CASTOLDI

Advanced
Waterjet Drives

CASTOLDI

Since 1962

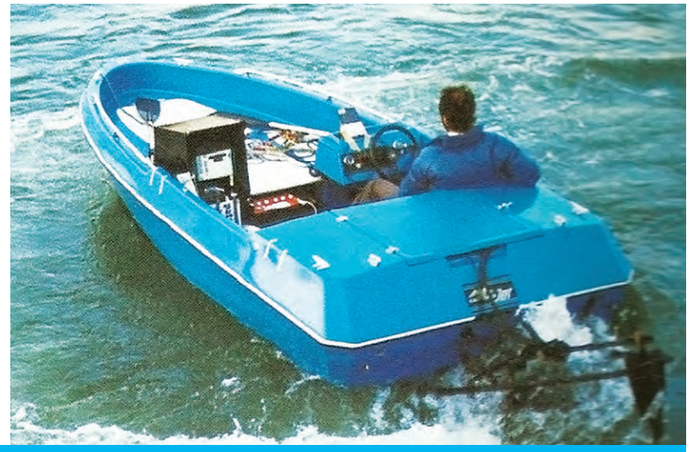
Forerunners, always

The waterjet drive is currently considered the most important innovation, ever, in marine propulsion systems.

The waterjet drive has gained acceptance as the leading means of propulsion for all types of high-speed crafts, ferries, workboats, patrol boats, landing crafts and the like. It is also reputed to be essential on many small vessels such as crew boats, tenders, S.A.R. boats, personal water craft and so on.

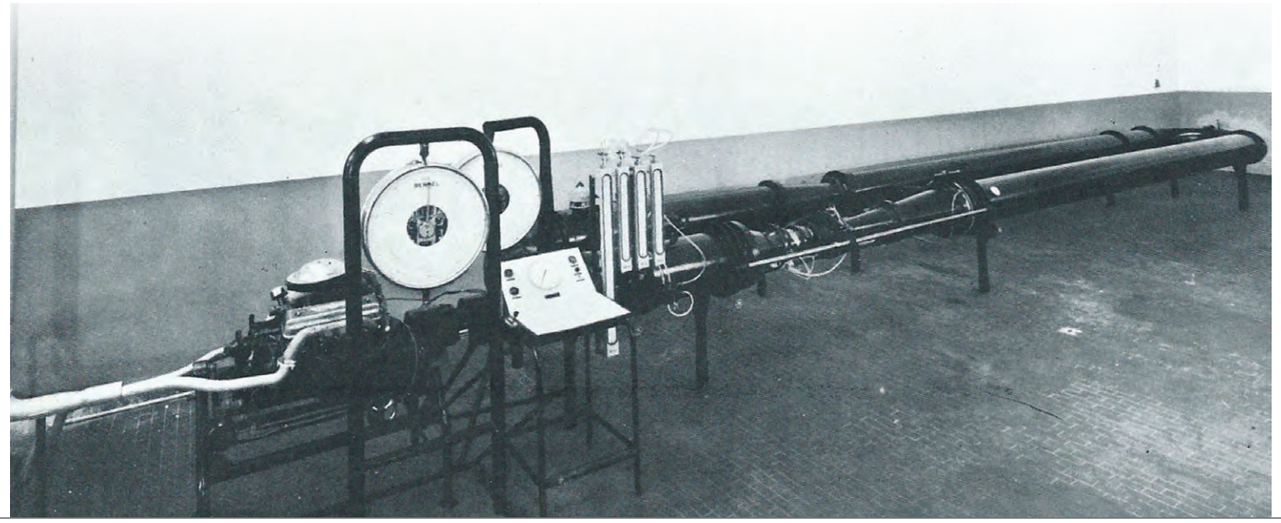
Ride on a modern waterjet powered boat and feel the notable difference from propellers: higher speed, faster acceleration, shallow water capability, great manoeuvrability and absence of vibration. In addition, the lower maintenance, longer engine life and advantages over propellers, (with their engine overloading, exposure to damage and danger for people in the water), are all indisputable.

The Castoldi Company is unanimously considered the innovator of the waterjet propulsion system and the author of its new launch and worldwide fame.



Castoldi pioneered the development of its revolutionary system in the early 1960s using facilities which were sophisticated and extraordinary for those times, and which are still rare today, such as the laboratory boat, equipped with special instruments for checking the net dynamic thrusts of the waterjet drive and the water impeller tunnel to test and determine the best impeller geometry in terms of efficiency and cavitation margin.

Presently the Company owns several laboratory boats which are used for testing each new waterjet model.



Since beginning this activity in 1962, more than 40,000 units have been delivered worldwide, and installed on various types of military, commercial and pleasure vessels.
The Castoldi Company has ISO 9001 certification, and all waterjet models comply with the requirements of the major Classification Registers such as ABS, BV, DNV, RINA, RMRS and RRR.

However, the challenge is never-ending; the waterjet design, range of models and control types are continuously being improved. This is possible through the work of the in-house R&D department, conducted by experienced engineers, using the latest software, working closely with a University, with the most sophisticated calculation tools.

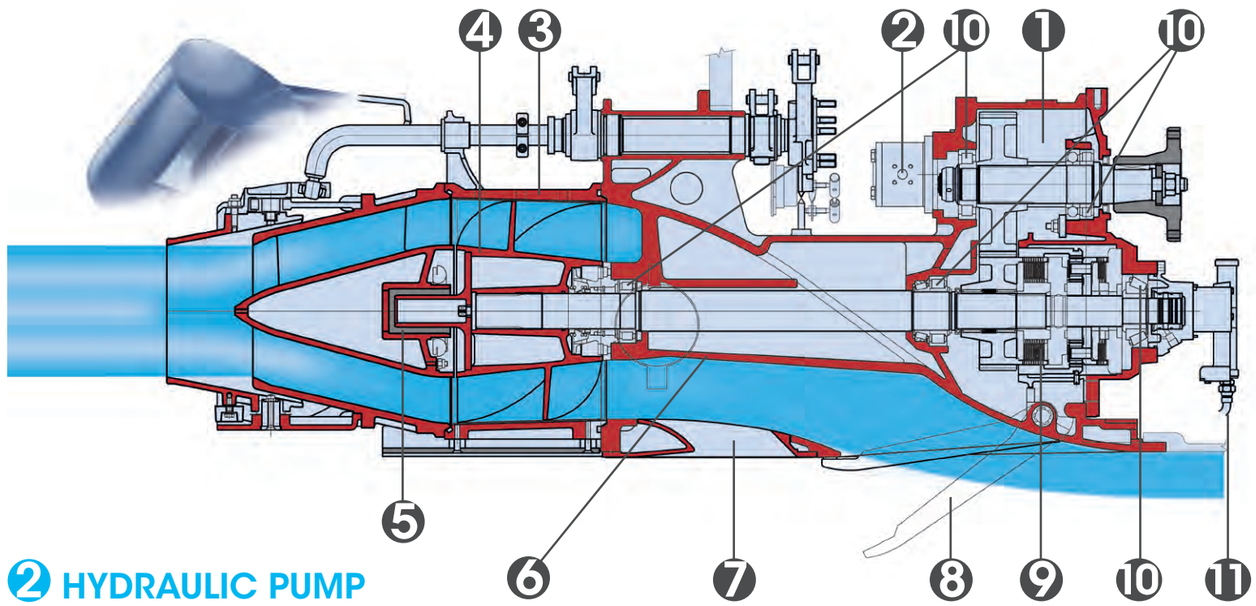
Castoldi unique Waterjet Drive.

So different from all the competitors on the market, due to its many advanced exclusive features. Much more than a simple pump, it is a complete, integrated marine propulsion system.

