# Spare Parts and Modernisation Guide

FUEL SUPPLY SYSTEMS

AURA MARINE

# Contents

# Engine uptime

At Auramarine we are committed to ensuring the operational efficiency of your vessel's fuel system throughout its entire lifetime. From design and delivery, to regular maintenance and the latest retrofits, we are here to support you at every stage of your vessel's journey and offer a complete, robust solution.

Our decades of global industry experience has further reiterated the importance of maintaining every aspect of a ship's fuel supply system in order to maximise operational efficiency, combustion system health and avoid disruption to operations. We understand that diligent planning and preparation are key to ensuring the technical integrity of fuel systems, which is why our robust spare parts and lifecycle service is critical to safeguarding operations and reducing costs.

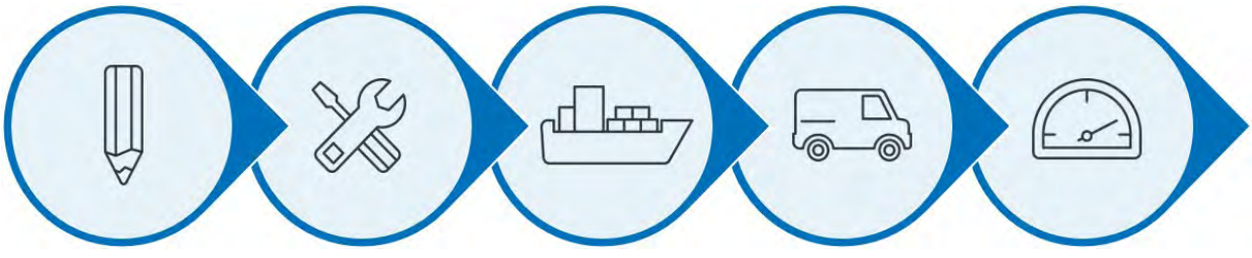
Our service also guarantees that your fuel system meets intended requirements under pre-defined operating conditions.

With increasing regulatory changes, the ongoing transformation of the marine energy supply chain, and the introduction of alternative low sulphur and new fuels, the necessity for ship owners and operators to be adaptable and invest in future proofing measures is more important now than ever before.

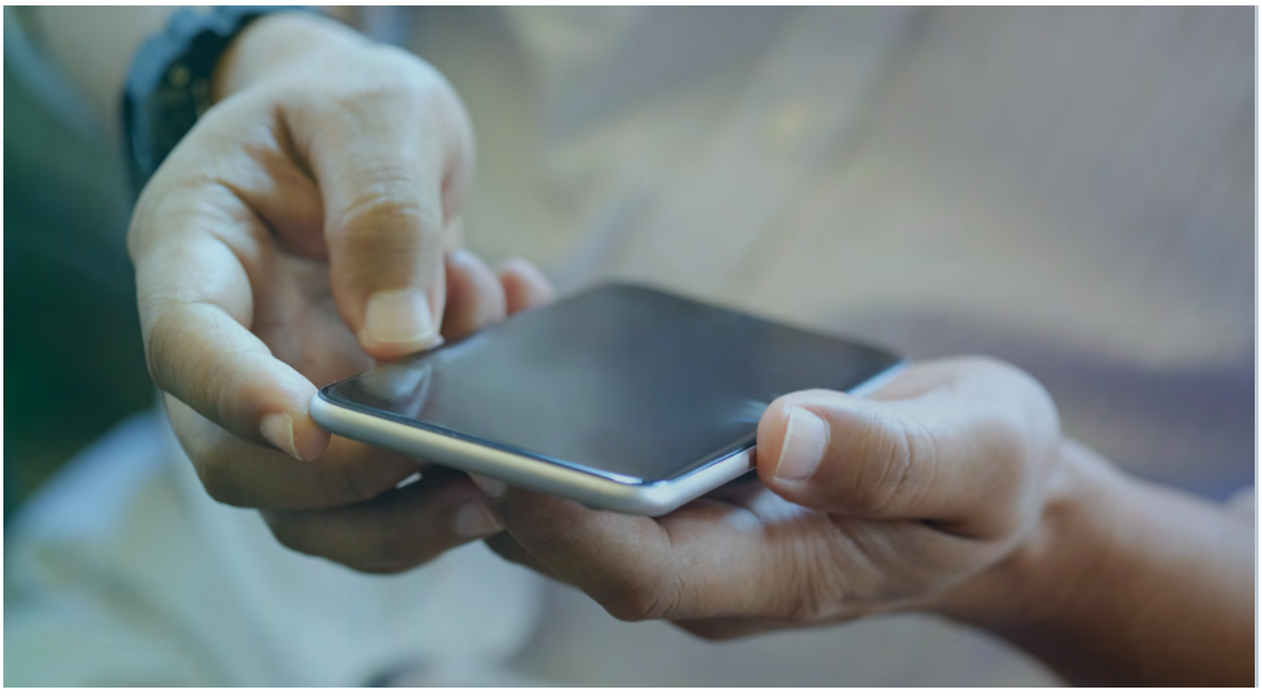
Auramarine's spare parts, lifecycle services and technical support are available worldwide, with our main hubs located in Finland and Shanghai, China, for rapid delivery. As scheduling can also be critical, we use long-term trusted logistics partners to reliability and ensure business continuity.

Our global representative network is always ready, and at your service in over 25 countries.

We can also provide quality spare parts for third-party fuel supply units. Contact us at after.sales@auramarine.com to find out more about our solutions.



Design / Installation at shipyard / In service system support / Spare parts / Optimisation and Modernisations,



# How to use this guide

At Auramarine, we enable you to avoid the time consuming and laborious process of locating a specific part for a fuel system. All we require from you is some information, such as:

- Fuel supply unit serial number (if Auramarine)
- Type of the previous part
- Required values such as flow rate, filter mesh size etc.
- Part code (from Auramarine fuel supply unit part list)

**IMPORTANT:**
The full Auramarine spare part inventory comprises of thousands of spare and wear parts. This catalogue therefore serves as a brief overview to our spare and wear part offering.

## For quotations and support:

- Send us an e-mail at: after.sales@auramarine.com
- Call us: +358 20 486 5030
- Fill in the contact form on our website (scan QR code below)
- Get in touch with our representative network as listed on our website.

Our solutions are also available via the Shipserv portal (account ID 76676).

# Recommended spare part inventory

Investing in the right spares inventory onboard a vessel is vital in ensuring minimal fuel system downtime and smooth spare parts' administration. Despite this being important for all equipment onboard, it is particularly critical for fuel supply systems, which generate a vessel's power.

## Built-in redundancy

Auramarine's fuel supply systems include backups to ensure alternative ways of operating for all critical functions.

For example, pumps are designed in a set of two, one of which acts as a spare to serve as a backup in case there is a need for repair or maintenance. If a viscometer or viscosity controller happened to fail, the system is also equipped with a backup controller, which automatically adjusts the steam valve based on the temperature. Our automatic filters are equipped with a by-pass filter to ensure that even in the case of a filter breakdown there are always options to continue operating.

As for filter elements, a cleaning cycle runs smoothly with one element in use, and a clean filter element ready for the next round. Shaft seals, couplings (between motor and pump) and seal kits for the filter, are critical spare parts that should always be readily available onboard to ensure the continuity of operations.

Similarly to the pumps, the electric motors and heaters come in sets of two in case a repair is required or maintenance is needed. If steam heaters are applied, the automatic steam control valve has a manual backup valve.

While our systems are carefully designed and manufactured with strategic backups to ensure the smooth running of operations and the avoidance of downtime, vessels should still always carry an optimised set of critical spares to safeguard against all eventualities.

## Solving challenges from new fuels

The International Maritime Organisation's (IMO) recent implementation of the 0.5% global sulphur cap, as well as its 2050 decarbonisation targets, has led to a significant increase in vessels using fuels that the main and auxiliary engines were not originally designed to run on.

In such cases, modifications or technical interventions to existing systems need to be made; an expert engineering review by Auramarine is therefore strongly recommended. The main parts concerned are pumps, filters, flowmeters as well as heating and cooling.

