Associazione Italiana Strumentisti

ISA Italy Section

Associazione Termotecnica Italiana
Sezione Lombardia

Giornata di studio
"Dispositivi di Sicurezza contro le sovrapressioni"

Standard di riferimento e normative applicabili

Principali omologazioni applicabili (CE e ASME): overview e principali differenze nell'iter omologativo

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Milano, 21 Settembre 2016 Auditorium TECNIMONT
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Foreword

The world of pressure relief devices is actually dominated by American and European certifications, respectively known as "*ASME Stamp*" and "*CE marking*".
The ASME Stamp certification follows the American Standards (ASME and API), the CE marking follows the International Standards under ISO/EN.

The American standards are well consolidated: the first issue and adoption of the ASME Code was in 1915; that one of the API 520 (at that time called "*recommended practice*") is dated 1955.
The first issue of an ISO standard for pressure relief devices (ISO 4126 – General requirements) is dated 1981.

ASME code started up from the need to setting a standard to be followed by the rising industry. Large adoption also outside the United States is a consequence of its long history. ASME code is considered reliable and complete. If a subject is not exhaustively developed into the Code itself, the Code refers to other reference documents (for pressure relief devices, mainly API 520 and 526).

The standard EN 4126 comes from the converge of the original national standards and norms (BS, DIN, AFNOR, UNI, etc.) from the various European Countries. This convergence follows the constitution of the European Union and the issue of the several European Directives to be satisfied within the Union.
For pressure relief devices, the applicable Directive is the Pressure Equipment Directive 2014/68/UE (PED). Pressure relief devices are defined as safety accessories and classified in category IV.

The standard EN 4126 was initially developed in parallel with the standard ISO 4126.
Since the European Working Group and International Working Group are mainly composed by the same experts, in the last years, the standard has been developed by Technical Committee ISO/TC 185 "Safety Devices for protection against excessive pressure" in collaboration with Technical Committee CEN/TC 69 "Industrial valves" the secretariat of which is held by AFNOR.

PARCOL's Specialties – SAFETY DEVICES

The current ISO international standard is identical to the corresponding EN ISO European standard, a part for the *Annex ZA – Relationship between this International Standard and the Essential Requirements of EU Directive*, not included in the published ISO.

The parts of the European EN ISO standards are also called "*harmonized standards*", because, with the Annex ZA provide the compliance to the requirements (the so called *"essential safety requirements"*), that products shall satisfy to be CE marked.
Note: the essential safety requirements refer to Materials, Design, Manufacturing, etc.

In the American world, everything is defined, regulated and written: valve overall dimensions, orifices size, mechanical design, valve sizing and selection, testing procedures and laboratories, etc. This means that the same pressure relief device certified ASME Stamp produced by two different manufacturers, passed the same technical prescriptions listed in the ASME Code.

In the European Union, the approach is different: every Manufacturer, within the rules defined in PED, can use the standards and design codes he prefers, but always giving evidence that the PED essential safety requirements are satisfied.
This means that, the same pressure relief device manufactured by two different Manufacturers for the same market (and, exasperating, for the same plant) should be different in one or more aspects. As an example, a Manufacturer will adopt American materials and design codes, the other one will choose European materials and design standards.

27.6.2014 EN Official Journal of the European Union L 189/215

ANNEX II

CONFORMITY ASSESSMENT TABLES

1. The references in the tables to categories of modules are the following:

I	=	Module A
II	=	Modules A2, D1, E1
III	=	Modules B (design type) + D, B (design type) + F, B (production type) + E, B (production type) + C2, H
IV	=	Modules B (production type) + D, B (production type) + F, G, H1

2. The safety accessories defined in point 4 of Article 2, and referred to in Article 4(1)(d), are classified in category IV. However, by way of exception, safety accessories manufactured for specific equipment may be classified in the same category as the equipment they protect.

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UNIstore - 2013 - 379846
EN ISO 4126-1:2013 (E)

Annex ZA
(informative)

Relationship between this International Standard and the Essential Requirements of EU Directive 97/23/EC (PED)

By agreement between ISO and CEN, this CEN annex is included in the DIS and the FDIS but will not appear in the published ISO standard.

This International Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive 97/23/EC (PED).

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this International Standard and Directive 97/23/EC (PED)

Sub-clauses of this International Standard	Essential Requirements of Directive 97/23/EC (PED)	
	Essential Requirements	Annex I of PED
5,6,7,8,9	Safety accessories	2.11.1
5.1.5	Safety of operation	2.3
5.1.6	Drain and venting	2.5
6.3	Proof test	3.2.2
10	Marking and labelling	3.3

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

Codes, standards and involved Organizations

		ASME Stamp	CE marking
Reference Codes and Standards		- ASME - API	- ISO - EN - Nationals (for Italy: UNI) - Any accredited (e.g.: ASME, API)
Involved Organizations	for Codes and standards	- ASME - API	- ISO/TC 185 - CEN - for Italy: CTI-UNI (CT 223/GL 01)
	for certification	- ASME - ASME certified *	- EU Notified Bodies °
Testing laboratories		- ASME certified *	- Any accredited °

Compliance to **ISO 17025** *– General requirements for the competence of testing and calibration laboratories*

ISO/DIS 4126-11 requires that the laboratories test reports comply with the requirements of ISO 17025. This does not mean that a third party certifies it. The laboratory can check the accordance or if a third party (e.g., EU Notified Body) is involved, this can ask to evidence the accordance. No certification is required.

* ASME certified independent inspectors and flow laboratory are from The National Board of Boiler and Pressure Vessel Inspectors.
Other ASME certified private flow laboratories are available.

° An Italian Notified Body or Testing Laboratory, shall be accredited by Accredia, the sole National Accreditation Body that performs accreditation with authority derived from the State.

6.6 Seat leakage test

The seat leakage test of a safety valve shall be carried out after adjustment of the set or cold differential test pressure. The test procedure and leakage rate shall be agreed between the manufacturer and the purchaser.

NOTE For example, API 527 can be used.

ISO 4126-1:2013(E)

Bibliography

[1] ISO 6708:1995, *Pipework components — Definition and selection of DN (nominal size)*

[2] ISO 7268, *Pipe components — Definition of nominal pressure*

[3] ANSI/ASME B 16.34, *Valves — Flanged, threaded, and welding end*

[4] API 527, *Seat tightness of pressure relief valves*

[5] EN 12516 (all parts), *Industrial valves — Shell design strength*

Reference Organizations – ASME Stamp
General overview

asme.org

api.org

nationalboard.org

ASME is a not-for-profit membership organization that enables collaboration, knowledge sharing, career enrichment, and skills development across all engineering disciplines, toward a goal of helping the global engineering community develop solutions to benefit lives and livelihoods. Founded in 1880 by a small group of leading industrialists, ASME has grown through the decades to include more than 130,000 members in 151 countries. Thirty-two thousand of these members are students.

From college students and early-career engineers to project managers, corporate executives, researchers and academic leaders, ASME's members are as diverse as the engineering community itself. ASME serves this wide-ranging technical community through quality programs in continuing education, training and professional development, codes and standards, research, conferences and publications, government relations and other forms of outreach.

The American Petroleum Institute (API) is the only national trade association that represents all aspects of America's oil and natural gas industry. Our 650 corporate members, from the largest major oil company to the smallest of independents, come from all segments of the industry. They are producers, refiners, suppliers, marketers, pipeline operators and marine transporters, as well as service and supply companies that support all segments of the industry.

Although our focus is primarily domestic, in recent years our work has expanded to include a growing international dimension, and today API is recognized around the world for its broad range of programs:
- Mission
- Advocacy
- Research & Statistics
- Standards
- Certification

The National Board of Boiler and Pressure Vessel Inspectors was created in 1919 to promote greater safety to life and property through uniformity in the construction, installation, repair, maintenance, and inspection of pressure equipment.

The National Board membership oversees adherence to laws, rules, and regulations relating to boilers and pressure vessels. The National Board Members are the chief boiler inspectors representing most states and all provinces of North America, as well as many major cities in the United States.

Reference Organizations – CE marking
General overview

iso.org

cen.eu

uni.com

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

CEN, the European Committee for Standardization, is an association that brings together the National Standardization Bodies of 33 European countries.

CEN is one of three European Standardization Organizations (together with CENELEC and ETSI) that have been officially recognized by the European Union and by the European Free Trade Association (EFTA) as being responsible for developing and defining voluntary standards at European level.

CEN provides a platform for the development of European Standards and other technical documents in relation to various kinds of products, materials, services and processes. CEN supports standardization activities in relation to a wide range of fields and sectors including: air and space, chemicals, construction, consumer products, defence and security, energy, the environment, food and feed, health and safety, healthcare, ICT, machinery, materials, pressure equipment, services, smart living, transport and packaging.

UNI - Ente Nazionale Italiano di Unificazione - è un'associazione privata senza scopo di lucro riconosciuta dallo Stato e dall'Unione Europea che da quasi 100 anni elabora e pubblica norme tecniche volontarie – le norme UNI – in tutti i settori industriali, commerciali e del terziario.

Sono soci UNI le imprese, i professionisti, le associazioni, gli enti pubblici, i centri di ricerca, gli istituti scolastici e accademici, le rappresentanze dei consumatori e dei lavoratori, il terzo settore e le organizzazione non governative, che insieme costituiscono una piattaforma multi-stakeholder di confronto tecnico unica a livello nazionale.

