

THE WORLD'S FIRST LNG/DUAL FUEL FAST RO-RO FERRY

INCAT HULL 069

# FRANCISCO





ABOVE: INCAT HULL 069, FRANCISCO DURING SEA TRIALS.

## HULL 069 FRANCISCO

Incat has built the world's first high speed Ro-Ro ferry to be powered by LNG as a primary fuel. The ship will service passengers crossing the River Plate between Argentina and Uruguay for South American customer Buquebus.

Launched in 2013, *Francisco* (Incat Hull 069) is the first craft built under IMO's High Speed Craft Code powered by gas turbines using LNG as the primary fuel and marine distillate for standby and ancillary use. This is a huge step in a new era of eco-sustainable heavy-duty transportation.

With the continuing emphasis on eco operations and fuel efficiency Incat has continued to develop the breed with lightweight, environmentally friendly, fuel-efficient ships carrying heavier vehicle loads than ever before and at the lowest operational costs.

*Francisco*, has the capacity for over 1000 passengers and 150 cars she has a proven lightship speed of 53 knots, and an operating speed of 47 to 50 knots.

**ONCE AGAIN INCAT HAS PUSHED THE BOUNDARIES OF SHIP BUILDING TECHNOLOGY WITH HULL 069.**

## HULL 069 99M WAVE PIERCING CATAMARAN



### GENERAL PARTICULARS

Yard No:	069
Designer:	Revolution Design Pty Ltd.
Builder:	Incat Tasmania Pty Ltd.
Class Society:	Det Norske Veritas
Certification:	DNV + IAI HSLC R4 CAR FERRY B GAS FUELLED EO
Length overall:	99.00m
Length waterline:	90.54m
Beam (overall)	26.94m
Draft (design)	2.98m
Deadweight:	450 tonnes
Speed:	51.8 knots @ 450 tonnes deadweight, 100% MCR Lightship trial speed: 58 knots @ 100% MCR

### CAPACITIES

Passenger Capacity: maximum 1024 persons (passengers and crew)

Tier 2 Passenger Deck is divided into three areas as follows:

- T2 Aft Lounge (Economy Class) with seating areas and Bar/Kiosk.
- T2 Duty Free Shop Lobby with Male/Female Toilets
- T2 Duty Free Shop.

Tier 3 Passenger Deck is divided into four areas as follows:

- T3 Aft Lounge (Tourist Class) with seating areas and Bar/Kiosk.
- T3 Main Foyer with Reception Area, Business Lounges (P&S), Male/Female Toilets and Disabled Toilet/ Mothers Room.
- T3 Mid Lounge (Business Class) with seating areas Bar/Kiosk, Male/Female Toilets.
- T3 Forward Lounge (First Class) with seating areas, Bar, VIP Lounge and Male/Female Toilets.

The Tier 4 wheelhouse and Tier 3 lower wheelhouse are accessed from the T3 Forward Zone.

Vehicle Capacity: 150 car spaces at 4.5m long x 2.3m wide.

Tier 1 Vehicle Deck clear height: 2.3m

Tier 1 Vehicle Deck: Axle load: 2.0 tonne per axle

Vehicle Access: Via shore based stern ramps across transom.

### TANKAGE

- Fuel Oil (main storage) 2 x 70,000 (approx) litres
- Fuel Oil (generator header tanks) 2 x 1,240 litres
- LNG (main storage) 2 x 40m<sup>3</sup>
- Fresh Water: 1 x 5,000 litres
- Black & Grey Water: 1 x 5,000 litres
- E/R Oily Water: 2 x 160 litres
- Bilge Holding: 1 x 1,000 litres
- Aft Hydraulic Oil: 2 x 400 litres
- Fwd Midships Hydraulic Oil: 1 x 200 litres

### CONSTRUCTION

Design - Two slender, aluminum hulls connected by a bridging section with centre bow structure at the forward end. Each hull is divided into nine vented, watertight compartments divided by transverse bulkheads. Two compartments in each hull are prepared as fuel tanks with an additional compartment prepared as a long range tank.

### AIR CONDITIONING

Reverse cycle heat pump units throughout are capable of maintaining between 20-22 deg C and 50% RH with a full passenger load and ambient temperature of between 0 deg C and 35 deg C and 60 % RH.

### SAFETY & EVACUATION

Four Marine Evacuation Stations (MES), two port and two starboard, each MES is capable of serving a total of up to 256 persons. A total of nine, 128-person open reversible life-rafts are fitted.

