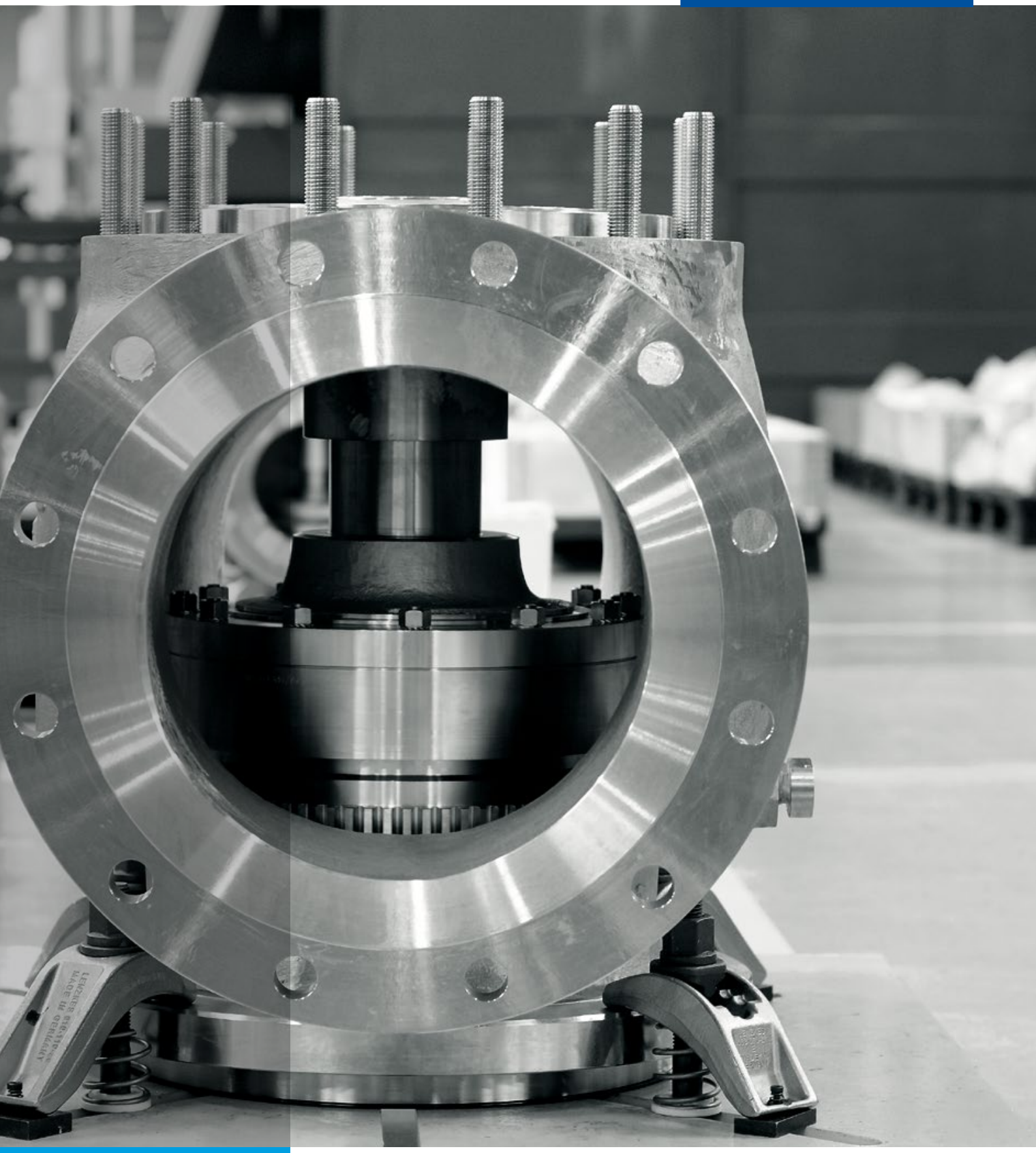
TRILLIUM
FLOW TECHNOLOGIES™

Sarasin-RSBD®
Pressure Relief Valves



TRILLIUM VALUES

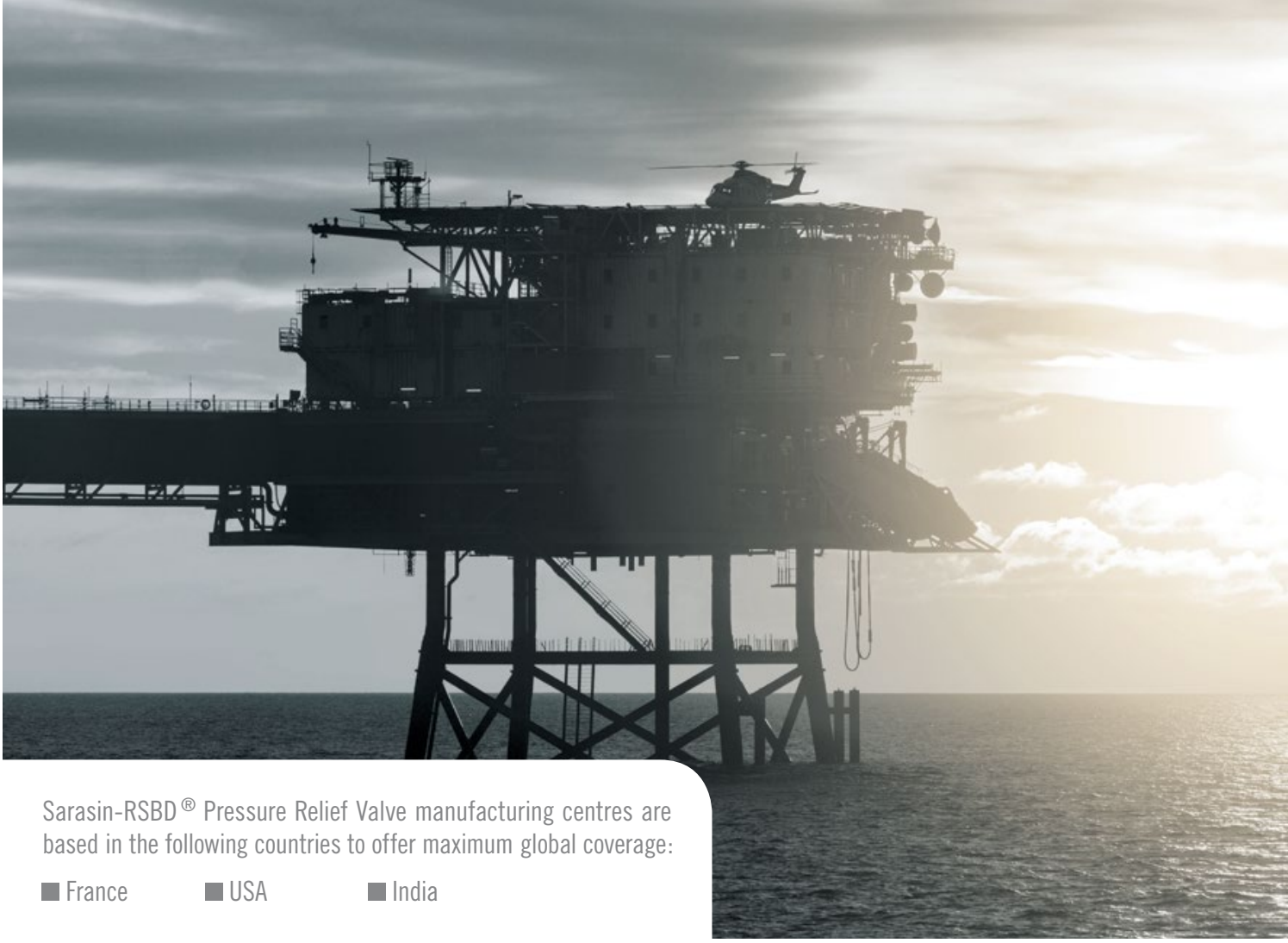
our Vision

We will become
the most relied upon
flow control solutions company
in the world.

our Mission

To sustainably, efficiently,
and passionately assist our customers
by providing critical products and services
to help them meet the needs of today's
ever-challenging world.

CUSTOMERS	Seamlessly align with customers while continuously improving our customer engagement and service levels
TECHNOLOGY	Develop and apply advanced technologies
EXECUTION	Passionate pursuit of continuous improvement, excellent results and value creation for everyone
TEAM	Attract and develop a diverse, energized and collaborative team focused on our mission



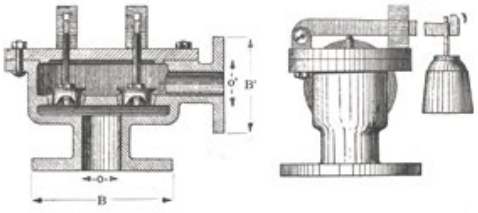