UNI rappresenta l'Italia presso le organizzazioni di normazione europea (CEN) e mondiale (ISO) e organizza la partecipazione delle delegazioni nazionali ai lavori di normazione sovranazionale, con lo scopo di:
- promuovere l'armonizzazione delle norme necessaria al funzionamento del mercato unico,
- sostenere e trasporre le peculiarità del modo di produrre italiano in specifiche tecniche che valorizzino l'esperienza e la tradizione produttiva nazionale.

Gruppo Misto CTI-UNI

CT 223/GL 01 – Dispositivi di protezione e controllo degli impianti a pressione

Reference Codes and Standards
American Society of Mechanical Engineers (ASME)

ASME Boiler & Pressure Vessel Code (2015 Edition) is composed by 12 sections (see right). Sections related to pressure relief devices are:

- Section I – Power Boilers (ovp 3%; bd 4%)
- Section II – Materials
- Section V – Nondestructive Examinations
- Section VIII – Pressure vessels (ovp 10%; bd 7%)
- Section IX – Welding

Other ASME related documents are:

- ASME B16.34 (2014) = Valves – Flanges, Threaded and Welding End
- ASME B31.1 (2014) = Power piping
- ASME PTC-25 (2014) = Pressure relief devices *

* PTC stands for "Performance Test Code"

AN INTERNATIONAL CODE
2015 ASME Boiler & Pressure Vessel Code
2015 Edition
July 1, 2015

SECTIONS

I Rules for Construction of Power Boilers

II Materials
- Part A — Ferrous Material Specifications
- Part B — Nonferrous Material Specifications
- Part C — Specifications for Welding Rods, Electrodes, and Filler Metals
- Part D — Properties (Customary)
- Part D — Properties (Metric)

III Rules for Construction of Nuclear Facility Components
- Subsection NCA — General Requirements for Division 1 and Division 2
- Appendices
- Division 1
  - Subsection NB — Class 1 Components
  - Subsection NC — Class 2 Components
  - Subsection ND — Class 3 Components
  - Subsection NE — Class MC Components
  - Subsection NF — Supports
  - Subsection NG — Core Support Structures
  - Subsection NH — Class 1 Components in Elevated Temperature Service*
- Division 2 — Code for Concrete Containments
- Division 3 — Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste
- Division 5 — High Temperature Reactors

IV Rules for Construction of Heating Boilers

V Nondestructive Examination

VI Recommended Rules for the Care and Operation of Heating Boilers

VII Recommended Guidelines for the Care of Power Boilers

VIII Rules for Construction of Pressure Vessels
- Division 1
- Division 2 — Alternative Rules
- Division 3 — Alternative Rules for Construction of High Pressure Vessels

IX Welding, Brazing, and Fusing Qualifications

X Fiber-Reinforced Plastic Pressure Vessels

XI Rules for Inservice Inspection of Nuclear Power Plant Components

XII Rules for Construction and Continued Service of Transport Tanks

Reference Codes and Standards
American Petroleum Institute (API)

- API STANDARD 520, Part I (2014)
  Sizing, Selection and Installation of Pressure-relieving Devices in Refineries – Sizing and selection
- API STANDARD 520, Part II (2015)
  Sizing, Selection and Installation of Pressure-relieving Devices in Refineries – Installation
- API STANDARD 521 (2014)
  Pressure-relieving and Depressurizing Systems
- API STANDARD 526 (2009)
  Flanged Steel Pressure-relief Valves
- API STANDARD 527 (2014)
  Seat tightness of Pressure-relief Valves

energy API

Sizing, Selection, and Installation of Pressure-relieving Devices

Part I—Sizing and Selection

API STANDARD 520
NINTH EDITION, JULY 2014

Contents

Page

Reference Codes and Standards
American Petroleum Institute (API)

Flanged Steel Pressure-relief Valves

API STANDARD 526
SIXTH EDITION, APRIL 2009

Table 26—Pilot-operated Pressure-relief Valves "N" Orifice (Effective Orifice Area = 4.34 in.²)

Materials[b]	Valve Size	ASME Flange Class		Maximum Pressure Limits[a] (psig)				Center-to-Face Dimensions (in.)	
				Inlet Flange (Set) Pressure Limit			Outlet Pressure Limit[a]		
Body	Inlet by Orifice by Outlet	Inlet	Outlet	–450 °F to –21 °F	–20 °F to 100 °F	500 °F	1[illegible]		
Temperature Range, –20 °F to 500 °F									
Carbon Steel	4N6 4N6 4N6 4N6 4N6	150 300 600 900 1500	150 150 150 300 300		285 740 1480 2220 3705	170 605 1205 1810 3015	[illegible]	[illegible]	[illegible]
Temperature Range, –450 °F to 500 °F									
Austenitic Stainless Steel	4N6 4N6 4N6 4N6 4N6	150 300 600 900 1500	150 150 150 300 300	275 720 1440 2160 3600	275 720 1440 2160 3600	170 480 955 1435 2390	[illegible]	[illegible]	[illegible]
Temperature Range, –20 °F to 500 °F									
Nickel/Copper Alloy	4N6 4N6 4N6 4N6	150 300 600 900	150 150 150 300		230 600 1200 1800	170 475 945 1420	[illegible]	[illegible]	[illegible]
Temperature Range, –20 °F to 300 °F									
Alloy 20[c]	4N6 4N6 4N6 4N6 4N6	150 300 600 900 1500	150 150 150 300 300		230 600 1200 1800 3000	180 465 930 1395 2330	[illegible] [illegible] [illegible] 600 600	[illegible] [illegible] [illegible] 9 13/16 9 13/16	[illegible] [illegible] [illegible] 9 3/16 9 3/16

a Inlet and outlet flange pressure limits correspond to the values in ASME B16.34 unless enclosed in parentheses. A value that is shown in parentheses is less than that provided in ASME B16.34. The outlet flange values at 100 °F above are the limit for this standard. Inlet and outlet flange pressure values at other temperatures may only be interpolated using charts from Annex B or from tables in ASME B16.34, if these values do not exceed the values in parentheses or the outlet flange values at 100 °F above. Pressure changes within the temperature ranges above may not be linear. User is cautioned to review the outlet temperature for possible cryogenic applications and select the appropriate materials.

b Materials given are minimum requirements for the pressure and temperature ratings. Other suitable materials may be used, as required for the service involved.

c Materials limited to 300 °F. Pressure ratings indicated in the 500 °F column are limited to 300 °F.

Designation	Effective Orifice Area (in.²)
D	0.110
E	0.196
F	0.307
G	0.503
H	0.785
J	1.287
K	1.838
L	2.853
M	3.60
N	4.34
P	6.38
Q	11.05
R	16.00
T	26.00

Table 1—Standard Effective Orifice Areas and Letter Designations

Table 16—Spring-loaded Pressure-relief Valves "T" Orifice (Effective Orifice Area = 26.00 in.²)

Materials[b]	Valve Size	ASME Flange Class		Maximum Inlet Flange (Set) Pressure Limit[a] (psig)						Outlet Pressure Limit[a] (psig)		Center-to-Face Dimensions (in.)	
				Conventional and Balanced Bellows Valves									
Body/ Bonnet	Inlet by Orifice by Outlet	INLET	OUTLET	–450 °F to –76 °F	–75 °F to –21 °F	–20 °F to 100 °F	450 °F	800 °F	1000 °F	Flange Rating Limit[a] 100 °F	Bellows Rating Limit[a] 100 °F	INLET	OUTLET
Temperature Range Inclusive –20 °F to 800 °F													
Carbon Steel	8T10 8T10[c] 8T10 8T10	150 300 300 300	150 150 150 150			(65) (65) (120) (300)	(65) (65) (120) (300)	(65) (65) (120) (300)		(30) (30) (60) (100)	30 30 60 100	10 7/8 10 7/8 10 7/8 10 7/8	11 11 11 11
Temperature Range Inclusive 801 °F to 1000 °F													
...me ...lenum ...el	8T10 8T10	300 600	150 150					(120) (300)	100 (215)	(60) (100)	60 100	10 7/8 10 7/8	11 11
Temperature Range Inclusive –450 °F to 1000 °F													
...nitic ...less ...el	8T10 8T10[c] 8T10	150 300 300	150 150 150	(50) (50) (65)	(65) (65) (120)	(65) (65) (120)	(65) (65) (120)	(65) (65) (120)	(20) (65) (120)	(30) (30) (60)	30 30 60	10 7/8 10 7/8 10 7/8	11 11 11
Temperature Range Inclusive –20 °F to 900 °F[d]													
...opper ...[d]	8T10 8T10[c] 8T10	150 300 300	150 150 150			(65) (65) (120)	(65) (65) (120)	(65) (65) (120)	50 (65) (120)	(30) (30) (60)	30 30 60	10 7/8 10 7/8 10 7/8	11 11 11
Temperature Range Inclusive –20 °F to 300 °F[e]													
...0[e]	8T10 8T10[c] 8T10	150 300 300	150 150 150			(65) (65) (120)	(65) (65) (120)			(30) (30) (60)	30 30 60	10 7/8 10 7/8 10 7/8	11 11 11

...et and outlet flange pressure limits correspond to the values in ASME B16.34 unless enclosed in parentheses. A value that is shown in parentheses is ...s than that provided in ASME B16.34. The outlet flange values at 100 °F above are the limits for this standard. Inlet and outlet flange pressure values ...other temperatures may only be interpolated using graphs from Annex B or from tables in ASME B16.34, if these values do not exceed the values ...parentheses or the outlet flange values at 100 °F above. Pressure changes within the temperature ranges above may not be linear. Bellows outlet pressure limits are the design pressure of the bellows at the outlet temperature of 100 °F, and pressure values at other temperatures may be determined from Annex C. User is cautioned to review the outlet temperature for possible cryogenic applications and select the appropriate materials.

b Materials given are minimum requirements for the pressure and temperature ratings. Other suitable materials may be used, as required for the service involved.

c Set pressure limited for low-pressure applications where a class 300 inlet flange is preferred over a class 150 flange.

d Materials limited to 900 °F. Pressure ratings indicated in the 1000 °F column are limited to 900 °F.

e Materials limited to 300 °F. Pressure ratings indicated in the 450 °F column are limited to 300 °F.

