SULZER

Cutting-edge pumping solutions for the concentrated solar power generation

The Sulzer advantage

Taking on new challenges

Around the world, the power industry is taking on the challenge to produce clean, dependable energy from renewable resources. Concentrated Solar Power Generation (CSP) provides a sustainable solution to energy needs, today and in the future. Sulzer has been working with customers to provide reliable and cost-effective solar power since supplying pumps to a CSP plant in 1984.

Designed to your needs

- The daily start-and-stop and temperature fluctuations in CSP operations place extreme demands on all components in a system. Sulzer provides pumping solutions that give lifetime reliability with increased output, high efficiency, and improved Mean Time Between Maintenance (MTBM)
- Sulzer answers demanding needs with a full line of steam generator feed water, cooling water and condensate extraction pumps for all CSP technologies

Focused on efficiency

- Selecting the right pump is one key factor for boosting operational efficiency; Sulzer is the specialist to provide efficient pumping solutions
- Thanks to leading-edge products, Sulzer contributes to improve customers' equipment efficiency

Improvement of environmental footprint

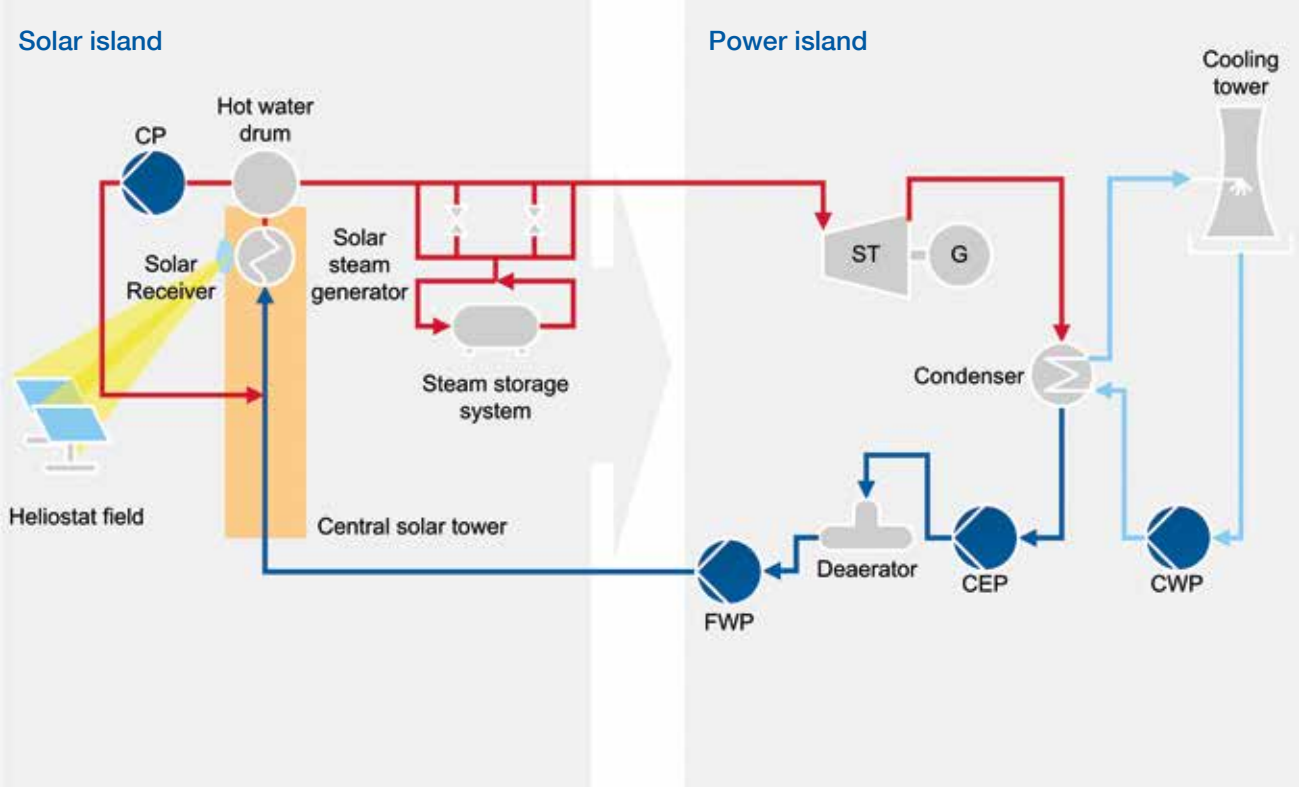
- Sulzer's high efficient pumps and services contribute to reduce overall emissions
- Sulzer aims at maintaining the balance between economic success, sound social responsibility and environmentally friendly solutions in short- and long-term decision making

Whatever the process, we have the pumping solutions

You set out the challenge, we present the solutions.

