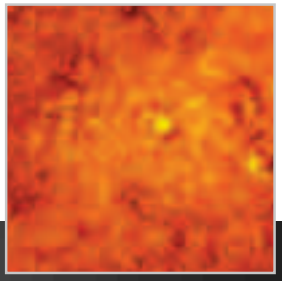
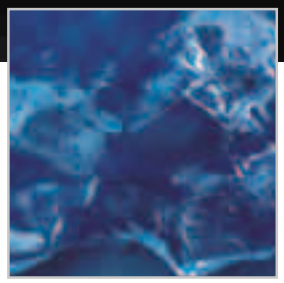
# EXTREME PERFORMANCE FOR EXTREME CONDITIONS

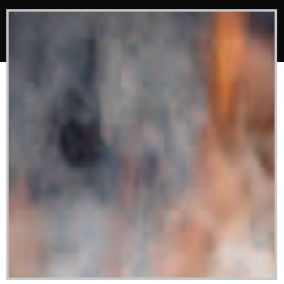
*High Temperature*

*Corrosive Media*





*Low Temperature*



*High Pressure*

**ULTRAMAX®**
ALL-WELDED PLATE HEAT EXCHANGER

**MAXCHANGER®**
ALL-WELDED PLATE HEAT EXCHANGER

**SUPERMAX®**
ALL-WELDED SHELL & PLATE HEAT EXCHANGER



TRANTER®
The heat transfer people

# When Conditions Are Tough...Take Your Performance To The Max

Now you can obtain the thermal efficiency and compactness of plate & frame heat exchangers in elevated pressure/ high and low temperature applications—with Tranter all-welded plate heat exchangers (PHEs). Until recently, heat exchangers in elevated pressure/temperature or corrosive media applications were often shell & tube (S&T) units. This meant constant tradeoffs in thermal efficiency, material mass and excessive physical footprint...until recently.

Three complementary lines of Tranter all-welded PHEs allow you to take your performance to the max, in less space and at lower cost than S&T tubular exchangers.

***SM-22***
*24-in. diameter shell x 3-ft length, with a 300-plate plate pack.*

# Plate Heat Exchanger Performance At Shell & Tube Pressures

Tranter's ULTRAMAX®, SUPERMAX® and MAXCHANGER® all-welded PHEs are so compact, they require only 30–50% of the space of equivalent S&T exchangers. This all-welded line meets challenging application needs with liquids, gases, steam and two-phase mixtures, including aggressive media, organic solvents, steam heaters and as interchangers that are beyond the capability of gasketed plate & frame units.

All three offer the distinct advantages of plate heat transfer efficiency, due in large measure to the turbulent flow created by the corrugated patterns of their plates. Because of their high efficiency, Tranter all-welded units can handle temperature approaches of less than 1°C (2°F). Tranter all-welded PHEs' small hold-up volume provides fast start-ups and close following of process changes. Beyond efficiency, all three offer cost effectiveness, high performance and minimal maintenance.

PHE Comparative Footprints For Largest Size Standard Units

| Model | Required Surface Area, $m^2$ ($ft^2$) | Footprint Area, $m^2$ ($ft^2$) | Dry Weight, kg (lb) |
|---|---|---|---|
| TEMA Shell & Tube | 203 (2,187) | 9 (100) | 6,350 (14,000) |
| ULTRAMAX (UM-92) | 56 (600)[a] | 1 (10) | 2,087 (4,600) |
| SUPERMAX (SM-22) | 56 (600)[a] | 0.7 (8) | 726 (1,600) |

[a] Common HVAC water–water application—10°F approach.

## Applications

**Oil & Gas Production And Refining**
- Optimization of heat recovery, cooling, condensation, dehydration and reboiling systems; usable with gas, light and heavy products
- Applications with distillation columns, fractionators, hydrocrackers, recrackers, hydrogen sulfide strippers and similar systems
- Waste heat recovery applied to feedwater heating
- LPG reliquefaction

**Chemical Processing**
- Optimization of condensation, heating/cooling, heat recovery and reboiling systems
- Applications with organics such as olefins, aromatics, alcohols, aldehydes, ketones, acids, ethers, esters, nitriles or sulphones, including halogenated compounds
- Applications with mineral acids and caustics, such as heating and cooling with heat recovery
- Viscous processing with monomers and resins
- Soaps and detergents, paints and coatings
- Mineral oil heating and cooling
- Gas cooling and drying: chlorine, hydrogen, nitrogen, carbon dioxide
- Vapor and solvent recovery

**Pharmaceuticals & Specialty Chemicals**
- Multifunction units for condensing and mist elimination
- Gas condensation with hygienic design
- Vapor and solvent recovery

**Emissions Control Systems**
- Ammonia liquor scrubber cooling

**Hvac, District Heating, Energy, Utilities, General Services**
- Hot water production system
- Steam heating
- Heat recovery
- Desuperheaters in heat recovery
- High temperature interchanger
- Evaporators and condensers for refrigeration duties, with all types of refrigerants

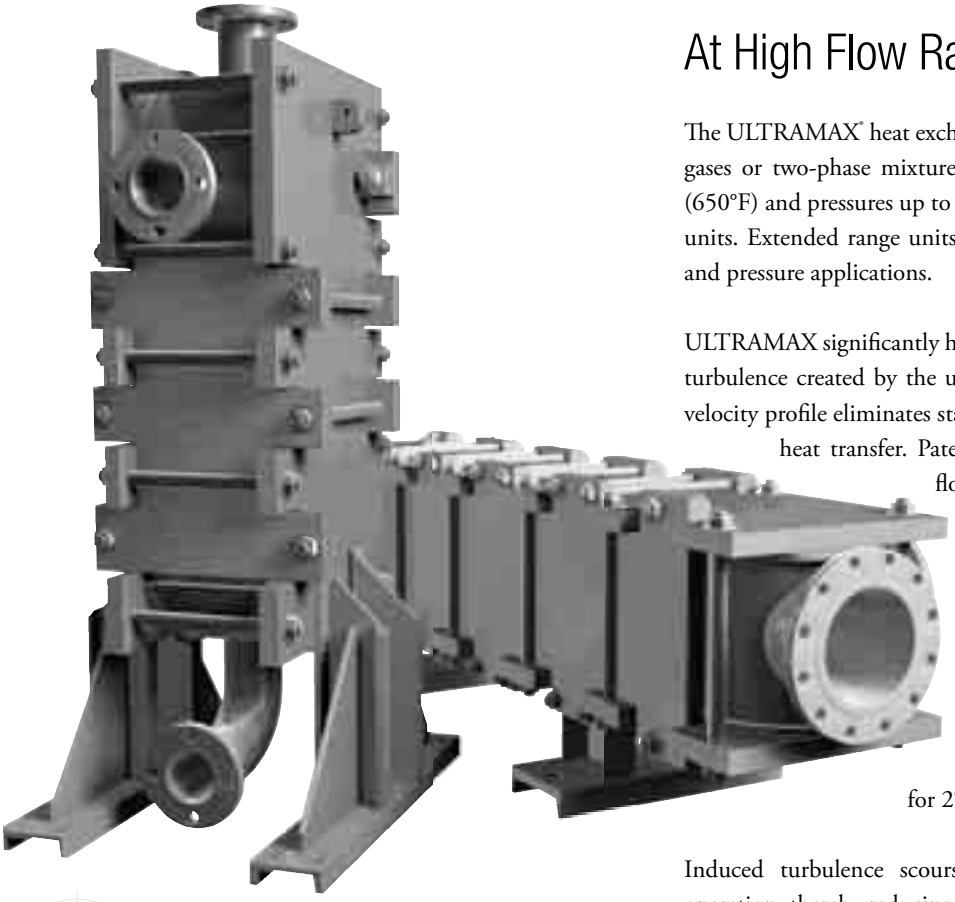
**Food Processing**
- Vegetable oil processing

# The Implications Of High Heat Transfer Rates

The illustration below depicts an actual SUPERMAX replacement for a S&T application. The significantly higher heat transfer rates of the SUPERMAX plates versus the tube bundle are responsible for the striking difference. The implications are clear: less cost for materials (stainless steel, titanium or other expensive higher alloys), simpler fabrication for shorter delivery lead times, easier installation, simpler support structures and vastly smaller footprints, especially considering dead space required to pull the S&T tube bundle for cleaning. The size and space savings are similarly significant for the ULTRAMAX unit.

