SPX®

Aftermarket Technical Service Solutions for Pumping Technologies

HIGH QUALITY OEM PARTS, SERVICE, REPAIR, UPGRADES + RE-RATES: DELIVERING VALUE FOR OUR CUSTOMERS

ClydeUnion Pumps

SPX - An Introduction

SPX is a Fortune 500 multi-industry manufacturing leader, headquartered in Charlotte, North Carolina. SPX manufactures and markets products, components, services and technologies that are integral to meeting today's challenges and tomorrow's needs. We are a place where innovation is fostered, and the real needs of business are understood. We transform ideas into powerful solutions to help our customers meet their goals, overcome business challenges and thrive in a complex, always changing marketplace.

SPX's Flow Technology segment designs, manufactures and markets engineering solutions and products used to process, blend, meter and transport fluids. We also offer equipment for air and gas filtration and dehydration. Our leading brands have global operations which service the food + beverage; power + energy; and industrial processes.

SPX®

CLYDEUNION PUMPS, AN SPX BRAND - GENERATIONS OF EXPERIENCE

Whilst the name is relatively new, the ClydeUnion Pumps brand is known worldwide for supplying reliable and robust engineered pumping solutions stemming from over 140 years of industry expertise.
Our experience spans across several complex industries including oil and gas, nuclear and conventional power generation, desalination and other key markets relevant to our product portfolio.

›ClydeUnion Pumps

Our Extensive Brand Heritage:

CLYDEUNION PUMPS
Weir Pumps - Clyde Pumps - Mather & Platt - Drysdale - WH Allen - Girdlestone - Allen Gwynnes - Harland