Sarasin-RSBD® Pressure Relief Valve manufacturing centres are based in the following countries to offer maximum global coverage:

■ France ■ USA ■ India

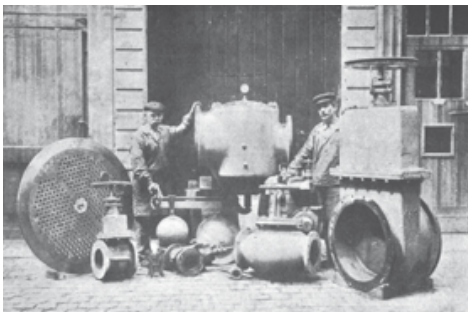
Sarasin-RSBD® Pressure Relief Valves are used extensively throughout the following industries:

SARASIN-RSBD®
A long and distinguished history

The early years



- **1848** - A local master blacksmith (DESCHAMPS), installed a forging mill in the town of Wazemmes, close to the city of Lille, France.
- **1905** - Two associates (DEFAYS and SARASIN) purchased the mill in order to incorporate a copper alloy foundry and thus created the company DEFAYS & SARASIN (The latter associate specialized in the manufacture of valves for vapour process applications and also in counterweight Pressure Relief Valves under the license name "MAURICE". These valves were intended mainly for textile industries).
- **1921** - The company became a limited company and was named SARASIN & Co.