***Shell & Tube***
*18-in. diameter shell x 22-ft length.*

# ULTRAMAX® For Efficient Transfer At High Flow Rates

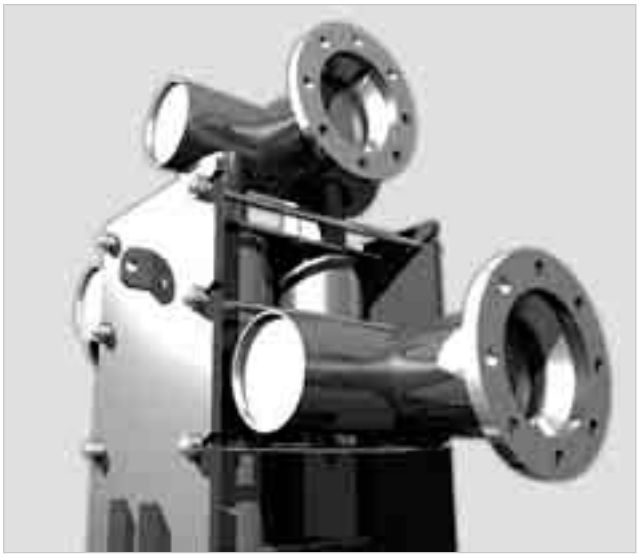


*High pressure/temperature ratings and flow rates characterize the ULTRAMAX UM-48 through UM-107. Both vertical and horizontal configurations are available.*

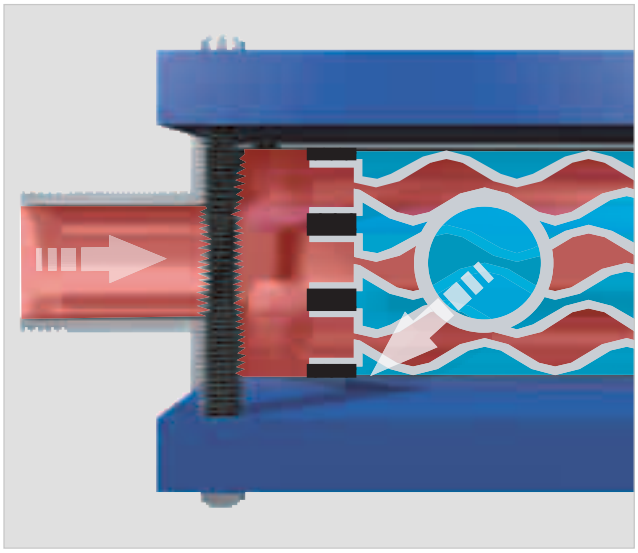
The ULTRAMAX® heat exchanger is designed for use with liquids, gases or two-phase mixtures at extreme temperatures to 343°C (650°F) and pressures up to 45 barg (650 psig) for standard range units. Extended range units are available for higher temperature and pressure applications.

ULTRAMAX significantly high "U" values result from the unique turbulence created by the unit's corrugated plates. The resulting velocity profile eliminates stagnant areas and promotes maximum heat transfer. Patented baffle clips allow for "Z" fluid flow to enter and exit between each pair of plate cassettes comprising the plate pack. The hot media flows on one side of the plate while the cold media flows on the other. This arrangement provides true countercurrent flow, unlike some competitive cross-flow units. Countercurrent flow offers full LMTD and allows for 2°F temperature approaches.

Induced turbulence scours the heat transfer surface during operation, thereby reducing fouling. This turbulence also aids the effectiveness of CIP procedures.



*By incorporating inlet and outlet manifolds into multiple core ULTRAMAX configurations, you can obtain virtually unlimited flow rates in a single unit.*



*This cross section of a chevron-patterned UM-20 plate pack indicates the flow of both channels through the unit.*

## Constructed to take the pressure

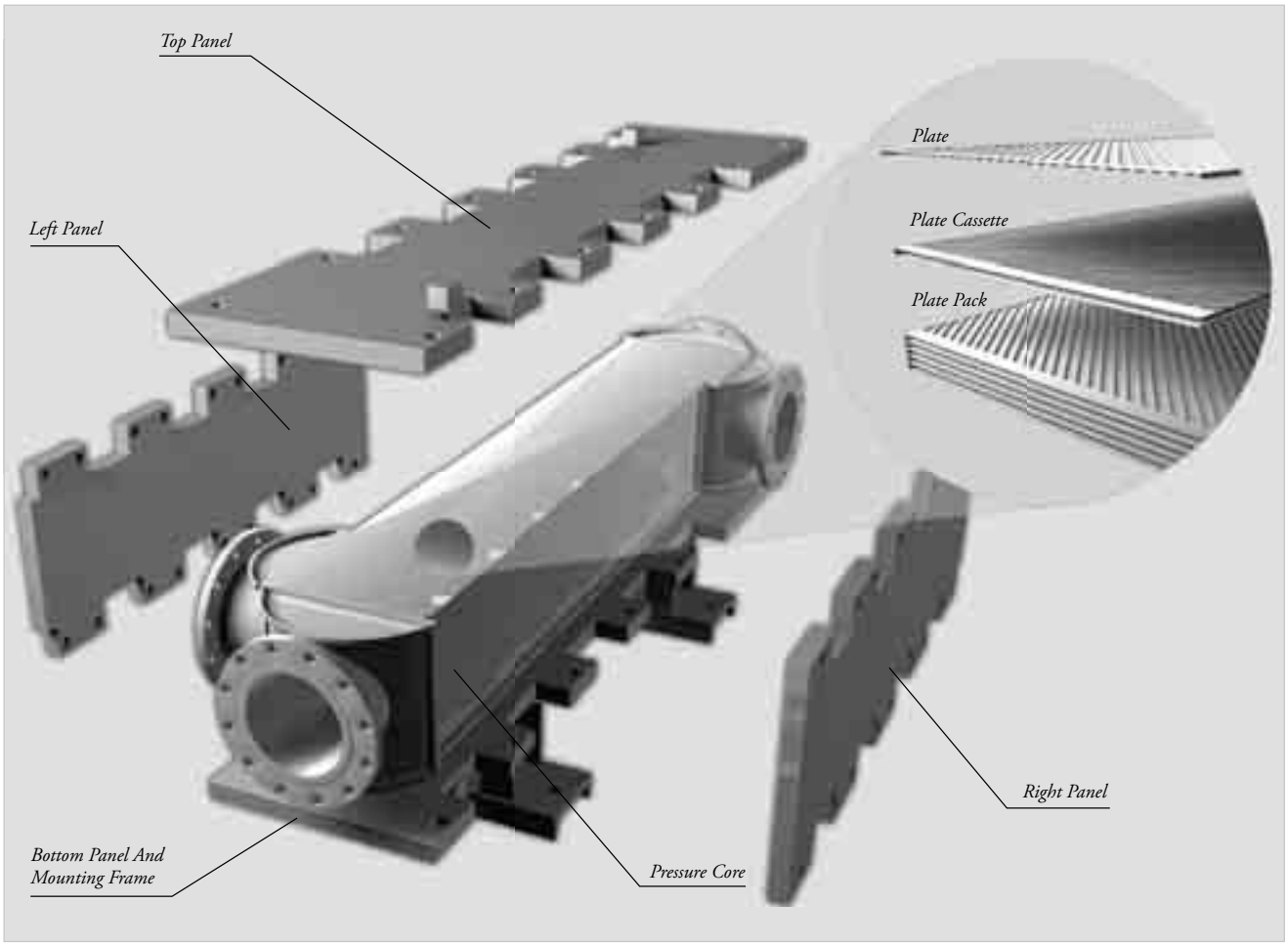
Working in much the same way as a conventional, gasketed plate & frame heat exchanger, the ULTRAMAX embossed metal plates are arranged alternately into cassettes and welded to form channels for hot and cold media. The plate pack is enclosed in a welded core with nozzles and installed in a frame to provide pressure integrity, either:

- A box of four bolted steel panels (UM-48 through UM-107).
- A frame of two bolted steel panels (UM-20).

The majority of the heat transfer plate welding is performed via a cost effective and reliable seam weld. The baffle clips eliminate continuous welding between the cassettes. These non-continuous welds allow the plate pack to expand and contract along the length of the pack as temperature and pressure changes take place. This accommodates differential thermal expansion and mechanical stresses better than many other heat exchanger designs.

