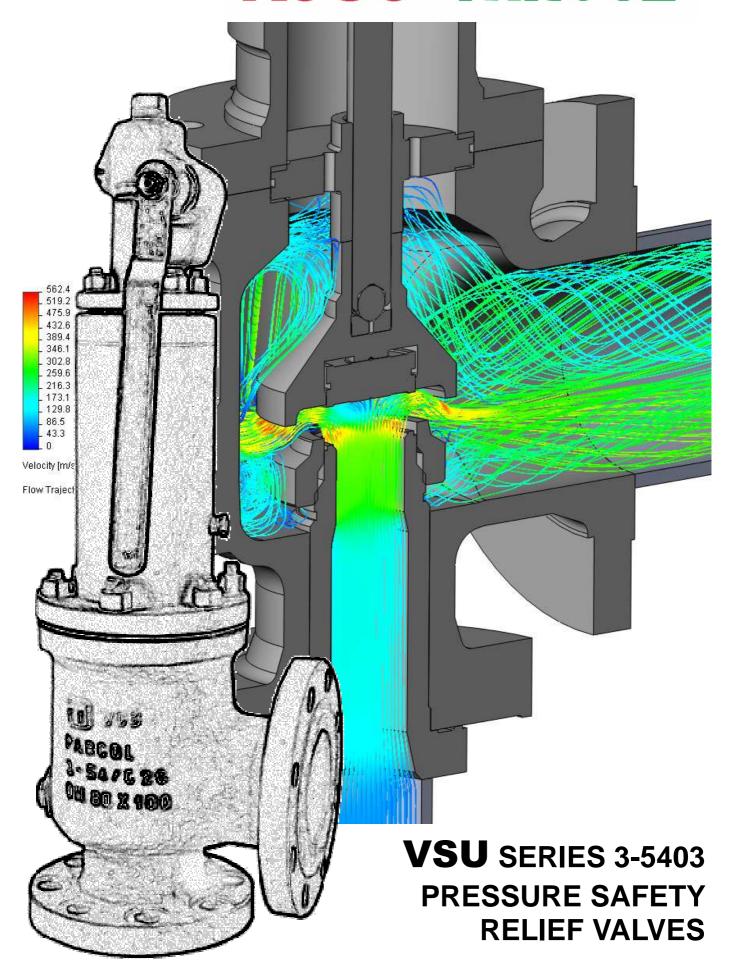
# KOSO PARCOL







Parcol 3-5483 tested on air (above) and on water (left). [Laboratories of Fluiddynamics of turbomachines, Energy Department, Politecnico di Milano, Italy]

The new series VSU 3-5403 universal pressure safety relief valves represents the third step in evolution of the first series 3-5401 dated 1989. The new series geometry is moulded by demanding experimental tests campaign supported by CFD and FEM analyses. Experimental tests, both on compressible (air) and incompressible (water) fluids, with and without back pressure, were performed according to PED requirements (standard ISO 4126-1 and working draft ISO 4126-11).

With respect to previous series VSU 3-5402, the new series still provides high quality overpressure protection *with the same valve* on gas, steam, vapour, liquid and two-phase mixtures services and, in addition, *offers dramatic improvement* of discharge flow rates under back pressure conditions.

#### Features and benefits

- PED marking
- full nozzle design, threaded at top, ensures better nozzle/body alignment
- internal body shape, design and dimensions are particularly studied to reduce built-up back pressure and to avoid damages to balanced bellows during fluid discharge
- excellent body drain for any application
- orifice areas fully meet the interchangeability criteria as per standard API 526.

### **Options**

On request all valves can be equipped with softseal, sealing surface washing, nozzle and/or body washing and/or jacketing, lifting lever and test gag. Auxiliary balanced piston and/or bellows protection can be supplied on balanced bellows valves.