# Customised spare part kits for planned maintenance

Our customised spare parts kits can be individually tailored to match a vessel's specific requirements to help maintain an optimal wear parts inventory at all times. This solution is based on our specialist software, which intelligently identifies a tailor-made spare parts kit for your specific fuel supply system over a given period.

You can subscribe to receive either an up-to-date, regular, or one-off free-of-charge suggested wear parts list for your vessel or fleet.

Investing in a robust and prepared list of spare parts is cost-effective as it enables the long-term safeguarding of operations, and ensures minimal fuel system downtime and smooth spares administration.

**10843 FEEDER BOOSTER UNIT AMB-M-15-SS**

| Item code | Position | Ordering code | Part No | Description | PCS | Maintenance rate |
|---|---|---|---|---|---|---|
| AM01412 | B001 | | | Strainer, Y-type | | |
| | | AFM000816 | 3 | Strainer screen | 1 | 2 year |
| AM01410 | B007 | | | Strainer, Y-type | | |
| | | AFM000487 | 3 | Strainer screen | 1 | 2 year |
| AM04878 | B014 | | | Filter, Combination | | |
| | | AFS000606 | SET2 | Gasket set | 1 | 1 year |
| | | AFM000549 | 6 | Candle element | 16 | 1 year |
| | | AFM000865 | 308 | Filter element | 1 | 1 year |
| | | AFS000733 | 1003 | Air escape aggregate | 1 | 1 year |
| AM01405 | B023 | | | Strainer, Y-type | | |
| | | AFM000486 | 3 | Strainer screen | 1 | 2 year |
| AM04822 | D003, D004 | | | Pump, screw | | |
| | | AFS000814 | G053 | Minor kit | 1 | 1 year |
| AM04811 | D006 | | | Pump, screw | | |
| | | AFS000422 | G053 | Minor kit | 1 | 1 year |
| AM04818 | D001, D002 | | | Pump, screw | | |
| | | AFS000817 | G053 | Minor kit | 1 | 1 year |
| AM04260 | B005, B002, B003, SP09 | | | Strainer, Basket element | | |
| | | CM002284 | 1 | Strainer screen, 200 um | 1 | 1 year |
| | | M002271 | 2 | Strainer screen, 200 um | 1 | 1 year |
| AM00186 | P004, P007, SP14 | | | Switch, Pressure | | |
| | | M021751 | 1 | Pressure switch, 1-10 Bar, 250V | 1 | 2 year |
| AM02756 | V014, V104A, V110A, V005, V006, V018, V019 | | | Valve, non return | | |
| | | M021489 | 1 | Non return valve, DN40 | 1 | 2 year |
| AM02754 | V114 | | | Valve, non return | | |
| | | M021487 | 1 | Non return valve, DN25 | 1 | 2 year |
| AM02757 | V152 | | | Valve, non return | | |
| | | M021490 | 1 | Non return valve, DN50 | 1 | 2 year |

Here is what your customised spare part kit could consist of

# Spare parts

# Electric components

Auramarine provides electric components to replace, repair and modernise existing components across the marine and power industries. The rapid and reliable availability of electric spare parts is becoming increasingly important in ensuring the safe and reliable running of fuel supply systems. Our delivery service ensures customers receive spare parts that are tailored to fit specific fuel supply systems in a short delivery time wherever they are in the world.

Likewise, if a replacement electric component requires updated drawings and documentation, Auramarine will provide support by supplying design details for any new set-up and submitting drawings and documentation as necessary.

We also provide complete control cabinets and starter panels.


Control logic for automatic filter, heater and fuel changeover unit.

Frequency controllers - marine approved

**NOTE:**

If you notice any abnormal automatic filter function, e.g. frequent “filter clogged” -alarms, please contact Auramarine for program update.