❶ INTEGRATED HEAVY DUTY GEARBOX
with built-in hydraulic multi-disc clutch

The integrated heavy duty gearbox with its wide range of transmission ratio options (No. 17 to N. 25 depending on the waterjet drive model) is the ultimate solution for engine coupling system with multiple advantages at one stroke:

- A very fine r.p.m. matching for every selected engine. This means full power absorption without over or under-loading the engine regardless of boat speed, resulting in extended engine life.
- Less weight.The integrated Castoldi gearbox is very light and simple as it is contained in the waterjet casing. It does not require an oil heat exchanger because its lubrication oil is cooled through the waterjet surface contact with the surrounding water. Therefore, the propulsion system weight is lower, compared to that of competitors, where marine transmissions must be added to the engine.
- The use of a single unique stainless steel cast impeller, designed with the best geometry ever tested, without the constraints of having to modify it for adaptation to the engine. The impeller has optimized efficiency and cavitation resistance under any operating conditions and meets high standards of quality production processes.
- The lifting of the input flange allows for a shorter and better-aligned cardan shaft without the need to trim the unit, allowing a drastic reduction in the engine room length. This is a clear advantage, given that long transmissions and forward engine installations may reduce the top speed due to moving the boat centre of gravity forward.
- The lowering of the impeller shaft and, consequently the centre of thrust, results in better manoeuvrability and boat running stability; moreover this allows the design of a flat, straight duct enabling the water stream to flow smoothly with minimum hydrodynamic losses at high speed.



❷ HYDRAULIC PUMP

Directly splined to the input shaft, thus avoiding any vulnerable belts.

❸ TITANIUM IMPELLER HOUSING LINER
(standard on large models).

Best resistance to marine corrosion and wear, for the longest operational life.

❹ IMPELLER

The Castoldi impeller is a true axial inducer type design and is recognized as having the best efficiency, cavitation resistance and lowest weight compared to any other type of pump.
It operates on a volume system with high flow rate and low pressure.
Because of its volume design, increased blade tip clearance due to wear, does not significantly compromise its efficiency. This can be contrasted to what happens to mixed flow impellers, operating with low flow rate and high pressure, which are much more vulnerable to this type of clearance issue, leading to fast and dramatic speed loss.

❺ IMPELLER VIBRATION RUBBER DAMPER

This item damps vibrations if any transitory cavitation occurs at the impeller. Because this device has no shaft bearing function, it can withstand a large degree of wear without affecting the waterjet integrity.

❻ SHAFT HOUSING

The impeller shaft rotates safely inside a protective housing, oil immersed; and is thus perfectly protected from any debris that might enter the duct and entwine around it.

❼ B.P.R. (optional)

This unique patented device provides an auxiliary water flow by-pass to the main water intake allowing an increase in the power operational range and thrust on low speed heavy boats, as well as a take-off improvement for middle speed heavy boats. It never affects full speed efficiency and can easily be retrofitted.

❽ MOVABLE PROTECTION GRID ON WATER INTAKE

The inlet grid protects the water intake from the suction of floating debris. It performs self-cleaning operations by rejecting the same through the shift opening of the flush mounted hydrodynamically profiled set of bars. The helmsman can activate the system, when the pressure gauge indicates a pressure drop in the waterjet duct.

❾ CLEAR-DUCT
superior unclogging system (optional)

The waterjet duct and intake cleaning system are assured through the synchronized simultaneous electrically controlled operations of impeller rotation reversing and the intake grid opening. This generates a back flushing, which is ejected through the water intake without any obstruction caused by the grid bars.
The whole operation is feasible using special parts, all included in the Castoldi integrated gearbox.

❿ ALL BEARINGS OIL LUBRICATED

All the bearings are lubricated by the same gearbox oil. They never come into contact with sea-water and are sized for several thousand hours of life.

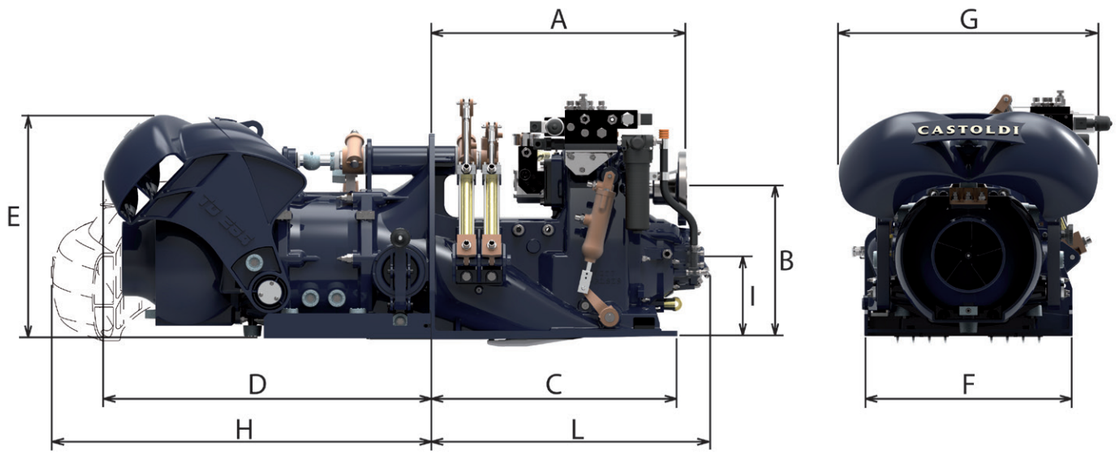
⓫ OIL LEVEL TRANSDUCER
(standard and available only on large models)

The oil level transducer allows for remote level control.

FULL PROTECTION AGAINST MARINE CORROSION

All the aluminium alloy components are protected by a hard anodizing treatment with 60 microns thickness of aluminum oxide (ceramic), three layers of special paint and cathodic protection by sacrificial anodes.

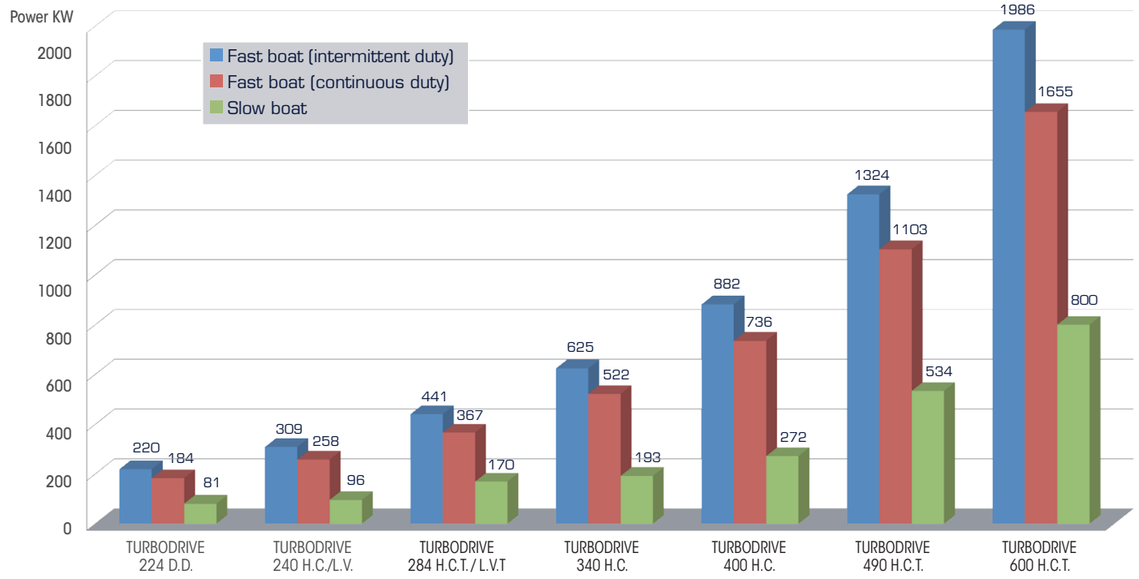
Dimensions



TURBODRIVE MODELS	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	L (mm)
224 D.D.	524	206	-	606	384	470	379	604	-	-
240 H.C. / L.V.	358	295,5	358	822,5	433	420	445	892,5	155,5	358
284 H.C.T. / L.V.T	598,5	353	578	795	535	500	624	903	185	572 651 (CLEAR-DUCT)
340 H.C.	737	418	715	991,5	645	600	722,4	1033,5	220	727 813,5 (CLEAR-DUCT)
400 H.C.	870	491	874	1142	767	680	850	1200	261	947 1063 (CLEAR-DUCT)
490 H.C.T.	1080	582,5	1161	1378	892	858	1080	1525	320	1062 1310 (CLEAR-DUCT)
600 H.C.T.	1560	737	1703	1470	1180	1160	1275	1605	392	1702