Heliostat with central tower and direct steam generation

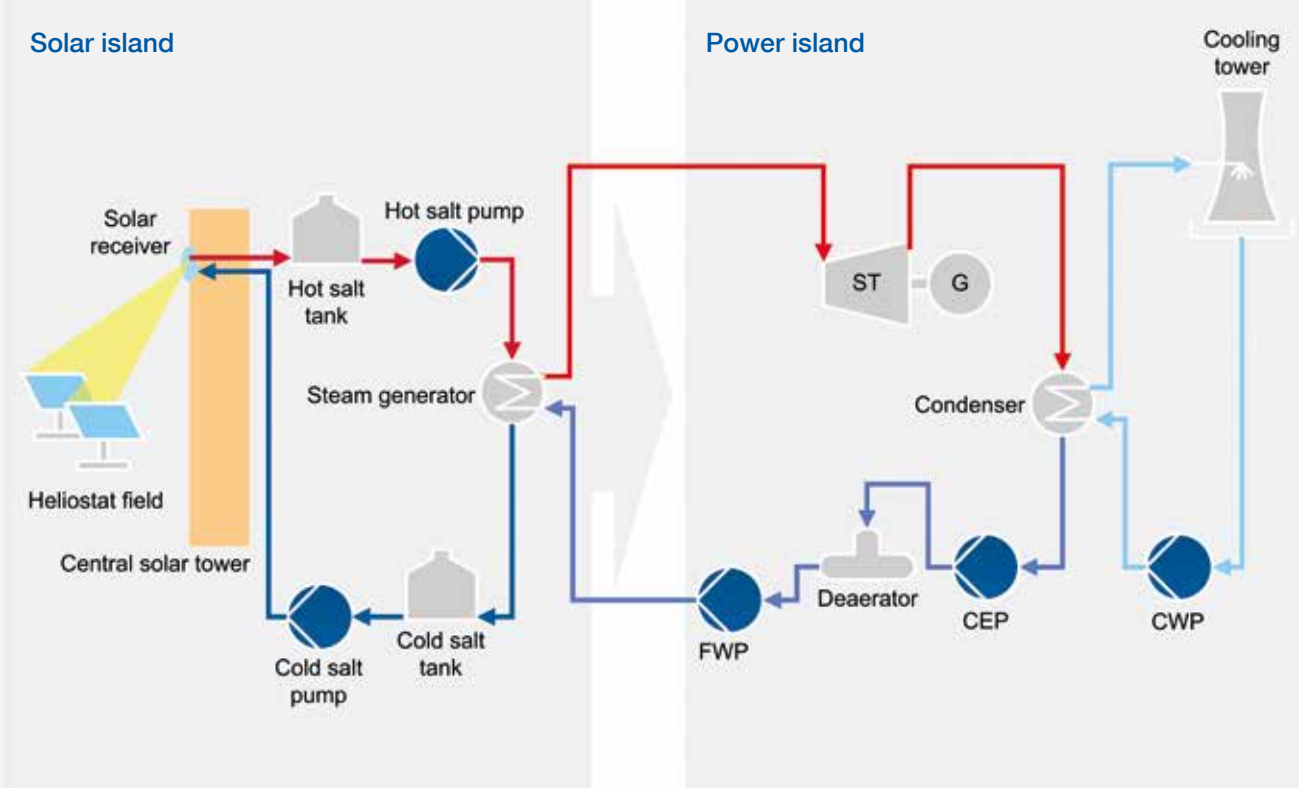
Using a central solar tower, heliostat fields involve direct steam generation provided with a certain steam storage capacity. Sulzer supports these processes with pumps for Feed Water (FWP), Hot Water Circulation (CP), Condensate Extraction (CEP) and Cooling Water (CWP).



CEP = Condensate Extraction Pump
CP = Hot Water Circulation Pump
CWP = Cooling Water Pump
FWP = Feed Water Pump
G = Generator
ST = Steam Turbine