Reference Codes and Standards
International Organization for Standardization (ISO)

ISO 4126 consists of the following parts, under the general title *Safety valves for protection against excessive pressure:*

- Part 1: Safety valves (2013)
- Part 2: Bursting discs safety devices (2003)
- Part 3: Safety valves and bursting disc safety devices in combination (2006)
- Part 4: Pilot operated safety valves (2013)
- Part 5: Controlled safety pressure relief systems (CSPRS) (2013)
- Part 6: Application, selection and installation of bursting disc safety devices (2014)
- Part 7: Common data (2013)
- Part 9: Application and installation of safety devices excluding stand-alone bursting disc safety devices (2008)
- Part 10: Sizing of safety valves for gas/liquid two-phase flow (2010)
- Part 11: Performance testing *(under preparation; last ISO/DIS is dated 2014-08)*

Reference Organizations – CE marking

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INTERNATIONAL STANDARD

ISO 4126-1

Third edition
2013-07-15

Safety devices for protection against excessive pressure —

Part 1:
Safety valves

Dispositifs de sécurité pour protection contre les pressions excessives — Partie 1: Soupapes de sûreté

Reference number
ISO 4126-1:2013(E)

© ISO 2013

UNI EN ISO 4126-1:2013

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 4126-1

July 2013

ICS 13.240

Supersedes EN ISO 4126-1:2004

English Version

Safety devices for protection against excessive pressure - Part 1: Safety valves (ISO 4126-1:2013)

Dispositifs de sécurité pour protection contre les pressions excessives - Partie 1: Soupapes de sûreté (ISO 4126-1:2013)

Sicherheitseinrichtungen gegen unzulässigen Überdruck - Teil 1: Sicherheitsventile (ISO 4126-1:2013)

This European Standard was approved by CEN on 28 December 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations whic... Standard the status of a national standard without any alteration. Up-to-date lists and b... standards may be obtained on application to the CEN-CENELEC Management Centre ...

This European Standard exists in three official versions (English, French, German). A v... under the responsibility of a CEN member into its own language and notified to the CEN... status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia,... Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary,... Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slove... Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZ...
COMITÉ EUROPÉEN DE NORMALISA...
EUROPÄISCHES KOMITEE FÜR NORM...

Management Centre: Avenue Marnix 17, B-10...

UNI EN ISO 4126-1:2013

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NORMA EUROPEA

Dispositivi di sicurezza per la protezione contro le sovrapressioni
Parte 1: Valvole di sicurezza

UNI EN ISO 4126-1

SETTEMBRE 2013

Safety devices for protection against excessive pressure
Part 1: Safety valves

La norma indica i requisiti generali per le valvole di sicurezza indipendentemente dal fluido per il quale sono state progettate. Essa si applica alle valvole di sicurezza che hanno un diametro di passaggio utilizzabile uguale o maggiore di 4 mm per pressioni di taratura di 0,1 bar o maggiori. Non è prevista nessuna limitazione per la temperatura.

Pagina I

PARCOL SPA
UNIstore - 2013 - 379846
EN ISO 4126-1:2013 (E)

Annex ZA
(informative)

Relationship between this International Standard and the Essential Requirements of EU Directive 97/23/EC (PED)

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5.1.5	Safety of operation	2.3
5.1.6	Drain and venting	2.5
6.3	Proof test	3.2.2
10	Marking and labelling	3.3

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

Steps for certification of safety valves

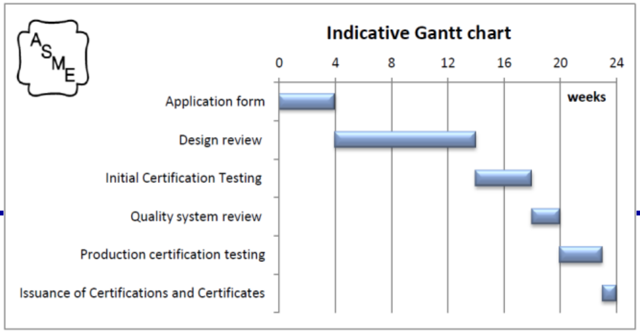
ASME UV Stamp (ASME Sect. VIII Div. 1) vs. CE marking (ISO 4126-1)

ASME Stamp

1. **Application Form**
   The Manufacturer contacts ASME.
2. **Design review**
   The technical dossier for the product/series under certification is reviewed by ASME or ASME certified inspector.
3. **Initial Certification Testing ("Provisional Testing")**
   The selected ASME certified flow laboratory defines the number of sample to be tested to define the performance characteristics of the product/series (overpressure, coefficient of discharge, blowdown).
4. **Quality System Review**
   Performed at Manufacturer's facilities.
   The ASME Quality Manual supplied by the Manufacturer is reviewed and approved.
5. **Production Certification Testing**
   During Quality System Review, the ASME Inspector selects the valves to be tested at the ASME certified flow laboratory.
   Valves are assembled and tested (set pressure and leakage tests only) at Manufacturer's facilities under the ASME Inspector witnessing.
   After plumbing, valves are shipped to the selected ASME certified flow laboratory to confirm the performances defined during Initial Certification Testing.
6. **Issuance of Certifications and Certificates**

CE marking

1. **Application Form**
   The Manufacturer contacts the selected Notified Body.
2. **Design review**
   The technical dossier for the product/series under certification is reviewed by the Notified Body.
3. **Performance Testing**
   The Manufacturer and the Notified Body select the accredited flow laboratory and the number of sample to be tested to define the performance characteristics of the product/series (overpressure, coefficient of discharge, blowdown).
4. **Quality System Review**
   Performed at Manufacturer's facilities.
   The ISO Quality Manual supplied by the Manufacturer is reviewed and approved.
5. **Production Certification Testing**
   Part of the Quality System Review consists in the assembling and testing (hydrostatic pressure, set pressure and leakage tests) under the Notified Body Inspector witnessing.
6. **Issuance of Certifications and Certificates**



PARCOL's Specialties – SAFETY DEVICES

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National Board Pressure Relief Device Certifications

NB-18

http://www.nationalboard.org/SiteDocuments/NB18/NB18.pdf

Stamps
ASME (left) and National Board (right)

ASME Stamp
Certified individual (CI)

UG-117 CERTIFICATES OF AUTHORIZATION AND CERTIFICATION MARKS

(a) A Certificate of Authorization to use the Certification Mark with the U, UM, UV, or UD Designators shown in Figures UG-116, UG-129.1, and UG-129.2 will be granted by the Society pursuant to the provisions of the following paragraphs. Stamps for applying the Certification Mark shall be obtained from the Society. For those items to be marked with the UM, UV, or UD Designators, a Certified Individual meeting the current requirements of ASME QAI-1 shall provide oversight to ensure that each use of the UM, UV, or UD Designators is in accordance with the requirements of this Division. In addition, each use of the UM, UV, or UD Designators is to be documented on the Certificate of Compliance Form (U-3 or U-3A) for vessels bearing the UM Designator, or a Certificate of Conformance Form (UV-1 or UD-1) as appropriate.

(1) Requirements for the Certified Individual (CI). The CI shall:

(-a) be an employee of the Manufacturer or Assembler.

(-b) be qualified and certified by the Manufacturer or Assembler. Qualifications shall include as a minimum:

(-1) knowledge of the requirements of this Division for the application of the Certification Mark with the appropriate designator;

(-2) knowledge of the Manufacturer's or Assembler's quality program;

(-3) training commensurate with the scope, complexity, or special nature of the activities to which oversight is to be provided.

(-c) have a record, maintained and certified by the Manufacturer or Assembler, containing objective evidence of the qualifications of the CI and the training program provided.

(2) Duties of the Certified Individual (CI). The CI shall:

(-a) verify that each item to which the Certification Mark is applied meets all applicable requirements of this Division and has a current capacity certification for the "UV" or "UD" Designators;

(-b) for the "UV" or "UD" Designators, review documentation for each lot of items to be stamped to verify, for the lot, that requirements of this Division have been completed;

(-c) sign the appropriate Certificate of Compliance/Conformance Form U-3, U-3A, UV-1, or UD-1 as appropriate prior to release of control of the item.

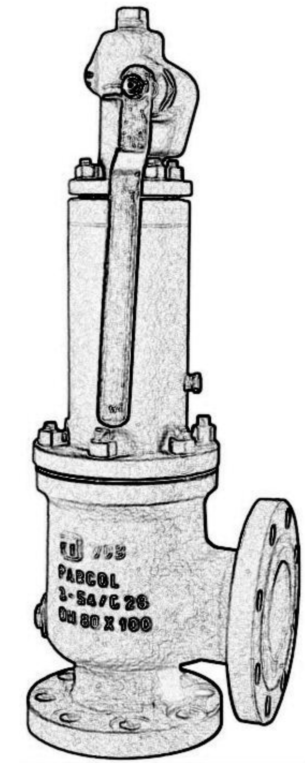
(3) Certificate of Compliance/Conformance Form U-3, U-3A, UV-1, or UD-1.

