

VERVE

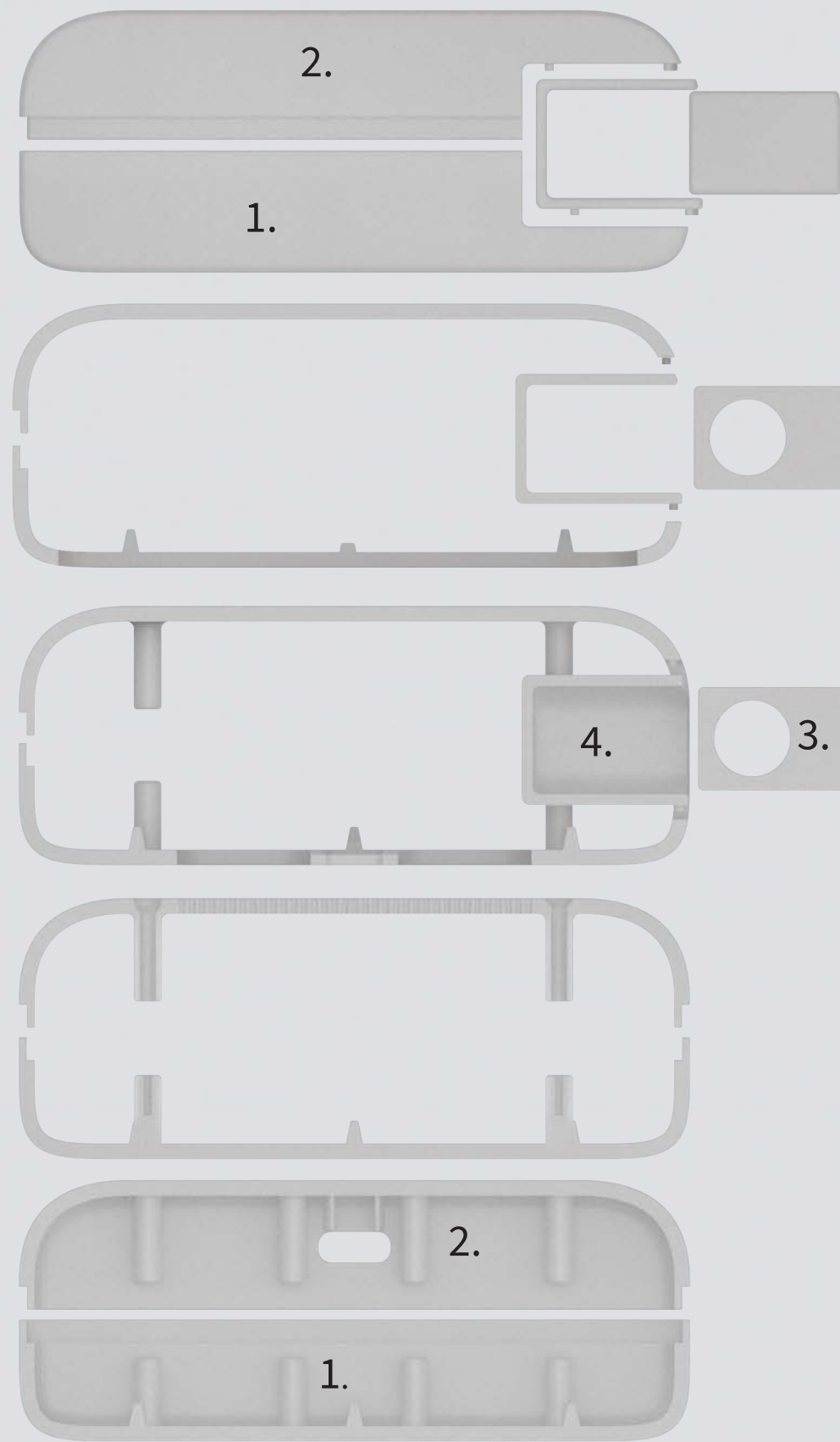
Adventure Unleashed



Verve is a portable hand-held inner tube sealer and tire pump that was designed to provide redundancy for wheelchair riders who often experience flat tires when traveling off the beaten path. Verve is a compact and effective solution for riders in need of reliable support on their adventures.

The Verve uses built-in replaceable tire sealant canisters to quickly and effectively deliver sealant, allowing riders to keep rolling and reach a bike shop where a more long-term fix can be applied. Verve features an extendable pump head that allows easy access to tire valves situated between spokes. The on-board pressure monitor and computer target the required pressure, displaying the target and current pressure on the monitor. LEDs are built-in to the case for easy viewing of sealant and battery levels for all users regardless of vision.