Heliostat with central tower and molten salt heat storage

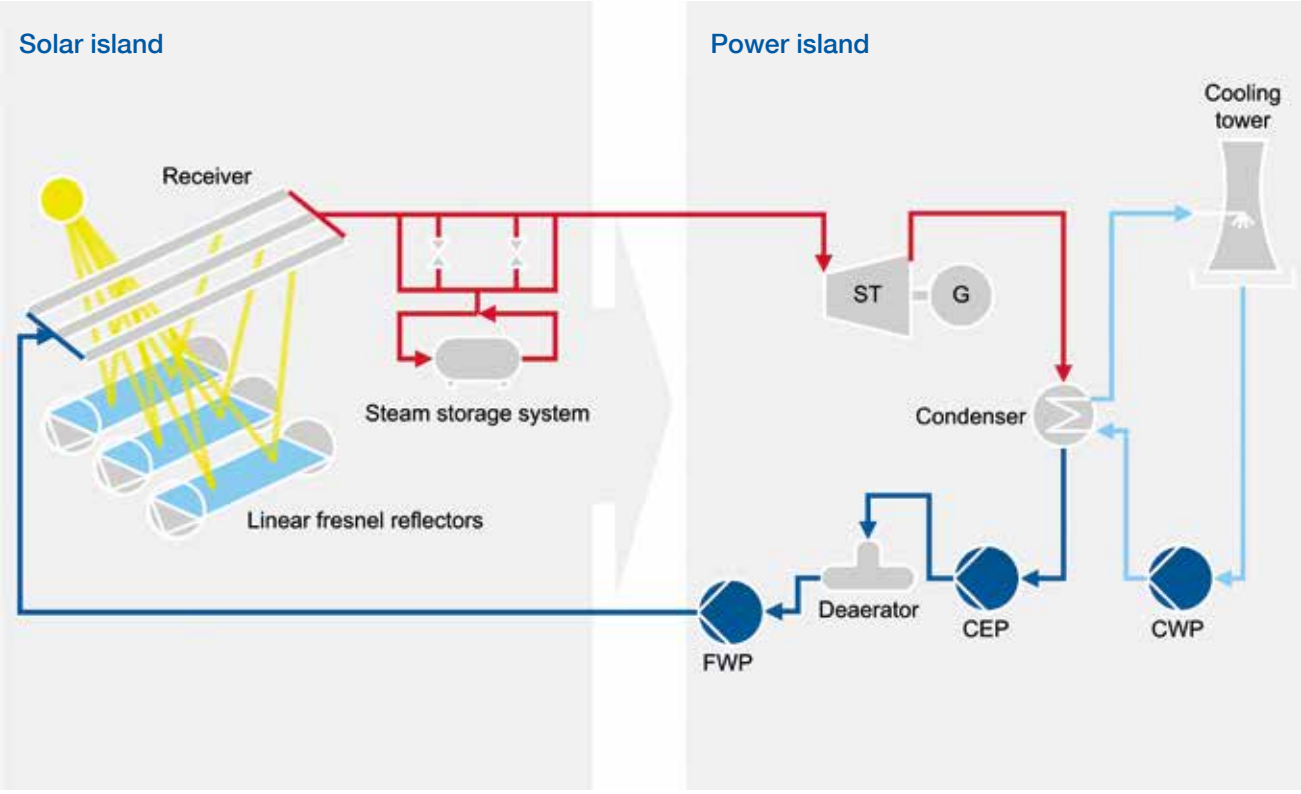
Using a central solar tower, heliostat fields heat up the molten salt. The molten salt is used as primary heat transfer fluid and also to store heat generated in this process. Sulzer supports these processes with pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP) and Molten Salt Circulation.



CEP = Condensate Extraction Pump
CWP = Cooling Water Pump
FWP = Feed Water Pump
G = Generator
ST = Steam Turbine

