# Ensure reliable engine performance

## Keep high quality equipment onboard from the start!

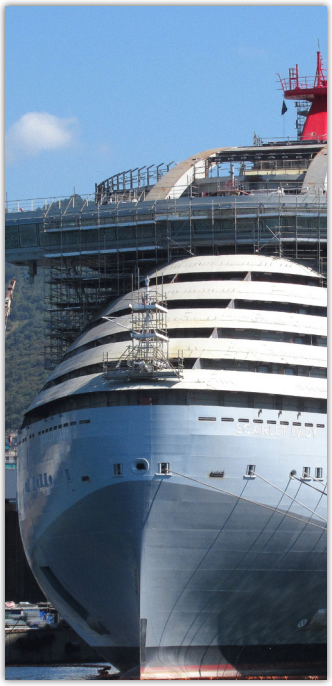
➠ Newbuildings

Innovative engineering since 1962

CHRIS-MARINE®

# Chris-Marine's offering to ship owners and managers

Chris-Marine® offers ship owners and managers complete overhaul and maintenance solutions for the main and auxiliary diesel and gas-engines onboard their vessels, thereby enabling them to secure continuous engine operation by using one single global supplier. We are continuously developing new products, solutions and services to support ship owners and their crew keeping the engines of their vessels running smoothly and without costly break-downs.



- We design, develop, manufacture and market our equipment under three strong brands: Chris-Marine®, Obel-P® and LEMAG®.
- We offer six product portfolios to our customers: Monitoring, Cleaning, Grinding & Machining, Fuel System Maintenance, Power Packs, Accessories & Consumables.
- In addition, we provide Mobile Workshop Solutions as well as Machine Rental, Training, Service & Aftersales.

Our customers are mainly engine builders, ship owners, shipyards and workshops. Our mission is to provide them with state-of-the-art engine care solutions to optimize the running of their engines cost-efficiently and with minimum environmental impact.

## Service, training, repair and rental

In addition to providing a wide range of machines and tools to our customers we offer numerous services and support.

- Onboard and workshop service support as well as rental machines.
- Machine inspection, refurbishment, calibration, and maintenance.
- Training (onboard or at one of our facilities).

## Super user help whenever you need it

Chris-Marine's Service & Aftersales teams are made up of highly knowledgeable and professional individuals whose mission is to keep your engines running safely, efficiently and sustainably around the clock and across the globe.

## Our promise to our customers

**Quality**
We ensure end-results that fulfill the most recent process quality criteria.

**Time**
We make your business more efficient and competitive by using state-of-the-art know-how.

**Documentation**
We deliver first-class documentation at the end of a job.

MAKERS LIST

**Quality equipment onboard prevents unnecessary downtime!**

When the manufacturers of engine care products are not clearly specified in the approved makers list, shipyards supply the cheapest domestically manufactured equipment available. This not only compromises reliability and accuracy, but also makes the process of finding suitable spare parts more difficult. Early equipment malfunction results in prolonged down-time, delayed/less efficient external maintenance visits, shortened lifetime of engine components, and potentially damage to other vital parts of the engine.

CHRIS-MARINE®

Innovative engineering since 1962

# Monitoring



To ensure reliable engine performance and determine the optimum time for overhaul, regular monitoring of diesel and gas engines is necessary. Monitoring helps to determine when it is time for maintenance and what type of maintenance needs to be done. Chris-Marine's portfolio of monitoring equipment can help you save costs by identifying potential problems before they occur.

LEMAG®
## LDM

### Liner Diameter Measurement

Instrument for measuring liner diameter without removal of cylinder head or valve housing.

- For 2-stroke liners 500–980 mm bore
- Accurate measurement of cylinder wear and clover leafing without removing the cylinder cover
- Ideal when preparing for docking, for condition-based liner maintenance or continual liner wear monitoring
- Up to 26 measurement levels in about one hour per cylinder
- Easy-to-use onboard version without need for calibration
- Workshop version including rugged casing, traditional micrometer kit and calibration rig
- User-friendly hand-held tablet with remote technical support and software upgrades

LEMAG®
## LCC

### Liner Condition Camera

Scans / documents the condition of cylinder liner surface, exhaust valve, piston rings and piston crown.

- Liner time scale: ~100 Rh
- Measurement time: ~15 min/liner

CHRIS-MARINE®
## CTM

### Coating Thickness Measurement

High precision coating thickness measurement on magnetic and non-magnetic base materials.