### MACHINERY

Gas Turbines: Two (2) GE Energy LM2500 marine gas turbines rated at 22MW each.

Water Jets: Two (2) Wartsila LJX 1720 SR waterjets are configured for steering and reverse.

Gensets: 4 x Caterpillar C18 340 kW generators fitted with marine brushless self-excited alternators, arranged for automatic start-up and paralleling, provide power for all passenger and ship services. The electrical control system considers one genset is maintained as a standby set.

GT Gensets: 2 x Caterpillar C9 200 kW generators fitted with marine brushless self-excited alternators provide electrical power for gas turbine services. Each GT genset is considered independent.

Trim Control: A hydraulically operated trim tab is fitted at the aft end of each hull to allow adjustment of the running trim of the vessel.

Hydraulics - Three hydraulic power packs, one forward and two aft, all alarmed for low level, high temperature, filter clog and low pressure, supply hydraulics for capstans, trim tabs, steering and stern ramp.

### ELECTRICAL

Distribution - 415V, 50 Hz. 3 phase. 4 wire distribution with neutral earth allowing 240 volt supply using one phase and one neutral. Distribution via distribution boards adjacent to or within the space they serve. 200-amp 415V 3-phase shore power connection point fitted in starboard anteroom.



ABOVE: FRANCISCO POWERING ALONG DURING SEA TRIALS

## DESIGN AND CONSTRUCTION

Together with its partner company Revolution Design Pty Ltd and in conjunction with Det Norske Veritas, Incat has worked to ensure the design, strength and safety of this new ship meets all requirements of the HSC code and the customer.

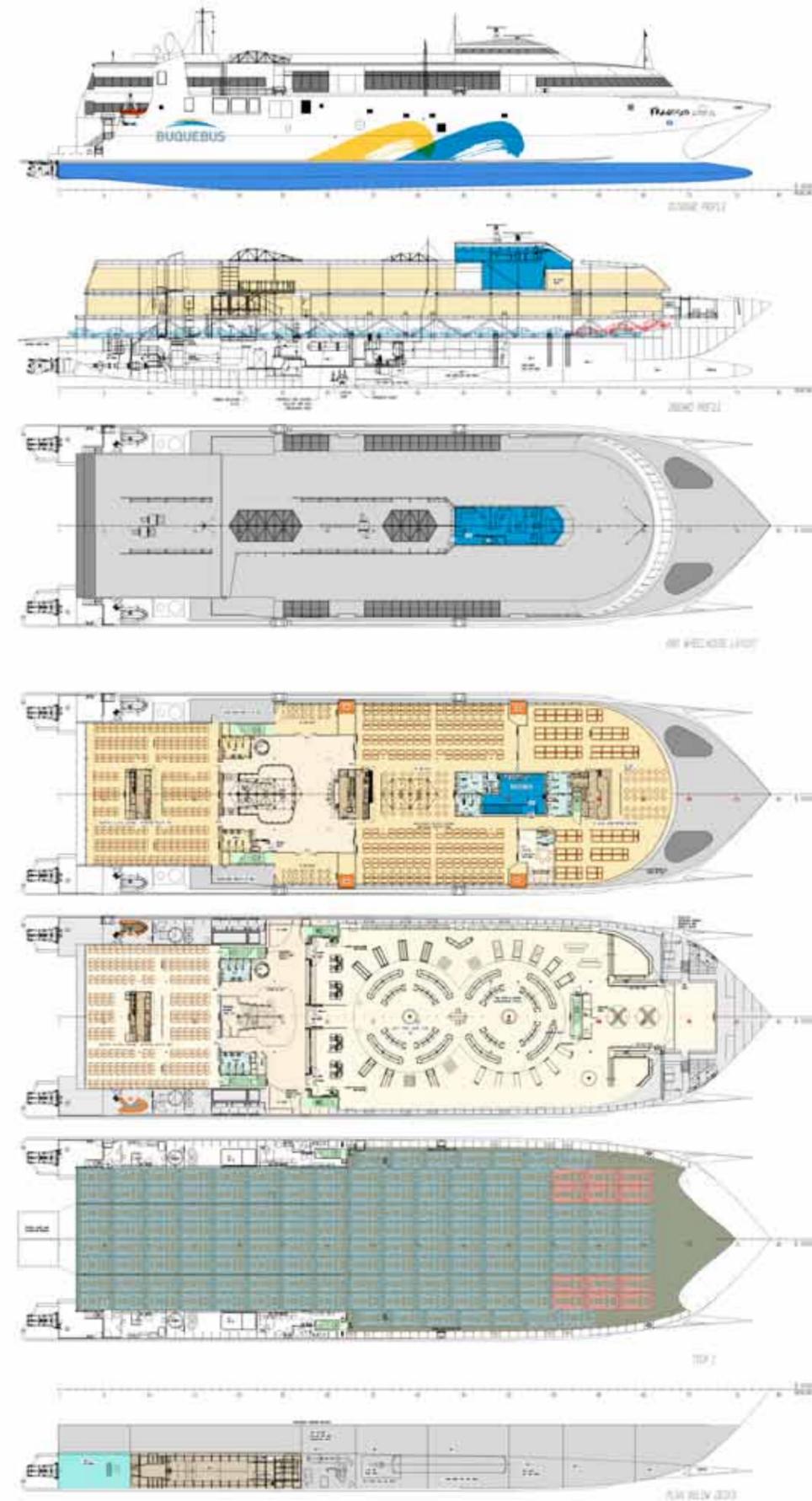
Hull 069 did not create any difficulties in the construction process for the hull or superstructure. The detail was, however, a little different by having only one drive line per hull instead of the typical two per side, and the jet rooms had one big jet duct instead of two (comparatively) smaller jets on a standard Incat 98m WPC.