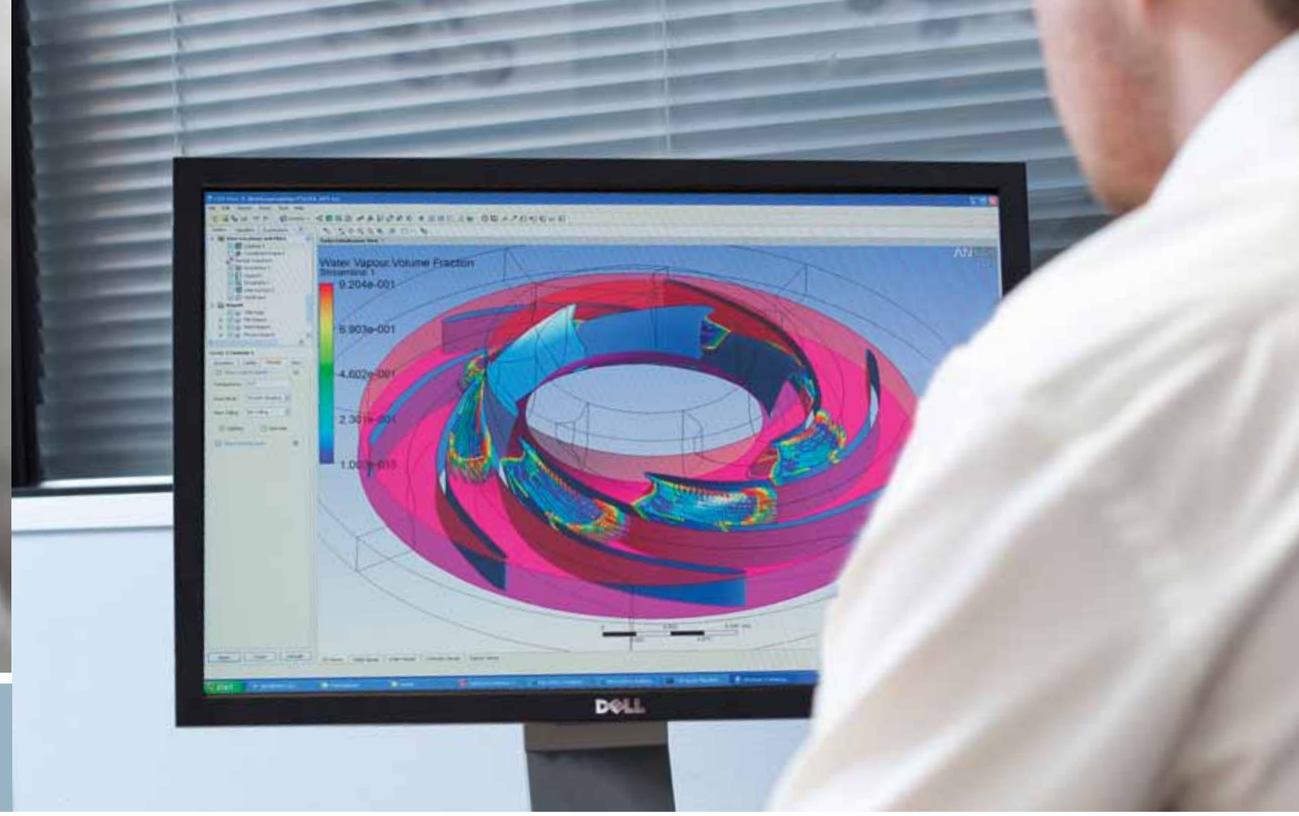
S&N PUMP CO.®

UNION Pump
Union Pump - David Brown Pumps
DB Guinard Pumps - American Pump - Pumpline

SPX®
›ClydeUnion Pumps

ABOVE - TECHNICAL SERVICE ENGINEERS ASSESS PUMP INSTALLATION

RIGHT - COMPUTATIONAL FLUID DYNAMICS (CFD) ANALYSIS OF PUMP IMPELLER



The Technical Services Team is a dedicated group of experienced pump engineers specialising in providing expert pump systems advice to our customers across all industries.

Possessing a wealth of pump and system design knowledge, fully equipped with the latest design, analytical and pump testing equipment, our Technical Services Team can be employed across a range of services to ensure your critical rotating plant is operating reliably, safely and at optimal levels of efficiency. Working in partnership with our customers the focus of these important aspects of pump operation deliver increased MTBF and plant life, reduced parts consumption, increased production and very importantly minimise energy costs and carbon emissions.

TECHNICAL SERVICES TEAM	CUSTOMER BENEFITS
PUMP SYSTEM ASSESSMENTS	Increased reliability and efficiency across entire system - reduction in energy costs/emissions
THERMOMETRIC AND FLOWMETER BASED PUMP TESTING	Verification of actual pump and system performance before and after improvement works
MATERIAL AND DESIGN UPGRADES FOR ALL BRANDS OF ROTATING EQUIPMENT	Improved reliability and extended plant life
HYDRAULIC RE-DESIGN AND RE-RATES	Enhanced efficiency, reliability and reduction in pump energy costs and emissions
CLYDEUNION PUMPS ACADEMY - PUMP TRAINING	Greater operator knowledge to ensure optimal pump operation, maintenance and reliability
EXPERIENCED ON-SITE SUPERVISION	Expert technical management of complex large machine installations, commissioning and outages
ASSET MANAGEMENT	Support for turnkey asset management programmes
CONDITION MONITORING (including using wireless real time data acquisition)	Ongoing remote and manual data sampling and expert trend analysis to assist reliability programmes
RE-ENGINEERING AND UPGRADING OF ANY 3RD PARTY PUMPS AND PARTS	Improved reliability, quick supply with leading OEM quality and design guarantees

ABOVE - ON-SITE ULTRASONIC FLOW MEASUREMENT

Pump System Testing and Assessment

ClydeUnion Pumps Technical Services offers pump testing and system assessments using thermometric and flow metre based methods to assess actual pump and system performance. This information is usually complemented with vibration, temperature and power characteristics forming a complete picture of pump efficiency and system health, determining how well matched your pump is to your system.