1898

Becoming established

- **1956** - SARASIN developed a range of spring loaded Pressure Relief Valves which would comply with the American standards intended for the oil industry. The first two customers of SARASIN were SHELL France and the SOCIÉTÉ DES PÉTROLES D'AQUITAINE (who became ELF Aquitaine and then later TOTAL S.A)
- **1969** - SARASIN purchased a factory at Haubourdin, close to the city of Lille, France and released its foundry to specialise exclusively in the manufacture of the Pressure Relief Valves.
- **1978** - SARASIN became the first French supplier of Pressure Relief Valves into the nuclear power industry, by equipping all Belgian and French nuclear sites and also developing this market segment into South Africa, China and Korea.

1973

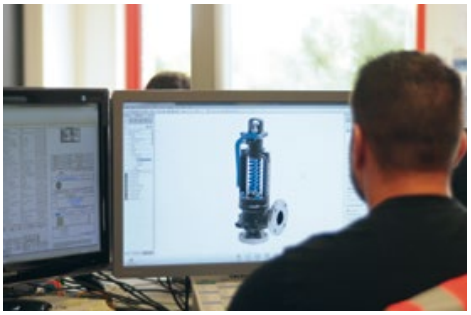
The "buy-out" years

- **1983** - SARASIN was sold to the US company ANDERSON & GREENWOOD, who were the leading global manufacturer of Pilot Operated Pressure Relief Valves. SARASIN & Co at this point became AGCO SARASIN and manufactured Pilot Operated Pressure Relief Valves (AGCO) for the French market whilst being able to promote its spring loaded Pressure Relief Valves into the US.market.
- **1986** - In July of this year, Anderson Greenwood was purchased by the American organisation KEYSTONE INTERNATIONAL Inc. Keystone at the same time, purchased YARWAY who owned manufacturing operations in Holland and France. The YARWAY plant in Holland was closed and SARASIN were called upon to additionally manufacture recirculation, basic tank tap and desuperheater valves in addition to the range of Pressure Relief Valves.
- **1987** - SARASIN became KEYSTONE France

Under private ownership

- **1989** - KEYSTONE ceased manufacture of SARASIN products and sold the factory at Haubourdin. In October of this year SEBIM HOLDINGS purchased the company and created the company SARASIN INDUSTRIE
- **1992** - SARASIN INDUSTRIE moved into a modern factory at Vendin-le-Vieil, located approximately 30km from Lille, France.

2017



The WEIR years

- **1998** - The British Industrial Group, WEIR PLC acquired SEBIM HOLDINGS. SARASIN were grouped under the WEIR Valves & Controls France Division.

- **2003** - The manufacture of all Pressure Relief Valves products was rationalized and was concentrated in the Vendin-le-Vieil plant.
  A new line of product was thus created: **Sarasin-RSBD®**.

- **2008** - WEIR Valves & Controls France became WEIR Power and Industrial France.

- **2016** - WEIR Power and Industrial France became WEIR Flow Control France.

- **2018** - Weir refocus the Group on mining services with the acquisition of ESCO Corporation and the sale of the Flow Control Division

Trillium Flow Technologies, a new commitment

- **2019** - Trillium Flow Technologies is set up under new owners, First Reserve.
  They continue to provide mission critical valves, pumps and aftermarket services in oil, gas, power generation, water & wastewater, chemical & petrochemical industries.

- The SARASIN-RSBD product range is now inclusive of spring loaded Pressure Relief Valves, Steam Safety Valves, Pilot Operated Pressure Relief Valves, Changeover Valves and Tank Blanketing Valves..

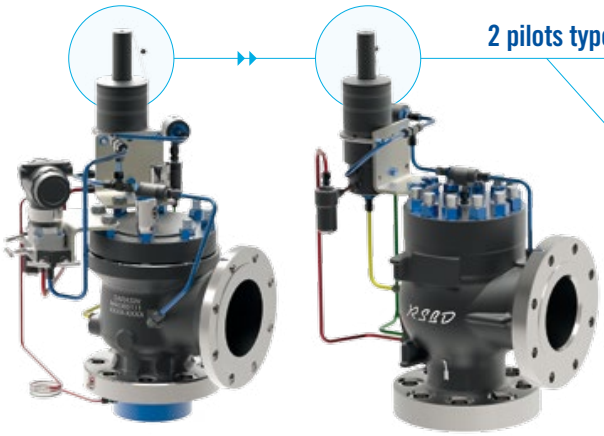
From Spring Loaded Pressure Relief Valves...

