

**CHCN**AV

# APACHE 4

**AUTONOMOUS HYDROGRAPHIC  
SURVEY USV**



**MARINE SURVEY  
& CONSTRUCTION**

# AUTONOMOUS HYDROGRAPHIC SURVEY USV

The APACHE 4 is an Unmanned Surface Vessel (USV) that supports a wide variety of Acoustic Doppler Current Profiler (ADCP) systems available on the market. It offers an unmanned operation solution with a shallow draft, high navigational accuracy and stable hovering for hydrologists when measuring water flow velocity and discharge of a current section. Very compact, it enables easy handling at the mission site, facilitates safe launching and convenient transportation by car.

The APACHE 4 USV brings together the best of high-accuracy positioning and automated navigation control technology, built around the operator's habits when conducting ADCP hydrographic cross-section flow measurements. The built-in adaptive water flow and hovering navigation technology significantly improves the accuracy of flow estimation. Even when GNSS positioning might be degraded by obstructed environment, the internal GNSS+IMU module continues to provide reliable position and heading for the ADCP and autopilot controller.

The APACHE 4 is a perfect solution for obtaining high quality data for flow and velocity measurements in water where manned boat access is impractical, such as in front of dam structures, or where safety is a concern, such as during flood level measurements.

## ADVANCED NAVIGATION CONTROLLER

### Integrated adaptive water flow straight-line and hovering technology

The autonomous control system enables APACHE 4 to navigate straight along the cross-section according to the profile view when the flow rate, turbulence, etc. changes. The hovering technology can make APACHE 4 hover stably in the turbulent flow at the start and end points of ADCP observation, thereby improving the accuracy of flow estimation.

## COMPATIBLE WITH MOST COMMON ADCPS

### Versatile. Carries up to 30 kg of payload

The APACHE 4 central access shaft design provides unmanned cross-sectional flow measurement solutions for the leading ADCPs on the market. The APACHE 4 is particularly suited for hydrologists using ADCP sensors such as the M9, RTDP 1200, RiverPro, and RiverRay who are looking for an integrated, portable, and affordable unmanned solution. It does not only carry the ADCP, but also provides its positioning, orientation, power, waterproofing, network and 4G transmission solutions.

## BUILT-IN SINGLE-BEAM ECHO SOUNDER

### Expand your unmanned survey capability

Single beam sounding data can be used to verify the accuracy of ADCP bottom tracking data, and even fed directly into the ADCP flow measurement software to compensate for the unavailability of ADCP data, and at the same time provides water depth profile data associated with the flow velocity profile measurement.

## SMART POSITIONING AND NAVIGATION

### Interrupted positioning with GNSS+IMU

APACHE 4 provides stable position and heading to the ADCP and autopilot. Its IMU sensor ensures the availability of position data even during momentary GNSS signal loss. The obstacle avoidance radar system and live video feed ensure safe operations in case of loss of visibility or difficult environmental conditions. Completely autonomous, the APACHE 4 is safely operated from the shore. The AutoPlanner and HydroSurvey software suite allows the operator to define the entire mission, from the survey area to the export of the results.



EFFICIENT  
HYDROGRAPHIC  
SURVEY USV



Motor



SBES Transducer



ADCP access shaft



360° Camera

# SPECIFICATIONS

Physical	
Hull dimension (L x W x H)	1.2 m x 0.75 m x 0.3 m
Material	Macromolecule polyester carbon fiber
Weight (w/o instrument and battery)	9 kg
Maximum payload	30 kg
Anti-wave & Wind	3 <sup>rd</sup> wind level and 2 <sup>nd</sup> wave level
Hull design	Triple-hull vessel
Water proof	IP65
Draft	10 cm
Indicator light	Two-color light (Display satellite and positioning status)
Video	360° omnidirectional video
Auto-return	Auto-return while low battery or signal loss
Power	
Type	Electric
Propeller type	Brushless DC
Direction control	Veering without steering engine
Maximum motor power	700 W
Maximum motor speed	7,000 rpm
Li-ion battery capacity	4 x 40,000 mAh, 18 V 2 x 15,000 mAh, 18 V
Battery endurance	2 x 2 hours @ 2 m/s (running on 2 battery sets)
Maximum speed	5 m/s
Communication	
Data communication	Network bridge: 1 km and 4G: unlimited
R/C communication	2.4 GHz
Remote control range	1 km
SIM Card slot	Nano SIM
UHF radio	Standard Internal Rx: 410 - 470 MHz Transmit power: 0.5 W Protocol: CHC, Transparent, TT450, 3AS Satel Link rate: 9,600 bps to 19,200 bps
Data formats	RTCM2.x, RTCM3.x, CMR input HCN, HRC, RINEX2.11, 3.02 NMEA 0183 output NTRIP Client, NTRIP Caster
Integrated 4G modem	LTE FDD: B1/B3/B5/B8 LTE TDD: B38/B39/B40/B41 WCDMA: B1/B8 TD-SCDMA: B34/B39 CDMA: BC0 GSM: 900/1,800 MHz

Interface	
Interface	2 x RJ45 port 2 x RS232 serial port 1 x RS485 serial port 1 x PPS
Navigation mode	Manual or Auto-Pilot
Water proof of master control	IP67
Data storage	Local multi-sessions and FTP push
Positioning	
Satellite system	BDS B1/B2, GPS L1/L2, GLONASS L1/L2, Galileo E1/E5, SBAS, QZSS
Channel	432
Single point position (RMS)	Horizontal: 1.5 m Vertical: 2.5 m
SBAS Positioning accuracy	Horizontal: 0.5 m Vertical: 0.85 m
DGNSS positioning accuracy	Horizontal: 0.4 m + 1 ppm Vertical: 0.85 m + 1 ppm
RTK Positioning accuracy	Horizontal: ±8 mm + 1 ppm Vertical: ±15 mm + 1 ppm
Heading accuracy	0.2 ° @1 m baseline
Inertial navigation accuracy	6 %/h
D230 Single Beam Echo Sounder	
Data type	CHCGD <sup>(1)</sup> , NMEA SDDPT/SDDBT, original waveform
Weight	1.1 kg
Sounding range	0.15 m to 200 m
Sounding accuracy	±0.01 m + 0.1% x D (D is the depth of water)
Resolution	0.01 m
Frequency	200 KHz
Beam angle	6.5° ± 1°
Supply voltage	10-30 V DC/ 220 V AC
Software	
Hydro Survey	Data collection and post-processing, coordinate conversion
Auto Planner	Path planning, autonomous navigation, hull parameter control, multi-angle video display



\* Specifications are subject to change without notice.  
(1) CHCGD is CHCNAV format.

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WWW.CHCNAV.COM | SALES@CHCNAV.COM

CHC Navigation Headquarter  
Shanghai Huace Navigation Technology Ltd.  
599 Gaojing Road, Building D,  
Shanghai, 201702, China  
+86 21 54260273

CHC Navigation Europe  
Infopark Building , Sétány 1, 1117  
Budapest, Hungary  
+36 20 235 8248  
+36 20 5999 369  
info@chcnav.eu

CHC Navigation USA LLC  
6380 S.Valley View Blvd Suite 246  
Las Vegas, NV 89118 USA  
+1 480 399 9533

CHC Navigation India  
409 Trade Center, Khokhra Circle,  
Maninagar East, Ahmedabad,  
Gujarat, India  
+91 90 99 98 08 02