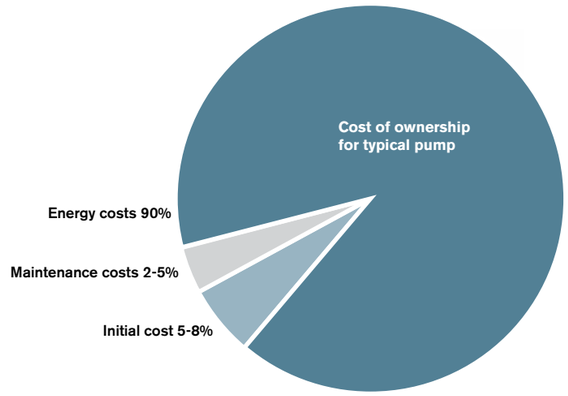
BENEFITS

- Increase in pump and system efficiency
- Reduction in energy consumption and operating costs
- Improved pump and system reliability
- Reduction in system emissions
- Problem solving and Root Cause Analysis (RCA)
- Increased Mean Time Between Failure (MTBF)

METHODS EMPLOYED

The Technical Services Team deploys Pump System Assessment methodology. The objective in this method of assessment is to ensure a uniform and systematic approach in the assessment of industrial pumping systems to identify opportunities for reducing energy consumption and carbon emissions in line with legislative and government targets.

This method combines a consultative approach with a thorough system energy and reliability audit utilising our full suite of testing equipment including flow and power meters, multi-channel data logger, vibration analyser, pressure transducers and temperature gauge.



Pump Life Cycle Cost chart courtesy of BPMA

STEP-BY-STEP APPROACH

STEP 1 Pre-assessment preparation (by site staff)

STEP 2 First assessment meeting on-site

STEP 3 On-site inspection & survey

STEP 4 Gathering data/testing

STEP 5 Data analysis

STEP 6 Reporting

REVIEW OF PUMP VIBRATION FREQUENCY SPECTRA

SYMPTOMS OF POOR SYSTEM AND PUMP PERFORMANCE

Most pump systems will benefit from a system audit and pump test to optimise system performance, however the following are examples that highlight your pump is no longer matching your system requirements:

- Standby pump in continuous operation
- Pump operating conditions do not match nameplate conditions
- Pump output is controlled by discharge valve throttling
- High machinery vibration and temperature
- Poor reliability and MTBF
- High wear rates and parts usage
- High power consumption

If any of the above symptoms are evident then a site test and/or system assessment will identify how to improve your pump and system performance.

REPORTING

Our step-by-step approach will ensure that the operating history and customer requirements are fully understood prior to completing the study and presenting our findings in a concise technical report. This report will make clear our recommendations supported by anticipated improvements in performance, reliability and energy efficiency with any investment payback illustrations provided if required.

Design Improvements, Material Upgrades and Hydraulic Re-rates

Throughout the service life of your pumping equipment process change, design improvements and material developments create opportunities to greatly improve the performance and reliability of your asset. With over 140 years of experience combined with the latest design and optimisation tools the Technical Services Team offers a comprehensive range of engineering solutions to modify pumping equipment to satisfy any such change in requirements.

After consultation and ideally a full site survey, our team of OEM pump improvement engineers will analyse the data before producing a design proposal which will either improve the mechanical design, modify the hydraulic design or change the material specification, or a combination of all three to optimise the pump performance in your system.

In line with new equipment design regulations you can also be assured that when improvements are being made they will be fully documented and all factors will be considered. Changes to the design stresses, pressure boundary loading and rotor dynamic performance will be assessed to ensure your upgrade will be problem free and OEM safety and design code qualifications fully maintained.

ENGINEERING BENEFITS

- Efficiency improvement
- Energy reduction
- Reduced energy costs
- Change in flow or pressure characteristics
- Increasing rotating equipment reliability
- Increase in pump service intervals
- 'Bad Actor' improvements

