-cut sheets for large-area flow-battery stack designs.

Applications USE CASES

All-Vanadium VRFB | Iron–Chromium ICRFB | All-Iron IFB | Zinc–Bromine ZBB | Zinc Hybrid Zn-HYBRID | Long-Duration 4–8 h

Flow-CC	Flow-10	Flow-25	Flow-45	Flow-70
Carbon Cloth 0.7 mm	Graphite Felt 1.0 mm	Graphite Felt 2.5 mm	Graphite Felt 4.35 mm	Graphite Felt 7.0 mm

01 Specifications

PHYSICAL PROPERTIES / TYPICAL VALUES

Flow® Series electrodes • physical properties & typical values

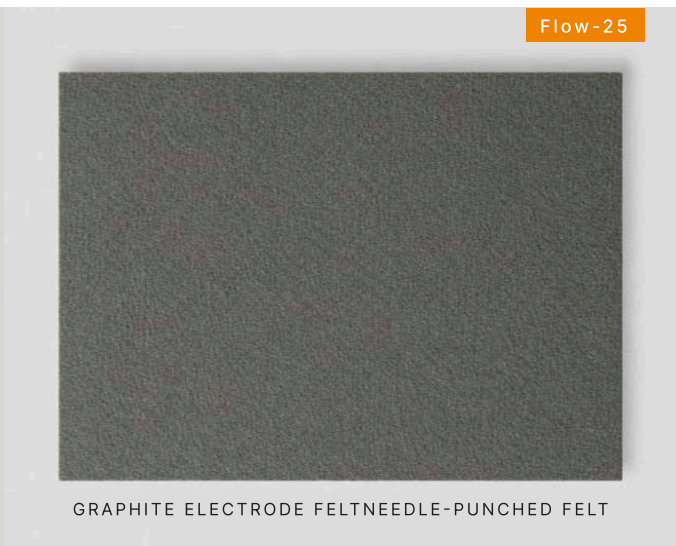
Parameter	Unit	Flow-10	Flow-25	Flow-45	Flow-70	Flow-CC
Type	—	Felt	Felt	Felt	Felt	Cloth
Precursor fiber	—	PAN	PAN	PAN	PAN	PAN
Wettability	—	Good	Good	Good	Good	Good
Nominal thickness	mm	0.85 – 1.1	2.5 ± 7.5%	4.35 ± 7.5%	7 ± 7.5%	0.7 ± 0.1
Bulk density	g/cm³	0.09 – 0.13	0.08 – 0.11	0.08 – 0.11	0.08 – 0.11	0.29 – 0.34
Areal weight	g/m²	90 – 140	200 – 250	350 – 480	560 – 770	240 – 290
Open porosity	%	> 90	> 90	> 90	> 90	> 75
Area-specific resistance (a)	mΩ·cm²	< 100	< 200	< 200	< 300	< 50
Tensile strength	N	≥ 5	≥ 8	≥ 8	≥ 8	≥ 10
Ash content	wt.%	< 0.9	< 0.5	< 0.5	< 0.5	< 1.0
Energy efficiency (b)	%	≥ 83	≥ 83	≥ 82	—	≥ 83.5
Activation state	—	Activated	Activated	Activated	Unactivated	Activated
Roll width	mm	> 1400 (graphite felt) / > 1200 (carbon cloth) • custom-cut to customer requirements				

(a) Area-specific resistance (ASR) measured at 0.1 MPa per NB/T 42082-2016 — closest to actual stack operating pressure.

(b) Energy efficiency (EE) measured at a current density of 160 mA/cm².

Flow-70 unactivated grade is intended for zinc–bromine and zinc-hybrid systems. Width, thickness, and high-purity (low-ash) grades available on request.

CARBON CLOTH ELECTRODE · WOVEN CARBON CLOTH



GRAPHITE ELECTRODE FELTNEEDLE-PUNCHED FELT

02 Selection Guide

APPLICATION SELECTION GUIDE

Model	Compatible chemistry	Thickness (mm)	Primary application
Flow-CC	All flow-battery chemistries	0.7 ± 0.1	Highest power density. Lowest ASR in the series — designed for high-power-density stacks.
Flow-10	VRFB / ICRFB	0.85 – 1.1	High power density; suited to flow-through stack architectures.
Flow-25	VRFB / IFB	2.5 ± 7.5%	Standard commercial grade. Balanced performance — covers mainstream commercial stack formats.
Flow-45	VRFB / IFB	4.35 ± 7.5%	Long-duration storage (4–8 h). Lower stack pressure drop and improved cycle-energy efficiency.
Flow-70	ZBB / Zn-hybrid	7 ± 7.5%	Ultra-long-duration storage. Unactivated cathode option helps reduce surface-activation cost.

03 Core Performance

KEY ADVANTAGES

— 01
Large-format single-piece electrode
Web widths **> 1400 mm** (felt) and **> 1200 mm** (cloth), custom-cut to size, no splicing required for large-area stacks.

— 02
Full five-thickness portfolio
Covers **0.7 – 7.0 mm** with proprietary 1.0 mm and 7.0 mm grades, power-type to long-duration stacks all served.

— 03
PAN-based precursor
Durable mechanical properties, predictable surface chemistry.

— 04
ASR measured at 0.1 MPa
ASR is measured at a pressure close to actual stack operating conditions, making the data more relevant for stack design.

— 05
Integrated continuous production line
Excellent **cross-web uniformity** across the full roll. Complete process parameter traceability.

— 06
Customizable ultra-low ash
Proprietary purification furnace can deliver ash content **< 0.1 wt.%** — for high-reliability, long-life applications.

Quality, Testing & Delivery

CERTIFICATIONS

ISO 9001:2015	Quality management system
NB/T 42082-2016	Electrode performance testing
GB/T 24218.18-2014	Tensile strength testing
ASTM D2415	Ash-content determination
COA	Certificate of Analysis with every lot
Packaging	Moisture-sealed rolls with interleaving paper & edge protection

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