Linear Fresnel reflector with direct steam generation

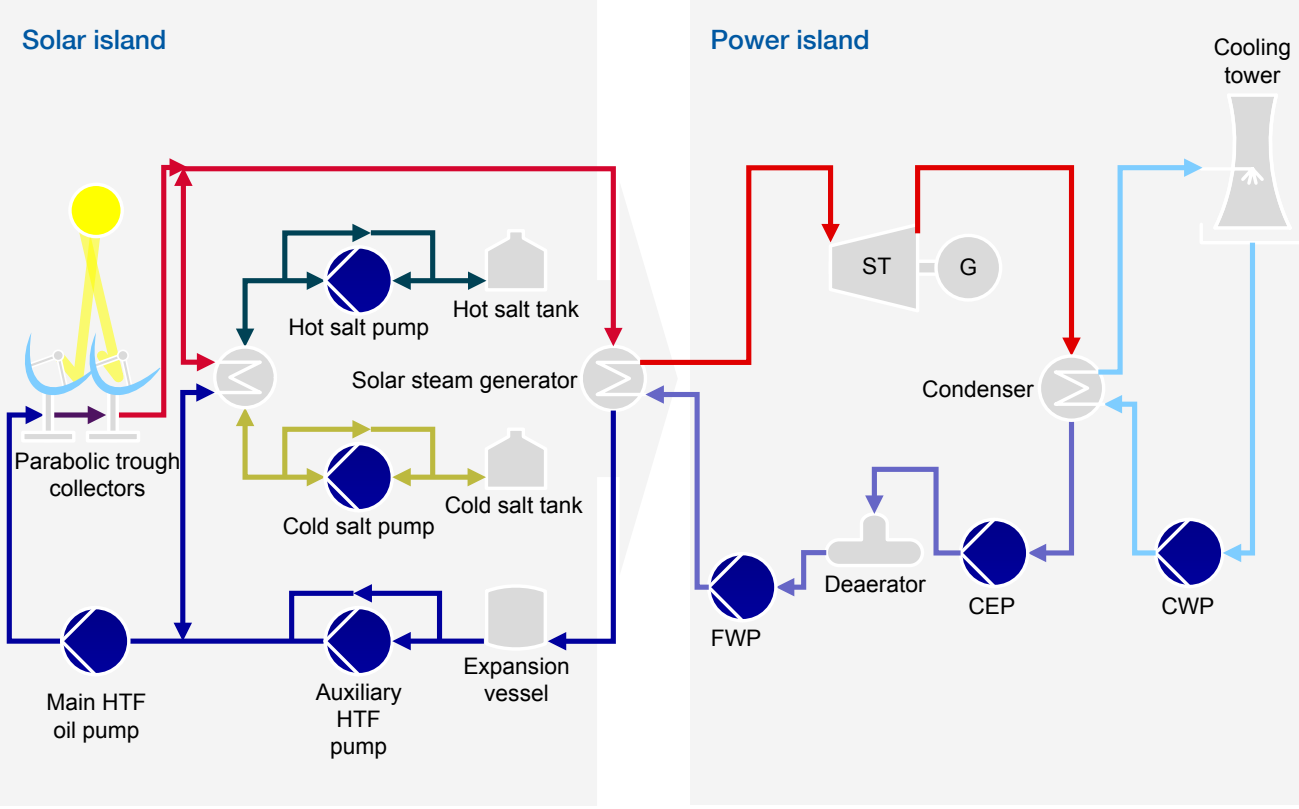
Using linear Fresnel reflector, collectors involve direct steam generation provided with a certain steam storage. Sulzer supports these processes with pumps for Feed Water (FWP), Condensate Extraction (CEP) and Cooling Water (CWP).



CEP = Condensate Extraction Pump
CWP = Cooling Water Pump
FWP = Feed Water Pump
G = Generator
ST = Steam Turbine

Parabolic trough with molten salt heat storage

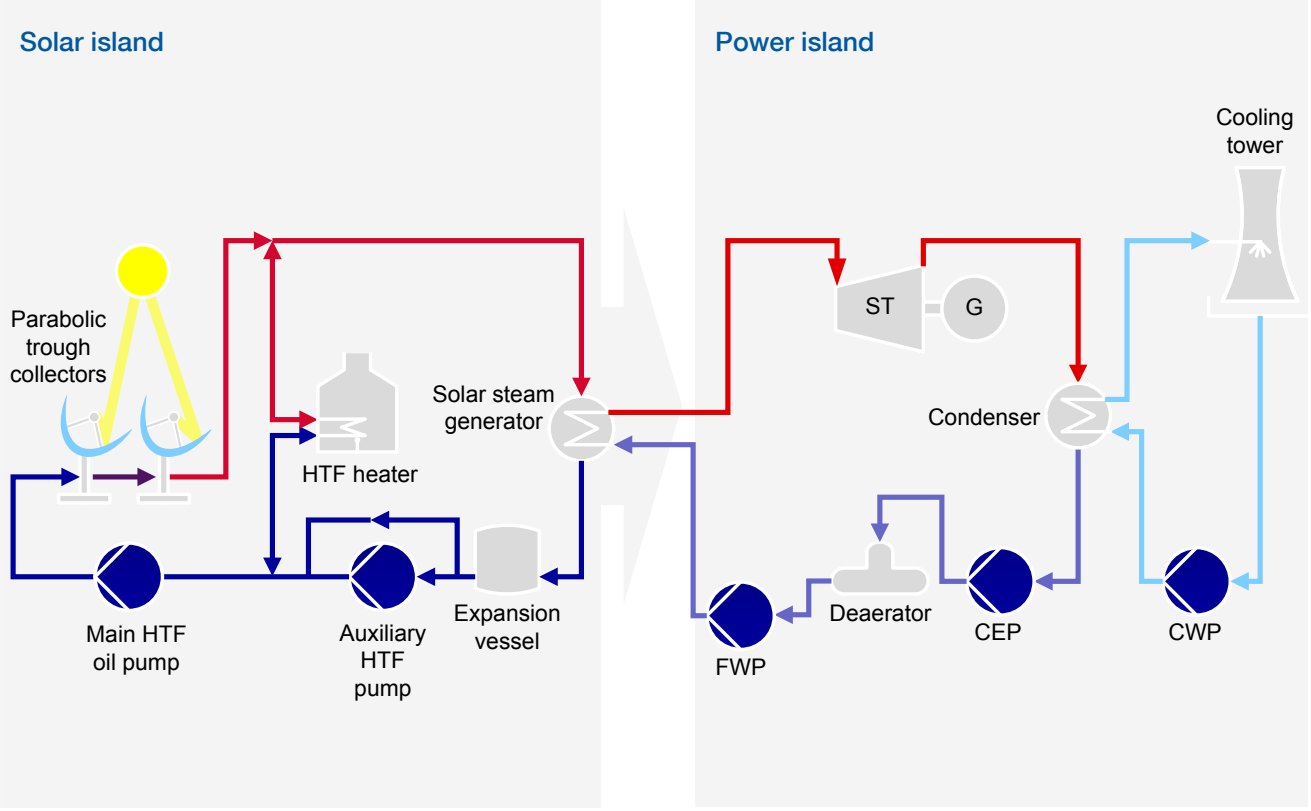
Parabolic trough collector systems are using thermal oil as primary heat transfer fluid to heat up the salt. The molten salt is used as secondary heat transfer fluid to store heat generated in this process. Sulzer equipment for these operations includes pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP), molten salt circulation, as well as main and auxiliary pumps for Heat Transfer Fluid (HTF).