Product Name	STARFLOW® P3-P4-P5	9 Series	9 Series (integral flange design)
APPLICATION	Heavy duty process applications, liquids, steam, vapour sour gas, multi-phase fluids	Thermal Expansion	Thermal Expansion
INLET SIZES	1" through 12"	1/2" through 1 1/2"	3/4" through 1"
INLET RATINGS	ANSI Class 150 through 2500 FLANGED (B16.5)	ANSI Class 150 through 2500 NPT male or female FLANGED (B16.5, EN 1092-1)	ANSI Class 150 through 900 FLANGED (B16.5)
ORIFICE SIZES	sixteen sizes - [D] to [W]	five sizes - [B] to [G]	one size - [D] special design to meet SHELL DEP standards
SET PRESSURE RANGE	up to 431 barg [6251 psig]	up to 431 barg [6251 psig]	up to 153 barg [2219 psig]
TEMPERATURE RANGE	-196°C to +538°C [-320°F to +1000°F]	-196°C to +454°C [-320°F to +849°F]	-196°C to +454°C [-320°F to +849°F]
MATERIALS	SA 216 Gr. WCC I SA 352 Gr. LCC SA 217 Gr. WC6/WC9 SA 351 Gr. CF8M I SA 995 Gr. 4A/6A Various exotic Alloys	SA 216 Gr. WCC SA 351 Gr. CF3M I SA 995 Gr. 4A/6A Various exotic Alloys	SA 216 Gr. WCC SA 351 Gr. CF3M I SA 995 Gr. 4A/6A Various exotic Alloys
ASME CODE STAMP	UV & V [liquid]	UV & V [liquid]	UV & V [liquid]
DESIGN STANDARD	ASME BPVC section VIII API STD 526	ASME BPVC section VIII	ASME BPVC section VIII

Trillium Flow Technologies provides a comprehensive range of Sarasin-RSBD® Pressure Relief Valves for use throughout the oil, gas, power generation, chemical and petrochemical industries. The extensive range of products is available for all industrial applications where essential protection is needed against situations of overpressurization.

Sarasin-RSBD® products are recognised globally for their high quality, innovative design and durability.

...To Pilot Operated Pressure Relief Valves



2 pilots type

DGSB & DGSHP Pilots

Non-flowing Gas
(Pop Action)
Pres. up to 431 barg
Temp. -60°C to +230°C

DCSB & DMS Pilots

Non-flowing Gas & Liquid
(Pop & Modulating Action)
Pres. up to 431 barg
Temp. -60°C to +327°C

76 Series - Full Nozzle	78 Series - Semi Nozzle
Heavy duty process applications liquids, steam, vapour sour gas, multi-phase fluids Cryogenic (LNG)	Heavy duty process applications liquids, steam, vapour sour gas, multi-phase fluids
1" through 12"	1" through 8"
ANSI Class 150 through 2500 FLANGED (B16.5)	ANSI Class 150 through 2500 FLANGED (B16.5)
eighteen sizes - [D] to [W]	fourteen sizes - [D] to [T]
up to 431 barg [6251 psig]	up to 431 barg [6251 psig]
-196°C to +327°C [-320°F to +620°F]	-60°C to +327°C [-76°F to +620°F]
SA 216 Gr. WCC SA 351 Gr. CF8M I SA 995 Gr. 4A/6A Various exotic Alloys	SA 216 Gr. WCC SA 351 Gr. CF8M I SA 995 Gr. 4A/6A Various exotic Alloys
UV & V [liquid]	UV & V [liquid]
ASME BPVC section VIII API STD 526 (spring loaded tables)	ASME BPVC section VIII API STD 526

From Pilot Operated Pressure Relief Valves dedicated to LNG & FLNG installations...