Pressure switch

Pressure transmitter

Sensor PT100

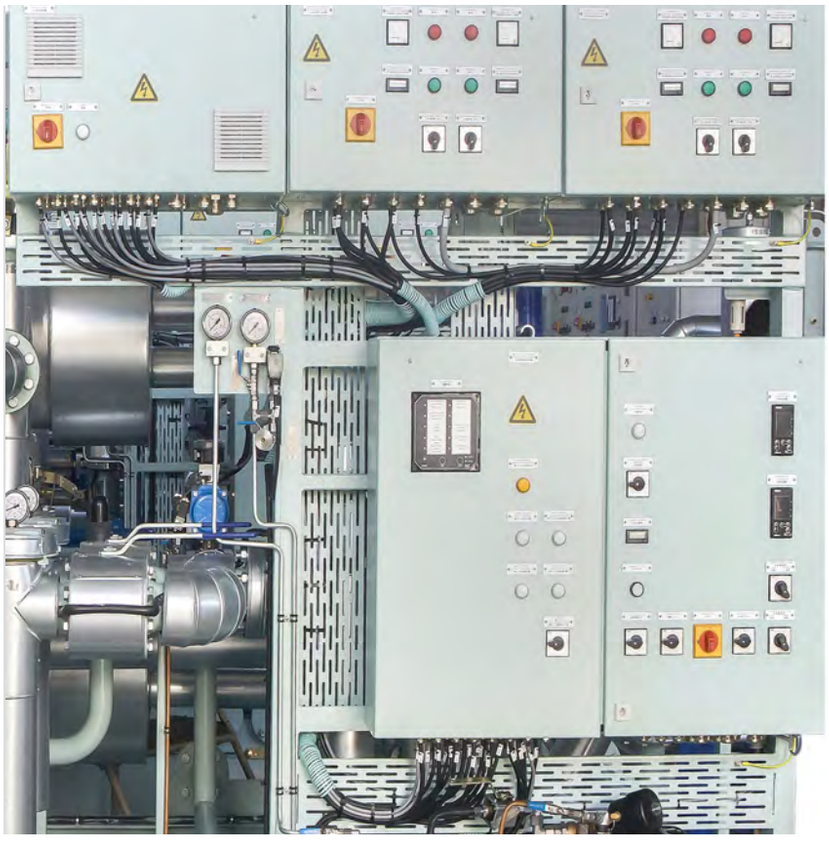
Temperature controller

Time relay

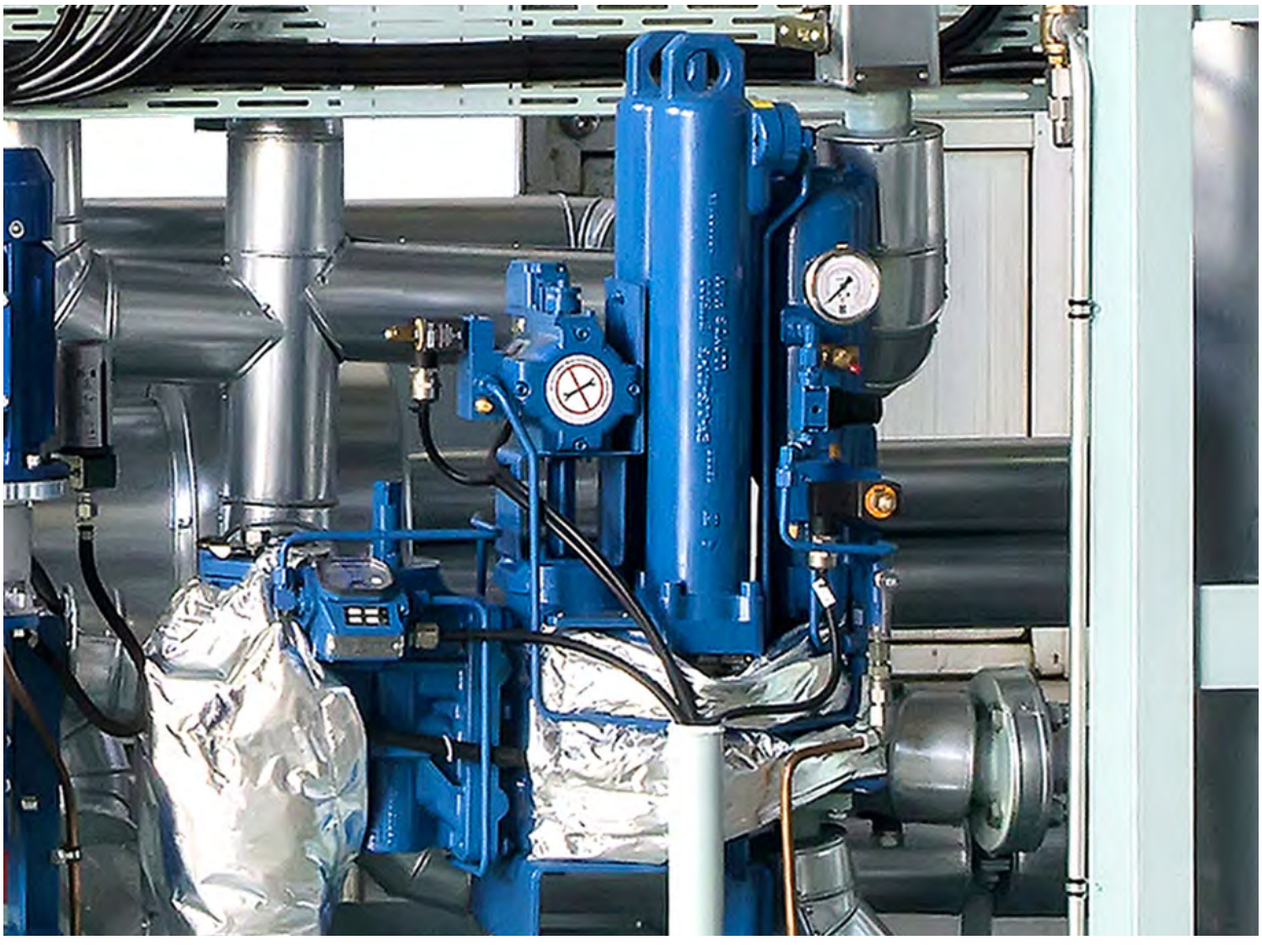
Viscosity controller

**In addition to these components, a wide range of parts are available upon request:**

- Contactors
- Switches
- Signal lamps
- Temperature contactors



# Filters



Filters mitigate the risk of new types of fuels that can cause excessive wear and tear for the engine components. However, different fuels can require a change in filter replacement intervals, which can be shorter than previously required.

Typical filter spare parts comprise of gaskets, O-rings, candle elements and pressure switches.

In addition to filter spare parts, Auramarine can also provide consultation and recommendations for the most effective technical option if a vessel's engines operate with fuels of which the properties differ from what the system was originally designed for.

The suitability of each option depends on the system's current arrangement on board, as well as the engine manufacturer's latest recommendations. We can also provide quality filters and filter spare parts for third-party fuel supply units.

Contact us and find out what we can offer for your equipment.

Air escape aggregate

Candle element

Coil for solenoid valve for
110 VAC or 230 VAC

Connector plug
for solenoid valve

Control disc
for 6.72 filter

Cover
for air escape aggregate

CPU for filter

Filter, available as automatic
or by-pass filter

Filters, filter elements

Filter disc for 6.23 filter

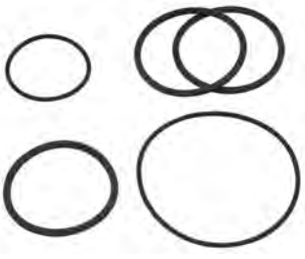
Filter element, by-pass type

Filter element for 6.23 filter

Filter element, by-pass filter

Filter element, by-pass filter

Float for air escape aggregate



Gasket sets, various

Gasket sets, various

Installation frame/drip tray for additional filter

Limit switch, ATEX approved upon request

Limit switch, ATEX approved upon request

Multi-mantle element for duplex filter

Nozzle for air escape valve

Pneumatic actuator

## Filtration upgrades

For filtration upgrades, please see Filtration upgrades for enhanced engine protection on page 32.

Pressure indicator shut-off ball valve, brass AFM0


Pressure differential switch indicator

Safety valve for automatic filter

Solenoid valve

Solenoid valve set for type 6.23

In addition to these components, a wide range of parts is available upon request.

# Flowmeters

Measuring and documenting the consumption of fuels onboard a vessel is becoming increasingly necessary to improve efficiency and minimise fuel costs. Furthermore, compliance with the EU MRV and IMO data collection regulations, requires accurate fuel consumption measuring. Fuel consumption measuring can also provide benefits in relation to the fuel changeover process.

## Mass flow meters

Mass flow meter transmitters are built with an advanced architecture and provide a wide variety of I/O and application flexibilities, making them the top choice for compact integral mounting.

If bunkers are purchased in metric tonnes, it is easier to measure fuel consumption in terms of mass weight. Most marine fuel mass flow meters use a laterally vibrating, curved tube, mass flow meter, which also measures the density of the fluid. Such a design provides excellent accuracy both for low and high fuel flows, which is beneficial especially when multiple fuels are in use. Mass flow meters always provide comparable results between fuels.

- Well-known brands of highly accurate mass volume flow and density measurement for applications that require a compact, drainable design
- Not prone to sticking and also provide density reporting
- Auramarine offers a range of flow meters from trusted brands for various types of needs, e.g. Emerson, Promass Endress Hauser

## Volumetric flow meters

Most volumetric flow meters are comprised of moving parts (either wheels or screws). The volumetric flow meters provide a local reading, pulse signal and/or a mA signal, and they are exceptionally user friendly. The functionality is easy to monitor, which means any faults can be rapidly detected and simple repairs can, in the majority of cases, be carried out on site.

- Positive displacement principal
- Electronic display of total and resettable volume and actual flow rates
- Adjustable analog (mA) and pulse output signals
- Auramarine offers a range of flow meters from trusted brands for various types of needs, e.g. Aquametro and VAF

## How to order?

To ensure that you receive the right type and size of flowmeter, contact us (see page 6) and inform us of one or all of the below specifications:

- Serial number of your fuel supply unit (if Auramarine)
- The type of your current flow meter given on the part
- The item code on the fuel supply unit part list (available on board)
- The required flow rate for the new flowmeter
- Auramarine can help to find the best fit by reviewing your fuel supply system's measuring and reporting capabilities and needs


**Mass flow meter (Emerson).**
Photo courtesy of Emerson


**Mass flow meter (Endress Hauser)**

**Volumetric flow meter: Aquametro, VAF**

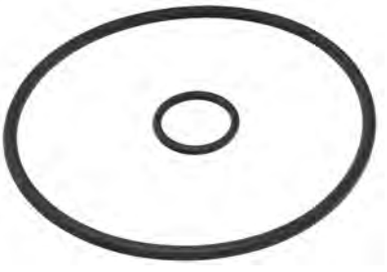
**Volumetric flow meter Aquametro**

# Flow meter spare parts

Accessories,
Spare electronic display

Drivers

Inlet filters



O-ring set, VZO 40

Roller counter

Rotary pistons

In addition to these components, a wide range of parts are available upon request:

- Gaskets
- Internal parts for flowmeters
- Measuring parts
- Spare electronics
- Separating plates

**Flow meter upgrades**

For Flow meter upgrades, see page 35

# Gauges and indicators



## Pressure gauges
## Thermometers

Make sure that you choose a pressure gauge that meets the pressure range requirements of your current or modernised fuel supply unit. Contact Auramarine to find the best suitable parts for your system.

# Heat exchangers

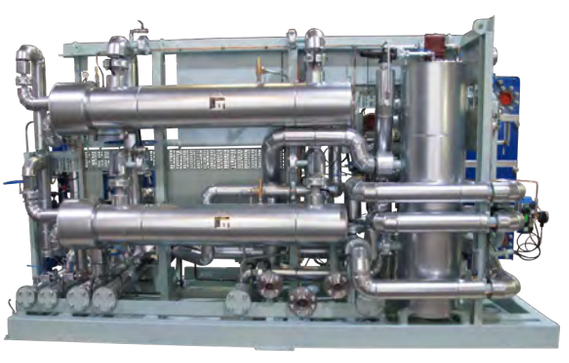
Auramarine heat exchangers are available in shell design and in tube type design with U-tubes. The selection comprises of heat exchangers for steam, thermal oil, hot water or electrical heating. ATEX heaters are also available upon request.