(-a) The appropriate Certificate of Conformance shall be filled out by the Manufacturer or Assembler and signed by the Certified Individual. Mass produced pressure relief devices may be recorded on a single entry provided the devices are identical and produced in the same lot.

(-b) The Manufacturer's or Assembler's written quality control program shall include requirements for completion of Certificates of Conformance forms and retention by the Manufacturer or Assembler for a minimum of five years.

(b) Application for Authorization. Any organization desiring a Certificate of Authorization shall apply to the Boiler and Pressure Vessel Committee of the Society, on forms issued by the Society,[40] specifying the Certification Designator desired and the scope of Code activities to be performed. When an organization intends to build Code items in plants in more than one geographical area, either separate applications for each plant or a single application listing the addresses of all such plants may be submitted. Each application shall identify the Authorized Inspection Agency providing Code inspection at each

ASME NB



Terms and definitions

Reference standard		***API 520 Part 1 (2014)***	***ISO 4126-1:2013***
set pressure	**pset**	The inlet gauge pressure at which the pressure relief device is set to open under service conditions	Predetermined pressure at which a safety valve under operating conditions commences to open (1)
overpressure	**ovp**	The pressure increase over the set pressure of the relieving device. Overpressure is expressed in pressure units or as a percentage of set pressure. Overpressure is the same as accumulation only when the relieving device is set to open at the maximum allowable working pressure of the vessel	Pressure increase over the set pressure (2)
coefficient of discharge	**K**	The ratio of the mass flow rate in a valve to that of an ideal nozzle. The coefficient of discharge is used for calculating flow through a pressure relief device	Value of actual flowing capacity (from tests) divided by the theoretical flowing capacity (from calculation)
blowdown	**bd**	The difference between the set pressure and the closing pressure of a pressure relief valve, expressed as a percentage of the set pressure or in pressure units	Difference between set and reseating pressures (3)
back pressure	**bp**	The pressure that exists at the outlet of a pressure relief device as a result of the pressure in the discharge system. Backpressure is the sum of the superimposed and built-up backpressures. **built-up backpressure** The increase in pressure at the outlet of a pressure relief device that develops as a result of flow after the pressure relief device opens. **superimposed backpressure** The static pressure that exists at the outlet of a pressure relief device at the time the device is required to operate. Superimposed backpressure is the result of pressure in the discharge system coming from other sources and may be constant or variable.	Pressure that exists at the outlet of a safety valve as a result of the pressure in the discharge system (4) **built-up back pressure** Pressure existing at the outlet of a safety valve caused by flow through the valve and the discharge system **superimposed back pressure** Pressure existing at the outlet of a safety valve at the time when the device is required to operate
flow area	**A**	**Actual discharge area** The area of a pressure relief valve (PRV) is the minimum net area that determines the flow through a valve	Minimum cross-sectional flow area (but not the smallest area between disc and seat) between inlet and seat which is used to calculate the theoretical flow capacity, with no deduction for any obstruction

1) It is the gauge pressure measured at the valve inlet at which the pressure forces tending to open the valve for the specific service conditions are in equilibrium with the forces retaining the valve disc on its seat
2) Overpressure is usually expressed as a percentage of the set pressure
3) Blowdown is normally stated as a percentage of set pressure except for pressures of less than 3 bar when the blow down is expressed in bar
4) The back pressure is the sum of the superimposed and built-up back pressures

Typical PRV functional characteristics

Reference standard		*API 520 Part 1 (2014)*		*ISO 4126-1:2013*	
service		**vapor/gas**	**liquid**	**vapor/gas**	**liquid**
max overpressure	**ovp**	10% ÷ 21%	10% ÷ 25%	10%	10%
coefficient of discharge	**K**	0.975 (1)	0.37 ÷ 0.62 (1)	-	-
max blowdown	**bd**	15% (1)	15% (1)	15%	20%
max back pressure	**bp**	50% (1) (2)	50% (1) (2)	(3) (4)	(5)

1) For reference only. Refer to PRV manufacturer for effective value.
2) Evaluated as bp / pset | gauge (50% is valid for balanced valves only; for conventional ones, consider 10%)
3) No indication, but tests shall be performed for backpressures higher than 25%
4) Evaluated as bp / (pset + ovp) | abs
5) Evaluated as bp / (pset + ovp) | gauge according to ISO/DIS 4126-11 - Safety devices for protection against excessive pressure - Part 11: Performance testing

API STANDARD 520, PART 1—SIZING AND SELECTION
SIZING, SELECTION, AND INSTALLATION OF PRESSURE-RELIEVING DEVICES IN REFINERIES 75

NOTE The curve above shows that up to and including 25 % overpressure, capacity is affected by the change in lift, the change in the orifice discharge coefficient, and the change in overpressure. Above 25 %, capacity is affected only by the change in overpressure. Noncertified valves operating at low overpressure tend to chatter; therefore, overpressures of less than 10 % should be avoided.

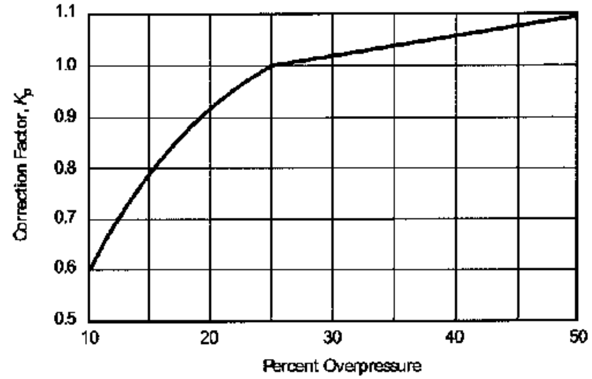


Figure 38—Capacity Correction Factors Due to Overpressure for Noncertified PRVs in Liquid Service

PARCOL's Specialties – SAFETY DEVICES

Valve sizing

Reference standard	API 520 Part 1 (2014)	ISO 4126-7:2013
Vapor/Gas	$A_g = \frac{W}{CK_d P_1 K_b K_c}\sqrt{\frac{TZ}{M}}$	$A_g = \frac{Q_m}{p_0 C K_{dr} K_b}\sqrt{\frac{T_0 Z}{M}}$
Liquid	$A_l = \frac{11.78Q}{K_d K_w K_c K_v}\sqrt{\frac{\rho_l}{P_1 - P_2}}$	$A_l = \frac{Q_m}{1.61 K_{dr} K_v}\sqrt{\frac{v}{p_0 - p_b}}$
Alternate discharge	$A = \max\left(A_g; A_l\right)$	$A = \max\left(A_g; A_l\right)$
Two-phase mixture	$A_{C.2.2} = \frac{277.8W}{K_d K_b K_c K_v G}$ $A_{C.2.3} = \frac{16.67 Q \rho_{l0}}{K_d K_b K_c K_v G}$	**ISO 4126-10:2010** $A_0 = \frac{Q_{m,out}}{K_{dr,2ph} C}\sqrt{\frac{v_0}{2p_0}}$

Note: refer to reference standards for proper terminology and units of measure

K_{dr}	Certified derated discharge coefficient. K_d is the coefficient of discharge determined by test	$= 0.9 \cdot K_d$
$K_{dr,2ph}$	Discharge coefficient for two-phase flow, if not experimentally available. $K_{dr,g}$, $K_{dr,l}$ and ε_{seat} are respectively the certified discharge coefficient for single-phase vapor/gas flow, the certified discharge coefficient for single-phase liquid flow and the void fraction in the narro west cross-section of the valve at sizing conditions for a homogeneous two-phase mixture	$= \varepsilon_{seat} \cdot K_{dr,g} + (1 - \varepsilon_{seat}) \cdot K_{dr,l}$

Valve sizing
Gas – Critical flow

			API 520-1 2014	ISO 4126-7 2013
set pressure	pset	barg	10	10
overpressure	ovp	%	10%	10%
relieving pressure	p0	bar	12.01	12.01
relieving temperature	T0	° C	30	30
backpressure	pb	barg	0	0
flowrate	Q	kg/h	10 000	10 000
molar mass	M	-	28.964	28.964
compressibility factor	Z	-	1	1
isentropic exponent at relieving pressure and temperature	k	-	1.4	1.4
function of the isentropic exponent, k	C	-	0.0270	2.7033
coefficient of discharge	Kd (1)	-	0.975	0.975
capacity correction factor due to backpressure	Kb (1)	-	1.000	1.000
combination correction factor for installation with a rupture disc	Kc	-	1	1
backpressure ratio pb / p0 | abs	r	-	8.4%	8.4%
backpressure ratio pb / pset | gauge	r_g	-	0%	0%
critical pressure	pc	bar	6.35	6.35
flux		-	**critical**	**critical**
			Formula (5)	par. 6.3.3
minimum flow area	A	cm2	**11.350**	**11.352**

1) According to API 520 nomenclature

Δ API / ISO	**-0.02%**

API

critical

$$A = \frac{W}{C K_d P_1 K_b K_c}\sqrt{\frac{TZ}{M}} \quad (5)$$

$$C = 0.03948\sqrt{k\left(\frac{2}{k+1}\right)^{\frac{(k+1)}{(k-1)}}} \quad (9)$$