The real challenges came in a number of areas, including the hull side cut out to enable the LNG tank with cold box to be fitted, which was about twice the size of a conventional engine room soft patch in the vessel side. Revolution Design structural engineers factored that into the vessel design to allow this to occur without causing any other significant problems.

The gas piping requirements, including the provision of ventilated ducts and their welding and fixing required many months of attention. Whilst none of these activities are different from processes and standards that are applied within a standard Incat vessel, the sheer number of the systems that required this level of detail was significantly greater than normal.

The integration of systems within the vessel combining the highly complex GE LM2500 turbine systems as well as the gas systems, into the ships control and monitoring systems was obviously a difficult and time consuming task. These systems came together into the Gas Control System and the Gas Safety Systems. These systems added huge amounts of additional complexity to the vessel and the work load to design and then install and commission all of these systems was enormous.

Once again the sheer tenacity and professionalism of Incat staff shone through, with the comment being made many times by different people, "I just love the challenge of this. No one else has done this before us. We are the first again."



## FRANCISCO 99m

LOA:	99.00 m
LWL:	90.54 m
Beam:	26.94 m
Draft:	2.98m
Deadweight:	450 tonnes
Capacity:	Over 1000 passengers and 150 cars.
	Duty free shop over 1100 square metres
Engines:	GE Gas Turbine LM2500
	2 x 22 MW Total power
	44 MW
Waterjets:	Wartsila LJX 1720SR
Gearbox:	Renk: Bus 175



## LNG POWER

The vessel has the first installation of LNG powered dual fuel engines in an Incat high speed ferry, and the first high speed craft built under the HSC code to be powered by Gas Turbines using LNG as the primary fuel and marine distillate for standby and ancillary use.