**Plate type heat exchanger (for cooling)**

**In addition to complete heat exchangers, a wide range of parts are available upon request:**

- Gasket sets
- Heating elements (electric)
- Safety thermostats
- Safety valves
- Tube inserts (steam, electric)

To ensure that you receive the right type and size of heat exchanger and other parts, please provide your fuel supply unit serial number. We can also provide quality heat exchangers and spare parts for third-party fuel supply units.



**Tube type heat exchanger, steam heating**

**Tube type heat exchanger, electrical heating**

# Electric motors

Electric motors serve the fuel pumps on Auramarine fuel supply units. The different properties of low sulphur fuels, compared with traditional fuels, means that the low lubricity and low viscosity of low sulphur fuel oil can detrimentally affect the fuel pumping system. Upgrades may be necessary to ensure adequate pumping capacity and lubricity for a vessel's main and auxiliary engines.

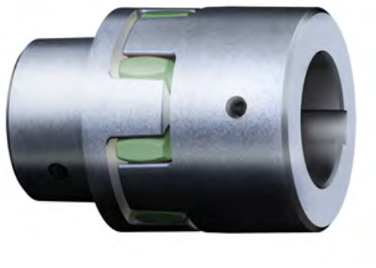
Auramarine provides electric motors from the following brands:

- ABB
- Lönne
- Hoyer
- Kolmeks
- WEG
- others on request

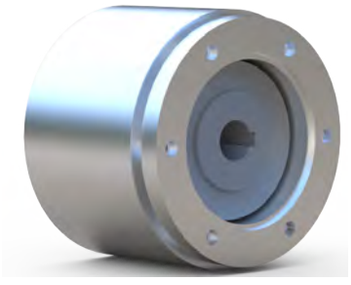
We also provide pneumatically operated motors for emergency pump units.

In addition to motors, spare parts such as bearings and oil seals are also available. To ensure that you receive the right type of spare parts, please provide us with your fuel supply unit serial number. We can also provide quality spare part motors for third-party fuel supply units. Contact us and find out what we can offer for your equipment.

**Fuel pump motor**



**Mechanical coupling for motor**



**Magnetic coupling for motor**

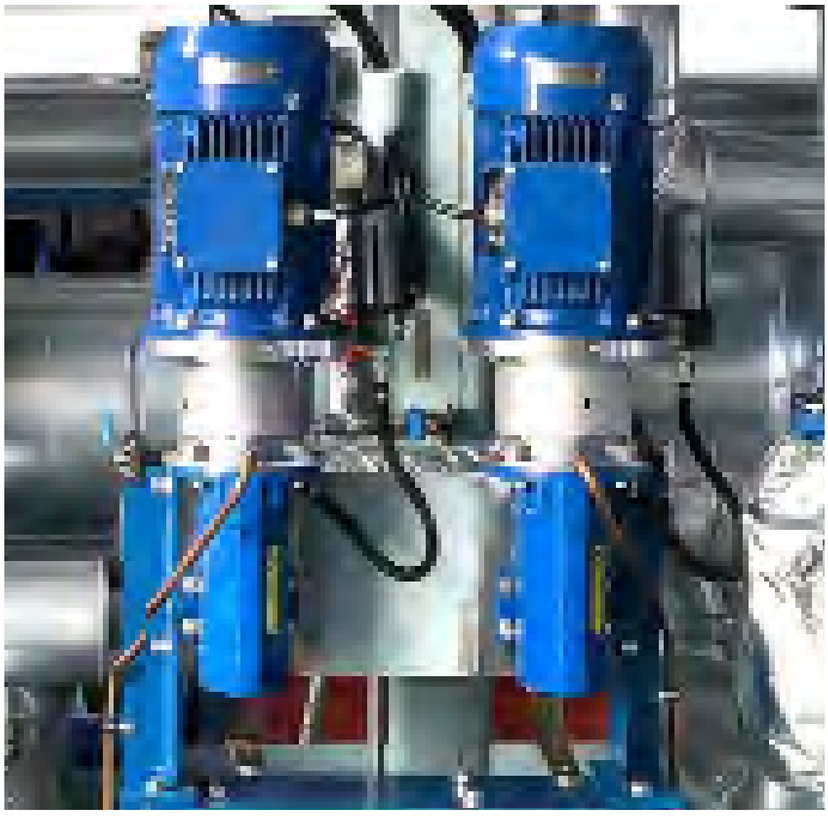
# Pumps and accessories

The following information will help find the right part for your fuel supply systems:

- Auramarine product code from item list
- Product information from name plate or serial number of the fuel supply unit
- Flow rate

The most frequently required wear parts for pumps are mechanical shaft seals, gaskets and ball bearings (also available as ready “Minor kits”).

We can also provide quality pump spare parts for third-party fuel supply units. Contact us and find out what we can offer for your equipment.



**IMPORTANT:**

There are specific spare parts for each pump type. Always contact Auramarine for your right part.

## Pump upgrades

When new fuels are introduced to the fuel system, pump upgrades may be necessary to ensure adequate pumping capacity and lubricity for main and auxiliary engines. A professional pump compatibility check is recommended before taking into use any new type of fuel. Also additional cooling arrangements may be necessary. See page 34.

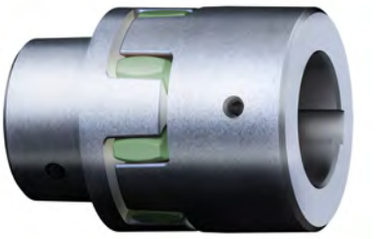
Screw type pump

Screw type pump

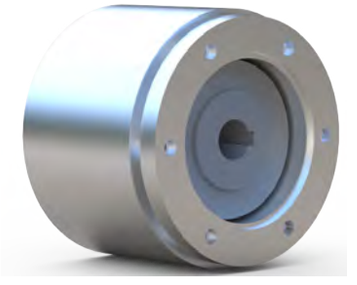
Screw type pump (High-pressure MGO solution)