- Easy-to-use condition-based maintenance and wear monitoring of piston rings in 2-stroke engines
- Measures non-magnetic coatings on magnetic or non-magnetic base materials
- Automatically detects whether the base material is magnetic or non-magnetic
- Compatible with LDM, trend-plotting software included
- Reliable and non-destructive measurements

CHRIS-MARINE®
## REPLICA TEST

### Replica Test Kit

Detects cat fines, clogged graphites, micro cracks and other microscopic details on cylinder liners.

- No need to remove cylinder cover prior to replicating ranges
- Reusable dispensing gun for silicon rubber
- The silicon rubber is hardened after only five minutes on the cylinder liner wall
- Analysis performed by Chris-Marine

CCM

### Combustion Chamber Monitoring Service

Chris-Marine offers an extensive combustion chamber monitoring service (CCM), performed by highly skilled engineers. The service involves vital data collection, root cause analysis and recommendations regarding preventive measures that need to be taken to avoid costly combustion chamber damage. A typical inspection can look like this with regard to data collection:

- Liner measurements made with LDM
- Coating thickness measurements of piston rings made with CTM
- Ring pack photos taken with a liner condition camera LCC
- 360° photos of the complete liner length including exhaust valve taken with LCC
- Replica sampling including microscopic analysis

The data collected is analyzed by Chris-Marine's CCM experts and compiled in an extensive written report. The report is also presented during an online meeting and includes recommendations regarding preventive maintenance.

LEMAG®
## SPEAT

### Shaft Power Efficiency Analyzing Tool
A time-saving tool for checking crankshaft deflection.

- Measures, records and monitors performance and navigational data
- Constant KPI visualisation to inform about energy efficiency
- Helps to reduce fuel consumption and emissions
- Data download and transfer function
- Supports ISO 19030-2 ships and marine technology
  - measurement of changes in hull and propeller performance readings

LEMAG®
## SHAFTPOWER


### Permanent Shaft Power Measuring System
Monitors vessel efficiency in relation to design propeller curve, allowing for cost-efficient maintenance of hull and propeller.

- Helps to improve efficiency
- Protects from overload and breakdown
- Optimises fuel consumption
- Controls the effect of energy saving devices
- Robust and maintenance free design

LEMAG®
## ECI

### Electronic Cylinder Pressure Indicator
Improves engine uptime and lowers operating costs by allowing technicians to balance, fine tune and monitor main and auxiliary engines.

- Enables fine tuning of engine performance
- Lowers operating costs
- Designed to withstand harsh conditions
- Takes continuous engine readings
- Detects problems before downtime occurs
- Safe, innovative and precise crank angle sensor

LEMAG®
## DI5 & DI5C

### Electronic Crankshaft Deflection Indicator
A time-saving tool for checking crankshaft deflection.

- No need to enter crank case to record readings
- Large measuring range
- Invar extension bars for minimum heat expansion
- Backlit display and rechargeable lithium ion batteries
- Complete set with transducer, cable, extension bars and case
- Optional ovality kit for measuring cylinder wear available

CHRIS-MARINE®
## SRM

### Surface Roughness Measuring
Device for standard-compliant roughness measurements.

- Documents roughness prior to, during and after honing
- To be used on any surface
- Easy to use - switch on and measure
- Possible to separate drive unit from display unit
- Calibration standard included
- 2.4 inch colour graphic LCD screen
- Memory card and PC software for generation of reports included

LEMAG®
## CALIBRATION

### Calibration Kits & Services
Complete sets of onboard calibration and testing equipment combined with services, ensuring your equipment is available and ready when you need it.

- Sets can be combined from the full range of our PRESSOTEST, TEMPmag calibrators and CAL GAUGES
- All instruments and accessories are delivered in a heavy duty transport and storage case
- Factory calibration and exchange sets
- Full service offering including service agreements

# Grinding & Machining of cylinder heads

4 -stroke engines

Grinding and machining of cylinder heads according to engine makers' specifications is very important as failure to maintain the condition of cylinder heads means jeopardizing engine performance. This could become a very costly affair. The good news is that there is a variety of machines available to make maintenance accurate and efficient.

CHRIS-MARINE®
## 75H

### Valve Spindle Grinding Machine

For grinding of valves on high and medium speed diesel engines, and valves and valve seats on smaller 2-stroke diesel engines, in existing lathes.