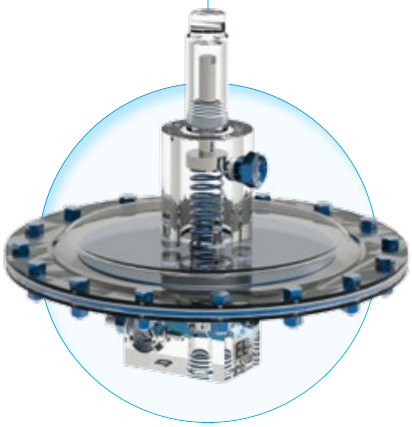
Product Name	74 VP Series (very low pressure)	74 LP Series (low pressure)	78 LP Series
APPLICATION	LNG / FLNG	LNG / FLNG	LNG / FLNG
INLET SIZES	2" through 14"	2" through 14"	2" through 6"
INLET RATINGS	ANSI Class 150 through 300 FLANGED (B16.5)	ANSI Class 150 through 300 FLANGED (B16.5)	ANSI Class 150 through 300 FLANGED (B16.5)
ORIFICE SIZES	eight sizes - [ND50] to [ND350]	eight sizes - [ND50] to [ND350]	four sizes - [ND50] to [ND150]
SET PRESSURE RANGE	15 to 250 mbar [6" to 100" wc] (standard applications) 70 to 250 mbar [28" to 100" wc] (cryogenic applications)	200 mbar to 2 barg [80" wc to 29 psig]	1 to 10 barg [15 to 145 psig]
TEMPERATURE RANGE	-40°C to +120 °C [-40°F to +248°F] (standard applications) -196°C to +120°C [-320°F to +248°F] (cryogenic applications)	-196°C to +200°C [-320°F to +392°F]	-29°C to +200 °C [-20°F to +392°F]
MATERIALS	SA 216 Gr. WCC SA 352 Gr. LCC SA 351 Gr. CF8M	SA 216 Gr. WCC SA 352 Gr. LCC SA 351 Gr. CF8M	SA 216 Gr. WCC SA 352 Gr. LCC SA 351 Gr. CF8M
ASME	N/A	UV	UV
DESIGN STANDARD		ASME BPVC section VIII	ASME BPVC section VIII

The range of tank blanketing valves is designed to assist with the protection of storage tanks from the effects of inbreathing and outbreathing, thus preventing a tank from buckling effects or total collapse.

Sarasin-RSBD® Pilot Operated Pressure Relief Valves bring unrivalled low-pressure protection for storage tanks and vessels on LNG & FLNG installations.

DGBP pilot

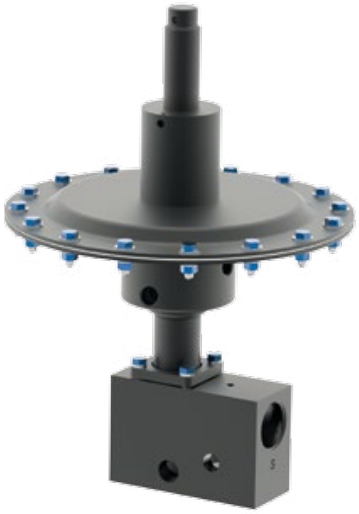
Flowing
Set pressure range
15 mbar to 2 bar
Temperature range
-196°C to 200 °C



DGTBP pilot

Flowing
Set pressure range
3 to 300 mbar
(standard applications)
70 to 300 mbar
(cryogenic applications)
Temperature range
-40°C to 120 °C
(standard applications)
-196°C to 120°C
(cryogenic applications)