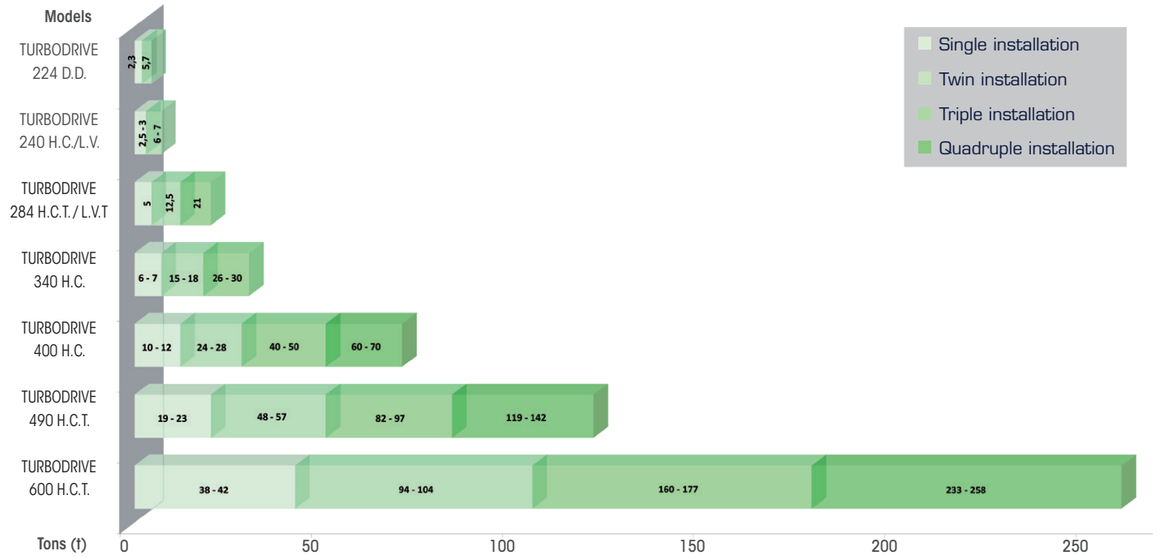
TURBODRIVE MODELS	IMPELLER DIAMETER AT THE INLET (mm)	DRY WEIGHT (kg)	IMPELLER HOUSING MATERIAL	MOVABLE DEBRIS SCREEN GRID	INTEGRATED GEAR BOX RATIOS NUMBER
224 D.D.	224	51,7	STAINLESS STEEL	FIXED	-
240 H.C.	238	130	STAINLESS STEEL / TITANIUM (OPT.)	MECHANICALLY OPERATED / ELECTRICALLY OPERATED (OPT.) + CLEAR-DUCT (OPT.)	18
240 L.V.	238	125	STAINLESS STEEL / TITANIUM (OPT.)	MECHANICALLY OPERATED	18
284 H.C.T.	282	190	STAINLESS STEEL / TITANIUM (OPT.)	ELECTRICALLY OPERATED + CLEAR-DUCT (OPT.)	25
284 L.V.T	282	180	STAINLESS STEEL / TITANIUM (OPT.)	MECHANICALLY OPERATED	25
340 H.C.	337	307	STAINLESS STEEL / TITANIUM (OPT.)	ELECTRICALLY OPERATED + CLEAR-DUCT (OPT.)	25
400 H.C.	400	480	TITANIUM	ELECTRICALLY OPERATED + CLEAR-DUCT (OPT.)	21
490 H.C.T.	490	930	TITANIUM	ELECTRICALLY OPERATED + CLEAR-DUCT (OPT.)	20
600 H.C.T.	600	1580	TITANIUM	ELECTRICALLY OPERATED + CLEAR-DUCT (OPT.)	13

Max power input



A conventional stempost hull with minimum deadrise of 3° at transom is recommended to prevent trapped air from entering the waterjet drive.
The minimum waterjet immersion must be with the waterline at the level of the impeller shaft.
For displacement boats the speed depends more on efficient hull shape than displacement or input power.
Best efficiency will be obtained using low input power at, or below, the craft natural displacement speed.

Maximum suggested displacement



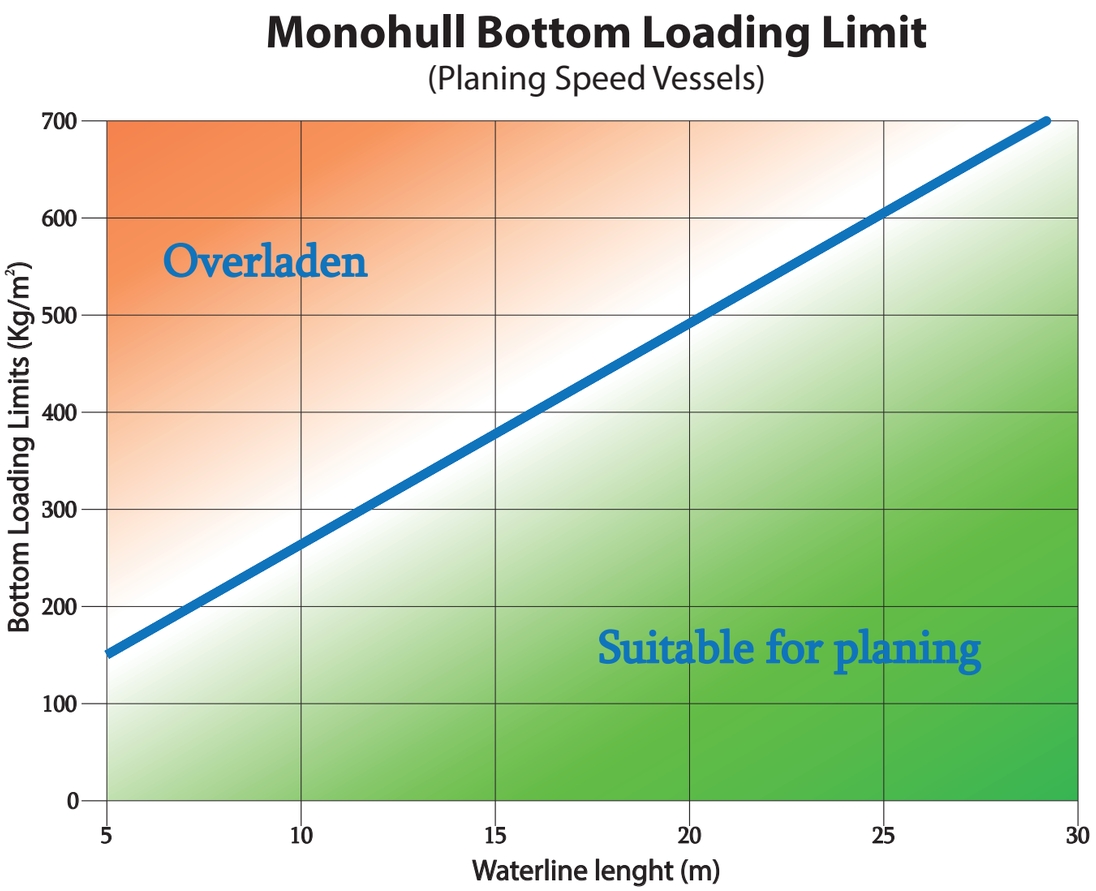
The maximum suggested displacement is purely indicative as this depends on hull shape, LCG, installed power etc..
Please contact Castoldi for advice on any application.