Also available on request:

- ATEX marking
- special materials (included compliance to standard NACE MR0175)
- valve sizing according to standard API 520 Part I (using API 520 coefficients and API 526 effective discharge areas)

# VSU SERIES 3-5403 PRESSURE SAFETY RELIEF VALVES

Universal Safety Relief Valves Series 3-5403 are basically designed and manufactured in two versions:

- model 3-5433, conventional type;
- model 3-5483, balanced bellows type.

The conventional type valves are suitable for applications with low built-up back pressure (also in combination with constant superimposed back pressure) while balanced bellows types are specifically designed for high demanding back pressures applications.

When back pressure is present at valve outlet it is well known that discharge capacity can be dramatically influenced and correct valve selection shall be done.

Back pressure can be built-up and/or superimposed (constant, variable or both).

The built-up back pressure is the increase in pressure at valve outlet as a result of the opening of the safety valve itself.

The discharge coefficients for 3-5433 type conventional valve with built-up back pressure are given in figure 1.

The discharge coefficients for 3-5483 type valve with balancing bellows and built-up back pressure are the same shown in figure 2 for superimposed back pressure.

The superimposed back pressure is the static pressure at

The superimposed back pressure is the static pressure at the outlet of a pressure relief valve at the time it is required to operate. It is the result of pressure in the discharge system coming from other sources and may be constant or variable.

When back pressure is constant and the safety relief valve is not provided with balanced bellows, it is necessary to decrease the set pressure value of the same amount of back pressure.

When back pressure is variable a 3-5483 type valve with balancing bellows shall be used: the discharge coefficients as function of back pressure are given in figure 2.

The balanced bellows also avoids that highly corrosive, fouling and toxic fluids or high viscous liquids come in contact with sliding parts, spring and bonnet, ensuring longer trouble-free valve life.

Two versions are available for bonnet: open and closed (tight) type. Open bonnet is normally used for valves discharging clean, no toxic fluids (i.e. air and steam) to atmosphere and when the discharge temperature exceeds the temperature limits for spring with closed bonnet. In case of bellows and closed bonnet, this last one is vented to atmosphere through a suitable screwed hole in order to quarantee a correct bellows operation.

#### **TECHNICAL DATA**

#### Model 3-5433 Conventional type

Service	Gas	Liquid	Alternate discharge	Gas/liquid mixture
overpressure (1)	10%	10%	10%	10%
K (2) (3) (4)	0.967	0.751	0.967 / 0.751	(6)
max back pres- sure (5)	21%	14%	21% / 14%	(6)

#### Model 3-5483 Balanced bellows type

Service	Gas	Liquid	Alternate discharge	Gas/liquid mixture	
overpressure (1)	10%	10%	10%	10%	
K (2) (3) (4)	0.980	0.789	0.980 / 0.789	(6)	
max back pres- sure (5)	65%	60%	65% / 60%	(6)	

- (1) Minimum value = 0.1 bar according to standard ISO 4126-1
- (2) Coefficients of discharge  $K_d$  for gas and  $K_L$  for liquid (corresponds to  $K_d$  of standard ISO 4126-1)
- (3) Value without back pressure. For corrected K values with back pressure refer to figures 1 and 2
- (4) For orifices D and E, K is, respectively for gas and liquid, 0.964 and 0.780 for model 3-5433 and 0.952 and 0.810 for model 3-5483
- (5) Evaluated as ratio between back pressure and relieving pressure (absolute values for gas; gauge values for liquid)
- (6) According to standard API 520 Part I, Annex C

Blowdown values are within the limits of standards ISO 4126-1 and API 520.

Minimum set pressure for valves model 3-5433 is 0.5 bar; for valves model 3-5483 it depends by orifice size.