...To Tank Blanketing Systems

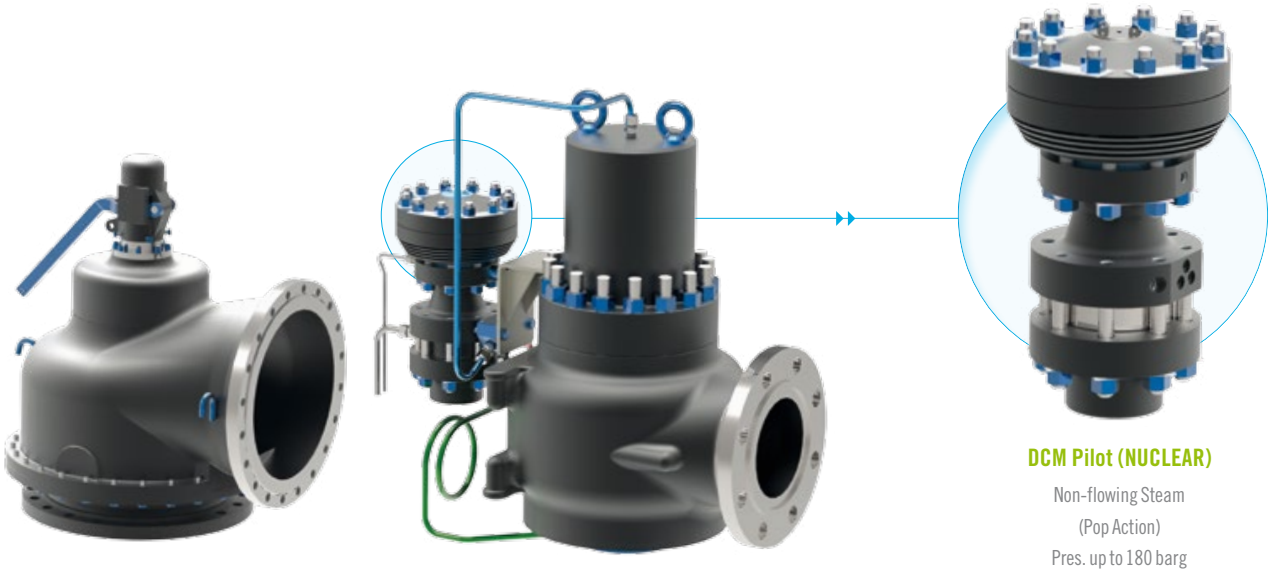


Product Name	77 Series
APPLICATION	Tank storage protection
INLET SIZES	1/2" through 1"
INLET RATINGS	NPT male or female ANSI Class 150 through 300 (for 1"" size only) FLANGED (B16.5, EN 1092-1)
SET PRESSURE RANGE	2 to 1000 mbarg 1" wc to 402" wc
MATERIALS	SA 479 Gr. 316L

A complete ASME Section I package dedicated to power markets (steam boiler applications)...

Product Name	STARSTEAM ®	STARFLOW-V ™	76-STARECO ™
APPLICATION	Boiler steam - high pressure	Boiler steam - low & medium pressure	Economizer applications (Water & steam)
INLET SIZES	1 1/2" through 8"	1 1/2" through 12"	1" through 12"
INLET RATINGS	ANSI Class 600 through 2500 FLANGED (B16.5) 3000# & 4500# BUTT WELD	ANSI Class 150 through 1500 FLANGED (B16.5)	ANSI Class 150 through 2500 FLANGED (B16.5)
ORIFICE SIZES	ten sizes - [1] to [T]	fifteen sizes - [F] to [W]	seventeen sizes - [D] to [W]
SET PRESSURE RANGE	up to 380 barg [5511 psig]	up to 103 barg [1493 psig]	up to 461 barg [6686 psig]
TEMPERATURE RANGE	up to 649°C [1200°F]	up to 649°C [1200°F]	up to 330°C [626°F]
MATERIALS	SA 216 Gr. WCC SA 217 Gr. WC6/WC9/C12A SA 351 Gr. CF8M	SA 216 Gr. WCC SA 217 Gr. WC6/WC9 SA 351 Gr. CF8M	SA 216 Gr. WCC SA 217 Gr. WC6/WC9/C12A SA 351 Gr. CF8M
ASME	V & UV	V & UV	V
DESIGN STANDARD	ASME BPVC section I & VIII	ASME BPVC section I & VIII	ASME BPVC section I

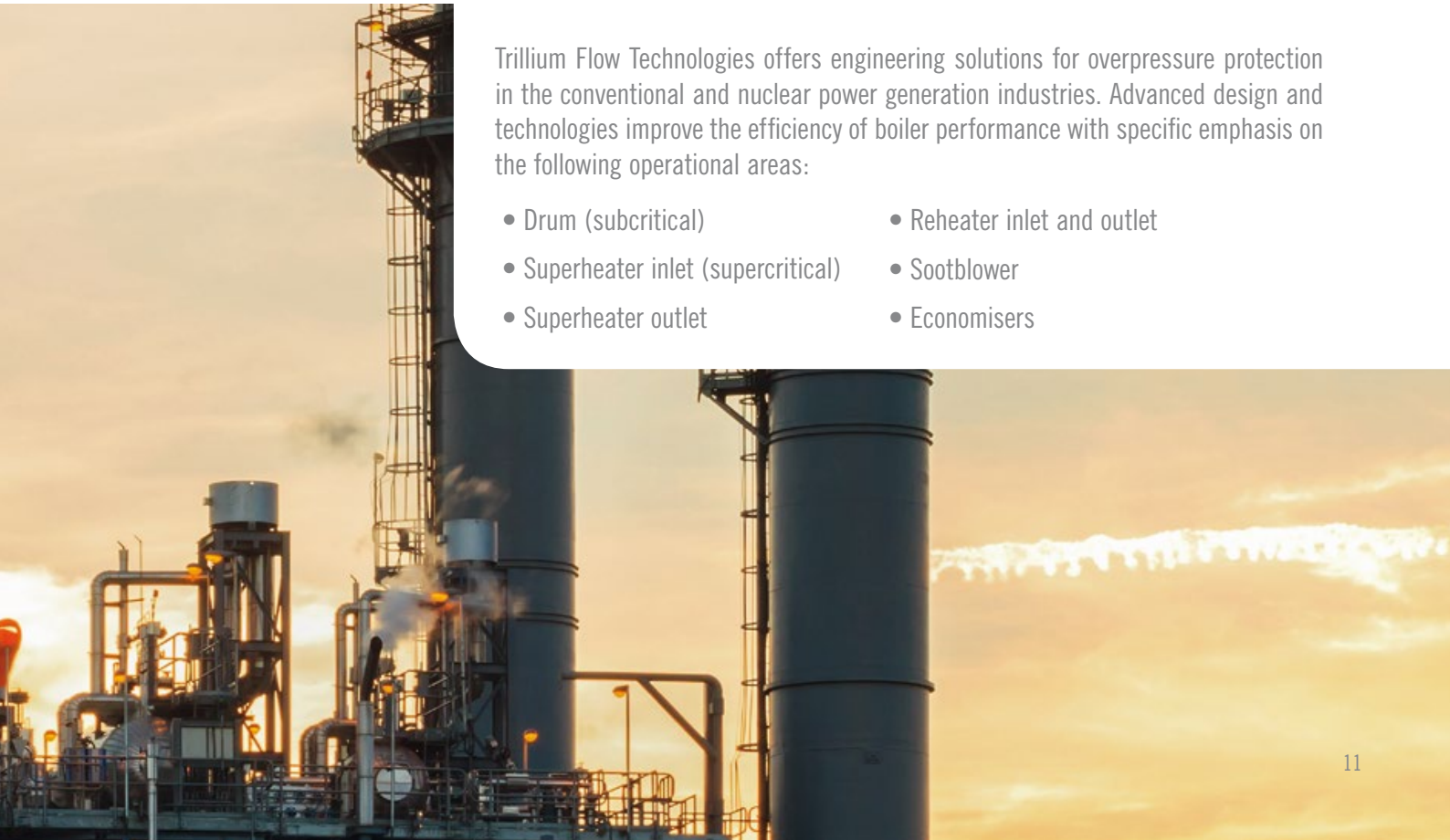
...Plus any other specific power applications