PROBLEM	CAUSE	SOLUTION							
		HYDRAULIC RE-RATE	IMPELLER INLET RE-DESIGN	BEARING UPGRADE	SEAL SYSTEM UPGRADE	ROTOR UPGRADE	MATERIAL UPGRADE	LUBRICATION UPGRADE	MOTOR UPGRADE
STANDBY PUMP OPERATION	System requirement not met by single pump	■							
DISCHARGE THROTTLING	Pump output (flow) exceeds requirements	■							
CAVITATION	Low NPSHA	■	■				■		
BEARING FAILURE	High loading or poor lubrication	■		■				■	
SEAL FAILURE	Seal system mismatch to pump				■		■		
INSUFFICIENT CAPACITY	Pump not rated for process requirements	■							
MOTOR FAILURE	Motor power output insufficient	■							■
SHAFT FAILURE	High shaft loading or poor material	■				■	■		
HIGH VIBRATION	High loading, out of balance or system resonance	■	■			■			
POOR MTBF	High loading, poor pump selection or design	■		■		■	■	■	

MATERIAL UPGRADES

Material upgrades are available to satisfy increased plant life requirements and we offer our expertise in the development and application of corrosion resistant materials, wear resistant coatings and non-metallic materials. These upgrades can result in excellent solutions where irons, bronzes and less corrosion resistant stainless steels were originally specified.

HYDRAULIC RE-RATING

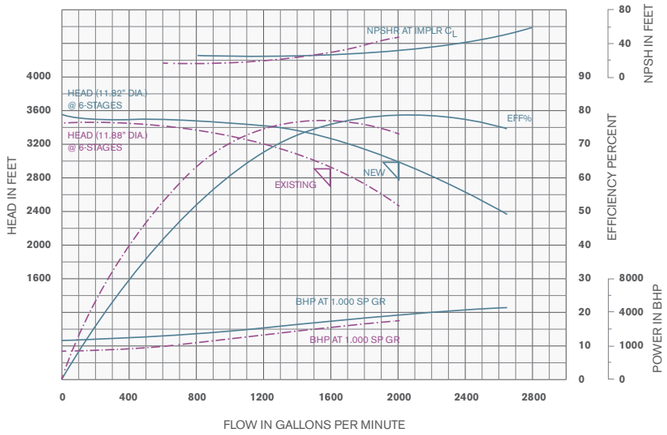
Our engineering specialists offer hydraulic re-rating by means of their hydraulic design capabilities and fluid flow analysis software. This service adjusts your equipment accordingly to either match an existing system or to amend your system requirements. This optimises your pump and system interaction and improves operational efficiency.

MECHANICAL DESIGN ENHANCEMENT

A mechanical upgrading service is available for our customers who desire reliable, competitive, quality pump sets. Our engineering team analyse current design advancements using the latest 3D design tools to resolve seal leakage, reliability issues and improve noise and vibration performance.