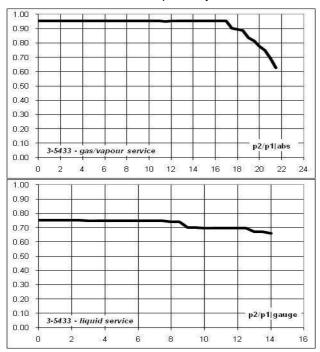
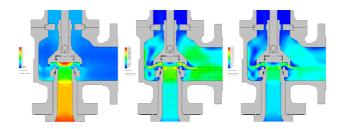


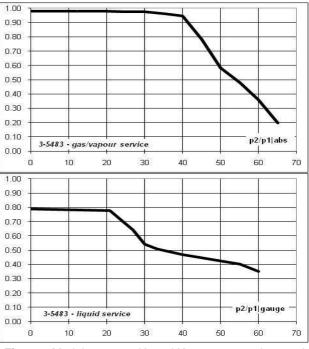
Fig. 1 – Model 3-5433 –  $K_D$  and  $K_L$  versus built-up back pressure

#### **TABLE of ORIFICES**

orifice	flow	flow	thrust	thrust	valve mir	nimum lift
type	diameter	area	diameter	area	3-5433	3-5483
-	mm	cm <sup>2</sup>	mm	cm <sup>2</sup>	mm	mm
D	10.2	0.82	11.5	1.04	4.0	-
D(a1)	10.2	0.82	18.5	2.69	-	4.5
E	13.6	1.45	15	1.77	5.0	-
E(a)	13.6	1.45	18.5	2.69	-	4.5
F	17	2.27	17.2	2.32	7.5	-
F(a)	17	2.27	24.3	4.64	-	4.8
G	23.5	4.34	24.3	4.64	10.3	12.3
Н	27.7	6.03	28.5	6.38	12.5	14.3
J	36.3	10.3	37.5	11.0	16.1	18.5
K	41.7	13.7	43.5	14.9	18.5	21.3
L	51.9	21.2	54	22.9	23.0	26.5
М	58.2	26.6	60.5	28.7	25.8	29.7
N	63.9	32.1	66.5	34.7	28.3	32.6
Р	77.6	47.3	79	49.0	34.4	39.5
Q	102	81.7	105	86.6	45.2	52.0
R	123	118.8	125	122.7	54.6	62.7
T	157	193.6	159	198.6	69.6	80.0
U	175	240.5	181	257.3	77.6	89.2



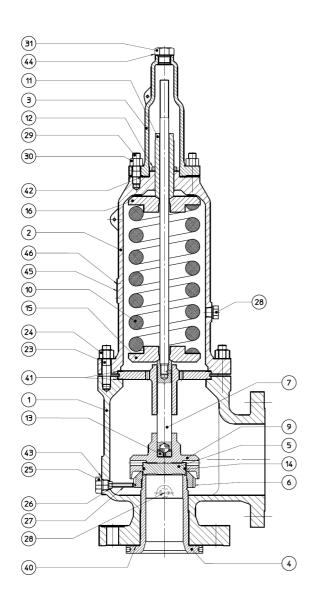
Pressure, velocity and Mach contours in a conventional safety valve during discharge simulation.

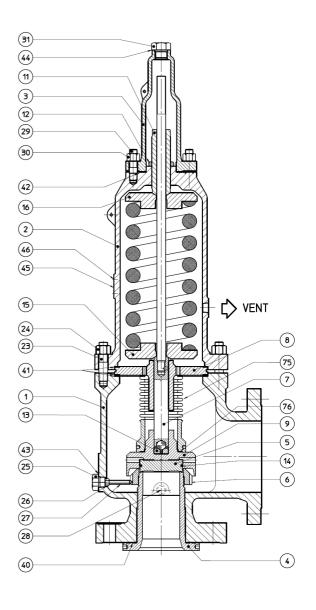


*Fig.* 2 – Model 3-5483 –  $K_D$  and  $K_L$  versus superimposed and built-up back pressure

# **3-5433 CONVENTIONAL TYPE**

# 3-5483 BALANCED BELLOWS TYPE





Item	Part name
1	Body
2	Tight bonnet
3	Сар
4	Nozzle
5	Disc
6	Adjusting ring
7	Stem assembly
8	Guide
9	Disc holder
10	Spring
11	Adjusting screw
12	Lock nut