## Multi-pass and multi-core configurations answer application challenges

The external panels are carbon steel (standard) or optional stainless steel for low temperature applications. Large-capacity or multi-pass configurations incorporate up to five cores within a single enclosure, allowing greater flexibility in process flow. The ULTRAMAX line offers six different plate lengths, including the largest plate size in its class, with an area of 0.989 $m^2$ (10.65 $ft^2$).




*The ULTRAMAX exchanger employs heavy-gauge bolted panels to provide pressure integrity to the internal core.*

# SUPERMAX® For Amazing Efficiency In A Small Footprint

*The Removable Cover and Standard SUPERMAX units are shown above. Contact the Tranter factory for additional information on the removable cover option.*

The SUPERMAX® shell & plate heat exchanger is designed for pressures to 70 barg (1,015 psig) and at temperatures up to 537°C (1,000°F) for standard range units. Extended range units are available for higher temperature and pressure applications. With alternating channels for hot and cold media, the SUPERMAX can be configured to provide true countercurrent or co-current flow. The SUPERMAX line offers three different diameters of circular plates.

The SUPERMAX is particularly suited to applications having a large flow imbalance, allowing higher flow rates on the shell side. Horizontal orientation makes the SUPERMAX an excellent choice for condenser/evaporator/boiling applications.

## Accordion-like core thrives through thermal expansion cycles

The chevron-type plates are fabricated into a cassette by a resistance seam weld, whose burst test strength is stronger than parent metal. Cassettes are then placed together and perimeter welded to each other, producing an accordion-like core that is highly tolerant to thermal expansion. A patented compression bellows option allows for extreme thermal expansion in high temperature applications. The plate pack is then inserted in a cylindrical shell. The shell and

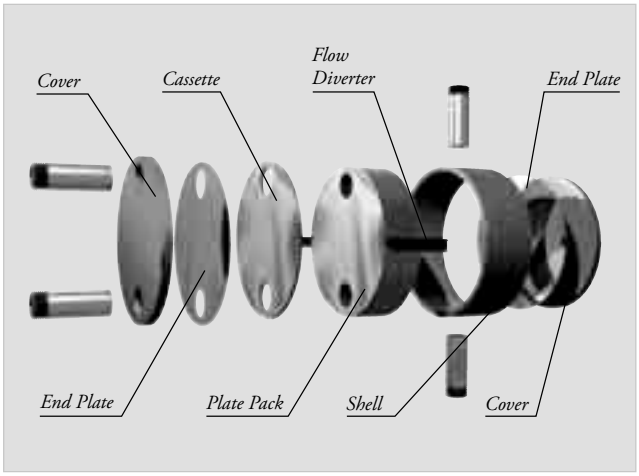
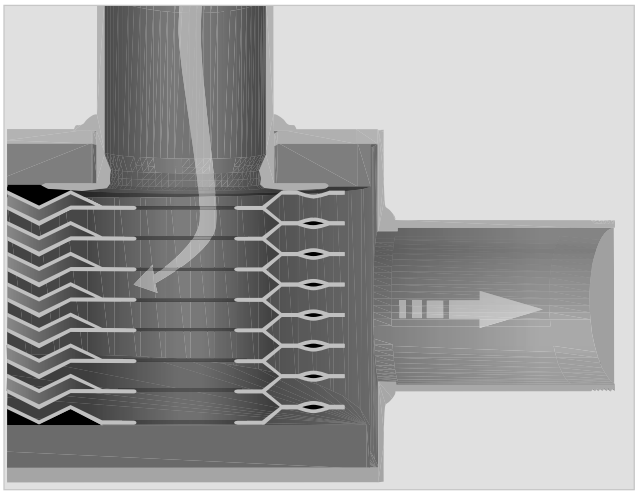



*Plate cassettes are welded together in an accordion pattern, producing a core of up to 300 plates that is highly tolerant of thermal cycling stresses. The SM-07 Standard unit is shown.*



*SUPERMAX flow patterns can be either countercurrent or co-current for higher efficiency.*

plate pack is fitted with special fluid diverters to ensure proper flow throughout the unit. End plates, nozzles and top and bottom covers are welded to the shell to form a pressure vessel of high integrity. Extra-large nozzle sizes can be accommodated on the shell side of the exchanger.

## The right materials for the job

SUPERMAX plate materials may be Type 316L stainless steel, titanium or other alloys; shells may be fabricated of carbon steel, Types 304, 316, 316L stainless steel or titanium. The unit can be fabricated from dissimilar metals when only one side will be exposed to corrosive conditions.

## Optional configurations meet special needs

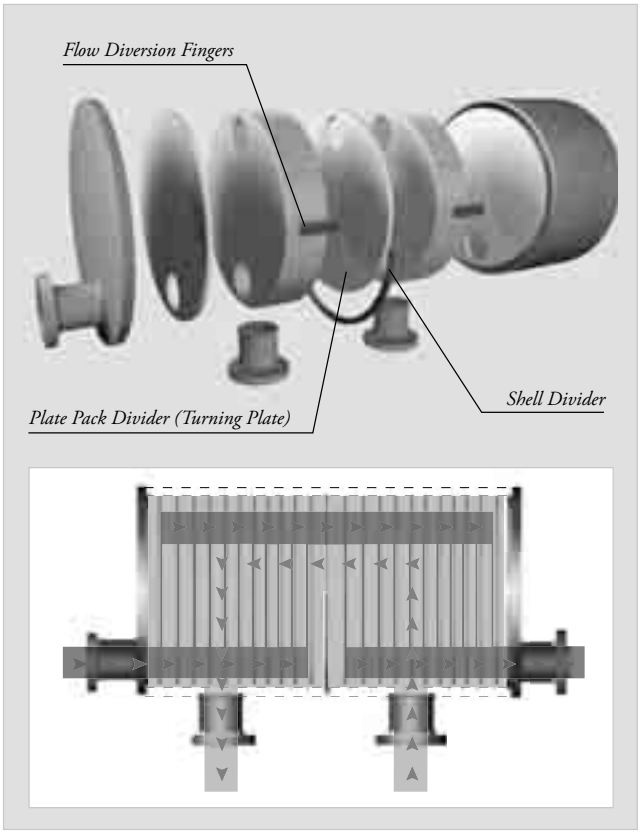
Various optional configurations of the SUPERMAX unit enable this versatile exchanger to meet wide-ranging application needs. The Removable Cover SUPERMAX exchanger provides full accessibility to the plate pack for inspection and/or mechanical cleaning by removing the plate pack bundle.

The Two-In-One SUPERMAX has two separate plate packs that share one shell. These cores can handle different or identical fluids. For flows that require a high flow rate, the two inlets and outlets can be piped together.

*The Two-In-One SUPERMAX unites two independent plate packs in a single shell.*

The Multi-Pass SUPERMAX establishes multiple passes through separate plate pack zones on both the plate and shell sides.

*The Removable Cover SUPERMAX exchanger is fully accessible for inspection and/or mechanical cleaning by removing the cover plate assembly.*




*The Multi-Pass SUPERMAX has separate plate pack and shell zones with countercurrent (shown above) or co-current flow.*

*All-welded, 316L SS or titanium construction makes the MAXCHANGER highly durable in demanding applications.*

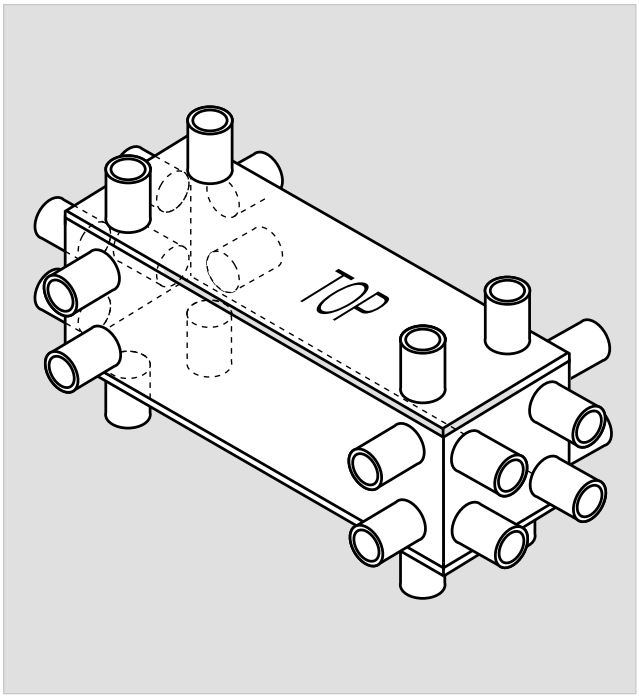
# MAXCHANGER®—The Design Engineer's Friend

MAXCHANGER® single- and multiple-pass designs fit virtually any application requirement. The unique geometry of the patented MAXCHANGER's variable interspaces produce extremely high "U" values. Channels formed between the specially dimpled, welded plates direct the two heat transfer media countercurrently through alternate paths for maximum efficiency, immediate thermal response and a close temperature approach capability of less than 1°C (2°F).