- For valve disc diameters smaller than 180 mm
- Used together with an existing standard lathe
- Designed for precision grinding of valve spindle seat face for medium speed and auxiliary diesel engines
- Template for correct setting of grinding angles
- Diamond dresser for grinding wheel tuning
- Pneumatically driven grinding motor

CHRIS-MARINE®
## BSP2

### Valve Spindle Grinding Machine

For grinding of valve spindles on 4-stroke medium and high speed diesel engines.

- Operating range 6–50 mm stem diameter
- Up to 250 mm valve disc diameter
- Semi-automatic grinding machine
- Grinding angles set according to customer's requirement
- Colour touch screen display
- Electrically driven
- Anti-vibration dampers

CHRIS-MARINE®
## VRL

### Valve Seat and Recess Lathe

Combined machine for in-situ machining of valve seats and seat recesses on 4-stroke medium speed diesel engines.

- Valve seats from 55 to 230 mm diameter
- Recesses from 74 to 200 mm diameter
- Machining angles set according to customer's requirement
- Stepless adjustable rotation speed and self-centering pilot spindle
- Machining horizontally, vertically and chamfering
- Pilot spindle with recess measurement slot for easy handling
- Automatic feed mechanism
- Diameter measuring tool
- Electrically driven
- Superior to grinding alternatives

CHRIS-MARINE®
## VSL

### Valve Spindle Grinding Machine

Portable lathe for in-situ machining of valve seats on 4-stroke diesel engines.

- Valve seats from 50 to 230 mm diameter
- Machining angles set according to customer's requirement
- Stepless adjustable rotation speed
- Adjustable machining diameters
- Self-centering pilot spindle
- Pre-set angles
- Automatic feed mechanism
- Electrically driven
- Superior to grinding alternatives

CHRIS-MARINE®
VGT

## Valve Spindle Grinding Machine

2-stroke engines

Designed and developed for grinding of valves and valve seats on 2-stroke diesel engines.

- Up to 96 mm valve stem diameter
- Anti-vibration dampers
- Self-centering of valve and seat
- Grinding angles set according to customer's requirement
- Diamond dresser for grinding wheel and full set of tools included
- Electrically driven

CHRIS-MARINE®
LBD

## Valve Spindle and Seat Grinding Machine

Designed and developed for grinding of valves and valve seats on large bore 2-stroke diesel engines.

- Up to 650 mm valve seat diameter
- Anti-vibration dampers
- Self-centering of valve and seat
- Grinding angles set according to customer's requirement
- Pneumatically driven

2-stroke and 4-stroke engines

CHRIS-MARINE®
WR

## Working Rig

A range of working rigs for safe maintenance of 2-stroke and 4-stroke engine parts.

- Ranging in capacity from 300 kg up to 4000 kg
- Comes in 10 configurations
- Safe and efficient with self-locking turning gear
- For easy handling and overhaul of cylinder covers, exhaust valves and fuel pumps
- Adjustable length and height
- Anti-vibration dampers
- Turning capacity: 0-360˚ (depending on engine part)

ACCESSORIES & CONSUMABLES

## Quality matters

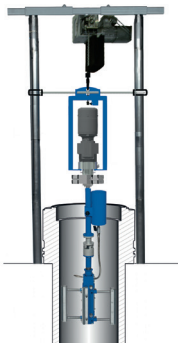
Choosing the right grinding wheels, turning bits and honing stones is a key aspect for acheiving superior results. Our grinding wheels and turning bits come in different shapes and qualities to make sure there's a perfect fit for various types of jobs. We offer ceramic and diamond honing stones to get the very best honing results.
All our accessories and consumables have been carefully selected and tested to give the best result when it comes to performance, lifetime and surface roughness.

# Grinding & Machining of cylinder liners

## 2-stroke and 4-stroke engines

The honing process rectifies longitudinal and circumferential surface geometry, thus restoring the cylinder liner's oil retaining surface properties. Honing is vital to prolong the lifetime of cylinder liners and to avoid running-in problems. If honing isn't performed regularly there is a risk that the maximum wear limit provided by the engine makers won't be reached before cylinder condition issues occur. Some common cylinder condition problems are broken piston rings and cylinder scuffing.

CHRIS-MARINE®
### HONA



**Automatic Honing and Deglazing Machine**

Fully automatic honing machine for restoration of medium speed engine cylinder liner geometry and surface structure. For workshop and in-situ use.

- For honing of liners 140–670 mm bore
- Adjustable stone pressure
- Removes scuffing marks and restores surface cross pattern
- Fully automatic operation with automatic stroke control
- Ability to specify exact cross pattern angle
- Cannot go beyond set turning points
- Speed and stroke length adjusted during operation
- Electrically driven

CHRIS-MARINE®
### HONS

**Honing and Deglazing Machine**

Honing machine for restoration of medium speed engine cylinder liner geometry and surface structure. For workshop and in-situ use.