ISO

$$\dot{Q}_m = p_o\, C A K_{dr} K_b \sqrt{\frac{M}{Z T_o}}$$

$$C = 3{,}948\sqrt{k\left(\frac{2}{k+1}\right)^{(k+1)/(k-1)}}$$

Difference between results is negligible

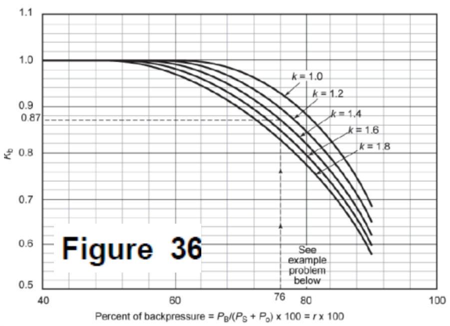
Flow is critical when pb < pc

$$p_c = p_0\left[\frac{2}{k+1}\right]^{\frac{k}{k-1}}$$

Valve sizing
Gas – Subcritical flow

			API 520-1 2014	ISO 4126-7 2013
set pressure	pset	barg	10	10
overpressure	ovp	%	10%	10%
relieving pressure	p0	bar	12.01	12.01
relieving temperature	T0	° C	30	30
backpressure (superimposed, constant)	pb	barg	9	9
flowrate	Q	kg/h	10 000	10 000
molar mass	M	-	28.964	28.964
compressibility factor	Z	-	1	1
isentropic exponent at relieving pressure and temperature	k	-	1.4	1.4
function of the isentropic exponent, k	C	-	0.0270	2.7033
coefficient of discharge	Kd (1)	-	0.975	0.975
capacity correction factor due to backpressure (Fig. 36)	Kb (1)	-	0.764	1.000
combination correction factor for installation with a rupture disc	Kc	-	1	1
backpressure ratio pb / p0 | abs	r	-	83.4%	83.4%
backpressure ratio pb / pset | gauge	r_g	-	90%	90%
critical pressure	pc	bar	6.35	6.35
flux		-	**subcritical**	**subcritical**
capacity correction factor for subcritical flow (API)	F2	-	0.906	n.a.
theoretical capacity correction factor for subcritical flow (ISO)	Ksub (2)	-	n.a.	0.764
			Formula (5)	par. 6.3.3
minimum flow area	A	cm2	**14.849**	**14.858**
			Formula (15)	
			14.849	

1) According to API 520 nomenclature
2) Corresponds to Kb in ISO 4126-7



Δ API / ISO -0.06%

Difference between results is negligible

API

critical

$$A = \frac{W}{C K_d P_1 K_b K_c}\sqrt{\frac{TZ}{M}} \quad (5)$$

$$C = 0.03948\sqrt{k\left(\frac{2}{k+1}\right)^{\frac{(k+1)}{(k-1)}}} \quad (9)$$

subcritical

$$A = \frac{17.9 \times W}{F_2 K_d K_c}\sqrt{\frac{ZT}{M \times P_1(P_1 - P_2)}} \quad (15)$$

$$F_2 = \sqrt{\left(\frac{k}{k-1}\right) r^{\left(\frac{2}{k}\right)}\left[\frac{1 - r^{\left(\frac{k-1}{k}\right)}}{1-r}\right]} \quad (18)$$

ISO

$$\dot{Q}_m = p_o\, C A K_{dr} K_b \sqrt{\frac{M}{Z T_o}}$$

$$C = 3,948\sqrt{k\left(\frac{2}{k+1}\right)^{(k+1)/(k-1)}}$$

$$K_b = \sqrt{\frac{\frac{2k}{k-1}\left[\left(\frac{p_b}{p_o}\right)^{\frac{2}{k}} - \left(\frac{p_b}{p_o}\right)^{\frac{k+1}{k}}\right]}{k\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}}}$$

Valve sizing
Gas – Subcritical flow – F_2 and K_b

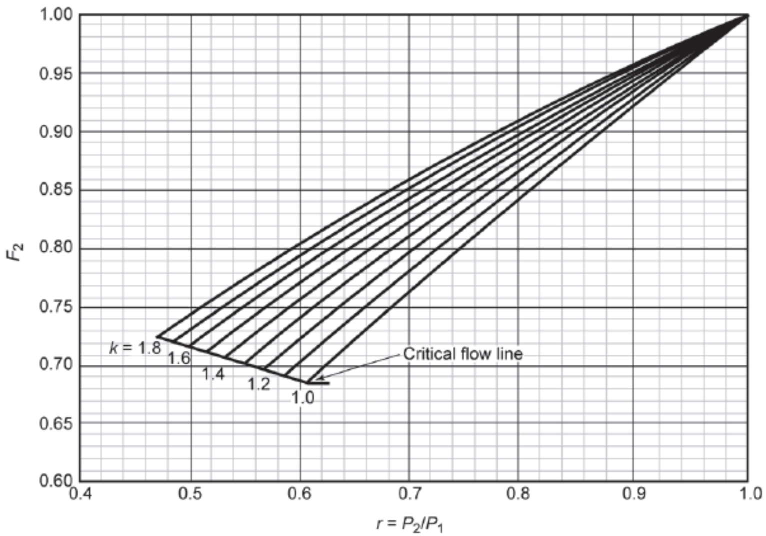
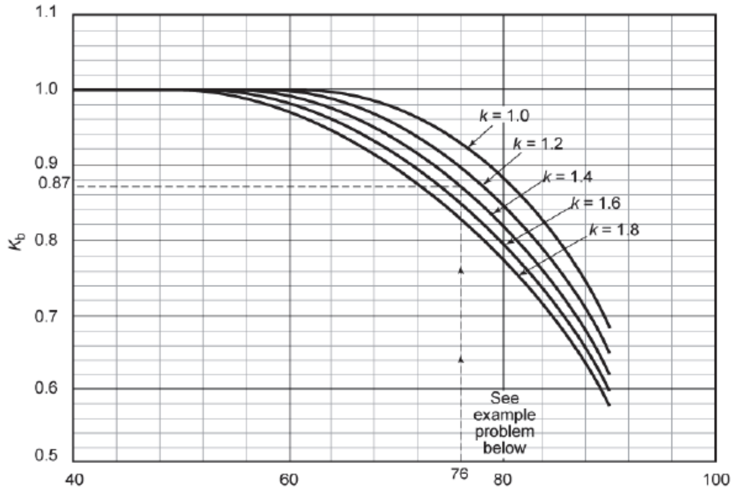


Figure 35—Values for F_2 for Subcritical Flow

$$F_2 = \sqrt{\left(\frac{k}{k-1}\right) r^{\left(\frac{2}{k}\right)} \left[\frac{1-r^{\left(\frac{k-1}{k}\right)}}{1-r}\right]} \quad (18)$$

5.6.4) equal to the critical flow equation (see 5.6.3) and algebraically solving for K_b. A graphical presentation of the capacity correction factor, K_b, is given in Figure 36. This alternate sizing procedure allows the designer to use the critical flow equation to calculate the same area obtained with the subcritical flow equation provided K_b is obtained from Figure 36 (instead of a K_b value of 1.0 when the critical flow equations of 5.6.3 are used).



Percent of backpressure = $P_B/(P_S + P_o) \times 100 = r \times 100$

K_b = backpressure correction factor,
P_B = backpressure, in psia,
P_S = set pressure, in psia,
P_O = ovepressure, in psi.

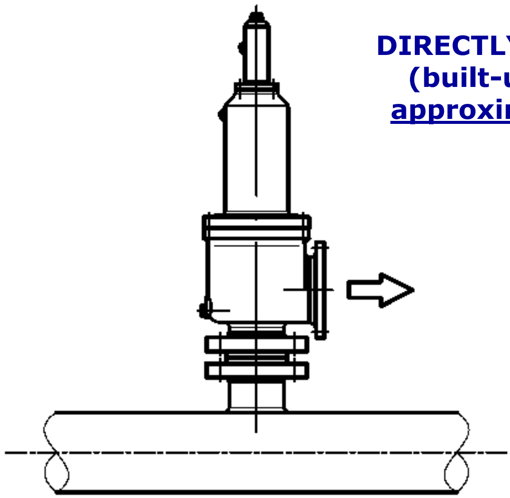
Set Pressure (MAWP)	= 100 psig
Overpressure	= 10 psi
Superimposed backpressure (constant)	= 70 psig
Spring set	= 30 psi
Built-up backpressure	= 10 psi
Percent absolute backpressure	$= \frac{(70 + 10 + 14.7)}{(100 + 10 + 14.7)} \times 100$
	= 76
K_b (follow dotted line for $C_p/C_V = k = 1.4$)	= 0.87 (from the curve)

NOTE This chart is typical and suitable for use only when the make of the valve or the actual critical flow pressure point for the vapor or gas is unknown; otherwise, the valve manufacturer should be consulted for specific data. This correction factor should be used only in the sizing of conventional (non-balanced) PRVs that have their spring setting adjusted to compensate for the superimposed backpressure. It should not be used to size balanced type valves.