Centrifugal pumps and adapters

Balancing bush



Coupling, mechanical



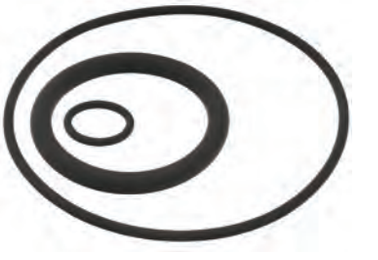
Coupling, magnetic

Distance sleeves

Distance washer

Joint spare part kits

Minor kits including gaskets, shaft seal and ball bearing



O-rings

Plug for deaeration

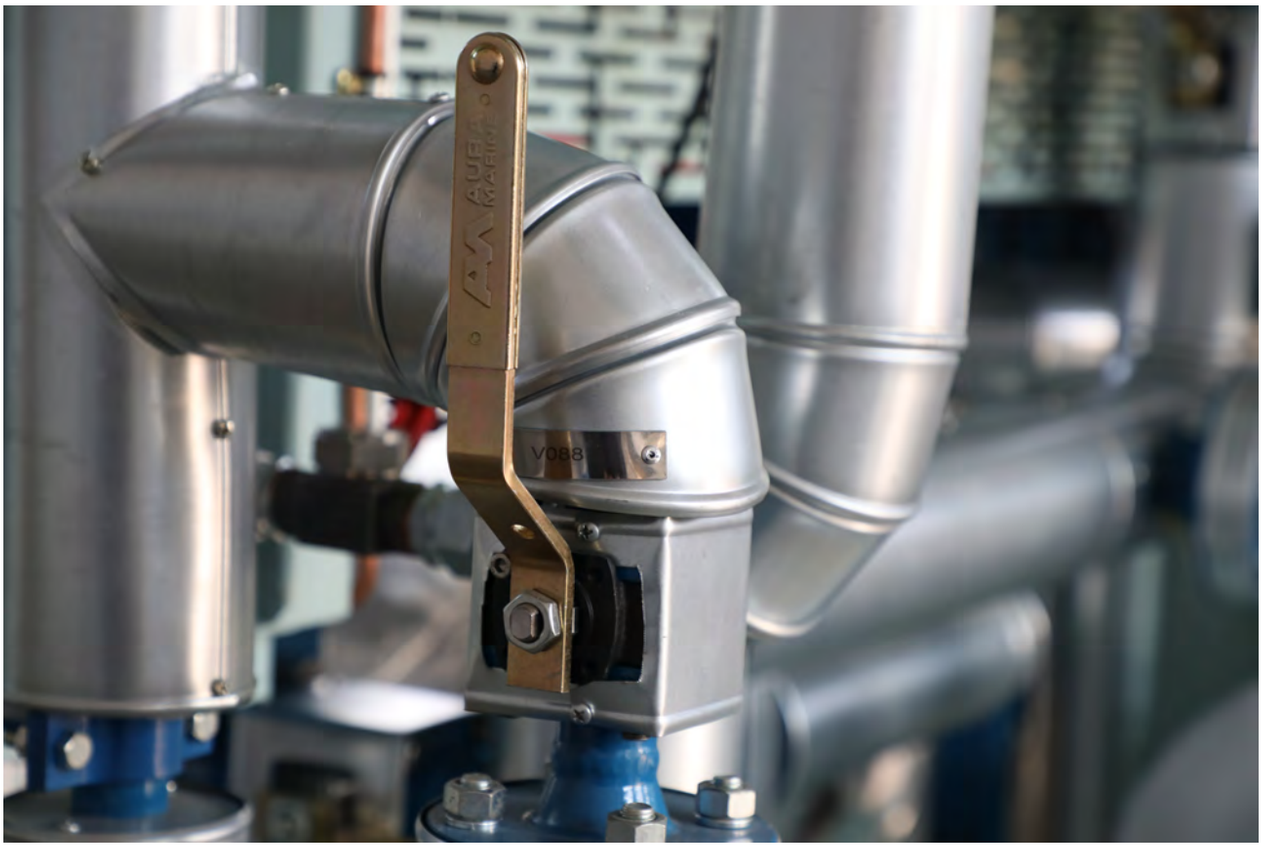
Secondary seals, various

Rotor set

Shaft seal spare part kit

Spare part kit valve element

# Valves




Auramarine's spare valves and valve parts are carefully selected to meet the specific requirements of a fuel supply system in both the marine and power industries.

It is critical that our customers understand how different fuels behave when a new fuel is introduced to a system, and how this can impact valve performance; more specifically the heating, media and control.

Our team can provide technical support to ensure you select the right parts for your fuel supply system. In addition to the system parts, our experts are ready to support you with technical consultation and design, as well as drawing updates if system modernisations or modifications are required.

**IMPORTANT:**

There are specific spare parts for each valve type. Always contact Auramarine for your right part. Please inform us the fuel supply unit serial number and valve type.

2-way valve

3-way valve

3-way valve

Temperature control system (various capillaries lengths available)

Control valve

Limit switch

Self-acting temperature controls with 2-port valves

Shut-off valve

Solenoid valve

Spare part repair kits, a wide selection with instructions

# Viscometers

The constant monitoring of fuel viscosity at an engine inlet is critical in ensuring continuous engine operation. With a wide range of new fuels being introduced to the market, it is increasingly vital that fuel supply system components meet the requirements set by the chosen fuel(s).

In addition to simply replacing a damaged viscometer, Auramarine can also assess whether upgrading a viscometer to the next generation will provide superior performance and additional value.

This is worth considering especially if the previous viscometer's measuring range and viscosity limits are not adequate for new fuel types.

Auramarine provides spare viscometers for the marine and power industries from trusted manufacturers VAF and Emerson. The Emerson type viscometer comes as a full unit, while the VAF viscometer can either be purchased as a full unit, or with the sensor pendulum and the O-rings as separate items.

**Viscometer, VAF**

**Viscometer, Emerson**

**Adapter kits**

(includes Viscometer and adapter). Extended version of Adapter kit is available upon request. This is built case by case. Typical parts are e.g. steam control valve, PID controller and other accessories.

**Flow tube**

**Housing, spare**

**Sensor pendulum**

**Viscosity controller**

# Modernisation services based on your needs

# Component upgrades with consultation services

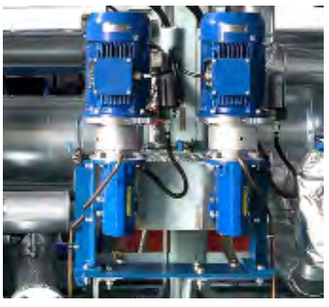
With an increasingly changing fuel landscape leading to many new fuels with different properties, investing in an expert review and advisory service is vital when selecting fuel system components to ensure that the components meet the viscosity, temperature and other properties of the fuel(s) requirements.

Auramarine's expert engineers can review a vessel's existing fuel supply system design to assess which solutions would best serve the vessel in the future. For example, a mechanical pump coupling can be changed to a magnetic coupling to eliminate pump leakage, for which the existing pump can be prone to if it is designed for a different viscosity.

Viscometers can be upgraded to a new model, or a damaged viscometer can be replaced with a modern one. Old viscometers, which were suitable for measuring the viscosity ranges they were previously designed for are no longer adequate with the introduction of new fuels altering the measuring range and viscosity limits. Therefore, the current viscometers may not be appropriate and effective for measuring such ranges.

Furthermore, spare parts availability is greater for modern viscometers, which consist of less moving parts. With modern viscometers, the system can be digitalised (no more pneumatic systems). Typical viscometer accessories are housings for retrofit purposes, steam control valves (when necessary) and components for electrical modifications.

Fuel filter upgrades also benefit from a technical consultation, which takes into consideration the effects of issues such as CAT fines. Alongside the installation of additional filtration capacity, you can also benefit from our plug and play filter installation. The installation comprises of a frame with a control cabinet installed  and also acts as a drip tray to easily fulfill the safety requirements for secondary containment system under parts of the fuel supply system.



# Engineering and technical consultation

Holistic approach, process design, dimensioning

## Engineering preview

When modifications and technical interventions are made to existing fuel systems, an expert engineering preview needs to be conducted. Auramarine's expert engineers can review a ship's existing fuel supply system design and assess the most effective and efficient solution to best serve the vessel in the future.