ABOVE - OPTIMISATION OF VOLUTE CASING EFFICIENCY USING CFD

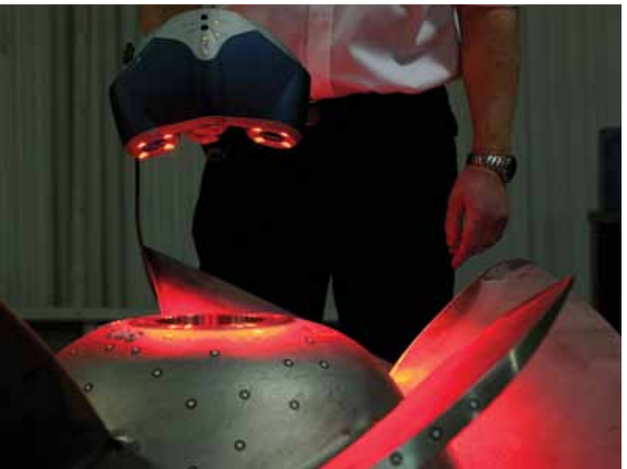
CUP-BB3 RE-RATE FOR HIGHER FLOW

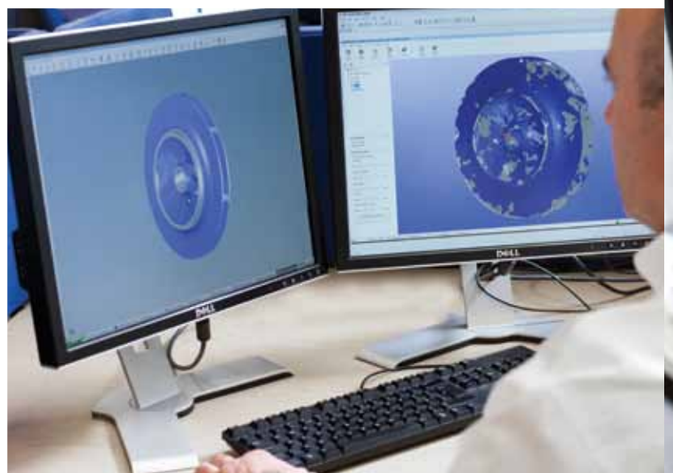


The Technical Services Team brings the benefit of ClydeUnion Pumps OEM parts quality, problem solving and design expertise to any brand of rotating equipment. By employing the same rigorous design, upgrade and rapid manufacturing principles applied to ClydeUnion Pumps OEM parts, significant benefits can be realised for non-ClydeUnion Pumps branded and local replicator parts.

PROBLEM	CLYDEUNION PUMPS RE-ENGINEERING SOLUTION
MECHANICAL FAILURE	Equipment analysis and design upgrade
CORROSION AND EROSION DAMAGE	Metallurgical failure analysis, Root Cause Analysis and material/design upgrade
POOR MACHINERY PERFORMANCE	Process and design review to ensure pump design is matched to system requirements
POOR PARTS QUALITY	Re-engineered parts manufactured to ClydeUnion Pumps OE quality assurance standards including full inspection and material certification
OBSOLETE PARTS	Re-engineered parts for all brands regardless of original equipment availability
POOR DELIVERY AND RESPONSIVENESS	Parts supplied under ClydeUnion Pumps 'Rapid Response' process

BELOW - 3D SCANNING AND RE-ENGINEERING PROCESS





Re-Engineering and Upgrade Process

1. CONSULTATION

Prior to commencing the re-engineering programme our engineer will meet with the client to understand how ClydeUnion Pumps can meet your needs and improve upon the quality, delivery or part design.

2. LASER SCANNING OF PARTS

Hand-held laser scanning is the perfect solution for rapid scanning and inspection of parts. Unlike surface mounted scanning arms the handheld laser scanner is extremely lightweight and does not require to be mounted to an inspection table. This allows quick deployment followed by rapid and accurate scanning of parts on site, in storage as well as in the workshop. Rapid scanning of large parts and surfaces can be carried out while maintaining accuracy on precision machined toleranced surfaces.

3. RAPID MANUFACTURE

For cast and turned parts the ClydeUnion Pumps Rapid Response process can be employed for greatly accelerated manufacturing lead times in as little as 24 hours for turned parts. For cast parts this process utilises rapid 3D pattern manufacture processes allowing patterns to be produced directly from 3D CAD data.

4. ANALYSIS AND RE-ENGINEERING

Once the part is scanned and inspected the file will be electronically transmitted along with the engineers report describing the condition of the part and any operational history and improvement requirements discussed with the customer. If required a full laboratory metallurgical failure mode analysis report can be arranged at this stage to better understand complex reliability problems.

After an analysis and review by our design and improvement teams, engineers scanned data is then used to create a full manufacturing model and drawing of the part.

Typical improvements:

- Increased part strength and reduction of stress concentrations
- Improved or modified hydraulic design to increase efficiency, adjust pressure and flow characteristics and improve suction design to reduce cavitation damage
- Upgraded materials to stronger and more corrosion resistant ClydeUnion Pumps approved materials

5. QUALITY ASSURANCE

ClydeUnion Pumps re-engineered parts are manufactured exactly in accordance with ClydeUnion Pumps Original Equipment parts and our ISO 9001 Quality Assurance system. This system offers advantages over inferior design, low cost replicator parts and provides OEM designed parts fit for the customers requirement.