Item	Part name
13	Pivoting bush
14	Retaining ring
15	Lower spring seat
16	Upper spring seat
23	Body stud
24	Nut
25	Plug
26	Nut
27	Adjusting ring set screw
28	Plug (not shown on body)
29	Bonnet stud
30	Nut

Item	Part name
31	Plug
40	Gasket
41	Gasket
42	Gasket
43	Gasket
44	Gasket
45	Name plate (not shown)
46	Name plate rivet (not shown)
48	Auxiliary piston
75	Bellows
76	Bellows gasket

#### **MAIN FEATURES**

**BODY** 

Construction: cast.

Sizes and

rating

see tables. Series according to standard API 526 with ANSI and EN ratings.

Connections: - flanged ANSI and EN. The nozzle raised face has a diameter matching with ANSI and EN standards but is greater in height (see table of dimen-

sions).

- socket welding ends in accordance with ANSI B 16.5 or screwed in accordance with ANSI B 2.1 up to size

1.1/2"x 3" included.

- lug type, lens-type seal or other connection type according to Customer's

standard available on request.

**Jackets** 

: for all valve bodies, jackets with ANSI

150 and PN 16 are available.

Inlet and outlet connections are NPT female screwed. Other types are op-

tional (socket weld, flanged).

Washing

: optionally, connections are supplied for the washing of the disc and nozzle seating surfaces. Connection may be

screwed or socket weld.

**NOZZLE** 

Construction: from bar stock or cast.

Mounting threaded and positively guided in the

body.

Jackets : an inner jacket is provided for fluids

which easily solidify.

Connections consist of two tapped holes in the nozzle flanges which are

thicker than the standard ones.

DISC

Construction: from bar stock.

: Co-Cr hard facing; others on request. Coating

Soft seal : rubber ring. Materials and limitations of

use supplied on request.

**BONNET** 

Construction: from bar stock or cast.

Realization : usually tight. Open bonnet for high tem-

perature service or on request.

: flanged on body. Mounting

CAP

Construction: from bar stock or cast.

Two types: plain or with lifting lever.

the plain caps up to 2" x 3" size in-Mountina

cluded are screwed on the bonnet.

Other caps are flanged.

Accessories : test gag; open-valve limit switch; plumb-

ing.

**DISC HOLDER** 

Construction: from bar stock or cast.

: holds the disc by means of an elastic Mounting

ring in the lower side; holds an hardened bush on which the ball of assembled stem pivots in the upper side.

STAINLESS STEEL BELLOWS

Construction: the upper part of the bellows is welded

on a disc clamped between body and bonnet; the lower part of the bellows is welded on a ring nut screwed on the

disc holder.

Diameters : the bellows thrust area equals the ori-

fice thrust area listed in table.

the maximum temperature for AISI 316L Application

: construction is 350 ℃. limits

The maximum pressure values are the

same of standard API 526.

Specific data are available on request.

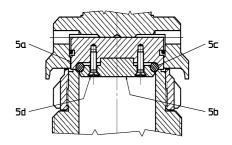
Accessories : bellows protection device; auxiliary pis-

ton. Supplied on request for particularly

heavy operating conditions.

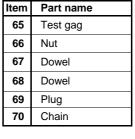
# **ACCESSORIES and SPARE PARTS**

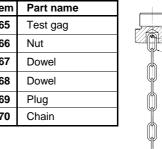
## SOFT SEAL

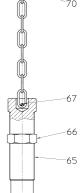


Item	Part name
5a	Disc
5b	Ring locking disc
5c	Sealing ring
5d	Screw

## LIFTING LEVER



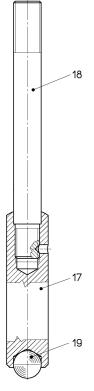




**TEST GAG** 

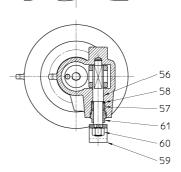
-68

#### STEM ASSEMBLY

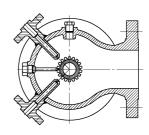


Item	Part name
17	Spindle
18	Stem
19	Ball

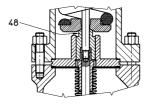
Item	Part name
51	Manual lift cap
53	Stop disc
54	Screw
55	Fork
56	Fork shaft
57	Packing
58	Packing end ring
59	Lever
60	Nut
61	Packing gland