- For honing of liners 140–670 mm bore
- Rectifies the circular shape of the liner
- Removes scuffing marks and restores surface cross pattern
- Easily operated directly on the engine or in honing rig
- Variable hoisting speed
- Adjustable stone pressure
- Pneumatically driven

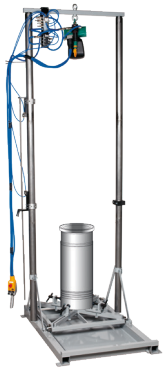
CHRIS-MARINE®
### VKS

**Wear Edge Milling Machine**

Portable machine for safe removal of wear edges in cylinder liners.

- For liners 250–1000 mm diameter
- Easily adjustable for different wear edge positions
- Reduces piston pulling time and preserves piston rings and liners
- Complete removal of a wear edge within less than 15 min
- Down to 250 mm diameter depending on engine type
- Pneumatically driven
- Workop and onboard versions available
- Version not requiring a "Hot Work Permit" is available

CHRIS-MARINE®
### HR



**Honing Rig**

Honing rig for workshop and other non-in-situ applications.

- Optimal platform for honing of cylinder liners
- For liners from 200–800 mm outer diameter
- Robust and compact design
- Capacities: up to 400 mm for HR40 and 800 mm for HR800
- Fits all service workshops
- Smaller and bigger sizes available on request

## 4-stroke engines

CHRIS-MARINE®
### UPRE

**Unistress Piston Ring Expander**

For 4-stroke engines with straight-cut piston rings.

- Lowest stress possible for desired opening of the ring
- Provided with a stop, limiting deformation of the ring
- Delivered adjusted and ready for use
- Suits any type of piston ring and diameter upward of 130 mm:
  -Type 1: piston rings 100–250 mm
  -Type 2: piston rings 250–380 mm
  -Type 3: piston rings 380–600 mm
  -Type 4: piston rings 600–980 mm

# Grinding & Machining of sealing surfaces

2-stroke and 4-stroke engines

Grinding and machining of sealing surfaces according to engine makers' specifications is very important as failure to do so means jeopardizing engine performance. Lower engine performance and possible down-time is costly and should be avoided. Chris-Marine offers a range of machines to make sure the engine maker's specifications are met.

CHRIS-MARINE®
CPM

**Surface Grinding Machine**
For grinding of sealing surfaces between cylinder head and cylinder liner, and between cylinder liner and engine frame on medium bore diesel engines.

- Standard operating range 320-700 mm diameter
- Eliminates and prevents water and gas leakages
- Great savings from in-situ grinding and milling
- Easily operated by a single operator
- Optional milling equipment available
- Pneumatically driven

# Fuel system maintenance

2-stroke engines

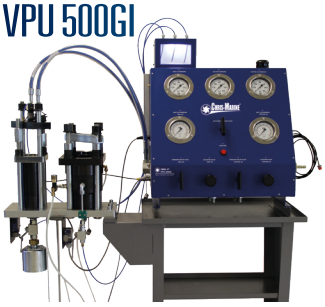
When a fuel injector performs less than optimal it can start opening at the wrong time as well as leak fuel before or after injection. This results in unnecessary fuel consumption and engine maintenance.

OBEL-P®
VPU 500F

**Fuel Valve Test Rig**
For testing of fast fuel injectors for Wärtsilä RT flex engines.

- Pneumatic/Hydraulic test rig with an oil flow up to 7.5 l/min
- Scalable pump technology developed for correct testing of Wärtsilä RT flex/W-X FAST fuel injectors
- Gauges for air and oil pressure
- Hydraulic dis-/re-assembly tool support
- Optional safety valve test adapters
- Test aux. engine fuel injectors with optional adapters

OBEL-P®
VPU 500GI



**Fuel Injector Test Unit**
Designed for effective testing of MAN B&W gas valves & window, resume and blow off valve in MAN B&W 2–stroke marine engines running on natural gas.

- The test unit features a robust design as a professional tool for fuel valve testing on board ships and in offshore sites
- Pneumatic fuel valve test unit, designed for testing of gas fuel-injectors from 2-stroke engines
- Air powered test rig up to 450 bar
- High-precision pressure control
- Nozzle seal test with up to 400 bar of Nitrogen
- Working test with up to 400 bar of Nitrogen
- Valve holders for injector, window, resume and blow-off valve

OBEL-P®
VPU 500 LGIP

**Fuel Injector Test Unit**
Designed for effective testing of the main gas injection valve and blow-off valve in MAN B&W 2–stroke marine gas engines running on LPG.