BOTTOM LOADING: RISKS AND LIMITS

One of the primary reasons for using a waterjet propulsion system is to improve performance; to maximize this potential the vessel must be suitable for planing.

Designers and builders are fully aware that any increase in AUW, during vessel construction, will increase the bottom loading, which causes the vessel to be overladen. In turn, this can cause poor performance and difficulty in planing as the waterjet model originally selected for the vessel may be too small for the increased weight, necessitating an upgrade to a larger waterjet.

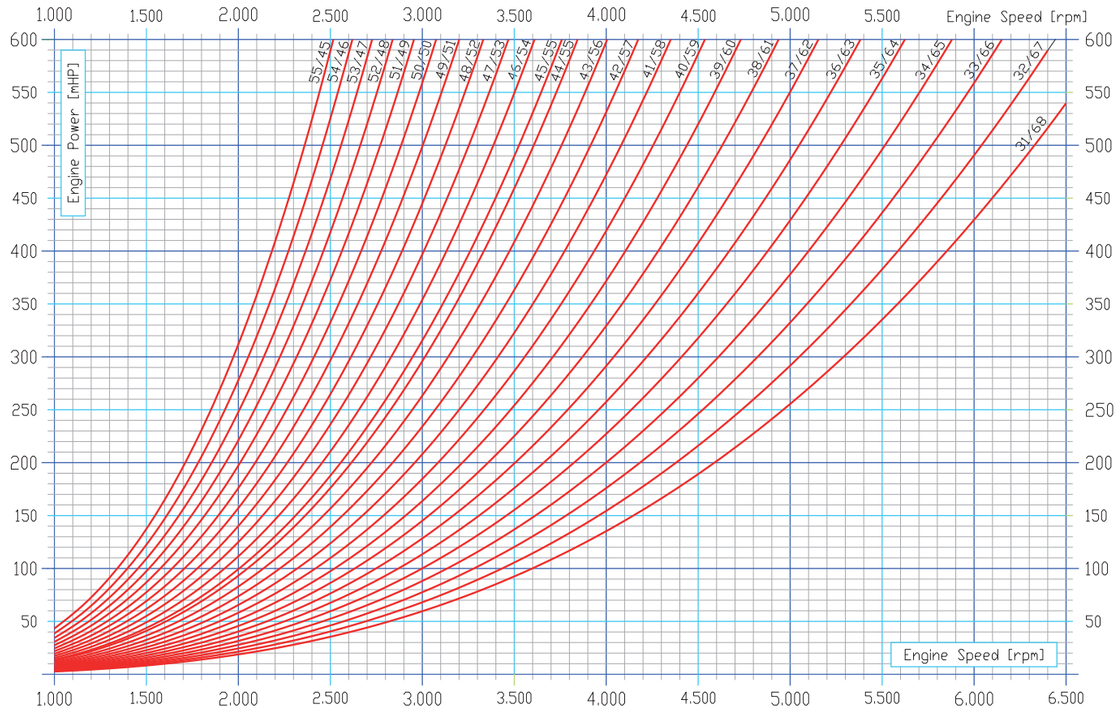
To help you understand how loads affect the performance of your vessel, and its suitability for planing with waterjet propulsion, we have provided a loading limit diagram with reference parameters.



$$\text{Loading (kg/m}^2) = \frac{\text{AUW (kg)}}{\text{LWL} \times \frac{\text{RPX}}{\text{BWL}} \text{ (m}^2)}$$

HEAVY DUTY INTEGRATED GEARBOX WHEEL RATIO SELECTION CHART

For matching a given engine, the proper gear ratio is indicated on the diagram by the curve closest to the intersection point of the maximum engine power and operating r.p.m.
The diagram refers to Turbodrive 284 H.C./L.V.

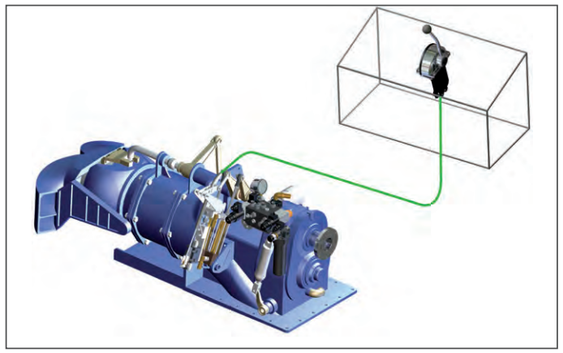


Control Systems

Whatever your budget allows, whatever your situation calls for, each and every Castoldi waterjet model has options to suit your requirements. We provide a complete range of fully integrated control systems, from simple mechanical/hydraulic to advanced electronic equipped with a joystick docking feature.

REVERSING CONTROL OPTIONS

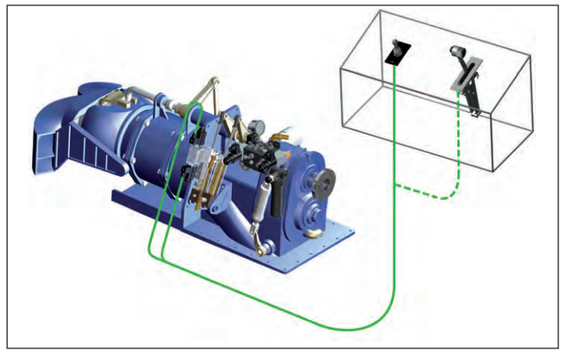
Mechanical/hydraulic



Provides the proportional control (non follow-up) of the reversing bucket actuated by means of a push/pull cable operated by the helm lever.
The helm lever is directly connected to the spool of the hydraulic control valve on the waterjet hydraulic reversing actuator.
The helm lever can be set to any position whether or not the hydraulic system is operating; hence the position of the reversing bucket can be selected prior to the engine start-up.

- Integrated hydraulic components, waterjet mounted
- Use of conventional lever
- No electricity required
- Available for all the models up to TD 490 H.C. included.

Electric/hydraulic



Provides the on/off control (non-follow up) of the reversing bucket. Electric cables connect a single axis joystick to a standard hydraulic solenoid valve (CETOP 3), that can be configured to either 12 or 24 volt systems, which in turn is connected to the waterjet hydraulic steering actuator. An indicator is provided to show the steering nozzle position, through its full range of travel.
With this system, rather than having a joystick, it is possible to use a special Castoldi single lever control box, which manages the reversing bucket with a switch and the engine rpm mechanically.

- Integrated hydraulic components and feedback sensors, waterjet mounted
- Cables with plug-in connectors
- Available for all the models.

ACES ELECTRONIC CONTROL SYSTEM

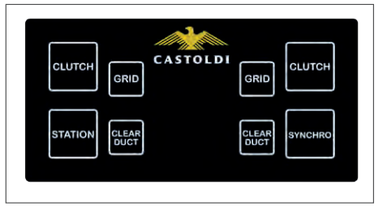
A modular, software-configurable electronic control system based on modern CAN bus technology.
It uses separate microprocessor control units (IP 67) that can be connected in various combinations to build a vessel control system.

- Suitable for single and multiple installations
- Expandable from one to six control stations
- Computerised setup process
- Variety of control devices for different configurations
- Intuitive user interface
- Capable of interfacing with bow thruster, autopilot and dynamic position
- Integrated hydraulic components and feedback sensors, waterjet mounted
- Cables with plug-in connectors
- Separate and independent backup systems provided, depending on the selected configuration
- Available from TD 284 H.C. to TD 600 H.C.T. included.