Figure 36—Constant Backpressure Correction Factor, K_b, for Conventional PRVs (Vapors and Gases Only)

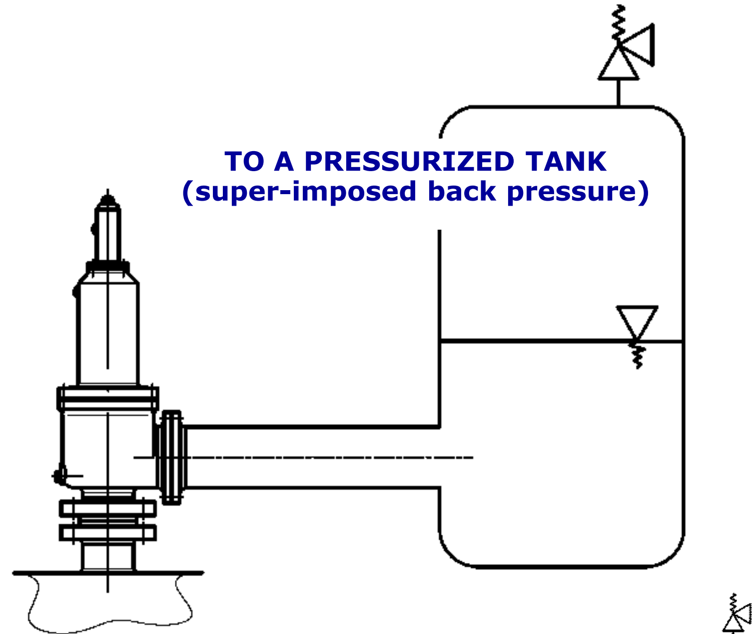
PARCOL's Specialties – SAFETY DEVICES

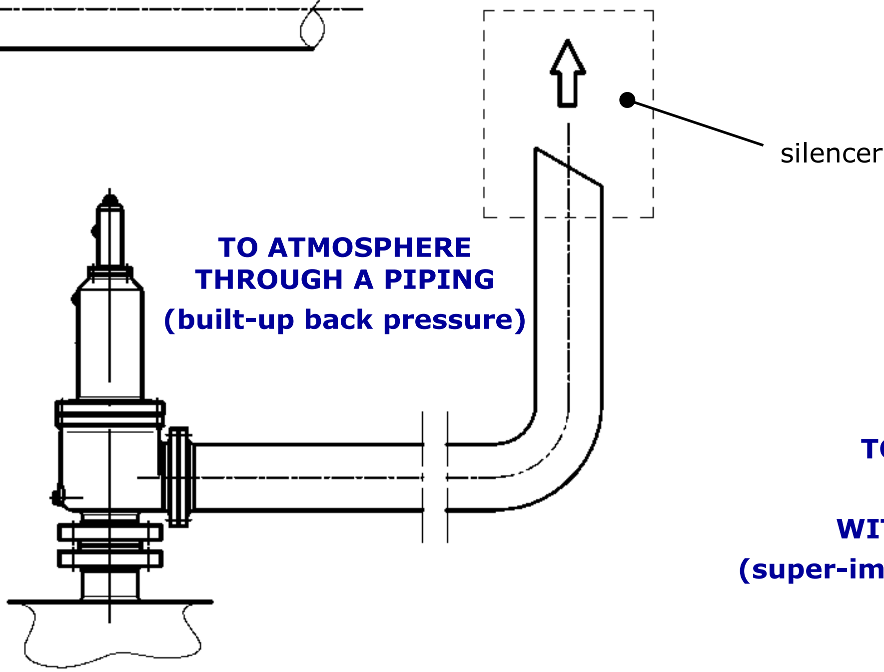
Discharge under back pressure conditions



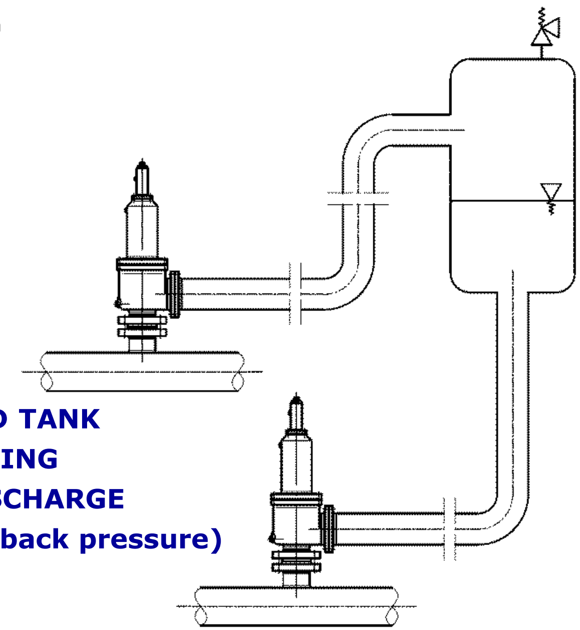
DIRECTLY TO ATMOSPHERE
(built-up back pressure
approximately negligible)

TO A PRESSURIZED TANK
(super-imposed back pressure)





TO ATMOSPHERE
THROUGH A PIPING
(built-up back pressure)

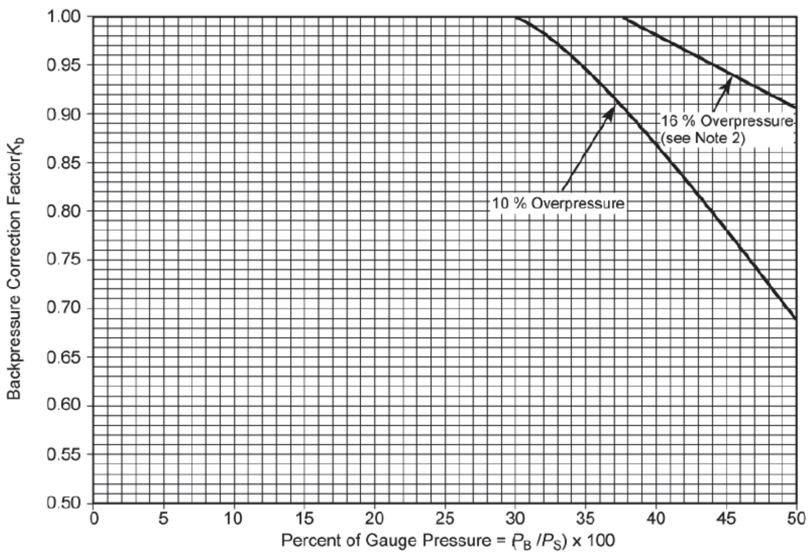


TO A PRESSURIZED TANK
THROUGH A PIPING
WITH MULTIPLE DISCHARGE
(super-imposed + built-up back pressure)

Back pressure correction factors (API 520 Part 1)

Note : The curves are a compromise of the values recommended by various PRV manufacturers and may be used for a preliminary sizing only. **PRV manufacturers should be consulted for the effective correction factors**.

SHALL



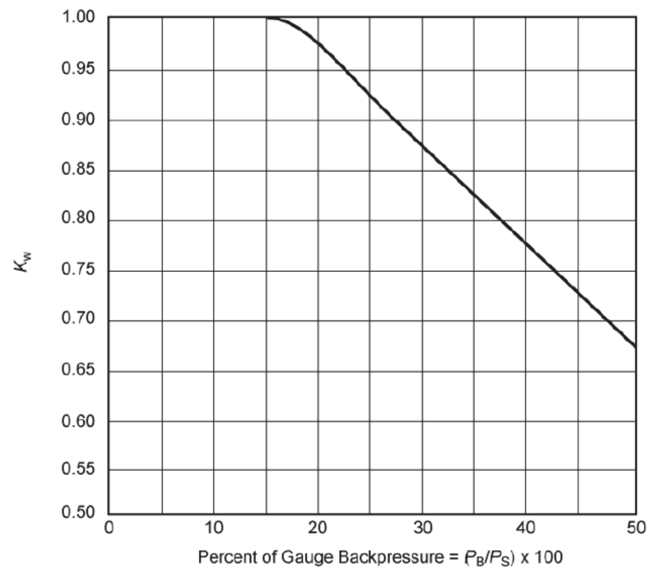
P_B = backpressure, in psig
P_S = set pressure, in psig

NOTE 1 The curves above represent a compromise of the values recommended by a number of relief valve manufacturers and may be used when the make of the valve or the critical flow pressure point for the vapor or gas is unknown. When the make of the valve is known, the manufacturer should be consulted for the correction factor. These curves are for set pressures of 50 psig and above. They are limited to back pressure below critical flow pressure for a given set pressure. For set pressures below 50 psig or for subcritical flow, the manufacturer must be consulted for values of K_b.

NOTE 2 See 5.3.3.

NOTE 3 For 21 % overpressure, K_b equals 1.0 up to P_B/P_S = 50 %.

Figure 30—Backpressure Correction Factor, K_b, for Balance Spring-loaded PRV (Vapors and Gases)



K_W = correction factor due to backpressure.
P_B = backpressure, in psig.
P_S = set pressure, in psig.

NOTE The curve above represents values above recommended by various manufacturers. This curve may be used when the manufacturer is not known. Otherwise, the manufacturer should be consulted for the applicable correction factor.