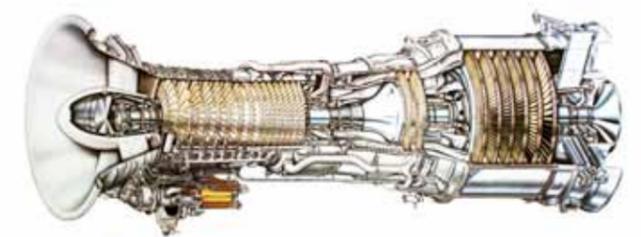
## LNG FUEL TANKS

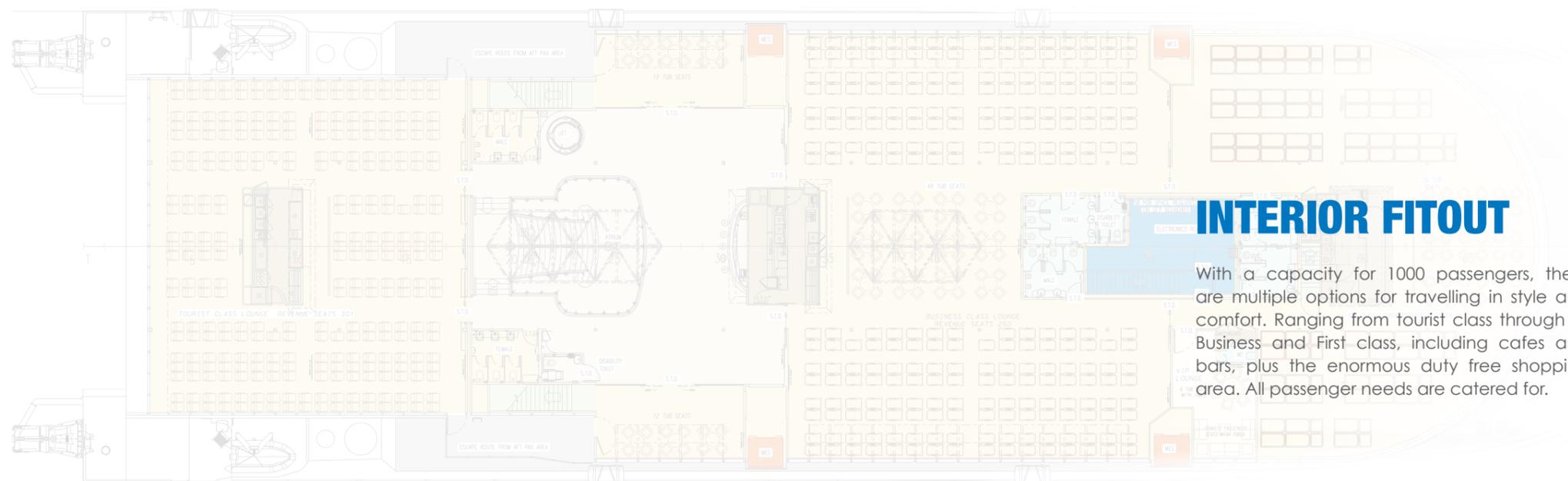
The fuel tanks provide for up to four hours of high speed operation. Of course the fuel tanks and system has been designed for the specific route and refuelling requirements for our client. As a back-up, long range distillate tanks are provided for auxiliary and delivery voyage use.

## GAS TURBINES

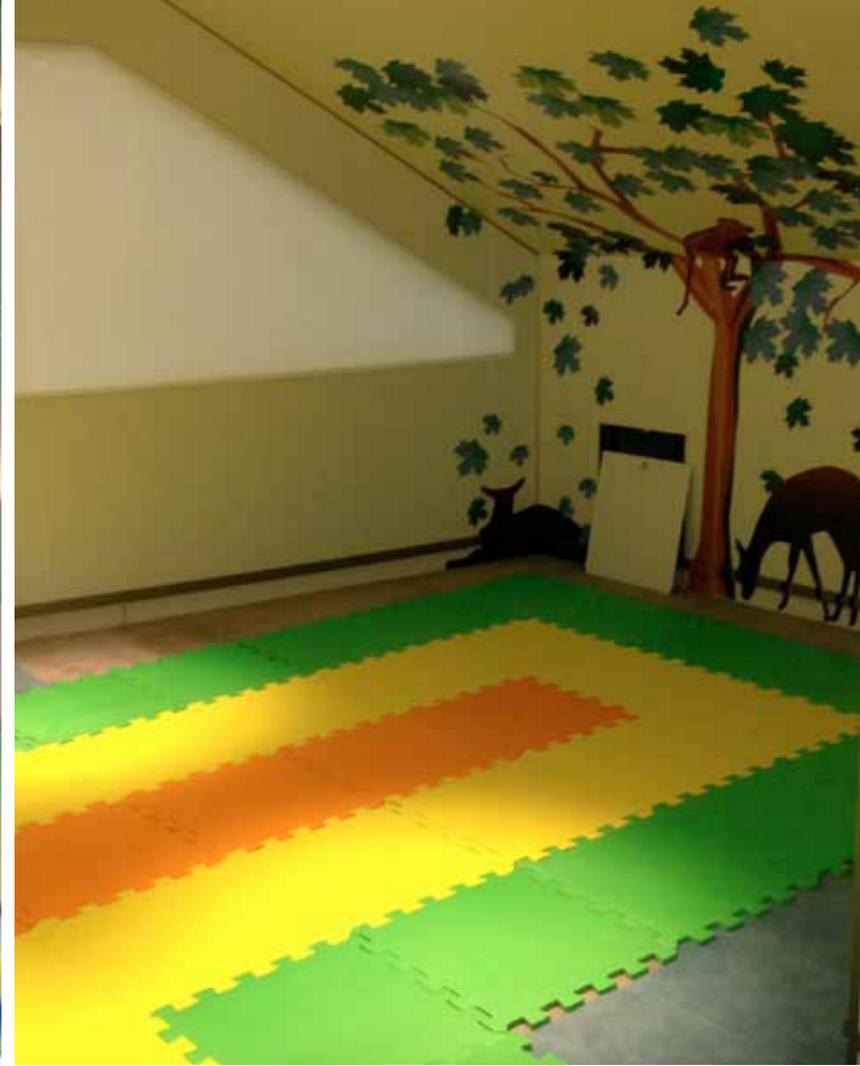
The LM2500 is a single-rotor gas turbine with an aero-dynamically coupled power turbine. More than 1450 units have logged over 65,000,000 operating hours.