Verve is an innovative solution that breaks down barriers for mobility device users, allowing them to explore the unknown with confidence. It provides a reliable safety net to ensure that no obstacle can get in their way, making it an essential accessory for any adventure. With its smart features and user-friendly design, Verve is a must-have tool for wheelchair riders who value independence and freedom.



Verve uses ZAMAK 3 for its die cast components for three key factors:

- ZAMAK 3 is the most commonly used die casting zinc alloy in north America, this makes it easier to source competitively priced manufacturing while maintaining a domestically manufactured product.
- Verve's exterior casing and air pump housing are both die cast out of ZAMAK 3 but require post processing for thread tapping and or various surface finishes. ZAMAK 3 performs well in this application.
- ZAMAK 3 offers high impact resistance and vibration resistance both of which are key to avoiding damage to delicate components inside Verve.

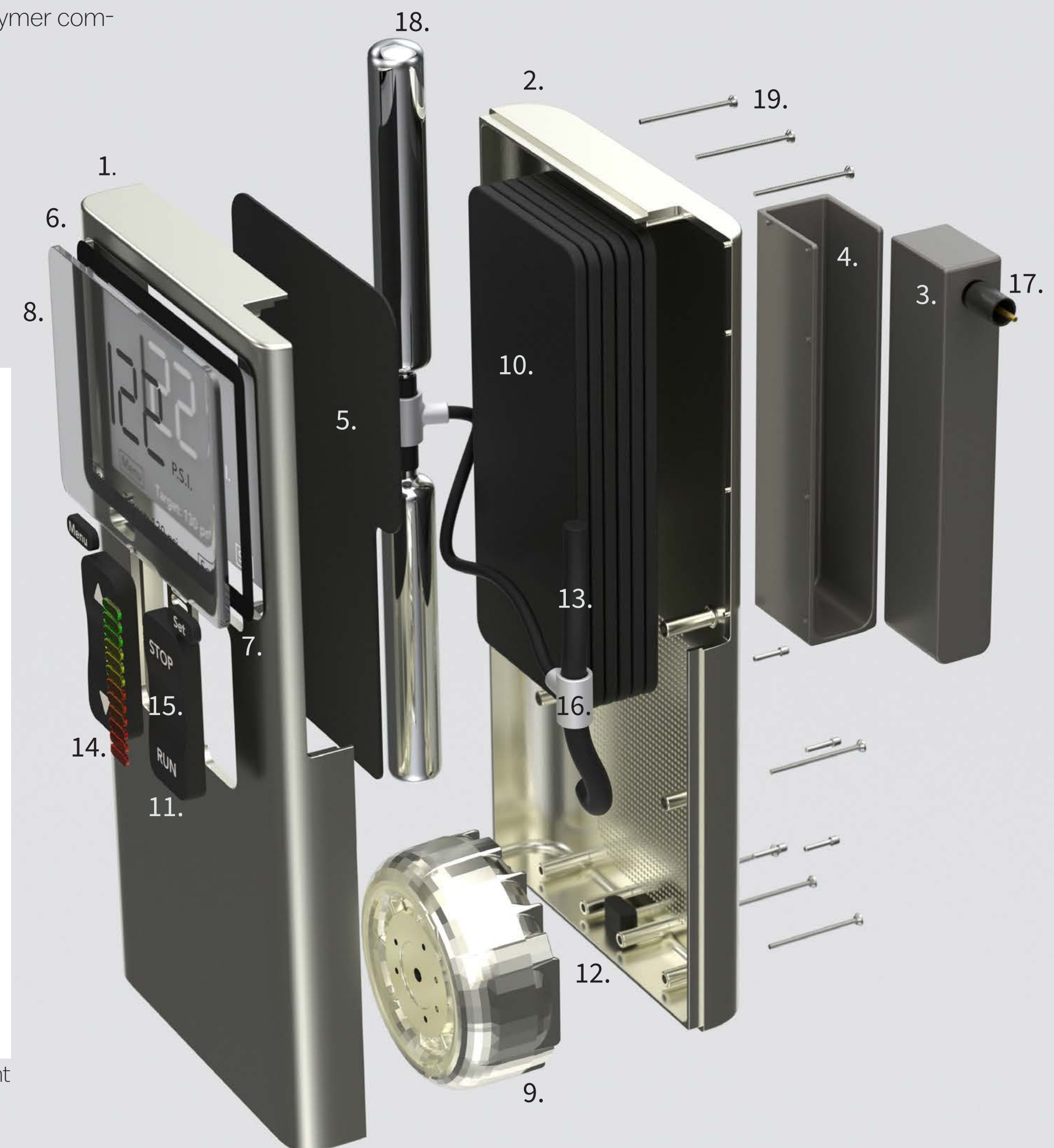
The design of the Verve casing is ideal for die casting as all sides feature natural draft angles offered by the continuous radius' used in creating any die cast component.