The system consists of 4 components (IP 67), two available as stand-alone options:

Electronic control box (available as stand-alone option)

Available with a single or twin lever, it manages the engine rpm and the waterjet bucket proportional control. Other functions are available through the switch panel to manage the waterjet built-in hydraulic clutch engagement/disengagement, the Clear-Duct unclogging system/grid opening, driving station recall, and the engine rpm/reversing bucket synchro.
Each lever can be equipped with a booster switch on the upper side, which can be used to accelerate the engine when the bucket is in intermediate positions, to get high thrust at low speed.



Joystick

Designed to assist the operator by simplifying all manoeuvres. Inexperienced boaters will appreciate the simplicity of the "push to go" system, which is more intuitive than conventional controls, while master skippers will appreciate its ease of use for reducing time in docking operations.
The joystick can be moved freely along all its axes and rotated by turning the head. It also incorporates a backlit switch panel for managing its activation, bow thruster activation (if present) and joystick emergency deactivation.
A wireless version is also available, allowing full control from any position in the boat.
In this configuration, the ACES Electronic Control System can also be interfaced with:

- Bow thruster
- Autopilot
- Dynamic positioning
- USV interface for remote control platform.

Electronic steering system (available as stand-alone option)

Simplifies the traditional steering hydraulic apparatus by eliminating all hoses running from the helm to the waterjet. It is equipped with an electromagnetic brake that allows adjustment of torque (hardness), helm rotation (number of turns) and settings to limit nozzle travel.
In multiple installations, the steering nozzles are electronically synchronized (no tie rod required).

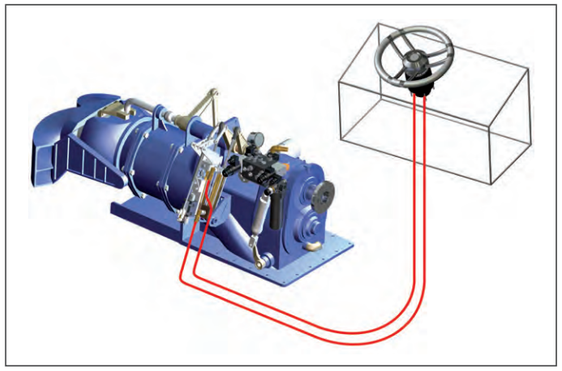
Backup

When activated, bypasses the ACES system and provides the combined direct control of the reversing, steering, clutch, movable grid and engine rpm for all the waterjets.

STEERING CONTROL OPTIONS

Several solutions are available both for single and multiple installations:

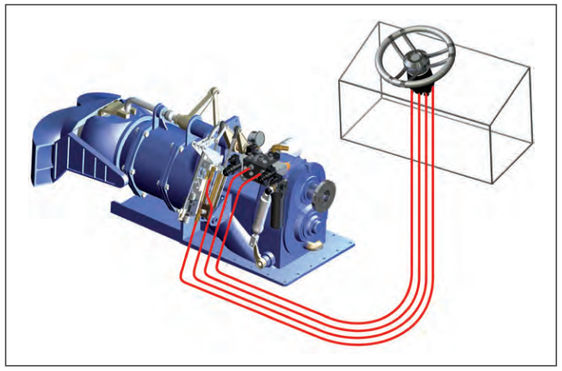
Manual/hydraulic



The helm wheel hydraulic pump (oil self-fed) is directly connected to the waterjet hydraulic steering actuator, through hoses.
In multiple installations a tie rod is required to mechanically synchronize the waterjet steering nozzles.

- Available for all the models up to TD 340 H.C. included (only in single installation).

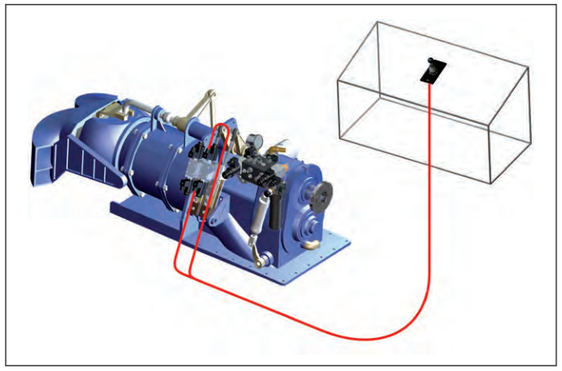
Hydraulic power assisted



The helm wheel hydraulic pump is directly connected to the waterjet hydraulic steering actuator through hoses, but the oil feed is taken from the waterjet integrated gearbox.
In multiple installations it is possible to switch the oil feed from one waterjet to another by means of a dedicated steering feed panel. In multiple installations a tie rod is required to mechanically synchronize the waterjet steering nozzles.

- Available from TD 284 H.C. to TD 340 H.C. included while standard from TD 400 H.C. to TD 600 H.C.T. included.

Electric/hydraulic



Provides the on/off control (non-follow up) of the steering nozzle.
Electric cables connect a single axis joystick to a standard hydraulic solenoid valve (CETOP 3), that can be configured to either 12 or 24 volt systems, which in turn is connected to the waterjet hydraulic steering actuator. An indicator is provided to show the steering nozzle position, through its full range of travel.
In multiple installations a tie rod is required to mechanically synchronize the waterjet steering nozzles.

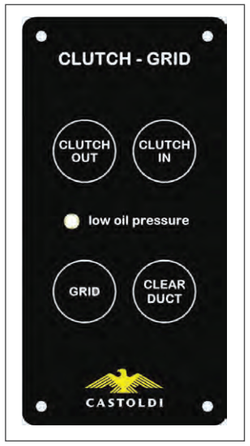
- Available from TD 284 H.C. to TD 600 H.C.T. included.

Electronic

Described in the ACES section.
In multiple installations, the steering nozzles are electronically synchronized (no tie rod required).

PANELS

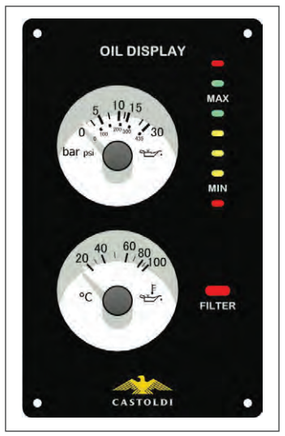
Clutch/Grid/Clear-Duct



Manages the engagement/disengagement of the waterjet built-in hydraulic clutch on all the H.C. models except for the TD 240 H.C., which is equipped with a simple activation switch.
Controls the actuation of the movable grid and the Clear-Duct unclogging system (if installed) from TD 284 H.C. up to TD 600 H.C.T. included.

- Not present with the ACES electronic control box.

Oil



Shows the waterjet oil level, pressure and temperature in real-time.
Incorporates alarms for low oil pressure and clogged oil filter.

- Standard from TD 340 H.C. to TD 600 H.C.T. included.

Steering feed

Switches the oil feed from one waterjet to another, in multiple installations, when the hydraulic power assisted steering system is installed.

Reversing bucket position gauge

Shows the reversing bucket position, through its full range of travel.

- Not present with the mechanical and mechanical/hydraulic control systems
- Standard on all the models equipped with electric/hydraulic reversing control system.

Steering nozzle position gauge

Shows the steering nozzle position, through its full range of travel.

- Standard from TD 340 H.C. up to TD 600 H.C.T. included.

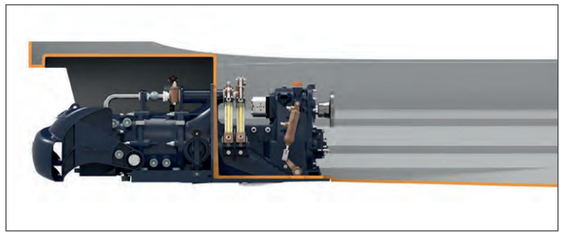
Display

Shows in real time, by means of a simple and intuitive graphic, the position of the steering nozzle and reversing bucket.