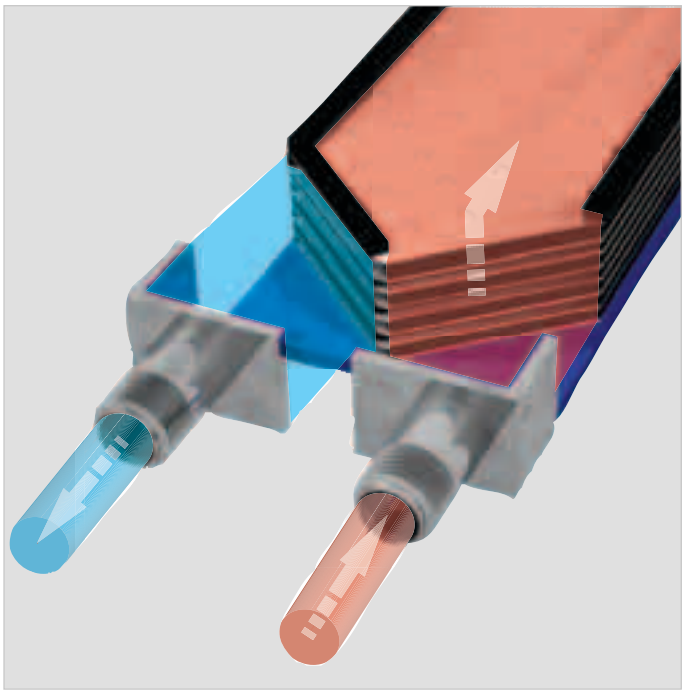
## Constructed for long life cycles

The 1-mm (0.039-in.) thick dimpled heat exchanger plates are sandwiched between top and bottom plates specified to withstand the design pressure. Special spacers separate the plates, isolating the channels and establishing countercurrent flow. Four corner angles (or half-pipes) are welded to side plates, top and bottom plates and to the heat exchange plate points, forming inlet and outlet headers.

The corner angle fittings or corner half-pipe fittings, enable inlets and outlets—NPT or flanged—to be located in any number of configurations for maximum flexibility in tight spaces.




*MAXCHANGER permits inlets and outlets to be configured flexibly for small footprints without conflicts or complex piping.*



*MAXCHANGER can achieve an extremely close temperature approach of less than 1°C (2°F).*

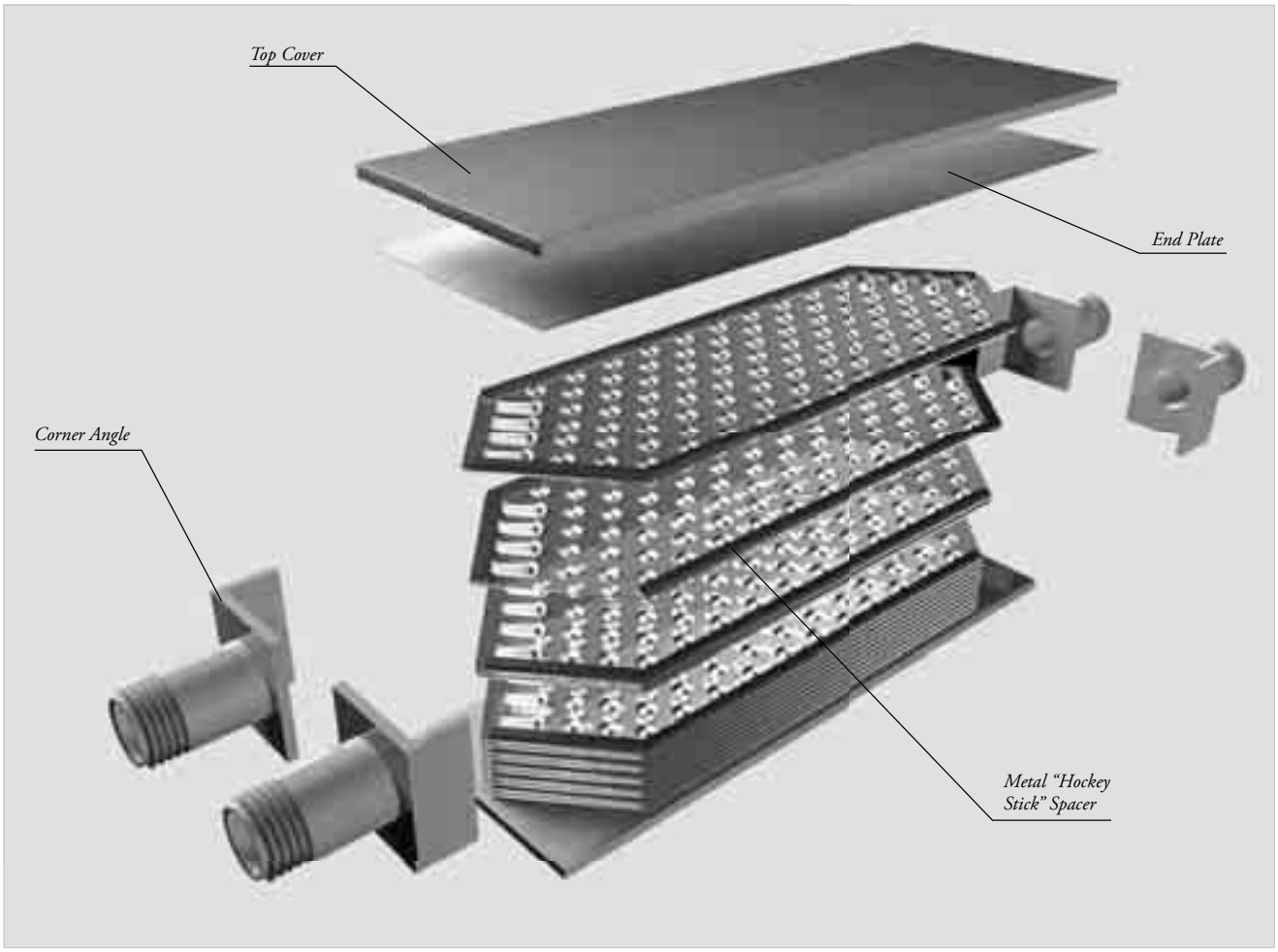
## Worth a second look

A quick look a the MAXCHANGER may lead you to dismiss it as a CBE-type unit. Yet there is nothing *brazed* in this unit—it is truly all-welded 316L SS. Consider MAXCHANGER ratings: to 70 barg (1,015 psig) and 538°C (1,000°F). No CBE can survive under those conditions.

The difference…MAXCHANGER plates and spacers are welded into a 100% steel block able to withstand all that temperature, pressure and corrosives can dish out. CBEs, on the other hand comprise a sandwich of different metallurgical layers—steel, plus brass, bronze, silver, tin, zinc, or copper—simply linked to each other. Consequently, CBE brazements are only about one-third as strong as the plate material. With thermal cycling and attack by corrosives, this sandwich breaks down, causing leaks, cross-contamination and failure.

MAXCHANGER gives you shell & tube performance under these demanding conditions, for a fraction of the installed mass and footprint. Its space efficiency is further enhanced by the nozzle configuration flexibility. While CBEs are limited to nozzles on the front (or back) plates alone, MAXCHANGER nozzles can be configured on the front, back, either side, and top or bottom—even at the corners—thanks to the way the channels are formed. This space-saving benefit can help design engineers optimize overall system footprint. With MAXCHANGER durability, the unit will often outlive the system service life, eliminating the need for service access for an additional space-saving benefit.