The front, rear, and pump extension components are all indexed to fit together securely without excessive fasteners being used. Zinc die casting lends high dimensional accuracy and stability across a wide variety of temperatures. This allows the combination of polymer components to be integrated into the design easily.

Verve uses a variety of polymers. Nylon, Polypropylene, Silicone, and Polycarbonate are used in various locations. Injection molded Nylon and Polypropylene are used on moving components for their superior wear characteristics, Polycarbonate is used for optical clarity and impact resistance to protect the LCD, and Silicone is used for its superior hand feel and durability on all buttons

Zinc die casting allows for a very high strength to weight ratio on thin walled parts. Verve uses a wall thickness of 3 mm and a rib thickness of 2 mm and is able to achieve high strength with minimal weight being added. The front and rear casing of Verve weigh only 535 grams contributing to the overall weight of 884 grams.

Part Number	Part Name	Material	Weight (lbs)	Okala Factor for Material used (Per Pound)	Calculated Impact for material	MFG Process	Okala Factor for MFG Process	Calculated Impact for Process	Total Combined Impact Per Component	Color/Finish	Quantity	Notes
1	Front Casing	Zinc - Zamak 3	0.5	15	7.5	Die Casting	18.5	9.25	16.75	Polished	1	
2	Rear Casing	Zinc - Zamak 3	0.68	15	10.2	Die Casting	18.5	12.58	22.78	Polished	1	
3	Pump Extension	Polypropylene	0.033	1.9	0.0627	Injection moulding	0.72	0.0237	0.0864	Matte	1	Interference fit
4	Pump Extension Casing	Nylon	0.0154	3.8	0.05852	Injection moulding	0.72	0.011	0.06852	Matte	1	Interference fit
5	Main PCB	PCB RoHs	0.029	86	2.494	PCB printing	N.A.	N.A.	2.494	As is	1	Snap fit to outer casing
6	LCD screen	LCD	0.015	8.8	0.132	Sourced	N.A.	N.A.	0.132	As is	1	Glue into place
7	LCD Bezel	Polypropylene	0.00077	1.9	0.001463	Die Cutting	N.A.	N.A.	0.001463	As is	1	Glue into place
8	LCD Protector	Polycarbonate	0.15	3.7	0.555	Injection moulding	0.72	0.108	0.663	Polished	1	Glue into place
9	Air Pump	Zinc	0.215	15	3.225	Die Casting	18.5	3.977	7.202	Raw Zinc	1	Via McMaster-Carr
10	Battery	LiPo	0.23	13	2.99	Sourced	N.A.	N.A.	2.99	As is	1	Lithium Polymer
11	Front buttons	Silicone	0.0048	1.7	0.00816	Cast	0.72	0.0034	0.01156	Matte texture with printed lettering	4	
12	USB-C Charging port	Various	N.A.	N.A.	N.A.	Sourced	N.A.	N.A.	N.A.	As is	1	
13	Pressure Hoses	Vinyl	0.005	13	0.065	Sourced	N.A.	N.A.	0.065	As is	4	
14	Front panel LED Covers	Polycarbonate	0.00038	3.7	0.001406	Injection moulding	0.72	0.00027	0.001676	Polished	12	Multicolored
15	Front Panel LEDs	LED	N.A.	N.A.	N.A.	Sourced	N.A.	N.A.	N.A.	As is	12	Individually operable
16	Hose T Fittings	Aluminum	0.005	4.5	0.0225	CNC Milling	1.0	0.005	0.0275	Anodized black	3	
17	Schrader Pump Head Assembly	Various	N.A.	N.A.	N.A.	Sourced	N.A.	N.A.	N.A.	As is	1	
18	Sealant Canisters	Steel	0.05	5.3	0.265	Hydro Formed	0.56	0.028	0.293	Clear Powdercoat	2	For sealant storage
19	Case Screws	Stainless Steel	0.00000407	5.3	0.000021571	CNC Turning	1.5	0.0000061	0.00002768	Raw stainless steel	12	Via McMaster-Carr
TOTALS:			1.93335407						55.49950075		61	



Part Numbers on BOM - See diagram to the right

Design Development

Sketches, Paper Models, CAD Experimentation

Quick Fix
automated
a mobile tire repair system
for wheelchair riders and cyclists.

Option B
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Simple forms made
from 2 simple clasp shells

contains hot thread and
highly compressed
air or CO₂

Die casting benefits for this concept:

- 1) Symmetric construction using clasp shells allow for easy integration of draft angles and minimal number of tooling
- 2) High pressure sealants and CO₂ are used in this product. Die casting allows for structural support around these mechanical components.