- Available with ACES as alternative to the gauges.

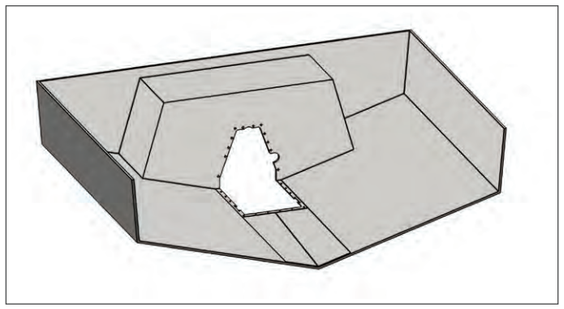
Installation

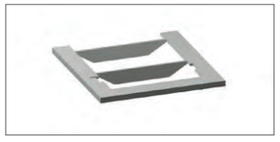
Basics

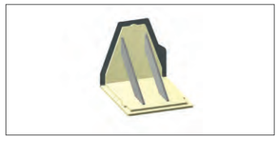


The waterjet is mounted with half of its length inboard by means of a cut and bolting including both the hull and transom region of the boat, thus obtaining a compact and rugged connection which is able to transfer a greater thrust effect into the hull structure.
The waterjet connection flange is on an "L" shaped integral cast and the waterjet body displays contours on two planes, with an angle of 90° with its bottom plane matching the hull, parallel to the waterjet axis (thrust axis).

Cut preparation

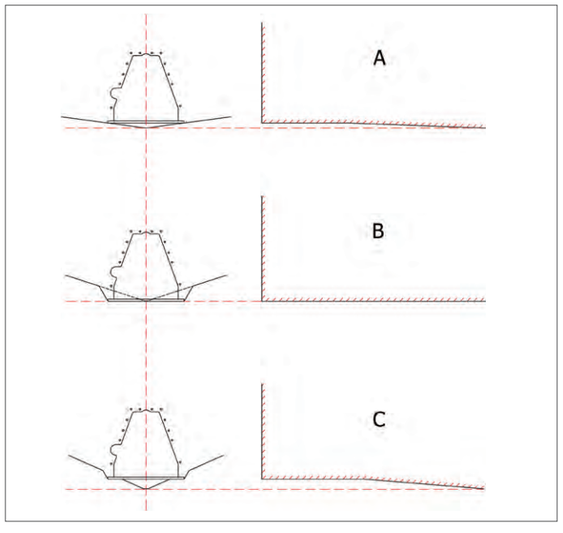






The cut contour part on the hull must have a step-shaped recession to fit the waterjet flange thickness which will ensure that the intake will be flush with the hull.
This hull cut shaping must be obtained by inserting a template into the mould for G.R.P. boats or by using fixed or welded plates on wooden or metal boats.

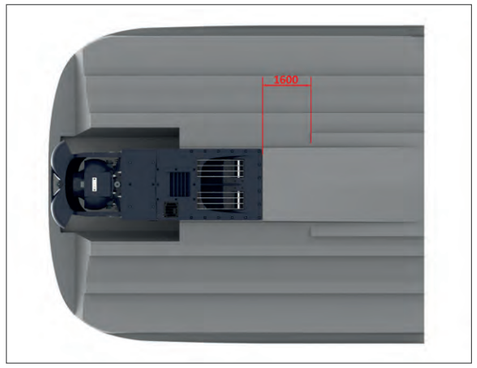
Single installation



To mount a central waterjet on a V hull, a local flat area must be built around the V to match the waterjet bottom frame.
Cutting the hull V is the simplest way to obtain a flat area for hulls with light deadrise (A).
For hulls with medium V it is better to build a plane which completely protrudes outside the V itself (B).
For hulls with deep V it is better to build a plane which half protrudes outside the V itself (C).

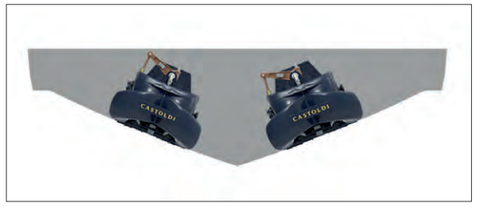
Hull

Being directionally stable, hard-chine monohedron hulls with lifting strakes and without appendages or steps are preferred, with deadrise angles between 4° and 24°.



Lifting strakes must not be placed in front of the waterjet intake and be at least at 1.600 mm from it.
Other items that might cause turbulence (such as water intakes for engine cooling, transducers etc.) must be placed far from and lateral to the water intake.

Twin installation



The side waterjets in a multi-installation should be mounted flush to the hull with zero degree trim angle.

Multi installation alignment

For twin or triple installation, the waterjet drives must be installed with their axes parallel to each other, allowing for a solid mechanical interconnection of the steering levers and an optimum compound of each waterjet individual thrust.

Fixing holes preparation and mounting

Because of the waterjet unique integral "L" shaped flange, the waterjet itself is used as a template to drill all the mounting holes around the edge of the boat cut. After having dismounted rams and hydraulics from the waterjet, it can be inserted into the boat from the outside and after sealing the waterjet "L" flange by applying a silicone paste, it can be bolted to the hull and transom.

Mounting on steel hull

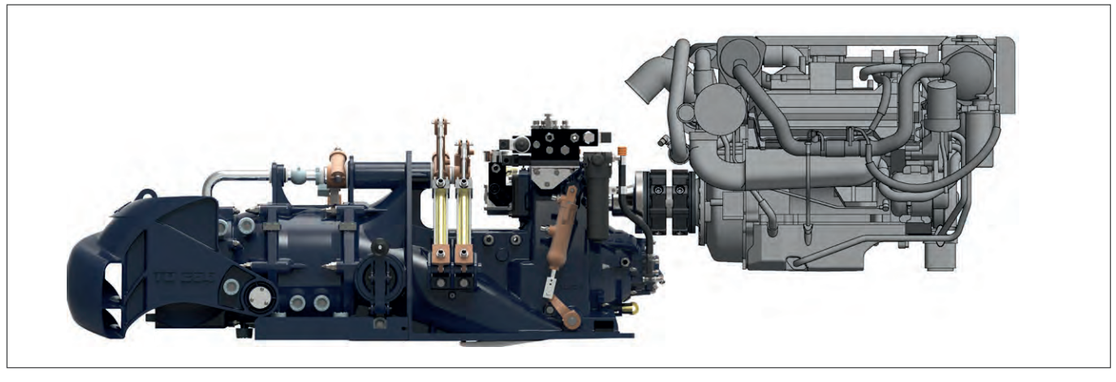
For steel hulls, the waterjet flange and all the other links must be insulated from the hull for anticorrosion purposes.

Hardware

The hardware required for the installation (studs, nuts, bolts, etc.) is supplied with the waterjet package.

Driveline system

Compact coupling example

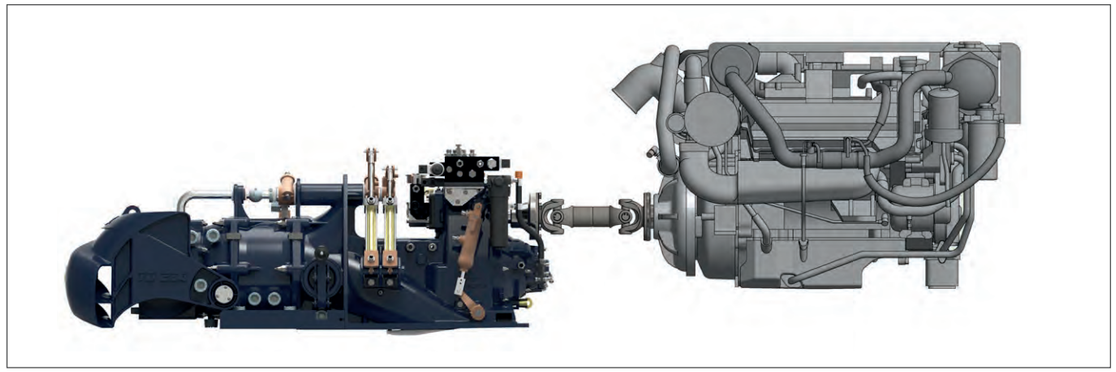


Compact coupling can be made with two flexible joints and an intermediate shaft.