- The test unit is robust and suitable for testing on board ships and offshore.
- The following tests can be executed:
  - Non return valve seal test
  - Nozzle leakage test
  - Function test
  - Blow-off valve test

2-stroke and 4-stroke engines

CHRIS-MARINE®
IGT

**Fuel Injector Grinding Tool**
For reconditioning of fuel injector pipe sealing surfaces on 4-stroke medium speed diesel engines.

- Portable with low weight
- For workshops onboard and ashore
- Fine feed adjustment for grinding
- Electrically driven with pneumatically driven grinding head

OBEL-P®
## VPUD

### Fuel Injector Test Rig
2-stroke and 4-stroke engines

Fuel valve test unit with digital read-out
for testing of fuel injectors for 2-stroke and 4-stroke engines.

- Scalable pump technology for Wärtsilä 2-stroke fuel injectors
- Activators for electronically controlled injectors and pilot valves
- Adapters for injectors with integrated fuel pump
- Systems for test of combined gas-diesel injectors
- Optionally prepared for testing of common rail injector systems
- Pneumatically driven

# Power Packs
2-stroke and 4-stroke engines

That powerful hydraulic tools require great power packs is no secret. In cooperation with MAN Diesel, Wärtsilä and 2-stroke engine owners worldwide, Chris-Marine has developed a range of mobile Hydraulic Power Units (HPUs). The units deliver up to 5 times the normal speed when needed, while fulfilling the requirement for pressures above 3000 bar.

OBEL-P®
## HPU

### Hydraulic Power Unit Series
Portable Hydraulic Power units for all hydraulic tools.

- Hydraulic pressure up to 3.500 bar at 7 bar air inlet pressure
- Flow rates up to 1.9 l/min
- Adjustable maximum outlet pressure for tool protection
- Back-up hand power optional
- Hoses and couplings available as an option

# Superior engine parts cleaning
2-stroke and 4-stroke engines

In order for an engine to work efficiently its various parts need to be thoroughly cleaned to remove scale, oil deposits and rust. Chris-Marine therefore offers a variety of washing solutions, like single stage aqua spray washers for overall cleaning of engine parts, as well as advanced ultrasonic cleaners that reach every orifice.

CHRIS-MARINE®
## UCS SMALL RANGE

### Ultrasonic Cleaning Systems
Our onboard range of ultrasonic washers is optimal for cleaning and protection of smaller engine parts like injector nozzles, lube oil filters and fuel pump parts. There are four versions available, with internal dimensions:

- UCS 60: 500 x 300 x 400 mm
- UCS 75: 600 x 500 x 250 mm
- UCS 90: 600 x 500 x 300 mm
- UCS 126: 700 x 600 x 300 mm

CHRIS-MARINE®
## UCS 1000/1500

### Ultrasonic Cleaning Systems
UCS 1000 and UCS 1500 are ultrasonic cleaning systems for cleaning of engine parts like pistons, valve spindles, fuel injectors, cylinder heads, intercoolers and heat exchangers. They have the following internal dimensions.

- UCS 1000: 1000 x 1000 x 1000 mm
- UCS 1500: 1500 x 1000 x 1000 mm

ULTRASONIC

### Ultrasonic efficiency for easy and thorough cleaning onboard
The ultrasonic onboard cleaning tanks offer a customized solution to the onboard cleaning requirements of the marine industry. The patented frequency sweep maximizes the ultrasonic efficiency, and helps to reduce the cleaning time, thus saving both time and money as a result of the fast and efficient cleaning. Thoroughly cleaned engine parts perform better and last longer.

**Ultra Rinse cleaning chemicals**
We offer a range of cleaning chemicals, designed specifically for ultrasonic cleaning, that enable rapid penetration and removal of deposits.

# MSC RANIA
# Combustion Chamber Inspection

**Business case**

## MSC

MSC Mediterranean Shipping Company is the largest shipping company in the world. With more than 600 container vessels the company is a major player in logistics connecting the world.
MSC's container ship MSC RANIA was built in 2005 and is sailing under the flag of Panama.
Her carrying capacity is 8400 TEU and her current draught is reported to be 12.4 meters. Her length overall is 331.99 meters and her width 43.2 meters.
Thousands of customers depend on the timely arrival of MSC RANIA. It is therefore crucial to avoid unplanned off-hire.