Under extreme conditions, or even non-demanding conditions, compared to CBEs, MAXCHANGER is truly worth a second look.




*This exploded view of the all-welded MAXCHANGER unit shows the large number of dimpled contact points that provide maximum pressure resistance and heat transfer.*

# Idea Notebook

Wherever a heat source exists, Tranter all-welded plate heat exchangers can capture it…for impressive energy savings.

# The Versatility Of All-Welded Units

Welcome to Idea Notebook, encompassing a variety of illustrations and flow charts that demonstrate the flexibility of ULTRAMAX, SUPERMAX and MAXCHANGER all-welded plate heat exchangers in Process Engineering applications and in OEM and Integrator systems.

Study each of the applications to learn how our all-welded units can give you the thermal efficiency and compactness of plate & frame exchangers in elevated pressure/high and low temperature or corrosive media applications traditionally handled by S&T heat exchangers.

We're ready to complement your design with superior technology—and your anticipated savings in cash!

Note that the applications shown are concepts only based on generalized conditions. Any product recommendations and performance guarantees can be made only with the completion of application data sheets and/or process modeling.

## For OEMs and Integrators

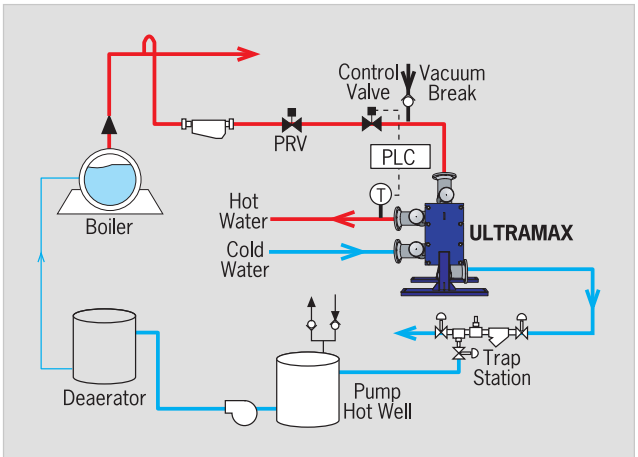
*Saving space and weight in modular skidded systems (SUPERMAX in foreground).*

*ULTRAMAX squeezes into a significantly smaller footprint with vastly lower mass than S&T HEs, thanks to superior heat transfer performance.*

*MAXCHANGER inlet/outlet options place few limits on piping flexibility.*

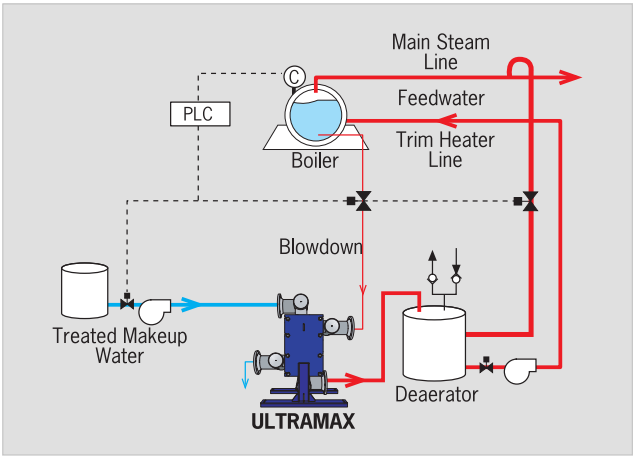
## For process engineering

### Steam Water Heating



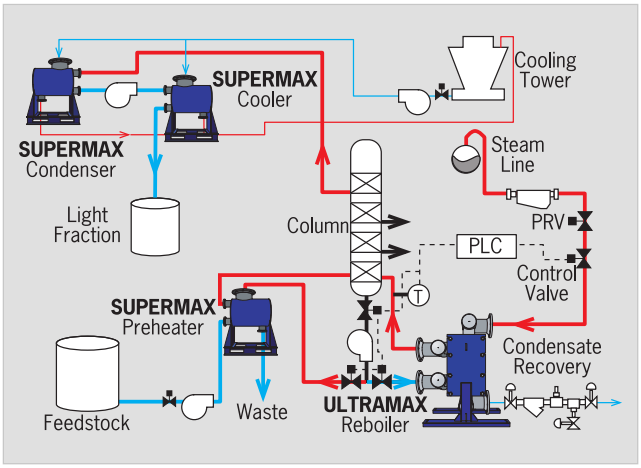

*An ULTRAMAX HE uses steam to provide hot water for district heating, CIP solutions or process needs.*

### Boiler Blowdown Heat Recovery



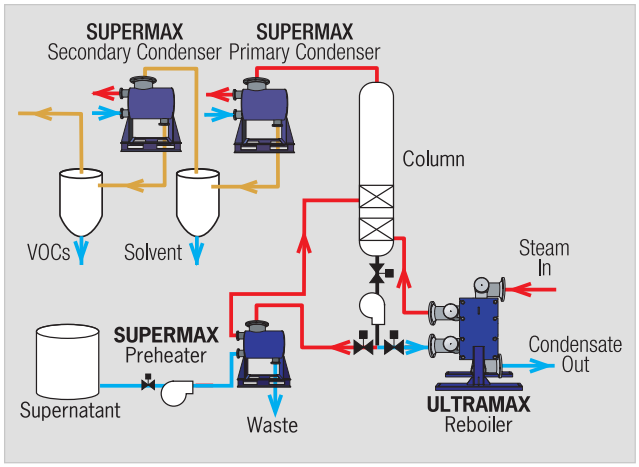

*An ULTRAMAX HE is used to recover blowdown heat for heating makeup water, reducing deaerator steam load.*

## Fractionation



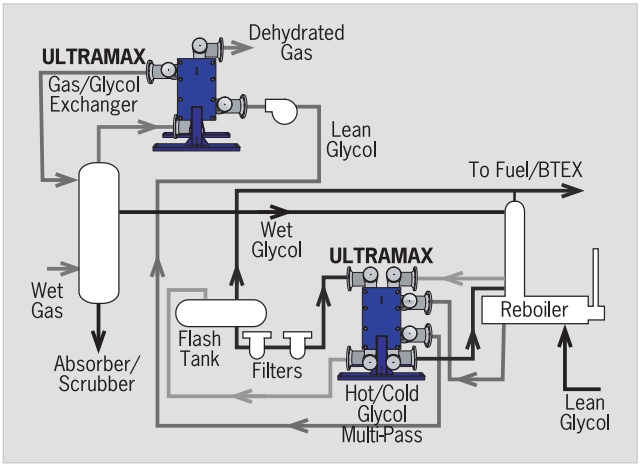

*An ULTRAMAX functions as a reboiler, while SUPERMAX HEs recover waste heat and condense light fractions.*

## Solvent Recovery



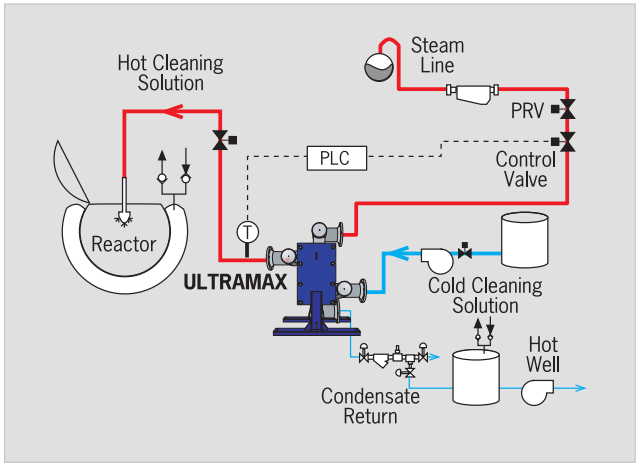

*SUPERMAX HEs serve as preheaters and condensers, while an ULTRAMAX HE functions as a reboiler.*