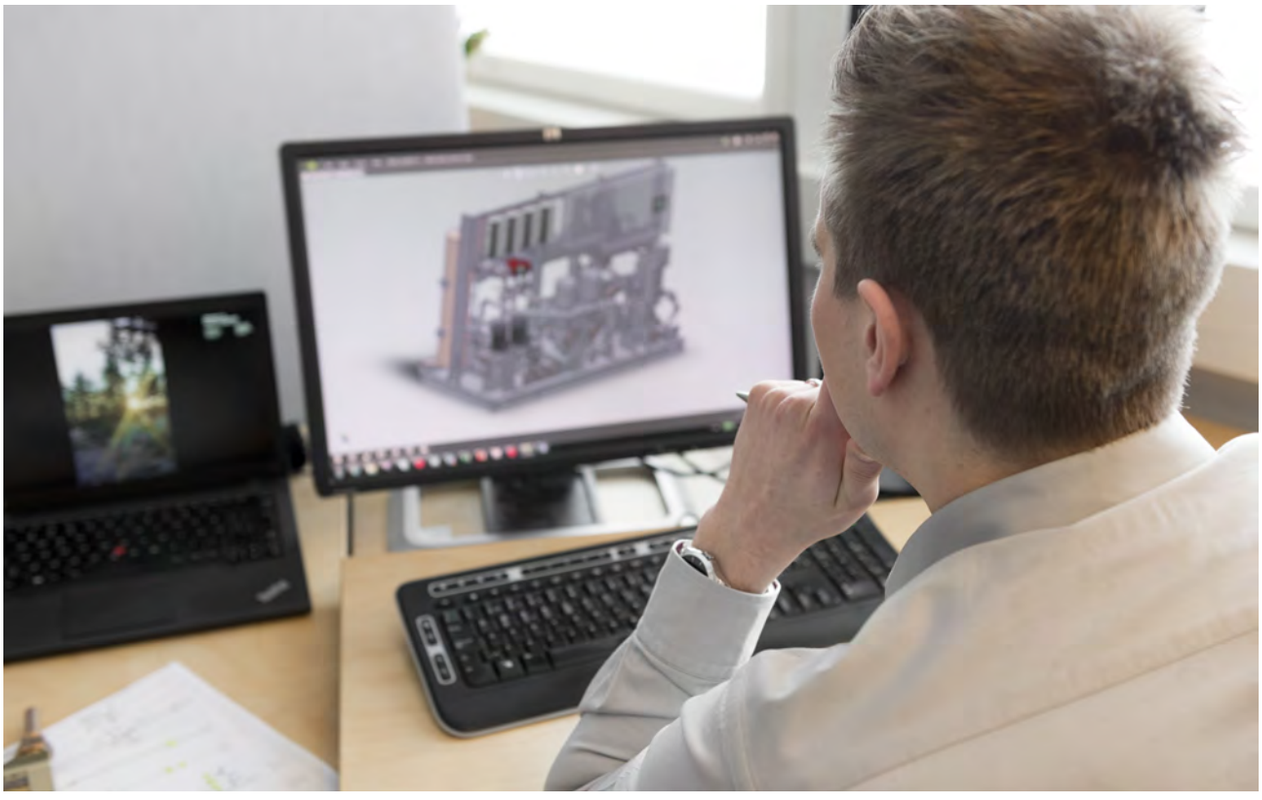
## Design and parts lists

Auramarine has a knowledgeable and experienced in-house engineering team, who specialise in fuel supply system processes and have significant experience in developing engineering modifications. We deliver the design details for any new set-up and submit the drawings and parts list for production and component deliveries.

## Technical consultation and documentation for class approvals

We can also provide technical consultation and submit updated drawings, and documentation, ready for class approval.

Auramarine can help with your process design, component dimensioning of filters and components, and other fuel system related change requirements. We take a holistic approach and have an in-depth understanding of how various parts of the fuel supply system interact.



# System conversions and modernisation

We offer a comprehensive technical review of your vessel, or fleet's, fuel supply systems to determine the best possible adaptation of existing on-board fuel supply systems to handle new fuels. We can also provide technical meetings with our product specialists as part of this service. Once the necessary steps have been identified, project and component schedules are matched with upcoming ship or fleet maintenance schedules.

- A project may involve initial service engineer visits, installation supervision and/or start-up and commissioning.
- Early contact is advised especially from a component delivery point of view.

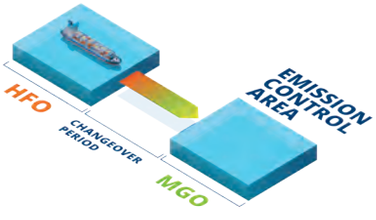
Auramarine can also update technical drawings for class approval.

Both individual ships and especially a series of ships benefit from Auramarine's fuel supply system conversions and modernisation upgrades.

- MGO booster design and installation
- Additional cooling capacity; coolers and/or chillers that are needed to keep fuel viscosity above 2 cSt
- Engine room -specific modernisations and damage repairs for fuel supply systems. Such projects may also involve fuel supply system alterations or capacity increase. In case of emergency repairs, we always take into account their urgency and can respond with short delivery times to minimise any downtime.
- FuelSafe automated changeover system design and installation
- Additional fuel heating capacity for various needs and configurations
- Heating media control valves updates to reach capacity and adjustability for various viscosity areas. For such updates it is important to understand how different fuels behave and how that impacts heating media control valve performance.

MGO unit

Cooling and chilling units




Fuel changeover system

Control optimisation

Engine room specific modernisations

# Electrical components and control optimisation for improved system performance

## Replacing electrical components

In relation to the replacement of electrical components, typical cases include broken components, a system design change or the replacement of obsolete or outdated components or systems. The reasons for such replacements can be functional, operational, or stem from the need to add control automation in order to make the work easier for personnel onboard.

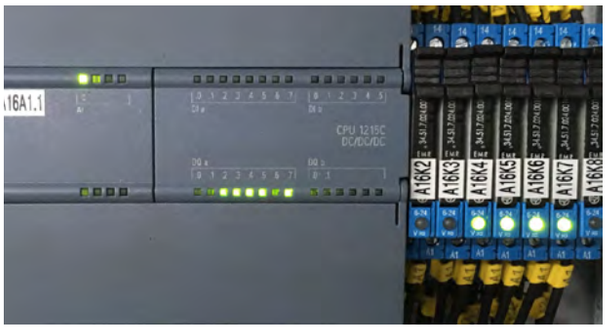
This can involve additional control panels or control cabinets.

The replacement of electric components often calls for updated drawings and documentation. Auramarine can support with the design details for any new set-up and submit the drawings and documentation as necessary.

## Fuel heating and cooling

In order for fuel systems to remain fully functional and adaptable to different fuel types and qualities, control optimisation for existing heaters and coolers can be required to improve system functionality and flexibility.

For example, the coolers originally installed on-board a vessel, may not be able to run effectively on new fuels. Optimisation ensures that the cooling/heating process runs faultlessly and is adaptable to all new fuel system upgrades. This is especially important with new fuel blends, where uncertain or unclear properties are being introduced to a vessel's fuel supply system.




Auramarine offers a review of your existing heater and cooler systems from an engineering and system process perspective, and can recommend the necessary improvements, and if needed, carry out essential modifications. With a wide variety of heating and cooling arrangements on-board vessels, our control optimisation systems are tailored to fit each specific existing system to enable optimum performance.

Depending on the scope of the technical solution, upgrades are typically made during docking.

## Early detection of system failures

Control optimisation can also enhance trouble-shooting capabilities. For example, properly optimised systems can detect system failures or deficiencies at an early stage, preventing malfunctions, or instabilities, in fuel supply.

Optional features include viscosity and temperature control with signals to ECR.and fuel consumption signaling (mA or pulse).

# Filtration upgrades for enhanced engine protection

Filters mitigate the risk of new types of fuels causing excessive wear and tear to engine components. However, different fuels can require a change in filter replacement intervals; for example, sometimes these can be shorter than previously required.

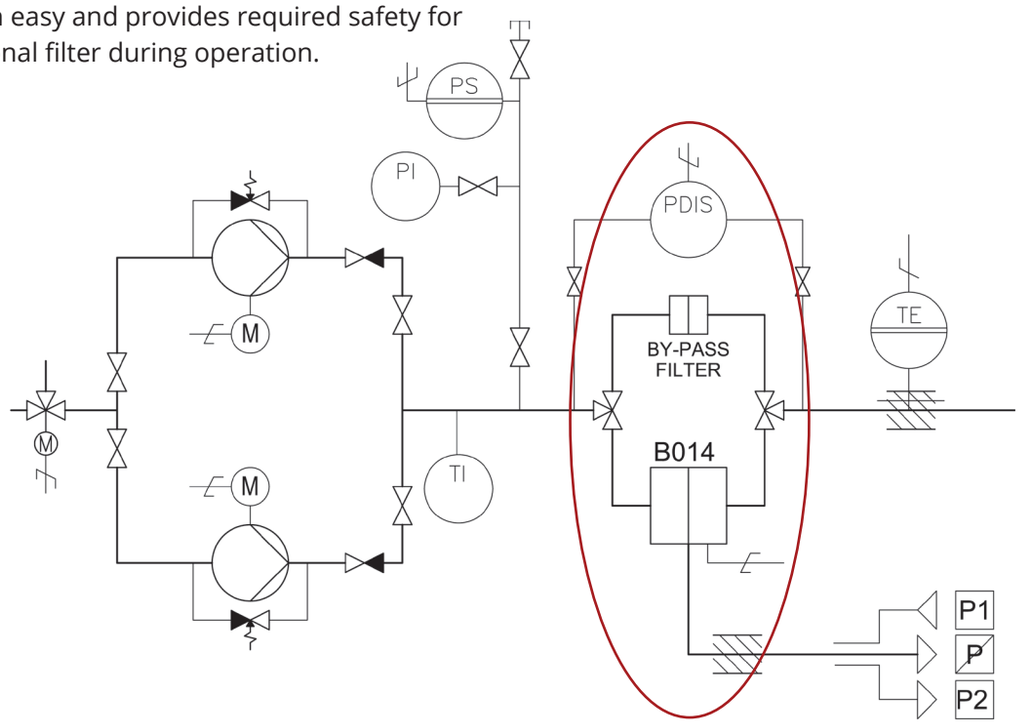
Auramarine's filtration upgrades ensure that, with the right filters in place, vessels have better control over replacement schedules whilst following the latest engine manufacturer guidelines.