DCM Pilot (NUCLEAR)

Non-flowing Steam
(Pop Action)
Pres. up to 180 barg
Temp. up to 590°C

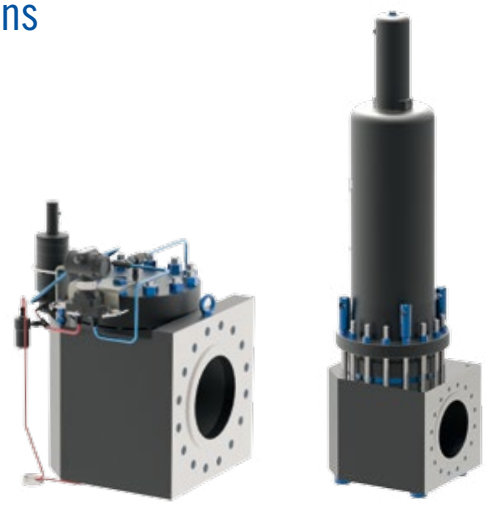
MBP	86 Series - Full Nozzle
Low pressure steam - Turbines and Condensers	Steam - Medium pressure
6" through 30"	1" through 8"
ANSI Class 150 FLANGED (B16.5)	ANSI Class 150 through 2500 FLANGED (B16.5)
ten sizes	eighteen sizes - [D] to [T]
up to 50 mbarg [20" wc] (weight loaded) up to 1 barg [15 psig] (spring loaded)	up to 180 barg [2610 psig]
up to 150°C [302°F]	up to 590°C [1094°F]
SA 216 Gr. WCC	SA 216 Gr. WCC SA 217 Gr. WC6/WC9/C12A SA 351 Gr. CF8M
N/A	
	ASME BPVC section VIII

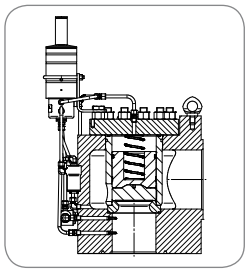


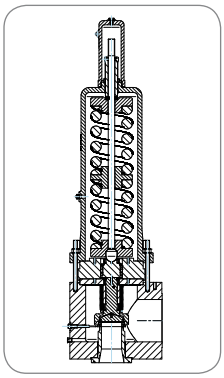
Trillium Flow Technologies offers engineering solutions for overpressure protection in the conventional and nuclear power generation industries. Advanced design and technologies improve the efficiency of boiler performance with specific emphasis on the following operational areas:

- Drum (subcritical)
- Superheater inlet (supercritical)
- Superheater outlet
- Reheater inlet and outlet
- Sootblower
- Economisers

Forged body design for challenging process applications







Product Name	Forged block body design
APPLICATION	Special process duties
INLET SIZES	0.5" through 8"
INLET RATINGS	Threaded lug, hub, flange
ORIFICE SIZES	
SET PRESSURE RANGE	In excess of API Std 526 limitations
TEMPERATURE RANGE	-196°C to +625°C [-320°F to +1157°F]
MATERIALS	A350 Gr. LF2 A182 Gr. F316/F55 B462 Gr.N10276 B564 Gr. N06625 Various exotic alloys
ASME	V & UV
DESIGN STANDARD	ASME BPVC section I or VIII API STD 526 (if required)

- The forged design provides the ability to reach higher set pressures and back pressures.
- This in turn allows a reduction in the required amount of selected valves compared to cast steel equivalents.
  - Reduction in installation costs.
  - Reduction in maintenance costs.
  - Reduction in the risk of chattering (a common problem with multiple valves opening simultaneously).
  - Reduction in the overall cost of ownership.
- The forged design may be provided with special dimensions.
- It is possible to provide special centre to face dimensions, as well as non-standard end drillings such as API 6A.