## Glycol Mediated Gas Dehydration



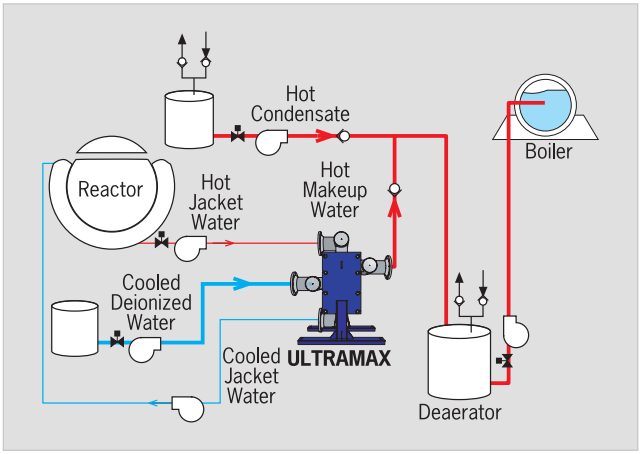

*One ULTRAMAX HE uses hot dehydrated gas to heat lean glycol as a scrubbing medium, while another multi-pass unit heats both wet glycol and hot glycol from the still column.*

## CIP Solution Heat



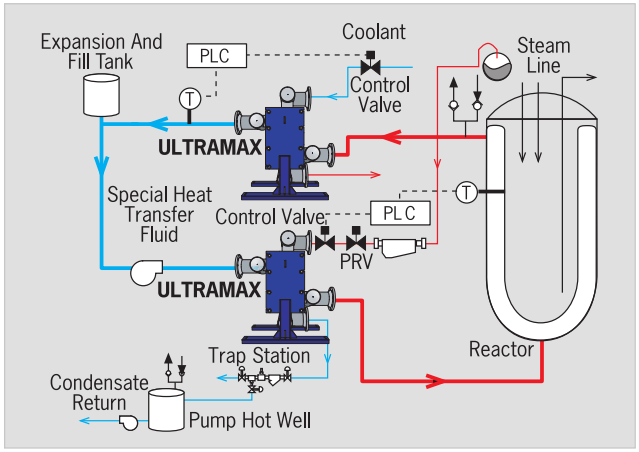

*An ULTRAMAX HE uses steam to heat cold cleaning solution for critical clean-in-place reactor residue removal.*

## Waste Heat Recovery



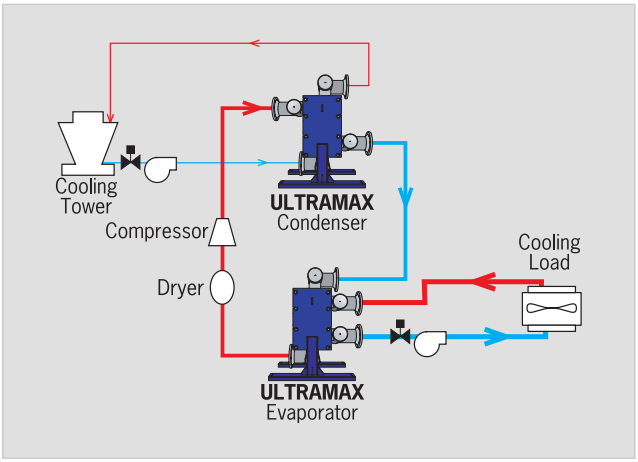

*An ULTRAMAX HE uses byproduct heat from an exothermic reactor to heat boiler makeup water, reducing fuel costs.*

## Reactor Temperature Control



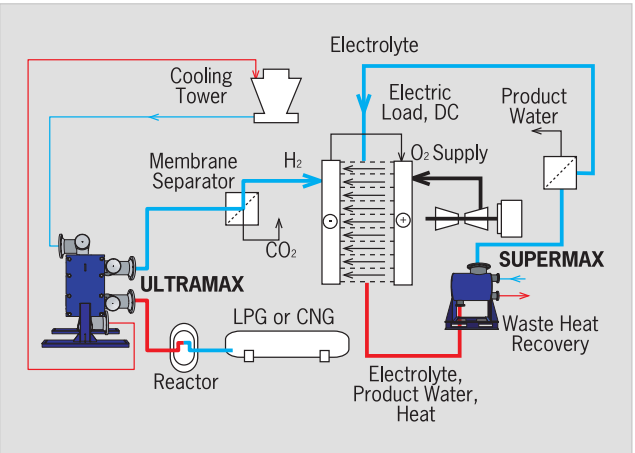

*Two ULTRAMAX HEs provide precise temperature control for a glass-lined reactor; one applying cooling media and the other steam to modulate the temperature of a special heat transfer fluid.*

## Refrigerant Condensation



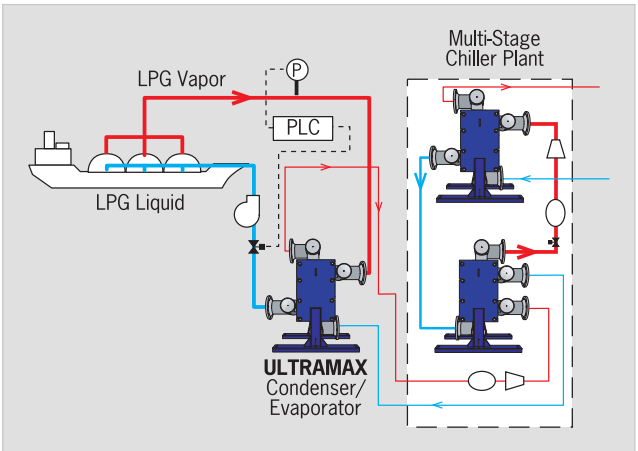

*Two ULTRAMAX HEs comprise the essentials of a high-performance chiller system.*

## Fuel Cell Gas And Electrolyte Cooling

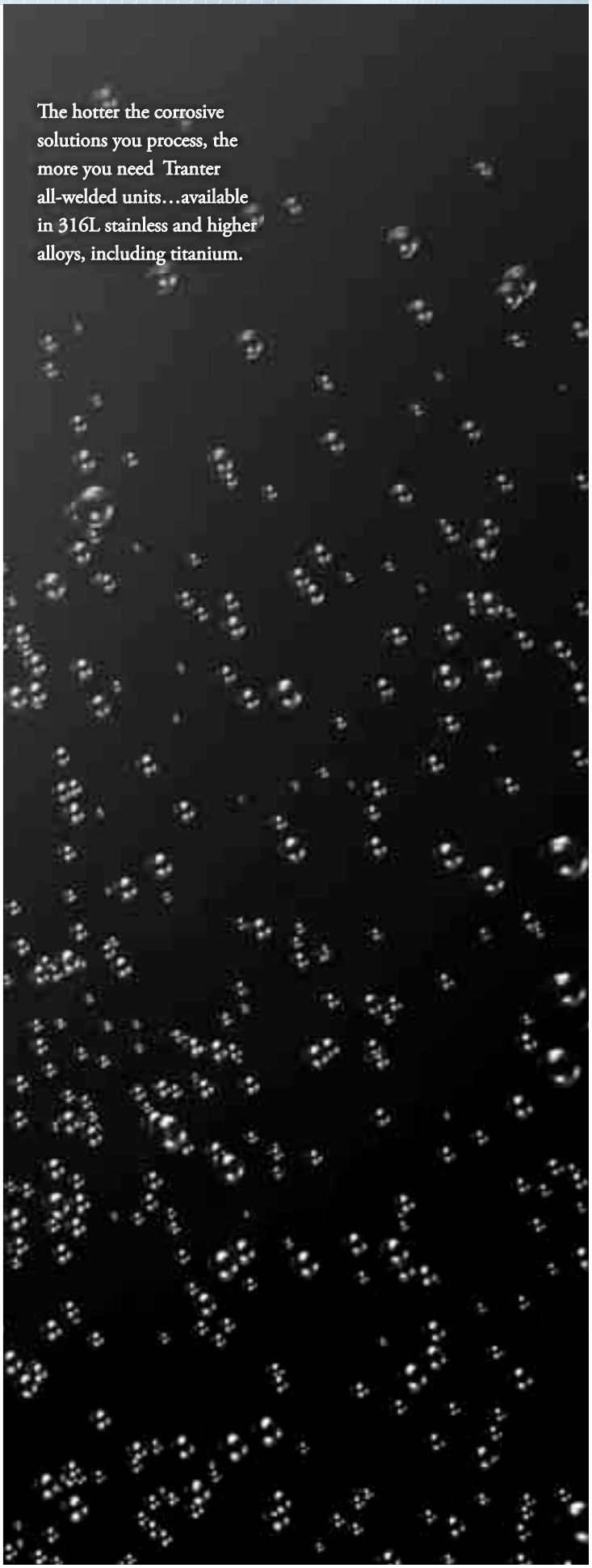



*An ULTRAMAX HE cools reaction gases for membrane separation, while a SUPERMAX HE cools electrolyte and recycles byproduct heat.*