CEP = Condensate Extraction Pump
CWP = Cooling Water Pump
FWP = Feed Water Pump
G = Generator
HTF = Heat Transfer Fluid
ST = Steam Turbine

Parabolic trough without heat storage

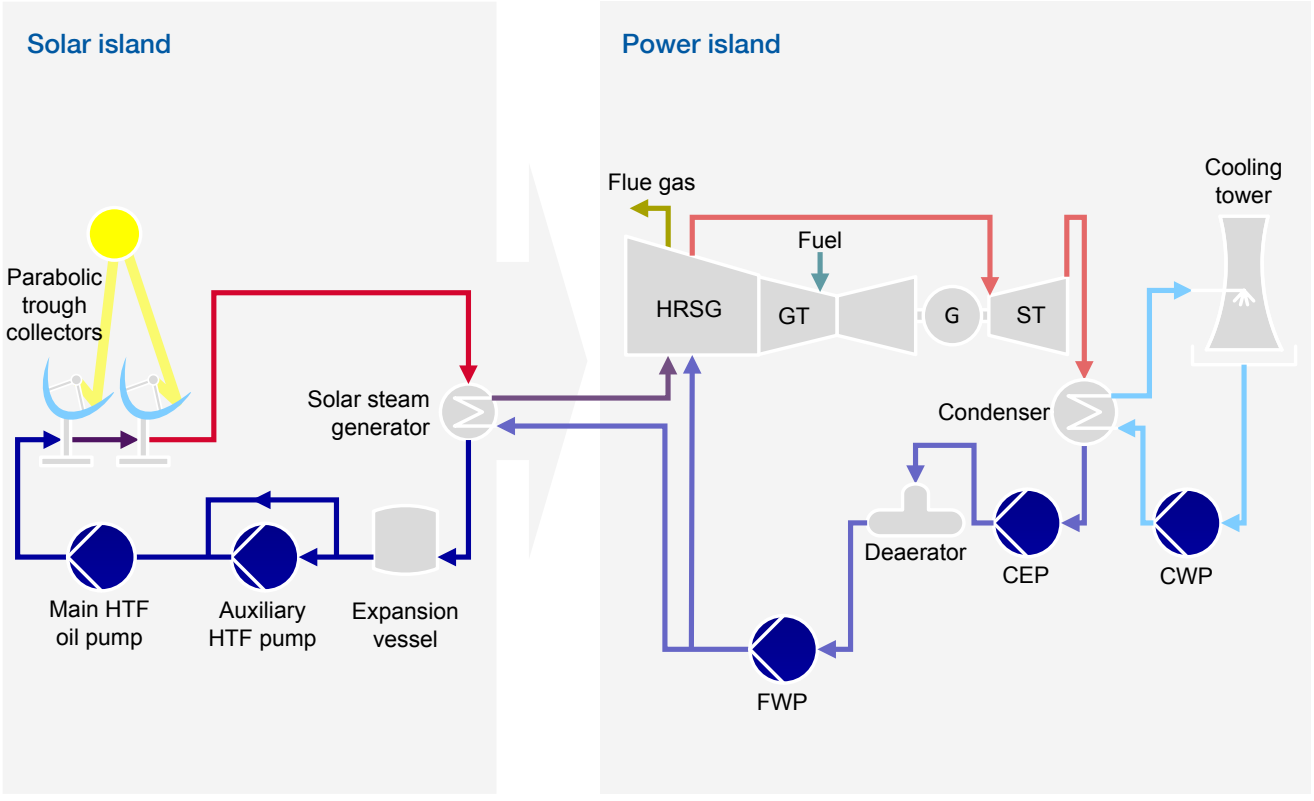
This system is using thermal oil as primary heat transfer fluid heated up to around 400°C. It is continually pumped through the solar field with high and variable flow rates and temperatures. Sulzer equipment for these operations includes pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP) as well as main and auxiliary pumps for Heat Transfer Fluid (HTF).