### Challenge

Since the introduction of the 2020 low-sulphur fuel cap, many ship owners have faced challenges with increased wear and other critical issues in the combustion chamber area of their 2-stroke engines.
MSC had to find a monitoring solution that would help them avoid unplanned off-hire in order to keep delivering goods on time.
MSC therefore turned to Chris-Marine for a solution.

### Solution

Chris-Marine offers an extensive combustion chamber monitoring service (CCM), performed by highly skilled engineers.

The service involves vital data collection, root cause analysis and recommendations regarding preventive measures that need to be taken to avoid costly combustion chamber damage.

With over 600 inspected 2-stroke engines to date, Chris-Marine has gained extensive experience of engine condition monitoring and root cause analysis, and are experts when it comes to engine condition monitoring & reconditioning.

### CCM Inspection

During the MSC RANIA inspection, the following data was collected with monitoring tools from Chris-Marine.

- Liner measurements made with LDM
- Coating thickness measurements of piston rings made with CTM
- Ring pack photos taken with a liner condition camera LCC
- 360° photos of the complete liner length including exhaust valve taken with LCC
- Replica sampling including microscopic analysis

The data collected was analyzed by Chris-Marine's CCM experts and compiled in an extensive written report. The report which also included recommendatins regarding preventive maintenance was shared with MSC's technical department during an online presentation.

### Customer feedback

*"Thanks to Chris-Marine's CCM inspection service we can avoid unplanned off-hire and reduce overhauling costs. The continual condition monitoring of our ship's cylinder liners is crucial to keep its engines running efficiently.*
*Pre-inspection of the cylinder before a piston overhaul or dry docking significantly reduces downtime and associated costs."*

***LDM***

***CTM***

***LCC***

***Replica Test Kit***

# Quality accessories & consumables for superior engine maintenance results

Selecting the right grinding wheels, honing stones, couplings and other accessories, is of high importance to engine maintenance results. Chris-Marine's accessories & consumables have therefore been carefully selected and tested to make sure they keep the very best standard.

CHRIS-MARINE®
ULTRA RINSE

## Ultrasonic Cleaning Chemicals

We offer a range of cleaning chemicals, designed specifically for ultrasonic cleaning, that enable rapid penetration and removal of deposits.

- Concentrated powder products
- Highly effective even at low concentration mixtures with water
- Can be customized to the specific need of the customer
- Excellent wetting and penetration properties

CHRIS-MARINE®
HON LIQ

## Honing Liquid

To ensure a smooth and efficient honing process

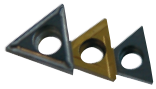
- Water mixable honing fluid based on mineral oil
- Ensures shortest possible honing time
- Prevents residues from clogging the stones
- Provides corrosion resistance for cylinder liners
- Tested and approved by leading engine designer

CHRIS-MARINE®
GRINDING WHEELS

## Grinding Wheels

Choosing the right grinding wheels for a specific job is the key aspect for achieving superior grinding results. Chris-Marine's grinding wheels have been carefully selected, tested and proven for each type of metal alloy, surface finish and workload.

CHRIS-MARINE®
TURNING BITS



## Turning Bits

Turning bits for our portable lathes are supplied in different shapes and qualities. Each type has been carefully tested to give the best result when it comes to performance, lifetime and surface roughness.

CHRIS-MARINE®
HOSES & COUPLINGS

## Hoses & Couplings

Our hoses and couplings fulfill the requirements and specifications required by engine designers such as MAN Diesel & Wärtsilä.

- Ultra-high working pressures
- Low volumetric expansion
- Kink-resistant steel-reinforced construction
- Provides corrosion abrasion-resistant covers

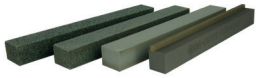
CHRIS-MARINE®
DIAL GAUGE

## Dial Gauges

Instruments used to balance and align Chris-Marine machines and equipment.

- Dial gauges to align several of our machines and machine accessories
- Facilitates adjustment when setting angles
- Minimises vibrations when centering grinding wheels
- Different reading scales to optimize accuracy
- Analogue reading

CHRIS-MARINE®
HONING STONES



## Honing Stones

Honing time and stone consumption increase with cylinder diameter and stroke length. It is therefore important to choose the right honing stones.
Diamond stones have superior endurance and remove material faster than ceramic stones. They are therefore suitable for coarse honing of large engines or highly worn smaller engines.
Ceramic stones provide superior oil retaining properties for the cylinder liner and are therefore mandatory when finishing the running surface structure.
ed in different shapes and qualities. Each type has been carefully tested to give the best result when it comes to performance, lifetime and surface roughness.