Fuel handling systems such as HFO and MDO feeder/booster units are usually equipped with auto-back-flushing filters, located typically after the feeder pump (also known as a supply pump).

To provide adequate engine protection, we recommend replacing existing filters with fine filters. Another possibility is to add a second (fine) filter in front of the engine. For a second separate filter we recommend our combined drip tray and installation frame which makes the installation easy and provides required safety for the additional filter during operation.

## Suggested steps:

- an analysis of your current system's ability to cope with engine manufacturer's requirements
- suggestions for the best possible technical options to prevent potential damage from cat fines. In certain cases, the existing system has restrictions that call for a re-evaluation of the whole fuel handling process due to space constraints or control system issues
- modification design, including upgraded specifications (with filters starting from six microns)
- quality components
- support in incorporating modified items



Fuel filter


CPU for fuel filter

Installation frame/drip tray for additional filter

Filter elements

## Catalytic fines

HFO and LSFO are residual fuels, and a considerable amount of catalytic fines - also known as cat fines - can remain in the fuels due to their production process. Cat fines are very small particles that are a product of the refining process known as catalytic cracking. They have been found to cause severe abrasive wear in engine components if not removed by a fuel treatment system. For this purpose, main and auxiliary engine manufacturers have already recommended a maximum acceptable level of cat fines. Please refer to the latest service letters of engine manufacturers and ISO 8217 marine fuel standard for further information.
To provide proper engine protection, we recommend exploring whether the current system arrangement allows the replacement of existing filters with fine filters. Another possibility is to add a second (fine) filter in front of the engine. The choice depends on the current system arrangement on-board. Fine filters are available starting from 6 micron.

# Importance of fuel pump compatibility with new fuels

Traditionally, on-board fuel handling systems compromise of pumps designed for HFO/MDO use.
The current IMO 2020 global sulphur cap regulation requires vessels to use low-sulphur fuels unless they are using an exhaust gas cleaning system (scrubber), in which case heavy fuel oil can be burned. These compliant low sulphur fuels will have a sulphur content between 0.5% and 0.1%, however, they carry the risk of causing a reduction in pumping capacity because of their different viscosities.

The very different properties of these fuel types call for a professional pump compatibility check before any new type of fuel can be successfully introduced into the system.

Upgrades may be necessary to ensure pumping capacity and lubricity for a vessel's main and auxiliary engines. Auramarine's expert service engineers can carry out the fuel pump compatibility check for you. If an upgrade is needed based on the inspection outcome, Auramarine will deliver the correct parts, carry out the assembly and test the pump function and performance.

## What should be checked?

For screw pumps, correct clearances and dimension measurements are important for maintaining the required pumping capacity. Pumps should be inspected for signs of wear and tear, including checking the condition of the gaskets. Screw dimensions should also be investigated to ensure lubricity compatibility in relation to the new fuels.

Practical steps include an investigation of the pump's properties to ensure it meets the requirements set by the new fuels. If the documentation is not available, a picture of the pump name plate can often provide Auramarine with sufficient information.

- **clearances**
- **gaskets**
- **wear and tear**
- **dimensions**
- **lubricity compatibility**
- **documentation**

## Steps to maintain correct pumping capacity

If a vessel's fuel pumps need to be replaced, Auramarine can support by defining the specification of a new pump and delivering pumps that are compatible with new fuels and the correct size in terms of dimensions and capacity.  Auramarine can also provide a completely updated fuel system piping and instrumentation diagram for classification purposes. Throughout all modification processes, cost-efficiency and system flexibility are key considerations.

Mechanical pumps can be delivered with magnetic coupling as an option, which helps to eliminate possible shaft seal leakages.

Pump replacements can usually be carried out during a longer port stay; an Auramarine delivery will include all the elements necessary for the implementation process to run smoothly. A typical delivery compromises the pump and all relevant instructions and technical support. Pump replacements may require minor changes to a vessel's original pipework.

If the vessel has a fuel changeover system, an emergency pump to act as a black-start pump unit is worth considering for added redundancy.

# Flow meter upgrades and retrofits

Auramarine can provide support when improving fuel consumption measuring and reporting. More specifically, in the case that existing flow meters are becoming outdated and new flow meters are being considered to enable real-time measurements on-board with higher degrees of accuracy.

For example, compliance with the EU MRV and IMO data collection regulations requires accurate fuel consumption measuring. Fuel consumption measuring can also provide benefits in relation to the fuel changeover process.

## Upgrade options

**Replacement of volumetric with mass flow meters**

In order to replace a volumetric flow meter with a mass flow meter, typically some piping modifications are required as the size of the mass flow meter is usually larger. In addition, a degree of integration is needed into the fuel handling system for effective operation.

**Upgrade of existing volumetric flow meters**

Another possibility is to combine the measured density information with the volumetric information. In certain cases, this can be more cost-effective and the indications are that it is as accurate as mass flow meters under normal operating conditions. It is also suitable for low or high flows. The upgrade also requires certain re-cabling, engineering updates and integration within the fuel handling system to ensure effective operation.

**Separate flow meters for each fuel type in use**

Install separate flow meters for each fuel type in use.

Contact us to find the best fit for your ship or fleet, and review your fuel supply system's current measuring and reporting capabilities. Based on the review, we will recommend specific improvements to reach compliance with current regulation and to best support your ship's optimised fuel profile.

# Modernisation Case Examples

## Additional MGO boosters/ feeders

### Auxiliary engines

If a vessel - or any of its engines - fully transfers to using MGO, the fuel conditioning process is very different from when using HFO.  An easy solution to facilitating a smooth transition lies in the installation of an additional MGO unit. The installation enables the functional change of any of the ship's engines to run on MGO and ensures that the fuel properties fulfil the engine manufacturer's requirements at the engine inlet. The same goes for cases where an additional, new auxiliary engine dedicated to MGO operation is installed.

A typical case is when one fuel supply unit has traditionally been supplying fuel to both main and auxiliary engines. However, in a situation where the vessel is in port and running solely on its auxiliary engine (MGO), the main engine does not consume fuel, as the auxiliary engine can provide the power needed during the port stay. A separate MGO unit for the auxiliary engine is therefore of great value as it simplifies the preparations for port calls saving both time, money and emissions.

### Onboard power

Additional MGO units are also beneficial for diesel engines when generator engine capacity is increased to enable sufficient electric capacity and power for any increased onboard electricity consumption. This is especially prevalent on cruise vessels where diesel electric propulsion is more commonly used. Typical cases include;

additional reefer container capacity and cargo hold ventilation, the need of which often increases simultaneously with the reefer capacity, or power required for crane operations. The vessel's generator working loads vary during different operations, so additional MGO units providing more generator capacity can help to meet all the alternative requirements.

## HFO

Additionally, if a vessel operates on HFO and uses an exhaust gas cleaning system at sea, an additional MGO unit will enable the vessel to sustain the power needed in port with its genset while shutting down the HFO and exhaust gas cleaning system.

Similarly, vessels with exhaust gas cleaning systems can also benefit from additional MGO units if the scrubber capacity is not enough for all the generator engines. For example, a proportion of the engines could be run with MGO /LSFO ensuring the vessel's compliance at all times. They can also be useful during scrubber maintenance breaks, providing constant power generation whilst ensuring compliance with all regulations.