## LP Gas Reliquefaction

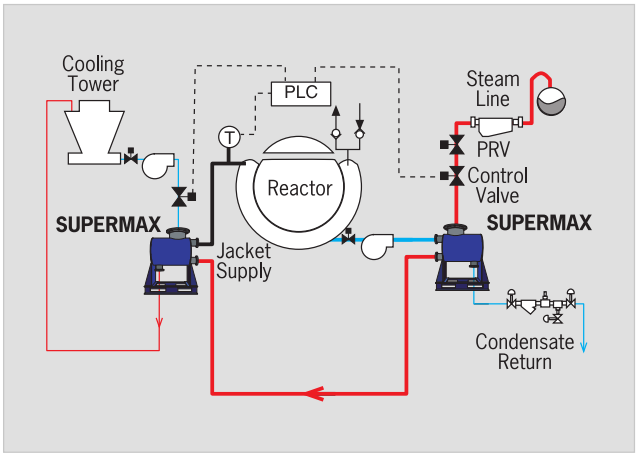



*ULTRAMAX HEs can be configured as a multi-stage chiller and condenser to reliquefy LPG during transport.*



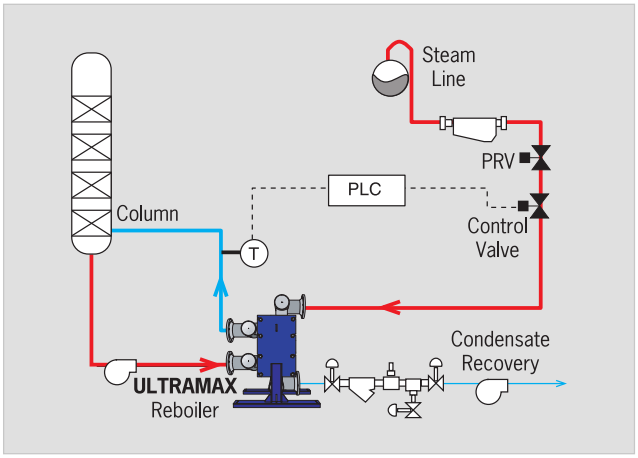
Thermal shock can be destructive to conventional heat exchangers. Tranter all-welded units withstand temperature swings well over long life cycles.

## Reactor Sequential Heating And Cooling



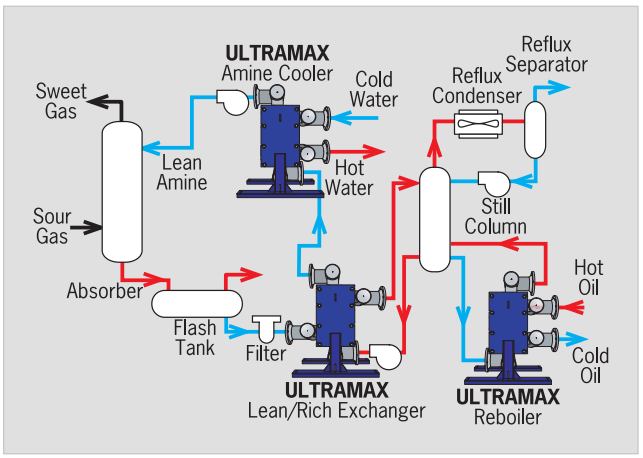

*SUPERMAX HEs supply controlled heat and cooling for batch reactors for efficient attainment of maximum yield.*

## Reboiler Heating



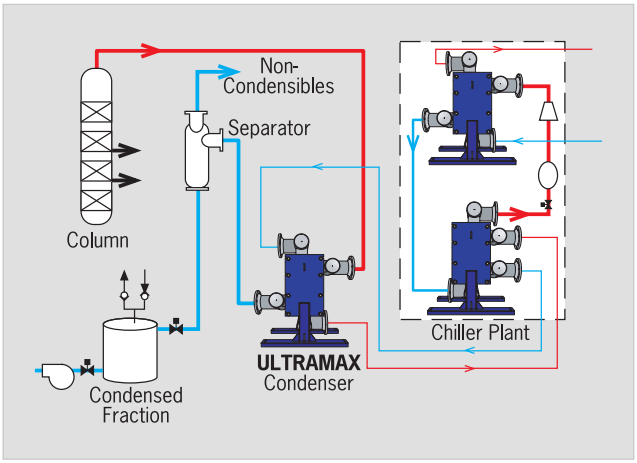

*An ULTRAMAX HE functions as a steam heated reboiler in a fractionation column. Small hold-up volume enables precise temperature control.*

## Amine Processing



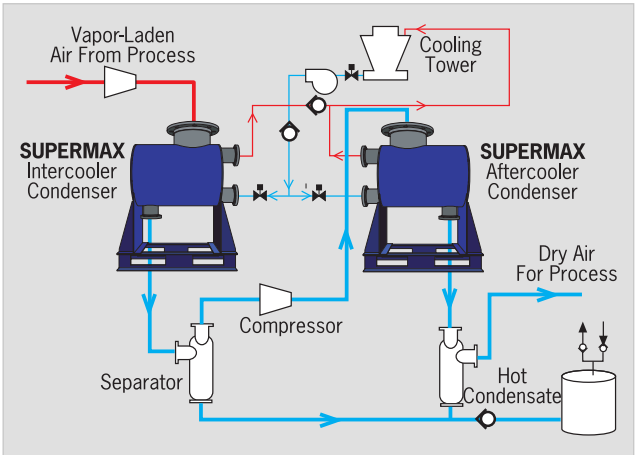

*One ULTRAMAX HE uses column bottoms to preheat rich/lean amine mixtures for distillation, while a second recovers heat and cools lean product for gas absorption.*

## Gas Condensation



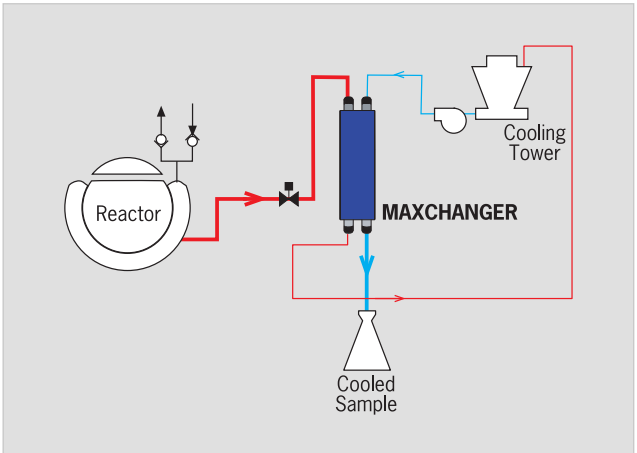

*A multi-pass ULTRAMAX supplied by a chiller functions as a condenser for light fractions while passing noncondensibles for disposal or compression.*

## Air Purification Or Gas Aftercooling




*A SUPERMAX is used as an aftercooler to condense vapor from wet air; a second SUPERMAX to condense a special cooling media.*

## Reactor Sample Cooling




*A MAXCHANGER rapidly cools a reactor sample for analysis in continuous or batch processing.*

The close temperature approach of Tranter all-welded units makes even low-grade heat sources opportunities for attractive energy savings.

Tranter all-welded heat exchanger manufacturing facilities are ISO certified, adhering to the highest standards in designing, manufacturing and testing plate heat exchangers.

# Applications Data

## Extended range–pushing the limits

Our standard specifications are a sampling of typical capabilities. Higher capabilities are usually possible. Contact the factory for information on extended range specifications for your particular application.

## Sizes to cover a wide range of applications

From the tiny MAXCHANGER MX-12 to the huge UM-107, the largest plate in its class, there is a Tranter all-welded unit to accommodate wide-ranging flow rates and fluid properties. Tranter all-welded units are further tunable to the application by the ability to adjust the number of plates comprising the plate pack. These exchangers satisfy the component needs of high-volume OEMs as well as world-class process facilities. With the aid of sophisticated algorithms built into Tranter's Configurator software, you will be presented with an optimal solution for your needs.