CEP = Condensate Extraction Pump
CWP = Cooling Water Pump
FWP = Feed Water Pump
G = Generator
HTF = Heat Transfer Fluid
ST = Steam Turbine

Hybrid integrated solar combined cycle (ISCC)

This process uses parabolic trough collectors and thermal oil as primary heat transfer fluid. Sulzer equipment includes pumps for Feed Water (FWP), Condensate Extraction (CEP), Cooling Water (CWP), as well as main and auxiliary pumps for Heat Transfer Fluid (HTF).



CEP = Condensate Extraction Pump
CWP = Cooling Water Pump
FWP = Feed Water Pump
G = Generator
GT = Gas turbine
HRSG = Heat Recovery Steam Generator
HTF = Heat Transfer Fluid
ST = Steam Turbine

Our comprehensive product portfolio

Power plant type	Application						
	Solar island			Power island			
	HTF oil pump	Molten salt pump	Hot water circulation pump	Feed Water Pump (FWP)	Condensate Extraction Pump (CEP)	Cooling Water Pump (CWP)	Auxiliary pump
	Pump type						
	HZB-HTF BBS ZE/ZF OHH	VEY VNY	ZE/ZF PRER/ PRETR	MD MC MBN GSG	SJD (CEP) ZE	SJT SJM SMD SMN ZPP	AHLSTAR SNS
Heliostat with central tower and direct steam generation		✓	✓	✓	✓	✓	✓
Heliostat with central tower and molten salt heat storage		✓		✓	✓	✓	✓
Linear Fresnel reflector with direct steam generation			✓	✓	✓	✓	✓
Parabolic trough without heat storage	✓			✓	✓	✓	✓
Parabolic trough with molten salt heat storage	✓	✓		✓	✓	✓	✓
Hybrid integrated solar combined cycle (ISCC)	✓			✓	✓	✓	✓

Product overview

Solar island

HTF oil pumps

HZB-HTF DOUBLE SUCTION VOLUTE PUMP

FEATURES AND BENEFITS

- Centerline mounting to allow free thermal expansion and high nozzle loads
- Minimum bearing span to minimize shaft deflection
- Single cover casing design to reduce overhaul times
- Carbon steel or chrome steel casing with excellent mechanical properties
- Double mechanical seal provides safer operation

KEY CHARACTERISTICS

Capacities	4'000 m^3/h / 17'500 USgpm
Heads	up to 340 m / 1'115 ft
Pressures	up to 48 bar / 700 psi
Temperatures	up to 425°C / 800°F

APPLICATIONS

- HTF oil main pump

BBS BETWEEN BEARINGS SINGLE STAGE PUMP *ISO 13709 / API 610 BB2*

FEATURES AND BENEFITS

- Centerline support for reduced thermally induced misalignment
- Double suction impeller for low Net Positive Suction Head Required (NPSHR)
- First critical speed is well above operating speed range for smooth operation
- Casing designed for 2 times API 610 nozzle loads for freedom from piping distortions
- Grouted or ungrouted, 1x or 2x nozzle load baseplates for reduced installation cost

KEY CHARACTERISTICS

Capacities	up to 5'000 m^3/h / 22'000 USgpm
Heads	up to 450 m / 1'500 ft
Pressures	up to 50 bar / 740 psi
Temperatures	up to 425°C / 800°F

APPLICATIONS

- HTF oil main pump

ZE/ZF AND OHH END SUCTION PUMPS

FEATURES AND BENEFITS

- Designed for hot or cold water medium design pressure applications with relatively low Net Positive Suction Head (NPSH) available
- Modular construction to provide maximum interchangeability of spares

KEY CHARACTERISTICS

Capacities	up to 2'600 m^3/h / 11'440 USgpm
Heads	up to 300 m / 1'000 ft
Pressures	up to 100 bar / 1'450 psi
Temperatures	up to 425°C / 800°F

APPLICATIONS

- Condensate extraction
- Boiler circulation
- HTF oil
- Auxiliary services

Molten salt pumps

VEY AND VNY VERTICAL TURBINE PUMPS

FEATURES AND BENEFITS

- Engineered suction design for optimized submergence
- Engineered bearing bushings for better shaft alignment and adaptation to the thermal expansion
- Main shaft sealing by throttle bushing for permanent leak-off recirculation to the molten salt tank
- Auxiliary shaft sealing deflector preventing leakage of molten salt to the atmosphere
- Efficient thermal barrier between hot/cold sections
- Muff coupling to ease dismantling
- Special design to allow thermal expansions: extended wear ring zone and clearances calculated considering all the relative expansions