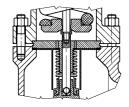
#### NOZZLE FLUSHING DEVICE







BELLOWS PROTECTION DEVICE

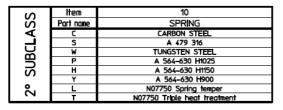


# **MATERIALS OF CONSTRUCTION**

ASS	ltem	Part name	Α	С	D	E	F	G	Н
⋖	1	BODY	SA 216 WCB	SA 217 WC6	SA 217 WC9	SA 217 C5	SA 352 LCB	SA 351 CF8M	SA 351 CF3M
=	- 4 - 5	NOZZLE DISC	SEE 1º SUBCLASS TABLE						
BASIC	6	ADJUSTING RING	SA 351 CF3M						
\$	9	DISC HOLDER		S41600 H	IARDENED 22	0-280 HB		A 479 316	A 479 316L
I 🚵	14	RETAINIG RING			SEE 1	SUBCLASS	TABLE	•	
	25	PLUG			SA 47	9 304			SA 479 316L
	26	NUT	A 479 304 A 479 316L						
ВООУ	27	adjusting ring locking screw	A 479 304 A 479 316L						
<u> </u>	28	PLUG			SA 47	9 304			SA 479 316L

	ltem	Part name	Α	С	D	E	F	G		
	2	BONNET	SA 216 WCB	SA 217 WC6		SA 217 C5	SA 352 LCB	SA 351 CF8M SA 351 CF8M		
		CAP								
	8	GUIDE			SEE 1º SUBC			_		
	10	SPRING			SEE 2° SUBC					
	11	adjusting screw		S41600 F	IARDENED 22			A 479 316		
	12	LOCK NUT				9 304				
	13	PIVOTING BUSH	SEE 1º SUBCLASS TABLE							
		SPRING SEAT		CARBON STEEL + ZINC COAT A						
	17	PUSH ROD		S41600 HARD				XM-19		
	18	STEM			IARDENED 23			A 479 316		
10	19	BALL	S	42000 HARDE		RC		9 316		
"		BODY STUD			93 B7			93 B8		
0)	24	NUT			194 4			194 8		
CLASS		BONNET STUD			93 B7			93 B8		
	30	NUT		SA 1	194 4		SA 1	194 8		
Ū		PLUG				9 304				
		GASKETS		T<300°C INOR			O°C GRAPHITI	Ε		
BASIC	42	CAP GASKET		NORGANIC COMPOUND						
<del></del>		GASKETS				0 316L				
0)		PLATE	-	A 240 304						
⋖	46	RIVET	-	0.44400 11400		INIUM				
$\mathbf{a}$	48 51	PISTON MANUAL LIFT CAP		S41600 HARD			A 4/5	XM-19 SA 351 CF8M		
	53	STOP DISC	-	CADDON	SA 216 WCB STEEL + ZIN			SA 479 316		
<b>⊢</b>	54	SCREW			(UNI) EN 208			A4 ISO 3506		
ш	55	FORK		0,0		1 CF3M		A4 130 3300		
BONNET	56	FORK SHAFT	1	S/1600 L	IARDENED 22			SA 479 316		
5		PACKING SEALING RING	-	34 1000 F		GRAPHITE		3A 4/9 310		
$\stackrel{\leftarrow}{\sim}$	58	PACKING END RING	1		A 479 316	GRAFILLE				
$\simeq$		LEVER	1	_	ARBON STEE	- 7NC COA	т			
Ш	60	NUT	1		SA 1					
	61	PACKING GLAND				79 316				
	65	TEST GAG			ARBON STEE		т			
	66	NUT			ARBON STEE					
	67	PIN	1			0 304	•			
	68	PIN		A 240 304						
	69	PLUG	1			9 304				
	70	CHAIN		NIC	HEL PLATED		EL			
	75	BELLOWS	1	A240 316L						
	76	BELLOWS GASKET		T<300°C INOR			O°C GRAPHITI	E		
	81	CENTERING RING			564-630 H90					
	82	BALL BEARING			ROMIUM STEE			NOT		
	83	UPPER SPRING SEAT		FORESEEN						