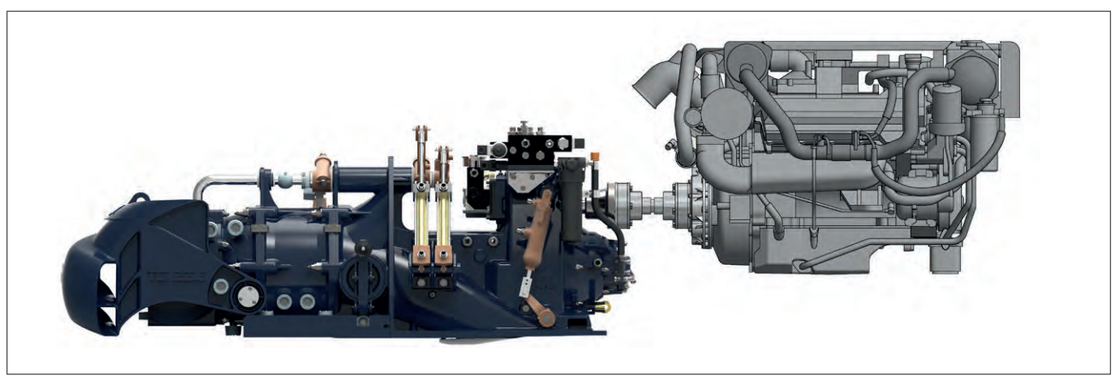
Remote coupling example

Remote coupling can be realized with a constant velocity joint or a cardan shaft of required length. In either case a flexible coupling has to be installed on the engine flywheel.

Version with flexible coupling and cardan shaft.



Version with flexible coupling and C.V. joint.



The waterjet basic principles

Essentially a waterjet drive is like an aircraft turbojet with the difference that the operating fluid is water instead of air.
The propelling force is generated by adding momentum to the water through accelerating a specific flow of water sternward.
Water flow from under the vessel is fed through an inlet duct mounted at the transom, flush to the hull bottom, into an inboard pump (the impeller) adding head to the water. A grid is fitted at the duct water inlet to protect the intake.
From the pump, the water flow passes through an integrated stator which removes the water swirl generated by the impeller and converts all this pressurized energy into speed, discharging a straight high-speed jet much higher than the boat speed.
This water acceleration generates the thrust which propels the boat.
Steering and reversing thrusts are generated by deflecting the water flow by means of directional deflectors called reversing bucket and steering nozzle.
When the reversing bucket is placed in an intermediate neutral position, the water flow is equalized.
In this way, vertical neutral thrust can be achieved independently from the pump speed resulting in zero forward and backward thrust which keeps the boat at a standstill, while full steering is available for precise manoeuvring.
Fine trimmable forward, backward and side movements can be achieved simply by raising and lowering the reversing bucket from the neutral position and by moving the steering nozzle.

Waterjet typical benefits

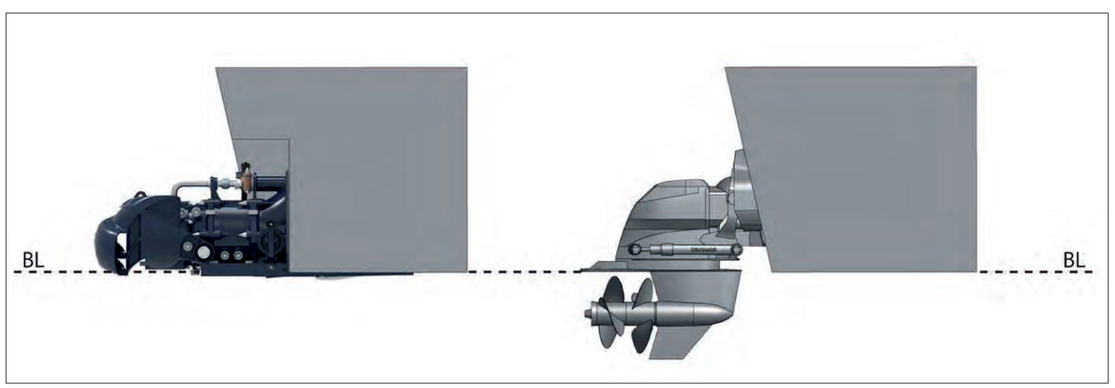
Speed

Above speeds of approximately 30 knots the traditional fixed pitch propeller, an open stream machine, cannot operate due to the poor priming of its blades.

The introduction of a case which produces a radial discontinuance with the outside, allows an increase of the priming of the turbo-machinery blades and the achievement of higher speeds (40 – 60 knots depending on waterjet design).

Greatest versatility

The waterjet drive gives a boat the widest possible operating range: from open sea to shallow waters, due to the elimination of all under keel protrusions. This also contributes greatly to the reduction of night time operational risks.



Maximum active and passive safety features

The absence of open rotating parts provides complete safety for people in the water.

Rescue operations by divers for survivors can be safely performed with the engine running to withstand wind or currents.

The reversing bucket may be quickly activated to stop the boat at any speed, within 1.5 times its length.

It is possible to shift from full forward to full backward with no strain on the engine as the direction of the water flow is the only thing that is altered in stopping or reversing.

Running comfort

The absence of high speed cavitation pressure peaks, caused by proximity of the propeller blades to the hull and torque effects, drastically reduces hull vibrations and under water noise.

Eco friendly

The waterjet, not having open rotating parts or under hull appendages, cannot cause damage to aquatic fauna. The intense water flow and the option of directing it downward, allows the waterjet to oxygenate stagnant waters.

Furthermore, as water is suctioned to the surface, suspended mucilage is dissipated.

Maximum reliability, low vulnerability, endurance

It is impossible to damage the impeller, shafts or steering and reversing actuators in the event of grounding as nothing protrudes from the keel. Therefore, unscheduled down-times are eliminated.

The increased blade tip clearance of the axial flow impeller, caused by wear after extended use in sandy waters, does not affect speed as dramatically as mixed flow impellers do.

There is no danger of vital components (control levers, hydraulic rams) being affected by sea incrustations, by corrosion or by impact as these are all inboard mounted where they are serviceable without docking the vessel.

Maximised engine life

The impossibility of over-loading the engine leads to reduced engine wear as the characteristic of the waterjet is to maintain constant power absorption and engine speed (according to cubic law); regardless of boat speed.

Excellent maneuvrability at all speeds in forward, reverse, neutral and in any position in between

The boat speed and direction can be adjusted continuously, independently from the pump speed, by setting the bucket, without the impeller losing its grip on the water, because it is never disengaged.

This is a great advantage because the maximum thrust is available at low speed for performing precise maneuvers while in severe conditions, in contrast to traditional propulsion systems in which thrust increases boat speed.

In a twin installation, using one drive in reverse, the other in neutral (and balancing their thrusts to keep the boat at a standstill), it is possible to move the boat sideways while adjusting the steering nozzles, without the use of bow thrusters or electronic control systems.

Castoldi Waterjet additional benefits

For its exclusive features the Castoldi waterjet drive offers many additional benefits

Less weight

The Castoldi waterjet drive is very light due to the aluminum alloy construction of its principle parts.
The gearbox is integrated in the unit therefore the engine need not be provided with a marine transmission.
All this makes Castoldi waterjets the lightest ones on the market, even lighter than the smaller waterjets of other manufacturers, when combined with the weight of the marine transmissions.