- ClydeUnion Pumps factory processes, drawings and design specification
- Quality plans specifying:
  - Inspection
  - NDT
  - Material certificates
  - Manufacturing, test and balancing certificates
- Full ClydeUnion Pumps OEM parts warranty

Condition Monitoring

ClydeUnion Pumps extensive knowledge of pumps and pump systems can be used in assisting with the specification of condition monitoring to provide safeguarding of all pump equipment. Being able to accurately determine when a pump requires an overhaul or when a bearing may have failed is critical to ensure maximum cost savings and pump reliability to our customers.

Asset Management

The task of monitoring pump condition, scheduling regular maintenance, managing maintenance staff and spares holding logistics can be a very daunting task for customers of medium to large sites. Many sites are left to go with insufficient maintenance, risking increased future costs due to equipment failure and process downtime.

LEFT - HAND HELD VIBRATION MEASURING
RIGHT - ENGINEER CONDUCTING ASSET REVIEW

SYSTEM UPGRADES

It is possible to upgrade existing system installations with the most up-to-date control and instrumentation equipment. This will ensure the essential measurements of pump reliability and performance are captured, using the correct selection of equipment to suit the client's requirements at site.

REAL TIME MONITORING

Data acquisition can be set up in such a way as to provide real time monitoring. This can be configured with wireless or wired systems which can be monitored at site by the clients personnel or by ClydeUnion Pumps through the internet.

DATA ANALYSIS

Our specialist engineers are capable of full data analysis and problem diagnosis of your system to be able to provide the most beneficial solution. Data can be analysed as part of a site survey or the results can be sent to ClydeUnion Pumps for an in-house analysis.

MAINTENANCE SCHEDULING

ClydeUnion Pumps have the ability identify the maintenance requirements of all pumping equipment at site and determine the necessary schedule for both predictive and preventative maintenance regimes. This will ensure the equipment is kept in a condition to maximise mean time before overhaul, thus ensuring reduced costs and downtime.

TREND SPOTTING

All maintenance records, pump history and failure diagnosis will be properly documented and maintained. Trends will be more easily identifiable and this will make problem areas more recognisable.

INVENTORY MANAGEMENT

The identification and management of spares will ensure all necessary maintenance, wear parts and insurance spares are stocked whilst still maintaining a cost to risk balance that can be pre-agreed with the client. Identical spares will be identified and duplicate part spares holding will be reduced. This will save on cost for spares holding as well as physical storage space.

ClydeUnion Pumps recognises the importance training has to play in the safe, effective and efficient operation of pump equipment.

CLYDEUNION PUMPS ACADEMY

ClydeUnion Pumps Academy has a dedicated team providing a wide range of pump training courses specifically for pump customers. The training courses are structured to suit a specific range of abilities and knowledge; introductory to advanced level courses, ensuring that all training needs can be provided whatever the ability and add value to your operation. Some of the available courses are listed below.

TRAINING COURSE
Applied Hydraulics
Vibration Analysis
Centrifugal Pump Failures, Diagnosis, Causes and Solutions
Maintenance of Pumps (CUP-BB1 / CUP-BB3)
Maintenance of Pumps (CUP-OH1 / CUP-OH2 / CUP-BB2 / CUP-BB5)
Cavitation: NPSH, Materials, Coatings
Hydraulic Modifications on Centrifugal Pumps
Nuclear Power Station Pump Training
Pump Application - Oil and Industrial
Instrumentation and Condition Monitoring
Introduction to Centrifugal Pumps
Components within a Centrifugal Pump
Operation Conditions of Centrifugal Pumps
Pump Maintenance - General Principles
Installation, Commissioning, Operation and Maintenance of Small Pumpsets (Client Specific)
Installation, Commissioning, Operation and Maintenance of Large Pumpsets (Client Specific)
Operation and Maintenance of Reciprocating Pumps
System Design and Troubleshooting Considerations for Reciprocating Pumps
Fundamentals and Maintenance of Direct Acting Pumps

TRAINING CURRICULUM

Training courses have been developed specifically to suit the needs of system designers, engineers, operators and maintenance staff.