## Fuel System Maintenance

| Fuel Injector Test Rigs | VPU 500F | VPUD 1100 | VPUD 1000 | VPUD 1100 SV | VPUD 1000 CR |
|---|---|---|---|---|---|
| • Suitable for engines | WIN GD RT-Flex/ W-X FAST | Wärtsilä RND, RTA 48-96 MAN 4-stroke | MAN 2-stroke injectors incl. slide fuel valves excl. gas injectors | Conventional 4-stroke and 2-stroke injectors incl. MAN slide fuel valves | Wärtsilä-RT flex/w-x common rail/DF |
| • Test procedure | -Open pressure test<br>-Nozzle sealing test<br>-Atomizing Test<br>-Safety valve test option) | - Injector prefill<br>- Opening pressure test<br>- Nozzle leakage test<br>- Manual operation (for test of 4-stroke engines) | - Injector prefill<br>- Opening pressure test<br>- Nozzle leakage test<br>- O-ring sealing test<br>- Venting /Non-return valve test | - Injector prefill<br>- Opening pressure test<br>- Nozzle leakage test<br>- Venting /Non-return valve test<br>- O-ring sealing test Manual operation (for test of 4-stroke engines | - Injector solenoid test<br>- Injector spray test<br>- Nozzle sealing test |
| • Pressure (bar) output@input | 0-600 bar@8<br>0-500 bar@7 | 0-1100@10,<br>0-800@7 | 0-1100@10,<br>0-800@7 | 0-1100@10,<br>0-800@7 | 0-1100@10,<br>0-800@7 |
| • Air consumption depending on output (l/min) | 2500-4000 | 2500-4000 | 2500-4000 | 2500-4000 | 2500-4000 |
| • Hydraulic gauge | Class 1.0 | Class 1.0 | Class 1.0 | 1.0 | N/A |
| • Display | N/A | Class 0.2 | Class 0.2 | Class 0.2 | Class 0.2 |
| • Pneumatic inlet | 3/4" BSP female | 1/2" BSP claw clutch female | | | |
| • Hydraulic outlet | 1/4" BSP male coupling | | | | |
| • Weight (kg) | 140 kg (excluding valve holder) | 90 | 90 | 90 | 75 |
| • Dimension L x W x H mm | 1000 x 850 x 1460 | 560 x 950 x 1525 | | | |
| • Electric power supply | N/A | 1-phase 115/230 V AC | | | |

## Fuel System Maintenance

| Fuel Injector Test Units | VPU 500 GI | VPUD 1000 LGI 1.2 | VPU 500 LGIP |
|---|---|---|---|
| • Engine types | MAN ME-GI | MAN ME-LGI | MAN ME-LGI |
| • Gas fuel type | Ethane & Methane (Gaseous Nat. Gas) | Methanol & Ethanol (Liquid Gas) | Propane, LPG (Liquid Gas) |
| • Test procedures | - Gas sealing and injection test for injector valve<br>- Gas sealing test of window valve<br>- Gas sealing test of blow-off/ purge valve<br>- Gas sealing test of resume valve<br>- Gas sealing test of bleed valve<br>- Gas sealing test of block valve | - Opening pressure test<br>- Nozzle leakage test<br>- Window valve test<br>- Blow-off valves test | - Non return valve seal test<br>- Nozzle leakage test<br>- Function test<br>- Blow-off valve test - Non return valve seal test<br>- Nozzle leakage test<br>- Function test<br>- Blow-off valve test - Non return valve seal test<br>- Nozzle leakage test<br>- Function test<br>- Blow-off valve test |
| • Electric Power supply | 1x115VAC (110VAC) + PE or 1x230VAC (220VAC + PE; 50/60 Hz; 100 VA | 1x115VAC (110VAC) + PE or 1x230VAC (220VAC + PE; 50/60 Hz; 100 VA | 1x115VAC (110VAC) + PE or 1x230VAC (220VAC + PE; 50/60 Hz; 100 VA |
| • Test media | Nitrogen & Hydraulic Oil | Nitrogen & Hydraulic Oil | Nitrogen & Hydraulic Oil |
| • Air consumption | 300 - 1050 l/min; 7 bar | 300 - 1050 l/min; 7 bar | 300 - 1050 l/min; 7 bar |
| • Hydraulig gauges | Class 1.0 | Class 1.0 | Class 1.0 |
| • Display | N/A | Class 0.2 | N/A |
| • Weigh | 230 kg | 230 kg | 230 kg |
| • Dimensions | 520 x 1580 x 1611 mm (3 valve versions)<br>520 x 2002 x 1611 mm (4 valve versions) | 694 x 1651 x 1475 mm | 694 x 1431 x 1475 mm |
| • Max. Inlet Pressure | 10 bar | 10 bar | 10 bar |