### All-Welded PHE Standard Range General Specifications

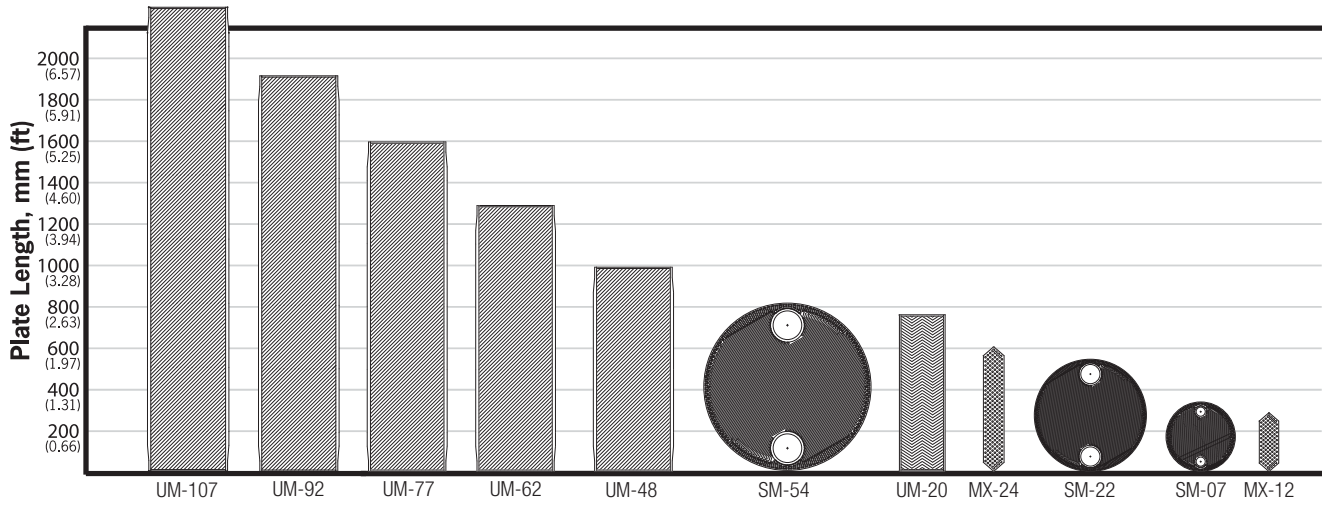
| | ULTRAMAX | SUPERMAX | MAXCHANGER |
|---|---|---|---|
| Max. Pressure Rating, barg (psig)[a] | 45 (650) | 70 (1,015) | 70 (1,015) |
| Max. Temperature Rating, °C (°F) | 343 (650) | 538 (1,000) | 538 (1,000) |
| Standard Plate Material[b] | 316L SS | 316L SS | 316L SS |
| Standard Frame | Carbon Steel | Carbon Steel Frame, 316L SS Shell | 316L SS |
| Max. Connections, DN (ANSI RF in.) | 250 (10) | 400 (16) | 50 (2) |

[a] Contact factory for higher pressure and temperature ratings
[b] Higher performance materials are available.

### Tranter All-Welded PHE Comparative Performance

| | ULTRAMAX® | SUPERMAX® | MAXCHANGER® |
|---|---|---|---|
| Compact | ++ | ++ | +++ |
| Light Weight | + | ++ | +++ |
| Liquids, Gas, Steam, Dual Phase | +++ | +++ | ++ |
| Elevated Pressure | ++ | +++ | ++ |
| Elevated Temperature | ++ | +++ | +++ |
| High Q | +++ | +++ | +++ |
| Mech. Or Therm. Fatigue Resistance | + | +++ | ++ |
| Mechanically Cleanable | 0 | ++ | 0 |
| Pressure Drop | ++ | ++ | ++ |

0=Not recommended +=Good ++=Excellent +++=Outstanding




*Tranter all-welded PHE applications span a wide range of capacities and fluid properties.*

# Other Tranter Plate Heat Exchanger Products And Accessories

## Portable CIP systems

Cleaning on-site, in-place is the proactive approach to maintaining your equipment. Nothing fits your all-welded PHEs or their maintenance needs like a Tranter portable CIP system. The Tranter portable CIP system is designed to clean most types of deposits in all-welded PHEs, including crystallization, particulates, chemical reactions, corrosion and biological foulants. With these systems you can efficiently maintain heat transfer performance, prevent excessive pressure drops and deposit corrosion, and minimize downtime. Tranter portable CIP systems are available in two standard sizes or custom configurations to your specifications.

*CIP-50 System (foreground) is compact and portable. Tranter can also configure custom CIP system configurations (background).*

CIP Systems Specifications[a]

| | CIP-50-25-F | CIP-100-50-S |
|---|---|---|
| Recommended Nozzle Size, mm (in.) | 25.4-102 (1-4) | 102-203 (4-8) |
| Pump Size, litres/min (gpm) | 94.5 (25) | 189 (50) |
| Tank Capacity, litres (gal) | 189 (50) | 378 (100) |
| Hose Size, mm (in.) | 25.4 (1) | 50.8 (2) |
| Heater | No | Yes |
| Max. Hold-up Volume, litres (gal) | 132 (35) | 284 (75) |

[a] Tranter can also custom build units to meet your specifications.

## SUPERCHANGER®

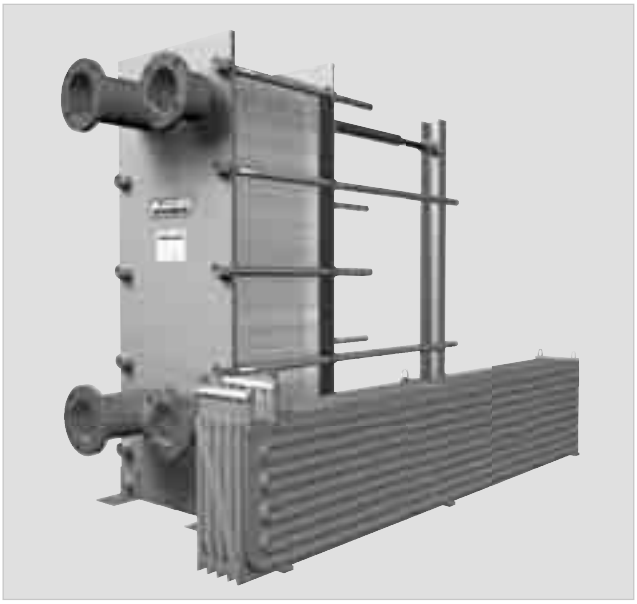
SUPERCHANGER® plate & frame heat exchangers transfer heat more efficiently than S&T in most applications, due in large measure to the turbulent flow created by the corrugated patterns of the plates. They offer "U" values three to five times greater than S&T units, a less than 2°F temperature approach, easy maintenance and in-place expansion capability.

SUPERCHANGER offers the broadest selection of plate designs, including herringbone and chevron styles with fully glued, SPOTGLUED® or Clip-On gaskets. End frames offer a choice between studded port connections and flanged extended nozzles. A broader selection means a better match to your requirements, thus lower costs.

## PLATECOIL®

These versatile, highly efficient PLATECOIL® prime surface heat exchangers replace costly and unwieldy pipecoil, steam sparging or expensive resistance heating elements. High internal flow velocities of these exchangers generate effective heat transfer rates.

Tranter's exclusive Multi-Zone configuration—designed to uniformly deliver steam to all levels of the unit through zoned headers—and two Serpentine configurations are available in more than 300 standard sizes or can be custom designed. Single- and double-embossed styles may be flat, bent or rolled as immersion heaters, banked for tanks, used in mixers, cryogenic shrouds, jacketed vessels, clamp-on panels and a wide variety of other configurations.



*The SUPERCHANGER® plate & frame unit (left) and PLATECOIL prime surface panels fabricated into cargo heating banks.*

## At the forefront of heat exchanger technology for more than 70 years

Tranter top quality, high-performance, proprietary products are on the job in demanding industrial and commercial installations around the world. Backed by our comprehensive experience and worldwide presence, Tranter offers you exceptional system performance, applications assistance and local service. Tranter is close to its customers, with subsidiary companies, agents, distributors and representatives located worldwide. Contact us for a qualified discussion of your needs.

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