BENEFITS

- **Health and Safety**

  It is important that each task is conducted in the correct manner to ensure safety to the individual and others.

- **Reduced Costs**

  The methods used and experience gained will produce an increased efficiency in the employee's role.

- **Continuous Improvement**

  Training will ensure the most current and best practices are utilised to stay ahead of the competition.

ClydeUnion Pumps Academy

CLYDEUNION PUMPS APPLIED HYDRAULICS TRAINING

SPX®

AFTERMARKET TECHNICAL SERVICE SOLUTIONS FOR PUMPING TECHNOLOGIES

Global locations

EUROPE

Annecy	**P:** +(33) 45 005 5600	**F:** +(33) 45 005 5880	**E:** cu.annecy@spx.com
Glasgow	**P:** +(44) 141 637 7141	**F:** +(44) 141 633 2399	**E:** cu.glasgow@spx.com
Milan	**P:** +(39) 02 64 672 230	**F:** +(39) 02 64 672 400	**E:** cu.milan@spx.com
Moscow	**P:** +(7) 495 967 3453	**F:** +(7) 495 785 0636	**E:** cu.moscow@spx.com
Paris	**P:** +(33) 14 717 1440	**F:** +(33) 14 717 1412	**E:** cu.paris@spx.com
Penistone	**P:** +(44) 122 676 3311	**F:** +(44) 122 676 6535	**E:** cu.penistone@spx.com

AMERICAS

Baton Rouge, LA	**P:** +(1) 225 775 2660	**F:** +(1) 225 774 7555	**E:** cu.batonrouge@spx.com
Battle Creek, MI	**P:** +(1) 269 966 4600	**F:** +(1) 269 962 5447	**E:** cu.battlecreek@spx.com
Burlington, ON	**P:** +(1) 905 315 3800	**F:** +(1) 905 336 2693	**E:** cu.burlington@spx.com
Calgary, AB	**P:** +(1) 403 236 8725	**F:** +(1) 403 236 7224	**E:** cu.calgary@spx.com
Los Angeles, CA	**P:** +(1) 562 622 2380	**F:** +(1) 562 622 2375	**E:** cu.downey@spx.com
Houston, TX	**P:** +(1) 281 372 5040	**F:** +(1) 281 372 5042	**E:** cu.houston@spx.com

SOUTH AMERICA

Itapira, SA	**P:** +(55) 19 3843 9820	**F:** +(55) 19 3863 3947	**E:** cu.brasil@spx.com

ASIA

Beijing	**P:** +(86) 106 598 9500	**F:** +(86) 106 598 9505	**E:** cu.beijing@spx.com
Indonesia	**P:** +(62) 21 753 5559	**F:** +(62) 21 753 6031	**E:** cu.indonesia@spx.com
New Delhi	**P:** +(91) 120 4640 400	**F:** +(91) 120 4640 401	**E:** cu.newdelhi@spx.com
Shanghai	**P:** +(86) 216 160 6966	**F:** +(86) 216 160 6968	**E:** cu.shanghai@spx.com
Singapore	**P:** +(65) 62 76 7117	**F:** +(65) 62 78 7117	**E:** cu.singapore@spx.com

MIDDLE EAST/AFRICA

Abu Dhabi	**P:** +(971) 2 659 1480	**F:** +(971) 2 659 1481	**E:** cu.uae@spx.com
Algeria	**P:** +(213) 21 69 2319	**F:** +(213) 21 60 3046	**E:** cu.algeria@spx.com
Angola	**P:** +(244) 923 516 224	**F:** +(1) 281 445 4061	**E:** cu.angola@spx.com
Dubai	**P:** +(971) 4 880 7755	**F:** +(971) 4 886 1133	**E:** cu.uae@spx.com

CLYDEUNION PUMPS, AN SPX BRAND

149 Newlands Road, Cathcart, Glasgow, G44 4EX, United Kingdom

P: +44 (0)141 637 7141

F: +44 (0)141 633 2399

E: cu.sales@spx.com

CUP-02-AMTS-UK