Changeover Valves for plant maintenance without the need for process shutdowns.

Product Name	RS Series
APPLICATION	Gas/vapor, steam, liquid, multi-phase fluids
SIZES	Single way : 2" – 2 x 2" through 10" – 2 x 10" Dual way : 2" – 2 x 1" through 10" – 2 x 8"
INLET RATINGS	ANSI Class 150 through 600 FLANGED (B16.5)
SET PRESSURE RANGE	up to 100 barg [1450 psig]
TEMPERATURE RANGE	-60°C to +427°C [-76°F to +800°F]
MATERIALS	SA 216 Gr. WCC SA 352 Gr. LCC SA 351 Gr. CF3M

- High CV values, resulting in less than 3% pressure drop to the active PRV inlet.
  - Reduction in field installation costs and space requirements through a preassembled and compact design.
  - Reduction of valve chattering risk.
- Clear, positive indication of the active Pressure Relief Valve
- High integrity provisions for dual interlocking in either Pressure Relief Valve position.
- Tested packing design plus minimal leak points ensure reduced fugitive emissions.
- No seat lapping is required for maintenance. Minimal spare parts reduce the cost of ownership.
- Simple operation, built-in seat equalization and no special tool requirements minimize the total valve operating time.

The Sarasin-RSBD® forged Pressure Relief Valves are manufactured for use in high integrity process industries such as the upstream oil & gas.

The Sarasin-RSBD® dual pressure relief device system provides a safe and efficient method of switching from an active to a standby Pressure Relief Valve. The system overpressure protection may be maintained without a process shut-down. A tandem system is also available for dual Pressure Relief valves which are discharging into a closed header system.

Pressure Relief Valve expertise

Trillium has extensive experience in valve services. Trillium technicians are qualified in either valve assembly, calibration or troubleshooting. We are able to address Trillium's own product ranges for all fluid appli-cations (oil, gas, steam generation, cryogenics).

This team is fully supported by highly skilled product and applications experts who are able to resolve any valve operational issues.

Trillium's service teams are able to overhaul or repair any Sarasin-RSBD® Pressure Relief Valve, either in our own workshops or at customer specified premises Trillium also have access to a network of global service partner workshops.

We can also offer supervision throughout the commissioning and start-up processes of the installation of valves.

Testing Capability

In addition to regular liquid and gas test benches for factory acceptance and hydrostatic testing, Trillium Flow Technologies has invested in specialist cryogenic and steam test benches.

50 valves per day

10 inspections per day

-196°C to 300°C

9 Series - Seat Tightness Test

Cryogenic test bench

TYPE	Boil-Off
CAPACITY	30L
MIN. / MAX. INLET SIZES	1/2" through 8"
MAX. ALLOWABLE WORKING PRESSURE	200 bar (liquid & gas)
TEMPERATURE RANGE	-196°C to +20°C [-320°F to 68°F]
APPLICABLE STANDARD	NF EN 13648-1 API STD 527
DESIGN STANDARD	PED 2014/68/UE

Steam test bench

TYPE	Saturated
CAPACITY	2 x 1700L
MIN. / MAX. INLET SIZES	1/2" through 8"
MAX. ALLOWABLE WORKING PRESSURE	100 bar [1450 psig]
TEMPERATURE RANGE	Up to 300°C [572°F]
APPLICABLE STANDARD	ASME PTC 25
DESIGN STANDARD	PED 2014/68/UE

Starsteam® – Back Pressure Test

CERTIFICATES AND APPROVALS

Our manufacturing facilities and product lines are accredited and certified in accordance with:

ASME B&PV Codes	UV V	SELO TS	
PED 2014/68/UE	CE	EAC TR CU 010/012/032	EAC
ATEX 94/9/EC	Ex	TSSA	TECHNICAL STANDARDS & SAFETY AUTHORITY TSSA
ISO 9001/14001 ISO/TS 29001	CERTIFIED ISO 9001 · CERTIFIED ISO 14001 · CERTIFIED ISO/TS 29001	Korea Gas Safety Corporation Certificate	
ISO 45001	CERTIFIED ISO 45001	Type approvals Lloyd's & BV	BUREAU VERITAS 1828 BUREAU VERITAS

TRILLIUM FLOW TECHNOLOGIES™

Flow Control

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