Figure 31—Capacity Correction Factor, K_w, Due to Backpressure on Balanced Spring-loaded PRVs in Liquid Service

Valve sizing
Gas – Evaluation of backpressure (API vs. ISO)

			pset = constant; pb = increase				pset = decrease; pb = constant			
			1	2	3	4	5	6	7	8
set pressure	pset	barg	4	4	4	4	4	3	2	1
overpressure	ovp	%	10%	10%	10%	10%	10%	10%	10%	10%
relieving pressure	p0	bar	5.41	5.41	5.41	5.41	5.41	4.31	3.21	2.11
backpressure	pb	barg	0	0.5	1	2	0	0	0	0
backpressure ratio pb / p0 | abs (ISO)	r	-	18.7%	28.0%	37.2%	55.7%	18.7%	23.5%	31.5%	47.9%
backpressure ratio pb / pset | gauge (API)	r_g	-	0%	13%	25%	50%	0%	0%	0%	0%

K_b = 1

K_b = 0.92

out of range

K_b = 0.679

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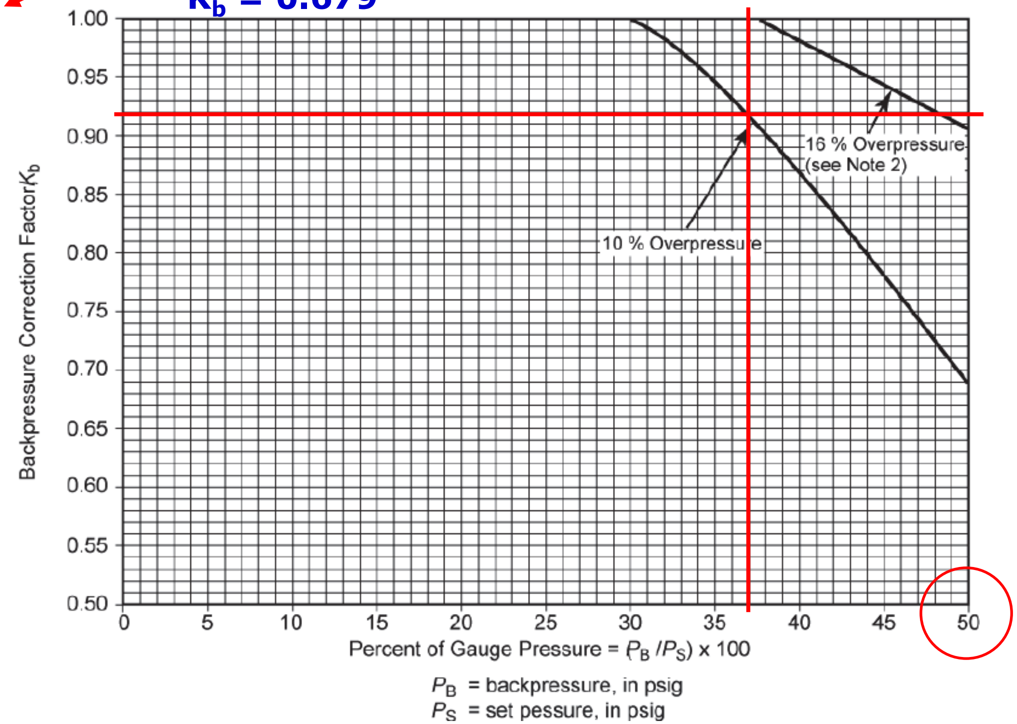


Evaluation of back pressure
Compressible vs. incompressible fluids

ISO 4126-1:2013
Par. 7.3.3.4 Value of test pressure

<<…For **compressible fluids** when the ratio of absolute back pressure to absolute relieving pressure exceeds the value of 0.25, the coefficient of discharge can be largely dependent upon this ratio. Then tests shall be conducted at ratios between the pressure ratio of 0.25 and the maximum pressure ratio required to obtain curves or tables of coefficient of discharge versus the ratio of absolute back pressure and absolute relieving pressure, this curve may be extended to cover the tests with pressure ratios less than 0.25. …>>

ISO/DIS 4126-11:2011 — *preliminary draft*
Par. 3 Terms and definitions

Back pressure ratio (BPR)

The back pressure ratio is the ratio of back pressure and actual relieving pressure, usually expressed as percentage. Both definitions of BPR, based on gauge or absolute pressures, can be adopted for the purpose of tracing the curve of discharge coefficient vs. BPR.

If BPR is assumed as the ratio of absolute back pressure and actual absolute relieving pressure, the value of BPR is always equal to 100 when the back pressure equals the relieving pressure.

If BPR is defined as the ratio of back pressure and actual back pressure, both expressed as gauge, BPR is always null under atmospheric back pressure conditions, and equals 100 when the back pressure equals the relieving pressure.

Note: This definition of back pressure ratio modifies the one reported in the reference standards - e.g., 4126-1 § 7.3.3.4 - that refers to pressure in absolute units.

This difference/chance is related to the following reasons:

- In the case of **incompressible fluids**, the parameter, accounting for the discharging flow rate, is the pressure difference rather than the absolute pressure ratio, as occurs in the case of compressible fluids. Moreover, the limiting ratio of $Pb/Pp<0.25$, expressed in absolute units, reported in 4126-1 § 7.3.3.4, lacks of meaning operating with incompressible fluids (as its origin is related to the passage from sonic to subsonic discharge conditions occurring in compressible fluids). Considering what above, it is clear that the operational and discharge capability of a safety valve operating with uncompressible fluids must be verified also for back pressure ratios less than 0.25
- The main influence of back pressure is the lift reduction, that leads to the reduction of the discharge coefficient (mostly for geometrical reasons). In the case of a safety device operating with air at a low set pressure rate (i.e., closed to atmosphere), the BPR evaluated by absolute pressures can be very high also at atmospheric back pressure (50% for a relative relieving pressure of 1 bar) while the disc reaches the nominal lift. This implies that it can result quit hard to find a single curve representative of the K vs BPR trend for a valve size range also including low set pressures. The use of relative pressure in the definition of BPR can really help in finding this curve. Notice that the difference in the two definitions becomes negligible over a certain relieving pressure.

Testing laboratories
Independent flow laboratories

The main area of the National Board Testing Laboratory contains three test systems using steam, nitrogen, and water. Each system features the following:

	Steam	Air			Water
Media	Dry Saturated Steam	Compressed Nitrogen			Ambient Temp. Water
Maximum Source Pressure	850 psi (58 bar)	3,500 psi (238 bar)			625 psi (43 bar)
Flow Measurement Method	Timed Weight Method	Sonic Flow Nozzle and Sharp-Edged Orifice Plate			Sharp-Edged Orifice Plates and Timed Weight Method
Maximum Stamped Set Pressure	500 psi (34 bar) 4" (DN 100)	Low: 580 psi (39 bar) 6" (DN 150)	Medium: 1,100 psi (75 bar) 4" (DN 100)	High: 2,025 psi (138 bar) ¾" (DN 20)	500 psi (34 bar) 4" (DN 100)
Maximum Stamped Flow Capacity	16,000 pph (7,257 Kg/h)	13,000 SCFM (22,087 m^3/h)	25,000 SCFM (42,475 m^3/h)	5,000 SCFM (8,495 m^3/h)	550 gpm (2,082 L/min)

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

<<… As the world's only independent ASME certified flow laboratory, the National Board Testing Laboratory, located north of Columbus, remains the leader in promoting accurate performance measurement of pressure relieving devices and the development of technical standards…>>

In April 2016, **Mr. Joseph Ball,** Director of National Bard Pressure Relief Department was nominated Convenor of ISO TC 185 WG 18 for the development of ISO 4126 Part 11: Performance Testing.
Previous Convenor was **Prof. Vincenzo Dossena**, Head of Fluid-dynamics of Turbo-machines Laboratories (LFM) at Politecnico di Milano University, that resigned in October 2015 after more than five years of important job culminating in the ISO/DIS 4126:11 dated 08-2014.

POLITECNICO DI MILANO

<<… Independent Testing Laboratory located in Milan, north of Italy, is leader in performance measurement of pressure relieving devices under backpressure conditions and the development of technical standards.
It is the reference Testing Laboratory for Italian Manufacturers of pressure relieving devices. …>>

"Fluid-dynamics of Turbo-machines" Laboratories (LFM) at "Politecnico di Milano" University

Media		**air** (dried and preheated)	**water**
Media testing temperature		ambient	ambient
Valves inlet range		low pressure: 1/4" ÷ 6" high pressure: 1/4" ÷ 4"	1/4" ÷ 3"
Nozzle diameter		6 ÷ 70 mm	6 ÷ 50 mm
Maximum Testing Pressure		35 bar	10 bar
Backpressure	built-up	10 bar	10 bar
	superimposed	8 bar	6 bar
Flow capacity		0.05÷8 kg/s	1÷80 kg/s
Flow measurement method		sonic flow nozzle and sharp-edged orifice plate	electromagnetic flow-meter

PARCOL's Specialties – SAFETY DEVICES

Testing laboratories – NATIONAL BOARD (NBTL)

Parcol Safety Valves during Provisional Tests at "National Board Testing Laboratories" in Worthington, Columbus, OH

DN 2" J 3" during testing with steam

DN 1½" H 3" during testing with water

DN 2" J 3" during testing with nitrogen

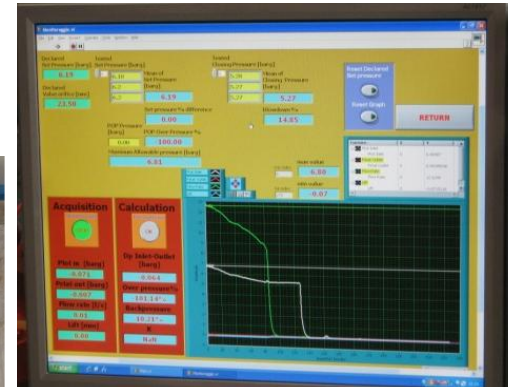
THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