KEY CHARACTERISTICS

Capacities	up to 4'000 m^3/h / 17'600 USgpm
Heads	up to 400 m / 1'300 ft
Pressures	up to 100 bar / 1'450 psi
Temperatures	up to 600ºC / 1'100ºF

APPLICATIONS

- Molten salt

Hot water circulation pumps

ZE/ZF AND PRER/PRETR END SUCTION PUMPS

FEATURES AND BENEFITS

- Designed for hot or cold water medium design pressure applications with relatively low Net Positive Suction Head (NPSH) available
- Modular construction to provide maximum interchangeability of spares

KEY CHARACTERISTICS

Capacities	up to 2'600 m^3/h / 11'440 USgpm
Heads	up to 300 m / 1'000 ft
Pressures	up to 300 bar / 4'350 psi
Temperatures	up to 450ºC / 840ºF

APPLICATIONS

- Condensate extraction
- Boiler circulation
- HTF oil
- Auxiliary services

Power island

Feed water pumps

MD HIGH PRESSURE STAGE CASING PUMPS

FEATURES AND BENEFITS

- Modular hydraulics for high efficiency in a wide range of operating conditions
- Centerline mounted with large branch sizes for optimized inlet flow, low noise level and higher allowable forces and moments
- Unaffected by rapid temperature variations
- Stiff shaft design for critical speeds above the maximum operating speed
- Multiple screws mechanical tensioners are used on large sizes to allow simpler tightening and loosening

KEY CHARACTERISTICS

Capacities	up to 1'200 m³/h / 5'300 USgpm
Heads	up to 2'800 m / 9'200 ft
Pressures	up to 350 bar/ 5'080 psi
Temperatures	up to 210°C / 410°F

APPLICATIONS

- Feed water

MC HIGH PRESSURE STAGE CASING PUMP

FEATURES AND BENEFITS

- Modular hydraulics for high efficiency in a wide range of operating conditions
- Large branch sizes for optimized inlet flow, low noise level and higher allowable forces and moments
- Unaffected by rapid temperature variations
- Easy access to the seal cooling chambers for cleaning
- Stiff shaft design for critical speeds above the maximum operating speed
- Low pressure version with dedicated large sizes for condensate extraction service

KEY CHARACTERISTICS

Capacities	up to 1'700 m³/h / 8'500 USgpm
Heads	up to 1'750 m / 5'500 ft
Pressures	up to 180 bar / 2'610 psi
Temperatures	up to 180°C / 355°F

APPLICATIONS

- Feed water
- Condensate extraction

MBN MEDIUM PRESSURE STAGE CASING PUMP

FEATURES AND BENEFITS

- Simple construction to minimize dimensions and reduce investment and maintenance costs
- High quality investment cast impellers and diffusers for better efficiency
- Fast and easy impeller mounting
- Bearing unit can be serviced without disassembling the pump
- Wide range of materials including duplex stainless steel grades

KEY CHARACTERISTICS

Capacities	up to 700 m³/h / 3'080 USgpm
Heads	up to 900 m / 2'950 ft
Pressures	up to 100 bar / 1'450 psi
Temperatures	up to 180°C / 355°F

APPLICATIONS

- Feed water

GSG DIFFUSER STYLE BARREL PUMP

FEATURES AND BENEFITS

- Direct drive options to 6 MW
- Back-to-back rotor stack allows up to 16 stages
- Multiple sizes cover a broad hydraulic range
- Low pressure, high pressure, twistlock, and high temperature designs suit many applications

KEY CHARACTERISTICS

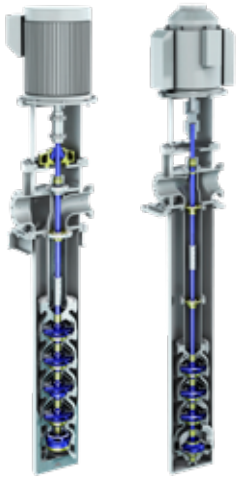
Capacities	up to 900 m^3/h / 4'600 USgpm
Heads	up to 2'600 m / 10'000 ft
Pressures	up to 300 bar / 4'500 psi
Temperatures	up to 425°C / 800°F

APPLICATIONS

- Feed water

Condensate extraction pumps

SJD (CEP) VERTICAL CAN MOUNTED TURBINE TYPE PUMP



FEATURES AND BENEFITS

- Carbon graphite product lubricated bearing in bowls and columns for long maintenance-free periods
- Removable seal housing allows servicing throttle bushing without removing the head
- Separate fabricated driver stand allows using one suction and discharge head per pump size
- Spacer coupling allows servicing the mechanical seal and thrust bearing as needed
- Can is provided with lateral and anti-rotational ribs uniform inlet velocity along the can length
- Various options available for the first stage impeller hydraulics, including double suction impeller allowing optimum sizing of pump