	Item	4	5	8	13	14
	Part name	NOZZLE	DISC	GUIDE	PIVOT BUSH	RETAINING RING
	01 02	SA 479 316	A 564-630 H900 A 479 316			
S	03	3A 4/9 JIO	A 479 316+stell.gr.6	A 564-630 H900	A 564-630 H900	
S	04 05	SA 479 316+stellite gr.6	A 564-630 H900 A 479 316+stell.gr.6			
∢	06		A 564-630 H1150			A 479 316
ΙJ	07 08	SA 479 316	A 479 316 A 479 316+stell.gr.6 A 479 316	S 21800		
<u> </u>	09	SA 479 316	A 564-630 H1150		(Nitronic 60)	
SUBCL	10 11	stellite gr.6	A 479 316+stellite gr.6	Fe43B + stell.gr.6	A 479 316+stell.gr.6	N07750
	12	SA 479 316	A 479 316+N10276	(T≤380°C)	_	
٠	13 14	SA 479 316 + N10276 SA 479 316L		A 479 316	C 24800	
	15	SA 479 316L+HVD1	HVD1	(T>380°C)	S 21800 (Nitranic 60)	A 479 316
	16 17	S31050 + HVD-1 N10276	N10276	A 479 316+Stell.		
1	18	N04400 / N04405	N05500			





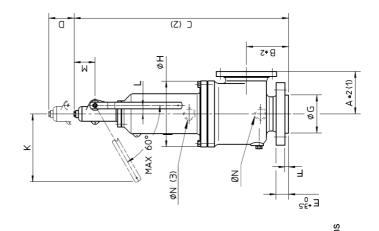
Parcol VSU standard construction with lifting lever



Parcol VSU with body steam jacketing

#### **OVERALL DIMENSIONS and MASSES**

			•	150	ĕ		16	9			10	24	1065	20	90				78	20	87	35		114	21
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			_	006			160				18	18	875	17			13	130	23			80		89	7
'n	.,	3-5433	×	909			100		0	ş					67	16				235	07		1/2"	71	76
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			ſ	900€	900		07	100			121		714		27		105	120							
			פ	2500			400																	63	99
		E E	H - 5	1500			250		300	07	171	156	713	150	73	16	95	95	196	235	07	73		09	63
2.	'n	3-5433	I	009	900		100	160			162	154	700		99								1/5	47	0
			I	300			70		150	16	7	130	591	0	36	14	-	0	0	2	-			0	
			_	150	300		16	40			127	136	297	130	75	16	6	10	16	16	32	5,		30	ř
		3-5483	I	150	300		16	40	150	16	124	130	269		34									31	E
		3-5483	E F(a)										581					3							
11/2	'n	3-5433	D-E	2500			007		300	07	165	140	579	130	9	14	73	88	160	165	32	51	1/2*	77	97
		3-5483	F(a) F	006	1500		160	250			-		2												Ī
				006			160				152	124	566		20			85						28	OE.
		3-5433	ט	150	300	900	16	6 5	150	16	121		627	110	38			88	136	06		77	3/8*	20	22
11/2"	2.	3-5433	D - E	006	1500		160	250	300	70	140	105	247	130	20	14	73	85	160	165	32	51	1/2"	33	£
		3-5483	F(a)	150	900	900	16	<b>9</b> 40	150	16	121	124	481	110	38			88	136	06		77	3/8	19	21
+	2.	3-5433 3-5483 8	D-E D(a1)-E(a) F(a)	150	300	900	16	40 10	150	16	114	105	777	110	35	12	20	68	136	06	32	44	3/8	16	18
		, é			ANSI			N <sub>O</sub>	ANSI	INO							ANSI	IND						Without lever	With laver
ntrata-inlet	scita-outlet	VALVOLA type	CIO - Orifice			ENTRATA	dring		IG USCITA ,	rating	٧	80	U	Q	ш	ш	Ų	9	I	¥	_	Σ	(NPT)	SBNZA LEVA-Without lever	CON I FVA-With lever