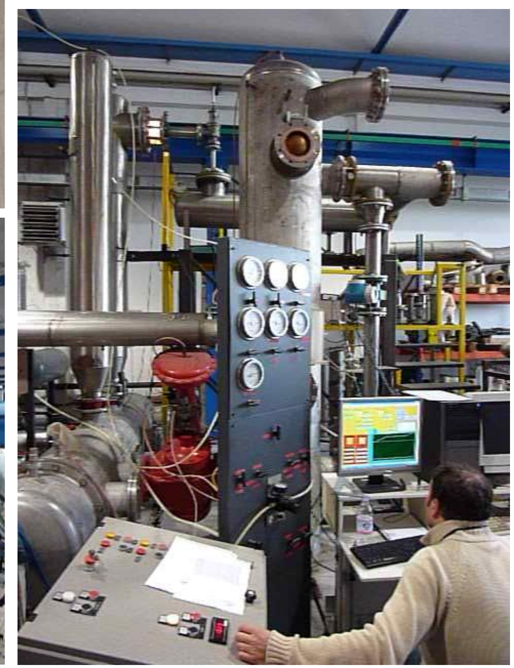
Testing laboratories – Politecnico di Milano (LFM)

Parcol Pressure Safety Relief Valves during Discharge Test at "Fluid-dynamics of Turbo-machines" Laboratories (LFM) at "Politecnico di Milano" University

POLITECNICO DI MILANO

DN 2" J 3" during testing with air





DN 1½" G 2½" during testing with water

Required marking on identification plate

ASME VIII-1	ISO 4126-1	PED
- the name of the manufacturer; - manufacturer's design or type number; - NPS size (DN) (the nominal pipe size of the valve inlet); - set pressure, and, if applicable, cold differential test pressure; - certified capacity (as applicable): ▪ kg/h of saturated steam at an overpressure of 10% or 0.2 bar, whichever is greater <u>for valves certified on steam</u>; ▪ l/min of water at 20°C at an overpressure of 10% or 0.2 bar, whichever is greater <u>for valves certified on water</u>; ▪ kg/min of air at an overpressure of 10% or 0.2 bar, whichever is greater <u>for valves on compressible fluids other than steam</u>. - year built; - the Certification Mark with the UV Designator placed under the Mark; - the National Board Mark (valves series certified at National Board Testing Laboratories only).	- set pressure in barg (or other internationally recognized unit); - reference standard (ISO 4126-1:2013); - manufacturer's series/type identification number; - certified derated discharge coefficient (K_{dr}), indicating the reference fluid (*G* for gas, *S* for steam, *L* for liquid). Example: *0.9 x 0.945 – S;* - flow area in square millimetres (or other internationally recognized unit); - lift minimum value, expressed in mm, and related overpressure (expressed, for example in percentage of set pressure); - cold differential test pressure (if applicable) in barg (or other internationally recognized unit); - serial number or alternative coding to indicate year of manufacture.	- CE marking and identification code of Notified Body certifying the PED applied Module; - the manufacturer name and its address or other means of identification of the manufacturer; - year of manufacture; - valve type or series; - serial number; - temperature ***minimum*** values: those mentioned within the classes of materials (e.g.: -20°C for C steel, +20°C for CrMo steel etc.) or defined by Technical Dept. for Client's specific applications; - pressure and temperature ***maximum*** values: ▪ <u>in case of no more limiting conditions than those defined by materials rating</u> of pressure containing parts, the indication of rating and manufacture material is adequate; ▪ <u>in case of more limiting conditions</u>, due for example to the presence of non-metallic materials, their pressure and/or temperature maximum limits shall be defined; for example, the maximum temperature assuring the seals integrity shall to be indicated.

Typical identification plates

Typical for ASME Stamp

PARCOL
Canegrate
Italy

Year: **2016**
Serial N: **S0000xxxx**
Type: **3-5433**

UV (1)

NPS: **3" x 4"**
Rating: **ANSI 300 x ANSI 150**
Set pressure: **20 bar**
Overpressure: **10%**
Cold differential test pressure: **-**
Cert. capacity: **545 kg/min**
Temp. min: **0 °C** max: **200 °C**
Kdr = **0.9 x 0.975 – G**
Body: **SA-216 WCB**
Nozzle: **316**
Disc: **316**
Spring: **carbon steel**
Orif.: **L 21.1 cm2**
Tag: **xxxxxxxxxxxx**

NB (1)

Space for supplementary marking (i.e.: CC, bp, CE, ATEX, when applicable) (2)

1) *Marking by punching*
2) *CC = ASME Code Case; supplementary requirements by Client, if any (e.g.: bp = backpressure)*

Example: application of Code Case 2203

Lifting lever is mandatory on air, water over 60 °C and steam service. According to Code Case 2203, lifting lever can not be provided, but only with written approval by Customer.
Reference to Code Case shall be present on valve identification plate.

Typical for CE and ATEX marking

PARCOL
Canegrate
Italy

Year: **2016**
Serial N: **S0000xxxx**
Type: **3-5433**

NPS: **3" x 4"**
Rating: **ANSI 300 x ANSI 150**
Set pressure: **20 bar**
Overpressure: **10%**
Cold differential test pressure: **-**
Cert. capacity: **32 710 kg/h**
Temp. min: **0 °C** max: **200 °C**
Kdr = **0.9 x 0.967 – G**
Body: **SA-216 WCB**
Nozzle: **316**
Disc: **316**
Spring: **carbon steel**
Orif.: **L 21.1 cm2**
Tag: **xxxxxxxxxxxx**

Ex **II 2 G T6X**

CE **xxxx** (1)

1) *Identification code of Notified Body certifying the Module D or the Module F*

PARCOL's Specialties – SAFETY DEVICES

Certificates

The American Society of Mechanical Engineers

ASME UV

CERTIFICATE OF AUTHORIZATION

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the certification mark and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this certification mark shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY: PARCOL S... Via Isonz... Canegrate (M... Italy

SCOPE: Manufacture of pressure vessel pressure re...

AUTHORIZED: January 15, 2016
EXPIRES: December 12, 201...
CERTIFICATE NUMBER: 47,537

Board Chair, Confo...
Director, Conformity...

THE NATIONAL BOARD OF BOILER & PRESSURE VESSEL INSPECTORS

Certificate of Authorization

NB

This is to certify that
PARCOL S.p.A.
Nameplate Abbrev.: PARCOL
Via Isonzo 2
Canegrate (MI), 20010
ITALY

is authorized to apply the "NB" mark to specified PRESSURE RELIEF DEVICES in accordance with the provisions of the National Board. The scope of Authorization is limited to National Board Certified devices which have been manufactured, assembled and stamped with the following construction codes:

ASME Section VIII, Division 1: "UV" Stamp

ISSUE DATE: February 2, 2016
EXPIRATION December 12, 2017

Executive Director

PCL

CERTIFICATO
CERTIFICATE

Esame CE di tipo (Modulo B) secondo direttiva 97/23/CE
EC Type-examination (Module B) according to Directive 97/23/EC

Certificate No.: TIS-PED-MI-09-04-048009-3460 Rev.001

Nome ed indirizzo del costruttore: PARCOL S.P.A.

Milano, 04/05/2011

CERTIFICATO
CERTIFICATE

L'Ente di Certificazione TÜV Italia Srl
Organismo Notificato Pressure Equipment Directive
The Certification Body of TÜV Italia Srl
Pressure Equipment Directive Notified Body

certifica che
certifies that

PARCOL S.P.A.
Via Isonzo 2
I - 20010 CANEGRATE (MI)

ha realizzato, gestisce e mantiene un sistema qualità come descritto nella Pressure Equipment Directive (97/23/CE) Allegato III Modulo D
has implemented, operates and maintains a quality system as described in the Pressure Equipment Directive (97/23/EC) Annex III Module D

per il seguente campo di applicazione
for the scope

Safety valves series 3-5300 and 3-5400
Dwg: 3-5300P001 Rev.11, 3-5300P002 Rev.5, 3-5360P002 Rev.2, 3-5300P005 Rev.8, 3-5300P023 Rev.4, 3-5300P025 Rev.18, 3-5360P005 Rev.4, 3-5360P023 Rev.1, 3-5400P002 rev.7, 3-5400P003 Rev.5, 3-5402P002 rev.2, 3-5402P003 rev.2, 3-5402P002 Rev.4, 3-5403P003 Rev.4, 3-5403P004 Rev.4

Il rapporto finale No. AR-TIS-PED-MI-15-03-048009-12175 comprova che il sistema qualità soddisfa i requisiti della Pressure Equipment Directive (97/23/CE)
Evidence that the quality system satisfies the Pressure Equipment Directive (97/23/EC) requirements is documented in Assessment Report No.: AR-TIS-PED-MI-15-03-048009-12175

Il produttore è pertanto autorizzato ad apporre sull'attrezzatura a pressione, nell'ambito del suddetto campo di applicazione del sistema qualità, il seguente numero identificativo dell'Organismo Notificato (marchio CE come illustrato)
The manufacturer is, therefore, authorized to provide the pressure equipment manufactured within the scope of the assessed quality system with the below listed Notified Body identification number (following the product's CE marking as illustrated):

CE 0948

Certificato No. / *Certificate No.*: PED-0948-QSD-441-15

Data emissione: 14/05/2015
Data Prima Emissione: 14/05/2015
Data Scadenza: 13/05/2018

Organismo Notificato No.: 0948
Notified Body No.: 0948
Gennaro Oliva
Industrie Service Division Manager

TÜV Italia • Gruppo TÜV SÜD • Via Carducci 125, Pal. 23 • 20099 Sesto San Giovanni (MI) • Italia • www.tuv.it

Many thanks for Your kind attention

fabio.rampini@parcol.com
Engineering and Development

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