Simplified engineering and installation

Every Castoldi waterjet drive is equipped and delivered in a single module which includes a propulsion system with water intake, duct, steering and reversing devices, with top quality equipment required for its installation, interconnection and control, to ensure the best performance.
All this produces a pre-assembled, factory tested package; each waterjet incorporates its own self-contained hydraulic system for actuating the reversing bucket, the steering nozzle, the hydraulic clutch and the movable grid.

Top performance

High efficiency at medium to high speeds (25-60 knots) due to the following:
The axial flow impeller has been designed to achieve the highest efficiency and the best resistance to cavitation.
The lowering of the impeller shaft, made possible by the integrated gearbox, allows the design of a flat, straight duct enabling the water stream to flow smoothly with minimum hydrodynamic losses at high speed.

Constant performance in shallow and sandy water operations

As well as the inherent waterjet characteristic all rotating parts being contained in the casing and no under keel protrusions, which allows shallow water operations, Castoldi waterjets are the best choice for boats operating in shallow and sandy waters for the following reasons:

The axial flow impeller is less sensitive than mixed flow impellers to clearance which may be formed between the impeller and the impeller housing following use in shallow and sandy waters which can greatly affect boat performance.

There is no water lubricated tail seal with support function, which would be vulnerable in sandy waters, and could induce vibrations and consequent damage to shafts, gearboxes, engines and hulls.

The impeller shaft rotates safely inside the fin oil chamber, and is therefore perfectly protected from sand or debris being suctioned into the waterjet.

Excellent sea-keeping characteristics and course stability

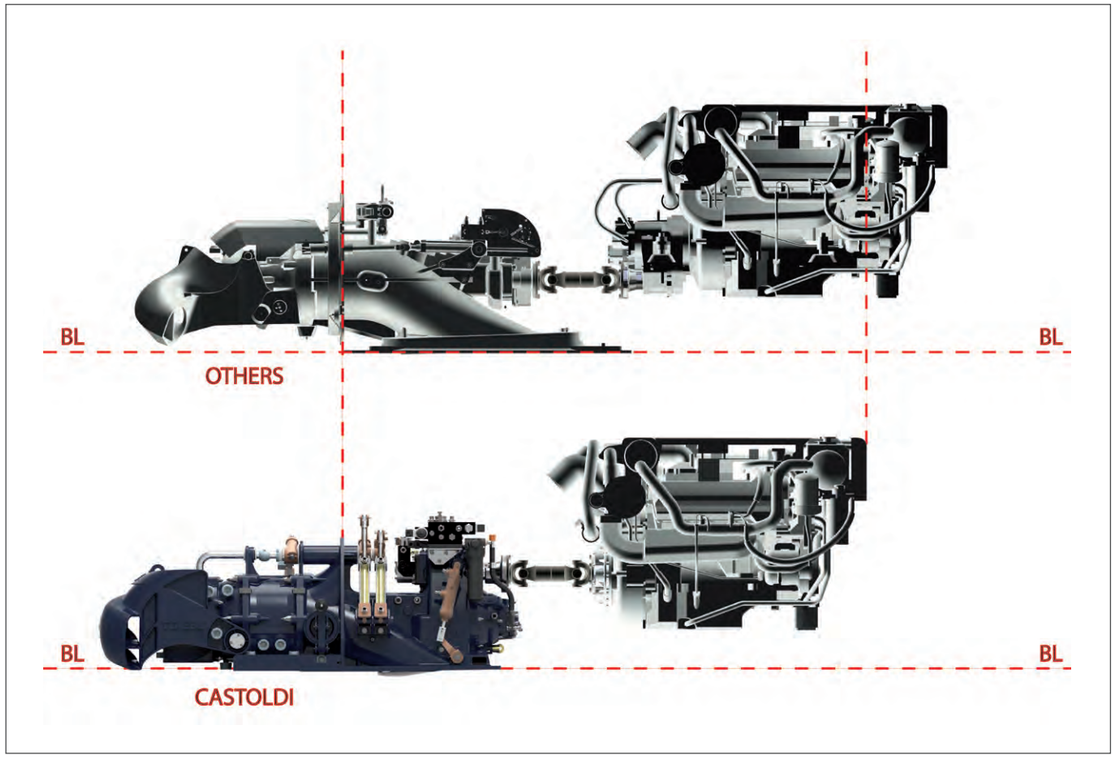
The water intake is positioned as closely as possible to the stern thus limiting aeration during rough water conditions.

The "holdfast effect" of the water intake and the mass of water flowing into the duct contribute to keeping the boat in contact with the water surface and stable.

The lowering of the impeller shaft and consequently the center of thrust, allowed by the integrated gearbox, provides optimum course stability.

Most compact installations

The integrated gearbox greatly reduces the engine room length.



Minimum possibility of water intake and duct clogging

The water intake is protected by the movable debris screen grid which, in most situations, blocks and rejects debris.

Furthermore, the limited number of impeller and stator blades (respectively 3 and 5) allows the easy transmission and discharge of ingested debris which, in any case, would not damage the impeller shaft as this turns in an oil bath inside the fin.

If, in the remote event that, despite all this prevention, the waterjet does become clogged, it is possible to manually remove the debris by opening the inspection hatch, positioned close to the water intake. On request the superior Castoldi Clear-Duct unclogging system can be installed.

Simplified maintenance, minimised overhaul

The Castoldi waterjet may be disassembled and accessed for inspection in just a few seconds, simply by removing the rear part. The impeller is driven by the spline shaft and it is kept in place by a single special screw which also acts as an extractor for easier removal.

Longer service life

Longer service life is achieved through rugged construction and full protection against corrosion.

The whole unit is protected by a hard anodizing treatment, plating all light-alloy components with 60 microns thickness of aluminum oxide (ceramic), three layers of special paint and cathodic protection by sacrificial anodes. All the main parts (impeller, impeller shaft, etc.) are manufactured with the best available materials (AISI 316 L, Duplex, Titanium etc...).

Italian tradition of speed on water.

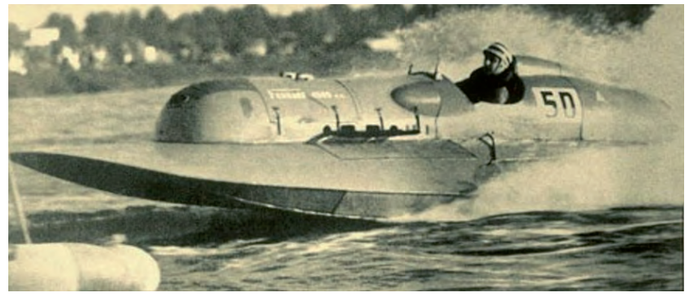
1906 - 2000

Luigi Castoldi, founder of Castoldi Company and other world renowned Companies such as B.C.S. and Mosa was an ingenious and acclaimed engineer. At the age of 24, he designed a racing boat which, with his brother Achille at the helm, won the 1930 World Speed Record in the 100 HP outboard category.

In the early 60s he revolutionized the waterjet propulsion system.

1933

Mario Castoldi designed the Macchi Castoldi "M.C. 72" hydroplane, which won the Schneider Cup and set the world water speed record, of 382,94 knots, which remains unbeaten.



1953

Achille Castoldi, 5 times world champion and world speed recordman in 800 kg Racers class in his "Arno XI" Timossi boat / Ferrari engine F1: 131,51 knots. Record still unbeaten.

1974

Franco Castoldi won the offshore race Santa Margherita - Montecarlo - Santa Margherita. He travelled 200 nm at an average speed of 57,2 knots with an Enfield 37' boat equipped with two 600 HP engines and a special twin stage counter revolving waterjet drive, designed by his father Luigi Castoldi. This is, to-date, the only long-distance offshore race in the history of motor boating to be won by a boat having something other than a propeller as its propulsion system.

Applications.

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