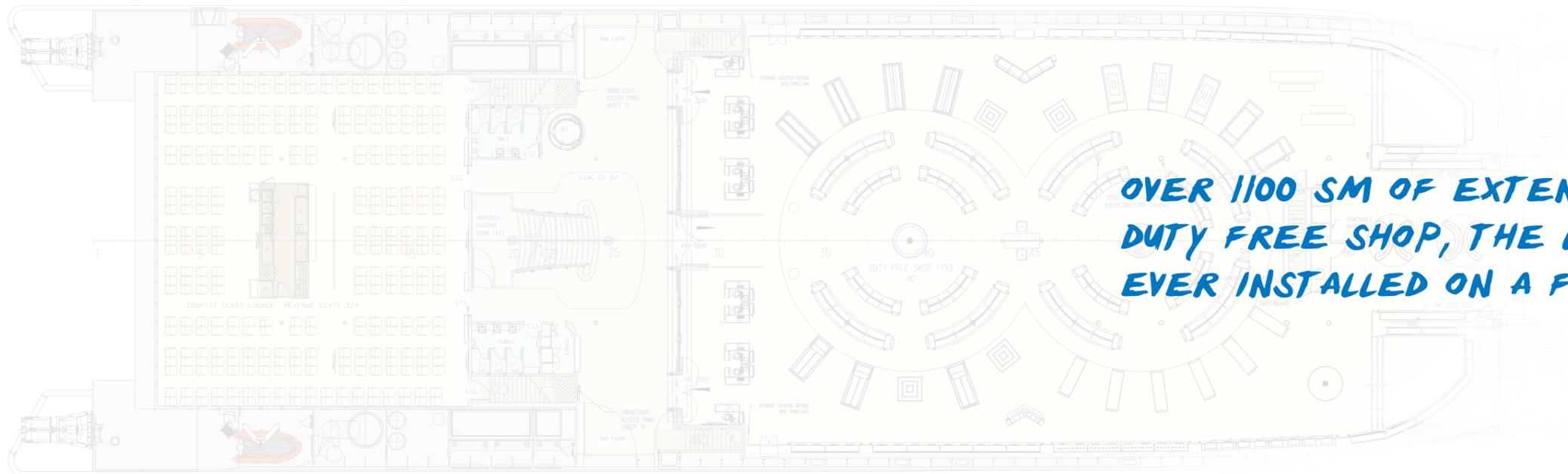
Dimensions:	l = 4.29 m, $\varnothing$ = 1.52 m
Weight:	3266 kg
Compr. / HPT / PT:	16 / 2 / 6 stage
Combustor:	Annular
Compression ratio:	18 : 1
Output (ISO):	22,233 kW
Speed LPT:	500 - 3780 rpm
Fuel:	ISO 8217:1996(E) Class F DMX / DMA Natural gas





**THE PASSENGER CABIN INCLUDES  
TOURIST, BUSINESS & FIRST CLASS SEATING.**





**OVER 1100 SM OF EXTENSIVELY FITTED OUT DUTY FREE SHOP, THE LARGEST SHOPPING AREA EVER INSTALLED ON A FAST FERRY.**



**BUILDING THE**  
*WORLD'S FASTEST,*  
*ENVIRONMENTALLY CLEANEST,*  
*MOST EFFICIENT*  
**HIGH SPEED FERRY**



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