KEY CHARACTERISTICS

Capacities	up to 4'900 m^3/h / 21'560 USgpm
Heads	up to 400 m / 1'300 ft
Pressures	up to 94 bar / 1'360 psi
Temperatures	up to 100°C / 212°F

APPLICATIONS

- High pressure condensate extraction

ZE END SUCTION PUMP

FEATURES AND BENEFITS

- Designed for hot or cold water medium design pressure applications with relatively low Net Positive Suction Head (NPSH) available
- Modular construction to provide maximum interchangeability of spares

KEY CHARACTERISTICS

Capacities	up to 2'600 m^3/h / 11'440 USgpm
Heads	up to 300 m / 1'000 ft
Pressures	up to 100 bar / 1'450 psi
Temperatures	up to 425°C / 800°F

APPLICATIONS

- Condensate extraction
- Boiler circulation
- HTF oil
- Auxiliary services

Cooling water pumps

SJT VERTICAL TURBINE PUMP AND SJM VERTICAL MIXED FLOW PUMP

FEATURES AND BENEFITS

- Optimized hydraulics for high efficiency
- Packed stuffing box for reliable sealing and simple maintenance; mechanical seal is optional
- Rubber-lined product-lubricated bearing in bowls and columns for long maintenance-free periods; other bearing materials also available
- Spacer coupling allows servicing of the seal and thrust bearing as required

KEY CHARACTERISTICS

Capacities	up to 62’000 m³/h / 270’000 USgpm
Heads	up to 110 m per stage / 350 ft per stage
Pressures	up to 64 bar / 930 psi
Temperatures	up to 50°C / 120°F

APPLICATIONS

- Cooling water pumps
- Auxiliary services

SMD AND SMN AXIALLY SPLIT CASING DOUBLE SUCTION PUMPS

FEATURES AND BENEFITS

- Optimum hydraulic fit with high efficiency maintained over a wider flow range
- Exceptionally low Net Positive Suction Head Required (NPSHR) value not only at the best efficiency point but also on overload
- Maintenance-friendly features; excellent interchangeability of parts
- Horizontal and vertical constructions

KEY CHARACTERISTICS

Capacities	up to 25’000 m³/h / 110’000 USgpm
Heads	up to 260 m / 850 ft
Pressures	up to 34 bar / 490 psi
Temperatures	up to 140°C / 280°F

APPLICATIONS

- Cooling water pumps
- Auxiliary services

ZPP DOUBLE SUCTION AXIALLY SPLIT SINGLE STAGE PUMP

FEATURES AND BENEFITS

- Exceeds requirements of international ISO 5199 standard
- Unique, patented and superior design features minimize life cycle costs
- Quick and easy installation, reliable operation, easy maintenance and service

KEY CHARACTERISTICS

Capacities	up to 25’000 m³/h / 110’000 USgpm
Heads	up to 160 m / 525 ft
Pressures	up to 20 bar / 290 psi
Temperatures	up to 120 °C / 250 °F

APPLICATIONS

- Cooling water pumps
- Auxiliary services

Auxiliary pumps

AHLSTAR END SUCTION SINGLE STAGE LONG COUPLED CENTRIFUGAL PUMP

FEATURES AND BENEFITS

- Exceeds standard requirements of international ISO 5199 and ISO 2858 standards
- Suitable for the most demanding industrial applications
- Unique, patented and superior design features minimize life cycle costs
- Quick and easy installation, reliable operation, easy maintenance and service

KEY CHARACTERISTICS

Capacities	up to 11'000 m^3/h / 48'400 USgpm
Heads	up to 160 m / 525 ft
Pressures	up to 25 bar / 360 psi
Temperatures	up to 180°C / 355°F

APPLICATIONS

- Cooling water pumps
- Auxiliary services

SNS END SUCTION SINGLE STAGE CENTRIFUGAL PUMP

FEATURES AND BENEFITS

- Designed to meet the design requirement of EN ISO 5199 international standard
- Exceeding EU's (European Union) requirements for energy-related products (ErP)
- Highest efficiency across the whole pump range, exceeding the benchmark efficiency index MEI 0.7 (Minimum Efficiency Index)
- New, state-of-the art hydraulics ensure optimum capacity with low net positive suction head required (NPSHr)
- Low energy consumption, high standardization, easy installation and unique construction also equate to lower maintenance and operating costs

KEY CHARACTERISTICS

Capacities	up to 1'400 m^3/h / 6'000 USgpm
Heads	up to 160 m / 525 ft
Pressures	up to 16 bar / 230 psi
Temperatures	up to 120°C / 250°F

APPLICATIONS

- Auxiliary services

For more information, please contact power@sulzer.com
www.sulzer.com