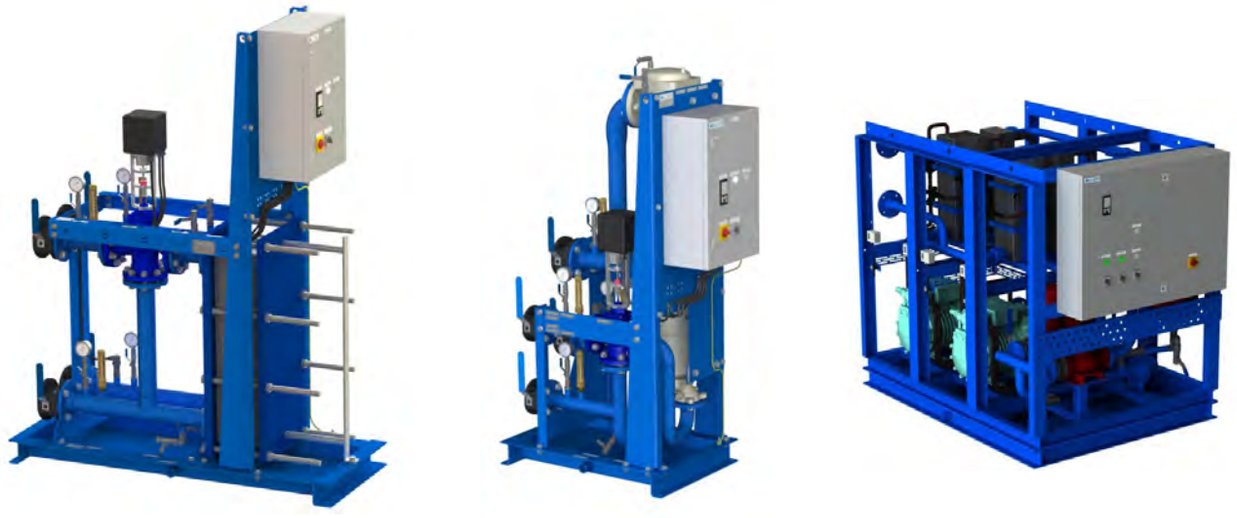
An existing unit running with HFO can also be modified by adding a cooler in order to maintain the fuel condition of MGO, i.e. cooling the fuel instead of heating it; the most cost-efficient solution dependent on the vessel engine, fuel supply system specifications and operating profile.

In summary, additional MGO units provide more flexibility and enable a vessel to always produce the power and propulsion required with alternative fuels.

## How Auramarine can help

If you're considering the installation of additional MGO units, contact our global team of experts for a technical review of your system, needs analysis and a solution that's right for the specific demands of your fleet. Once the best solution is defined for you, Auramarine will update the technical documentation and arrange the approvals and documentation for classification. We can also provide project management support and commissioning if required, as well as providing ongoing support with our lifecycle services and spare parts services.  By working with our team, we'll ensure a thorough and expert analysis of your vessels' fuel supply systems.  And by recommending additional MGO capabilities, we will work to save you time and money, drive efficiencies into your operations and make sure that you always stay compliant.

# Additional cooling capacity



Auramarine  cooling and chilling units

## Introducing new fuels

In cases where the fuel supply system has originally been designed to solely handle HFO, there is typically no fuel cooling system installed.  This is because the fuel properties of HFO do not require it to be cooled down in order to meet the engine manufacturer's temperature and viscosity requirements at the engine inlet.  However, when low-sulphur fuels are introduced to the fuel system - which contain significantly different properties to HFO - issues can occur when ensuring the correct fuel temperature and viscosity at engine inlet. This can lead to costly fuel system damage and potential down time.

## Fuel viscosity

The key to effectively managing fuel viscosity is by controlling its temperature.  The correct fuel viscosity and temperature are crucial in ensuring engine and fuel system health. For example, low viscosity can cause engine problems; the guidelines provided by engine manufacturers must be followed to ensure the correct viscosity. When transitioning from HFO to LSFO, or MGO, it is important to know that the cooling capacity requirements will need to increase; additional cooling units are therefore required to ensure the correct viscosity at the engine inlet.

Similarly, increased cooling capacity can also be required when a vessel is trading in different climates around the world as the existing coolers may not have enough capacity to maintain the required fuel temperature in, for example, tropical conditions.

One solution is to install an additional auxiliary cooling or chilling unit. Auramarine chiller(s) provide more cooling capacity and enable the right fuel temperature and viscosity within the limits specified by the engine manufacturer.

## How Auramarine can help

Firstly, you need to contact the Auramarine Lifecycle Services/Modernisation team.

We will then conduct a thorough technical review of your fuel supply system, to define a needs analysis and propose the right cooling capacity solutions while taking into consideration the engine room dynamic, the fuel supply system set up, as well as each vessel's operational requirements. We will then provide a proposed solution for review. On approval, we will update the drawings and documentation and can also provide the classification materials and project management support as agreed case by case. If the cooler/chiller is added to an existing Auramarine booster, we will update the PI-diagram accordingly.

In the case of a third-party fuel system containing loose components, Auramarine can also help by supplying suitable components (coolers, chillers, automatic filters). After the delivery of the equipment to the preferred location we can then provide commissioning and installation supervision if required. The installation can also be arranged by the ship owner's preferred partner or by shipyard. The installation of an additional cooler or chiller will require changes to fuel system (fuel and cooling water piping, electrics changes) which will also need to be taken into consideration when planning the task. On completion of the installation, our team will continue to provide ongoing support with our lifecycle services and spare parts services.

# Additional cooling arrangement for feeder pump circulation

During a port stay, or in a low-load situation, pressure from the feeder circulation ensures that there is sufficient pressure and readiness for engine startup in the booster circulation. With practically no fuel consumption or low fuel demand, the fuel temperature in the feeder circulation is prone to rise.

When running on fuel oil, a temperature increase in the feeder circulation is not typically an issue, however when using MGO it is critical to maintain a low enough temperature to avoid pump problems. If the fuel temperature rises, the fuel viscosity will drop, which can cause subsequent pressure losses and reduce the fuel's effectiveness as a lubricant. This in turn can lead to a range of fuel system malfunctions including that of fuel pumps and machinery with moving parts in the fuel circulation system.
As vessels are unique in their systems and chosen propulsion methods, individually tailored solutions are required. The risk of pump issues can be mitigated with additional cooling arrangements or with the introduction

When using MGO, temperature rise in feeder circulation during port stay may cause fuel pressure losses if not addressed by cooling or fuel pump optimisation

of variable frequency drives (VFD), whilst the maintenance of the correct booster circulation pressure and readiness for problem-free engine start-up, can ensure all potential issues are reduced.

For example, if the fuel pump circulation is operated through a conventional starter system, with the pump operating continuously, an additional cooling arrangement for the feeder pump circulation will maintain the correct MGO temperature. In such cases, changes to the fuel system piping (including fuel, cooling water and electrics) are needed.

Another alternative is to add frequency converters to optimise the fuel pump rpm. In low load situations, and low fuel demand, the variable frequency drive will lower the pump rpm to an optimised level where heating and pressure issues do not occur. If this alternative is chosen, changes to electrics and related documentation are required.

## How Auramarine can help

Once we get your enquiry, our team of experts will conduct a technical review of your system, provide a needs analysis and a proposed solution. The drawings and other documentation are updated accordingly, and approvals (also for classification) can be arranged on an agreed case by case basis. Project management support is also available as required. The installation can be carried out by the vessel owner's chosen installation partner or by a shipyard. After the delivery of equipment, we can provide commissioning and installation supervision, and provide ongoing support with our lifecycle services and spare parts services.

# Auramarine general spare part sales terms and conditions

Find our Spare Part Sales Terms and Conditions on our website: Auramarine / Lifecycle services / Auramarine Original Spare Parts

**Auramarine is your trusted fuel systems expert for marine and power industry. Our proud heritage stems from the founding of the company in Finland in the early 1970's. Since then we have delivered over 15 000 robust and reliable auxiliary systems to our customers all over the world, continuously aiming for superior service and customer value.**

## WE ARE THE PIONEERS IN FUEL SYSTEMS.

(ID 691763)


**AURAMARINE LTD**

**P.O. Box 84 FI-20101 Turku FINLAND**
**+358 20 486 5030**

**after.sales@auramarine.com**
**sales@auramarine.com**
**www.auramarine.om**


AURA MARINE

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001