## Power Packs

| Hydraulic Power Units | HPU 1500 | HPU 1500-2 | HPU 2250 | HPU 2250-2 | HPU 2800-3 | HPU 3500-3 |
|---|---|---|---|---|---|---|
| • Drive medium | Air/Hand | Air/Hand | Air | Air | Air | Air |
| • Mululipurpose (incl fuel injector test) | – | X | – | – | – | – |
| • Pump technology | Single | Single | Single | Twin | Double acting | Double acting |
| • Pneumatic inlet pressure (bar) | 0-10 | 0-10 | 0-10 | 0-10 | 0-10 | 0-10 |
| • Hydraulic pressure (bar) Output@input | 1500@7 1000@4.6 | 1500@7 1000@4.5 | 2000@7 1700@6 1400@5 | 2000@7 1700@6 1400@5 | 2200@5 2600@6 3000@7 | 2200@5 2600@6 3000@7 |
| • Standard safety valve setting (bar) | 1050/1450 (adjustable) | 220-240 V 50-60 Hz | 220-240 V 50-60 Hz | 220-240 V 50-60 Hz | 220-240 V 50-60 Hz | |
| • Hydraulic flow @ no output pressure (l/min) | 0.3 | 0.45 | 0.45 | 1.9 | 0.8 | 0.8 |
| • Air consumption @ 0 bar (l/min) | 300-1050 | 300-1050 | 300-1050 | 300-1050 | Up to 2500 | Up to 2500 |
| • Hydraulic gauge (bar/160 MPa, class 1.0, Ø 160) | 1600 | 1600 | 2500 | 2500 | 4000 (optional 3000) | 4000 |
| • Pneumatic inlet | 1/2" BSP female (ISO-228-1-G-1/2), adapter for reduction to 1/4" BSP included | | | | 1/2" BSP female (ISO-228-1-G-1/2) | |
| • Hydraulic outlet | CEJN 116 male incl | | 1/4" BSP female (ISO-228-G-1/4), adapter CEJN 125 male incl | | | 1/4" BSP female (ISO-228-G-1/4), adapter CEJN 125 female incl |
| • Weight (kg) | 16 | 20 | 23 | 28 | 33.5 | 33.5 |
| • Dimension LxWxH mm | 340x256x380 | 380x360x380 | 440x330x400 | 440x330x400 | 460x330x400 | 460x330x400 |
| • Typical engine/tool (smallest HPU) | MAN ≤60 Wärtsilä RND 4 stroke | MAN ≥70 MC Sulzer Z-series | RTA ≤72 RTA Flex ≤72 | RTA ≥84 RTA Flex ≥84 | MAN ME engines Workshop | MAN ME engines Workshop |

## Ultrasonic cleaning

| Ultrasonic Cleaning Systems | UCS 60 | UCS 75 | UCS 90 | UCS 126 |
|---|---|---|---|---|
| • Overall dimensions (LxWxH mm) | 600 x 400 x 600 | 700 x 600 x 450 | 700 x 600 x 500 | 800 x 700 x 500 |
| • Internal dimensions (LxWxH mm) | 500 x 300 x 400 | 600 x 500 x 250 | 600 x 500 x 300 | 700 x 600 x 300 |
| • Tank capacity (litre) | 60 | 75 | 90 | 126 |
| • Working tank capacity (litre) | 52 | 60 | 75 | 105 |
| • Transducers (no.) | 8 | 8 | 12 | 24 |
| • Ultrasonic power (peak Watt) | 800 | 800 | 1200 | 2400 |
| • Full power consumption (kW) | 1.4 | 1.4 | 1.6 | 2.2 |
| • Power supply | 220-240 V 50-60 Hz | 220-240 V 50-60 Hz | 220-240 V 50-60 Hz | 220-240 V 50-60 Hz |
| • Equipment weight (kg) | 15 | 18 | 20 | 25 |
| • Max load weight (kg) | 30 | 30 | 30 | 50 |

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