DN uscribo-outliery   S   S   S   S   S   S   S   S   S	DN entrata-Inlet	it.			.5				.9		,9	Ţ	.8		.8	10.
Figure   F	DN uscita-outle	ļi.			.9				.8		1		9		.71	12"
Figure	TPO VALVOLA				3-5433			ኢ	433		3-5	33	3-54		3.5433	3-5433
CIO   COMPIGE   Compige   CIO   COMPige   CIO   CIO	Valve type				3-5483			3-5	1483		3.5	83	3-54			3-5483
ANSI  Ans	ORIFICIO - Orific	Ce	₩-Т	Ь	N - W - T	Д	_	0 - R	0	œ	ы		1		T	Π
ANSI			009		006		1500	150	150	150	300	300	150	300	300	150
othogy   Mail   Mail	RATING ENTRATA	ANSI						300	0 0 0 0 0 0	900		009				300
NNS   NNS	Inlet rating		100		160		250	16	16	16	70	70	16	70	40	16
Name		<u>N</u>						40	40 100	40		100				40
F. column   F.	RATING USCITA	ANS			150			1	50		1	0	\$	0	150	150
	Outlet rating	N			16			,	16		1	,	16		16	16
$  \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	∢		210		222	254	222	2.	41		26		27	6	310	370
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	8			197		225	197	2,	40		24	0	27	9	301	340
F   F   F   F   F   F   F   F   F   F	J		1065		1129	1302	1129	1226	13,	8	1226	1348	141	- 5	1414	1600
	٥			220		260	220	220	26	0	220	260	26	0	260	300
F         ANSI         16         20         2	ш		95		79	79	71	9	69		9		,9		19	89
	4				16			2	0.7		2(	0	20		20	20
		ISNY			160			2	16		21	9	27	0	270	324
H   278   310   374   310   374   374   346   448	,	S			160			2	16		21	9	270	285	285	345
N NPT)   N NPT   N N	=		278		310	374	310	m	74		37	4	77	œ	448	520
L	×			370		510	370	370	51	0	370	510	51	0	510	650
National Parameters   105   123   105   123   105   123	_			87		62	87	87	.9	2	87	62	79		62	80
N NPT)	Σ			105		123	105	105	12	3	105	123	12	3	123	160
SBCA_LEN4-without lever	I'N N	)		1/2"		3/4"	1/2"	(1)	3/4"		3/		3/1		3/4*	3/4"
SBQA ENA-Without lever         1f1         120         135         175         146         230         260         250         280         355         365         365         365         365         360         400           CON LEVA-HITH lever         1f8         128         143         185         f54         240         270         260         290         370         380         400																
CON LEVA-With lever		A-Without lever	111	120	135	175	146	230	26	0	250	280	355	365	385	520
		A-With lever	118	128	143	185	154	240	27	0	260	290	370	380	400	540

NOTE In case of 3-5483 type valve equipped with auxiliary piston, contact Parcol Technical Department for mass and dimensions

1) When the outlet flange is RJ increase the dimension A of 6.5 mm for ANSI 150 and 8 mm for ANSI 300 2) The dimension C is the same both with standard cap and lifting lever 3) For 3-5483 type valve only

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